

# Rapid City Area Air Monitoring Report

## March 27, 2023

### SD Department of Agriculture and Natural Resources

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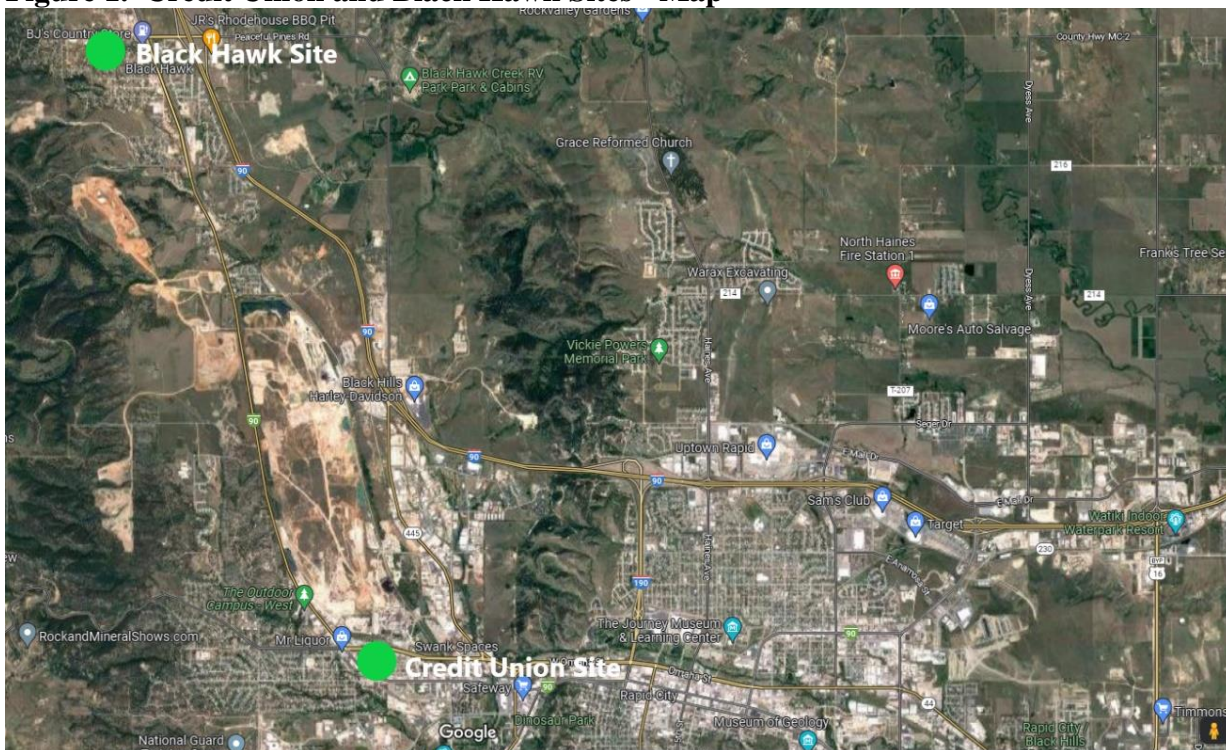
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#### Introduction

The focus of this report is on particulate matter 10 microns in diameter or less (PM-10) and particulate matter 2.5 microns in diameter or less (PM-2.5) pollution levels collected by the South Dakota Department of Agriculture and Natural Resources (DANR) in the Rapid City area. *The data in this report is draft and subject to change.*

Current levels of air pollutants in Rapid City can be viewed by going to the DANR Air Quality **Real Time Data** webpage (<https://denravweb.sd.gov/AirVision/default.aspx>). From this location you can view the hourly concentration data from a majority of DANR's monitoring sites in the state. Two of these sites are located in the Rapid City area: Credit Union and Black Hawk. Figure 1 below shows the locations of the two sites.

**Figure 1. Credit Union and Black Hawk Sites - Map**



## **High Wind Dust Alerts**

A high wind dust alert is issued by the National Weather Service during the following three meteorological conditions established in the Natural Events Action Plan for Rapid City: 1) Five consecutive days of 0.02 inches or less of precipitation each day, excluding dry snow; 2) forecasted peak wind gusts greater than 40 miles per hour; and 3) forecasted average hourly wind speed greater than 20 miles per hour.

Fifteen high wind dust alerts were issued by the National Weather Service in 2022 and no alerts have been issued so far in 2023. Table 1 provides the 24-hour PM-10 concentration from the Credit Union site compared to the Black Hawk site for the alert days in 2022. Wind direction data was obtained from the meteorological station at the Black Hawk monitor site.

**Table 1. Credit Union and Black Hawk PM10 Comparison During High Wind Dust Alerts**

<b>No.</b>	<b>Date</b>	<b>Credit Union PM-10 (ug/m<sup>3</sup>)</b>	<b>Black Hawk PM-10 (ug/m<sup>3</sup>)</b>	<b>Wind Direction</b>
1	1-14-2022	185.8	15.8	NNW
2	1-18-2022	103.3	2.7	NW
3	1-21-2022	43.1	2.1	NW
4	2-08-2022	87.9	16.8	NNW
5	3-21-2022	42.2	51.0	NNW
6	3-22-2022	68.2	13.2	NNW
7	3-24-2022	103.4	15.6	WNW
8	4-12-2022	46.9	20.7	NNW
9	4-17-2022	82.9	2.1	NNW
10	10-11-2022	113.9	0.7	NNW
11	10-12-2022	28.9	25.3	NW
12	10-13-2022	77.8	5.7	NNW
13	10-14-2022	36.9	17.6	NW
14	11-07-2022	91.9	8.7	SSE
15	12-02-2022	99.3	11.3	NNW

*Note:* “ug/m<sup>3</sup>” means micrograms per cubic meter.

## **Air Monitoring Report for PM-10 and PM-2.5**

### ***PM-10***

Figure 2 shows the 24-hour average sample concentrations for PM-10 at the Credit Union Site for January through December 2022. The federal 24-hour National Ambient Air Quality Standard for PM-10 is 150 micrograms per cubic meter and is represented as the bold red line.

Four 24-hour samples for PM-10 had a concentration greater than the 24-hour standard of 150 micrograms per cubic meter in 2022. Three of the four exceedances were flagged due to high winds, smoke, blowing snow, malfunction, or a combination. One of the four exceedances occurred at the Credit Union site, on January 14, 2022, with a concentration of 185.8 micrograms per cubic meter.

**Figure 2. January thru December 2022 24-Hour PM-10 Concentrations at Credit Union Site**

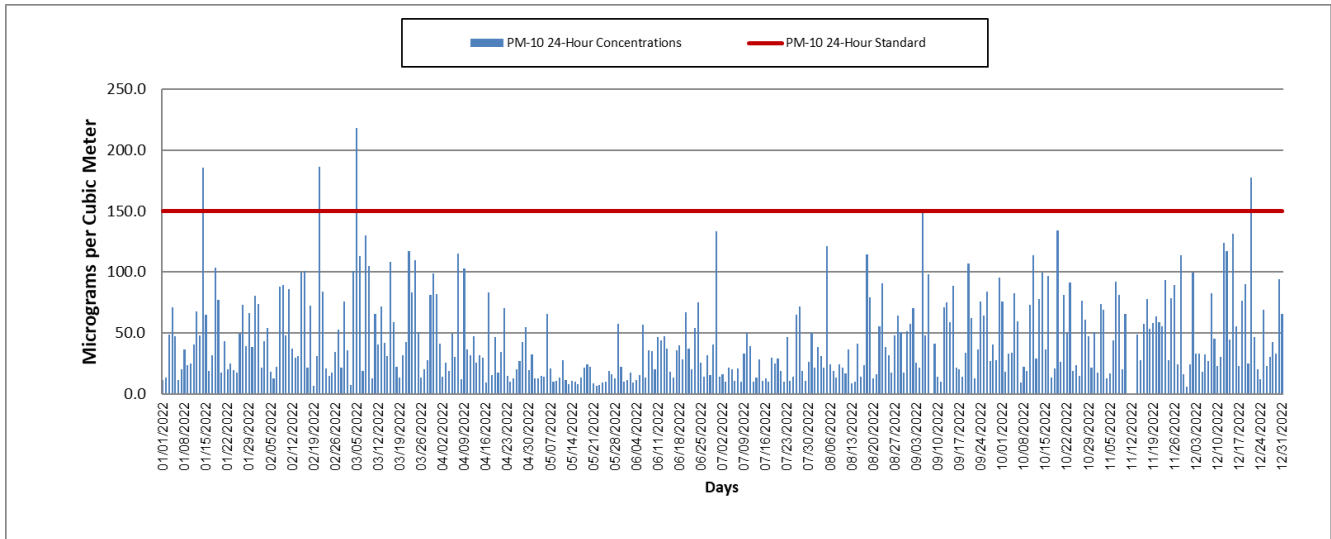
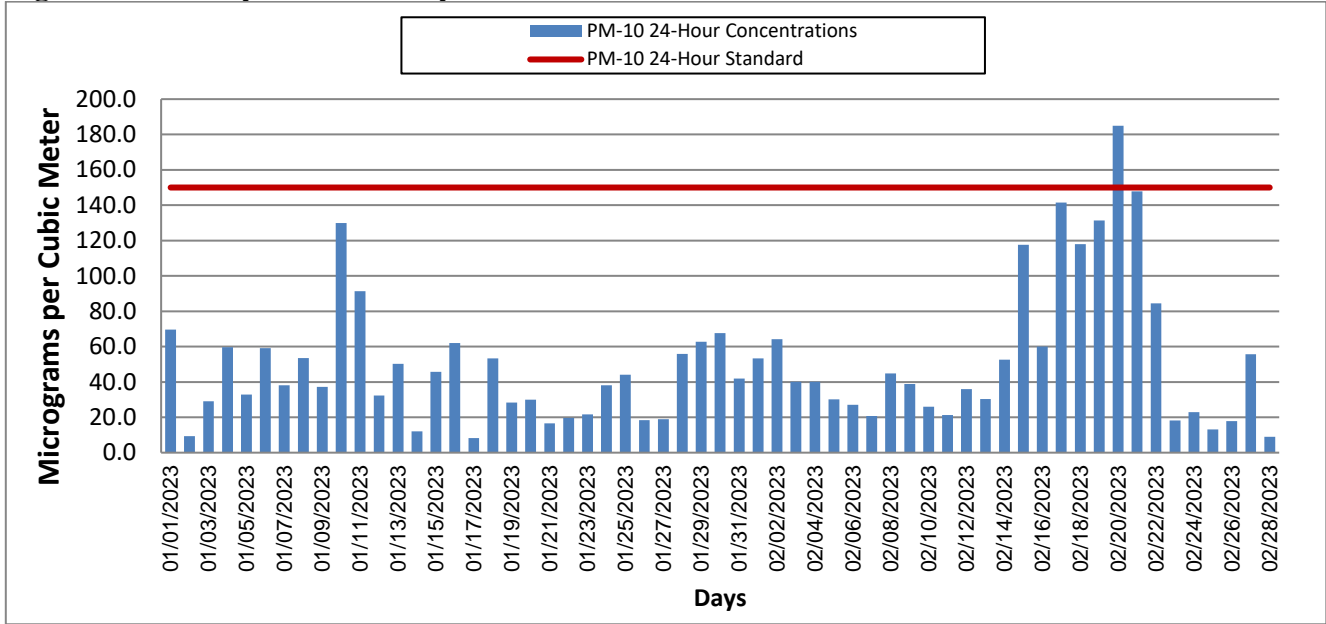


Figure 3 shows the 24-hour average sample concentrations for PM-10 at the Credit Union Site for January through February 2023. The federal 24-hour National Ambient Air Quality Standard for PM-10 is 150 micrograms per cubic meter and is represented as the bold red line.

The highest 24-hour PM-10 concentration so far in 2023 was recorded on February 20, 2023, with a level of 185.0 micrograms per cubic meter. This day exceeded the PM-10 24-hour standard. Winds were generally out of the north with peak winds up to 39 miles per hour. Sustained winds of 20-25 mph occurred in Rapid City. DANR determined this exceedance was caused by a communication error between the instrument’s clock, and the data logger clock. This error causes the concentrations to increase by small increments until the instrument’s clock is readjusted to match the data logger clock.

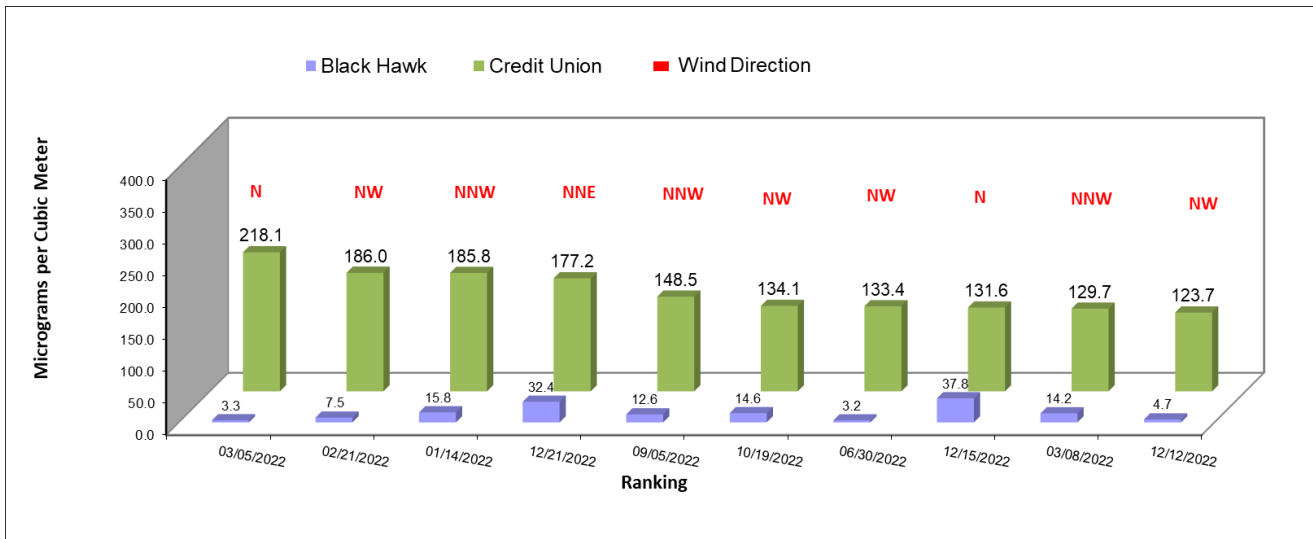
**Figure 3. January and February 2023 24-Hour PM-10 Concentrations at Credit Union Site**



Figures 4 and 5 show the ten highest 24-hour average concentration days for 2022 and for the period from January through February 2023. PM-10 concentrations at the Credit Union Site are shown in green and are compared to the corresponding Black Hawk Site concentrations in purple for those days.

DANR uses this comparison along with the wind direction to help determine what may be contributing to PM-10 concentrations at each site. For example, DANR can estimate how well fugitive dust emissions from the quarry area are controlled when the wind direction is out of the north (N) to north-northwest (NNW) or south (S) to south-southeast (SSE).

**Figure 4. 10 Highest 24-Hr. PM-10 Concentrations for 2022: Credit Union vs Black Hawk**



**Figure 5. 10 Highest 24-Hr. PM-10 Concentrations for Jan. & Feb. 2023: Credit Union vs Black Hawk**

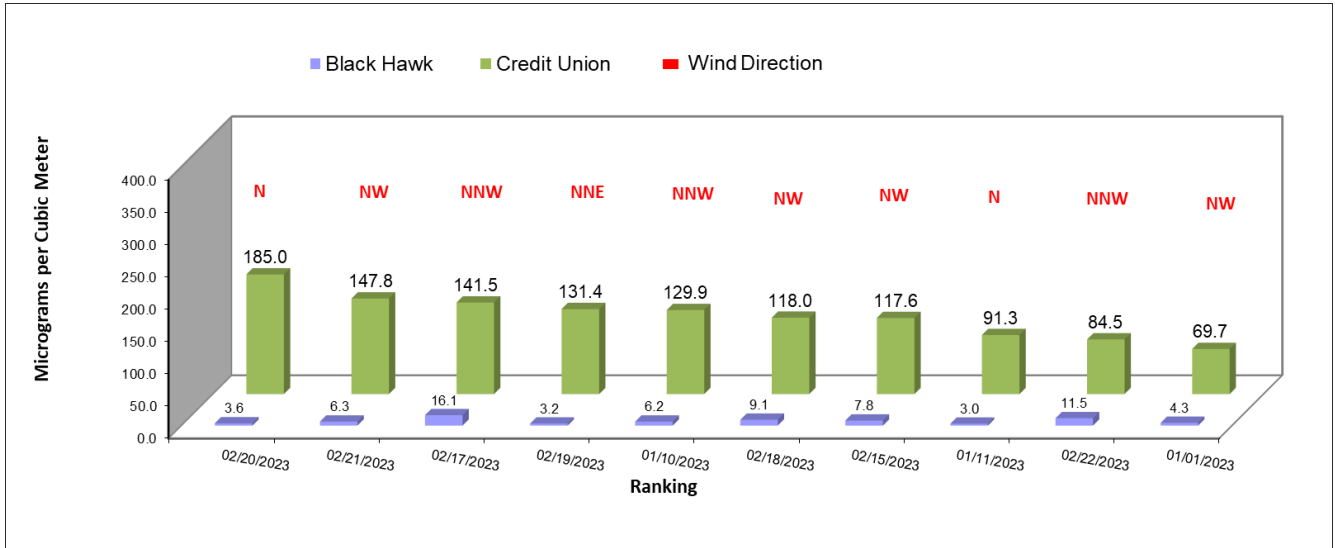
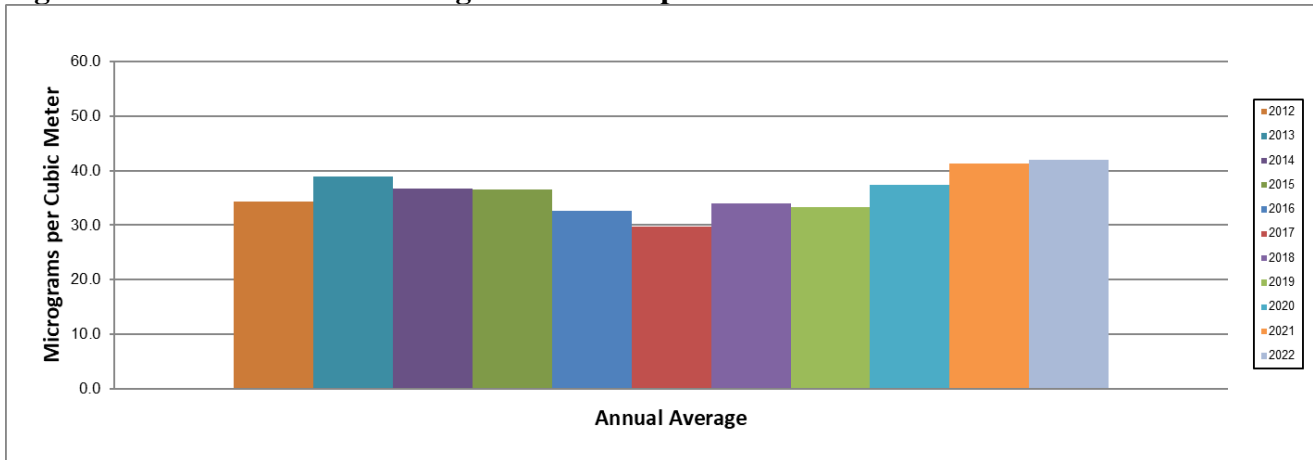


Figure 6 shows a comparison of the past ten years of annual averages for PM-10 at the Credit Union Site. The annual average for 2022 is the highest average from the period from 2012-2022, with an annual average of 42.0 micrograms per cubic meter.

**Figure 6. 10-Year Annual Average PM-10 Comparison**



**\* No annual standard for PM-10 so annual concentrations indicate trends.**

***PM-10 Attainment Status***

In order for an area to demonstrate attainment with the 24-hour National Ambient Air Quality Standard for PM-10, the expected number of days with a 24-hour average concentration above 150 micrograms per cubic meter must be equal to or less than 1.0. Table 2 provides the expected three-year average for the Credit Union Site for calendar year 2020 through 2022.

The Credit Union Site exceeded the 24-hour National Ambient Air Quality Standard for PM-10 nine times during the 2020 through 2022-time frame. Exceedances caused by exceptional events are

not included in the attainment determination. DANR considers all nine of the exceedances to be caused by exceptional events; the five in 2021 and four in 2022 were either caused by high winds, smoke, blowing snow, malfunction, or a combination. Therefore, DANR has flagged those exceedances in EPA’s database and those days should not be used to determine the attainment status.

**Table 2. Rapid City PM-10 Attainment Status**

Site	Expected Number of Exceedances Per Year	3-Year Expected Average (2022)	Attainment Status
Credit Union	2020 – 0.0	0 <sup>1</sup>	Attainment <sup>1</sup>
	2021 – 0.0 <sup>1</sup>		
	2022 – 0.0 <sup>1</sup>		

<sup>1</sup> - To date, EPA has not made a determination whether these exceedances qualify as exceptional events or not. If EPA disagrees that the exceedances were caused by exceptional events, there would be five exceedances in 2021, and four in 2022. These exceedances would result in an expected average over 1, which means the attainment status would be undefined.

***PM-2.5***

Figure 7 provides a graph of the 24-hour PM-2.5 concentrations at the Credit Union Site for January through December 2022. The 24-hour PM-2.5 concentrations are represented in light blue while the bold red line represents the 24-hour PM-2.5 federal National Ambient Air Quality Standard of 35 micrograms per cubic meter. The 24-hour PM2.5 standard was exceeded on September 13, 2022 with a 24-hour average concentration of 38 micrograms per cubic meter. Smokes from fires in the western U.S. attributed the high PM-2.5 readings at the CU site.

DANR is working with other local, state, and federal agencies on ways to minimize the impact of smoke during slash pile burning in the future. As a result, DANR has developed memorandums of understanding with these agencies to establish best management practices for slash pile burning activities.

**Figure 7. January thru December 2022 24-Hour PM-2.5 Concentrations at Credit Union Site**

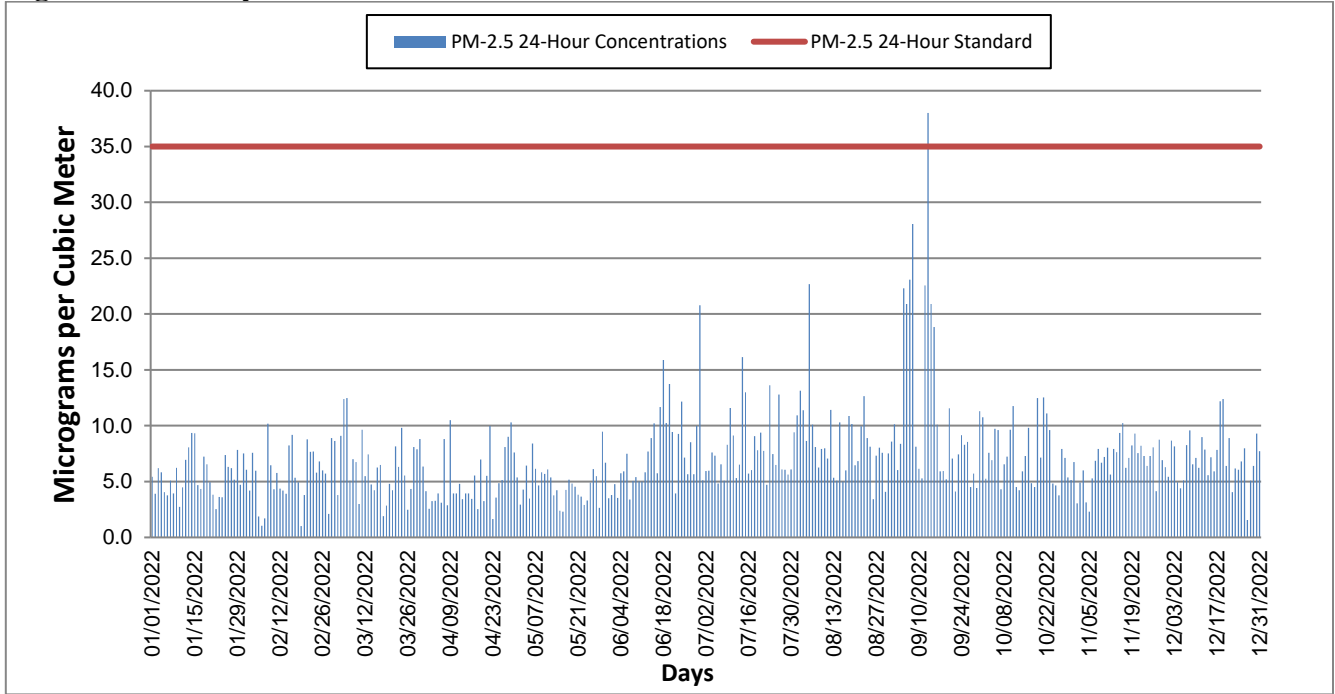
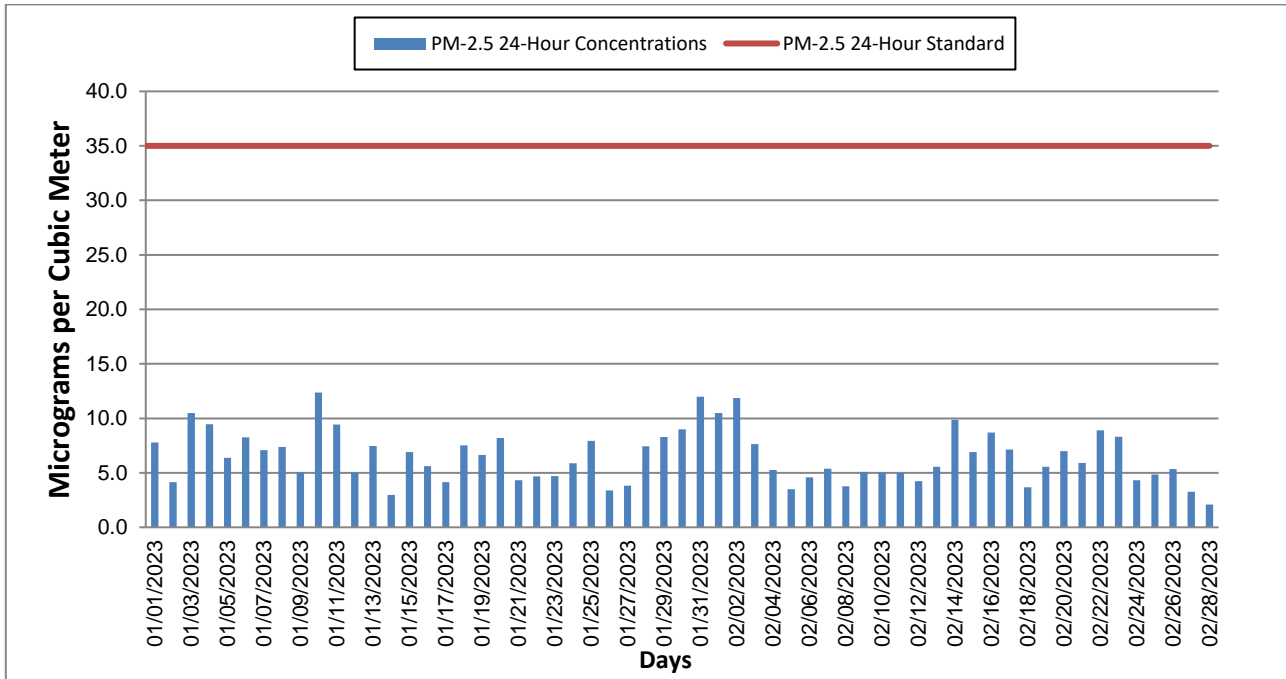


Figure 8 provides a graph of the 24-hour PM-2.5 concentrations at the Credit Union Site for January and February 2023. Again, the 24-hour PM-2.5 concentrations are represented in light blue while the bold red line represents the 24-hour PM-2.5 federal National Ambient Air Quality Standard of 35 micrograms per cubic meter.

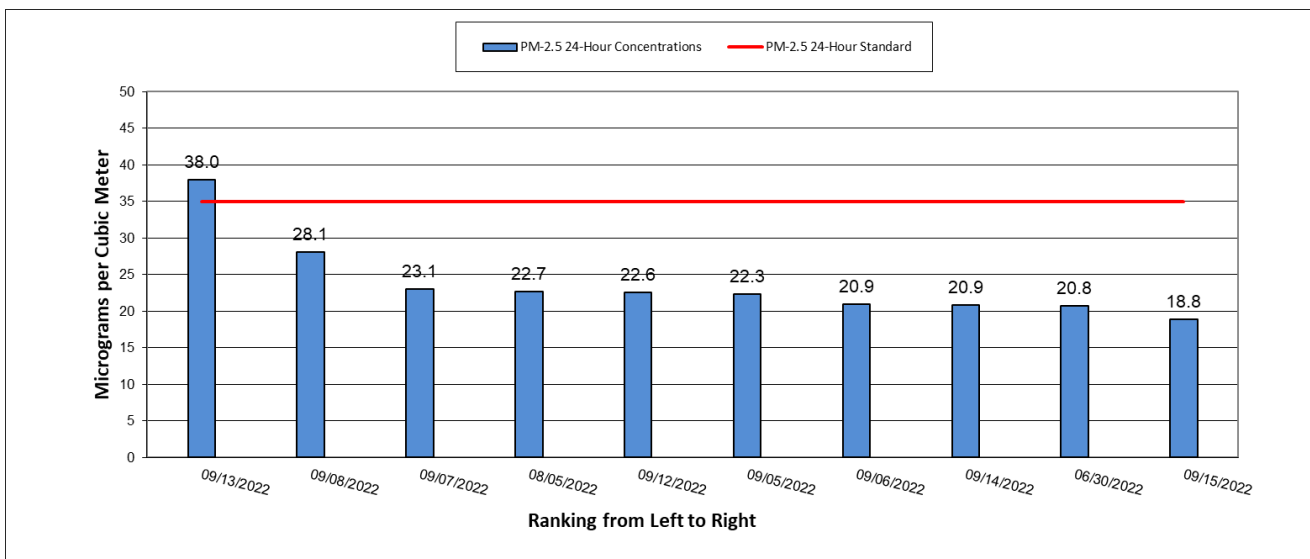
The highest 24-hour PM-2.5 concentration so far in 2023 was recorded on January 10, 2023 with a concentration of 12.4 micrograms per cubic meter. This day did not occur during a high wind dust alert event and did not exceed the PM-2.5 24-hour standard of 35 micrograms per cubic meter.

**Figure 8. January and February 2023 24-Hour PM-2.5 Concentrations at Credit Union Site**



Figures 9 and 10 show the ten highest 24-hour PM-2.5 concentrations for 2022 and for the period January through February 2023. The highest 24-hour PM2.5 concentration for 2022 was recorded on September 9, 2022, with a concentration of 38.0 micrograms per cubic meter. The highest 24-hour PM2.5 concentration for 2023 was recorded on January 10, 2023 with a concentration of 12.4 micrograms per cubic meter. The federal 24-hour National Ambient Air Quality Standard for PM-2.5 is 35 micrograms per cubic meter and is represented in Figures 9 and 10 as the bold red line.

**Figure 9. 10 Highest 24-Hour PM-2.5 Sample Concentrations for 2022**





**Figure 10. 10 Highest 24-Hour PM-2.5 Sample Concentrations for Jan. & Feb. 2023**

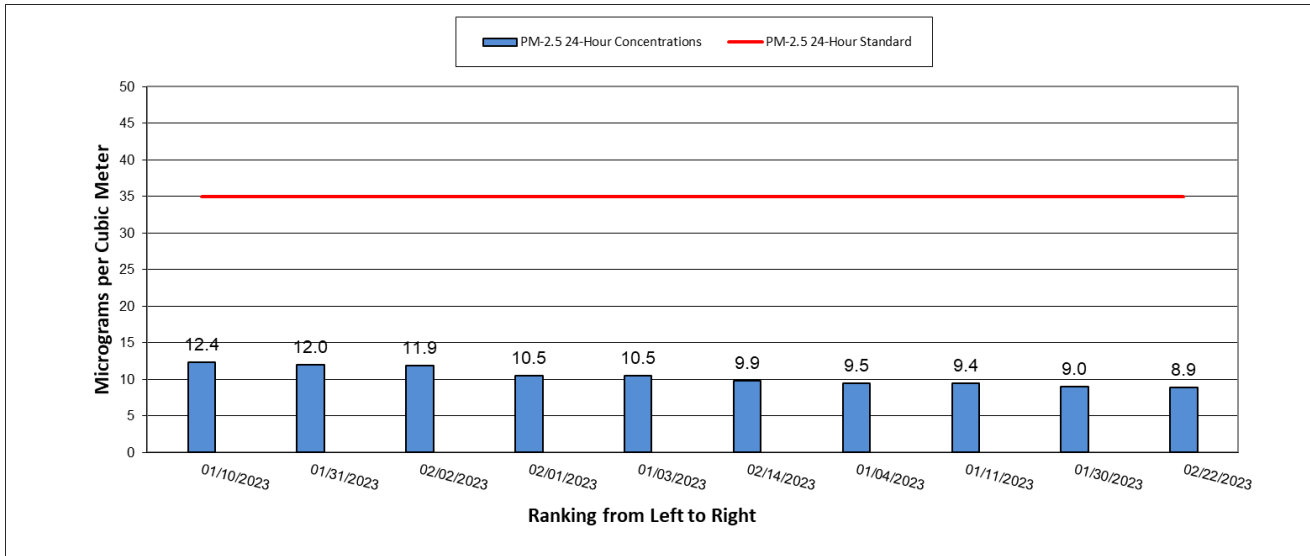
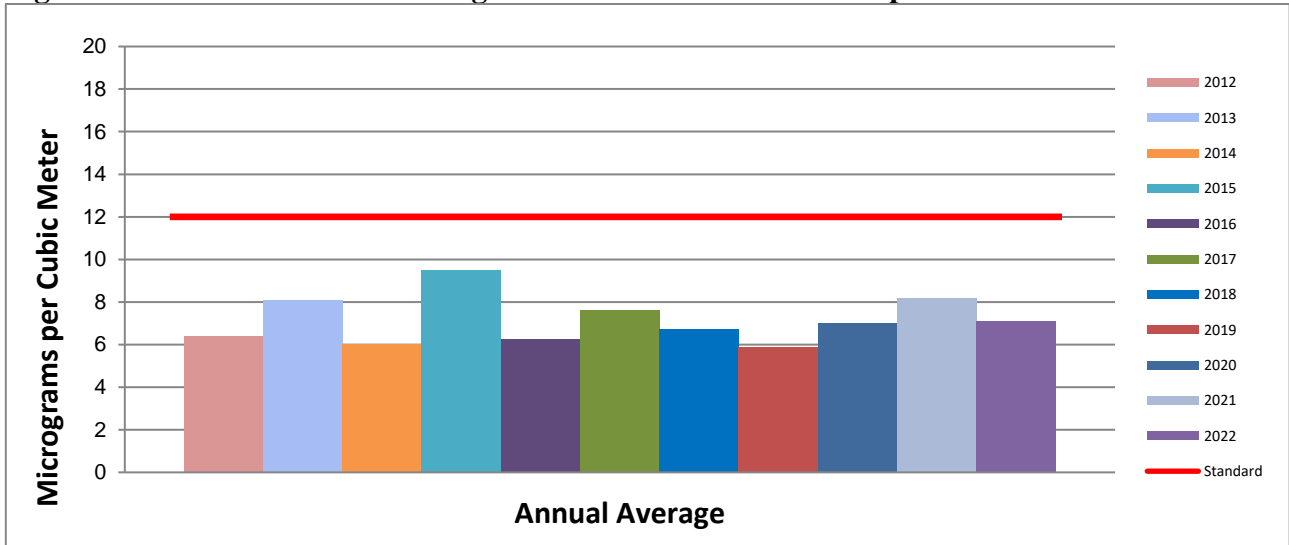


Figure 11 shows a comparison of the past ten years of annual averages. The federal annual National Ambient Air Quality Standard for PM-2.5 is 12 micrograms per cubic meter and is represented in Figure 11 as the bold red line. The annual average concentration for PM-2.5 in 2022 was 7.1 micrograms per cubic meter.

**Figure 11. 10-Year Annual Average PM-2.5 Concentration Comparison**



***PM-2.5 Attainment Status***

In order for an area to demonstrate compliance with the 24-hour National Ambient Air Quality Standards for PM-2.5, the 24-hour average of 35 micrograms per cubic meter cannot be exceeded by the 98<sup>th</sup> percentile concentration averaged over three years. Table 3 displays the PM-2.5 concentrations for the Credit Union Site for calendar years 2020, 2021, and 2022. The three-year average of the 98<sup>th</sup> percentile values for this three-year period is 23.2 micrograms per cubic meter

which demonstrates attainment with the 24-hour National Ambient Air Quality Standard for PM-2.5.

**Table 3. Rapid City PM-2.5 Compliance Status**

<b>Site</b>	<b>Yearly 98<sup>th</sup> Percentile</b>	<b>24-Hour Design Value (2022)</b>	<b>Attainment Status</b>	<b>Percent of Standard</b>
Credit Union	2020 – 22.3 ug/m <sup>3</sup> 2021 – 26.3 ug/m <sup>3</sup> 2022 – 20.9 ug/m <sup>3</sup>	23.2 ug/m <sup>3</sup>	YES	66%

*Note:* “ug/m<sup>3</sup>” means micrograms per cubic meter.