1982 ANNUAL REPORT ON AIR QUALITY IN THE STATE OF MAINE

Prepared by
Jeffrey C. Emery

Maine Department of Environmental Protection
Bureau of Air Quality Control
Division of Air Quality Services

Leighton E. Carver, Division Director
David E. Tudor, Bureau Director
Henry E. Warren, Commissioner

TABLE OF CONTENTS

TABLE OF CONTENTS (CON'T)

LIST OF TABLES

LIST OF FIGURES

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.

The majority of data now collected in the State is collected by industry. The Department 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.

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

Figure 1-1, which depicts the annual geometric means for total suspended particulates, shows a variety of improvements as well as a lack of improvement in some areas. As can be seen from the graphs all of the sites shown had a reduction in the annual geometric means for 1982. Bangor has shown a steady improvement over the last five years while the other sites with the exception of Presque Isle have shown improvements in 1981 and 1982. Most of the improvements shown have been due to control programs which have been implemented over the last few years.

Figure 1-2 indicates the sulfur dioxide trends at three sites with a long term history. Millinocket, which was declared a non-attainment area in 1979, has shown a steady significant decline in the annual average due to control measures and process changes. Portland and Madawaska appear to have shown some improvements but there does not appear to be any strong trend in that direction.

TABLE 1-1

NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Concentration
Particulates (TSP)	Annual Geometric Mean:	
	Primary	75 ug/m^3
	Secondary	60 ug/m^3*
	Twenty-Four Hour:**	
	Primary	260 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
Hydrocarbon	Three Hour**	160 ug/m^3

* = 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

Pollutant	Averaging Time	Concentration
Particulates (TSP)	Annual Geometric Mean	60 ug/m^3
	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*	.08 ppm(120 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

* = Not to be exceeded more than once per year.
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

POLLUTANT	REGIONS* 1	2	3	4	TOTALS
Total Suspended Particulates					
Annual Geometric Mean**					
State	1	2	1	1	5
Federal	0	0	0	0	0
Twenty-four Hour					
State	10	58	58	26	152
Federal	0	11	5	5	21
Lead					
Twenty-four Hour					
State	0	0	0	0	0
Federal	0	0	0	0	0
Carbon Monoxide					
One Hour	n/a	0	0	n/a	0
Eight Hour	n/a	0	0	n/a	0
Ozone					
One Hour					
State	154	58	19	0	231
Days					
Federal	6	1	0	0	7
Nitrogen Dioxide					
Annual Arithmetic Mean	0	0	n/a	n/a	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	7	7
Federal	0	0	0	2	2
Three Hour					
State	0	0	0	1	1
Federal	0	0	0	1	1

*Region 5 has not been included because there was no monitoring in this region during 1982.

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

FIGURE 1-1
FIVE YEAR TREND - TOTAL SUSPENDED PARTICULATES

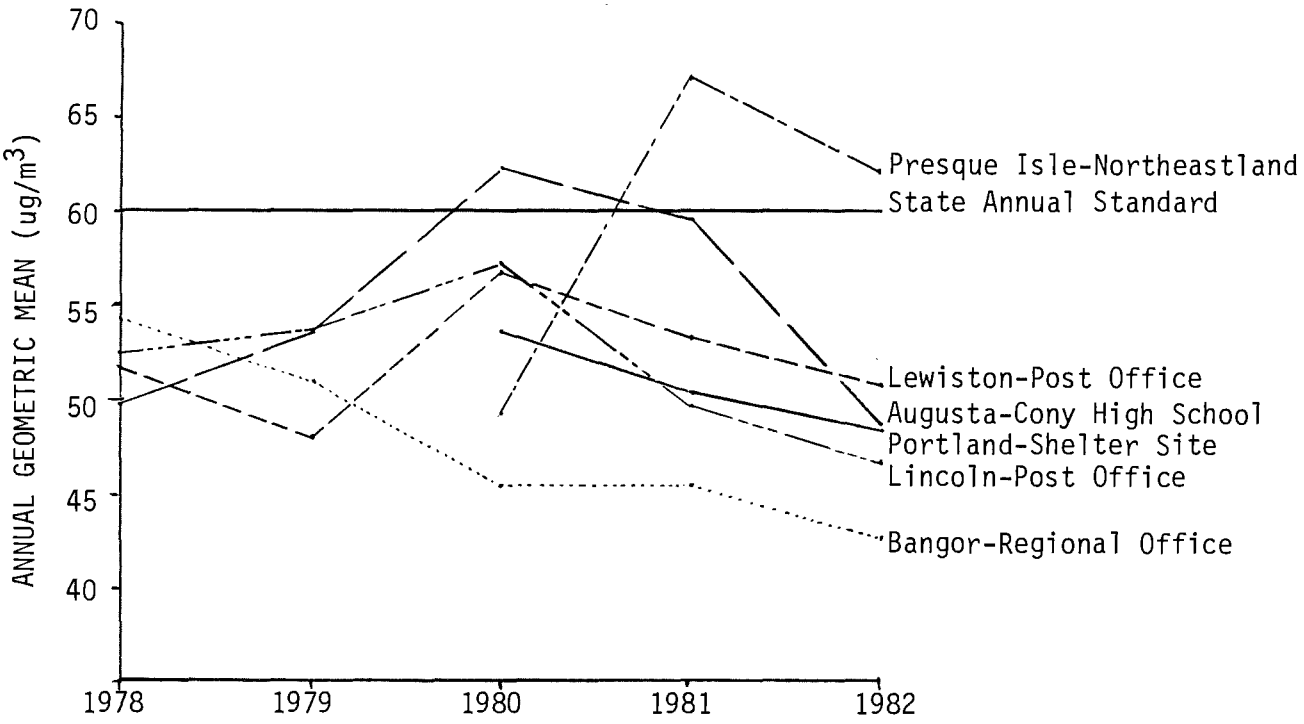


FIGURE 1-2
FIVE YEAR TREND - SULFUR DIOXIDE

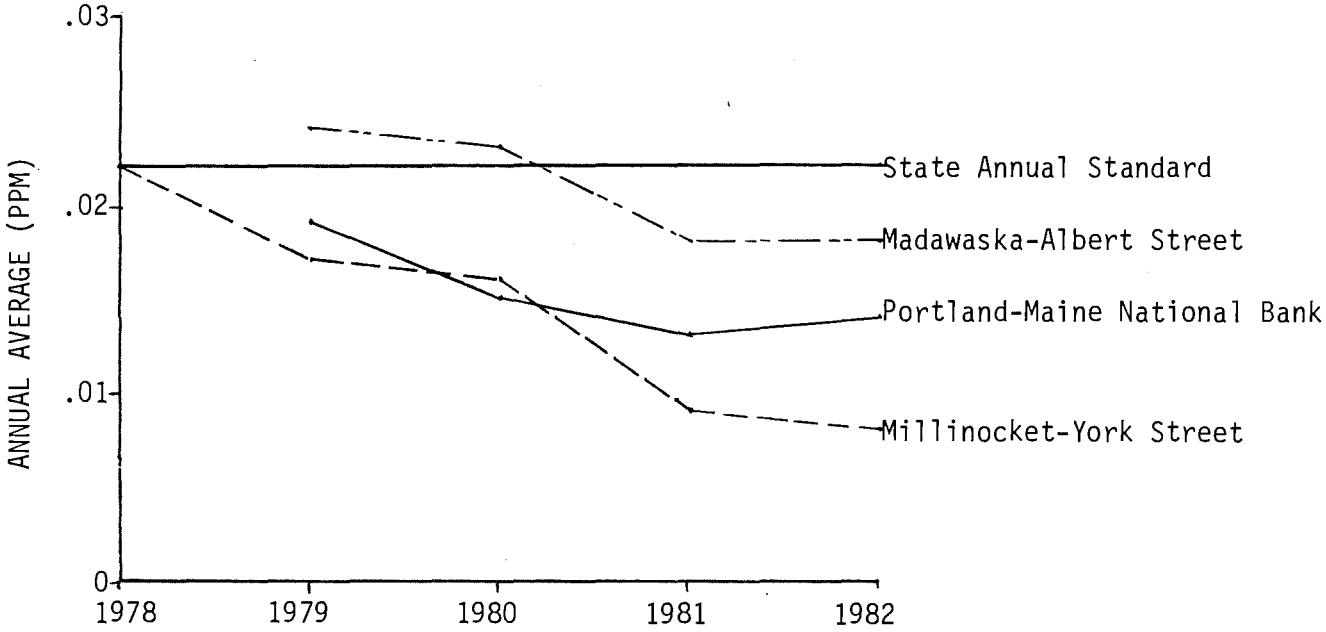


FIGURE 1-3
FIVE YEAR TREND - CARBON MONOXIDE

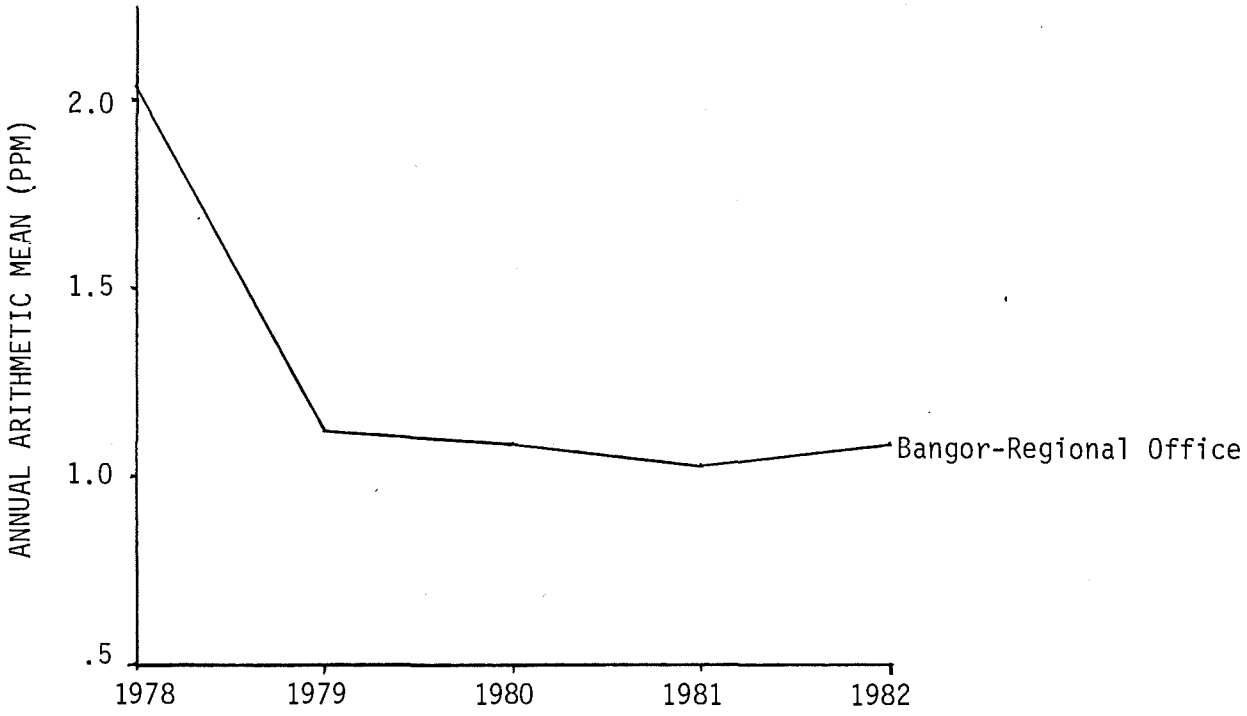


FIGURE 1-4
FIVE YEAR TREND - OZONE

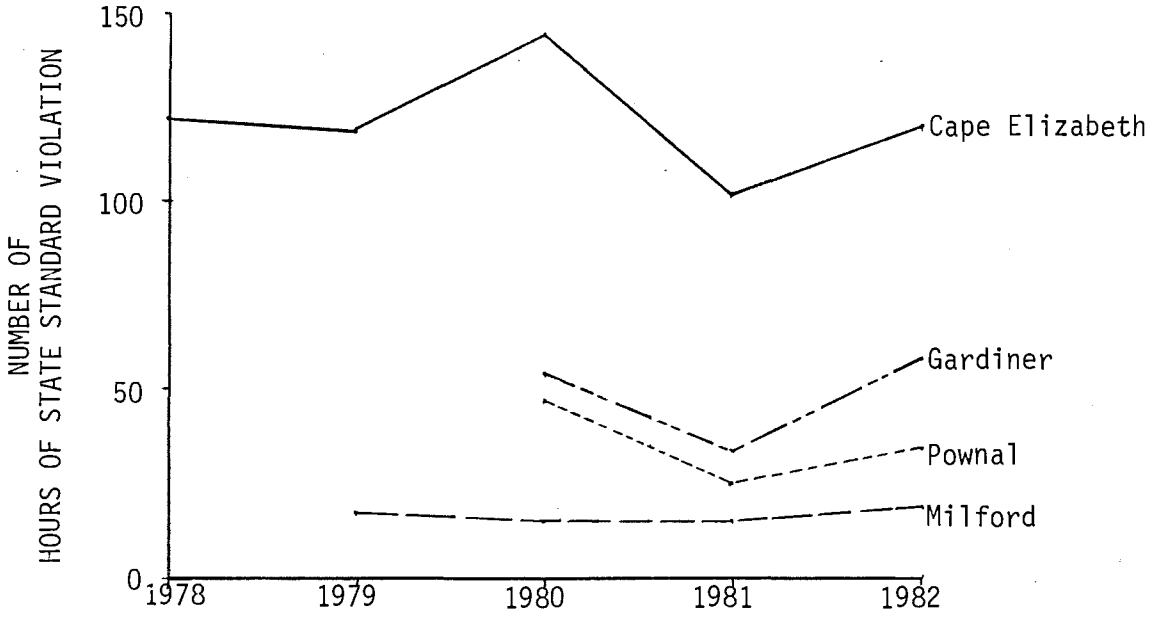


Figure 1-3 for carbon monoxide shows a very significant reduction in levels from 1978 to 1979 and then a fairly constant level since that time. It should be pointed out that this graph depicts annual averages whereas the carbon monoxide standards are for one hour and eight hour time periods.

Figure 1-4 depicts the number of hourly violations of the state ozone standard. The only result that can be pointed out from these sites is that there does not appear to be any improvement at any of the sites. Ozone is very dependent upon meteorological conditions and because of that the number of violations recorded each year is quite variable.

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

1.2 Monitoring Sites

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.

Continuous gaseous monitoring is done at forty-nine sites in Maine. Carbon Monoxide is monitored at two of these stations, ozone at eight, sulfur dioxide at forty, nitrogen oxides at two, hydrogen sulfide at two and hydrocarbons at one.

Particulate sampling is done at eighty-six sites in Maine. All of these stations monitor total suspended particulates. Two of these sites also collect fine particulate fractions. Also, lead monitoring is done at six stations. Eight of these sites are analyzed for sulfates although not all of them are on a regular basis. In addition to the above eighty-six sites there are two sites collecting acid rain data which are part of the state monitoring network.

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

Tables 1-4, 1-5, and 1-6 present all the monitoring sites in Maine and indicate which parameters are monitored at each site. The site numbers in the tables are two characters, a number and a letter. The number represents the Air Quality Control Region in which the site is located and the letter corresponds to the actual monitoring sites within the Regions. The map in Figure 1-5 shows the Air Quality Control Regions within the State and Figures 1-6 through 1-9 show the locations of the sites within the Regions.

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 1982 monitored data, 6) in the case of some pollutants, historical tables presenting 1982 data along with data for

TABLE 1-4

PARTICULATE POLLUTANTS MONITORING SITES

Site	Location	TSP	FP	Pb	SO_4	ACID RAIN
1-A	Biddeford/Biddeford Post Office	X				
1-B	Biddeford/Biddeford Treatment Plant	X				
1-Ba	Bridgton/Upper Ridge Road					X
1-C	Brunswick/NAS/Coastal Savings Bank	+				
1-D	Brunswick/NAS/Exchange	+				
1-G	Kittery/Greenfield Drive	+		+	+	
1-J	Portland/Congress Square	X				
1-K	Portland/Oxford and Elm Street Shelter Site	X		X		
1-L	Portland/Tukey's Bridge	0		X		
1-M	Portland/Mobil Station/Congress Street	+				
1-N	Portland/Perry Iron Works	0		+		
1-O	South Portland/SMVTI/Vocational Drive	X			X	
1-P	Westbrook/SD Warren/NET&T Company	X				
1-Q	Westbrook/Westbrook Police Dept.	X				
1-R	Westbrook/S.D. Warren/Research Bldg.	X				
1-T	Westbrook/SD Warren/Westbrook Hospital	X				
1-U	Westbrook/SD Warren/Park Road	X				
1-V	Westbrook/SD Warren/Warehouse #5/Main St.	X				
1-Z	Yarmouth/CMP/Cousins Island/Fairbanks Line	0				
1-AA	Yarmouth/CMP/Cousins Island/Shoreview Drive	0				
2-C	Auburn/Lepage Bakery/Second Street	X				
2-E	Augusta/Cony High School	X	+	X	X	
2-F	Augusta/Hartford Fire House	+				
2-H	Fairfield/Fairfield Post Office	-				
2-J	Hallowell/Stevens School	0	0		+	
2-K	Jay/IP/Weather Level I/Lagoon Hill	X				
2-L	Jay/International Paper/Crash Road	X				
2-M	Jay/International Paper/Jay Hill	X				
2-N	Jay/IP/Bracketts/Crash Road	-				
2-O	Jay/IP/Water Treatment Plant	-				
2-P	Jay/IP/Water Treatment Plant #2	+				
2-Q	Farmingdale/4800 Northern Avenue	+	+		+	
2-R	Lewiston/Post Office	X		X	X	
2-U	Madison/MP/Madison Municipal Bldg.	X				
2-V	Madison/MP/Coro Property/Pine Street	X				
2-X	Mexico/BC/Mexico Treatment Plant	X			X	
2-Y	Mexico/BC/Carter Residence/Harlow Hill Rd.	X				
2-AA	Mexico/BC/Labonville/Route #2	X				
2-BB	Mexico/BC/Mexico Pump House	-				
2-CC	Mexico/BC/Carver's Residence/Fourth Street	+				
2-DD	South Paris/Wilner Wood/Bessey Motors	0				
2-EE	So. Paris/Wilner Wood/Reilly Prop./Gary St.	0				
2-GG	Canton/IP/Kennetts Property/Cowhill Road	-				
2-MM	Rumford/BC/Rumford High School	-				
2-NN	Rumford/BC/Taylor Mountain I	+				
2-OO	Skowhegan/SD Warren/Hinckley School	X				

TABLE 1-4

PARTICULATE POLLUTANTS MONITORING SITES (CON'T)

Site	Location	TSP	FP	Pb	SO_4	ACID RAIN
2-PP	Skowhegan/SD Warren/Eaton Ridge	X				
2-QQ	Thomaston/Martin Marietta/Dexter Ave.	X				
2-RR	Thomaston/MM/Sanders Property/Old County Rd.	X				
2-SS	Thomaston/MM/Pease Property/Buttermilk Lane	X				
2-VV	Thomaston/Martin Marietta/Marsh Road	X				
2-XX	Brooks/Route #139-Ryan Property	0				
2-YY	Searsport/CMP/Sears Island	+				
2-ZZ	Waterville/Al Corey's Music Store	X				
3-A	Acadia National Park/McFarland Hill					X
3-B	Bangor/Regional Office/31 Central St.	X			X	
3-C	Bangor/Kenduskeag Pump Station	X		X		
3-D	Bangor/Bangor Daily News	X				
3-E	Bangor/BIA-Bldg. #487/Air Natn'l Guard	X				
3-F	Brewer/Fire Station/South Main St.	X				
3-G	Brewer/Brewer Junior High School	X				
3-H	Bucksport/St. Regis/Fire Station	-				
3-I	East Millinocket/GNP/Aeration Lagoon	-				
3-J	East Millinocket/GNP/Katahdin School	X				
3-L	Lincoln/LP&P/Vocational Education Bldg.	X				
3-M	Lincoln/LP&P/Lincoln Post Office	X				
3-N	Lincoln/LP&P/Katahdin Avenue Field	-				
3-P	Lincoln/LP&P/Thomas Motel Trailer Park	+				
3-R	Millinocket/GNP/Wastewater Treatment Plant	-				
3-S	Millinocket/GNP/York Street	X			X	
3-V	Millinocket/GNP/East Avenue	X			X	
3-X	Old Town/Marsh Island Apartments	X				
3-Y	Old Town/Penobscot Shoe Company	X				
3-AA	Newburgh/Newburgh Consolidated School	X				
3-BB	Milford/Diamond Intern'l/Shumway Field/	X				
3-DD	Woodland/GP/"D" Street	X				
3-FF	Woodland/GP/Secondary Treatment Pipeline	X				
3-GG	Woodland/GP/Woodland High School	X				
3-II	Woodland/GP/Chip-N-Saw Waferboard Mill	0				
4-A	Easton/JMH/Patterson Property/Station Rd.	-				
4-B	Fort Kent/Univ. Me. Fort Kent-Cyr Hall	+				
4-C	Madawaska/Fraser Paper/Madawaska High School	X				
4-E	Madawaska/Fraser Paper/Albert Street	X				
4-H	Presque Isle/Regional Office/634 Main St.	-				
4-I	Presque Isle/Skyway School/Industrial Park	-				
4-J	Presque Isle/Northeastland Hotel/436 Main St.	X		X	X	
4-K	Presque Isle/Steego Auto Parts/Maple St.	-				
4-L	Presque Isle/Creasey Ridge Road	X				

X = In operation through the year.
+ = Started operating during the year.
- = Discontinued operation during the year.
0 = Operated during part of the year.

TABLE 1-5

GASEOUS POLLUTANT MONITORING SITES

Site	Location	CO	O_3	SO_2	NO_x	HC	H_2S
1-B	Biddeford/Biddeford Treatment Plant			+			
1-E	Cape Elizabeth/State Park Shelter Site		0				
1-F	Pownal/Trailer Site/Post Office Prkg. Lot		0				
1-G	Kittery/Greenfield Drive			+			
1-H	Portland/Maine National Bank			X			
1-K	Portland/Oxford and Elm Street Shelter Site				0	0	
1-V	Westbrook/SD Warren/Warehouse #5/Main Street			+			
1-W	Westbrook/SD Warren/Duck Pond Road			+			
1-Y	Yarmouth/CMP/Spruce Point Road			-			
1-BB	Kennebunkport/Goat Island Lighthouse		0				
2-A	Anson/Madison Paper/Hilton Hill			+			
2-D	Auburn/Northeast Ethanol/Woodbury Hill			+			
2-I	Gardiner/Gardiner High School		0				
2-M	Jay/International Paper/Jay Hill	-		X			-
2-N	Jay/IP/Bracketts/Crash Road			X			
2-O	Jay/IP/Water Treatment Plant			X			-
2-S	Lewiston/Country Kitchen Prkg. Lot/Canal St.			X			
2-T	Lewiston/New England Telephone Bldg.			-			
2-Y	Mexico/BC/Carter Residence/Harlow Hill Rd.			X			
2-Z	Mexico/BC/Riverside Service Station			+			
2-CC	Mexico/BC/Carver's Residence/Fourth Street			+			
2-GG	Canton/IP/Kennetts Property/Cowhill Road		0	-	-		
2-HH	Rockland/MC/Rockland Treatment Plant			X			
2-JJ	Rockland/MC/Park Street Warehouse			-			
2-KK	Rockland/MM/Benner Hill			X			
2-MM	Rumford/BC/Rumford High School			-			
2-NN	Rumford/BC/Taylor Mountain			+			
2-QQ	Thomaston/Martin Marietta/Dexter Avenue			X			
2-UU	Thomaston/Martin Marietta/Swamp Site			X			
2-VV	Thomaston/Martin Marietta/Marsh Road			X			
2-WW	Thomaston/Martin Marietta/Route #1			X			
3-A	Acadia National Park/McFarland Hill		+				
3-B	Bangor/Regional Office/31 Central Street	X					
3-J	East Millinocket/GNP/Katahdin School			X			
3-K	Deer Isle/Harrison Marshall Prop./Sunshine Rd.		0				
3-M	Lincoln/LP&P/Post Office Building			X			
3-P	Lincoln/LP&P/Thomas Motel Trailer Park			X			
3-Q	Lincoln/LP&P/Fish Hill Base			+			
3-R	Millinocket/GNP/Wastewater Treatment Plant			X			
3-S	Millinocket/Great Northern Paper/York Street			X			
3-T	Millinocket/GNP/Westwood Street			-			
3-V	Millinocket/Great Northern Paper/East Avenue			X			

TABLE 1-5

GASEOUS POLLUTANT MONITORING SITES (CON'T)

Site	Location	CO	O_3	SO_2	NO_x	HC	H_2S
3-W	Millinocket/GNP/Municipal Waste Treatment Plant			+			
3-Z	Milford/St. Regis Stud Mill		0				
3-CC	Bradley/Buchanan Property/Main Street			-			
3-FF	Woodland/GP/Secondary Treatment Pipeline			X			
4-C	Madawaska/Fraser Paper/Madawaska High School			X			
4-E	Madawaska/Fraser Paper/Albert Street			X			
4-F	Madawaska/Fraser Paper/Sewage Treatment Plant			X			

X = In operation through the year.
+ = Started operating during the year.
- = Discontinued operation during the year.
0 = Operated during part of the year.
B = Integrated samples using bubbler box.

TABLE 1-6

METEOROLOGICAL MONITORING SITES

Site	Location	WS/WD
1-I	Portland/Cheverus High School	X
1-S	Westbrook/SD Warren Wind	X
1-X	Yarmouth/CMP/Cousins Island Meteorology	X
1-CC	Portsmouth/New Hampshire/Vaughn Street	X
2-B	Auburn/Lewiston-Auburn Airport	X
2-G	Augusta/State Airport-Governor's Hangar	X
2-K	Jay/International Paper/Weather/Lagoon Hill	X
2-W	Madison/Madison Paper/Abenaki Mill Parking Lot	X
2-FF	South Paris/Wilner Wood Products/Wilner Weather	O
2-GG	Canton/IP/Kennetts Property/Cowhill Road	X
2-II	Rockland/MC/Crocketts Point	X
2-LL	Rumford/BC/Boise-Cascade Weather/Route #2	X
2-TT	Thomaston/MM/Martin Marietta Weather/Route #1	X
3-E	Bangor/BIA-Bldg.#487-Air Natn'l Guard	X
3-H	Bucksport/St. Regis/Fire Station	X
3-J	East Millinocket/GNP/Katahdin School	X
3-K	Deer Isle/Harrison Marshall Property/Sunshine Road	O
3-O	Lincoln/LP&P/Lincoln Town Garage	X
3-U	Millinocket/GNP/GNP Company Office	X
3-EE	Woodland/GP/Georgia Pacific Mill	X
3-HH	Eastport/Pleasant Street	X
4-B	Fort Kent/Univ. Me. Fort Kent-Cyr Hall	+
4-D	Madawaska/Fraser Paper Co./Bridge Street	X
4-F	Madawaska/FP/Sewage Treatment Plant	X
4-G	Presque Isle/Regional Office/634 Main Street	X

X = In operation through the year.
+ = Started operating during the year.
- = Discontinued operation during the year.
O = Operated during part of the year.

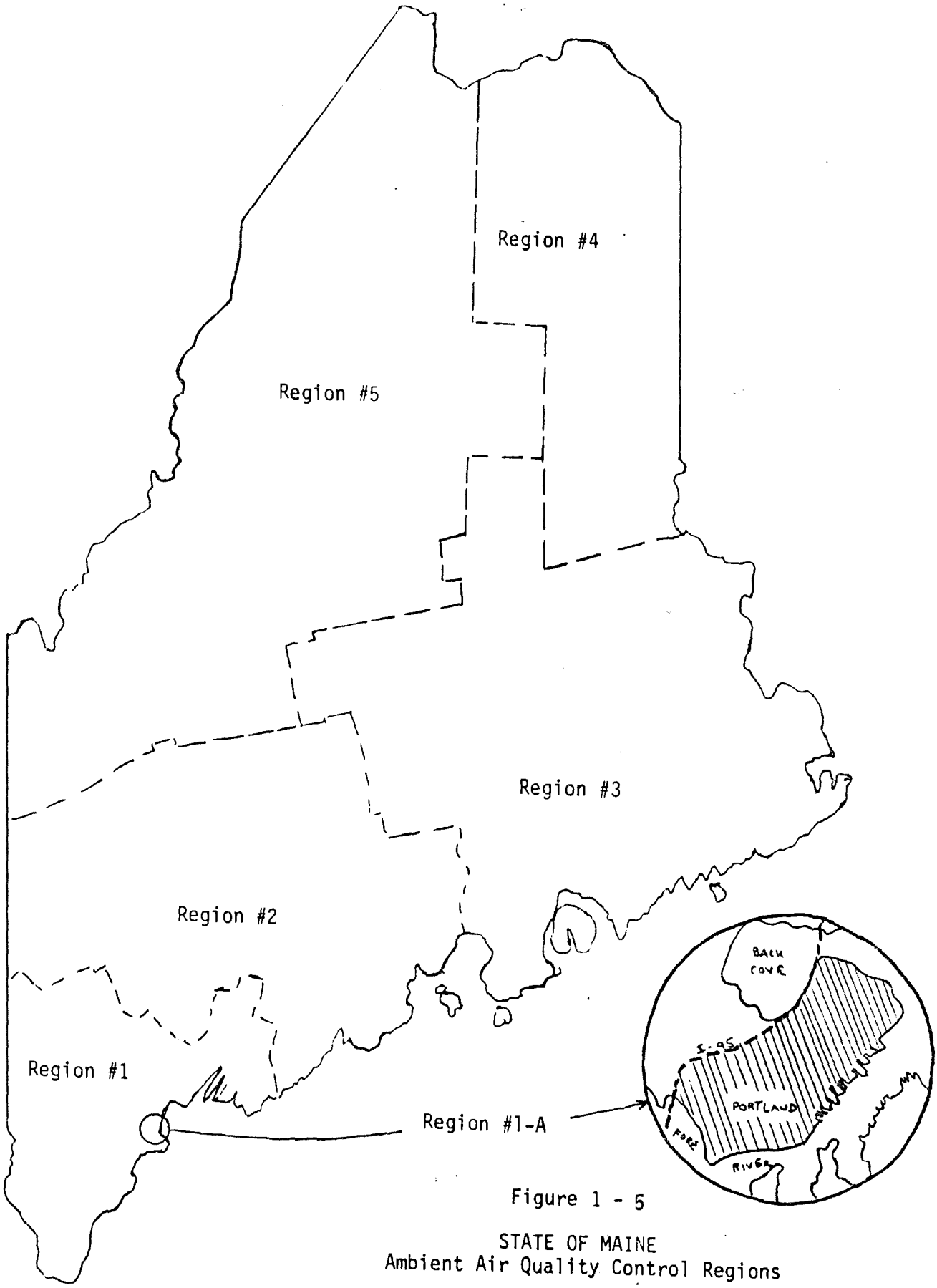


Figure 1 - 5

STATE OF MAINE
Ambient Air Quality Control Regions

FIGURE 1-6
AIR QUALITY MONITORING SITES
IN AIR QUALITY CONTROL REGION #1
AND REGION #1-A

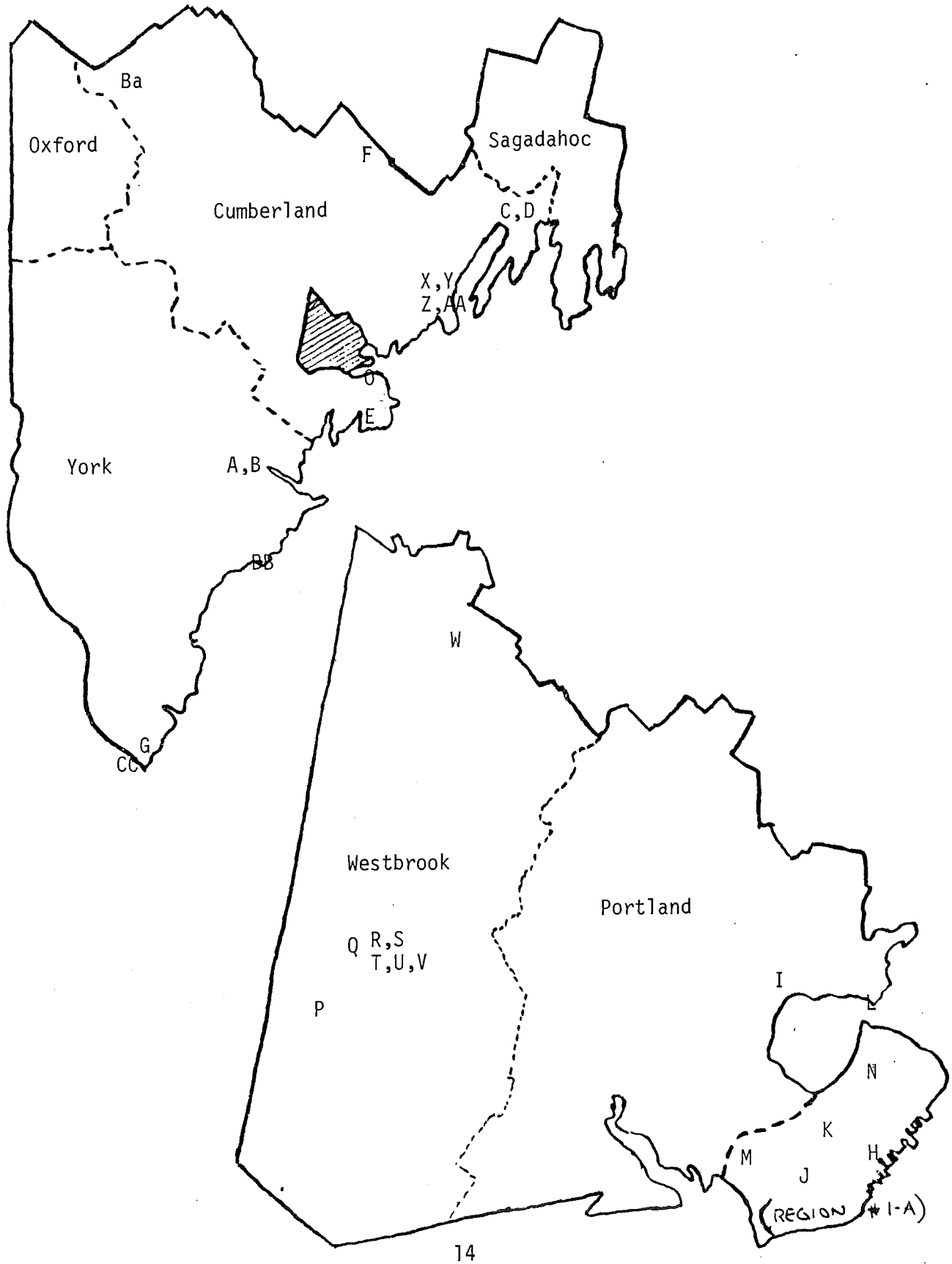


FIGURE 1-7
AIR QUALITY MONITORING SITES
IN AIR QUALITY CONTROL REGION #2

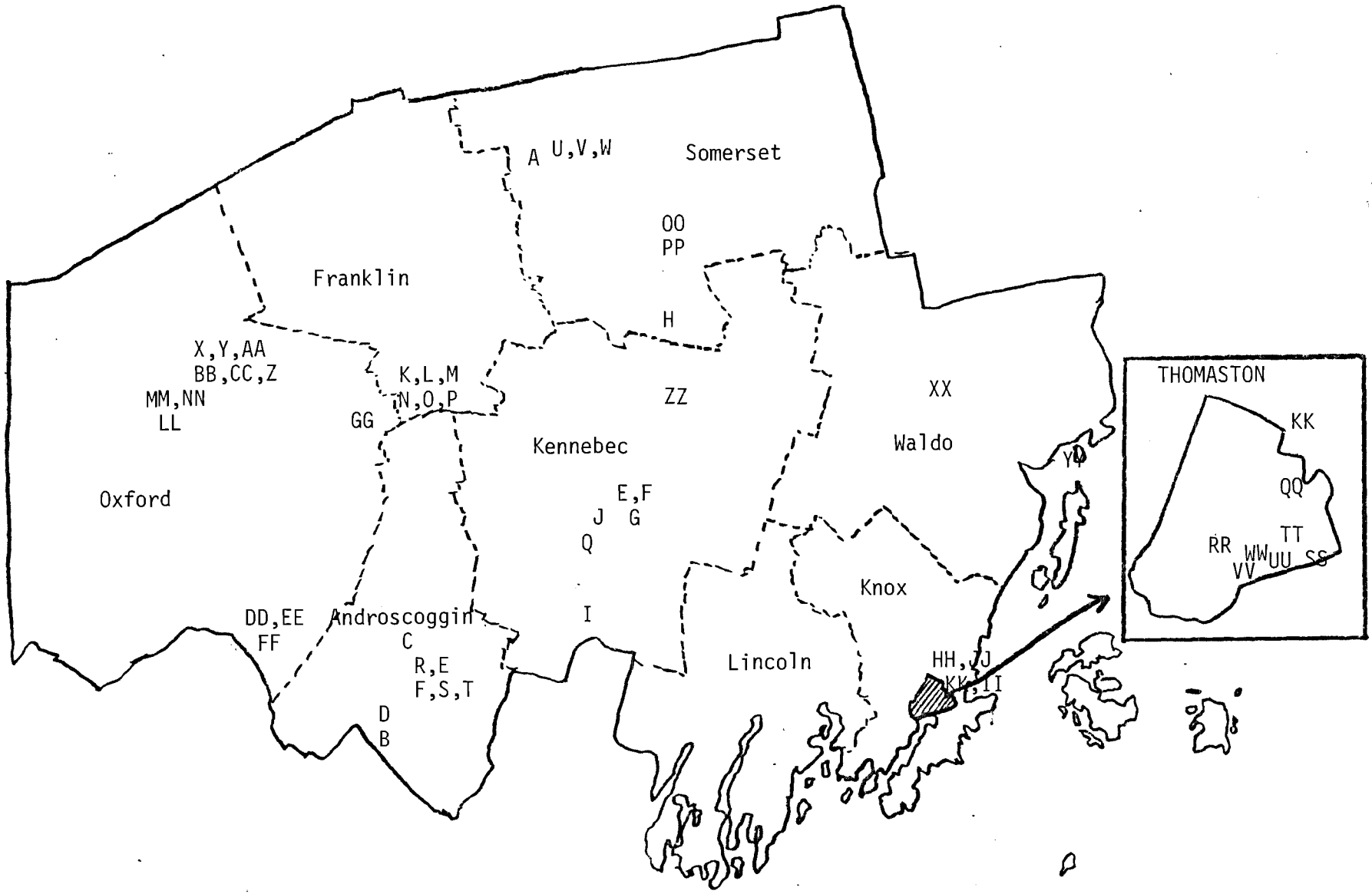


FIGURE 1-8
AIR QUALITY MONITORING SITES
IN AIR QUALITY CONTROL REGION #3

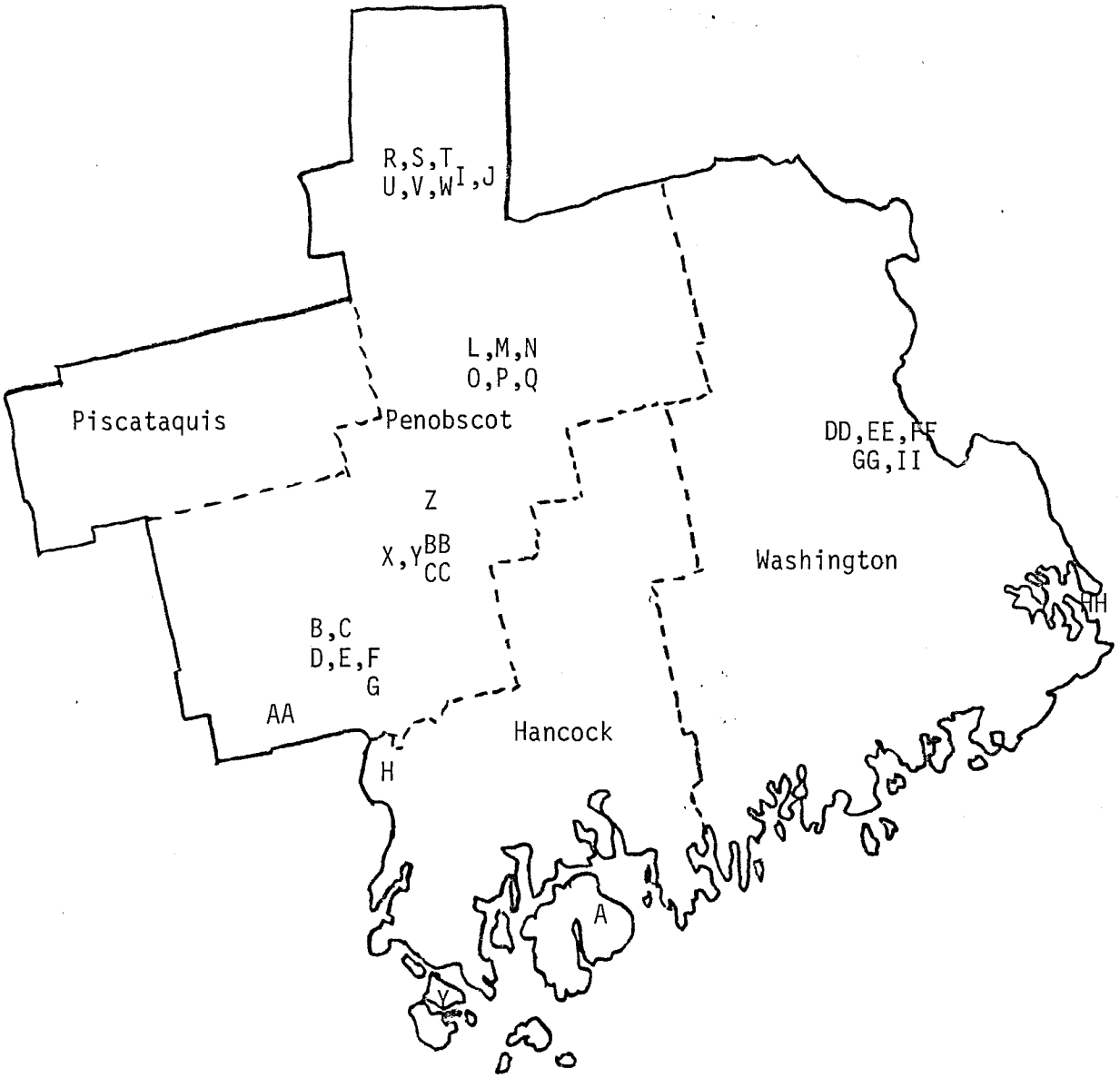
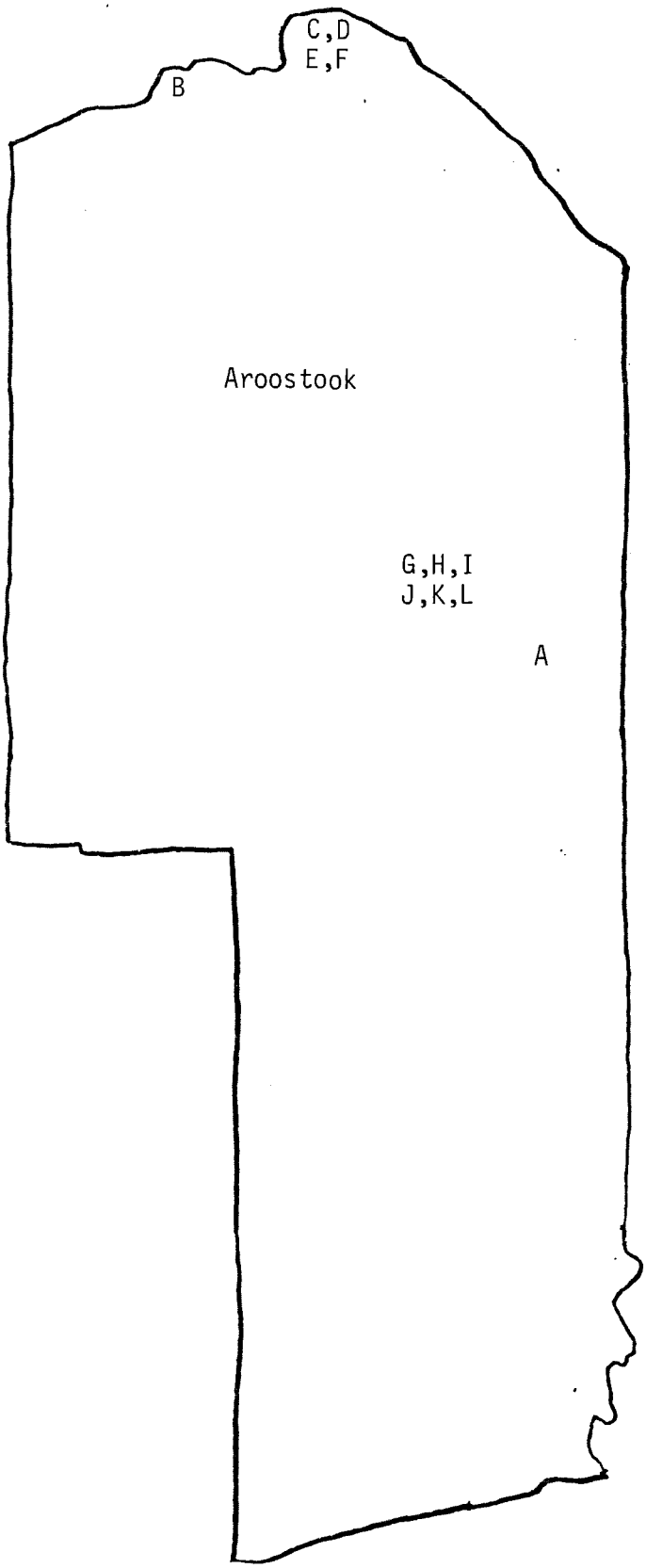


FIGURE 1-9
AIR QUALITY MONITORING SITES
IN AIR QUALITY CONTROL REGION #4



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 1982 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, TSP).

For pollutants that have short-term standards, the highest or the highest and second 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 1982 has been presented in the Data Summary Tables. However, in making comnparisons 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 1982 and those years prior to 1982 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. There may be data for some sites prior to what is presented in this report. That data has not been entered into the computer and therefore statistical summaries are not available. As more of the past data is entered into the computer, historical comparisons will be of more value in showing variations from year to year.

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 set 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 O_3 can be more reliably determined using the Trends Tables, than by looking at just the Historical Comparison Tables.

2. CARBON MONOXIDE (CO)

2.1 Description and Sources

Carbon monoxide is a colorless, odorless and tasteless gas. Therefore you do not even know you are breathing it until you feel its detrimental effects. It consititutes 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. Such has been the case in Bangor.

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 a 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 proposes to retain the existing primary 8-hour standard at 9 ppm and to lower the primary 1-hour standard to 25 ppm. The change in the 1-hour standard is being 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 monitored at two sites in Maine during 1982 using continuous monitoring equipment utilizing the non-dispersive infrared technique.

Tables 2-1 and 2-2 are the 1982 Data Summaries for CO. Table 2-1 presents 1-hour concentrations. Table 2-2 presents 8-hour average concentrations. Table 2-3 presents the CO Historical Comparison and Table 2-4 presents the CO trends.

TABLE 2-1

CARBON MONOXIDE

1982 DATA SUMMARY
(1-Hour Concentrations -- Parts Per Million)

SITE	LOCATION	% DATA RECOVERY	HIGHEST CONCENTRATION	SECOND HIGHEST	# OF VIOLATIONS
2-M	Jay/Jay Hill	61.2%	1.0	0.6	0
3-B	Bangor/Regional Office/31 Central Street.	96.4%	10.7	9.8	0

TABLE 2-2

CARBON MONOXIDE

1982 DATA SUMMARY
(8-Hour Concentrations -- Parts Per Million)

SITE	LOCATION	% DATA RECOVERY	HIGHEST CONCENTRATION	SECOND HIGHEST	# OF VIOLATIONS
2-M	Jay/Jay Hill	61.2%	0.4	0.4	0
3-B	Bangor/Regional Office/31 Central Street	96.4%	6.3	6.1	0

TABLE 2-3

CARBON MONOXIDE

HISTORICAL COMPARISONS
(8-Hour Concentrations)

SITE 3-B

Bangor Regional Office - 31 Central Street

YEAR	SECOND HIGH	# OF VIOLATIONS
1974	20.9 PPM	46
1975	14.6 PPM	48
1976	12.9 PPM	25
1977	13.7 PPM	24
1978	11.8 PPM	8
1979	6.2 PPM	0
1980	8.2 PPM	0
1981	7.2 PPM	0
1982	6.1 PPM	0

TABLE 2-4

CARBON MONOXIDE

TRENDS
(1-Hour Concentrations)

SITE 3-B

Bangor Regional Office - 31 Central Street

	PERCENTILES		
YEAR	10%	50%	90%
1978	0.0	1.3	5.2
1979	0.0	0.5	3.0
1980	0.0	0.5	3.2
1981	0.0	0.5	2.7
1982	0.0	0.7	2.8

3. OZONE (O_3)

3.1 Description and Sources

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

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

Ozone is not emitted directly from a source as are other pollutants. It forms as a secondary pollutant. Its 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 one-third of the ozone in the State of Maine is transported into the State from sources located outside the State. In addition one-third of the ozone is naturally occurring background concentrations, part of which is also transported into the State. The remaining one-third 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 O_3 is know to weaken materials such as rubber and fabrics.

3.3 Standards

The existing National Ambient Air Quality Standards (NAAQS) for ozone is 0.12 ppm and will be attained when "the expected number of days per calender year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one." This standard is new as of February 8, 1979 and replaces 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. The current State Standard is .08 ppm. It was established at the same time the original Federal Standard was established and has not been changed.

3.4 Monitoring

Ozone was monitored at eight sites in Maine during 1982 using continuous monitoring equipment of two kinds, either chemiluminescence or ultra-violet absorption analyzers. Maines' 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 1982 Data Summary for Ozone. Table 3-2 presents the Ozone Historical Comparisons and Table 3-3 presents the Ozone Trends.

TABLE 3-1

OZONE

1982 DATA SUMMARY
(Parts Per Million)

SITE	LOCATION	% DATA RECOVERY*	HIGHEST CONCENTRATION	SECOND HIGHEST	# OF VIOLATIONS STATE**	# OF VIOLATIONS FEDERAL***
1-E	Cape Elizabeth/ Shelter Site	46.8%	.142	.140	120	5
1-F	Pownal/Trailer Site	43.5%	.105	.105	34	0
1-BB	Kennebunkport/ Goat Island Light	31.0%	.126	.126	46	1
2-I	Gardiner/Gardiner High School	45.7%	.126	.122	58	1
2-GG	Canton/IP/Kennetts Property	37.5%	.113	.113	56	0
3-A	Acadia Nat'l Park/ McFarland Hill****	23.4%	.055	.055	0	0
3-K	Deer Isle/Harrison Marshall Property	26.4%	.125	.115	46	0
3-Z	Milford/St. Regis Stud Mill	39.3%	.105	.105	19	0

* Maximum data recovery based on ozone monitoring season is 50.0%.
** Total number of hours greater than .080 ppm minus one.
*** Number of days in violation.
**** This site became operational in October, 1982 and will remain in operation on a continuous basis.

TABLE 3-2

OZONE

HISTORICAL COMPARISONS
(1-Hour Concentrations)

SITE 1-E

CAPE ELIZABETH
Shelter Site

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1978	.160 PPM	122
1979	.155 PPM	119
1980	.178 PPM	144
1981	.122 PPM	101
1982	.140 PPM	120

SITE 1-F

POWNAL
Trailer Site

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1980	.123 PPM	47
1981	.116 PPM	25
1982	.105 PPM	34

SITE 2-I

GARDINER
Gardiner High School

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1980	.143 PPM	54
1981	.122 PPM	33
1982	.122 PPM	58

SITE 3-Z

MILFORD
St. Regis Stud Mill

YEAR	SECOND HIGH	# OF STATE VIOLATIONS
1979	.120 PPM	17
1980	.095 PPM	15
1981	.105 PPM	15
1982	.105 PPM	19

TABLE 3-3

OZONE

TRENDS
(1-Hour Concentrations)

SITE 1-E

CAPE ELIZABETH
Shelter Site

YEAR	PERCENTILES 10%	50%	90%
1978	.015	.035	.065
1979	.018	.036	.070
1980	.019	.035	.065
1981	.015	.032	.056
1982	.018	.036	.058

SITE 1-F

POWNAL
Trailer Site

YEAR	PERCENTILES 10%	50%	90%
1980	.004	.025	.052
1981	.003	.023	.049
1982	.005	.026	.048

SITE 2-I

GARDINER
Gardiner High School

YEAR	PERCENTILES 10%	50%	90%
1980	.008	.031	.056
1981	.009	.029	.050
1982	.009	.030	.053

SITE 3-Z

MILFORD
St. Regis Stud Mill

YEAR	PERCENTILES 10%	50%	90%
1979	.010	.025	.045
1980	.010	.030	.045
1981	.005	.025	.045
1982	.005	.025	.050

4. NITROGEN DIOXIDE (NO_2)

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 (NO_x) that are formed when nitrogen in the air combines with oxygen during high temperature combustion. Most of the rest of the NO_x 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 NO_x 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. NO_x also deteriorates fabrics and fades fabric dyes. Nitrate salts formed from nitrogen oxides have been associated with the corrosion of metals. Nitrogen oxides can also reduce visibility.

4.3 Standards

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

4.4 Monitoring

Nitrogen Dioxide was monitored at two sites in Maine during 1982 using continuous monitoring equipment.

Table 4-1 is the 1982 Data Summary for NO_2. Table 4-2 presents the NO_2 Historical Comparison.

TABLE 4-1

NITROGEN DIOXIDE

1982 DATA SUMMARY
(Parts Per Million)

SITE	LOCATION	% DATA RECOVERY	ANNUAL AVERAGE
1-K	Portland/Shelter Site*	24.5	.016
2-GG	Canton/IP/Kennetts Property	50.5	.003

TABLE 4-2

NITROGEN DIOXIDE

HISTORICAL COMPARISONS
(Annual Concentrations in PPM)

SITE	LOCATION	1980	1981	1982
1-K	Portland/Shelter Site*	.013	.029	.016
2-GG	Canton/IP/Kennetts Property	--	.004	.003

* This site operated only during the ozone season in 1982.

5. SULFUR DIOXIDE (SO_2)

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 is a short-term 24-hour average standard of .088 ppm not to be exceeded. The third is a short-term 3-hour average concentration of .439 ppm not to be exceeded.

5.4 Monitoring

Sulfur dioxide was monitored at forty sites in Maine during 1982 using continuous monitoring equipment utilizing either the pulsed fluorescent or coulometric methods.

Table 5-1 is the 1982 Data Summary for SO_2. Tables 5-2 and 5-3 present the SO_2 Historical Comparison Data.

TABLE 5-1

SULFUR DIOXIDE

1982 DATA SUMMARY
(Parts Per Million)

SITE	LOCATION	% DATA RECOVERY	MAX 3-HR	MAX 24-HR	ANNUAL AVERAGE
1-B	Biddeford/Biddeford Treatment Plant	90.6%	.166	.079	.013
1-G	Kittery/Greenfield Drive	3.1%	.011	.006	.002
1-H	Portland/Maine National Bank	92.8%	.110	.056	.014
1-V	Westbrook/SD Warren/Warehouse #5/Main St	89.3%	.085	.032	.008
1-W	Westbrook/SD Warren/Duck Pond Road	77.9%	.045	.019	.003
1-Y	Yarmouth//CMP/Spruce Point Road	34.5%	.118	.071	.005
2-A	Anson/MP/Hilton Hill	89.3%	.022	.012	.002
2-D	Auburn/NEE/Woodbury Hill	6.9%	.029	.014	.003
2-M	Jay/IP/Jay Hill	98.2%	.081	.026	.005
2-N	Jay/IP/Bracketts Crash Road	98.4%	.068	.025	.004
2-O	Jay/IP/Water Treatment Plant	94.7%	.158	.023	.004
2-S	Lewiston/Country Kitchen Parking Lot	90.7%	.096	.056	.010
2-T	Lewiston/New England Telephone Building	20.5%	.129	.056	.022
2-Y	Mexico/BC/Carter Res./Harlow Hill Rd.	89.5%	.122	.035	.005
2-Z	Mexico/BC/Riverside Service Station	77.9%	.140	.055	.010
2-CC	Mexico/BC/Carver's Residence/Fourth St.	28.5%	.134	.042	.010
2-GG	Canton/IP/Kennetts Property/Cowhill Rd.	97.3%	.126	.038	.005
2-HH	Rockland/MC/Rockland Treatment Plant	86.5%	.062	.029	.006
2-JJ	Rockland/MC/Park Street Warehouse	81.9%	.065	.045	.004
2-KK	Rockland/MM/Benner Hill	89.9%	.034	.016	.002
2-MM	Rumford/BC/Rumford High School	0.9%	.162	.054	.019
2-NN	Rumford/BC/Taylor Mountain I	52.4%	.225	.075	.016
2-QQ	Thomaston/Martin Marietta/Dexter Avenue	91.2%	.071	.030	.002
2-VV	Thomaston/Martin Marietta/Swamp Site	77.4%	.082	.024	.002
2-WW	Thomaston/Martin Marietta/Marsh Road	91.2%	.025	.016	.002
2-XX	Thomaston/Martin Marietta/Route #1	72.6%	.046	.015	.002
3-J	East Millinocket/GNP/Katahdin School	97.7%	.130	.072	.005
3-M	Lincoln/LP&P/Post Office Building	43.1%	.099	.073	.007
3-P	Lincoln/LP&P/Thomas Motel Trailer Park	38.1%	.092	.062	.005
3-Q	Lincoln/LP&P/Fish Hill Base	12.8%	.034	.009	.002
3-R	Millinocket/GNP/Wastewater Treatment Plant	98.8%	.160	.078	.010
3-S	Millinocket/GNP/York Street	97.3%	.141	.063	.008
3-T	Millinocket/GNP/Westwood Street	11.4%	.054	.025	.005
3-V	Millinocket/GNP/East Avenue	98.6%	.088	.030	.004
3-W	Millinocket/GNP/Municipal Wastewater Treatment Plant	14.1%	.037	.017	.003
3-CC	Bradley/Buchannan Property/Main St.	55.3%	.122	.022	.003
3-FF	Woodland/GP/Secondary Treatment Pipeline	89.2%	.155	.067	.004
4-C	Madawaska/Fraser Paper/Madawaska H. S.	94.9%	.273	.139	.007
4-E	Madawaska/Fraser Paper/Albert Street	95.0%	.705	.152	.018
4-F	Madawaska/FP/Sewage Treatment Plant	80.0%	.381	.083	.010

TABLE 5-2

SULFUR DIOXIDE

HISTORICAL COMPARISONS-MAXIMUM 24-HOUR CONCENTRATIONS

SITE	LOCATION	MAXIMUM 24-HOUR CONCENTRATIONS 1978	1979	1980	1981	1982
1-H	Portland/Maine National Bank	.065	.081	.068	.058	.056
1-Y	Yarmouth/CMP/Spruce Point Road	----	----	----	.029	.071
2-M	Jay/IP/Jay Hill	----	----	----	.021	.026
2-N	Jay/IP/Bracketts Crash Road	----	----	----	.024	.025
2-O	Jay/IP/Water Treatment Plant	----	----	----	.015	.023
2-S	Lewiston/Country Kitchen Parking Lot	----	----	----	.035	.056
2-T	Lewiston/New England Telephone Building	----	----	----	.043	.056
2-Y	Mexico/BC/Carter Residence/Harlow Hill Rd.	----	----	.034	.028	.035
2-Z	Mexico/BC/Riverside Service Station	----	----	.056	.080	.055
2-GG	Canton/IP/Kennetts Property/Cowhill Rd.	----	----	----	.031	.038
2-HH	Rockland/MC/Rockland Treatment Plant	----	----	----	.033	.029
2-KK	Rockland/Martin Marietta/Benner Hill	----	----	.021	.013	.016
2-MM	Rumford/BC/Rumford High School	----	----	.034	.034	.054
2-QQ	Thomaston/Martin Marietta/Dexter Ave.	----	----	.017	.026	.030
2-VV	Thomaston/Martin Marietta/Swamp Site	----	----	.012	.022	.024
2-WW	Thomaston/Martin Marietta/Marsh Road	----	----	.017	.010	.016
2-XX	Thomaston/Martin Marietta/Route #1	----	----	.011	.011	.015
3-J	East Millinocket/GNP/Katahdin School	----	----	.118	.077	.072
3-M	Lincoln/LP&P/Lincoln Post Office	----	----	----	.226	.073
3-R	Millinocket/GNP/Waste Treatment Plant	.211	.207	.264	.084	.078
3-S	Millinocket/GNP/York Street	.341	.303	.149	.092	.063
3-T	Millinocket/GNP/Westwood Street	.050	.048	.076	.052	.025
3-V	Millinocket/GNP/East Avenue	----	.156	.114	.044	.030
3-CC	Bradley/Buchanan Property/Main Street	----	----	----	.004	.022
3-FF	Woodland/GP/Secondary Treatment Pipeline	----	----	.037	.103	.022
4-C	Madawaska/Fraser Paper/Madawaska High Sch.	.042	.124	.062	.125	.139
4-E	Madawaska/Fraser Paper/Albert Street	----	.174	.132	.135	.152
4-F	Madawaska/FP/Sewage Treatment Plant	----	.108	.073	.085	.083

TABLE 5-3

SULFUR DIOXIDE

HISTORICAL COMPARISONS-SITES WITH VIOLATIONS

SITE	LOCATION	TOTAL NUMBER OF VIOLATIONS* 1978	1979	1980	1981	1982
3-R	Millinocket/GNP/Waste Treatment Plant	48	32	31	0	0
3-S	Millinocket/GNP/York Street	37	22	14	1	0
3-V	Millinocket/GNP/East Avenue	--	2	1	0	0
3-FF	Woodland/GP/Secondary Treatment Pipeline	--	--	0	1	0
4-C	Madawaska/FP/Madawaska High School	0	1	0	1	1
4-E	Madawaska/Fraser Paper/Albert Street	--	5	10	7	7
4-F	Madawaska/FP/Sewage Treatment Plant	--	2	0	0	0

*Includes 3-Hour and 24-Hour Violations.

6. PARTICULATES (TSP)

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 to hundreds of 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 poisionous 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 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:

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

EPA is considering revising the particulate standards to account for the deeper inhalability of smaller particles. The new standards, rather than applying to TSP, would apply to inhalable particulates (IP). A particle size of 10 or 15 micrometers is being considered as the upper size limit.

Secondary:

The current secondary TSP standard is 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.

EPA is also considering a small-particle secondary standard designed to protect visibility.

State Standards:

The current State Standards include 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.

6.4 Monitoring

Particulates were monitored at 86 sites in Maine during 1982 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.

Certain samplers, called Dichotomous Samplers, are designed to collect particles smaller than either 15 or 10 microns in two different size classes. Size selective particulate data are collected from two sites in the State (see Table 1-4), however, because of insufficient data and the lack of a standard the data is not included in this report.

TABLE 6-1

TOTAL SUSPENDED PARTICULATES (TSP)

1982 DATA SUMMARY
(Micrograms Per Cubic Meter)

SITE	LOCATION	DAYS SAMPLED	HIGHEST 24-HOUR	SECOND HIGHEST 24-HOUR	ANNUAL GEOMETRIC MEAN
1-A	Biddeford/Biddeford Post Office	201	108	93	38.9
1-B	Biddeford/Biddeford Treatment Plant	204	152	148	43.0
1-C	Brunswick/NAS/Coastal Savings Bank	296	156	144	42.0
1-D	Brunswick/NAS/Exchange	297	159	116	30.7
1-G	Kittery/Greenfield Drive	11	79	57	32.0
1-J	Portland/Congress Square	223	127	110	45.5
1-K	Portland/Oxford and Elm Street Shelter Site	215	131	128	48.2
1-L	Portland/Tukey's Bridge	82	151	148	60.7
1-M	Portland/Mobil Station/Congress Street	141	219	148	51.2
1-N	Portland/Perry Iron Works	23	109	101	52.9
1-O	South Portland/SMVTI/Vocational Drive	200	79	69	32.5
1-P	Westbrook/S.D. Warren/N.E.T.&T. Company	355	132	128	44.0
1-Q	Westbrook/Westbrook Police Department	114	149	138	55.6
1-R	Westbrook/S.D. Warren/Research Bldg.	348	209	188	55.3
1-T	Westbrook/S.D. Warren/Hospital	347	145	112	36.0
1-U	Westbrook/S.D. Warren/Park Road	353	137	128	37.5
1-V	Westbrook/S.D. Warren/Warehouse #5/Main St.	355	170	164	59.9
1-Z	Yarmouth/CMP/Cousins Island/Fairbanks Line	115	76	55	21.8
1-AA	Yarmouth/CMP/Cousins Island/Shoreview Drive	96	55	52	21.2
2-C	Auburn/Lepage Bakery/Second Street	115	199	193	47.4
2-E	Augusta/Cony High School	173	234	233	48.5
2-F	Augusta/Hartford Fire House/Hartford Square	165	332	212	46.9
2-H	Fairfield/Fairfield Post Office	69	163	128	49.5
2-J	Hallowell/Stevens School	115	69	68	27.6
2-K	Jay/International Paper Weather/Lagoon Hill	343	139	138	40.0
2-L	Jay/IP/Crash Road	340	156	151	22.1
2-M	Jay/IP/Jay Hill	347	164	154	28.5
2-N	Jay/IP/Bracketts-Crash Road	207	76	74	20.9
2-O	Jay/IP/Water Treatment Plant	216	718	576	48.7
2-P	Jay/IP/Water Treatment Plant #2	241	153	98	21.5
2-Q	Farmingdale/4800 Northern Avenue	9	73	45	23.5
2-R	Lewiston/Lewiston Post Office	111	184	172	50.8
2-U	Madison Paper/MP/Madison Municipal Building	262	151	135	42.6
2-V	Madison Paper/MP/Coro Property/Pine Street	275	133	132	41.4
2-X	Mexico/BC/Mexico Treatment Plant	255	142	121	42.3
2-Y	Mexico/BC/Carter Residence/Harlow Hill Rd.	195	101	96	30.9
2-AA	Mexico/BC/Labonvilles/Route #2	255	139	138	53.5
2-BB	Mexico/BC/Mexico Pump House	193	175	130	41.1
2-CC	Mexico/BC/Carver's Residence/Fourth Street	83	132	109	40.3
2-DD	South Paris/Wilner Wood/Bessey Motors	64	151	147	66.1
2-EE	South Paris/WW/Reilly Property/Gary St.	69	144	140	69.5

TABLE 6-1 (CON'T)

SITE	LOCATION	DAYS SAMPLED	HIGHEST 24-HOUR	SECOND HIGHEST 24-HOUR	ANNUAL GEOMETRIC MEAN
2-GG	Canton/IP/Kennetts Property/Cowhill Rd.	204	51	50	19.0
2-MM	Rumford/BC/Rumford High School	2	61	56	58.4
2-NN	Rumford/BC/Taylor Mountain I	199	137	106	37.9
2-OO	Skowhegan/SD Warren/Hinckley School	228	70	65	18.5
2-PP	Skowhegan/SD Warren/Eaton Ridge	238	59	55	17.4
2-QQ	Thomaston/Martin Marietta/Dexter Avenue	202	159	131	25.5
2-RR	Thomaston/MM/Sanders Prop./Old County Rd.	208	91	78	23.7
2-SS	Thomaston/MM/Pease Prop./Buttermilk Lane	199	105	102	34.0
2-VV	Thomaston/Martin Marietta/Marsh Road	203	199	184	28.3
2-XX	Brooks/Route #139/Ryan Property	24	62	45	23.8
2-YY	Searsport/CMP/Sears Island	30	54	34	19.8
2-ZZ	Waterville/Al Corey's Music Store	113	174	142	40.4
3-B	Bangor/Regional Office/31 Central Street	228	168	154	42.7
3-C	Bangor/Kenduskeag Pump Station	230	179	169	52.1
3-D	Bangor/Bangor Daily News	229	183	166	43.4
3-E	Bangor/BIA/Bldg. #487/Air Natn'l Guard	225	98	85	24.7
3-F	Brewer/Fire Station/So. Main St.	110	187	169	53.1
3-G	Brewer/Brewer Junior High School	115	119	104	36.4
3-H	Bucksport/St. Regis/Fire Station	260	184	165	40.7
3-I	East Millinocket/GNP/Aeration Lagoon	13	50	38	26.6
3-J	East Millinocket/GNP/Katahdin School	115	146	145	30.8
3-L	Lincoln/LP&P/Vocational Ed. Building	359	183	178	41.5
3-M	Lincoln/LP&P/Lincoln Post Office	360	291	258	46.6
3-N	Lincoln/LP&P/Katahdin Avenue Field	101	353	289	78.8
3-P	Lincoln/LP&P/Thomas Motel Trailer Park	258	283	243	44.4
3-R	Millinocket/GNP/Wastewater Treatment Plant	18	79	45	27.8
3-S	Millinocket/GNP/York Street	340	218	177	43.3
3-V	Millinocket/GNP/East Avenue	175	190	138	34.1
3-X	Old Town/Marsh Island Apartments	114	216	117	38.6
3-Y	Old Town/Penobscot Shoe Company	114	178	171	32.1
3-AA	Newburgh/Newburgh Consolidated School	327	63	56	15.9
3-BB	Milford/Diamond Intern'l/Shumway Field	151	85	84	31.6
3-DD	Woodland/GP/"D" Street	325	126	113	25.3
3-FF	Woodland/GP/Secondary Treatment Pipeline	317	141	139	31.6
3-GG	Woodland/GP/Woodland High School	327	149	149	36.6
3-II	Woodland/GP/Chip-N-Saw Waferboard Mill	232	133	123	32.8
4-A	Easton/JMH/Patterson Property/Station Rd.	133	62	56	17.8
4-B	Fort Kent/Univ. Me. Fort Kent-Cyr Hall	2	71	16	33.7
4-C	Madawaska/Fraser Paper/Madawaska High Sch.	340	297	295	47.1
4-E	Madawaska/Fraser Paper/Albert Street	349	121	120	35.2
4-H	Presque Isle/High School	173	130	118	35.1
4-I	Presque Isle/Skyway School/Industrial Park	169	116	69	21.6
4-J	Presque Isle/Northeastland Hotel/436 Main	178	302	267	62.0
4-K	Presque Isle/Steego Auto Parts/Maple St.	172	175	138	36.9
4-L	Presque Isle/Creasey Ridge Road	307	54	50	13.5

TABLE 6-2

TOTAL SUSPENDED PARTICULATES

HISTORICAL COMPARISONS-ANNUAL GEOMETRIC MEANS

SITE	LOCATION	ANNUAL GEOMETRIC MEANS (UG/M^3) 1978	1979	1980	1981	1982
1-A	Biddeford/Biddeford Post Office	35.6	39.0	107.7	41.7	38.9
1-B	Biddeford/Biddeford Treatment Plant	----	----	----	47.2	43.0
1-J	Portland/Congress Square	----	----	53.6	48.2	45.5
1-K	Portland//Oxford & Elm St. Shelter Site	----	----	53.5	50.4	48.2
1-L	Portland/Tukey's Bridge	----	----	----	62.9	60.7
1-O	South Portland/SMVTI/Vocational Drive	30.5	30.9	40.5	37.2	32.5
1-P	Westbrook/SD Warren/N.E.T.&T. Company	----	43.7	42.4	38.8	44.0
1-Q	Westbrook/Westbrook Police Department	----	----	59.3	60.3	55.6
1-R	Westbrook/SD Warren/Research Bldg.	----	----	55.7	52.0	55.3
1-T	Westbrook/SD Warren/Westbrook Hospital	----	----	----	31.2	36.0
1-U	Westbrook/SD Warren/Park Road	----	----	----	33.3	37.5
1-V	Westbrook/SD Warren/Warehouse #5/Main St.	----	----	----	68.4	59.9
2-C	Auburn/Lepage Bakery/Second Street	----	----	73.0	53.5	47.4
2-E	Augusta/Cony High School	49.8	53.5	62.1	59.5	48.5
2-H	Fairfield/Fairfield Post Office	----	----	----	59.9	49.5
2-K	Jay/Intrn'l Paper Weather/Lagoon Hill	----	----	----	33.3	40.0
2-L	Jay/IP/Crash Road	----	24.3	23.8	23.2	22.1
2-M	Jay/IP/Jay Hill	----	27.8	28.0	27.5	28.5
2-N	Jay/IP/Bracketts-Crash Raod	----	----	----	17.1	20.9
2-O	Jay/IP/Water Treatment Plant	----	----	----	46.8	48.7
2-R	Lewiston/Post Office/49 Ash Street	51.7	48.0	56.7	53.1	50.8
2-U	Madison/MP/Madison Municipal Building	----	----	----	39.7	42.6
2-V	Madison/MP/Coro Property/Pine St.	----	----	----	32.1	41.4
2-X	Mexico/BC/Mexico Treatment Plant	41.0	43.3	48.7	42.0	42.3
2-Y	Mexico/BC/Carter Res./Harlow Hill Road	----	30.3	28.7	26.8	30.9
2-AA	Mexico/BC/Labonvilles/Route #2	----	----	----	48.3	53.5
2-BB	Mexico/BC/Mexico Pump House	----	----	----	37.5	41.1
2-DD	South Paris/Wilner Wood/Bessey Motors	69.6	56.4	57.4	52.6	66.1
2-EE	So. Paris/Wilner/Reilly Prop./Gary St.	73.3	59.6	53.6	58.7	69.5
2-GG	Canton/IP/Kennetts Property/Cowhill Rd.	----	----	----	14.6	19.0
2-MM	Rumford/BC/Rumford High School	----	33.0	32.7	28.9	58.4
2-OO	Skowhegan/SD Warren/Hinckley School	19.8	19.7	16.5	16.1	18.5
2-PP	Skowhegan/SD Warren/Eaton Ridge	19.6	24.3	16.5	16.5	17.4
2-QQ	Thomaston/Martin Marietta/Dexter Avenue	40.5	33.4	33.5	25.7	25.5
2-RR	Thomaston/MM/Sanders Prop./Old County Rd.	----	26.9	29.0	24.5	23.7
2-SS	Thomaston/MM/Pease Prop./Buttermilk Lane	----	40.4	50.0	37.8	34.0
2-VV	Thomaston/Martin Marietta/Marsh Road	----	----	26.4	30.8	28.3
2-XX	Brooks/Ryan Property/Route #139	----	----	----	31.2	23.8
2-ZZ	Waterville/Al Corey's Music Store	----	----	----	49.6	40.4
3-B	Bangor/Regional Office/31 Central St.	54.1	51.9	45.3	45.3	42.7
3-C	Bangor/Kenduskeag Pump Station	75.5	68.4	58.3	53.8	52.1
3-D	Bangor/Bangor Daily News	57.6	52.6	48.1	47.0	43.4
3-E	Bangor/BIA Bldg. #487/Air Natn'l Guard	32.3	31.4	29.3	28.5	24.7
3-F	Brewer/Fire Station/South Main Street	53.4	----	60.3	55.0	53.1

TABLE 6-2 (CON'T)

SITE	LOCATION	ANNUAL GEOMETRIC MEANS (UG/M^3) 1978	1979	1980	1981	1982
3-G	Brewer/Brewer Junior High School	----	----	41.4	43.6	36.4
3-H	Bucksport/St. Regis/Fire Station	----	----	----	32.0	40.7
3-I	East Millinocket/GNP/Aeration Lagoon	----	----	31.1	25.6	26.6
3-J	East Millinocket/GNP/Katahdin School	----	----	31.3	26.3	30.8
3-L	Lincoln/LP&P/Vocational Education Bldg.	43.6	48.6	46.9	44.8	41.5
3-M	Lincoln/LP&P/Lincoln Post Office	52.4	53.6	57.1	49.5	46.6
3-N	Lincoln/LP&P/Katahdin Avenue Field	----	53.8	55.8	65.1	78.8
3-R	Millinocket/GNP/Waste Treatment Plant	----	28.7	29.6	23.9	27.8
3-S	Millinocket/GNP/York Street	----	50.5	48.9	42.7	43.3
3-V	Millinocket/GNP/East Avenue	----	36.1	38.6	33.4	34.1
3-X	Old Town/Marsh Island Apartments	40.2	38.3	44.5	42.6	38.6
3-Y	Old Town/Penobscot Shoe Company	----	29.9	40.0	37.1	32.1
3-AA	Newburgh/Newburgh Consolidated School	----	----	23.6	19.2	15.9
3-BB	Milford/Diamond Intern'l/Shumway Field	----	----	32.9	29.1	31.6
3-DD	Woodland/GP/"D" Street	----	29.9	31.7	26.6	25.3
3-FF	Woodland/GP/Secondary Treatment Pipeline	----	39.7	35.0	33.0	31.6
3-GG	Woodland/GP/Woodland High School	----	----	32.3	44.9	36.6
3-II	Woodland/GP/Chip-N-Saw Waferboard Mill	----	----	----	38.2	32.8
4-A	Easton/JMH/Patterson Prop./Station Rd.	----	----	----	13.9	17.8
4-C	Madawaska/FP/Madawaska High School	37.3	39.1	47.1	43.7	47.1
4-E	Madawaska/Fraser Paper/Albert Street	----	25.3	41.0	37.3	35.2
4-H	Presque Isle/Presque Isle High School	38.7	39.9	40.8	44.5	35.1
4-I	Presque Isle/Skyway Sch./Industrial Park	----	22.7	26.7	25.8	21.6
4-J	Presque Isle/Northeastland Hotel/436 Main	----	----	49.1	67.0	62.0
4-K	Presque Isle/Steego Auto Parts/Maple St.	----	----	----	39.1	36.9
4-L	Presque Isle/Creasey Ridge Road	----	----	----	15.2	13.5

TABLE 6-3

TOTAL SUSPENDED PARTICULATES

HISTORICAL COMPARISON-SITES WITH VIOLATIONS

SITE	LOCATION	TOTAL # OF SHORT TERM VIOLATIONS 1978	1979	1980	1981	1982
1-A	Biddeford/Biddeford Post Office	0	0	1	0	0
1-B	Biddeford/Biddeford Treatment Plant	--	--	--	0	1
1-R	Westbrook/SD Warren/Research Building	--	--	0	0	5
1-V	Westbrook/SDW/Warehouse #5/Main Street	--	--	--	0	4
2-C	Auburn/Lepage Bakery-Second Street	--	--	--	0	4
2-E	Augusta/Cony High School	2	4	5	4	7
2-H	Fairfield/Fairfield Post Office	--	--	--	5	1
2-L	Jay/IP/Crash Road	--	0	0	1	2
2-M	Jay/IP/Jay Hill	--	0	1	1	2
2-O	Jay/IP/Water Treatment Plant	--	--	--	18	24
2-R	Lewiston/Lewiston Post Office	0	0	0	2	3
2-U	Madison/MP/Madison Municipal Building	--	--	--	0	1
2-X	Mexico/BC/Mexico Treatment Plant	0	1	1	0	0
2-AA	Mexico/BC/Labonville's/Route #2	--	--	--	1	0
2-BB	Mexico/BC/Mexico Pump House	--	--	--	0	1
2-DD	So. Paris/Wilner Wood/Bessey Motors	2	3	4	0	1
2-EE	So. Paris/WW/Reilly Property/Gary St.	10	8	3	1	0
2-PP	Skowhegan/SD Warren/Eaton Ridge	0	1	0	0	0
2-QQ	Thomaston/Martin Marietta/Dexter Ave.	--	--	--	1	1
2-SS	Thomaston/MM/Pease Prop./Buttermilk Ln.	--	0	1	0	0
2-VV	Thomaston/Martin Marietta/Marsh Road	--	--	--	1	3
2-ZZ	Waterville/Al Corey's Music Store	--	--	--	2	1
3-B	Bangor/Regional Office/31 Central St.	0	1	0	2	2
3-C	Bangor/Kenduskeag Pump Station	10	7	4	3	6
3-D	Bangor/Bangor Daily News	0	2	1	3	4
3-F	Brewer/Brewer Fire Station	0	--	3	2	4
3-J	East Millinocket/GNP/Katahdin School	--	--	2	0	0
3-L	Lincoln/LP&P/Vocational Education Bldg.	0	2	5	4	4
3-M	Lincoln/LP&P/Post Office	1	2	5	7	6
3-N	Lincoln/LP&P/Katahdin Ave.	--	3	18	39	14
3-S	Millinocket/GNP/York Street	--	0	6	2	2
3-V	Millinocket/GNP/East Avenue	--	0	2	0	1
3-X	Old Town/Marsh Island Apartments	0	1	0	1	1
3-Y	Old Town/Penobscot Shoe Company	--	0	3	1	2
3-FF	Woodland/GP/Secondary Treatment Pipeline	--	2	4	3	0
3-GG	Woodland/GP/Woodland High School	--	--	0	3	0
4-C	Madawaska/Fraser Paper/Madawaska H.S.	0	1	2	9	13
4-H	Presque Isle/Presque Isle High School	0	1	0	3	0
4-J	Presque Isle/Northeastland Hotel	--	--	0	10	12
4-K	Presque Isle/Steego Auto Parts	--	--	--	0	1

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 (calender 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 eight sites in Maine during 1982 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 1982 Data Summaries for Lead. Table 7-3 presents the Lead Historical Comparison Data.

TABLE 7-1

LEAD (Pb)

1982 DATA SUMMARY
(Micrograms/Cubic Meter)

SITE	LOCATION	# OF SAMPLES	HIGHEST 24-HR CONCENTRATION	2ND HIGH CONCENTRATION	ANNUAL ARITHMETIC MEAN
1-G	Kittery/Greenfield Drive	10	.58	.32	.18
1-K	Portland/Shelter Site	123	.91	.89	.29
1-L	Portland/Tukey's Bridge	77	1.28	1.27	.52
1-N	Portland/Perry's	25	1.06	1.00	.44
2-E	Augusta/Cony High School	56	.66	.60	.24
2-R	Lewiston/Post Office/49 Ash St.	54	.97	.54	.24
3-C	Bangor/Kenduskeag Pump Station	61	.70	.61	.24
4-J	Presque Isle/Northeastland Hotel	61	.89	.85	.24

TABLE 7-2

LEAD (Pb)

1982 DATA SUMMARY BY QUARTERS
(Micrograms/Cubic Meter)

SITE	LOCATION	1982 QUARTERLY AVERAGES 1ST	2ND	3RD	4TH
1-G	Kittery/Greenfield Drive	---	---	---	.18
1-K	Portland/Shelter Site	.34	.21	.23	.32
1-L	Portland/Tukey's Bridge	.51	.40	.64	---
1-N	Portland/Perry's	---	---	---	.44
2-E	Augusta/Cony High School	.27	.18	.22	.30
2-R	Lewiston/Lewiston Post Office	.21	.20	.25	.28
3-C	Bangor/Kenduskeag Pump Station	.25	.16	.24	.31
4-J	Presque Isle/Northeastland Hotel	.24	.20	.23	.28

TABLE 7-3

LEAD (Pb)

HISTORICAL COMPARISONS
(Micrograms/Cubic Meter)

SITE	LOCATION	MAXIMUM 24-HOUR CONCENTRATION/AAM				
		1978	1979	1980	1981	1982
1-L	Portland/Tukey's Bridge	--------	--------	--------	1.45/.59	1.28/.52
2-E	Augusta/Cony High School	2.06/1.03	1.46/.48	.99/.34	.73/.24	.66/.24
2-R	Lewiston/Post Office/49 Ash St.	1.75/ .85	1.23/.40	.90/.28	1.11/.29	.97/.24
3-C	Bangor/Kenduskeag Pump Station	2.08/1.19	1.16/.44	.85/.30	.62/.22	.70/.24
4-J	Presque Isle/Northeastland Hotel	---------	--------	.52/.21	.93/.22	.89/.24

8. SULFATES (SO_4)

8.1 Description and Sources

Sulfates 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. Fine particulate compounds, including sulfates are formed from chemical reactions between sulfur 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.

8.3 Standards

There are currently no standards for levels of sulfates in ambient air. EPA is presently working on a standard and will be making a proposal in the near future.

8.4 Monitoring

Sulfate levels were measured at eleven sites in Maine during 1982 by taking samples of the Hi-Vol filters from those sites and analyzing the samples for sulfates. Some of the sites are analyzed for sulfates on a routine basis while others may only be anlyzed if there has been a violation of an ambient air standard. Because there are no standards and the monitoring methodology is still questionable the data has not been included in this report. As soon as the accuracy of the monitoring methodology is confirmed and a standard is proposed the data will be summarized in the annual reports.

TABLE 8-1

SULFATE THRESHOLDS FOR ADVERSE HEALTH EFFECTS

ADVERSE HEALTH EFFECT	THRESHOLD CONCENTRATION FOR SUSPENDED SULFATES
Aggravation of Asthma	6 to 10 Micrograms Per Cubic Meter for 24 Hours.
Aggravation of Heart and Lung Disease in the Elderly	9 Micrograms Per Cubic Meter for 24 Hours
Subtle Decreases in Childhood Lung Function	9 to 13 Micrograms Per Cubic Meter for 1 Year.
Increase in Acute Respiratory Disease in Children	13 Micrograms Per Cubic Meter for 1 Year.

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 a 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 1982 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 signficant 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 operated sites for the year 1982. The sulfate deposition figures were corrected for marine aerosol contribution.

TABLE 9-1

ATMOSPHERIC DEPOSITION
DATA SUMMARY FOR 1982

SITES	LOCATION	pH			DEPOSITION (Kg/ha)	
		MAXIMUM	MINIMUM	VOLUME WEIGHTED MEAN	SO_4	NO_3
1-Ba	Bridgton/Upper Ridge Road	7.53	3.75	4.36	19.0	10.6
3-A	Acadia National Park/ McFarland Hill	6.14	3.58	4.44	21.3	11.3

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

10.4 Monitoring

Hydrocarbons were monitored at only one site in the State during 1982. This monitoring was conducted as part of the ozone program operated in Portland during the ozone season. However, insufficient data was collected during the summer to summarize in a meaningful form.

11. HYDROGEN SULFIDE (H_2S)

11.1 Description and Sources

Hydrogen sulfide is a colorless gas with the very disagreeable odor of rotten eggs. Hydrogen sulfide can be found naturally where sulfur containing compounds are decaying. However, the major source of hydrogen sulfide would be as a by-product from petroleum refining, kraft pulping for paper production and various chemical processes.

11.2 Health and Welfare Effects

In addition to the annoying odor, hydrogen sulfide can tarnish silverware and copper and can darken the lead in paint which may ruin the exterior of some homes. In dilute form hydrogen sulfide can cause nausea, headaches and dizziness. In concentrated form hydrogen sulfide can be lethal.

11.3 Standards

There is currently no ambient air standard for hydrogen sulfide.

11.4 Monitoring

A limited amount of data was collected at two sites in Jay, Maine during 1982 but because there are no standards that data has not been included in this report.