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Environmental Health Section

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May 31, 2001

FILE

Mr. Ron Heavner
U.S. EPA - Region VIII
One Denver Place
999 18th Street, Suite 300
Denver, CO 80202-2466

Re: FY '00-'01 PPA, Air Quality Media Workplan, Monitoring, Item C (Network Review)

Dear Mr. Heavner:

Enclosed are two copies of the referenced review. Please note that our network plans addressed in the review are either vague or not addressed. Because we do not have a clear understanding of the impact of the regional haze rule and what $PM_{2.5}$ monitoring will be required after December 31, 2001, it is not practical for us to consider any major network changes. Because the review is based on a calendar year, it does not include any of the network changes we have recently discussed: these changes will be addressed in the network modification plan and included in next year's review.

If you have any question about the review, please contact me by e-mail at dharman@state.nd.us or phone at 701-328-5188.

Sincerely,

Daniel E. Harman
Manager
Air Quality Monitoring
Division of Air Quality

DEH:saj
Enc:

North Dakota Department of Health
Division of Environmental Engineering

Ambient Air Quality Monitoring Annual Network Review 2000

May 2001

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The North Dakota Department of Health, Division of Environmental Engineering, has the primary responsibility of protecting the health and welfare of North Dakotans from the detrimental effects of air pollution. Toward that end, the Division of Environmental Engineering ensures that the ambient air quality in North Dakota is maintained in accordance with the levels established by the State and Federal Ambient Air Quality Standards (AAQS) and the Prevention of Significant Deterioration of Air Quality (PSD) Rules. To carry out this responsibility, the Division of Environmental Engineering operates and maintains a network of ambient air quality monitors and requires five major industrial pollution sources to conduct source specific ambient air quality monitoring.

To evaluate the effectiveness of the State's air quality monitoring effort, the U.S. Environmental Protection Agency (EPA) requires the Division of Environmental Engineering to conduct an annual review of the State's ambient air quality monitoring (AAQM) network. EPA's requirements, as set forth in 40 CFR 58.20, are to (1) determine if the system meets the monitoring objectives defined in 40 CFR 58, Appendix D, and (2) identify network modifications such as termination or relocation of unnecessary sites or establishment of new sites which are necessary. 40 CFR 58.25 requires the State to annually develop and implement a schedule to modify the AAQM network to eliminate any unnecessary sites or correct any inadequacies indicated as a result of the annual review required by 40 CFR 58.20(d). This document and subsequent revisions satisfy these annual requirements.

1.1 Network Review Process

The locations of sites in a monitoring program are established to meet certain objectives. The May 10, 1979, Federal Register (40 CFR 58), "Air Quality Monitoring, Data Reporting, and Surveillance Provisions," as amended, has specified a minimum of four basic monitoring objectives. These objectives are as follows:

1. *To determine the highest <u>pollutant concentrations</u> expected to occur in an area covered by the network.*

2. *To determine representative concentrations in areas of high <u>population density</u>.*

3. *To determine the impact on ambient pollution levels by a <u>significant source</u> or class of sources.*

4. *To determine the <u>general/background</u> concentration levels.*

5. *To determine the impact on air quality by <u>regional transport</u>.*

6. *To determine <u>Welfare-related</u> impacts.*

The link between basic monitoring objectives and the physical location of a particular monitoring site involves the concept of spatial scale of representativeness. This spatial scale is determined by the physical dimensions of the air parcel nearest a monitoring site throughout which actual pollutant concentrations are reasonably similar. The goal in locating sites is to match the spatial scale represented by the sample of monitored air with a spatial scale most appropriate for the monitoring objective. Spatial scales of representativeness, as specified by EPA, are described as follows:

Microscale - dimensions ranging from several meters up to about 100 meters.

Middle Scale - areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 km.

Neighborhood Scale - city areas of relatively uniform land use with dimensions of 0.5 to 4.0 km.

Urban Scale - overall, city-wide dimensions on the order of 4 to 50 km. (Usually requires more than one site for definition.)

Regional Scale - rural areas of reasonably homogeneous geography covering from 50 km to hundreds of km.

The relationships between monitoring objectives and spatial scales of representativeness, as specified by EPA, are as follows:

Monitoring Objective	Appropriate Siting Scales
Highest Concentration	Micro, middle, neighborhood
Population Exposure	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
General/Background	Urban, regional
Regional Transport	Urban, regional
Welfare-related Impacts	Urban, regional

Recommended scales of representativeness appropriate to the criteria pollutants monitored in North Dakota are shown below:

Criteria Pollutant	Spatial Scales
Inhalable Particulate (PM_{10})	micro, middle, neighborhood, urban, regional
Sulfur Dioxide (SO_2)	middle, neighborhood, urban, regional
Ozone (O_3)	middle, neighborhood, urban, regional
Nitrogen Dioxide (NO_2)	middle, neighborhood, urban
Carbon Monoxide (CO)	micro, middle, neighborhood

Using this physical basis to locate sites allows for an objective approach, ensures compatibility among sites, and provides a common basis for data interpretation and application. The annual review process involves an examination of existing sites to evaluate their monitoring objectives and spatial scale with sites deleted, added, or modified accordingly. Further details on network design can be found in 40 CFR 58, Appendix D.

1.2 General Monitoring Needs

As can be gathered from the prior discussion, each air pollutant has certain characteristics which must be considered when establishing a monitoring site. These characteristics may result from 1) variations in the number and types of sources and emissions in question; 2) reactivity of a particular pollutant with other constituents in the air; 3) local site influences such as terrain and land use; and 4) climatology. The State AAQM network is designed to monitor air quality data for three basic conditions: 1) background monitoring; 2) population exposure; and 3) highest concentration. With the advent of the Regional Haze Rule, it has become necessary to consider adding a fourth condition: long range transport. The industrial AAQM network sites are designed to monitor air quality data for source specific highest concentration impacts on a neighborhood scale.

The primary function of the department operated continuous sites is to collect background data to determine if and when there is any change in background concentrations. Beulah and Fargo NW are exceptions to this primary function. Beulah is source impact and population exposure because of the major sources in the vicinity of Beulah. The site is a combination of a down-wind site and between the city and two major source. Fargo NW is population orientated because Fargo is a major population center with PSD sources in the Fargo-Moorhead area. The data from these sites will be used as input to dispersion models to evaluate permits-to-construct and permits-to-operate for projects located in or near population centers in the eastern part of the state. The PM_{10} site at Fargo NW is maintained to provided data for comparison to the State PM_{10} standard. The $PM_{2.5}$ sites are population exposure except for Sharon and TRNP - SU which are background sites.

Before the next network modification plan is completed in January 2002, the need for several sites/parameter combinations will be reviewed. The current list of sites/parameters to be reviewed are TRNP-SU $PM_{2.5}$, Dickinson, Hannover, Fargo NW FRM $PM_{2.5}$, Beulah N FRM $PM_{2.5}$.

Background sites are chosen to determine concentrations of air contaminants in areas remote from urban sources and generally are sited using the regional spatial scale. This is true for NO_2 despite the fact that the regional spatial scale is not normally used for NO_2 monitoring.

Once a specific location is selected for a site, monitoring sites are established in accordance with the specific probe siting criteria specified in 40 CFR 58, Appendix E.

Since all industrial AAQM network sites are source specific, all the pollutants at industry sites are source oriented on a neighborhood scale. Industrial sites are initially selected using dispersion modeling results and meteorological data. If a particular location is determined not to be practical due to, for example, inaccessibility or power not reasonably available, then sites in a prevailing wind direction are considered. These sites are the most likely locations to have elevated ambient concentrations. The data collected at the industry-operated sites is included in the data summaries for comparison but not included in any discussion of the State ambient monitoring network needs or analysis. Each industry network is an entity unto itself and does not influence the placement of State operated sites.

The Fort Berthold Indian Reservation operates an ambient air quality monitoring network. Since the Department has influence on neither the operation nor maintenance of the network, the data collected are included only to indicate the presence of the sites and reflects the data sent to the Department. The data validity is not certified by inclusion.

1.3 Monitoring Objectives

The monitoring objectives of the Department are to track those pollutants that are judged to have the potential for violating either State or Federal Ambient Air Quality Standards and to ensure that those pollutants do not cause significant deterioration of our existing air quality. To accomplish these objectives, the Department operated 11 AAQM sites around the State. Nine were SLAMS sites, and two were special purpose monitoring (SPM) sites. There were three industries reporting ambient air quality data to this Department. Table 1 lists each site's type and the parameters monitored. Figure 1 shows the approximate site locations. For the industry networks, each network is represented by a single circle whether there is a single site or multiple sites.

The numbers in the Site Name/Company column in Table 1 and in the '#' column in Tables 2, 5, 7, 9, 13, and 14 correspond to the numbers on the figures. The numbers in the circles correspond to the monitoring site monitoring that pollutant and the squares correspond to the major sources for that particular pollutant.

TABLE 1

AAQM Network Description

Site Name AQS Site #	Type Station	Parameter Monitored[1]	Operating Schedule	Monitoring Objective[2]	Spatial Scale[2]	Date Site/Parameter Began
1 Beulah North 380570004	SLAMS	$PM_{2.5}$ SO_2, NO_2, O_3, MET NH_3 cont. $PM_{2.5}$	6th Day cont. cont.	Population Exposure Population Exposure General Background[3] Population Exposure	Neighborhood Neighborhood Regional Neighborhood	12/98 04/80 11/00 6/00
2 Bismarck Residential 380150003	SLAMS	$PM_{2.5}$	3rd Day	Population Exposure	Urban	12/98
3 Dickinson Residential 380890002	SLAMS	PM_{10}	6th Day	Population Exposure	Urban	07/89
4 Dunn Center 380250003	SLAMS	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/79
5 Fargo NW 380171004	SLAMS	PM_{10} $PM_{2.5}$ $PM_{2.5}$ SO_2, NO_2, O_3, MET cont. $PM_{2.5}$	6th Day 3rd day 3rd Day cont. cont.	Population Exposure Population Exposure Collocated Population Exposure Population Exposure	Urban Urban N/A Urban Urban	05/98 12/98 05/98
6 Grand Forks North 380350004	SLAMS	$PM_{2.5}$	3rd Day	Population Exposure	Urban	12/98
7 Hannover 380650002	SLAMS	SO_2, NO_2, O_3, MET	cont.	General Background	Regional	10/84
8 Mandan Refinery - SPM 380590002	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	12/95
9 Mandan Refinery NW - SPM 380590003	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	09/98
10 Sharon[4] 380910001	SLAMS	SO_2, NO_2 O_3, MET $PM_{2.5}$	cont. 6th Day	General Background	Regional	07/94 12/98
11 TRNP - SU 380070002	SLAMS	SO_2, O_3 MET $PM_{2.5}$	cont. 6th Day	General Background	Regional	07/98 6/00
Company	**Site Name** AQS Site #					
12 Amerada Hess Corporation	TIOGA #1 381050103 TIOGA #2 381050104 TIOGA #3 381050105	SO_2 H_2S, MET SO_2	cont. cont. cont.	Source Impact Source Impact Source Impact	Urban Urban Urban	07/87 07/87 11/87
13 Bear Paw Energy, Inc.	MGP #3 380530104 MGP #5 380530111	SO_2, MET SO_2, MET	cont. cont.	Source Impact Source Impact	Urban Urban	11/94 05/94
14 Dakota Gasification Company	DGC #12 380570102 DGC #14 380570118 DGC #16 380570123 DGC #17 380570124	SO_2, NO_2, MET SO_2 SO_2 SO_2, NO_2	cont. cont. cont. cont.	Source Impact Source Impact Source Impact Source Impact	Urban Urban Urban Urban	01/80 01/89 10/95 10/95

1. MET refers to meteorological and indicates wind speed and wind direction monitoring equipment.
2. Not applicable to MET.
3. This analyzer will serve a duel role of population exposure and general background
4. The primary purpose for the site was completed December 31and the continuous analyzers were shut off. The $PM_{2.5}$ sampler will continue until December 31, 2001.

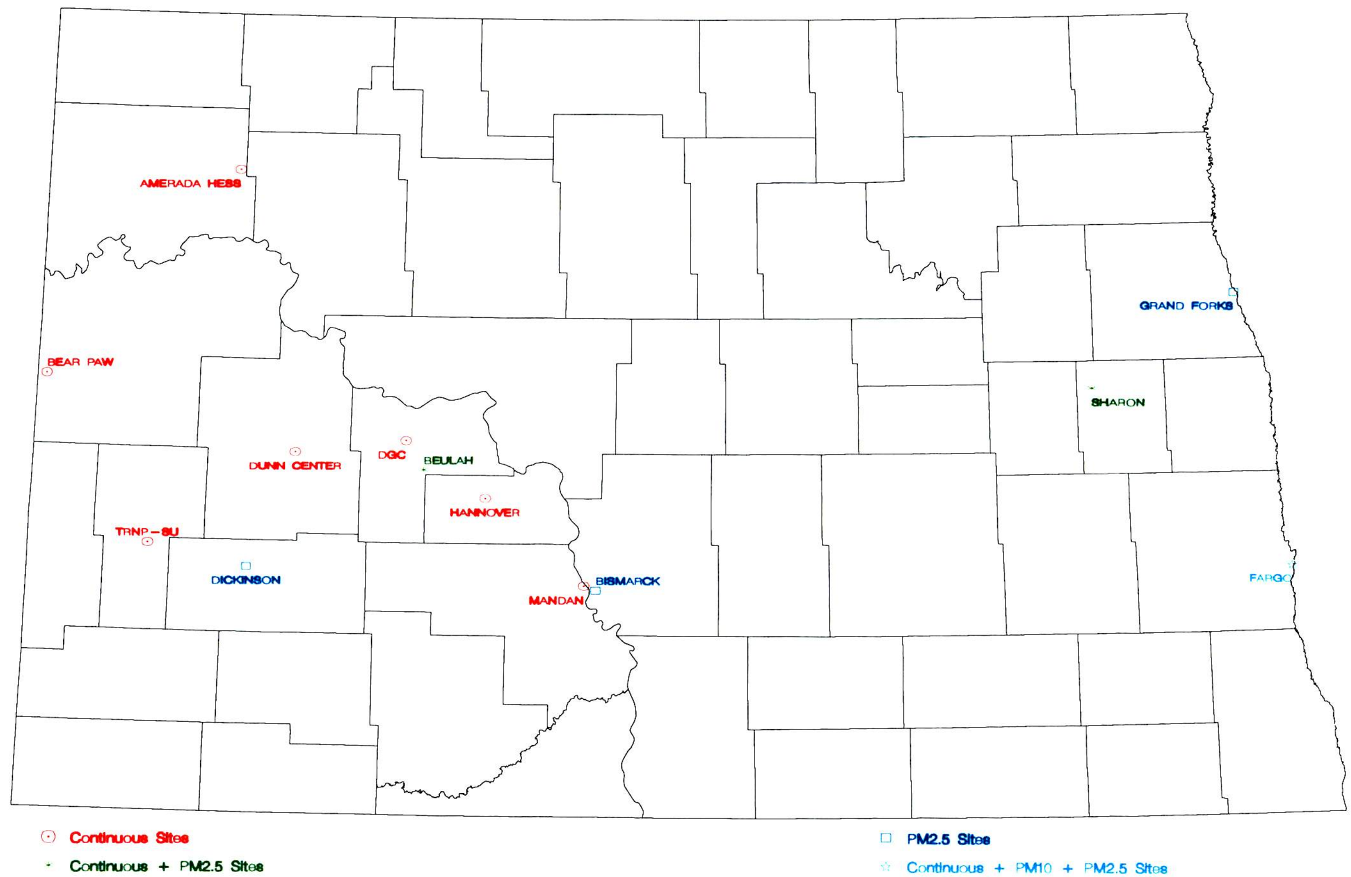

Figure 1 North Dakota Ambient Air Quality Monitoring Sites

2.0 AMBIENT AIR MONITORING NETWORK COVERAGE

The State of North Dakota is attainment for all criteria pollutants. As such, there are no "problem areas" in the general sense of the term. However, there are areas of concern where the Department has established monitoring sites to track the emissions of specific pollutants from point sources. Also, three major sources maintained monitoring networks in the vicinity of their plants (see Table 1 and Figure 1).

2.1 Sulfur Dioxide

Energy development in the west and west-central portions of North Dakota has produced a number of sources of sulfur dioxide (SO_2). These sources include coal-fired steam-powered electrical generating facilities, a coal gasification plant, natural gas processing plants, an oil refinery, and flaring at oil/gas well sites. As a result, SO_2 is one of the Department's major concerns in regard to ambient air quality monitoring.

2.1.1 Point Sources

The major SO_2 point sources (>100 TPY) are listed in Table 2 along with their emissions from the emissions inventories reported to the Department. Figure 2 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Figure 2A shows the contribution of point sources to the total SO_2 emissions. The "Point Sources"category consists of Utility Boilers (power plant boilers) and oil and gas wells.

2.1.2 Other Sources

The western part of the State has a number of potential SO_2 sources associated with the development of oil and gas. These sources include individual oil/gas wells, oil storage facilities, and compressor stations. Emissions from such sources can create two problems. First, these sources may directly emit significant amounts of hydrogen sulfide (H_2S) to the ambient air (see Section 2.7). Second, flaring the H_2S from these sources can create significant concentrations of SO_2 in the ambient air. The primary counties for these sources in western North Dakota are outlined in green on Figure 2. Figure 2A shows the contribution of "Other Sources" and "Area Sources." The "Other Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants. "Area Sources" are the remaining sources of SO_2 such as agricultural burning. This estimate is based on the 1985 NAPAP Emissions Inventory.

TABLE 2

Major SO_2 Sources

(>100 TPY)

2000

#	Source Name	County	City	Pollutant Emissions	Percentage of Total Emissions	Facility ID
1	Basin Electric: Leland Olds Station #2	Mercer	Stanton	28,588	16.5	380570001
2	Minnkota Power Coop: M. R. Young #2	Oliver	Center	21,078	12.2	380650020
3	Minnkota Power Coop: M R Young #1	Oliver	Center	18,095	10.5	380650001
1	Basin Electric: Leland Olds Station #1	Mercer	Stanton	16,864	9.8	380570001
4	Otter Tail Power Company: Coyote	Mercer	Beulah	14,530	8.4	380570012
5	Great River Energy: Coal Creek #1	Mc Lean	Underwood	14,332	8.3	380550017
5	Great River Energy: Coal Creek #2	Mc Lean	Underwood	12,817	7.4	380550017
6	Dakota Gasification Company	Mercer	Beulah	11,403	6.6	380570013
7	Great River Energy: Stanton 1	Mercer	Stanton	7,661	4.4	380570004
8	Basin Electric: AVS #1	Mercer	Beulah	6,641	3.8	380570011
8	Basin Electric: AVS #2	Mercer	Beulah	6,407	3.7	380570011
9	BP Amoco: Mandan Refinery	Morton	Mandan	5,343	3.1	380590003
10	Montana Dakota Utilities: Heskett #2	Morton	Mandan	1,778	1.0	380590001
11	Amerada Hess Corp: Tioga Gas Plant	Williams	Tioga	1,337	0.8	381050004
10	Montana Dakota Utilities: Heskett #1	Morton	Mandan	1,019	0.6	380590001
7	Great River Energy: Stanton 10	Mercer	Stanton	973	0.6	380570007
12	Bear Paw Energy, Inc.: Grasslands Plant	Mc Kenzie	--	805	0.5	380530023
13	American Crystal Sugar: Drayton Plant	Pembina	Drayton	657	0.4	380670003
14	Univ. Of North Dakota Heating Plant	Grand Forks	Grand Forks	648	0.4	380350003
15	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	557	0.3	380970019
16	Bear Paw Energy - Lignite Gas Plant	Burke	Lignite	463	0.3	380130071
17	Petro-Hunt, LLC	Billings	Killdeer	367	0.2	380070002
18	North Dakota State University	Cass	Fargo	325	0.2	380170005
19	Minn-Dak Farmers Cooperative	Richland	Wahpeton	171	0.1	380770026

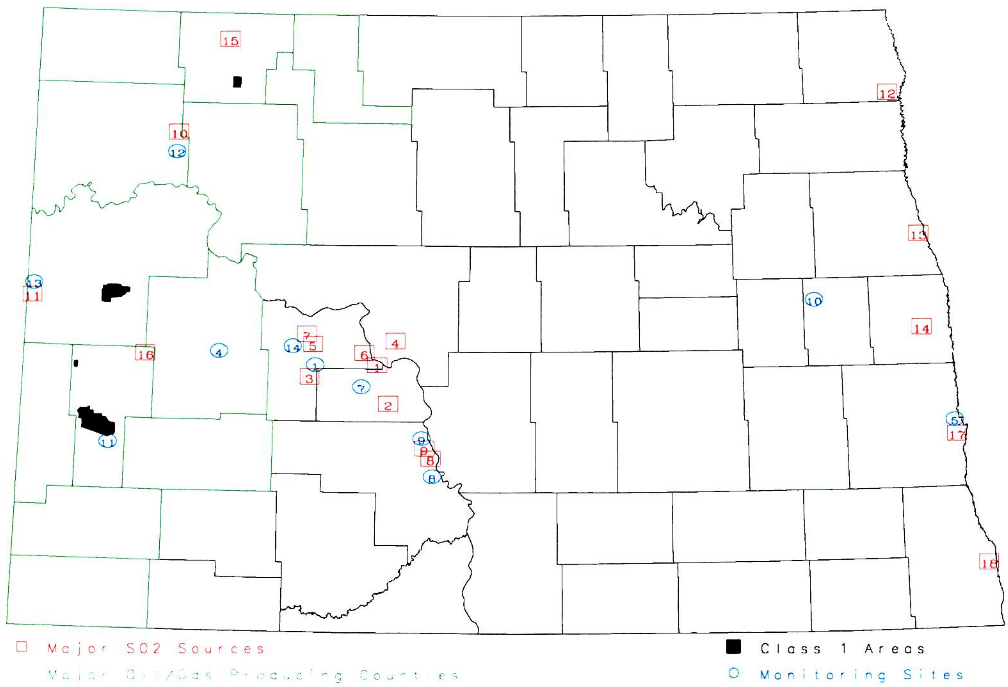

Figure 2 Major Sulfur Dioxide Sources

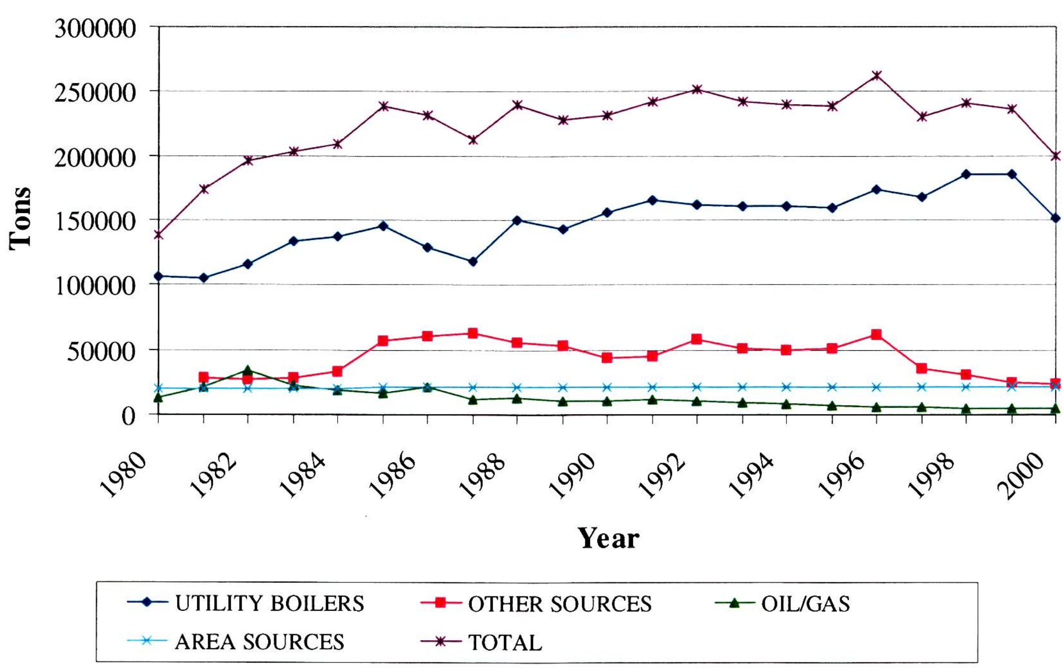

Figure 2A Annual Sulfur Dioxide Emissions

2.1.3 Monitoring Network

The SO_2 monitoring sites are shown on Figure 2. As can be seen, these monitoring sites are concentrated in the vicinity of the oil and gas development in the west and the coal-fired steam electrical generating plants in the central part of the State. Table 3 shows the 2000 annual SO_2 data summaries; Table 4 shows the 5-minute data summary. There were no exceedances of either State or Federal SO_2 standards.

2.1.4 Network Analysis

The nine largest SO_2 sources in the state are within 45 miles of both the Beulah and Hannover sites. This makes these two sites very important in tracking the impact of these nine sources on the ambient air. One would expect that as the large sources came on line, beginning in 1980, a noticeable change would be seen on the ambient air quality. This has not been the case. There have been possible short term influences, but no significant long term impact by these nine sources combined. Figures 3, 4, 5, and 6, present a 21-year view of the percentage of data greater than the minimum detectable value (MDV), 1-hour maximums, 3-hour maximums, and 24-hour maximums, for the state operated sites. Because the industry sites are sited specifically for maximum expected concentrations (primarily as predicted by dispersion models and secondarily in a downwind direction), the industry sites are not reviewed for particular long term trends.

The best long term indicator of any change in the amount of SO_2 in the ambient air is seen by reviewing the percentages of data points greater than the MDV. Figure 3 presents this data for the active state sites from 1980 through 1999. To calculate valid annual statistics, at least 75% of the data must be greater than the MDV. Therefore, the annual mean is not a valid indicator and, consequently, not addressed.

TABLE 3

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Sulfur Dioxide (PPB)

				MAXIMA									
				1 - HOUR		3 - HOUR		24 - HOUR					
LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	1ST MM/DD/HH	2ND MM/DD/HH	1ST MM/DD/HH	2ND MM/DD/HH	1ST MM/DD	2ND MM/DD	ARITH MEAN	1HR #>273	24HR #>99	% >MDV
Amerada Hess - Tioga #1	2000	JAN-DEC	8292	53 11/04/13	28 02/01/23	31 11/04/14	19 02/01/23	10 11/04	6 01/14	1.5			14.0
Amerada Hess - Tioga #3	2000	JAN-DEC	8706	64 09/20/01	63 01/10/12	53 09/20/02	47 02/03/14	20 02/03	20 09/20	3.0			24.7
Bear Paw - MGP #3	2000	JAN-DEC	8709	138 01/24/08	101 11/28/11	49 01/24/08	39 11/28/11	10 01/24	7 08/28	1.3			10.2
Bear Paw - MGP #5	2000	JAN-DEC	8697	267 08/23/07	218 09/08/00	134 08/23/08	80 09/08/02	24 08/23	11 09/08	1.5			13.2
Beulah - North	2000	JAN-DEC	8732	159 08/27/11	64 08/22/12	74 08/27/11	49 08/22/14	14 08/27	8 08/22	2.1			28.3
DGC #12	2000	JAN-DEC	8685	74 08/21/13	57 08/27/09	50 08/21/14	30 03/05/11	13 08/21	8 08/24	2.3			35.7
DGC #14	2000	JAN-DEC	8634	65 08/21/09	56 08/24/15	41 08/24/17	31 08/09/14	11 08/21	9 08/24	1.8			17.0
DGC #16	2000	JAN-DEC	8507	127 08/18/22	118 08/18/12	90 08/18/14	90 08/18/23	39 08/18	13 08/19	2.6			33.1
DGC #17	2000	JAN-DEC	8673	190 03/05/08	120 08/18/18	86 03/05/08	65 08/18/20	17 03/05	16 08/09	2.4			28.4
Dunn Center	2000	JAN-DEC	8721	50 08/25/09	26 12/13/08	25 08/25/11	15 12/15/05	8 12/13	8 12/15	1.4			15.9
Fargo NW	2000	JAN-DEC	8731	9 12/30/20	8 12/28/02	6 12/28/02	6 12/30/23	3 11/14	3 12/31	1.1			5.1
Hannover	2000	JAN-DEC	8715	110 07/13/09	105 07/26/11	52 07/13/11	48 07/26/11	12 01/31	11 03/11	2.2			25.9
Mandan - SPM	2000	JAN-DEC	8720	161 11/07/16	152 12/21/08	126 11/07/17	123 11/07/14	58 11/19	53 11/07	6.0			39.1
Mandan NW - SPM	2000	JAN-DEC	8731	106 10/21/01	91 04/12/04	67 02/24/23	66 10/21/02	25 04/12	16 10/21	3.5			39.3
Sharon	2000	JAN-DEC	7740	5 02/18/20	5 02/18/21	4 02/18/20	3 11/17/02	2 02/18	2 11/17	1.0			0.9
TRNP - SU (Painted Canyon)	2000	JAN-DEC	8176	11 01/11/18	11 02/23/05	9 01/11/20	9 02/13/05	4 02/13	4 02/15	1.1			7.5

The maximum 1-hour concentration is 267 ppb at Bear Paw - MGP #5 on 08/23/07
The maximum 3-hour concentration is 134 ppb at Bear Paw - MGP #5 on 08/23/08
the maximum 24-hour concentration is 58 ppb at Mandan - SPM on 11/19

* The air quality standards are:

STATE Standards -
1) 273 ppb maximum 1-hour average concentration.
2) 99 ppb maximum 24-hour average concentration.
3) 23 ppb maximum annual arithmetic mean concentration.

FEDERAL Standards -
1) 500 ppb maximum 3-hour concentration not to be exceeded more than once per year.
2) 140 ppb maximum 24-hour concentration not to be exceeded more than once per year.
3) 30 ppb annual arithmetic mean.

TABLE 4

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : SO_2 5-Minute Averages (ppb)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	5-MINUTE MAXIMA 1ST	DATE MM/DD/HH	2ND	DATE MM/DD/HH	3RD	DATE MM/DD/HH	# HOURS >600	% >MDV
Bear Paw - MGP #3	2000	JAN-DEC	8709	482	01/24/08	286	11/28/11	167	09/06/10	0	18.5
Bear Paw - MGP #5	2000	JAN-DEC	8697	499	08/23/08	494	09/07/23	437	08/23/07	0	23.8
Beulah - North	2000	JAN-DEC	8732	209	08/27/11	120	08/22/12	120	08/27/12	0	39.2
Dunn Center	2000	JAN-DEC	8590	70	08/25/09	68	08/25/10	44	07/05/17	0	25.3
Fargo NW	2000	JAN-DEC	8731	9	12/30/20	8	12/28/02	8	12/30/21	0	5.1
Hannover	2000	JAN-DEC	8715	164	07/13/09	156	03/09/08	131	07/26/11	0	35.0
Mandan - SPM	2000	JAN-DEC	8720	297	12/21/08	234	12/09/23	203	02/06/20	0	51.0
Mandan NW - SPM	2000	JAN-DEC	8731	167	03/22/11	157	08/23/09	151	05/25/09	0	52.8
Sharon	2000	JAN-DEC	7740	5	02/18/20	5	02/18/21	4	02/18/19	0	0.9
TRNP - SU (Painted Canyon)	2000	JAN-DEC	8176	11	01/11/18	11	02/23/05	10	01/11/19	0	7.5

The maximum 5-minute concentration is 499 ppb at Bear Paw - MGP #5 on 08/23/08

* No Standard is currently in effect:

Beginning in 1980, major events are easily traceable. In 1980, the oil industry was expanding. In 1981, MDU's Coyote Power Station began operation. In 1982 the oil industry in western North Dakota hit its peak activity. 1983, 1984, and 1985 were startup years for Basin Electric's Antelope Valley Unit #1, the synthetic natural gas plant (aka, Dakota Gasification Company), and Antelope Valley Unit #2, respectively. From 1987 through 1993, for the Beulah and Hannover sites, there was a steady increasing trend in the percentage of data greater than the MDV. However, Hannover showed a decrease form 1993 to 1997 while Beulah continued to increase until 1997. In contrast, the Dunn Center site has remained consistently between 5% and 10% until this year.

The same patterns seen in Figure 3 are discernable in the 1-hour, 3-hour, and 24-hour maximum concentration graphs (see Figures 4, 5, and 6, respectively). As can be seen from the graphs, the Mandan Refinery - SPM site exceeded the state and nearly the Federal 24-hour standard (see Figure 6): The 24-hour average was 143 ppb.

Because the newer sites (Fargo NW, Mandan Refinery - SPM, Mandan Refinery NW - SPM, Sharon, and TRNP - SU) have a limited amount of data, no attempt is made to evaluate the results.

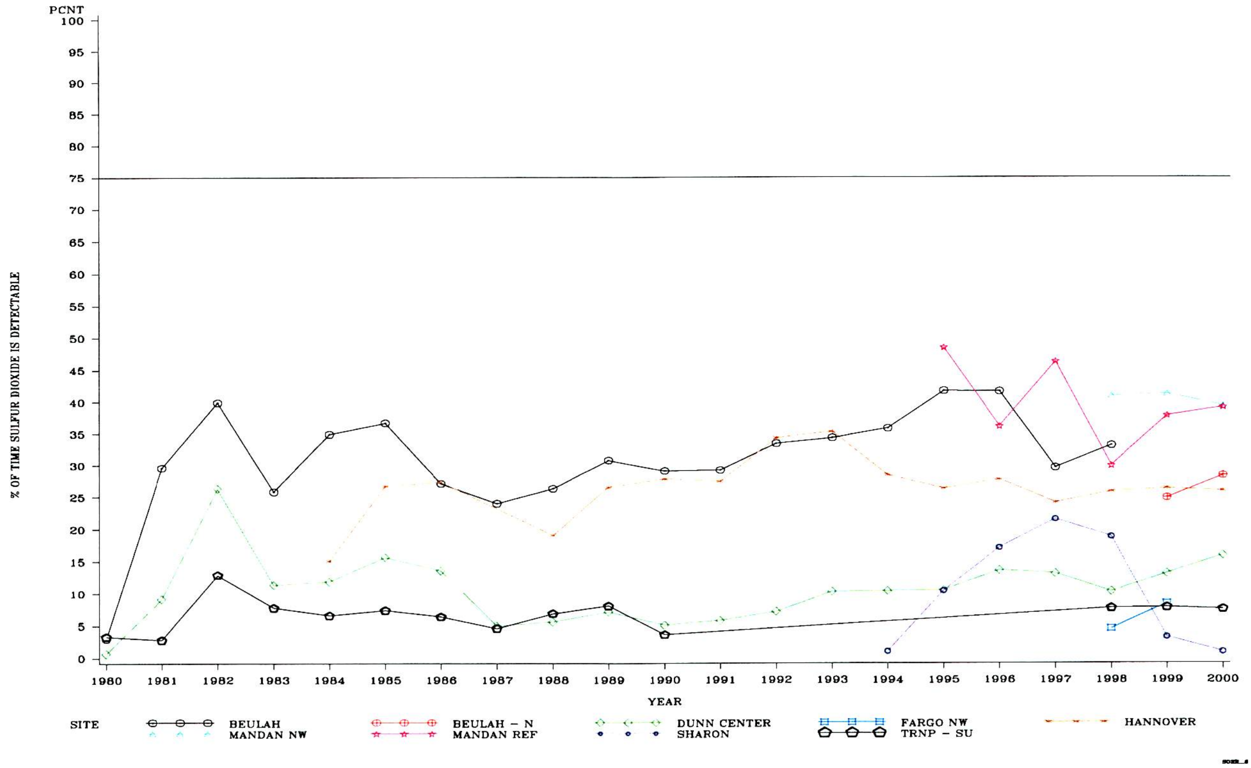

Figure 3 Percentage of Time SO_2 Detectable

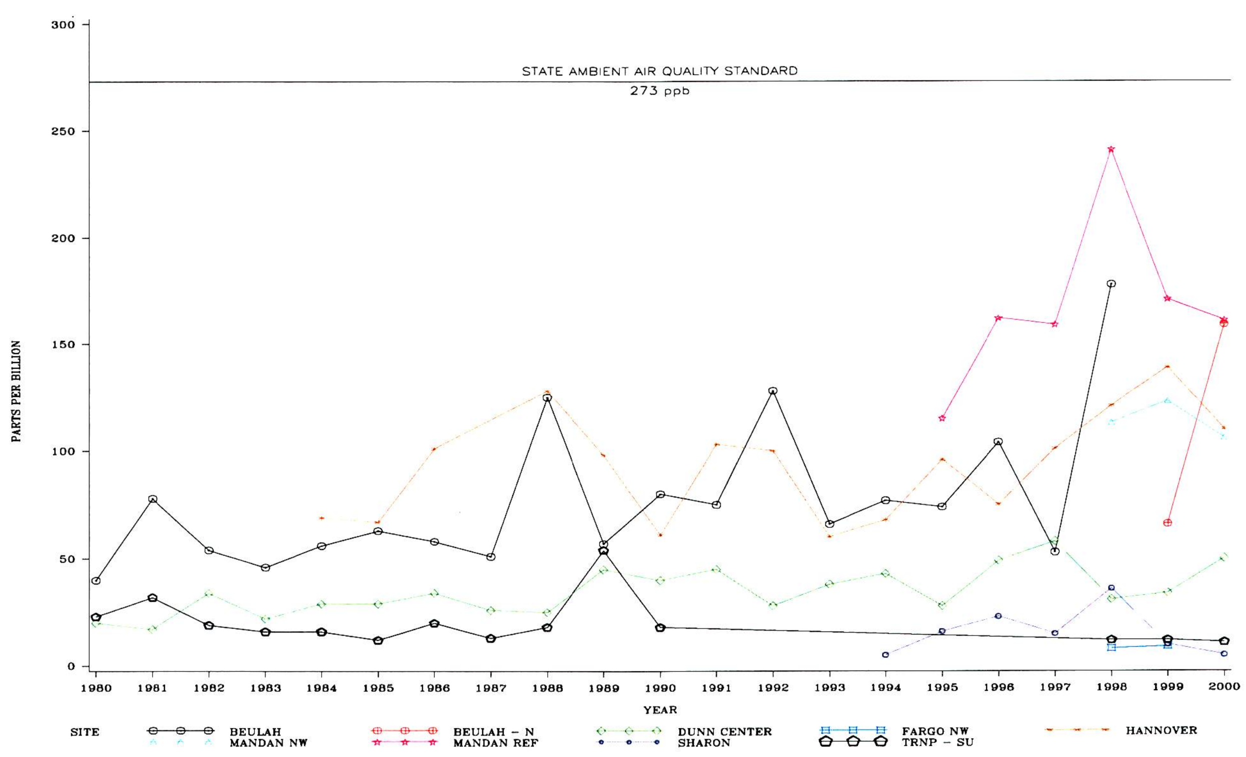

Figure 4 SO_2 Maximum 1-Hour Concentrations

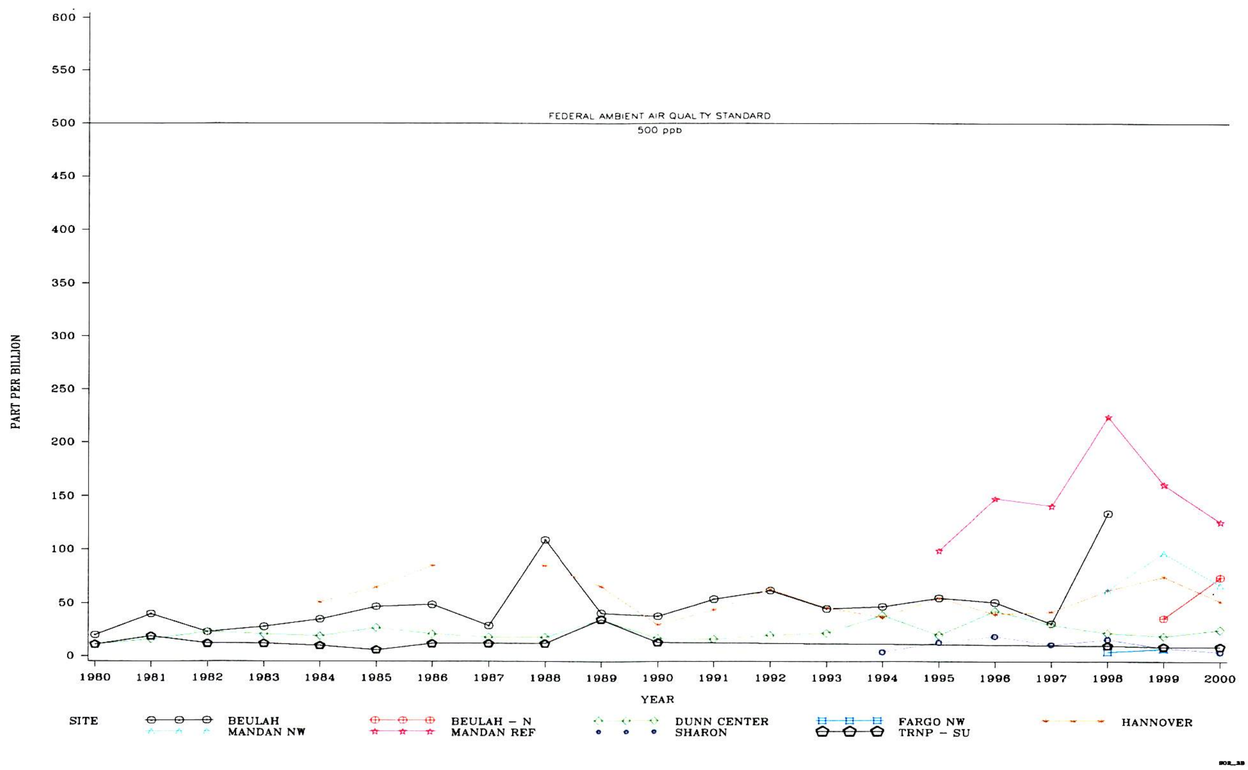

Figure 5 SO_2 Maximum 3-Hour Concentrations

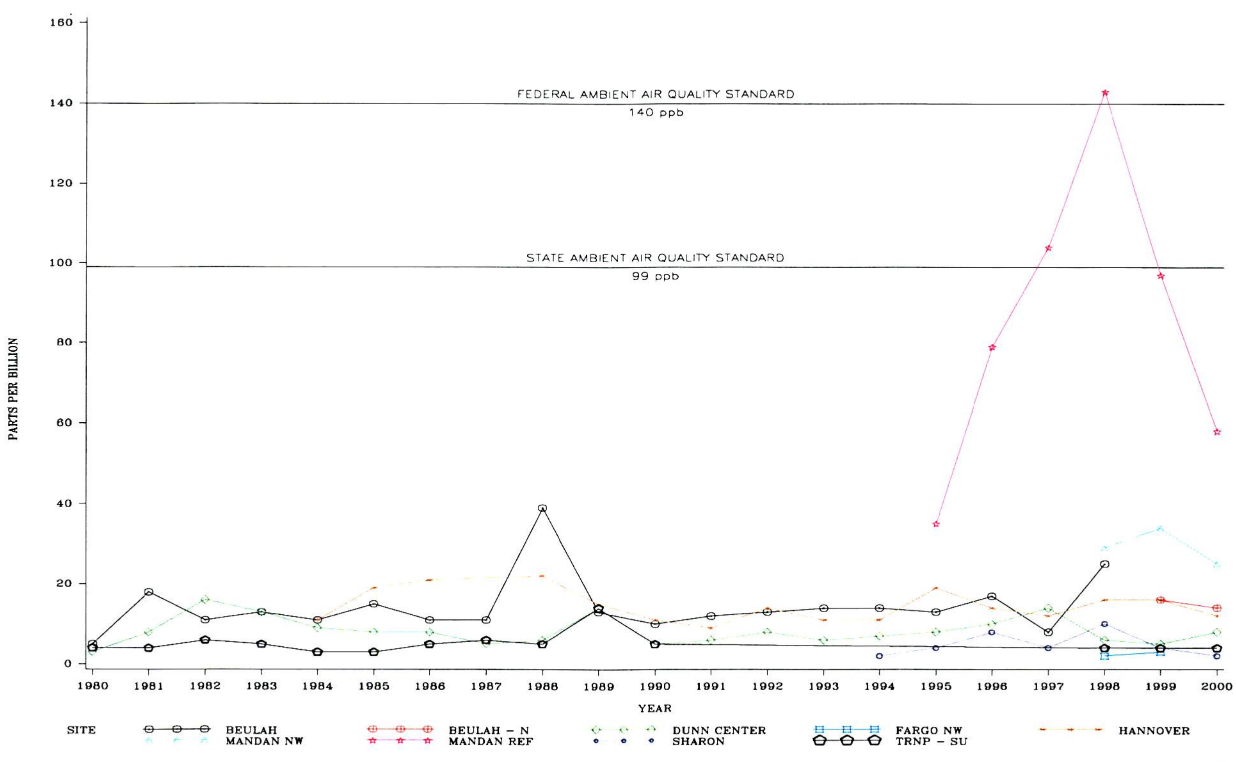

Figure 6 SO_2 Maximum 24-Hour Concentrations

2.2 Oxides of Nitrogen

Oxides of Nitrogen (NO_x) is the term used to represent both nitric oxide (NO) and nitrogen dioxide (NO_2). NO_2 is formed when NO is oxidized in the ambient air. There are no ambient air quality standards for NO.

2.2.1 Point Sources

The major NO_x stationary point sources (>100 TPY) are listed in Table 5 along with their emissions as calculated from the most recent emission inventories reported to the department. Figure 7 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). The larger NO_x point sources in North Dakota are associated with coal-fired steam-powered electrical generating plants in the west-central portion of the State and large internal combustion compressor engines in the natural gas fields in the western part of the State. Figure 7A shows the contribution of point sources to the total NO_2 emissions. The "Point Sources"category consists of Utility Boilers (power plant boilers) and oil and gas wells.

2.2.2 Area Sources

Another source of NO_X is automobile emissions. North Dakota has no significant urbanized areas with regard to oxides of nitrogen; the entire population of the State is less than the 1,000,000 population figure that EPA specifies in the NO_2 requirement for NAMS monitoring. Figure 7A shows the contribution of "Other Sources" and "Area Sources." The "Other Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants. "Area Sources" are the remaining sources of SO_2 such as agricultural burning. This estimate is based on the 1985 NAPAP Emissions Inventory.

2.2.3 Monitoring Network

The Department currently operates five $NO/NO_2/NO_x$ analyzers. These are located at Beulah, Dunn Center, Fargo, Hannover, and Sharon. The Dakota Gasification Company (DGC) network also operates analyzers at sites DGC #12 and DGC #17. Table 6 shows the 2000 NO_2 data summaries. The measured NO_2 values are quite low, particularly the annual means. From Figure 7 it can be seen that $NO/NO_2/NO_x$ analyzers, except for Dunn Center and Sharon, are well placed with respect to the major NO_x sources: Dunn Center and Sharon are defined as background sites.

TABLE 5

Major NO_x Sources (> 100 TPY)

2000

#	Source NAME	COUNTY	CITY	POLLUTANT EMISSIONS	PERCENT OF TOTAL EMISSIONS	Facility ID
1	Minnkota Power Coop: M R Young #2	Oliver	Center	17,727	20.0	380650020
2	Otter Tail Power Company: Coyote	Mercer	Beulah	12,620	14.3	380570012
3	Basin Electric: Leland Olds Station #2	Mercer	Stanton	9,330	10.6	380570001
1	Minnkota Power Coop: M R Young #1	Oliver	Center	7,584	8.6	380650001
4	Basin Electric: AVS #1	Mercer	Beulah	7,324	8.3	380570011
4	Basin Electric: AVS #2	Mercer	Beulah	6,748	7.6	380570011
5	Great River Energy: Coal Creek #2	Mc Lean	Underwood	5,325	6.0	380550017
5	Great River Energy: Coal Creek #1	Mc Lean	Underwood	5,211	5.9	380550017
6	Dakota Gasification Company	Mercer	Beulah	3,477	3.9	380570013
7	Amerada Hess Corp: Tioga Gas Plant	Williams	Tioga	2,480	2.8	381050004
3	Basin Electric: Leland Olds Station #1	Mercer	Stanton	2,328	2.6	380570001
8	Great River Energy: Stanton #1	Mercer	Stanton	1,850	2.1	380570004
9	BP Amoco: Mandan Refinery	Morton	Mandan	1,055	1.2	380590003
8	Great River Energy: Stanton #10	Mercer	Stanton	776	0.9	380570007
10	Montana Dakota Utilities: Heskett #2	Morton	Mandan	712	0.8	380590001
11	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	559	0.6	380970019
12	American Crystal Sugar: Drayton Plant	Pembina	Drayton	538	0.6	380670003
13	Minn-Dak Farmers Cooperative	Richland	Wahpeton	516	0.6	380770026
10	Montana Dakota Utilities: Heskett #1	Morton	Mandan	326	0.4	380590001
14	Cavalier Air Station	Pembina	Cavalier	267	0.3	380670005
15	Univ. Of North Dakota Heating Plant	Grand Forks	Grand Forks	239	0.3	380350003
16	Northern Border Pipeline: CS #4	Mc Kenzie	Arnegard	167	0.2	380530014
17	Bear Paw Energy, Inc.: Alexander	Mc Kenzie	Alexander	162	0.2	380530024
18	Bear Paw Energy - Lignite Gas Plant	Burke	Lignite	133	0.2	380130071
19	North Dakota State University	Cass	Fargo	130	0.1	380170005
20	Amerada Hess: Cherry Creek	Mc Kenzie	–	111	0.1	380530005
21	Williston Basin - Dickinson	Stark	Dickinson	108	0.1	380590004
22	Northern Border Pipeline: CS #8	Mc Intosh	--	107	0.1	380510001
23	Amerada Hess: Antelope #2	Mc Kenzie	–	106	0.1	380530045
24	Northern Border Pipeline: CS #5	Dunn	--	104	0.1	380250014
25	Northern Border Pipeline: CS #7	Morton	--	103	0.1	380590014
26	Northern Border Pipeline: CS #6	Morton	--	102	0.1	380590007
27	Amerada Hess: Hawkeye	Mc Kenzie	--	100	0.1	380530004

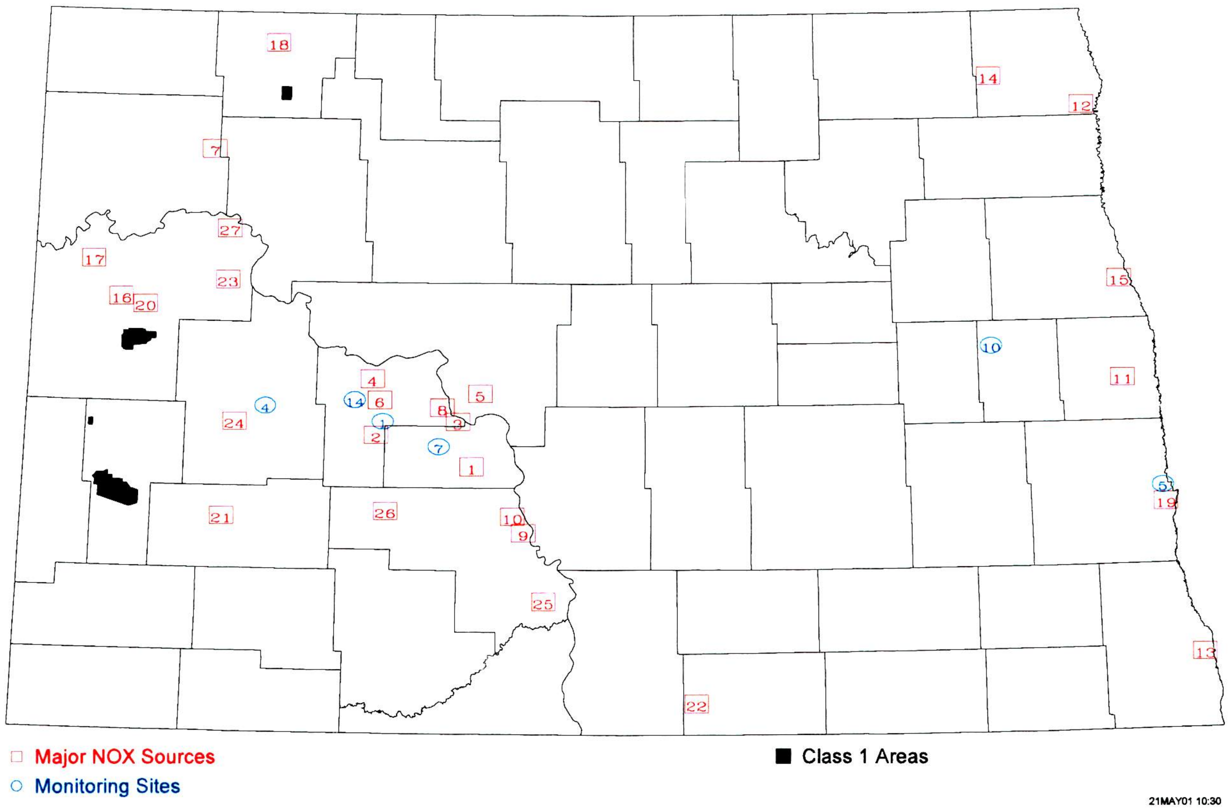

Figure 7 Major Nitrogen Dioxide Sources

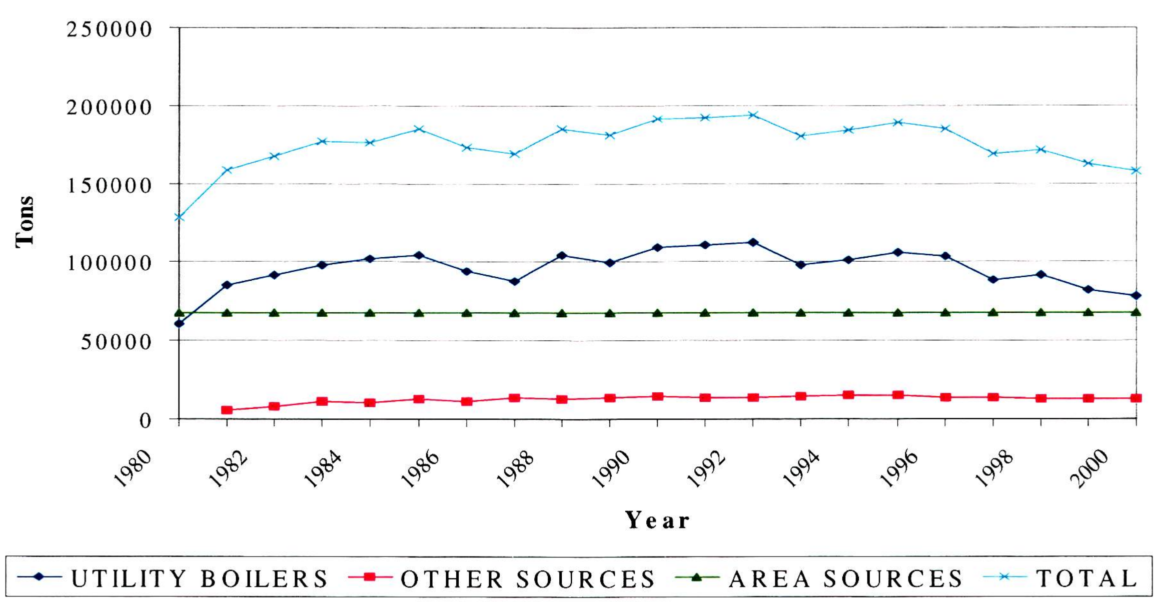

Figure 7A Annual Nitrogen Dioxide Emissions

TABLE 6

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Nitrogen Dioxide (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD/HH	MAXIMA 1 - HOUR 2ND MM/DD/HH	ARITH MEAN	% >MDV
Beulah - North	2000	JAN-DEC	8714	45 02/17/17	44 02/17/18	3.4	80.0
DGC #12	2000	JAN-DEC	8660	43 02/17/18	41 02/17/19	3.6	86.6
DGC #17	2000	JAN-DEC	8534	94 05/15/00	67 04/16/00	4.1	94.8
Dunn Center	2000	JAN-DEC	8696	16 12/15/03	15 01/31/16	2.0	52.5
Fargo NW	2000	JAN-DEC	8708	47 12/14/06	45 03/16/22	6.6	82.4
Hannover	2000	JAN-DEC	7318	30 07/26/11	29 01/31/23	2.5	63.7
Sharon	2000	JAN-DEC	8723	16 08/15/20	15 12/28/01	1.9	48.0

The maximum 1-hour concentration is 94 ppb at DGC #17 on 05/15/00

* The air quality standards are:
STATE - 53 ppb maximum annual arithmetic mean.

FEDERAL - 53 ppb annual arithmetic mean.

2.2.4 Network Analysis

Ten of the eleven largest NO_2 sources in the state are within 45 miles of the Beulah and Hannover monitoring sites. Figures 8 and 9 show the trends for the state operated sites for the last 21 years. Since the industry operated sites are placed for maximum concentrations, trends are not considered.

With the exception of Beulah in 1981, the percentage of data greater than the MDV, shown in Figure 8, was reasonably stable until 1993. The significant increase in the percentage of detectable concentrations is contrary to the quantity of NO_2 emitted. In Figure 7A show an increasing, but slow, trend in NO2 emissions from 1980 until 1993. From 1994 until present, there has been a decreasing trend in NO2 emissions. A possible explanation for Hannover is the analyzer was changed in March 1992 from a Meloy 8101C to a TECO 42. However, the analyzer change did not produce a discreet jump: the increase was seen at both the Beulah and Hannover sites. A possible conclusion is the increase in detectable NO_2 concentrations is real and not the result of equipment changes. Another possibility, and more likely, is a change in the wind flow patterns. As Hannover began a decline in 1995, Sharon began to increase. In 2000, Hannover was the only site that had a decrease in the number of hourly averages less than the minimum detectable value. Beulah and Fargo NW are the only State sites with more then 75% of the possible values greater then the MDV.

If the 1-hour maximum concentrations had followed a pattern similar to the one shown in Figure 8, the equipment change could have accounted for the increase in the percentage of data greater than the MDV. However, the 1-hour maximums, shown in Figure 9, have shown an overall decrease. Since Beulah - N is relatively new site, no valid trending is possible.

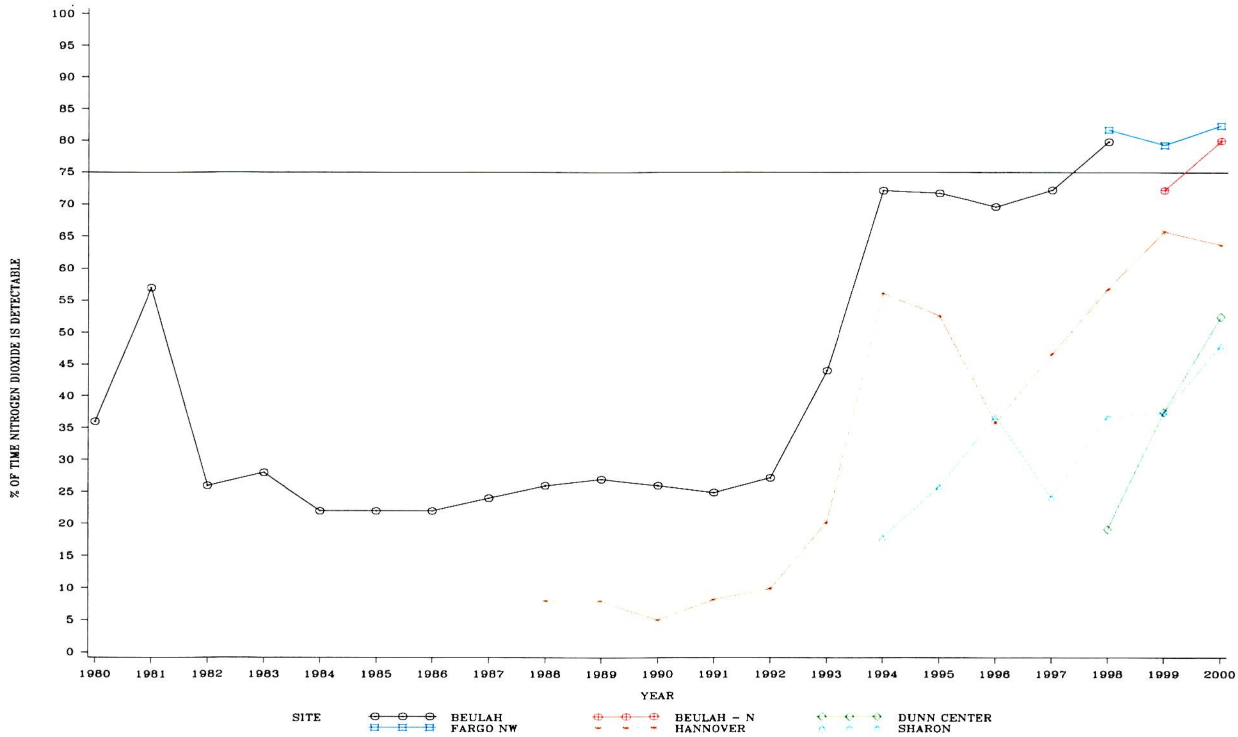

Figure 8 Percentage of Time NO_2 Detectable

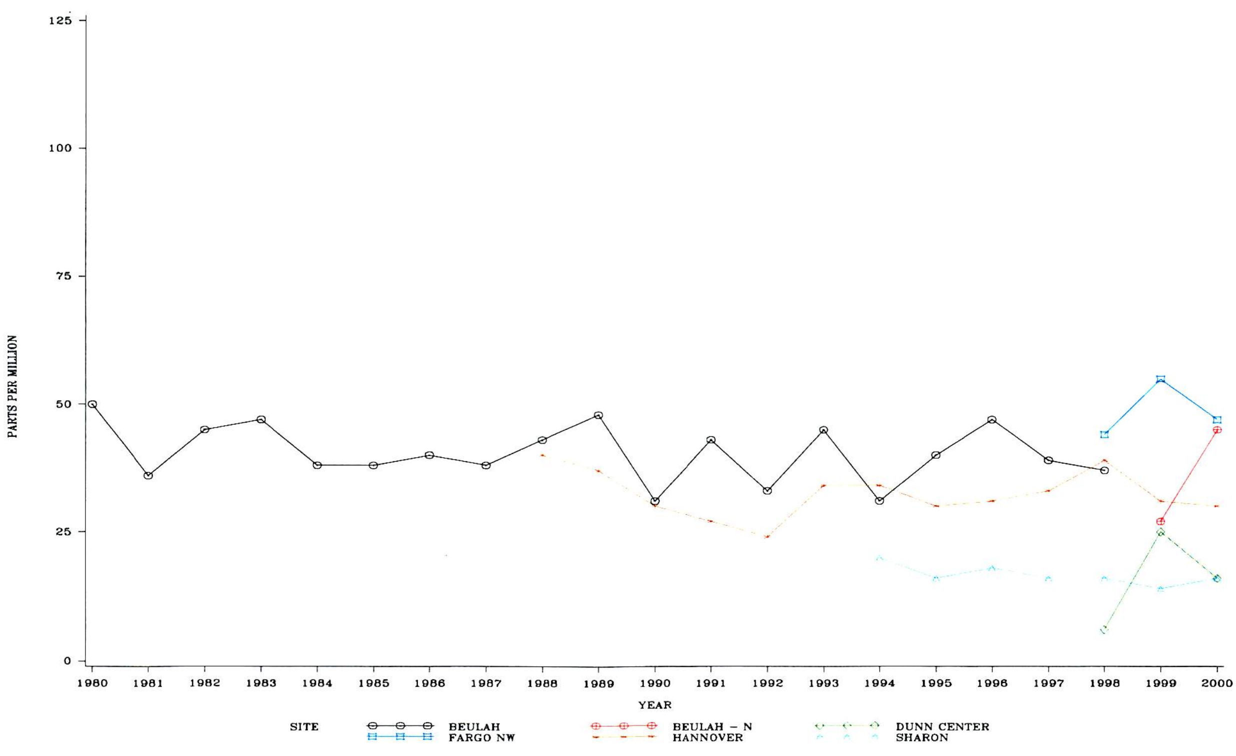

Figure 9 NO_2 Maximum 1-Hour Concentrations

2.3 Ozone

Unlike most other pollutants, ozone (O_3) is not emitted directly into the atmosphere but results from a complex photochemical reaction between volatile organic compounds (VOC), oxides of nitrogen (NO_x), and solar radiation. Both VOC and NO_x are emitted directly into the atmosphere from sources within the State. Since solar radiation is a major factor in O_3 production, O_3 concentrations are known to peak in summer months. 40 CFR 58 defines the O_3 monitoring season for North Dakota as May 1 through September 30. However, O_3 analyzers at all sites collect data year round for use in dispersion modeling.

2.3.1 Point Sources

The major stationary point sources (> 100 TPY) of VOC, as calculated from the most recent emission inventories reported to the Department, are listed in Table 7. Figure 10 shows the approximate locations of these facilities.

2.3.2 Area Sources

Point sources contribute only part of the total VOC and NO_x emissions. The remaining emissions are attributed to mobile sources in urban areas. The EPA has specified a design criteria for selecting NAMS locations for O_3 as any urbanized area having a population of more than 200,000. North Dakota has no urbanized areas large enough to warrant population-oriented monitoring.

TABLE 7

Major VOC Sources
(> 100 TPY)

2000

#	Source Name	County	City	Pollutant Emissions	Percent of Total Emissions	Facility ID
1	Dakota Gasification Company	Mercer	Beulah	374	23.8	380570013
2	EOTT Energy Pipeline Ltd.	Billings	Fryburg	194	12.3	380070038
3	Minnkota Power Coop: M. R. Young #2	Oliver	Center	160	10.2	380650020
4	Kaneb Pipe Line Operating Partnership, LP	Stutsman	Jamestown	151	9.6	380930037
5	Otter Tail Power Company: Coyote	Mercer	Beulah	125	8.0	380570012
6	Cargill, Inc.	Cass	West Fargo	124	7.9	380170066
7	BP Amoco: Mandan Refinery	Morton	Mandan	120	7.6	380590003
8	Northern Sun - ADM	Ransom	Enderlin	120	7.6	380730001
9	ADM - Velva	Mc Henry	Velva	103	6.6	380490005
10	Hood Flexible Packaging	Grand Forks	Grand Forks	100	6.4	380350052

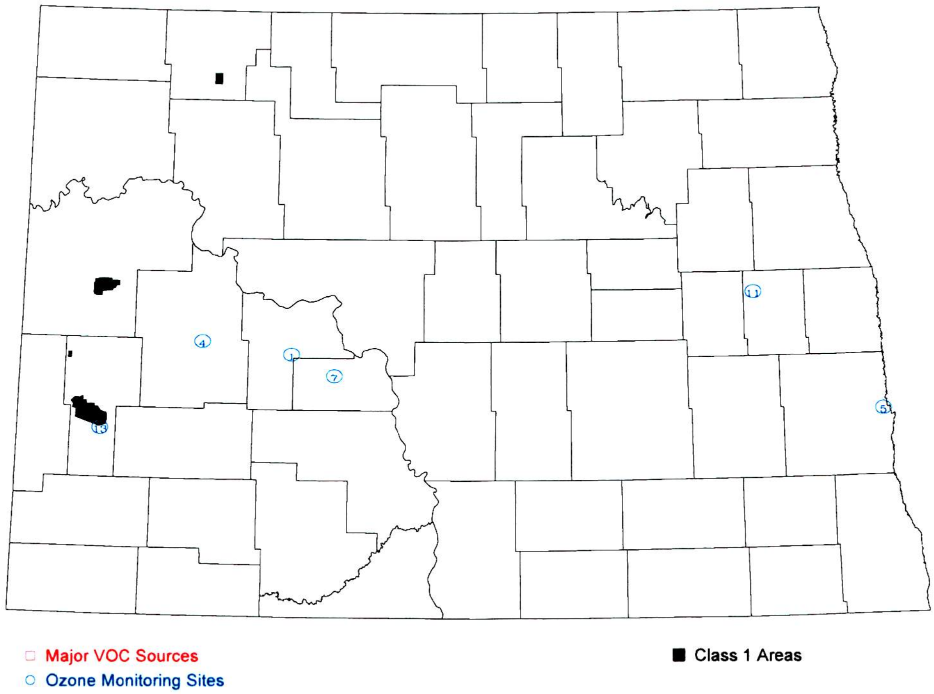

Figure 10 Major VOC Sources

TABLE 8

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Ozone (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD/HH	MAXIMA 1 - HOUR 2ND MM/DD/HH	MAXIMA 8 - HOUR 1ST MM/DD/HH	MAXIMA 8 - HOUR 2ND MM/DD/HH	MAXIMA 8 - HOUR 3RD MM/DD/HH	MAXIMA 8 - HOUR 4TH MM/DD/HH	1HR #>120	8HR #>80
Beulah - North	2000	JAN-DEC	8655	60 04/23/15	60 05/26/13	55 04/23/10	54 04/23/09	54 05/26/11	54 05/26/10		
Dunn Center	2000	JAN-DEC	6734	71 09/17/16	62 09/17/15	55 09/08/10	54 09/17/10	54 09/17/09	54 09/17/08		
Fargo NW	2000	JAN-DEC	8723	78 06/09/14	75 06/09/15	71 06/09/11	69 06/09/10	69 06/09/09	69 07/29/08		
Hannover	2000	JAN-DEC	8720	62 08/11/15	61 05/11/11	56 08/11/10	56 08/11/09	56 05/27/10	56 05/27/09		
Sharon	2000	JAN-DEC	8732	69 06/09/17	68 05/05/16	64 06/09/10	59 06/09/09	59 06/09/11	59 04/25/10		
TRNP - SU (Painted Canyon)	2000	JAN-DEC	8734	66 09/17/14	65 07/01/12	62 07/01/08	61 07/01/07	61 08/24/10	61 08/24/09		

The maximum 1-hour concentration is 78 ppb at Fargo NW on 06/09/14
The 4th highest 8-hour concentration is 69 ppb at Fargo NW on 07/29/08

* The air quality standards for ozone are:
STATE - 120 ppb not to be exceeded more than once per year.

FEDERAL Standards -
1) 120 ppb maximum 1-hour concentration with no more than one expected exceedance per year.
2) Fourth highest daily maximum 8-hour averages for a 3-year period not to exceed 80 ppb.

2.3.3 Monitoring Network

The state currently has six continuous ozone analyzers in operation. These are at Beulah, Dunn Center, Fargo, Hannover, Sharon, and Theodore Roosevelt National Park - South Unit. Table 8 presents 2000 1-hour and 8-hour data summaries. Figure 11 shows the maximum 1-hour averages by month for 2000.

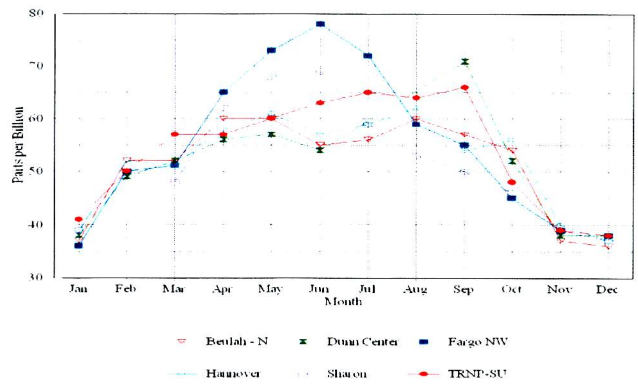

Figure 11 Monthly Maximum Ozone Concentrations

2.3.4 Network Analysis

Only two of the six monitoring sites are in an area not significantly influenced by VOC sources (see Figure 10). Beulah and Hannover are within 45 miles of six of the ten major VOC sources in the state. TRNP-SU is located in a Class I area surrounded by oil fields. Fargo NW is located in Fargo and influenced by city traffic. Dunn Center and Sharon are located in rural areas surrounded by crop land. With this diversity of site locations and influences, it would be expected to see a diversity of ozone concentrations. On the contrary, Figure 12 shows a significant similarity among the maximum 1-hour concentrations. Since 1980, there have been only three hours of data collect higher than 80 ppb and none of these exceeded 100 ppb. Another, even stronger, indication of a uniform ozone distribution is the 8-hour concentrations: The difference between the highest and 4th highest concentrations (see Table 8).

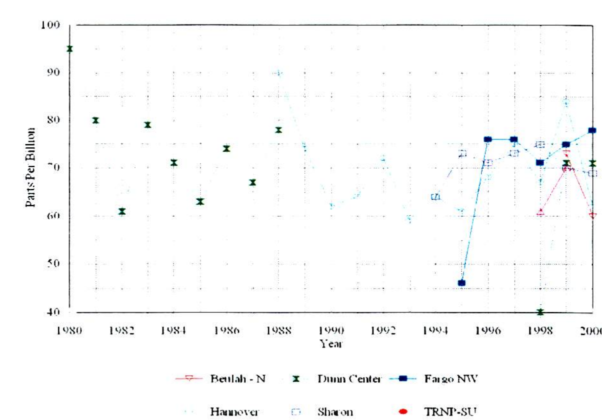

Figure 12 Annual Maximum Ozone Concentrations

2.4 Inhalable Particulates

The inhalable particulate standards are designed to protect against those particulates that can be inhaled deep into the lungs and cause respiratory problems. The major designation for inhalable particulates is PM. Within this designation are two subgroups: PM_{10} and $PM_{2.5}$. The PM_{10} particulates have an aerodynamic diameter less than or equal to a nominal 10 microns and are designated as PM_{10}. The $PM_{2.5}$ particulates have an aerodynamic diameter less than or equal to a nominal 2.5 microns and are designated as $PM_{2.5}$.

2.4.1 Sources

The major PM_{10} point sources (>100 TPY) are listed in Table 9 along with their emissions as calculated from the most recent emissions. Figure 13 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Most of these sources are large coal-fired facilities, and the PM_{10} particles are part of the boiler stack emissions; However, some of the emissions are the result of processing operations. Not included in this table are sources of fugitive dust such as coal mines, gravel pits, agricultural fields, and unpaved roads. Figure 7A shows the contribution of point sources to the total NO_2 emissions. The "Point Sources"category consists of Utility Boilers (power plant boilers) and oil and gas wells. The "Other Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants. "Area Sources" are the remaining sources of SO_2 such as agricultural burning. This estimate is based on the 1985 NAPAP Emissions Inventory.

2.4.2 Monitoring Network

The State operates PM_{10} sampler at one site and seven FRM $PM_{2.5}$ samplers. Since PM_{10} and smaller particles are of concern mainly because of their effects on people, monitoring efforts are concentrated in population centers. Table 10 shows the inhalable PM_{10} particulate data summary, Table 11 shows the FRM $PM_{2.5}$ particulate data summary and Table 12 shows the continuous $PM_{2.5}$ particulate data summary.

R&P single-day samplers were installed at Beulah, Dickinson, TRNP - SU, and Sharon. And, R&P sequential samplers were installed at Bismarck, Fargo, and Grand Forks. Duplicate samplers were co-located at Beulah and Fargo. Continuous $PM_{2.5}$ analyzers were installed at Beulah and Fargo.

TABLE 9

Major PM_{10} Sources
(> 100 TPY)

2000

#	Source Name	County	City	Pollutant Emissions	Percent of Total Emissions	Facility ID
1	Dakota Gasification Company	Mercer	Beulah	1,381	18.42	380570013
2	BP Amoco: Mandan Refinery	Morton	Mandan	1,260	16.81	380590003
3	Great River Energy: Coal Creek #2	Mc Lean	Underwood	830	11.07	380550017
4	Otter Tail Power Company: Coyote	Mercer	Beulah	668	8.92	380570012
3	Great River Energy: Coal Creek #1	Mc Lean	Underwood	633	8.45	380550017
5	American Crystal Sugar: Drayton Plant	Pembina	Drayton	491	6.55	380670003
6	Basin Electric: AVS #1	Mercer	Beulah	450	6.01	380570011
6	Basin Electric: AVS #2	Mercer	Beulah	347	4.63	380570011
7	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	291	3.89	380970019
8	Basin Electric: Leland Olds #2	Mercer	Stanton	275	3.66	380570001
9	Minnkota Power Coop: M R Young #1	Oliver	Center	214	2.85	380650001
9	Minnkota Power Coop: M R Young #2	Oliver	Center	164	2.19	380650001
10	Minn-Dak Farmers Cooperative	Richland	Wahpeton	162	2.17	380770026
11	University of North Dakota Heating Plant	Grand Forks	Grand Forks	116	1.55	380350003
12	Great River Energy: Stanton #1	Mercer	Stanton	110	1.46	380570004
8	Basin Electric: Leland Olds #1	Mercer	Stanton	104	1.39	380570001

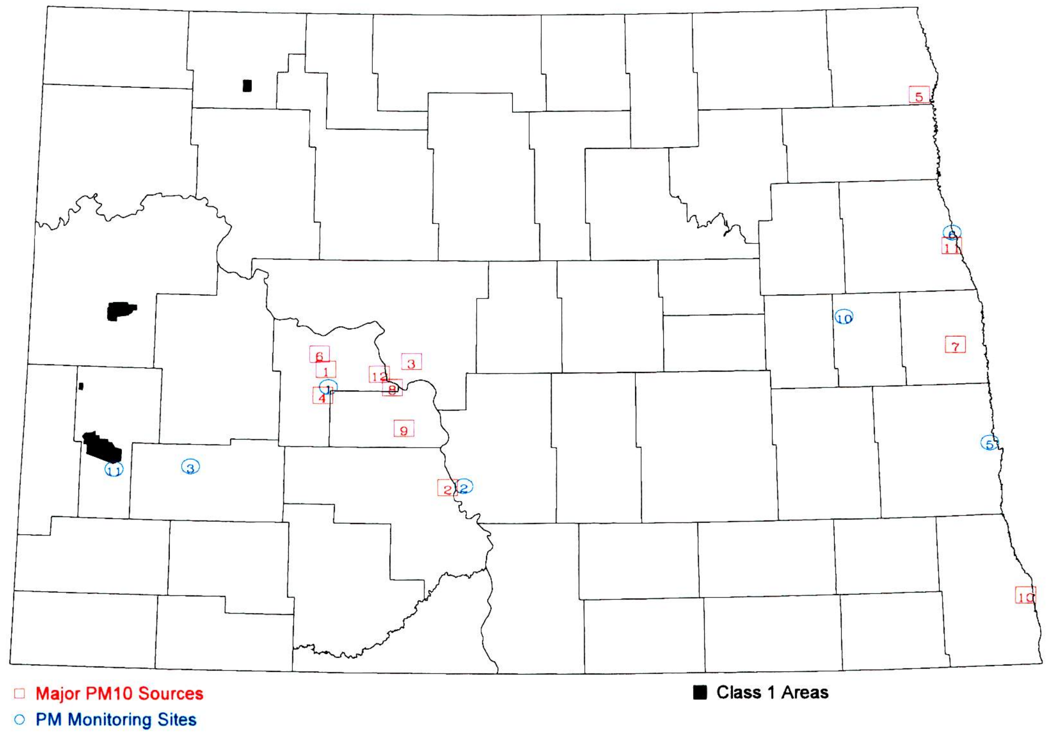

Figure 13 Major PM_{10} Sources

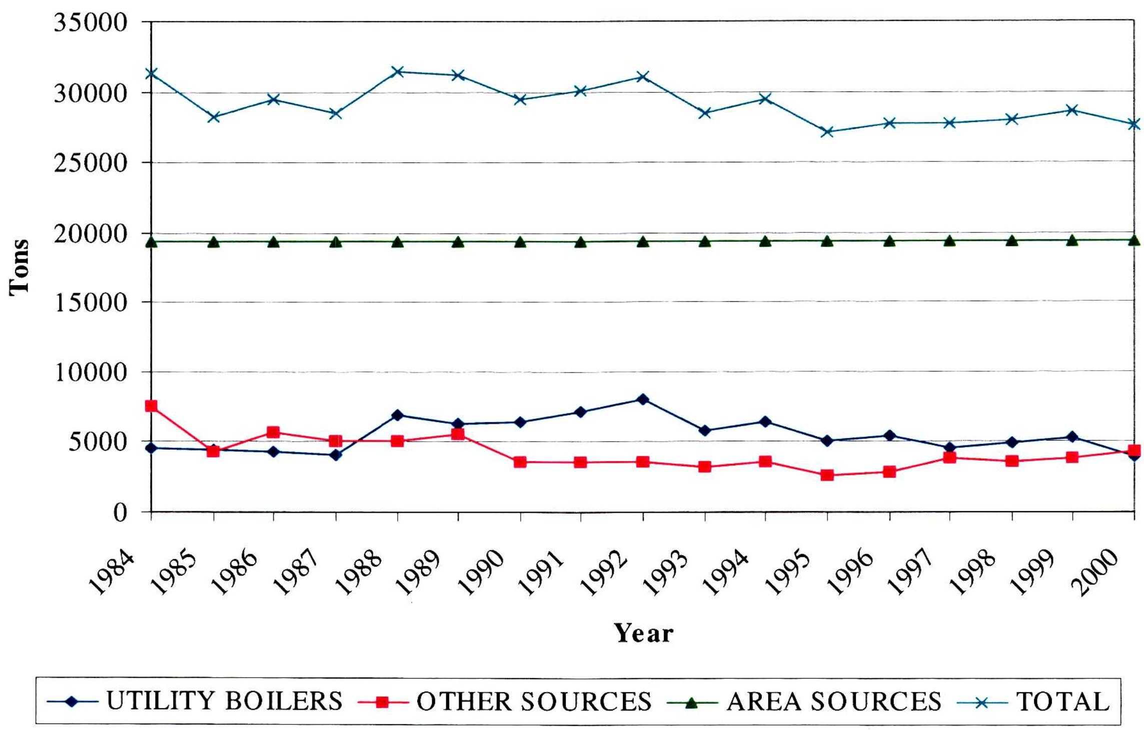

Figure 13A Annual PM Emissions

TABLE 10

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Inhalable PM_{10} Particulates (µg/m³)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST MM/DD	MAXIMA 2ND MM/DD	MAXIMA 3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
Fargo NW	2000	JAN-DEC	56	3.6	42.4 07/29	39.1 05/06	36.4 08/04	16.8			98.2

The maximum 24-hour concentration is 43.4 µg/m³ at Fargo NW on 07/29

* The STATE and FEDERAL air quality standards are:
  1) 150 µg/m³ maximum averaged over a 24-hour period with no more than one expected exceedance per year.
  2) 50 µg/m³ expected annual arithmetic mean.

TABLE 11

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : FRM $PM_{2.5}$ Particulates (µg/m³)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST MM/DD	MAXIMA 2ND MM/DD	MAXIMA 3RD MM/DD	ARITH MEAN	#>150	AM>50	% >MDV
Beulah - North	2000	JAN-DEC	59	1.8	14.0 08/04	11.5 12/20	10.7 12/14	6.1			98.3
Bismarck Residential	2000	JAN-DEC	121	2.1	21.3 01/28	14.5 08/25	14.3 08/04	6.6			100.0
Dickinson Residential	2000	JAN-DEC	59	1.3	12.3 08/04	10.1 02/12	9.6 01/19	5.4			94.9
Fargo NW	2000	JAN-DEC	117	1.8	28.1 02/21	26.5 01/28	26.4 07/29	7.7			96.5
Grand Forks - North	2000	JAN-DEC	113	1.6	28.0 01/28	27.5 12/14	24.6 07/29	8.1			98.2
Sharon	2000	JAN-DEC	57	0.4	37.7 08/24	21.0 07/29	17.8 06/12	6.9			91.2
TRNP - SU (Painted Canyon)	2000	JUL-DEC	27	1.9	12.0 08/04	9.8 08/10	9.1 07/23	5.6			96.3

The maximum 24-hour concentration is 37.7 µg/m³ at Sharon on 08/24

* The ambient air quality standards are:
  FEDERAL Standards -
  1) 24-hour: 3-year average of 98th percentiles not to exceed 65 µg/m³.
  2) Annual: 3-year average not to exceed 15µg/m³.

Table 12

COMPARISON OF AIR QUALITY DATA WITH
THE NORTH DAKOTA AMBIENT AIR QUALITY STANDARDS *

POLLUTANT : Continuous $PM_{2.5}$ (µg/m³)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD/HH	1 - HOUR 2ND MM/DD/HH	24 - HOUR 1ST MM/DD	24 - HOUR 2ND MM/DD	24 - HOUR 3RD MM/DD	24 - HOUR 4TH MM/DD	MEAN	1HR #>150	24HR #>65
Beulah - North	2000	OCT-DEC	2198	144.3 11/29/15	126.9 11/29/14	33.4 11/29	24.9 11/07	17.2 10/13	10.9 12/20	5.6		
Fargo NW	2000	JUL-DEC	4399	170.3 07/04/21	72.6 09/29/19	21.8 07/29	19.8 07/30	15.9 08/02	15.4 07/04	5.1	1	

The maximum 1-hour concentration is 170.3 µg/m³ at Fargo NW on 07/04/21
The highest 24-hour concentration is 33.4 µg/m³ at Beulah - North on 11/29

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 µg/m³.
2) Annual: 3-year average not to exceed 15 µg/m³.

2.4.3 PM_{10} Network Analysis

The only PM_{10} site remaining is at Fargo NW, as a population-oriented site. This sampler was shut down and moved to Bismarck effective December 31. This change makes room for the speciation sampler planned to begin operation as soon as the sampler is received and set up. The projected start date is July 1, 2001.

2.4.4 $PM_{2.5}$ Network

The $PM_{2.5}$ network currently has seven sites with nine samplers. Bismarck, Fargo and Grand Forks are non-CORE required sites operating on a 1-in-3 day schedule with a duplicate sampler in Fargo. Beulah, Dickinson, Sharon, and TRNP - SU operate in a 1-in-6 day schedule with a duplicate sampler in Beulah. During the year, continuous $PM_{2.5}$ analyzers were add to Fargo and Beulah. The plan is to use these two analyzers to replace the FRM samplers as soon as EPA identifies what needs to be done to make these FEM $PM_{2.5}$ analyzers

The intent is to begin using these analyzers as the primary data source and use a FRM sampler only for quality assurance purposes. As the $PM_{2.5}$ samplers are replaced or removed from service, some will be converted to PM_{10} samplers and used along with speciation samplers to collect a data set comparable to the IMPROVE samplers. This is expected to provide data that can be used in the regional haze/visibility determinations.

2.4.5 Speciation Network

The Department participated in the EPA Mini-Trends Network operation a MET One SASS and a URG speciation samplers at Bismarck. This test period for the samplers ran for eight months with the data report to AIRS-AQS using POCs 5 and 6.

Future plans call for a sampler in Bismarck, TRNP - NU, and a National Trends Network sampler in Fargo. The order of installation is Bismarck, then Fargo, as soon as MET One gets the display unit problems resolved and a sampler delivered, and TRNP - NU. Fargo is expected to begin July 1 and TRNP - NU no later than January 1, 2002.

The goal of the two state-selected sites is to supplement the data collected by the two IMPROVE samplers: TRNP - NU and Lostwood. With the combined data, it is expected the Department will be able to make a better assessment of the current visibility and track improvement over time.

2.5 Carbon Monoxide

Many large urban areas in the United States have problems attaining the NAAQS for carbon monoxide (CO) where the primary source of CO is automobiles. North Dakota does not have sufficient population with the corresponding traffic congestion and geographical/meteorological conditions to create significant CO emission problems. However, there are several stationary sources in the State that emit more than 100 TPY of CO.

2.5.1 Sources

The major stationary CO sources (>100 TPY) are listed in Table 13 along with their emissions as calculated from the most recent emissions inventories reported to the department. Figure 20 shows the approximate locations of these facilities (the numbers correspond to the site and source tables). Most of these sources are the same sources that are the major emitters of SO_2 and NO_x. However, the corresponding levels of CO from these sources are considerably lower.

2.5.2 Monitoring Network

Carbon monoxide monitoring in North Dakota was terminated March 31, 1994, after 5 years of operation. The conclusion drawn from the data was that North Dakota did not have a CO problem. A summary report of the data collected at the West Acres Shopping Mall was drafted for the Fargo-Moorhead Council of Governments for use in their traffic planning program.

TABLE 13

Major CO Sources
(> 100 TPY)

2000

#	Source Name	County	City	Pollutant Emissions	Percentage of Total Emissions	Facility ID
1	Dakota Gasification Company	Mercer	Beulah	2,195	18.0	380570013
2	Minn-Dak Farmers Cooperative	Richland	Wahpeton	1,176	9.6	380770026
3	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	1,066	8.7	380970019
4	Great River Energy: Coal Creek #1	Mc Lean	Underwood	981	8.0	380550017
4	Great River Energy: Coal Creek #2	Mc Lean	Underwood	968	7.9	380550017
5	Basin Electric: AVS #2	Mercer	Beulah	749	6.1	380570011
6	Minnkota Power Coop: M. R. Young #2	Oliver	Center	730	6.0	380650020
5	Basin Electric: AVS #1	Mercer	Beulah	716	5.9	380570011
7	Otter Tail Power Company: Coyote	Mercer	Beulah	570	4.7	380570012
8	Basin Electric: Leland Olds #2	Mercer	Stanton	536	4.4	380570001
9	Amerada Hess Corp: Tioga Gas Plant	Williams	Tioga	399	3.3	381050004
10	American Crystal Sugar: Drayton Plant	Pembina	Drayton	365	3.0	380670003
6	Minnkota Power Coop: M R Young #1	Oliver	Center	360	3.0	380650001
11	Northern Sun - ADM	Mc Henry	Velca	294	2.4	380730001
12	Montana Dakota Utilities: Heskett #1	Morton	Mandan	280	2.3	380590001
13	BP Amoco: Mandan Refinery	Morton	Mandan	273	2.2	380590003
8	Basin Electric: Leland Olds #1	Mercer	Stanton	163	1.3	380570001
14	University of North Dakota Heating Plant	Grand Forks	Grand Forks	139	1.1	380350003
15	Bear Paw - Alexander	Mc Kenzie	Alexander	136	1.1	380530024
16	Cavalier Air Station	Pembina	Cavalier	103	0.8	380670005

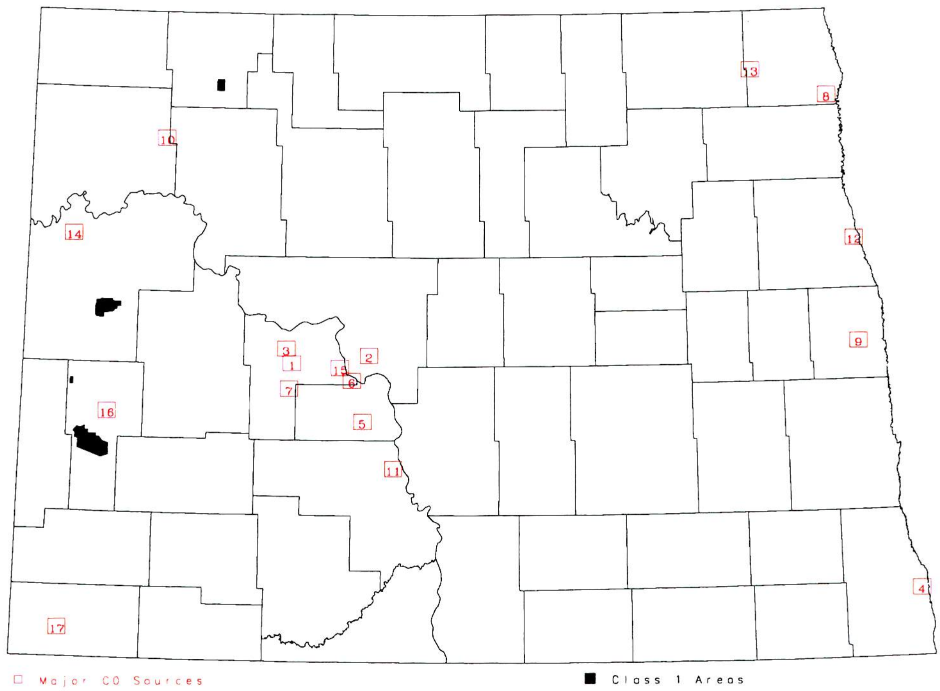

Figure 14 Major CO Sources

2.6 Lead

Through prior sampling efforts, the Department has determined that the State has low lead concentrations (38.6% of the standard) and no significant lead sources. This determination, coupled with the Federal requirement for a NAMS network only in urbanized areas with populations greater than 500,000, resulted in terminating the lead monitoring program effective December 31, 1983. Along with the low monitored concentrations, lead has been completely removed from gasoline since lead monitoring began in 1979.

2.7 Hydrogen Sulfide

Although no Federal Ambient Air Quality Standard exists for hydrogen sulfide (H_2S), the State of North Dakota has developed H_2S standards.

2.7.1 Sources

H_2S emissions of concern stems almost totally from the oil and gas operations in the western part of the State; principally from the green outlined area on Figure 2.

Flares and treater stacks associated with oil/gas wells, oil storage tanks, compressor stations, pipeline risers, and natural gas processing plants are potential H_2S emission sources.

2.7.2 Monitoring Network

Currently there are no State or industry H_2S monitoring sites.

2.8 Air Toxics

Air toxics were monitored at Fargo and Beulah at various times throughout the year. Due to funding changes and lapses in funding neither site ran for a complete calendar year.

2.8.1 Sources

The major air toxics sources are listed in Table 14 and Figure 15 shows the approximate locations of these facilities (the numbers correspond to the site and source tables).

Table 14

Major Air Toxics Sources
(>100 TPY)

2000

#	Major Source	County	City	Pollutant Emission	Percent of Total Emissions	Facility ID
1	Dakota Gasification Company	Mercer	Beulah	3004.20	69.27	380570013
2	ADM - Velva	Mc Henry	Velva	199.40	4.60	380490005
3	Great River Energy - #2	Mc Lean	Falkirk	190.70	4.40	380550017
3	Great River Energy - #1	Mc Lean	Falkirk	162.82	3.75	380550017
4	Northern Sun	Ransom	Enderlin	150.50	3.47	380730001
5	Minnkota Power - M. R. Young #2	Oliver	Center	139.60	3.22	380650001
6	Basin Electric - AVS #2	Mercer	Beulah	132.60	3.06	380570011
7	BP Amoco	Morton	Mandan	129.50	2.99	380590003
6	Basin Electric - AVS #1	Mercer	Beulah	114.80	2.65	380570011
8	Basin Electric - Leland Olds #2	Mercer	Beulah	112.80	2.60	380570001

2.8.2 Monitoring Network

The air toxics network consisted of two sites: Beulah - N and Fargo NW. The data collected was reviewed and the contractor added the data to the AIRS-AQS database. The data at Fargo NW did not indicated anything unusual for the area when compared to other sites across the country. At Beulah, methyl ethyl ketone (MEK) is the only air toxic the produced any results the were of any interest. Based on data provided by DGC, there seems to be a source of MEK other than DGC though it is not clear what that source could be. The expected concentrations based on DGC-provided data are non-detectable (ND). However, typical concentrations are 1-4 ppm with peaks as high as 293 ppm. Since the data is a 24-hour sample, using wind direction to identify the source has been unsuccessful. Several possible sources have been investigated. These sources are the sampler itself, the construction material in the shelter, and the sample train. The conclusion is that the source is an external source we have not been able to identify. The other data, when compared to other

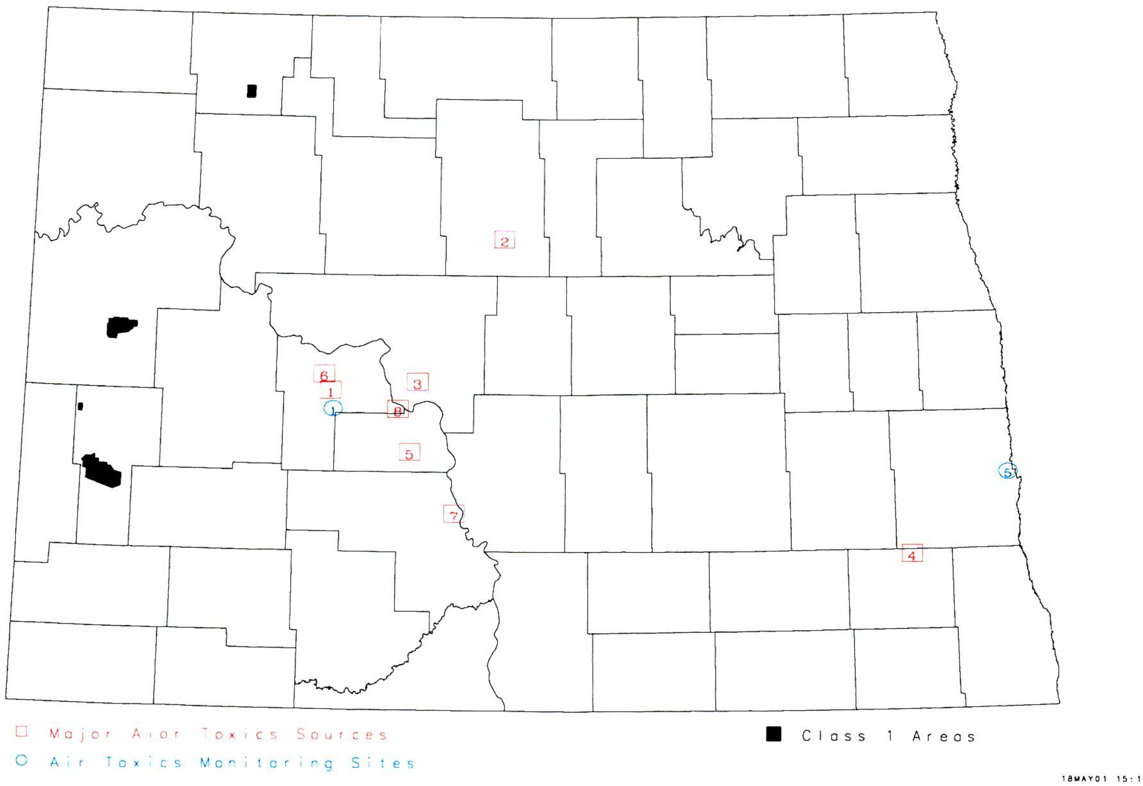

Figure 15 Major Air Toxics Sources

sites of similar industrial influence, are comparable to the other sites monitoring at the same time.

Data summaries are not included in this review because there are approximately 70 parameters reported. The data is available in AIRS-AQS using Parameter Occurrence Code (POC) 5.

3.0 SUMMARY AND CONCLUSIONS

The North Dakota Ambient Air Quality Monitoring Network is designed to monitor those air pollutants which demonstrate the greatest potential for deteriorating the air quality of North Dakota. Due to a greater number of pollution producing sources in the western part of the State (primarily associated with the energy producing industries) the greatest percentage of the network is located in the western part of the State.

3.1 Sulfur Dioxide (SO_2)

Neither the State nor Federal standards were not exceeded at any monitoring site. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 267 ppb (97.8%); 3-hour - 134 ppb (26.8%); 24-hour - 58 ppb (58.6%); annual - 6.0 ppb (26.1%).

There is no SO_2 5-minute standard currently in effect. The maximum 5-minute average was 295 ppb.

3.2 Nitrogen Dioxide (NO_2)

Neither the State nor Federal standards were exceeded at any of the monitoring sites. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: annual - 6.6 ppb (12.5%)

3.3 Ozone (O_3)

Neither the State nor Federal standard was exceeded during the year. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 78 ppb (65.0%); 8-hour - 69 ppb (86.3%).

3.4 Inhalable Particulates

Neither the State nor Federal PM_{10} standards were exceeded during the year. The maximum concentrations and the maximum concentrations expressed as a percentage of the applicable PM_{10} standard are as follows: 24-hour - 42.4 $\mu g/m^3$ (28.3%); annual - 16.8 $\mu g/m^3$ (33.6%).

The proposed Federal $PM_{2.5}$ standards were exceeded during the year. The maximum concentrations and maximum concentrations expressed as a percentage of the standard are as follows: 24-hour FRM - 37.7 $\mu g/m^3$ (58.0%); annual FRM - 8.1 $\mu g/m^3$ (54.0%).

3.5 Carbon Monoxide (CO)

No monitoring was conducted.

3.6 Lead

No monitoring was conducted.

3.7 Hydrogen Sulfide

No monitoring was conducted.

3.8 Air Toxics

Data at both Beulah and Fargo are similar to comparable sites operating at the same time. The data and data summaries are available on the AIRS-AQS database.