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August 5, 2002

FILE

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

Re: FY '02-'03 PPA, Air Quality Media Workplan, Monitoring, Item B (Network Review)

Dear Mr. MacRae:

An electronic copy of the referenced review was e-mailed to you July 8, 2002. 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, 2002, 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 questions 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:alm

North Dakota Department of Health
Division of Air Quality

Ambient Air Quality Monitoring
Annual Network Review
2001

May 2002

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1.0 INTRODUCTION

The North Dakota Department of Health, Division of Air Quality, 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 Air Quality 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 Air Quality 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 Air Quality 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 pollutant concentrations expected to occur in an area covered by the network.*
2. *To determine representative concentrations in areas of high population density.*
3. *To determine the impact on ambient pollution levels by a significant source or class of sources.*
4. *To determine the general/background concentration levels.*
5. *To determine the impact on air quality by regional transport.*
6. *To determine Welfare-related 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 four basic conditions: 1) background monitoring; 2) population exposure; 3) highest concentration; and; 4) long range transport/regional haze. 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 Bismarck 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 2003, the need for several sites/parameter combinations will be reviewed. The current list of existing sites/parameters to be reviewed are Fargo NW FRM $PM_{2.5}$ and Beulah N FRM $PM_{2.5}$. Consideration is being given to reopening the site at Lostwood National Wildlife Refuge. If approved, the site will have SO_2, NO_x, O_3, continuous PM_{10} and $PM_{2.5}$, WS, WD, Temperature, Delta Temperature, and Solar Radiation,

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.

To satisfy the need for a long range transport/regional haze site, the TRNP - NU site was reopened with SO_2, NO_x, O_3, PM_{10}, $PM_{2.5}$, Speciation, WS, WD, Temperature, and Relative Humidity.

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 12 AAQM sites around the State. Ten 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 10/00
2 Bismarck Residential 380150003	SLAMS	$PM_{2.5}$ $PM_{2.5}$ Speciation PM_{10}	3rd Day 6th Day 6th Day	Population Exposure	Urban	12/98 1/01 1/01
3 Dickinson Residential[4] 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} $PM_{2.5}$ $PM_{2.5}$ $PM_{2.5}$ Speciation SO_2, NO_2, O_3, MET cont. $PM_{2.5}$	3rd Day 3rd Day 3rd Day 3rd Day cont. cont.	Population Exposure Population Exposure Collocated Population Exposure Population Exposure Population Exposure	Urban Urban N/A Urban Urban Urban	05/98 12/98 7/01 05/98 7/00
6 Grand Forks North[4] 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 - NU	SLAMS	SO_2, NO_2, O_3, MET	cont.	Long range Transport	Regional	8/01
12 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 #					
13 Amerada Hess Corporation	TIOGA #1 381050103	SO_2	cont.	Source Impact	Urban	07/87
	TIOGA #2 381050104	H_2S, MET	cont.	Source Impact	Urban	07/87
	TIOGA #3 381050105	SO_2	cont.	Source Impact	Urban	11/87
14 Bear Paw Energy, Inc.	MGP #3 380530104	SO_2, MET	cont.	Source Impact	Urban	11/94
	MGP #5 380530111	SO_2, MET	cont.	Source Impact	Urban	05/94
15 Dakota Gasification Company	DGC #12 380570102	SO_2, NO_2, MET	cont.	Source Impact	Urban	01/80
	DGC #14 380570118	SO_2	cont.	Source Impact	Urban	01/89
	DGC #16 380570123	SO_2	cont.	Source Impact	Urban	10/95
	DGC #17 380570124	SO_2, NO_2	cont.	Source Impact	Urban	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. Terminated December 31, 2001.

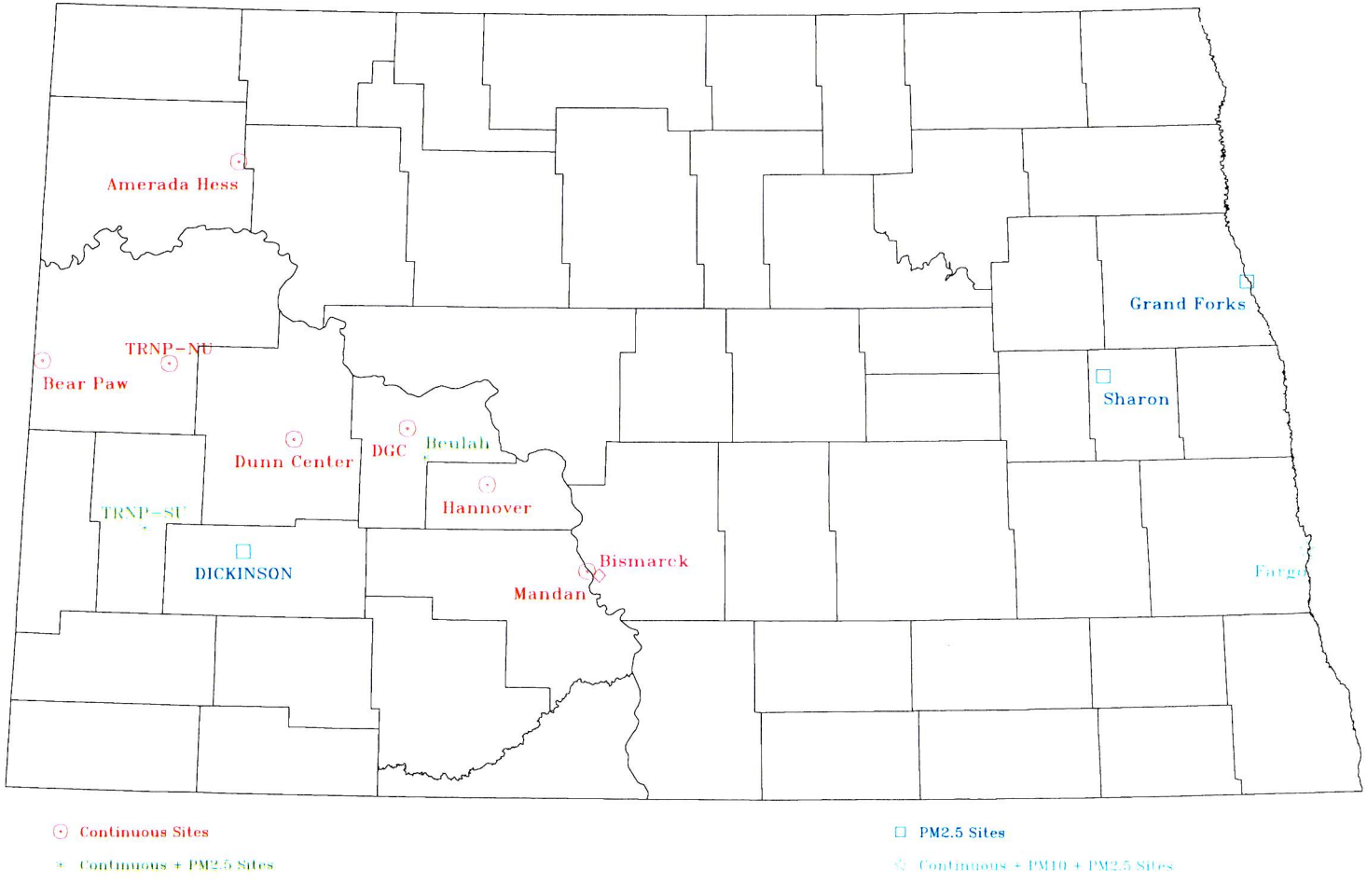

Figure 1 North Dakota Ambient Air Quality Monitoring Sites

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.

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 Point Sources" that consists of DGC, refineries, gas processing plants, and agriculture processing plants.

TABLE 2

Major SO_2 Sources

(>100 TPY)

2001

#	Facility Name	County	City	Pollutant Emissions	Percentage of Total Emissions	Faility ID
1	Basin Electric: Leland Olds Station #2	Mercer	Stanton	36,219	19.90%	380570001
2	Minnkota Power Coop: M R Young #1	Oliver	Center	23,179	12.70%	380650001
3	Otter Tail Power Company: Coyote	Mercer	Beulah	16,258	8.90%	380570012
1	Basin Electric: Leland Olds Station #1	Mercer	Stanton	15,237	8.40%	380570001
4	Great River Energy: Coal Creek #1	Mc Lean	Underwood	14,630	8.00%	380550017
2	Minnkota Power Coop: Square Butte	Oliver	Center	12,377	6.80%	380650020
4	Great River Energy: Coal Creek #2	Mc Lean	Underwood	11,684	6.40%	380550017
5	Dakota Gasification Company	Mercer	Beulah	10,022	5.50%	380570013
6	Great River Energy: Stanton 1	Mercer	Stanton	9,046	5.00%	380570004
7	Basin Electric: AVS #1	Mercer	Beulah	6,843	3.80%	380570011
8	Bear Paw Energy, Inc.: Grasslands Plant	Mc Kenzie	--	5,381	3.00%	380530023
9	Tesoro Refinery & Marketing	Morton	Mandan	5,256	2.90%	380590003
7	Basin Electric: AVS #2	Mercer	Beulah	5,226	2.90%	380570011
10	Montana Dakota Utilities: Heskett #2	Morton	Mandan	2,625	1.40%	380590001
11	Amerada Hess Corp: Tioga Gas Plant	Williams	Tioga	2,131	1.20%	381050004
6	Great River Energy: Stanton 10	Mercer	Stanton	1,214	0.70%	380570007
10	Montana Dakota Utilities: Heskett #1	Morton	Mandan	1,022	0.60%	380590001
12	American Crystal Sugar: Drayton Plant	Pembina	Drayton	652	0.40%	380670003
13	Univ. Of North Dakota Heating Plant	Grand Forks	Grand Forks	610	0.30%	380350003
14	Bear Paw Energy - Lignite Gas Plant	Burke	Lignite	585	0.30%	380130071
15	Petro-Hunt, Llc	Billings	Killdeer	562	0.30%	380070002
16	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	520	0.30%	380970019
17	North Dakota State University	Cass	Fargo	312	0.20%	380170005
18	ADM Corn Processing: Wahalla	Pembina	Wahalla	200	0.10%	380670004
19	Minn-Dak Farmers Cooperative	Richland	Wahpeton	164	0.10%	380770026

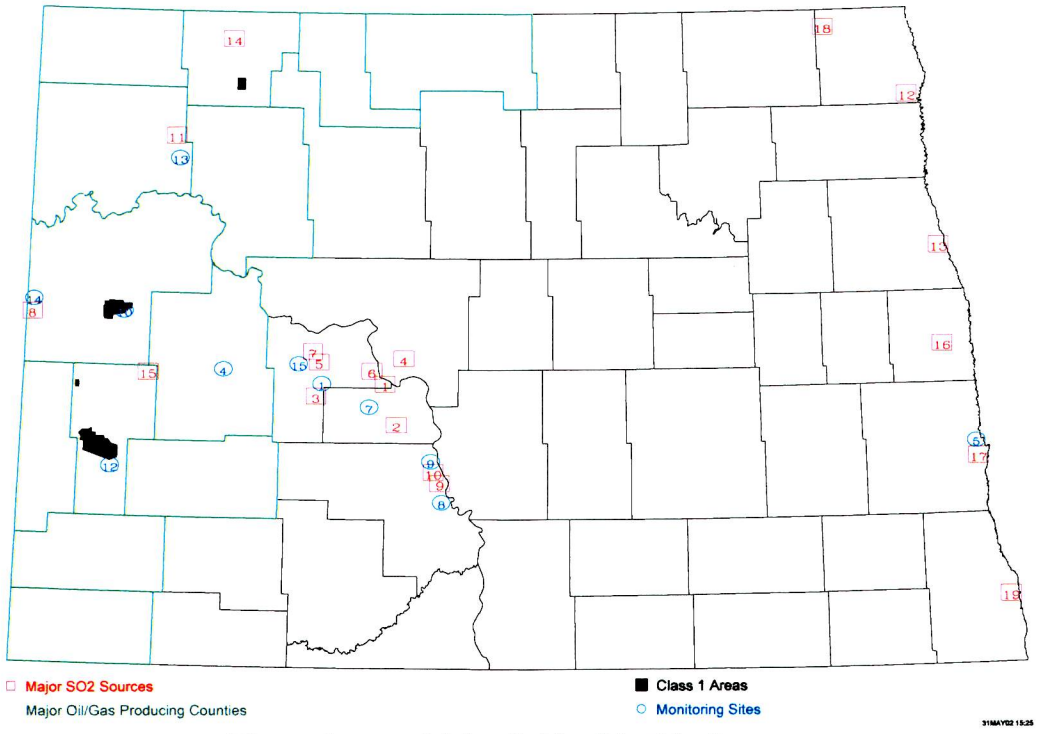

Figure 2 Major Sulfur Dioxide Sources

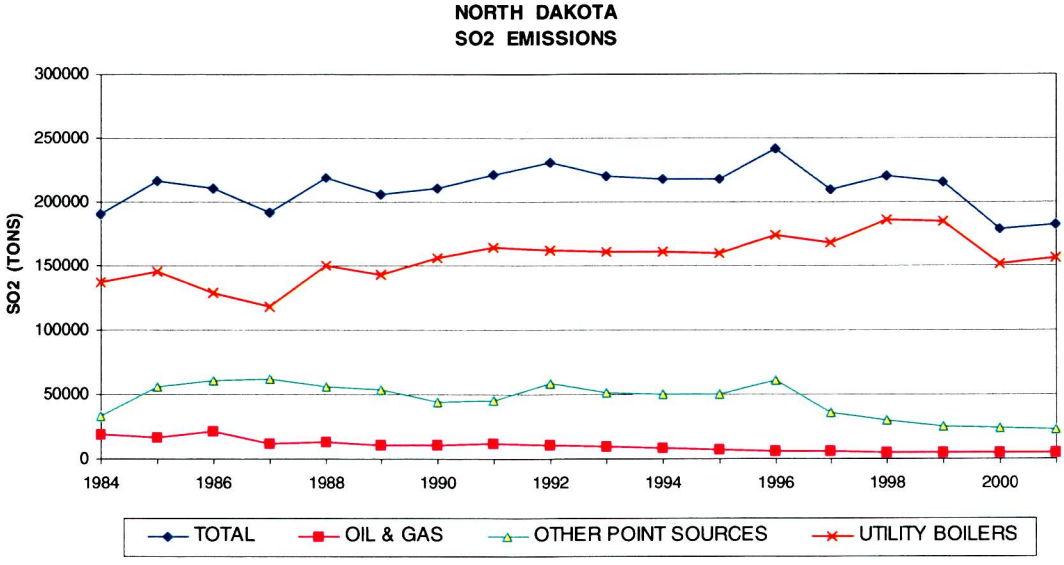

Figure 2A Annual Sulfur Dioxide Emissions

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 2001 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 10 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 ten 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 ten sources combined. Figures 3, 4, 5, and 6, present a 22-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 2001. 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)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1-HOUR 1ST MM/DD/HH	MAXIMA 1-HOUR 2ND MM/DD/HH	MAXIMA 3-HOUR 1ST MM/DD/HH	MAXIMA 3-HOUR 2ND MM/DD/HH	MAXIMA 24-HOUR 1ST MM/DD	MAXIMA 24-HOUR 2ND MM/DD	ARITH MEAN	1HR #>273	24HR #>99	% >MDV
Amerada Hess - Tioga #1	2001	JAN-DEC	8192	57 06/10/18	57 11/19/22	30 11/19/23	29 11/08/11	7 11/19	6 11/08	1.4			12.1
Amerada Hess - Tioga #3	2001	JAN-DEC	8634	81 11/18/09	76 06/18/17	64 06/18/17	50 11/18/11	22 05/21	20 03/24	2.9			24.8
Bear Paw - MGP #3	2001	JAN-DEC	8695	48 08/30/07	21 02/05/10	18 08/30/08	11 12/12/08	3 12/12	3 08/30	1.2			8.0
Bear Paw - MGP #5	2001	JAN-DEC	8690	47 02/10/08	28 08/18/07	18 02/10/08	13 02/10/11	6 02/10	3 06/03	1.3			10.8
Beulah - North	2001	JAN-DEC	8691	89 07/06/07	87 03/28/13	67 03/28/14	66 03/24/11	26 03/24	17 03/28	2.0			22.7
DGC #12	2001	JAN-DEC	8686	164 03/12/22	108 03/12/19	99 03/12/23	96 03/12/20	27 03/12	14 03/28	2.2			31.4
DGC #14	2001	JAN-DEC	8707	111 03/15/10	95 01/17/10	65 03/15/14	63 03/15/11	17 03/15	11 03/13	1.9			20.7
DGC #16	2001	JAN-DEC	8570	96 08/08/07	75 08/07/12	47 08/07/14	42 03/16/14	10 08/07	10 08/18	2.1			21.6
DGC #17	2001	JAN-DEC	8687	84 08/07/12	72 08/07/13	54 08/07/14	48 08/08/11	13 08/07	11 08/08	1.9			19.6
Dunn Center	2001	JAN-DEC	8360	25 09/15/09	20 07/09/08	14 07/24/11	13 09/15/11	5 02/14	5 07/09	1.3			12.5
Fargo NW	2001	JAN-DEC	8372	12 02/11/05	9 02/27/23	7 02/27/20	7 02/27/23	4 02/27	3 02/11	1.1			4.0
Hannover	2001	JAN-DEC	5465 ***	85 01/24/03	62 03/25/09	51 03/25/11	50 01/24/05	16 01/24	10 03/25	2.1			21.1
Mandan - SPM	2001	JAN-DEC	8695	140 03/28/12	119 03/28/13	116 03/28/14	77 11/07/20	38 01/15	33 02/13	5.5			37.7
Mandan NW - SPM	2001	JAN-DEC	8661	115 09/27/10	91 09/27/09	90 09/27/11	74 12/14/20	26 09/25	23 03/28	3.9			42.4
TRNP - NU	2001	AUG-DEC	3637 ***	9 10/01/10	7 09/15/16	6 10/01/11	6 12/11/14	2 12/11	2 10/01	1.1			3.6
TRNP - SU (Painted Canyon)	2001	JAN-DEC	8700	20 02/07/17	16 07/17/19	15 02/07/17	12 07/17/20	4 02/07	3 07/17	1.1			6.7

The maximum 1-hour concentration is 164 ppb at DGC #12 on 03/12/22
The maximum 3-hour concentration is 116 ppb at Mandan - SPM on 03/28/14
The maximum 24-hour concentration is 38 ppb at Mandan - SPM on 01/15

* 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	2001	JAN-DEC	8695	143	08/30/07	58	02/05/10	38	03/20/08	0	16.6
Bear Paw - MGP #5	2001	JAN-DEC	8690	91	05/14/22	79	02/10/08	58	02/10/09	0	23.2
Beulah - North	2001	JAN-DEC	8691	169	03/28/14	161	07/06/07	152	03/28/13	0	36.5
Dunn Center	2001	JAN-DEC	8358	30	09/15/09	28	09/03/08	27	07/24/08	0	19.8
Fargo NW	2001	JAN-DEC	8372	12	02/11/05	11	12/31/14	11	12/31/15	0	4.8
Hannover	2001	JAN-DEC	5465	173	01/24/03	118	01/24/02	93	03/25/10	0	30.8
Mandan - SPM	2001	JAN-DEC	8695	229	03/28/13	225	02/03/20	203	09/30/11	0	49.3
Mandan NW - SPM	2001	JAN-DEC	8661	222	01/08/14	173	09/27/10	153	09/27/09	0	56.8
TRNP - NU	2001	AUG-DEC	3637	12	10/01/09	12	10/01/10	10	10/01/11	0	5.7
TRNP - SU (Painted Canyon)	2001	JAN-DEC	8700	20	02/07/17	17	11/11/23	16	07/17/19	0	8.6

The maximum 5-minute concentration is 229 ppb at Mandan - SPM on 03/28/13

* 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. The Beulah - N site began operation in 1998 and has shown a steady decrease in percentage detectable. 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, in 1998, 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, and TRNP - SU) have a limited amount of data, no attempt is made to evaluate the results.

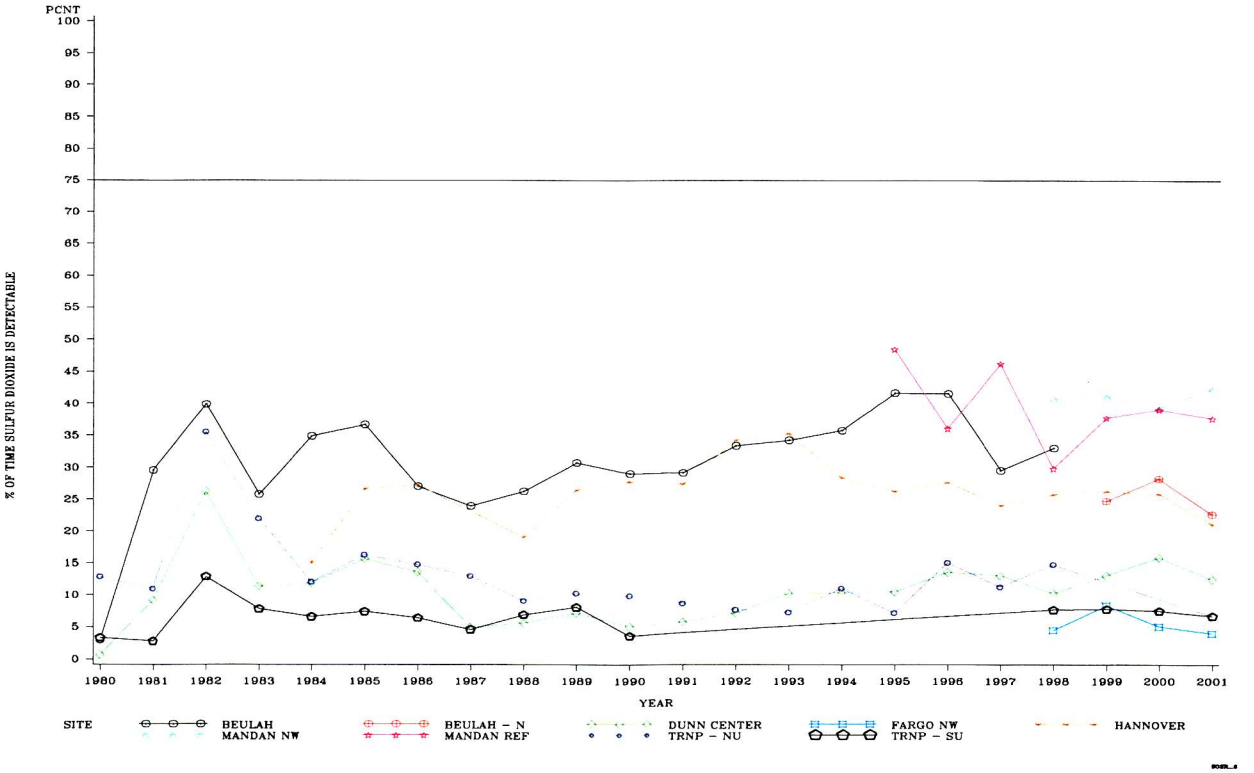

Figure 3 Percentage of Time SO_2 Detectable

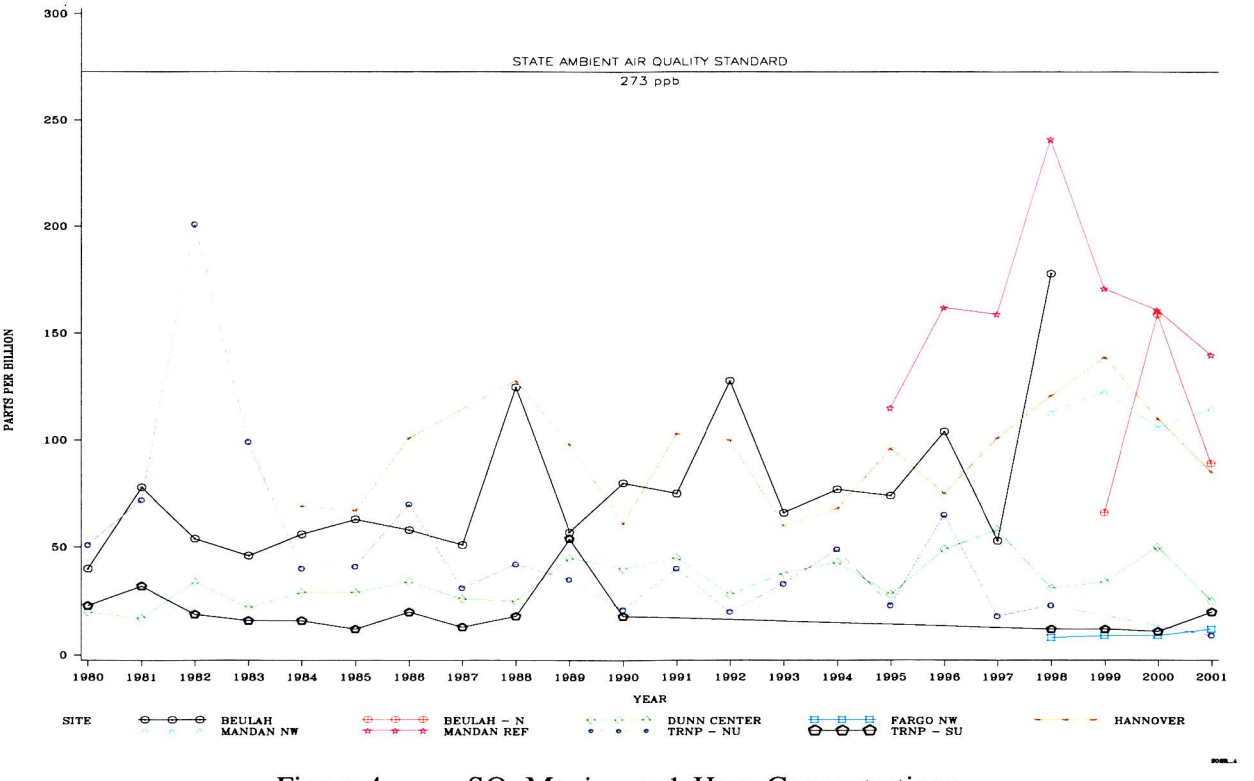

Figure 4 SO_2 Maximum 1-Hour Concentrations

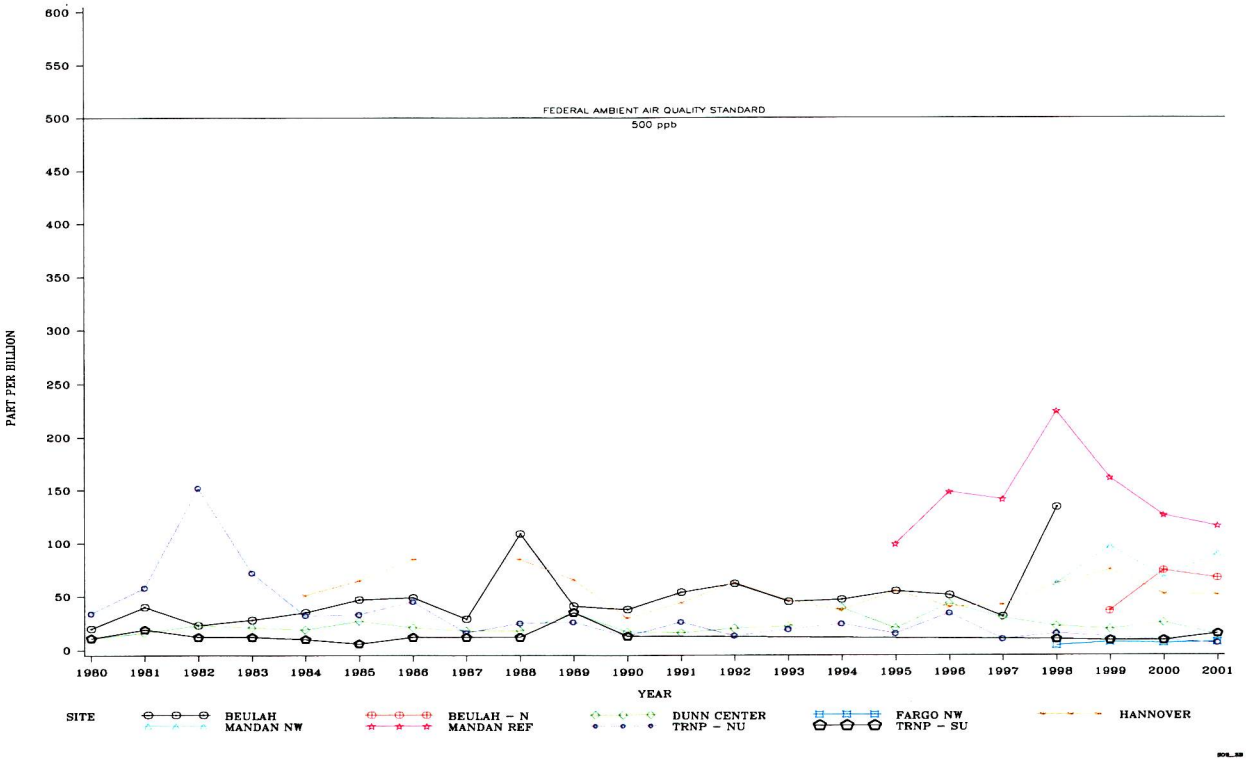

Figure 5 SO_2 Maximum 3-Hour Concentrations

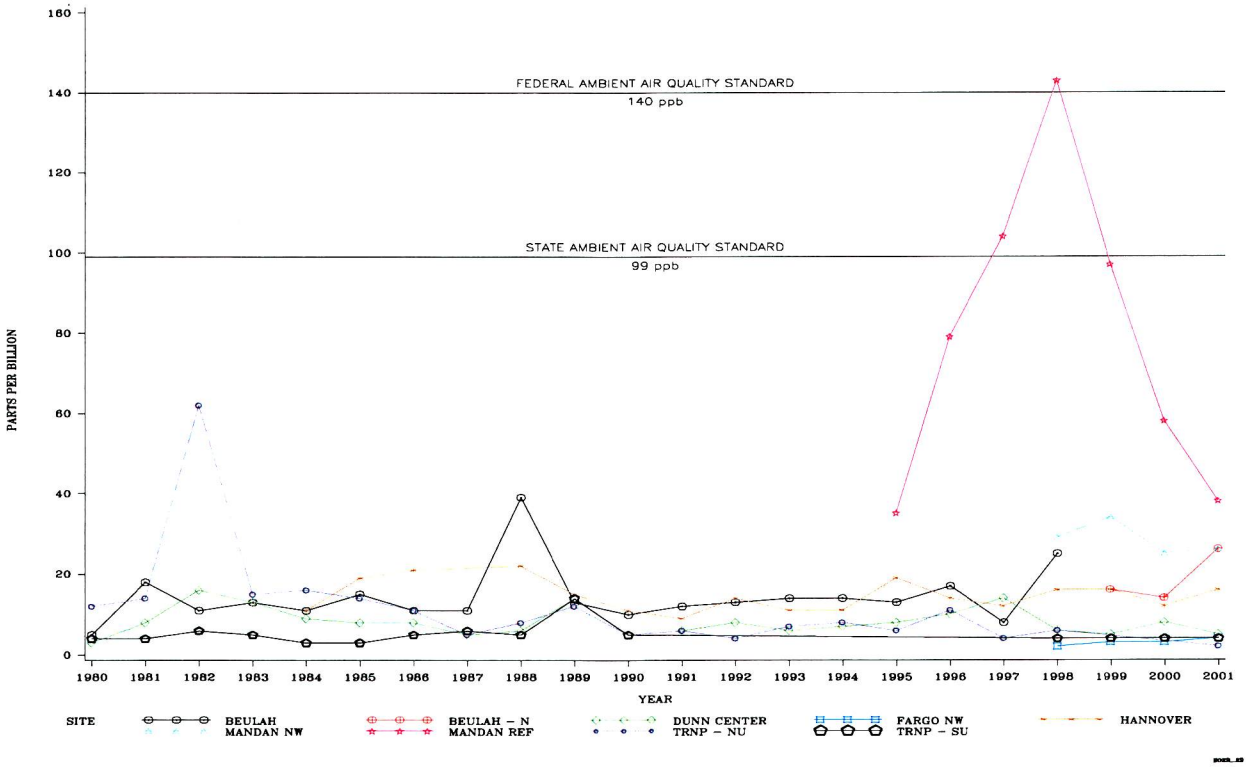

Figure 6 SO_2 Maximum 24-Hour Concentrations

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 Point Sources" and "Utility Boilers." The "Other Point Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants.

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 TRNP - NU. The Dakota Gasification Company (DGC) network also operates analyzers at sites DGC #12 and DGC #17. Table 6 shows the 2001 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 TRNP - NU, are well placed with respect to the major NO_x sources: Dunn Center and TRNP - NU are defined as a background site and long range transport/regional haze, respectively.

TABLE 5

Major NO_x Sources
(> 100 TPY)

2001

#	FACILITY NAME	COUNTY	CITY	POLLUTANT EMISSIONS	PERCENT OF TOTAL EMISSIONS	FACILITY ID
1	Otter Tail Power Company: Coyote	Mercer	Beulah	14,144	16.10%	380570012
2	Minnkota Power Coop: Squar Butte	Oliver	Center	13,287	15.10%	380650020
3	Basin Electric: Leland Olds Station #2	Mercer	Stanton	12,608	14.30%	380570001
2	Minnkota Power Coop: M R Young #1	Oliver	Center	9,220	10.50%	380650001
4	Basin Electric: AVS #1	Mercer	Beulah	7,596	8.60%	380570011
5	Great River Energy: Coal Creek #1	Mc Lean	Underwood	5,236	6.00%	380550017
5	Great River Energy: Coal Creek #2	Mc Lean	Underwood	5,192	5.90%	380550017
4	Basin Electric: AVS #2	Mercer	Beulah	5,018	5.70%	380570011
6	Dakota Gasification Company	Mercer	Beulah	3,483	4.00%	380570013
7	Amerada Hess Corp: Tioga Gas Plant	Williams	Tioga	2,372	2.70%	381050004
3	Basin Electric: Leland Olds Station #1	Mercer	Stanton	2,057	2.30%	380570001
8	Great River Energy: Stanton #1	Mercer	Stanton	2,044	2.30%	380570004
9	Montana Dakota Utilities: Heskett #2	Morton	Mandan	936	1.10%	380590001
10	Tesoro Refinery & Marketing	Morton	Mandan	867	1.00%	380590003
8	Great River Energy: Stanton #10	Mercer	Stanton	838	1.00%	380570007
11	American Crystal Sugar: Drayton Plant	Pembina	Drayton	547	0.60%	380670003
12	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	491	0.60%	380970019
13	Minn-Dak Farmers Cooperative	Richland	Wahpeton	447	0.50%	380770026
9	Montana Dakota Utilities: Heskett #1	Morton	Mandan	296	0.30%	380590001
14	Amerada Hess: Antelope #2	Mc Kenzie	–	241	0.30%	380530045
15	Univ. Of North Dakota Heating Plant	Grand Forks	Grand Forks	199	0.20%	380350003
16	Cavalier Air Station	Pembina	Cavalier	194	0.20%	380670005
17	Bear Paw Energy - Lignite Gas Plant	Burke	Lignite	179	0.20%	380130071
18	Northern Border Pipeline: CS #4	Mc Kenzie	Arnegard	163	0.20%	380530014
19	ADM Corn Processors: Walhalla	Pembina	Walhalla	161	0.20%	380670004
20	North Dakota State University	Cass	Fargo	137	0.20%	380170005

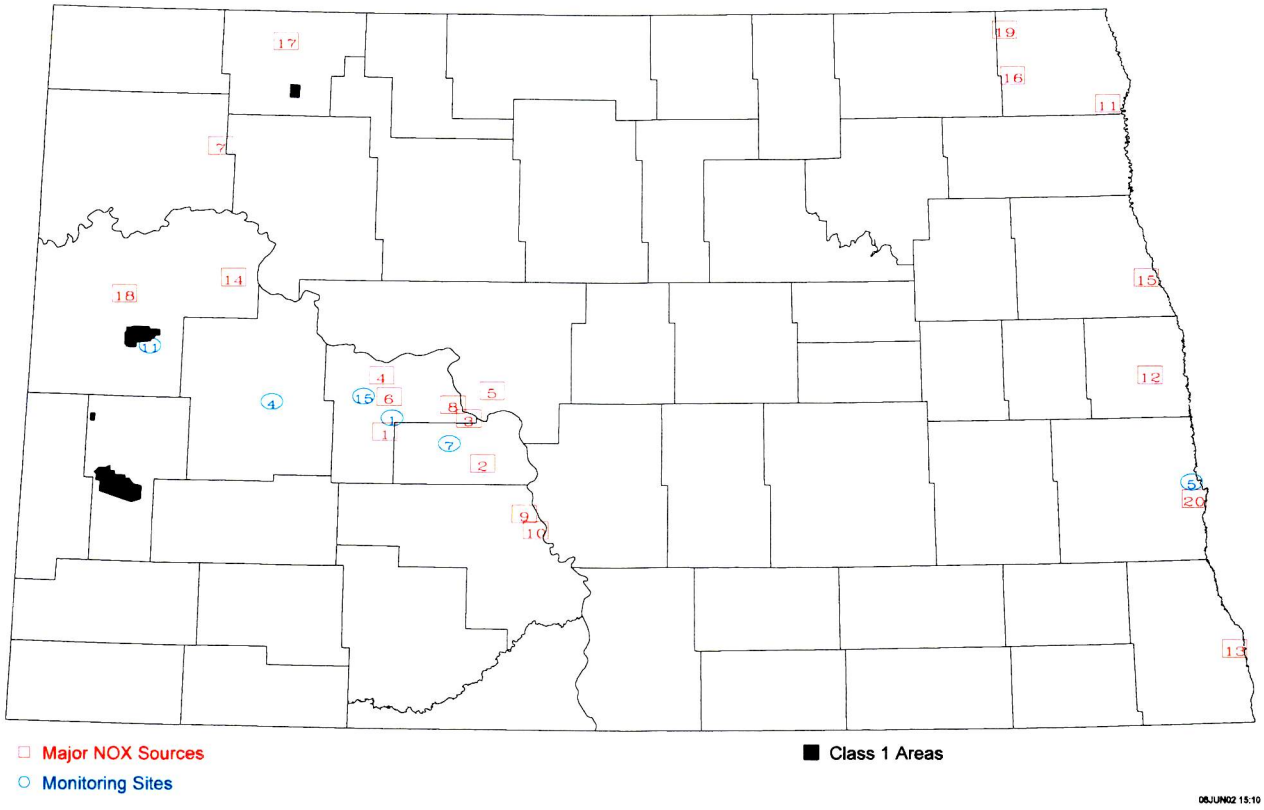

Figure 7 Major Nitrogen Dioxide Sources

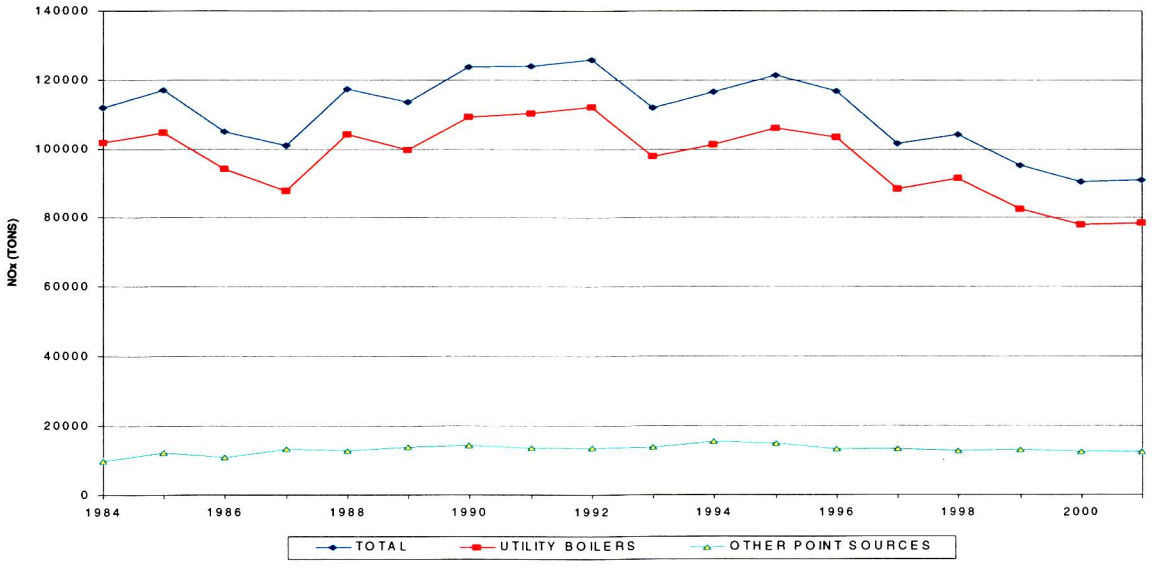

Figure 7A Annual Nitrogen Dioxide Emissions

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	2001	JAN-DEC	8674	40 05/22/16	26 05/22/15	3.4	77.8
DGC #12	2001	JAN-DEC	8570	33 08/26/01	30 07/02/21	3.6	86.1
DGC #17	2001	JAN-DEC	8619	84 11/17/07	66 09/26/06	3.4	76.3
Dunn Center	2001	JAN-DEC	8564	23 07/09/08	22 03/28/20	1.9	44.8
Fargo NW	2001	JAN-DEC	8690	57 03/02/22	56 03/02/20	6.5	81.1
Hannover	2001	JAN-DEC	4737 ***	27 12/06/18	26 02/09/21	2.6	63.5
TRNP - NU	2001	AUG-DEC	3625 ***	9 09/06/22	9 09/07/00	1.3	20.1

The maximum 1-hour concentration is 84 ppb at DGC #17 on 11/17/07

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

FEDERAL - 53 ppb annual arithmetic mean.

*** Less than 80% of the possible samples (data) were collected.

2.2.4 Network Analysis

Nine of the ten 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 1980 - 2001. 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. 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. Because TRNP - NU is a new site for NO2, and less than 5 months of data were available, it was not included in the graphs.

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.

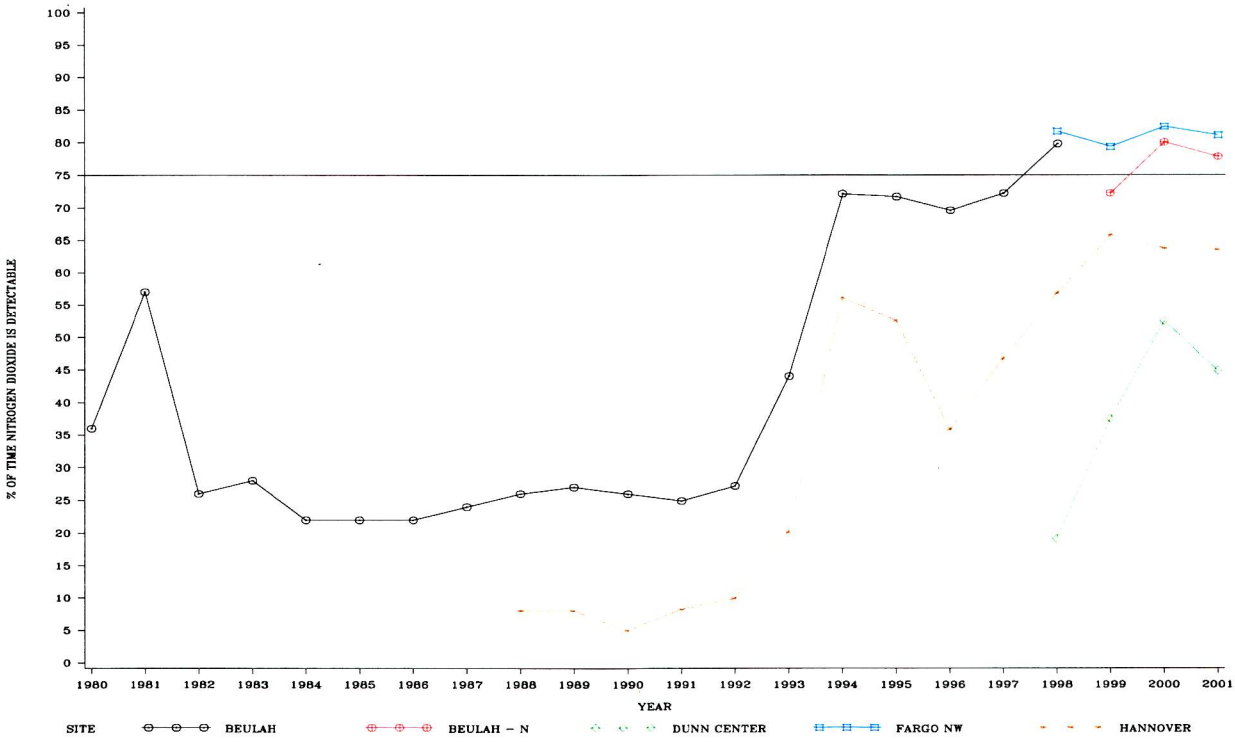

Figure 8 Percentage of Time NO_2 Detectable

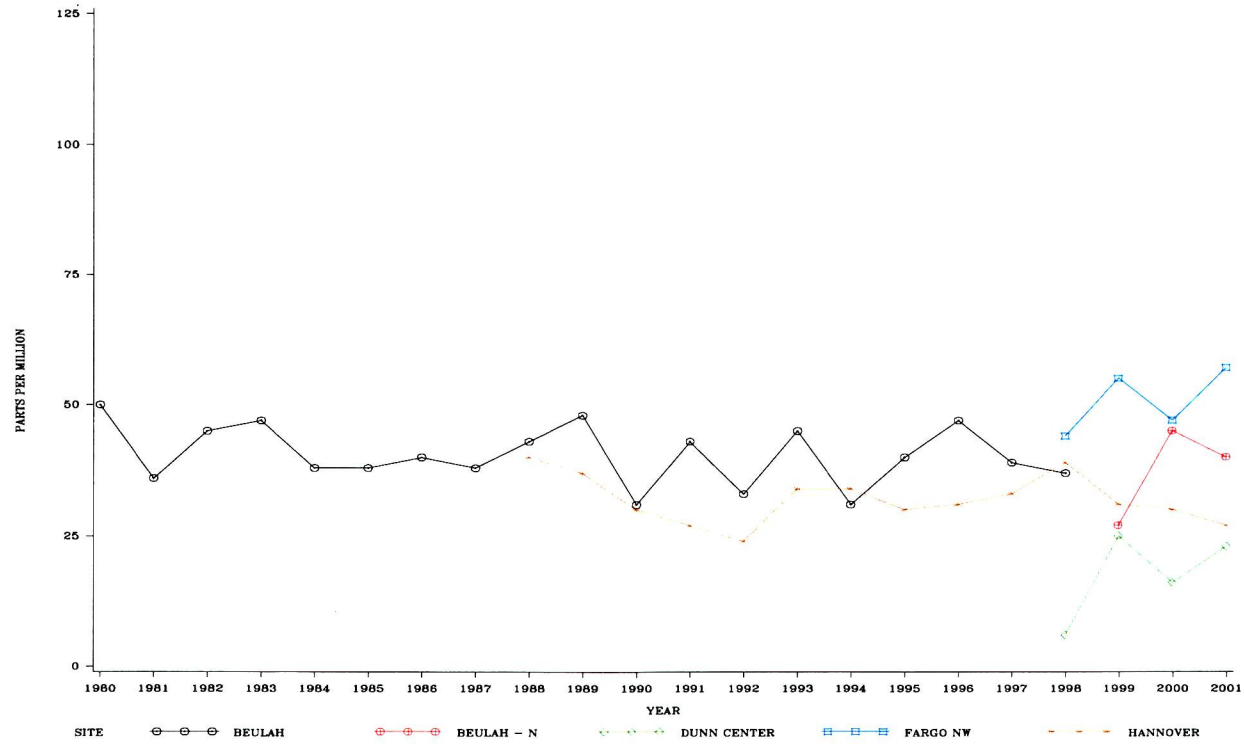

Figure 9 NO_2 Maximum 1-Hour Concentrations

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)

2001

#	FACILITY NAME	COUNTY	CITY	POLLUTANT EMISSIONS	PERCENT OF TOTAL EMISSIONS	FACILITY ID
1	Dakota Gasification Company	Mercer	Beulah	374	34.5%	380570013
2	Kaneb Pipe Line Operating Partnership,Lp	Stutsman	Jameston	184	17.0%	380930037
3	Otter Tail Power Company: Coyote	Mercer	Beulah	138	12.7%	380570012
4	Minnkota Power Coop: Square Butte	Oliver	Center	131	12.1%	380650020
5	Tesoro Refinery & Marketing	Morton	Mandan	131	12.1%	380590003
6	Northern Sun - ADM	Ransom	Enderlin	125	11.5%	380730001

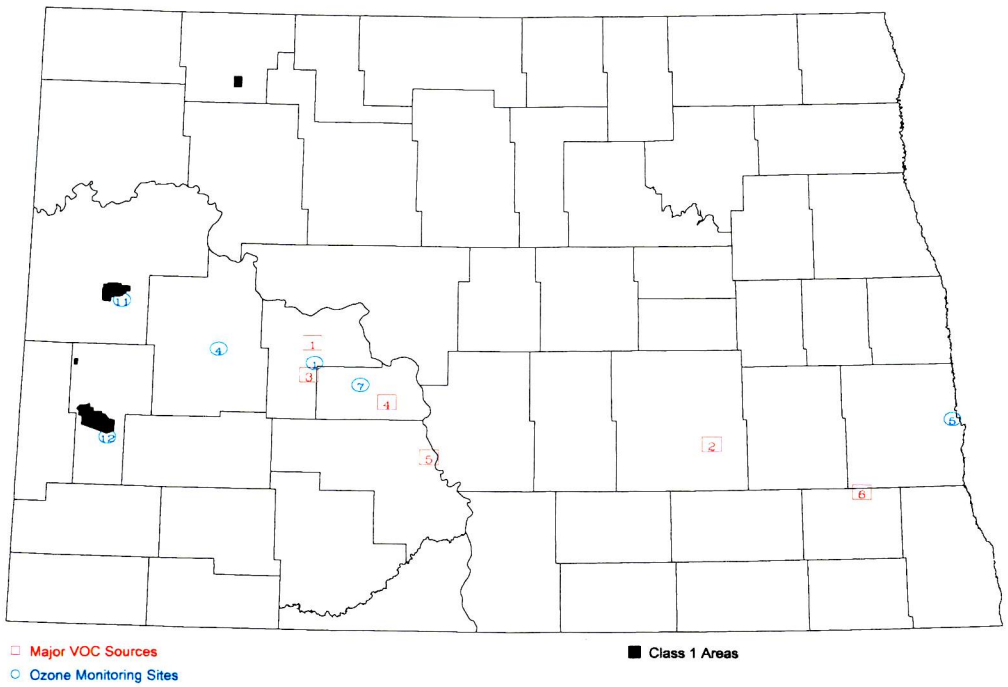

Figure 10 Major VOC Sources

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	1 - HOUR 2ND MM/DD/HH	8 - HOUR 1ST MM/DD/HH	8 - HOUR 2ND MM/DD/HH	8 - HOUR 3RD MM/DD/HH	8 - HOUR 4TH MM/DD/HH	1HR #>120	8HR #>80
Beulah - North	2001	JAN-DEC	8692	68 04/28/12	68 04/28/13	63 04/28/09	61 04/28/08	61 04/28/10	61 04/28/07		
Dunn Center	2001	JAN-DEC	8703	67 04/28/12	66 05/27/14	63 09/28/11	61 09/28/10	61 09/28/12	61 09/28/09		
Fargo NW	2001	JAN-DEC	8707	70 06/27/17	69 05/19/17	63 06/27/10	63 06/27/11	63 06/28/09	63 05/19/10		
Hannover	2001	JAN-DEC	5475 ***	69 04/28/13	68 04/28/12	65 04/28/08	61 04/28/09	61 04/28/07	61 04/28/10		
TRNP - NU	2001	AUG-DEC	3144 ***	67 09/28/16	66 09/28/14	65 09/28/12	58 09/28/13	58 09/28/11	58 09/28/14		
TRNP - SU (Painted Canyon)	2001	JAN-DEC	8705	64 05/13/14	63 04/28/13	60 09/28/11	59 09/28/12	59 09/28/10	59 09/28/13		

The maximum 1-hour concentration is 70 ppb at Fargo NW on 06/27/17
The 4th highest 8-hour concentration is 63 ppb at Fargo NW on 05/19/10

* 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.

*** Less than 80% of the possible samples (data) were collected

2.3.3 Monitoring Network

The state currently has six continuous ozone analyzers in operation. These are at Beulah, Dunn Center, Fargo, Hannover, Theodore Roosevelt National Park - North Unit, and Theodore Roosevelt National Park - South Unit. Table 8 presents 2001 1-hour and 8-hour data summaries. Figure 11 shows the maximum 1-hour averages by month for 2001.

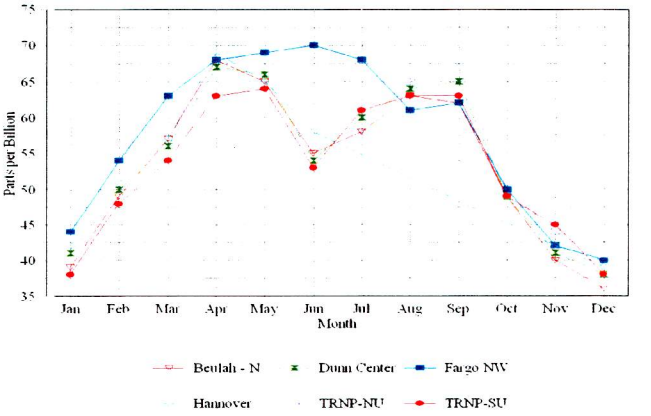

Figure 11 Monthly Maximum Ozone Concentrations

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 four of the six major VOC sources in the state. TRNP - NU and TRNP-SU are located in a Class I area surrounded by oil fields. Fargo NW is located in Fargo and influenced by city traffic. Dunn Center is located in a rural area surrounded by crop land. With this diversity of site locations and influences, one would expect 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 four 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 are within 5 ppb (see Table 8).

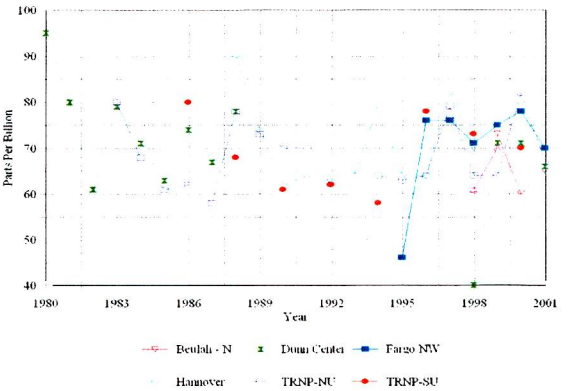

Figure 12 Annual Maximum Ozone Concentrations

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 PM_{10} emissions. The "Utility Boilers"category consists of power plant boilers. The "Other Point Sources" category consists of DGC, refineries, gas processing plants, and agriculture processing plants.

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.

TABLE 9

Major PM_{10} Sources
(> 100 TPY)

2001

#	FACILITY NAME	COUNTY	CITY	POLLUTANT EMISSIONS	PERCENT OF TOTAL EMISSIONS	FACILITY ID
1	Dakota Gasification Company	Mercer	Beulah	1,362	23.3%	380570013
2	Tesoro Refinery & Marketing	Morton	Mandan	1,092	18.6%	380590003
3	Otter Tail Power Company: Coyot	Mercer	Beulah	516	8.8%	380570012
4	Basin Electric: Leland Olds #1	Mercer	Stanton	444	7.6%	380570001
5	Great River Energy: Coal Creek #2	Mc Lean	Underwood	435	7.4%	380550017
6	Basin Electric: AVS #1	Mercer	Beulah	380	6.5%	380570011
5	Great River Energy: Coal Creek #1	Mc Lean	Underwood	330	5.6%	380550017
6	Basin Electric: AVS #2	Mercer	Beulah	296	5.1%	380570011
7	American Crystal Sugar: Drayton Plant	Pembina	Drayton	290	5.0%	380670003
4	Basin Electric: Leland Olds #2	Mercer	Stanton	281	4.8%	380570001
8	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	162	2.8%	380970019
9	Minn-Dak Farmers Cooperative	Richland	Wahpeton	151	2.6%	380770026
10	Minnkota Power Coop: M R Young #1	Oliver	Center	1180	2.0%	380650001

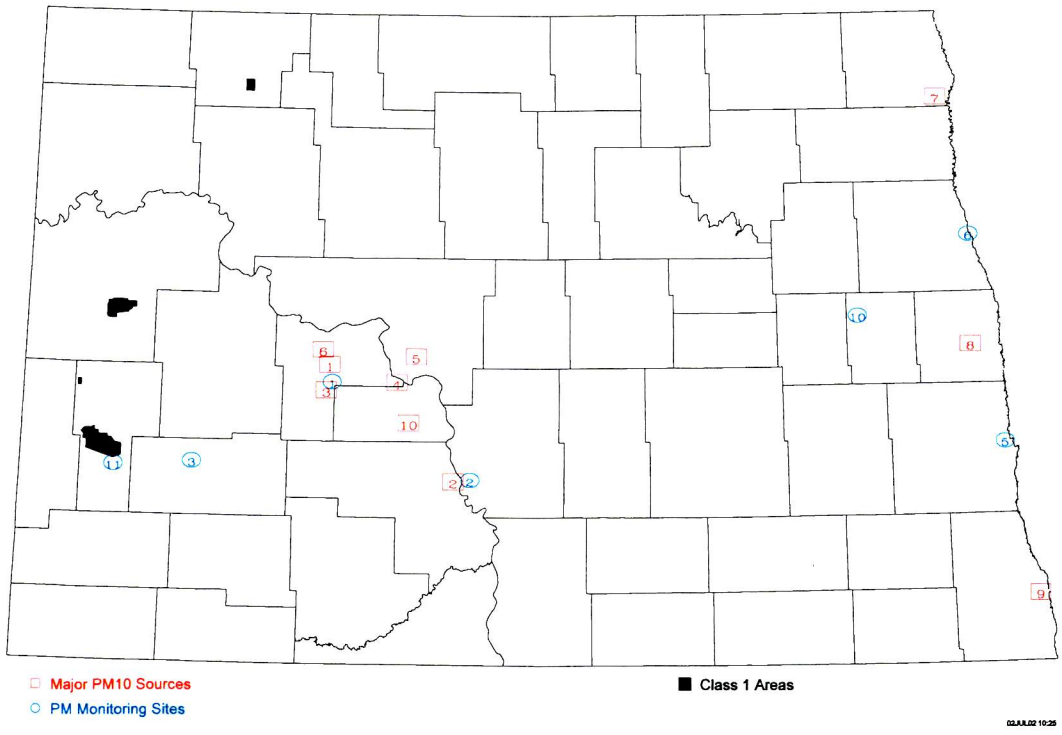

Figure 13 Major PM_{10} Sources

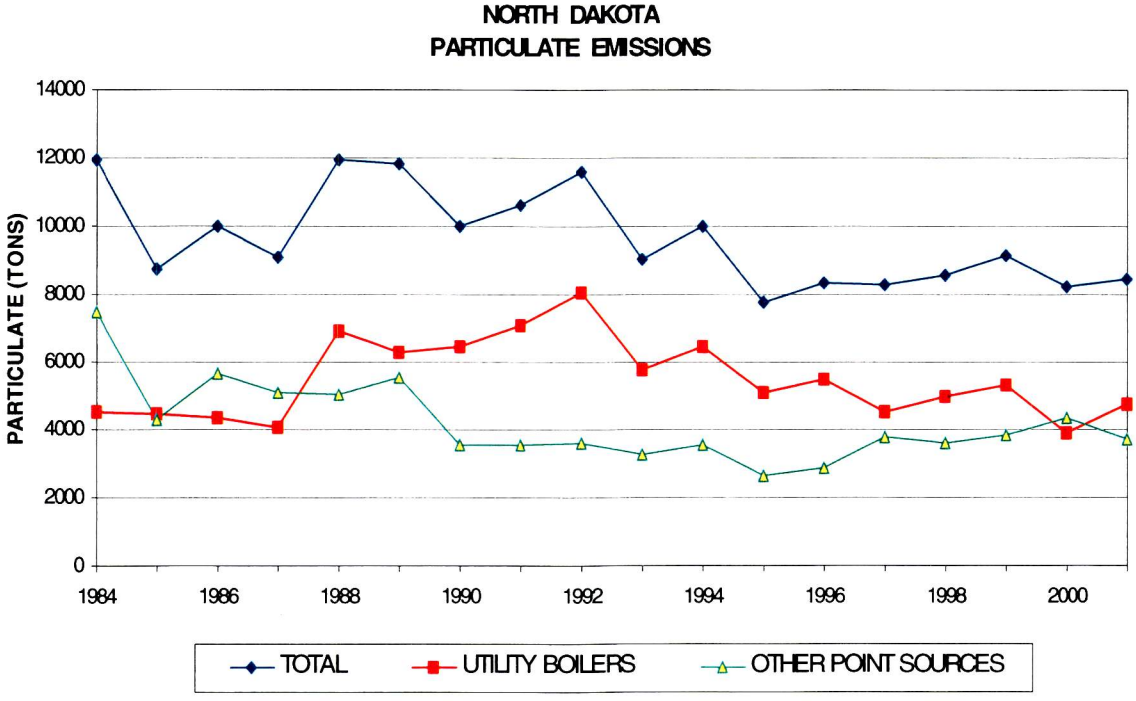

Figure 13A Annual PM Emissions

TABLE 10

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

POLLUTANT : Inhalable PM_{10} Particulates ($\mu g/m^3$)

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
Bismarck Residential	2001	JAN-DEC	55	5.6	84.4 05/19	44.1 05/07	41.0 09/28	20.2			100.0

The maximum 24-hour concentration is 84.4 µg/m3 at Bismarck Residential on 05/19

* The STATE and FEDERAL air quality standards are:
1) 150 $\mu g/m^3$ maximum averaged over a 24-hour period with no more than one expected exceedance per year.
2) 50 $\mu g/m^3$ 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 ($\mu g/m^3$)

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	2001	JAN-DEC	61	1.3	16.4 02/12	16.1 12/15	12.5 03/08	5.8			96.7
Bismarck Residential	2001	JAN-DEC	119	1.8	21.6 11/12	19.7 02/12	17.1 04/04	6.7			98.3
Dickinson Residential	2001	JAN-JUN	31 ***	1.8	16.7 01/13	13.0 02/12	12.6 02/24	5.9			93.5
Fargo NW	2001	JAN-DEC	114	0.6	36.0 03/29	25.6 04/04	23.9 10/31	8.2			98.2
Grand Forks - North	2001	JAN-DEC	120	0.5	35.1 03/29	25.9 02/12	22.5 10/31	8.3			96.7
Sharon	2001	JAN-DEC	53	1.6	18.0 12/15	14.1 02/12	12.5 04/19	6.2			98.1
TRNP - SU (Painted Canyon)	2001	JAN-DEC	56	1.5	13.3 01/13	10.9 08/23	10.1 02/12	4.6			91.1

The maximum 24-hour concentration is 36.0 µg/m3 at Fargo NW on 03/29

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 $\mu g/m^3$.
2) Annual: 3-year average not to exceed 15$\mu g/m^3$.

Table 12

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

POLLUTANT : Continuous $PM_{2.5}$ ($\mu g/m^3$)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMA 1 - HOUR 1ST MM/DD/HH	MAXIMA 1 - HOUR 2ND MM/DD/HH	MAXIMA 24 - HOUR 1ST MM/DD	MAXIMA 24 - HOUR 2ND MM/DD	MAXIMA 24 - HOUR 3RD MM/DD	MAXIMA 24 - HOUR 4TH MM/DD	MEAN	1HR #>150	24HR #>65
Beulah - North	2001	JAN-DEC	8718	151.4 03/28/13	150.0 03/28/14	29.7 03/28	17.2 03/24	16.5 02/09	15.4 01/15	6.8	1	
Fargo NW	2001	JAN-DEC	8185	105.5 05/29/21	83.1 08/28/07	25.1 06/28	18.3 07/16	16.4 11/27	16.0 11/06	4.8		

The maximum 1-hour concentration is 151.4 µg/m3 at Beulah - North on 03/28/13
The highest 24-hour concentration is 29.7 µg/m3 at Beulah - North on 03/28

* The ambient air quality standards are:
FEDERAL Standards -
1) 24-hour: 3-year average of 98th percentiles not to exceed 65 $\mu g/m^3$.
2) Annual: 3-year average not to exceed 15 $\mu g/m^3$.

2.4.3 PM_{10} Network Analysis

The only PM_{10} site remaining is at Bismarck Residential, as a population-oriented site. This sampler is colocated with a FRM $PM_{2.5}$ sampler and a speciation sampler.

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.

The intent of the TEOMs 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

Speciation samplers are installed in Bismarck, TRNP - NU, and a National Trends Network sampler in Fargo. The goal of the two state-selected sites is to supplement the data collected by the two IMPROVE samplers: TRNP - SU 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)

2001

#	FACILITY NAME	COUNTY	CITY	POLLUTANT EMISSIONS	PERCENT OF TOTAL EMISSIONS	FACILITY ID
1	Dakota Gasification Company	Mercer	Beulah	2,035	18.6%	380570013
2	Great River Energy: Coal Creek #1	Mc Lean	Underwood	996	9.1%	380550017
2	Great River Energy: Coal Creek #2	Mc Lean	Underwood	912	8.3%	380550017
3	American Crystal Sugar: Hillsboro Plant	Traill	Hillsboro	849	7.8%	380970019
4	Minn-Dak Farmers Cooperative	Richland	Wahpeton	765	7.0%	380770026
5	Basin Electric: AVS #1	Mercer	Beulah	750	6.8%	380570011
6	Basin Electric: Leland Olds #2	Mercer	Stanton	638	5.8%	380570001
7	Otter Tail Power Company: Coyote	Mercer	Beulah	629	5.7%	380570012
8	Minnkota Power Coop: M R Young #2	Oliver	Center	596	5.4%	380650020
5	Basin Electric: AVS #2	Mercer	Beulah	572	5.2%	380570011
8	Minnkota Power Coop: M R Young #1	Oliver	Center	399	3.6%	380650001
9	Amerada Hess Corp: Tioga Gas Plant	Williams	Tioga	397	3.6%	381050004
10	BP Amoco: Mandan Refinery	Morton	Mandan	397	3.6%	380590003
11	American Crystal Sugar: Drayton Plant	Pembina	Drayton	318	2.9%	380670003
12	Montana Dakota Utilities: Heskett #1	Morton	Mandan	255	2.3%	380590001
13	Northern Sun - ADM	Mc Henry	Velva	166	1.5%	380730001
14	University of North Dakota Heating Plant	Grand Forks	Grand Forks	141	1.3%	380350003
6	Basin Electric: Leland Olds #1	Mercer	Stanton	137	1.3%	380570001

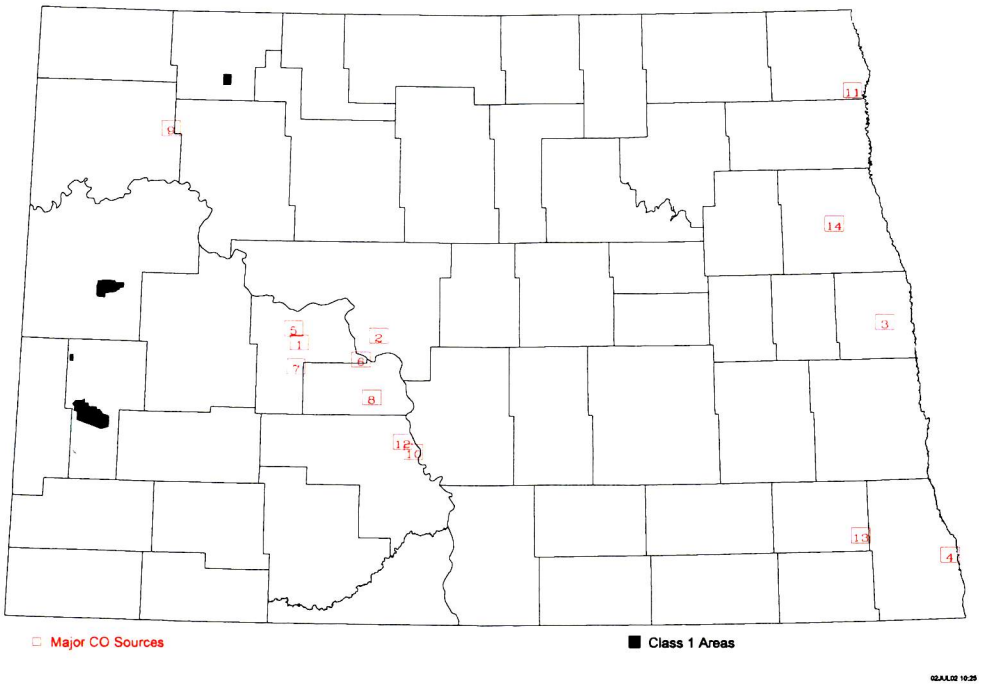

Figure 14 Major CO Sources

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 Beulah to track air toxics emission at DGC. The data collected is added to the AQS database by ERG.

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)

2001

#	FACILITY NAME	COUNTY	CITY	POLLUTANT EMISSIONS	PERCENT OF TOTAL EMISSIONS	FACILITY ID
1	Dakota Gasification Company	Mercer	Beulah	3045.3	74.8%	380570013
2	Northern Sun	Ransom	Enderlin	209.9	5.2%	380730001
3	ADM - Velva	Mc Henry	Velva	174.4	4.3%	380490005
4	BP Amoco	Morton	Mandan	154.2	3.8%	380590003
5	Basin Electric - AVS #1	Mercer	Beulah	135.2	3.3%	380570011
6	Basin Electric - Leland Olds #2	Mercer	Beulah	130.4	3.2%	380570001
7	Minnkota Power - M. R. Young #2	Oliver	Center	115.8	2.8%	380650001
8	Basin Electric - AVS #2	Mercer	Beulah	105.9	2.6%	380570011

2.8.2 Monitoring Network

The air toxics network consisted of one site at Beulah - N. The data collected was reviewed and the contractor added the data to the AQS database. Methyl ethyl ketone (MEK) is the only air toxic that 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 sites of similar industrial influence, are comparable to the other sites monitoring at the same time.

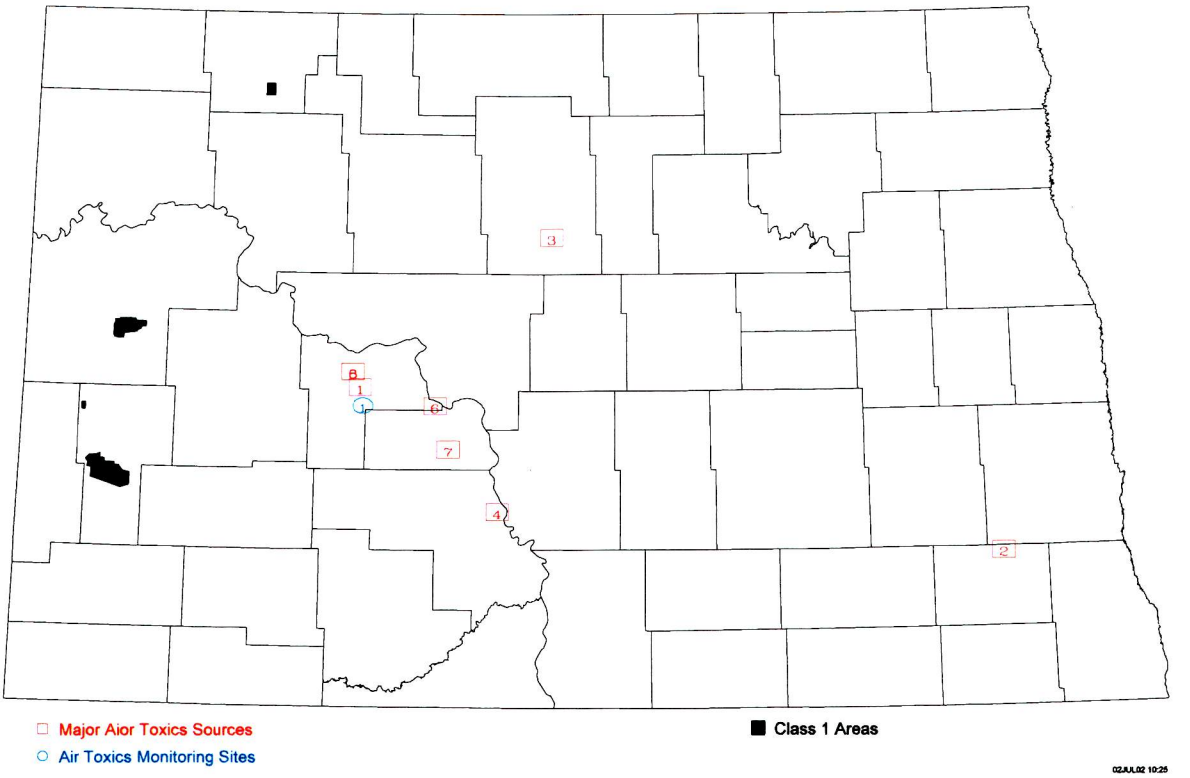

Figure 15 Major Air Toxics Sources

Data summaries are not included in this review because there are approximately 70 parameters reported. The data is available in 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 - 164 ppb (60.1%); 3-hour - 116 ppb (23.2%); 24-hour - 38 ppb (38.4%); annual - 5.5 ppb (23.9%).

There is no SO_2 5-minute standard currently in effect. The maximum 5-minute average was 229 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 - 6.5 ppb (12.3%)

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 - 70 ppb (58.3%); 8-hour - 63 ppb (78.8%).

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 - 84.4 $\mu g/m^3$ (56.3%); annual - 20.2 $\mu g/m^3$ (40.4%).

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 - 36.0 $\mu g/m^3$ (55.4%); annual FRM - 8.3 $\mu g/m^3$ (55.3%).

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 Beulah is similar to comparable sites operating at the same time. The data and data summaries are available on the AQS database.