South Dakota
Ambient Air Monitoring
Annual Plan
2017

Pierre Airport Site Performance Evaluation Program (PEP) Audit

South Dakota Department of Environment and Natural Resources
Air Quality Program

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Executive Summary

The South Dakota Department of Environment and Natural Resources (DENR) develops an annual ambient air monitoring network plan which is a review of the ambient air monitoring network each year as required by Title 40 of the Code of Federal Regulation (CFR), Part 58. The review finds the state's ambient air quality concentrations are demonstrating attainment with the Environmental Protection Agency's (EPA's) National Ambient Air Quality Standards (NAAQS).

The annual plan is published on the department's air quality website to provide public review and comments so appropriate adjustments can be made to meet the needs of the general public before the annual plan is finalized. The public review period began on June 1 and ended on June 30, 2017. No comments were received during the review period. The annual plan includes the following major sections:

1. Ambient air monitoring goals, plans and needs are in Sections 3.0 through 5.0, respectively;
2. Proposed modifications to the ambient air monitoring network to meet the changing trends, national requirements, and state needs are in Section 6.0;
3. Sampling frequency waivers are identified in Section 7.0;
4. Purchase replacement plan is in Section 8.0;
5. Evaluation of collected data compared to the National Ambient Air Quality Standards is in Section 9.0;
6. Air pollution trends for each site are in Sections 10.0; and
7. Special air quality monitoring is identified in Section 11.0.

The department is planning the following site modifications in 2017 and 2018:

1. Continue to replace the old TA Series FH 62 C14 and old Met One BAM continuous particulate matter monitors with new particulate matter monitors as resources allow;

2. Evaluate the need to move the air monitoring site in Aberdeen so air quality concentrations can be better characterized to determine:
    a. Highest concentration for the area;
    b. Improve location to evaluate the facilities with air quality emissions;
    c. Allow the addition of continuous monitors to collect more data per year;
    d. Alert the public when air quality concentrations exceed health impact levels; and
    e. Continuous samplers so the public can view the current data on the DENR webpage and EPA AirNow site.

1.0 INTRODUCTION

The United States Environmental Protection Agency through Title 40 of the Code of Federal Regulation and the Performance Partnership Agreement (PPA) requires the South Dakota Department of Environment and Natural Resources to complete an annual ambient air monitoring plan. EPA's requirements for the annual plan are listed in Title 40 of the Code of Federal Regulations § 58.10. The plan will cover a review of the ambient air monitoring sites and determine if the network is meeting the monitoring objectives in Title 40 of the Code of Federal Regulations Part 58, Appendixes A, C, D, and E. The plan will identify needed modifications to the network such as the termination or relocation of a monitor, addition of new parameters, or the establishment of new stations. The plan will update compliance concentrations for comparison to the National Ambient Air Quality Standards and to determine trends for each sampling parameter.

The department is required to take public comments on the plan for 30 days prior to submitting the plan to EPA. The department will comply with this requirement by posting this document on the department's Air Quality Program website at the following location for 30 days:

http://denr.sd.gov/des/aq/airprogr.aspx

All comments received by the department during this 30 day period will be addressed by the department and the appropriate changes will be incorporated into the plan. If a substantial change is made to the plan because of a comment, another 30 day public comment period will be completed. The final annual plan will be submitted to EPA for review including all public comments and the department's responses to the comments.

2.0 AMBIENT AIR MONITORING NETWORK HISTORY

In 1972, South Dakota developed and EPA approved a State Implementation Plan (SIP) which included the establishment and operation of an ambient air monitoring network for the state. In 1980, South Dakota submitted a revision to its State Implementation Plan to upgrade the program by establishing a network of State and Local Air Monitoring (SLAMS) stations and Special Purpose Monitoring (SPM) stations.

In the past, EPA has changed the National Ambient Air Quality Standards several times. Currently, EPA has established National Ambient Air Quality Standards for Particulate Matter (PM), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), Ozone, Carbon Monoxide (CO), and Lead.

The particulate matter 10 microns in diameter or less (PM_{10}) standard was set in 1987 setting a 24-hour level of 150 micrograms per cubic meter (mg/m3) and an annual standard of 50 micrograms per cubic meter. In 2006, EPA revoked the annual standard leaving only the 24-hour standard. The department began monitoring for PM_{10} in 1987, and is currently monitoring PM_{10} concentrations in Sioux Falls, Brookings, Watertown, Union County, Aberdeen, Badlands National Park, Wind Cave National Park, Black Hawk and Rapid City. The PM_{10} monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for PM_{10} has continuously demonstrated attainment with the PM_{10} standards.

The particulate matter 2.5 microns in diameter or less ($PM_{2.5}$) standards for 24-hour and annual levels were set in 1997. EPA revised the $PM_{2.5}$ standard significantly by reducing the 24-hour standard from 65 micrograms per cubic meter to 35 micrograms per cubic meter in 2006. The annual standard was revised from 15 micrograms per cubic meter to 12 micrograms per cubic meter in 2013. The department began monitoring for $PM_{2.5}$ in 1999, and is currently monitoring $PM_{2.5}$ concentrations in Sioux Falls, Brookings, Watertown, Union County, Aberdeen, Pierre, Badlands National Park, Wind Cave National Park, and Rapid City. The $PM_{2.5}$ monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for $PM_{2.5}$ has continuously demonstrated attainment with the $PM_{2.5}$ standards.

EPA set the first Sulfur Dioxide standards in 1971. The primary standards were 140 parts per billion for the 24-hour average and 30 parts per billion (ppb) for the annual average. The secondary standard was 500 parts per billion for the 3-hour average. The Sulfur Dioxide standard was revised in 2010 setting a new primary 1-hour standard of 75 parts per billion and revoking the 24-hour and annual standards. The department began monitoring for Sulfur Dioxide in 1974. All the bubbler method samplers were closed out in the 1980s because of problems with the test method in cold climates and low concentration levels. In 2002, the program began setting up continuous analyzers and currently operates Sulfur Dioxide analyzers in Sioux Falls, Union County, Badlands National Park, and Rapid City. The Sulfur Dioxide monitoring network represents the highest population areas and rural areas of the state. South Dakota's ambient air monitoring network for Sulfur Dioxide has continuously demonstrated attainment with the Sulfur Dioxide standards.

The Nitrogen Dioxide standard was established in 1971 setting an annual average standard of 53 parts per billion. In 2010, EPA revised the standard by adding a one-hour standard of 100 parts per billion. The annual standard was retained without any change in concentration level. The department first tested for Nitrogen Dioxide in 1974. All the bubbler method samplers were closed out in the 1980s because of problems with the test method in cold climates and low concentration levels. The department started testing again for Nitrogen Dioxide in 2003 and currently operates continuous Nitrogen Dioxide monitors in Sioux Falls, Union County, Badlands, and Rapid City. The Nitrogen Dioxide monitoring network represents the most populated and rural areas of the state. South Dakota's ambient air monitoring network for Nitrogen Dioxide has continuously demonstrated attainment with the Nitrogen Dioxide standards.

The ozone standard was established in 1979, setting a 1-hour average standard of 0.120 parts per million (ppm). In 1997, the standard was revised setting an 8-hour average of 0.08 parts per million. In 2008, EPA set the 8-hour average of 0.075 parts per million. In 2015, EPA set the current 8-hour average of 0.070 parts per million. South Dakota's ambient air monitoring network for ozone was established in 1999 and is currently monitoring concentrations in Sioux Falls, Union County, Brookings, Badlands National Park, Wind Cave National Park, and Black Hawk (near Rapid City). The ozone monitoring network represents the highest population and two rural areas of the state. South Dakota's ambient air monitoring network for ozone has continuously demonstrated attainment with the ozone standards.

The Carbon Monoxide standard was established in 1971. The primary and secondary standards were 35 parts per million for the 1-hour average and 9 parts per million for the 8-hour average. In 1985, the primary standards were retained without revision and the secondary standards were revoked and have not changed since then. The department began monitoring for Carbon Monoxide in 2009 as part of collecting air monitoring data to show background levels for the criteria pollutants prior to the anticipated construction of the Hyperion Energy Center. Three years of data was collected and monitoring was discontinued because concentrations were very low in 2013. A second site was added in 2011, at the School for the Deaf Site in Sioux Falls as part of the required testing at a National Core (NCore) site. South Dakota's ambient air monitoring network for Carbon Monoxide has continuously demonstrated attainment with the Carbon Monoxide standards.

The lead standard was established in 1978, with a concentration of 1.5 micrograms per cubic meter. In 2008, the standard was significantly revised setting a concentration level of 0.15 micrograms per cubic meter. EPA made changes to the air monitoring requirements for lead in 2009 to help determine where states would need to test. The final rule did not require lead monitoring at the National Core site and all sources in South Dakota have emission levels less than 0.5 ton per year. Therefore, testing for lead is not required at this time.

Data collected from the ambient air monitoring network is entered into the federal database called the Air Quality System (AQS). Individuals interested in reviewing the air quality data can go to the EPA website at the following address:

http://www.epa.gov/airdata/

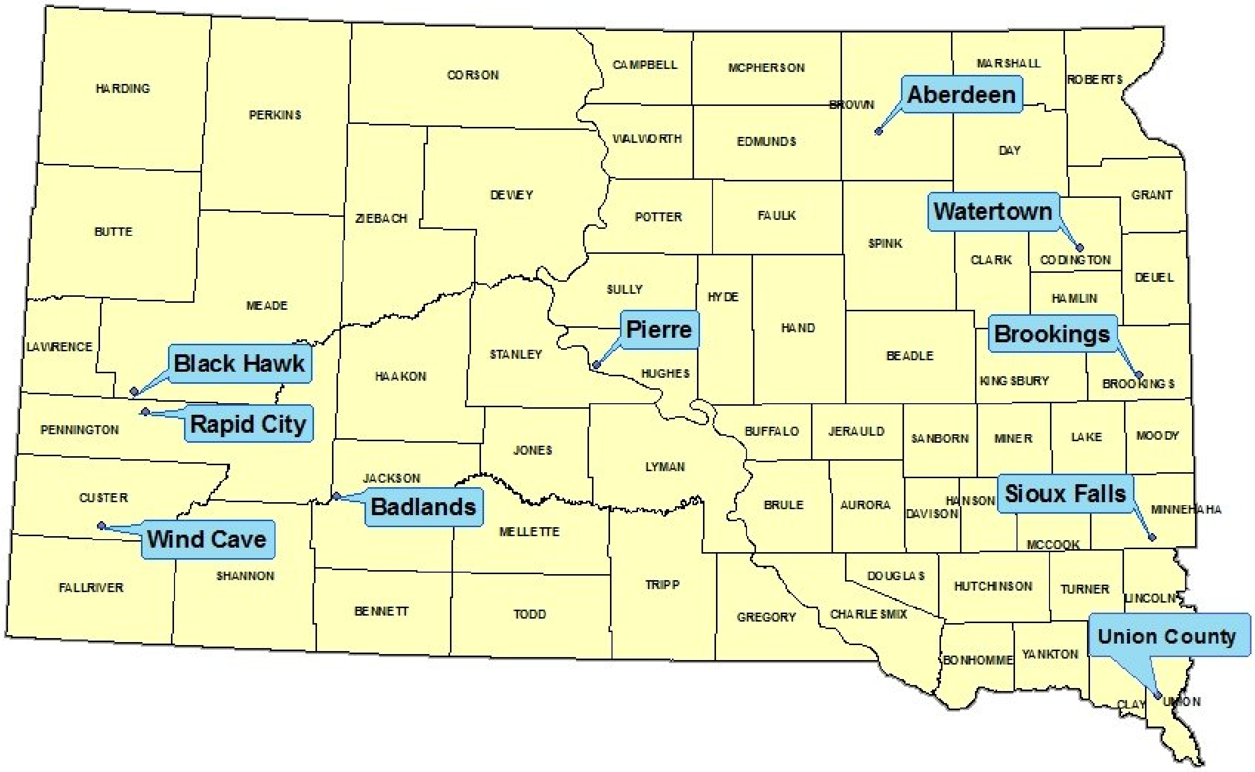
3.0 AIR MONITORING GOALS

The department's Air Quality Program was established with the primary goal of protecting the health, welfare and property of South Dakotans from the detrimental effects of air pollution. The Clean Air Act of 1970 and subsequent amendments define air quality standards for various air pollutants necessary to protect the public from injurious pollution concentrations.
In order to attain and maintain the National Ambient Air Quality Standards, the department developed regulations that restrict air pollution from sources, establishes these restrictions in an air quality permit, requires periodic inspections to ensure compliance, and maintains an ambient air monitoring network to provide air quality information and monitor the success of the Air Quality Program. Based on the ambient monitoring concentrations collected throughout the state, the department's Air Quality Program is meeting its goals.

4.0 AIR MONITORING PLAN

In calendar year 2016, the ambient air monitoring network includes 13 ambient air monitoring sites run by the department. Figure 4-1 shows a map of the general locations and cities with ambient air monitoring sites at the beginning of 2016.

Figure 4-1 – South Dakota Air Monitoring Sites



The following types of ambient air monitors and monitoring sites are operated in South Dakota:

1. State and local air monitoring stations;
2. Special purpose monitors;
3. Prevention of Significant Deterioration (PSD) monitors;
4. Interagency Monitoring of Protected Visual Environments (IMPROVE) sites;
5. Environmental Radiation Network (RadNet) ambient monitoring systems; and
6. National Core multi pollutant sites.

Ambient air monitoring site files are maintained in the department's Pierre office for the state and local air monitoring stations and special purpose monitoring sites. The ambient air monitoring site files are available for public review during normal working hours from 8:00 AM to 5:00 PM each workday. The monitoring site files contain at a minimum the following information for each site:

1. Air Quality System site identification form;
2. Sampling location;
3. Sampling and analysis method;
4. Operating schedule;
5. Monitoring objective and spatial scale;
6. Beginning date of operation; and
7. Site maps.

4.1 State and Local Air Monitoring Stations

A State and Local Air Monitoring Station consists of an air monitor for at least one air pollutant parameter selected by the state or local air programs to determine compliance with the National Ambient Air Quality Standards. At the beginning of 2016, 11 of the networks sites were considered a state and local air monitoring station. The sites in the network collected PM_{10} data at 10 sites, $PM_{2.5}$ data at 10 sites, Sulfur Dioxide and Nitrogen Dioxide at four sites, Ozone at six sites, and Carbon Monoxide at one site.

4.2 Special Purpose Monitoring

Special Purpose Monitoring is a generic term for all monitors not used to determine compliance with the National Ambient Air Quality Standards and used for special studies. The data is reported to EPA, the equipment is EPA or non-EPA designated monitoring methods, and the monitoring data is used for special circumstances or needs. Four of the ambient air monitoring network sites operated some kind of special purpose monitoring monitor in 2016. The parameters tested by the special purpose monitoring monitors in South Dakota include:

1. Weather stations at the Black Hawk and School for the Deaf sites;
2. PM_{coarse} monitor, Total Reactive Nitrogen (NOy) analyzer, and $PM_{2.5}$ speciation monitors at the School for the Deaf Site;
   and
3. Radiation monitors operated at the Pierre Quonset and Rapid City National Guard sites.

Particulate matter coarse (PM_{coarse}) is particulate matter 10 microns in diameter or less (PM_{10}) minus particulate matter 2.5 microns in diameter or less ($PM_{2.5}$).

4.3 Prevention of Significant Deterioration Monitoring Sites

In 2016, no Prevention of Significant Deterioration air monitoring projects were started or completed.

4.4 Interagency Monitoring of Protected Visual Environments Network

Two Interagency Monitoring of Protected Visual Environments sites are being operated by the National Parks Service in South Dakota. The site locations are at the Badlands and Wind Cave National Park. Data results for parameters collected by the National Park Service can be requested from the individual national parks.

4.5 Radiation Network

The Radiation Network sites in Pierre and Rapid City are being operated as a part of the national network of sampling sites. The Pierre Site has been operated since the early 1980s. The state has a limited role in operating the monitor. The state collects the samples and ships the samples to the EPA office of Radiation and Indoor Air. The type of sample collected is airborne particulates and measurements taken are gross beta radiation levels.

In 2009, EPA requested a second site in the state to be located in the Rapid City area. The new Radiation Network monitor was installed at the Rapid City National Guard Site on May 7, 2009. The site is operated by the department's Rapid City Regional Office in conjunction with the Rapid City National Guard.

The general objectives of the sampling sites are to provide a means of estimating ambient levels of radioactive pollutants in our environment, to follow trends in environmental radioactivity levels, and to assess the impact of fallout and other intrusions of radioactive materials. Specifically, the Radiation Network monitors were designed to:

1. Provide a direct assessment of the population's intake of radioactive pollutants due to fallout;
2. Provide data for developing a set of dose computational models for specific sources and a national dose computational model to aggregate all sources and determine total population dose;
3. Monitor pathways for significant population exposure from routine, accidental, and terrorist releases of radioactivity from major sources;
4. Provide data for indicating additional sampling needs or other actions required to ensure public health and environmental quality in the event of a major release of radioactivity to the environment; and
5. Serve as a reference for data comparison with other localized and limited monitoring programs.

The radiation data collected at this site may be reviewed at:

http://oaspub.epa.gov/enviro/erams_query.simple_query

4.6 National Core Multi-Pollutant Site

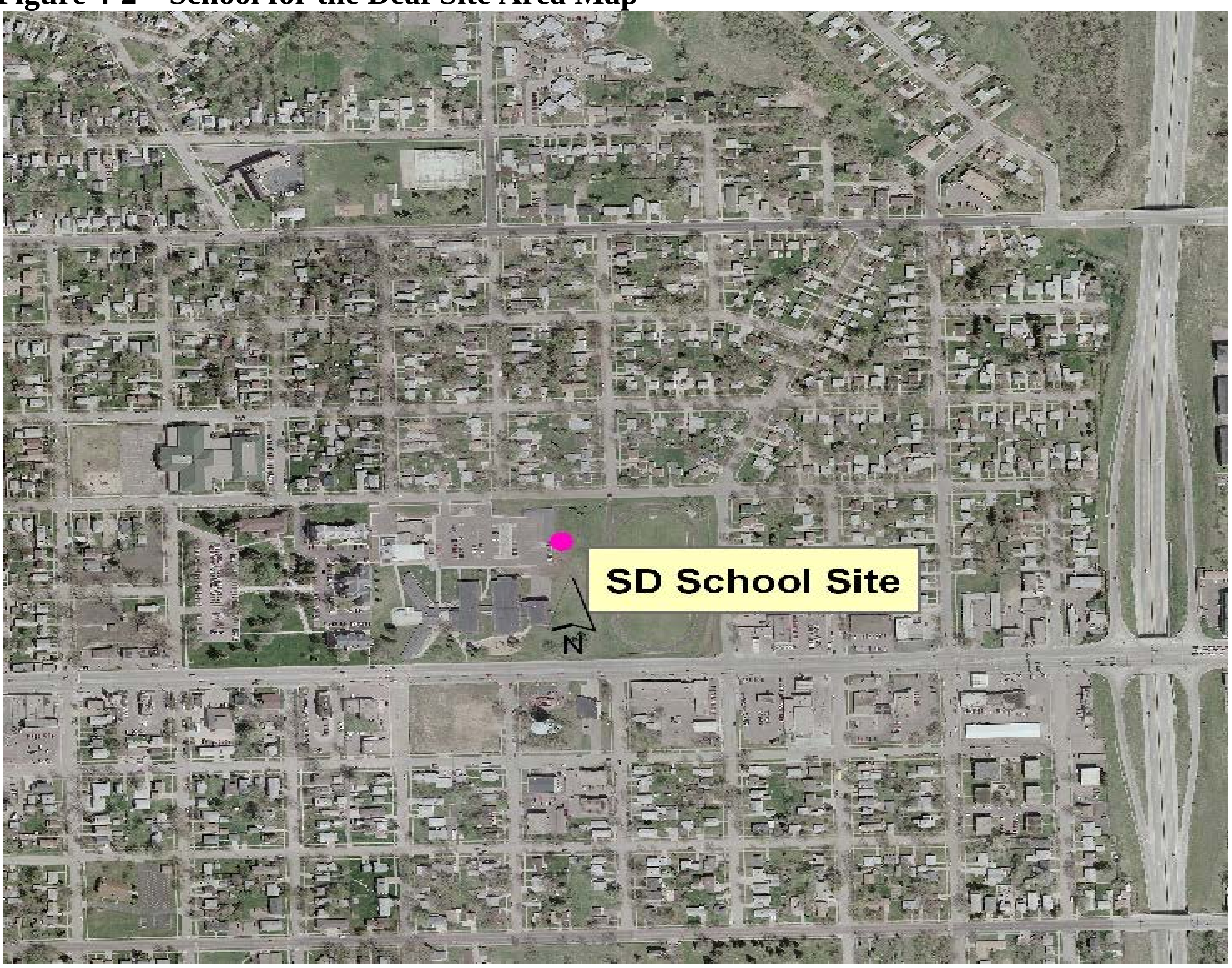
The National Core multi-pollutant monitoring site will provide data on several pollutants at lower detection levels and replaces the National Air Monitoring Station (NAMS) sites that have existed for several years. Each state's ambient air monitoring network is required to have at least one National Core site. At the beginning of 2011, all required parameters were operating at the School for the Deaf Site. The National Core site addresses the following monitoring objectives:

1. Timely reporting of data to the public through AirNow for air quality forecasting and other public reporting mechanisms;
2. Support development of emission strategies through air quality model evaluation and other observational methods;
3. Accountability of emission strategy progress through tracking long-term trends of criteria and non-criteria pollutants and their precursors;
4. Support long-term health assessments that contribute to ongoing reviews of the National Ambient Air Quality Standards;

5. Compliance through establishing nonattainment/attainment areas by comparison with the National Ambient Air Quality Standards; and
6. Support multiple disciplines of scientific research including public health, atmospheric and ecological.

The National Core site in South Dakota is located on the School for the Deaf campus in Sioux Falls, which is identified as the SD School Site (46-099-0008). This site meets the location requirements to be in an urban residential area. Sioux Falls was selected as the National Core site for South Dakota because it is the largest city in the state and is one of the state's fastest growing communities. See Figure 4-2 for an aerial view of the city around the School for the Deaf Site.

Figure 4-2 – School for the Deaf Site Area Map



The National Core site collects data for trace level Sulfur Dioxide, nitrogen oxides, all reactive oxides of nitrogen, Carbon Monoxide, ozone, $PM_{2.5}$ continuous and filter based manual monitors, $PM_{PM10- PM2.5}$, $PM_{2.5}$ speciated, PM_{10} and meteorological parameters of wind speed, wind direction, relative humidity, and ambient temperature.

5.0 AMBIENT AIR MONITORING NEEDS AND REQUIREMENTS

5.1 Monitoring State's Largest Population Centers

South Dakota's industrial base and population centers are typical of the northern plains states. The largest industry in the state is agriculture. Most of the other industries are located in several localized areas. The industries in these locations are typically small (less than 50 employees) and generally do not produce large quantities of air pollutants. Most are considered service oriented businesses or light industrial. The only heavy industrial facilities are the Big Stone Power Plant in Grant County and the quarry area in Rapid City.

The population distribution of the state follows the general industrial distribution. Most of the state's population of 814,180, in the 2010 Census, lives either on the eastern or western third of South Dakota. Since 2010, there has been a modest population increase in South Dakota of about 6.3% according to estimates done in 2016. The two largest cities in South Dakota are Sioux Falls and Rapid City located in southeastern and western South Dakota, respectively. The remaining population is primarily spread across the eastern third of the state with the remaining portion of the state sparsely populated. See Table 5-1 for a list of the 10 largest cities and Table 5-2 for a list of the 10 largest counties in the state.

Table 5-1 – 10 Largest Cities in South Dakota 2010

Ranking	City Name	Counties	Population
1	Sioux Falls	Minnehaha/Lincoln	153,888
2	Rapid City	Pennington /Meade	67,956
3	Aberdeen	Brown	26,091
4	Brookings	Brookings	22,056
5	Watertown	Codington	21,482
6	Mitchell	Davison	15,254
7	Yankton	Yankton	14,454
8	Pierre	Hughes	13,646
9	Huron	Beadle	12,592
10	Vermillion	Clay	10,571

Table 5-2 – 10 Counties with the Highest Populations 2010

Ranking	Counties	Population
1	Minnehaha	169,468
2	Pennington	100,948
3	Lincoln	44,828
4	Brown	36,531
5	Brookings	31,965
6	Codington	27,277
7	Meade	25,434
8	Lawrence	24,097
9	Yankton	22,438
10	Davison	19,504

Given South Dakota's population distribution, most of the air monitoring efforts of the state have in the past been concentrated in the areas of high population. Within these areas of high population, monitoring sites are chosen that will determine areas of high pollution concentration, determine if the National Ambient Air Quality Standards are being met, identify and attempt to quantify pollutant concentrations emitted by industries, and identify sources that have the potential to release the highest amounts of pollutants. A majority of the air monitoring sites are currently being operated in or near the five largest cities and seven largest counties in the state. However, as EPA continues to lower the National Ambient Air Quality Standards, the department has established some of the monitoring sites in rural areas such as the Wind Cave National Park, Badlands National Park, Union County, and Pierre. These sites are helping to determine long range impacts from other states and countries on South Dakota's rural and urban areas.

5.2 Real Time Data

Air monitoring goals have shifted to the collection of data using continuous air monitoring samplers and providing the data as quickly as possible for the public to use. Continuous samplers provide more data at lower operational cost, which is necessary as EPA continues to expand ambient air monitoring programs for the same amount of funding or less. In many cases, the continuous monitoring can be accessed by telephone and uploaded to a website for public use. The public can then use this data to determine if they need to take extra precautions when doing outdoor activities. The real time information is also used to monitor PM_{10} and $PM_{2.5}$ concentrations when high wind dust alerts are forecasted for Rapid City and all parameters during national or international events such as wildfires impact South Dakota.

The sites reporting data to the department's real time webpage are Wind Cave National Park, Badlands National Park, Brookings (Research Farm), Union County (Union County #1), Rapid City (Rapid City Credit Union and Black Hawk), Watertown, Pierre, and Sioux Falls (School for the Deaf) sites. The data includes hourly concentrations of PM_{10}, $PM_{2.5}$, Sulfur Dioxide, Nitrogen Dioxide, Carbon Monoxide, and ozone. The South Dakota's air quality real time website is located at:

http://denr.sd.gov/des/aq/aarealtime.aspx

In 2016, data uploaded from the $PM_{2.5}$ and PM_{10} monitors and ozone analyzers at Wind Cave National Park, Badlands National Park, Brookings Research Farm, Union County #1, Credit Union, Black Hawk, Watertown, Pierre, and School for the Deaf sites were reporting hourly data to EPA's AirNow website located at:

http://www.airnow.gov/

This data along with other monitoring sites around the nation provides the public and EPA with near real time data to show current air pollution levels and forecast levels for long range transport. The goal for the future is to add other locations in the state to this website and to the department's website.

5.3 Class I Areas

With the development of coal bed methane and oil and gas production in North Dakota, Wyoming, Montana and Colorado there is a growing need for data in rural and small cities in the western part of the state. In addition, South Dakota has developed a plan to implement the regional haze regulations required by the federal Clean Air Act. The implementation of these regulations will put more importance on air pollution levels in the state's two class I areas of Badlands and Wind Cave National Parks.

Ambient air monitors were placed in these areas in order to determine background levels and the impact of long range transport of air pollutants like particulate matter and ozone. In addition, continuous data is needed for modeling purposes to help in determining air quality permit requirements. The National Park sites collect data from Interagency Monitoring of Protected Visual Environments monitors for PM_{10}, $PM_{2.5}$, and chemical analysis of the collected particulates. The department collects PM_{10}, $PM_{2.5}$, Sulfur Dioxide, Nitrogen Dioxide, and ozone data at the Badlands Site and PM_{10}, $PM_{2.5}$, and ozone data at the Wind Cave Site.

5.4 Ozone Monitoring

Ozone monitoring is occurring in three sites on the eastern half of South Dakota and three sites on the western half of South Dakota and all sites demonstrate that South Dakota is attaining the current ozone standard. However, since EPA decided to lower the ozone standard in 2015, South Dakota may have areas that can exceed the lower ozone standard in both rural and urban areas of the state.

Modeling conducted by Western Regional Air Partnership (WRAP), indicates that South Dakota contributes approximately 3 parts per billion to its ozone concentration. In 2016, South Dakota monitored ozone at six sites throughout South Dakota. Based on Western Regional Air Partnership's modeling, South Dakota contributes approximately 5% to its ozone levels and the other 95% is from natural sources and transported into South Dakota from other states and countries. It will be important to maintain ozone monitoring in all areas of South Dakota to help demonstrate that long range transport of air pollution affects ozone concentration in South Dakota's rural and urban areas.

5.5 PM2.5 Monitoring

In 2006, EPA significantly lowered the 24-hour $PM_{2.5}$ standard from 65 micrograms per cubic meter to 35 micrograms per cubic meter. EPA also lowered the annual standard from 15 micrograms per cubic meter to 12 micrograms per cubic meter in 2012. These revisions of the standards brought the compliance levels close to the concentrations recorded at the monitoring sites in the state's network.

Testing for $PM_{2.5}$ levels is a higher priority in South Dakota because recorded concentrations are significantly closer and may exceed the current 24-hour standard since EPA lowered the standards. In 2016, South Dakota monitored $PM_{2.5}$ at ten sites throughout South Dakota.

5.6 Metropolitan Statistical Areas

Title 40 of the Code of Federal Regulations Part 58, Appendix D, contains information used to design an ambient air monitoring network and lists three basic objectives in designing an ambient air monitoring network. The three basic objectives are listed below:

1. Provide air pollution data to the general public in a timely manner. The department accomplishes this objective by providing near real time data on the department's website at:

   http://denr.sd.gov/des/aq/aarealtime.aspx

   The sites reporting data to the department's real time webpage are Wind Cave National Park, Badlands National Park, Brookings (Research Farm), Union County (Union County #1), Rapid City (Credit Union and Black Hawk sites), Watertown, Pierre (Airport), and Sioux Falls (School for the Deaf) sites. Specifically in the Rapid City area, High Wind Dust Alerts are called when meteorological conditions are forecasted that could cause high PM_{10} concentrations. This information along with a report graphing hourly concentrations recorded during the alert is also provided to the public through the department's website;
2. Support compliance with ambient air quality standards and emissions strategy development. The department accomplishes this objective by locating the sites throughout the state to assess the permit control measures and pollution emission impacts on the state. For example, the Rapid City air monitoring sites specifically evaluate the permit control measures and the special measures taken to reduce fugitive dust levels; and
3. Support for air pollution research studies. The department supports research by loading the air quality data into EPA's Air Quality System database site and by supporting local studies when requested by the state's colleges.

EPA identified in Appendix D the air monitoring requirements for ozone, Carbon Monoxide, Nitrogen Dioxide, Sulfur Dioxide , particulate matter, and lead. The number of required air monitoring sites for ozone and particulate matter is based on the state's Metropolitan Statistical Areas (MSA) (e.g., determined by the population of the Metropolitan Statistical Area and each pollutant's design value in the Metropolitan Statistical Area). Each design value is specific to the pollutant and form of the standard. To determine the number of monitoring sites for ozone and particulate matter, the design value is calculated based on the pollutant concentration and the applicable form of the standard in Title 40 Code of Federal Regulations Part 50, divided by the applicable pollutant's standard in Title 40 Code of Federal Regulations Part 50, and the results multiplied by 100. The percentage is compared to the values in Appendix D to determine the minimum number of monitoring sites for ozone and particulate matter.

If there is no ambient air monitoring data for the Metropolitan Statistical Area, only the minimum number of sites listed in Appendix D is required to be operated. If there is a minimum of three years of air quality data for the Metropolitan Statistical Area, a design value is calculated. If the Metropolitan Statistical Area has a design value greater than 85% of the standards for ozone and $PM_{2.5}$ and if the Metropolitan Statistical Area has a 3 year average of the 1st max greater than 80% of the standard for PM_{10} and the population is greater than 100,000 people a minimum of one site is required. The required number of sampling sites continues to increase as the population increases. If the highest concentration site in a Metropolitan Statistical Area has a design value less than 80% for PM_{10} and 85% for ozone and $PM_{2.5}$, the required number of sites may be one or even zero depending on the design value and population of the Metropolitan Statistical Area.

There is one additional ambient air monitoring requirement in Appendix D for an ozone network. If a Metropolitan Statistical Area is required to have one or more ozone monitors, at least one of the ozone monitoring sites is required to be located at the expected high concentration area for the Metropolitan Statistical Area.

Table 5-3 shows the population, design values as percent of the National Ambient Air Quality Standards and the minimum site requirements for the Sioux Falls, Rapid City, and Sioux City Metropolitan Statistical Areas in the state after adding the data for 2016 sampling year.

Table 5-3 – Title 40 of the Code of Federal Regulations Part 58, Appendix D Requirements for Metropolitan Statistical Area

2010 MSA Population	Counties	Site	AQS ID	Design Values as % of the NAAQS [1]	> 85% [2] Criteria (Yes or No)	Minimum Sites Required
Sioux Falls MSA						
169,468 44,828	Minnehaha Lincoln	SD School	46-099-0008	PM_{10} 24-hour = 56%	No	0
5,618 8,347	McCook Turner	SD School	46-099-0008	$PM_{2.5}$ 24-hour = 57%	No	0
228,261	**Total**	SD School	46-099-0008	$PM_{2.5}$ Annual = 62%	No	0
		SD School	46-099-0008	Ozone 8-hr = 91%	Yes	1
Rapid City MSA						
100,948 25,434	Pennington Meade	RC Credit Union	46-103-0020	PM_{10} 24-hr = 100%	Yes	1
126,382	**Total**	RC Credit Union	46-103-0020	$PM_{2.5}$ 24-hr = 57%	No	0
		RC Credit Union	46-103-0020	$PM_{2.5}$ Annual = 60%	No	0
		RC Library	46-103-1001	PM_{10} 24-hr = 42%	No	0
		RC Library	46-103-1001	$PM_{2.5}$ Annual = 48%	No	0
		RC Library	46-103-1001	$PM_{2.5}$ 24-hr = 44%	No	0
		Black Hawk	46-093-0001	PM_{10} 24-hr = 34%	No	0

2010 MSA Population	Counties	Site	AQS ID	Design Values as % of the NAAQS [1]	> 85% [2] Criteria (Yes or No)	Minimum Sites Required
		Black Hawk	46-093-0001	Ozone 8-hr = 81%	No	0
Sioux City MSA						
14,399 6,000 21,006 102,172 **143,577**	Union, SD Dixon, NE Dakota, NE Woodbury, IA **Total**	UC #1	46-129-0001	PM_{10} 24-hr = 50%	No	0
		UC #1	46-129-0001	$PM_{2.5}$ 24-hr = 57%	No	0
		UC #1	46-129-0001	$PM_{2.5}$ Annual = 62%	No	0
		UC #1	46-129-0003	Ozone 8-hr = 87%	Yes	1

[1] – PM_{10} sites are 3 year average of 1st max % of the National Ambient Air Quality Standards; and
[2] – The criteria for PM_{10} is greater than 80% and the population of the Metropolitan Statistical Area is 100,000 or greater.

As a result of evaluating the air monitoring site data, based on the design values and populations, South Dakota is required to have an ozone monitoring site in the Sioux Falls and Sioux City Metropolitan Statistical Area (Union County #1). The main change was not an increase in concentration levels but because the ozone standard was revised down to 0.070 parts per million and these areas are now within 85% of the standard. With the increase in PM_{10} concentrations during the last two years the Rapid City Metropolitan Statistical Area one PM_{10} monitoring site is now required.

The department operates the following additional types of monitors to meet the specific network requirements in 40 Code of Federal Regulations Part 58, Appendix D:

1. $PM_{2.5}$ speciation monitor in Sioux Falls at the School for the Deaf Site; the largest urban area in the state and National Core Site;
2. $PM_{2.5}$ background and transport monitors at the Badlands and Wind Cave sites; and
3. National Core monitoring equipment located in the city of Sioux Falls at the School for the Deaf Site.

Another requirement in Appendix D is providing for a Photochemical Assessment Monitoring Stations (PAMS) which is required in areas classified as serious, severe, or extreme nonattainment for ozone. All areas in South Dakota are attaining the National Ambient Air Quality standard for ozone so no Photochemical Assessment Monitoring Stations sites are required.

There is no Appendix D minimum requirement for air monitoring for Carbon Monoxide. However, a Carbon Monoxide air monitoring site is required at the National Core Site. Carbon Monoxide air monitoring started at the National Core Site (School for the Deaf Site) in 2011.

There are population monitoring requirements for Nitrogen Dioxide in Appendix D. A Nitrogen Dioxide monitor is required when the core based statistical area (CBSA) has a population level of 500,000 or greater. There are no core based statistical areas with a population level greater than or equal to 500,000 in South Dakota. Therefore, there are no required Nitrogen Dioxide monitoring sites in South Dakota.

Sulfur Dioxide has a population based monitoring requirement for a core based statistical area. The monitoring requirement is based on a calculation using the total amount of Sulfur Dioxide, in tons, emitted within the counties in the core based statistical area and the population within the core based statistical area counties. The calculation is called the population weighted emissions index for the core based statistical area. Union County is part of the Sioux City core based statistical area and is the only area in South Dakota with a population weighted emissions index that has a value high enough to require a monitoring site. Union County does not contribute significantly to the population weighted emissions index for Sulfur Dioxide in the Sioux City core based statistical area. The EPA rules require the monitoring site to be located in the parent core based statistical area or Sioux City, Iowa area in this case. There are no Sulfur Dioxide monitoring sites required in South Dakota.

The minimum requirements for lead are based on the lead air emissions from a source or airport with an annual emissions rate of 0.5 tons per year or greater. There are no sources with an annual emission rate at or over 0.5 ton per year so there are no required monitoring sites in South Dakota.

5.7 Future Monitoring

There is currently minimal monitoring being completed in other parts of the state that have small, but expanding populations and industries. These areas include the northeastern and the northern Black Hills portions of the state. These areas will continue to be evaluated to determine whether additional monitoring efforts need to be conducted in those areas.

PM_{10}, $PM_{2.5}$ and ozone will be the focus of the ambient air monitoring network as levels of these pollutants have the greatest potential to have concentrations close to the standard as EPA continues to lower the National Ambient Air Quality Standards for these pollutants.

EPA has also determined for large sources of Sulfur Dioxide the area around the source needs to be characterized by either modeling the sources emissions or air monitoring to determine if there are short term high concentrations of Sulfur Dioxide that could affect public health. The rule requires states to model or monitor these source areas before EPA will determine the attainment status of the county or area. South Dakota has one large source of Sulfur Dioxide emissions, Big Stone Power Plant, indicated by EPA in the rule that would be required to be characterized.

The department had made preparations to conduct air monitoring to characterize the Sulfur Dioxide emissions following the data rule. But under a consent decree between EPA and environmental groups on March 2, 2015, with no state input, EPA is requiring states to update the recommendations for counties with large sources of Sulfur Dioxide emissions. EPA will use the data to designate the counties for the 1-hour National Ambient Air Quality Standards for

Sulfur Dioxide. DENR had originally requested that Grant County along with the rest of the state be designated as attaining of the 1-hour Sulfur Dioxide standard. Grant County is impacted by the consent decree because the Big Stone Power Plant is a large source of Sulfur Dioxide emissions as specified by the consent decree. DENR provided EPA with updated information to show the Big Stone Power Plant is not causing the area to exceed the 1-hour standard by the deadline of September 2015. EPA sent back a reply they intended to designate Grant County as unclassifiable. DENR responded by sending EPA the companies modeling data showing Big Stone Power Plant is not causing the area to exceed the 1-hour standard in April 2016. EPA agreed with the modeling that the Big Stone Power Plant is not causing the area to exceed the 1-hour standard.

6.0 NETWORK MODIFICATIONS FOR 2017 and 2018

6.1 New Sites

The department will make the following changes and will continue to evaluate the following areas for the need to modify the ambient air monitoring network:

1. The department is evaluating setting up a new state and local air monitoring stations site to be located in Aberdeen which would have continuous PM2.5 and ozone samplers. This site would be setup either in 2017 or later.

6.2 Sites Closed

No sites are planned to be closed in the 2017.

6.3 Modifications

The department is planning the following site modifications:

1. The department will continue to evaluate locations where continuous PM monitors can replace manual monitors in the network;
2. The Speciation SASS monitor was replaced with a Super SASS monitor in November 2016; and
3. Continue to replace the old Thermo BETA PM10 monitors.

7.0 REQUEST FOR WAIVER

There were no sampling frequency waivers requested for the 2017 sampling year and none are proposed for 2018.

8.0 EQUIPMENT REPLACEMENT PLAN

8.1 Overview

The department is tasked with sampling the ambient air quality throughout the state of South Dakota to demonstrate compliance with the National Ambient Air Quality Standards and to do special testing when needs arise or as required by EPA. In 2016, there were 10 active sites within South Dakota where criteria pollutants are monitored. The monitored pollutants include: particulate matter (PM_{10} and $PM_{2.5}$), Nitrogen Dioxide, Ozone, Carbon Monoxide, and Sulfur Dioxide.

The reliable operation of the monitors requires significant investment in staff time and inventory for upkeep, both which tend to increase as the monitors age. Monitors should be replaced when they reach an age when cost of upkeep meets or exceeds the cost of new purchase and when funding permits.

The average operational age of a Particulate Matter monitor is about 10 years mainly due to detector and hardware board failures. With some major replacement of monitor components the operational age may be extended.

Monitors also experience catastrophic failures, at which time a determination is made whether replacing core components on an aging instrument is viable. The age of some instruments make sourcing parts difficult to impossible.

8.2 Data Loggers

The department currently operates eight ESC 8832 style data loggers and has two ESC 8872 style data loggers that are awaiting deployment. The department also has two older style 8816 that can be used as a backup if needed. The average age of the ESC 8816 and 8832 style data loggers is 10 years. ESC has discontinued the 8816 and 8832 style which makes it difficult to purchase replacement parts. In addition to the age of the data loggers, the department has lost a few data loggers to lighting strikes that come through the meteorological probes or down the power and phone lines.

Agile Air, which purchased ESC, is offering a newer data logger version 8872. The department has received reports from other states as well as from Agile Air that the computer-data logger interface is difficult to use. A priority for the department will be to deploy and field test one of the 8872 data loggers that are currently in inventory to determine if this data logger meets the department's needs or another data logger needs to be evaluated.

Table 8-1 provides a location and service record of the existing data loggers at the time this document was written.

Table 8-1 - Data Logger Service Records

No.	Serial #	Asset #	Model	Purchased	Cost	Comments
1	3901	NA	8816	<2006	no data	backup
2	3802	none	8816	<2006	no data	backup
1	2772	347247	8832	2008	$8,485	
2	2771K	347248	8832	2008	$8,485	
3	2770K	347249	8832	2008	$8,485	
4	2331K	NA	8832	2008	$8,485	
5	2431	NA	8832	2008	$8,485	
6	3992K	NA	8832	2011	$8,485	
7	4467K	351778	8832	2012	$8,485	
8	4868		8832	2015	$10,285	
9	0622		8872	2016	$8,650	
10	0623		8872	2016	$8,650	

8.3 Manual Particulate Matter Monitors

8.3.1 Partisol Monitors

The department currently has eight Thermo Scientific Partisol 2000i manual monitors and five Thermo Scientific Partisol 2000 manual monitors (see Table 8-2). These Partisol manual monitors are Federal Reference Method (FRM) for $PM_{2.5}$ and PM_{10} monitoring.

Our oldest Partisol monitor is seven years old, with expected average longevity of 12-15 years. We currently have two spares in reserve, one matching each style of Partisol monitors that are deployed in the field. Given the average age and the number of deployed Partisol monitors, we expect increasing costs associated with monitor upkeep.

Table 8-2 – Partisol Service Record

No.	Serial #	Asset #	Model	Purchased	Cost	Comments
1	1041106	0350223	2000i	2011	$7,271	
2	1031106	0350222	2000i	2011	$7,271	
3	201021106	0350224	2000i	2011	$7,271	
4	201011106	0350226	2000i	2011	$7,271	
5	201881204	0351195	2000i	2011	$9,580	
6	1751203	0351196	2000i	2012	$9,580	
7	1891204	0351197	2000i	2012	$9,580	
8	205631504		2000i	2016		
1	210881007	0349210	2000FRM	2010	$6,818	
2	210851007	0349214	2000FRM	2010	$6,818	
3	210811007	0349212	2000FRM	2010	$6,818	
4	210771006	0349211	2000FRM	2010	$6,818	

No.	Serial #	Asset #	Model	Purchased	Cost	Comments
5	210801007	0349209	2000FRM	2010	$6,818	

8.3.2 Hi-Vol PM_{10} Monitors

The department currently does not operate any Hi-Vol Particulate Matter manual monitors. The department has chosen to retain four working monitors in case the need arises for lead monitoring, special studies, or for lab analysis to determine contribution from sources.

8.3.3 Speciation $PM_{2.5}$ Monitors

The department currently has one speciation monitor at its National Core site and it was obtained in late 2016 with the cooperation of EPA. The current model is a SuperSASS which allows two sample cartridges to be loaded enabling the sampler to collect samples every 3rd day with physical loading only required every 6th day. Samples are collected on a regular basis and sent to be analyzed in an EPA approved lab.

8.4 Continuous Particulate Matter Monitors

The department operates three kinds of continuous PM monitors: FH64C14 BETA, 5014i BETA, and a Met One BAM. The typical life-span for a continuous monitor running 24 hours a day, 365 days a year, is 10 years.

8.4.1 Thermo FH64C14 BETA Monitors

The department currently runs two Thermo FH64C14 BETA continuous monitors in the field. There are four located in the lab with systematic problems that make the monitors unusable as backup monitors. Therefore, there are currently no FH64C14 BETA continuous monitors in reserve. Table 8-3 provides a description of each monitor.

This BETA continuous monitor fleet is aging with the oldest in operation over 15 years. The current average age of the monitors is thirteen years old; the newest of these monitors is twelve years old. The expected lifespan of the detectors in the monitor is ten years. The detectors can currently be replaced at $3,043 each. The main problems seen with the aging monitors are failing operating systems and detectors. In addition to the age, every two years, each monitor needs to be sent in to clean the measurement chamber at a current cost of $910. No other monitor currently has this requirement.

Table 8-3 - BETA Service Record

No.	Serial #	Asset #	Purchased	Cost	Comments
1	405	0339810	2002	$13,972	
2	E1000	0343701	2005	$15,447	Broken
3	749	0341980	2004	$12,686	
4	814	0341981	2004	$12,686	Broken
5	E1011	0343702	2005	$13,253	Broken

No.	Serial #	Asset #	Purchased	Cost	Comments
6	727	0341968	2004	$14,820	Broken

8.4.2 Thermo 5014i BETA Monitors

The department has two Thermo 5014i BETA continuous monitors. These monitors are three years old. Each monitor has had substantial downtime due to hardware and software failures and hardware defects. Both monitors have been sent back to the manufacturer for repair on several occasions. One unit is in service in Brookings; the other has been pulled from the field and recently repaired (see Table 8-4). The department will continue to use these monitors for PM_{10} sampling using one as a monitor and the other as a backup.

Table 8-4 - 5014 Service Record

No.	Serial #	Asset #	Purchased	Cost	Comments
1	CM13381007	353481	2014	$19,600	
2	CM13361013	353480	2014	$19,600	

8.4.3 Met One BAM 1020 Monitors

The department has eleven operating BAM continuous monitors and one in reserve (See Table 8-5). The oldest monitors are nine years old. The department has not had many problems with these monitors but expect to begin having more operational problems as the fleet ages.

Table 8-5 - BAM Service Record

No	Serial #	Asset #	Purchased	Cost	Comments
1	H2949	346880	2008	$21,192	
2	H2972	346881	2008	$21,192	
3	H7027	347244	2008	$19,159	
4	H7028	347243	2008	$19,159	
5	H7051	347246	2008	$19,159	
6	H7236	347245	2008	$19,159	
7	K1801	349383	2010	$17,027	
8	M5333	350197	2011	$19,747	
9	M12165	351076	2012	$19,597	
10	T15065	355248	2015	$18,368	
11	T19274	355390	2015	$18,343	
12	T15079	355391	2015	$18,343	

8.4.4 Particulate Matter Monitor Priorities for Equipment Replacement

The Thermo FH64C14 BETA Particulate Matter continuous monitor is the highest priority for upgrade of the Particulate Matter monitoring network. This style of monitor has exceeded the useful life span. The purchase of the Thermo 5014 BETAs in 2014 was the start of that replacement process but after considering the unreliability of this monitor, a different style of monitor will be pursued.

The department is considering purchasing a Teledyne API T640x monitor to replace the two BAM monitors at the National Core site in Sioux Falls. The Teledyne API T640x monitor is a continuous monitor that is able to simultaneously measure $PM_{2.5}$, PM_{10}, and PM_{coarse}. This would free two BAM monitors to use as spares and/or replacement monitors. In addition, particulate monitors will be replaced as funding is available.

8.5 Continuous Gas Analyzers and Calibrators

The gaseous pollutant air monitoring network consists of continuous gas analyzers and calibrators that date back to 2003. The department has purchased various pieces of equipment nearly every year over the past decade with the last being a Teledyne-API NOx analyzer in 2016. The department typically purchases replacement equipment for instruments that are 7–10 years old, although some analyzers, such as ozone can have a longer lifespan. Most of the analyzers and calibrators can be purchased for between $9,000 and $13,000.

8.5.1 Ozone Analyzers

The department currently operates ozone analyzers at six sites throughout South Dakota. The ozone instruments have been the most reliable and durable instruments in the monitoring network. In fact, the three oldest instruments in the network are an ozone analyzer and two ozone calibrators purchased in 2003.

The department purchased a new ozone analyzer in 2014, with the anticipation of eventually needing to replace the ozone equipment at Badlands National Park. This purchase gave us two backup ozone analyzers and one lab ozone analyzer. The lab ozone analyzer is used to conduct checks on ozone transfer standards and could be put in the field in case of an emergency.

On March 31, 2015, the department replaced the ozone analyzer at the Badlands site. The ozone instrument that was replaced was provided by the National Park Service, who operated it before the department took over the monitoring at this site. This instrument was altered by the National Park Service consultant, Air Resource Services, and operated a little differently, which made it difficult to make repairs. For this reason, the department used one of the backup ozone analyzers at the Badlands site. With this move, the department still has one backup ozone analyzer and one lab ozone analyzer (see Table 8-6).

Table 8-6 - Ozone Analyzers

No.	Serial #	Asset #	Purchased	Cost	Comments
1	49c-78317-388	340664	2003	$6,345	
2	0414006406	341964	2004	$6,596	
3	0525812377	343703	2005	$7,081	
4	0615817056	344589	2006	$7,069	
5	0810029426	3M Project	2008	$7,137	
6	08270002	347239	2008	$7,137	
7	1313057856	352631	2013	$9,450	Lab Analyzer
8	1427262856	354125	2014	$9,150	

8.5.2 Sulfur Dioxide Analyzers

The department operates Sulfur Dioxide analyzers at four sites in South Dakota. The department also has three Sulfur Dioxide backup analyzers for use when there is a major repair needed. There is one located in the lab in Pierre and one each at the Sioux Falls regional office and the Rapid City regional office.

The Sulfur Dioxide analyzers have been fairly reliable and seldom need to be sent in for repair. Occasionally a lamp or detector needs to be replaced, which is something the department can do in-house. As with most Thermo Scientific instruments, the department does replace the pumps and installs pump kits on occasion, which is also something the department does in-house. The oldest model is from 2004 (see Table 8-7).

Table 8-7 - Sulfur Dioxide Analyzers

No.	Serial #	Asset #	Purchased	Cost	Comments
1	0414006405	341883	2004	$8,585	
2	0525112351	343645	2005	$9,293	
3	0621217058	344692	2006	$12,865	
4	0829531903	347356	2008	$11,079	
5	0829531904	347357	2008	$11,079	
6	0926837682	348300	2009	$11,079	
7	1117348531	350199	2011	$12,065	

8.5.3 Nitrogen Dioxide Analyzers

The department operates Nitrogen Dioxide analyzers at four sites in South Dakota. The NCORE site in Sioux Falls also includes a NOy analyzer in addition to the traditional NOx analyzer. The department has three backup analyzers, although with the purchase of two new analyzers in 2016, the 2004 analyzer will be retired this year. The backup analyzers are typically housed at the regional offices in Sioux Falls and Rapid City.

Nitrogen Dioxide analyzers have been the most difficult to maintain and operate of the gaseous pollutant analyzers. Replacement parts can be very expensive and if the instrument needs to go back to the factory for repair, the cost can easily reach $1,000 to $2,000. The oldest analyzer in our network, which is a C-Series instrument, was purchased in 2004 (see Table 8-8).

Table 8-8 - Nitrogen Dioxide Analyzers

No.	Serial #	Asset #	Purchased	Cost	Comment
1	0414006404	341932	2004	$9,242	
2	2411	355732	2015	$11,966	
3	3006	356827	2016	$11,900	
4	0824131747	347242	2008	$10,350	
5	298	357347	2016	$22,475	
6	1116748523	350098	2011	$11,671	
7	1424162705	354197	2014	$13,100	
8	0824131748	347241	2008	$10,350	

8.5.4 Carbon Monoxide Analyzers

The department operates just one Carbon Monoxide analyzer at our National Core site in Sioux Falls. A Carbon Monoxide analyzer was located at Union County #1 for a few years, but has since been moved to the National Core site in Sioux Falls. The Thermo Scientific Carbon Monoxide analyzer which was the main Carbon Monoxide at the National Core site is now the backup analyzer (see Table 8-9).

Table 8-9 - Carbon Monoxide Analyzers

No.	Serial #	Asset #	Purchased	Cost	Comment
1	0723923521	346191	2007	$13,320	
2	0174	347421	2008	$9,329	

8.5.5 Multi-gas/Ozone Calibrators

The department operates either a multi-gas or ozone calibrator at each of the eight monitoring sites with gas analyzers. There is also an Environics 6103 located at the Sioux Falls regional office and Rapid City regional office that are used by staff to conduct quarterly audits. The department originally used primarily Thermo Scientific calibrators for weekly checks and quarterly audits. Since then, the department started purchasing Environics 6103 calibrators, which can be used for multi-gas, ozone and photometer operation and are much lighter and easier to transport. Both types of calibrators have been very reliable and inexpensive to operate. The annual calibration of the flow controllers in these instruments has been the only recurring cost.

The department has continued to purchase Environics 6103 calibrators over the past few years and therefore will surplus the two 146C calibrators this year (see Table 8-10).

Table 8-10 - Multi-gas/Ozone Calibrators

No.	Serial #	Asset #	Model	Purchased	Cost	Comments
1	49CPS-7832-388	340751	49CPS	2003	$7,583	
2	49CPS-78318-388	340753	49CPS	2003	$7,583	
3	0414006403	341965	146C	2004	$9,235	
4	0414006401	341967	49CPS	2004	$7,871	
5	0528713392	343674	146C	2005	$9,778	
6	0525812378	343830	49i-PS	2005	$8,943	
7	0623018063	344875	146i	2006	$10,350	
8	0824131746	347240	49i-PS	2008	$9,630	
9	0807328333	N/A	49i-PS	2008	$9,630	
10	4290	347267	6103	2008	$10,440	
11	4298	347268	6103	2008	$10,440	
12	4299	347269	6103	2008	$10,440	
13	4561	348429	6103	2009	$10,440	
14	4562	348430	6103	2009	$10,440	
15	5047	350198	6103	2011	$10,485	
16	5881	352825	6103	2013	$10,615	

17	6223	354154	6103	2014	$10,485	
18	6588	355338	6103	2015	$10,738	

8.6 Meteorological Stations

8.6.1 Overview

The department currently has two meteorological (met) stations: Black Hawk and School for the Deaf. Each meteorological station consists of a temperature sensor, barometric pressure sensor, wind direction vane, and anemometer (wind speed) mounted on a 10 meter tower. The operation of each instrument on the tower is checked every month. The School for the Deaf meteorological station is audited once per quarter since it is a requirement of the National Core Site and the Black Hawk met station is audited biannually.

The department no longer supports the meteorological towers at Brookings Research Farm and Union County #1 at the start of 2016, based on a decision weighing cost of upkeep versus currently available data and our monitoring needs. Our weather data needs at those locations are being met by reliable and available data from the National Weather Service collected from nearby airports.

9.0 COMPLIANCE WITH NATIONAL AMBIENT AIR QUALITY STANDARDS

This section provides a comparison of the collected data to the National Ambient Air Quality Standards. The comparison will determine if an area is attaining the standard. In addition, the comparison will assist in determining if more monitoring stations for certain parameters are needed in an area or an area no longer needs to monitor for a certain parameter or parameters.

9.1 Particulate Matter (PM_{10})

The PM_{10} National Ambient Air Quality Standards is based on a 24-hour average concentration. The maximum 24-hour average concentration allowed is 150 micrograms per cubic meter. Attainment with the 24-hour standard is demonstrated when there is less than or equal to one expected exceedance per year averaged over three years. A 24-hour average concentration of 154.4 micrograms per cubic meter is the highest level that still attains the 24-hour standard for PM_{10}.

In 2016, the statewide PM_{10} monitoring network included 10 monitoring locations. Two of the sites recorded data using manual monitors providing 24-hour sample concentrations. Eight of the sites have continuous samplers providing 1-hour concentrations. Rapid City has two PM_{10} air monitoring sites. Cities with one site include Sioux Falls, Aberdeen, Watertown, Black Hawk, and Brookings. Rural sites are operated at Badlands, Wind Cave and Union County.

Table 9-1 contains a list of the expected exceedance, second maximum concentration, attainment status and percent of the standard for the PM_{10} ambient air monitors throughout the state for calendar years 2014 to 2016. The percent of the standard is the second maximum concentration for the three years divided by the standard (150 micrograms per cubic meter). Sites with a PM_{10} percent standard greater than 80% of the National Ambient Air Quality Standards have a potential to have a 24-hour sample exceed the PM_{10} standard. During 2016, no site had a percent greater than 80%.

Table 9-1 – Statewide PM_{10} 24-Hour Concentrations

Site	Expected Exceedance	Second Maximum	Attainment?	Percent of the Standard
RC Library	0.0	42 ug/m^3	Yes	28%
RC Credit Union	0.7	106 ug/m^3	Yes	70%
Black Hawk	0.0	69 ug/m^3	Yes	46%
SD School	0.0	54 ug/m^3	Yes	36%
Badlands	0.0	33 ug/m^3	Yes	22%
Brookings Research Farm	0.0	53 ug/m^3	Yes	35%
Aberdeen	0.0	65 ug/m^3	Yes	43%
Watertown	0.0	94 ug/m^3	Yes	62%
Wind Cave	0.0	36 ug/m^3	Yes	24%
UC #1	0.0	58 ug/m^3	Yes	38%

The exceptional event is calculated by taking the sum of the PM_{10} concentrations that exceeded the 24-hour standard at a site divided by 3 (years). In 2014, 2015 and 2016, two PM_{10} concentration exceeded the 24-hour standard at the Rapid City Credit Union Site resulting in an expected exceedance of 0.7. The department flagged one of the exceedances in Air Quality System as an exceptional event. Currently, all the sites in South Dakota are attaining the PM_{10} 24-hour standard.

9.2 Particulate Matter ($PM_{2.5}$)

The $PM_{2.5}$ National Ambient Air Quality Standards consist of a 24-hour and annual standard. The 24-hour standard is 35 micrograms per cubic meter. Attainment of the 24-hour standard is achieved when the maximum 24-hour average concentration, based on the annual 98th percentile averaged over three years (24-hour average design value), is less than or equal to 35 micrograms per cubic meter.

The $PM_{2.5}$ annual standard is 12 micrograms per cubic meter. Attainment is demonstrated when the maximum annual arithmetic mean averaged over three consecutive years (annual design value) is equal to or less than 12 micrograms per cubic meter.

The testing for $PM_{2.5}$ concentrations continues to be a major priority for the state as EPA continues to lower the standard. EPA revised the 24-hour standard significantly lower, by 46%, in 2006. EPA then revised the annual standard in 2012 from 15 to 12 µ/m^3, which represents a 20% reduction in the annual standard.

In 2016, there were 10 $PM_{2.5}$ state and local air monitoring stations sites operated in the state. Federal Reference Method (FRM) manual monitors, Partisol 2000, were operated at three of the $PM_{2.5}$ sites. Met One BAM continuous $PM_{2.5}$ monitors with Federal Equivalent Method designation were operated at eight of the sites. The School for the Deaf Site operates both methods.

9.2.1 $PM_{2.5}$ 24-Hour Standard

Table 9-2 shows the yearly 24-hour 98th percentile for calendar years 2014 to 2016 used in the calculation of the 24-hour design value for $PM_{2.5}$ in 2016, the 24-hour design value, designation status of each site, and the percent of the standard. The percent of the standard in this case and for the rest of the pollutants is the design value divided by the standard.

In 2016, the highest 24-hour 98th percentile concentration was 17.3 micrograms per cubic meter or 49% of the standard and was recorded at the Union County #1 site on a Met One BAM continuous $PM_{2.5}$ monitor. The site with the second highest 24-hour 98th percentile concentration was at the Rapid City Credit Union Site with 15.7 micrograms per cubic meter collected on a Met One BAM continuous $PM_{2.5}$ monitor.

Starting in late May and continuing to the late summer in 2015, wildfires in Canada and the Pacific States had a big effect on concentrations of $PM_{2.5}$. The wildfires increased the design value levels by double or more from previous years at the sites located in the western half of the state. Smoke from the same wildfires had little effect on the design value concentrations in the eastern part of the state.

Table 9-2 – Statewide $PM_{2.5}$ 24-Hour Concentrations

Site	Yearly 98th Percentile	24-hour Design Value 2016	Attainment Status	Percent of the Standard
RC Library	2014 – 16.0 ug/m^3 2015 – 21.2 ug/m^3 2016 – 14.5 ug/m^3	17 ug/m^3	Yes	48%
RC Credit Union	2014 – 15.0 ug/m^3 2015 – 30.4 ug/m^3 2016 – 15.7 ug/m^3	20 ug/m^3	Yes	57%
Badlands	2014 – 11.4 ug/m^3 2015 – 23.3 ug/m^3 2016 – 8.6 ug/m^3	14 ug/m^3	Yes	40%
Pierre Airport	2015 – 15.4 ug/m^3 2016 – 10.9 ug/m^3	13 ug/m^3	[1]	37%
SD School	2014 – 22.8 ug/m^3 2015 – 21.6 ug/m^3 2016 – 15.4 ug/m^3	20 ug/m^3	Yes	57%
Aberdeen	2014 – 17.4 ug/m^3 2015 – 13.8 ug/m^3 2016 – 14.4 ug/m^3	15 ug/m^3	Yes	42%
Brookings Research Farm	2015 – 18.8 ug/m^3 2016 – 12.4 ug/m^3	19 ug/m^3	[1]	54%
Watertown	2014 – 15.3 ug/m^3 2015 – 18.2 ug/m^3	16 ug/m^3	Yes	45%

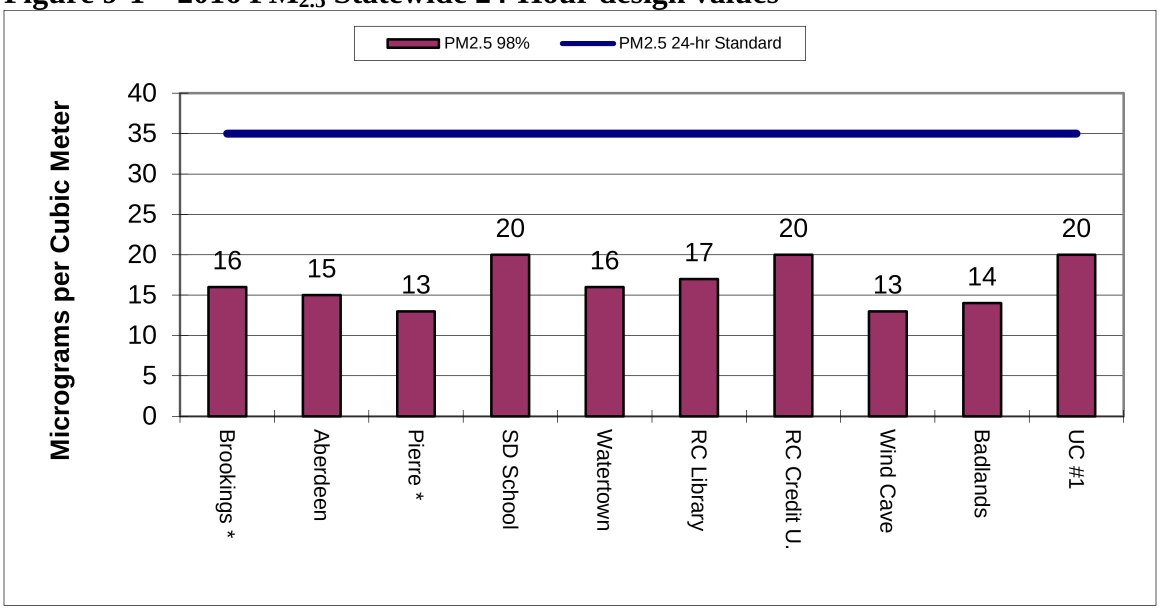
Site	Yearly 98th Percentile	24-hour Design Value 2016	Attainment Status	Percent of the Standard
	2016 – 13.4 ug/m^3			
Wind Cave	2014 – 7.1 ug/m^3 2015 – 21.3 ug/m^3 2016 – 9.7 ug/m^3	13 ug/m^3	Yes	37%
UC #1	2014 – 23.1ug/m^3 2015 – 19.9 ug/m^3 2016 – 17.3 ug/m^3	20 ug/m^3	Yes	57%

[1] – There is only two years of data available for the Pierre Airport and Brookings Research Farm sites. Based on two years of data, these two sites will attain the standard once three years of data is collected.

Figure 9-1 contains a graph of the 24-hour design values for each site. The highest design value in 2016 was recorded at the School for the Deaf site, the Rapid City Credit Union site and the Union County #1 site all with a concentration of 20 micrograms per cubic meter or 57% of the standard. The Wind Cave site and the Pierre Airport site had the lowest 24-hour design values for $PM_{2.5}$ at 13 micrograms per cubic meter. The monitoring sites had a mixed change with some decreasing and others staying the same in concentration levels with the addition of the 2016 data. All sites are attaining the 24-hour $PM_{2.5}$ standard.

The design values for both regions of the state vary by the same difference. In the east and the west halves of the state the sites are within 7 micrograms per cubic meter of each other.

Figure 9-1 – 2016 $PM_{2.5}$ Statewide 24-Hour design values



* - There is only two years of data available for the Pierre Airport and Brookings Research Farm sites.

In 2016, the Union County site had levels greater than the standard on two days. On both of these days the AirNow Tech maps showed smoke in the area. The remaining sites in the state had no exceedances of the standard in 2016.

When using the 98^{th} percentile standard one or two 24-hour $PM_{2.5}$ concentrations greater than the standard at a continuous monitoring site will not affect the 24-hour design value or the area attainment status because the 98^{th} percentile may be the 7^{th} or 8^{th} highest reading for the year. But these concentrations affect the annual design value and need to be considered when evaluating the data results for each year.

9.2.2 $PM_{2.5}$ Annual Standard

Table 9-3 contains a list of the annual averages, annual design values, attainment status, and percent of the standard for each of the $PM_{2.5}$ sites using the data from 2014 to 2016 in the state. The highest annual average concentration in 2016 was recorded at the School for the Deaf site at 6.5 micrograms per cubic meter. The second highest annual concentration was at the Rapid City Credit Union site with an annual average of 6.2 micrograms per cubic meter. The Wind Cave Site had the lowest annual average at 1.9 micrograms per cubic meter in 2016.

Table 9-3 – Statewide $PM_{2.5}$ Annual Concentrations

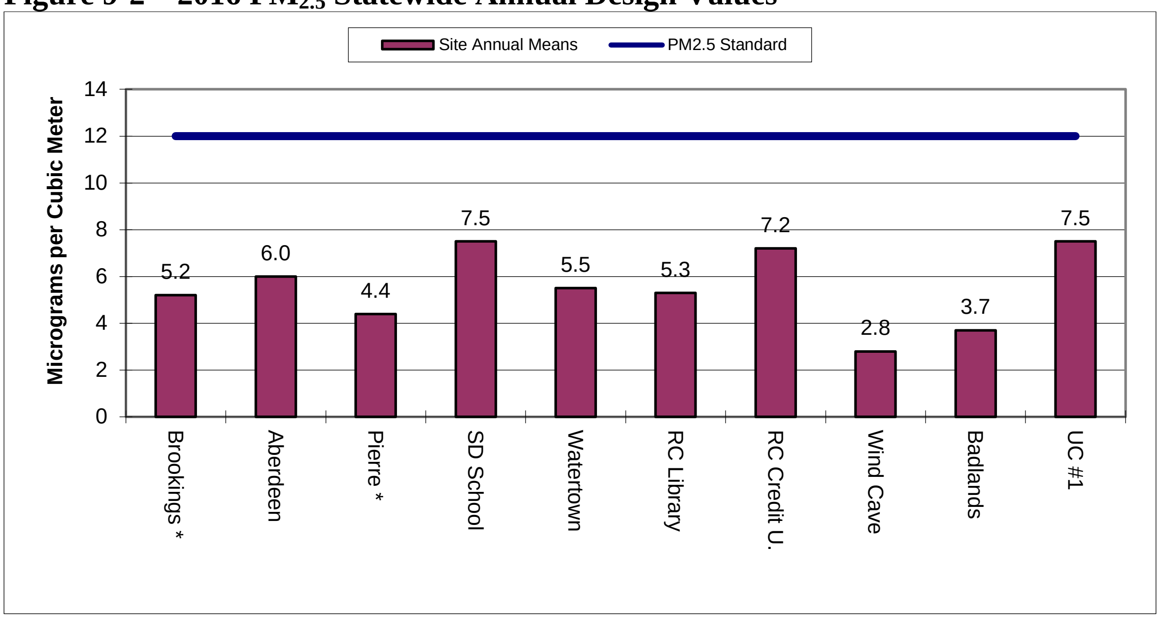
Site	Annual Averages	2016 Annual Design Values	Attainment Status	Percent of the Standard
RC Library	2014 – 5.8 ug/m^3 2015 – 5.6 ug/m^3 2016 – 4.9 ug/m^3	5.3 ug/m^3	Yes	44%
RC Credit Union	2014 – 4.5 ug/m^3 2015 – 9.5 ug/m^3 2016 – 6.2 ug/m^3	7.2 ug/m^3	Yes	60%
Badlands	2014 – 4.3 ug/m^3 2015 – 4.4 ug/m^3 2016 – 2.5 ug/m^3	3.7 ug/m^3	Yes	30%
Pierre Airport [1]	2015 – 4.5 ug/m^{3*} 2016 – 4.3ug/m^3	4.4 ug/m^{3*}	Yes	36%
SD School	2014 – 7.4 ug/m^3 2015 – 8.6 ug/m^3 2016 – 6.5 ug/m^3	7.5 ug/m^3	Yes	62%
Brookings Research Farm [1]	2015 – 5.9 ug/m^{3*} 2016 – 4.5 ug/m^3	5.2 ug/m^{3*}	Yes	43%
Aberdeen	2014 – 6.2 ug/m^3 2015 – 6.2 ug/m^3 2016 – 5.4 ug/m^3	6.0 ug/m^3	Yes	50%
Watertown	2014 – 4.5 ug/m^3 2015 – 7.0 ug/m^3 2016 – 5.1 ug/m^3	5.5 ug/m^3	Yes	45%
Wind Cave	2014 – 2.4 ug/m^3 2015 – 4.1 ug/m^3	2.8 ug/m^3	Yes	23%

Site	Annual Averages	2016 Annual Design Values	Attainment Status	Percent of the Standard
	2016 – 1.9 ug/m^3			
UC #1	2014 – 8.6 ug/m^3 2015 – 8.2 ug/m^3 2016 – 5.8 ug/m^3	7.5 ug/m^3	Yes	62%

[1] – There is only two years of data available for the Pierre Airport and Brookings Research Farm sites. Based on two years of data, these two sites will attain the standard once three years of data is collected.

Figure 9-2 contains a graph of the $PM_{2.5}$ annual average design value for each site. None of sites in the network had a 2016 design value that exceeded the annual $PM_{2.5}$ standard. The highest design values occur in the southeastern part of the state. The highest annual design value occurred at the School for the Deaf site and the Union County #1 site with levels of 7.5 micrograms per cubic meter which is 62% of the annual standard. The lowest $PM_{2.5}$ annual design value occurred at the Wind Cave site with a concentration of 2.8 micrograms per cubic meter which is 23% of the annual standard.

Figure 9-2 – 2016 $PM_{2.5}$ Statewide Annual Design Values



* - There is only one year of data available for the Pierre Airport and Brookings Research Farm sites.

9.3 Lead

During the early 1980's, the department conducted lead sampling. The levels detected were well below the National Ambient Air Quality Standards levels at that time. After passage of the 1990 Clean Air Act Amendments, there were concerns with the way EPA had instructed states in determining if those areas were in attainment of the lead standard. For this reason, a monitoring site was established in April 1992, at the Jaehn's Site in Rapid City to determine compliance with the standard. This site was downwind of GCC Dacotah, which is a cement plant that burns coal and has the potential to emit lead. The results of the analyzed data from the second quarter of 1992 through the first quarter of 1994 showed lead levels well below the National Ambient Air Quality Standards. Due to the low concentrations of lead in Rapid City, the sampling site was terminated at the end of the first quarter in 1994.

EPA changed the lead National Ambient Air Quality Standards on October 15, 2008. The change significantly lowered the lead standard from 1.5 micrograms per cubic meter to 0.15 micrograms per cubic meter based on the annual maximum three month rolling average. Attainment of the lead National Ambient Air Quality Standards is achieved if the annual maximum three month rolling average, averaged over a three year period, is less than or equal to 0.15 micrograms per cubic meter.

In 2010, EPA completed a rule change that requires source type testing in addition to network testing if a source has emissions of 0.5 tons or greater per year. The rule originally required lead testing at the National Core Site. The final rule required lead testing at the National Core Site only if the site is located in a city with a 500,000 and greater population. None of the facilities in the South Dakota emissions inventory have lead emissions at or greater than 0.5 tons per year so no source related testing is required at this time. The National Core site is located in Sioux Falls and the city has a population under 500,000 so no testing is required. Currently, there are no lead sampling sites planned for South Dakota because of the low potential for concentrations of lead pollution.

The lead sampling in the past and current emissions levels indicates that South Dakota is attaining the new lead standard.

9.4 Ozone

Ozone monitoring in South Dakota will continue to be one of the priority air pollutants because concentrations are getting close to the standard as EPA continues to lower the ozone standard. Ozone concentrations have not changed significantly in the state but the revisions of the standard brings the concentration closer to the state’s background levels.

In 1999, the first ozone monitor was setup in South Dakota and was located at the Sioux Falls Hilltop Site. In 2000, a second ozone monitor was added at the Robbinsdale Site in Rapid City. In 2005, the Rapid City ozone monitoring site was moved to the Rapid City Credit Union Site because of the planned move of the Robbinsdale sampling shelter to the Wind Cave Site.

In 2003, the National Parks Service added an ozone monitor to the Badlands Site, which is a Class I area. It is located in a shelter next to the Interagency Monitoring of Protected Visual Environments monitors near the park visitor center/headquarters.

In 2005, a fourth ozone site was added, at the Wind Cave Site. The Wind Cave Site was added to determine if a large increase in oil and gas production in Colorado, Wyoming and Montana would cause impacts on the Wind Cave National Park, which is a Class I area.

Air dispersion modeling results completed by the department showed the Rapid City Credit Union Site does not meet location requirements in Title 40 of the Code of Federal Regulations Part 58 because it is located in the middle of the one microgram impact area for Nitrogen Dioxide emissions from industrial sources in Rapid City. Nitrogen Dioxide emissions artificially lower ozone levels for a short distance from the source so concentrations will not reflect the actual area levels. Because of the Nitrogen Dioxide emissions the ozone analyzer was moved from the Rapid City Credit Union Site to the Black Hawk Site in 2007.

Beginning in 2008, the Hilltop Site had to be moved and a new location was found at the School for the Deaf campus. The move to a new location was required because the city of Sioux Falls had to revert the Hilltop property back to the original owner when the water tower system was replaced ending the agreement to use the property.

In 2008, a fifth site was added, north of Brookings at the Research Farm. The site was setup and operated in cooperation with the 3M Company and Valero Renewable Fuels Company as part of the issuance of a Prevention of Significant Deterioration permit.

In 2008, EPA adopted a new ozone standard at 0.075 parts per million. The form of the standard remained as the fourth highest, daily 8-hour average, averaged over three years (ozone design value). In 2011, EPA implemented the 0.075 parts per million standard. EPA completed a 5-year review of the ozone standard and in 2015 the standard was further lowered to 0.070 parts per million.

In 2009, because of an application for a Prevention of Significant Deterioration permit a sixth site was added, in the area of the proposed project in Union County, the Union County #3 Site. After the permit expired with no renewal, the department closed the Union County #3 Site and moved the ozone analyzer to the Union County #1 Site.

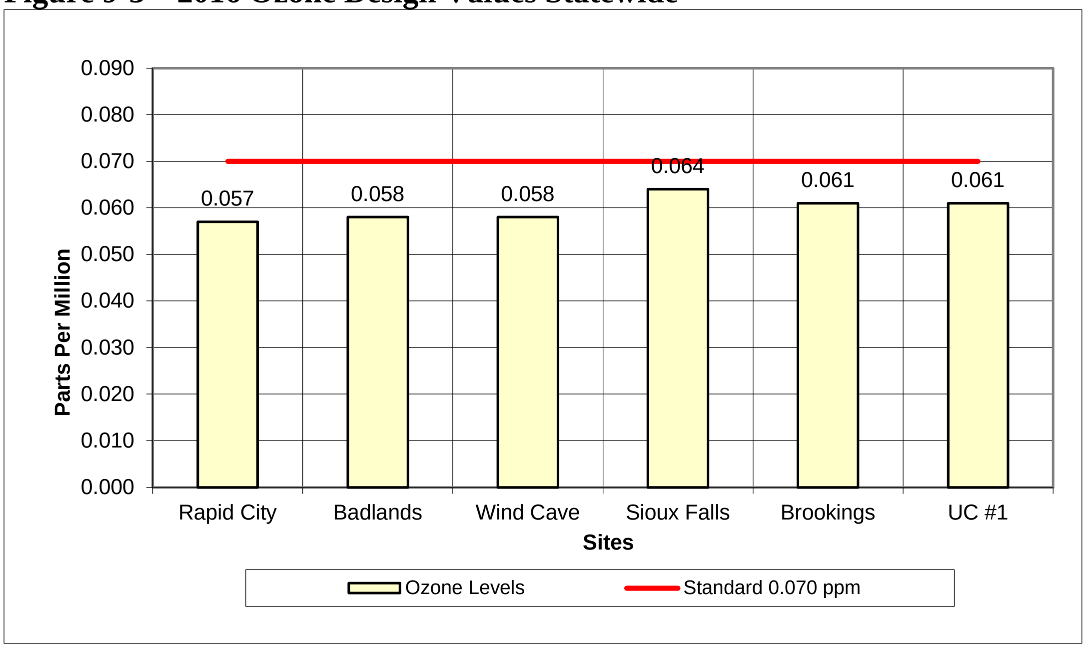
The 4^{th} highest concentration for each year, 2016 design value in parts per million, attainment status, and percent of the standard for each of the sites can be seen in Table 9-4 and the 2016 design value is summarized in Figure 9-3. In 2016, the School for the Deaf Site had the highest 3-year average ozone concentrations in the state at 0.064 parts per million, which is 91% of the 2015 revised ozone standard. The School for the Deaf Site continues to be the highest ozone highest concentration site in the state since 2010. The second highest locations were the Brookings Research Farm and the Union County #1 sites both at 0.061 parts per million also located in the eastern edge of the state. The Black Hawk site is reporting the lowest ozone design values all with 0.057 parts per million. Ozone concentrations had a lower 3-year average design value at all the sites.

Table 9-4 – Statewide Ozone 4^{th} highest Concentrations

Site	4^{th} Highest Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
SD School	2014 – 0.066 ppm 2015 – 0.061 ppm 2016 – 0.066 ppm	0.064 ppm	Yes	91%
Brookings	2014 – 0.061 ppm			

Site	4th Highest Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
Research Farm	2015 – 0.063 ppm 2016 – 0.061 ppm	0.061 ppm	Yes	87%
Black Hawk	2014 – 0.056 ppm 2015 – 0.059 ppm 2016 – 0.058 ppm	0.057 ppm	Yes	81%
Badlands	2014 – 0.057 ppm 2015 – 0.057 ppm 2016 – 0.060 ppm	0.058 ppm	Yes	82%
Wind Cave	2014 – 0.057 ppm 2015 – 0.059 ppm 2016 – 0.060 ppm	0.058 ppm	Yes	82%
UC #1	2014 – 0.062 ppm 2015 – 0.061 ppm 2016 – 0.060 ppm	0.061 ppm	Yes	87%

Figure 9-3 – 2016 Ozone Design Values Statewide



The data collected in the past three years demonstrates that South Dakota is attaining the national ozone standard but the sites located in the eastern part of the state are close to the new 2015 ozone standard.

9.5 Sulfur Dioxide

Concentrations of Sulfur Dioxide are low in the state where the department believes the greatest Sulfur Dioxide concentrations should occur and the probability of exceeding the standard is very

low. Based on the data collected statewide, testing for this parameter should remain a low priority.
Four Sulfur Dioxide ambient air monitoring sites were operated in 2016. The analyzers were located at School for the Deaf, Badlands, Rapid City Credit Union, and Union County #1 sites. EPA made a major change to the Sulfur Dioxide standard in 2009 replacing the 24-hour and annual primary standard with a new 1-hour standard. The 1-hour Sulfur Dioxide standard concentration is 75 parts per billion based on the three year average of the yearly 99th percentile level (1-hour design value).

9.5.1 Sulfur Dioxide 1-Hour Standard

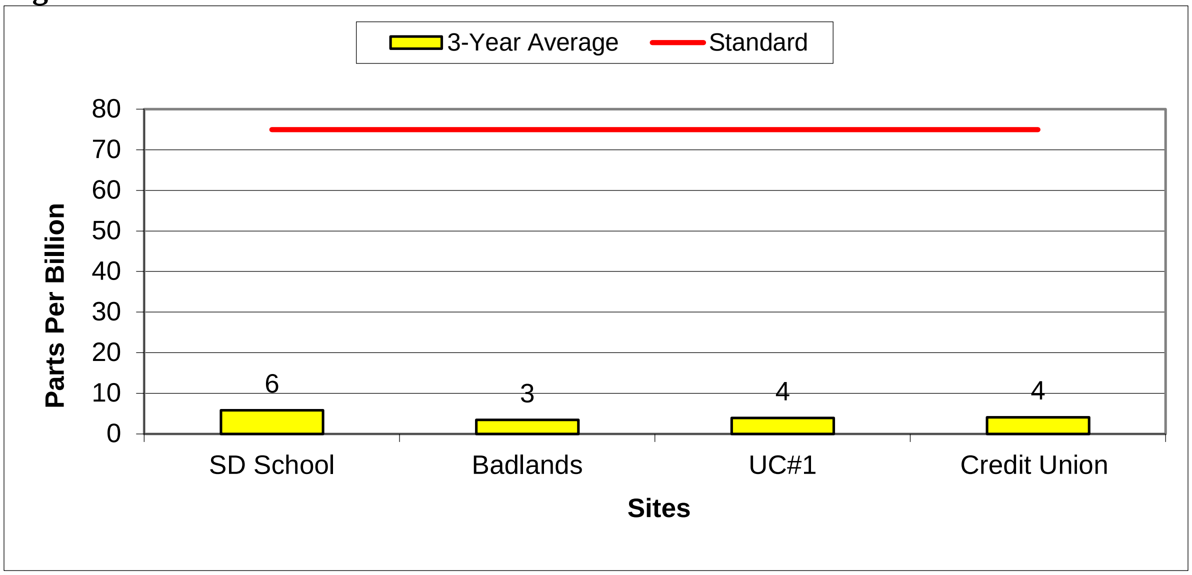
Table 9-5 contains the yearly 99th percentile concentration, the 3-year average 1-hour design value, the attainment status, and percent of the standard for each site. The site Sulfur Dioxide design values are based on Sulfur Dioxide data collected in 2014 to 2016. The highest 99th percentile 1-hour level in 2016 was recorded at the School for the Deaf site with 4 parts per billion.

Table 9-5 – 2016 Statewide Sulfur Dioxide 1-hour Design Values

Site	99th Percentile Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
SD School	2014 – 11 ppb 2015 – 3 ppb 2016 – 4 ppb	6 ppb	Yes	8%
RC Credit Union	2014 – 7 ppb 2015 – 5 ppb 2016 – 1 ppb	4 ppb	Yes	5%
Badlands	2014 – 2 ppb 2015 – 7 ppb 2016 – 2 ppb	3 ppb	Yes	4%
UC #1	2014 – 4 ppb 2015 – 5 ppb 2016 – 3 ppb	4 ppb	Yes	5%

Figure 9-4 shows the three year average of the yearly 99th percentile or design value for the 1-hour concentration for each of the sites in the network for 2016. All four of the sites recorded concentrations well under the 1-hour standard. The highest 1-hour design value was recorded at the School for the Deaf site with a maximum concentration of 6 parts per billion which is 8% of the standard. The second highest was recorded at the Union County #1 and Rapid City Credit Union sites with a concentration of 4 parts per billion which is 5% of the standard. All of the sites are within 3 parts per billion of each other, so all are well under the current standard. The data collected in the past three years demonstrates that South Dakota is attaining the new 1-hour Sulfur Dioxide standard.

Figure 9-4 – 2016 Sulfur Dioxide 1-Hour Concentrations



9.5.2 Sulfur Dioxide 3-Hour Secondary Standard

The secondary Sulfur Dioxide standard is based on a 3-hour average concentration of 0.500 parts per million, not to be exceeded more than once per year. The EPA Air Quality Systems does not calculate the yearly 3-hour average so a comparison could not be made to the secondary standard for Sulfur Dioxide. South Dakota has very low levels of Sulfur Dioxide at the four monitoring sites. Therefore, the department has opted to use the maximum 1-hour concentrations as a comparison for the 3-hour standard for Sulfur Dioxide. If the maximum 1-hour average does not exceed the secondary standard there should not be an issue with attainment.

The highest 1-hour average concentration was recorded at the Union County #1 site at 0.006 parts per million which is 1.2% of the Sulfur Dioxide secondary standard. All four sites are attaining the secondary standard for Sulfur Dioxide.

9.6 Nitrogen Dioxide

Beginning in 2010, the standard for Nitrogen Dioxide was revised by adding a 1-hour standard of 100 parts per billion and keeping the annual arithmetic mean standard of 53 parts per billion. Attainment is demonstrated when the 3-year average of 98th percentile daily maximum 1-hour concentration is less than or equal to 100 parts per billion (1-hour design value) and the annual arithmetic mean is less than or equal to 53 parts per billion (annual design value).

There were four Nitrogen Dioxide ambient air monitoring sites operated in 2016. The sampling locations were at the School for the Deaf, Badlands, Rapid City Credit Union, and Union County #1 sites.

Levels of Nitrogen Dioxide remain low in the state. Rural sites like Badlands remain well below the standard. Future priority locations for testing will include one year of testing for current background levels and multiple years of testing near major sources of Nitrogen Dioxide emissions for compliance with the national standards.

9.6.1 Nitrogen Dioxide 1-Hour Standard

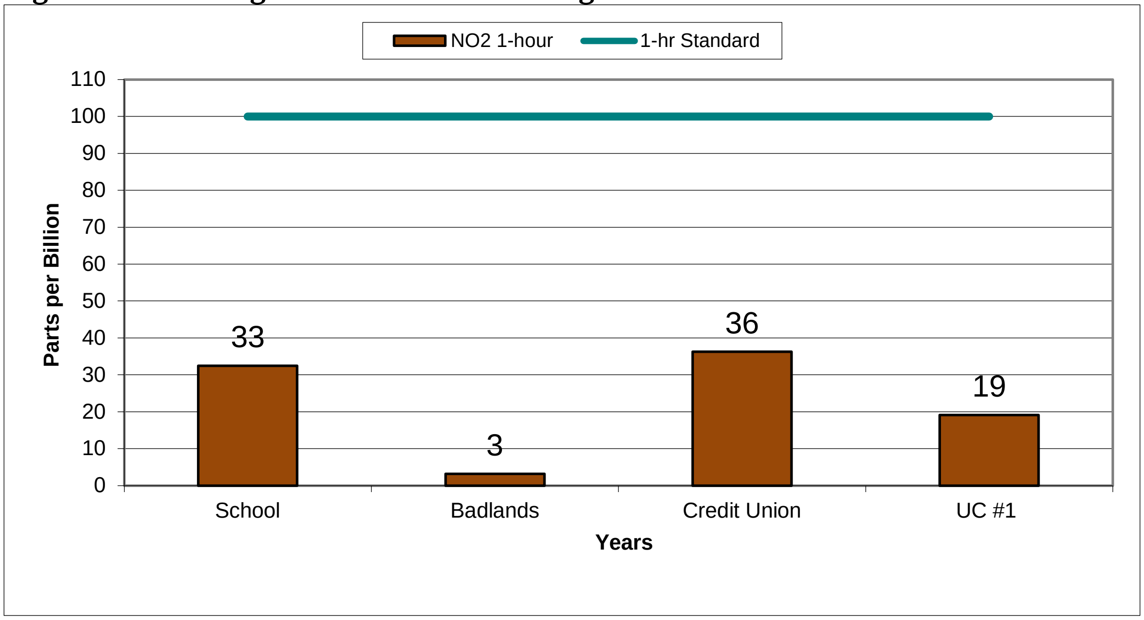
Table 9-6 contains the 1-hour 98th percentile concentration for each of the last three years, 1-hour design values, the attainment status, and the percent of the standard for each site. The Rapid City Credit Union Site had the highest yearly 98th percentile 1-hour concentration at 37.6 parts per billion. The second highest 1-hour concentration for 2016 was recorded at the School for the Deaf Site at 34.5 parts per billion.

Table 9-6 – Nitrogen Dioxide 1-Hour 98th Percentile Concentrations

Site	98th Percentile Concentration	3-year Average Design Values	Attainment Status	Percent of the Standard
SD School	2014 – 33.3 ppb 2015 – 29.7 ppb 2016 – 34.5 ppb	33 ppb	Yes	33%
Badlands	2014 – 3.3 ppb 2015 – 2.7 ppb 2016 – 3.5 ppb	3 ppb	Yes	3%
RC Credit Union	2014 – 33.8 ppb 2015 – 37.3 ppb 2016 – 37.6 ppb	36 ppb	Yes	36%
UC #1	2014 – 20.7 ppb 2015 – 20.6 ppb 2016 – 16.1 ppb	19 ppb	Yes	19%

Figure 9-5 shows the Nitrogen Dioxide 1-hour design values for each of the sites with three years of data. The Rapid City Credit Union Site had the highest concentration at 36 parts per billion or 36% of the standard. The School for the Deaf Site recorded the 2nd highest 1-hour Nitrogen Dioxide design value at 33 parts per billion or 33% of the standard. In general the rural areas with background levels have concentrations near the detection level. Rural areas impacted by a large source of Nitrogen Dioxide emissions like at Union County #1 recorded higher concentrations than background sites but the levels are still well under the standard. All sites had concentrations under the 1-hour Nitrogen Dioxide standard and are attaining the standard using data from 2014 to 2016.

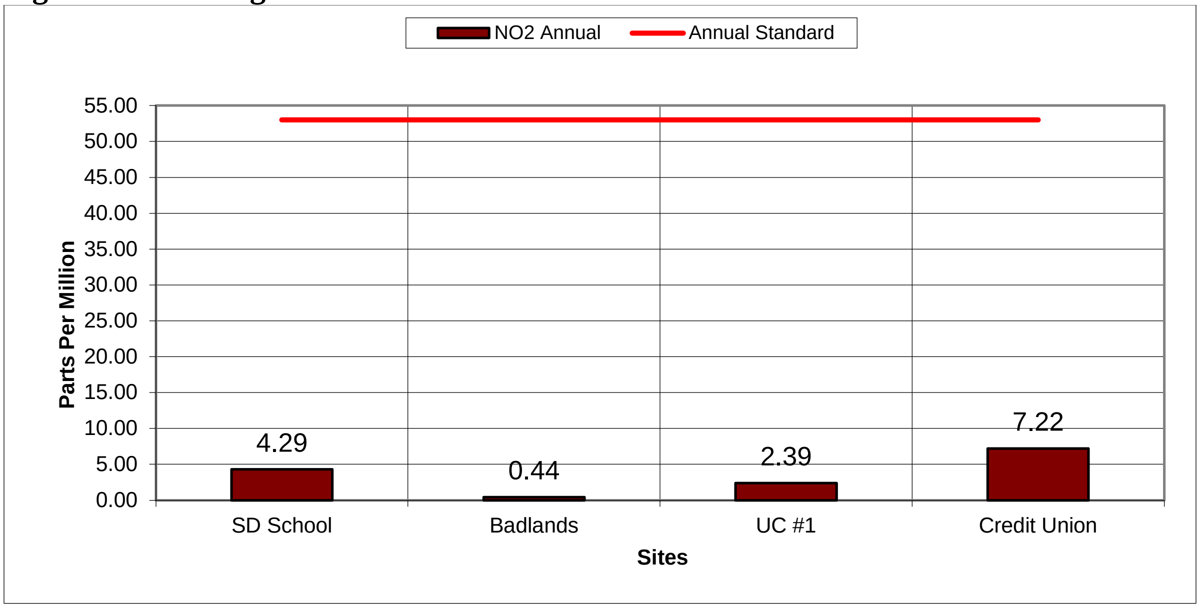
Figure 9-5 – Nitrogen Dioxide 1-hour Design Values 2016



9.6.2 Nitrogen Dioxide Annual Standard

Figure 9-6 shows the annual average for the four sites operated in 2016. The highest Nitrogen Dioxide annual average was recorded at the Rapid City Credit Union Site at 7.22 parts per billion. The Badlands Site remained at about same level near the detection level for the sampling method. In 2016, all four sites attained the annual standard for Nitrogen Dioxide.

Figure 9-6 – Nitrogen Dioxide Annual Concentration 2016



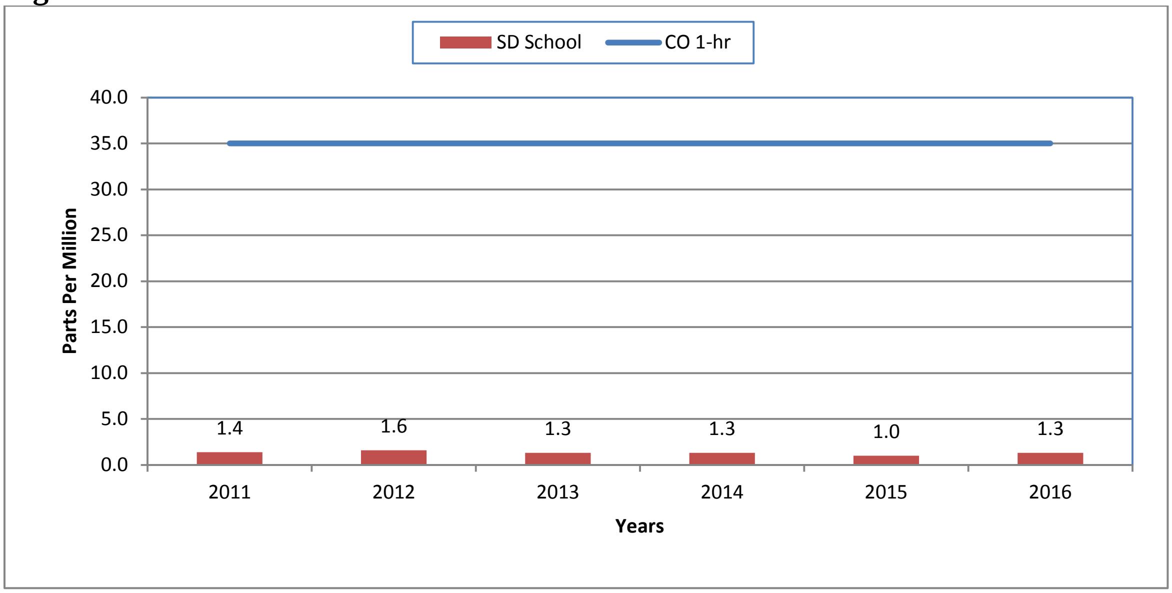
9.7 Carbon Monoxide

Carbon Monoxide testing has a low priority in South Dakota. South Dakota's low population and traffic numbers on the state's roads keep the potential very low for concentrations near or over the standard.

The Carbon Monoxide standard is based on two primary standards in the form of a one-hour and an 8-hour average concentration. The department started the operation of the first Carbon Monoxide analyzer in January of 2010 at Union County #1 Site in Union County. A second analyzer was added, to the School for the Deaf Site as required by the National Core sampling requirements and began testing at the start of 2011. Three years of testing show low concentrations at the Union County #1 Site, so testing for Carbon Monoxide ended in 2013.

The one-hour standard is 35.0 parts per million and is not to be exceeded more than once per year. The highest 1-hour concentration of Carbon Monoxide recorded at the School for the Deaf Site was 1.3 parts per million in 2016. Figure 9-7 shows the Carbon Monoxide 1-hour maximum concentrations for the School for the Deaf Site from 2011 through 2016. The Carbon Monoxide concentrations are very low. The Carbon Monoxide data shows the area is attaining the 1-hour National Ambient Air Quality Standards.

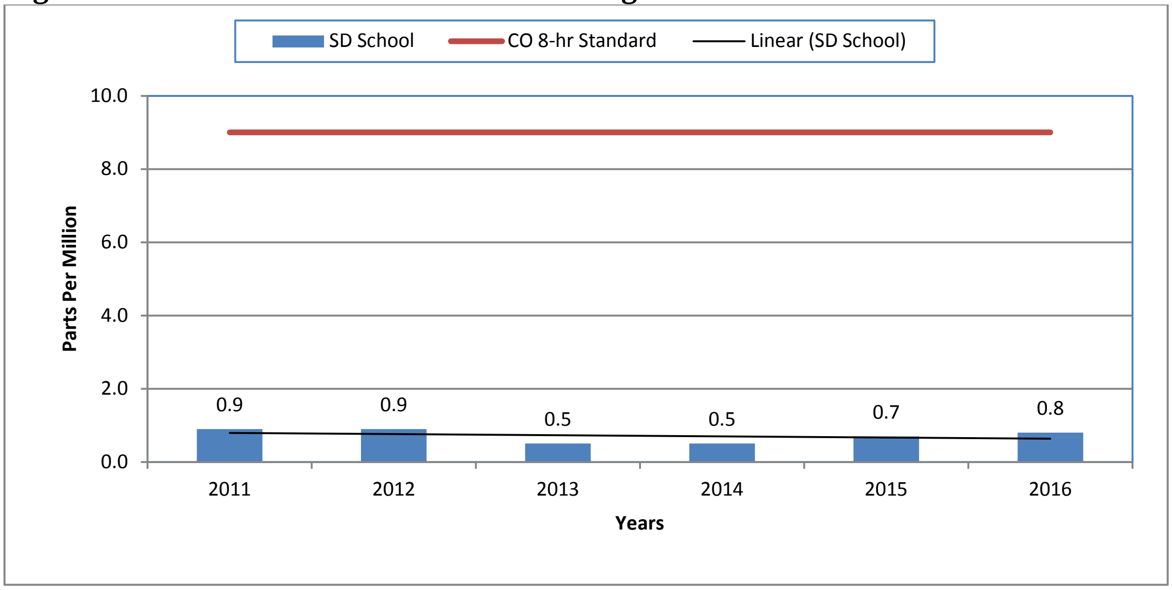
Figure 9-7 - Carbon Monoxide 1-Hour Concentration 2016



The other standard is an 8-hour average concentration of 9.0 parts per million, not to be exceeded more than once per year. The highest 8-hour average recorded at the School for the Deaf Site was 0.8 parts per million in 2016. The Carbon Monoxide concentrations are very low so the area is attaining the National Ambient Air Quality Standards. Figure 9-8 shows the Carbon Monoxide maximum 8-hour average concentrations from the School for the Deaf Site from 2011 to 2016.

The Carbon Monoxide concentrations at the School for the Deaf Site represent urban areas being collected in an area that has some of the highest traffic counts in the state. Future sampling may be limited to the collection of a year of data to determine background and population exposure.

Figure 9-8 - Carbon Monoxide 8-Hour Average Concentration 2016



9.8 2016 High Concentrations Summary

Evaluating high concentration days are important because they affect the design values and need to be considered when evaluating the data results for each year. A conceptual theory on what caused the high concentrations can be formed and further developed in future years. In some cases, if local sources are causing the problem, early actions can be taken to reduce concentration levels and further protect public health from high levels. As EPA revises the national standards lower, information on the cause of the high concentration day needs to be collected soon after the event instead of three years after a standard revision. In some cases, the information may show long range transport or an exceptional event.

The department defined high concentration days as days where the concentration was 90% or greater than the applicable standard. The evaluation of high concentration day for each parameter is as follows:

1. Ozone $\geq$ 0.063 parts per million, 8-hour average;
2. $PM_{2.5} \geq$ 32 micrograms per cubic meter, 24-hour average;
3. $PM_{2.5} \geq$ 10.8 ug/ m^3, annual average;
4. $PM_{10} \geq$ 135 ug/ m^3, 24-hour average;
5. Nitrogen Dioxide $\geq$ 90.0 parts per billion, 1-hour maximum;
6. Sulfer Dioxide $\geq$ 67.0 parts per billion, 1-hour maximum;
7. Carbon Monoxide $\geq$ 8.1 parts per million, 8-hour average; and

8. Carbon Monoxide $\geq$ 31.5 parts per million 1-hour maximum.

A review of the data showed no high concentrations days at the following sites in 2016: Aberdeen, Badlands, Black Hawk, Pierre, Rapid City Library, and Watertown. None of the recorded samples at any of the locations throughout the state for $PM_{2.5}$ (annual), Sulfur Dioxide, Nitrogen Dioxide, and Carbon Monoxide (1-hour or 8-hour) had levels that exceeded the high concentration day listed above for these pollutants.

9.8.1 $PM_{2.5}$ High Concentration Days

In 2016, $PM_{2.5}$ (24-hour) had three high concentration days. There was one at Wind Cave and two in Union County. There was one at both Wind Cave and Union County in April and one at Union County in May. We could not find any local sources to explain the high concentrations, but smoke plumes were indicated on all three days. The high $PM_{2.5}$ (24-hour) readings are shown in Table 9-7.

Table 9-7 – 2016 High $PM_{2.5}$ Readings

Site	Monitor	Date	Concentration (ug/m^3)
Wind Cave	Continuous	4/3/16	32.2
UC #1	Continuous	4/13/16	38.2
UC #1	Continuous	5/7/16	40.0

Figures 9-9 to 9-14 show the AirNow and AirNow Tech maps for the days having high $PM_{2.5}$ readings. The AirNow Tech maps show smoke plumes in the areas all three days.

Figure 9-9 – AirNow Map for 4/3/16

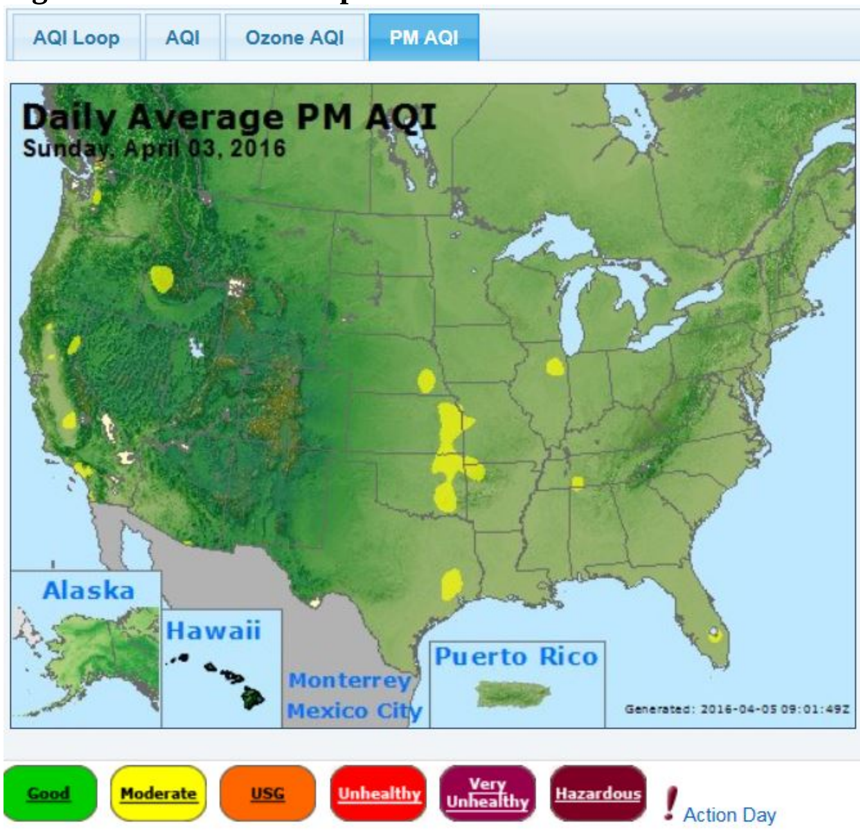


Figure 9-10 – AirNow Tech Map for 4/3/2016

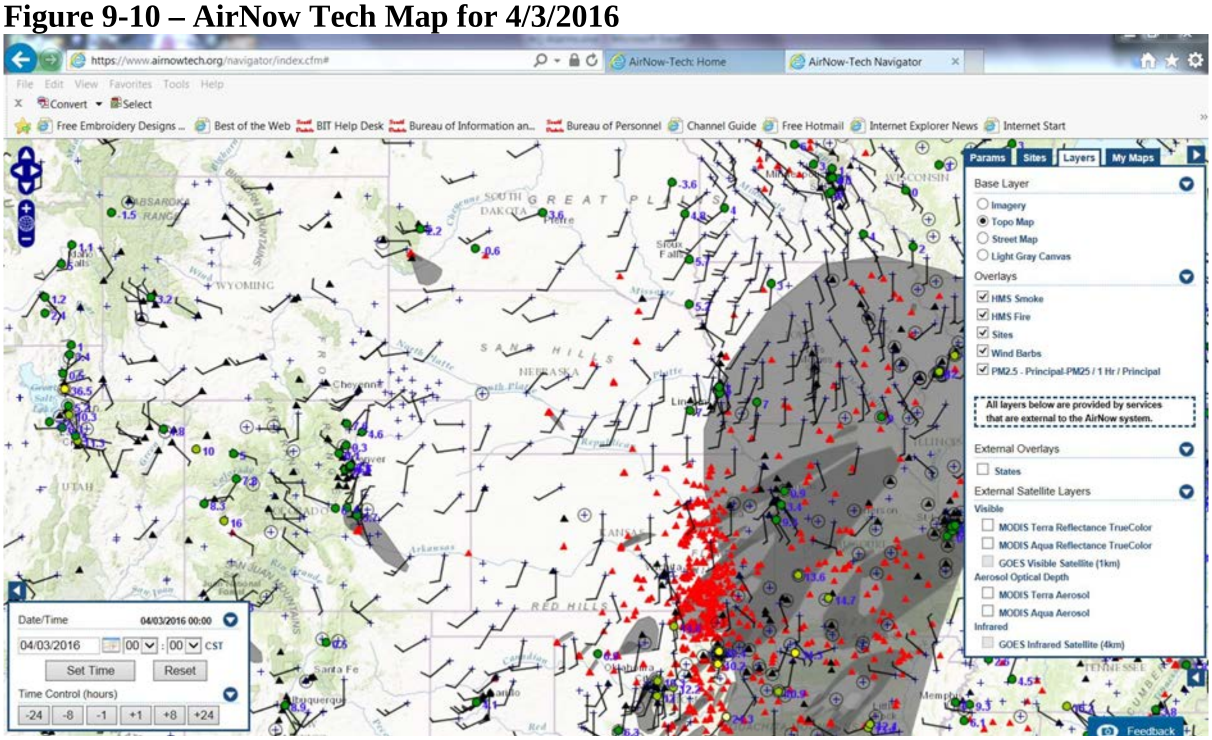


Figure 9-11 – AirNow Map for 4/13/16

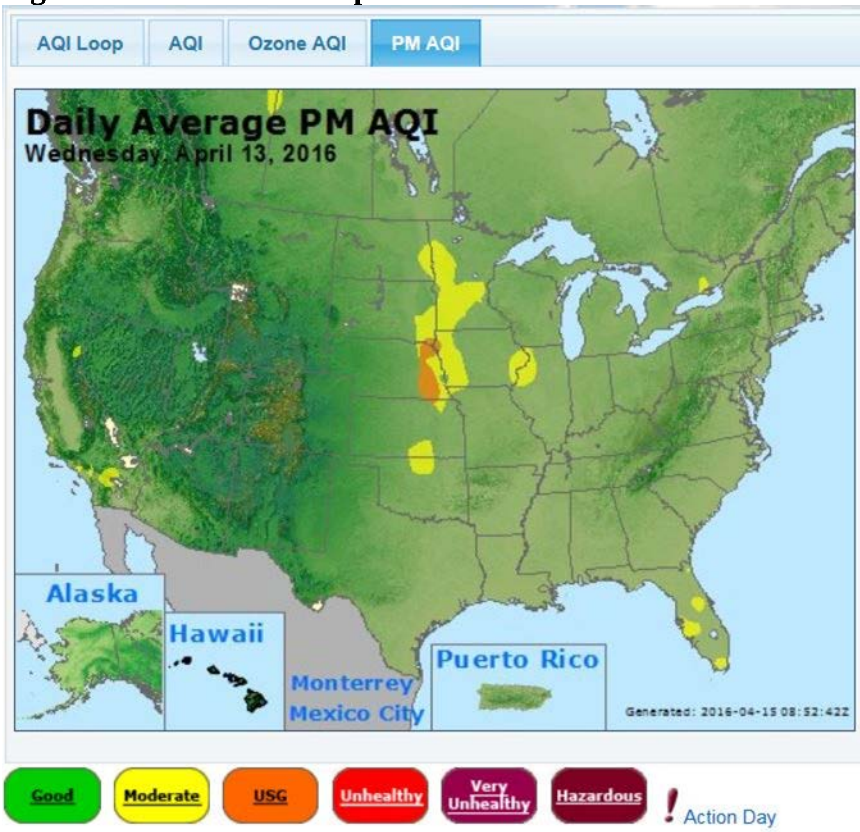


Figure 9-12 – AirNow Tech Map for 4/13/16

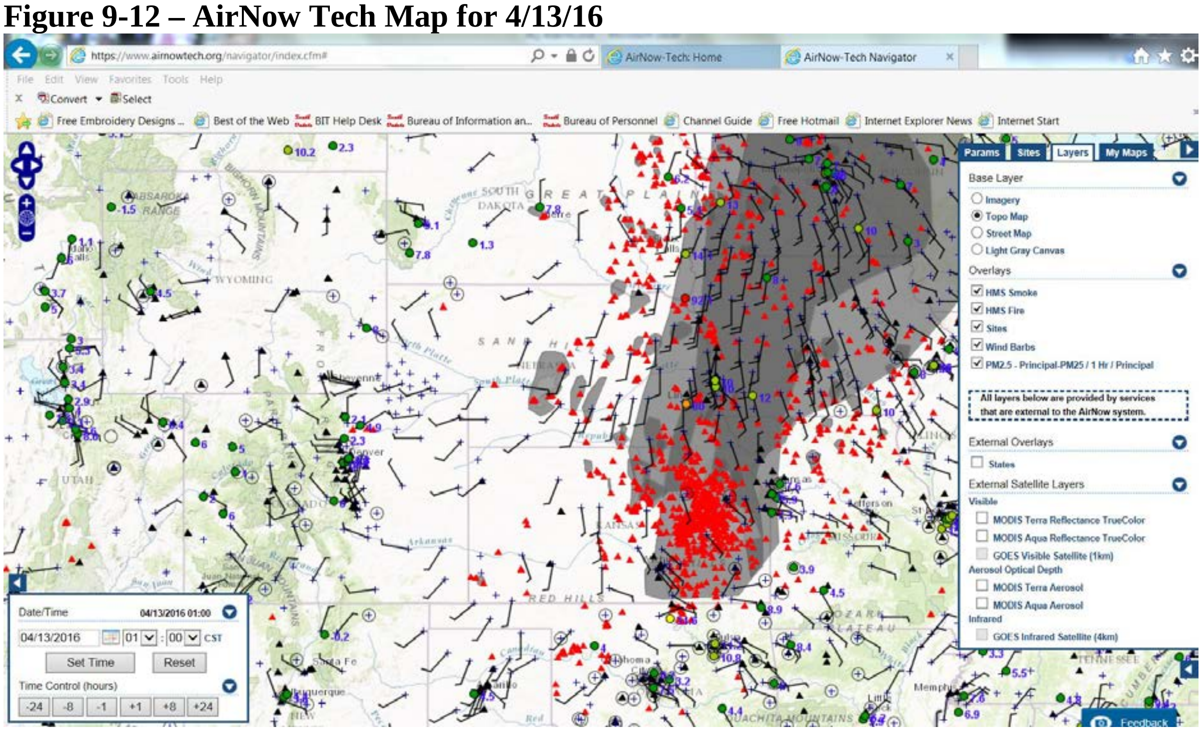


Figure 9-13 – AirNow Map for 5/7/16

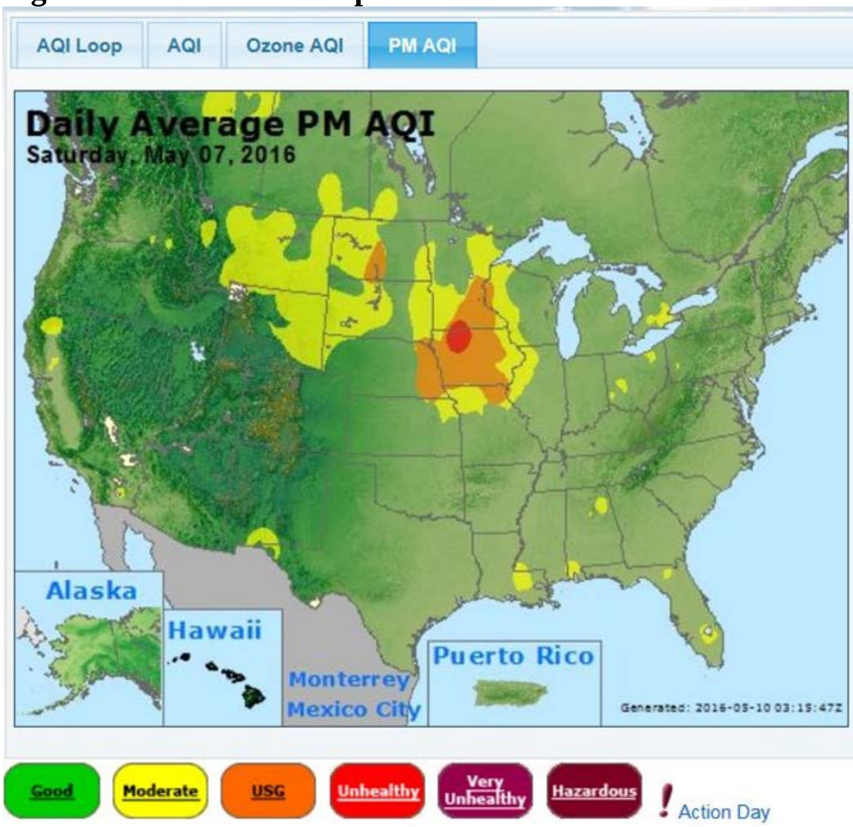
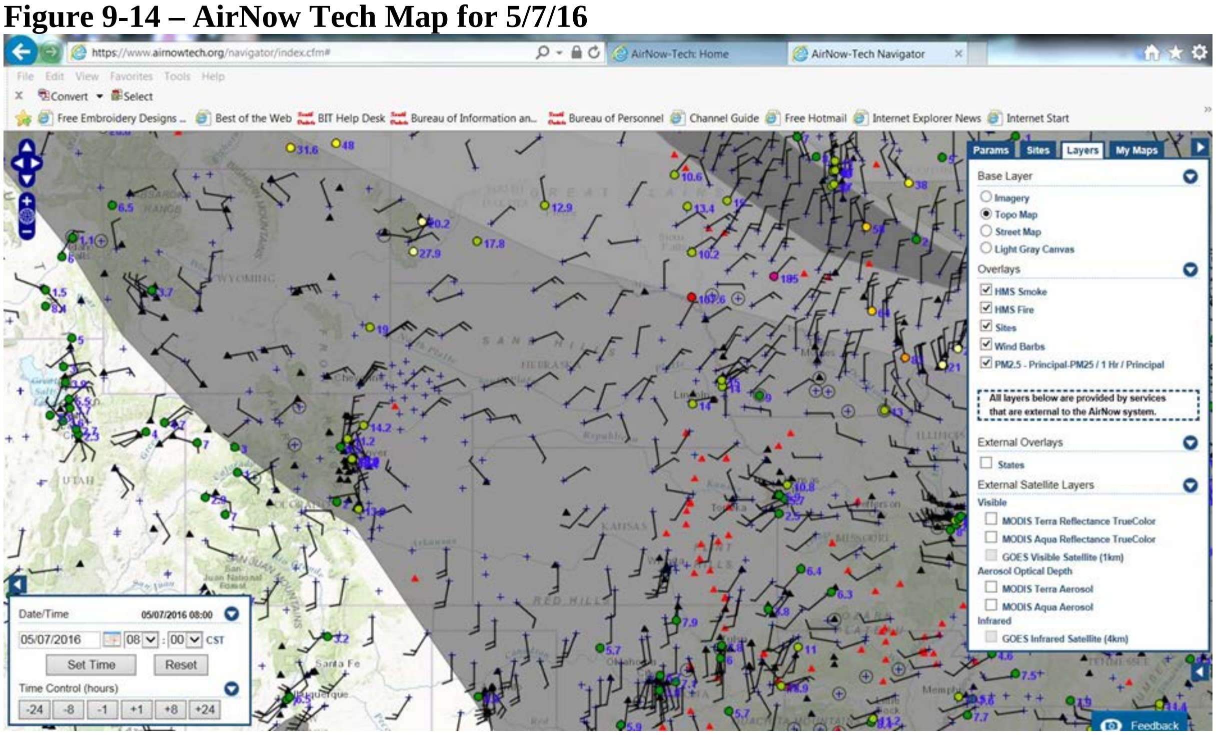


Figure 9-14 – AirNow Tech Map for 5/7/16



9.8.1 PM_{10} High Concentration Days

During 2016, there was one high concentration day for PM_{10}. The high concentration day occurred at the Rapid City Credit Union Site with a 24-hour average of 155 micrograms per cubic meter. No local sources could be identified, but the AirNow Tech maps indicate there was smoke in the area. Figures 9-15 and 9-16 show the AirNow and AirNow Tech maps for the high concentration day.

Figure 9-15 - AirNow Map for 5/6/16

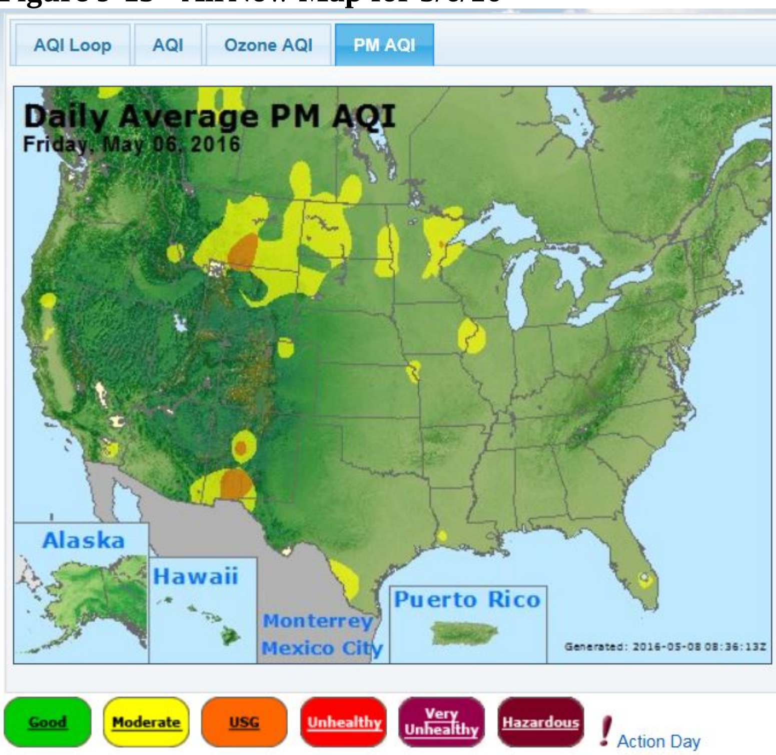
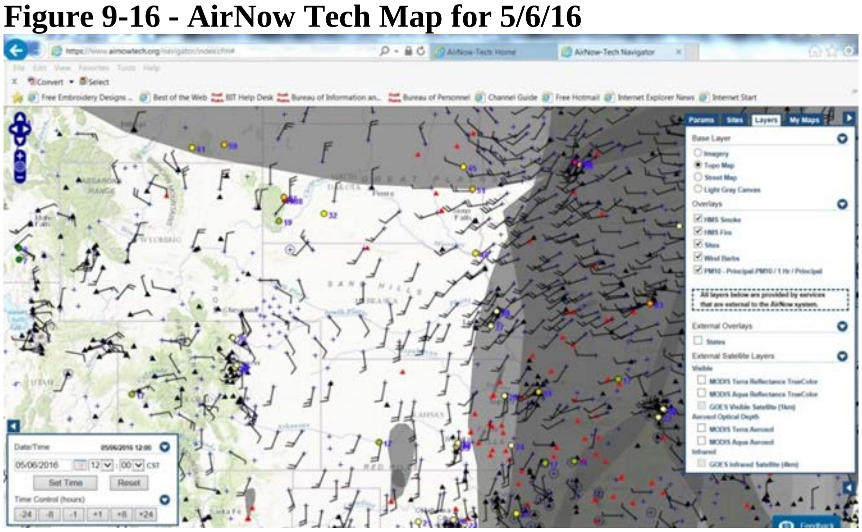


Figure 9-16 - AirNow Tech Map for 5/6/16



9.8.2 Ozone High Concentration Days

During 2016, there were nine high concentration days for ozone and all but one were at sites on the eastern part of the state (Table 9-8). The highest concentration day occurred June 9th at the School for the Deaf Site in Sioux Falls with an 8-hour average of 0.072 parts per million. The Brookings Research Farm Site and the Union County Site also had high concentrations that day. Figures 9-17 through 9-34 show the AirNow and AirNow Tech maps for the days with a high ozone concentration. We could not identify that local sources were the cause, in most cases, the maps again show smoke plumes in the area.

Table 9-8 - 2015 High Ozone Readings

Monitor	Date	Concentration (ug/m^3)
SD School	4/14/16	0.064
Wind Cave	4/23/16	0.067
SD School	5/30/16	0.064
SD School	6/8/16	0.065
SD School	6/9/16	0.072
Brookings Research Farm	6/9/16	0.071
UC #1	6/9/16	0.064
SD School	6/10/16	0.071
UC #1	6/10/16	0.063
SD School	6/11/16	0.070
SD School	6/17/16	0.063
SD School	6/19/16	0.066

Figure 9-17 - AirNow Map for 4/14/16

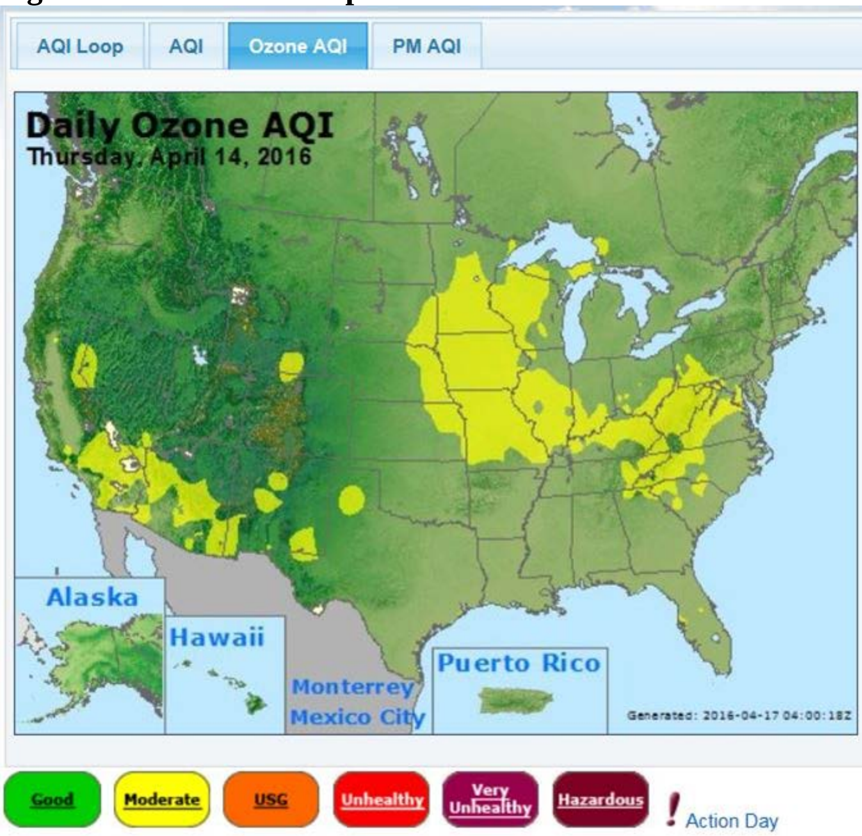


Figure 9-18 - AirNow Tech Map for 4/14/16

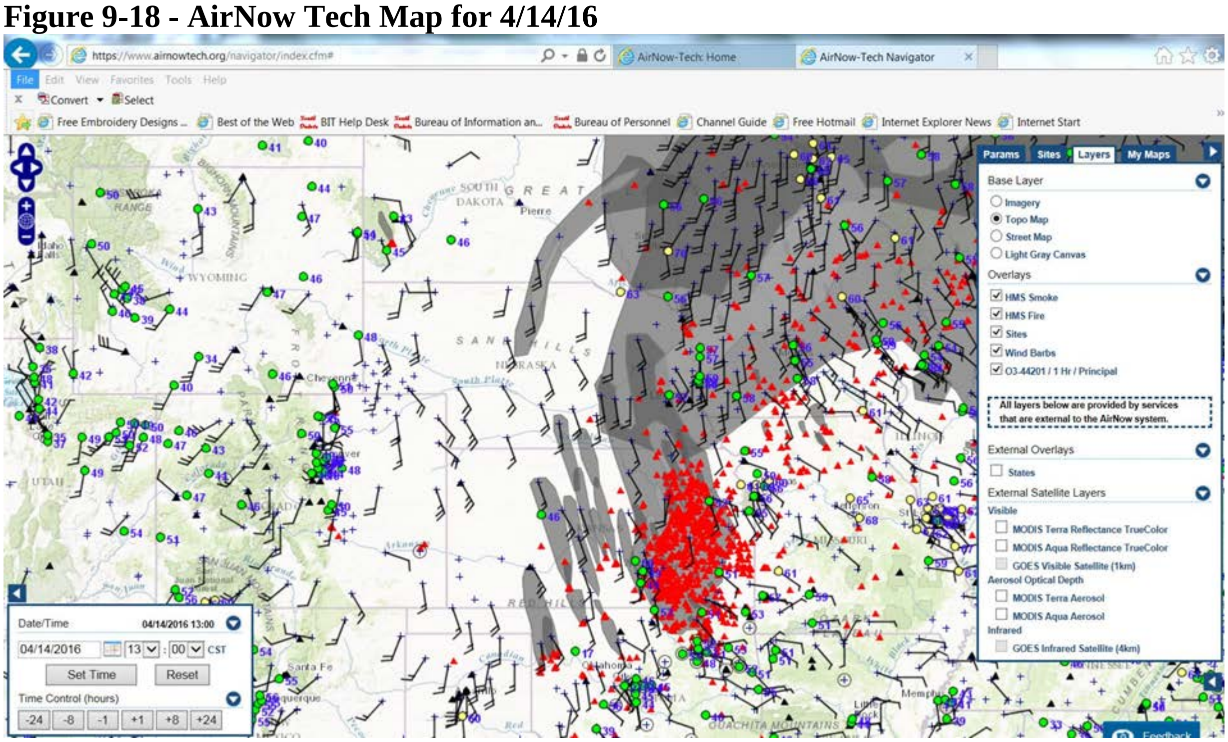


Figure 9-19 - AirNow Map for 4/23/16

Figure 9-20 - AirNow Tech Map for 4/23/16

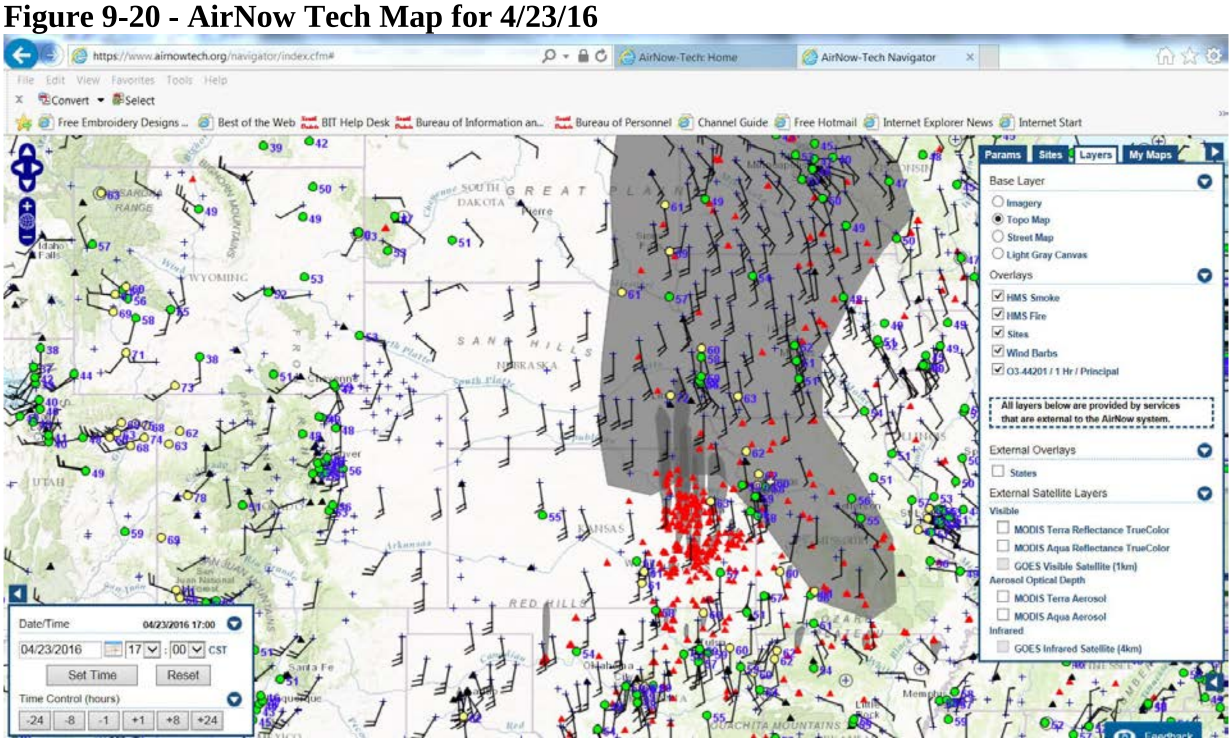


Figure 9-21 - AirNow Map for 5/30/16

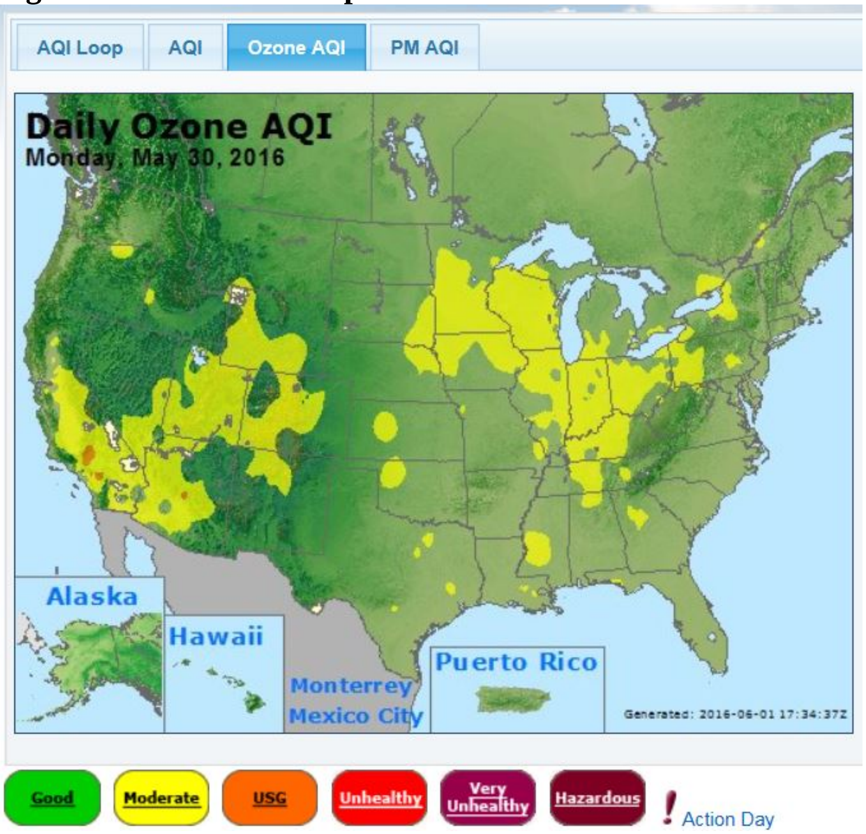


Figure 9-22 - AirNow Tech Map for 5/30/16

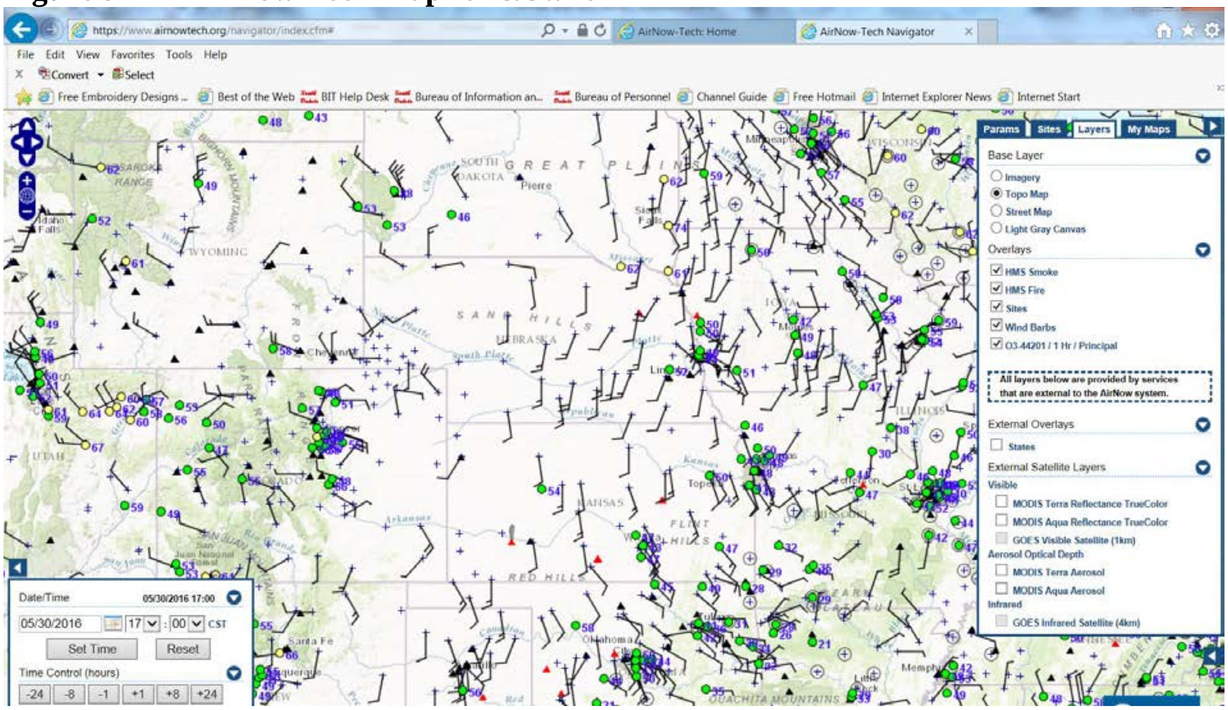


Figure 9-23 - AirNow Map for 6/8/16

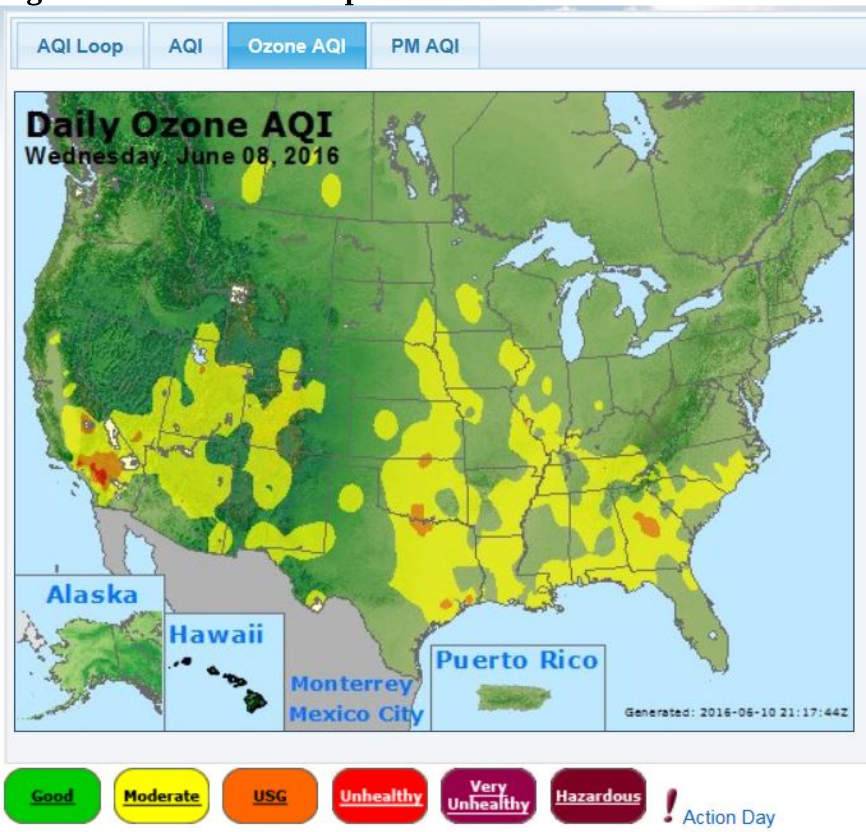


Figure 9-24 - AirNow Tech Map for 6/8/16

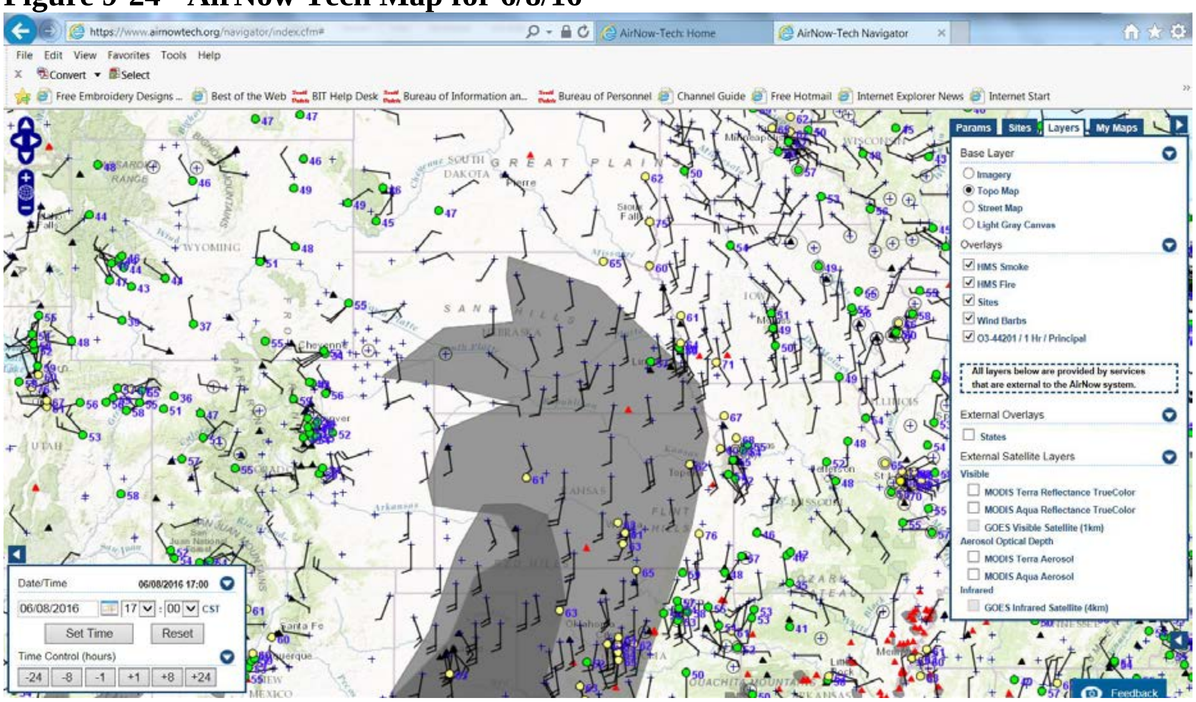


Figure 9-25 - AirNow Map for 6/9/16

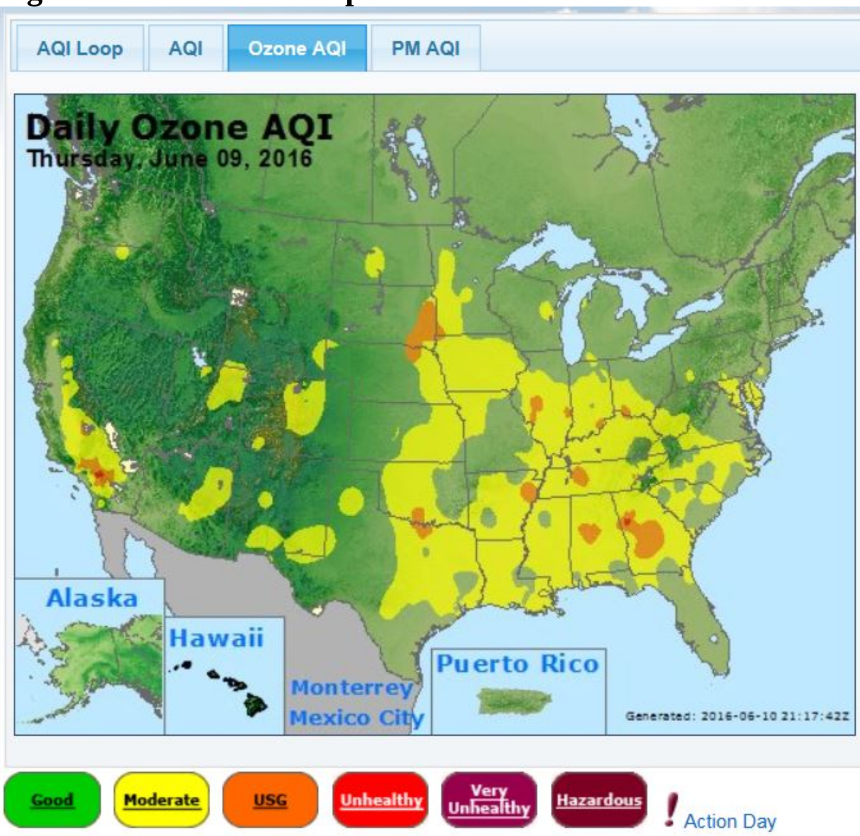


Figure 9-26 - AirNow Tech Map for 6/9/16

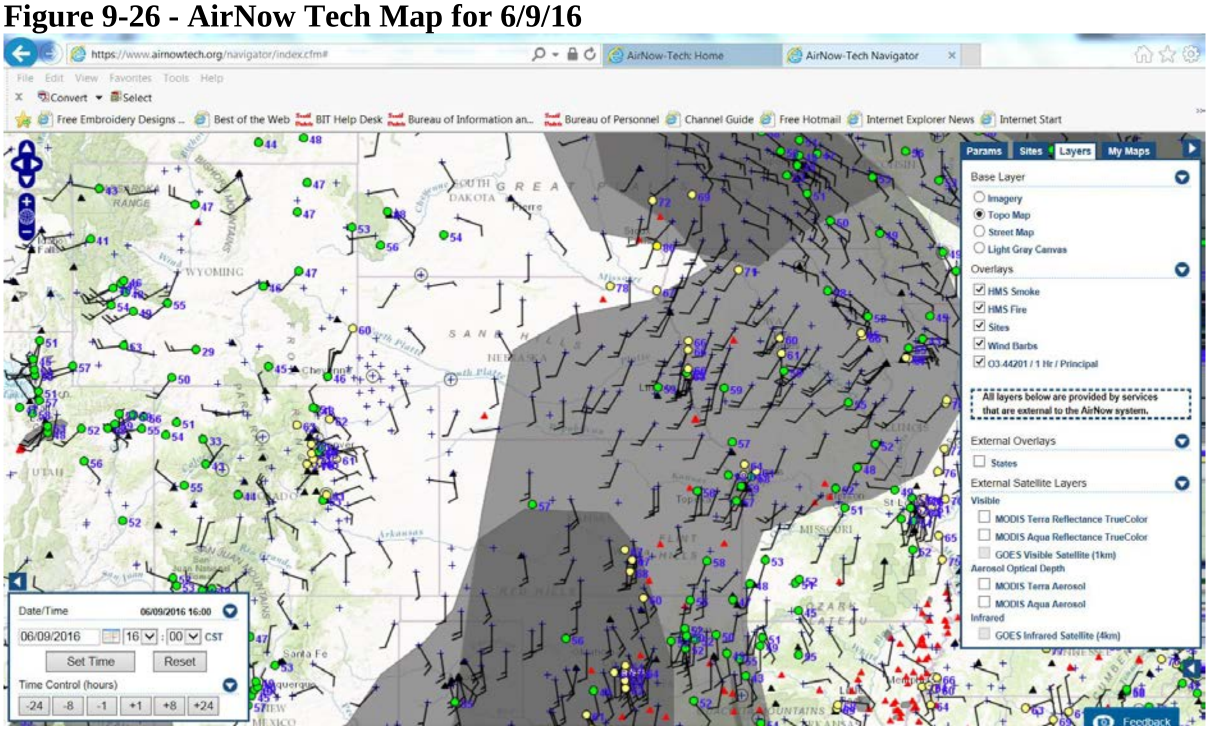


Figure 9-27 - AirNow Map for 6/10/16

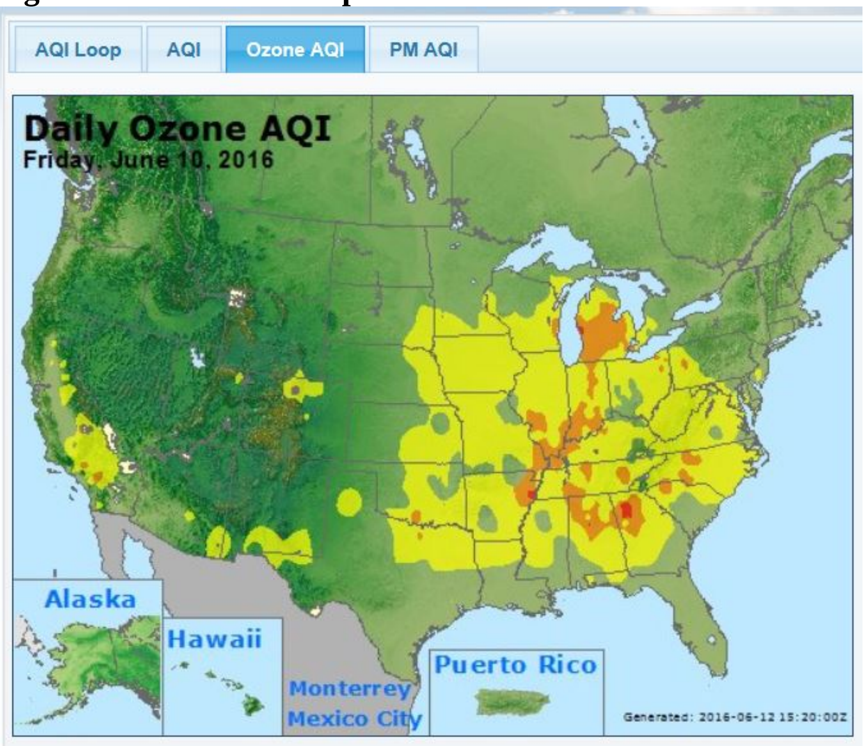


Figure 9-28 - AirNow Tech Map for 6/10/16

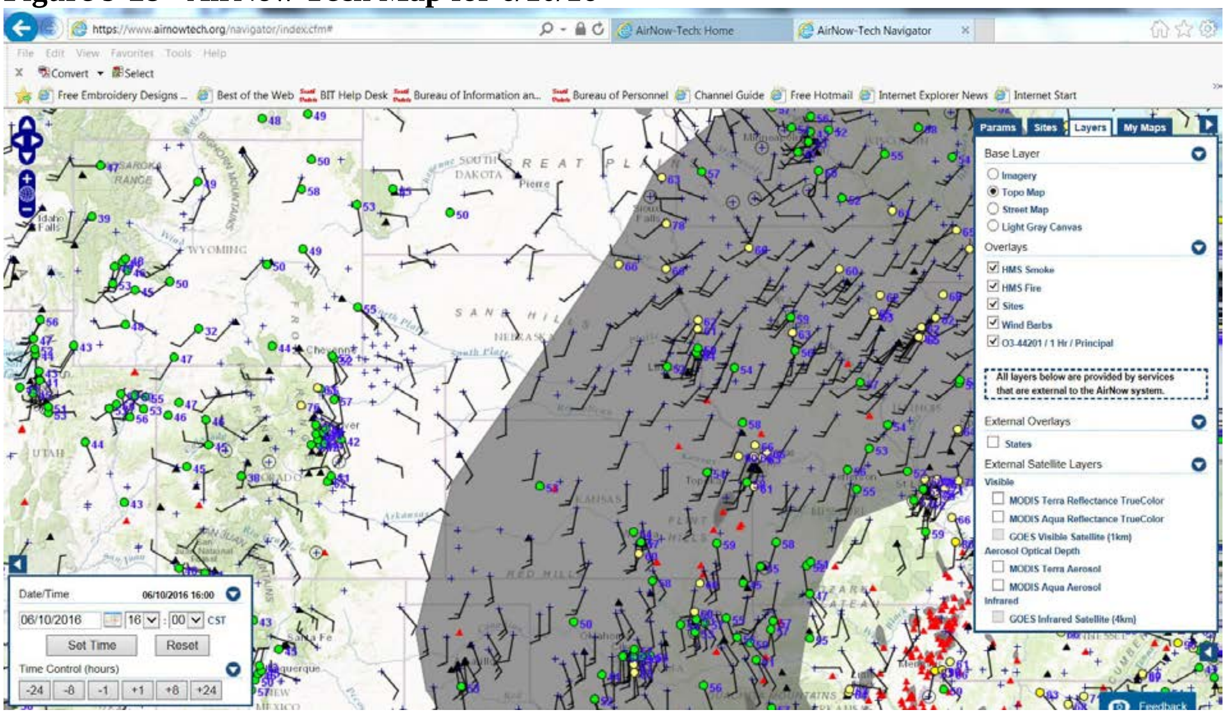


Figure 9-29 - AirNow Map for 6/11/16

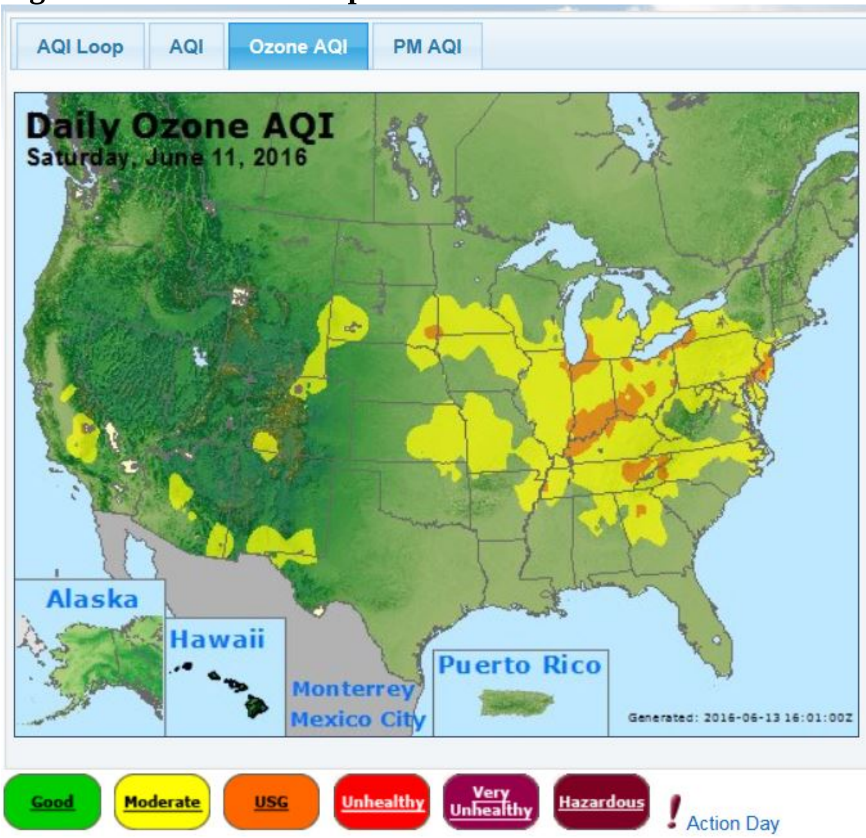


Figure 9-30 - AirNow Tech Map for 6/11/16

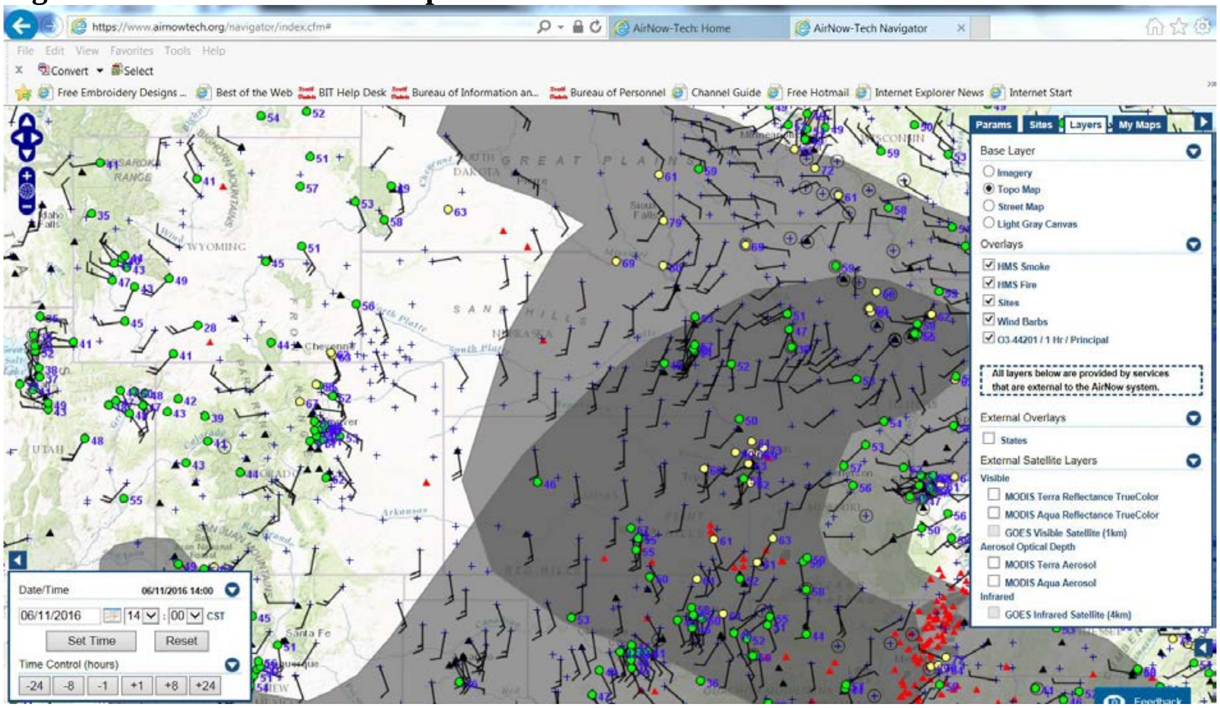


Figure 9-31 - AirNow Map for 6/17/16

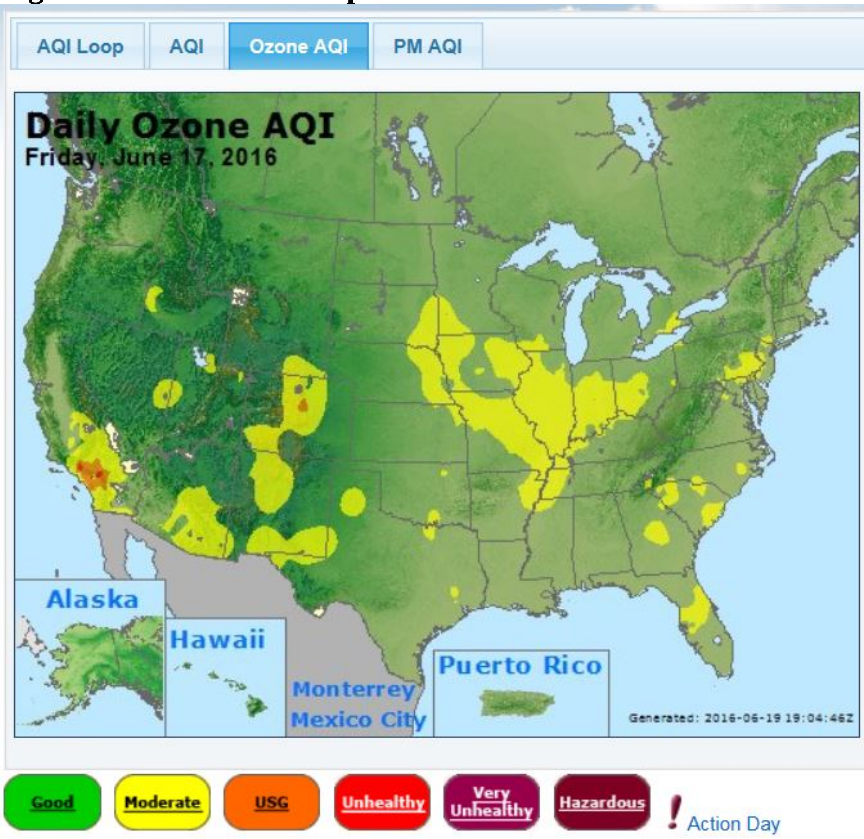


Figure 9-32 - AirNow Tech Map for 6/17/16

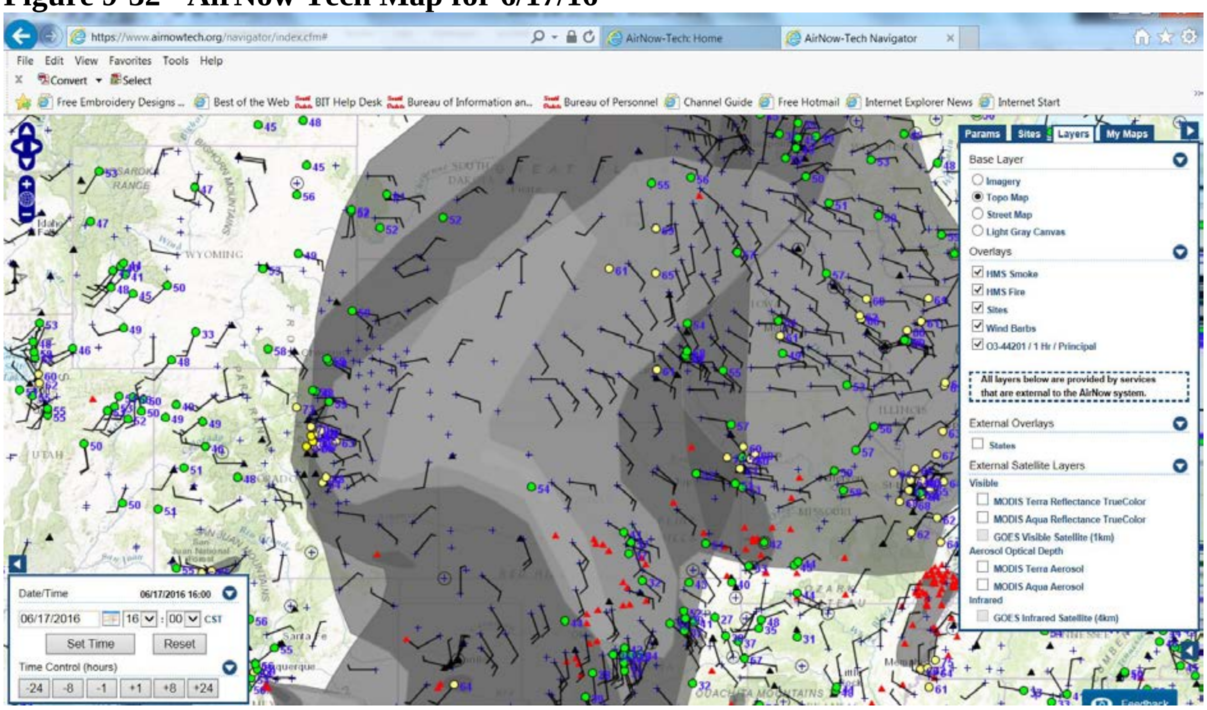


Figure 9-33 - AirNow Map for 6/19/16

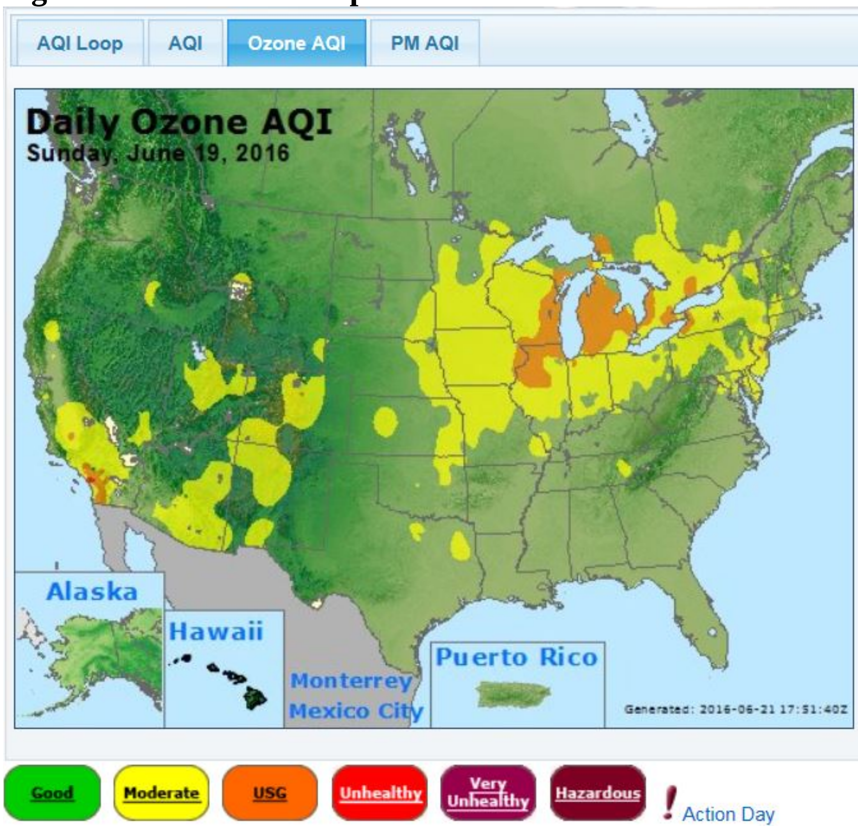
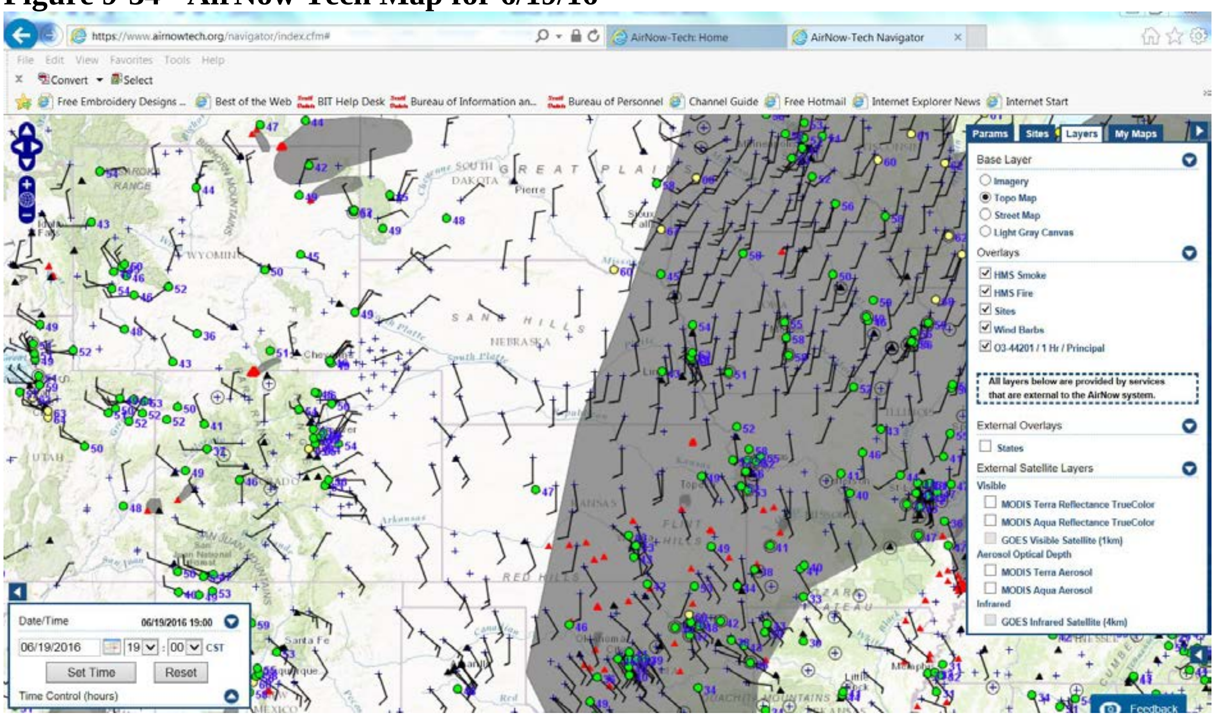


Figure 9-34 - AirNow Tech Map for 6/19/16



10.0 AIR MONITORING SITE TRENDS

This section will evaluate each air monitoring site in the network, determine if the site will continue and examine trends for each pollutant. Through this evaluation a determination is made if site goals are being met and if each testing parameter is needed at the site. This section also has site specific information tables including Air Quality System ID #, location, operation, data use, sampling schedule, monitoring objectives, spatial scale, and sampling and analytical methods required as part of the annual plan requirements in Title 40 of the Code of Federal Regulations Part 58.

10.1 Rapid City Area

The Rapid City area had a total of two monitoring sites collecting data in 2016. The high concentration site for PM_{10} was located at the Rapid City Credit Union Site and a continuous PM_{10} monitor was used to determine compliance with the National Ambient Air Quality Standards. In addition, Sulfur Dioxide and Nitrogen Dioxide analyzers were operated to determine current concentration levels. The Rapid City Library Site has manual Andersen PM_{10} and Partisol 2000 $PM_{2.5}$ monitors collecting 24-hour data using a filter based gravimetric sampling method.

In cooperation with the City, County, and industry, the department is implementing a Natural Events Action Plan for the Rapid City area. Part of this plan is to alert the public of the potential of high dust levels caused by high winds and to advise the public of precautions to take during the high wind events. Under this plan high wind dust alerts are called when the following forecast conditions occur:

1. Hourly wind speeds exceed 20 miles per hour;
2. Peak wind gusts are greater than 40 miles per hour; and
3. Five consecutive days of 0.02 inches or less of precipitation each day excluding dry snow.

During 2016, a total of 8 high wind dust alerts were called for the Rapid City area. None of the alert days exceeded the PM_{10} 24-hour standard. The Natural Events Action Plan for the Rapid City area is working to maintain PM_{10} concentrations below the National Ambient Air Quality Standards during the high wind events on most days but still concentrations can exceed the standard.

In the fall of 2008, a surface water quality problem was found when Rapid Valley began using Rapid Creek for a drinking water source. Testing indicated high levels of chlorides during snow melt events caused the drinking water to smell and the water treatment plant had to stop producing drinking water until chloride levels dropped. Testing indicated liquid deicer used on the streets during snow and ice events was causing the problem. The city of Rapid City began a process of reducing the use of liquid deicer and increasing the use of river sand in the eastern and south eastern parts of Rapid City to help reduce chloride levels in Rapid Creek. The department is working with Rapid City to determine which streets can be changed from chemical deicer to sand so air quality levels have not been affected. Currently, the changes in sanding material at these locations in the city have not cause high concentrations of PM_{10}.

An attainment designation was requested in for PM_{10} and was approved by EPA for the Rapid City area in 2006. An attainment designation for the 24-hour $PM_{2.5}$ standard was requested for the Rapid City area in 2008 and for the annual standard in 2014. EPA designated Pennington and Meade Counties as attainment/unclassifiable for both the 24-hour and the annual standards.

10.1.1 Rapid City Library Site

The Rapid City Library Site is located on the library building in Rapid City. The site was established in 1972, and it is the oldest sampling site in South Dakota still operating. The site is geographically located in the downtown area of the city east of the hogback and in the Rapid Creek river valley. The site purpose is to evaluate population exposure, fugitive dust controls, the success of the street sanding and sweeping methods employed by the city of Rapid City and general concentration levels in the eastern part of the city. Figure 10-1 shows a picture of the Rapid City Library Site.

PM_{10} sampling began at the site in 1985. The PM_{10} Hi-vol monitors were replaced as planned at the start of 2016 with Partisol 2000 monitors. The change in monitoring equipment adjusted the monitor flow rates to a similar rate for both PM_{10} and $PM_{2.5}$.

Figure 10-1 – Rapid City Library Site

$PM_{2.5}$ monitors were added to the site in 1999. In 2012, the Andersen RAAS 100 $PM_{2.5}$ monitors were replaced with R&P Partisol 2000i monitors. Table 10-1 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

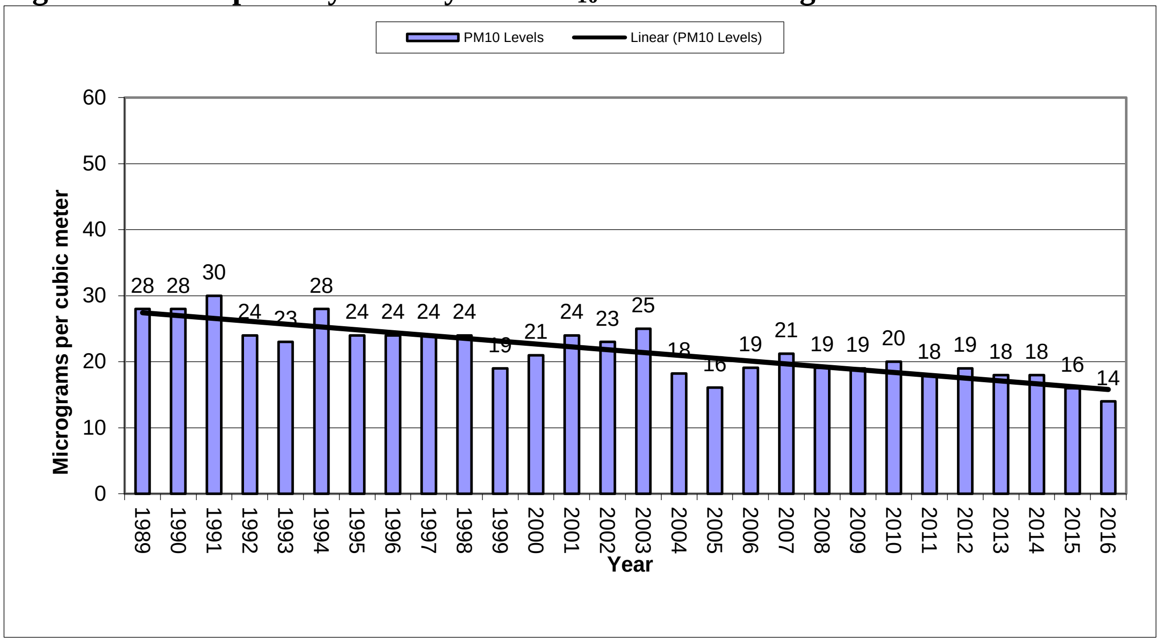
Table 10-1 – Rapid City Library Site Specifics

Parameter	Information
Site Name	Rapid City Library
AQS ID Number	46-103-1001
Street Address	6th and Quincy, Rapid City, South Dakota
Geographic Coordinates	UTM Zone 13, NAD 83, E 641,837.99, N 4,882,111.77
MSA	Rapid City
PM_{10}	**(Manual)**
Sampler Type	Federal Reference Method RFPS-1298-126
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Partisol 2000
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS),
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Equivalent Method RFPS-0498-117
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000i $PM_{2.5}$ w/VSC Cyclone
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)

10.1.1.1 *Rapid City Library Site PM10 Data*

Annual average PM_{10} concentrations for the Rapid City Library Site are shown in Figure 10-2. The PM_{10} concentrations show a decline of concentrations from a high of 30 micrograms per cubic meter in 1991, to a low of 14 micrograms per cubic meter in 2016. The largest reduction in annual concentrations came when changes were implemented by the city on the street sanding and sweeping operations in the early 1990s. In the last 13 years, annual concentrations have leveled off and are almost steady with a 1 to 3 microgram per cubic meter change per year. The plan is to continue the PM_{10} monitoring because this is the only site east of the hogback in Rapid City and the site will provide a check on PM_{10} levels as the city of Rapid City adjusts its sanding techniques in eastern part of the city.

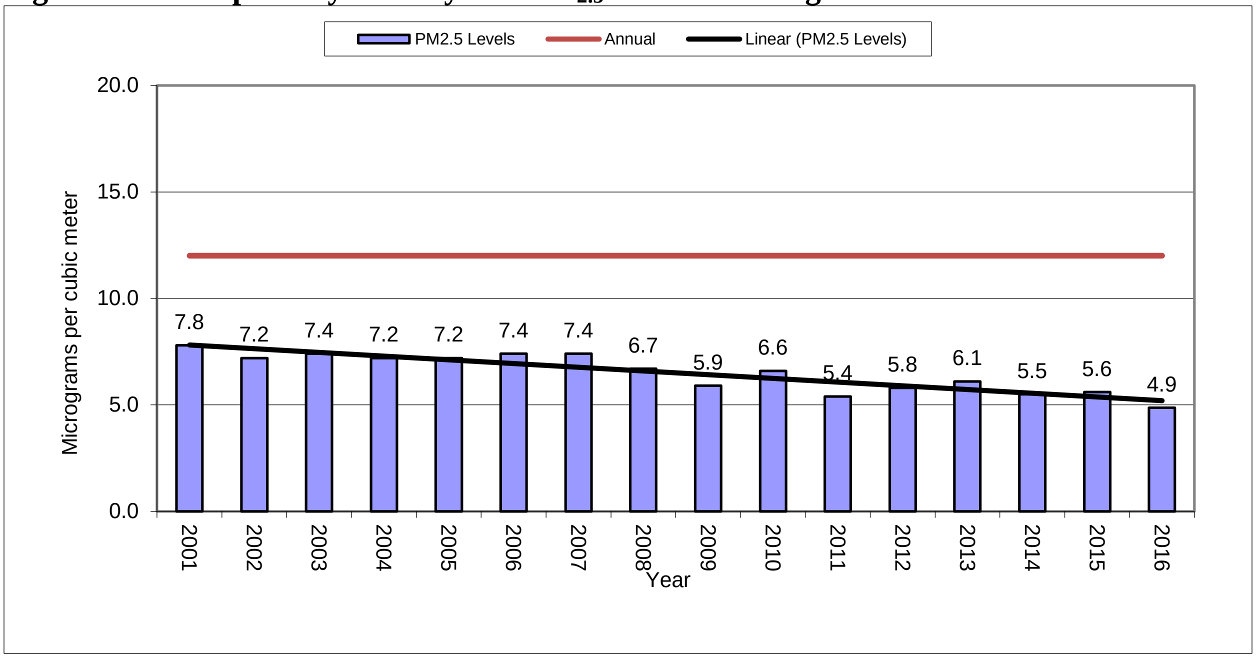
Figure 10-2 – Rapid City Library Site PM_{10} Annual Averages 2016



10.1.1.2 *Rapid City Library Site $PM_{2.5}$ Data*

The graph in Figure 10-3 shows the $PM_{2.5}$ annual average for each sampling year since 2001. The highest annual average was 7.8 micrograms per cubic meter in 2001 and the lowest was 4.9 micrograms per cubic meter in 2016. The annual average concentrations vary in difference from the highest to lowest annual average by 2.9 micrograms per cubic meter. The trends indicate a declining $PM_{2.5}$ concentration levels for the site but for the past six years the $PM_{2.5}$ concentrations like the PM_{10} concentrations have leveled off with 2016 recording the lowest annual average $PM_{2.5}$ concentration for this site. Plans are to continue testing for $PM_{2.5}$ at this site.

Figure 10-3 – Rapid City Library Site $PM_{2.5}$ Annual Averages 2016



10.1.2 <u>Rapid City Credit Union Site</u>

The Rapid City Credit Union Site is located on a lot next to Fire Station #3 building. The Rapid City Credit Union Site replaced the Fire Station #3 Site in October 2003 and is the high PM_{10} concentration location for the western part of Rapid City. The Rapid City Credit Union Site is located just south of the quarry area and is centrally located in relation to the quarry facilities. Figure 10-4 contains a picture of the monitoring site looking in a northwest direction towards the quarry area. The goal of this site is to determine if the Rapid City area is attaining the PM_{10} standard and population exposure.

Figure 10-4 – Rapid City Credit Union Site

Continuous samplers Thermo BETA PM_{10}, Met One BAM $PM_{2.5}$, Thermo Sulfur Dioxide and Thermo Nitrogen Dioxide monitors were operated at this site in 2016. The BETA PM_{10} monitor provides hourly concentrations on an everyday sampling schedule. The hourly readings from the continuous PM_{10} monitor are used to assist in the calling of high wind dust alerts for Rapid City and to compare concentrations to the PM_{10} National Ambient Air Quality Standards.

A continuous Met One BAM $PM_{2.5}$ monitor is used to supply hourly data for investigation of high concentration days and to compare to the $PM_{2.5}$ standards. Table 10-2 contains details on the monitoring site specific to the requirements in 40 Code of Federal Regulations Part 58.

Table 10-2 – Rapid City Credit Union Site Specifics

Parameter	Information
Site Name	Rapid City Credit Union
AQS ID Number	46-103-0020
Street Address	106 Kinney Ave.
Geographic Coordinates	UTM Zone 13, NAD 83, E 638,199.75, N 4,882,811.92
MSA	Rapid City
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Day
Scale Representation	Neighborhood

Parameter	Information
Monitoring Objective	High Concentration and Population
Sampling Method	Met One BAM-1020
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operation Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Instrumental Thermo 43i
Analysis Method	Pulsed Fluorescent
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1289-074
Operation Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Instrumental Thermo 42i
Analysis Method	Chemiluminescence
Data Use	SLAMS (Comparison to the NAAQS) and Real-Time Data

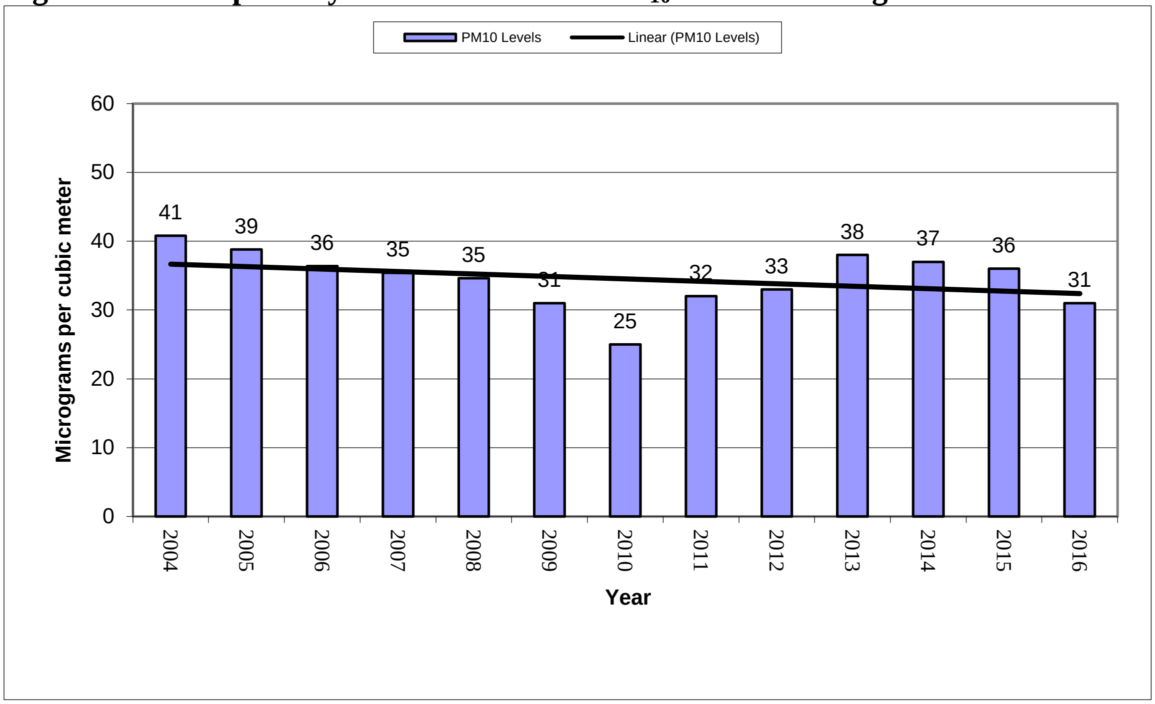
In 2011, continuous Sulfur Dioxide and Nitrogen Dioxide analyzers were added to the Rapid City Credit Union Site to provide data on population exposure and source oriented testing near the facilities in the quarry area. Six years of testing were completed at the end of 2016.

10.1.2.1 *Rapid City Credit Union Site PM_{10} Data*

The Rapid City Credit Union Site began operation in October of 2003. Only three months of data was collected in 2003, so 2004 is the first complete sampling year. Figure 10-5 shows a graph of the annual average PM_{10} concentration.

The PM_{10} annual average concentration trend shows a declining level each year from 2004 to 2010. In 2011, average concentration levels increased back to the level in 2009 and increased through 2013. Since 2013, average concentration levels declined slightly. Testing for PM_{10} concentrations is a priority for this site and the parameter will be continued.

Figure 10-5 – Rapid City Credit Union Site PM_{10} Annual Averages



10.1.2.2 *Rapid City Credit Union Site $PM_{2.5}$ Data*

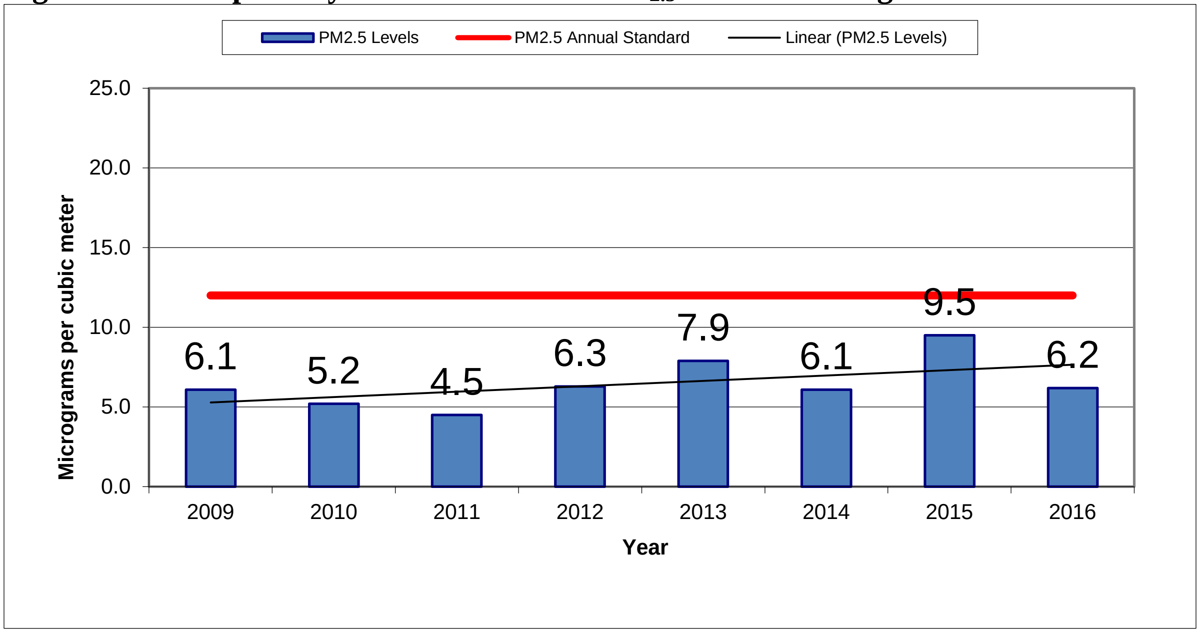
The testing for $PM_{2.5}$ parameter using the manual method began at this site in October 2003 and completed the first full year of testing in 2004. The Rapid City Credit Union Site records the highest $PM_{2.5}$ concentrations in the Rapid City area for both 24-hour and annual concentrations using the manual FRM monitor.

In 2009, a continuous method $PM_{2.5}$ monitor was added to the site as a special purpose monitor. Because the continuous monitor was a new method, EPA allows the operation of the monitor as a special purpose method for up to three years before the data from the monitor is required to be compared to the $PM_{2.5}$ standard. By the end of 2011, the continuous monitor had operated for three years and the Met One continuous $PM_{2.5}$ monitor received the federal equivalent method number. Data was similar between the methods of $PM_{2.5}$ monitoring, so as a cost savings measure the manual $PM_{2.5}$ monitor was removed and the continuous monitor became the state and local air monitoring stations monitor providing more valid data at a lower cost per year of operation.

Figure 10-6 shows the annual average for each sampling year since 2009 when the continuous monitor was setup. The annual average concentrations decreased over the first three years. In 2011, $PM_{2.5}$ annual concentrations declined to the lowest level since the site began operation with a concentration of 4.5 micrograms per cubic meter for the annual average. The highest annual average for $PM_{2.5}$ at this site was 9.5 micrograms per cubic meter in 2015. Smoke from wildfires in Canada and Pacific Northwest states had a large impact on the substantial increase in the $PM_{2.5}$ annual average concentration in 2015. Over the eight year period, annual concentrations changed by 5 micrograms per cubic meter. The trends for the eight years since the continuous monitor was installed show the site concentration level to be at a slight increase due to the 2015 wildfires. In 2016, the annual average dropped back down to normal.

The parameter of $PM_{2.5}$ will be continued at this site using the continuous monitor to determine compliance with the National Ambient Air Quality Standards and to determine any change in concentration levels.

Figure 10-6 – Rapid City Credit Union Site $PM_{2.5}$ Annual Averages

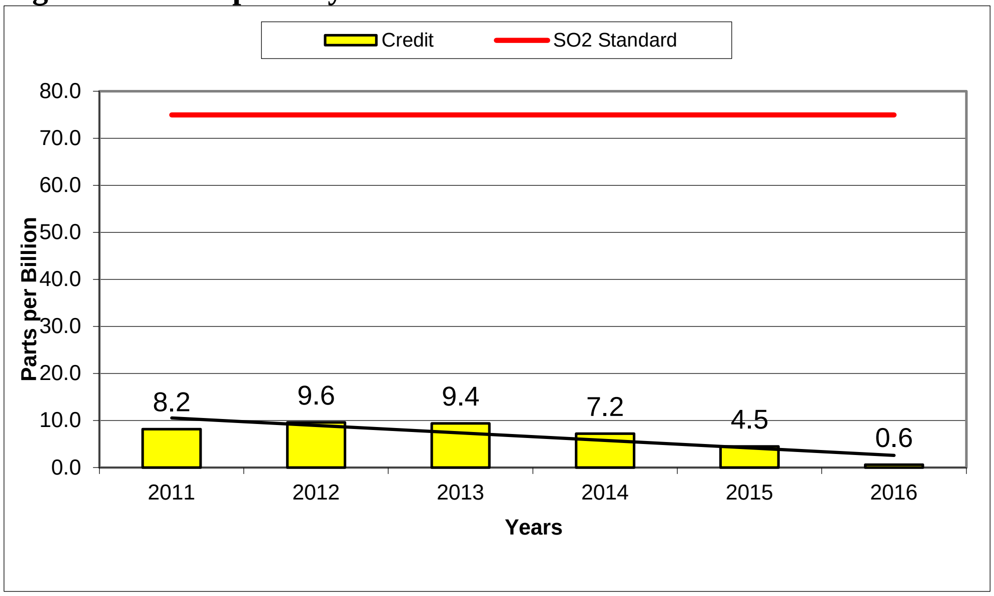


10.1.2.3 *Rapid City Credit Union Site Sulfur Dioxide*

Testing for Sulfur Dioxide started at the beginning of 2011 for this site. Some testing for the parameters was done in the 1990s but that data is old and there is need for the collection of new data. The annual standard for Sulfur Dioxide was dropped when the standard was revised so the 1-hour, daily maximum, 99 percentile concentrations will be used to track trends.

See Figure 10-7 for the 1-hour daily maximum concentration of Sulfur Dioxide recorded at the Rapid City Credit Union Site. The concentration level is low at only 0.8% of the standard. Trends indicate a decreasing Sulfur Dioxide concentration level for this site. Testing for Sulfur Dioxide will continue at this site to determine if the trend will continue.

Figure 10-7 – Rapid City Credit Union Site Sulfur Dioxide 99th Percentile 1-hour Averages

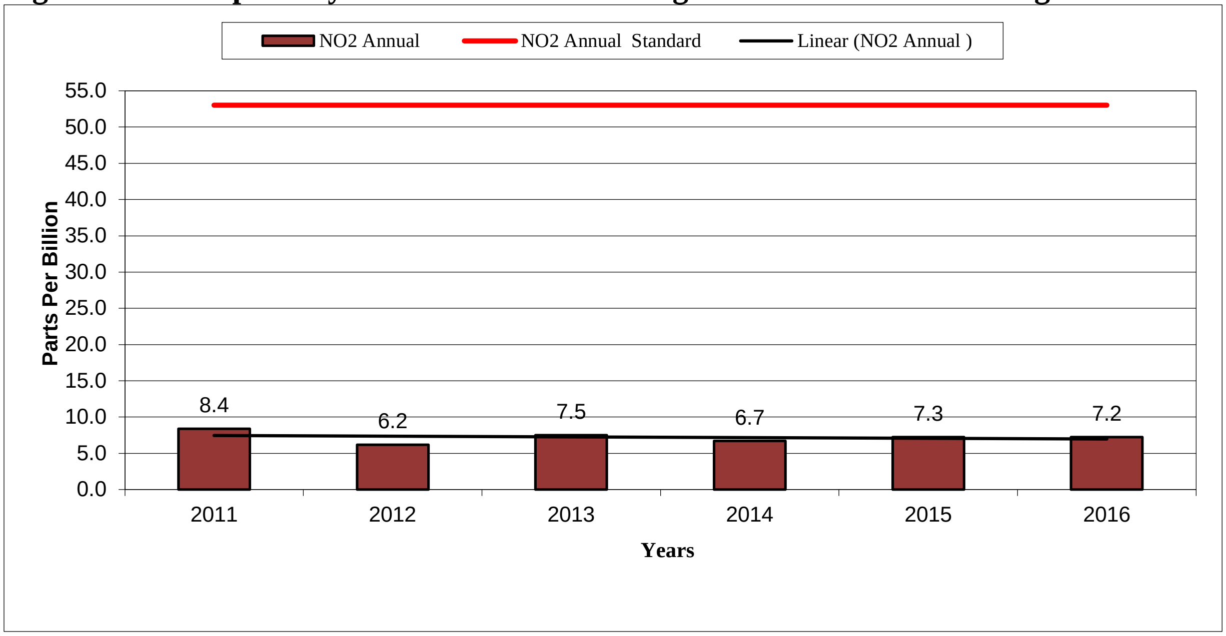


10.1.2.4 *Rapid City Credit Union Site Nitrogen Dioxide*

Testing for Nitrogen Dioxide started at the beginning of 2011 for this site. Some testing for the parameters was completed in the 1990s but that data is old and there is a need for the collection of new data. The Nitrogen Dioxide standard includes a 1-hour and annual average concentration so the annual will be represented to track trends.

See Figure 10-8 for concentrations of Nitrogen Dioxide at the Rapid City Credit Union Site. The concentration are low at 13% of the standard in 2016. The trend line shows a slightly declining concentration level for the annual average. Testing for Nitrogen Dioxide will continue at this site to further define the pollution level trend for this site.

Figure 10-8 – Rapid City Credit Union Site Nitrogen Dioxide Annual Averages



10.2 Black Hawk Site

Black Hawk is a small town located just north of Rapid City in Meade County north of the quarry area. Black Hawk is not an incorporated city but is a growing subdivision and is part of the Rapid City Metropolitan Statistical Area. The goal of the Black Hawk Site is to determine urban background concentrations for PM_{10} coming into the Rapid City area from the north and determine compliance with the ozone National Ambient Air Quality Standards in the Rapid City Metropolitan Statistical Area.

The Black Hawk Site was setup in the fall of 2000. The site is located on a small hill east of the Black Hawk Elementary School. PM_{10} and $PM_{2.5}$ monitors were located on a sampling shelter until October 2003 when the sampling shelter was moved to the Rapid City Credit Union Site. The monitors were then located on scaffolding within a fenced area until the fall of 2006 when a shelter was added back to the site.

At the end of 2004 the $PM_{2.5}$ monitors were removed because concentrations were the lowest in the area and the potential for concentrations over the National Ambient Air Quality Standards were very low. In 2007, the ozone analyzer was moved from Rapid City Credit Union Site to the Black Hawk Site to operate the ozone parameter outside of the modeled one microgram Nitrogen Dioxide influence area from air quality sources in western Rapid City. See Figure 10-9 for a current picture of the site looking to the northwest.

The land use around the site is mainly residential with a few service type businesses. There are no obstructions around the monitoring site. The limestone quarry industries are located to the south and southeast of the Black Hawk Site and are expanding to ore bodies located closer to this site. The closest new limestone quarry is currently operating about 1.5 miles south of the site.

Figure 10-9 – Black Hawk Site

The site's spatial scale is neighborhood for PM_{10} and ozone sampling. The objectives of the PM_{10} sampling are high concentration, population, and source impact. The objectives of the ozone sampling are high concentration and population. The goals are being met. Table 10-3 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Table 10-3 – Black Hawk Site Specifics

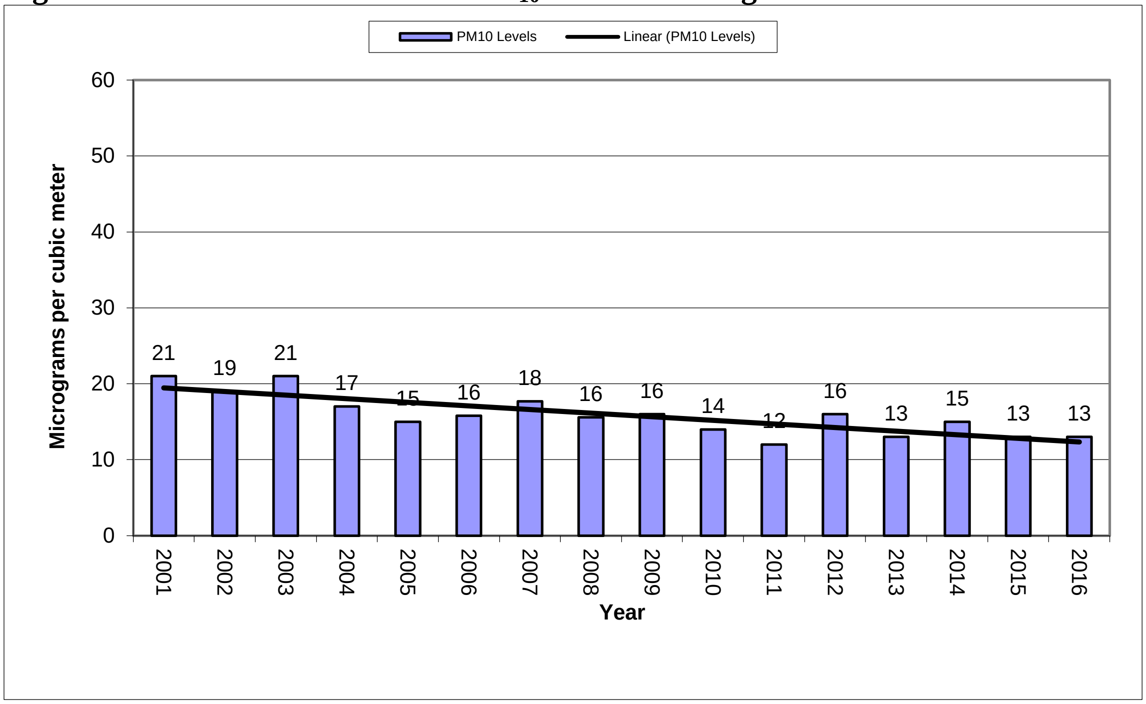
Parameter	Information
Site Name	Black Hawk Elementary
AQS ID Number	46-093-0001
Street Address	7108 Seeaire Street
Geographic Coordinates	UTM Zone 13, NAD 83, E 634,683.07 N 4,890,309.65
MSA	Rapid City
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population, Urban Background
Sampling Method	T A Series FH 62 C14 Continuous
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day

Parameter	Information
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Instrumental Thermo 49i
Analysis Methods	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS) and Real-time Data

10.2.1 Black Hawk Site PM_{10} Data

Figure 10-10 contains a graph showing the PM_{10} annual averages for the Black Hawk Site. The first four years of PM_{10} concentration levels remained about the same. In 2005, the annual average dropped significantly. The highest annual average was 21 micrograms per cubic meter recorded in both 2001 and 2003. The lowest level of 12 micrograms per cubic meter was recorded in 2011. In 2016, the PM_{10} concentrations stayed the same as the concentration in 2015. The overall trend shows a decrease in concentrations over the sixteen year period but has started to flatten out in the last four years if not more.

Figure 10-10 – Black Hawk Site – PM_{10} Annual Averages

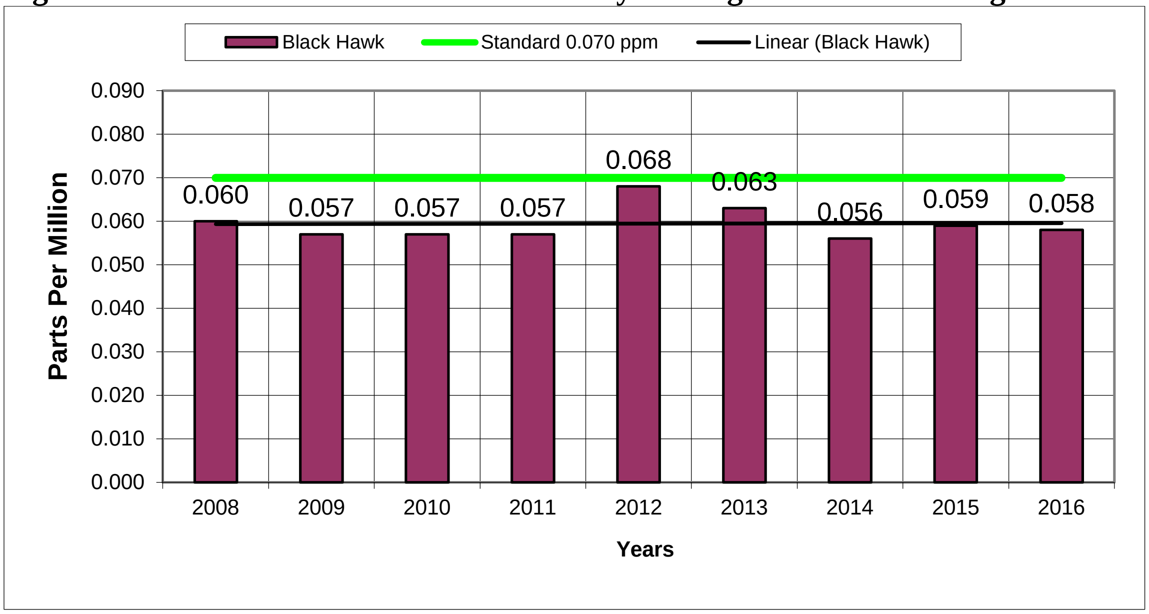


10.2.2 Black Hawk Site Ozone Data

The 2016 sampling year is the ninth ozone season at the Black Hawk Site (see Figure 10-11). In the first year of testing (2008), the site recorded the second highest ozone level in the state. In 2012, the ozone levels were up statewide by 4 parts per billion and significantly at this site at 11 parts per billion. In 2016, ozone levels dropped slightly from 2015. The overall trends show a steady ozone concentration level.

The testing results show the area is attaining the ozone standard. Plans are to continue to test for ozone at this location.

Figure 10-11 – Black Hawk Site Ozone Yearly 4th Highest 8-hour Averages



10.3 Badlands Site

The Badlands is one of two Class I areas in South Dakota designated for visibility protection under the Clean Air Act. The Badlands area is a large national park that attracts more than two million visitors each year. The Badlands area is a dry semi-desert area with short prairie grass and beautiful sandstone cliff vistas.

The Badlands Site was established in 2000, with manual monitors for PM_{10} and $PM_{2.5}$. The site is located next to the Interagency Monitoring of Protected Visual Environments site which also included an ozone analyzer operated by the National Park Service. The site is in the southeast part of the park near the visitor center. Figure 10-12 shows a current picture of the Badlands Site.

In October of 2004, the number of pollutant parameters was increased by adding continuous monitors for PM_{10}, $PM_{2.5}$, Sulfur Dioxide, and Nitrogen Dioxide. The changes increased the amount of data collected and provide additional information on transport of air pollution. At the end of 2007, the department took over the operation of the ozone monitor at this site upon a request made by the National Park Service.

Figure 10-12 –Badlands Site

The Interagency Monitoring of Protected Visual Environments data is used to determine what types of sources are impacting the visibility of the national parks in South Dakota. The goal of having a state and local air monitoring stations site next to the Interagency Monitoring of Protected Visual Environments site is to determine air pollution background levels and to see if pollution trends show long range transport of air pollution into the state. Table 10-4 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Table 10-4 – Badlands Site Specifics

Parameter	Information
Site Name	Badlands
AQS ID Number	46-071-0001
Street Address	25216 Ben Reifel Road, Interior, South Dakota 57750
Geographic Coordinates	UTM Zone 14, NAD 83, E 263,173.81 N 4,847,799.95
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM - 1020

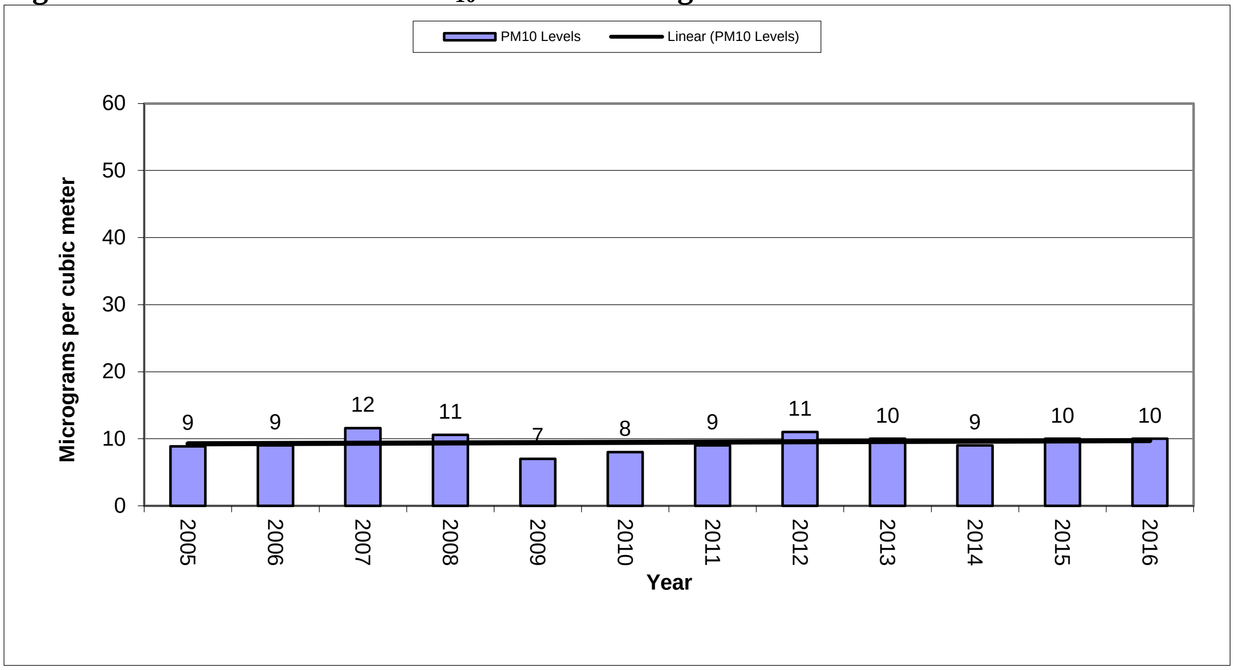
Parameter	Information
Analysis Method	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental Thermo 43c
Analysis Methods	Pulsed Fluorescent
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1289-074
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental Thermo 42i
Analysis Method	Chemiluminescence
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental Thermo 49i
Analysis Method	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS) and Real-time Data

10.3.1 Badlands Site PM_{10} Data

PM_{10} data has been collected at this site since 2000. The PM_{10} manual monitor was operated on an every sixth day schedule through 2004. Beginning in 2005, a continuous Thermo Beta Gauge PM_{10} monitor replaced the manual monitors.

Figure 10-13 contains a graph of the annual averages for the Badlands Site. The annual average concentration over the last 12 years varied only slightly overall. The highest annual average concentration of 12 micrograms per cubic meter was recorded in 2007. The lowest annual average concentration of 7 micrograms per cubic meter was recorded in 2009. Trends indicate a steady to slightly increasing concentration level over the 12 years of testing. The PM_{10} concentrations recorded at this site are some of the lowest levels in the state and are considered background for the western half of the state. This parameter is meeting the goals for testing at this site and will be continued.

Figure 10-13 – Badlands Site PM_{10} Annual Averages

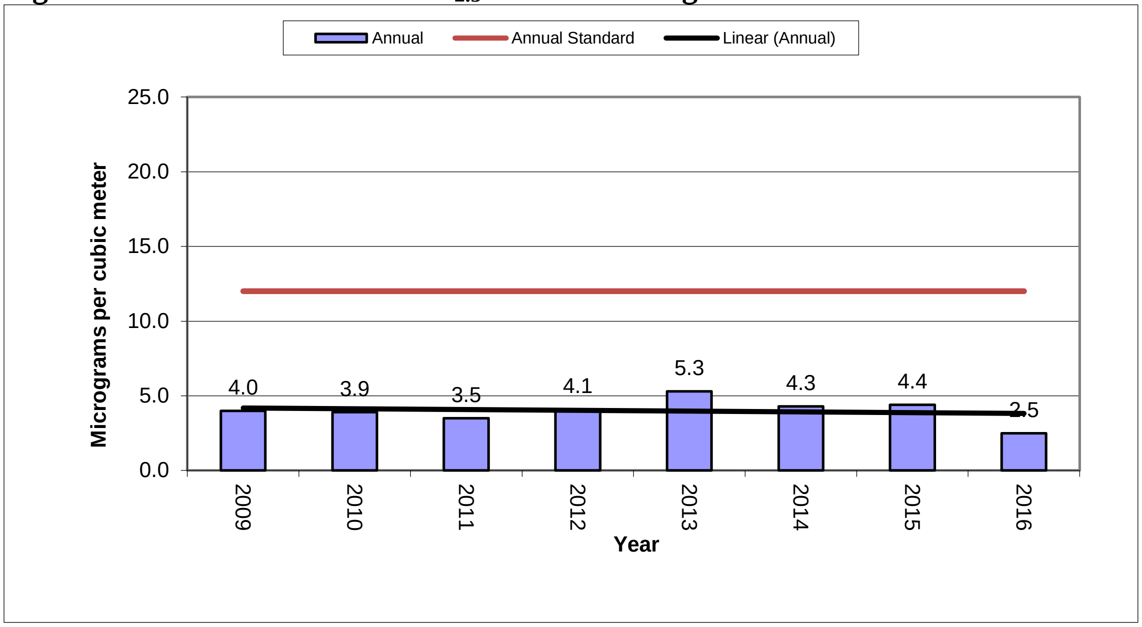


10.3.2 Badlands Site – $PM_{2.5}$ Data

The $PM_{2.5}$ manual monitors ran on an every third day schedule from 2001 to 2008. With the completion of the 2003 year, the site had three years of $PM_{2.5}$ data and the department was able to make a comparison of the concentration levels to the 24-hour and annual standards. The department determined that the area was attaining the standard. Beginning in 2009, the continuous Met One BAM-1020 Federal Equivalent Method replaced the manual RAAS 100 and the sampling schedule went to every day providing hourly and 24-hour average concentrations.

Figure 10-14 contains a graph of the annual averages. The annual averages for the Badlands Site show a concentration range with a high of 5.3 micrograms per cubic meter in 2013 and a low of 2.5 micrograms per cubic meter in 2016. The trend for the annual average is a fairly steady concentration level. $PM_{2.5}$ concentrations at this site are the lowest in the state and represent background levels for western South Dakota. This parameter is meeting the goals for testing at this site and will be continued.

Figure 10-14 – Badlands Site $PM_{2.5}$ Annual Averages

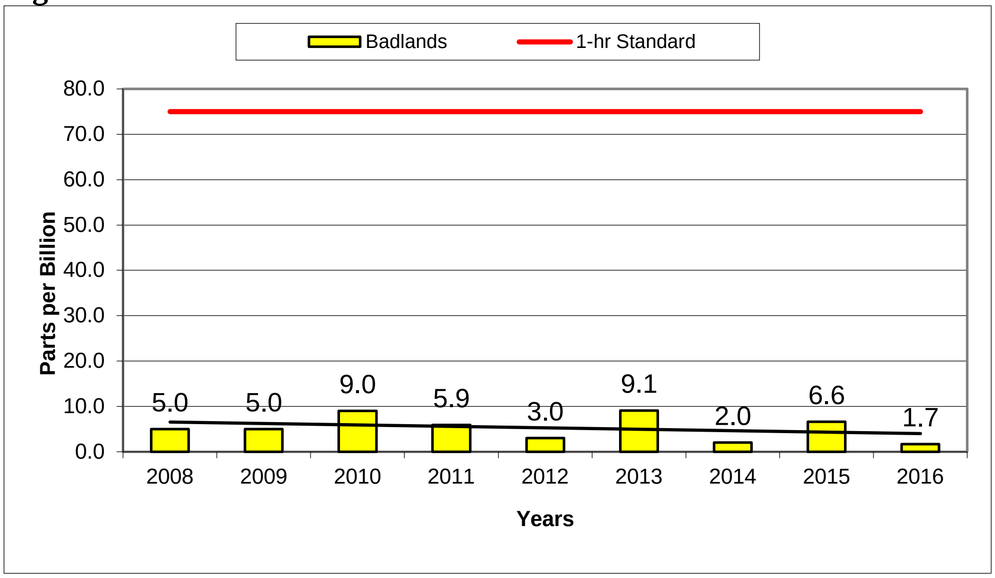


10.3.3 <u>Badlands Site Sulfur Dioxide Data</u>

The first year of testing at the Badlands Site for Sulfur Dioxide occurred in 2005. As expected, concentrations for Sulfur Dioxide are very low and represent background levels. Concentrations are at or near the detection limit for the analyzers at 0.1 parts per billion for the annual average levels for Sulfur Dioxide.

In 2016, the annual average was down from 2015 from 6.6 parts per billion to 1.7 parts per billion. See Figure 10-15 to view a graph of the annual average concentrations for Sulfur Dioxide. The linear trend line shows a slightly decreasing level in concentrations but levels are very low and indicate minimal concentrations of Sulfur Dioxide. This parameter is meeting the goals for testing at this site and will be continued but the department may consider moving it to another location in the future.

Figure 10-15 – Badlands Site Sulfur Dioxide 99th Percentile 1-hour Average



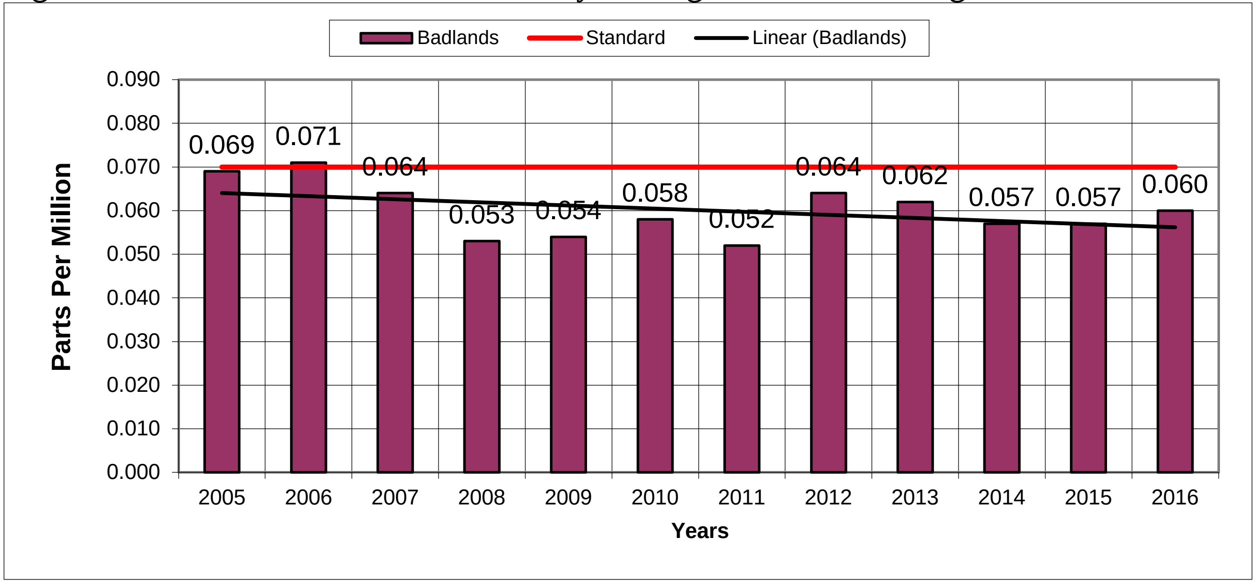
10.3.4 <u>Badlands Site Ozone Data</u>

The first year of testing at the Badlands Site for ozone was in 2005, with equipment being operated by the National Park Service. The department completed quarterly audits of the ozone analyzer so data could be compared to the National Ambient Air Quality Standards. At the beginning of 2008 sampling year, the department took over the operation of the ozone analyzer.

Concentrations of ozone at this site have varied over the twelve years of testing. The yearly 4th highest 8-hour average ranged from a high of 0.071 parts per million in 2006 to a low of 0.052 parts per million in 2011. This trend is similar to most of the sites in the western part of the state with lower ozone levels since 2006 and concentrations in 2016 are up slightly from 2015. See Figure 10-16 to view a graph of the yearly 4th highest 8-hour average. The linear trends line shows a declining concentration level.

This parameter will continue to be a priority at this location because of past concentration levels and the testing is meeting the needs to continue the sampling effort.

Figure 10-16 – Badlands Site Ozone Yearly 4th Highest 8-hour Averages

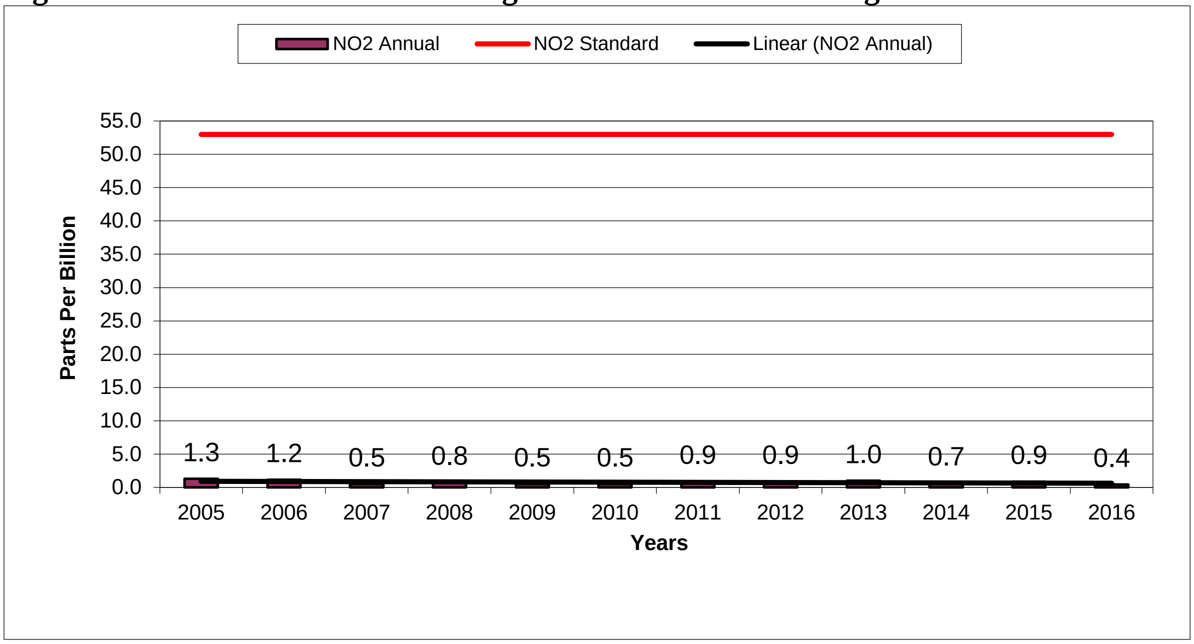


10.3.5 Badlands Site Nitrogen Dioxide Data

The first year of testing at the Badlands Site for Nitrogen Dioxide occurred in 2005. As expected, concentrations for Nitrogen Dioxide are very low and represent background levels. Many hourly concentrations are at the detection limit of the analyzer at 1.0 parts per billion. The calculated annual average levels for all twelve years are close to the detection level for Nitrogen Dioxide.

See Figure 10-17 to view a graph of the annual average concentrations. The linear trends line shows a stable concentration level. This parameter will continue at this location providing background concentration levels and the testing is meeting the needs to continue the sampling effort.

Figure 10-17 – Badlands Site – Nitrogen Dioxide Annual Averages



10.4 Wind Cave Site

The Wind Cave National Park is one of two Class I areas in South Dakota designated for visibility protection under the Clean Air Act. The Wind Cave area is a large national park located in the southern Black Hills of South Dakota. The Wind Cave Site was established in 2005, with manual monitors for $PM_{2.5}$ and continuous monitors for $PM_{2.5}$, PM_{10}, Sulfur Dioxide, Nitrogen Dioxide, and ozone. At the end of 2010, the manual $PM_{2.5}$ monitors were removed from the site leaving only the continuous $PM_{2.5}$ monitor for this parameter.

The monitoring equipment is located in a sampling shelter next to the Interagency Monitoring of Protected Visual Environments site operated by the National Park Service. The site is located a short distance west of the visitor center. Figure 10-18 shows a current picture of the Wind Cave Site.

Figure 10-18 – Wind Cave Site

The Interagency Monitoring of Protected Visual Environments data will be used to determine what types of sources are impacting the visibility of the national parks in South Dakota. The purpose of having a State and Local Air Monitoring Stations site next to the Interagency Monitoring of Protected Visual Environments site is to determine air pollution background levels, and to see if pollution trends show long range transport of air pollution from outside of the state. Table 10-5 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Table 10-5 – Wind Cave Site Specifics

Parameter	Information
Site Name	Wind Cave
AQS ID Number	46-033-0132
Street Address	290 Elk Mountain Camp Road, Hot Springs, South Dakota
Geographic Coordinates	UTM Zone 13, NAD 83, E 622,471.56 N 4,823,856.93
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM - 1020
Analysis Method	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data

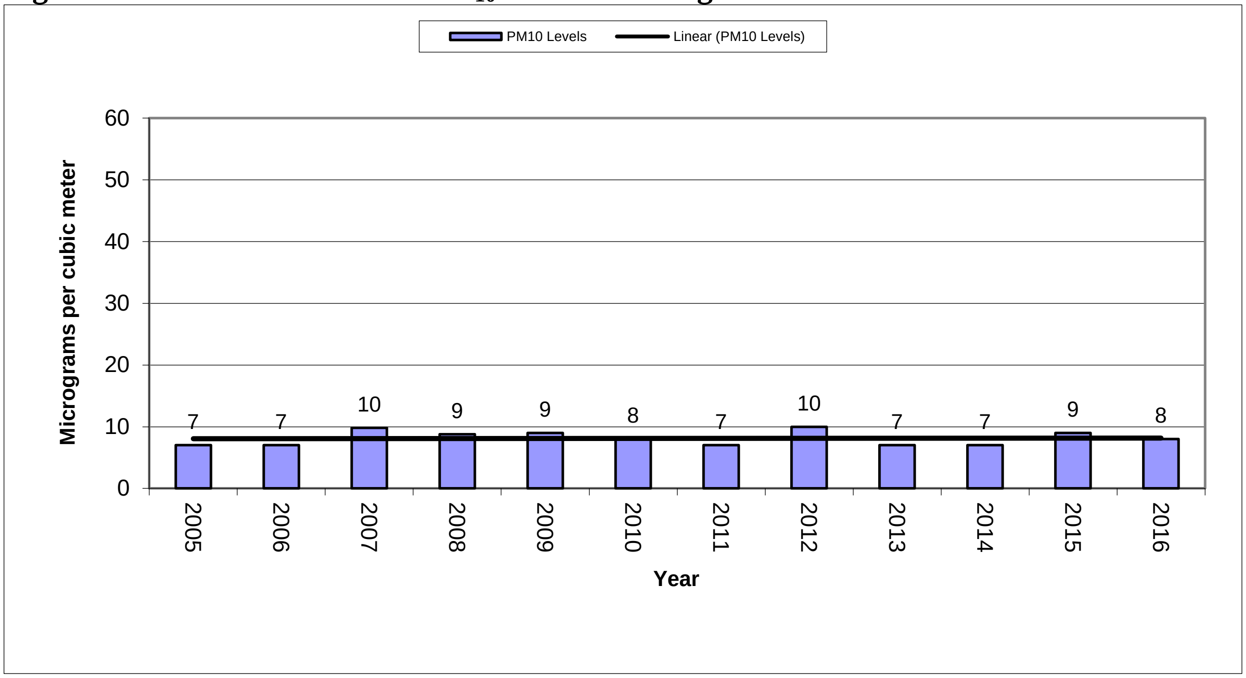
Parameter	Information
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 FEM
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SPMs
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental Thermo 49i
Analysis Method	Ultra Violet
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data

10.4.1 Wind Cave Site PM_{10} Data

The PM_{10} concentrations at this site are one of the lowest in the state and are similar in concentrations as the Badlands Site. The Wind Cave Site is the most remote site in the state and a site that has no influence from industry and agriculture activities near the location. Figure 10-19 contains a graph showing the annual average PM_{10} concentrations.

The 2016, PM_{10} concentrations were slightly less than those in 2015. The trend line indicates ~~a~~ steady concentration levels over the 12 years of testing. The concentrations ranged from 7 to 10 micrograms per cubic meter and are very low representing background levels. This parameter is meeting the goals of background, visibility protection, long range transport, and will be continued.

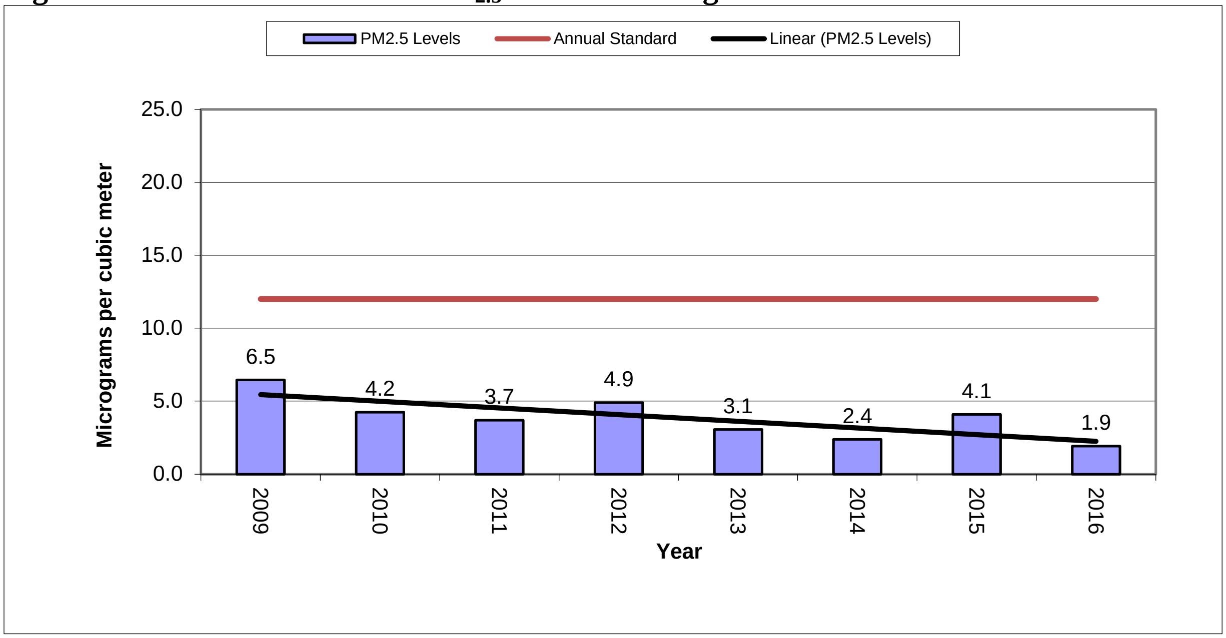
Figure 10-19 - Wind Cave Site PM_{10} Annual Averages



10.4.2 Wind Cave Site $PM_{2.5}$ Data

The $PM_{2.5}$ concentrations are similar to the levels recorded at the Badlands Site and are some of the lowest in the state. Figure 10-20 contains a graph showing the annual average $PM_{2.5}$ concentration levels.

Figure 10-20 - Wind Cave Site $PM_{2.5}$ Annual Averages

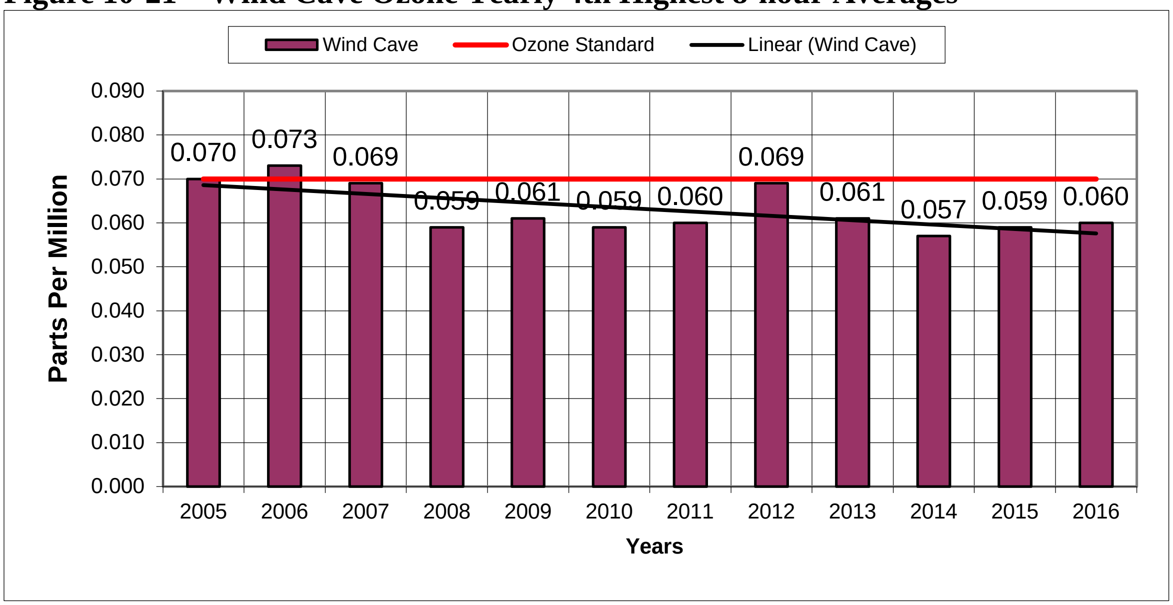


The linear trend line indicates a decrease in concentration levels during the last eight years of testing. The $PM_{2.5}$ annual average concentration range from 6.5 micrograms per cubic meter in 2009 to 1.9 micrograms per cubic meter in 2016. Concentrations were down in 2016 for this site due to impacts from wildfire smoke coming from fires in Canada and the Pacific Northwest states during 2015. This parameter is meeting the goals of background, visibility protection, and long range transport and will be continued.

10.4.3 Wind Cave Site Ozone Data

Figure 10-21 contains a graph of the ozone 8-hour concentrations for the Wind Cave Site since 2005. The Wind Cave Site had the highest reported yearly 4th highest 8-hour ozone level in the state at 0.073 parts per million recorded in 2006. Ozone levels began to fall in 2007 and the trend line shows decreasing concentrations. In 2012, Wind Cave ozone levels jumped back up to the approximate levels recorded when the department first started monitoring for ozone. During the last four years ozone concentrations have fallen and are similar to most of the years beginning in 2008. Overall Wind Cave ozone levels decreased significantly since testing began.

Figure 10-21 – Wind Cave Ozone Yearly 4th Highest 8-hour Averages



Testing for ozone is meeting the needs of the monitoring network by detecting transport pollution levels for this area of the state. Therefore, this parameter will be continued.

10.5 Sioux Falls Area

In 2016, one sampling site was operated in the Sioux Falls area, the School for the Deaf Site. The criteria pollutant parameters tested at this site include PM_{10}, $PM_{2.5}$, ozone, Carbon Monoxide, Sulfur Dioxide, and Nitrogen Dioxide. In addition, special purpose parameters are sampled including $PM_{course,}$ speciation $PM_{2.5}$ and Total Reactive Nitrogen. Air monitoring data shows the Sioux Falls area is attaining all of the National Ambient Air Quality Standards set by EPA.

The city continues to grow and now includes residential areas in two counties: 1) Minnehaha and 2) Lincoln. Sioux Falls is the largest city in the state with a 2010 Census population of 169,468 for Minnehaha County and 44,828 in Lincoln County. The industrial base is mainly service oriented businesses with a small amount of heavy industry.

10.5.1 School for the Deaf Site

The School for the Deaf Site replaced the SF Hilltop Site on January 1, 2008. The site is the National Core site for the state. This is a very busy monitoring site collecting more than 140,000 data points per year all loaded to the EPA national database. Figure 10-22 shows a current picture of the School for the Deaf Site.

Figure 10-22 – School for the Deaf Site

The School for the Deaf Site is located on the east central part of the city. The site is about 1.2 miles southeast of the main industrial area in Sioux Falls. The area around the site is mainly residential. Interstate 229 which is a major commuting road runs north and south about three city blocks east of the monitoring site. Table 10-6 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58. In addition to the parameters listed in Table 10-6, a $PM_{2.5}$ speciation monitor is operated at an every 3rd day sampling schedule.

Table 10-6 – School for the Deaf Site Specifics

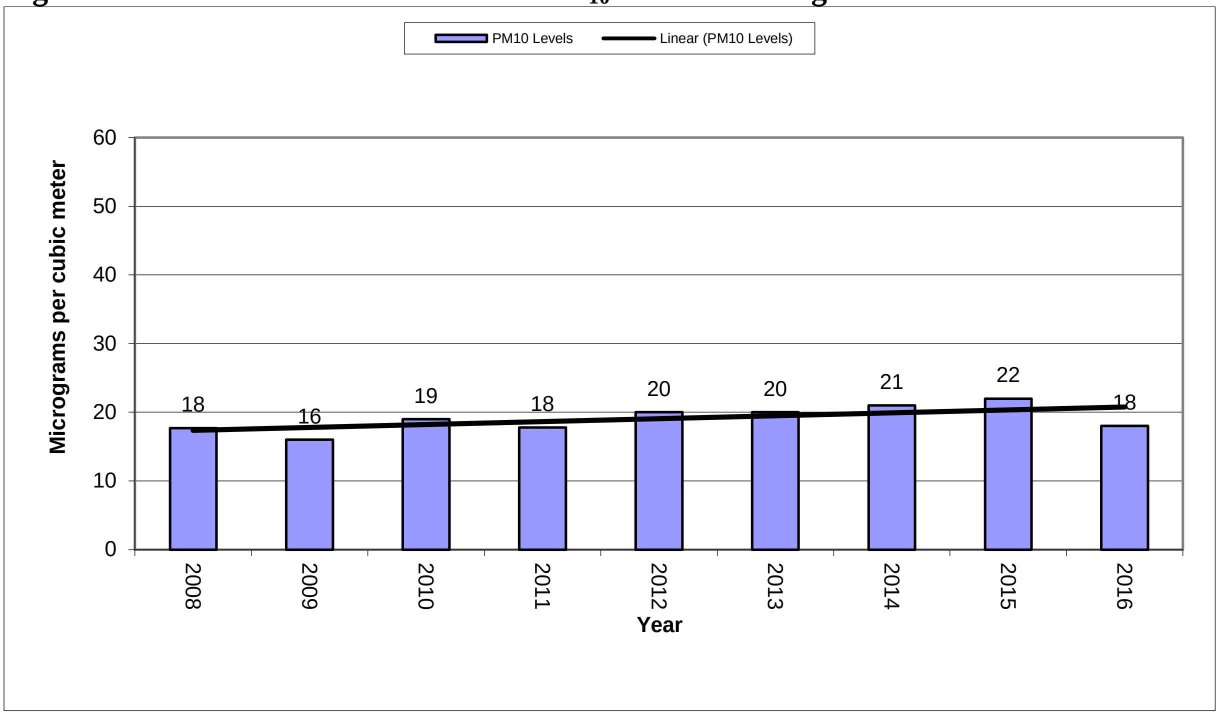
Parameter	Information
Site Name	SD School
AQS ID Number	46-099-0008
Street Address	2009 East 8th Street, Sioux Falls, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 687,288.70 N 4,822,930.29
MSA	Sioux Falls
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Daily/Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	beta attenuation
Data Use	SLAMS (Comparison to the NAAQS)
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Reference Method RFPS-0498-117
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000 w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)
$PM_{10-2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0709-185
Operating Schedule	Every Daily/Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	beta attenuation
Data Use	SLAMS (Comparison to the NAAQS)
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Daily/Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	beta attenuation
Data Use	SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Hourly

Parameter	Information
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Instrumental Thermo 49C
Analysis Methods	Ultraviolet
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1194-099
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Teledyne API's T200
Analysis Methods	Chemiluminescence detection
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
NO_y	**(Continuous)**
Sampler Type	None
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	Population
Sampling Method	Teledyne API's T200
Analysis Methods	Chemiluminescence NO-Dif-NO_y
Data Use	SPMs
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Instrumental Thermo 43i TLE
Analysis Methods	Pulsed Fluorescence
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data
CO	**(Continuous)**
Sampler Type	Federal Reference Method RFCA-1093-093
Operating Schedule	Hourly
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Teledyne API 300E
Analysis Methods	Gas/Filter/Correlation
Data Use	SLAMS (Comparison to the NAAQS), Real-time Data

10.5.1.1 *School for the Deaf Site PM_{10} Data*

Figure 10-23 shows a graph of the PM_{10} annual averages since 2008. The annual averages at the School for the Deaf Site range from a high of 22 micrograms per cubic meter in 2015 to a low of 16 micrograms per cubic meter in 2009. The trend line indicates a slightly increasing concentration level. This parameter is meeting the goals of high concentration and population and will be continued.

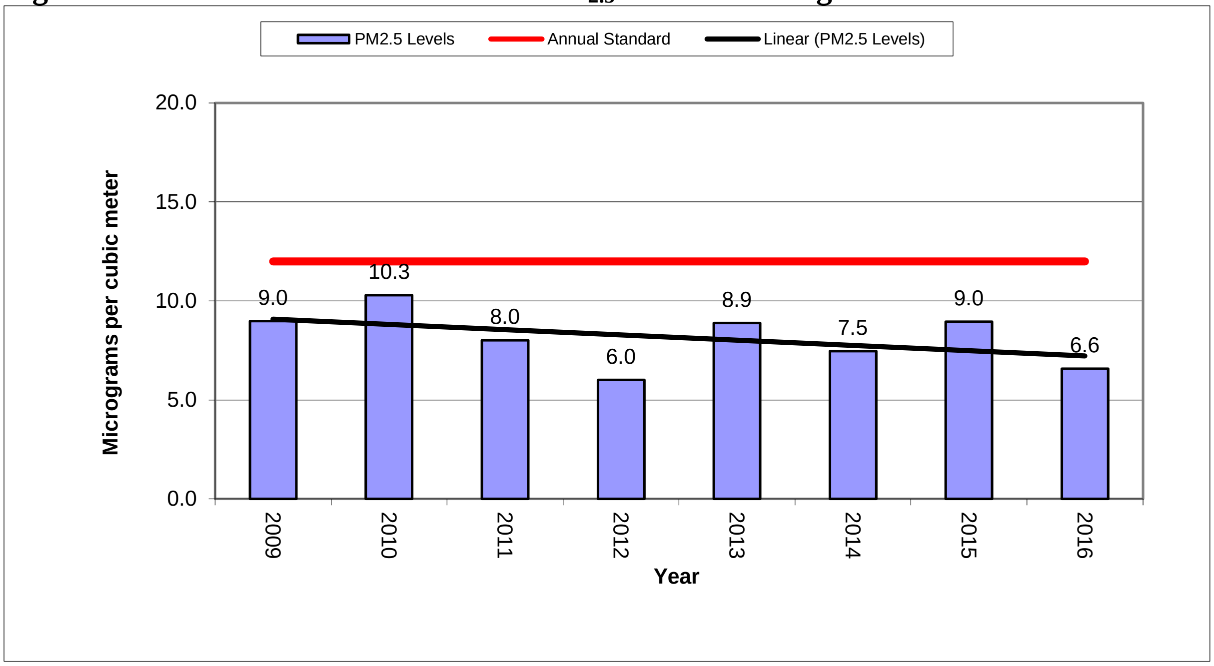
Figure 10-23 – School for the Deaf Site PM_{10} Annual Averages



10.5.1.2 *School for the Deaf Site – $PM_{2.5}$ Data*

$PM_{2.5}$ data has been collected at this site since 2008. Annual averages for the School for the Deaf Site range from a low of 6 micrograms per cubic meter in 2012 to a high of 10.3 micrograms per cubic meter in 2010. The overall trend at this site shows a slight decrease in concentration levels. Figure 10-24 contains a graph of the annual averages.

Figure 10-24 – School for the Deaf Site $PM_{2.5}$ Annual Averages

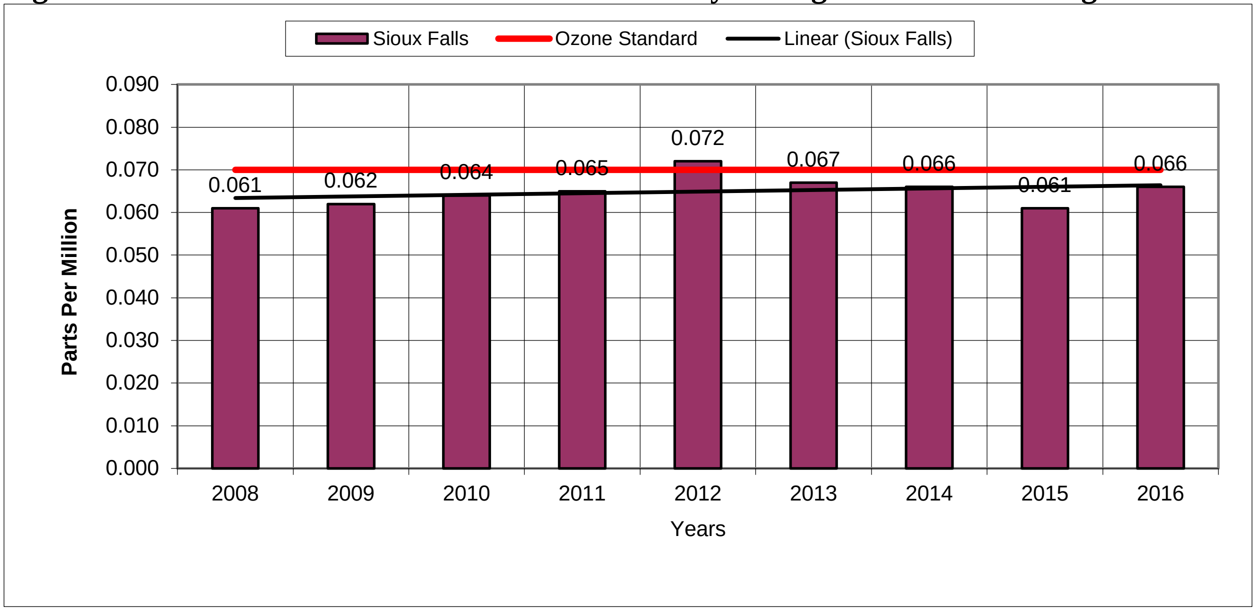


Concentrations of $PM_{2.5}$ are some of the highest in the state at this site. In 2014, the School for the Deaf Site had concentrations of $PM_{2.5}$ that ranked as the highest in the state along with the City Hall Site but in some previous years it has rank as low as the third highest site statewide. This parameter will remain a priority because of past high concentrations levels for the annual and 24-hour standards. Testing for this parameter is meeting the goals of high concentration and population and will be continued.

10.5.1.3 *School for the Deaf Site Ozone Data*

Figure 10-25 contains a graph of each year's 4th highest ozone concentration level. The ozone analyzer runs on a continuous sampling schedule providing hourly concentrations to the data logger. The official yearly ozone season for South Dakota runs from March 1 to October 31.

Figure 10-25 – School for the Deaf Site Ozone Yearly 4th Highest 8-Hour Averages



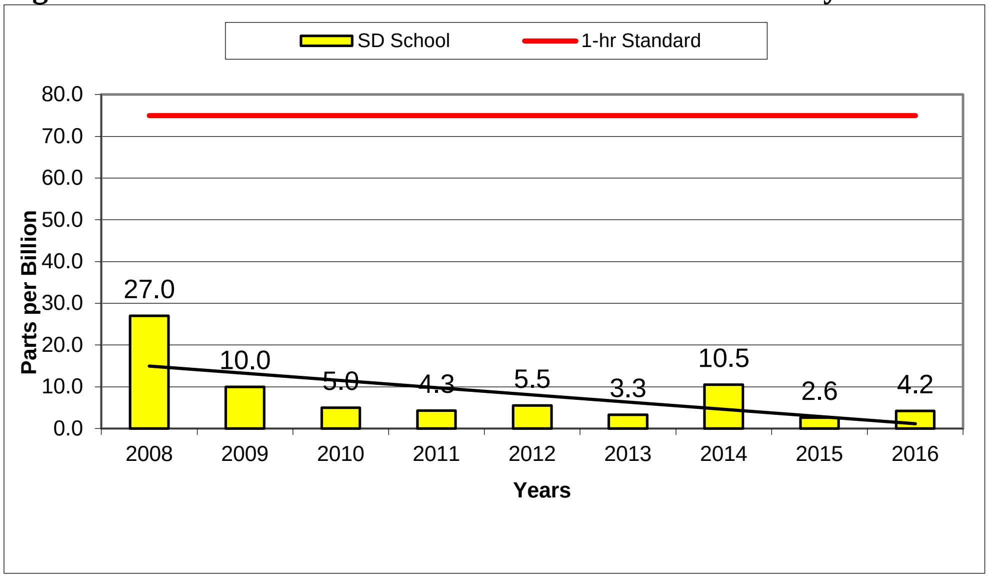
Sampling began for ozone at this site in 2008. The highest yearly 4th highest 8-hour ozone concentration recorded at this site was in 2012 at 0.072 parts per million. The lowest yearly 4th highest 8-hour ozone concentration was recorded at 0.061 parts per million in 2008 and 2015. The trend line shows a slightly increasing level of ozone over the nine years of testing mostly due to the 2012 sampling year. In 2016, concentrations of ozone increased from the level in 2015. This parameter is meeting the goals of high concentration and population testing and is one of the highest sites in the state so the testing will be continued at this site.

10.5.1.4 *School for the Deaf Site Sulfur Dioxide Data*

Testing for Sulfur Dioxide started in 2008 at this site. A continuous analyzer is operated providing hourly concentration levels. The levels of Sulfur Dioxide have dropped in concentration since the first year of testing. The type of analyzer was changed to a trace level Sulfur Dioxide analyzer in 2011. The detection level of this analyzer is now 0.1 parts per billion.

In 2015, concentrations of Sulfur Dioxide decreased to the lowest level since testing began, but were up slightly in 2016. The trend line shows a drop in concentrations of Sulfur Dioxide over the nine years of testing. This parameter is meeting the goals of high concentration and population and testing will be continued at this site. Figure 10-26 contains a graph of the Sulfur Dioxide yearly 1-hour 99th percentile for each sampling year.

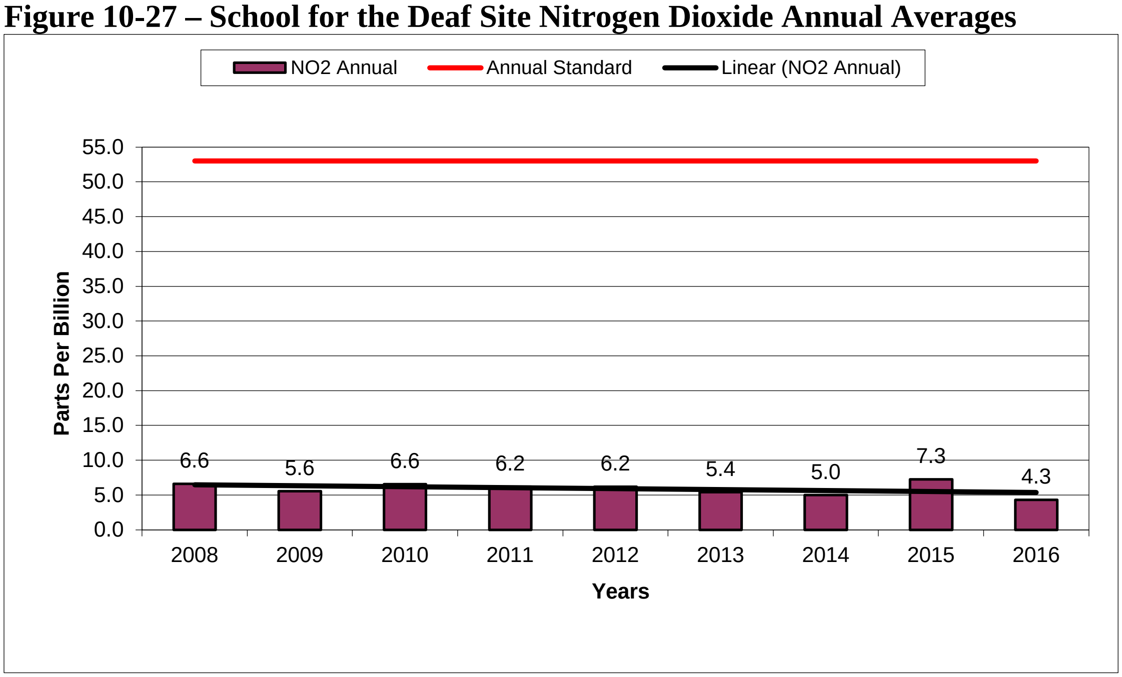
Figure 10-26 – School for the Deaf Site Sulfur Dioxide Yearly 1-hour 99th Percentile



10.5.1.5 *School for the Deaf Site Nitrogen Dioxide Data*

The School for the Deaf Site began testing for Nitrogen Dioxide in 2008. The Nitrogen Dioxide analyzer provides hourly concentration levels. The School for the Deaf Site is the second highest Nitrogen Dioxide concentration area in the state. There is only 3 parts per billion difference in annual concentration levels from the highest annual average of 7.3 parts per billion in 2015 to the lowest of 4.3 parts per billion in 2016. Trends show concentrations have a slight decrease at this site. Figure 10-27 shows the annual average for each of the years that data was collected. This parameter is meeting the goals of high concentration and population and will be continued.

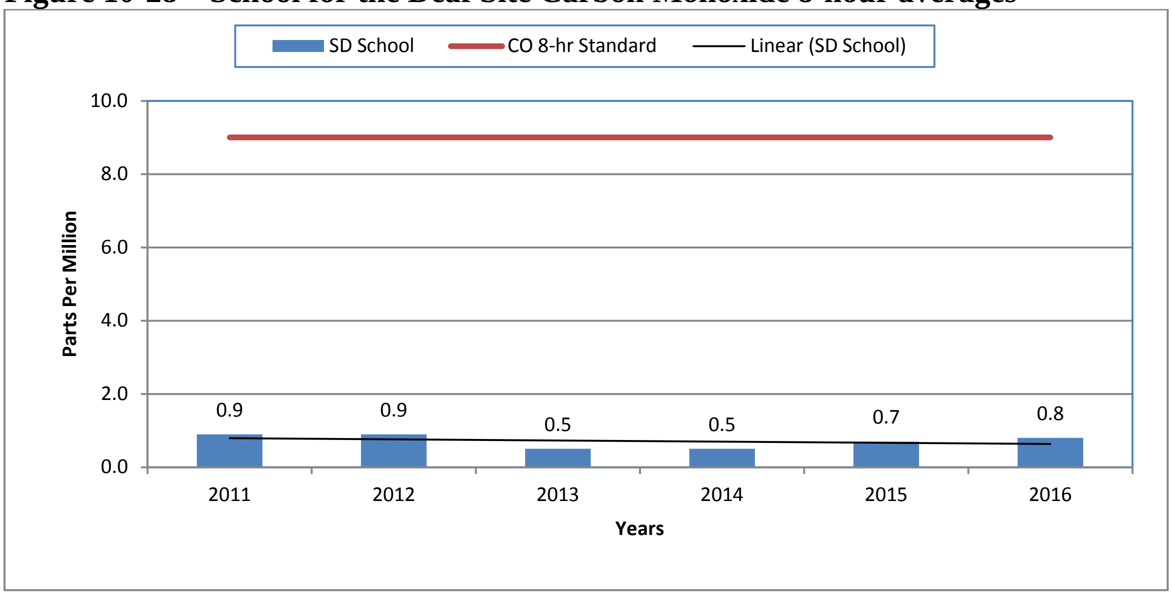
Figure 10-27 – School for the Deaf Site Nitrogen Dioxide Annual Averages



10.5.1.6 *School for the Deaf Site Carbon Monoxide Data*

The department operates just one Carbon Monoxide analyzer at our National Core site in Sioux Falls. A Carbon Monoxide analyzer was located at Union County #1 for a few years, but has since been shut down. The School for the Deaf Site began testing for Carbon Monoxide in 2011. The Carbon Monoxide analyzer provides hourly concentration levels. The highest 8-hour average recorded at the School for the Deaf Site was 0.9 parts per million in 2011 and 2012. Trends show concentrations are declining slightly at this site. The Carbon Monoxide concentrations are very low so the area is attaining the National Ambient Air Quality Standards. Figure 10-28 shows the 8-hour average for each of the years that data was collected. This parameter is meeting the goals of high concentration and population and will be continued.

Figure 10-28 – School for the Deaf Site Carbon Monoxide 8-hour averages



10.6 Aberdeen Area

In 2016, one sampling site was operated in the city of Aberdeen at the Fire Station #1 Site. The Fire Station #1 Site was established in 2000 as part of the implementation of the $PM_{2.5}$ air monitoring network. The parameters tested at the site include PM_{10} and $PM_{2.5}$. The monitoring site is located in the center of the city on top of the fire station roof just east of the main downtown business area. The area around the site has service type businesses, county and city offices, and residential area to the east. See Figure 10-29 for a picture of the monitoring site.

Figure 10-29 – Aberdeen's Fire Station #1 Site

In 2009, Fire Station #1 was renovated and a small addition was added to the south side of the building. The addition required no changes at the site so the location requirements in Title 40 of the Code of Federal Regulations Part 58 are still met. Table 10-7 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Table 10-7 – Fire Station #1 Site Specifics

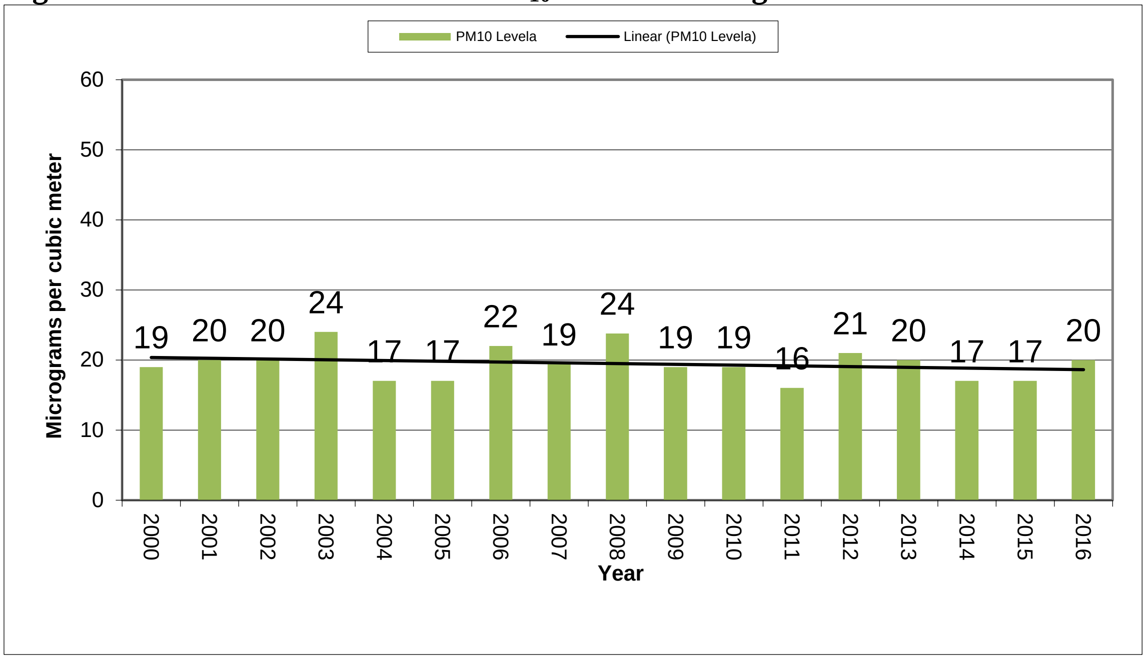
Parameter	Information
Site Name	Fire Station #1
AQS ID Number	46-013-0003
Street Address	111 2nd Ave SE, Aberdeen, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 540,216.92 N 5,034,545.94
MSA	None
PM_{10}	**(Manual)**
Sampler Type	Federal Reference Method RFPS-1298-126
Operating Schedule	Every 6th Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Partisol 2000i
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS),
$PM_{2.5}$	**(Manual)**
Sampler Type	Federal Reference Method RFPS-0498-117

Parameter	Information
Operating Schedule	Every 3rd Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Partisol 2000i w/VSCC
Analysis Methods	Gravimetric
Data Use	SLAMS (Comparison to the NAAQS)

10.6.1 Fire Station #1 Site PM_{10} Data

In 2009, the sampling schedule for PM_{10} changed from every third day to every 6th day because concentrations at the site continue to be low and the chance of recording a concentration over the current standard is very low. Figure 10-30 contains a graph of the annual averages since the site was setup in 2000.

Figure 10-30 – Fire Station #1 Site PM_{10} Annual Averages

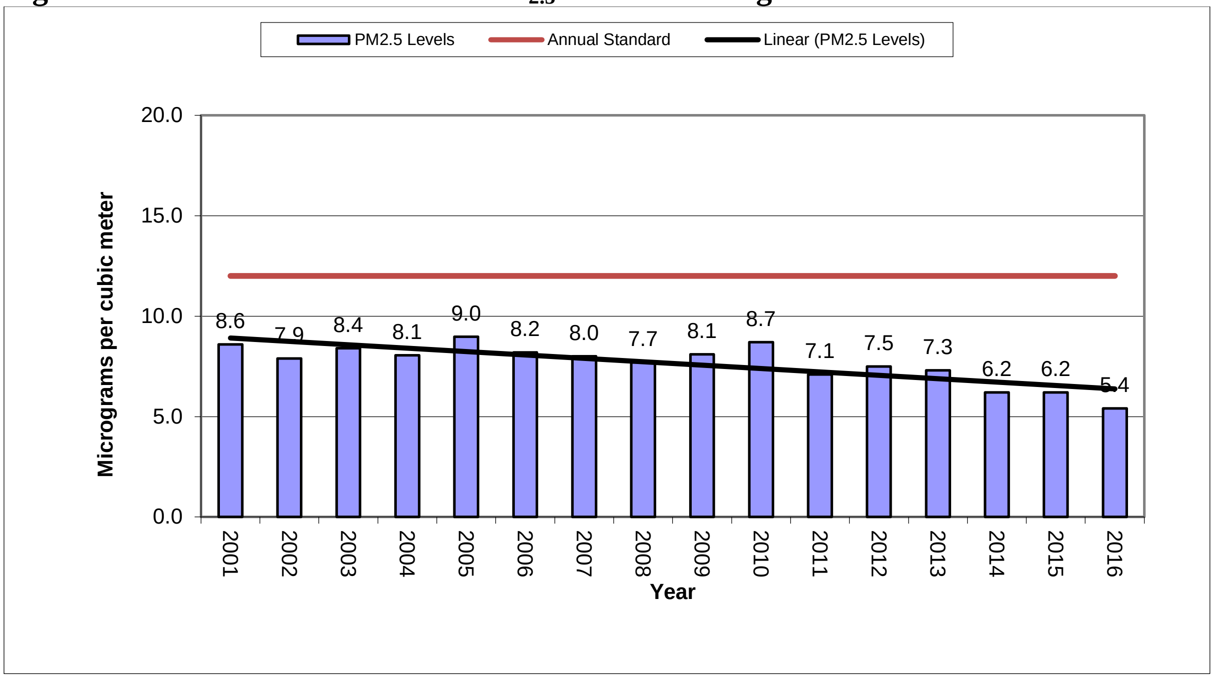


The annual average concentrations change from year to year but with the addition of the annual average for 2016 the trends line indicates a slight decrease in concentrations over the seventeen years of testing. The annual averages range from a low of 16 micrograms per cubic meter in 2011 to a high concentration level of 24 micrograms per cubic meter recorded in 2003 and 2008. The testing for this parameter is meeting the goals of high concentration and population.

10.6.2 Fire Station #1 Site $PM_{2.5}$ Data

Sampling began for $PM_{2.5}$ at this site in 2001. The $PM_{2.5}$ monitors run on an every third day sampling schedule. Annual averages for the Fire Station #1 Site in Aberdeen have ranged from 5.4 micrograms per cubic meter in 2016 to 9.0 micrograms per cubic meter in 2005. The trend line shows that annual average is declining in concentration level over the last sixteen years. The testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-31 contains a graph of the annual average concentrations.

Figure 10-31 – Fire Station #1 Site $PM_{2.5}$ Annual Averages



Because of continued industrial growth, to provide for the testing for other pollutants and to provide real time hourly data to the public, the Aberdeen area will be evaluated to determine if a new site location would better represent the sampling needs of this area.

10.7 Brookings Area

In 2016, one air monitoring site was operated in the Brookings County. The older site located at the City Hall building in the center of the city of Brookings was discontinued. The Research Farm Site was setup in 2008 and is located at the Soil Conservation Farm northwest of the city of Brookings.

10.7.1 Brookings Research Farm Site

The Brookings Research Farm Site was set up in cooperation with the 3M Company in Brookings and Valero Renewable Fuels Company near the city of Aurora which provided the equipment for the site. The sampling was a requirement of the Prevention of Significant Deterioration permits for both facilities. The department is operating the site and provided data to the facilities. The 3M Company has completed their air monitoring report using the data for 2008. Valero Renewable Fuels Company decided not to complete the facility upgrade under its Prevention of Significant Deterioration permit and no longer needs data from the Brookings Research Farm Site. Ozone data collected between 2008 and 2010 was added as a state and local air monitoring stations site to the National Database in 2010 and the site was continued, adding continuous PM_{10} and $PM_{2.5}$ in 2015.

The site location is outside of the Nitrogen Dioxide one microgram area modeled for the facilities in the Brookings area. The goals of the monitoring site were the evaluation of impacts to the ozone concentrations from modification at the 3M Company and Valero Renewable Fuels Company and to date the goals have been met. New goals have been added to collect ozone data downwind of a small city and for comparison to the National Ambient Air Quality Standards. The completion of the 2016 sampling year provides nine years of testing and a better idea of trends for the ozone data. Figure 10-32 shows a current picture of the monitoring site. Table 10-8 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Figure 10-32 – Brookings Research Farm Site

Table 10-8 – Brookings Research Farm Site Specifics

Parameter	Information
Site Name	Brookings Research Farm
AQS ID Number	46-011-0003
Street Address	3714 Western Ave.
Geographic Coordinates	UTM Zone 14, NAD 83, E 674766.316 N 4912930.911
MSA	None
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional

Parameter	Information
Monitoring Objective	High Concentration, Population, and Background
Sampling Method	Thermo 49i
Analysis Methods	ultraviolet
Data Use	SLAMS (Comparison to the NAAQS),
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Thermo 5014i BETA
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	Population and High Concentration
Sampling Method	Met One BAM-1020
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data

10.7.1.1 *Brookings Research Farm Site PM_{10} Data*

PM_{10} sampling began at this site in 2015. The annual average for 2015 was 18 micrograms per cubic meter and for 2016 was 15 micrograms per cubic meter. Testing for this parameter is meeting the goals of high concentration and population.

10.7.1.2 *Brookings Research Farm Site $PM_{2.5}$ Data*

$PM_{2.5}$ sampling began at this site in 2015. The annual average for 2015 was 5.9 micrograms per cubic meter and for 2016 was 4.5 micrograms per cubic meter. Testing for this parameter is meeting the goals of high concentration and population. Most of the high 24-hour concentrations occur on days that are regional in scale. Annual averages are well under the standard and similar to the levels recorded at sites on the eastern edge of the state.

10.7.1.3 *Brookings Research Farm Site Ozone Data*

The 2016 sampling year is the ninth ozone season of testing. In 2016, the Brookings Research Farm Site had a fourth highest 8-hour average for the year under the standard of 0.070 parts per million. The ozone data trend indicates an increasing level.

The testing for this parameter is meeting the goals of a state and local air monitoring stations location and will be continued because it is one of three sites recording the highest concentrations in the state. It is meeting the goal of high concentration and population. The graph in Figure 10-33 shows the yearly 4th highest ozone concentration level for the last nine years.

Figure 10-33 – Brookings Research Farm Site Ozone Yearly 4th Highest 8-Hour Averages

10.8 Watertown Area

In 2016, one sampling site was operated in the city of Watertown. Watertown is the fourth largest city in South Dakota with a population of 21,482. The city has an increasing growth rate and industrial base. The industrial base is a mixture of service-oriented business and light industry. One other air monitoring site was operated in Watertown starting in 1974 and closed 1987. No other air monitoring data has been operated in the city. Figure 10-34 shows a picture of the monitoring site.

Figure 10-34 – Watertown Site

The current Watertown Site was established in 2003 as part of the implementation of the $PM_{2.5}$ network. In 2012, the manual $PM_{2.5}$ monitors were replaced with a continuous monitor. Tested at the site includes the parameters of PM_{10} and $PM_{2.5}$ at a sampling frequency of every day.

The monitoring site is located in the western third of the city just east of an industrial park area. The site is located on City property in a monitoring shelter. The area around the site has service type businesses and light industry to the west and south. Residential areas are located to the north and east of the site. There have been no significant changes noted in buildings or trees around the site during this review. Table 10-9 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Table 10-9 – Watertown Site Specifics

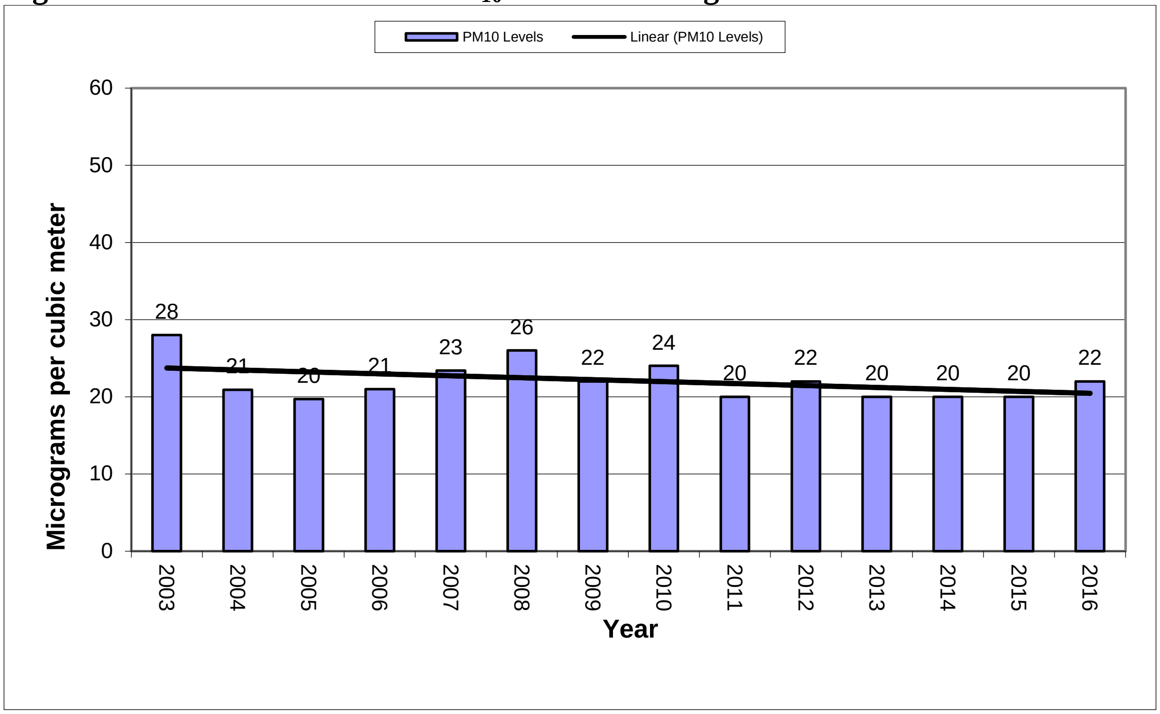
Parameter	Information
Site Name	Watertown
AQS ID Number	46-029-0002
Street Address	801 4th Ave. SW, Watertown, SD
Geographic Coordinates	UTM Zone 14, NAD 83, E 647,740.74 N 4,973,300.25
MSA	None
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0798-122
Operating Schedule	Every Day
Scale Representation	Neighborhood
Monitoring Objective	High Concentration and Population
Sampling Method	Met One BAM-1020 Continuous
Analysis Methods	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-Time Data
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	SLAMS (Comparison to the NAAQS) Real-time Data

10.8.1 Watertown Site PM_{10} Data

The PM_{10} monitor operated on an every third day sampling schedule until 2006 when a continuous PM_{10} monitor replaced the manual monitors and an everyday sampling schedule began. The highest recorded annual average for PM_{10} concentrations was 28 micrograms per cubic meter recorded in 2003. The lowest annual average concentration of 20 micrograms per cubic meter was recorded on the manual monitor in 2005 and continuous monitor in 2011, 2013, 2014, and 2015. The annual average indicates concentration levels are slightly decreasing during the 13 years of testing but the last three years of testing concentrations have remained at the same level. PM_{10} concentration levels can get close to and have exceeded the 24-hour standard.

Testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-35 contains a graph of the annual averages.

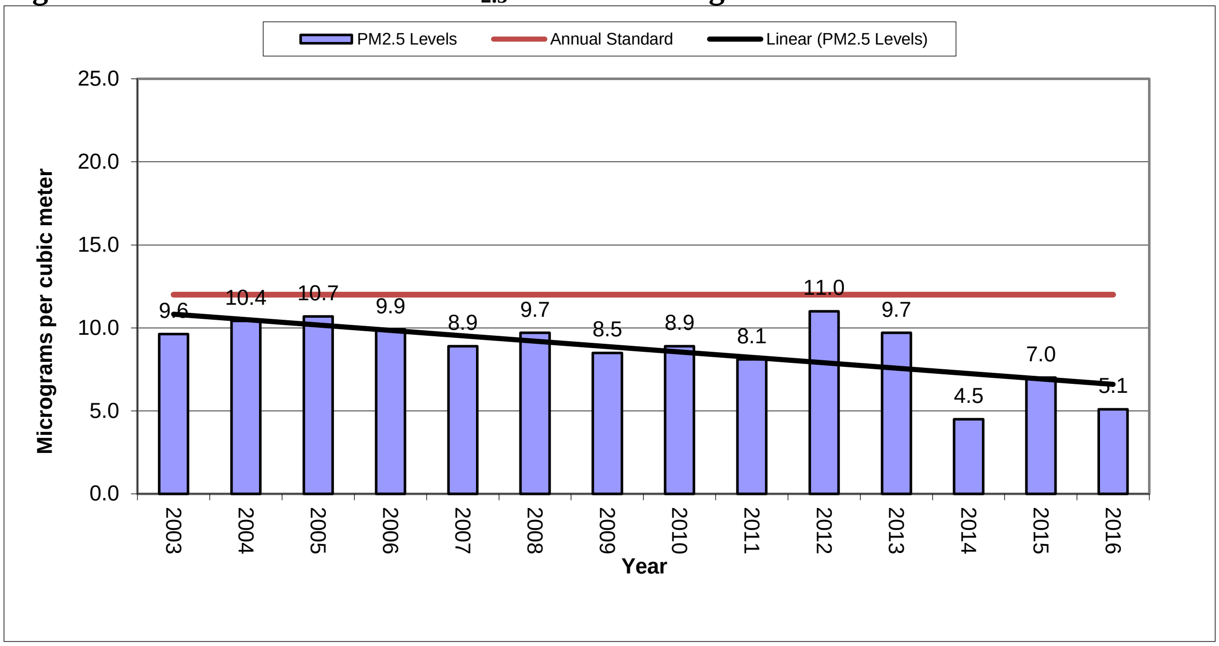
Figure 10-35 – Watertown Site PM_{10} Annual Averages



10.8.2 Watertown Site $PM_{2.5}$ Data

The $PM_{2.5}$ monitors were run on an every third day schedule since the $PM_{2.5}$ monitors were setup in 2003. Beginning in 2012, a continuous monitor was installed and the site reported hourly concentrations on an everyday schedule. Annual averages for the Watertown Site range from a high of 11.0 micrograms per cubic meter in 2012 to a low of 4.5 micrograms per cubic meter in 2014. The annual average shows a decrease in $PM_{2.5}$ concentration levels over the 14 years of testing even when including the 2012 year. Testing for this parameter is meeting the goals of high concentration and population and will be continued. Figure 10-36 contains a graph showing the annual average concentration for each year of operation.

Figure 10-36 – Watertown Site $PM_{2.5}$ Annual Averages



10.9 Union County Area

At the beginning of 2009, three new monitoring sites were set up in Union County. No ambient air quality testing had ever been completed in this county. All three sites are located north of Elk Point. The sampling goals for the new sites were to determine air pollution levels near the location of the proposed Hyperion Energy Center prior to construction, during construction, and post construction. Currently, the proposed project's Prevention of Significant Deterioration air quality permit has expired, no new application was submitted by the company and purchase easements on the property in Union County have all expired. By the end of 2013, the sites had collected five years of data so there is an adequate amount of data for use to show background levels and the difference in sampling locations for future use. With no current project pending there is only need for one site to continue to show current levels in rural Union County.

In 2012, the Union County #3 site was closed with the ozone parameter moved to Union County #1. At the end of 2013, the Union County #2 site was closed because it was a duplicate site to Union County #1. At the end of 2013, the Carbon Monoxide testing at Union County #1 was discontinued because recorded concentrations were very low and there was no indication concentrations would ever get close to the standard level.

10.9.1 Union County #1 Site

The Union County #1 Site is located about 4 1/2 miles north of Elk Point. Sampling began just before January 1, 2009. The goals for the site are background and for comparison to the National Ambient Air Quality Standards. Figure 10-37 provides a picture of the monitoring site looking to the North. Table 10-10 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Figure 10-37 – Union County #1 Site

Table 10-10 – Union County #1 Site Specifics

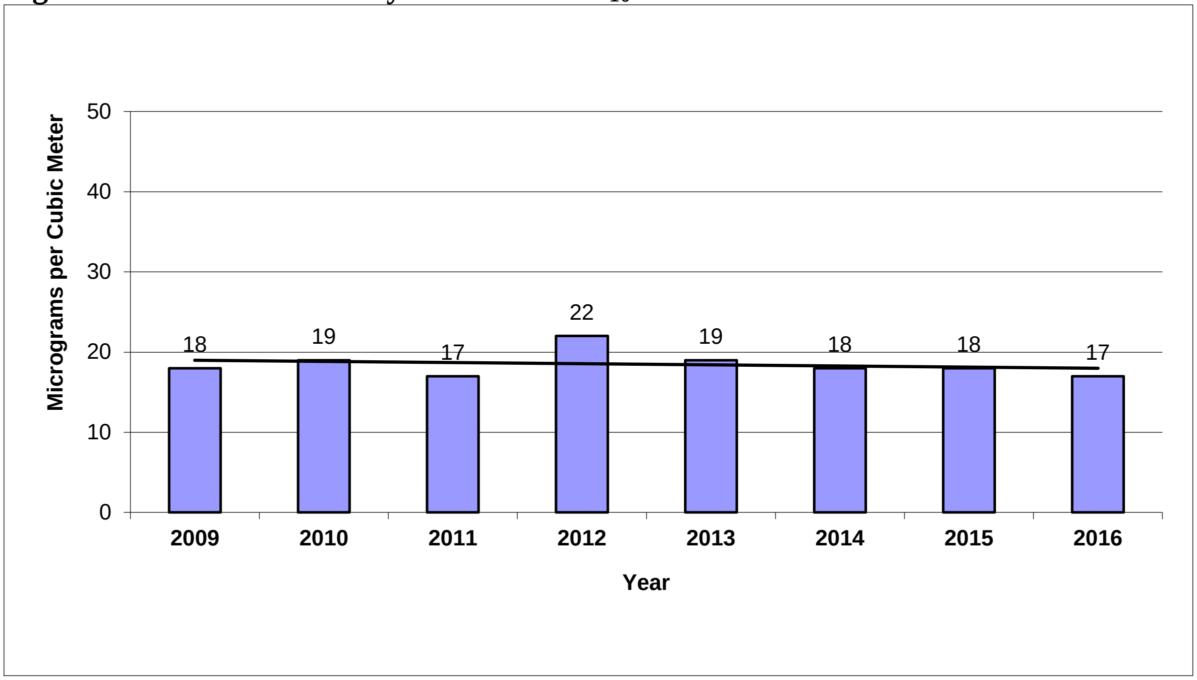
Parameter	Information
Site Name	UC #1
AQS ID Number	46-127-0001
Street Address	31988 457th Ave.
Geographic Coordinates	Lat. + 42.751518 Long. – 96.707208
MSA	Sioux City, IA-NE-SD
PM_{10}	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-1102-150
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Thermo TA Series FH 62 C14 Continuous
Analysis Method	Beta Attenuation

Parameter	Information
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
SO_2	**(Continuous)**
Sampler Type	Federal Equivalent Method EQSA-0486-060
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Instrumental 43i Trace Level Thermo
Analysis Methods	Pulsed Fluorescent
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
NO_2	**(Continuous)**
Sampler Type	Federal Reference Method RFNA-1194-099
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Teledyne API T200
Analysis Method	Chemiluminescence
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)
Ozone	**(Continuous)**
Sampler Type	Federal Equivalent Method EQOA-0880-047
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Thermo 49i
Analysis Method	Ultraviolet
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)

10.9.2 Union County #1 Site PM_{10} Data

The average concentrations of PM_{10} at the UC #1 Site represent concentration levels similar to other sites in eastern South Dakota. The annual average PM_{10} concentrations at this site range from 17 micrograms per cubic meter in 2011 to 22 micrograms per cubic meter in 2012. Trends indicate concentrations show little change and are steady for UC #1 Site. See the annual averages for the UC #1 Site in Figure 10-38.

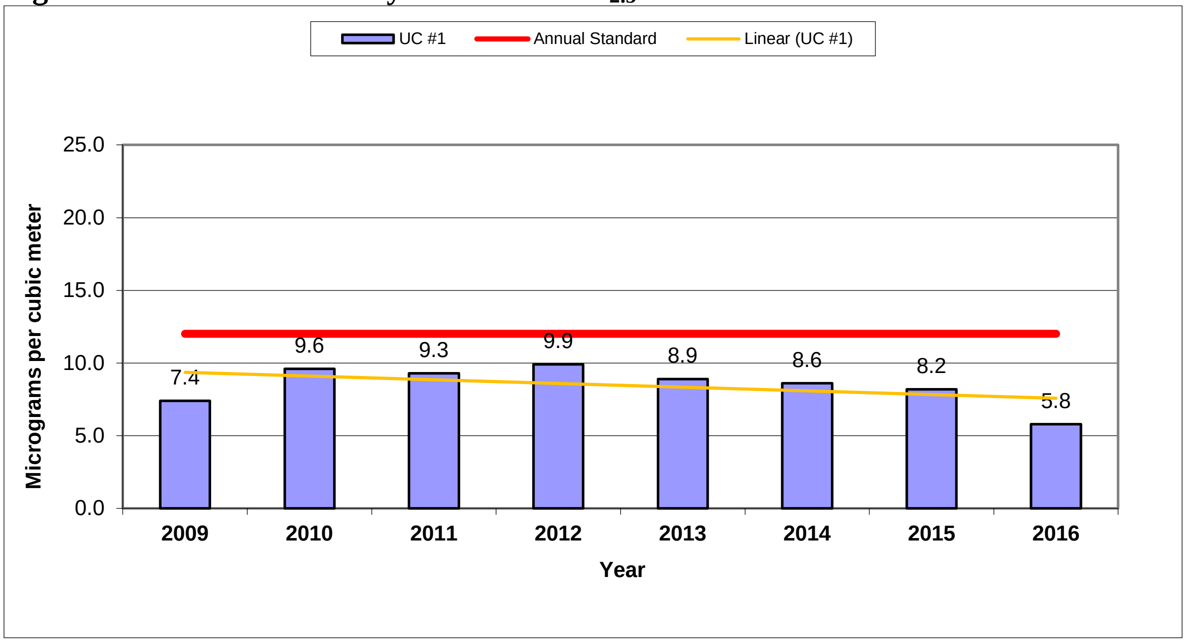
Figure 10-38 – Union County #1 Annual PM_{10} Concentrations



10.9.3 Union County #1 Site $PM_{2.5}$ Data

The Union County #1 Site continues to be one of the highest annual average and 24-hour locations in the state and on some years is the highest concentration site in the state. The trend lines show concentrations to be slightly decreasing over the eight years of testing. The last four years concentrations have decreased compared to levels in 2012. See Figure 10-39 to view a graph of the annual averages.

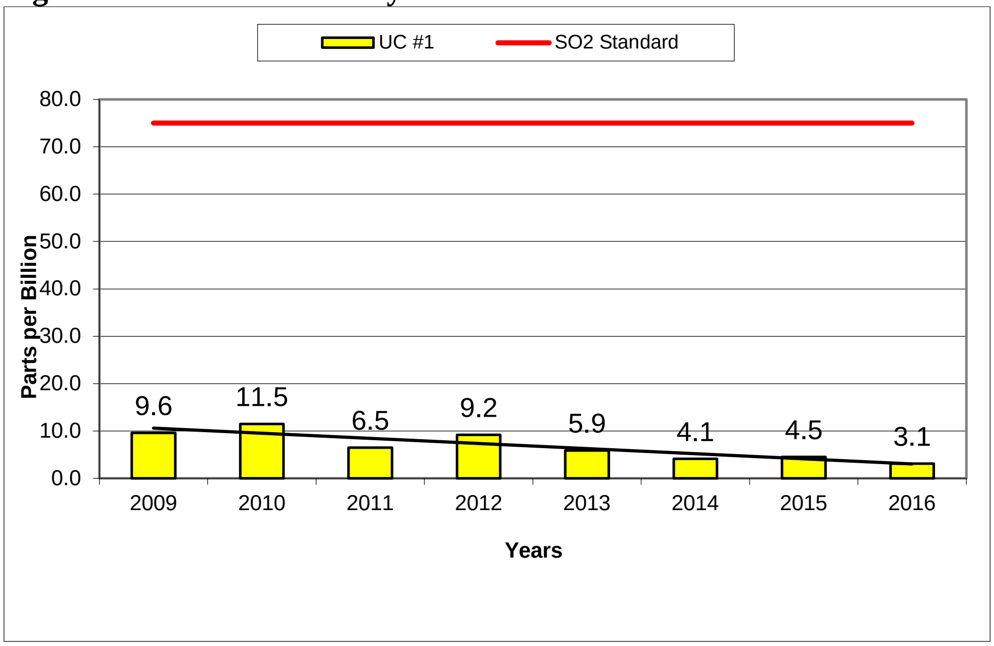
Figure 10-39 – Union County #1 Annual $PM_{2.5}$ Concentrations



10.9.4 Union County #1 Site Sulfur Dioxide Data

Concentrations of Sulfur Dioxide follow the same trend as other sites in the state with many hourly average concentrations low near the detection level (0.1 parts per billion) for the analyzer method being used to collect the data. A trace level Sulfur Dioxide analyzer has operated at this site beginning in 2009. Trends indicate Sulfur Dioxide levels are dropping at this site. See Figure 10-40 for a graph showing the 1-hour 99th percentile for this site.

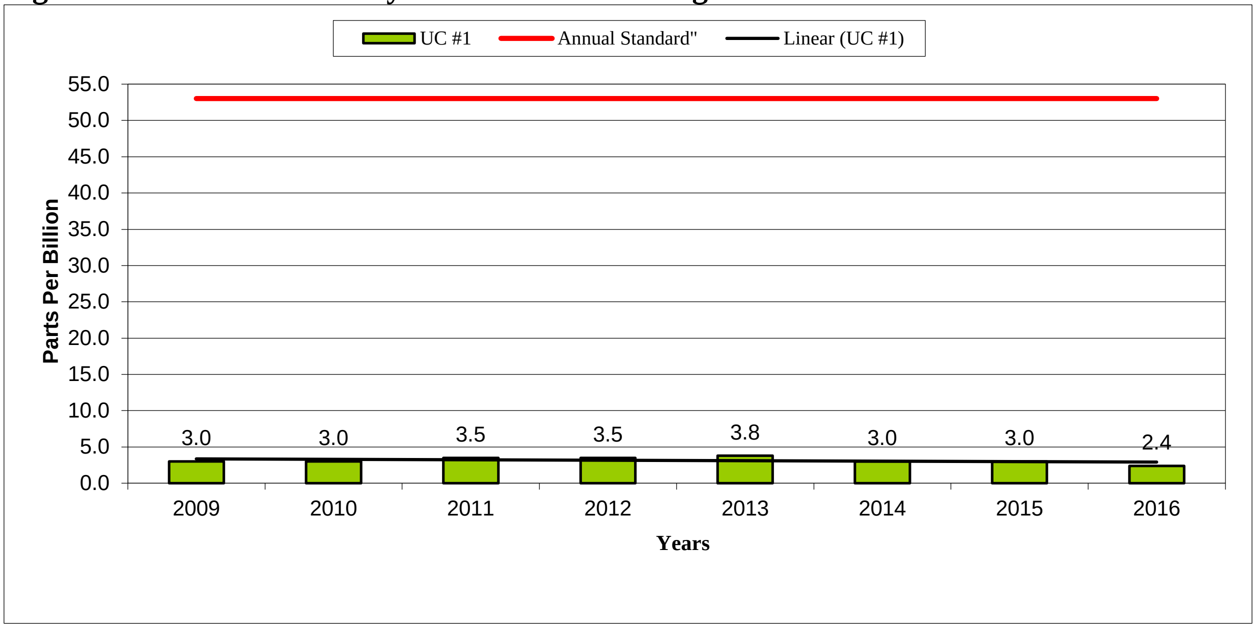
Figure 10-40 – Union County #1 Sulfur Dioxide 1-hour Concentrations



10.9.5 Union County #1 Site Nitrogen Dioxide Data

Concentrations of Nitrogen Dioxide follow the same trends as other rural areas in the state like the Badlands and Wind Cave sites. Annual average concentrations are very low near the detection level for the analyzer method being used to collect the data. Just as the Sulfur Dioxide parameter, the Nitrogen Dioxide parameter differences are noted from year to year when comparing a 1-hour average but the annual averages are very close in concentration. Trends indicate a steady concentration level for Union County #1 over the seven years of testing. Figure 10-41 shows a graph of the annual average concentrations for this site.

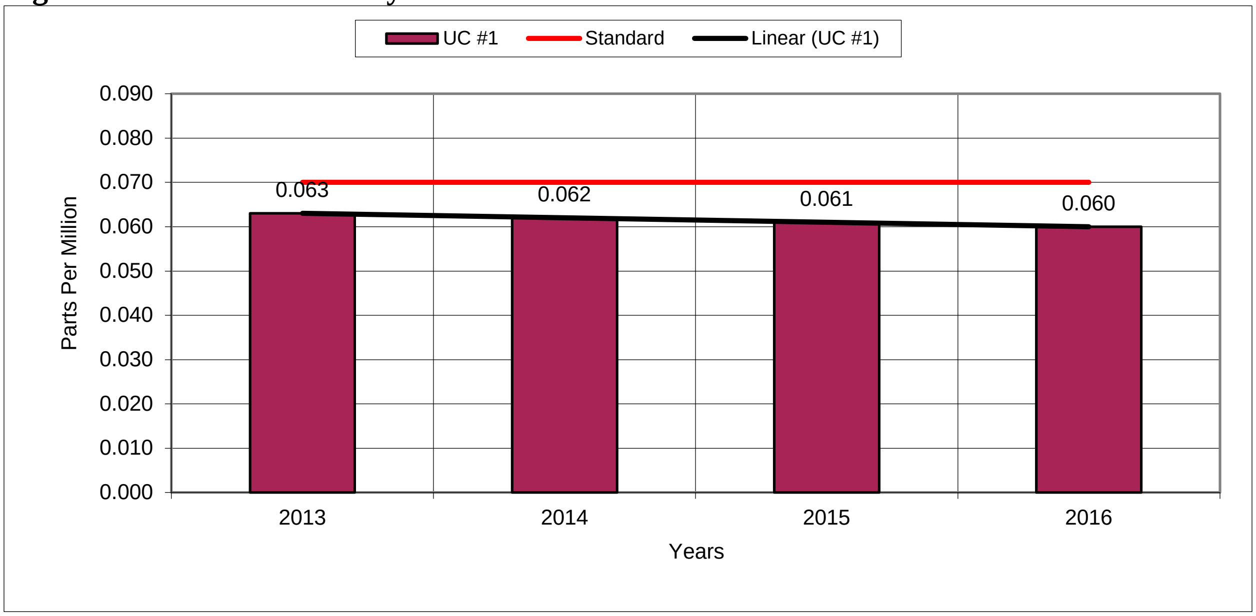
Figure 10-41 – Union County #1 Site Annual Nitrogen Dioxide Concentrations



10.9.6 <u>Union County #1 Site Ozone Data</u>

The ozone 8-hour average for the Union County #1 site recorded a concentration that was similar to levels recorded at the other two sites in the eastern part of the state in 2016. See Figure 10-42 for a graph of the ozone concentrations at the Union County #1 Site. The trend is slightly decreasing in concentration levels.

Figure 10-42 – Union County #1 Site Ozone Concentrations



10.10 Pierre Area

Pierre is the capital city of South Dakota. It is located in the center of the state along the rough river bluffs overlooking the Missouri River. The population was 13,646 at the 2010 census. Pierre has a relatively dry, four-season climate with long, dry, cold winters, hot summers and brief spring and autumnal transitions.

10.10.1 Pierre Airport Site

At the beginning of 2015, a new monitoring site was set up in Pierre. The site is located at the Pierre Regional Airport Industrial Park in northeast Pierre. The sampling goal for the new site was to test in a new area of the state with no past $PM_{2.5}$ monitoring. Figure 10-43 provides a picture of the monitoring site looking to the North. Table 10-11 contains details on the monitoring site specific to the requirements in Title 40 of the Code of Federal Regulations Part 58.

Figure 10-43 – Pierre Airport Site

Table 10-11 – Pierre Airport Site Specifics

Parameter	Information
Site Name	Pierre Airport
AQS ID Number	46-065-0003
Street Address	4293 Airport Road
Geographic Coordinates	Lat. + 44.373786 Long. – 100.287269
MSA	None

Parameter	Information
$PM_{2.5}$	**(Continuous)**
Sampler Type	Federal Equivalent Method EQPM-0308-170
Operating Schedule	Every Day
Scale Representation	Regional
Monitoring Objective	Background, Transport
Sampling Method	Met One BAM-1020 w/$PM_{2.5}$ VSCC
Analysis Method	Beta Attenuation
Data Use	Real-time Data and SLAMS (Comparison to the NAAQS)

10.10.2 Pierre Airport Site – $PM_{2.5}$ Data

2016 was the second year of monitoring at the Pierre Airport Site. The annual PM2.5 concentration at the site was 4.45 micrograms per cubic meter in 2015 and 4.32 micrograms per cubic meter in 2016. After three years of data is collected a graph with a trend line will be shown. The Pierre Airport site shows relatively low concentrations, just above those at the National Parks sites.

11.0 SPECIAL AIR QUALITY MONITORING

11.1 $PM_{2.5}$ Speciation Monitoring Program

Speciation Monitoring Program

The chemical speciation network will quantify mass concentrations and significant $PM_{2.5}$ constituents which include trace elements, sulfate, nitrate, sodium, potassium, ammonium, and carbon. This series of analytes is very similar to those measured within the Interagency Monitoring of Protected Visual Environments program.

Physical and chemical speciation data are anticipated to provide valuable information for:

1. Assessing trends in mass component concentrations and related emissions, including specific source categories.
2. Characterizing annual and seasonal spatial variation of aerosols.
3. Determining the effectiveness of implementation control strategies.
4. Helping to implement the $PM_{2.5}$ standard by using speciated data as input to air quality modeling analyses.
5. Aiding the interpretation of health studies by linking effects to $PM_{2.5}$ constituents.
6. Understanding the effects of atmospheric constituents on visibility impairment and regional haze.

South Dakota has one site that collects samples as part of the Speciation Network. This site collects 24-hour air samples on a 3-day schedule. The site is in Sioux Falls, located in southeastern South Dakota. Sioux Falls is the largest city in the state. The speciation monitor was moved from the KELO site to the School for the Deaf Site at the beginning of 2009. The School for the Deaf Site is located on the east central part of the city. The site is about 1.5 miles southeast of the main industrial area in Sioux Falls. The area around the site is mainly residential. Interstate 229 which is a major commuting road runs north and south about three city blocks east of the monitoring site. The predominant wind direction is northwest for most of the year with southeast winds during the summer months. Carbon samples were taken by the Met One SASS monitor. In September 2009, the Interagency Monitoring of Protected Visual Environments URG 3000N sampler was set up to do the carbon sampling. In November 2016, EPA Region 8 gave us a Met One Super SASS monitor to replace the SASS monitor.

At the beginning of 2016, a new lab was contracted to analyze and enter the data into the Air Quality System. There has been a lag in data entry and all of the 2016 data has not yet been entered. The following graphs will only show data through 2015. Figure 11-1 shows a comparison of the $PM_{2.5}$ concentrations between the speciation monitor, the manual monitor, and the continuous monitor located at this site (in 2015 the speciation mass was discontinued).

It appears that sampling frequency and method type is affecting the difference in concentration levels and overall trend for the speciation monitor. The first two years of testing the speciation monitor ran on an every sixth day schedule. In 2011 to 2015, the schedule was changed to every third day. This reduced some of the difference in annual average concentration and brings the speciation monitor annual average comparable to the manual monitor annual average. The continuous monitor annual average is calculated using three times more samples so a difference in the annual mean is expected.

Figure 11-1 – Average $PM_{2.5}$ Concentration

Figure 11-2 shows the average total organic carbon and elemental carbon concentrations for the URG monitor. Concentrations of carbon are low. The organic carbon concentrations are higher than the elemental carbon. The average contribution of elemental carbon to the overall concentration remained about the same. The overall trend for total carbon shows a slight increase in total carbon levels in the seven years of testing.

Figure 11-2 – Average URG Monitor Total Carbon Concentrations

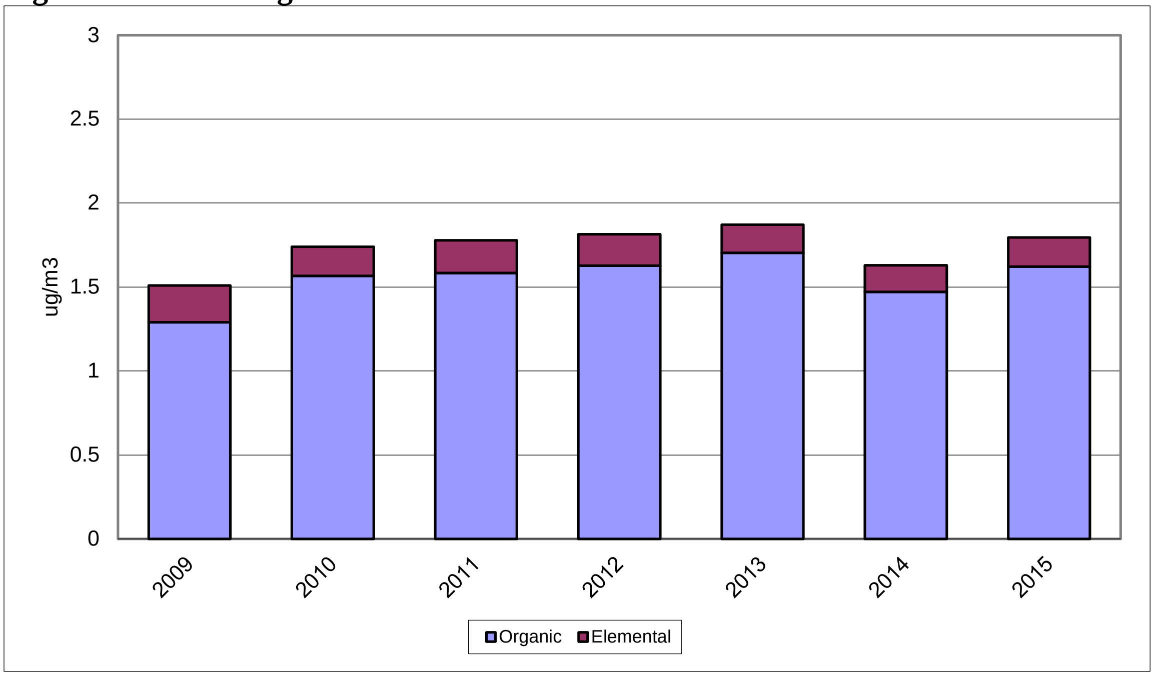
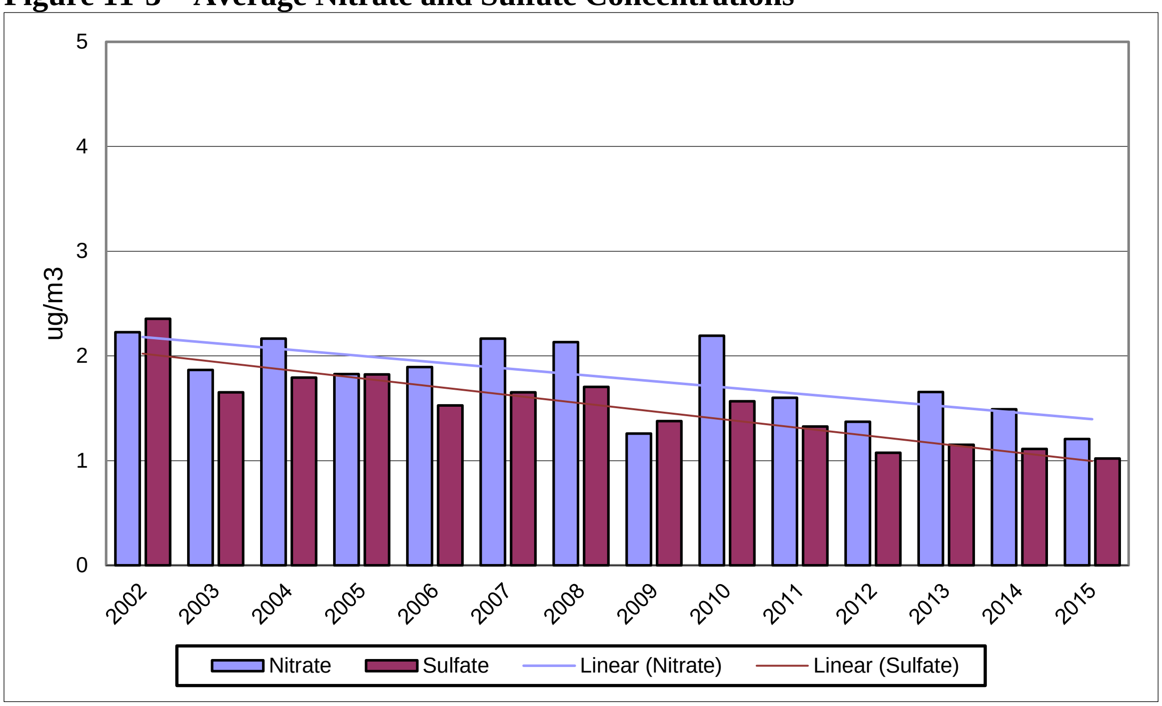


Figure 11-3 shows the average nitrate and sulfate concentrations analyzed from the $PM_{2.5}$ samples. The graph shows trends for the concentration of nitrates and sulfates are declining overall. 2015 had the lowest concentrations during the fourteen years of testing in Sioux Falls.

Figure 11-3 – Average Nitrate and Sulfate Concentrations



12.0 CONCLUSIONS

The ambient air quality monitoring network has demonstrated that South Dakota is currently attaining the federal National Ambient Air Quality Standards. All sites meet the requirements of Title 40 of the Code of Federal Regulation, Part 58, Appendix A, C, D, and E. The Air Quality Program is working to ensure that any changes in the air quality of the state are reviewed for possible health effects to the public. The ambient air quality monitoring network is continually reviewed to ensure that there is adequate coverage of populated areas in the state. As the state's population and industry changes, monitoring sites will be added or moved to new locations.

Major modifications to the sampling network include:

1. Evaluate the Aberdeen area and determine if current site meets the testing needs; and
2. Evaluate the state's sulfur dioxide and nitrogen dioxide monitor sites to determine if analyzers need to be moved to areas of the state with no data for these pollutants.

Equipment Purchase Priorities include the following items:

1. Replace old Thermo FH 62 C14 Particulate Matter BETA monitors;
2. Replace ESC 8816 data loggers;
3. Replace C series calibrators and analyzers;
4. Maintain the National Core site; and
5. Purchase new equipment as required to meet EPA requirements.

There is an ongoing effort to maintain staff training regarding the latest monitoring techniques and procedures to perform these studies. It is anticipated that the ambient air monitoring network will operate in much the same manner as it has in the past. This will include the identification of pollution problems, measurement and evaluation of the extent of the problem, and determination of action to be taken to protect the environment and the health of the people of South Dakota.

13.0 REFERENCES

1. Environmental Protection Agency, May 1977. Quality Assurance Handbook for Air Pollution Measurement Systems Volume II, Ambient Air Specific Methods (as amended), EPA-600/4-77-027a, Office of Air Quality Planning and Standards, Research Triangle Park, N.C.;
2. Environmental Protection Agency, January 2003. Title 40 Code of Federal Regulation, Parts 50 and 58 (as amended), United States Government Printing Office, Superintendent of Documents, Washington, D.C.; and
3. Environmental Protection Agency, March 1998. SLAMS / NAMS / PAMS Network Review Guidance, EPA-454/R-98-003, Office of Air Quality Planning and Standards, Research Triangle Park, N.C.

4 Environmental Protection Agency, Federal Register, March 2016. Title 40 Code of Federal Regulation, Part 58, Revisions to Ambient Monitoring Quality Assurance and Other Requirements; Final Rule