NORTH DAKOTA
DEPARTMENT of HEALTH

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July 13, 2005

FILE

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

Re: FY '04-'05 PPA, Air Quality
Media Workplan, Monitoring,
Item B (Network Review)

Dear Mr. Distler:

An electronic copy of the enclosed referenced review was e-mailed to you on July 13, 2005. Due to the pending update to 40 CFR 58, it is not practical for us to consider any major network changes.

Because this review is based on a calendar year, it does not include any network changes that may have occurred since January 1, 2005, as a part of the 2005 network modification plan. Those changes will be address in the 2006 network review.

If you have any questions about this review, please contact me by e-mail at dharman@state.nd.us or by 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 Air Quality

Ambient Air Quality Monitoring
Annual Network Review
2004

June 2005

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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 three 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), "Ambient Air Quality Surveillance Regulations," as amended, has specified a minimum of six 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. Industrial AAQM network sites are designed to monitor air quality data for source specific highest concentration impacts on an urban scale. Tribal network sites and data are included in this review even though there is only minimal influence on the network operation.

The primary function of the department's four required sites (see Table 1) are to satisfy the six monitoring objectives. 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 this site is 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. Dunn Center is the background site. And, TRNP-NU is the regional transport site. The remaining sites are used to support modeling and/or supplement data collected at the required sites.

Before the next network modification plan is completed in January 2006, the need for several sites/parameter combinations will be reviewed. The current list of existing sites/parameters to be reviewed is Bismarck Residential SO_2 and NO_x. Consideration is being given to opening a site at TRNP - SU along the eastern boundary of the park. 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.

Since all industrial AAQM network sites are source specific, all the pollutants at industry sites are source oriented on an urban 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. The data validity is not certified by inclusion.

The Fort Totten Indian Reservation is in the process of evaluating the need for an ambient air monitoring network along with what parameters and how many sites may be needed. If they establish a network with acceptable quality assurance, the data will be included in our data summaries.

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 10 AAQM sites around the State. Eight 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, 14, and 15 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 Required PM non-CORE required	$PM_{2.5}$ SO_2, NO_2, O_3, MET NH_3 cont. $PM_{2.5}$	6th Day cont. cont. cont.	Population Exposure Population Exposure General Background[3] Population Exposure	Neighborhood Neighborhood Regional Neighborhood	12/1998 04/1980 11/2000 10/2000
2 Bismarck Residential 380150003	SLAMS PM non-CORE required	$PM_{2.5}$ $PM_{2.5}$ Speciation PM_{10}	3rd Day 6th Day 6th Day	Population Exposure	Urban	12/1998 1/2001 1/2001
3 Dunn Center 380250003	SLAMS Required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$, cont. PM_{10}	cont.	General Background	Regional	10/1979 09/2005
4 Fargo NW 380171004	SLAMS Required PM non-CORE required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$, PM_{10}[5] PM_{10}[4] $PM_{2.5}$ $PM_{2.5}$ Speciation	cont. cont. 3rd Day 3rd Day 3rd Day	Population Exposure Population Exposure Population Exposure Population Exposure Population Exposure	Urban Urban Urban Urban Urban	05/1998 7/2000 05/1998 12/1998 7/2001
5 Hannover 380650002	SLAMS	SO_2, NO_2, O_3, MET cont. PM2.5	cont.	General Background	Regional	10/1984 10/2002
6 Lostwood NWR 380130004	SLAMS	SO_2, NO_2, O_3, MET, cont. $PM_{2.5}$, cont. PM_{10}	cont.	General Background	Regional	10/2003
7 Mandan Refinery - SPM 380590002	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	12/1995
8 Mandan Refinery NW - SPM 380590003	SPM	SO_2, MET	cont.	Source Impact	Neighborhood	09/1998
9 TRNP - NU 380530002	SLAMS Required	SO_2, NO_2, O_3, MET cont. $PM_{2.5}$, PM_{10}[5] PM_{10}[4] $PM_{2.5}$ $PM_{2.5}$ Speciation	cont. cont. 6th Day 6th Day 6th Day	Long range Transport	Regional	8/2001
10 TRNP - SU 380070002	SLAMS	SO_2, O_3, MET $PM_{2.5}$ cont. $PM_{2.5}$	cont. 6th Day	General Background	Regional	07/1998 06/2000 04/2003
Company	**Site Name** AQS Site #					
11 Amerada Hess Corporation	TIOGA #1 381050103 TIOGA #3 381050105	SO_2 SO_2	cont. cont.	Source Impact Source Impact	Urban Urban	07/1987 11/1987
12 Bear Paw Energy, Inc.	MGP #3 380530104 MGP #5 380530111	SO_2, MET SO_2, MET	cont. cont.	Source Impact Source Impact	Urban Urban	11/1994 05/1994
13 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	01/1980 01/1989 10/1995 10/1995

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 dual role of population exposure and general background.
4. Terminated effective June 30.
5. Began effective July 1.

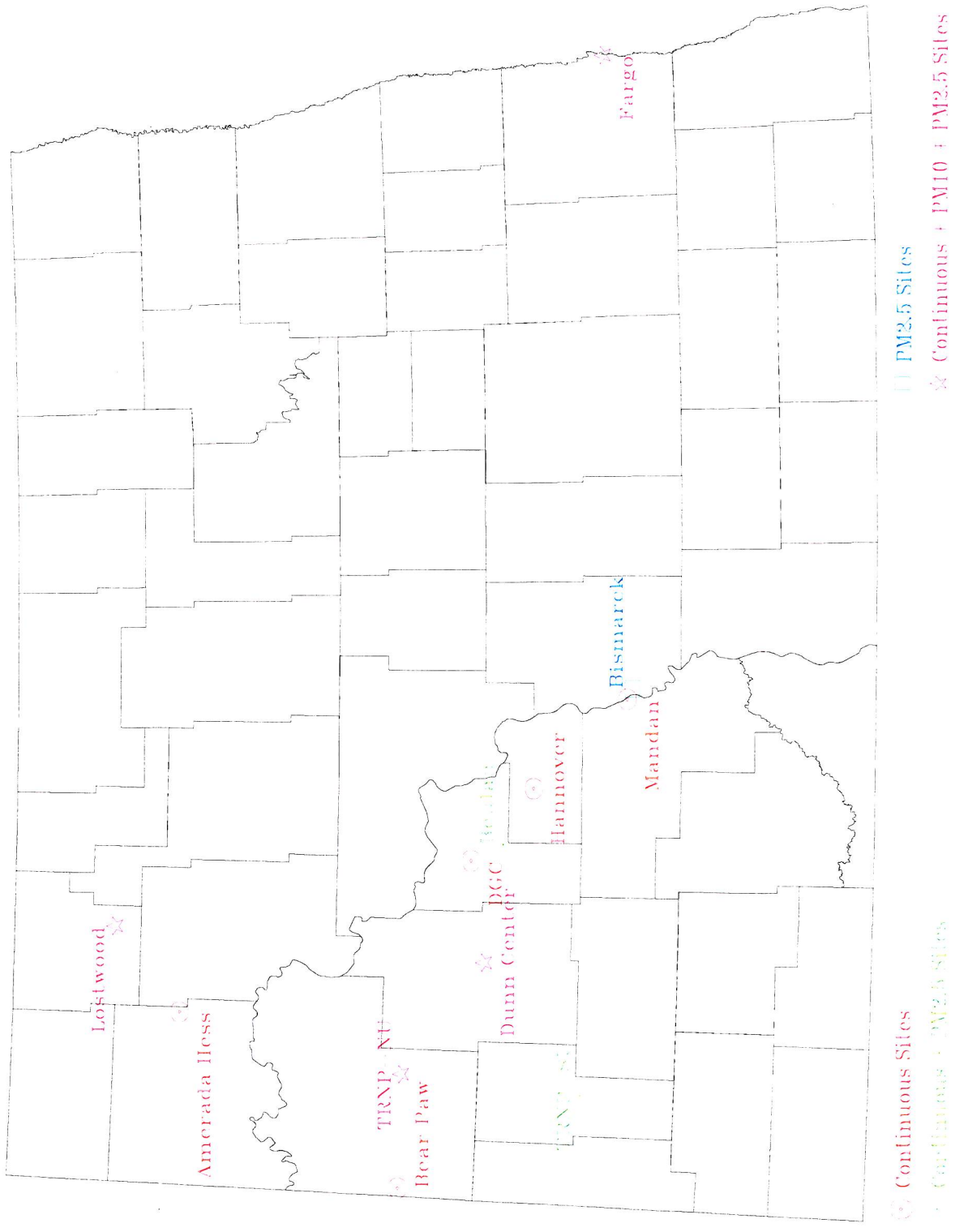

Figure 1 North Dakota Ambient Air Quality Monitoring Sites

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)

2004

#	COMPANY	SOURCE	Pollutant Emissions	Percent of Total Emissions	Facility ID
1	Basin Electric Power Cooperative	Leland Olds Station	48438	29.70%	3805700001
2	Minnkota Power Cooperative, Inc.	M R Young Station 1 & 2	31381	19.24%	3806500001
3	Great River Energy	Coal Creek Station	27212	16.69%	3805500017
4	OtterTail Power Company	Coyote	16018	9.82%	3805700012
5	Basin Electric Power Cooperative	Antelope Valley Station	14134	8.67%	3805700011
6	Great River Energy	Stanton Station	8798	5.40%	3805700004
7	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	4290	2.63%	3805900003
8	Montana Dakota Utilities Co.	RM Heskett Station	3896	2.39%	3805900001
9	Dakota Gasification Co.	Plant	3866.4	2.37%	3805700013
10	Amerada Hess Corporation	Tioga Gas Plant	1596	0.98%	3810500004
11	American Crystal Sugar	Hillsboro Plant	631	0.39%	3809700019
12	Bear Paw Energy	Grasslands Plant	623	0.38%	3805300023
13	American Crystal Sugar	Drayton Plant	606	0.37%	3806700003
14	University of North Dakota	Heating Plant	592	0.36%	3803500003
15	North Dakota State University	Heating Plant	356	0.22%	3801700005
16	Petro-Hunt	Little Knife Gas Plant	244	0.15%	3800700002
17	ADM Corn Processing	Walhalla	204	0.13%	3806700004
18	Minn-Dak Farmers Cooperative	Wahpeton Plant	183	0.11%	3807700026

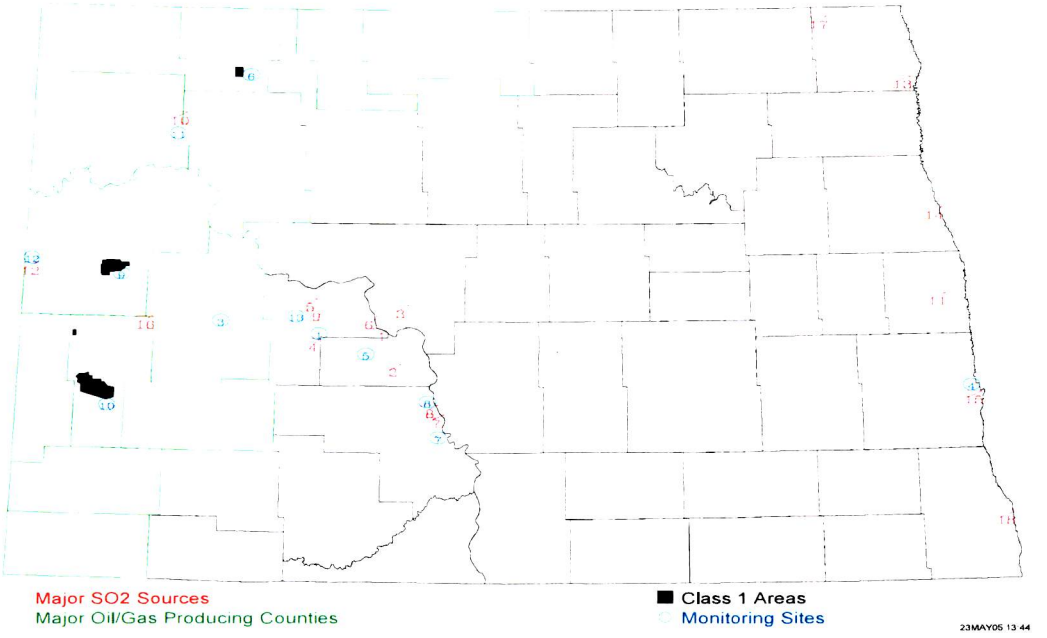

Figure 2 Major Sulfur Dioxide Sources

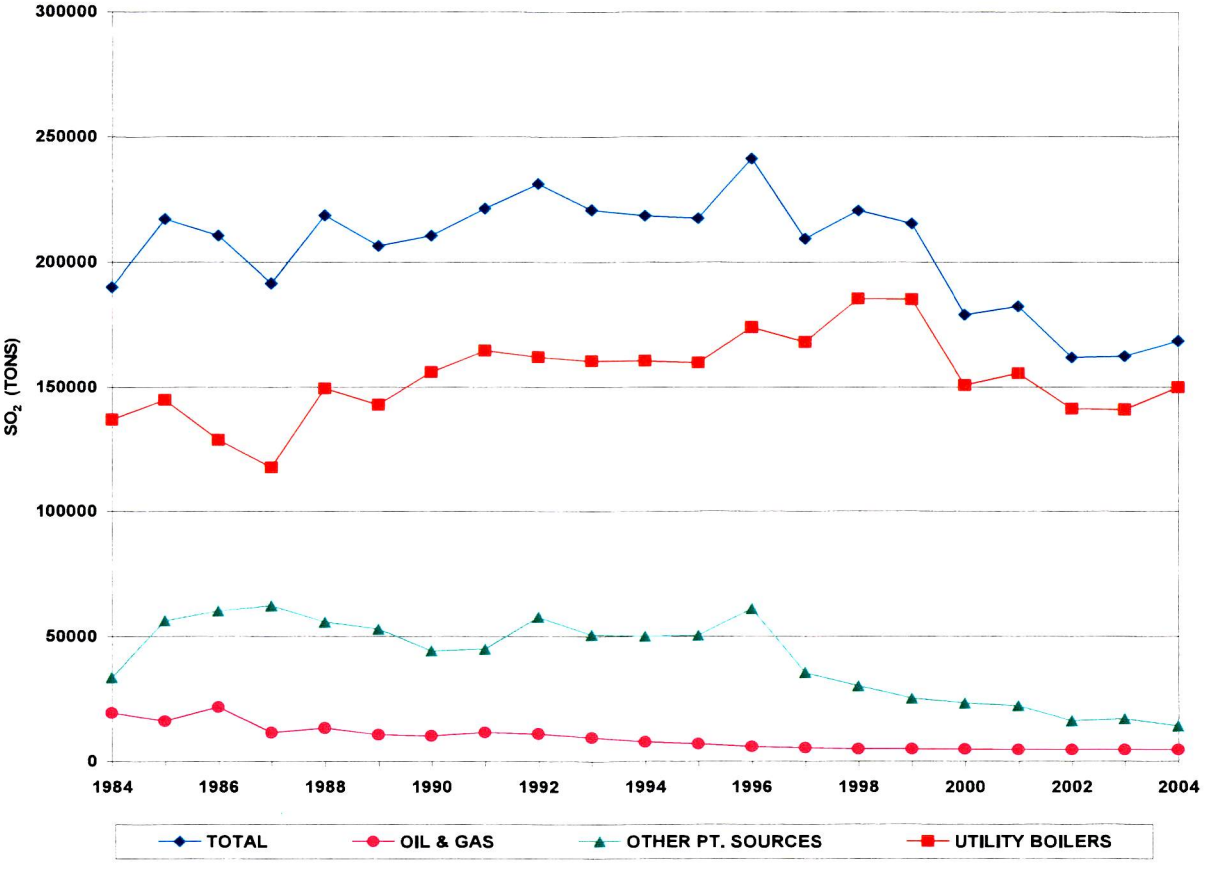

Figure 2A Annual Sulfur Dioxide Emissions

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 west-central part of the State. Table 3 shows the 2004 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: 1) a 25-year view of the percentage of data greater than the minimum detectable value (MDV); 2) 1-hour maximums; 3) 3-hour maximums; and 4) 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 hourly data points greater than the MDV. Figure 3 presents this data for the active state sites from 1980 through 2004. To calculate valid, unbiased statistics, at least 75% of the data for the averaging period 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	MAX 1-HOUR 1ST MM/DD:HH	MAX 1-HOUR 2ND MM/DD:HH	MAX 3-HOUR 1ST MM/DD:HH	MAX 3-HOUR 2ND MM/DD:HH	24-HOUR 1ST MM/DD	24-HOUR 2ND MM/DD	ARITH MEAN	1HR #>273	24HR #>99	% >MDV
Amerada Hess - Tioga #1	2004	JAN-DEC	8699	191 05/03:05	74 05/05:05	67 05/03:05	57 05/04:11	14 11/02	11 05/04	1.6			14.7
Amerada Hess - Tioga #3	2004	JAN-DEC	8687	322 05/03:09	174 03/29:18	134 05/03:11	106 03/29:20	31 03/29	24 12/12	3.2	1		24.6
Bear Paw - MGP #3	2004	JAN-DEC	8672	43 01/28:09	20 06/04:13	16 01/28:11	14 01/27:17	4 01/27	4 01/28	1.1			4.9
Bear Paw - MGP #5	2004	JAN-DEC	8704	166 01/30:17	140 01/30:19	115 01/30:17	80 01/30:14	42 01/30	7 08/20	1.3			7.5
Beulah - North	2004	JAN-DEC	8719	60 07/25:07	50 10/04:09	33 07/25:08	30 10/04:11	7 05/20	7 10/04	1.9			21.8
DGC #12	2004	JAN-DEC	8722	64 07/25:08	48 10/16:13	47 07/25:08	31 10/16:14	8 12/08	7 07/25	1.9			23.5
DGC #14	2004	JAN-DEC	8687	38 08/04:11	35 07/11:08	22 08/03:08	21 08/20:14	11 08/04	6 08/20	1.8			18.5
DGC #16	2004	JAN-DEC	8698	94 09/09:09	90 04/23:12	43 04/23:14	35 09/08:14	16 09/08	13 09/09	1.9			19.2
DGC #17	2004	JAN-DEC	8648	60 09/09:10	47 08/07:11	36 09/09:11	30 09/09:14	13 09/09	10 08/04	1.8			19.7
Dunn Center	2004	JAN-DEC	8700	17 01/28:21	16 10/16:11	13 10/16:11	11 07/01:11	4 01/03	4 07/01	1.2			10.8
Fargo NW	2004	JAN-DEC	8392	7 01/13:17	7 01/20:01	6 01/13:17	5 01/20:02	3 02/03	2 01/13	1.1			5.5
Hannover	2004	JAN-DEC	8732	87 09/10:07	85 07/04:08	55 07/04:08	53 04/02:11	12 12/08	11 09/27	2.2			25.7
Lostwood NWR	2004	JAN-DEC	8683	40 01/03:13	36 01/16:14	27 12/07:11	23 01/16:17	11 02/05	11 01/21	1.6			16.8
Mandan - SPM	2004	JAN-DEC	8727	158 03/08:20	126 02/06:11	102 03/10:20	88 03/10:23	46 02/06	43 03/10	6.0			47.6
Mandan NW - SPM	2004	JAN-DEC	8335	88 10/09:09	85 06/06:07	59 03/26:20	52 03/26:17	21 03/26	21 05/28	3.6			47.9
TRNP - NU	2004	JAN-DEC	8729	29 05/18:07	24 05/18:06	20 05/18:08	10 02/01:14	4 02/01	4 01/29	1.2			10.6
TRNP - SU (Painted Canyon)	2004	JAN-DEC	5062 ***	16 07/23:06	12 07/06:23	6 07/23:08	5 07/06:23	2 07/23	2 08/02	1.1			3.4

The maximum 1-hour concentration is 322 ppb at Amerada Hess - Tioga #3 on 05/03:09
The maximum 3-hour concentration is 134 ppb at Amerada Hess - Tioga #3 on 05/03:11
The maximum 24-hour concentration is 46 ppb at Mandan - SPM on 02/06
The maximum annual average concentration is 6.0 ppb at Mandan - SPM

* 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.

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

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 - M I N U T E M A X I M A 1ST	DATE MM/DD:HH	2ND	DATE MM/DD:HH	3RD	DATE MM/DD:HH	# HOURS >600	% >MDV
Amerada Hess - Tioga #1	2004	JAN-DEC	8699	398	05/03:05	250	05/05:05	237	05/04:12	0	23.2
Amerada Hess - Tioga #3	2004	JAN-DEC	8687	485	05/03:09	303	03/29:18	299	03/29:20	0	43.4
Bear Paw - MGP #3	2004	JAN-DEC	8673	141	06/04:13	81	06/04:12	61	01/28:09	0	12.9
Bear Paw - MGP #5	2004	JAN-DEC	8704	319	01/30:19	298	01/30:16	252	01/30:14	0	17.6
Beulah - North	2004	JAN-DEC	8719	107	08/15:10	97	10/04:09	93	07/25:07	0	31.8
Dunn Center	2004	JAN-DEC	8701	26	05/16:06	25	01/28:21	24	07/01:10	0	18.9
Fargo NW	2004	JAN-DEC	8249	20	10/26:18	17	06/28:16	16	10/26:09	0	10.4
Hannover	2004	JAN-DEC	8732	323	04/02:08	173	09/10:07	153	04/02:10	0	35.7
Lostwood NWR	2004	JAN-DEC	8683	94	01/16:14	71	01/17:09	67	01/03:13	0	23.4
Mandan - SPM	2004	JAN-DEC	8727	261	03/08:20	202	02/06:10	195	02/06:11	0	60.9
Mandan NW - SPM	2004	JAN-DEC	8336	183	05/27:11	169	06/06:07	167	07/31:10	0	59.4
TRNP - NU	2004	JAN-DEC	8729	45	02/01:12	44	05/18:07	42	05/28:10	0	14.7
TRNP - SU (Painted Canyon)	2004	JAN-DEC	5062	47	07/23:06	25	07/19:07	18	07/14:09	0	10.4

The maximum 5-minute concentration is 485 ppb at Amerada Hess - Tioga #3 on 05/03:09

* No Standard is currently in effect:

Beginning in 1980, major events are easily traceable. In 1980, the oil industry was expanding. In 1981, Otter Tail Power'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. At Hannover, from 1987 through 1993, there was a steady increasing trend in the percentage of data greater than the MDV. However, Hannover showed a decrease from 1993 to 1997. The Beulah - N site began operation in 1998 and tracked the Hannover data, showing no particular trend.

Fargo NW has both a low detection percentage and low maximum concentrations. It appears the most significant influence on the detection percentage and maximum concentrations is the meteorology.

Both of the Mandan sites are source specific to the Tesoro Refinery. The primary function for the Mandan – SPM site was to validate the dispersion modeling results for the refinery and the R. M. Heskett power plant. The Mandan NW – SPM site was added after a near-excursion federal 24-hour standard occurred in 1998. Since then, both sites have been used to track the emissions reductions at the refinery. Since 1996, the SO_2 emissions have decreased 33 percent and the ambient concentrations followed the emissions reductions until 2004. It has been determined both sites have fulfilled their monitoring objectives and will be terminated. The current plan is to replace these two sites by expanding the current Bismarck site to include SO2, NOx, O3, continuous PM_{10} and $PM_{2.5}$, and MET. Network modification forms will be submitted after a final decision had been made.

The TRNP – SU site is located in a Class I area and based on experience and dispersion modeling results, meteorology is the most significant influence on the monitoring data fluctuations with the Title V emission sources that have been shown to have the greatest influence. When the monitoring results are compared to the total emissions in Figure 7A, it is apparent the monitoring data does not track emissions.

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). Because Lostwood has a limited amount of data, no attempt is made to evaluate the results.

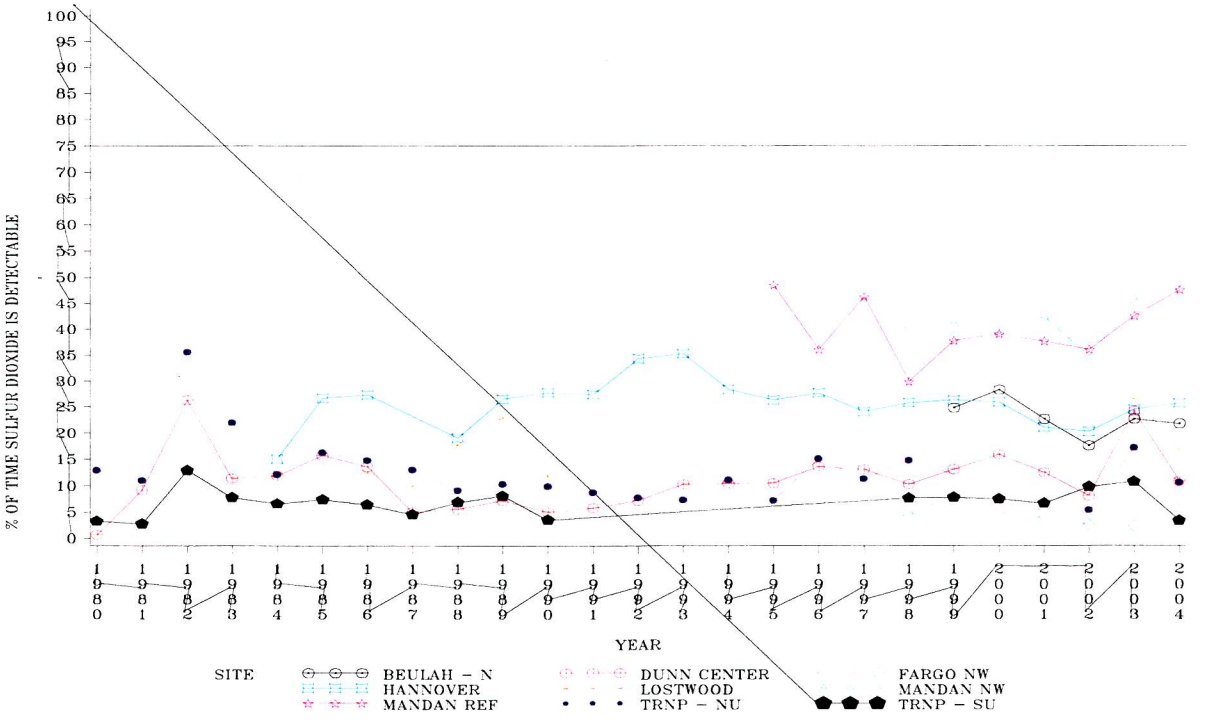

Figure 3 Percentage of Time SO_2 Detectable

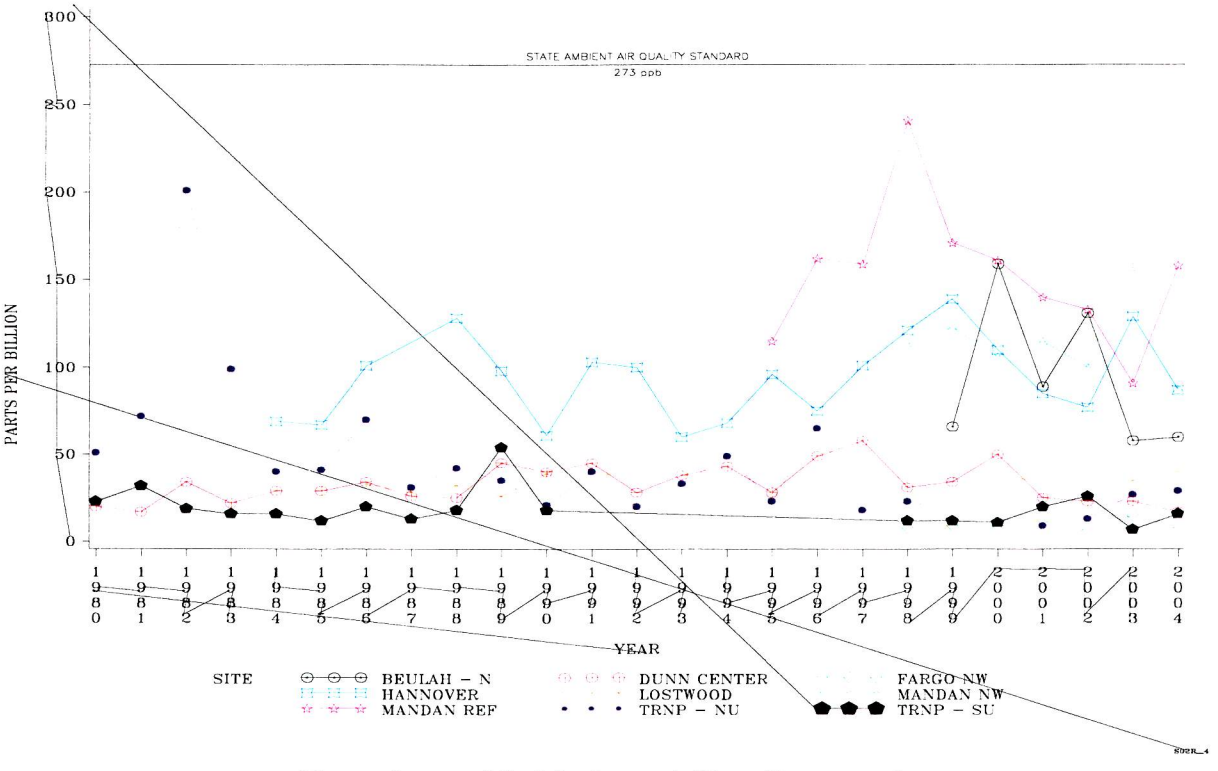

Figure 4 SO_2 Maximum 1-Hour Concentrations

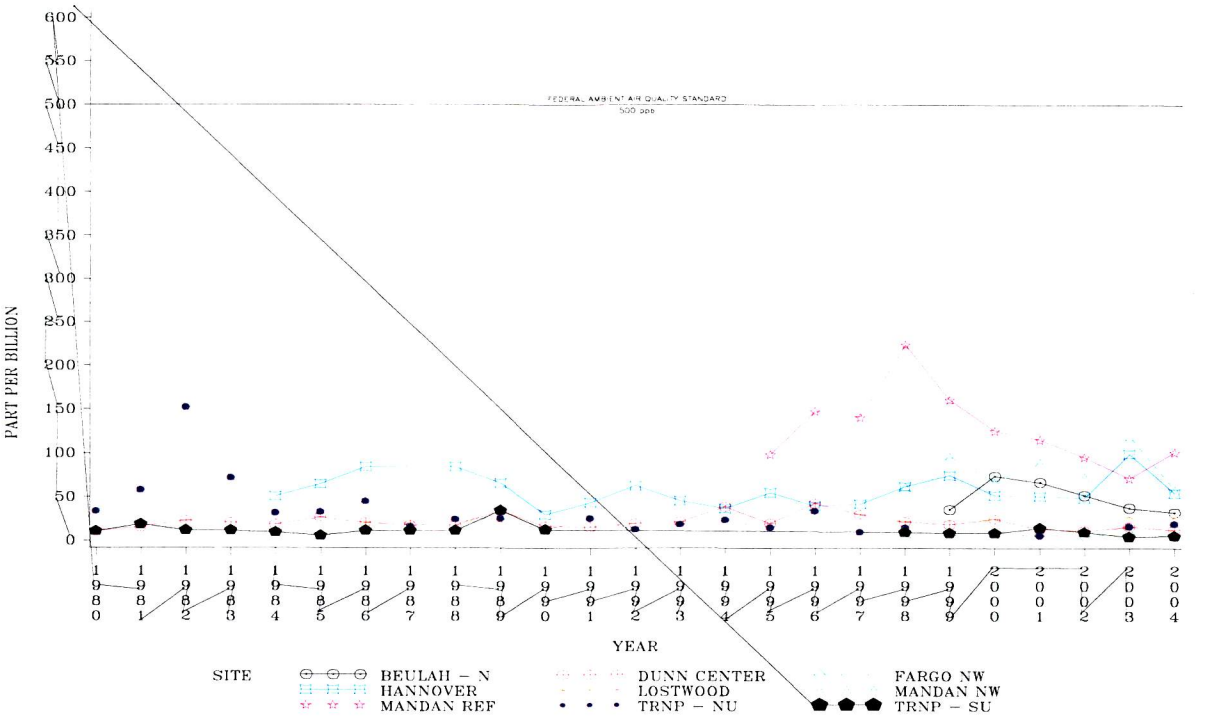

Figure 5 SO_2 Maximum 3-Hour Concentrations

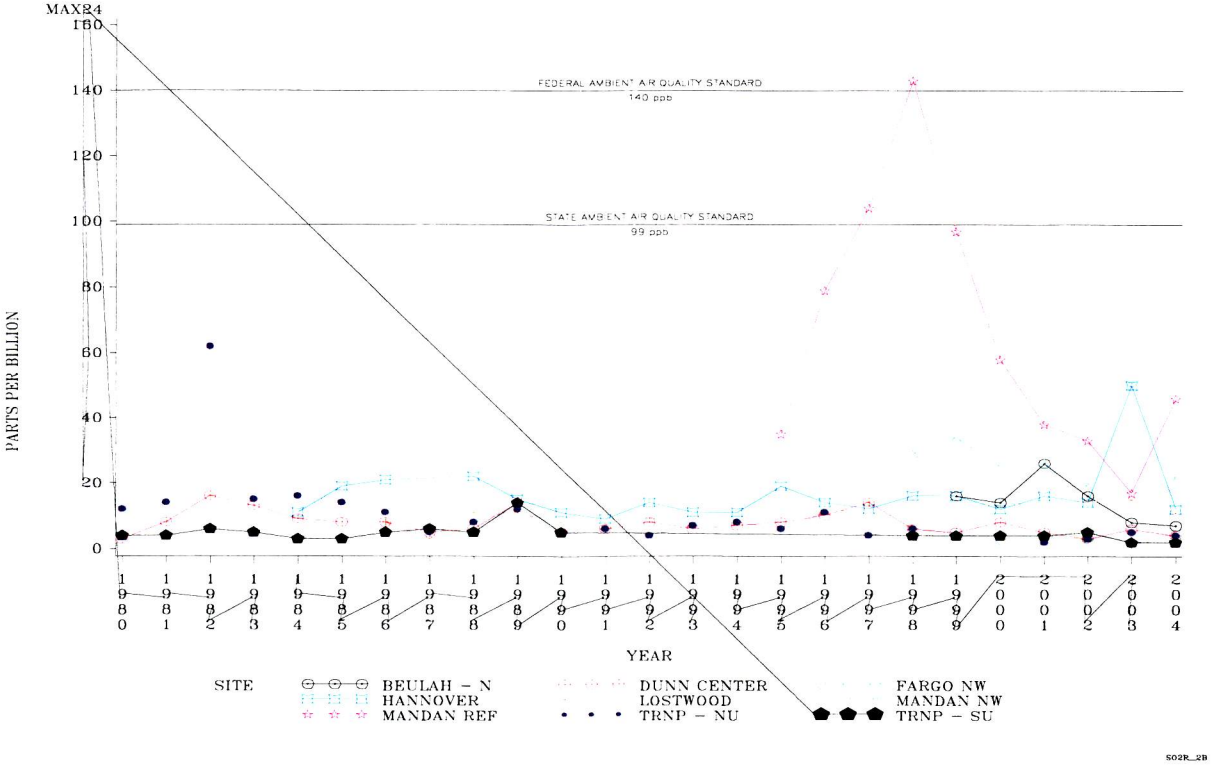

Figure 6 SO_2 Maximum 24-Hour Concentrations

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 is no ambient air quality standard 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 six $NO/NO_2/NO_x$ analyzers. These are located at Beulah, Dunn Center, Fargo, Hannover, Lostwood NWR, and TRNP - NU. The Dakota Gasification Company (DGC) network also operates analyzers at sites DGC #12 and DGC #17. Table 6 shows the 2004 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 and long range transport/regional haze sites, respectively.

TABLE 5

Major NO_x Sources
(> 100 TPY)

2004

#	COMPANY	SOURCE	NOX	Percent of Total Emissions	Facility ID
1	Minnkota Power Cooperative, Inc.	M R Young Station 1 & 2	23,393	27.21%	3806500001
2	OtterTail Power Company	Coyote	13,857	16.12%	3805700012
3	Basin Electric Power Cooperative	Leland Olds Station	12,897	15.00%	3805700001
4	Basin Electric Power Cooperative	Antelope Valley Station	12,105	14.08%	3805700011
5	Great River Energy	Coal Creek Station	10,802	12.56%	3805500017
6	Dakota Gasification Co.	Plant	3,130	3.64%	3805700013
7	Great River Energy	Stanton Station	2,879	3.35%	3805700004
8	Amerada Hess Corporation	Tioga Gas Plant	1,833	2.13%	3810500004
9	Montana Dakota Utilities Co.	RM Heskett Station	1,207	1.40%	3805900001
10	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	834	0.97%	3805900003
11	American Crystal Sugar	Hillsboro Plant	618	0.72%	3809700019
12	American Crystal Sugar	Drayton Plant	496	0.58%	3806700003
13	Minn-Dak Farmers Cooperative	Wahpeton Plant	469	0.55%	3807700026
14	Cavalier AFS	Power Plant	253	0.29%	3806700005
15	University of North Dakota	Heating Plant	250	0.29%	3803500003
16	Northern Border Pipeline Co.	Station #4	188	0.22%	3805300014
17	North Dakota State University	Heating Plant	153	0.18%	3801700005
18	Bear Paw Energy	Lignite Gas Plant	137	0.16%	3801300071
19	Bear Paw Energy	Alexander	133	0.15%	3805300024
20	Northern Sun (Division of ADM)	Oil Seed Processing	126	0.15%	3807300001
21	ADM Corn Processing	Walhalla	110	0.13%	3806700004
22	Northern Border Pipeline Co.	Station #8	101	0.12%	3805100001

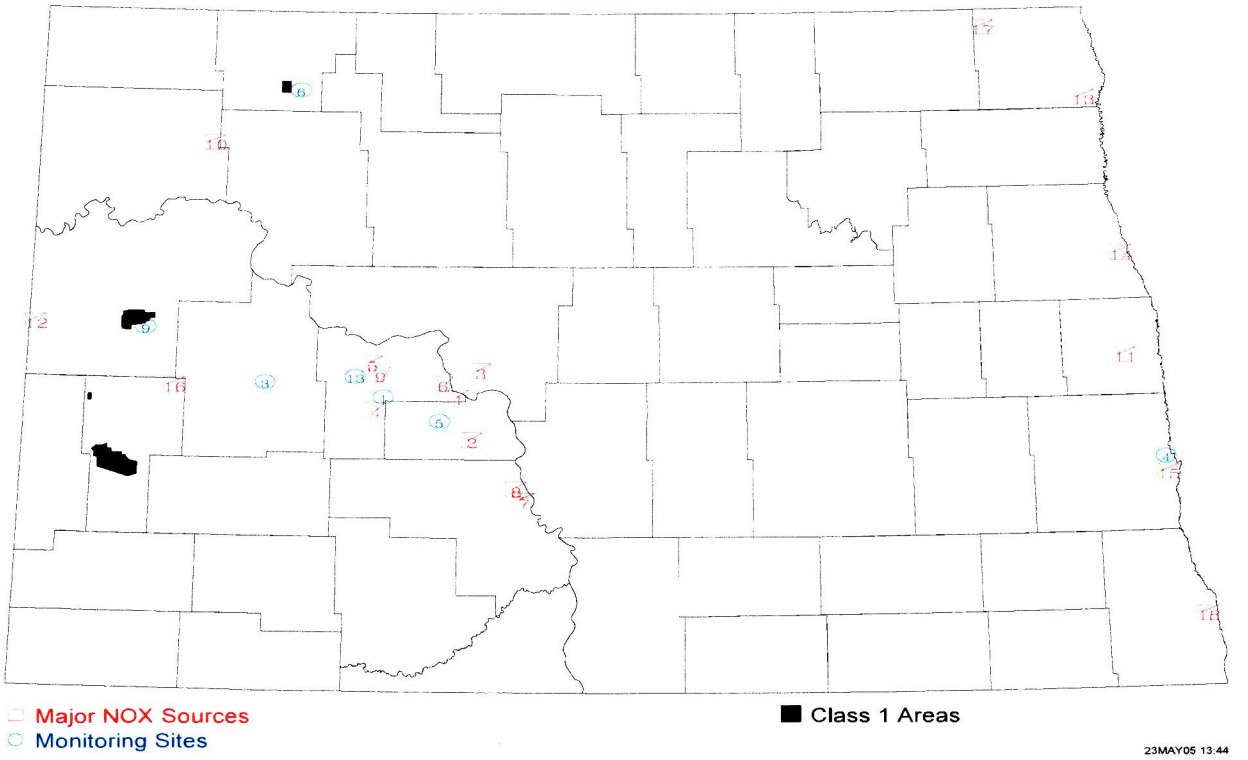

Figure 7 Major Nitrogen Dioxide Sources

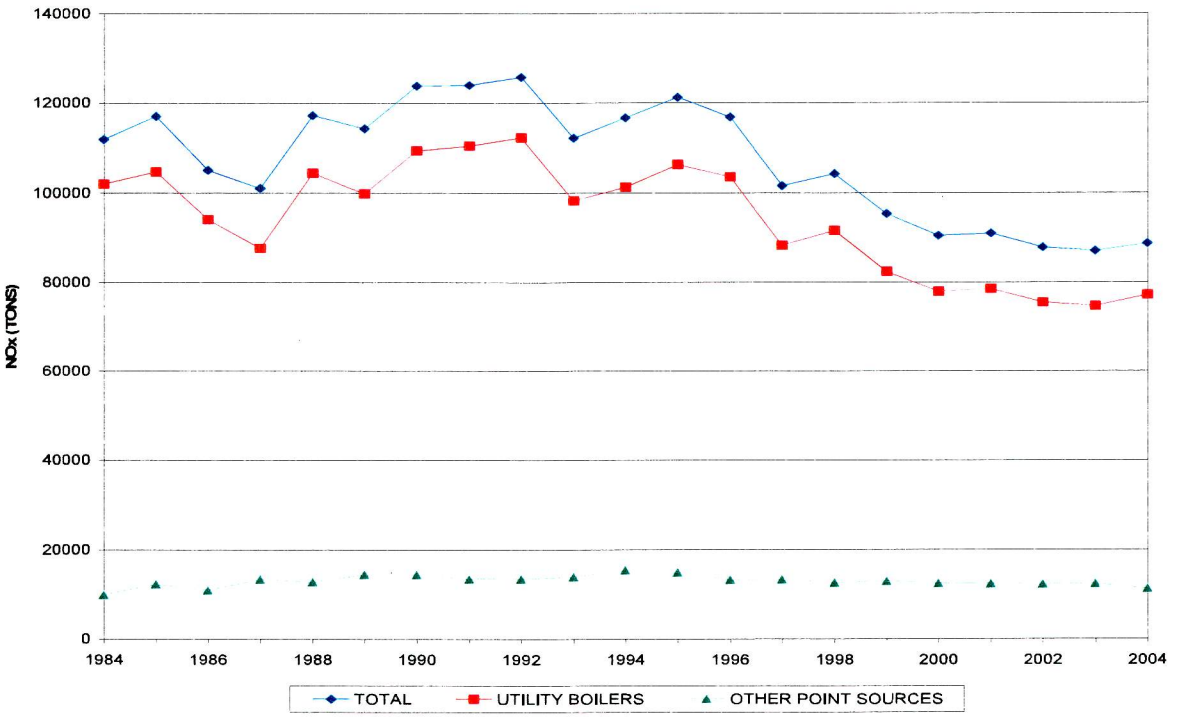

Figure 7A Annual Nitrogen Dioxide Emissions

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	2004	JAN-DEC	8690	38 10/05:19	25 04/05:21	3.0	95.4
DGC #12	2004	JAN-DEC	8639	46 04/05:21	30 04/05:22	2.9	95.2
DGC #17	2004	JAN-DEC	7872	28 07/22:20	27 08/07:11	2.2	93.4
Dunn Center	2004	JAN-DEC	8672	21 08/04:01	17 01/28:21	1.9	94.4
Fargo NW	2004	JAN-DEC	8593	50 02/18:09	48 02/15:05	6.1	96.3
Hannover	2004	JAN-DEC	8706	35 03/12:19	27 03/13:17	2.4	92.3
Lostwood NWR	2004	JAN-DEC	8655	16 12/07:09	15 02/03:18	1.9	94.6
TRNP - NU	2004	JAN-DEC	8707	14 12/29:20	13 12/29:21	1.5	98.2

The maximum annual average concentration is 6.1 ppb at Fargo NW

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

FEDERAL - 53 ppb annual arithmetic mean.

2.2.4 Network Analysis

The nine 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 - 2004. 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. Figure 7A show an increasing, but slow, trend in NO2 emissions from 1984 until 1992. From 1993 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, Dunn Center and Hannover were the only sites that had a decrease in the number of hourly averages less than the minimum detectable value.

If the annual average 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 annual averages, shown in Figure 9, have shown no particular trend. Since TRNP-NU is a relatively new site, no valid trending is possible.

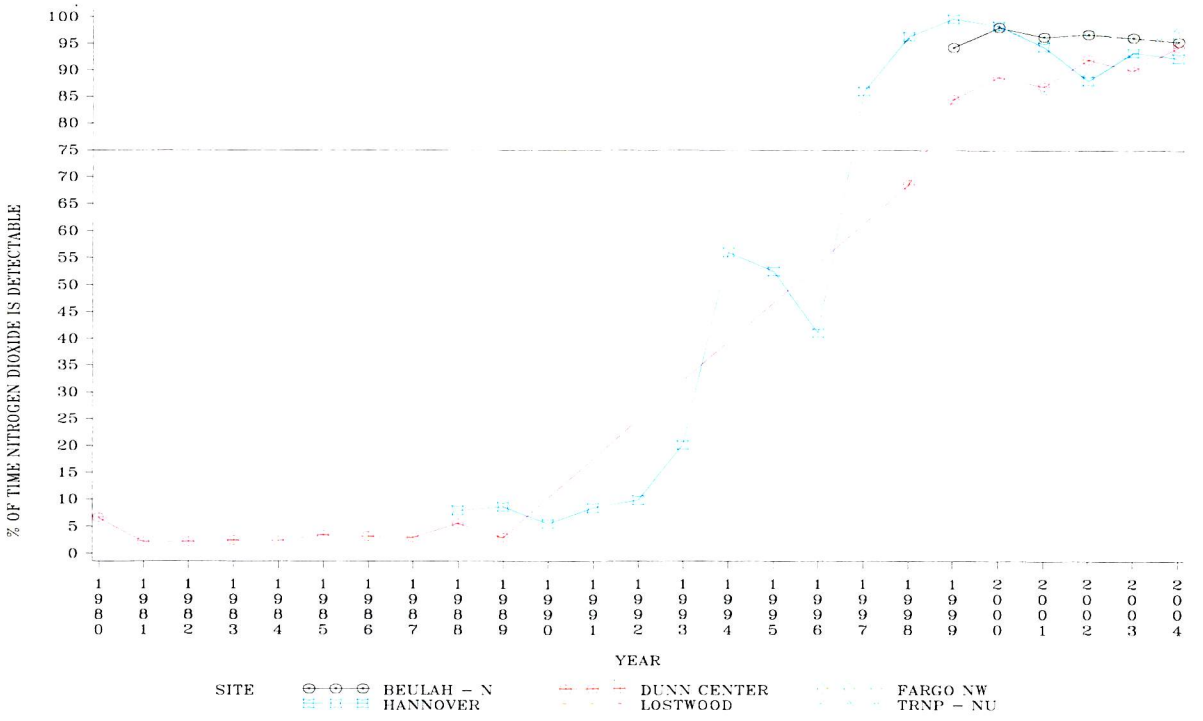

Figure 8 Percentage of Time NO_2 Detectable

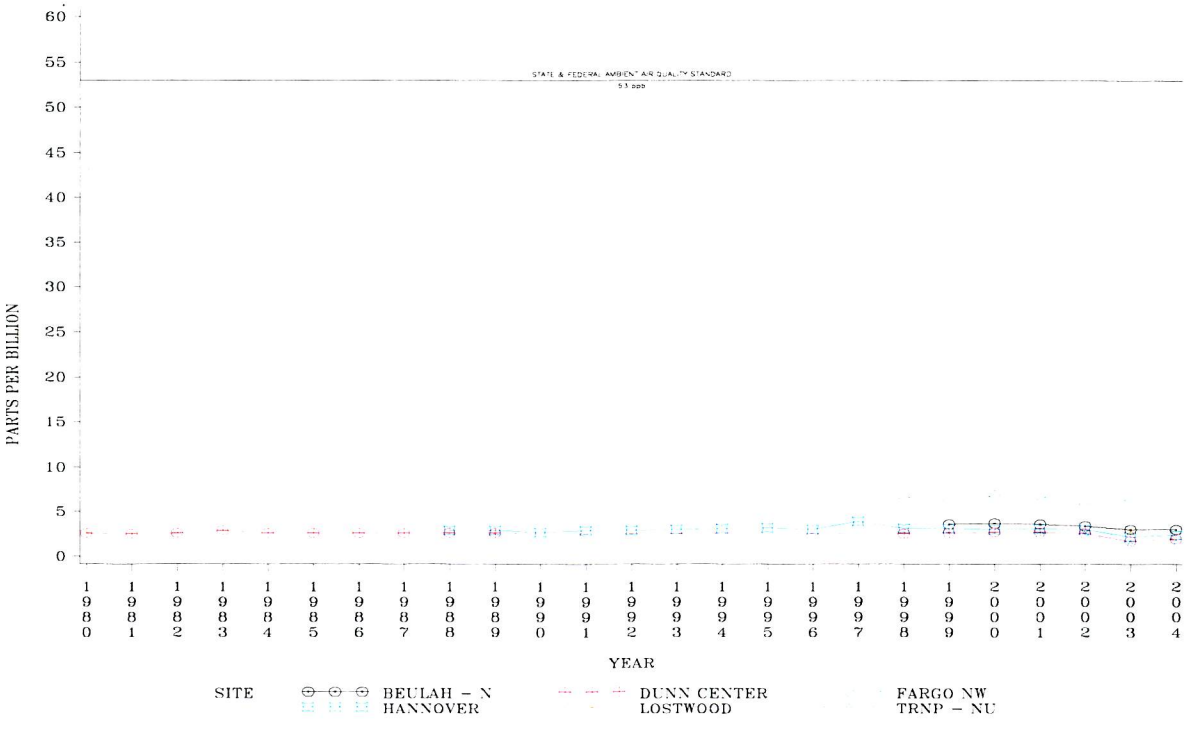

Figure 9 NO_2 Annual Average Concentrations

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)

2004

#	Company	Source	Pollutant Emission	Percentage of Total Emissions	Facility ID
1	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	452	20.28%	3805900003
2	Dakota Gasification Co.	Plant	413	18.56%	3805700013
3	Minnkota Power Cooperative, Inc.	M R Young Station 1 & 2	226	10.16%	3806500001
4	Kaneb Pipe Line Operating Partnership	Jamestown Products Terminal	197	8.84%	3809300037
5	Northern Sun (Division of ADM)	Oil Seed Processing	190	8.53%	3807300001
6	Great River Energy	Coal Creek Station	160	7.17%	3805500017
7	ADM Corn Processing	Ethanol Plant - Walhalla	137	6.15%	3806700004
8	Otter Tail Power Company	Coyote	122	5.50%	3805700012
9	Basin Electric Power Cooperative	Antelope Valley Station	118	5.31%	3805700011
10	ADM Processing	Oil Seed Proc. - Velva	107	4.79%	3804900005
11	Basin Electric Power Cooperative	Leland Olds Station	105	4.70%	3805700001

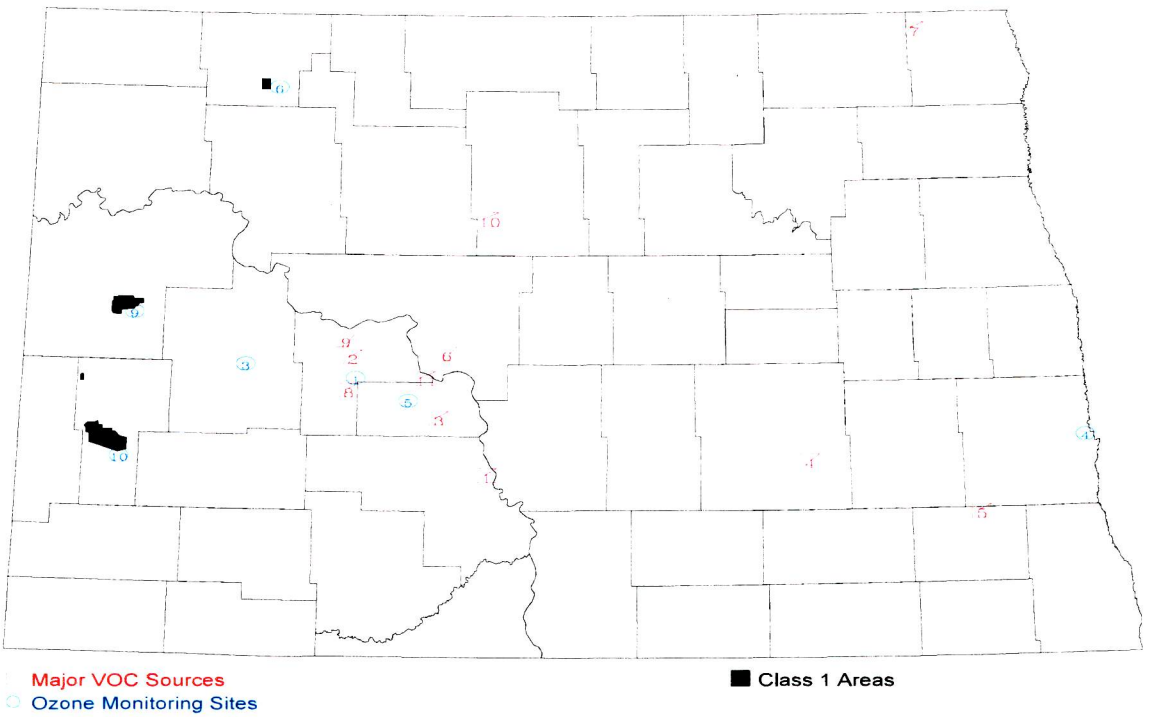

Figure 10 Major VOC Sources

TABLE 8

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

POLLUTANT : Ozone (PPB)

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MAXIMUM 1-HOUR 1ST MM/DD	MAXIMUM 1-HOUR 2ND MM/DD	MAXIMUM 8-HOUR 1ST MM/DD	MAXIMUM 8-HOUR 2ND MM/DD	MAXIMUM 8-HOUR 3RD MM/DD	MAXIMUM 8-HOUR 4TH MM/DD	1HR #>120	8HR #>80
Beulah - North	2004	JAN-DEC	8722	60 06/05	59 05/17	57 06/05	54 06/06	54 07/26	53 05/17		
Dunn Center	2004	JAN-DEC	8717	57 08/01	56 08/06	55 06/05	51 05/17	51 04/05	49 04/06		
Fargo NW	2004	JAN-DEC	8729	71 09/12	68 05/18	66 09/12	64 05/18	62 09/13	61 09/20		
Hannover	2004	JAN-DEC	8686	58 06/05	54 04/05	55 06/05	51 06/06	50 04/05	49 04/03		
Lostwood NWR	2004	JAN-DEC	8685	62 06/22	62 06/05	60 06/05	59 05/18	58 05/17	58 03/08		
TRNP - NU	2004	JAN-DEC	8735	70 08/01	67 06/05	65 06/05	61 08/06	57 05/17	56 04/05		
TRNP - SU (Painted Canyon)	2004	JAN-DEC	5066 ***	63 06/30	62 06/05	62 06/05	57 06/30	56 07/26	55 06/06		

The maximum 1-hour concentration is 71 ppb at Fargo NW on 09/12
The highest 4th highest 8-hour concentration is 61 ppb at Fargo NW on 09/20

* 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 seven continuous ozone analyzers in operation. These are at Beulah, Dunn Center, Fargo, Hannover, Lostwood NWR, Theodore Roosevelt National Park - North Unit, and Theodore Roosevelt National Park - South Unit. Table 8 presents the 2004 1-hour and 8-hour data summaries. Figure 11 shows the maximum 8-hour averages by month for 2004.

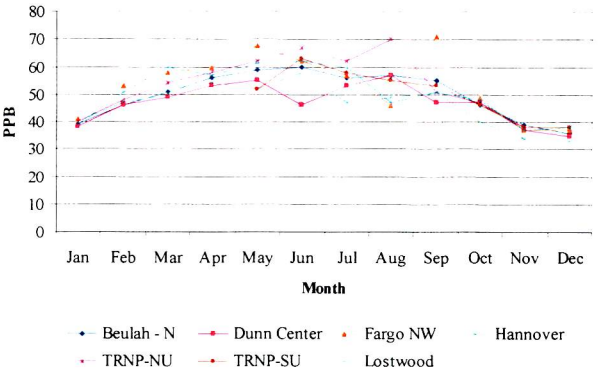

Figure 11 Monthly Maximum Ozone Concentrations

2.3.4 Network Analysis

Only two of the seven monitoring sites are in an area not significantly influenced by VOC sources (see Figure 10). Beulah and Hannover are within 45 miles of seven of the ten major VOC sources in the state. Lostwood NWR, 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 five 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: for all sites, the difference between the highest and 4th highest concentrations are within 9 ppb (see Table 8).

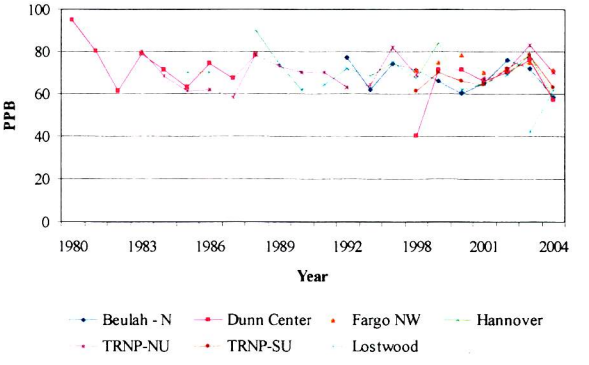

Figure 12 Annual Maximum Ozone Concentrations

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 13A 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 three PM_{10} samplers, four continuous PM_{10} analyzers, five manual $PM_{2.5}$ samplers, four continuous $PM_{2.5}$ analyzers, and three speciation samplers. Tables 10 and 12 show the inhalable PM_{10} and continuous particulate data summaries, respectively. Tables 11 and 13 show the FRM $PM_{2.5}$ and continuous particulate data summaries, respectively.

R&P $PM_{2.5}$ single-day samplers are installed at Beulah, TRNP - SU, and TRNP - NU. And, R&P $PM_{2.5}$ sequential samplers were installed at Bismarck and Fargo.

TABLE 9

Major PM_{10} Sources
(> 100 TPY)

2004

#	COMPANY	SOURCE	PM10	Percent of Total Emissions	Facility ID
1	Basin Electric Power Cooperative	Antelope Valley Station	714	28.23%	3805700011
2	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	459	18.15%	3805900003
3	OtterTail Power Company	Coyote	265	10.48%	3805700012
4	American Crystal Sugar	Drayton Plant	262	10.36%	3806700003
5	Dakota Gasification Co.	Plant	214	8.46%	3805700013
6	Basin Electric Power Cooperative	Leland Olds Station	209	8.26%	3805700001
7	Minnkota Power Cooperative, Inc.	M R Young Station 1 & 2	160	6.33%	3806500001
8	Great River Energy	Coal Creek Station	133	5.26%	3805500017
9	Great River Energy	Stanton Station	113	4.47%	3805700004

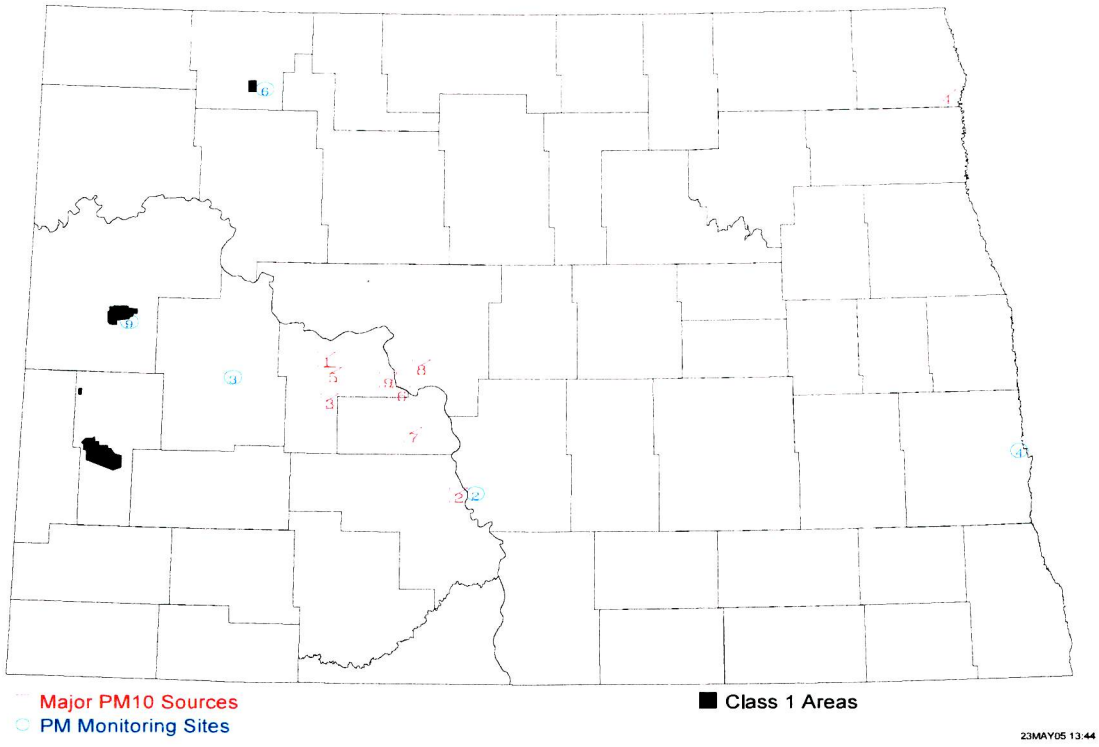

Figure 13 Major PM_{10} Sources

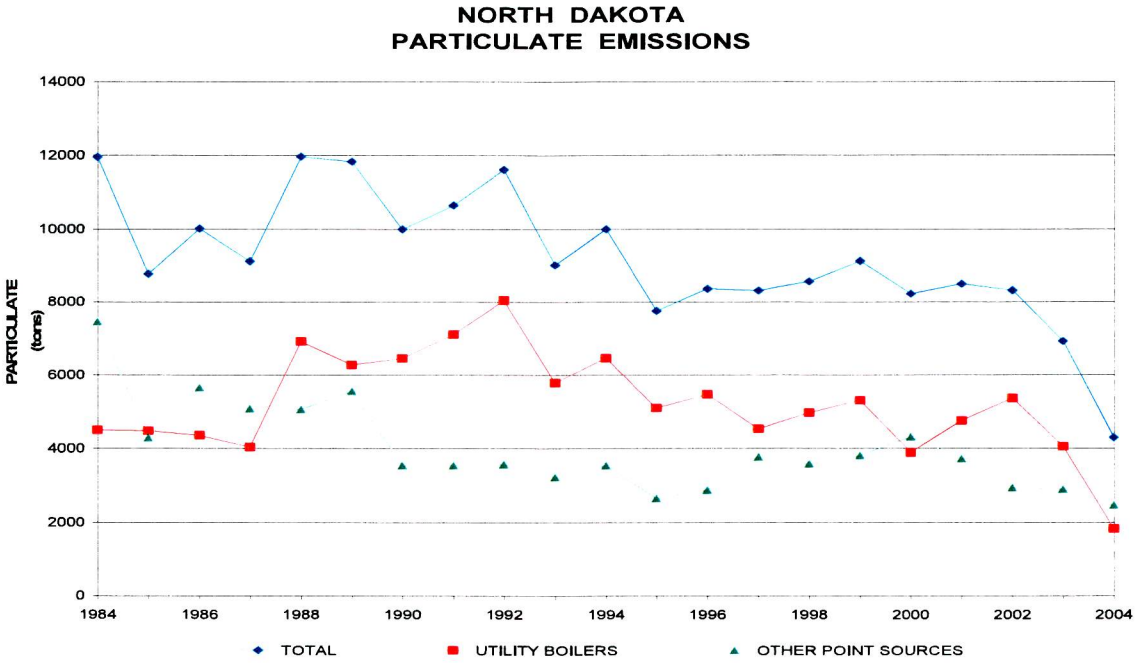

Figure 13A Annual PM Emissions

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	2004	JAN-DEC	61	0.0	43.0 07/26	33.0 10/12	30.0 07/20	14.5			96.7
Fargo NW	2004	JAN-JUN	60	3.0	39.0 05/03	36.0 03/25	31.0 01/16	14.9			98.3
TRNP - NU	2004	JAN-JUN	29 ***	1.0	30.0 05/03	15.0 04/15	12.0 03/10	8.3			96.6

The maximum 24-hour concentration is 43.0 µg/m3 at Bismarck Residential on 07/26

* 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.

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

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	2004	JAN-DEC	61	1.8	13.7 02/03	10.8 10/30	10.0 01/16	5.6			98.4
Bismarck Residential	2004	JAN-DEC	120	1.3	20.5 02/03	18.1 12/26	17.9 10/27	6.2			99.2
Fargo NW	2004	JAN-DEC	118	1.5	28.1 11/17	26.5 03/25	26.0 02/27	7.5			99.2
TRNP - NU	2004	JAN-DEC	54	1.9	11.2 12/05	8.8 10/18	8.3 01/16	4.9			98.1
TRNP - SU (Painted Canyon)	2004	JAN-DEC	59	1.3	9.0 12/05	8.9 08/19	8.4 03/04	4.4			94.9

The maximum 24-hour concentration is 28.1 µg/m3 at Fargo NW on 11/17

* 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_{10} ($\mu g/m^3$)

				MAXIMA 1-HOUR		MAXIMA 24-HOUR					
LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	1ST MM/DD:HH	2ND MM/DD:HH	1ST MM/DD	2ND MM/DD	3RD MM/DD	4TH MM/DD	MEAN	24HR #>150	AM>50
Dunn Center	2004	SEP-DEC	2714 ***	235.0 12/11:17	174.0 12/17:11	42.9 12/11	42.3 10/14	33.1 12/21	29.0 10/10	12.7		
Fargo NW	2004	JUN-DEC	4308 ***	249.0 11/11:17	191.0 11/23:07	61.6 10/12	54.0 10/11	50.4 11/11	49.8 08/17	19.8		
Lostwood NWR	2004	JAN-DEC	8611	310.4 04/28:07	275.4 04/24:23	73.0 04/24	59.7 04/25	51.8 12/20	42.3 04/28	11.1		
TRNP - NU	2004	JUN-DEC	4747 ***	98.0 09/02:05	86.0 12/20:19	32.2 12/20	28.6 08/16	24.2 08/17	22.7 09/19	10.2		

The highest 24-hour concentration is 73.0 µg/m3 at Lostwood NWR on 04/24
The highest Annual Mean concentration is 10.2 µg/m3 at TRNP - NU

* 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.

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

Table 13

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

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

				MAXIMA 1-HOUR		MAXIMA 24-HOUR						
LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	1ST MM/DD:HH	2ND MM/DD:HH	1ST MM/DD	2ND MM/DD	3RD MM/DD	4TH MM/DD	MEAN	1HR #>150	24HR #>65
Beulah - North	2004	JAN-DEC	8737	68.3 10/20:03	68.1 04/30:16	18.8 08/17	18.1 08/16	13.7 07/24	13.1 10/20	5.9		
Dunn Center	2004	SEP-DEC	2714 ***	31.2 09/20:06	30.0 10/20:08	7.7 12/30	7.5 12/27	7.3 12/26	7.1 09/18	2.2		
Fargo NW	2004	JAN-DEC	8655	67.9 05/05:07	66.6 07/04:21	15.6 08/17	14.9 11/17	14.3 05/05	12.8 09/03	3.8		
Hannover	2004	JAN-DEC	8568	56.4 12/10:09	47.5 02/03:02	17.7 08/17	15.7 08/16	13.8 07/24	13.6 12/10	5.9		
Lostwood NWR	2004	JAN-DEC	8431	39.8 02/23:22	28.8 04/28:07	18.4 08/16	15.7 08/17	10.9 02/24	10.8 07/17	2.7		
TRNP - NU	2004	JAN-DEC	8599	45.9 04/28:07	41.2 09/02:05	19.8 08/16	14.0 08/17	10.8 04/28	10.3 08/15	3.9		
TRNP - SU (Painted Canyon)	2004	JAN-DEC	4944 ***	36.2 08/16:03	32.0 07/17:20	23.5 08/16	18.9 08/17	13.3 07/23	11.8 08/15	5.7		

The highest 24-hour concentration is 29.6 µg/m3 at Estevan, SK on 07/12
The highest Annual Mean concentration is 5.7 µg/m3 at TRNP - SU (Painted Canyo

* 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

Since PM_{10} and smaller particles are of concern mainly because of their health effects, two sites are located in population centers, Bismarck and Fargo. The two manual samplers at Fargo and TRNP – NU were terminated effective June 30 and

replaced continuous analyzers effective July 1. A continuous analyzer was added to the Dunn Center site effective September 8. The remaining PM_{10} manual sampler (Bismarck) will be replaced with a continuous analyzer when the Bismarck site is upgraded in 2005.

2.4.4 $PM_{2.5}$ Network

The manual $PM_{2.5}$ network currently has five sites. Bismarck, Fargo and Beulah are non-CORE required sites. Bismarck and Fargo operate on a 1-in-3 day schedule while Beulah, TRNP - SU and TRNP - NU operate on a 1-in-6 day schedule. Continuous $PM_{2.5}$ analyzers (TEOMs) have been installed at Beulah, Dunn Center, Fargo, Hannover, Lostwood NWR, TRNP-NU, and TRNP-SU.

The intent of the TEOMs is to begin using these analyzers as the primary data source and use a FEM sampler only for quality assurance purposes. Our initial work to compare the TEOM data with the manual sampler data has not met with much success. In a comparison of the manual and continuous data collected through 2003, there was good correlation in the summer and poor correlation in the winter. The conclusion was that in the summer the manual samplers and the TEOMs were both losing the volatiles. Using the Fargo speciation sulfate and nitrate data, manual and continuous PM2.5 data as a foundation, when the speciation sulfates and nitrates were added to the TEOM data, the correlation, slope and intercept were within the range required to use the TEOM as an acceptable replacement for the manual samplers. The Short Creek site TEOM, which runs at 40°C, showed a reasonable correlation for all four seasons as well as the entire year. With this information in hand, EPA Region 8 agreed to allow North Dakota to run the $PM_{2.5}$ TEOMS at 40°C. This temperature change was made around during the last week of December 2004 and the first week of January 2005.

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 NWR. 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. The data collected is added to the AQS database by RTI.

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 14 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 CO levels 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 14

Major CO Sources
(> 100 TPY)

2004

#	COMPANY	SOURCE	CO	Percent of Total Emissions	Facility ID
1	Great River Energy	Coal Creek Station	1896	15.52%	3805500017
2	Dakota Gasification Co.	Plant	1676	13.72%	3805700013
3	Montana Dakota Utilities Co.	RM Heskett Station	1407	11.52%	3805900001
4	Basin Electric Power Cooperative	Antelope Valley Station	1363	11.16%	3805700011
5	Minnkota Power Cooperative, Inc.	M R Young Station 1 & 2	1018	8.33%	3806500001
6	Basin Electric Power Cooperative	Leland Olds Station	927	7.59%	3805700001
7	American Crystal Sugar	Hillsboro Plant	858	7.02%	3809700019
8	OtterTail Power Company	Coyote	772	6.32%	3805700012
9	Minn-Dak Farmers Cooperative	Wahpeton Plant	497	4.07%	3807700026
10	Amerada Hess Corporation	Tioga Gas Plant	427	3.50%	3810500004
11	American Crystal Sugar	Drayton Plant	315	2.58%	3806700003
12	Northern Sun (Division of ADM)	Oil Seed Processing	309	2.53%	3807300001
13	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	220	1.80%	3805900003
14	Great River Energy	Stanton Station	153	1.25%	3805700004
15	University of North Dakota	Heating Plant	141	1.15%	3803500003
16	Bear Paw Energy	Alexander	123	1.01%	3805300024
17	ADM Corn Processing	Walhalla	113	0.93%	3806700004

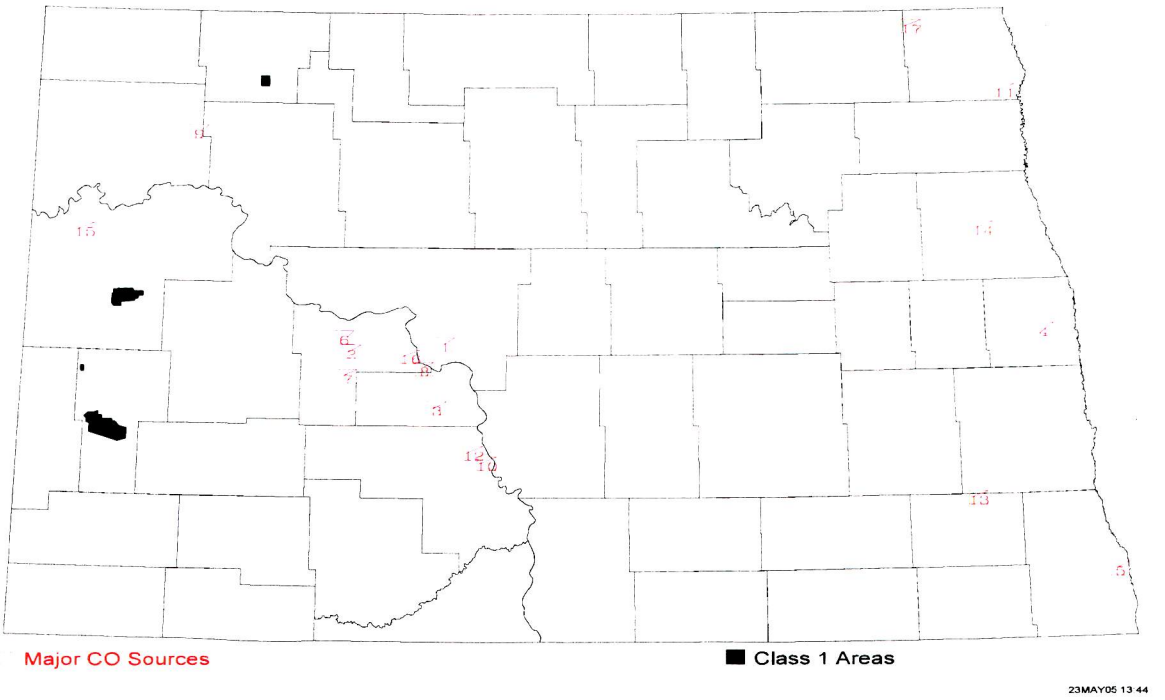

Figure 14 Major CO Sources

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

Currently there are no state or federal air toxics monitoring sites.

2.8.1 Sources

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

2.8.2 Monitoring Network

Currently there are no state or industry air toxics monitoring sites. The Historic raw data and associated summaries are available in AQS.

Table 15

Major Air Toxics Sources
(>100 TPY)

2004

#	COMPANY	SOURCE	HAPS	Percent of Total Emissions	Facility ID
1	Dakota Gasification Co.	Plant	2818	78.26%	3805700013
2	Northern Sun (Division of ADM)	Oil Seed Processing	337	9.36%	3807300001
3	ADM Processing	Velva	207	5.75%	3804900005
4	Tesoro Refining and Marketing Company	Tesoro Mandan Refinery	128	3.55%	3805900003
5	Great River Energy	Coal Creek Station	111	3.08%	3805500017

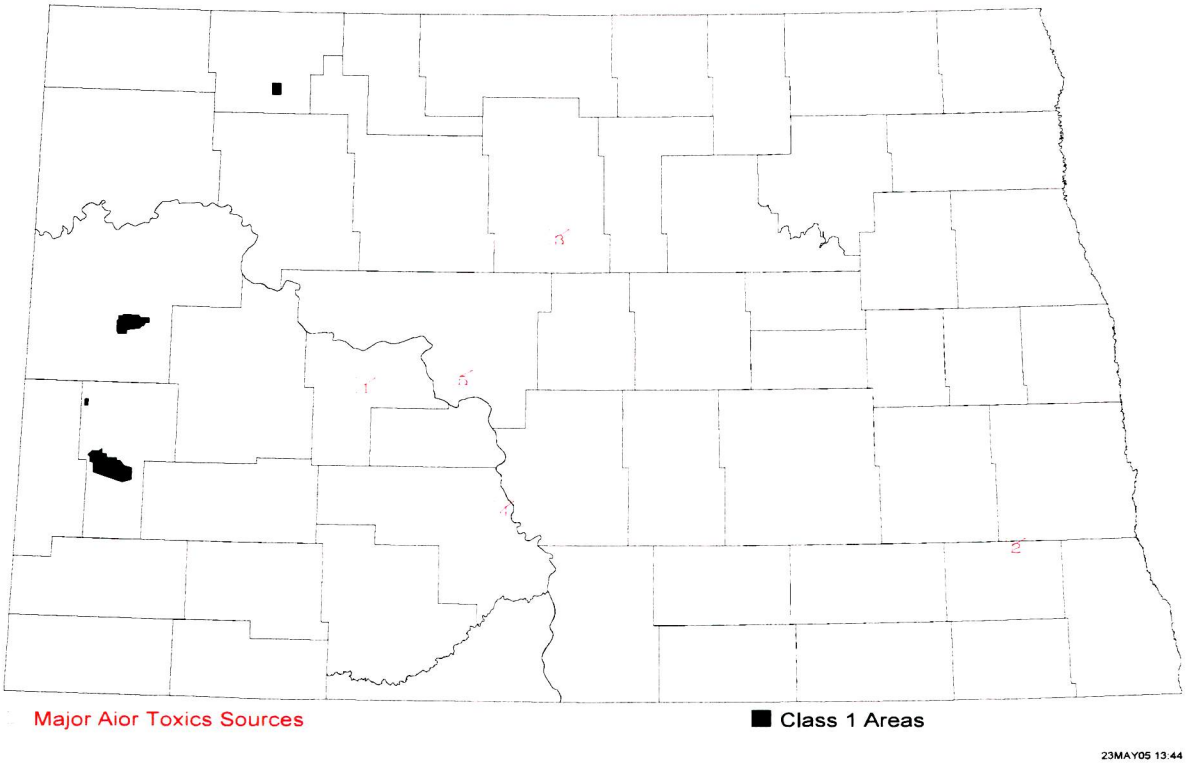

Figure 15 Major Air Toxics Sources

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 - 322 ppb (117.9%); 3-hour - 134 ppb (26.8%); 24-hour - 46 ppb (46.5%); annual – 6.0 ppb (20.0%).

Figure 15 Major Air Toxics Sources

There is no SO_2 5-minute standard currently in effect. The maximum 5-minute average was 485 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 - 6.1 ppb (11.5%)

3.3 Ozone (O_3)

Neither the State nor Federal standard was exceeded during the year. The 1-hour maximum and highest 4th highest 8-hour concentrations and the concentrations expressed as a percentage of the applicable standard are as follows: 1-hour - 71 ppb (59.2%); highest 4th highest 8-hour - 61 ppb (76.3%).

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 - 73 $\mu g/m^3$ (48.7%); annual - 19.8 $\mu g/m^3$ (39.6%).

The Federal $PM_{2.5}$ standards were not exceeded during the year. The maximum concentrations and maximum concentrations expressed as a percentage of the standard are as follows: 24-hour FRM – 28.1 $\mu g/m^3$ (43.2%); annual FRM - 7.5 $\mu g/m^3$ (50.0%).

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

No monitoring was conducted.