NORTH DAKOTA
STATE DEPARTMENT OF HEALTH
AND CONSOLIDATED LABORATORIES
State Capitol
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Bismarck, North Dakota 58505-0200

FILE

ENVIRONMENTAL HEALTH SECTION
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May 23, 1991

Marshall Payne, Chief
Technical Operations Branch
U.S. EPA, Region VIII
999 18th Street, Suite 500
One Denver Place
Denver, CO 80202-2405

Marshall

Dear Mr. Payne:

Enclosed are two copies of the North Dakota Network Review for 1991 which satisfies Item X.E.1. of the SEA. You will note that we have included information on the Industrial Ambient Air Monitoring Sites as well as the State network.

Documentation in response to Item X.E.2. will be forwarded next week. With the exception of the QA Plan Review (Item X.F.) which will be completed next month, this should conclude our major Air Quality Monitoring-related action items for the FY91 SEA.

If you have any questions, please feel free to contact Chuck McDonald of my staff.

Sincerely,

Dana K. Mount, P.E.
Director, Division of
Environmental Engineering

DKM/CMM:dgg
Enc:

NORTH DAKOTA STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL ENGINEERING

AMBIENT AIR QUALITY MONITORING
ANNUAL NETWORK REVIEW
1991

May 1991

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

1.0 INTRODUCTION

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

To evaluate the effectiveness of the State's air quality monitoring effort, the U.S. Environmental Protection Agency (EPA) requires the Division of Environmental Engineering to conduct an annual review of the State's ambient air quality monitoring (AAQM) network. EPA's requirements, as set forth in 40 CFR 58.20, are (1) to determine if the system meets the monitoring objectives defined in Appendix D to 40 CFR 58, and (2) to identify needed modifications to the network such as termination or relocation of unnecessary stations or establishment of new stations 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 stations 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 those 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 basic monitoring 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.

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 station throughout which actual pollutant concentrations are reasonably similar. The goal in siting stations 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 below:

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 4.0 to 50.0 km. (Usually requires more than one site for definition.)

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

The relationship 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 (sometimes urban)
Population	Neighborhood, urban
Source Impact	Micro, middle, neighborhood
General/Background	Neighborhood, 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

The use of this physical basis for locating stations allows for an objective approach, ensures compatibility among stations, and provides a physical basis for the interpretation and application of data. The annual review process involves an examination of existing

stations to evaluate their monitoring objectives and spatial scale, and sites are deleted, added, or modified accordingly. Further details on network design can be found in Appendix D to 40 CFR 58.

1.2 General Monitoring Needs

As can be gathered from the prior discussion, each air contaminant has certain characteristics which must be accounted for when siting monitoring equipment. These characteristics may result from variations in the number and type of sources and emissions in question, reactivity of a particular pollutant with other constituents in the air, local site influences such as terrain and land use, and climatology. The State AAQM network is currently designed to provide air quality data for three basic conditions: (1) highest concentration, (2) population oriented monitoring and (3) background monitoring.

Population oriented monitoring is not a major consideration in this State because of our relatively sparse population and becomes a factor mainly in regard to PM_{10}. Carbon monoxide (CO) is the only parameter for which highest concentration monitoring is done. All PM_{10} monitoring in populated areas is done on a "neighborhood" spatial scale. The CO monitoring is conducted on a micro scale. For the remaining pollutants, the primary concern is for background monitoring. (An exception is the

monitoring done at the Beulah and Plaza Sites.) Background stations are chosen to determine concentrations of air contaminants in areas remote from urban sources and generally are sited according to a "regional" spatial scale. This is true for NO_2 as well despite the fact that the "regional" scale is not normally used for NO_2 monitoring. Once general locations are established, all monitoring stations are sited in accordance with the specific probe siting criteria specified in Appendix E to 40 CFR 58. The industrial sites all monitor "source impact" on a "neighborhood" scale.

1.3 Monitoring Objectives

The monitoring objectives of the Department are to track those pollutants that are judged to have the potential for violating the State and Federal Ambient Air Quality Standards and to ensure that those pollutants do not increase to such a degree as to cause deterioration of our existing air quality. To accomplish these objectives, the Department operates and maintains 12 AAQM sites around the State. Nine are fixed SLAMS/NAMS sites, and three are special purpose monitoring (SPM) sites. There are also seven industries that report environmental data to this Department. Table 1 lists the types of stations and parameters monitored, and Map 1 shows the approximate network site locations.

TABLE 1

AAQM NETWORK DESCRIPTION

Site	Type Station	AIRS I.D. No.	Parameter* Monitored	Ref/Equiv. Method Designation No.	Operating Schedule	Monitoring Objective	Spatial Scale	Date Site Began	Date Q.A. Began
1 Fargo-Commercial	NAMS	38-017-1001	PM_{10}	RFPS-1287-064	6th Day	Population Exposure	Neighborhood	6/85	6/85
Fargo-Commerical Dup.		38-017-1001	PM_{10}	RFPS-1287-064	6th Day	Collocated SSI	N/A		
2 Fargo-Commercial	SPM	38-017-1003	CO	RFCA-0981-054	cont.	Highest Concentration	Micro	11/90	11/90
3 Beulah-Residential	SLAMS	38-057-0001	SO_2	EQSA-0276-009	cont.	Population Exposure	Urban	4/80	7/80
			NO_2	RFNA-0777-022	cont.	Population Exposure	Urban	6/80	7/80
			O_3	RFDA-1075-003	cont.	Population Exposure	Urban	4/89	4/89
			Met	N/A	cont.	N/A	N/A	4/80	7/80
4 Bismarck-Commercial	SLAMS	38-015-0001	PM_{10}	RFPS-1287-064	6th Day	Population Exposure	Neighborhood	4/85	4/85
5 Dickinson-Residential	SLAMS	38-089-0002	PM_{10}	RFPS-1287-064	6th Day	Population Exposure	Neighborhood	7/89	7/89
6 Dunn Center-Rural	SLAMS	38-025-0003	SO_2	EQSA-0276-009	cont.	General Background	Regional	10/79	5/80
			Met	N/A	cont.	N/A	N/A	10/79	5/80
7 Grand Forks-Commercial	SLAMS	38-035-0001	PM_{10}	RFPS-1287-064	6th Day	Population Exposure	Neighborhood	7/89	7/89
8 Hannover-Rural	SLAMS	38-065-0002	SO_2	EQSA-0276-009	cont.	General Background	Regional	10/84	10/84
			NO_2	RFNA-0777-022	cont.	General Background	Regional	11/85	11/85
			O_3	RFDA-1075-003	cont.	General Background	Regional	5/85	5/85
			Met	N/A	cont.	N/A	N/A	10/84	10/84
9 TRNP(NU)-Rural	SLAMS	38-053-0002	SO_2	EQSA-0276-009	cont.	General Background	Regional	2/80	6/80
			O_3	RFDA-1075-003	cont.	General Background	Regional	11/82	11/82
			H_2S	N/A	cont.	General Background	Regional	5/80	6/80
			Met	N/A	cont.	N/A	N/A	2/80	6/80
10 Williston-Commercial	SLAMS	38-105-0001	PM_{10}	RFPS-1287-064	6th Day	Population Exposure	Neighborhood	5/85	5/85
11 Plaza-Residential	SPM	38-061-0002	SO_2	EQSA-0276-009	cont.	Population Exposure	Neighborhood	9/90	9/90
			H_2S	N/A	cont.	Population Exposure	Neighborhood	9/90	9/90
			Met	N/A	cont.	N/A	N/A	9/90	9/90
12 UND-Residential	SPM	38-035-0003	SO_2	EQSA-0276-009	cont.	Source Impact	Middle	1/90	1/90
			NO_2	RFNA-1289-074	cont.	Source Impact	Middle	1/90	1/90
			Met	N/A	cont.	N/A	N/A	1/90	1/90
13 Amerada Hess Corporation	INDUS	38-105-0103	SO_2	EQSA-0276-009	cont.	Source Impact	Neighborhood	7/87	7/87
		33-105-0104	SO_2	EQSA-0779-039	cont.	Source Impact	Neighborhood	7/87	7/87
		38-105-0105	H_2S	N/A	cont.	Source Impact	Neighborhood	7/87	7/87
			Met	N/A	cont.	N/A	N/A	11/87	11/87
14 Dakota Gasification Company	INDUS	38-057-0113	SO_2 (2)	EQSA-0276-009	cont.	Source Impact	Neighborhood	7/84	7/84
		38-057-0114	H_2S	N/A	cont.	Source Impact	Neighborhood	5/83	5/83
		38-057-0118							
15 Falkirk Mining Company	INDUS	38-055-0110	PM_{10}	RFPS-0389-071	6th Day	Source Impact	Neighborhood	8/88	8/88
		33-055-0112	PM_{10}	RFPA-1087-062	6th Day	Source Impact	Neighborhood	8/88	8/88
			Met	N/A	cont.	N/A	N/A	7/90	7/90

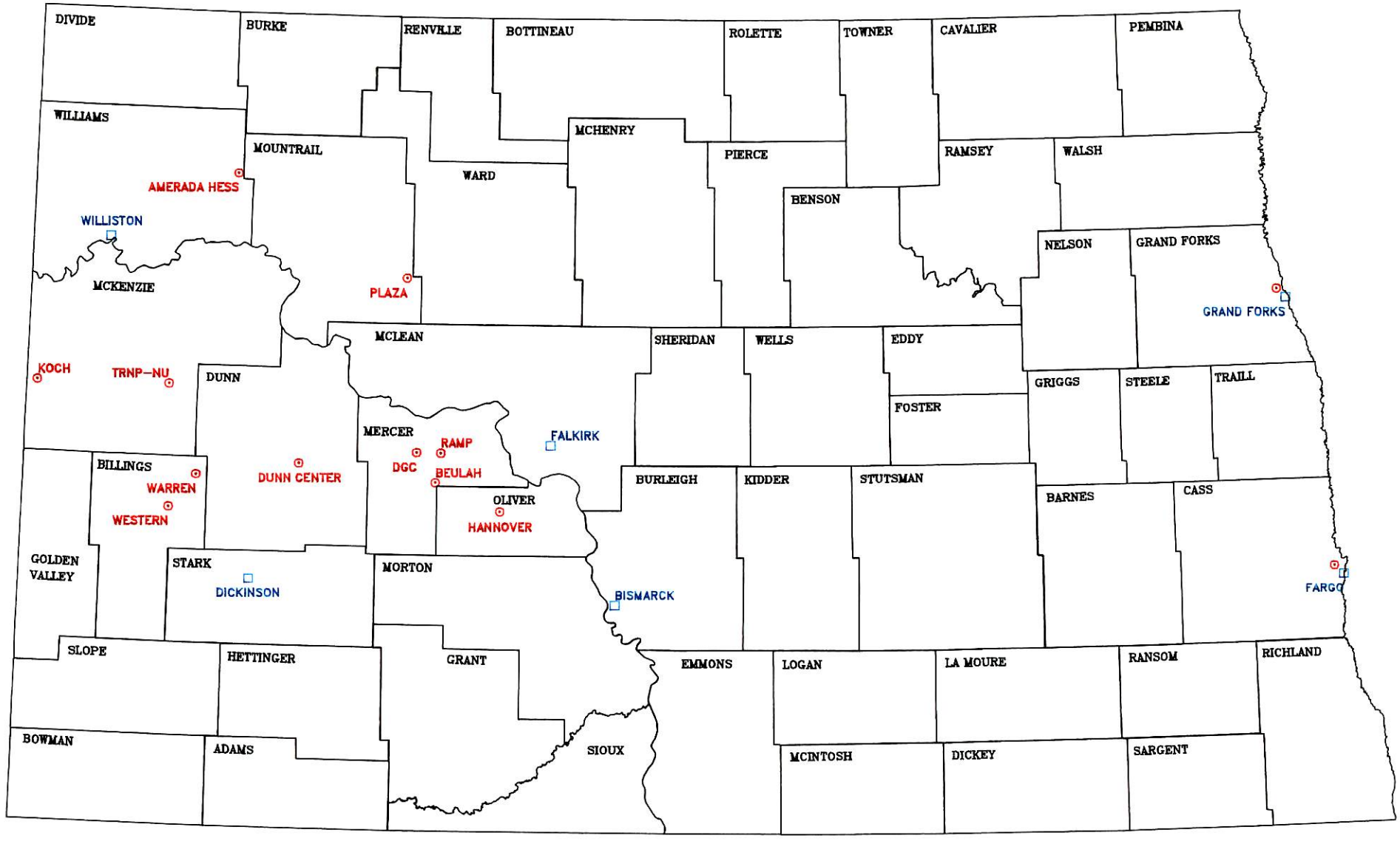
TABLE 1 (Cont.)

AAQM NETWORK DESCRIPTION

Site		Type Station	AIRS I.D. No.	Parameter* Monitored	Ref/Equiv. Method Designation No.	Operating Schedule	Monitoring Objective	Spatial Scale	Date Site Began	Date Q.A. Began
16	Koch Hydrocarbon Company	INDUS	38-053-0101	SO_2 (2)	EQSA-0276-009	cont.	Source Impact	Neighborhood	7/81	7/81
			38-053-0109	H_2S	N/A	cont.	Source Impact	Neighborhood	10/81	10/81
				Met	N/A	cont.	N/A	N/A	7/81	7/81
17	RAMP	INDUS	38-057-0101	SO_2 (4)	EQSA-0276-009	cont.	Source Impact	Neighborhood	8/79	8/79
			38-057-0102	NO_2 (3)	RFNA-0179-035	cont.	Source Impact	Neighborhood	8/79	8/79
			38-057-0103	O_3	RFOA-1176-017	cont.	Source Impact	Neighborhood	8/79	8/79
			38-057-0104	Met	N/A	cont.	N/A	N/A	8/79	8/79
18	Warren Petroleum Company	INDUS	38-007-0110	SO_2	EQSA-1078-032	cont.	Source Impact	Neighborhood	10/78	10/78
				H_2S	N/A	cont.	Source Impact	Neighborhood	10/78	10/78
				Met	N/A	cont.	N/A	N/A	10/78	10/78
19	Western Gas Processors	INDUS	38-007-0108	SO_2	EQSA-0276-009	cont.	Source Impact	Neighborhood	7/81	7/81
			38-007-0109	H_2S	N/A	cont.	Source Impact	Neighborhood	3/88	3/88
				Met	N/A	cont.	N/A	N/A	7/81	7/81

*Met refers to meteorological and indicates wind speed and wind direction monitoring equipment.

NORTH DAKOTA AMBIENT AIR QUALITY MONITORING SITES



⊙ = CONTINUOUS SITES □ = PM10 SITES

MAP 1

21MAY91 8:31

2.0 AMBIENT AIR MONITORING NETWORK COVERAGE

The entire State of North Dakota is attainment for all of the criteria pollutants. As such, there are no "problem areas" in the general sense of the term. There are, however, areas of concern where the Department has established monitoring sites to track the emissions of specific pollutants from area sources. Also, several major industries maintain monitoring networks in the vicinity of their plants (see Map 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 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 this Department's major concerns in regard to ambient air quality monitoring.

2.1.1 Point Sources

The major point sources of SO_2 (>1000 TPY) are listed in Table 2 along with their emission rates as calculated from the most recent (1989) emissions inventory. Map 2 shows the approximate locations

TABLE 2

MAJOR SO_2 SOURCES
(> 1000 TPY)

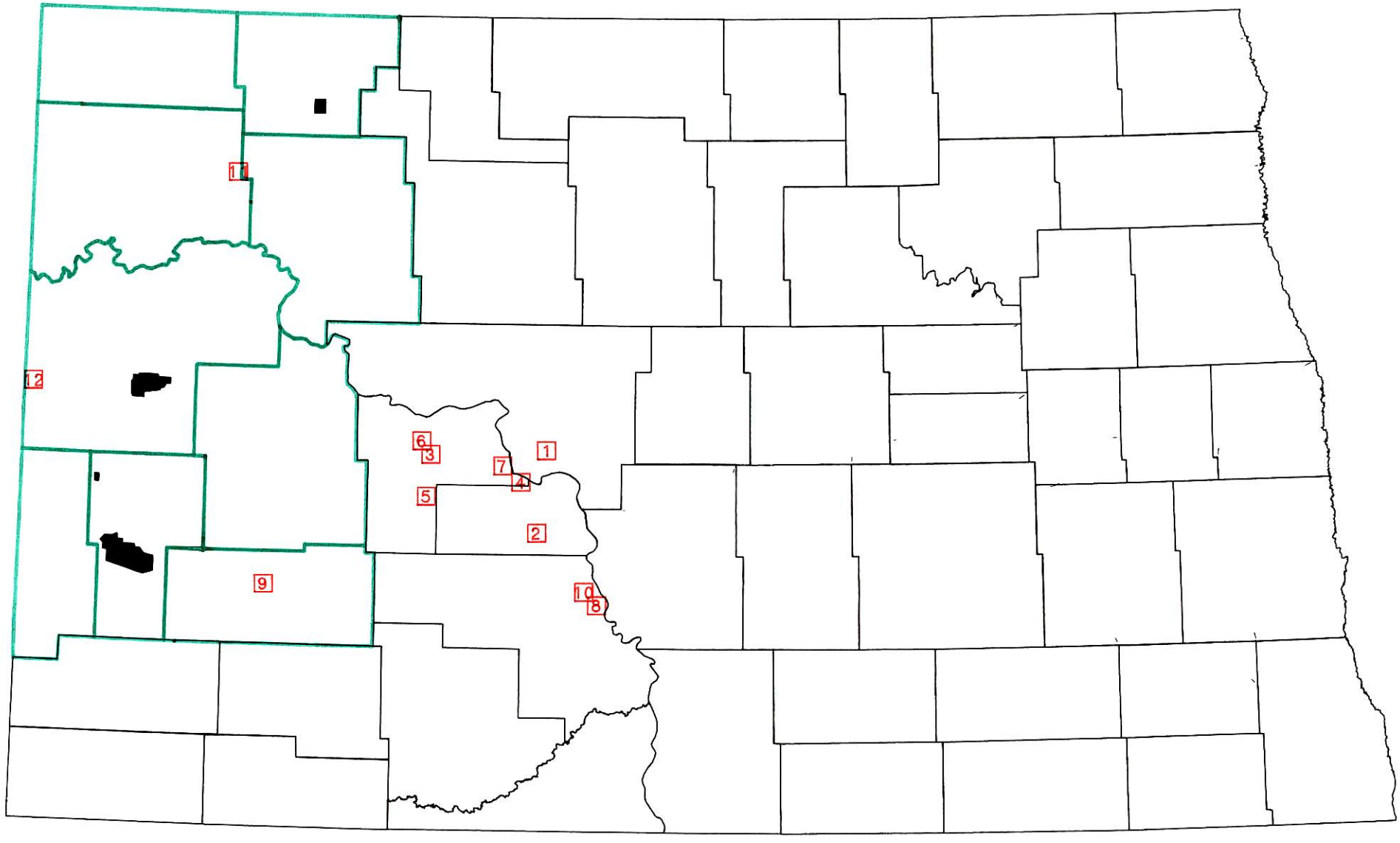
#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Year
1	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	McLean	43702.1
2	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	34169.9
3	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	32868.1
4	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	22158.0
5	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	16140.0
6	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	12627.0
7	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	11077.0
8	Amoco Oil Company	Oil Refinery	Mandan	Morton	7306.4
9	Royal Oak Enterprises	Charcoal Briquetting Plant	Dickinson	Stark	3495.7
10	Montana Dakota Utilities (Heskett)	Steam Electric Gen. Facility	Mandan	Morton	2874.3

TABLE 2 (Cont.)

MAJOR SO_2 SOURCES
(> 1000 TPY)

#	Name of Company	Type of Source	Location	County	SO_2 Emissions Ton/Year
11	Amerada-Hess Corporation (Tioga Gas Plant)	Natural Gas Processing Plant	Tioga	Williams	2700.2
12	Koch Hydrocarbon Company	Natural Gas Processing Plant	McKenzie Co.	McKenzie	1603.0

MAJOR SULFUR DIOXIDE SOURCES



□ Major SO2 Sources

Major Oil/Gas Producing Counties

■ Class 1 Areas

MAP 2

21MAY91 10:44

of these facilities (the numbers correspond to the table).

2.1.2 Other Sources

The western part of the State has a number of potential sources of SO_2 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 (which will be addressed later); and second, flaring of the H_2S from these sources can create significant concentrations of SO_2 in the ambient air. The counties of primary concern for such sources in western North Dakota are outlined in green on Map 2.

2.1.3 Monitoring Network

The SO_2 monitoring sites are indicated in Table 1. As can be seen, these monitoring sites are concentrated in the vicinity of the oil and gas development in western North Dakota and the coal-fired steam electrical generating plants in the

central part of the State. Table 3 shows the latest SO_2 data for these sites.

2.2 Nitrogen Oxides

Nitrogen oxides (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.

2.2.1 Point Sources

The larger point sources of NO_x in North Dakota are associated with coal burning steam 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. The major stationary point sources (>1000 TPY) of NO_x, as calculated from the most recent (1989) emission inventory, are listed in Table 4. Map 3 shows the approximate locations of these facilities.

2.2.2 Area Sources

Another source of oxides of nitrogen is automobile emissions. North Dakota has no significant urbanized areas with regard to oxides of nitrogen; in fact, the entire population of the State is less

TABLE 3

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

POLLUTANT : SULFUR DIOXIDE (PPB) STATE: NORTH DAKOTA YEAR: 1990

					MAXIMA										
		SAMPLING		NUM	1 - HOUR		3 - HOUR		24 - HOUR		ARITH	ARITH	1HR	24HR	ANNL
LOCATION	YEAR	PERIOD	METH	OBS	1ST	2ND	1ST	2ND	1ST	2ND	MEAN	S.D.	#>273	#>99	AM>23
AMERADA HESS - TIOGA #1	1990	JAN-DEC	20	6531	227	212	187	170	53	51	***	***			
AMERADA HESS - TIOGA #3	1990	JAN-DEC	20	8713	413	382	364	241	108	87	8.6	27.30	9	1	
BEULAH	1990	JAN-DEC	9	8697	80	61	38	29	10	10	2.4	3.75			
DGC SO2 #1	1990	JAN-DEC	20	8371	72	69	57	52	15	13	2.3	3.82			
DGC SO2 #4	1990	JAN-DEC	20	5038	122	102	79	62	22	19	***	***			
DUNN CENTER	1990	JAN-DEC	9	7395	40	26	17	13	5	4	1.2	1.10			
GRAND FORKS UND - SPM	1990	JAN-DEC	9	4512	639	633	634	608	399	120	***	***	29	2	
HANNOVER	1990	JAN-DEC	9	4519	61	55	30	30	11	9	***	***			
KOCH - MGP #1	1990	JAN-DEC	20	7455	78	53	27	25	5	5	1.5	2.28			
KOCH - MGP #3A	1990	JAN-DEC	20	8404	160	110	61	39	14	12	1.7	3.59			
LOSTWOOD	1990	JAN-DEC	9	8694	39	33	14	14	8	5	1.3	1.21			
OLSON RANCH - SPM	1990	JAN-SEP	9	6192	29	22	19	15	7	5	***	***			
PLAZA - SPM	1990	OCT-DEC	9	2182	53	37	26	25	11	10	***	***			
RAMP #1	1990	JAN-DEC	20	8501	131	114	76	69	33	17	2.5	4.69			
RAMP #2	1990	JAN-DEC	20	8251	30	29	28	19	13	12	2.4	2.64			
RAMP #3	1990	JAN-DEC	20	8687	64	64	50	38	10	10	2.0	3.78			
RAMP #5	1990	JAN-DEC	20	6472	109	90	85	55	17	15	***	***			
TRNP - NU	1990	JAN-DEC	9	8693	21	20	13	13	5	4	1.2	0.94			
TRNP - SU	1990	JAN-JUN	9	4337	18	12	13	9	5	3	***	***			
WARREN #4	1990	JAN-DEC	16	8515	42	38	21	19	7	5	1.2	1.40			
WESTERN #3	1990	JAN-DEC	20	8170	54	37	19	19	5	4	1.3	1.40			

	%
LOCATION	>MDV
AMERADA HESS - TIOGA #1	18.2
AMERADA HESS - TIOGA #3	30.0
BEULAH	29.1
DGC SO2 #1	32.7
DGC SO2 #4	39.3
DUNN CENTER	5.1
GRAND FORKS UND - SPM	30.0
HANNOVER	27.8
KOCH - MGP #1	14.7
KOCH - MGP #3A	16.8
LOSTWOOD	11.8
OLSON RANCH - SPM	8.3
PLAZA - SPM	45.9
RAMP #1	29.2
RAMP #2	43.2
RAMP #3	22.4
RAMP #5	62.7
TRNP - NU	9.9
TRNP - SU	3.6
WARREN #4	4.0
WESTERN #3	14.8

* THE AIR QUALITY STANDARDS FOR SO2 ARE 1) THE MAXIMUM ALLOWABLE 1-HR CONCENTRATION IS 273 PPB (715 $\mu G/M^3$). 2) THE MAXIMUM ALLOWABLE 24-HOUR CONCENTRATION IS 99 PPB (260 $\mu G/M^3$). 3) THE MAXIMUM ALLOWABLE ANNUAL MEAN IS 23 PPB (60 $\mu G/M^3$).

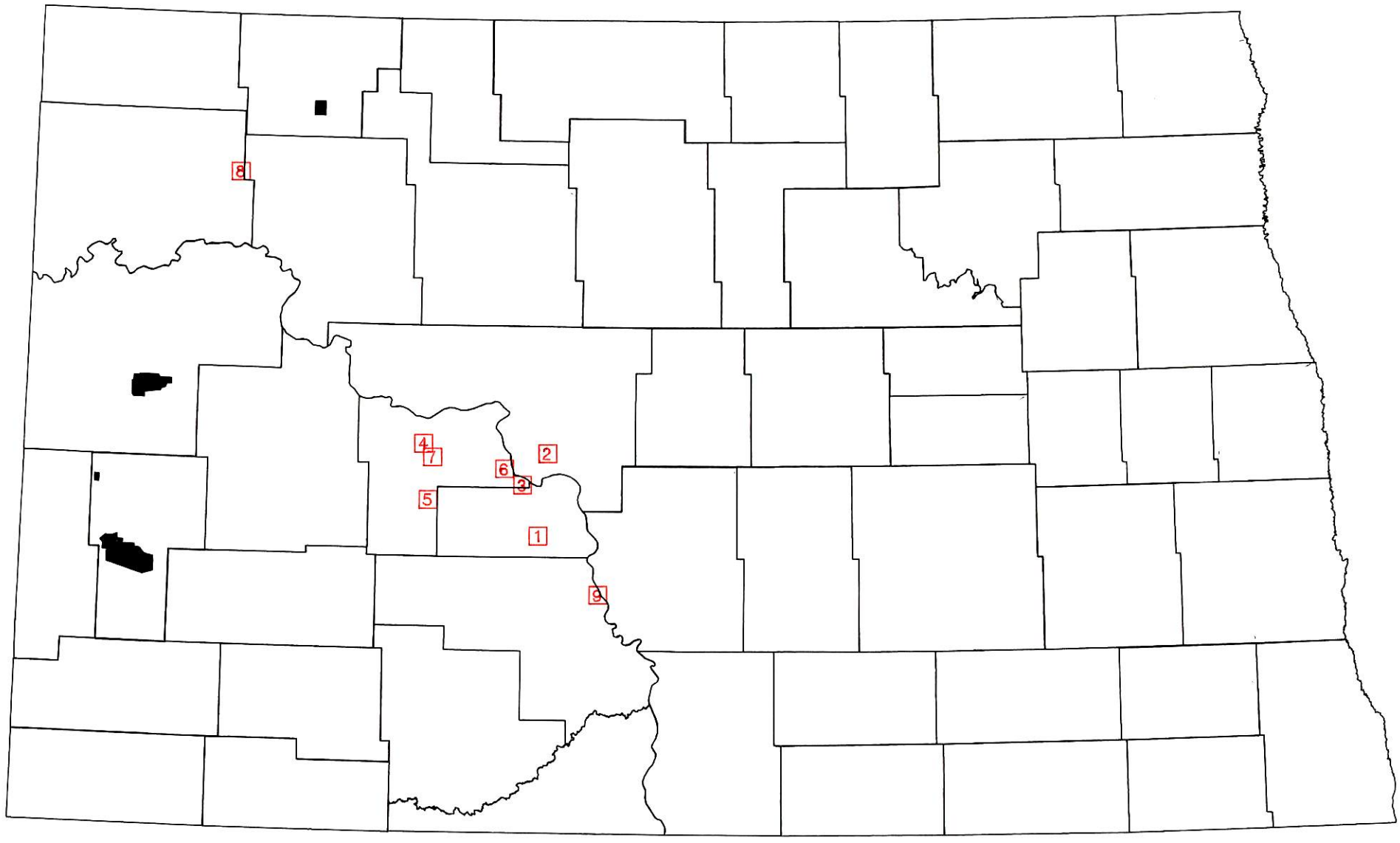
*** LESS THAN 75% OF THE POSSIBLE SAMPLES (DATA) WERE COLLECTED

TABLE 4

MAJOR NO_x SOURCES
(> 1000 TPY)

#	Name of Company	Type of Source	Location	County	NO_x Emissions Ton/Year
1	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	27300.1
2	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	McLean	27256.4
3	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	15718.0
4	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	10835.0
5	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	10760.0
6	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	6476.0
7	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	3374.0
8	Amerada Hess Corporation (Tioga Gas Plant)	Natural Gas Processing Plant	Tioga	Williams	2328.6
9	Amoco Oil Company	Oil Refinery	Mandan	Morton	1568.0

MAJOR NITROGEN OXIDE SOURCES



18

□ Major NOX Sources

■ Class 1 Areas

MAP 3

20MAY91 - 13:15

than the 1,000,000 population figure that EPA specifies in their requirement for NO_2 NAMS monitoring.

2.2.3 Monitoring Network

The Department currently operates three $NO/NO_2/NO_x$ analyzers in the State. These are located at Beulah, UND, and Hannover. The latest summary of NO_2 data is shown in Table 5. The Lostwood site was closed at the end of 1990.

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 to September 30. However, we operate the O_3 analyzers from April 1 to September 30 in order to collect two full quarters of data. The RAMP O_3 monitor operates all four quarters.

TABLE 5

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

POLLUTANT : NITROGEN DIOXIDE (PPB) STATE: NORTH DAKOTA YEAR: 1990

LOCATION	YEAR	SAMPLING PERIOD	METH	NUM OBS	MAXIMA 1 - HOUR 1ST	MAXIMA 1 - HOUR 2ND	ARITH MEAN	ARITH S.D.	A.M. > 50	% >MDV
BEULAH	1990	JAN-DEC	22	8696	31	30	4	3.5		26.9
GRAND FORKS UND - SPM	1990	JAN-DEC	74	3298	50	50	***	***		60.2
HANNOVER	1990	JAN-DEC	22	4515	30	28	***	***		5.6
LOSTWOOD	1990	JAN-DEC	14	8361	26	26	2	0.8		2.6
RAMP #2	1990	JAN-JUN	20	3343	37	26	***	***		41.3
RAMP #2	1990	JUL-DEC	14	4310	29	28	***	***		31.9
RAMP #3	1990	JAN-DEC	14	8598	34	29	3	2.1		17.6
RAMP #5	1990	JAN-DEC	14	8622	42	40	3	3.1		16.9

* THE AIR QUALITY STANDARDS ARE 50 PPB (100 $\mu G/M^3$) MAXIMUM ANNUAL ARITHMETIC MEAN AND 100 PPB (200 $\mu G/M^3$) MAXIMUM 1-HOUR CONCENTRATION NOT TO BE EXCEEDED OVER 1 PERCENT OF THE TIME IN ANY CALENDAR QUARTER.

*** LESS THAN 75% OF THE POSSIBLE SAMPLES (DATA) WERE COLLECTED

2.3.1 Point Sources

Table 6 lists the major point sources of VOC emissions in the State (>100 TPY). Map 4 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 monitoring for ozone.

2.3.3 Monitoring Network

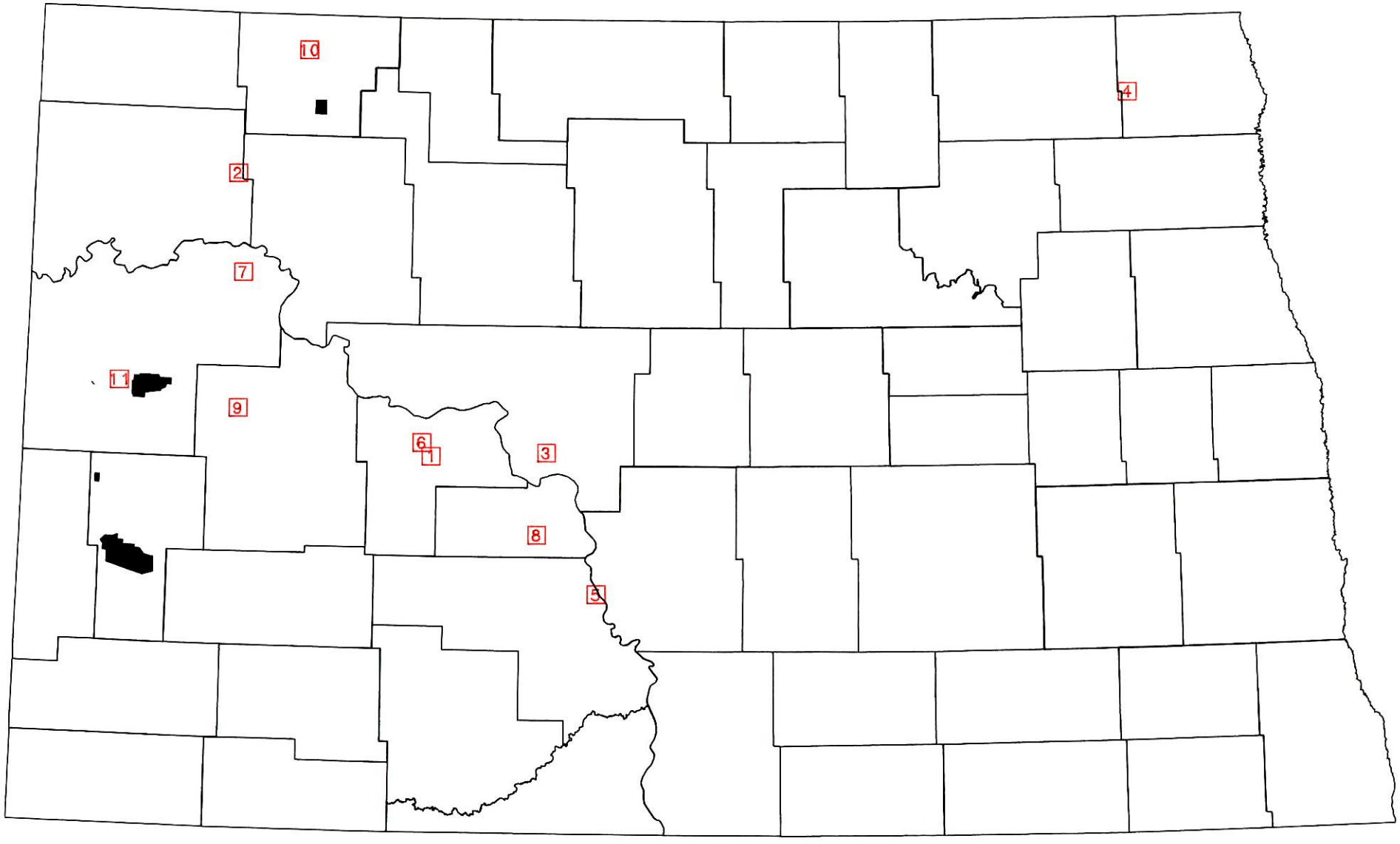
The State currently has three continuous ozone analyzers in operation. These are at Beulah, Hannover and Theodore Roosevelt National Park - North Unit. The RAMP network has one monitor. The latest summary of O_3 data is included in Table 7.

TABLE 6

MAJOR VOC SOURCES
(> 100 TPY)

#	Name of Company	Type of Source	Location	County	VOC Emissions Ton/Year
1	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	1405.5
2	Amerada Hess Corp. (Tioga Gas Plant)	Natural Gas Processing Plant	Tioga	Williams	1064.7
3	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	McLean	350.4
4	Cavalier Air Force Station	Power Plant	Concrete	Pembina	248.0
5	Amoco Oil Company	Oil Refinery	Mandan	Morton	247.7
6	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	237.0
7	Amerada Hess Corp. (Hawkeye Station)	Gas Compressor	----	Dunn	228.9
8	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	183.2
9	Amerada Hess Corp. (Blue Buttes Station)	Gas Compressor	----	McKenzie	177.2
10	OXY USA, Inc.	Natural Gas Processing Plant	Lignite	Burke	127.5
11	True Oil Company (Redwing Gas Plant)	Natural Gas Processing Plant	----	McKenzie	101.6

MAJOR VOC SOURCES



□ Major VOC Sources
■ Class 1 Areas

MAP 4

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TABLE 7

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

POLLUTANT : OZONE (PPB) STATE: NORTH DAKOTA YEAR: 1990

LOCATION	YEAR	SAMPLING PERIOD	DAYS SAMPLED	METH	NUM OBS	1-HOUR MAXIMA 1ST	DATE	2ND	DATE	3RD	DATE	#HOURS >120	% >MDV
BEULAH	1990	APR-SEP	183	4	4360	70	6/26	69	7/ 2	67	5/30	0	99.4
HANNOVER	1990	APR-JUN	78	3	1857	62	5/30	58	5/25	57	4/21	0	100.0
RAMP #2	1990	JAN-DEC	181	17	8622	65	6/26	63	9/ 3	62	5/30	0	99.5
TRNP - NU	1990	APR-SEP	183	4	2874	70	6/26	69	7/ 2	69	7/ 6	0	100.0

* THE AIR QUALITY STANDARD FOR OZONE IS 120 PPB (235 $\mu G/M^3$) MAXIMUM 1-HR CONCENTRATION NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR.

2.4 Inhalable Particulates

The inhalable particulate standard is designed to protect against those particulates that can be inhaled deep into the lungs and cause respiratory problems. These particulates have an aerodynamic diameter less than or equal to a nominal 10 micrometers and are designated as PM_{10}.

2.4.1 Sources

Table 8 lists the sources of PM_{10} emissions in the State that are >100 TPY. Most of these sources are large solid fuel burning 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 dirt roads. The major sources of PM_{10} are shown on Map 5.

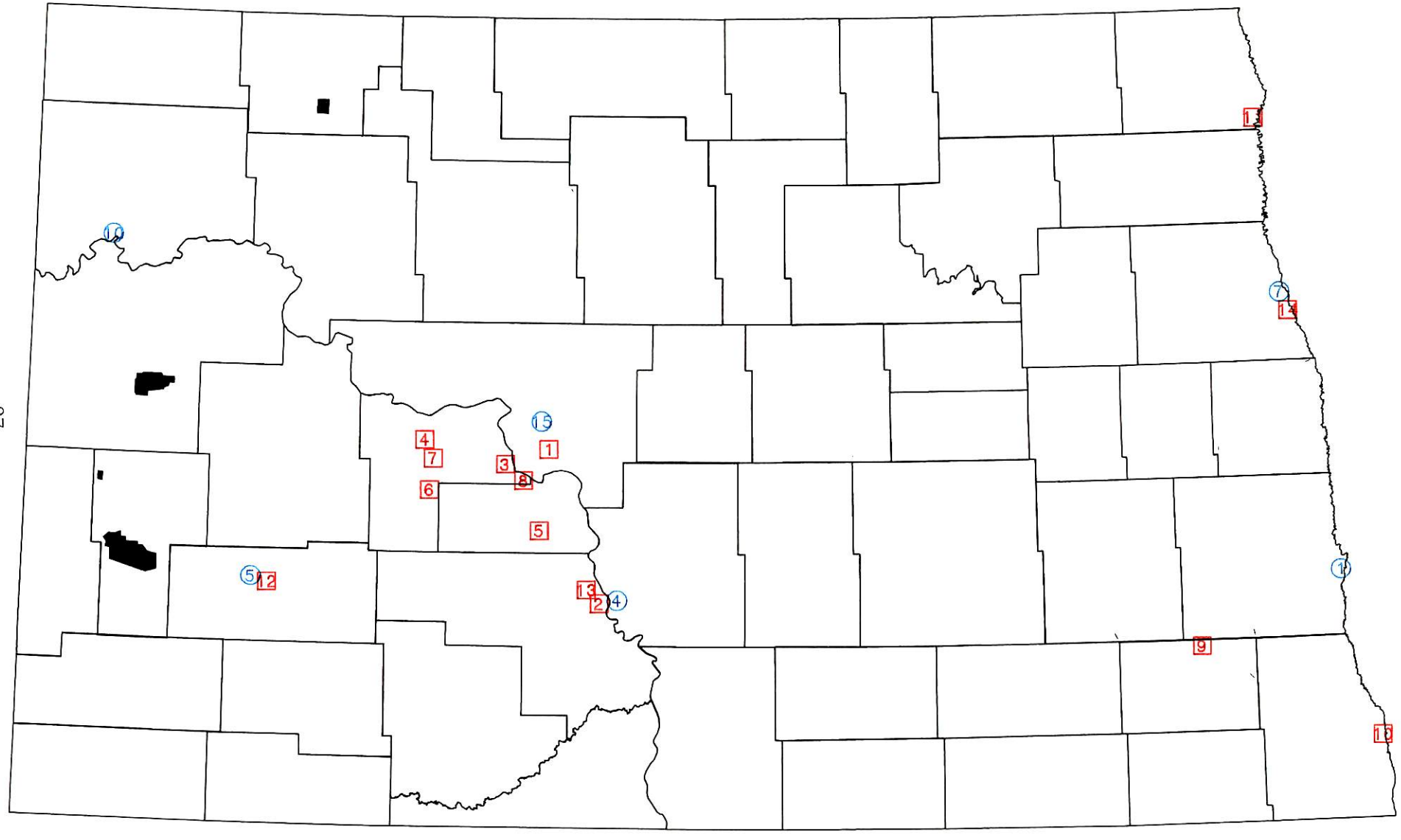
2.4.2 Monitoring Network

The State operates six PM_{10} monitors at the five sites shown on Map 5; the Fargo site has collocated samplers. Since PM_{10} is mainly of concern because of its effects on people, EPA has had us concentrate our monitoring efforts in the

TABLE 8
MAJOR PM_{10} SOURCES
(> 100 TPY)

#	Name of Company	Type of Source	Location	County	PM_{10} Emissions Ton/Year
1	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	McLean	3603.1
2	Amoco Oil Company	Oil Refinery	Mandan	Morton	1421.4
3	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	668.1
4	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	474.0
5	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	465.3
6	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Facility	Beulah	Mercer	455.0
7	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	388.6
8	Basin Electric Power Cooperative (Leland Olds)	Steam Electric Gen. Facility	Stanton	Mercer	248.5
9	National Sun Ind., Inc.	Sunflower Processing Plant	Enderlin	Ransom	180.3
10	Minn-Dak Farmers Coop.	Sugar Beet Processing Plant	Wahpeton	Richland	153.7
11	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	145.5
12	Royal Oak Enterprises	Charcoal Briquetting Plant	Dickinson	Stark	137.6
13	Montana Dakota Utilities (Heskett Plant)	Steam Electric Gen. Facility	Mandan	Morton	124.0
14	University of North Dakota	Heating Plant	Grand Forks	Grand Forks	122.1

MAJOR PM10 SOURCES



□ Major PM10 Sources
○ Monitoring Sites
■ Class 1 Areas

MAP 5

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population centers of the State. There is one reporting industrial network. The latest inhalable particulate monitoring data for the network are shown in Table 9.

2.5 Carbon Monoxide

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

2.5.1 Sources

Table 10 lists the major (>100 TPY) stationary sources of CO in the State. Most of these sources are the same sources that are the major emitters of SO_2 and NO_x, but the corresponding levels of CO from these sources is considerably lower. The major sources of CO in the State are shown on Map 6 .

TABLE 9

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

POLLUTANT : INHALABLE PARTICULATES ($\mu G/M^3$) STATE: NORTH DAKOTA YEAR: 1990

LOCATION	YEAR	SAMPLING PERIOD	NUM OBS	MIN	MAXIMA 1ST	MAXIMA 2ND	MAXIMA 3RD	ARITH MEAN	ARITH S.D	#>150	AM>50	% >MDV
BISMARCK	1990	JAN-DEC	60	7.2	106.9	84.3	81.3	23.9	18.07			100.0
DICKINSON RES	1990	JAN-DEC	61	2.8	74.6	52.2	48.0	18.1	12.74			98.4
FALKIRK #10	1990	JUL-DEC	28	8.4	103.7	80.9	74.5	35.1	23.38			100.0
FALKIRK #6A	1990	AUG-DEC	20	6.7	40.3	35.8	31.0	20.6	8.77			100.0
FALKIRK #9	1990	JAN-AUG	35	4.4	463.0	340.0	105.1	48.1	26.45	2		100.0
FARGO	1990	JAN-DEC	61	5.8	203.9	75.7	62.8	24.8	26.61	1		100.0
FARGO DUPLICATE	1990	JAN-DEC	61	7.1	225.7	75.7	62.7	25.4	28.92	1		100.0
GRAND FORKS	1990	JAN-DEC	60	6.9	139.3	104.3	66.2	24.8	21.37			100.0
WILLISTON	1990	JAN-DEC	54	5.0	239.1	58.9	48.9	21.7	31.67	1		100.0

* THE STATE AIR QUALITY STANDARDS ARE 50 $\mu G/M^3$ EXPECTED ANNUAL ARITHMETIC MEAN, AND A MAXIMUM OF 150 $\mu G/M^3$ AVERAGED OVER A 24-HR PERIOD WITH NO MORE THAN ONE EXPECTED EXCEEDANCE PER YEAR

*** LESS THAN 75% OF THE POSSIBLE SAMPLES (DATA) WERE COLLECTED

TABLE 10

MAJOR CO SOURCES
(> 100 TPY)

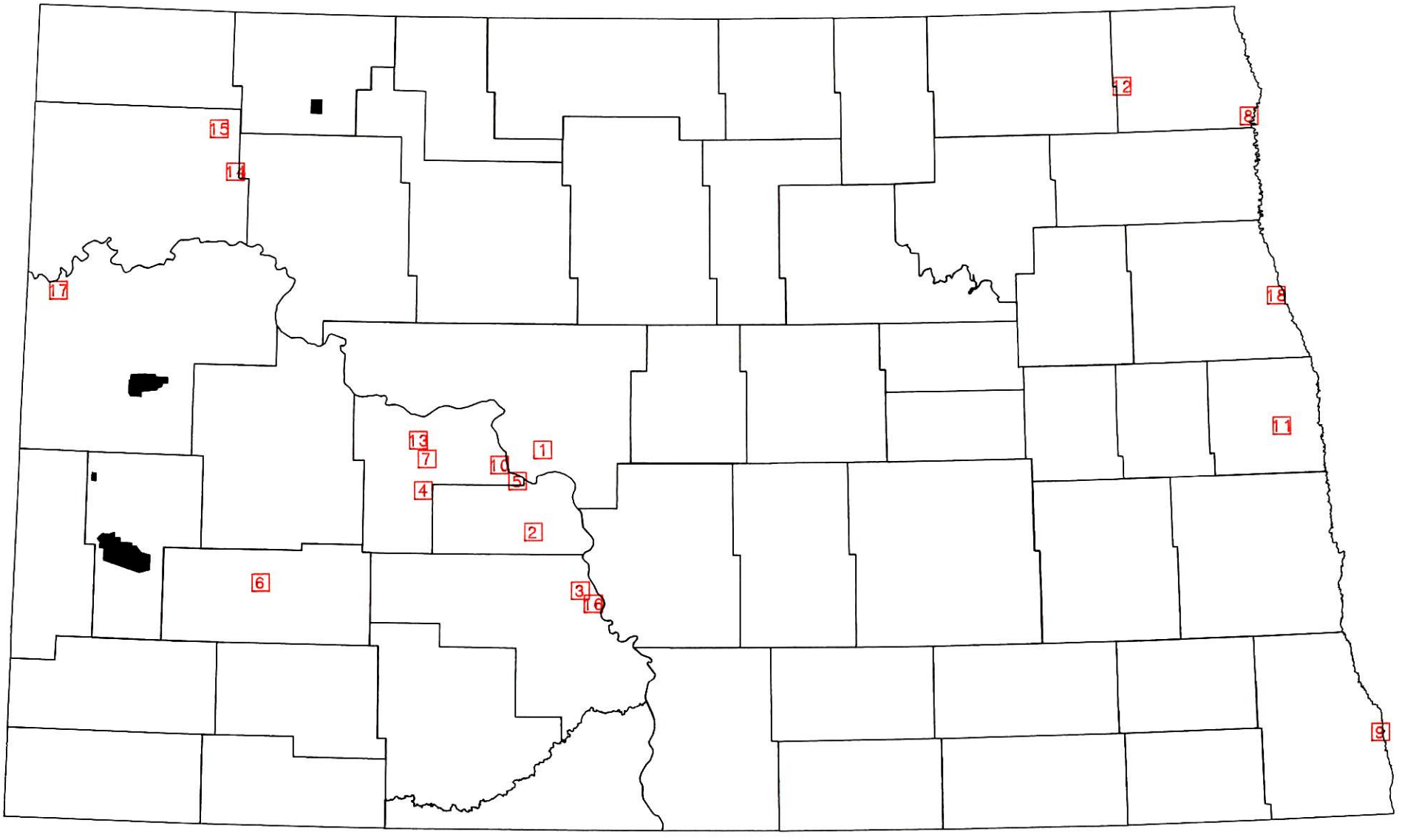
#	Name of Company	Type of Source	Location	County	CO Emissions Ton/Year
1	CPA/UPA (Coal Creek)	Steam Electric Gen. Facility	Underwood	McLean	2084.7
2	Minnkota Power Coop.	Steam Electric Gen. Facility	Center	Oliver	1099.4
3	Montana Dakota Utilities (Heskett Plant)	Steam Electric Gen. Plant	Mandan	Morton	903.3
4	Montana Dakota Utilities (Coyote Station)	Steam Electric Gen. Plant	Beulah	Mercer	590.4
5	Basin Electric Power Coop. (Leland Olds)	Steam Electric Gen. Plant	Stanton	Mercer	576.0
6	Dakota Gasification Co.	Synthetic Fuel Plant	Beulah	Mercer	497.0
7	Royal Oak Enterprises	Charcoal Briquetting Plant	Dickinson	Stark	483.7
8	American Crystal Sugar Co.	Sugar Beet Processing Plant	Drayton	Pembina	351.2
9	Minn-Dak Farmers Coop.	Sugar Beet Processing Plant	Wahpeton	Richland	310.7
10	United Power Association	Steam Electric Gen. Facility	Stanton	Mercer	281.5

TABLE 10 (Cont.)

MAJOR CO SOURCES
(> 100 TPY)

#	Name of Company	Type of Source	Location	County	CO Emissions Ton/Year
11	American Crystal Sugar Co.	Sugar Beet Processing Plant	Hillsboro	Pembina	279.2
12	Cavalier Air Force Station	Power Plant	Concrete	Pembina	238.0
13	Basin Electric Power Cooperative (AVS)	Steam Electric Gen. Facility	Beulah	Mercer	237.0
14	Amerada Hess Corp. (Tioga Gas Plant)	Natural Gas Processing Plant	Tioga	Williams	212.1
15	Western Gas Processors, Ltd.	Natural Gas Processing Plant	Temple	Williams	183.0
16	Amoco Oil Company	Oil Refinery	Mandan	Morton	163.0
17	Northern Natural Gas	Compressor Station	Fort Buford	Williams	161.2
18	University of North Dakota	Heating Plant	Grand Forks	Grand Forks	160.3

MAJOR CO SOURCES



32

□ Major CO Sources

■ Class 1 Areas

MAP 6

21MAY91 7:37

2.5.2 Monitoring Network

The Department operated a CO monitor for part of 1990 at the UND site. No significant levels of CO were measured there. The monitor was relocated to Fargo near the busiest traffic intersection in the State. The Fargo site was established in December 1990. The monitoring results are shown in Table 11.

2.6 Lead

Through prior sampling efforts, the Department has determined that the State of North Dakota does not have any significant sources of lead. This determination, coupled with the Federal requirement for a NAMS network only in urbanized areas with populations greater than 500,000, resulted in the termination of the lead monitoring program effective January 1, 1984.

2.7 Hydrogen Sulfide

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

TABLE 11

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

POLLUTANT : CARBON MONOXIDE (PPM) STATE: NORTH DAKOTA YEAR: 1990

LOCATION	YEAR	SAMPLING PERIOD	METH	NUM OBS	MIN	MAXIMA 1-HOUR 1ST	MAXIMA 1-HOUR 2ND	MAXIMA 8-HOUR 1ST	MAXIMA 8-HOUR 2ND	1HR #>35	8HR #>9	% >MDV
FARGO - SPM	1990	DEC-DEC	54	301	0.0	3.6	3.4	1.8	1.3		***	40.2
GRAND FORKS UND - SPM	1990	FEB-MAY	54	1954	0.0	2.5	2.5	0.8	0.8		***	4.5

* THE AIR QUALITY STANDARDS FOR CO ARE 1) THE MAXIMUM ALLOWABLE 1-HR CONCENTRATION IS 35 PPM (40 $\mu G/M^3$). 2) THE MAXIMUM ALLOWABLE 8-HOUR CONCENTRATION IS 9 PPM (10 $\mu G/M^3$).

*** LESS THAN 75% OF THE POSSIBLE SAMPLES (DATA) WERE COLLECTED

2.7.1 Sources

H_2S emissions of concern stem almost totally from the oil and gas operations in the western part of the State and principally from the green outlined area on Map 2. Flares and treater stacks associated with oil/gas wells, oil storage tanks, compressor stations, pipeline risers, and natural gas processing plants are all potential sources of H_2S emissions.

2.7.2 Monitoring Network

There currently are two State-operated monitoring sites for H_2S emissions. These are the TRNP-NU and the Plaza sites. The Lostwood site closed at the end of 1990 and the Plaza site replaced the Olson Ranch site. There are five industry-operated H_2S monitoring sites. The latest summary of H_2S data is shown in Table 12.

TABLE 12

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

POLLUTANT : HYDROGEN SULFIDE (PPB) STATE: NORTH DAKOTA YEAR: 1990

LOCATION	YEAR	SAMPLING PERIOD	METH	NUM OBS	MAXIMA 1 - HOUR 1ST	1 - HOUR 2ND	24 - HOUR 1ST	24 - HOUR 2ND	3 - MONTH 1ST	3 - MONTH 2ND	ARITH MEAN	ARITH S.D.	1HR #>200	24HR #>100	ANNL AM>20	% >MDV
AMERADA HESS - TIOGA #2	1990	JUN-DEC	20	4958	209	170	35	6	2	2	2.5	5.31	1			13.0
DGC #2	1990	JUN-DEC	20	5089	32	19	10	9	3	3	3.0	1.93				43.2
KOCH - MGP #1	1990	JUN-DEC	20	3551	33	19	3	3	1	1	2.1	0.94				8.2
LOSTWOOD	1990	JUN-DEC	20	5095	88	71	16	7	2	2	1.3	2.72				3.1
OLSON RANCH - SPM	1990	JUN-SEP	20	2595	73	66	8	5	1	1	1.3	2.41				4.2
PLAZA - SPM	1990	OCT-DEC	20	2050	114	110	16	16	4		3.8	8.50				19.4
TRNP - NU	1990	JUN-DEC	20	5096	9	8	4	2	1	1	1.0	0.36				0.5
WARREN #4	1990	JUN-DEC	16	4438	431	372	58	57	8	7	6.9	19.85	9			27.2
WESTERN #2	1990	JUN-DEC	20	4396	79	75	10	8	1	1	2.2	2.45				5.0

* THE AIR QUALITY STANDARDS FOR H2S WHICH BECAME EFFECTIVE JUNE 1, 1990 ARE 1) THE MAXIMUM INSTANTANEOUS (CEILING) CONCENTRATION IS 10 PPM (14 MG/M^3). 2) THE MAXIMUM 1-HR CONCENTRATION IS 200 PPB (280 $\mu G/M^3$) NOT TO BE EXCEEDED MORE THAN ONCE PER MONTH. 3) THE MAXIMUM 24-HR CONCENTRATION IS 100 PPB (140 $\mu G/M^3$) NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR. 4) THE MAXIMUM CONCENTRATION IS 20 PPB (28 $\mu G/M^3$) AVERAGED OVER 3 CONSECUTIVE MONTHS.

*** LESS THAN 75% OF THE POSSIBLE SAMPLES (DATA) WERE COLLECTED

3.0 NETWORK MODIFICATIONS

4.0 PRIORITIZED EQUIPMENT NEEDS LIST

Equipment Priority List

1. 2 - Wind sets (wind speed/wind direction) with recorders ($4000/each)

   (These sets are needed to replace two Weather Measure wind sets that are 10 years old and becoming unreliable.)

5.0 SUMMARY AND CONCLUSIONS

5.0 SUMMARY AND CONCLUSIONS

The North Dakota Ambient Air Quality Monitoring Network is designed to monitor those criteria 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.

As can be seen by the data summaries, there were a few air pollution problems in the State. The Amerada Hess Tioga Gas Plant and UND's heating plant both experienced down-wash problems with strong winds which caused the SO_2 plume to impact the ground near the sources. Both sources are making changes to their respective facilities which should correct the problems.

The State H_2S standards changed effective June 1, 1990. Therefore, only the data summary for that period after the change has been included. The only site showing any violations is the Warren Petroleum Site #4. We are working with them to try to isolate the source(s) of the emissions so that corrective action can be taken.

The two PM_{10} exceedances at the Falkirk Site #9 occurred in January 1990. The site was determined to be a nonrepresentative site and there were also analysis problems with the samples. Site #9 was

closed and Site #10 was established as a replacement. No exceedances have been measured at the new site.

A CO monitor was operated the first part of 1990 in conjunction with the SPM at UND. No problems were observed at that location; so, a new site was established in Fargo near the reported busiest intersection in the State. Limited results appear to show no problems with CO in the State.

Table 12 summarizes the evaluations for each of the sites in the State network. The monitoring site at UND will have to be moved to a more representative location to reflect the new predicted maximum concentration location resulting from the new smokestack. Timing of the move will be predicated on progress of the construction. No other changes, expect for the possible relocation of the "Portable Unit," are anticipated for 1991.

TABLE 13

MONITORING SITE EVALUATION

Site	Parameter*	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed	Date Deleted
Beulah Residential	SO_2	X				
	NO_2	X				
	O_3	X				
	MET	X				
Bismarck Commercial	PM_{10}	X				
Dickinson Residential	PM_{10}	X				
Dunn Center Rural	SO_2	X				
	MET	X				
Fargo Commercial (SPM)	PM_{10}	X				
	CO	X				
Grand Forks Commercial	PM_{10}	X				
Hannover Rural	SO_2	X				
	NO_2	X				
	O_3	X				
	MET	X				
Lostwood Rural	SO_2				X	1/91
	H_2S				X	1/91
	NO_2				X	1/91
	MET				X	1/91
Portable Unit (SPM) (Western ND oil/gas Area Network)	SO_2	X				
	H_2S	X				
	MET	X				
University of North Dakota (SPM)	SO_2			X		
	NO_2			X		
	Met			X		
TRNP-NU Rural	SO_2	X				
	O_3	X				
	H_2S	X				
	MET	X				

Site	Parameter*	Meets Needs	Modification Needed	New Site Needed	Parameter Not Needed	Date Deleted
TRNP-SU Rural	SO_2				X	7/90
	H_2S				X	7/90
	MET				X	7/90
Williston Commercial	PM_{10}	X				

*Met refers to meteorology and indicates wind speed and wind direction data are available from those locations.