# Enclosure 3

## Indiana's Assessment of Round 2 Air Quality Designations for the 2010 Primary 1-Hour Sulfur Dioxide ($SO_2$) Standard

## Background

On June 2, 2010, the United States Environmental Protection Agency (U.S. EPA) revised the primary National Ambient Air Quality Standard (NAAQS) for sulfur dioxide ($SO_2$) [75 FR 35520]. U.S. EPA revoked both the previous 24-hour and annual primary $SO_2$ standards and established a new 1-hour $SO_2$ standard at a level of 75 parts per billion (ppb), based on the three year average of the annual 99$^{th}$ percentile of the 1-hour daily maximum concentrations.

On August 5, 2013, U.S. EPA published a notice announcing designations of twenty-nine (29) areas in sixteen (16) states as nonattainment for the 2010 primary 1-hour $SO_2$ NAAQS, based on certified ambient air quality monitoring data for the years 2009-2011 that showed these areas were violating the standard (78 FR 47191).[1] In the State of Indiana, four areas comprised of nine townships in five counties were designated nonattainment. However, at that time U.S. EPA was not yet prepared to issue designations for the remaining areas.

On March 2, 2015, the U.S. District Court for the Northern District of California accepted, as an enforceable order, an agreement between U.S. EPA, the Sierra Club, and the Natural Resources Defense Council to resolve litigation concerning the deadline for completing air quality designations for the remainder of the country.[2] The court's order directs U.S. EPA to complete remaining designations in three additional rounds: Round 2 by July 2, 2016, Round 3 by December 31, 2017, and Round 4 by December 31, 2020. U.S. EPA will complete these designations by designating areas as either nonattainment, attainment, or unclassifiable.

The court order directs U.S. EPA to designate two groups of areas under Round 2 of the air quality designations: (1) areas that have newly monitored violations of the 2010 primary $SO_2$ NAAQS that were not previously designated during Round 1 designations and (2) areas that contain any stationary source(s) that, according to U.S. EPA's Air Quality Markets Database, either emitted more than 16,000 tons of $SO_2$ in 2012 or emitted more than 2,600 tons of $SO_2$, had an annual average emission rate of at least 0.45 lbs $SO_2$/MMBtu (pounds per one million British thermal units) in 2012, and that has not been announced (as of March 2, 2015) for retirement.

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[1] http://www.gpo.gov/fdsys/pkg/FR-2013-08-05/pdf/2013-18835.pdf
[2] http://www.epa.gov/airquality/sulfurdioxide/designations/pdfs/201503FinalCourtOrder.pdf

In response to the court's order, on March 20, 2015, U.S. EPA identified five coal-fired power plants in Indiana, as listed in Table 1, as meeting Round 2 criteria established in the court's order.

**Table 1:**
**Indiana $SO_2$ Sources Identified by U.S. EPA as Meeting Round 2 Air Quality Designation Criteria**

| County | Facility Name | 2012 $SO_2$ Emissions (tons) | 2012 $SO_2$ Emission Rate (lbs/MMBtu) |
|---|---|---|---|
| Spencer | Rockport Generating Station | 54,390 | 0.583 |
| Jefferson | Clifty Creek Generating Station | 52,839 | 1.767 |
| Gibson | Gibson Generating Station | 22,447 | 0.249 |
| LaPorte | Michigan City Generating Station | 11,584 | 1.006 |
| Posey | A.B. Brown Generating Station | 7,091 | 0.521 |

The March 2, 2015, court order directs U.S. EPA to complete the second round of area designations by July 2, 2016. States may submit updated recommendations and supporting information to U.S. EPA for consideration for the affected areas by no later than September 18, 2015.

U.S. EPA's final area designations are expected to be based on 2012-2014 ambient air quality monitoring data reported from $SO_2$ monitors currently in place, as well as refined modeling states choose to conduct specifically for area designations. U.S. EPA expects to designate areas in the following manner:

- **Nonattainment:** An area that U.S. EPA has determined violates the 2010 primary 1-hour $SO_2$ NAAQS, based on the most recent three years of ambient air quality monitoring data or an appropriate modeling analysis, or that U.S. EPA has determined contributes to a violation in a nearby area.

- **Attainment**: An area that U.S. EPA has determined meets the 2010 primary 1-hour $SO_2$ NAAQS and does not contribute to a violation of the NAAQS in a nearby area based on either: a) the most recent three (3) years of ambient air quality monitoring data from a

monitoring network in an area that is sufficient to be compared to the NAAQS per U.S. EPA interpretations in the Monitoring Technical Assistance Document (TAD),[3] or b) an appropriate modeling analysis.

- **Unclassifiable**: An area where U.S. EPA cannot determine based on available information whether the area is or is not meeting the 2010 primary 1-hour $SO_2$ NAAQS and whether the area contributes to a violation in a nearby area.

## Indiana's Assessment

Consistent with U.S. EPA's March 20, 2015, guidance memorandum titled "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard,"[4] the Indiana Department of Environmental Management (IDEM) has conducted a thorough review of the affected areas in Indiana. IDEM's review focused on the following analysis criteria outlined in the guidance:

- **Ambient air quality data or dispersion modeling results:** Indiana's evaluation is based on 2012-2014 monitoring data and air dispersion modeling results. The air quality analysis evaluated the three-year average of the 99$^{th}$ percentile of the yearly distribution of 1-hour daily maximum $SO_2$ concentrations. Ambient air quality monitoring data was retrieved from U.S. EPA's Air Quality System (AQS) and refined dispersion modeling was performed using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181 to assess air quality in a particular location. U.S. EPA Region V reviewed IDEM's modeling protocol and provided comments which were addressed. Modeling results were conducted using 4$^{th}$ high maximum daily 1-hour values averaged over the three-year modeled period combined with representative temporally varying seasonal $SO_2$ background concentrations to indicate whether the area violated the standard or contributed to a violation in a nearby area. Modeling was performed to show that the existing monitor(s) are properly sited to assess air quality in the area.

- **Emissions-related data:** Indiana examined detailed emissions information from the Clifty Creek Generating Station (Jefferson County), A.B. Brown Generating Station (Posey County), Michigan City Generating Station (LaPorte County), and Rockport Generating Station (Spencer County) and all other significant sources of $SO_2$ emissions located in nearby areas. Significant emission levels in nearby areas indicate potential for the area to contribute to observed or modeled violations of the standard. Tables

[3] http://www.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf
[4] http://www.epa.gov/airquality/sulfurdioxide/pdfs/20150320SO2designations.pdf

identified in this analysis show all stationary sources with reported $SO_2$ emissions in tons per year (tpy) at the facility level.

- **Meteorology (weather and transport patterns):** Indiana performed source-oriented dispersion modeling to evaluate meteorological data to help determine how weather conditions, including wind speed and direction, affect the plume of sources contributing to ambient $SO_2$ concentrations.

- **Geography/topography:** The geography and topography analysis considered physical features and land use that might have an effect on the air shed and therefore, the distribution of pollutants over an area. Indiana does not have any significant topographic features that influence the distribution of $SO_2$ concentrations within the state.

- **Jurisdictional boundaries:** Indiana is recommending that U.S. EPA use county boundaries for the purpose of providing a clearly defined legal boundary for carrying out the air quality planning and enforcement functions for the area.

Indiana has developed the following evaluation for determining area designations and appropriate area boundaries for the 2010 1-hour primary $SO_2$ standard. Indiana relied on 2012-2014 site-specific monitoring data in determining whether the Gibson Generating Station is located in an area that violates or contributes to a violation of the 1-hour $SO_2$ NAAQS in a nearby area. Indiana relied on AERMOD air dispersion modeling of the Clifty Creek Generating Station, A.B. Brown Generating Station, Michigan City Generating Station, and Rockport Generating Station for area attainment designation recommendations as there are no site-specific monitors associated with these facilities.

Based on the results of this evaluation, Indiana recommends that Gibson, Jefferson, LaPorte, Posey, and Spencer counties be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment, performed in accordance with U.S. EPA's updated guidance, clearly demonstrates that these facilities, based on 2012-2014 quality-assured monitoring data and ambient air quality modeling, are not located in an area currently violating the NAAQS or are causing or contributing to a violation in a nearby area.

**Methodology for the Air Quality Modeling and Meteorology Inputs**

U.S. EPA provided guidance in order to conduct appropriate air dispersion modeling analyses to support 1-hour $SO_2$ designation recommendations. U.S. EPA's $SO_2$ NAAQS Designations Modeling TAD guidance has several recommendations for modeling methodology for determining attainment designations including:

1) Use of actual emissions to assess modeled concentrations to reflect current air quality.
2) Use of 3 years of modeling results to calculate a simulated 1-hour $SO_2$ design value consistent with the 3-year monitoring period.
3) Placement of receptors only in locations where an air quality monitor could be placed.
4) Use of actual stack heights rather than following the Good Engineering Practice (GEP) stack height policy when modeling actual emissions.

Indiana followed U.S. EPA's recommendations to conduct 1-hour $SO_2$ designation modeling in order to meet the requirements of the Consent Decree to determine whether there are modeled violations of the 1-hour $SO_2$ NAAQS. Modeling results look at the 4$^{th}$ high maximum daily 1-hour concentration averaged over the 3-year modeled period combined with representative temporally varying seasonal $SO_2$ background concentrations to determine the attainment status of the area where the Consent Decree emission sources reside.

**Model Selection**

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used AERMOD version 15181 for all dispersion modeling of the A.B. Brown Generating Station, Clifty Creek Generating Station, Michigan City Generating Station, and Rockport Generating Station, as well as nearby areas. Additionally, the regulatory default and rural mode options were selected. U.S. EPA's $SO_2$ NAAQS Designations Modeling TAD, specific to attainment designation modeling, recommended using actual stack heights when modeling actual emissions instead of following the GEP requirement.

**AERMAP**

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the elevation terrain heights for the receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 was used to assign the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in "40 CFR Part 51, Revision to the Guideline on Air Quality Models" Appendix W and later revised in the "AERMOD Implementation Guide."

**Receptor Grid and Modeling Domain**

The receptor grid and modeling domain was based on U.S. EPA's March 20, 2015, $SO_2$ guidance and $SO_2$ NAAQS Designations Modeling TAD. Indiana conducted modeling with a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. Indiana has conducted

exploratory modeling on each of the Consent Decree sources. Maximum modeled 1-hour $SO_2$ impacts or source-culpable modeled violations did not extend out beyond three km from each source. To ensure all maximum 1-hour $SO_2$ concentrations were modeled, the modeling grid was extended out to 10 km from each source. The receptor spacing and distance each nested grid covered from the source is listed below.

- Receptor spacing at the fence line for each facility were placed every 50 meters.
- Receptor spacing at 100 meters out to a distance of 3,000 meters (3 km) beyond each facility (extended if modeling results warranted).
- Receptor spacing at 250 meters out to a distance of 5,000 meters (5 km) beyond each facility (extended if modeling results warranted).
- Receptor spacing at 500 meters out to a distance of 10,000 meters (10 km) beyond each facility (extended if modeling results warranted).

Based on the $SO_2$ NAAQS Designations Modeling TAD Section 4.2, Indiana placed modeling receptors only where it was feasible to place a monitor. Indiana matched up each modeling domain for the four sources modeled with Google Maps projections to ensure the proximity of receptor locations.

**Modeled $SO_2$ Emissions**

Indiana modeled the hourly continuous emissions monitoring (CEM) data from each source mentioned in the Consent Decree. Along with the hourly emission data, hourly stack gas flow rate and temperature of the exhaust stream (when available) were modeled as these parameters tend to vary. This variation can influence the dispersion characteristics of the exhaust stream and have an impact on modeled 1-hour $SO_2$ concentration(s). In some cases federally enforceable emission limits anticipated to be in place by the July 2, 2016, date for final $SO_2$ area designations were modeled. Documentation of all controls and/or emission limits implemented at the sources by the compliance date, contrary to the 2012-2014 CEMS data, are provided for each source's attainment designation recommendation.

Intermittent Sources

Intermittent sources, such as emergency generators, fire pumps, and startup/shutdown emissions will be handled consistent with U.S. EPA's March 1, 2011, guidance "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour $NO_2$ NAAQS."[5] This

[5] http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

guidance was followed to assess the 1-hour $SO_2$ attainment designations as well. U.S. EPA recommended using appropriate data based on emission scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of maximum daily 1-hour concentrations. Review of the hours of operation for combustion turbines, emergency generators, startup/shutdown, fire pumps, and other auxiliary operations associated with the sources mentioned in the Consent Decree were determined to operate much less than 500 hours per year and on a random and infrequent basis that cannot be anticipated. Exploratory modeling was conducted on these intermittent sources and results showed a negligible impact from these auxiliary or emergency processes on the maximum modeled 1-hour $SO_2$ receptors from the electric generating units (EGUs). Indiana believes the intent of the Consent Decree is to determine the attainment status of the area surrounding the EGUs based on the actual emissions coming from the EGUs identified by U.S. EPA; therefore the EGUs were Indiana's main focus in its assessment.

Treatment of Inventory Sources

Emission sources located in the vicinity of the Consent Decree sources were evaluated to determine if they could cause or contribute to a NAAQS violation near the Consent Decree source. Based on U.S. EPA's March 1, 2011 guidance, Indiana focused on areas within 10 km for each of the modeled Consent Decree sources. U.S. EPA's $SO_2$ NAAQS Designations Modeling TAD Section 4.1, page 7 mentions that the number of sources to be explicitly modeled should cause a significant concentration gradient and the number of those sources to be modeled would generally be small. Indiana retrieved a list of all $SO_2$ emission sources in the county of the source addressed by the Consent Decree, as well as $SO_2$ emission sources in adjacent counties in Indiana and Kentucky, in order to determine which sources should be included in the modeling analyses. Seven Indiana sources and six Kentucky sources were identified with $SO_2$ emissions of 250 tpy or more located within 30 km of one of the Consent Decree sources. Actual emissions taken from the year 2013, the most recently available year, were modeled for all sources.

**Meteorological Data**

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the $SO_2$ NAAQS Designations Modeling TAD, Indiana used three years (2012-2014) of National Weather Service (NWS) surface and upper air meteorological data. The Indianapolis, Evansville, and South Bend NWS surface data and upper air data taken from Lincoln, Illinois and Wilmington, Ohio, were processed with the latest version of the AERMOD meteorological data preprocessor program, AERMET (version 15181), and used in the modeling of the Clifty Creek Generating Station, A.B. Brown Generating Station, Michigan City Generating Station, Rockport Generating Station, and nearby areas. Meteorological data, taken from the Gary-Illinois Institute of Technology

Research Institute (IITRI) meteorological monitoring station located in Lake County and near the shores of Lake Michigan, was preprocessed with the South Bend data to create a meteorological data set more representative of lakeshore conditions (i.e. lake breezes and other wind conditions associated with Lake Michigan). The Michigan City Generating Station was modeled using the Gary-IITRI meteorological dataset.

**AERMINUTE/AERSURFACE**

The NWS meteorological data can contain a number of calm wind speeds greater than ten percent of the 8,760 annual observation hours. The 1-minute wind speed and wind direction Automated Surface Observing System (ASOS) data from the NWS stations were processed with U.S. EPA's 1-minute data processor program, AERMINUTE version 14237.

U.S EPA's program, AERSURFACE, was used to determine the surface characteristics: albedo, Bowen ratio, and surface roughness for the Indianapolis, Evansville, and South Bend NWS meteorological tower locations. Surface characteristics were determined at each NWS location for each of the 12 wind direction sectors with a recommended default radius of one km. The albedo and Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with U.S. EPA Region V's document "Regional Meteorological Data Processing Protocol," dated August 2014. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

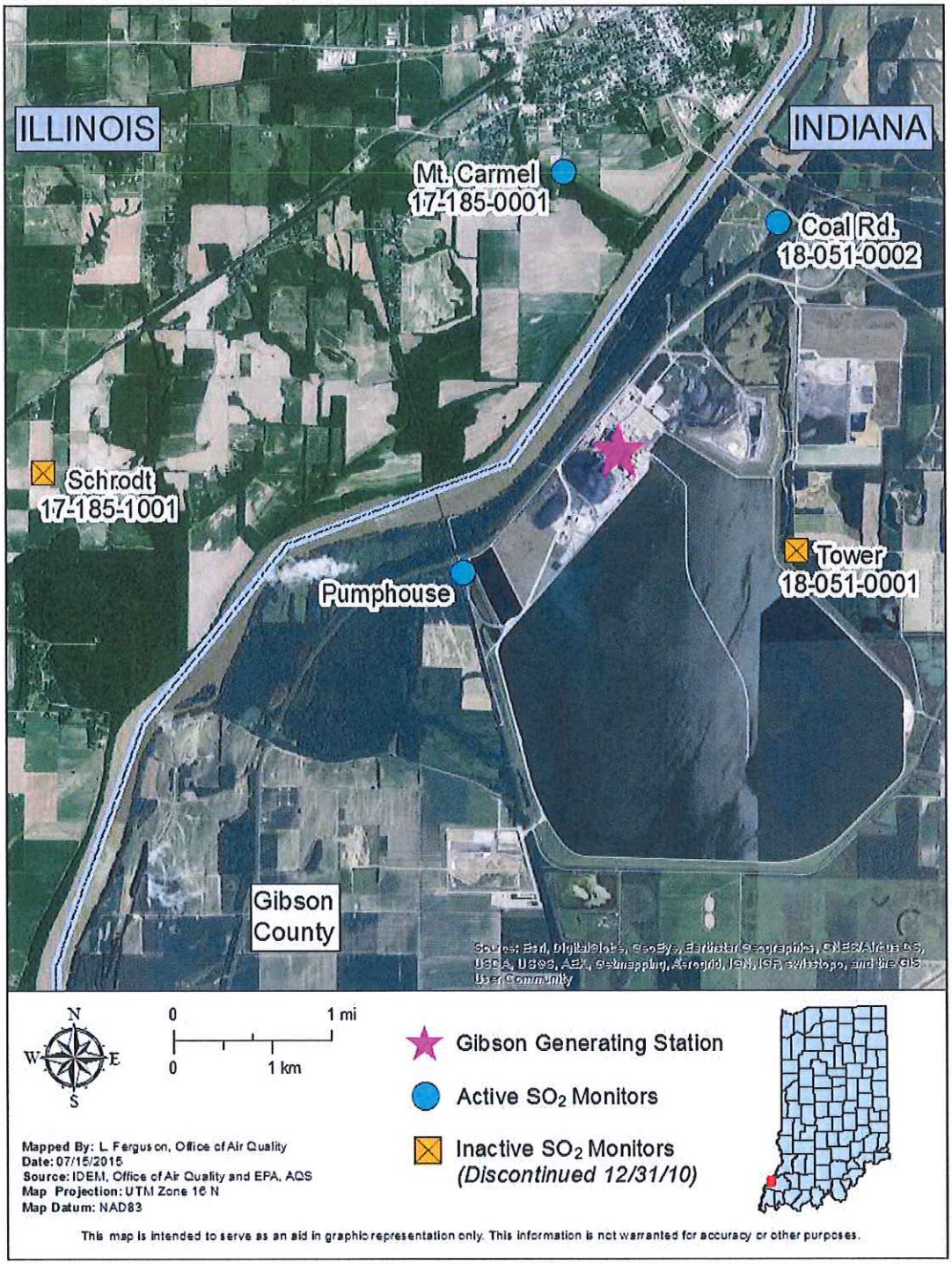
## Indiana's Recommendations

## Duke Energy Indiana, Inc. – Gibson Generating Station

The Gibson Generating Station (Gibson Station) is a coal-fired power plant consisting of five units that have a capacity to generate 3,342 megawatts (MW) of electricity combined. The Gibson Station is located on the bank of the Wabash River in Montgomery Township, Gibson County, Indiana, approximately 1.5 miles southeast of Mount Carmel, Illinois and 7.5 miles northwest of Owensville, Indiana. The plant is operated by Duke Energy Indiana, Inc. (DEI) and owned by DEI, Wabash Valley Power Association, Inc., and the Indiana Municipal Power Agency. Gibson Station is a stationary electric utility generating station with five coal-fired boilers; two boilers are rated at 5,875 MMBtu/hr, two boilers are rated at 5,987 MMBtu/hr, and a fifth boiler is rated at 5,900 MMBtu/hr.

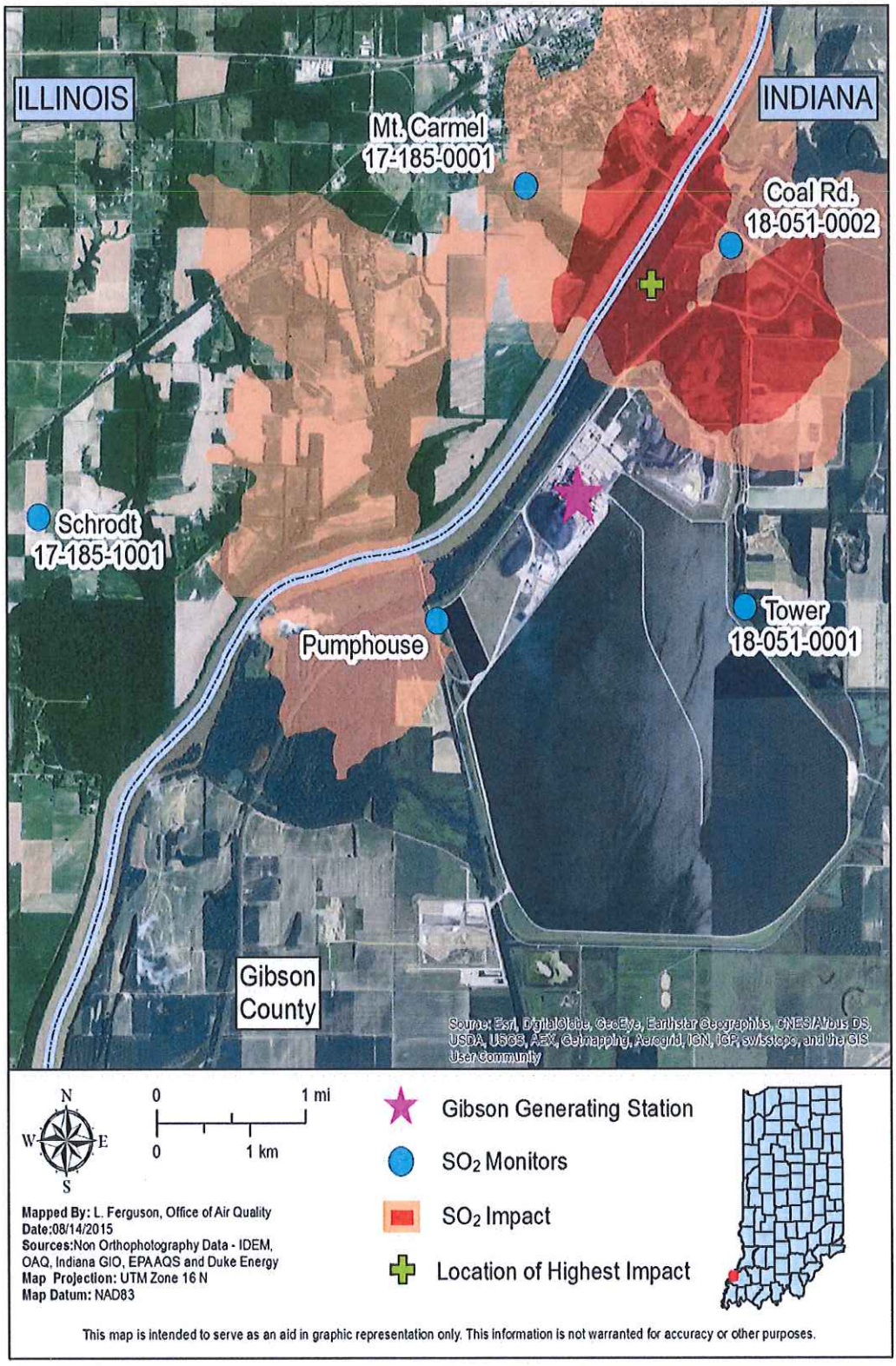
Due to conditions set forth in the Consent Decree and subsequent U.S. EPA guidance, Indiana relied on existing ambient air quality monitoring data from 2012-2014 to determine the attainment designation recommendation for the Gibson Station. Currently, there are three active monitors measuring ambient $SO_2$ concentrations in the area as depicted in Figure 1. The Coal Road and Pumphouse monitors are located on Gibson Station property northeast and southwest of the main stacks, respectively. The Mt. Carmel monitor is located north-northwest of the station in Wabash County, Illinois. The Coal Road and Mt. Carmel monitors have been in operation since 1979 and report data to U.S. EPA's AQS database. Two additional monitors, the Tower and Schrodt monitors, operated until December 2010 and also reported data to the AQS. The Pumphouse monitor, which became operational on August 21, 2014, is not reported to U.S. EPA's AQS and is, therefore, not comparable to the standard. The Pumphouse, Tower, and Schrodt monitors have been included as weight-of-evidence to illustrate that ambient $SO_2$ concentrations in the area have historically been, and currently are, below the standard and that the current ambient network is adequate to characterize potential impacts of the Gibson Station.

**Figure 1:**
**$SO_2$ Monitors in the Vicinity of Gibson Station**



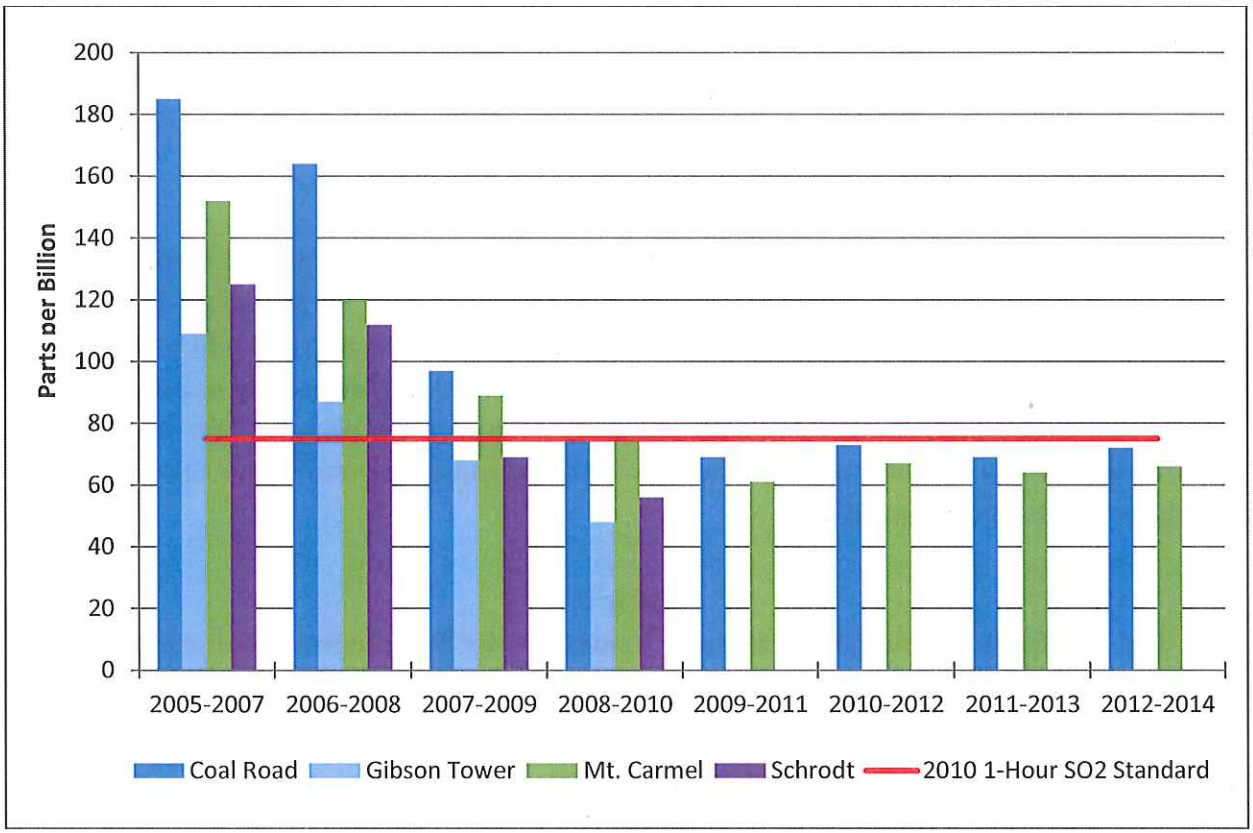
As shown in Figure 2, modeling has been performed which demonstrates that both the Coal Road and the Mt. Carmel monitors are in close proximity to the area of elevated impacts from the Gibson Station using 2012-2014 meteorological data. Modeling different years of meteorological data may shift the location of the highest impact slightly but, in general, given the prevailing south-southwest wind pattern as shown in Figure 3, the highest impacts are expected to be either at or very near the Coal Road and Mt. Carmel monitors. Therefore, the Coal Road and Mt. Carmel monitoring sites are properly located to adequately characterize peak ambient $SO_2$ concentrations and source-oriented impacts from the Gibson Station.

**Figure 2:**
**Gibson Station Location of Elevated Impacts**



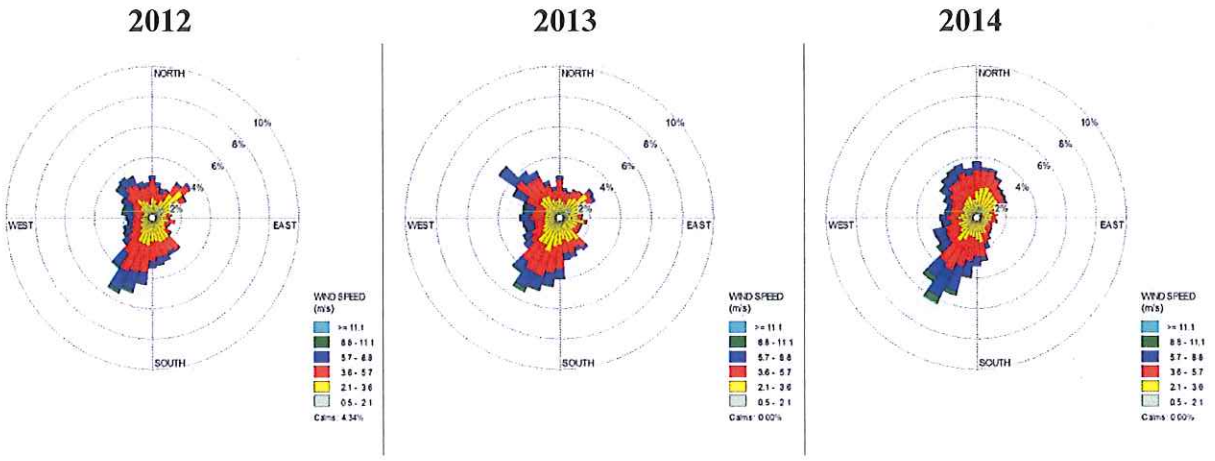
A comprehensive list of historical design values for monitors in the vicinity of the Gibson Station are shown in Graph 1 and demonstrate that all monitors at the Gibson Station are currently, and have been since 2010, below the $SO_2$ NAAQS. The Coal Road monitor used in this analysis is the same monitor used by U.S. EPA during Round 1 designations in 2013. It was established then that data from the monitor was appropriate for determining the attainment status of the area.

**Graph 1:**
**Gibson Station $SO_2$ Monitoring Network Historical Design Values**




The Evansville National Weather Service wind rose plots are shown in Figure 3. The wind roses show the frequency of the wind direction every 10 degrees for each of the wind speed ranges for the three-year modeled period of 2012-2014. The wind direction is the direction the wind is blowing from in compass degrees and the wind speeds are in meters per second (m/s). The wind roses demonstrate that the Coal Road monitor is sited appropriately to accurately characterize ambient $SO_2$ concentrations near the Gibson Station.

**Figure 3:**
**Evansville Wind Roses 2012-2014**




As shown in Figure 2, elevated levels of $SO_2$ were also found on Gibson Station property to the southwest of the main stacks. In response, Duke Energy installed the Pumphouse $SO_2$ monitor to assess ambient $SO_2$ concentrations. Table 2 outlines the daily 1-hour maximum $SO_2$ values for the Pumphouse monitoring site for August 21, 2014-July 31, 2015. Monitoring data from this monitor is not reported to U.S. EPA's AQS and is, therefore, not comparable to the standard, but has been included as weight-of-evidence to show $SO_2$ concentrations recorded at this monitor have been well below the standard.

**Table 2:**
**Top Ten Daily 1-Hour $SO_2$ Maximum Values for the Pumphouse Monitoring Site**

| Rank | Daily 1-Hour Maximum Value (ppb) | Date |
|---|---|---|
| 1 | 69 | 4/28/2015 |
| 2 | 64 | 5/13/2015 |
| 3 | 61 | 9/27/2014 |
| 4 | 60 | 10/22/2014 |
| 5 | 51 | 9/14/2014 |
| 6 | 48 | 3/2/2015 |
| 7 | 40 | 9/23/2014 |
| 8 | 38 | 9/7/2014 |
| 9 | 38 | 9/26/2014 |
| 10 | 37 | 8/25/2014 |

Indiana evaluated $SO_2$ sources within 30 km of the Gibson Station. The Gibson Station was the only significant source of $SO_2$ emissions identified in this area.

Indiana recommends that Gibson County, Indiana be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment, performed in accordance with U.S. EPA's updated guidance, clearly demonstrates that the Gibson Station, based on 2012-2014 quality-assured monitoring data, is not located in an area violating the NAAQS or causing or contributing to a violation of the NAAQS in a nearby area.

## Indiana-Kentucky Electric Corporation – Clifty Creek Generating Station

The Clifty Creek Generating Station (Clifty Creek) is a coal-fired power plant on the northern bank of the Ohio River in Madison Township, Jefferson County, Indiana. The power plant is located at 1335 Clifty Hollow Road in Madison, Indiana. The plant is owned by Ohio Valley Electric Corporation (OVEC) and its wholly owned subsidiary, Indiana-Kentucky Electric Corporation (IKEC), a consortium of several power companies including American Electric Power (AEP). All six of its generating units are rated at 217.26 MW and have a capacity to generate 1,303.56 megawatts (MW) of electricity combined. Five (5) of the units are wet-bottom pulverized coal-fired boilers identified as Units 1 through 5, with construction completed in 1955, each with a rated capacity of 1,869 MMBtu/hr. The sixth unit is a wet-bottom pulverized coal-fired boiler identified as Unit 6, with construction completed in 1956, with a rated capacity of 1,869 MMBtu/hr. Clifty Creek installed a flue gas desulfurization (FGD) system to provide $SO_2$ controls for its six generating units. The FGD system came online in July 2013.

Due to conditions set forth in the Consent Decree and subsequent U.S. EPA guidance, Indiana relied on AERMOD air dispersion modeling to determine the attainment designation recommendation for the Clifty Creek Generating Station as there is no site-specific $SO_2$ air quality monitor associated with this facility. Modeling results were conducted using 4$^{th}$ high maximum daily 1-hour values averaged over the three-year modeled period combined with representative temporally varying seasonal $SO_2$ background concentrations to indicate whether the area violates the standard or causes or contributes to a violation of the standard.

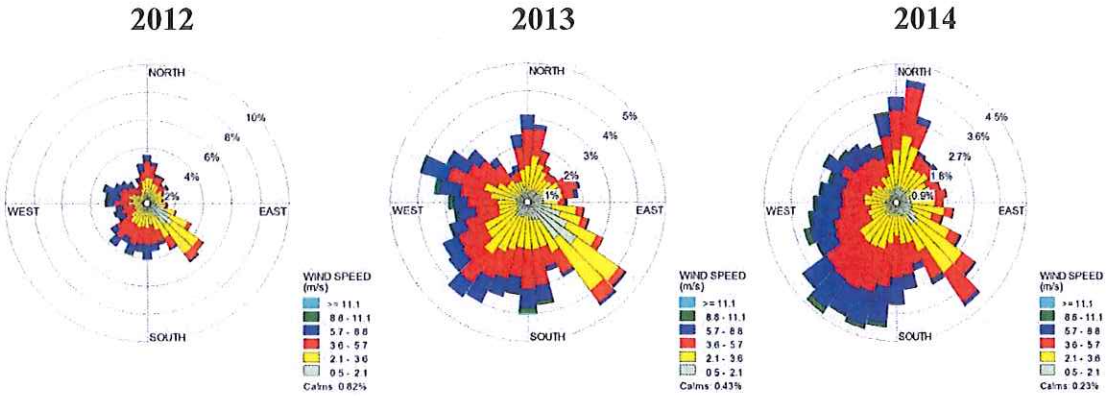
Indiana used meteorological data from the surface and upper air stations outlined in Table 3 to conduct modeling for Clifty Creek.

**Table 3:**
**Surface and Upper Air Meteorological Stations**

| Facility | Surface Met | Upper Air Met |
|---|---|---|
| Clifty Creek Generating Station | Louisville, KY NWS | Wilmington, OH NWS |

The Louisville National Weather Service wind rose plots are shown in Figure 4. A predominate southeast to southwest wind direction is shown in the Louisville wind rose plots with the higher wind speeds occurring when the wind directions are more southerly to southwesterly and westerly. Wind speeds are in meters per second (m/s).

**Figure 4:**
**Louisville Wind Roses 2012-2014**




Modeling of Clifty Creek used adjusted (i.e. without upwind major source impacts) temporally varying seasonal background concentrations. The New Albany $SO_2$ monitor data, listed in Table 4, is considered representative background for Jefferson County, Indiana. 99$^{th}$ percentile $SO_2$ concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated for 2012-2014 to determine the temporally varying seasonal $SO_2$ background, which were used directly in the model.

**Table 4:**
**99$^{th}$ Percentiles for Temporally Varying Seasonal $SO_2$ Background Values (ppb) for 2012-2014**

| | Hr 1 | Hr 2 | Hr 3 | Hr 4 | Hr 5 | Hr 6 | Hr 7 | Hr 8 |
|---|---|---|---|---|---|---|---|---|
| Winter | 6.61 | 7.81 | 5.50 | 5.57 | 4.25 | 5.09 | 4.89 | 5.95 |
| Spring | 8.10 | 5.36 | 7.03 | 8.25 | 5.64 | 4.85 | 3.51 | 5.39 |
| Summer | 6.84 | 4.05 | 3.99 | 5.35 | 4.14 | 3.10 | 4.40 | 4.62 |
| Fall | 3.34 | 3.50 | 3.69 | 3.64 | 2.80 | 3.36 | 3.39 | 4.62 |

| | Hr 9 | Hr 10 | Hr 11 | Hr 12 | Hr 13 | Hr 14 | Hr 15 | Hr 16 |
|---|---|---|---|---|---|---|---|---|
| Winter | 6.01 | 6.62 | 8.56 | 12.67 | 14.03 | 10.43 | 12.31 | 10.94 |
| Spring | 9.23 | 8.91 | 9.18 | 10.11 | 16.50 | 13.28 | 11.34 | 9.50 |
| Summer | 6.16 | 18.31 | 11.77 | 11.11 | 14.61 | 12.95 | 9.45 | 9.50 |
| Fall | 5.98 | 6.91 | 9.44 | 9.38 | 11.14 | 11.24 | 8.95 | 8.96 |

| | Hr 17 | Hr 18 | Hr 19 | Hr 20 | Hr 21 | Hr 22 | Hr 23 | Hr 24 |
|---|---|---|---|---|---|---|---|---|
| Winter | 10.38 | 8.80 | 8.90 | 6.90 | 6.15 | 8.28 | 6.28 | 8.04 |
| Spring | 17.56 | 15.06 | 13.38 | 11.96 | 9.41 | 7.69 | 5.08 | 9.02 |
| Summer | 7.80 | 8.64 | 10.04 | 10.26 | 8.10 | 6.14 | 7.44 | 6.50 |
| Fall | 10.81 | 12.77 | 7.85 | 6.35 | 3.90 | 3.30 | 4.70 | 5.55 |

Meteorological data from the nearest station to the Floyd County New Albany monitor, the Charlestown State Park meterological station listed in Table 5, was used to develop temporally varying seasonal $SO_2$ background values for Clifty Creek.

**Table 5:**
**Location of the New Albany $SO_2$ Monitor and Charlestown State Park Meteorological Station for Background Analysis**

| $SO_2$ Monitor and ID # | Monitor Location | Meteorological Station and ID # | Station Location | Distance |
|---|---|---|---|---|
| New Albany 18-043-1004 | 38.31° N 85.83° W | Charlestown State Park 18-019-0008 | 38.39° N 85.66° W | 10.7 miles |

Indiana evaluated $SO_2$ sources within 30 km of Clifty Creek. Clifty Creek is the only significant source of $SO_2$ emissions in Indiana in that region; however there are two large $SO_2$ emission sources in the State of Kentucky that were evaluated to determine possible impacts on Clifty Creek. 2013 actual emissions for these facilities, listed in Table 6, were modeled to evaluate whether these sources could be causing or contributing to a NAAQS violation in the area.

**Table 6:**
**Carroll and Trimble Counties-Kentucky: 1-Hour $SO_2$ Modeling Source Inventories**

| Source | Source ID | Location | 2013 $SO_2$ Emissions (tpy) |
|---|---|---|---|
| Ghent Generating Station | 21-041-00010 | Carroll County, KY | 3,522 |
| Trimble County Generating Station | 21-223-00002 | Trimble County, KY | 13,424 |

**Intermittent Source Justification**

Aside from Clifty Creek's six coal-fired EGUs, there are several smaller emission units that are intermittent and have random operational schedules or emit an insignificant level of $SO_2$ emissions.

- Four (4) No. 2 fuel oil-fired coal transfer station heaters, installed in 1993:

  (1) One (1) with a design heat capacity of 1.25 MMBtu/hr for Station 2;

  (2) One (1) with a design heat capacity of 1.75 MMBtu/hr for Station 5; and,

  (3) Two (2) each with design heat capacities of 2.75 MMBtu/hr for Stations B3 and B4.

- Stationary emergency fire pumps

Based on information provided by Clifty Creek, the transfer station heaters' actual emissions are estimated to be less than one (1) ton per year as ultra-low sulfur diesel is used to fuel these heaters. Due to the operation of the stationary emergency fire pumps, emissions are estimated to be less than 0.25 tons per year.

All these units are listed in their Part 70 Title V permit as "insignificant activities" as defined in 326 IAC 2-7-1 (21). IDEM did not include these sources in the modeling analysis since their level of activity was insignificant, intermittent, and random in nature.

Initial modeling, using hourly CEM data from 2012-2014, showed high modeled 1-hour $SO_2$ concentrations. This modeling included emissions before and after Clifty Creek had installed the FGD system. A decrease of 90% or more of $SO_2$ emissions occurred as a result of the installation and operation of the FGD system. Pursuant to Section 5 of the $SO_2$ NAAQS Designations Modeling TAD, "sources that implement emission controls during the relevant 3-year period and that becomes subject to an emission limit requiring that control may wish to demonstrate that limit assures attainment, even though the 3-year average emissions level would be estimated to yield NAAQS violations." Further discussion with U.S. EPA Region V indicated that federally enforceable emission limits in place by the final $SO_2$ area designation date of July 2, 2016, would be recognized as an appropriate assessment of an area's attainment designation. Therefore, Indiana modeled the $SO_2$ emissions from Clifty Creek after the FGD system became operational to determine the attainment designation. Modeled concentrations for Clifty Creek including the impact of nearby large $SO_2$ emission sources and temporally varying seasonal $SO_2$ background concentrations, as outlined in Table 7, are well below the 1-hour $SO_2$ NAAQS.

**Table 7:**
**Clifty Creek 1-Hour $SO_2$ Modeling Results**

| Modeled Source | Modeled Concentration Including Seasonal Hourly Background ($\mu g/m^3$) | 1-Hour $SO_2$ NAAQS ($\mu g/m^3$) | Facility Models Attainment |
|---|---|---|---|
| Clifty Creek Generating Station | 71.6 | 196.2 | Yes |

Indiana recommends that Jefferson County, Indiana be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment performed in accordance with U.S. EPA's updated guidance clearly demonstrates that the facility is not located in an area violating the NAAQS or causing or contributing to a violation of the NAAQS in a nearby area.

## Vectren – A.B. Brown Generating Station

The A. B. Brown Generating Station (A.B. Brown) is a coal-fired power plant on the northern bank of the Ohio River in Marrs Township, Posey County, Indiana. The plant is located approximately 8 miles east of Mount Vernon, Indiana, and 5 miles southwest of Evansville, Indiana, just west of the Posey-Vanderburgh County Line. A.B. Brown is owned by Vectren (formerly Southern Indiana Gas and Electric Company). Each of the two coal-fired EGUs has a rated capacity of 265.2 MW. Unit No. 1, constructed in 1974 with a startup date of 1979, consists of one dry bottom, pulverized coal-fired boiler with a design fuel heat input capacity of 2,518 MMBtu/hr. Unit No. 2, also a dry bottom, pulverized coal-fired boiler with a design fuel heat input capacity of 2,530 MMBtu/hr, was constructed in 1979 and had a startup date of 1985.

Due to conditions set forth in the Consent Decree and subsequent U.S. EPA guidance, Indiana relied on AERMOD air dispersion modeling to determine the attainment designation recommendation for the A.B. Brown Station as there is no site-specific air quality monitor associated with this facility. Modeling results were conducted using 4$^{th}$ high maximum daily 1-hour values averaged over the three-year modeled period combined with representative temporally varying seasonal $SO_2$ background concentrations to indicate whether the area violates the standard or causes or contributes to a violation of the standard.

Indiana used meteorological data from the surface and upper air stations, outlined in Table 8, to conduct modeling for A.B. Brown.

**Table 8:**
**Surface and Upper Air Meteorological Stations**

| Facility | Surface Met | Upper Air Met |
|---|---|---|
| A.B. Brown Generating Station | Evansville, IN NWS | Lincoln, IL NWS |

Modeling of A.B. Brown used adjusted (i.e. without upwind major source impacts) temporally varying seasonal background concentrations. The Evansville-Buena Vista monitor data, listed in Table 9, is considered representative background for Vanderburgh County, Indiana. Because A.B. Brown and the modeled inventory sources (see Table 11) are located southwest of the Evansville-Buena Vista monitor, impacts from the southwest direction were removed from the monitoring data. 99$^{th}$ percentile $SO_2$ concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated for 2012-2014 to determine the temporally varying seasonal $SO_2$ background, which were used directly in the model.

**Table 9:**
**99$^{th}$ Percentiles for Temporally Varying Seasonal $SO_2$ Background Values (ppb) for 2012-2014**

| | Hr 1 | Hr 2 | Hr 3 | Hr 4 | Hr 5 | Hr 6 | Hr 7 | Hr 8 |
|---|---|---|---|---|---|---|---|---|
| Winter | 6.00 | 4.22 | 3.88 | 4.27 | 6.02 | 4.95 | 5.25 | 7.43 |
| Spring | 4.99 | 3.83 | 4.30 | 4.34 | 3.30 | 4.47 | 7.75 | 9.52 |
| Summer | 2.71 | 2.22 | 1.00 | 1.00 | 2.87 | 3.45 | 3.34 | 5.99 |
| Fall | 3.46 | 3.30 | 2.85 | 3.52 | 4.00 | 4.35 | 4.80 | 5.28 |

| | Hr 9 | Hr 10 | Hr 11 | Hr 12 | Hr 13 | Hr 14 | Hr 15 | Hr 16 |
|---|---|---|---|---|---|---|---|---|
| Winter | 8.89 | 11.94 | 13.62 | 10.29 | 14.74 | 19.17 | 19.48 | 19.76 |
| Spring | 9.82 | 9.05 | 13.37 | 13.25 | 15.49 | 12.02 | 9.34 | 10.70 |
| Summer | 10.12 | 12.58 | 9.14 | 7.55 | 7.47 | 4.65 | 4.08 | 6.05 |
| Fall | 7.73 | 11.66 | 15.88 | 11.70 | 11.26 | 10.28 | 10.03 | 9.08 |

| | Hr 17 | Hr 18 | Hr 19 | Hr 20 | Hr 21 | Hr 22 | Hr 23 | Hr 24 |
|---|---|---|---|---|---|---|---|---|
| Winter | 16.64 | 16.70 | 9.18 | 6.89 | 8.01 | 6.59 | 6.74 | 6.22 |
| Spring | 13.01 | 12.93 | 11.32 | 8.26 | 5.59 | 3.81 | 5.90 | 6.10 |
| Summer | 7.88 | 8.56 | 7.12 | 2.71 | 2.72 | 2.22 | 2.86 | 3.40 |
| Fall | 10.11 | 9.85 | 8.87 | 8.51 | 5.70 | 2.59 | 3.06 | 3.31 |

Meteorological data from the nearest station to the Evansville-Buena Vista monitor, the Evansville, IN NWS station, listed in Table 10, was used to develop temporally varying seasonal $SO_2$ background values.

**Table 10:**
**Location of the Evansville-Buena Vista $SO_2$ Monitor and Evansville NWS Meteorological Station for Background Analysis**

| $SO_2$ Monitor and ID # | Monitor Location | Meteorological Station | Station Location | Distance |
|---|---|---|---|---|
| Evansville-Buena Vista 18-163-0021 | 38.01° N 87.58° W | Evansville, IN NWS | 38.05° N 87.52° W | 4.3 miles |

Indiana evaluated $SO_2$ sources within 30 km of A.B. Brown. Posey County, Indiana has two additional sources, listed in Table 11, contributing $SO_2$ emissions above 250 tpy. 2013 actual emissions for these facilities were modeled to evaluate whether these sources could be causing or contributing to a NAAQS violation of the standard in the area.

**Table 11:**
**Posey County, Indiana: 1-Hour $SO_2$ Modeling Source Inventories**

| Source | Source ID | Location | 2013 $SO_2$ Emissions (tpy) |
|---|---|---|---|
| SABIC Innovative Plastics | 129-00002 | Posey County, IN | 5,407 |
| Countrymark Refining and Logistics | 129-00003 | Posey County, IN | 476 |

**Intermittent Source Justification**

Aside from A.B. Brown's two coal-fired EGUs, there are several smaller emission units that are intermittent with random operational schedules or emit small amounts of $SO_2$ emissions.

- One (1) simple-cycle, natural gas-fired combustion turbine, designated as unit ABB No. 3, constructed in 1991, with a design fuel heat input capacity of 897.4 MMBtu/hr (nominal low heating value), utilizing distillate oil (No. 2 fuel oil) as a backup fuel with a CEM system for nitrogen oxides ($NO_x$) and $SO_2$, with a water injection system for control of $NO_x$ emissions, exhausting to Stack No. 3.

- One (1) simple cycle, natural gas-fired combustion turbine, designated as unit ABB No. 4, constructed in 2002, with a design fuel heat input capacity of 1,146 MMBtu/hour (maximum high heating value) with inlet fogger for power augmentation during high ambient temperature operation, with CEM system for $NO_x$ and $SO_2$, with dry low-$NO_x$ combustion, exhausting to Stack No. 4.

Based on 2012-2014 CEM data, ABB No. 3 emitted, on average, less than 650 pounds of $SO_2$ per year and ABB No. 4 emitted, on average, less than 885 pounds of $SO_2$ per year. The actual operational hours for the turbines varied each quarter. The maximum number of hours of operation for any year was 435 hours. IDEM did not include these sources in the modeling analysis since their level of activity was insignificant, intermittent, and random in nature.

**Specifically Regulated Insignificant Sources**

Insignificant activities at A.B. Brown, as covered by 326 Indiana Administrative Code 2-7-1(21), include:

- Two (2) diesel generators not exceeding 1,600 horsepower. The distillate oil-fired emergency generators were installed in 1974 and are rated at 398 boiler horsepower (bhp) each.

- One (1) additional distillate oil-fired fire pump was installed in 1974 and is rated at 200 bhp.

The total emissions from all three units are no more than 0.55 tpy based on a maximum of 500 hours of operation. IDEM did not include these sources in the analysis since their level of activity was insignificant, intermittent, and random in nature.

Initial modeling, using A.B. Brown's hourly CEM data from 2012-2014, showed that modeled 1-hour $SO_2$ concentrations from A.B. Brown and inventory sources would be above the 1-hour $SO_2$ NAAQS. After follow-up discussions with A.B. Brown, the company has agreed to modify their current PSD/Title V permit to lower their $SO_2$ emission's limit for coal-fired EGU No. 1 from 1.2 lbs/MMBtu to 0.8571 lbs/MMBtu, while maintaining the 0.69 lbs/MMBtu limit for Unit No. 2. This equates to emission rates of 3,021.6 lbs/hr for Unit No. 1 and 1,745.7 lbs/hr for Unit No.2. Both units can never exceed 2,158.2 lbs/hr when operating together. As such, Unit No. 1 cannot operate at full capacity when Unit No. 2 is running at 0.69 lbs/MMBtu. The revised emission's limit for Unit No. 1 would account for a total $SO_2$ emissions reduction of 2,609.1 lbs/hr. A.B. Brown plans on moving forward with the permit modification request and having controls installed and operational on Unit No. 1 by no later than March 2016 in order to meet the lower $SO_2$ emission's limit, well in advance of the July 2, 2016 consent decree deadline.

Indiana modeled the proposed $SO_2$ emission limits recommended by A.B. Brown. Five scenarios were modeled. Modeled concentrations for the worst case scenario (i.e. Unit No. 2 operating at 0.69 lbs/MMBtu and Unit No. 1 operating at 0.164 lbs/MMBtu) added to the temporally varying seasonal $SO_2$ background concentrations, as outlined in Table 12, are below the 1-hour $SO_2$ NAAQS.

**Table 12:**
**A.B. Brown 1-Hour $SO_2$ Modeling Results**

| Modeled Source | Modeled Concentration Including Seasonal Hourly Background ($\mu g/m^3$) | 1-Hour $SO_2$ NAAQS ($\mu g/m^3$) | Facility Models Attainment |
|---|---|---|---|
| A.B. Brown Generating Station | 196.08 | 196.2 | Yes |

Indiana recommends that Posey County, Indiana be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment, performed in accordance with U.S. EPA's updated guidance, demonstrates that the facility is not located in an area violating the NAAQS or causing or contributing to a violation of the NAAQS in a nearby area. Furthermore, limits supported by IDEM's attainment modeling will be incorporated into the applicable permit well in advance of the effective date of designations to ensure ongoing compliance with the 1-hour SO2 NAAQS.

## Northern Indiana Public Service Company – Michigan City Generating Station

The Michigan City Generating Station is a coal and natural gas-fired power plant on the southern shore of Lake Michigan in Michigan Township, LaPorte County, Indiana. The power plant is located at 101 Wabash Street in Michigan City, Indiana. The facility is owned by the Northern Indiana Public Service Company (NIPSCO) and operated by NiSource. The facility consists of one cyclone coal-fired boiler, identified as Boiler 12, with a design heat input capacity of 4,650 MMBtu/hr, an activated carbon injection system for control of mercury emissions permitted in 2014, and an electrostatic precipitator with a flue gas conditioning system for control of particulate matter, exhausting to Stack 4. Construction on Boiler 12 was completed in May 1974. Natural gas can be fired during startup, shutdown, and malfunctions. Boiler 12 has a selective catalytic reduction (SCR) system for $NO_x$ control. A circulating dry scrubber FGD system and a fabric filter baghouse were permitted to be installed on Boiler 12 in 2013.

Due to conditions set forth in the Consent Decree and subsequent U.S. EPA guidance, Indiana relied on AERMOD air dispersion modeling to determine the attainment designation recommendation for the Michigan City Generating Station. The receptor grid for the Michigan City Generating Station was revised in order to account for Lake Michigan and the inability to place a monitor in the water. Therefore, no modeling receptors were placed at locations that lie over Lake Michigan. There is one monitor that measured ambient $SO_2$ air quality monitoring data in the area through the year 2014. The monitor, as shown in Figure 5 with ID# 18-091-

0005, is located approximately 0.5 km southeast of the Michigan City Generating Station at 341 West 4th Street in Michigan City, Indiana. Monitoring data, as outlined in Table 13, shows the annual 99th percentile 1-hour daily maximum $SO_2$ values for the years 2012-2014, as well as the 2012-2014 1-hour $SO_2$ design value. Indiana is including this monitoring data as weight-of-evidence to show that the years 2012-2014 are all well below the standard.

**Figure 5:**
**Michigan City, Indiana Area $SO_2$ Monitors**

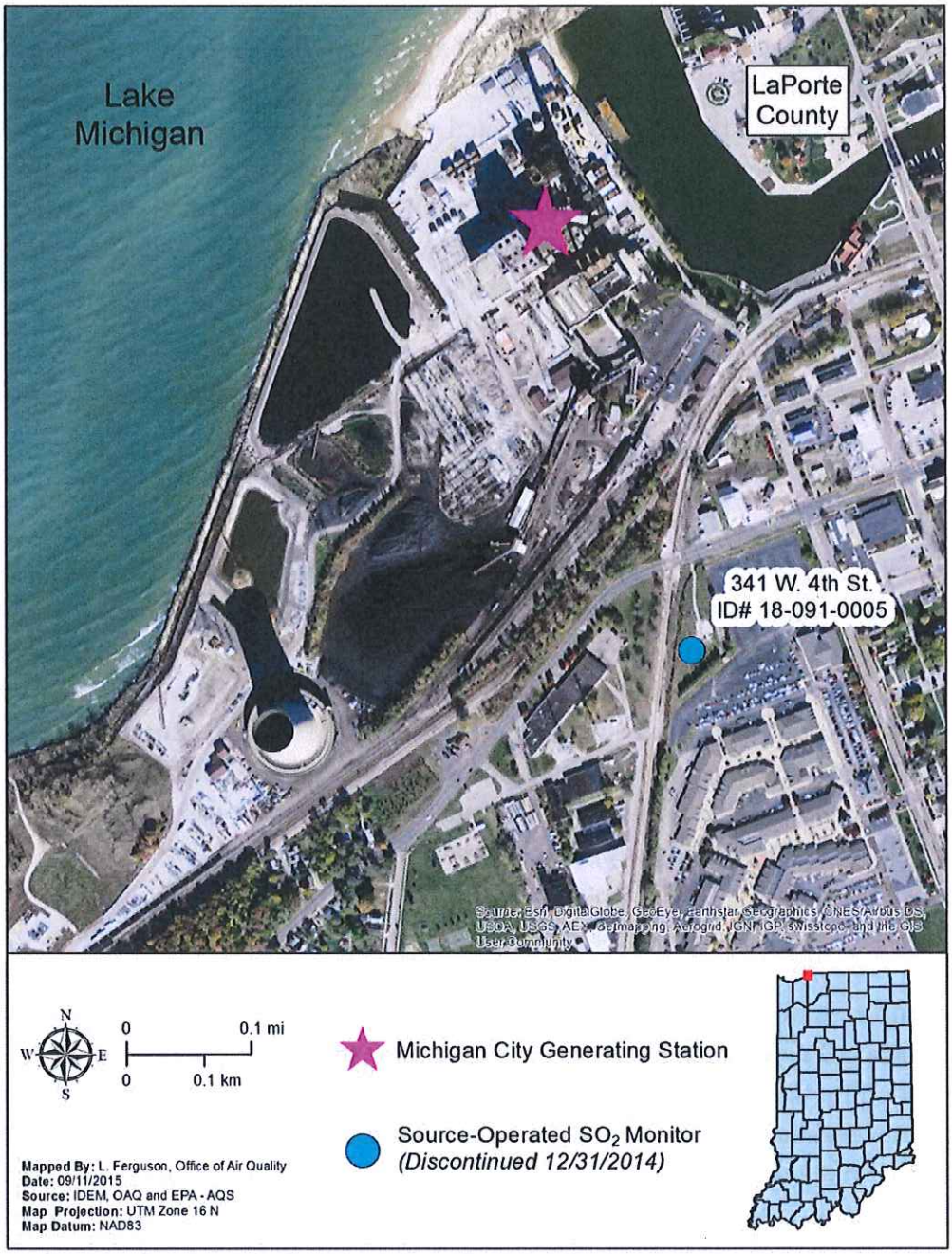


**Table 13:**
**2012-2014 Annual 99th Percentiles and 1-Hour $SO_2$ Design Value (ppb) for Monitor ID# 18-091-0005**

| Location | Monitor ID | Monitor | 2012 99th Percentile | 2013 99th Percentile | 2014 99th Percentile | 2012-2014 Design Value |
|---|---|---|---|---|---|---|
| LaPorte County, IN | 18-091-0005 | Michigan City | 21 | 15* | 15 | 17* |

*Incomplete data

Indiana used meteorological data from the surface and upper air stations outlined in Table 14 to conduct modeling for the Michigan City Generating Station. In order to address U.S. EPA Region V's comments on Indiana's consent decree modeling protocol, Indiana processed wind and meteorological parameters from IDEM's Gary-IITRI monitoring station in northern Lake County. The Gary-IITRI meteorological parameters were processed with South Bend data to compile a meteorological dataset representative of the Northwest Indiana area. The Gary-IITRI monitoring location was used with AERSURFACE for determining the first priority surface characteristics. However, since snow depth and precipitation data are not readily available from the Gary-IITRI monitoring site, adjustments to the albedo and Bowen ratio surface characteristics still used the precipitation, soil moisture, and snow depth data during the winter months from the South Bend NWS location.

**Table 14:**
**Surface and Upper Air Meteorological Stations**

| Facility | Surface Met | Upper Air Met |
|---|---|---|
| Michigan City Generating Station | Gary-IITRI monitoring station/South Bend, IN NWS | Lincoln, IL NWS |

Modeling of the Michigan City Generating Station used adjusted (i.e. without upwind major source impacts) temporally varying seasonal background concentrations. The ID# 18-091-0005 monitor, listed in Table 15, is considered representative background for LaPorte County, Indiana. 99th percentile $SO_2$ concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated for 2012-2014 to determine the temporally varying seasonal $SO_2$ background, which were included directly into the model.

**Table 15:**
**99th Percentiles for Temporally Varying Seasonal Hourly $SO_2$ Background Values (ppb) for 2012-2014**

| | Hr 1 | Hr 2 | Hr 3 | Hr 4 | Hr 5 | Hr 6 | Hr 7 | Hr 8 |
|---|---|---|---|---|---|---|---|---|
| Winter | 8.00 | 7.76 | 7.00 | 8.77 | 8.00 | 8.67 | 7.00 | 7.00 |
| Spring | 7.85 | 8.88 | 8.87 | 8.85 | 8.00 | 8.00 | 8.85 | 8.88 |
| Summer | 7.00 | 6.71 | 6.00 | 6.00 | 6.00 | 7.00 | 6.00 | 7.00 |
| Fall | 5.69 | 5.69 | 6.00 | 6.66 | 6.26 | 5.67 | 6.71 | 6.69 |

| | Hr 9 | Hr 10 | Hr 11 | Hr 12 | Hr 13 | Hr 14 | Hr 15 | Hr 16 |
|---|---|---|---|---|---|---|---|---|
| Winter | 7.00 | 8.00 | 9.00 | 8.00 | 8.00 | 9.00 | 7.00 | 8.00 |
| Spring | 7.92 | 7.99 | 8.00 | 9.00 | 7.94 | 8.00 | 7.90 | 6.00 |
| Summer | 8.00 | 8.91 | 7.92 | 8.91 | 7.88 | 7.00 | 8.00 | 8.00 |
| Fall | 7.76 | 8.00 | 8.00 | 8.00 | 8.73 | 8.54 | 7.76 | 6.71 |

| | Hr 17 | Hr 18 | Hr 19 | Hr 20 | Hr 21 | Hr 22 | Hr 23 | Hr 24 |
|---|---|---|---|---|---|---|---|---|
| Winter | 7.79 | 7.00 | 7.00 | 8.00 | 7.56 | 7.00 | 6.80 | 7.00 |
| Spring | 6.98 | 7.00 | 6.96 | 7.00 | 7.00 | 7.86 | 8.00 | 8.00 |
| Summer | 8.86 | 6.00 | 7.00 | 6.00 | 7.00 | 6.75 | 6.00 | 8.00 |
| Fall | 5.65 | 6.28 | 6.16 | 6.00 | 5.60 | 5.61 | 5.00 | 5.00 |

Meteorological data from the nearest station to the Michigan City monitor, i.e. the Gary-IITRI meteorological station, listed in Table 16, was used to develop temporally varying seasonal $SO_2$ background values for the Michigan City Generating Station.

**Table 16:**
**Location of the Michigan City $SO_2$ Monitor and Gary-IITRI Meteorological Station for Background Analysis**

| Monitor ID | Monitor Location | Meteorological Station and ID # | Station Location | Distance |
|---|---|---|---|---|
| 18-091-0005 | 41.72° N<br>86.91° W | Gary-IITRI<br>18-089-0022 | 41.61° N<br>87.30° W | 21.5<br>miles |

The South Bend NWS wind rose plots are shown in Figure 6, and the Gary-IITRI meteorological data site wind rose plots are shown in Figure 7. As shown in a comparison of the two wind roses, the Gary-IITRI wind rose has a higher frequency of northeast and northerly wind directions and southerly wind directions indicating the Gary-IITRI meteorological site is capturing the Lake Michigan lake/land breeze influence. This provides the justification for using

the Gary-IITRI meteorological data for the NIPSCO Michigan City Consent Decree modeling analysis since the NIPSCO facility is located on the Lake Michigan shoreline as shown in Figure 5. Wind speeds are in m/s.

**Figure 6:**
**South Bend Wind Roses 2012-2014**

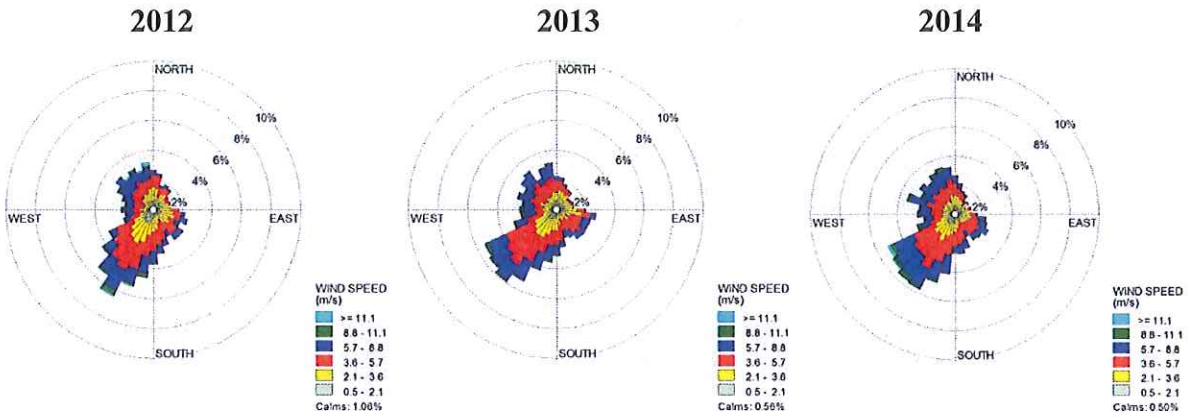
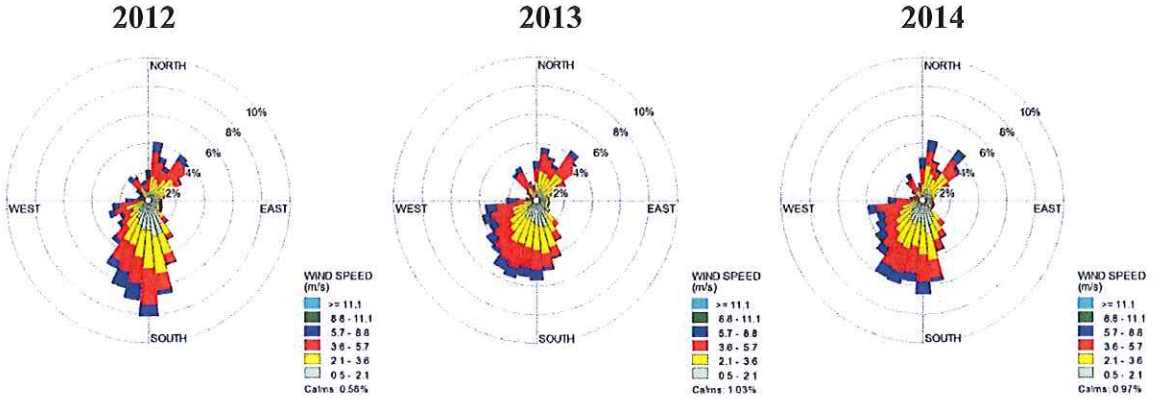



**Figure 7:**
**Gary-IITRI Wind Roses 2012-2014**




Indiana evaluated $SO_2$ sources within 30 km of the Michigan City Generating Station. Porter County, Indiana has two sources, listed in Table 17, contributing $SO_2$ emissions above 250 tpy. 2013 actual emissions for these facilities were modeled to evaluate whether these sources could be causing or contributing to a NAAQS violation in the area.

**Table 17:**
**Porter County, Indiana: 1-Hour $SO_2$ Modeling Source Inventories**

| Source | Source ID | Location | 2013 $SO_2$ Emissions (tpy) |
|---|---|---|---|
| NIPSCO Bailly Station | 127-00002 | Porter County | 2,474 |
| ArcelorMittal Burns Harbor | 127-00001 | Porter County | 13,864 |

**Intermittent Source Justification**

Aside from Michigan City Generating Station's coal-fired boiler, there are several smaller emission units that are intermittent with random operational schedules or emit small amounts of $SO_2$ emissions.

- One (1) natural gas-fired auxiliary boiler, identified as AUX1, rated at 109 MMBtu/hr, constructed in 2003, equipped with low $NO_x$ burners, exhausting to Stack AUX1, with a CEMS for $NO_x$.

Boiler AUX1 operated 2,062 hours in 2013, the highest annual operating hours of any of the last three years (i.e. 2012-2014). Based on these hours of operation, Boiler AUX1 emitted approximately 134.88 pounds of $SO_2$ in 2013. Since the total annual $SO_2$ emissions were very low from this auxiliary boiler, IDEM did not include this emission source in the modeling analysis.

**Specifically Regulated Insignificant Activities**

Insignificant activities at Michigan City Generating Station, as covered by 326 Indiana Administrative Code 2-7-1(21), include:

- One (1) 480,000 British thermal unit (BTU) boiler located in the Gate House, constructed in 1964.

- One (1) 297,000 BTU boiler located in the Relay House (Substation Bldg. #G15), constructed in 1953.

Due to the fact that $SO_2$ emissions from these types of sources are typically very low and the boilers have a heat input capacity of less than 1 MMBtu/hr, IDEM did not include these emission sources in the modeling analysis.

Modeling, using Michigan City Generating Station's hourly CEM data from 2012-2014, showed that modeled 1-hour $SO_2$ concentrations from the Michigan City Generating Station and inventory sources, listed in Table 17, would be below the 1-hour $SO_2$ NAAQS. Modeled concentrations for the Michigan City Generating Station when added to the temporally varying seasonal $SO_2$ background concentrations, as outlined in Table 18, are well below the 1-hour $SO_2$ NAAQS.

**Table 18:**
**Michigan City Generating Station 1-Hour $SO_2$ Modeling Results**

| Modeled Source | Modeled Concentration Including Seasonal Hourly Background ($\mu g/m^3$) | 1-Hour $SO_2$ NAAQS ($\mu g/m^3$) | Facility Models Attainment |
|---|---|---|---|
| Michigan City Generating Station | 169.9 | 196.2 | Yes |

Indiana recommends that LaPorte County, Indiana be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment performed in accordance with U.S. EPA's updated guidance clearly demonstrates that the facility is not located in an area violating the NAAQS or causing or contributing to a violation of the NAAQS in a nearby area.

## American Electric Power – Rockport Generating Station

The Rockport Generating Station (Rockport Station) is a coal-fired power plant located along the Ohio River in Ohio Township, Spencer County, Indiana. The power plant is located near Rockport, Indiana along U.S. Route 231, approximately one mile north of the William H. Natcher Bridge spanning the Ohio River. The facility is owned by Indiana Michigan Power, a unit of AEP. Each of the two coal-fired electric generating units has a rated capacity of 12,374 MMBtu/hr. The boilers consist of two dry-bottom, pulverized coal-fired opposed wall boilers, identified as units MB1 and MB2, both constructed in 1977 with startup dates of 1984 and 1989. Emissions from MB1 and MB2 are exhausted through a common stack, Stack CS012. The facility also has two No. 2 fuel oil-fired boilers, Auxiliary Boiler 1 and Auxiliary Boiler 2, constructed in 1977 with a startup date of 1983 and each with a design heat input capacity of 603 MMBtu/hr, both exhausting through Stack AB12.

Due to conditions set forth in the Consent Decree and subsequent U.S. EPA guidance, Indiana relied on AERMOD air dispersion modeling to determine the attainment designation recommendation for the Rockport Station as there is no site-specific air quality monitor associated with this facility. Modeling results were conducted using 4$^{th}$ high maximum daily 1-hour values averaged over the three-year modeled period, combined with representative temporally varying seasonal $SO_2$ background concentrations to indicate whether the area violates the standard or causes or contributes to a violation in a nearby area.

Indiana used meteorological data from the surface and upper air stations outlined in Table 19 to conduct modeling for the Rockport Station.

**Table 19:**
**Surface and Upper Air Meteorological Stations**

| Facility | Surface Met | Upper Air Met |
|---|---|---|
| Rockport Generating Station | Evansville, IN NWS | Lincoln, IL NWS |

Modeling for the Rockport Station used adjusted (i.e. without upwind major source impacts) temporally varying seasonal background concentrations. The Evansville-Buena Vista $SO_2$ monitor data, listed in Table 20, is considered representative background for Spencer County, Indiana. 99$^{th}$ percentile $SO_2$ concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated for 2012-2014 to determine the temporally varying seasonal $SO_2$ background, which was included directly into the model.

**Table 20:**
**99$^{th}$ Percentiles for Temporally Varying Seasonal Hourly $SO_2$ Background Values (ppb) for 2012-2014**

| | Hr 1 | Hr 2 | Hr 3 | Hr 4 | Hr 5 | Hr 6 | Hr 7 | Hr 8 |
|---|---|---|---|---|---|---|---|---|
| Winter | 6.00 | 4.25 | 3.81 | 4.20 | 5.75 | 4.76 | 5.66 | 7.41 |
| Spring | 4.48 | 3.87 | 3.57 | 4.06 | 2.91 | 3.31 | 4.47 | 8.25 |
| Summer | 2.37 | 2.38 | 1.00 | 1.00 | 3.60 | 3.90 | 3.83 | 4.26 |
| Fall | 2.23 | 2.28 | 2.22 | 3.20 | 3.54 | 3.00 | 3.99 | 5.26 |

| | Hr 9 | Hr 10 | Hr 11 | Hr 12 | Hr 13 | Hr 14 | Hr 15 | Hr 16 |
|---|---|---|---|---|---|---|---|---|
| Winter | 8.86 | 10.80 | 12.58 | 10.87 | 14.64 | 19.51 | 19.33 | 19.31 |
| Spring | 8.36 | 8.89 | 13.01 | 11.98 | 8.85 | 11.87 | 10.46 | 12.29 |
| Summer | 5.55 | 12.12 | 8.41 | 8.80 | 5.72 | 4.40 | 4.81 | 5.27 |
| Fall | 7.56 | 11.32 | 11.34 | 11.68 | 10.07 | 10.39 | 7.16 | 7.79 |

| | Hr 17 | Hr 18 | Hr 19 | Hr 20 | Hr 21 | Hr 22 | Hr 23 | Hr 24 |
|---|---|---|---|---|---|---|---|---|
| Winter | 15.65 | 17.13 | 9.25 | 10.40 | 8.60 | 8.35 | 6.29 | 6.12 |
| Spring | 12.28 | 13.04 | 11.68 | 8.29 | 5.26 | 3.81 | 5.76 | 6.06 |
| Summer | 6.35 | 9.76 | 7.11 | 4.74 | 4.04 | 2.21 | 3.04 | 1.00 |
| Fall | 10.68 | 10.11 | 6.67 | 4.68 | 4.42 | 2.59 | 2.80 | 2.79 |

The modeling analysis used temporally varying seasonal background values taken from the Evansville-Buena Vista $SO_2$ monitor located in Evansville, Vanderburgh County, Indiana. 1-hour $SO_2$ impacts from the southeast direction were removed from the monitoring data because the Rockport Station and the modeled inventory sources are located southeast of the monitor.

Meteorological data from the nearest station to the Evansville-Buena Vista monitor, i.e. the Evansville NWS station, listed in Table 21, was used for 1-hour $SO_2$ background values for the Rockport Station.

**Table 21:**
**Location of the Evansville-Buena Vista $SO_2$ Monitor and Evansville NWS Meteorological Station for Background Analysis**

| $SO_2$ Monitor and ID # | Monitor Location | Meteorological Station | Station Location | Distance |
|---|---|---|---|---|
| Evansville-Buena Vista 18-063-0021 | 38.01° N 87.58° W | Evansville NWS Station | 38.05° N 87.52° W | 4.3 miles |

Indiana evaluated $SO_2$ sources within 30 km of the Rockport Station. Warrick County, Indiana has three additional sources contributing $SO_2$ emissions above 250 tpy. Four $SO_2$ emission sources in the State of Kentucky were also included in the modeling analysis to determine possible impacts. 2013 actual emissions for these facilities, listed in Table 22, were modeled to evaluate whether these sources could be causing or contributing to a NAAQS violation in the area.

**Table 22:**
**Warrick County, Indiana and Daviess and Hancock Counties, Kentucky:**
**1-Hour $SO_2$ Modeling Source Inventories**

| Source | Source ID | Location | 2013 $SO_2$ Emissions (tpy) |
|---|---|---|---|
| ALCOA Warrick Power Plant | 18-173-00002 | Warrick County, IN | 5,699 |
| ALCOA Warrick Operations | 18-173-00007 | Warrick County, IN | 3,853 |
| SIGECO Culley | 18-173-00001 | Warrick County, IN | 1,948 |
| Big Rivers Electric Corp | 21-091-00003 | Hancock County, KY | 8,146 |
| Owensboro Municipal Utilities | 21-059-00027 | Daviess County, KY | 8,064 |
| Century Aluminum of KY | 21-091-00004 | Hancock County, KY | 2,262 |
| Owensboro Grain Co. | 21-059-00039 | Daviess County, KY | 382 |

**Intermittent Source Justification**

Aside from AEP Rockport Station's two coal-fired Main Boilers, MB1 and MB2, there are several smaller emission units that are intermittent with random operating schedules or emit small amounts of $SO_2$ emissions.

- Two (2) No. 2 fuel oil-fired boilers, identified as Auxiliary Boiler 1 and Auxiliary Boiler 2, constructed in 1977 with a startup date of 1983, each with a design heat input capacity of 603 MMBtu/hr, both exhausting through Stack AB12.

- Three (3) No. 2 fuel oil-fired emergency diesel generators, identified as DG1, DG2, and DG3, each with a design heat input capacity of 25.16 MMBtu/hr.

The highest annual operating hours for Auxiliary Boiler 1 and Auxiliary Boiler 2, during the last three years, 2012-2014, were 149 hours and 108 hours, respectively. In 2014, annual $SO_2$ emissions from both auxiliary boilers totaled 0.4 tpy. Emergency diesel generators DG1, DG2, and DG3 are restricted to operating no more than 780 hours per twelve (12) consecutive month period when main boilers MB1 and MB2 are in operation. In 2014, annual $SO_2$ emissions from the emergency diesel generators totaled 0.02 tpy. IDEM did not include these sources in the modeling analysis since their level of activity was insignificant, intermittent, and random in nature and annual emissions were well below 1 tpy.

**Specifically Regulated Insignificant Activities**

Insignificant activities at Rockport Station, as covered by 326 Indiana Administrative Code 2-7-1(21), include:

- Six (6) No. 2 fuel oil-fired space heaters, identified as WHU-5, WHU-6, WHU-7, WHU-8, WHU-9, and WHU-10 with design heat input capacities of 4.5 MMBtu/hr, 3.0 MMBtu/hr, 2.75 MMBtu/hr, 3.5 MMBtu/hr, 4.5 MMBtu/hr, and 2.2 MMBtu/hr, respectively.

- Two (2) No. 2 fuel oil-fired space heaters, identified as WHU-1 and WHU-2, each with design heat input capacities of 1.1 MMBtu/hr.

Since the total annual $SO_2$ emissions from these insignificant activities were not reported through Indiana's Emission Inventory Tracking System (EMITS) and are not expected to be significant, IDEM did not include these emission sources in the modeling analysis.

Modeling, using Rockport Station's hourly CEM data from 2012-2014, showed that modeled 1-hour $SO_2$ concentrations from the Rockport Station and inventory sources would be below the 1-hour $SO_2$ NAAQS. Modeled concentrations for the Rockport Station, when added to the temporally varying seasonal $SO_2$ background concentrations, as outlined in Table 23, are well below the 1-hour $SO_2$ NAAQS.

**Table 23:**
**Rockport Generating Station 1-Hour $SO_2$ Modeling Results**

| Modeled Source | Modeled Concentration Including Seasonal Hourly Background ($\mu g/m^3$) | 1-Hour $SO_2$ NAAQS ($\mu g/m^3$) | Facility Models Attainment |
|---|---|---|---|
| Rockport Generating Station | 152.1 | 196.2 | Yes |

Indiana recommends that Spencer County, Indiana be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment performed in accordance with U.S. EPA's updated guidance clearly demonstrates that the Rockport Station is not located in an area violating the NAAQS or causing or contributing to a violation of the NAAQS in a nearby area.

## Summary of Recommendations

Based on the results of this evaluation, Indiana recommends that Gibson, Jefferson, LaPorte, Posey, and Spencer counties be designated as attainment under the 2010 1-hour primary $SO_2$ standard. This recommendation is based on the fact that Indiana's assessment, performed in accordance with U.S. EPA's updated guidance, clearly demonstrates that these facilities, based on 2012-2014 quality-assured monitoring data and ambient air quality modeling, are not located in an area currently violating the NAAQS or causing or contributing to a violation of the NAAQS in a nearby area.