Sulfur Dioxide Data Requirements Rule

2018 Annual Review

Iowa Department of Natural Resources
Environmental Services Division
Air Quality Bureau
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Des Moines IA 50319

Final
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i. Executive Summary

The Iowa Department of Natural Resources (DNR) prepared this report to satisfy the annual data review provisions of the *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)*. The Data Requirements Rule (DRR) is a federal rule promulgated by the U.S. Environmental Protection Agency (EPA) in 2015.

The DRR mandates that air agencies document recent annual SO_2 emissions of sources in areas where modeling of actual emissions served as the basis for designating that area attainment. The air agency must also provide a recommendation regarding whether additional modeling is needed to determine if each area continues to meet the 2010 1-hour SO_2 NAAQS. Unless certain exemptions are met, a report must be submitted every year by July 1.

This is the second annual report for the DRR prepared by the DNR. The sources and areas that must be evaluated remain the same as last year: the Interstate Power & Light (IPL)-Burlington Generating Station in Des Moines County and the IPL-Ottumwa Generating Station in Wapello County.

Between 2016 and 2017, annual SO_2 emissions increased from both the Burlington and Ottumwa Generating Stations. However, their current SO_2 emissions remain below levels modeled previously that showed attainment with the 2010 1-hour SO_2 NAAQS. While additional modeling of these sources is not needed to demonstrate continued attainment of the NAAQS, new modeling analyses are provided to satisfy the criteria to exempt theses sources from the requirement to conduct future DRR reviews.

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1. Introduction

On August 21, 2015, the U.S. Environmental Protection Agency (EPA) published the *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)* (80 FR 51051). This rule, referred to as the Data Requirements Rule (DRR), includes provisions in 40 CFR 51.1205(b) that require the air agency to submit a report to EPA documenting SO_2 emissions in areas were modeling of actual SO_2 emissions served as the basis for designating the area attainment for the 2010 1-hour (hr) SO_2 NAAQS. The report must include an assessment of the cause of any emissions increases from the previous year and a recommendation regarding whether additional modeling is needed. The first such report is due by July 1 of the calendar year after the effective date of an area's initial designation. Thereafter, the report must be submitted annually, by July 1 of each year.

This stand-alone report is the second report prepared by the Iowa Department of Natural Resources (DNR) pursuant to the ongoing data review provisions of the DRR. There are two sources in two areas in Iowa that must be addressed at this time: Interstate Power and Light (IPL)-Burlington Generation Station (IPL-Burlington) in Des Moines County and IPL-Ottumwa Generating Station (IPL-Ottumwa) in Wapello County. These are the same sources and areas that required evaluation last year. This year's assessments can be found beginning in Chapter 2. A brief historical review of the DRR and the 2010 1-hr SO_2 NAAQS designations process is provided first.

1.1 History

On June 2, 2010, EPA signed a final rule (75 FR 35519) revising the SO_2 NAAQS. EPA established a new 1-hr SO_2 primary NAAQS of 75 parts per billion (ppb), based on the three-year average of the annual 99th percentile of daily 1-hr maximum concentrations. Whenever EPA revises a NAAQS the Clean Air Act (CAA) requires EPA to designate areas as "attainment" (meeting), "nonattainment" (not meeting), or "unclassifiable" (insufficient data). Within one year of a NAAQS revision, the Governor of each state must submit their designation recommendations. The CAA requires that EPA complete the designations process within three years of a NAAQS revision.

On August 5, 2013, EPA published (78 FR 47191) a final rule designating 29 areas in the U.S. as nonattainment for the 2010 1-hr SO_2 NAAQS. In that rulemaking, EPA committed to address, in separate future actions, the designations for all other areas for which it was not yet prepared to issue designations. At that time, EPA was still developing its strategy for completing the designations process. EPA anticipated using a hybrid approach, allowing the use of either modeling or monitoring data for designations purposes, but EPA anticipated the need to issue additional rulemaking and guidance documents prior to finalizing additional designations. Shortly thereafter, three lawsuits were filed against the EPA in different U.S. District Courts, alleging that EPA had failed to perform a nondiscretionary duty under the CAA by not issuing 1-hr SO_2 designations for all portions of the country within three years of NAAQS promulgation. To resolve the legal challenges a consent decree was entered in federal court on March 2, 2015.[1]

The consent decree established criteria and deadlines[2] for EPA to complete a second, third, and fourth round of designations for the 2010 1-hr SO_2 NAAQS. The second round mostly affected only those areas that contained a source meeting certain emissions-related criteria established in the consent decree. Such areas were required to be designated no later July 2, 2016, (sixteen months after the consent decree was finalized). The third round affected all undesignated areas that had not installed and begun operating a new SO_2 monitoring network by January 1, 2017. The deadline for the third round was December 31, 2017. Most areas in the U.S. were

[1] *Sierra Club, et al. v. McCarthy*, Case No. 3:13–cv–3953–SI (N.D. Cal., March 2, 2015) (Order Granting Joint Motion To Approve And Enter Consent Decree And Denying Other Motions As Moot; and Consent Decree)

[2] The dates by which EPA must sign designations for publication in the Federal Register.

designated in this round. In the fourth, and final round, the remaining undesignated areas must be designated by December 31, 2020.

1.1.1 SO_2 Data Requirements Rule

Approximately five months after the consent decree was finalized, EPA published the DRR (80 FR 51051, August 21, 2015). The DRR's primary purpose is to require air agencies to characterize maximum 1-hour SO_2 concentrations around sources emitting 2,000 tons per year (tpy) or more. Implementation of the DRR requires states to use either modeling or ambient monitoring to assess SO_2 concentrations, or to establish federally enforceable emission limits that limit a source's emissions to less than 2,000 tpy.

The DRR's initial implementation step required states to identify, by January 15, 2016, sources not located in a nonattainment area that had actual annual SO_2 emissions of at least 2,000 tons, or were deemed by the air agency as requiring further air quality characterization. In a letter to EPA dated December 15, 2015, the DNR identified 11 sources meeting the DRR's criteria.[3] These sources are listed in Table 1-1 and were identified using 2014 emissions data, the most recent available at the time.

The DRR then required states to select, by July 1, 2016, the evaluation method to be used to characterize SO_2 air quality for each affected source. As mentioned, three options were available, modeling, ambient monitoring, or limiting a source's SO_2 emissions to less than 2,000 tpy. For any area with multiple applicable sources, the same technique had to be used. The evaluation methods selected by the DNR are also provided in Table 1-1. The DNR chose to model eight sources (in 6 separate areas) and to utilize federally enforceable emissions limits for the remaining 3 sources (each in their own area).[4]

Table 1-1. Applicable DRR sources in Iowa and the chosen evaluation method.

County	Facility ID	Facility (Source) Name	2014 SO_2 Emissions (tons)	Evaluation Method
Allamakee	03-03-001	IPL – Lansing Generating Station	5,260	Limit emissions
Clinton	23-01-014	IPL – M. L. Kapp Generating Station	3,024	Limit emissions
Des Moines	29-01-013	IPL – Burlington Generating Station	3,657	Modeling
Linn	57-01-042	IPL – Prairie Creek Generating Station	4,033	Modeling
	57-01-080	ADM Corn Processing – Cedar Rapids	3,071	
Louisa	58-07-001	MidAmerican – Louisa Station	8,783	Modeling
Pottawattamie	78-01-026	MidAmerican – Walter Scott Jr Energy Center	13,749	Modeling
Scott	82-02-006	MidAmerican – Riverside Station	2,167	Limit emissions
Wapello	90-07-001	IPL – Ottumwa Generating Station	9,227	Modeling
Woodbury	97-04-010	MidAmerican – George Neal North	6,501	Modeling
	97-04-011	MidAmerican – George Neal South	6,813	

For sources being modeled, the DRR established January 13, 2017, as the deadline for states to submit the modeling results. This date also served as the compliance deadline for any new federally enforceable emission

[3] See Iowa's source identification letter to the EPA Region 7 Regional Administrator, dated December 15, 2015.
[4] See Iowa's method identification letter to the EPA Region 7 Regional Administrator, dated June 20, 2016.

limits used to satisfy the DRR. While these deadlines, and those associated with the monitoring option[5], allow the third and fourth rounds of designations to be informed by data that must be submitted pursuant to the DRR, meeting the second round's July 2, 2016, designation deadline required states and EPA to take actions before the DRR was finalized.

1.1.2 Round 2 Designations

Shortly after the consent decree was signed (and approximately five months before the DRR was published) EPA identified areas subject to the second round of designations. The consent decree required that two groups of area be designated by July 2, 2016: 1) areas with newly monitored violations of the 1-hr SO_2 standard, and 2) areas containing a stationary source that had not been announced for retirement and that according to the data in EPA's Air Markets Database emitted in 2012 either:

- more than 16,000 tons of SO_2; or
- more than 2,600 tons of SO_2 with an annual average emission rate of at least 0.45 lb/MMBtu.

In a letter to the DNR dated March 20, 2015, EPA identified three counties in Iowa that each contained a source meeting the consent decree's emissions-related criteria. These counties and sources are listed in Table 1-2 and shown in Figure 1-1. In their letter, EPA welcomed, but did not require, the submission of revised designation recommendations and supporting information for these areas. If provided, EPA requested these items by September 18, 2015. Meeting EPA's timeline required prompt action by the state to develop revised designation recommendations and supporting information. However, at that time, the DRR was not yet final.[6]

Table 1-2. Sources identified by EPA as being subject to the second round of 1-hr SO_2 designations.

County	Facility ID	Facility Name	2012 SO_2 Emissions (tons)	2012 SO_2 Rate (lb/MMBtu)
Des Moines	29-01-013	IPL – Burlington Generating Station	4,697	0.672
Wapello	90-07-001	IPL – Ottumwa Generating Station	11,985	0.666
Woodbury	97-04-010	MidAmerican – George Neal South	14,273	0.638

To assist states wanting to provide revised designation recommendations and supporting information, EPA included updated guidance[7] with their March 20, 2015, letters to states. EPA had also previously released, in December 2013, two draft Technical Assistance Documents (TADs) for characterizing source-oriented SO_2 concentrations, one TAD for using modeling and one TAD for using monitoring.

The DNR choose to conduct dispersion modeling of the affected sources listed in Table 1-2. Based on the dispersion modeling results, the Governor recommended in a letter dated November 4, 2015, that Des Moines, Wapello, and Woodbury Counties be designated attainment.

[5] Where monitoring is to be used to satisfy the DRR, all existing, new, or relocated ambient monitors had to be operational by January 1, 2017. The designations deadline for areas using ambient monitoring to satisfy DRR requirement is December 31, 2020. Iowa is not using ambient monitoring for purposes of the DRR.

[6] Technically, the DRR does not directly govern designations, it instructs states regarding requirements for characterizing SO_2 concentrations in certain situations. However, data submitted pursuant to the DRR has and will be used to inform the 3rd and 4th rounds, respectively, but it was not finalized in time to help inform the 2nd round.

[7] Stephen D. Page, EPA Memo, March 20, 2015, *"Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard"*

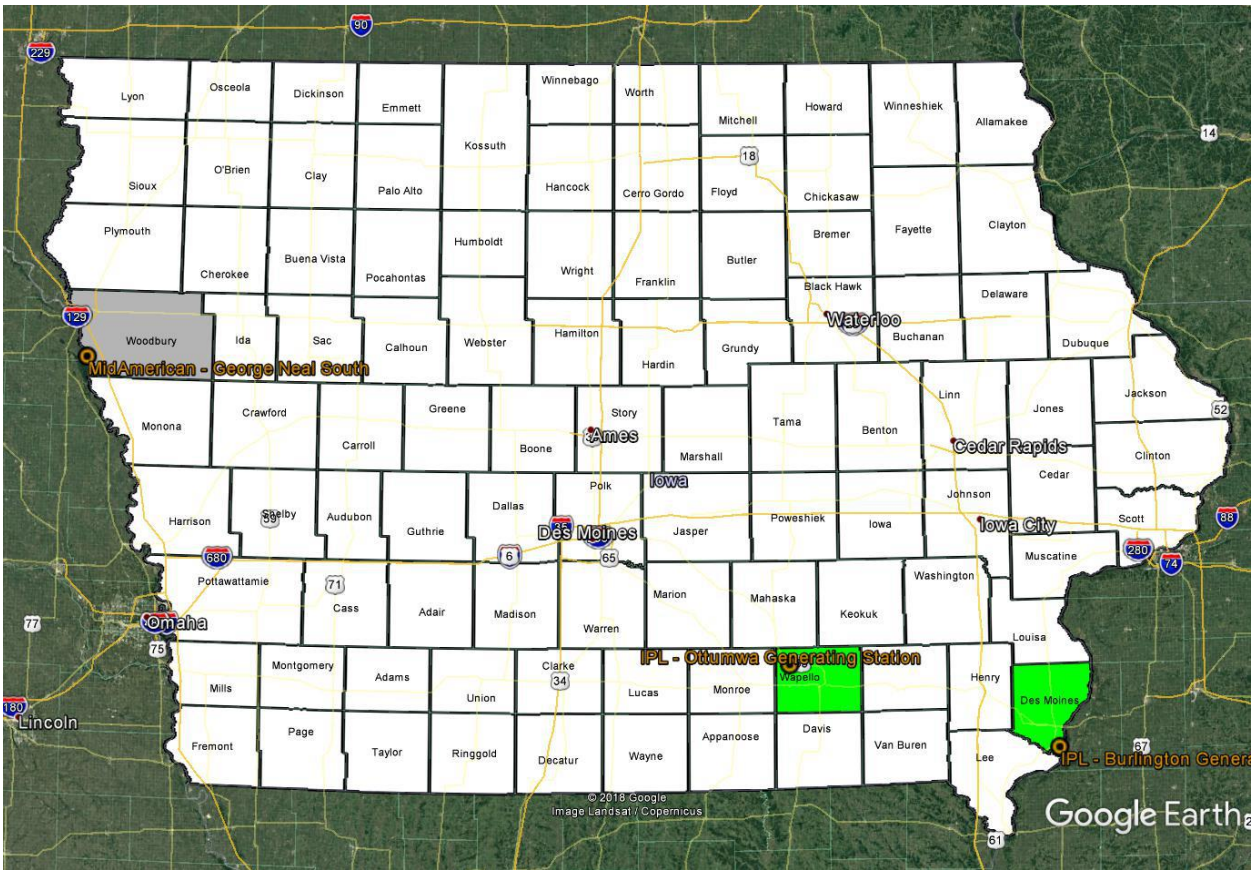

Figure 1-1. Locations of Des Moines, Wapello, and Woodbury Counties in Iowa and the round two affected sources. Shading differentiates designation: green = attainment; gray = unclassifiable.

For Des Moines and Wapello Counties, the DNR initially modeled IPL-Burlington and IPL-Ottumwa using anticipated future emissions limits. When differences emerged between the permitting and designations timelines, the modeling analyses and the technical support document (TSD) were revised to reflect the use of actual hourly emissions.[8] The DNR's revised modeling provided the technical basis for EPA's attainment designations for Des Moines and Wapello Counties.

In Woodbury County, only the MidAmerican-George Neal South electric power plant met the applicability criteria for the second round. However, nearby SO_2 sources must be addressed if they are expected to cause a significant concentration gradient in the area. This necessitated including MidAmerican's nearby George Neal North electric power plant in the modeling analysis for the Neal South facility.

The DNR modeled George Neal South and George Neal North-Unit 3 using maximum permitted allowable emission rates. The two other units at Neal North, Units 1 and 2, were modeled as operational but combusting only natural gas, and not coal. This was a conservative approach to address the pending shutdown of George Neal North - Units 1 and 2. Because the planned shutdowns of George Neal North - Units 1 and 2 were not federally enforceable when EPA was finalizing designations for the second round, EPA designated Woodbury County as unclassifiable.

EPA signed the final designations for the second round on June 30, 2016. They were published in the Federal Register on July 12, 2016 (81 FR 45039).

[8] The original TSD is dated September 18, 2015, and the updated TSD is dated December 23, 2015.

1.1.3 Required Ongoing Data Reviews

Although the designations for the second round were finalized prior to any implementation deadlines in the DRR, sources in those areas are still impacted by the DRR. For example, IPL-Burlington, IPL-Ottumwa, and both MidAmerican-George Neal facilities (Neal North and Neal South), had to be included in the DRR applicable source list because they had emissions greater than 2,000 tpy. Their being located in areas designated during the second round had no bearing on this requirement.

Relevant to this report are the DRR's provisions in 40 CFR 51.1205(b), regarding the ongoing data review requirements (discussed at the beginning of this Chapter). Since EPA's attainment designations for Des Moines and Wapello Counties are based on modeling of actual SO_2 emissions, those provisions apply.

Although Woodbury County was also designated in the second round of 1-hr SO_2 designations, it was designated unclassifiable, thus the provisions of 40 CFR 51.1205(b) do not apply. Additionally, the modeling for MidAmerican's-George Neal North and Neal South facilities were based on federally permitted maximum allowable emissions rates. Thus, those provisions will not apply should EPA act on the Governor's January 5, 2017, request to redesignate Woodbury County to attainment.

1.1.4 Round 3 Designations

For the third round of designations, the ongoing data review provisions of 40 CFR 51.1205(b) will also apply to any areas designated attainment based on modeling of actual emissions. While EPA completed designations for all areas in Iowa during this round, only Louisa and Pottawattamie Counties were designated attainment based on modeling of actual emission. Modeling that included the use of actual emissions demonstrated attainment in Linn County, but EPA chose to designate Linn County unclassifiable. All remaining areas in the state were designated attainment based on either the use of enforceable emission limits or the absence of larger SO_2 sources.

Designations for the third round were signed by EPA for publication in the Federal Register on December 21, 2017, published in the Federal Register on January 9, 2018 (83 FR 1098), and effective on April 9, 2018. The effective date is important because the first DRR report for an affected area is not due until July 1 of the calendar year after the effective date of an area's initial classification. Given the April 9, 2018, effective data, the first reports for any applicable areas designated in round three will not be due until July 1, 2019. To the extent that sources in or near Louisa and Pottawattamie Counties will require review pursuant to the DRR, the DNR will address such provisions in next year's report. Thus, at this time only the sources in Des Moines and Wapello Counties are subject to the DRR's ongoing review provisions.

2. Des Moines County Review

Burlington Generating Station (BGS) is the only source in Des Moines County identified by EPA as meeting the emissions-specific applicability criteria in the March 2, 2015, federal consent decree for the second round of 2010 1-hr SO_2 designations. It is a coal-fired electric generating facility operated by Interstate Power and Light (IPL), a subsidiary of Alliant Energy. See Figure 2-1 for the location of BGS.

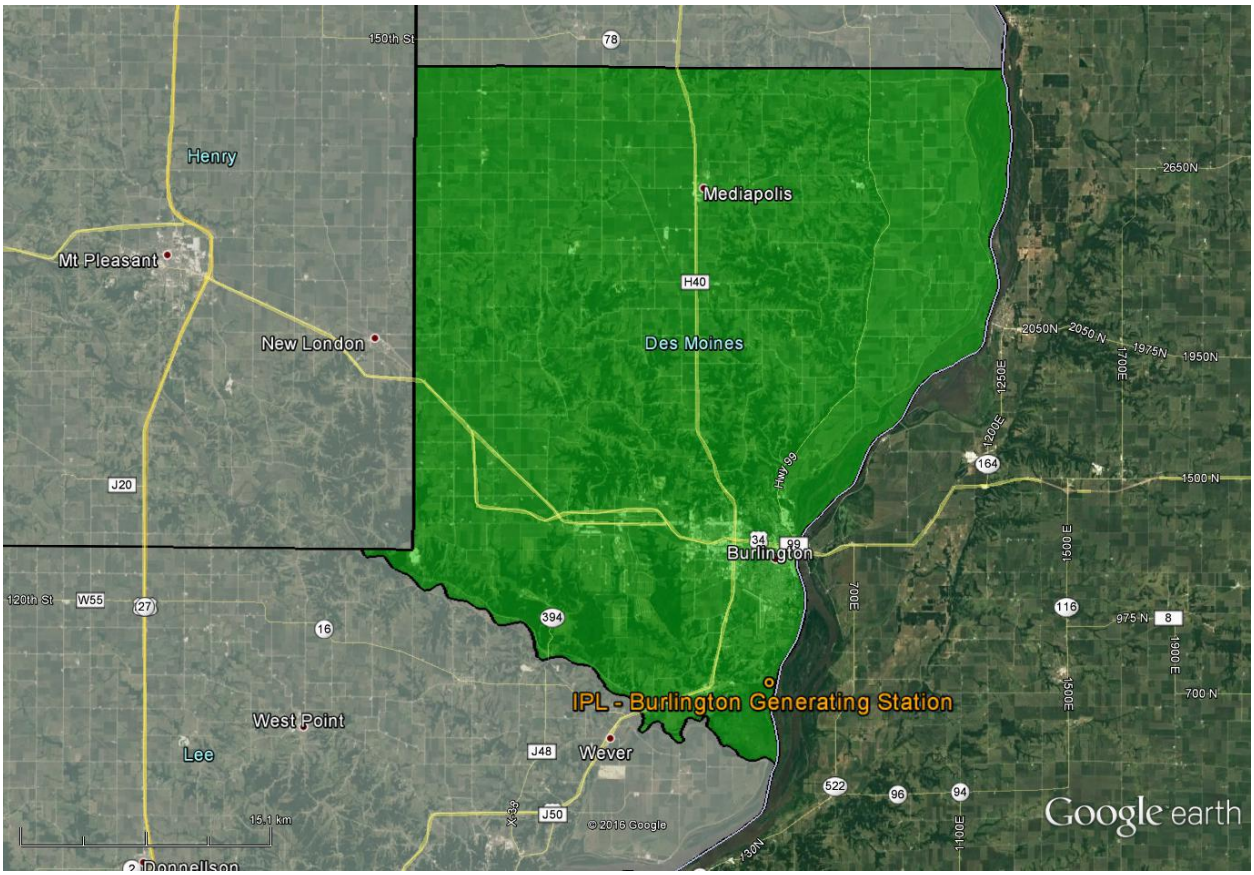

Figure 2-1. Location of IPL-Burlington Generating Station. Des Moines County is shaded in green and other counties in Iowa are shaded in white. Counties in Illinois are unshaded.

The SO_2 emission sources at BGS are a coal-fired main boiler, a natural gas-fired auxiliary boiler for heating, and four natural gas combustion turbines. The facility's emergency generator is an intermittent emission source that was excluded from the modeling analysis that supported the attainment designation. Its exclusion was justified pursuant to Section 5.5 of EPA's draft "*SO_2 NAAQS Designations Modeling Technical Assistance Document*" (most recently updated August 2016).

The SO_2 emission rates used in that modeling analysis are summarized in Table 2-1. Emission rates were based on maximum permitted allowable emission rates, except for the main boiler. The main boiler was modeled using hourly actual emissions from 2012-2014. Results from the designations modeling analysis, which showed attainment of the 1-hr SO_2 NAAQS, are reproduced in Table 2-2.[9]

[9] For a comprehensive review of that modeling analysis, see the December 23, 2015, updated TSD.

Table 2-1. SO_2 emission rates used in the BGS/Des Moines County designations modeling analysis.

Model ID	SO_2 Emission Point [fuel] (NG = Natural Gas)	Rated Capacity (MMBtu/hr)	SO_2 Limit	Notes	Modeling Emission Rate (lb/hr)
EP01	Combustion Turbine #1 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP02	Combustion Turbine #2 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP03	Combustion Turbine #3 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP04	Combustion Turbine #4 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP16	Auxiliary Boiler [NG]	15	500 ppm	Conservative Limit[†]	0.9
EP17	Main Boiler [coal]	2,077	1.0 lb/MMBtu	Actual Emissions	Varies Hourly[‡]

[†]The existing potential emission rate for the auxiliary boiler, EP16, is 0.009 lb/hr. The modeled emission rate, however, was conservatively higher as it reflected an earlier proposal to establish a new limit for this unit. There was no need to remodel this unit using the existing lower limit.

[‡]The SO_2 emission rates modeled for the main boiler, EP17, correspond to the actual reported continuous emissions monitoring system (CEMS) data provided by IPL for the period 2012-2014.

Table 2-2. Concentrations ($\mu g/m^3$) from the BGS/Des Moines County designations modeling analysis.

Model Design Value	Background Concentration	Total Concentration	1-Hour SO_2 NAAQS	Attains NAAQS?
60.9	32	92.9	196	Yes

2.1 Emissions Assessment

Because modeling of actual emissions provided the basis for the attainment designation of Des Moines County, the provisions in 51.1205(b) require that the state document the annual SO_2 emissions from BGS and provide an assessment of the cause of any emissions increase from the previous year. The state must also provide a recommendation, pursuant to 40 CFR 51.1205(b)(1), regarding whether additional modeling is needed to characterize air quality in the area to determine whether the area meets or does not meet the 2010 1-hr SO_2 NAAQS

At a minimum, the DRR requires a review of the most recent two years of emissions data. However, reviewing only that data would artificially limit the scope of the assessment and prevent the state from accurately determining if additional modeling is needed. It would exclude emissions data from 2012-2014, which modeling has already shown to meet the NAAQS. The DNR therefore included data back through 2012 in this review.

Burlington Generating Station's actual annual SO_2 emissions from 2012-2017, obtained using the Air Markets Program Data tool from EPA's Clean Air Markets Division (CAMD), are shown in Figure 2-2. The CAMD data includes emissions from the main boiler only. Because the combustion turbines were modeled using their maximum permitted emission rates and the auxiliary boiler was modeled using a conservative limit, there was no need to review actual emissions from these sources. Additionally, these units are not a significant source of SO_2 as their actual emissions, in total, are always much less than 1 ton per year.

The SO_2 emission from BGS increased by 15 tons between the previous year (2016) and the most recent year available (2017). This 0.5% emissions increase is attributable to a 1% increase in heat input combined with a decrease in the annual average emission rate of 0.5% (a decrease of ~0.003 lb/MMBtu). See Figure 2-3 for the annual heat input data and the annual average emission rates (rounded to 3 digits) from 2012-2017.

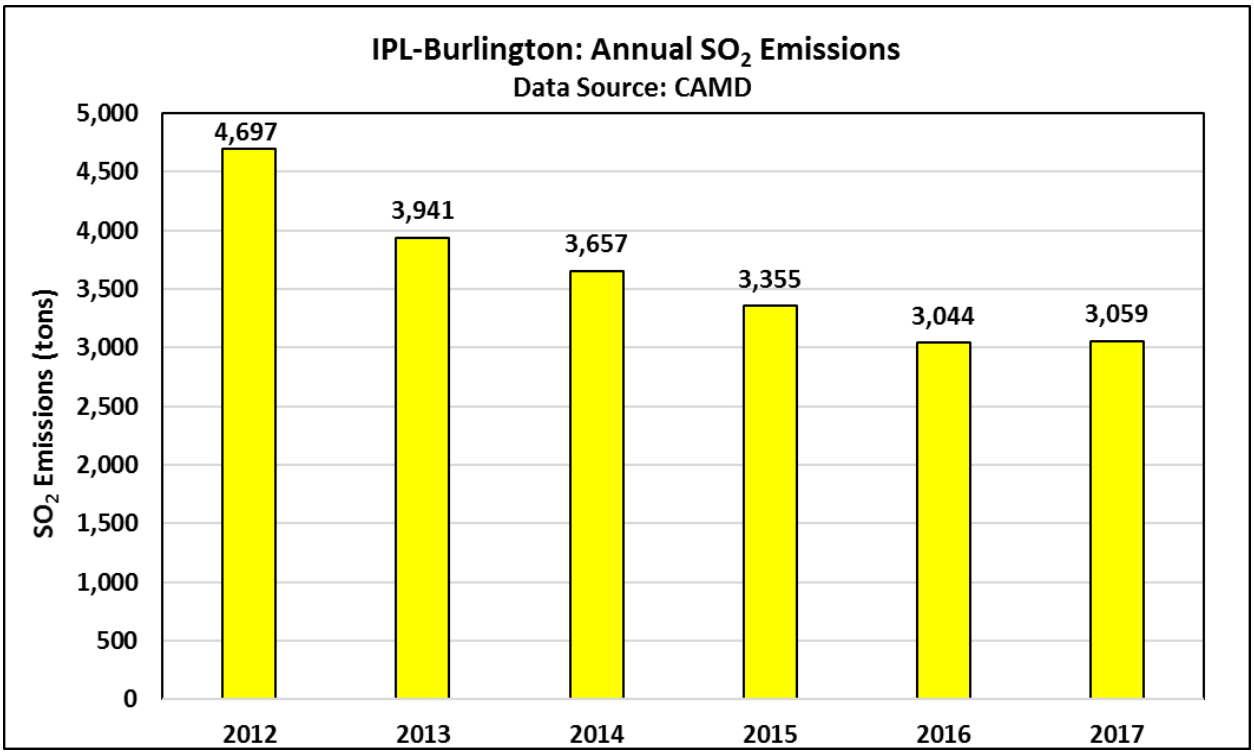

Figure 2-2. Annual 2012-2017 SO_2 emissions (tons per year) from BGS.

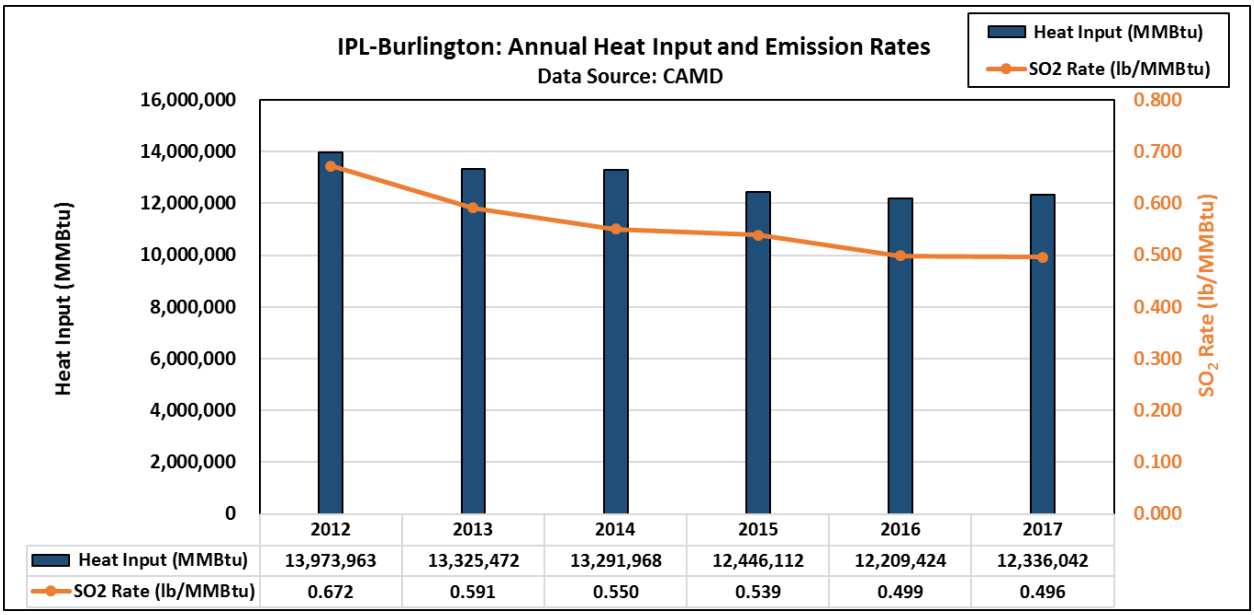

Figure 2-3. Annual 2012-2017 heat inputs (MMBtu) and SO_2 emission rates (lb/MMBtu) from BGS.

These comparisons provide insufficient information to make an informed recommendation regarding the need for additional modeling. An informed decision can only be made by including emissions data from 2012-2014, upon which the attainment designation was based.

Across the 2012-2014 timeframe, SO_2 emissions averaged 4,098 tons per year. The 2017 actual annual emissions were 3,059 tons. This represents a reduction of 1,039 tons, or 25%, and it is largely attributable to a reduction in the sulfur content of the coal, in combination with a reduction in heat input. The average emission rate across the 2012-2014 timeframe was 0.606 lb/MMBtu, while the 2017 annual average emission rate was 0.496

lb/MMBtu. This represents an 18% reduction and it can be explained by a reduction in the sulfur content of the coal. Additional SO_2 reductions across this same timeframe are attributable to a 9% reduction in heat input.

2.2 Recommendation

The modeling demonstration that supported the attainment designation yielded maximum modeled impacts well below the NAAQS (see Table 2-2) based on the use of actual emissions data from 2012-2014. While a slight SO_2 emissions increase occurred between 2016 and 2017, recent SO_2 emissions remain well below the levels observed in 2012-2014. Based on these facts, new modeling is not needed to determine that Des Moines County still meets the 2010 1-hr SO_2 NAAQS.

This conclusion is also supported by emission reductions from the nearby Iowa Army Ammunition Plant (IAAP). IAAP was accounted for in the original modeling analysis using a screening analysis.[10] Emissions from IAAP have declined every year from 2012 through 2017.[11]

However, the DNR did choose to conduct new modeling. A new analysis is warranted not because there are concerns over possible NAAQS violations, but because new modeling has the potential to alleviate the need to conduct future annual ongoing DRR data reviews for sources in Des Moines County.

2.3 New Modeling Demonstration

Pursuant to 40 CFR 51.1205(b)(2), an air agency will no longer be subject to the annual data review and reporting requirements for a particular area if the air agency provides air quality modeling demonstrating that air quality values at all receptors in the analysis are no greater than 50 percent of the 1-hour SO_2 NAAQS, and such demonstration is approved by the EPA Regional Administrator. As discussed below, the results from a new modeling analysis yield impacts less than half the NAAQS. Once approved by EPA, the ongoing data review provisions of the DRR will no longer apply to sources in Des Moines County.

2.3.1 Source Characterization and Emission Rates

The new modeling analysis for BGS utilizes actual hourly SO_2 emissions from the most recent 3-year period available, 2015-2017. Only emissions from the main boiler were revised as the other sources at BGS were originally modeled using either existing, or conservative, emission limits. A summary of the modeled emission rates is provided in Table 2-3 and a summary of the stack characteristics[12] is provided in Table 2-4.

Table 2-3. SO_2 emission rates used in the new modeling analysis for BGS.

Model ID	SO_2 Emission Point [fuel] (NG = Natural Gas)	Rated Capacity (MMBtu/hr)	SO_2 Limit	Notes	Modeling Emission Rate (lb/hr)
EP01	Combustion Turbine #1 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP02	Combustion Turbine #2 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP03	Combustion Turbine #3 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP04	Combustion Turbine #4 [NG]	288	1.8 lb/hr	Existing Limit	1.8
EP16	Auxiliary Boiler [NG]	15	500 ppm	Conservative Limit†	0.9
EP17	Main Boiler [coal]	2,077	1.0 lb/MMBtu	Actual Emissions	Varies Hourly‡

[10]For a discussion of the screening analysis, see the December 23, 2015, updated TSD.
[11]The annual SO_2 emissions from IAAP from 2012 through 2017 are: 753, 509, 504, 452, 262, and 205 tons per year, respectively.
[12]The stack characteristics did not change between the modeling analysis that supported the attainment designation and this new modeling analysis.

[†]The existing potential emission rate for the Auxiliary Boiler, EP16, is 0.009 lb/hr. The modeled emission rate, however, is conservatively higher as it reflects the older proposal to establish a new, less restrictive, limit for this unit. This conservative approach was retained for simplicity and consistency with the modeling analysis that supported the attainment designation.

[‡]The SO_2 emission rates for the main boiler, EP17, correspond to the CEMS data reported to and downloaded from CAMD for the period 2015-2017.

Table 2-4. BGS point source exhaust characteristics.

Model ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Stack Height (m)	Stack Diameter (m)	Exhaust Temperature (K)	Exhaust Velocity (m/s)
EP01	658898.2	4511791.1	161.05	11.28	3.08	788.7	24.56
EP02	658907.1	4511790.0	161.28	11.28	3.08	788.7	24.56
EP03	658916.8	4511788.9	161.65	11.28	3.08	788.7	24.56
EP04	658925.8	4511787.8	162.01	11.28	3.08	788.7	24.56
EP16	658985.4	4511701.9	162.1	52.36	0.59	533.2	10.17
EP17	659014.6	4511681.0	161.91	93.27	3.58	477.6	34.98

The Iowa Army Ammunition Plant is the only other SO_2 source in the area that warrants inclusion in the modeling analysis. The SO_2 emissions from this facility are attributable to a pair of coal-fired boilers that vent through a common stack. The common stack is not equipped with a continuous emissions monitoring system (CEMS). The facility is unique in that it has a very large property, which places the coal boilers far from ambient air (see Figure 2-4). The nearest ambient air is 1.9 km to the north of the boiler stack, which restricts the largest concentration gradients to the property. Because of IAAP's large property boundary and the absence of hourly varying actual emissions data, a screening analysis was originally used to model SO_2 impacts from IAAP. While EPA agreed that the screening analysis was likely conservative, they noted that this approach did not follow the modeling TAD and was not recommended.[13] To alleviate this concern, the new modeling analysis includes IAAP as an interactive source.

An hourly emission rate for IAAP was calculated based on the maximum coal-firing rate for each boiler and the maximum sulfur content of the coal from the available measurements made in 2015, 2016, and 2017. Sulfur content was highest in 2015 and its value yielded an emission rate of 622.6 lb/hr. This equates to an annual emission rate of 2,727 tons per year, which is considerably larger than any recently reported annual emissions (see footnote 11). It provides a suitable and conservative approach to account for emissions variability. The emission rate and stack characteristics for the common stack are provided in Table 2-5.

[13] For additional information, see EPA's Final Technical Support Document for Iowa for the second round of designations.

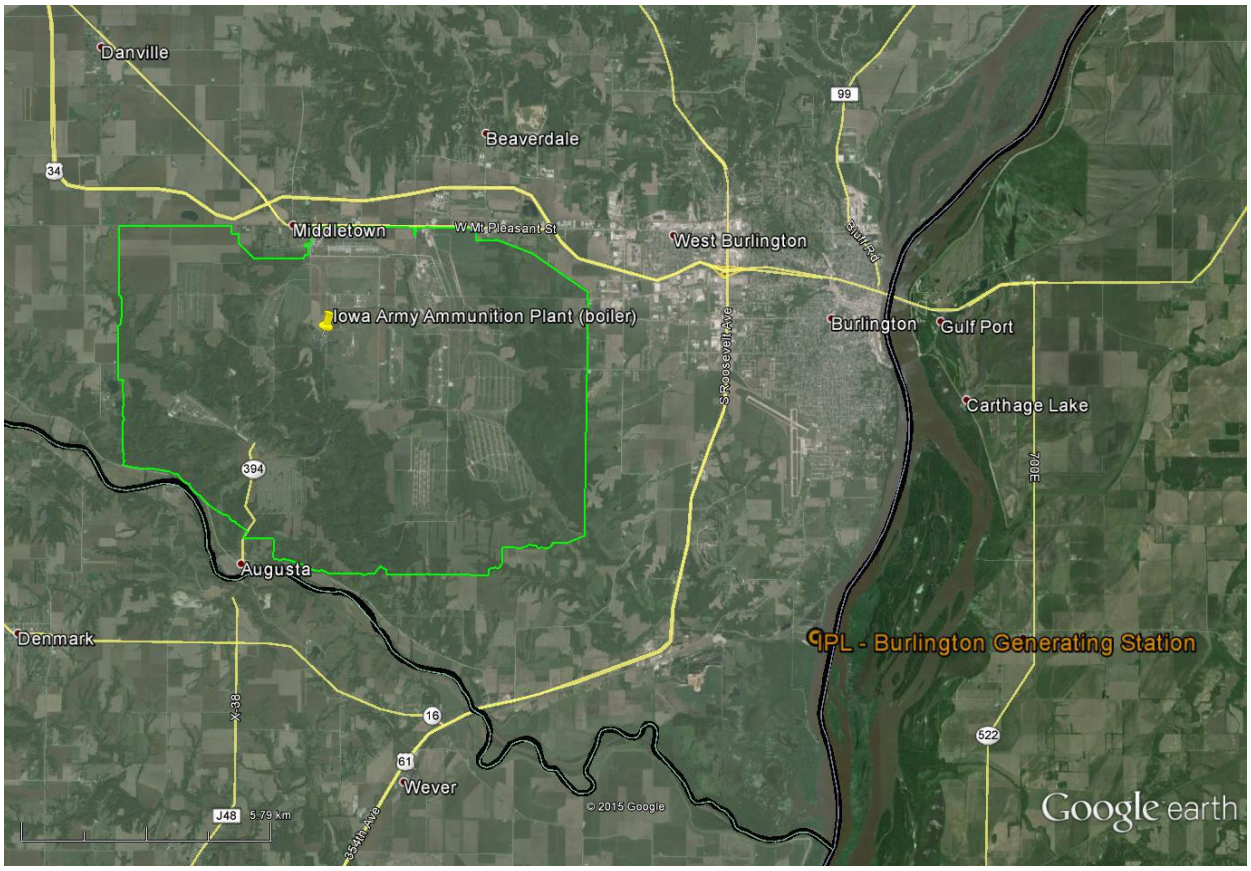

Figure 2-4. Iowa Army Ammunition Plant overview. Their fence line is shown in green.

Table 2-5. Iowa Army Ammunition Plant boiler point source characteristics.

Emission units:	Two (2) Zurn boilers (venting to a common stack)
Emissions:	622.6 lbs/hr, based on maximum coal firing for each boiler and the coal sulfur content reported in 2015 (which represents the maximum value from 2015–2017)
Stack Height:	150 ft
Discharge type:	Vertical/unobstructed
Diameter:	108 in
Temperature:	403 degrees F
Flow rate:	78,690 scfm (128,162 acfm)

2.3.2 Dispersion Model

The EPA recommended American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) was used to perform the analysis. The most current version (Version 16216r) of AERMOD available at the time of the analysis was used with regulatory default options as recommended in the EPA Guideline on Air Quality Models. The following supporting pre-processing programs for AERMOD were also used:

- BPIP-Prime (Version 04274)
- AERMET (Version 16216)
- AERMAP (Version 11103)

AERMOD is a steady-state plume model that simulates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. This model is recommended for short-range (<50 kilometers [km]) dispersion from the source. The model incorporates the Plume Rise Model Enhancement (PRIME) algorithm for modeling

building downwash. AERMOD is designed to accept input data prepared by two specific pre-processor programs, AERMET and AERMAP. AERMOD was run with the following options:

- Regulatory default options
- Direction-specific building downwash characterized by BPIP-PRIME
- Actual receptor elevations and hill height scales obtained from AERMAP
- SO_2 pollutant keyword

2.3.3 Receptor Grid

Receptors were sited outside of the fence line boundary of BGS and IAAP. Receptor placement grid spacing was:

- 50 meters along the facility fence line
- 50 meters from the fence line to 0.5 km
- 100 meters extending from 0.5 km to 1.5 km
- 250 meters extending from 1.5 km to 3 km
- 500 meters extending from 3 km to 5 km

Consistent with Section 4.2 of the TAD, receptors were not placed on water bodies within the gridded area. This would include removing receptors on the adjacent Mississippi River. Figure 2-5 shows the receptor grid for the modeling analysis.

Interpolated terrain elevations were input to the model using United States Geological Survey (USGS) National Elevation Dataset (NED) data for Des Moines County in North American Datum 1983 (NAD83). All receptors were assigned a terrain height and hill height using the terrain preprocessor AERMAP.

2.3.4 Meteorological Data

The meteorological data was updated concurrent with the 2015-2017 actual hourly emission rates modeled for BGS. The DNR preprocessed hourly meteorological data for the dispersion modeling analysis with the AERMET program. The surface data was collected from the Burlington (KBRL) station with upper air data from the Davenport NWS station (KDVN) for calendar years 2015 through 2017. Based on the results from a representivity study conducted by the Iowa DNR,[14] these meteorological data are considered representative of the conditions near the Burlington Generating Station. Figure 2-6 shows the 2015-2017 3-year wind rose for the KBRL station.

[14] The representativity analysis is documented in the DNR's "*2010 – 2014 AERMOD Meteorological Data Technical Support Document*," dated October 15, 2015.

Figure 2-5. Dispersion modeling receptor grid surrounding BGS and IAAP.

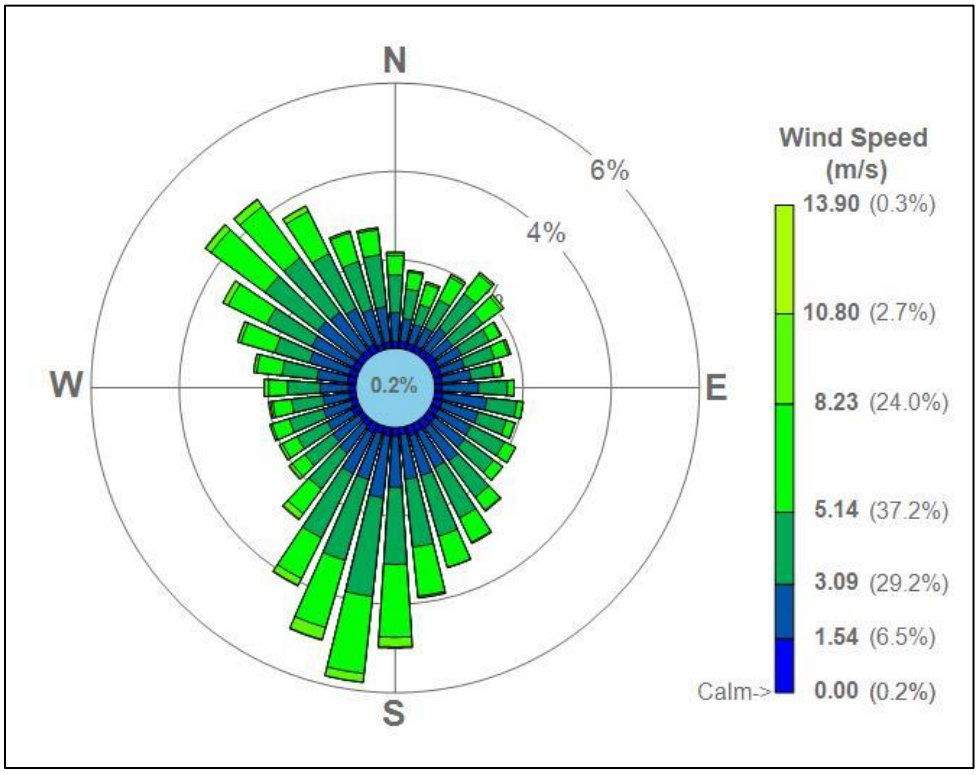

Figure 2-6. Burlington (KBRL) 3-year wind rose (2015 – 2017).

2.3.5 Background Concentration

The current 1-hr SO_2 state default background concentration of 7 µg/m^3 was added to the model design value for comparison to half the NAAQS. The state default SO_2 background concentration is the design value at the Lake Sugema monitor.

The model design value was used in conjunction with the background concentration for comparison to half the NAAQS. Consistent with EPA guidance for SO_2, the receptor with the highest 3-year average of the 99th percentile maximum daily 1-hr modeled concentration was added to the background concentration. AERMOD internally calculates the 3-year average of the 99th percentile 1-hr concentration at each receptor using the SO2 pollutant keyword.

2.3.6 Results and Conclusions

Table 2-6 summarizes the AERMOD output model design value, background concentration, and total concentration for comparison to half the 1-hr SO_2 NAAQS. A contour plot of the model results is provided in Figure 2-7. The maximum concentration of 80.32 µg/m^3 is less than half the 1-hr SO_2 NAAQS. Once the modeling is approved by the EPA Regional Administrator, no future DRR data reviews of the SO_2 sources in Des Moines County will be required.

Table 2-6. Model predicted concentrations (µg/m^3) for the BGS (and IAAP)/Des Moines County new analysis.

Model Design Value	Background Concentration	Total Concentration	1-Hour SO_2 NAAQS	Half the NAAQS	Below Half the NAAQS?
73.32	7	80.32	196	98	Yes

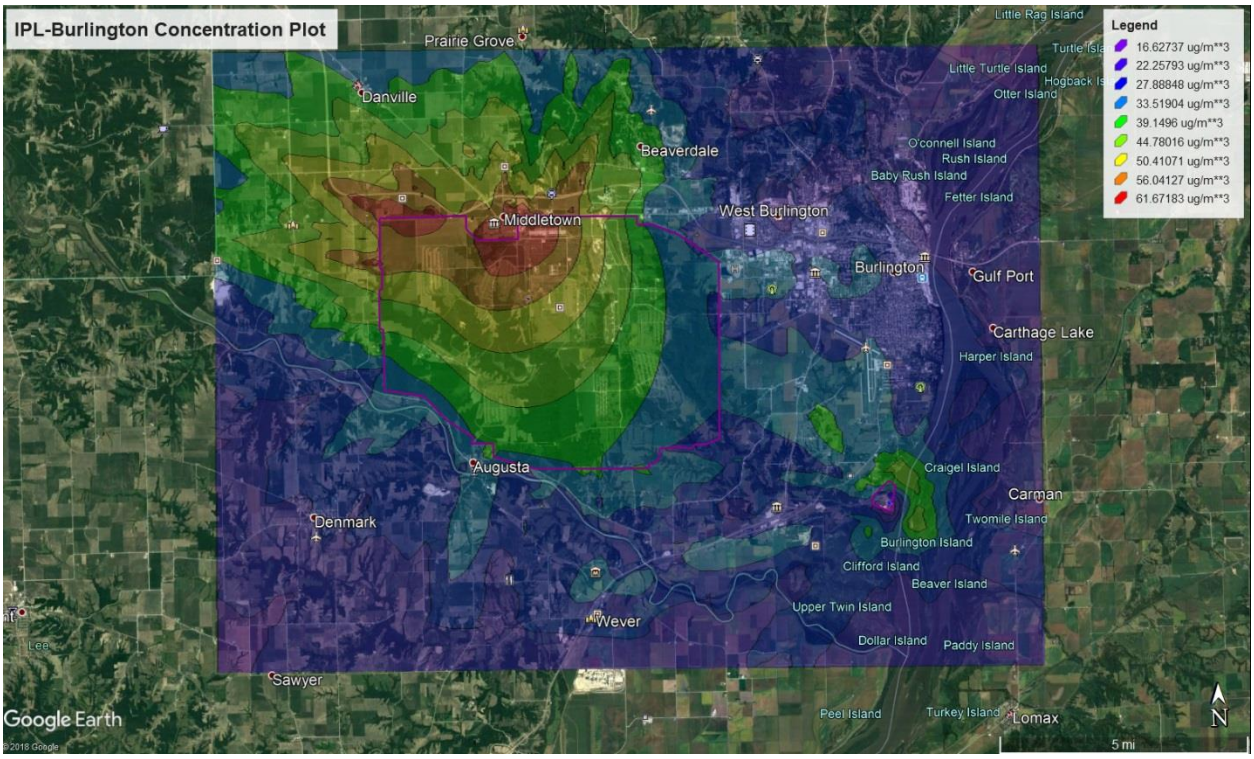

Figure 2-7. Contour plot of maximum 1-hr SO_2 impacts from the BGS (and IAAP)/Des Moines County new modeling analysis (excludes background).

3. Wapello County Review

Ottumwa Generating Station (OGS) is the only source in Wapello County identified by EPA as meeting the emissions-specific applicability criteria in the March 2, 2015, federal consent decree for the second round of 2010 1-hr SO_2 designations. It is a coal-fired electric generating facility operated by Interstate Power and Light (IPL), a subsidiary of Alliant Energy. See Figure 3-1 for the location of OGS.

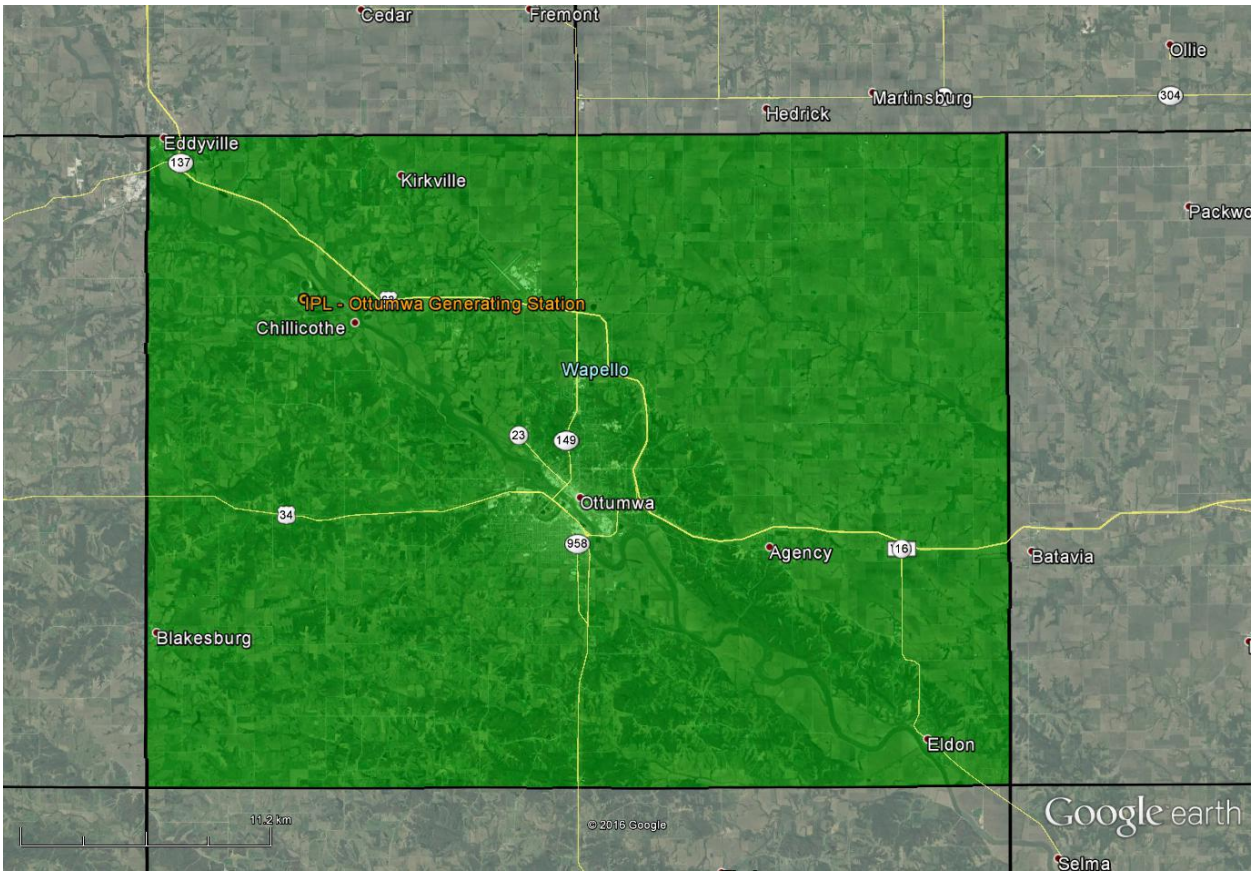

Figure 3-1. Location of IPL-Ottumwa Generating Station. Wapello County is shaded in green.

The SO_2 emission sources at OGS are a coal-fired main boiler and a fuel oil-fired auxiliary boiler for heating. The facility's emergency generator is an intermittent emission source that was excluded from the modeling analysis that supported the attainment designation. Its exclusion was justified pursuant to Section 5.5 of EPA's draft "*SO_2 NAAQS Designations Modeling Technical Assistance Document"* (most recently updated August 2016). No other SO_2 sources in the area were identified for inclusion in that modeling analysis.

The SO_2 emission rates used in that modeling analysis are summarized in Table 3-1. Emission rates were based on maximum permitted allowable emission rates, except for the main boiler. The main boiler was modeled using hourly actual emissions from 2012-2014. Results from the designations modeling analysis, which showed attainment of the 1-hr SO_2 NAAQS, are reproduced in Table 3-2.[15]

[15] For a comprehensive review of that modeling analysis, see the December 23, 2015, updated TSD.

Table 3-1. SO_2 emission rates used in the OGS/Wapello County designations modeling analysis.

Model ID	SO_2 Emission Point [fuel]	Rated Capacity (MMBtu/hr)	SO_2 Limit	Notes	Modeling Emission Rate (lb/hr)
EP1	Main Boiler [coal]	8,669	0.2 lb/MMBtu	Actual Emissions	Varies Hourly[‡]
EP67	Plant Heat Boiler [fuel-oil]	77.413	0.10143 lb/MMBtu	Existing Operating Limit, 0.1% sulfur	7.852

[‡] The SO_2 emission rates modeled for the main boiler, EP1, correspond to the actual reported CEMS data provided by IPL for the period 2012-2014.

Table 3-2. Concentrations ($\mu g/m^3$) from the OGS/Wapello County designations modeling analysis.

Model Design Value	Background Concentration	Total Concentration	1-Hour SO_2 NAAQS	Attains NAAQS?
107.4	32	139.4	196	Yes

3.1 Emissions Assessment

Because modeling of actual emissions provided the basis for the attainment designation of Wapello County, the provisions in 51.1205(b) require that the state document the annual SO_2 emissions from OGS and provide an assessment of the cause of any emissions increase from the previous year. The state must also provide a recommendation, pursuant to 40 CFR 51.1205(b)(1), regarding whether additional modeling is needed to characterize air quality in the area to determine whether the area meets or does not meet the 2010 1-hr SO_2 NAAQS

At a minimum, the DRR requires a review of the most recent two years of emissions data. However, reviewing only that data would artificially limit the scope of the assessment and prevent the state from accurately determining if additional modeling is needed. It would exclude emissions data from 2012-2014, which modeling has already shown to meet the NAAQS. The DNR therefore included data back through 2012 in this review.

Ottumwa Generating Station's actual annual SO_2 emissions from 2012-2017, obtained using the Air Markets Program Data tool from EPA's Clean Air Markets Division (CAMD), are shown in Figure 3-2. The CAMD data includes emissions from the main boiler only. Because the plant heat boiler was modeled using its maximum permitted emission rate, there was no need to review actual emissions from this source. Additionally, this unit is not a significant source of SO_2 as actual emissions from the plant heat boiler are always much less than 1 ton per year.

The SO_2 emission from OGS increased by 142 tons between the previous year (2016) and the most recent year available (2017). This 14% emissions increase is largely attributable to an 8% increase in heat input combined with an increase in the annual average emission rate of 5% (an increase of ~0.003 lb/MMBtu). See Figure 3-3 for the annual heat input data and the annual average emission rates (rounded to 3 digits) from 2012-2017.

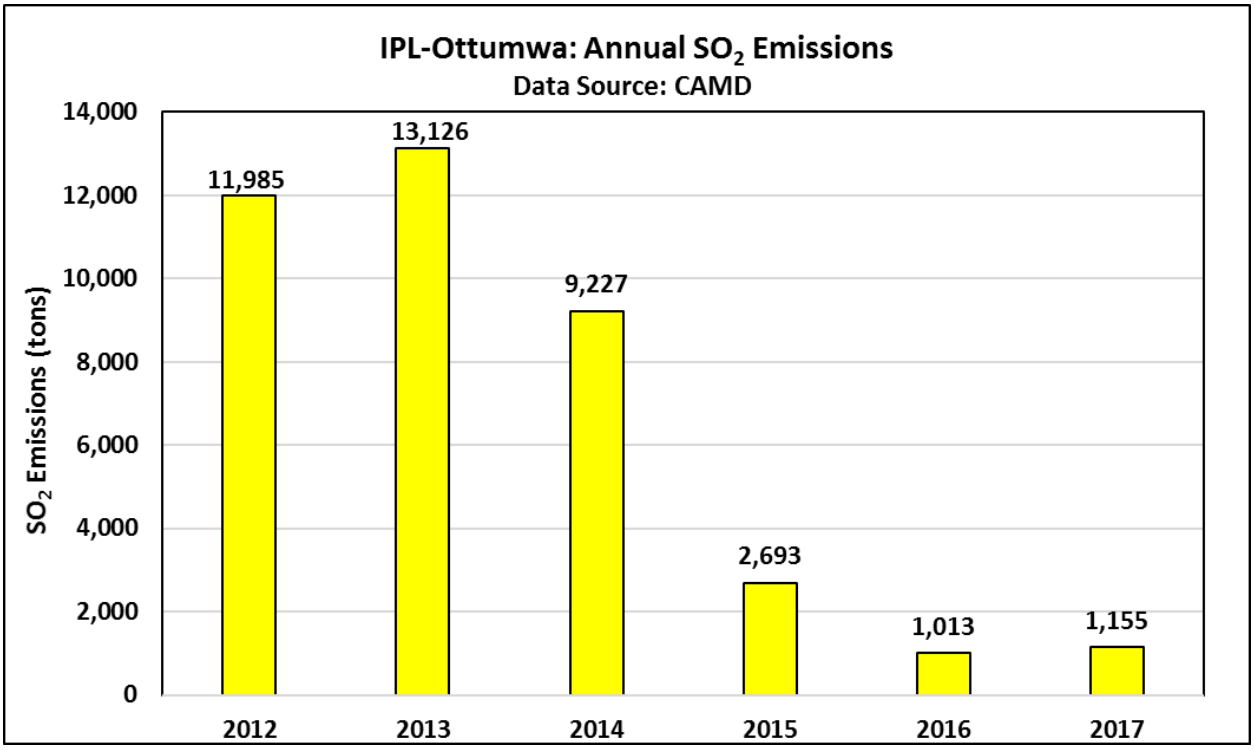

Figure 3-2. Annual 2012-2017 SO_2 emissions (tons per year) from OGS.

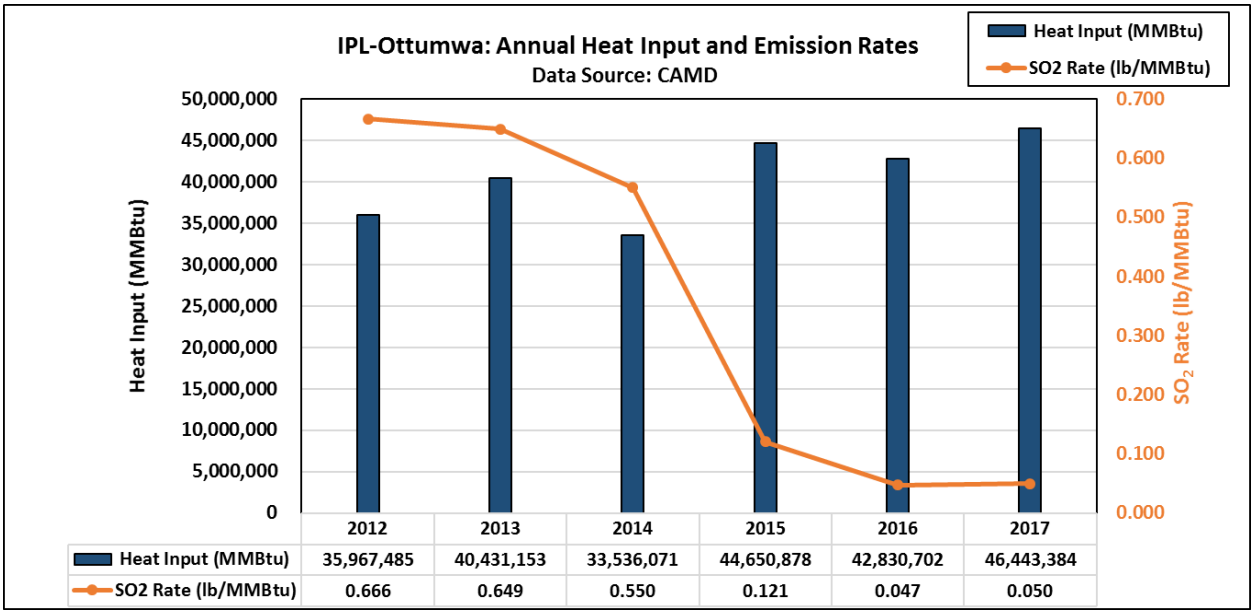

Figure 3-3. Annual 2012-2017 heat inputs (MMBtu) and SO_2 emission rates (lb/MMBtu) from OGS.

These comparisons provide insufficient information to make an informed recommendation regarding the need for additional modeling. An informed decision can only be made by including emissions data from 2012-2014, upon which the attainment designation was based.

Across the 2012-2014 timeframe, SO_2 emissions averaged 11,446 tons per year. The 2017 actual annual emissions were 1,155 tons. This represents a reduction of 10,291 tons, or 90%, and it is attributable to the operation of the flue gas desulfurization (FGD) system that was installed in late 2014. Other factors, such as changes in heat input or operating time, did not contribute to the SO_2 emissions decrease. In fact, both heat input and operating time increased in 2017, by 27% and 18% respectively, compared to their averages across the

2012-2014 timeframe. The role of the FGD in reducing SO_2 emissions is also evident in the emission rates. The 2012-2014 average emission rate was 0.625 lb/MMBtu, while the 2017 annual average emission rate was 0.050 lb/MMBtu, or 92% lower.

3.2 Recommendation

While an SO_2 emissions increase did occur between 2016 and 2017, it was more than offset by the emissions reductions produced from operation of the FGD. Additional modeling is not necessary to conclude that the area is still attaining the 2010 1-hour SO_2 NAAQS.

However, the DNR did choose to conduct new modeling. A new analysis is warranted not because there are concerns over possible NAAQS violations, but because new modeling has the potential to alleviate the need to conduct future annual ongoing DRR data reviews for sources in Wapello County.

3.3 New Modeling Demonstration

Pursuant to 40 CFR 51.1205(c), an air agency that demonstrates that an area would meet the 2010 1-hr SO_2 NAAQS with allowable emissions is not required to submit future annual reports for the area. As discussed below, the results from a new modeling analysis produced by the DNR satisfy this criterion. The ongoing data review provisions of the DRR will thus no longer apply to sources in Wapello County.

3.3.1 Source Characterization and Emission Rates

The maximum allowable SO_2 emission rates used in the new modeling analysis are summarized in Table 3-3. Only the emission rate for the main boiler required revision, as the plant heat boiler was previously modeled at its maximum permitted allowable emission rate. The modeled emission rate for OGS's main boiler was derived from the 0.075 lb/MMBtu 30-day rolling average federally enforceable maximum allowable permitted emission limit included in air construction permit number 78-A-019-P14, issued December 22, 2016. Since the permit limit is based on a 30-day rolling average, the DNR utilized methods in EPA's *Guidance for 1-Hour SO2 Nonattainment Area [State Implementation Plan] Submissions* memorandum, dated April 23, 2014, to convert the 30-day limit to a 1-hour critical value appropriate for modeling.

Table 3-3. SO_2 emission rates used in the new modeling analysis for OGS.

Model ID	SO_2 Emission Point [fuel]	Rated Capacity (MMBtu/hr)	SO_2 Limit	Notes	Modeling Emission Rate (lb/hr)
EP1	Main Boiler [coal]	8,669	0.075 lb/MMBtu	Critical Value	2,048[†]
EP67	Plant Heat Boiler [fuel-oil]	77.413	0.10143 lb/MMBtu	Existing Operating Limit, 0.1% sulfur	7.852[‡]

[†]This SO_2 emission rate is based on the federally enforceable limit in air construction permit 78-A-019-P14.
[‡]This federally enforceable limit is contained in air construction permit 04-A-816-S3.

The procedures for converting a longer-term limit to a shorter-term limit require an emissions dataset that characterizes the variability in the source's emissions over time. The best source of such data is CEMS data from the source itself, assuming the available data is expected to remain representative of future operating conditions. EPA's guidance anticipates that a robust dataset would encompass 3 to 5 years of data.

The most recent five-year hourly emissions dataset available for OGS is 2013-2017. The hourly SO_2 emissions from the coal-fired boiler, obtained from CAMD, are plotted in Figure 3-4. This figure shows a dramatic reduction in SO_2 emissions starting in the May 2015 timeframe. These reductions are attributable to operation of the new FGD.

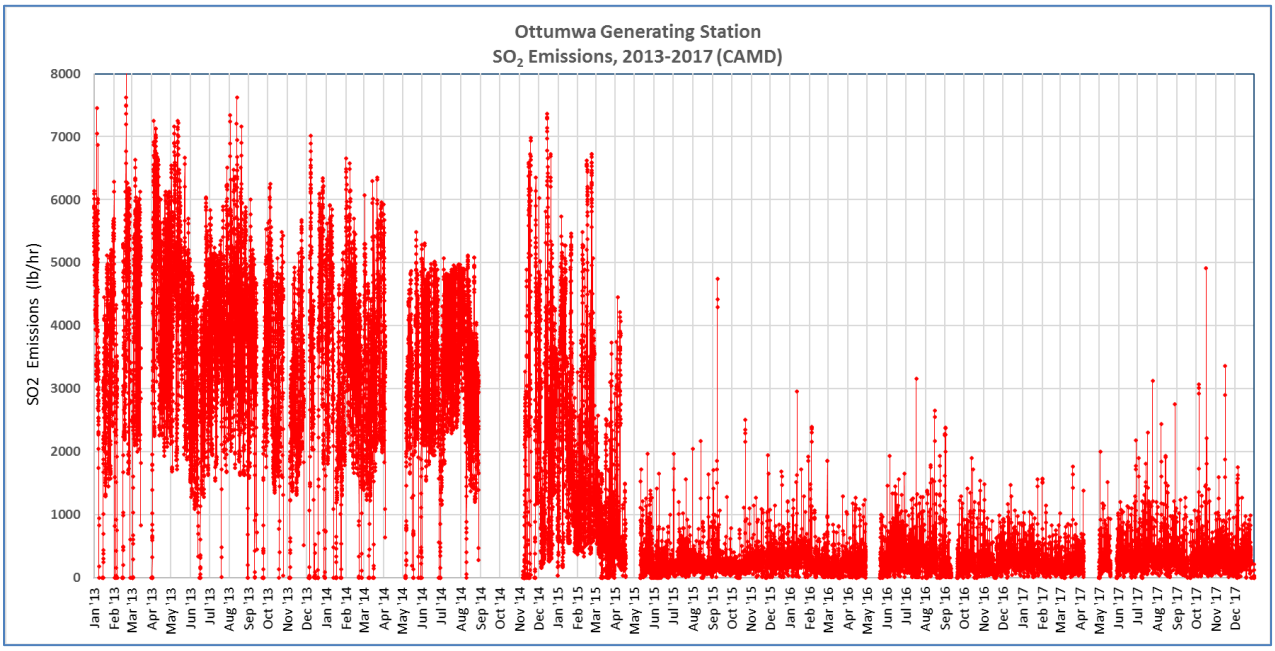

Figure 3-4. Hourly SO_2 emissions reported to CAMD from 2013-2017 for the coal-fired boiler at OGS.

Operation of the FGD significantly changes the variability of the hourly SO_2 emissions and renders the data before May 2015 unsuitable for use in deriving the 1-hour critical value. According to EPA guidance, in situations where three years of source-specific data are not available, an option for evaluating emissions variability is to use data from a similar source with similar controls. However, in this case, the DNR believes the best option is to utilize the 2016-2017 two-year dataset from OGS. This eliminates issues of source representativity because it retains the use of data measured directly from OGS. Additionally, assessments conducted by the DNR suggest that the use of a shorter timeframe is a conservative approach for OGS. For example, the ratio of the 99th percentile 30-day rolling average to the 99th percentile 1-hr value, using all data from 2015-2017, is approximately 0.5207. Repeating this calculation, using only the data that is considered representative of current operating conditions, the May 2015-2017 emissions data, produces a ratio of 0.3230. Replicating the calculations a third time, using only the 2016-2017 emissions data (shown in Figure 3-5), again yields a lower[16] ratio, of 0.3175.

The DNR concludes[17] that variability from OGS is best characterized using two years of its own data, rather than a longer-term dataset from a different facility. This eliminates the uncertainties associated with finding a surrogate source and ensures that the data used is unquestionably representative of OGS.

[16] The use of a smaller ratio yields a larger modeled 1-hour critical value, and is thus a more conservative approach.
[17] Should questions remain about the validity of this conclusion, such doubt is eliminated by the model results. The maximum modeled impact, with background, is approximately one-third of the NAAQS, see Section 3.3.6.

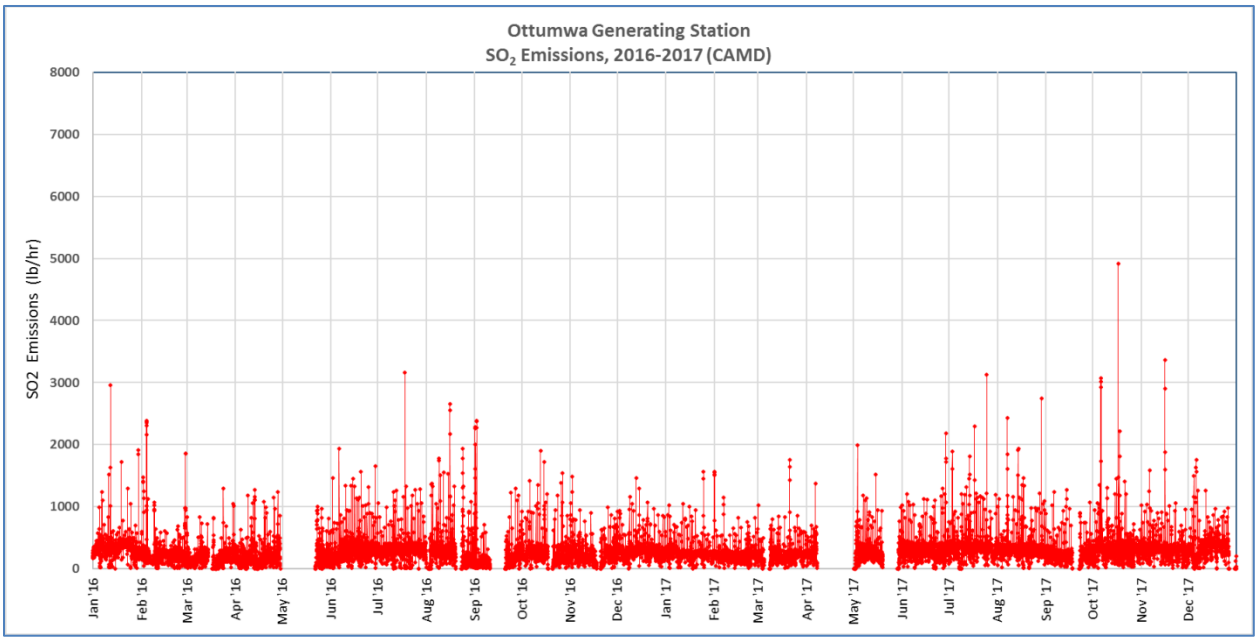

Figure 3-5. Hourly SO_2 emissions reported to CAMD from 2016 – 2017 for the coal-fired boiler at OGS.

The modeled 1-hour critical value is derived using the permitted emission rate of 0.075 lb/MMBtu, the boiler's maximum rated capacity of 8,669 MMBtu/hr, and the conversion ratio of 0.3175, as follows:

$$\left(\frac{0.075\,\frac{\text{lb}\cdot\text{SO}_2}{\text{MMBtu}}\times 8{,}669\,\frac{\text{MMBtu}}{\text{hr}}}{0.3175}\right)=2{,}048\,\frac{\text{lb}\cdot\text{SO}_2}{\text{hr}}$$

Table 3-4 summarizes the stack characteristics used in new the 1-hr SO_2 modeling demonstration. The GEP stack height was modeled for the main boiler stack (EP1) since allowable emission were modeled.[18]

Table 3-4. OGS point source exhaust characteristics.

Model ID	UTM Easting (m)	UTM Northing (m)	Base Elevation (m)	Stack Height (m)	Stack Diameter (m)	Exhaust Temperature (K)	Exhaust Velocity (m/s)
EP1	537387.3	4549481.6	208.12	152.5	7.62	369.26	27.63
EP67	537421.6	4549359	197.9	66.75	1.22	477.6	1.74

3.3.2 Dispersion Model

The EPA recommended American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) was used to perform the analysis. The most current version (Version 16216r) of AERMOD available at the time of the analysis was used with regulatory default options as recommended in the EPA Guideline on Air Quality Models. The following supporting pre-processing programs for AERMOD were also used:

- BPIP-Prime (Version 04274)
- AERMET (Version 16216)
- AERMAP (Version 11103)

[18] The GEP stack height was also used in the modeling analysis that supported the attainment designation, even though the GEP stack height was lower than the actual stack height. That was a conservative approach.

AERMOD is a steady-state plume model that simulates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. This model is recommended for short-range (<50 kilometers [km]) dispersion from the source. The model incorporates the Plume Rise Model Enhancement (PRIME) algorithm for modeling building downwash. AERMOD is designed to accept input data prepared by two specific pre-processor programs, AERMET and AERMAP. AERMOD was run with the following options:

- Regulatory default options
- Direction-specific building downwash characterized by BPIP-PRIME
- Actual receptor elevations and hill height scales obtained from AERMAP
- SO_2 pollutant keyword

3.3.3 Receptor Grid

Receptors were sited outside of the fence line boundary of OGS. Figure 3-6 shows the receptor grid for the modeling analysis. Receptor placement grid spacing was:

- 50 meters along the facility fence line
- 50 meters from the fence line to 0.5 km
- 100 meters extending from 0.5 km to 1.5 km
- 250 meters extending from 1.5 km to 3 km
- 500 meters extending from 3 km to 5 km

Interpolated terrain elevations were input to the model using United States Geological Survey (USGS) National Elevation Dataset (NED) data for Des Moines County in North American Datum 1983 (NAD83). All receptors were assigned a terrain height and hill height using the terrain preprocessor AERMAP.

3.3.4 Meteorological Data

Hourly meteorological data for the dispersion modeling analysis was preprocessed with the AERMET program by the Iowa DNR. The surface data was collected from the Ottumwa (KOTM) station with upper air data from the Davenport NWS station (KDVN) for calendar years 2012 through 2014. Based on the results from a representivity study conducted by the Iowa DNR,[19] these meteorological data are considered representative of the conditions near OGS. Figure 3-7 shows the 2012-2014 3-year wind rose for the KOTM station. Since maximum permitted allowable emission rates, and not actual emission rates, were modeled, the 2012-2014 meteorological data is sufficiently current.

[19] The representativity analysis is documented in the DNR's "*2010 – 2014 AERMOD Meteorological Data Technical Support Document*," dated October 15, 2015.

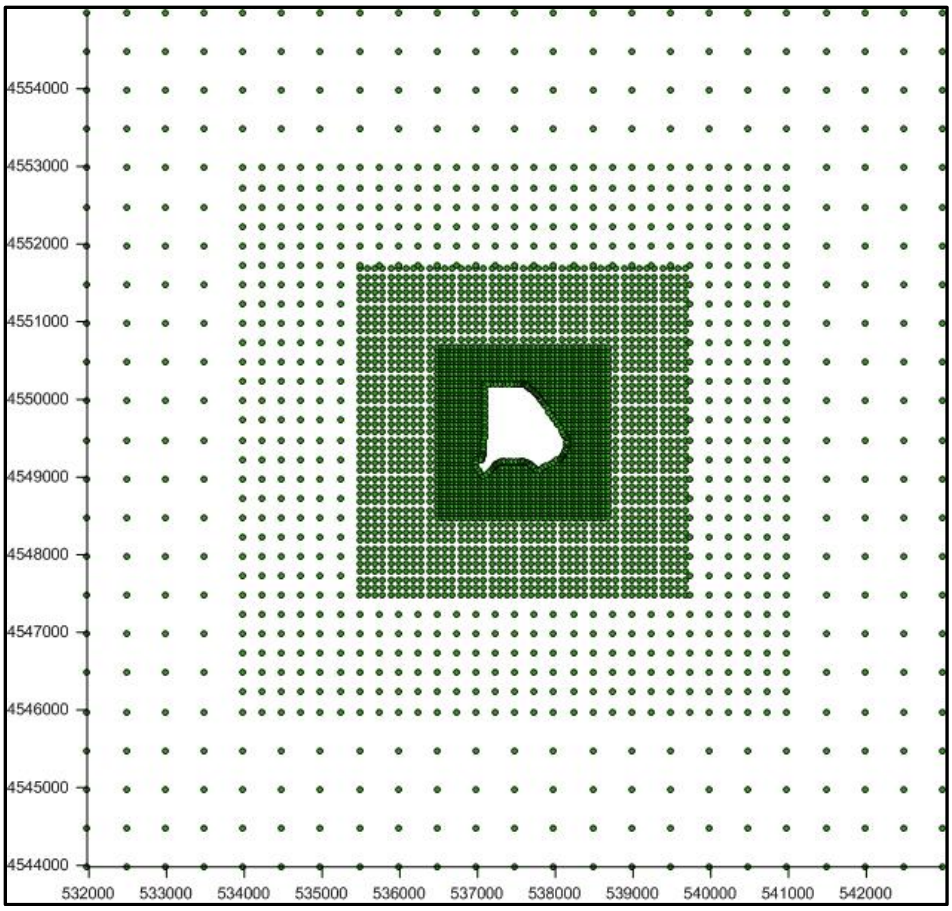

Figure 3-6. Dispersion modeling receptor grid surrounding OGS.

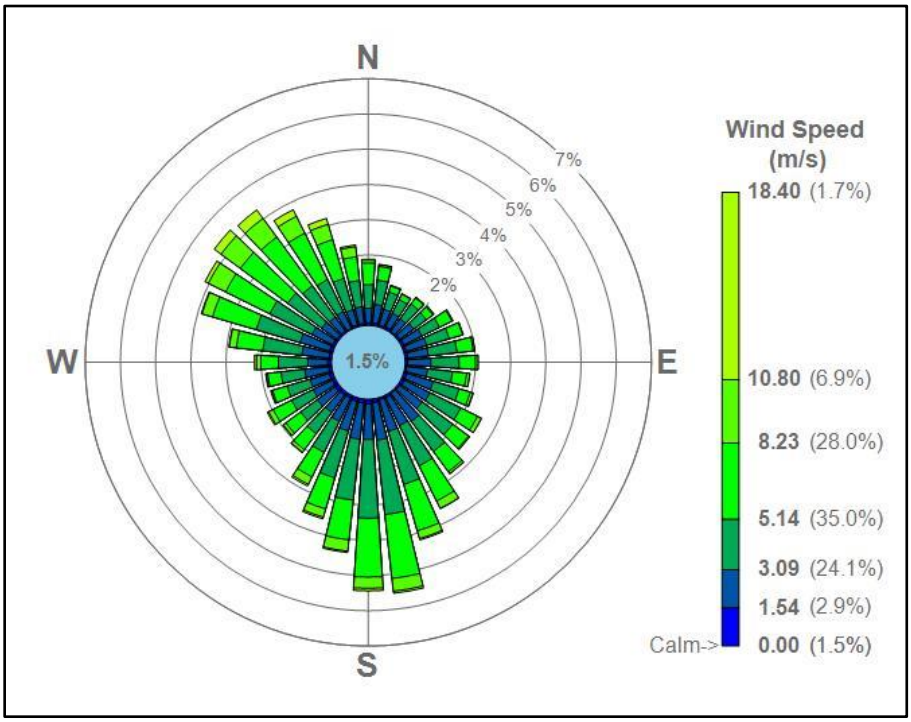

Figure 3-7. Ottumwa (KOTM) 3-year wind rose (2012 – 2014).

3.3.5 Background Concentration

The current 1-hr SO_2 state default background concentration of 7 µg/m^3 was added to the model design value for comparison to the NAAQS. The state default SO_2 background concentration is the design value at the Lake Sugema monitor.

The model design value was used in conjunction with the background concentration for comparison to the NAAQS. Consistent with EPA guidance for SO_2, the receptor with the highest 3-year average of the 99th percentile maximum daily 1-hr modeled concentration was added to the background concentration. AERMOD internally calculates the 3-year average of the 99th percentile 1-hr concentration at each receptor using the SO2 pollutant keyword.

3.3.6 Results and Conclusions

Table 3-5 summarizes the AERMOD output model design value, background concentration, and total concentration for comparison to the 1-hr SO_2 NAAQS. A contour plot of the model results is provided in Figure 3-8. The maximum concentration of 65.41 µg/m^3 is less than the 1-hr SO_2 NAAQS. The maximum modeled impact from OGS not only attains the NAAQS but is also below the standard by nearly a factor of three. No future DRR data reviews of the SO_2 sources in Wapello County will be required.

Table 3-5. Model predicted concentrations (µg/m^3) for the OGS/Wapello County new analysis.

Model Design Value	Background Concentration	Total Concentration	1-Hour SO_2 NAAQS	Attains NAAQS?
58.41	7	65.41	196	Yes

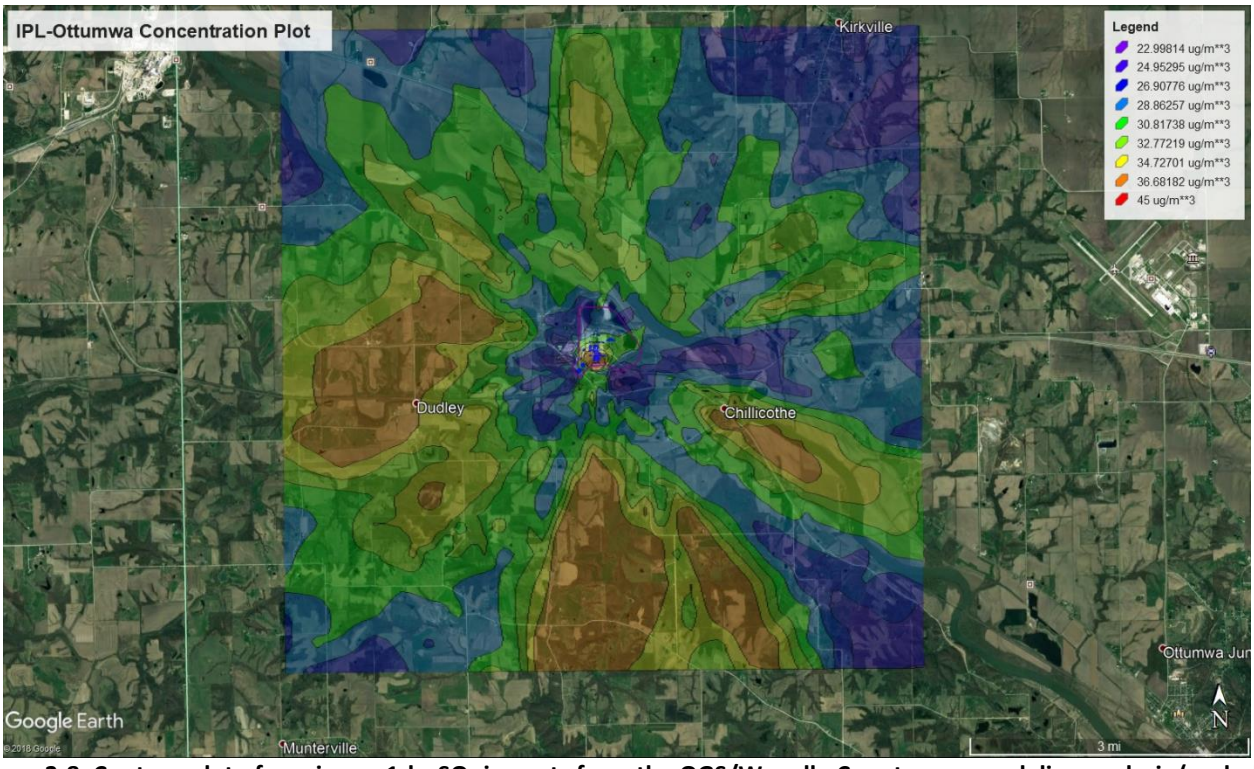

Figure 3-8. Contour plot of maximum 1-hr SO_2 impacts from the OGS/Wapello County new modeling analysis (excludes background).