2024 North Dakota Data Requirements Rule Report
North Dakota Department of Environmental Quality
Division of Air Quality

1. Background and History of the Data Requirements Rule

The Data Requirements Rule (DRR, 80 FR 51052) was promulgated to produce sulfur dioxide (SO_2) concentration data so that informed decisions may be made on designations for the 2010 1-hour SO_2 National Ambient Air Quality Standard (NAAQS). Because of the tendency of SO_2 concentrations to be highest near larger sources of SO_2, the Environmental Protection Agency (EPA) designed the DRR to require the collection of SO_2 data near larger sources. The final version of the DRR allowed for States to fulfill their requirements using data based on either ambient monitoring or dispersion modeling. Of the sources required to produce SO_2 data for the DRR in North Dakota, only the Tioga Gas Plant owned and operated by Hess Corporation chose to use data based on ambient monitoring. All the other DRR sources chose to produce SO_2 data using dispersion modeling. This annual DRR report addresses requirements for SO_2 sources that utilized data produced through dispersion modeling.

Because of a lawsuit filed by the Sierra Club and the Natural Resources Defense Council, requirements to produce SO_2 data for designations proceeded in stages. The outcome of that lawsuit was a Consent Decree (CD) with the EPA on March 2, 2015, which accelerated the data submission and designation schedule for certain sources. In North Dakota, the SO_2 sources that were required to submit SO_2 data earlier because of the CD were Coyote Station (Coyote), Coal Creek Station (CCS), and Leland Olds Station (LOS).

Table 1: Sources Modeled from Each Region in North Dakota, Time Span of Data Modeled for Each Region, Modeled Design Values, and Percent of 2010 NAAQS

Modeled Region	Sources Included	Year Span Modeled	Modeled Design Values (µg/m^3)	Percent of 2010 SO_2 NAAQS
McLean County / Eastern Mercer County Area	Coal Creek Station	2012–2014	167.3	85.4%
	Leland Olds Station			
	Stanton Station			
Central Mercer County Area	Coyote Station	2012–2014	115.9	59.1%
Northern Mercer County Area	Coyote Station	2013–2015	136.6	69.7%
	Antelope Valley Station			
	Great Plains Synfuels Plant			
Oliver County Area	Coal Creek Station	2013–2015	77.8	39.7%
	Coyote Station			
	Leland Olds Station			
	Milton R. Young Station			
	R.M. Heskett Station			
	Stanton Station			
Burleigh County and Morton County	R.M. Heskett Station	2013–2015	156.3	79.7%
	Mandan Refinery			

As is documented in Table 1, the modeling conducted for the McLean County and Mercer County Area encompassed emissions from 2012 through 2014 and included CCS, LOS, and Stanton Station. The Stanton Station permanently ceased operation in 2017. Modeling for the Central Mercer County area encompassed emissions from 2012 through 2014 and included the Coyote Station. Modeling for the Northern Mercer County area encompassed emissions from 2013 through 2015 and included the Coyote Station, Antelope Valley Station (AVS), and Great Plains Synfuels Plant (GPSP). Modeling conducted for the Oliver County area encompassed emissions from 2013 through 2015 and included the CCS, Coyote Station, LOS, Milton R. Young Station (MRYS), R.M. Heskett Station (Heskett), and Stanton Station. Heskett Station coal units permanently ceased operation in the first quarter of 2022. The modeling conducted for the Burleigh County and Morton County area encompassed emissions from 2013 through 2015 and included Heskett and the Mandan Refinery.

The required modeling analyses for the sources were submitted to the EPA by the prescribed deadline. The EPA approved the modeling analyses and the SO_2 data. Based on the modeling analyses, the EPA made the decision to designate areas of North Dakota surrounding these sources as "attainment/unclassifiable" for the 1-hour SO_2 NAAQS.

2. Procedure used for the Data Requirements Rule

The scope of the DRR is depicted in Figure 1. Operating electric generating units (EGU) and coal consumers are pinned with a green marker and permanently shut down units are indicated by a red circle with a slash. The North Dakota Department of Environmental Quality's Ambient Air Monitoring sites are pinned in yellow. The three North Dakota State monitoring locations located within the scope of the DRR region are as follows: Beulah North (38-057-0004), Hannover (38-065-0002) and Bismarck (38-015-0003). All three sites are equipped with SO_2 monitoring equipment, which provide 1-hour SO_2 readings 24-hours a day, 365 days a year. All data from the Ambient Air Monitoring Sites are reported to the EPA's AQS (Air Quality System) database.

All the sources addressed in the modeling analyses used actual emissions (Coyote Station, CCS, AVS, GPSP, MRYS, Stanton Station, the Mandan Refinery, and Heskett Station), except LOS, which used allowable emissions. LOS's owner, Basin Electric Power Cooperative, installed wet scrubbers and a new 600-foot stack in the middle of the modeled 3-year period (2012–2014) and therefore did not have three consecutive years of emissions data using the new wet scrubber, which would be representative of current and future emissions at the facility. Basin Electric used a Best Available Retrofit Technology (BART) permit allowable emission rate in the modeling analysis for LOS.

The DRR requires that each State must submit an annual report to the EPA for sources that demonstrated compliance with the NAAQS using modeling based on actual emissions. Since all North Dakota sources, except LOS, demonstrated compliance with the 1-hour SO_2 NAAQS using modeling and actual emissions data, the State must submit an annual report to EPA documenting each area's most recent annual emissions. The report must provide an assessment of the reason(s) for any emissions increase and provide a determination of whether air quality modeling would be needed to verify that the area around the source continues to comply with the 1-hour NAAQS.

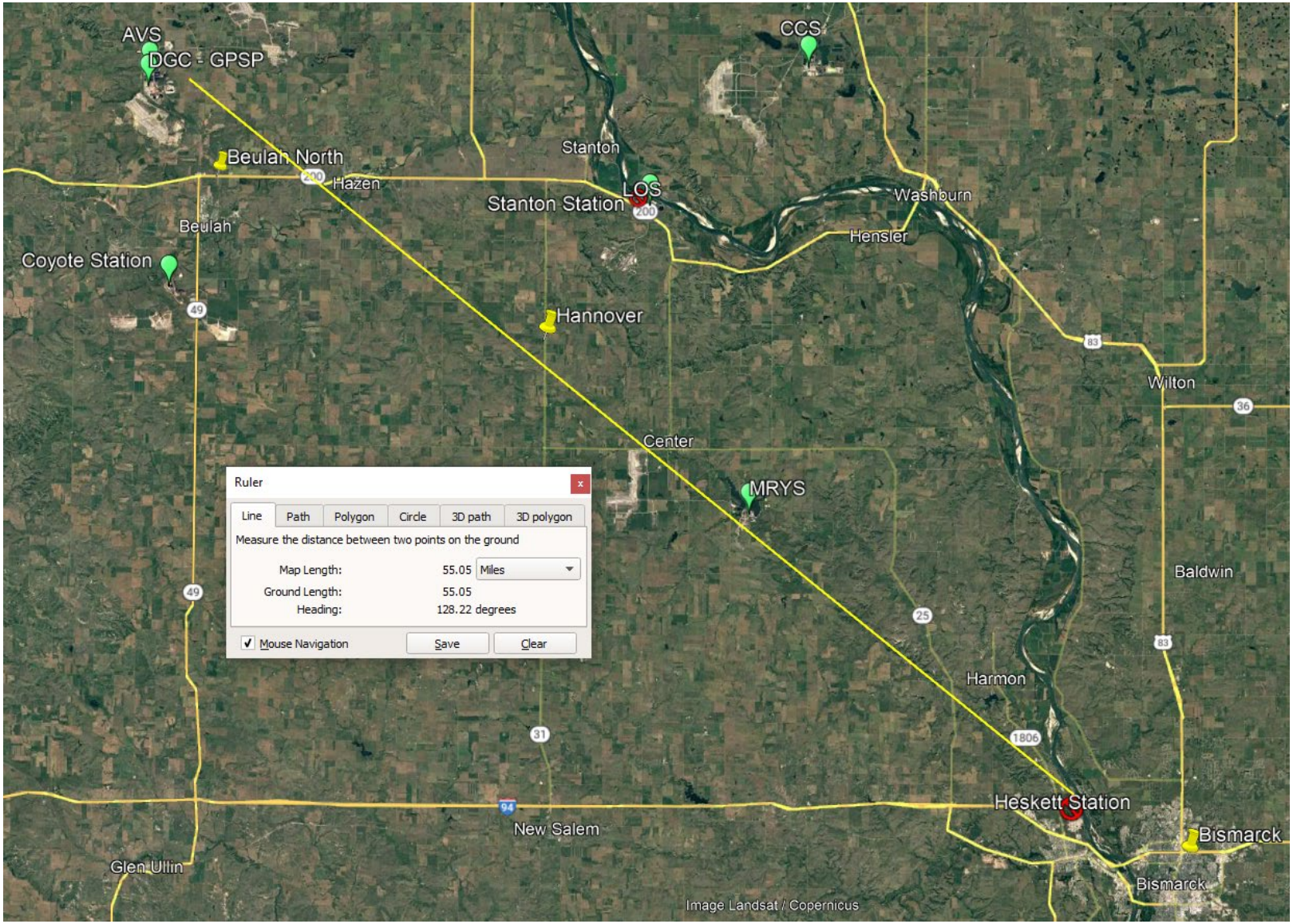

Figure 1: Scope for the sources reviewed in this report. Image from Google Earth.

The sources were modeled in each respective area, as denoted in Table 1, using hourly emissions from Continuous Emissions Monitoring System (CEMS) data. The most recent three years of data, at the time, were used in the modeling analyses. The DRR specifies that the total annual emissions in tons for the DRR sources should be compared in this report.

3. Results and Summary for the Data Requirements Rule

The Department accessed the Compliance Assurance Monitoring Air Markets Program Data (CAM AMPD) database and evaluated the annual SO_2 emissions. The data on the CAM AMPD include all North Dakota EGUs reporting for a given year except Mandan Refinery and GPSP. Data for these sources were taken from Annual Emission Inventory Reports submitted to the Department. Annual SO_2 emissions from individual DRR sources over the last 10 years are included in Table 2.

Table 3 contains SO_2 emissions information for the modeled regions and the individual sources within the modeled regions. Specifically, Table 3 includes each modeled region, the year span modeled for each region, the sources included in the region, the highest emitting round 3 modeled year, 2023 SO_2 emissions, the percent decrease in 2023 compared to the highest emitting round 3 modeled year, the 3-year average emissions of the modeled years, the percent decrease in 2023 compared to the 3-year average of round 3 modeled year emissions, the recent (2021-2023) 3-year average emissions, and the percent decrease from the recent 3-year average compared to the 3-year average of round 3 modeled emissions. The percent decrease calculation results are based on the recommendations of EPA Region 8 from August 13, 2019, and June 1, 2021.

The percent decreases displayed in Table 3 were calculated using the following equations:

$$\text{Percent Decrease in 2023 Compared to Highest Emitting Round 3 Modeled Year} =$$

$$\frac{\text{Highest Emitting Round 3 Modeled Year} - \text{2023 Emissions}}{\text{Highest Emitting Round 3 Modeled Year}} x\ 100\%$$

And,

$$\text{Percent Decrease in 2023 Compared to 3-Year Average of Round 3 Modeled Years} =$$

$$\frac{\text{3-Year Average Modeled Years} - \text{2023 Emissions}}{\text{3-Year Average Modeled Years}} x\ 100\%$$

And,

$$\text{Percent Decrease in "2021-2023 3-Year Average Emissions"}$$

$$\text{Compared to "3-Year Average of Round 3 Modeled Years"} =$$

$$\frac{\text{"3-Year Average Modeled Years"} - \text{"2021-2023 3-Year Average Emissions"}}{\text{"3-Year Average Modeled Years"}} x\ 100\%$$

Table 2: Annual SO_2 Emissions (tons) for Each Individual Source for Recent 10-Years

Company	Source	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Basin Electric Power Coop.	AVS 1	5,509	6,312	7,254	5,259	5,911	6,045	5,420	4,241	5,949	5,971
Basin Electric Power Coop.	AVS 2	6,975	6,716	5,089	7,603	6,126	4,718	5,896	6,770	5,673	5,149
Basin Electric Power Coop.	Leland Olds 1 [A]	412	681	711	554	652	723	484	565	652	466
Basin Electric Power Coop.	Leland Olds 2 [A]	1,025	1,066	1,217	1,364	1,052	1,314	1,236	910	1,384	1,405
Minnkota Power Coop.	M.R. Young 1	361	606	909	905	518	636	504	223	222	194
Minnkota Power Coop.	M.R. Young 2	1,710	2,129	1,729	2,507	2,258	2,021	2,173	2,099	1,668	1,802
Ottertail Power Co.	Coyote Station	12,777	8,786	11,873	13,444	14,913	10,060	11,975	12,684	11,606	13,753
Mon. Dak. Utilities	Heskett 1 [B]	1,030	1,010	703	642	916	991	962	1,111	175	0
Mon. Dak. Utilities	Heskett 2 [B]	2,339	2,046	1,887	1,485	1,228	1,105	1,384	1,459	155	0
Rainbow Energy Center, LLC	Coal Creek 1	7,885	7,667	7,643	3,096	3,458	3,555	2,499	3,477	3,340	2,258
Rainbow Energy Center, LLC	Coal Creek 2	7,940	7,776	5,633	3,296	3,400	2,727	2,801	3,354	2,925	3,288
Great River Energy	Stanton 1 [B]	2,493	2,076	2,412	395	0	0	0	0	0	0
Great River Energy	Stanton 10 [B]	98	88	67	28	0	0	0	0	0	0
Dakota Gasification	GPSP	3,818	3,294	2,825	5,203	2,837	3,033	5,671	3,272	2,808	2,382
Tesoro Refining and Marketing Co.	Mandan Refinery	257	250	291	198	135	123	154	206	200	233

[A] Modeled with allowable emission rates.
[B] Permanently shut down and decommissioned.

Table 3: Multiple Scenarios Presented for Comparison of: Recent Emissions to Highest Modeled Year, Recent Emissions to 3-Year Average Modeled Years, and Recent 3-Year Average Emissions to 3-Year Average Modeled Years

Modeled Region	Year Span Modeled	Sources Included	Highest Emitting Round 3 Modeled Year	2023 Emissions	Percent Decrease in 2023 Compared to Highest Emitting Round 3 Modeled Year	3-Year Average Modeled Years	Percent Decrease in 2023 Compared to 3-Year Average of Round 3 Modeled Years	2021-2023 3-Year Average Emissions	Percent Decrease in 2021-2023 3-Year Average Compared to 3-Year Average of Round 3 Modeled Years
McLean County / Eastern Mercer County Area	2012–2014	Coal Creek Station	16,273	5,546	66%	15,893	65%	6,214	61%
		Leland Olds Station	38,324	1,870	95%	15,794	88%	1,794	89%
		Stanton Station	2,591	0	Shutdown	2,334	Shutdown	0	Shutdown
		Full Region	*57,188*	*7,417*	*87%*	*34,021*	*78%*	*8,008*	*76%*
Central Mercer County Area	2012–2014	Coyote Station	12,777	13,753	**-8%**	11,999	**-14.6%**	12,681	**-6%**
Northern Mercer County Area	2013–2015	Coyote Station	12,777	13,753	**-8%**	11,381	**-21%**	12,681	**-11%**
		Antelope Valley Station	13,654	11,120	19%	13,055	15%	11,251	14%
		Great Plains Synfuels Plant	3,818	2,382	38%	3,245	27%	2,820	13%
		Full Region	*30,249*	*27,254*	*10%*	*27,681*	*2%*	*26,753*	*3%*

Modeled Region	Year Span Modeled	Sources Included	Highest Emitting Round 3 Modeled Year	2023 Emissions	Percent Decrease in 2023 Compared to Highest Emitting Round 3 Modeled Year	3-Year Average Modeled Years	Percent Decrease in 2023 Compared to 3-Year Average of Round 3 Modeled Years	2021-2023 3-Year Average Emissions	Percent Decrease in 2021-2023 3-Year Average Compared to 3-Year Average of Round 3 Modeled Years
Oliver County Area	2013–2015	Coal Creek Station	15,825	5,546	65%	15,617	64%	6,214	60%
		Coyote Station	12,777	13,753	**-8%**	11,381	**-21%**	12,681	**-11%**
		Leland Olds Station	7,622	1,870	75%	3,602	48%	1,794	50%
		Milton R. Young Station	2,735	1,997	27%	2,234	11%	2,070	7%
		R.M. Heskett Station	3,369	0	Shutdown	3,135	Shutdown	967	69%
		Stanton Station	2,591	0	Shutdown	2,262	Shutdown	0	Shutdown
		Full Region	*44,919*	*23,166*	*48%*	*38,230*	*39%*	*23,726*	*38%*
Burleigh County and Morton County	2013–2015	R.M. Heskett Station	3,369	0	Shutdown	3,135	Shutdown	967	69%
		Mandan Refinery	279	233	17%	262	11%	213	19%
		Full Region	*3,648*	*233*	*94%*	*3,397*	*93%*	*1,180*	*65%*

Table notes:
Percent decrease calculations are based on an EPA recommendation from August 13, 2019, and June 1, 2021.
-BOLD % represents an increase
-BOLD % represents a 15% or more increase.

Table 2 shows that individual source emissions from 2023 were generally comparable to 2022 emissions. Total SO_2 emissions were ~100 tons higher than 2022, and ~3500 tons lower than 2021. Table 3 indicates that each modeled region other than Central Mercer County experienced a decrease in emissions from the 2021-2023 3-year average emissions compared to the average of the round 3 modeled years emissions. Central Mercer County consists of one source (Coyote Station) and experienced a 6% increase

compared to the round 3 modeled years. The decreases ranged from 3% in the Northern Mercer County Area to 76% in the McLean County/Eastern Mercer County Area. Similarly, all 2023 modeled region emissions other than Central Mercer County also experienced decreases when compared to the average round 3 modeled year emissions and when compared to the highest emitting round 3 modeled year. Decreases ranged from 2% and 10% in Northern Mercer County to 93% and 94% in Burleigh Morton Counties, respectively.

Coyote Station was the only source to show an increase in any category. Coyote Station is the only source located in the Central Mercer County Area modeled region. Because of this, the Central Mercer County Area showed a 14.6% increase in 2023 compared to the 3-year average of round 3 modeled years.

As it applies to North Dakota, based on the modeling results summary presented in Table 1, EPA's general DRR guidelines[1] recommend that additional modeling be conducted if emissions in the area increase by 15% or more from the modeled rates. EPA also recognizes the importance of case-by-case judgment being used to determine if additional modeling should be required. Considering the DRR guidelines, the Department **highlighted** each modeled area and/or individual source which experienced a 15% or more emissions increase from the described scenarios displayed in Table 3. For all 15% or more increases, discussion of anomalies from year-to-year for individual sources, and other noteworthy items, as well as the Department's assessment of whether additional modeling should be required are explained in the following pages.

Coyote Station emitted 13,753 tons of SO_2 in 2023. This is ~1,200 tons less than was emitted in 2018, the year of maximum annual emissions within the last 10 years. Table 4 shows the operating hours and average SO_2 emission rate (lb/hr) in 2023 compared to 2018 and to the 2012-2014 modeled years. Coyote had a 12.6% increase in operating hours in 2023 compared to the modeled years, and only a 1.8% increase in the average SO_2 emission rate. Operating hours were slightly higher in 2023 than 2018, and the emission rate was 7.9% lower in 2023 than 2018.

[1] For complete text regarding additional modeling guideline, see: https://www.federalregister.gov/d/2015-20367/p-268 (visited 4/29/2024)

Table 4: Coyote Station Operating Hours and Emission Rates

Year	Operating Hours	Average SO_2 (lb/hr)
2012	6394	3328
2013	7175	3506
2014	7641	3344
2012-2014 (average)	7070	3393
2018	7954	3750
2023	7963	3454
Percent Increase in 2023 Compared to 3-Year Average of Round 3 Modeled Years (2012-2014)	12.6%	1.8%
Percent Increase in 2023 Compared to 2018	0.1%	-7.9%

As stated in North Dakota's 2018 DRR Report, the increase in emissions might be of more concern if the maximum concentration in the vicinity of Coyote Station was close to the 1-hour SO_2 NAAQS; however, it is not. The maximum concentration (i.e., design value) in the vicinity of Coyote Station, based on the 2012 through 2014 modeling of the Central Mercer County area, which was approved by the EPA, is 115.88 $\mu g/m^3$, compared to the 1-hour SO_2 NAAQS of 196.4 $\mu g/m^3$, which is only about 59% of the NAAQS. If emissions increased uniformly over all hours modeled, it would take an increase in emissions of approximately 70% to exceed the NAAQS. Since the observed increase in emissions relative to the 2012 through 2014 average is only 15%, the impacts from this emissions increase would be too small to even approach the standard, let alone exceed it.

Even though the model calculations are based on 1-hour averages, not annual averages, which are prone to short-term spikes, the design value for the NAAQS is based on the 3-year average of the daily maximum 4th-high concentration over a year, which greatly diminishes potential concentration increases based on short-term spikes in emissions. More specifically, the SO_2 NAAQS is based on the 4th-high value (99th percentile) over a year, not the 1st-high value, which greatly reduces the potential impact of short-term spikes. Higher-ranked concentrations such as the 1st-high to 3rd-high values typically drop off much more quickly than lower values in the annual distribution because they are more extreme values. Finally, the design value (the concentration compared to the NAAQS) is based on the 3-year average of annual 4th-high concentrations, which greatly smooths out spikes in one individual modeled year. The hourly emission rate and meteorological data for a 4th-high concentration in one year are completely independent of those in other years, so there is no reason why a 4th-high concentration in one year would increase the same as in another year.

After taking all this into account, even though the potential increase in the modeled design value for the 1-hour NAAQS could be somewhat higher, associated with the 15% increase in annual

emissions at Coyote Station since the 2012 through 2014 model years, an increase of more than 70% that would exceed the NAAQS would be practically impossible. Coyote Station 2023 emissions were also 1,200 tons lower than in 2018, which did not cause a monitored exceedance of the NAAQS. The monitor near Coyote Station had a 1-hour design value of 25 ppb in 2018, 33% of the 75 ppb standard.[2] Thus, it is the Department's assessment that the observed annual increase in emissions of 15% at Coyote Station in 2023 should not cause an exceedance of the 1-hour SO_2 NAAQS and the NAAQS will still be maintained in the vicinity of Coyote Station.

All facilities other than Coyote Station showed decreases in every category in Table 3. The percent decrease in the 2021-2023 3-year average compared to the 3-year average of round 3 modeled years ranged from 7% at Milton R. Young Station to 89% at Leland Olds Station. The percent decrease in 2023 compared to the 3-year average modeled years ranged from 11% at Milton R. Young Station to 88% at Leland Olds Station. The percent decrease in 2023 compared to the highest emitting round 3 modeled year ranged from 17% at the Mandan Refinery to 95% at Leland Olds Station.

Given the above information, the Department's position is that the sources modeled using actual emissions in the DRR modeling analyses in North Dakota should not exhibit significantly higher design values. The Department's review of the complete data set indicates that any increase to the design values would be minor and not threaten the SO_2 NAAQS using more recent years of data, thus maintaining compliance with the 1-hour SO_2 NAAQS is expected. Therefore, based on regulatory guidance, the Department's determination is that no additional modeling or monitoring is required under the Data Requirements Rule.

FOR THE NORTH DAKOTA DEPARTMENT
OF ENVIRONMENTAL QUALITY

Date 6/6/2024

By _____
James L. Semerad
Director
Division of Air Quality

[2] North Dakota Ambient Air Quality Monitoring, Annual Report for 2019. Available at: https://deq.nd.gov/DataPDFs/AQ/Monitoring/Monitoring_Annual_Reports/ARNP_19.pdf (visited 5/14/2024)