Technical Support Document:

Chapter 8
Final Round 4 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Texas

1. Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA, we, or us) must designate areas as either "nonattainment," "attainment," or "unclassifiable" for the 2010 1-hour sulfur dioxide (SO_2) primary national ambient air quality standard (NAAQS) (2010 SO_2 NAAQS). On or about August 13, 2020, EPA sent states our responses to certain designation recommendations for the 2010 SO_2 NAAQS. On August 21, 2020, EPA published a notice of availability (NOA) in the *Federal Register* (*see* 85 FR 51694), initiating a 30-day public comment period. The NOA and the technical support document (TSD) for EPA's intended designations provided background on the relevant CAA definitions and the history of the designations for this NAAQS. The TSD for EPA's intended designations also described Texas's recommended designations and EPA's assessment of the available information.

This TSD for EPA's final Round 4 area designations for Texas addresses any change in Texas's recommended designations since EPA communicated its intended designations in August 2020 and provides our assessment of additional relevant information that was timely submitted by Texas or other parties since the publication of the NOA. This TSD does not repeat information contained in the TSD for EPA's intended designations except as needed to explain our assessment of the newer information and to make clear the final action we are taking and its basis, but that information is incorporated as part of our final designations. If the assessment of the information that was already considered in the TSD for EPA's intended designations has changed based on new timely information and we are finalizing a designation based on such change in our assessment, this TSD also explains that change. For areas of Texas that are not explicitly addressed in this chapter, we are finalizing the designations described in our 120-day letters and Chapter 2 of the TSD for EPA's intended Round 4 area designations as explained in those documents.

In letters dated October 16, 2020 and November 15, 2020, Texas responded to EPA's intended designations by providing additional information including additional technical information for Howard, Hutchinson, and Navarro Counties, and revised designations recommendations for Howard and Hutchinson Counties. EPA also received public comments regarding the intended designations for Harrison, Howard, Hutchinson, Navarro, and Potter Counties. These comments are addressed in the Response to Comments document associated with this final action and/or in this final designations TSD.

Table 1 identifies Texas's current designation recommendations, EPA's final Round 4 designations, and the areas in Texas to which those designations apply. Chapter 1 of this TSD for

EPA's final designations explains the definitions we are applying in the final designations process.

Table 1-1. Summary of EPA's Final Designations and the Designation Recommendations by Texas

Area/ County	Texas's Recommended Area Definition	Texas's Recommended Designation	EPA's Intended Designation	EPA's Final Area Definition	EPA's Final Designation
Hutchinson	Hutchinson County	Unclassifiable/ Attainment	Nonattainment	Those portions of Hutchinson County encompassed by the rectangle with the vertices using Universal Traverse Mercator (UTM) coordinates in UTM zone 14 with datum NAD83 as follows: (1) Vertices—UTM Easting (m) 273540.5, UTM Northing (m) 3945147.6; (2) vertices—UTM Easting (m) 296187.4, UTM Northing (m) 3944698.5; (3) vertices—UTM Easting (m) 296187.4, UTM Northing (m) 3959485.8; (4) vertices—UTM Easting (m) 273540.5, UTM Northing (m) 3959499.4.	Nonattainment
Navarro	Navarro County	Attainment	Nonattainment	Those portions of Navarro County encompassed by the polygon with the vertices using Universal Traverse Mercator (UTM) coordinates in UTM zone 14 with datum NAD83 as follows: (1) Vertices—UTM Easting (m) 734940.8,	Nonattainment

				UTM Northing (m) 3520745.2; (2) vertices—UTM Easting (m) 737000.0, UTM Northing (m) 3520585.9; (3) vertices—UTM Easting (m) 756678.9, UTM Northing (m) 3532601.9; (4) vertices—UTM Easting (m) 756678.9, UTM Northing (m) 3542866.0; (5) vertices—UTM Easting (m) 734940.8, UTM Northing (m) 3542866.0.	
Howard	Howard County	Unclassifiable/ Attainment	Nonattainment	Those portions of Howard County encompassed by the rectangle with the vertices using Universal Traverse Mercator (UTM) coordinates in UTM zone 14 with datum NAD83 as follows: (1) Vertices—UTM Easting (m) 271177.6, UTM Northing (m) 3571453.5; (2) vertices—UTM Easting (m) 274913.8, UTM Northing (m) 3571453.5; (3) vertices—UTM Easting (m) 274913.8, UTM Northing (m) 3576035.9; (4) vertices—UTM Easting (m) 271177.6, UTM Northing (m) 3576035.9.	Nonattainment
Harrison	Harrison County	Attainment	Attainment/ Unclassifiable	Same as State's Recommendation	Unclassifiable

Orange*	Orange County	Unclassifiable/ Attainment	Unclassifiable	Same as State's Recommendation	Unclassifiable
Bexar*	Bexar County	Unclassifiable/ Attainment	Attainment/ Unclassifiable	Same as State's Recommendation	Attainment/ Unclassifiable
Jefferson*	Jefferson County	Attainment	Attainment/ Unclassifiable	Same as State's Recommendation	Attainment/ Unclassifiable
Robertson*	Robertson County	Unclassifiable/ Attainment	Attainment/ Unclassifiable	Same as State's Recommendation	Attainment/ Unclassifiable
Titus*	Titus County (partial)	Unclassifiable/ Attainment	Attainment/ Unclassifiable	Same as State's Recommendation	Attainment/ Unclassifiable

* EPA addresses this area in Chapter 2 with all other areas which EPA is designating "attainment/unclassifiable" or "unclassifiable."

Areas that the EPA previously designated in Round 1 (*see* 78 FR 47191), Round 2 (*see* 81 FR 45039 and 81 FR 89870), and Round 3 (*see* 83 FR 1098 and 83 FR 14597) are not affected by the designations in Round 4.

2. Technical Analysis for the Harrison County, Texas Area

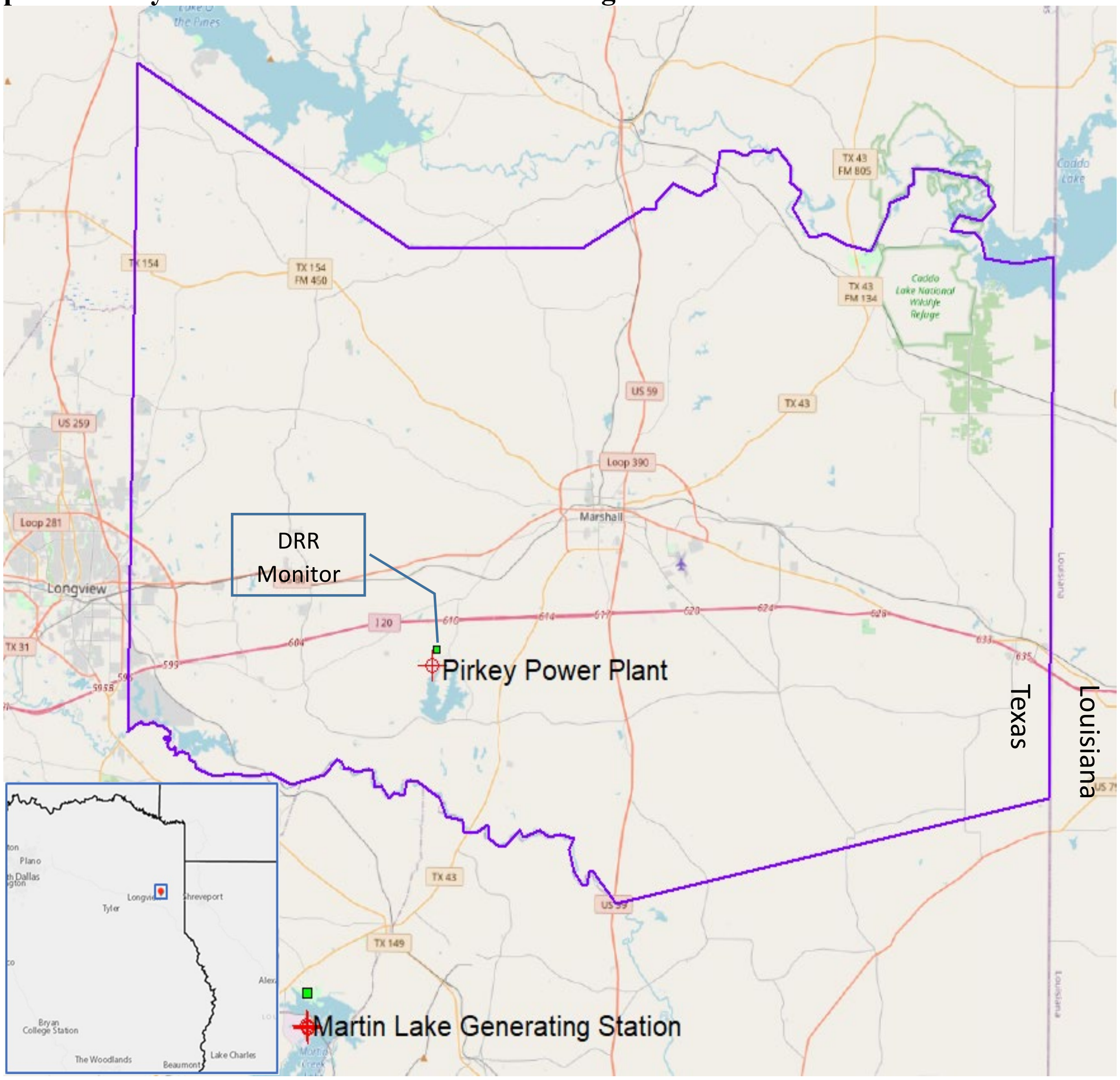
2.1. Introduction

The EPA must designate the Harrison County, Texas area by December 31, 2020, because the area has not been previously designated and installed and began operating a new EPA-approved monitor pursuant to the DRR. This section presents all the available air quality information for the portion of Harrison County, Texas that includes the following SO_2 source around which the DRR required the state to characterize air quality:

- The Pirkey Power Plant facility emits 2,000 tons of SO_2 or more annually. Specifically, Pirkey Power Plant emitted 2,916 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Texas has chosen to characterize it via monitoring.

As seen in Figure 2-1 below, the Pirkey Power Plant is located about 14 km SW of Marshall, Texas and about 41 km west of the boundary of Harrison County with Louisiana. The stacks are about 2.5 km south of I-20. The DRR monitor is located just over 1 km to the NNW of the stacks and near Red Oak Road. A second power plant, Martin Lake Generating Station, located about 23.8 km to the SSW of Pirkey Power Plant is shown on the figure.

Figure 2-1. Map of the Harrison County, Texas Area Addressing Pirkey Power Plant produced by EPA from Sierra Club's Modeling Files.



In its 2015 recommendation letter, Texas recommended that Harrison County be designated as attainment for the 2010 SO_2 NAAQS. Specifically, the State's recommended boundaries consist of Harrison County, Texas. Texas provided EPA with this recommendation prior to the installation and operation of the EPA-approved monitor and before the State had monitoring data for the 2017-2019 period and in the absence of any modeling analysis. Texas agreed with our intended attainment/unclassifiable designation for Harrison County in their October 16, 2020 letter. Because of the receipt of new information in Sierra Club's comments on our intended designation, EPA now does not agree with Texas's recommendation as to the designation category, and intends to designate all of Harrison County, Texas, as described below, as unclassifiable for the 2010 SO_2 NAAQS based upon currently available monitoring and modeling information for the 2017-2019 period. Our final boundaries are consistent with the State's recommended boundaries and are described below.

2.2. Summary of Information Reviewed in the TSD for the Intended Round 4 Area Designations

In its September 18, 2015, recommendation letter, Texas recommended that Harrison County be designated as attainment for the 2010 SO_2 NAAQS. As described in the intended designations TSD, the monitor, which was sited to characterize the maximum 1-hour SO_2 concentration in the area surrounding the Pirkey Power Plant, had a complete, valid 2017-2019 design value attaining the 2010 SO_2 NAAQS. EPA's intended designation agreed with Texas's recommendation.

2.3. Air Quality Monitoring Data for the Harrison County, Texas Area

In the TSD for the intended area designations, EPA considered design values for the air quality monitor in the Harrison County, Texas area. Specifically, EPA determined that the monitor (AQS ID# 48-203-1079) attained the 2010 SO_2 NAAQS with 2017-2019 design value of 54 ppb. EPA has no new quality assured monitoring information that warrants revising our prior analysis of available monitoring data.

2.4. Assessment of New Technical Information for the Harrison County, Texas Area and the Anderson/Rusk Counties, Texas Nonattainment Area Addressing Pirkey Power Plant and Martin Lake Generating Station

In its 2015 recommendation letter, Texas did not provide an air quality modeling analysis for the area surrounding Pirkey Power Plant to support an attainment area boundary. Texas agreed with our intended designation of attainment/unclassifiable in their 2020 letter.[1]

The discussion and analysis that follows below will reference the "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and the factors for evaluation contained in the EPA's September 5, 2019, guidance, July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.[2]

For this area, the EPA received and considered one new modeling assessment, including no assessments from the State and one assessment from other parties. The modeling assessment received was submitted to support comments regarding potential contributions from the Pirkey Power Plant to the previously designated Rusk/Panola County nonattainment area centered around the Martin Lake Generating Station (Martin Lake).[3] To be clear in referring to this assessment, the following table lists when it and previous assessments were received, provides an identifier for the assessments that are used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

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[1] Letter from Governor Abbot to Andrew Wheeler, October 16, 2020 in the docket for this action.

[2] *https://www.epa.gov/sites/production/files/2016-04/documents/so2modelingtad.pdf*.

[3] A portion of Rusk and Panola Counties, Texas was designated as nonattainment in Round 2 of the SO_2 designations, 81 FR 89870 (December 13, 2016).

Table 2-2. Modeling Assessment for the Harrison County, Texas Area and the Anderson/Rusk Counties Nonattainment Area.

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
Sierra Club	March 2016	Sierra Club 2016 modeling*	Modeled only Martin Lake using fixed temperatures and velocities.
Luminant	March 2016	Luminant modeling*	Contained CEM data for temperature and velocity, actual building dimensions for Martin Lake. Did not comply with modeling TAD.
Sierra Club	September 2020 (updated November 3, 2020)	Sierra Club 2020 modeling	Modeling included both Martin Lake and Pirkey Power Plant emissions for impacts around Pirkey Power Plant and in Martin Lake nonattainment area.

* 2016 modeling from Sierra Club and Luminant were evaluated in the Round 2 final designation TSD and was a basis of our nonattainment designation of the area around Martin Lake.[4]

Sierra Club's 2016 modeling included only emissions from Martin Lake Generating Station and the contribution from all other sources around the plant were represented through the use of background concentrations. This modeling was a basis of our nonattainment designation of the area around Martin Lake. Sierra Club's 2020 modeling includes both Martin Lake and Pirkey Power Plant with the finest portion of the grid centered on Martin Lake. Sierra Club's object of this 2020 modeling analysis was to assess Pirkey Power Plant's contributions to the nonattainment area around Martin Lake. Plant-specific data for Martin Lake Generating Station from Luminant's 2016 modeling was used to help refine Sierra Club's 2020 modeling analysis.

2.4.1. Modeling Analysis Provided by Sierra Club

Although Texas did not provide any dispersion modeling for this area, EPA did receive modeling from the Sierra Club in comments on our intended designation for Harrison County. While Sierra Club's initial comment was submitted on September 16, 2020, they submitted updated modeling files on November 3, 2020.

2.4.1.1.Model Selection and Modeling Components

[4] *See https://www.epa.gov/sites/production/files/2016-11/documents/texas_4_deferred_luminant_tsd_final_docket.pdf.*

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The Sierra Club used AERMOD version 19191 in its 2020 modeling, the most recent. A discussion of the Sierra Club's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

2.4.1.2.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

Sierra Club evaluated whether the area should be modeled using the rural or urban dispersion coefficient option in AERMOD. USEPA's AERSURFACE v. 20060 was used to determine land use within a three-kilometer radius circle surrounding the Martin Lake facility. EPA guidance states that urban dispersion coefficients are used if more than 50% of the area within 3 kilometers has urban land uses. Otherwise, rural dispersion coefficients are appropriate.[5] Approximately 9% of surrounding land use around the Martin Lake station was of urban-land-use types, less than the 50% value considered appropriate for the use of urban dispersion coefficients. For the purpose of performing the 2020 modeling for the area of analysis, the Sierra Club determined that it was most appropriate to run the model in rural mode.

The determination of the use of the rural dispersion for the modeling analysis followed EPA's guidance.

2.4.1.3.Modeling Parameter: Area of Analysis (Receptor Grid)

The Modeling TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the

[5] *See* EPA's SO_2 Designations Modeling TAD, Section 6.3 Urban/Rural Determination.

extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Harrison County, Texas area, the Sierra Club has included one other emitter of SO_2 within 24 kilometers (km); the Martin Lake Power Plant is approximately 23.5km SSW of the Pirkey Power Plant. The Sierra Club determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any 2010 SO_2 NAAQS violations in the area of analysis and any potential impact on SO_2 air quality from sources on nearby areas. No other sources beyond 24 km were determined by the Sierra Club to have the potential to cause significant concentration gradients within the area of analysis.

The grid receptor spacing for the area of analysis chosen by Sierra Club is as follows:

The Sierra Club centered the grid on the Martin Lake Power Plant. The area around Martin Lake was previously designated by EPA as nonattainment for the 2010 SO2 standard. According to Sierra Club's modeling report the grid had a regular:

- spacing of 100 meters out to a distance of 5 km from Martin Lake Power Plant and then spacing of 500 meters from that point out to a distance of 10 km from Martin Lake Power Plant, then finally spacing of 1000 m out to 50 km from Martin Lake Power Plant.

EPA notes that the modeling files furnished by the Sierra Club have a receptor grid that extends only to 25 km from the Martin Lake Power Plant rather than to 50 km as stated in their report. The modeling results on the 25 km-extent grid appear to have captured the maximum concentrations from the sources included in the modeling. The Sierra Club did not use fenceline receptors or exclude receptors on the properties of the modeled sources. Their regular grid was uninterrupted.

The receptor network contained 13,602 receptors, and the network covered the area around Martin Lake Generating Station in northeast Rusk County, TX and portions of Panola and Greg Counties, Texas. The grid extended into Harrison County, Texas to a distance about 2.7 km north of the Pirkey Power Plant, including receptors near the DRR monitor. Figures 2-2 and 2-3, generated by EPA from Sierra Club's modeling files, show the Sierra Club's chosen area of analysis surrounding the Martin Lake Generating Station and Pirkey Power Plant, as well as the receptor grid for the area of analysis.

Figure 2-2. Area of Analysis for the Harrison County, Texas Area Showing Overall Receptor Grid and the Locations of the DRR monitors.

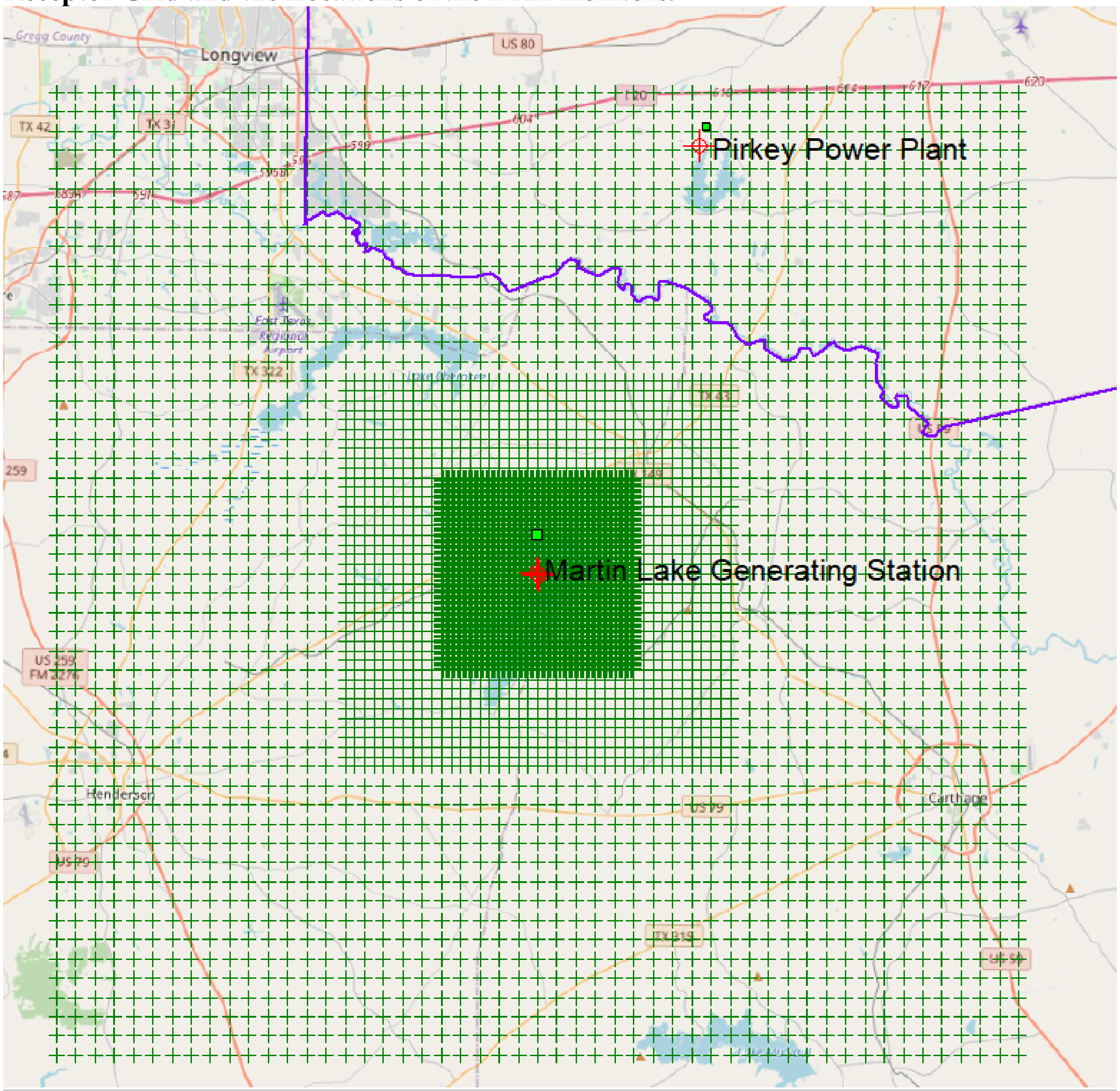
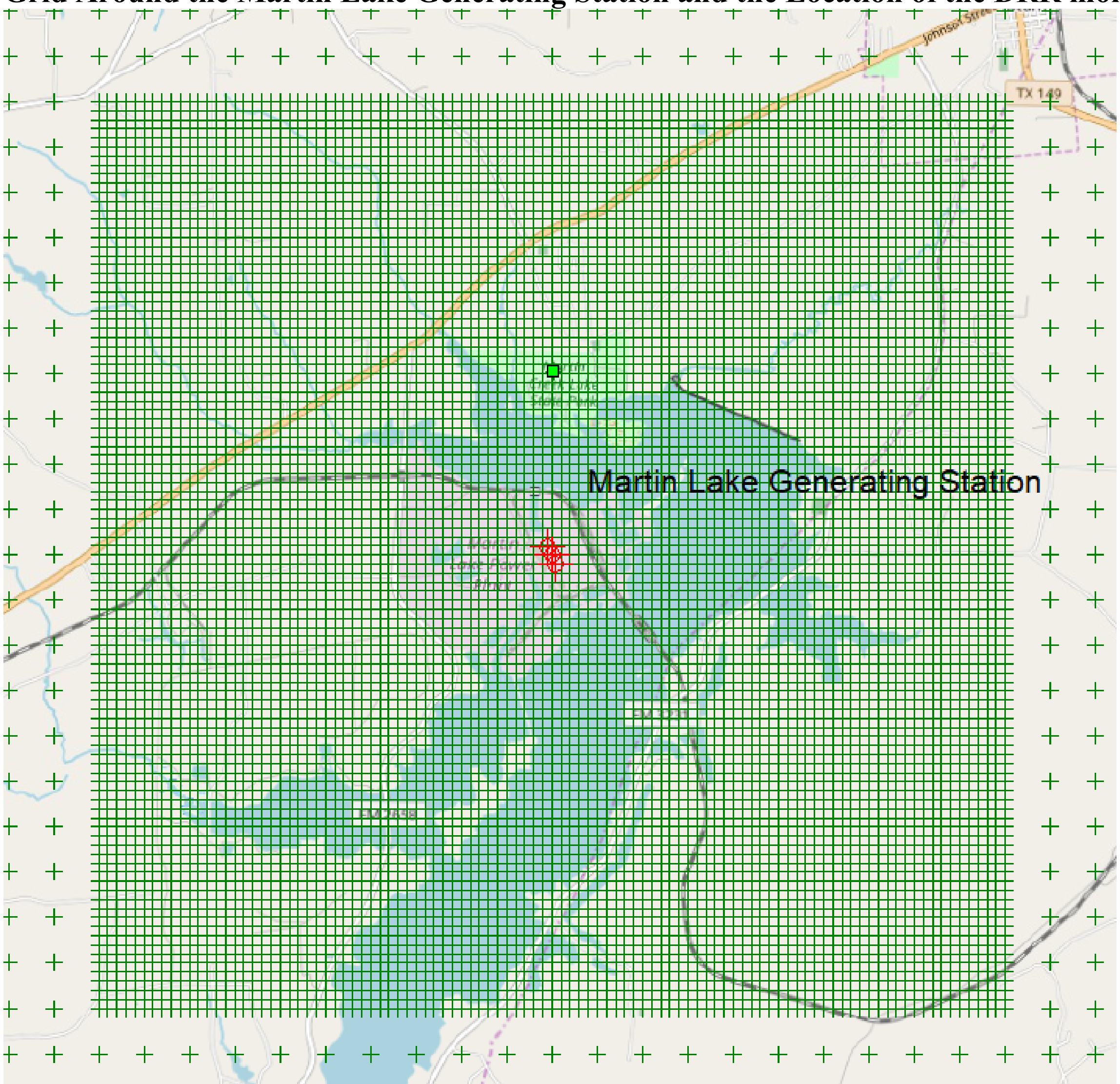


Figure 2-3. Area of Analysis for the Harrison County, Texas Area Showing Fine Receptor Grid Around the Martin Lake Generating Station and the Location of the DRR monitor.



Consistent with the Modeling TAD, the Sierra Club placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property. Sierra Club retained receptors in areas where it would not be feasible to place a monitor and also on modeled facilities' property, the Sierra Club opted to apply a regular grid of receptors without excluding selected receptor locations. Thus, the Sierra Club retained receptors in areas that are not ambient air opting to apply a regular grid of receptors without excluding selected receptor locations. Since receptors were retained in non-ambient air locations, EPA has screened all concentrations to ensure that the results only reflect ambient air. For example, EPA does not consider impacts from Martin Lake Generating Station on their own property as ambient air impacts.

2.4.1.4.Modeling Parameter: Source Characterization

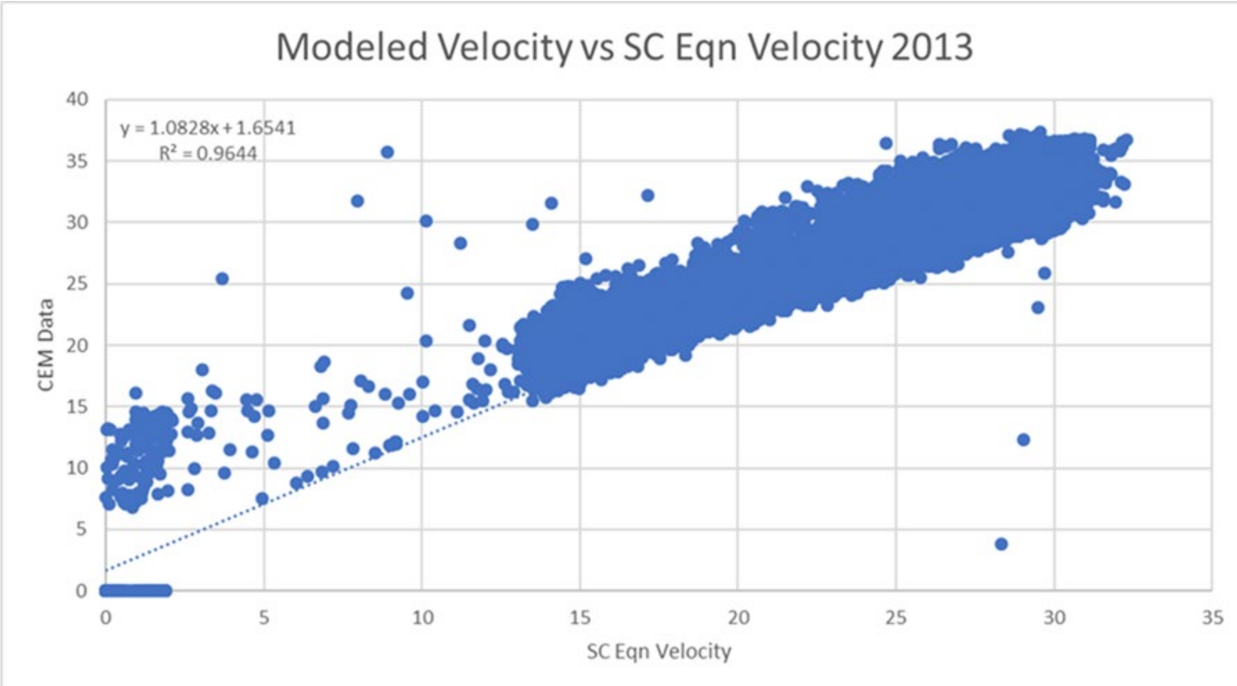
Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions.

The Sierra Club characterized the Pirkey Power Plant, located in Harrison County, Texas as well as the Martin Lake Generating Station in adjacent Rusk County, Texas. They included both of these sources in order to evaluate attainment of the NAAQS around the Pirkey Power Plant as well as any impacts by Pirkey on the previously designated nonattainment area around the Martin Lake Generating Station.

The Sierra Club attempted to characterize these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the Sierra Club used actual stack heights in conjunction with actual emissions. The Sierra Club characterized the Martin Lake's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. To synthesize variable hourly velocities, Sierra Club used the modeling files from Luminant's Round 2 modeling for the years 2013-2015 to develop a relationship between heat rate (available from CAMD) and velocity (unavailable from CAMD). This relationship was applied to the heat rate data for the years 2017-2019 to develop hourly emissions files with variable velocity and temperature. In Sierra Club's original modeling files submitted to EPA in September 2020, there was an error in the velocity calculation, yielding stack velocities for Martin Lake approximately 2X the appropriate velocities. In the transmittal for the supplemental modeling files Sierra Club stated that after submitting the September 2020 modeling report, they discovered an inadvertent error in the method used to derive the hourly stack exit velocities for the Martin Lake plant, which resulted in modeled variable exit velocities that were approximately 1.8 times too high. The Sierra Club corrected this error in the supplementary files submitted in November 2020. Figure 2-4 plots the CEM velocity recorded in 2013 against the Sierra Club's algorithm.[6] It shows that the algorithm captures the variability in exit velocities with some scatter about the observed velocity; the R^2 value of 0.96 indicates that the relationship explains 96% of the observed variation in exit velocities.

[6] EPA worksheet MartinLake2013vsSCeqnVelocity.xlsx included in docket to this action.

Figure 2-4. EPA generated plot of Martin Lake Velocities from 2013 CEM Data vs. the Velocity Obtained for the Same Hours from Sierra Club's Relationship.

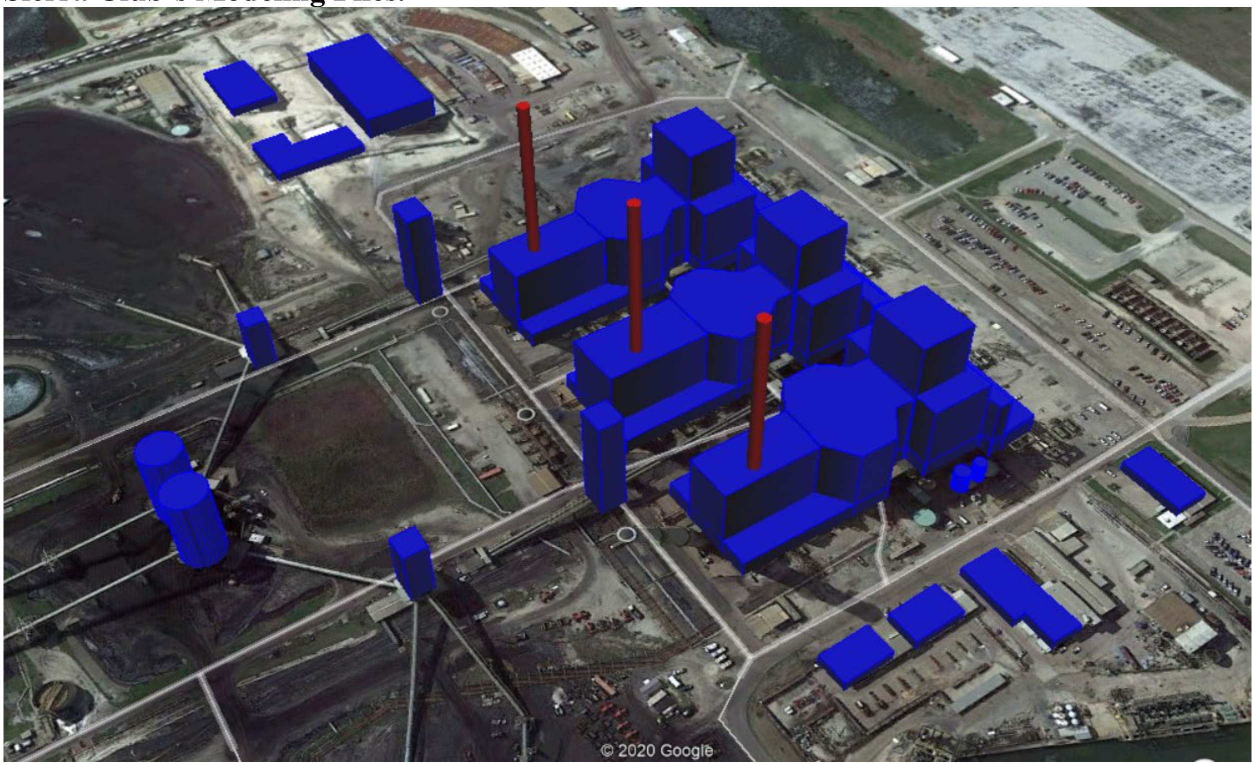


To derive stack exit temperatures for the Martin Lake plant, the actual hourly emission rates, stack temperatures and stack exit velocities for the 2013-2015 period, Sierra Club obtained data from the station's continuous emissions monitoring (CEM) system, as reported by Luminant. Sierra Club used this data to derive an average stack outlet temperature for each of the three units. The modeling used these constant temperatures for modeling the 2017-19 period. These average temperatures were 352, 358 and 355 °K, respectively. While it would be preferable to use variable temperatures to reduce uncertainty in the modeling, the methodology used to derive the constant temperatures and their use in the modeling are within the guidance of the modeling TAD.

EPA reviewed the relationships developed for the supplemental Sierra Club modeling and found that they should adequately characterize the velocity and temperature for use in modeling.

Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash. The layout and location of the buildings were available from earlier modeling conducted for Luminant for the Round 2 designation modeling. A view of the buildings and stacks at Martin Lake Generating Station was generated by EPA and is shown in Figure 2-5.

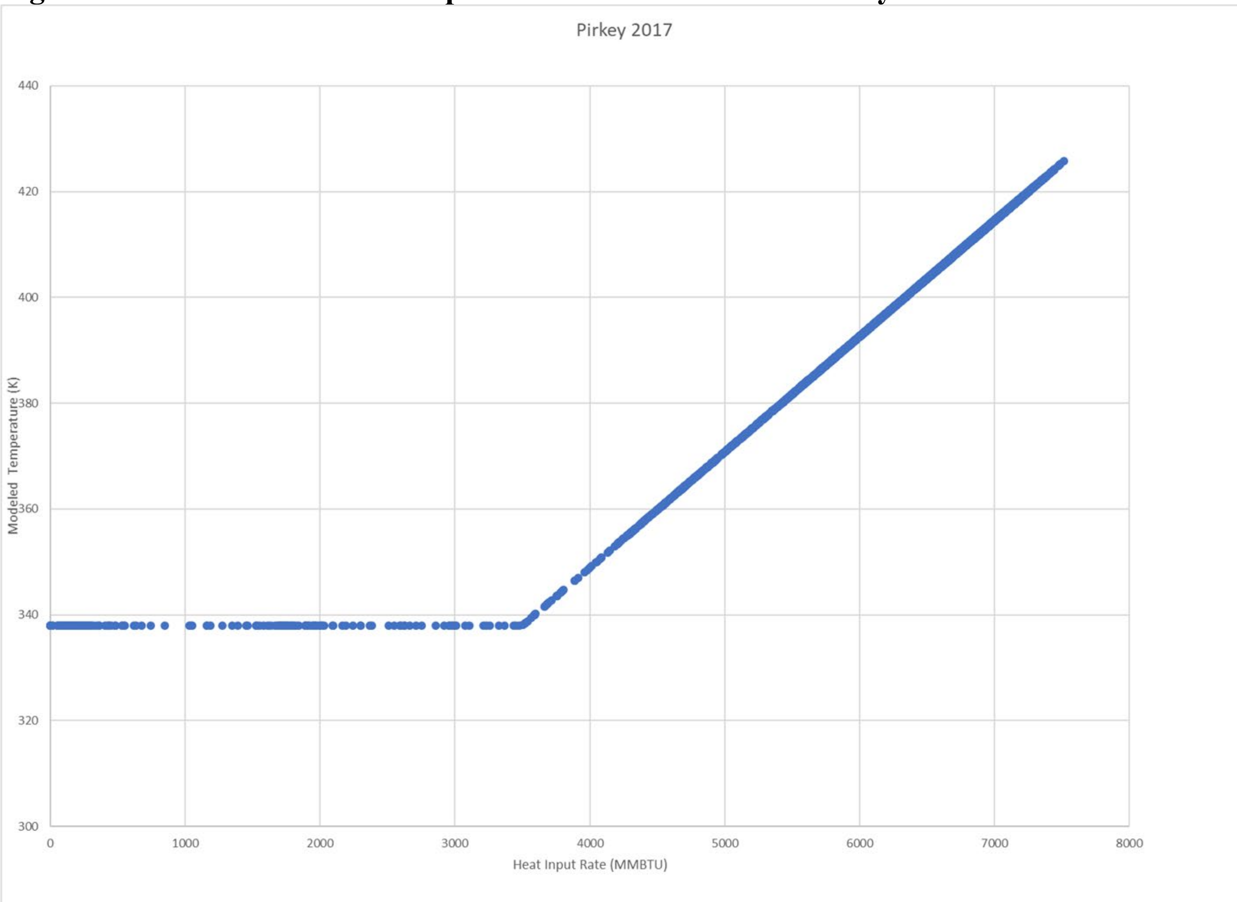
Figure 2-5. A View of Sierra Club's Building and Stack Configuration for the Martin Lake Power Plant, Originally from Luminant's Modeling Files, as Generated by EPA from Sierra Club's Modeling Files.



To derive the stack exit temperatures for the Pirkey Power Plant, stack exit temperatures at 50% and 100% load were provided by the US Energy Information Administration (EIA) annual power plant survey.[7] For Unit 1, these temperatures were: 149 ºF and 287 ºF (338 °K and 415 °K). All loads below 50% were assumed to have the same temperature as 50% load. Between 50% and 100% load, the temperature was assumed to increase proportionally with load. The % load for each hour was calculated from the heat input provided in the EPA CAMD database. EPA plotted the model temperature vs CAMD heat rate for 2017 to illustrate the profile of temperatures used in the modeling, shown in Figure 2-6.

[7] EPA was unable to locate a reference for these temperatures on the USEIA web site and could not verify them.

Figure 2-6. Plot of Modeled Temperature vs Heat Rate for Pirkey Power Plant for 2017.



A somewhat different approach was used to estimate variable velocities for the Pirkey Power Plant than was used for Martin Lake since the velocity data were not directly available from Luminant's 2016 modeling files. For the Pirkey Power Plant, the hourly heat input and exhaust flow rates provided by EPA for 2012-14 period in its Emissions Modeling Clearinghouse[8] were used to calculate a standard cubic feet (scf) per mmbtu ratio. For Unit 1, the calculated ratio was 21,953. This flow to heat input ratio was applied to the hourly heat input for the 2017-19 period provided by the EPA CAMD to determine the hourly flow rates in scf. Finally, the temperature calculated for each hour was applied to the standard cubic feet for each hour to determine the flow rate in actual cubic feet which could then be used to determine the velocity.

To check the accuracy of the hourly exit velocities calculated for the Pirkey Power Plant, Sierra Club compared the maximum and average exit velocities for 2012-2014 (32.2 m/s and 40.7 m/s) to the estimated values for 2017-2019. (25.6 m/s and 37.5 m/s). These updated values were used for the enclosed modeling analysis. Sierra Club states that "The accuracy of the modeling analysis would improve if the hourly exit velocities and temperatures for the 2017-19 period were obtained from the CEM system at the Pirkey plant. These measurements are not publicly available. However, the hourly values used for this report should explain most of the variability of the exit velocities and temperatures from the CEM system measurements."

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[8] Per Sierra Club modeling report, no reference given as to document used.

For Pirkey Power Plant, the Sierra Club stated that the boiler stack is relatively short and likely affected by downwash effects from nearby buildings and structures, but no building dimensions were publicly available. To incorporate downwash effects, Sierra Club estimated the dimensions using aerial and facility photographs. As shown in Figure 2-7 they estimated the height of two buildings immediately adjacent to the 160 m stacks (termed here as the adjacent buildings) as 99 meters. This would put the stack height to building height ratio as only about 1.62, a very low relative stack height, since the Good Engineering Practice stack height ratio would be 2.5; or in the case of a tall structure, the building height + 1.5L where L is the lesser of the building height or the projected width of the building normal to the wind direction. Since EPA does not have the actual building data to compare with Sierra Club's building height, we conducted our own analyses to investigate whether Sierra Club's building heights are reasonable.

Figure 2-7. A View of Sierra Club's Building and Stack Configuration for the Pirkey Power Plant, Generated by EPA from Sierra Club's Modeling Files.

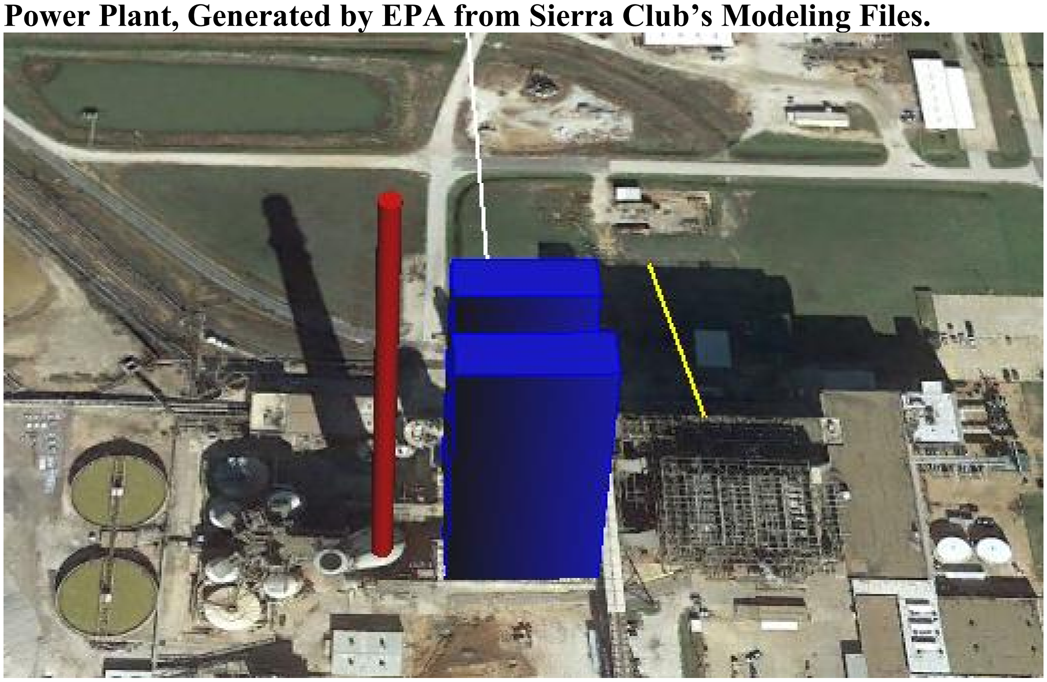
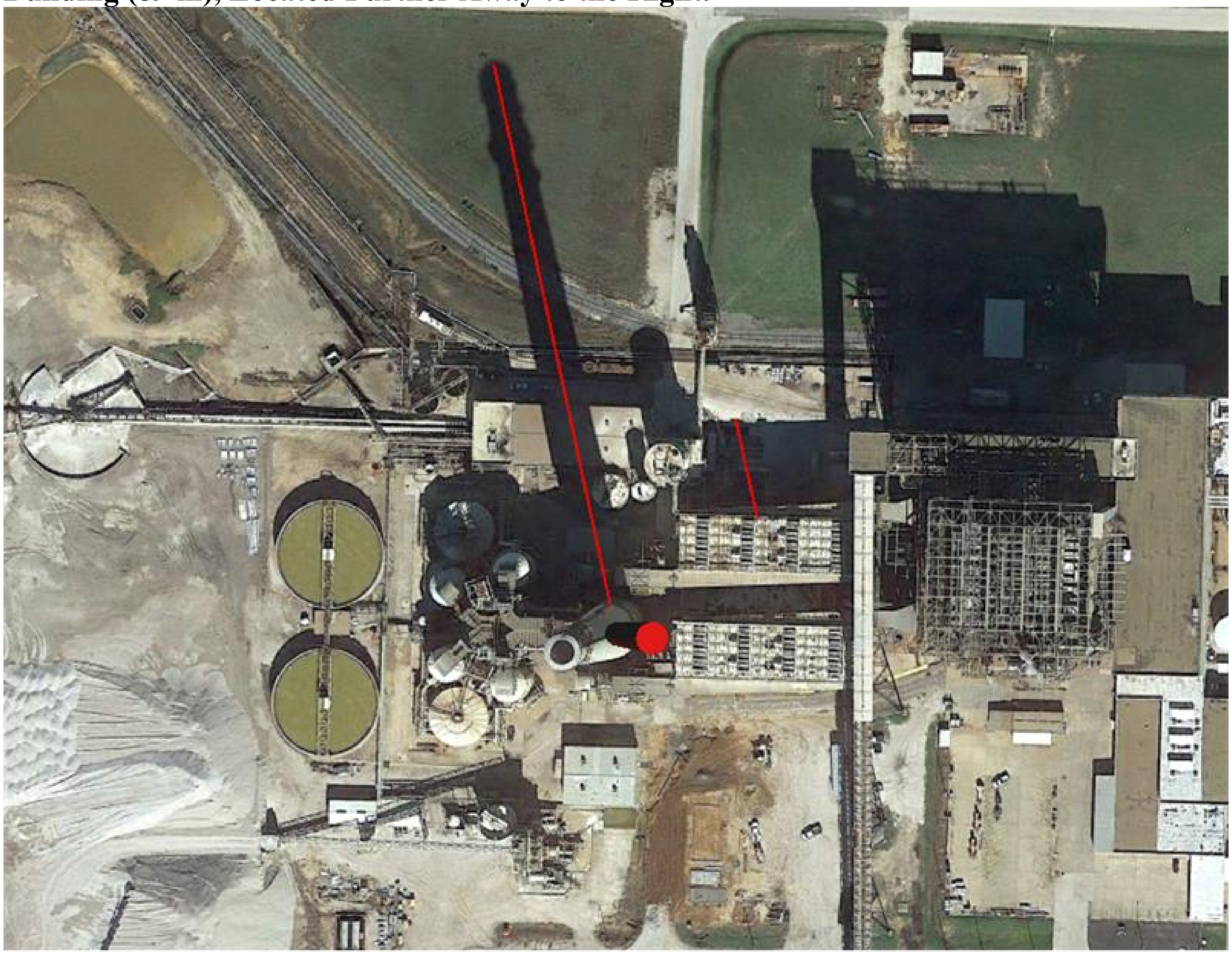


Figure 2-8. A Satellite View of the Pirkey Power Plant in November 2013 Illustrating the Shadow Length for the Stack (173 m), the Adjacent Building (29 m), and the Second Building (89 m), Located Further Away to the Right.



EPA used satellite photographs to conduct a shadow-length analysis, this uses the principle that for a given photograph the length of the shadows is proportional to the height of a structure. We selected a photograph from November 2013 (Figure 2-8) as best showing the shadows of the relevant structures. The shadow measurements for Pirkey Power Plant from the 11/2013 satellite photo were 176 m for the stack and 32 m for the building.

EPA then estimated the height of the adjacent building by multiplying the ratio of the building height to the stack height by the known height of the stack.

Estimated Height of Building = (32/176) * Actual Stack Height = 18% * 160 m = 29 m

Similarly, by shadow-length the height of the 2nd building, located further away to the east (termed here the eastern building), is about 60% of the height of the stack, or 96 m, which is similar to building height, 99 m, used in Sierra Club's modeling for the adjacent building.

We checked the result of the shadow-length analysis by using a photograph from Google Street View of the plant from a vantage point where there was a clear view of the top of the stack and the taller eastern building. Figure 2-9 below shows a view north from FM2625 looking across Brandy Branch Reservoir toward the plant. The view shows that the taller eastern building is visible above the tree line, but the adjacent building is not. The elevation of the reservoir is 103 m while the elevation at the base of the stack is 110 m.

Figure 2-9. A View of Pirkey Power Plant to the North from FM2625 Looking Across Brandy Branch Reservoir. The stack and the second building can be seen above the tree line.

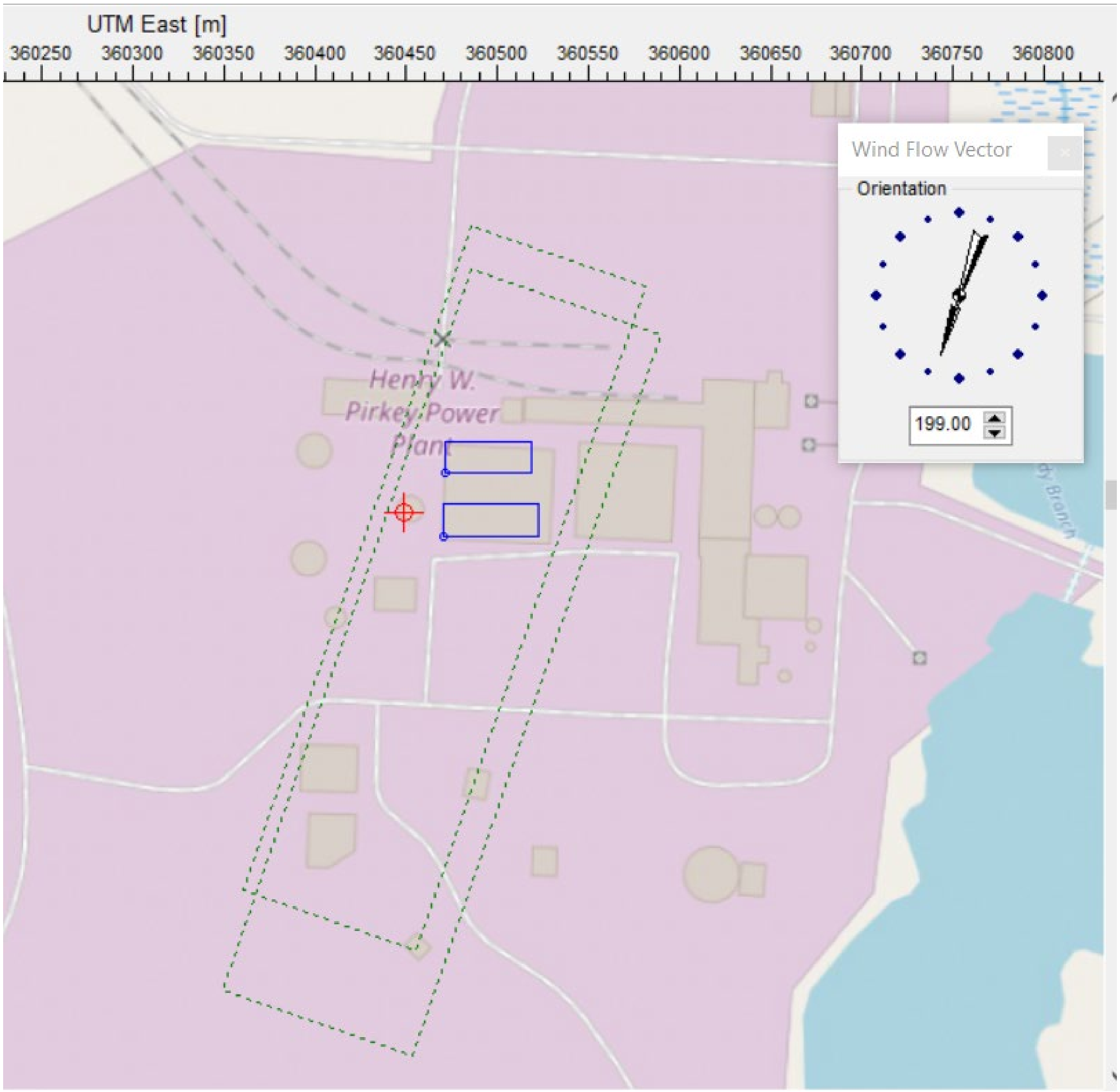
A rough estimate of the height of the building was made by EPA to check the shadow-length analysis we conducted earlier – to verify if Sierra Club's building heights were in error. Figure 2-10 is the diagram used to make an estimate of the relative height of the second building to the stack's height. The relative length of a line drawn from the shoreline of the lake to the top of the stack was then compared to the length of a line drawn from the shoreline to the top of the eastern building. The length of the line to the top of the stack is proportional to the height of the stack + (110 m – 103 m) while the length of the line to the top of the building is proportional to the height of the building + (110 m – 103 m). The length of the building's line is approximately 0.667 * length of the stack's line. The stack's line represents a length of 16 0m + 7 m or 167 m. Thus, the building's line represents a length of 0.667 * 167 m = 111 m. The eastern building's estimated height is then 111 m – 7 m = 104 m. This estimated height is similar to the 99 m height used by Sierra Club for the building adjacent to the stacks in the modeling. Possibly, the height for the higher eastern building was attributed to the adjacent building in error.

Figure 2-10. Diagram Used to Estimate the Relative Heights of the Pirkey Power Plant Stack and the Eastern Building.

Figure 2-11 shows the 5L area of influence for the Sierra Club's modeled buildings for a wind direction from Pirkey toward Martin Lake (19°, or a flow vector of 199°) as shown by the dashed green rectangles. Each stack is evaluated in AERMOD to determine if it is affected by building downwash from nearby buildings within a 5L area of influence, where L is the lesser of the building height and projected building width. As shown in Figure 2-11 the modeled stack is within this area of influence and so AERMOD's building wake algorithm would be activated whenever the winds were blowing toward Martin Lake. The eastern building can be seen in the diagram to the right of the two blue modeled buildings.

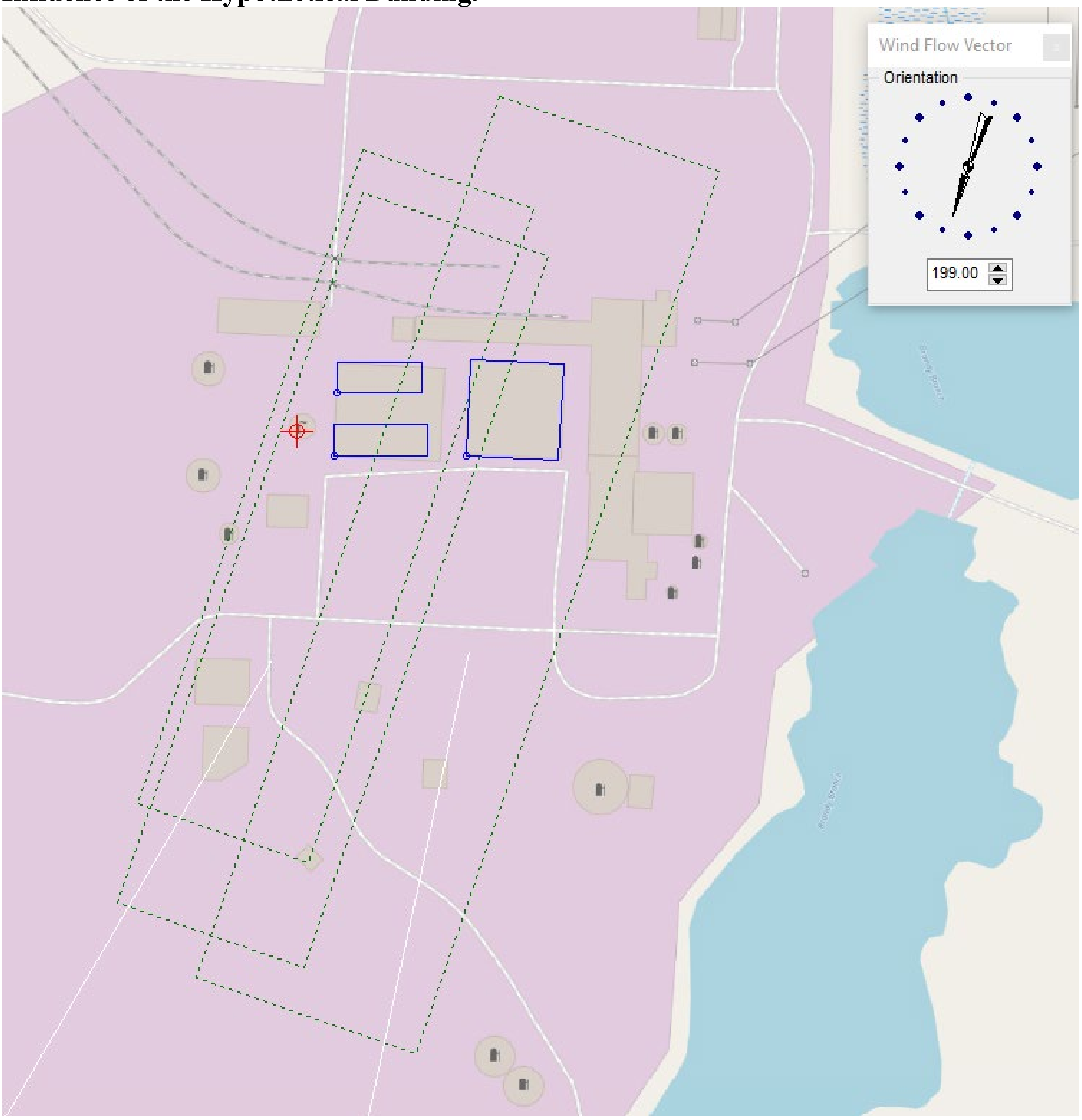
Figure 2-11. The 5L Area of Influence for Sierra Club's Modeled Buildings, Denoted by the Dotted Green Lines for a Wind Flow Vector Toward Martin Lake. The Pirkey Power Plant

Stack, denoted by the red cross, is Within the Area of Influence of the Buildings as Modeled.



The second, eastern, building has a horizontal dimension of about 50 m. To determine whether this hypothetical building (that is assuming that Sierra Club had attributed the height of this building to the nearer buildings) could affect the emissions from the stack due to building downwash EPA configured a building at that location with the dimensions 50 m x 50 m x 99 m. The 5L Area of Influence of the hypothetical building is plotted in Figure 2-12 along with the Areas of Influence from the two Sierra Club Buildings for wind flow vectors toward Martin Lake. The stack is outside of the hypothetical building's area of influence and so would in fact not be subject to AERMOD's building downwash algorithm. If the adjacent buildings were the correct height, ~30 m, *and* the second building were the correct height, the stack would be too tall to be influenced by the adjacent building and also outside the area of influence of the eastern building and so building wake effects would not be activated in AERMOD. Thus, the location of the nearest buildings in the model is such that the stack is incorrectly within the area of influence of the building for wind flow vectors toward Martin Lake so that the emissions from the stack are subject to building wake effects. A correct building configuration would not have subjected the emissions from Pirkey to building wake effects due to these buildings.

Figure 2-12. The 5L Area of Influence for Sierra Club's Modeled Buildings and the Hypothetical Building, Denoted by the Dotted Green Lines for a Wind Flow Vector Toward Martin Lake. The Pirkey Stack, denoted by the red cross, is Outside the Area of Influence of the Hypothetical Building.



While EPA has not investigated the influence of the building misconfiguration on concentrations in the vicinity of Martin Lake Generating Station, this does introduce uncertainty in the concentrations modeled.

2.4.1.5.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data.

The EPA believes that CEMS data provide acceptable historical emissions information, when they are available. These data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS, or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

As previously noted, the Sierra Club included Pirkey Power Plant and one other emitter of SO_2 within 24 km in the area of analysis. The Sierra Club has chosen to model these facilities using actual emissions. The facilities in the modeling analysis and their associated annual actual SO_2 emissions between 2017 and 2019 are summarized below.

For Pirkey Power Plant and Martin Lake Generating Station, Sierra Club provided annual actual SO_2 emissions between 2017 and 2019. This information is summarized in Table 2-3. A description of how the Sierra Club obtained hourly emission rates is given below this table.

Table 2-3. Actual SO_2 Emissions Between 2017 – 2019 from Facilities in the Harrison County, Texas Area.

Facility Name	SO_2 Emissions (tpy)		
	2017	**2018**	**2019**
Pirkey Power Plant	3,960	5,085	3,073
Martin Lake Generating Station	34,442	56,199	46,550
Total Emissions from All Modeled Facilities in the State's Area of Analysis	38,402	61,284	49,623

For Pirkey Power Plant and Martin Lake Generating Station, the actual hourly emissions data were obtained from EPA CAMD. EPA computed the total emissions from Sierra Club's modeling files and compared to TCEQ's facility emissions summary for 2017 and 2018.[9] 2019 emissions were still unavailable from TCEQ's website at the time of EPA's final Round 4 designations action. The Sierra Club's total yearly emissions were the same as in TCEQ's summary.

[9] 2014_2018statesum.xlsx included in the docket to this action.

Sierra Club's use of hourly varying emission rates conforms to the guidance of the Modeling TAD.

2.4.1.6.Modeling Parameter: Meteorology and Surface Characteristics

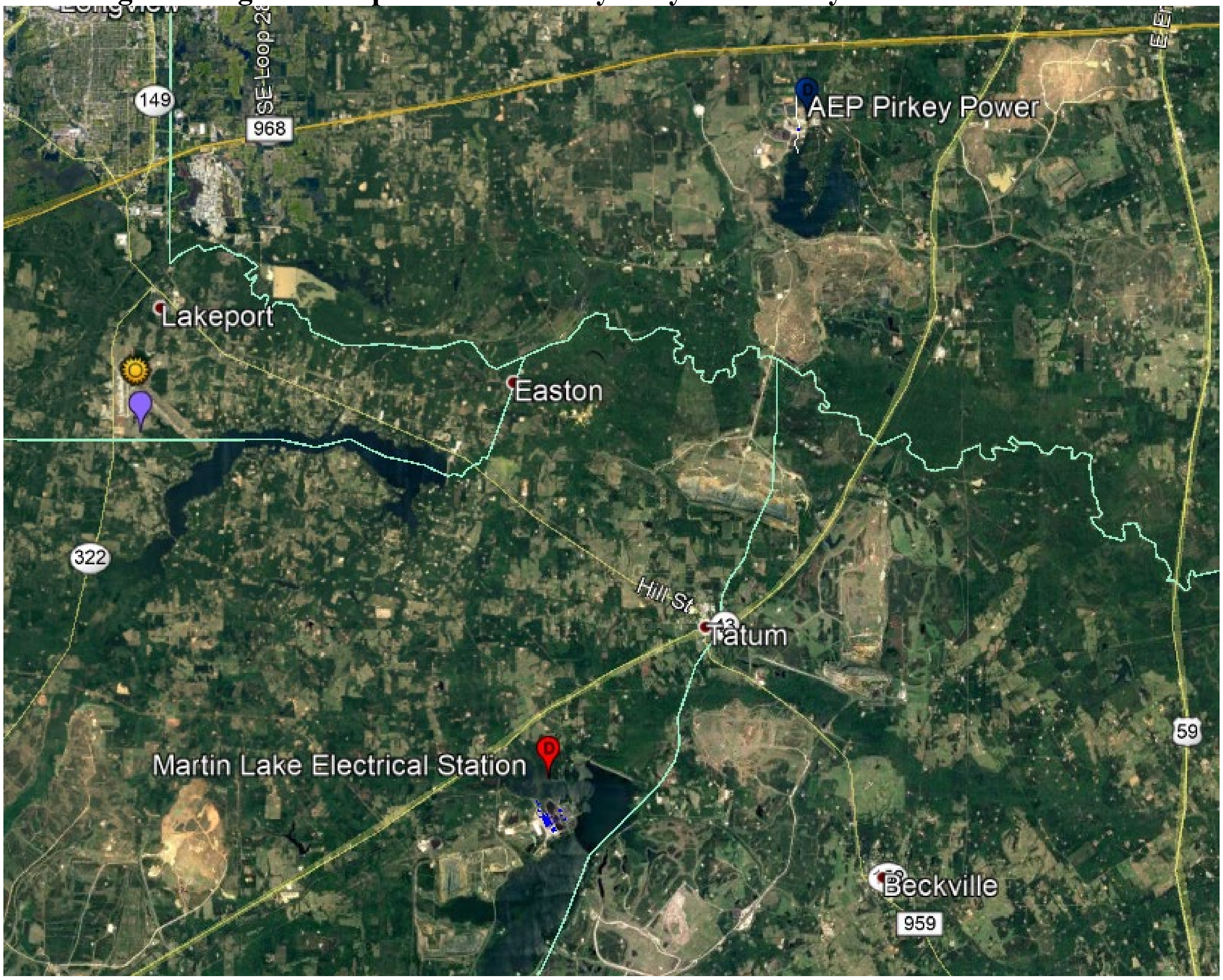
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data, for sources modeled with actual emissions) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Harrison County, Texas area, Sierra Club selected the surface meteorology from Longview E Texas Regional Airport, located at 32.3905, -94.71389, 23.4 km to the southwest of the Pirkey Power Plant, and coincident upper air observations from the same NWS station as best representative of meteorological conditions within the area of analysis. Longview Regional Airport is the closest ASOS station and upper air observation station to the Pirkey Power Plant.

The Sierra Club used AERSURFACE version 20060 using data from Longview Texas Regional Airport to estimate the surface characteristics of the area of analysis. The Sierra Club estimated values of surface roughness length (sometimes referred to as "Zo" and is related to the height of obstacles to the wind flow, which is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer) for 12 spatial sectors out to 1 km from the meteorological tower at a seasonal temporal resolution for average conditions. The Sierra Club also estimated values for albedo (the fraction of solar energy reflected from the earth back into space) and Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance) based on a 10 km by 10 km area centered on meteorological tower..

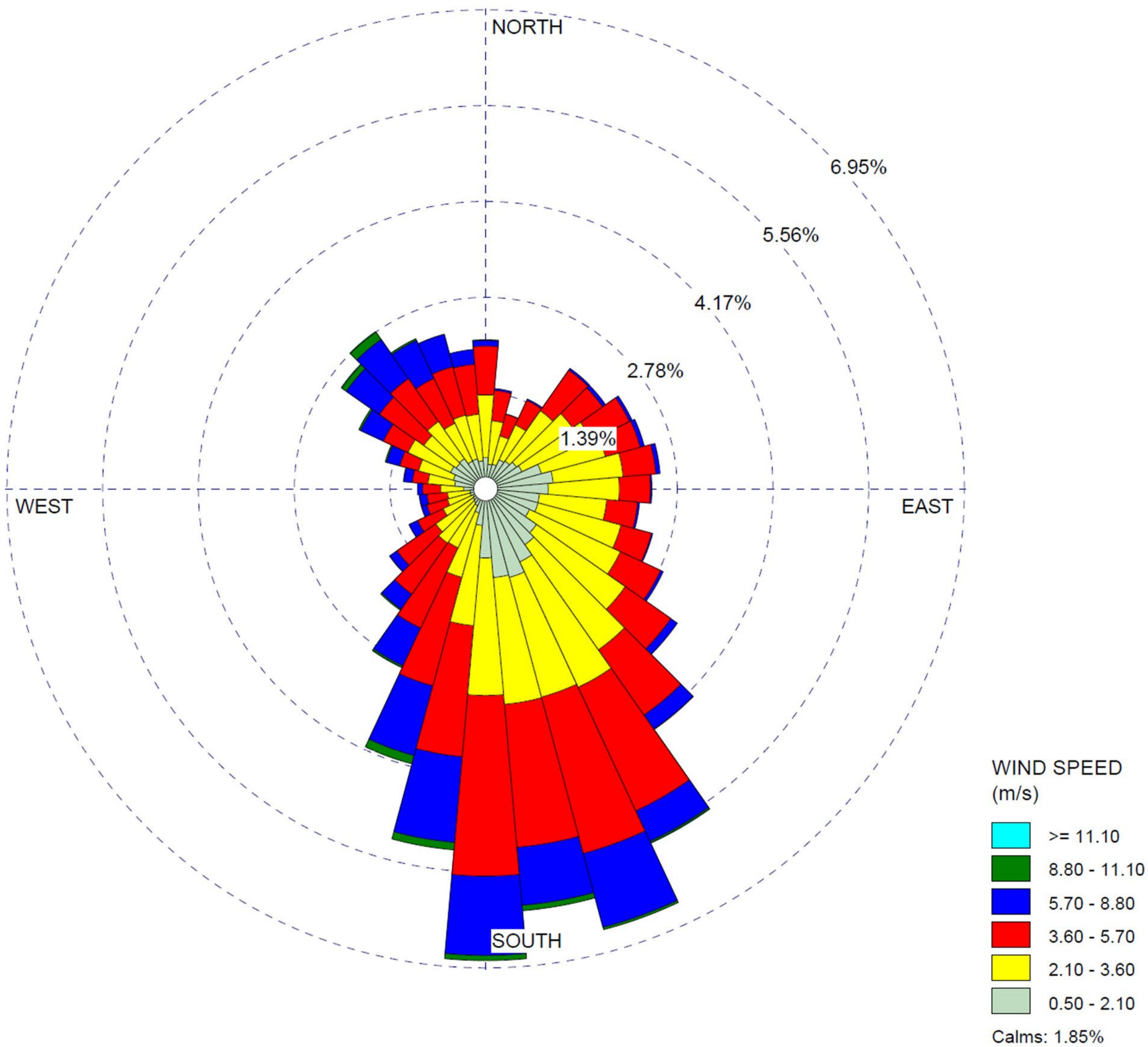
In the figure below, generated by the EPA, the location of this NWS station is shown relative to the area of analysis.

Figure 2-13. Area of Analysis and the NWS station in the Harrison County, Texas Area. The Longview Regional Airport is denoted by the yellow sun symbol.



As part of its analysis, the Sierra Club provided the 3-year surface wind rose for Longview Texas Regional Airport. In Figure 2-14, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The prevailing wind directions are from the south to southeast with very low frequency of winds from the direction of Pirkey Power Plant to Martin Lake (19°).

Figure 2-14: Harrison County, Texas Cumulative Annual Wind Rose for Years 2017 – 2019



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The Sierra Club followed the methodology and settings presented in the Modeling TAD and Appendix W in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from Longview Texas Regional Airport but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the Sierra Club set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

In summary, EPA finds that the Sierra Club followed the guidance of the modeling TAD in processing the meteorological data and in the site chosen.

2.4.1.7.Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as hill terrain with the Sabine River valley between Pirkey Power Plant and Martin Lake forming the boundary between Harrison County and Rusk County. To account for these terrain changes, the AERMAP terrain preprocessor program for AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the National Elevation Dataset (NED) in GeoTiff format.

In summary, EPA finds that Sierra Club followed the guidance of the Modeling TAD and Appendix W in processing the geographical data.

2.4.1.8.Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD and Appendix W offer two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a “tier 1” approach, based on a monitored design value, or 2) a temporally varying “tier 2” approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, the Sierra Club chose to use a tier 1 approach based on the monitored design value for the Milam County monitor (AQS ID# 48-331-1075) identified as the Rockdale John D. Harper Road Monitor located at 3990 John D Harper Road (Coordinates: 30.569534, -97.076294). This monitor is located approximately 300 km to the southwest from the Pirkey Power Plant. The Sierra Club described this monitor as having the lowest design value of any monitor in the State of Texas for the 2017-2019 period. The background concentration for this area of analysis was determined by the Sierra Club to be 4.7 micrograms per cubic meter ($\mu g/m^3$), equivalent to 1.8 ppb when expressed in 1 significant figure, and that value was incorporated into the final AERMOD results.

The Sierra Club's background value is very clean and likely an underestimate of the true background in the area of Pirkey and Martin Lake. For comparison, the closest population monitor to Pirkey Power Plant is the Shreveport, Louisiana site (AQS ID# 22-015-0008), located about 69 km east of the facility, and has a 2017-2019 design value of 8 ppb.

2.4.1.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Harrison County, Texas area of analysis are summarized below in Table 2-4.

Table 2-4: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Harrison County, Texas Area

Input Parameter	Value
AERMOD Version	19191
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	4
Modeled Structures	32
Modeled Fencelines	None
Total receptors	13,602
Emissions Type	Actual
Emissions Years	2017-2019
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Longview Texas Regional Airport
NWS Station Upper Air Meteorology	Longview Texas Regional Airport
NWS Station for Calculating Surface Characteristics	Longview Texas Regional Airport
Methodology for Calculating Background SO_2 Concentration	Milam County monitor (48-331-1075) Tier 1 based on 2017-2019 design value.
Calculated Background SO_2 Concentration	4.7 $\mu g/m^3$ (1.8 ppb)

The results presented below in Table 2-5 and Figure 2-15 show the geographic extent of the predicted modeled violations based on the input parameters.

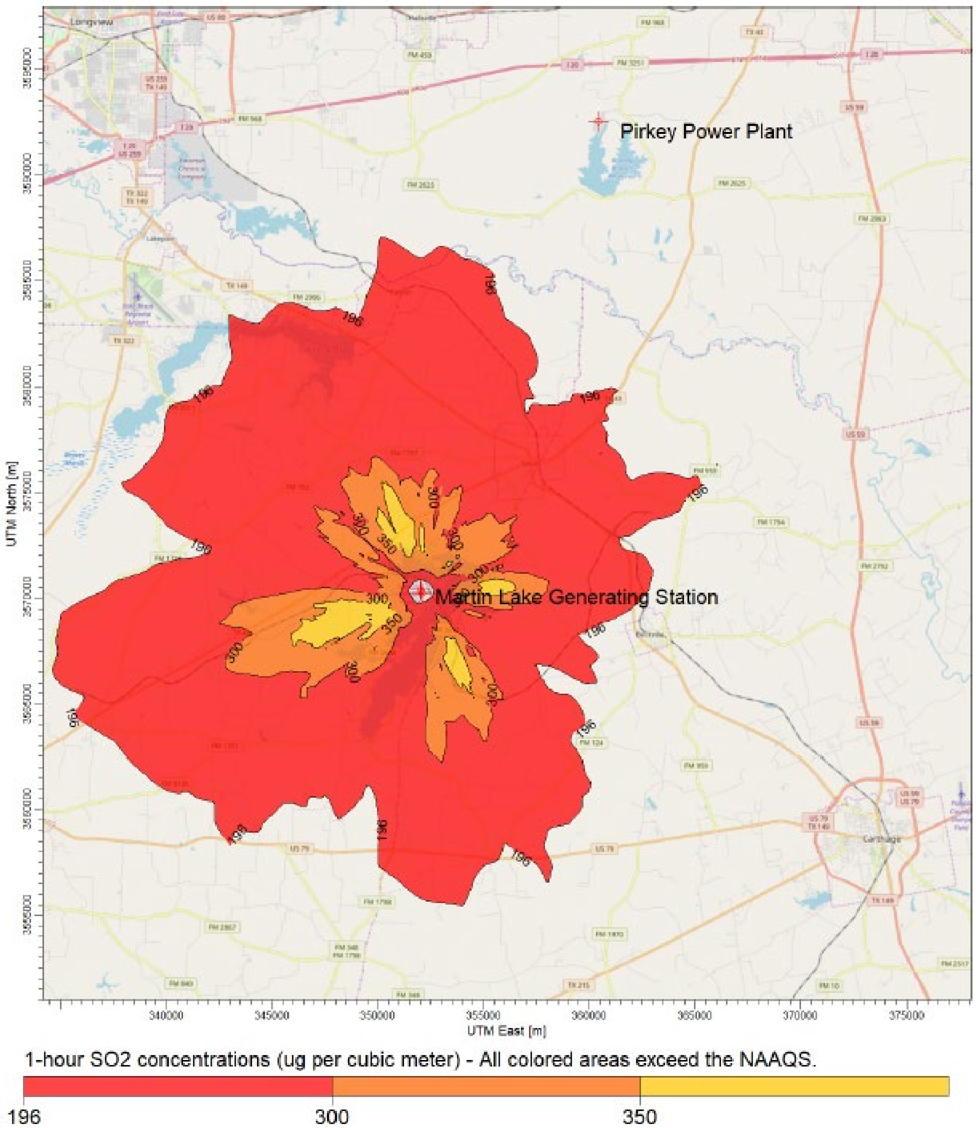
Table 2-5. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Harrison County, Texas Area*

Averaging Period	Data Period	Receptor Location UTM zone 14		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM East	UTM North	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average ALL Sources	2017-2019	351141.34	3573308.75	414.4	196.4**
99th Percentile 1-Hour Average Omitting Pirkey Emissions	2017-2019	351141.34	3573308.75	414.2	196.4**

* Maximum Concentration occurs in area of nonattainment in neighboring Rusk County
** Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor

Figure 2-15 was included as part of the Sierra Club's analysis and indicates that the predicted modeled violations are in an area around the Martin Lake Generating Station and that the area around Pirkey Power Plant is modeled as being in attainment with the 2010 SO_2 NAAQS.

Figure 2-15: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Harrison County, Texas Area



The modeling submitted by the Sierra Club indicates that the 2010 SO_2 NAAQS is violated. The modeling results also include the area in which a NAAQS violation was modeled.

In Sierra Club's modeling report they compare the modeled maximum and 99th percentile values at the Martin Lake monitor as shown in Table 2-6 (modeling report Table 2) to the observed maximum and 99th percentile values at the Martin Lake monitor and found that the model estimated values higher than the monitor by a factor of 1.3, indicating some degree of overestimation by the model as configured.

Table 2-6. Sierra Club's comparison of maximum and 99th percentile **values at the Martin Lake monitor, observed and Modeled for the 2017 – 2019 Period.**

Parameter	Ambient Monitor	AERMOD Modeling	AERMOD/Monitor Ratio
Maximum ($\mu g/m^3$)	418	526	1.3
99^{th} Percentile ($\mu g/m^3$)	285	378	1.3

2.4.1.10. The EPA's Assessment of the Modeling Information Provided by the Sierra Club

Sierra Club contends that the modeling demonstrates that SO_2 emissions from Pirkey Power Plant routinely contribute to violations of the 2010 SO_2 NAAQS at the Martin Lake monitor and the surrounding area's violations shown in Figures 2-15 and 2-16. The reasons Sierra Club states are that:

1. *Pirkey has a peak impact of 8.2 $\mu g/m^3$—well above what Sierra Club claims is EPA's one percent threshold for significant contribution—at the location of the Martin Lake monitoring station, approximately 1.9 km to the north of Martin Lake. Because Pirkey contributes up to 4.17% of the 196.2 $\mu g/m^3$ NAAQS at the nearby Martin Lake monitor—more than four times what Sierra Club claims is EPA's contribution threshold—the agency must include Pirkey as part of a broader nonattainment area that encompasses both plants.*
2. *Pirkey has a peak impact of 8.8 $\mu g/m^3$ at the location of the maximum impacts from both plants together—well above what Sierra Club claims is EPA's one percent threshold for significant contribution.*

EPA has examined Sierra Club's modeling analysis to determine what they deemed a "peak impact" and to determine if the analysis demonstrated a contribution of the Pirkey Power Plant to the Martin Lake nonattainment area.

Sierra Club's claim that EPA has established a one percent threshold for determination of either contribution or significant contribution for SO_2 matters is incorrect. CAA section 107(d) provides the agency with discretion to determine how best to interpret the terms in the definition of a nonattainment area (*e.g.*, "contributes to" and "nearby") for a new or revised NAAQS, given considerations such as the nature of a specific pollutant, the types of sources that may contribute to violations, the form of the standards for the pollutant, and other relevant information. In particular, EPA's position is that the statute does not require the Agency to establish bright line tests or thresholds for what constitutes "contribution" or "nearby" for purposes of designations.[10] Although Sierra Club is correct that the determination of whether an area contributes to nonattainment in a nearby area involves an assessment of whether the possibly contributing area "exacerbates" NAAQS violations in the nearby area, neither EPA nor any court has established for SO_2 a bright line test of any kind, whether based on a percentage of contribution of pollution to a violating ambient concentration or some other unit of measure, to conclude whether an area "exacerbates" a nearby area's NAAQS violation. Sierra Club asserts that the absence of the word "significant" in the CAA section 107(d)(1)(A)(i) definition of "nonattainment area" compels EPA to designate as nonattainment any area that has more than a "non-negligible" impact on

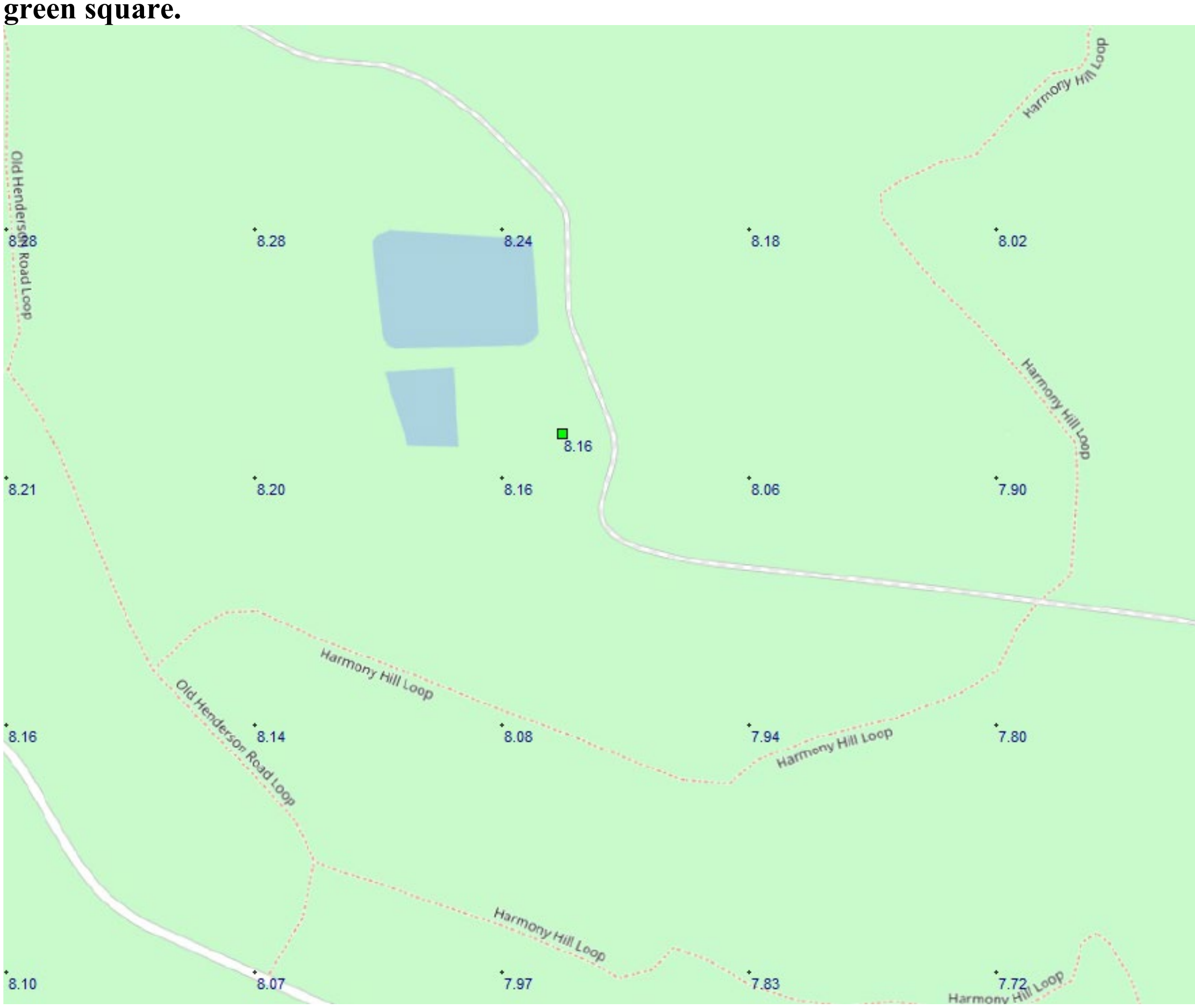
[10] This view was confirmed in *Catawba County v. EPA*, 571 F.3d 20 (D.C. Cir. 2009).

pollution levels in a nearby nonattainment area. But this assertion is too broad and overlooks the basic question of when and whether an area is contributing to actually NAAQS-violating concentrations when and where they occur in the nonattainment area. Applying either a simple 1% contribution test or unspecified “non-negligible” threshold of contribution to ambient concentrations in the nearby nonattainment area, without considering both the spatial and temporal relationships to when NAAQS violations occur in the area in order to determine whether the contributions exacerbate NAAQS violations, is not required under CAA section 107(d) or under the caselaw cited by Sierra Club, and would represent a departure from EPA’s approach in issuing SO_2 designations to date (and indeed from how EPA is determining whether an area contributes to NAAQS violations in other areas being designated in this action (see, *e.g.*, Whatcom County, Washington, addressed in Chapter 10 of this final designations TSD)).

Alternatives for the definition of peak impact are (1) the maximum concentrations of Pirkey Power Plant modeled alone at the locations cited, or (2) coincident impacts of Pirkey Power Plant with Martin Lake at these locations during an hour of modeled or monitored nonattainment. The distinction is important since EPA considers a contribution to nonattainment as a source having an impact at the same time and location of a measured or modeled violating concentration occurs, to determine whether that source exacerbates such a NAAQS violation. Any impacts that a source has at other hours of the year are not contributions to nonattainment. The locations cited for both of Sierra Club’s claims of contribution to violations are to the north of Martin Lake. These locations indicate that the peak impacts cited must be that of Pirkey Power Plant modeled alone since in AERMOD two sources cannot both contribute during the same hour at a location intermediate between the two sources. This would require the wind to blow in two different directions whereas in AERMOD the wind direction is fixed during a single hour. Also, examination of the modeling files shows that the peak impact magnitudes cited by the Sierra Club correspond to the maximum 3-year average 4^{th} high concentrations from AERMOD source group P_nobkg which has a single source, Pirkey Power Plant. For example, Figure 2-16 shows the 3-year average 99^{th} percentile values at the monitor site, demarked by the green square and other receptor locations nearby.

Figure 2-16. Predicted 99^{th} Percentile Daily Maximum 1-Hour SO_2 Concentrations for Pirkey Power Plant Emissions Alone, Averaged Over Three Years near the DRR monitor

in the Martin Lake Nonattainment area. The location of the DRR monitor is denoted by the green square.



The Sierra Club's peak impacts cited as evidence of contributing to violations are thus single-source maximum 99th percentile concentrations from Pirkey Power Plant and do not reflect coincident impacts of Pirkey Power Plant and other sources at locations and times of modeled violations.

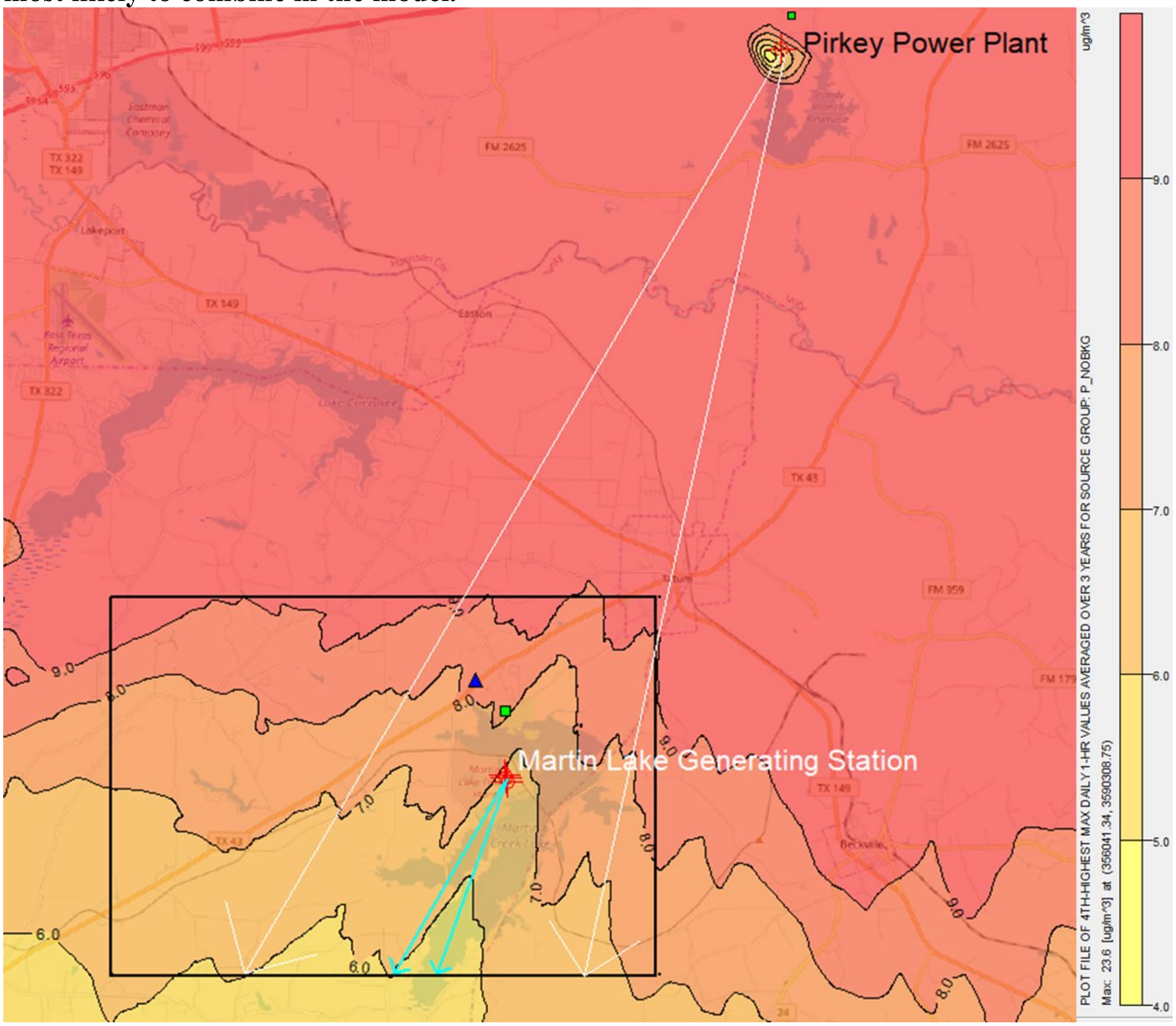
EPA has established a procedure for determining contribution to nonattainment given in the EPA's NO_2 Clarification Memo, which was issued as EPA guidance for the Prevention of Significant Deterioration (PSD) program.[11] Although the PSD memo does not say that it applies to NAAQS designations, such as the 2010 SO_2 NAAQS, a similar contribution analysis examines all cases where the cumulative concentration exceeds the 2010 SO_2 NAAQS at or below the 99th percentile. Therefore, the contribution analysis examines every multiyear average

[11] See Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2, National Ambient Air Quality Standard, March 1, 2011, https://www3.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf.

of same-rank daily maximum 1-hour values, beginning with the 4th-highest (99th-percentile), continuing down the ranked distribution at each receptor until the cumulative concentration is below the 2010 SO_2 NAAQS. Since the results of this procedure, or any other procedure investigating coincident impacts, were not included from Sierra Club's submission, EPA cannot determine whether Pirkey Power Plant contributes to the Martin Lake nonattainment area.

If there is a modeled contribution to nonattainment, it would occur to the south of Martin Lake, roughly in line with a vector from Pirkey Power Plant to Martin Lake. Figure 2-17 is an illustration of where any potential contributions from Pirkey would likely combine with emissions from Martin Lake. For purposes of illustrating collocated impacts, the white arrows are ± 10° from the vector connecting Pirkey and Martin Lake and the blue arrows are ± 10° from the same vector but originating at Martin Lake. The combination of impacts of the emissions from both sources would tend to be highest where the two sets of vectors overlap. The contours on the plot indicate that Pirkey Power Plant has the potential to cause 99^{th} percentile concentrations of 6-7 $\mu g/m^3$ in the area of overlap. As shown in Figure 2-15, there are modeled locations of nonattainment in the overlap area that have the potential to reflect contributions by Pirkey Power Plant. However, the available data does not demonstrate the coincidence of these two events. We cannot determine based on Sierra Club's analysis if the modeled concentrations from Pirkey would occur at the same time as nonattainment caused by the emissions from Martin Lake. Consequently, we are unable to determine, based on available information, whether Harrison County exacerbates and therefore contributes to SO_2 NAAQS violations in the nearby Rusk and Panola Counties nonattainment area.

Figure 2-17. Predicted 99th Percentile Daily Maximum 1-Hour SO2 Concentrations for Pirkey Emissions Alone, Averaged Over Three Years near the Martin Lake Nonattainment area. The location of EPA's final nonattainment area boundary for the Martin Lake area denoted by a Black Rectangle, the DRR monitor by the green square and the location of maximum 99th percentile concentrations from Martin Lake by a blue triangle. The area enclosed by the blue arrows are where emissions from Pirkey and Martin Lake would be most likely to combine in the model.



2.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Harrison County, Texas Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

2.6. Jurisdictional Boundaries in the Harrison County, Texas Area

EPA considers existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary for carrying out the air quality planning and enforcement functions for the area. Our goal is to base designations on clearly defined legal boundaries that align with existing administrative boundaries when reasonable.

In its September 18, 2015 recommendation letter, Texas recommended that the Harrison County area, as one of the Texas counties without an SO_2 monitor, be designated as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the State's recommended boundaries consist of the boundaries of Harrison County. Texas, however, provided EPA with this recommendation prior to the installation and operation of an EPA-approved monitor and before the State had monitoring data for the 2017-2019 period and in the absence of any modeling analysis. Texas agreed with our intended attainment/unclassifiable designation for Harrison County in their 2020 letter.[12] Because of the receipt of new information in Sierra Club's comments on our intended designation, EPA does not agree with Texas' recommendation as to the designation category and is designating all of Harrison County, Texas, as described below, as unclassifiable for the 2010 SO_2 NAAQS based upon currently available monitoring information for the 2017-2019 period and our consideration of dispersion modeling submitted by the Sierra Club. As part of its comments, Sierra Club asserted that EPA should designate Harrison County and some portion of Rusk County as a single nonattainment area consistently with how EPA in some cases examines or designates areas under the ozone and particulate matter NAAQS based on Core Based Statistical Areas (CBSAs). Although such an approach can be a reasonable starting point of analysis for designating areas in the context of more regional-oriented pollutants such as ozone and particulate matter, to date EPA has not used this approach in SO_2 designations, and did not propose to do so in the intended Round 4 designations. Moreover, under the court order, EPA's duty is to complete designations of the remaining undesignated areas in the U.S., which does not include any portion of Rusk County. Consequently, our intended boundaries are consistent with the State's recommended boundaries and are described below.

2.7. Other Information Relevant to the Designation of the Harrison County, Texas Area

EPA did not receive additional information relevant to the designation of this area, with the exception of previous modeling from 2016 that was utilized to support the previous nonattainment designation of the Martin Lake area, as discussed above.

[12] Letter from Governor Abbott to Andrew Wheeler, October 16, 2020 in the docket for this action.

2.8. EPA's Assessment of the Available Information for the Harrison County, Texas Area

A monitor in the Harrison County, Texas area is attaining the 2010 SO_2 NAAQS based on the 2017-2019 design value. During the public comment period, the Sierra Club submitted air dispersion modeling claiming to demonstrate contribution from the Pirkey Power Plant in Harrison County to a modeled nonattainment area in neighboring Rusk and Panola Counties, Texas.

Due to the remaining uncertainty in Sierra Club's modeling of impacts from Martin Lake due to synthetic variable velocities and fixed average temperatures, and the overprediction at the monitor with the Sierra Club modeling inputs, EPA believes that the Sierra Club's September 2020 modeling not provide sufficient evidence to find that in Harrison County, Texas should be designated as nonattainment based on a contribution to nonattainment in Rusk and Panola Counties, Texas, and based on available information we are unable to determine whether Harrison County contributes to the SO_2 NAAQS violations near Martin Lake.

The modeling submitted by the Sierra Club also has uncertainty in its modeled concentrations for the Pirkey Power Plant in the nonattainment area in Rusk and Panola Counties due to misconfiguration of the buildings modeled for the Pirkey Power Plant. EPA determined that while building wake effects would be modeled with Sierra Club's configuration that wake effects would have been reduced or absent if the buildings had been properly configured. Although the largest effect of the building wake on modeled concentrations occurs nearest to the Pirkey source, without correcting the error and remodeling we cannot determine the magnitude of the effect on modeled concentrations in the nonattainment area surrounding Martin Lake.

We also note that there is additional uncertainty in Sierra Club's modeling due to synthetic variable velocities for Martin Lake and Pirkey Power Plant and the use of fixed average temperatures for Martin Lake. The model estimated maximum and 99th percentile values higher than the maximum and 99th percentile concentrations at the Martin Lake monitor by a factor of 1.3, as noted by Sierra Club in their modeling report, and indicates that there is a degree of overestimation in the modeling analysis when using Sierra Club's modeling inputs.

The analysis of the modeling submitted by the Sierra Club did not contain our recommended procedure to determine contribution to nonattainment, as described above. A contribution by a source to nonattainment necessitates a determination of the concentrations caused by the source at the time and location of modeled nonattainment. Sierra Club's analysis determined only that Pirkey Power Plant is capable of causing concentrations of up to 7 $\mu g/m^3$ in locations of nonattainment near Martin Lake and where the plumes could overlap in the model. Their analysis did not consider whether these modeled Pirkey Power Plant impacts were coincident with the modeled periods of NAAQS violations.

EPA believes that the Sierra Club's 2020 modeling analysis is not a sufficient basis to find that in Harrison County, Texas should be designated as nonattainment based on a contribution to nonattainment in Rusk and Panola Counties, Texas. Therefore, EPA is unable to determine, based on available information, whether Harrison County contributes to violating air quality in the nearby Martin Lake nonattainment area. However, EPA considers that even with the uncertainties noted above that the Sierra Club modeling indicates that Pirkey may have the potential to contribute to modeled nonattainment near Martin Lake. We recommend that Pirkey Power Plant's emissions should be considered in any future modeling for an attainment demonstration in the Martin Lake nonattainment area. Due to the uncertainty in the modeled concentrations and omission of analysis as to whether the modeled Pirkey Power Plant impacts were coincident with the modeled NAAQS violations, an unclassifiable designation is appropriate because EPA does not have available information providing a clear basis for designating Harrison County as either nonattainment or attainment/unclassifiable.[13]

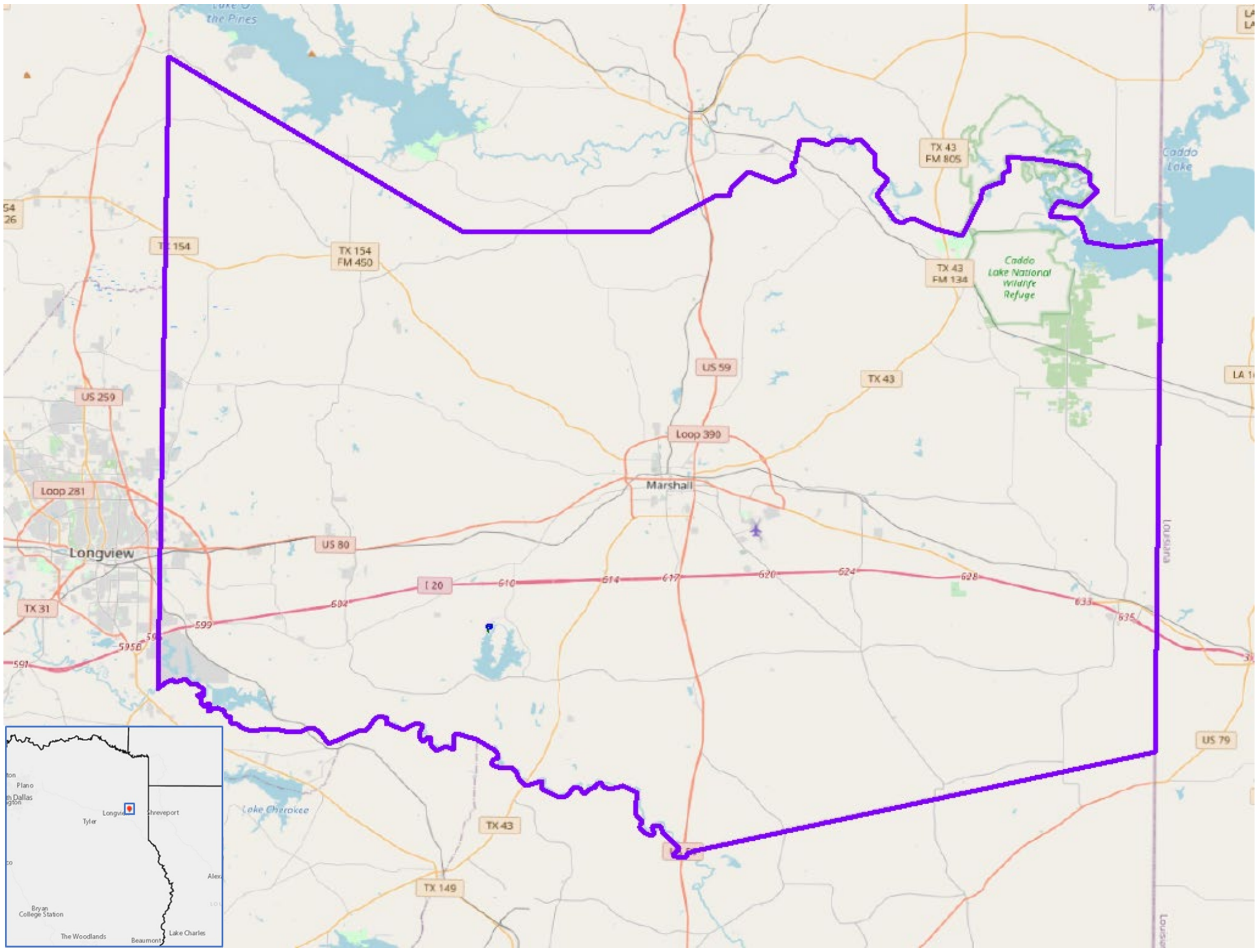
The EPA believes that our final unclassifiable area, bounded by the borders of Harrison County, has clearly defined legal boundaries, and we find these boundaries to be a suitable basis for defining our unclassifiable area.

2.9. Summary of EPA's Final Designation for the Harrison County, Texas Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA is designating Harrison County as unclassifiable for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the boundary of Harrison County with neighboring counties. Figure 2-18 shows the boundary of this designated area.

[13] Section 107(d)(1)(A)(i) of the CAA defines a nonattainment area as an area that does not meet the NAAQS or that contributes to a nearby area that does not meet the NAAQS. An attainment area is defined by section 107(d)(1)(A)(ii) of the CAA as any area (other than an area that meets the definition of a nonattainment area) that meets the NAAQS. Unclassifiable areas are defined by section 107(d)(1)(A)(iii) of the CAA as those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS.

Figure 2-18. Boundary of the Final Harrison County, Texas Unclassifiable Area



3. Technical Analysis for the Howard County, Texas Area

3.1. Introduction

EPA must designate the Howard County, Texas area by December 31, 2020, because the area has not been previously designated and Texas installed and began operating a new EPA-approved monitor pursuant to EPA's SO_2 Data Requirements Rule(DRR).[14] This section presents all the available air quality information for the portion of Howard County, Texas that includes the following SO_2 source around which the DRR required the state to characterize air quality:

- The Big Spring Carbon Black facility (also referred to as the Tokai Carbon Black facility) emits 2,000 tons or more of SO_2 annually. Specifically, Big Spring Carbon Black emitted 5,947 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Texas has chosen to characterize it via monitoring.

As seen in Figures 3-1 and 3-2 below, the Big Spring Carbon Black facility is located in west Texas about 3.5 km to the east of Big Spring, Texas on the west side of North Midway Road, just to the north of Interstate 20. The DRR monitor is located across North Midway Road approximately 0.15 km to the northeast of the Big Spring Carbon Black facility.

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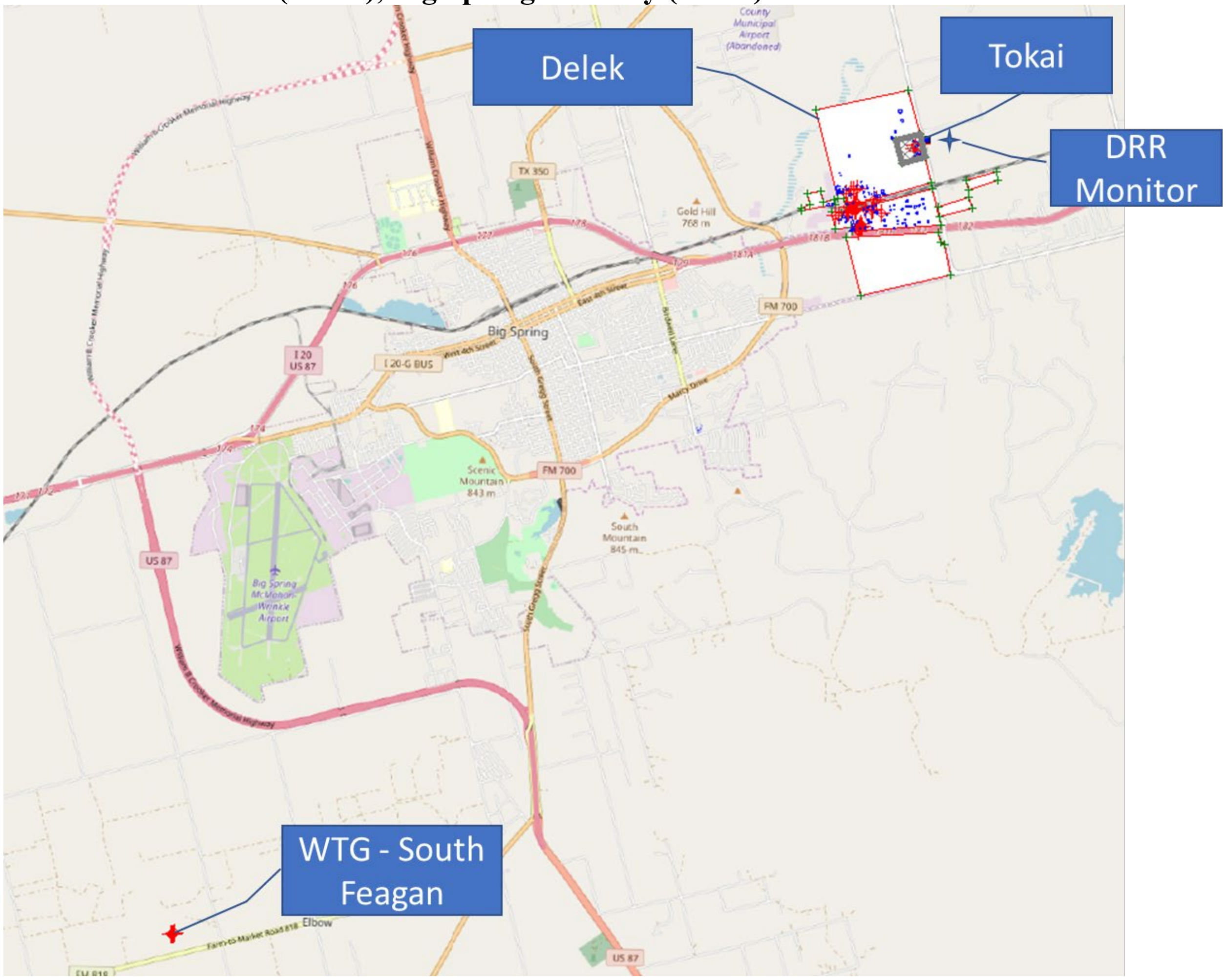
[14] *See* 80 FR 51052 (August 21, 2015), codified at 40 CFR part 51 subpart BB.

Figure 3-1. Map of the Howard County, Texas Area Addressing the Big Spring Carbon Black Plant and Other SO_2 Sources.

Figure 3-2. Detail Map of the Howard County, Texas Area Addressing the Big Spring Carbon Black Plant (Tokai), Big Spring Refinery (Delek) and DRR Monitor Locations.



3.2. Summary of Information Reviewed in the TSD for the Intended Round 4 Area Designations

In its September 18, 2015 recommendation letter, Texas recommended that Howard County be designated as attainment for the 2010 SO_2 NAAQS. Specifically, the State's recommended boundaries consist of the borders of Howard County. Texas, however, provided the EPA with this recommendation prior to the identification of existing SO_2 monitors and prior to the installation and operation of the EPA-approved monitor and before the State had monitoring data for the 2017-2019 period. Texas updated its recommendation on October 16, 2020, after these monitoring data became available, to unclassifiable[15]. The State of Texas also indicated that if EPA designates the area nonattainment, the size of the nonattainment should be limited to the area surrounding the property of Tokai and Delek. EPA does not agree with Texas' recommendation as to the designation category and is designating a portion of Howard County,

[15] Letter from Governor Abbott to EPA Administrator Andrew Wheeler, October 16, 2020.

Texas, as described below, as nonattainment for the 2010 SO_2 NAAQS based upon currently available monitoring and modeling information for the 2017-2019 period. The remainder of Howard County, Texas is designated as attainment/unclassifiable. Our boundaries are not consistent with the State's recommended boundaries and are described below.

EPA finds that multiple sources of SO_2 within Howard County may cause or contribute to violations of the 2010 SO_2 NAAQ. No other sources in neighboring counties would be expected to control their SO_2 emissions to bring Howard County into compliance with the standard.

EPA believes that our intended nonattainment area, will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended nonattainment area.

3.3. Air Quality Monitoring Data for the Howard County, Texas Area

In the TSD for the intended area designations, EPA considered design values for air quality monitors in the Howard County, Texas area. Specifically, EPA determined that the Howard County monitor (AQS ID# 48-227-1072) violated the 2010 SO_2 NAAQS with a 2017-2019 design values of 89 ppb. EPA has no new quality assured monitoring information that warrants revising our prior analysis of available monitoring data.

EPA considered design values for air quality monitors in the Howard County, Texas area by assessing the most recent 3 consecutive years (i.e., 2017-2019) of quality-assured, certified ambient air quality data in the EPA Air Quality System (AQS) using data from Federal Reference Method and Federal Equivalent Method monitors that are sited and operated in accordance with 40 CFR parts 50 and 58.[16] Procedures for using monitored air quality data to determine whether a violation has occurred are given in 40 CFR part 50 Appendix T, as revised in conjunction with the 2010 SO_2 NAAQS. The 2010 1-hour SO_2 NAAQS is met when the design value is 75 ppb or less. Whenever several monitors are located in an area, the design value for the area is determined by the monitor with the highest valid design value. The presence of one or more violating monitors (i.e., monitors with design values greater than 75 ppb) in a geographic area forms the basis for designating that area as nonattainment. The remaining factors, described in the next section, are then used as the technical basis for determining the spatial extent of the designated nonattainment area surrounding the violating monitor. Table 3-1 contains the 2017-2019 design values for the area of analysis.

[16] SO_2 air quality data are available from EPA's website at *https://www.epa.gov/outdoor-air-quality-data*. SO_2 air quality design values are available at *https://www.epa.gov/air-trends/air-quality-design-values*.

Table 3-1. 2010 SO_2 NAAQS Design Values for the Howard County, Texas Area

AQS Site ID	Monitor Location	2017 99th Percentile (ppb)	2018 99th Percentile (ppb)	2019 99th Percentile (ppb)	2017-2019 Design Value (ppb)
48-227-1072	1218 N. Midway Rd	88.2	99.3	79.6	**89**

The certified design value for the monitor violates the standard. Ambient air quality monitoring data affected by exceptional events may be excluded from use in identifying a violation if they meet the criteria for exclusion, as specified in the final rule "Treatment of Data Influenced by Exceptional Events" (81 FR 68216; October 3, 2016) codified in 40 CFR parts 50 and 51. In Section VII.B of the SO_2 NAAQS final rule preamble, we discussed schedules for states and tribes to flag data influenced by exceptional events and submit related documentation specifically for SO_2 data used in the initial designations process. For completeness we cite below analyses submitted by the State and industry representatives purporting to show that the hourly SO_2 concentrations exceeding the level of the NAAQS causing the monitor to produce a violating design value were the result of non-routine emissions and non-permitted excess emissions events at the Tokai Carbon Black Plant and the Delek Refinery, but not due to exceptional events as defined by our 2016 rule. Thus, these analyses removed data which are not covered by our rule. Both of the analyses removed the daily maximum hourly concentrations on selected days from the record and then recalculated the design value with the daily maximum concentrations for the remainder of the days. The days and hours removed were those that the State and/or industry deemed to be caused by emissions events at one of the plants. The EPA exceptional events policy[17] does not allow for removal of certified monitor observations associated with non-routine or excess emissions events from design value calculations, thus the recalculations conducted by the State and by industry do not influence our review of the monitor data in designating Howard County as nonattainment.

State and industry analyses also present this data along with modeling to support their position that *but-for* the excess emissions events the monitor would not have violated the NAAQS. We discuss the modeling in a separate section below. Excess emissions events with SO_2 releases greater than the reportable quantity of 500 pounds were reported to TCEQ.[18] There were 56 such events over the 3-year monitoring period: 32 for Tokai and 24 for Delek. Eight of these events occurred on days for which the monitor recorded a maximum one-hour SO_2 concentration above the level of the NAAQS. Table 3-2 gives the dates and average event emission rates for the coincident events. Note that in this analysis there were no coincident exceedances and reportable emission events identified in 2019.

[17] April 4, 2019 clarification memorandum on data modification methods, Chet Wayland, Additional Methods, Determinations, and Analyses to Modify Air Quality Data Beyond Exceptional Events.

[18] Emissions Event Reporting and Recordkeeping Requirements, Texas Administrative Code (TAC), 30 TAC 101.201

Table 3-2. Coincident emission events and NAAQS Exceedances for the DRR Monitor with the Event-Average Emission Rates for Delek and Tokai in Pounds Per Hour.

Year	Date	Daily Max SO_2 (ppb)	Avg. Delek Emission Rate (lb/hr)	Avg Tokai Emission Rate (lb/hr)
2017	24-Jan-17	98.1	169.3	-
2017	20-Nov-17	79.6	19.1	-
2017	23-Dec-17	107.3	209.0	-
2018	07-Jan-18	77.4	-	705.9
2018	10-Jan-18	76.1	-	705.9
2018	19-Jan-18	133.5	-	783.9
2018	09-Mar-18	460	717.1	-
2018	17-Nov-18	91.7	-	452.7

Industry subtracted all days on which a reportable event occurred plus they subtracted an additional 12 days with smaller, nonreportable events which were recorded in their on-site records. The subtraction of the additional days would indicate that small additional releases of SO_2 could cause nonattainment at the monitor. The State subtracted all days on which a reportable event occurred plus subtracted the day before the event started and the day after the event ended. The State asserted that the added days were justified due to uncertainty about when events actually began and in order to allow time for emissions to be transported after an event ended. Both of these recalculated design values were below the NAAQS at the monitor; the State's value was specified as 73 ppb and industry's value was not specified other than as below the NAAQS.

In a supplementary comment received on 11/15/2020 the State used a different approach to recalculating the design value for an unspecified period by subtracting days covered by 9 reportable excess emissions events in 2017-2020[19] plus 2 additional events in 2020 for which permitted emissions were thought to cause exceedance of the NAAQS level. One of these 2020 events was due to flaring during a turnaround and the other due to a duct leak allowing part of the flow to escape near the ground rather than be emitted from the stack. The State did not specify the recalculated design value but stated that it was below the NAAQS. The State comment claims that the flaring during turnaround would be prohibited in the future and that the second event due to a duct leak would be addressed by enhanced inspections in the future. Additional monitored NAAQS exceedances of 91.9 ppb and 81.0 ppb, unexplained at the time of this writing, occurred on 11/25/2020 and 12/1/2020.

For comparison purposes only (discounting monitoring data for regulatory purposes is not allowed under EPA's monitoring data guidelines unless the exceedances meet the statutory requirements in Section 319(b) of the CAA and the implementing regulations in the Exceptional Events Rule), the EPA recalculated the design value for 2017-2019 subtracting only the days with reportable excess emissions events. The recalculated design value obtained was 81 ppb, violating the 75 ppb 2010 SO_2 NAAQS. EPA concludes that the State and industry analyses do

[19] The updated State analysis included a 149-day long event in 2019, excluded from their previous analysis because its inclusion would cause an invalid design value due to incomplete data, which was coincident with four exceedances at the monitor during that period.

not show conclusively that the violations at the monitor are due solely to excess emissions events at the facilities. Neither conducted a culpability analysis with modeling or additional analysis showing that the releases which occurred during the events could cause high concentrations at the monitor on the days of concern. TCEQ and industry have not linked many of the hourly exceedances to a non-routine emissions event, suggesting that normal operations can result in monitored exceedances. In their comments, industry claims that corrective measures to address the non-routine emission events were implemented by April 2020. Since that time, however, there have been 4 additional monitored exceedances of the 1-hour NAAQS, with the most recent exceedance of 81 ppb occuring on December 1, 2020.

Days on which excess emissions events at Tokai Carbon Black or Delek Refinery were frequent over the monitoring period. The number of days affected for each year are: 32 days in 2017; 32 days in 2018; and 55 days in 2019 (excluding an event with a duration of 149 days). Over the three-year period nearly 11% of all days were affected by a reportable excess emissions event. If the distribution of event-days and exceedance-days were random then it would be expected that roughly 1 out of 10 exceedance days would be paired in time with an event. The actual frequency of association is 8 out of 22; about 1 in 3 exceedance days are paired in time with a reportable event. This indicates that a reportable event increases the incidence of exceedances but also shows that a reportable event is not required for an exceedance.

There has been two additional days with preliminary 1-hour values above 75 ppb with unexplained reasons for the monitored values (91.9 ppb on 11/26/2020 and 81.0 ppb on 12/1/2020).

Certified data collected at this monitor indicates that the monitor had complete data in all years for all four quarters and is valid for comparison with the 2010 SO_2 NAAQS. The 99th percentile concentration in each year was greater than the level of the 2010 SO_2 NAAQS and the 3-year design value was 19% above the 2010 SO_2 NAAQS. Therefore, a portion of the area must be designated nonattainment because of the violating monitor.

3.4. Assessment of New Technical Information for the Howard County, Texas Area Addressing Big Spring Carbon Black and Delek Refinery

In its October 16, 2020, revised designation recommendation letter, Texas provided an air quality modeling analysis for the area surrounding the Big Spring Carbon Black Plant and Delek Refinery. Industry also provided a similar modeling analysis. The purposes of this modeling were (1) to attempt to demonstrate that for the 2017-2019 period, the area would have attained the 2010 SO_2 NAAQS if not for non-routine emission events and (2) if EPA decided to designate the area as nonattainment to give information to help define the boundaries of the nonattainment area. Because of the two different purposes of the modeling, different EPA guidance applies to each. In the first case our relevant guidance is Appendix W and our Round 4 SO_2 designations guidance memorandum, which apply to attainment demonstrations for areas with violating monitors. In the second case, EPA's relevant guidance is the Modeling TAD and the Round 4 SO_2 designations memorandum guidance on modeling to evaluate the geographic extent of the violating areas and inform the boundaries of nonattainment areas.

Texas states that new federally enforceable and in effect limits on the operation of certain SO_2 sources with non-routine emissions when combined with new work practices will eliminate these non-routine emission from occuring in the future.[20] Texas modeled emission rates based on actual annual emissions for primary routine emissions for the period for comparison to the 2010 SO_2 NAAQS even though the monitor in the area indicates a violation of the 2010 SO_2 NAAQS. EPA notes that this modeling is inconsistent with our September 2019 guidance memorandum that explains that for areas with a monitored violation of the NAAQS, modeling of new allowable emissions, which should follow the Guideline on Air Quality Models (Appendix W to 40 CFR part 51), can be relied upon to provide a more accurate characterization of current conditions at the time of designation than does monitoring of past conditions. To demonstrate that an emission limit will provide for NAAQS attainment for a short-term standard, Appendix W requires modeling of a five-year period based on: (the maximum allowable emission limit or federally enforceable permit limit) times (the actual or design capacity (whichever is greater) or federally enforceable permit condition) times (continuous operation, *i.e.* all hours of each time period under consideration (for all hours of the meteorological database))[21]. Modeling of actual emissions may be used to inform boundary decisions for nonattainment areas.

However, when using the “actual emissions” approach, rather than a more conservative approach based on allowable emissions, it is necessary to provide as accurate a representation as possible of the actual emissions history of the source of the relevant time period. In the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used.[22]

Texas’s and Industry’s assessments and characterizations were performed using air dispersion modeling software, i.e., AERMOD, analyzing a hybrid of an annualized average of actual emissions and allowable emissions for sources combined with new work practices. After careful review of the State’s and Industry’s assessments, supporting documentation, and all available data, the EPA does not agree with the State’s unclassifiable designation recommendation nor the State’s nonattainment boundary (provided only if EPA designated the area nonattainment) for the area, and is designating the area as nonattainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

The area that the State has assessed via air quality modeling is located in Howard County, Texas, covering the central and southeastern portion as shown in Figures 3-3 and 3-4.

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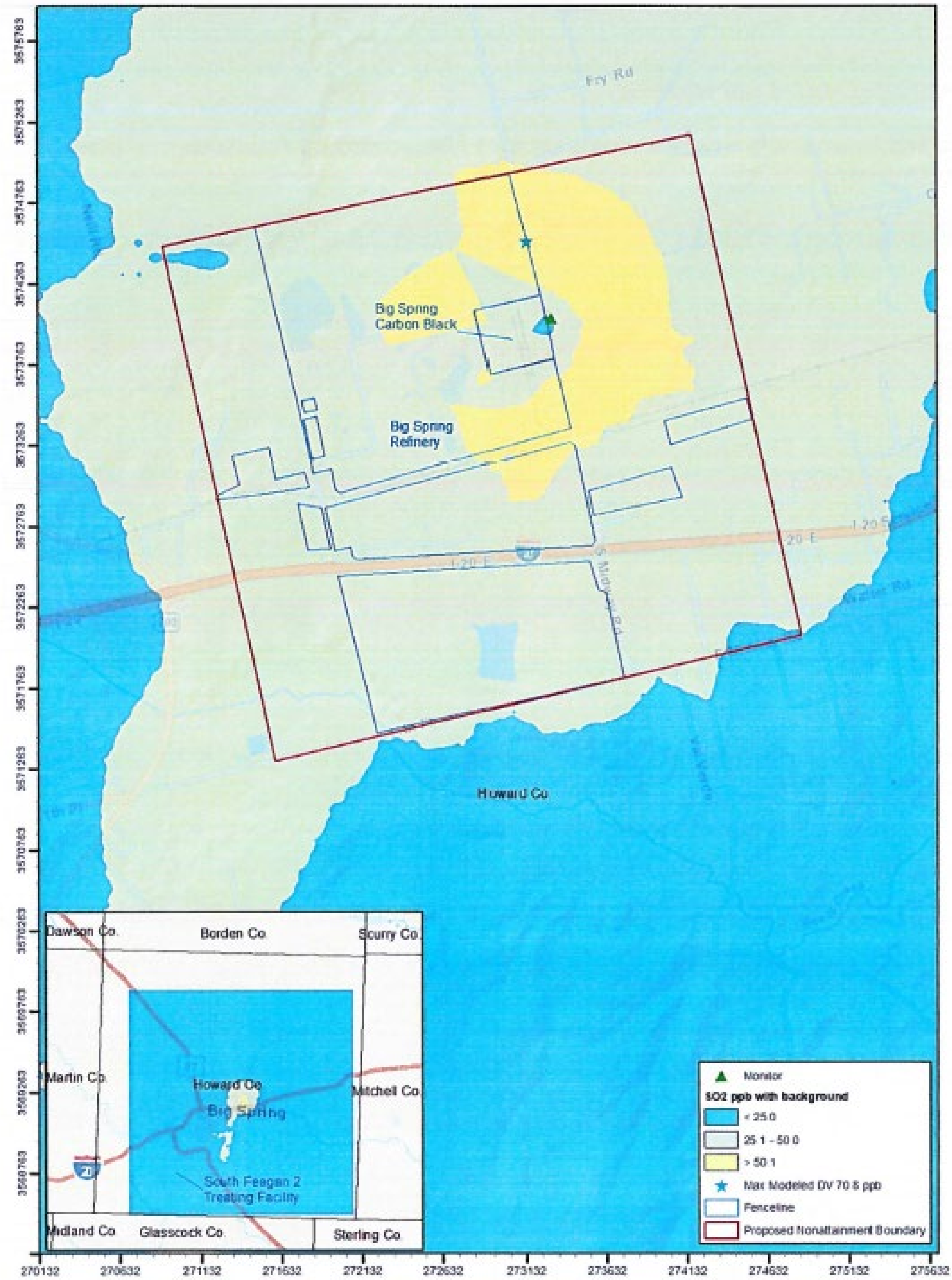
[20] As discussed above, in their comments, industry claims that corrective measures to address the non-routine emission events were implemented by April 2020. Since that time, however, there have been 4 additional days with hourly exceedances of the 2010 1-hour SO_2 NAAQS, with the most recent exceedance of 81 ppb occuring on December 1, 2020.

[21] 40 CFR part 51, appendix W, Table 8-1

[22] EPA SO_2 Modeling Technical Assistance Document, Section 5.2

Figure 3-3. The State's area of Analysis for Howard County, Texas. Plot produced by EPA from State's Modeling Files.

Figure 3-4. Detail of the Tokai Carbon Black Plant and Delek Refinery Showing the Location of the Area of Analysis and Results of State's Modeling Analysis as Given in the State's Letter of Recommendation.



Also included in the figures are other nearby emitters of SO_2. These other nearby sources are listed in Table 3-3 below.

The discussion and analysis that follows below will reference the *Guideline on Air Quality Models* (Appendix W to 40 CFR part 51) and the factors for evaluation contained in the EPA's September 5, 2019, guidance, July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

For this area, the EPA received and considered 2 different modeling assessments, including 1 assessment from the State and 1 assessment from industry. To avoid confusion in referring to these assessments, the following table lists them, indicates when they were received, provides an identifier for the assessment that is used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

Table 3-3. Modeling Assessments for the Howard County, Texas Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
TCEQ	10/16/2020	TCEQ	Included no flares at Tokai but included WTG emissions. Smaller Area of Analysis
Delek and Tokai	9/21/2020	Industry	Included assessment of flare emissions at Tokai but without WTG emissions. Larger Area of Analysis

3.4.1. Modeling Analysis Provided by the State

The State's modeling analysis provided was compiled by Atmospheric and Environmental Research (AER) and consisted of a modeling report and the modeling files. Though the report is dated May 7, 2020, it had been subsequently updated (October 2020) to use 2017-2019 emissions and meteorology and to modify the parameters used to model flare sources at Delek. To reduce confusion, we note where the information modeling report departs from the data contained in the modeling files. The State's modeling was intended to follow Appendix W because the State was attempting to support a designation other than nonattainment by following EPA's September 5, 2019, Round 4 guidance memorandum.

3.4.1.1.Model Selection and Modeling Components

Appendix W recommends the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD

- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The State used AERMOD version 19191. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

3.4.1.2.Modeling Parameter: Rural or Urban Dispersion

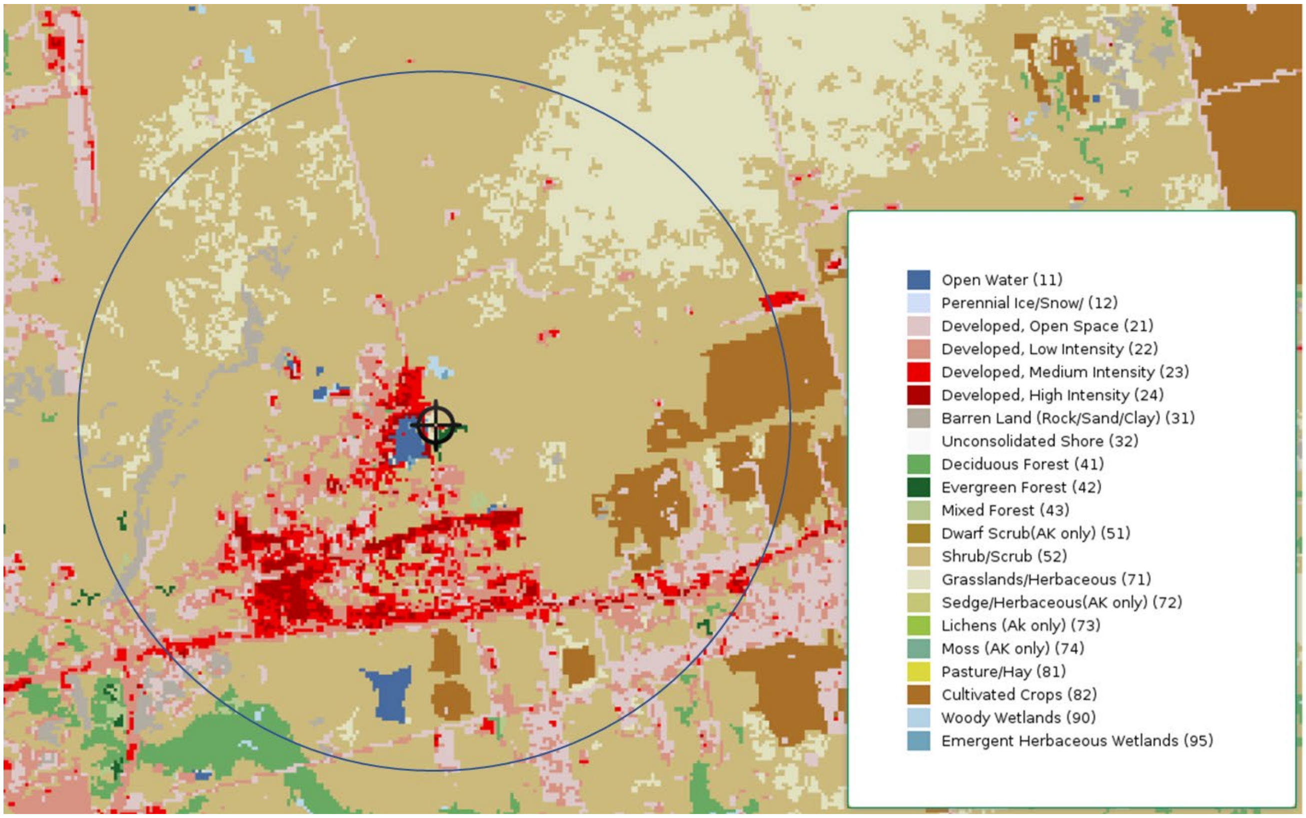
For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, the State determined that it was most appropriate to run the model in rural mode.

The State did not explain the characterization of the area as rural. Figure 3-5 is a plot of 2016 NLCD Land Cover type with a circle depicting a 3km radius around the facility[23]. The vast majority of the land use within 3km is not one of the developed types. EPA concurs that the area around the facilities is rural in character and that the use of the rural dispersion option is appropriate.

[23] Multi-Resolution Land Characteristics Consortium Viewer, https://www.mrlc.gov/viewer/.

Figure 3-5. 2016 Land Use Around the Tokai Carbon Black Plant with a Circle of Radius 3 kilometers.



3.4.1.3.Modeling Parameter: Area of Analysis

Appendix W recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in Appendix W include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to this section. For the Howard County, Texas area, the State has included two other emitters of SO_2 within 20 km of the Tokai Carbon Black facility in any direction. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Tokai Carbon Black Plant, the other emitters of SO_2 included in the area of analysis are: Delek Refinery and WTG – South Feagen. No other sources beyond 20 km were determined by the State to have the potential to cause significant concentration gradients within the area of analysis.

The grid receptor spacing for the area of analysis chosen by the State is as follows:

The receptors consist of 2 nested grids centered around the facility. The inner most nest goes from the center of the facility out to 5 kilometers with a grid spacing of 100 meters. The second and outermost grid goes from 5 km to 20 km with a grid spacing of 500 meters. In addition to the nested grid there are receptor points added at the locations of the nearby monitor and receptor points located at 25-meter intervals along the property line shown in 4-5 and 4-6. All nested receptors within this property boundary have been removed. The receptor network contained 37,748 receptors, and the network covered the central and southern portion of Howard County, Texas, not including any portion of Glasscock County to the south. Figures 3-6 and 3-7, included in the State's recommendation, show the State's chosen area of analysis surrounding the Tokai Carbon Black Plant, as well as the receptor grid for the area of analysis.

Figure 3-6: Area of Analysis for the Howard County area Showing the Complete Receptor Field Centered on the Big Spring Facility

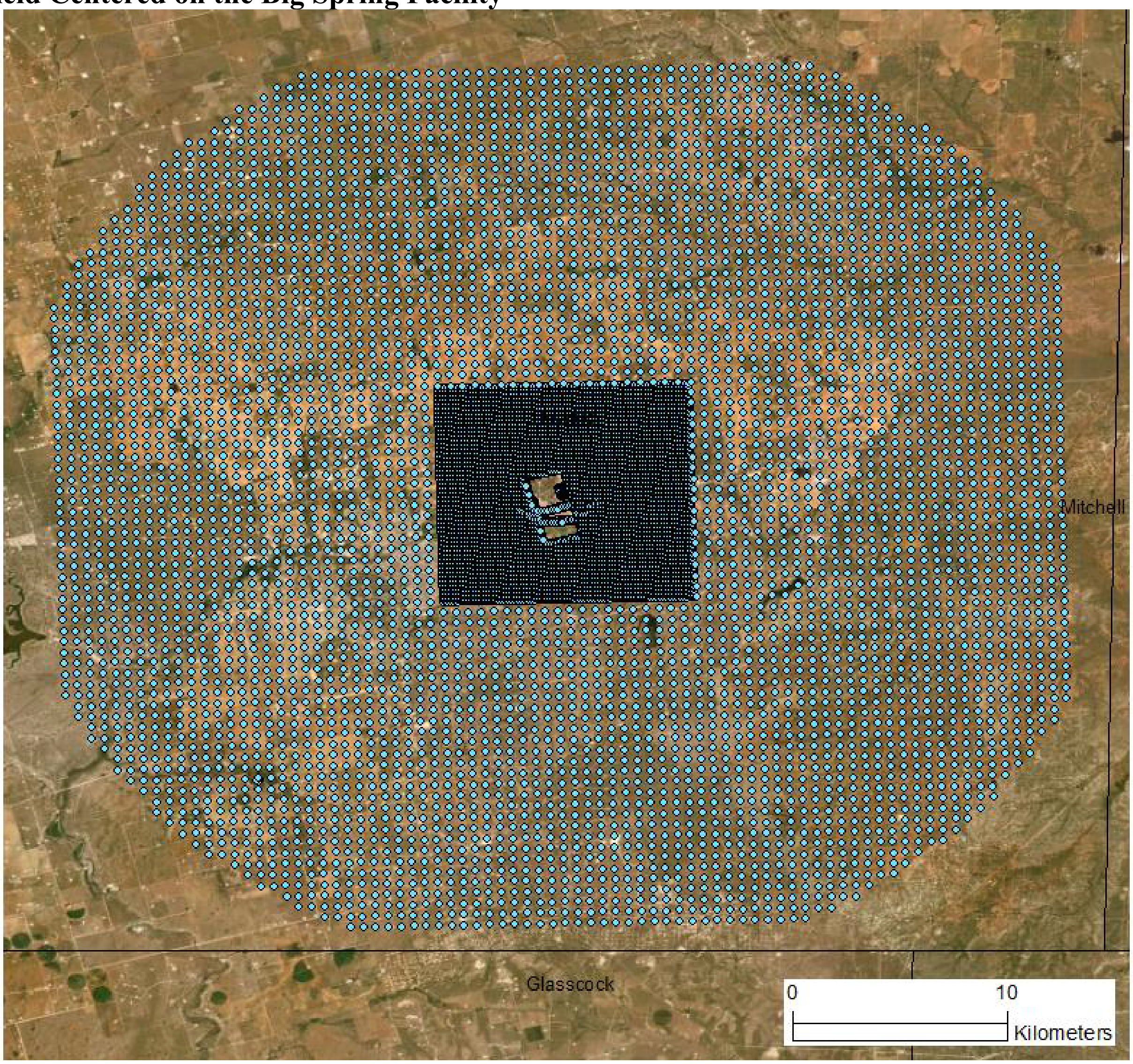
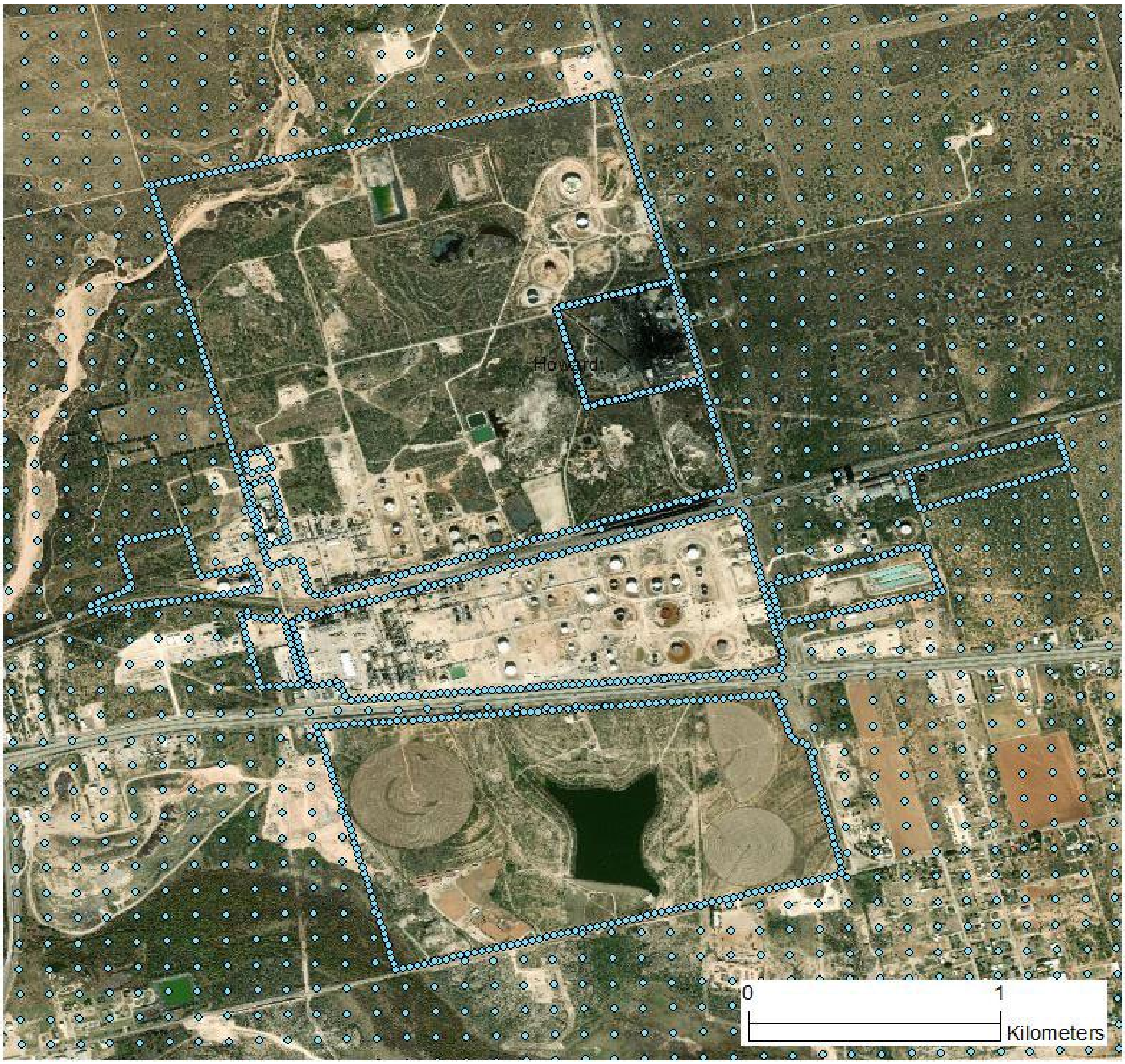


Figure 3-7: Zoomed-in Receptor Field Near the Tokai Carbon Black Plant and the Delek Refinery Showing Fenceline Receptors



Consistent with Appendix W, the State placed receptors for the purposes of this designation effort in locations that would be considered ambient air that are not on industry property. However, they did not place receptors to assess impacts by one facility on other facilities' property as required by Appendix W. An example of this omission is that the impact of Tokai sources on property belonging to Delek was not assessed. The State excluded receptors inside all facilities' fence lines with restricted access. While this omission of receptors on facilities would not be acceptable for use in determining whether an area is attaining the NAAQS (EPA would not be able to determine whether a violation would have occurred in one of the omitted areas), because these omitted areas are interior to EPA's final nonattainment boundary, they do not have an impact on the extent of the nonattainment area.

The receptor grid covered a sufficient distance from the Tokai Carbon Black Plant at a sufficient density to capture the gradients around the facility and to determine the maximum concentration among assessed receptors. The State excluded receptors on fenced company property which excluded the public. However, the State's receptor grid did not include coverage of impacts from each facility on other facilities' property.

3.4.1.4.Modeling Parameter: Source Characterization

Appendix W offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and additional details regarding good engineering practices (GEP) policy to be used when modeling allowable emissions.

The State included the DRR source, Tokai Carbon Black Plant, as well as other major SO_2 sources located within 20 km of the DRR source as shown in Table 3-4. Besides the Tokai facility, emission points were included at the Delek (Alon) refinery and the WTG South Feagan facility. The modeling parameters for these sources are shown in Table 3-5 for all 60 sources. Note that the modeling parameters shown in Table 11 of the State's report have been corrected to reflect the parameters and sources actually modeled.

Table 3-4. SO_2 Emissions of Other Nearby Sources Greater Than One TPY Near the Howard County, Texas DRR Monitor.

County	Facility Name	Distance from Violating Monitor (km)	2016 SO_2 Emissions (tons)	2017 SO_2 Emissions (tons)	2018 SO_2 Emissions (tons)
Howard	BIG SPRING REFINERY	1.4	721.8	769.8	937.4
Howard	BIG SPRING COGENERATION	1.6	0.4137	0.22	1.7
Howard	SOUTH FEAGAN 2 TREATING FACILITY	18.3	80.1	203.1	124.3
Howard	FRYAR TREATING FACILITY	18.3	8.4	Not Available	0.03
Howard	EAST VEALMOOR GAS PLANT	24.3	44.8	44.7	49.5
Glasscock	CORONADO MIDSTREAM DEADWOOD CRYO PLANT	38	125	145	30.8

Table 3-5. Sources Modeled by the State

Facility	Modeling ID	Height	Diameter (m)	Exit_Vel (m/s)	Exit_Temp (°K)	UTM East	UTM North
Alon	AC1HT23	15.849	1.158	2.621	553.706	272010.19	3572884.83
Alon	AIRHTR06	46.327	1.981	11.384	422.039	272203.28	3572631.73
Alon	BGVCMH02	26.547	0.914	6.096	594.261	272010.23	3572886.71
Alon	BOXAHT37	12.191	0.823	4.267	553.706	272462.38	3573102.96
Alon	BOXBHT37	12.191	0.305	4.267	553.706	272488.44	3573100.82
Alon	C8WSTH26	16.001	0.914	1.414	505.372	272156.24	3573045.51
Alon	CHRGAH02	44.346	3.047	7.62	533.15	272023.17	3572891.97
Alon	CHRGBH02	44.346	1.219	7.62	533.15	272023.17	3572891.97
Alon	CHRGDH02	43.584	2.286	3.779	560.928	272029.21	3572892.39
Alon	CHRGHT04	44.499	0.914	1.759	549.817	272124.50	3572912.76
Alon	CHRGHT05	50.594	3.048	2.405	505.372	272078.30	3572907.92
Alon	CHRGHT06	25.907	1.768	0.579	474.817	272215.06	3572656.76
Alon	CHRGHT09	24.992	0.61	4.054	574.817	272145.15	3573050.98
Alon	CHRGHT15	22.249	0.914	0.533	597.039	271999.13	3572983.71
Alon	CHRGHT80	32.612	0.914	1.158	422.039	271979.58	3573211.59
Alon	CLAYHT25	13.563	0.61	0.003	533.15	272128.13	3573014.97
Alon	CNDSRP69	53.337	0.914	13.289	553.706	272103.09	3573254.74
Alon	CNTCRP72	45.718	0.433	8.229	533.15	272075.03	3573264.58
Alon	CRUDEF02	60.957	0.6696	20	1273	271858.20	3572845.77
Alon	DEC5HT04	45.108	0.914	3.267	552.594	272141.11	3572917.93
Alon	DEC5HT05	40.536	0.914	2.14	480.372	272136.63	3572915.81
Alon	GSOILH23	15.239	0.914	2.066	503.706	272007.27	3572880.90
Alon	GTPOCP37	10.667	1.829	0.01	810.928	272413.06	3572913.91
Alon	GTWETP37	10.667	1.829	0.01	810.928	272413.06	3572913.91
Alon	HTOILH11	9.997	1.829	0.003	293.15	272221.14	3572658.51
Alon	HYDGNH77	26.791	0.853	1.92	505.372	272189.05	3572581.79
Alon	KTTLEH23	10.424	0.61	0.003	533.15	272004.17	3572885.30
Alon	NEASTF14	60.957	0.7052	20	1273	272172.04	3573281.81
Alon	PMAHTR37	7.62	0.762	9.144	366.483	272309.23	3572940.99
Alon	PMGTRF37	10.667	0.295	20	1273	272413.06	3572913.91
Alon	PMGTRH37	3.048	0.274	3.962	553.706	272434.12	3572940.62
Alon	REFMRF05	60.957	0.3172	20	1273	271798.97	3572831.68
Alon	REGENP06	46.327	1.981	11.384	422.039	272203.28	3572631.73
Alon	REHT1H05	50.594	3.048	2.405	505.372	272078.30	3572907.92
Alon	REHT2H05	50.594	3.048	2.405	505.372	272078.30	3572907.92
Alon	REHT3H05	50.594	3.048	2.405	505.372	272078.30	3572907.92
Alon	SOUTHF16	60.957	1.1192	20	1273	272581.42	3572868.29
Alon	STABLR80	18.287	0.61	5.059	599.817	272147.21	3573037.62
Alon	STM23B24	26.516	1.219	12.124	467.039	272228.05	3572684.87
Alon	STM24B24	19.811	1.829	15.727	617.594	272252.39	3572652.26
Alon	STRBRH77	18.226	0.853	2.865	505.372	272190.16	3572597.52

Alon	TGINC69	53.34	0.91	13.2886	553.70556	272102.99	3573254.74
Alon	TGINC71	45.72	0.43	8.2292	533.15	272074.84	3573264.58
Alon	WWVRUP20	60.957	0.762	0.53	810.928	272581.42	3572868.29
Tokai	DRY1006	60.347	1.311	28.04	560.928	273124.94	3573959.65
Tokai	DRYER22	60.347	1.649	28.04	560.928	273159.28	3573914.83
Tokai	DRYER23	60.347	1.649	28.04	560.928	273159.28	3573914.83
Tokai	DRYER24	60.347	1.649	28.04	560.928	273159.28	3573914.83
Tokai	POH1014	4.572	0.305	0.427	422.039	273245.39	3574030.61
Tokai	POH1015	4.572	0.305	0.183	422.039	273243.16	3574036.43
Tokai	PR1002	50.594	3.657	13.715	504.261	273134.48	3574010.91
Tokai	PR1004	50.594	3.657	13.715	504.261	273134.48	3574010.91
Tokai	PR1007	50.594	3.657	13.715	504.261	273134.48	3574010.91
WTG	EN101	9.144	0.305	45.108	645.372	260687.06	3560803.49
WTG	EN102	9.144	0.305	49.68	740.372	260687.06	3560803.49
WTG	EN103	9.144	0.305	38.098	645.372	260667.21	3560794.41
WTG	EN104	9.144	0.305	30.57	645.372	260687.96	3560797.69
WTG	FL1501	33.526	0.7108	20	1273	260724.16	3560807.94
WTG	HT501	6.096	0.305	1.219	477.594	260687.06	3560803.49
WTG	HT502	6.096	0.305	1.085	477.594	260687.06	3560803.49

The State did not model the flare emission points at Tokai Carbon Black Plant. Although these sources are not included in the NEI2017 inventory they are permitted to operate by the State. The flare emissions for 2017 – 2019, as summarized from the industry modeling, are given in Table 3-6. These three omitted emission points are together greater than 100 tpy in all years modeled.

Table 3-6. Tokai Flare Emission Rates (tpy) as given in the Industry Modeling.

Year	FLARE1	FLARE2	FLARE3	Total
2017	57.40	47.80	43.10	148.30
2018	73.38	68.93	70.82	213.13
2019	86.20	55.00	53.50	194.70

The State also did not include several nearby facilities with less than 1 tpy of SO_2 emissions. Table 3-7 gives the distance from Tokai Carbon Black Plant and the NEI2017 emission rates for these sources which were not included.

Table 4-7. Small SO_2 emission sources near the Tokai Carbon Black Plant with Distances and SO_2 Emission Rates.

Distance from Tokai (km)	Facility Name	FACILITY ID	UNIT_ID	ANNUAL SO2 EMISSIONS (tpy)
0.78	Ziler	16928311	110475613	0.011609
1.445	Big Spring Cogeneration	5649311	19945013	0.1
1.46	Big Spring Cogeneration	5649311	19944613	0.1
1.49	Big Spring Cogeneration	5649311	19944913	0.0105
1.51	Big Spring Cogeneration	5649311	19944513	0.0052
7.78	Big Spring	14465111	87179213	0.015479
7.89	Big Spring Gin	17982311	127931913	0.02
7.92	West Texas VA Medical Center	16040611	103033013	0.001298
7.92	West Texas VA Medical Center	16040611	103033013	9.84E-05
12.98	Big Spring Mcmahon	9114111	63149313	0.590535
12.98	Big Spring Mcmahon	9114111	62355513	0.114957
12.98	Big Spring Mcmahon	9114111	62355513	0.040376
16.72	Knott Booster Station	16866211	109910213	0.0266
16.72	Knott Booster Station	16866211	109910113	0.0263
16.72	Knott Booster Station	16866211	109910313	0.0255
16.72	Knott Booster Station	16866211	113186113	0.0251
16.72	Knott Booster Station	16866211	109910013	0.0142
16.72	Knott Booster Station	16866211	109909913	0.012
18.18	Fryar Treating Facility	17909111	126645113	0.0012
18.21	Fryar Treating Facility	17909111	126644913	0.0006
18.22	Fryar Treating Facility	17909111	126644813	0.0206

Due to the small size of these sources' emissions, excluding them from the modeling is acceptable.

With caveats, the State characterized the modeled sources within the area of analysis in accordance with the Modeling TAD. Specifically, the State followed the EPA's GEP policy in conjunction with a hybrid of allowable and actual emission rates. Sources using actual emission rates were not required to conform to GEP stack heights for the modeling and several of the emission points using actual emission rates were flagged by AERMOD as having a stack height > or = EPA formula height. The State also characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter.

The velocity and temperatures used for the stack parameters for the flares given in Table 3-5 which were modeled for Alon and WTG conform with TCEQ's flare modeling guidance.[24] The EPA cannot evaluate the diameters modeled since, by TCEQ's guidance, the diameter is calculated based on the added heat flux of the flare which is dependent on the actual flow rate and the combustible heat content of the gas stream; data which we do not have.

Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash. Figure 3-8 below shows the site plot for the Tokai Carbon Black Plant as modeled by the State. The industry modeling will be discussed later, but the site plot from the industry modeling is given in Figure 3-9 for comparison to the State's modeling. In Figure 3-8, the additional stacks, shown in yellow, are for the flare sources at Tokai. Several additional buildings, missing from the State's modeling, are shown in the site plan for the industry modeling. Some of these buildings are near to stacks and could potentially cause the plume to experience downwash, increasing modeled concentrations near the facility. The omission of the flare sources at Tokai is discussed below.

[24] See the file "TCEQ flare modeling guidance.pdf" in the docket for this action.

Figure 3-8. Site Plot of the Buildings and Stacks at the Tokai Carbon Black Plant modeled by the State.

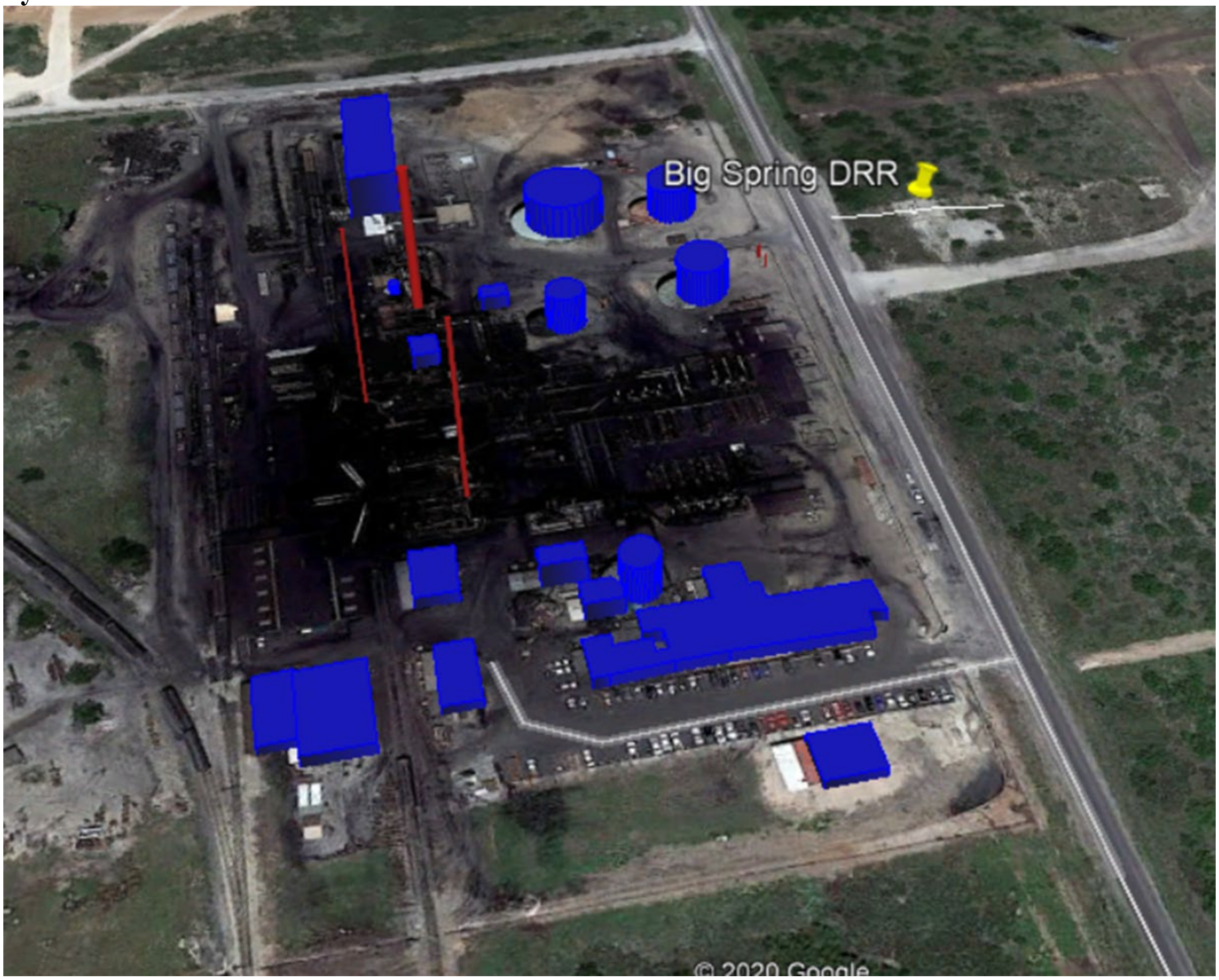
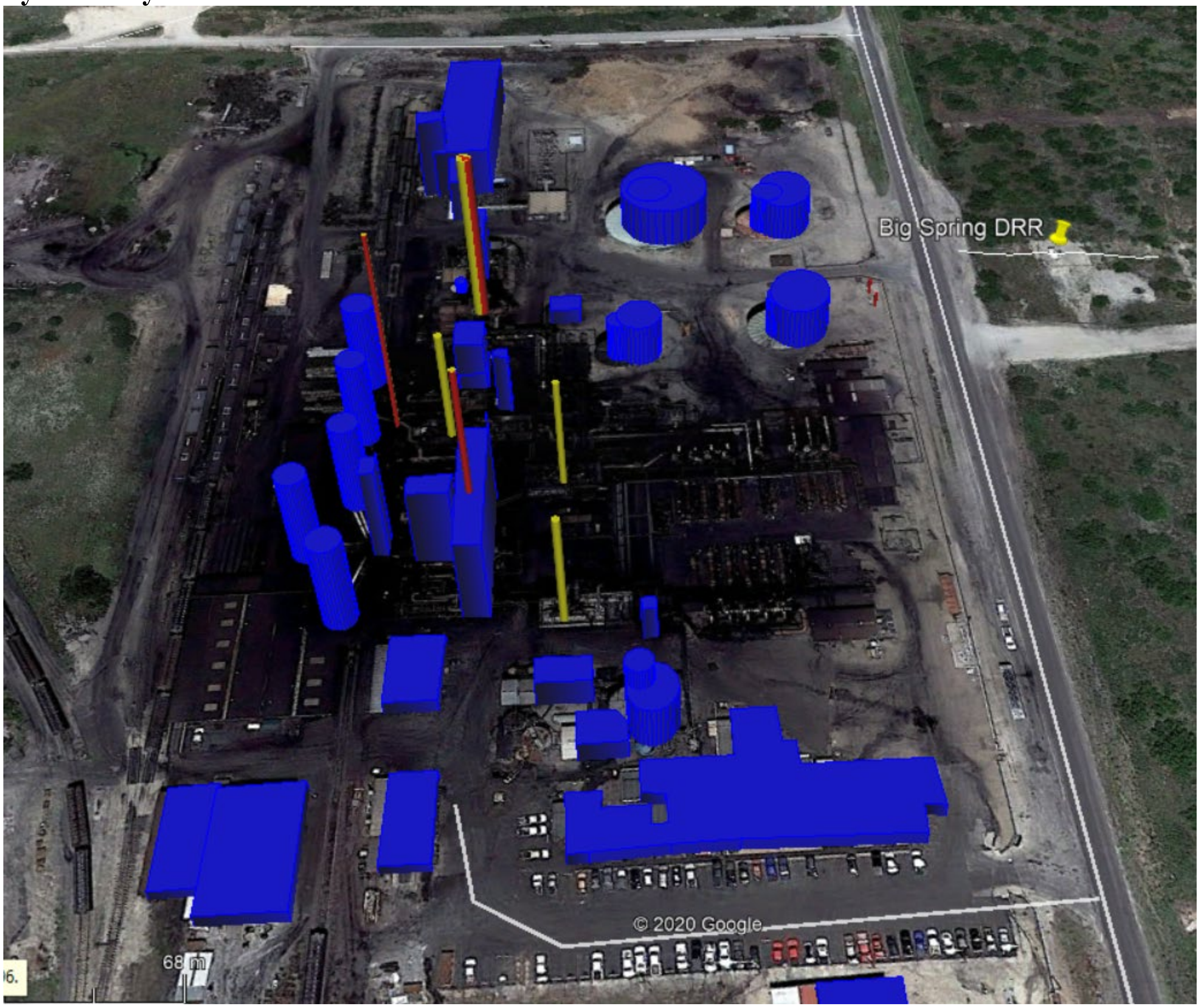


Figure 3-9. Site Plot of the Buildings and Stacks at the Tokai Carbon Black Plant Modeled by Industry.



3.4.1.5.Modeling Parameter: Emissions

For modeling to demonstrate attainment in an area with a violating monitor, Appendix W recommends the use of allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and in effect. EPA's September 5, 2019, Round 4 guidance memorandum says that EPA might consider, on a case-by-case basis, a designation other than nonattainment for areas where a source-oriented monitor has a design value violating the 2010 SO_2 NAAQS. One situation is where the source in question has recently become subject to and is complying with federally enforceable SO_2 emissions limits and modeling with those limits shows attainment of the 2010 SO_2 NAAQS, but the monitored design value does not yet account for these recent emissions reductions. EPA believes that, in such circumstances, the modeling of the new allowable emissions, which should follow the Guideline on Air Quality Models (Appendix W to 40 CFR part 51), may provide a more accurate characterization of current conditions at the time of designation than does monitoring of past conditions.

The Tokai Carbon Black Plant has recently proposed but not yet adopted restrictions on the use of the flares at the facility to reduce their SO_2 emissions to short periods of time after a failure requiring bypassing the dryers stack. These new conditions were used in the State's application of AERMOD, in that the flare emissions were not modeled. For the other sources at Tokai Carbon Black Plant and Delek Refinery permit limit emission rates were not used as recommended by Appendix W to demonstrate attainment but rather an assumed rate of actual emission rates based on total annual emissions divided by the number of hours in the year (8760). The stated purpose of the State's modeling is not to demonstrate compliance with the NAAQS using PTE emissions but rather as a component of a weight of evidence approach purporting to demonstrate that but-for excess emissions events at Tokai, including the use of flares, and Delek that the monitored violations of the standard would not have occurred and focused on modeling of assumed actual emissions rates during the monitored period.

For all sources at Tokai and for some sources at Delek the State calculated the hourly emission rate to be modeled using the annual emission rate from the STARS data and dividing by 8760 hours per year. This methodology did not take into account any operational information, including actual hours of operation for the year, or the frequency or magnitude of any daily maximum hourly emissions. The State's asserted justification for this is that in a review of the STARS emissions data it was noted that the day/week values are not always updated. The State noticed that some *other* facilities/sources that have non-zero annual emissions have 0 hours operated, creating doubt as to the accuracy of the data. Also, annual operating hours were only provided for 2018 (though they are included in EPA's NEI 2017 database). The State believes that assuming the same for the other years (2016-2017) as for 2018 can lead to over- or underestimated emission values. The State believes that while this methodology may slightly underestimate final concentration values, without more detailed hourly operational data there is no defensible way to say which hours the source did not operate.

The State gave the emissions rates modeled in Table 12 of their report which was not updated to reflect that rather than modeling the 2016-2018 period as in preliminary modeling they modeled the 2017-2019 period since the newer data had become available. The rates modeled are given in Table 3-8. EPA notes that for the common years between the State's report Table 12 and the modeled data, i.e. 2017 and 2018, the emission rates used in the modeling do not always agree with the rates given in Table 12.

Table 3-8. Average Emission Rates (gm/s) Used as Hourly Emission Rates for Modeled Sources as Calculated by EPA from State's Modeling Files Including the Facilities Delek, Tokai, and WTG-South Feagen.

Facility	Modeled Emission Rate (gm/s)			
Source	2017	2018	2019	Average
Delek (Total)	0.471159468	0.586204087	0.411829979	0.489042086
AC1HT23	0.001556	0.000121	6E-05	0.000579
AIRHTR06	0	9.5E-05	1.7E-05	3.73333E-05
BGVCMH02	0	0.01831	0.009128	0.009146
BOXAHT37	0.001973	0.004948	0.002241	0.003054
BOXBHT37	0.001125	0.002419	0.001781	0.001775

C8WSTH26	0.001502	0.004088	0.001945	0.002511667
CHRGAH02	0.013284	0.032221	0.017292	0.020932333
CHRGBH02	0.012275	0.028726	0.015091	0.018697333
CHRGDH02	0.019061	0.04859	0.024518	0.030723
CHRGHT04	0.002684	0.006513	0.003374	0.004190333
CHRGHT05	0.007088	0.0186	0.007681	0.011123
CHRGHT06	0.006898	0.020082	0.010051	0.012343667
CHRGHT09	0.001286	0.00321	0.001927	0.002141
CHRGHT15	0.001971	0.004079	0.002828	0.002959333
CHRGHT80	0.008538	0.020315	0.009927	0.012926667
CLAYHT25	0.000314	0.00082	0.000345	0.000493
CNDSRP69	0.118021	0.253342	0.106606	0.159323
CNTCRP72	0.180223	1.496413	0.245733	0.640789667
CRUDEF02	0.005158	0.049645	0.131728	0.062177
DEC5HT04	0.008181	0.018048	0.008328	0.011519
DEC5HT05	0.005431	0.012997	0.00634	0.008256
EN102	0.000138		2.9E-05	8.35E-05
EN103	0.000175	0.000164	5.8E-05	0.000132333
EN104	0.000175	0.000147	2.9E-05	0.000117
GSOILH23	0.001326	0.003443	0.001729	0.002166
GTPOCP37	0.005074	0.006677	0.005051	0.005600667
GTWETP37	0.005074	0.006677	0.005051	0.005600667
HTOILH11	0.001108	0.002974	0.001487	0.001856333
HYDGNH77	0.002776	0.007741	0.00374	0.004752333
KTTLEH23	0.000124	0.000383	0.000204	0.000237
NEASTF14	0.005097	0.292128	0.564856	0.287360333
PMAHTR37	0.011901	0.011685	0.000247	0.007944333
PMGTRF37	0.000739	0.002224	0.000935	0.001299333
PMGTRH37	0.000222	0.000521	0.000331	0.000358
REFMRF05	0.005727	0.103284	0.177884	0.095631667
REGENP06	21.500537	23.810295	17.476539	20.92912367
REHT1H05	0.006412	0.019095	0.0076	0.011035667
REHT2H05	0.012709	0.028922	0.018457	0.020029333
REHT3H05	0.005362	0.013624	0.007453	0.008813
SOUTHF16	0.137381	0.482439	0.063856	0.227892
STABLR80	0.002586	0.006861	0.003354	0.004267
STM23B24	0.01764	0.046064	0.023954	0.029219333
STM24B24	0.02394	0.071873	0.031894	0.042569
STRBRH77	0.001666	0.004585	0.002169	0.002806667
TGINC69	0	0	0.106379	0.035459667
TGINC71	0	0	0.245782	0.081927333
WWVRUP20	3.7E-05	0	0	1.23333E-05
Tokai (Total)	17.02889078	13.3158018	12.86060656	14.36298193
DRY1006	17.245586	14.279748	12.064719	14.53001767
DRYER22	11.951571	10.612005	9.333809	10.63246167

DRYER23	11.951571	10.612005	9.333809	10.63246167
DRYER24	11.951571	10.612005	9.333809	10.63246167
EN101		0.000112		0.000112
POH1014	5.8E-05	5.8E-05	5.2E-05	5.6E-05
POH1015	5.8E-05	5.8E-05	5.2E-05	5.6E-05
PR1002	33.386534	29.014009	25.226403	29.208982
PR1004	33.386534	29.014009	25.226403	29.208982
PR1007	33.386534	29.014009	25.226403	29.208982
WTG (Total)	1.46023625	0.89408025	0.976785	1.110367167
EN101	0.000106		2.9E-05	6.75E-05
EN102		0.00015		0.00015
FL1501	5.840638	3.575967	3.906794	4.441133
HT501	3.7E-05	3.7E-05	2.9E-05	3.43333E-05
HT502	0.000164	0.000167	0.000288	0.000206333
Grand Total	**3.020757617**	**2.728328783**	**2.316810133**	**2.688632178**

To estimate the degree of underestimation of emission rates based on annual emissions that may occur through the use of the State's methodology which divides the annual emissions by the total number of hours in a year, 8,760, EPA used the actual hours of operation for sources at the Tokai Carbon Black Plant in the NEI 2017 inventory to calculate an average hourly emission rate for the hours actually operated. This rate is then compared to the modeled emission rate for 2017 in Table 3-9.

Table 3-9. Comparison of State's 2017 Modeled Emission Rate for Tokai Sources to Hourly Rate Based on Annualized Emissions Prorated by the Actual Number of Hours of Operation for 2017.

Facility_Name	State Modeling ID	Annual Emissions (tpy)	Annual Hours	TCEQ Modeled Rate (gm/s)	True Annual Rate* (gm/s)	Percent Change
Big Spring Carbon Black Plant	DRYER22	415.4667	7896	11.95157	13.2593417	10.94%
Big Spring Carbon Black Plant	DRYER23	415.4667	7896	11.95157	13.2593417	10.94%
Big Spring Carbon Black Plant	DRYER24	415.4667	7896	11.95157	13.2593417	10.94%
Big Spring Carbon Black Plant	DRY1006	599.5	8064	17.24559	18.7340446	8.63%
Big Spring Carbon Black Plant	PR1002	1160.6	8736	33.38653	33.4782557	0.27%
Big Spring Carbon Black Plant	PR1004	1160.6	7896	33.38653	37.0397723	10.94%
Big Spring Carbon Black Plant	PR1007	1160.6	8736	33.38653	33.4782557	0.27%
Big Spring Carbon Black Plant	POH1014	0.002	8736	0.00006	5.7691E-05	-0.53%
Big Spring Carbon Black Plant	POH1015	0.002	7896	0.00006	6.3829E-05	10.05%
			Total	153.26	162.508475	6.03%

* True Annual Rate calculated by EPA by dividing the 2017 annual emissions for each source by the actual number of hours of operation for that source.

For 2017, totaling all sources at Tokai, the modeled emission rate is 6% lower than the true average annual emission rate based on the number of hours of operation.[25] By using the total, the estimated percent increase is weighted by the emission rates from each source, giving more importance to the hours of operation of sources with higher emission rates. This is an estimate only for the one year of the 3-year period, but if this is typical of the full period the maximum modeled design value due to Tokai, in the absence of background concentration, would be increased by a similar amount if the modeled emission rates were corrected to account for the actual operating hours

As previously noted, the State included Tokai Carbon Black Plant and two other emitters of SO_2 within 20 km in the area of analysis. The State modeled these facilities using estimates of hourly emission rates based on annual emission rates and not on federally enforceable PTE limits for SO_2 emissions. The facilities in the State's modeling analysis and their associated PTE rates are summarized below.

[25] It is important to note that for a short-term standard such as the 2010 1-hour SO_2 NAAQS that EPA's guidance recommends that the stringency of a longer-term limit compared to a modeled attaining 1-hour value should be increased by an adjustment factor so as to account for short-term variability in the emission rate. This short-term variability not considered in the State's modeling would conversely further increase the hourly rate that should be modeled in order to show attainment of the standard.

For all modeled sources, the State provided annual actual values. This information is summarized in Table 3-10. A description of how the State obtained hourly emission rates is given below this table.

Table 3-10. SO_2 Emissions based on Actual Emissions from Facilities in the Howard County Area from the Texas STARS Database.

	Non-modeled SO_2 Emissions (tpy, based on actual emissions)		Modeled SO_2 Emissions (tpy, based on actual emissions)		
Facility Name	**2015**	**2016**	**2017**	**2018**	**2019**
Tokai Carbon Black Plant	6,307	6,043	5,328	4,629	4,024
Delek Refinery	1,013	722	770	937	809
WTG South Feagan Plant	61	80	203	124	136
Total Emissions from All Modeled Facilities in the Area of Analysis	7,381	6,845	6,301	5,690	4,969

The State used 3-years of smoothed hourly emissions rates in the modeling for Tokai assuming full-time (8760 hours per year) operations corresponding to the annual tons per year for all sources excepting the flares. For the flares the State assumed zero emissions, whereas the industry modeling averaged 185 tpy of SO_2 emissions for the flare sources at Tokai. Emissions were varied for each modeled year according to the annual emissions for that year.

The State used 3-years of smoothed hourly emissions rates in the modeling for Delek and South Feagan Plant assuming full-time operations corresponding to the annual tons per year for all sources, including flares. Emissions were varied for each modeled year according to the annual emissions for that year.

The State argues that if only actual emissions for the years 2017-2019 are modeled, without including non-routine emissions events – that is events for which emissions are not permitted - or non-routine flaring, that attainment of the NAAQS is found. The State indicated that the industries have taken measures to reduce these excess emissions to the point where attainment of the standard can be expected going forward. EPA believes that the method used by the State to estimate the hourly emission rates used for modeling underestimates the true average emission rate by a significant fraction. The assumption of full-time operations rather than actual hours of operation reduced the average emission rate from Tokai by 6%. The combination of these two factors point to significant underestimates of the actual emissions used in modeling.

Moreover, considering only the long-term average emission rate does not account for short-term variability in emissions which would need to be included in modeling to assure protection of the NAAQS. The State did not present any data on short-term variability of emissions, but EPA's recommendation is that such data should be collected to estimate a factor to be used to increase the long-term average emission rate to ensure protection of the 2010 SO_2 NAAQS.

As well, EPA guidance is that in an area measuring violation of the NAAQS that allowable emission rates should be modeled when demonstrating attainment in order to ensure that when facilities are operating according to their permits that the NAAQS will not be violated in the future. The use of actual emissions, especially so when significantly underestimated and without limits that assure that actual emissions would not increase in the future, does not assure current or future attainment.

3.4.1.6.Modeling Parameter: Meteorology and Surface Characteristics

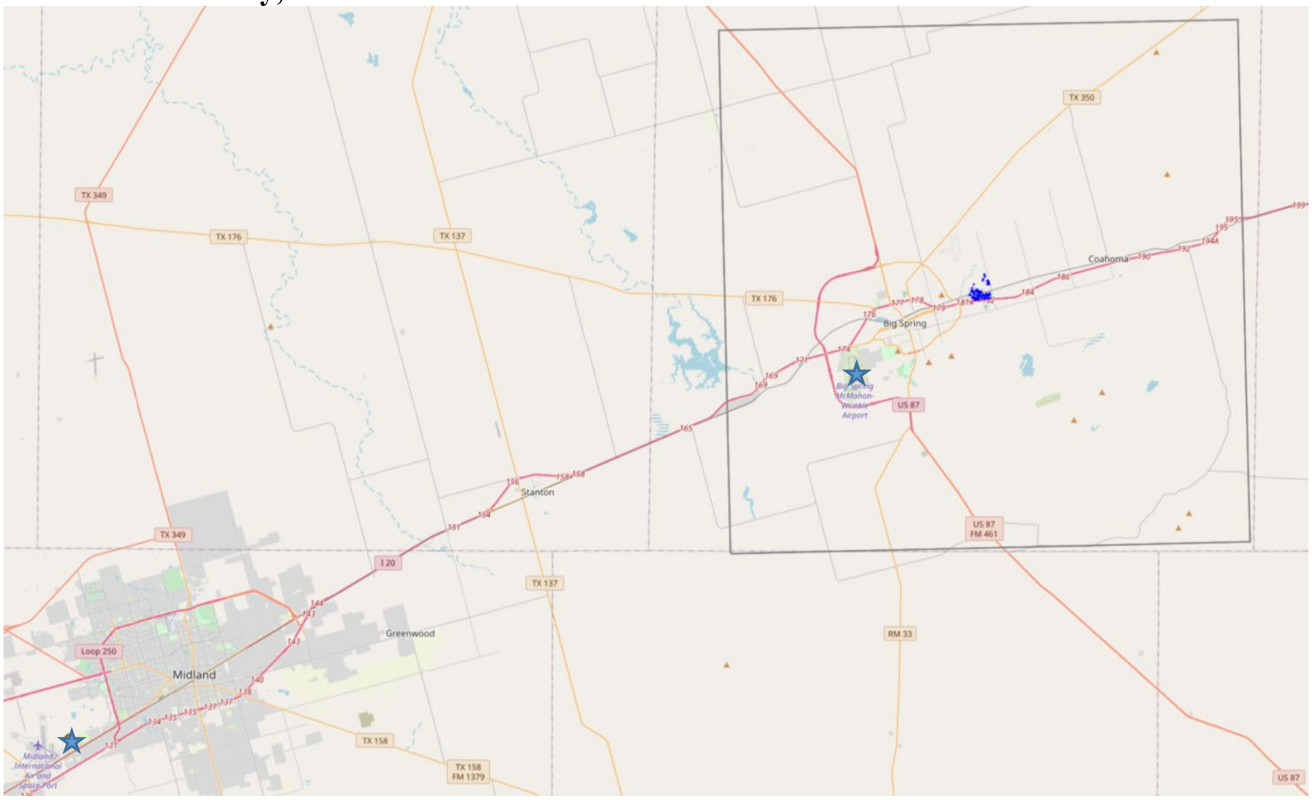
Per Appendix W, the most recent (or most representative) 5 years of meteorological data should be used when modeling with allowable emissions. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Howard County, Texas area, the State selected the surface meteorology from Midland International Airport (KMAF) located approximately 83 km to the southwest of the source and coincident upper air observations from the same location as best representative of meteorological conditions within the area of analysis. The Midland International Airport was deemed the most representative NWS site having the appropriate surface based hour-by-hour and one-minute meteorological data sets that can be used in the dispersion modeling as well as being located in the same geographical setting as the Tokai Carbon Black Plant.

The State used AERSURFACE version v20060 using data from Midland International Airport to estimate the surface characteristics of the area of analysis. The State estimated values for 12 spatial sectors out to1 km at a monthly temporal resolution for surface moisture classifications which varied by month. The State also estimated values for albedo (the fraction of solar energy reflected from the earth back into space), the Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance), and the surface roughness (sometimes referred to as “Zo” and is related to the height of obstacles to the wind flow, which is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer).

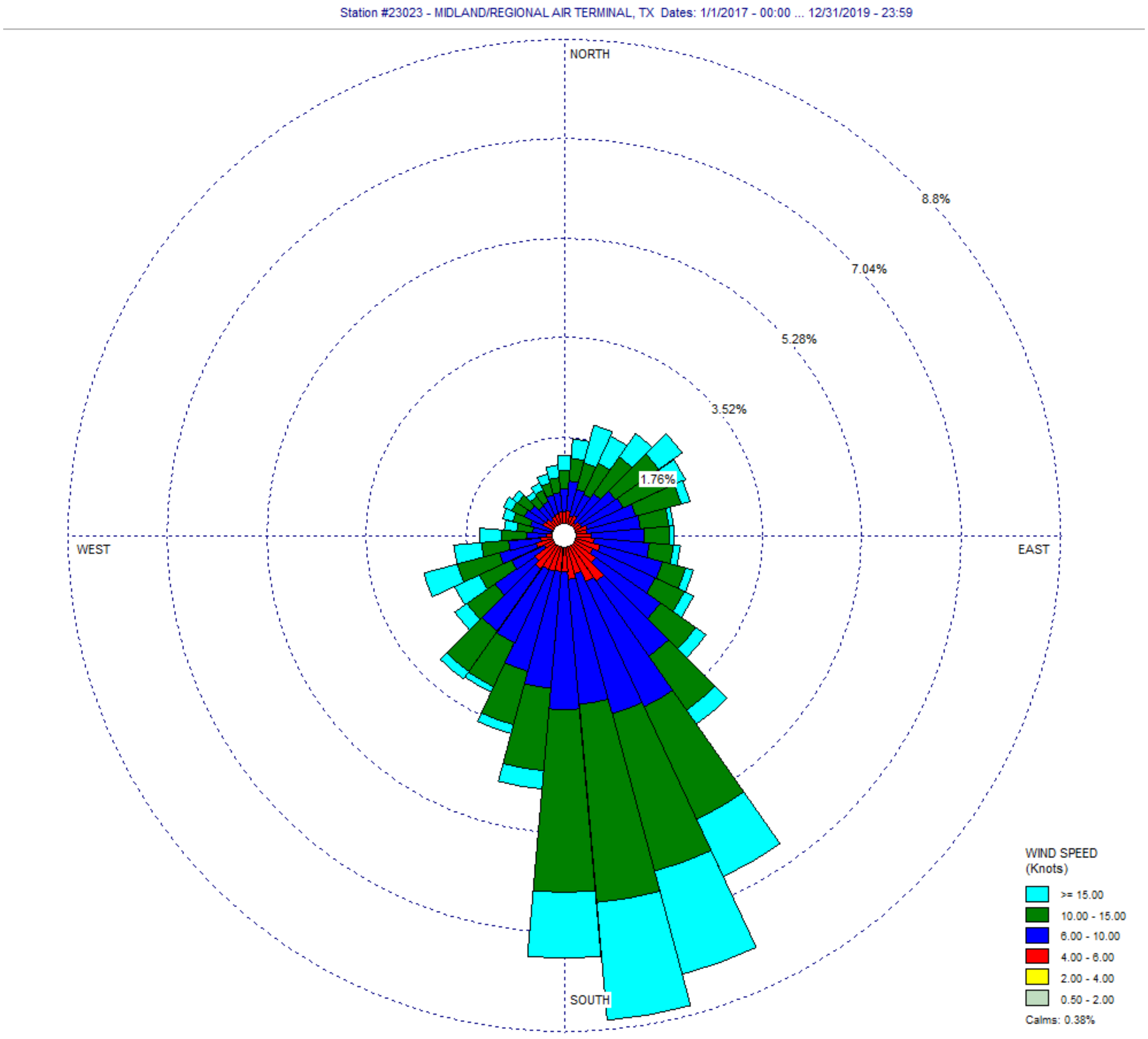
In the Figure 3-10, generated by the EPA, the location of this NWS station is shown relative to the area of analysis.

Figure 3-10. State's Area of Analysis (black rectangle) and the NWS stations (blue stars) in the Howard County, Texas Area.



The 3-year surface wind rose for Midland International Airport was generated by EPA using WRPLOT and the met data provided by the State. In Figure 3-10, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. The wind is blowing from the south to southeast (145-180°, a 35° sector) about 31% of the time. Winds toward the monitor from Tokai (200-260°, a 60° sector) occur only about 19% of the time. The monitor is located in a direction that emissions from the nearby source, Delek Refinery can combine with the emissions from the Tokai Carbon Black Plant.

Figure 3-11: Howard County, Texas Cumulative Annual Wind Rose for Years 2017 – 2019 Produced by EPA from the Modeling Files for Midland International Airport.



Since the meteorological data chosen by the State was from an ASOS station 84 km distant from the facility while there is a closer ASOS station at Big Spring Airport, 13 km distant. The State presumably chose the Midland data since the upper air data were also from that location. EPA compared the plots from the Iowa Environmental Mesonet (IEM)[26] for both airports for comparison. Figure 3-12 is the ASOS data before processing for use in AERMOD. Comparing to the AEMOD input the data, as expected, are similar though in the absence of AERMINUTE processing the calms are 3.8% compared to the modeled data set's 0.38%. Comparing Figure 3-12 to Figure 3-13 shows that the data from the Midland ASOS station is very similar to that from the Big Spring ASOS station but having much lower incidence of calms (3.8% vs 10%) with a

[26] https://mesonet.agron.iastate.edu/

very similar distribution of wind directions and wind speeds. The average wind speed at Midland was 9.9 knots compared to 8.9 knots for Big Spring. We note that the incidence of missing data from Midland (704 observations) is higher than the incidence at Big Spring (340 observations).

Figure 3-12. Wind Rose for the ASOS data from Midland International Airport for the 2017-2019 Period.

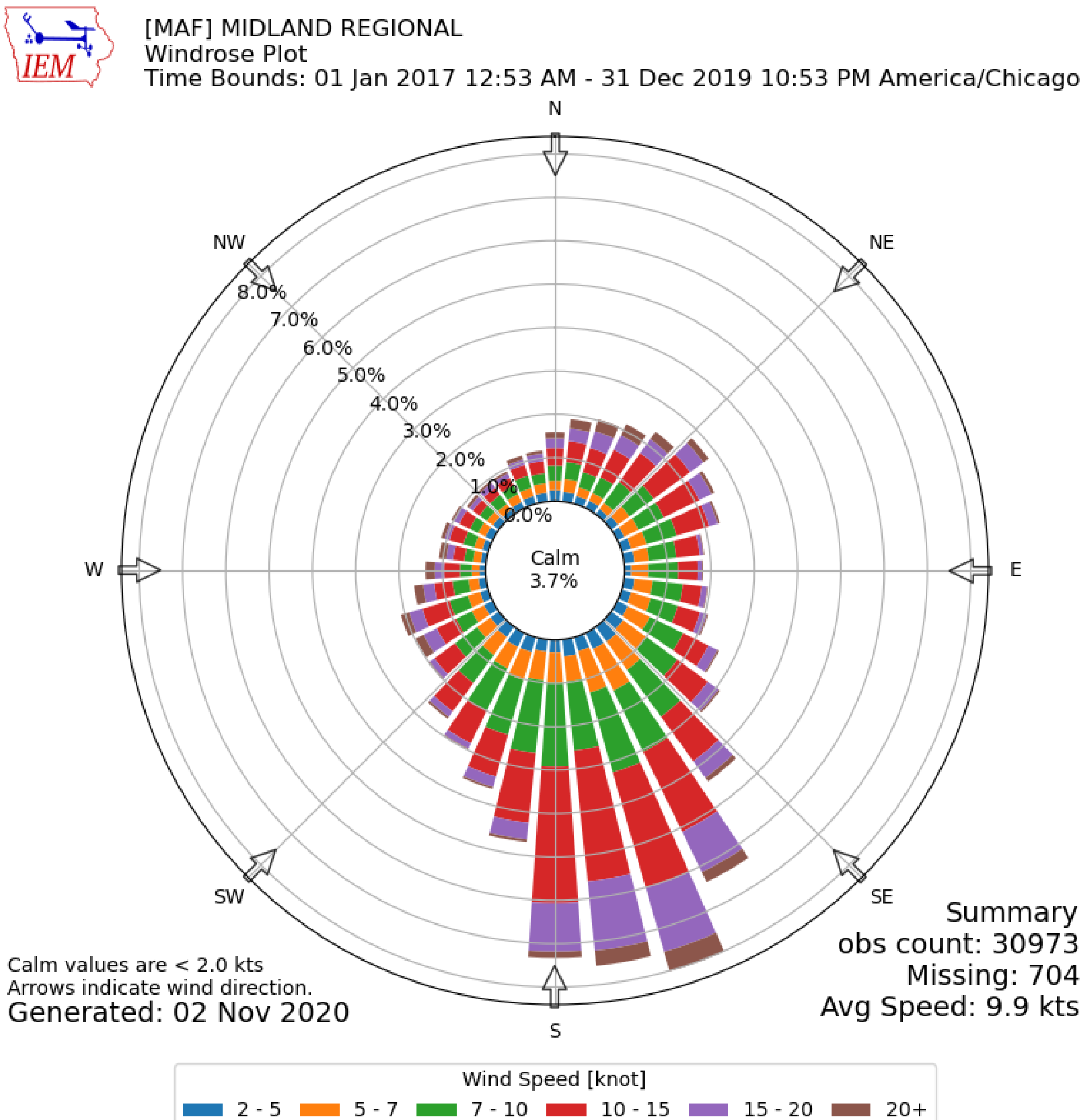
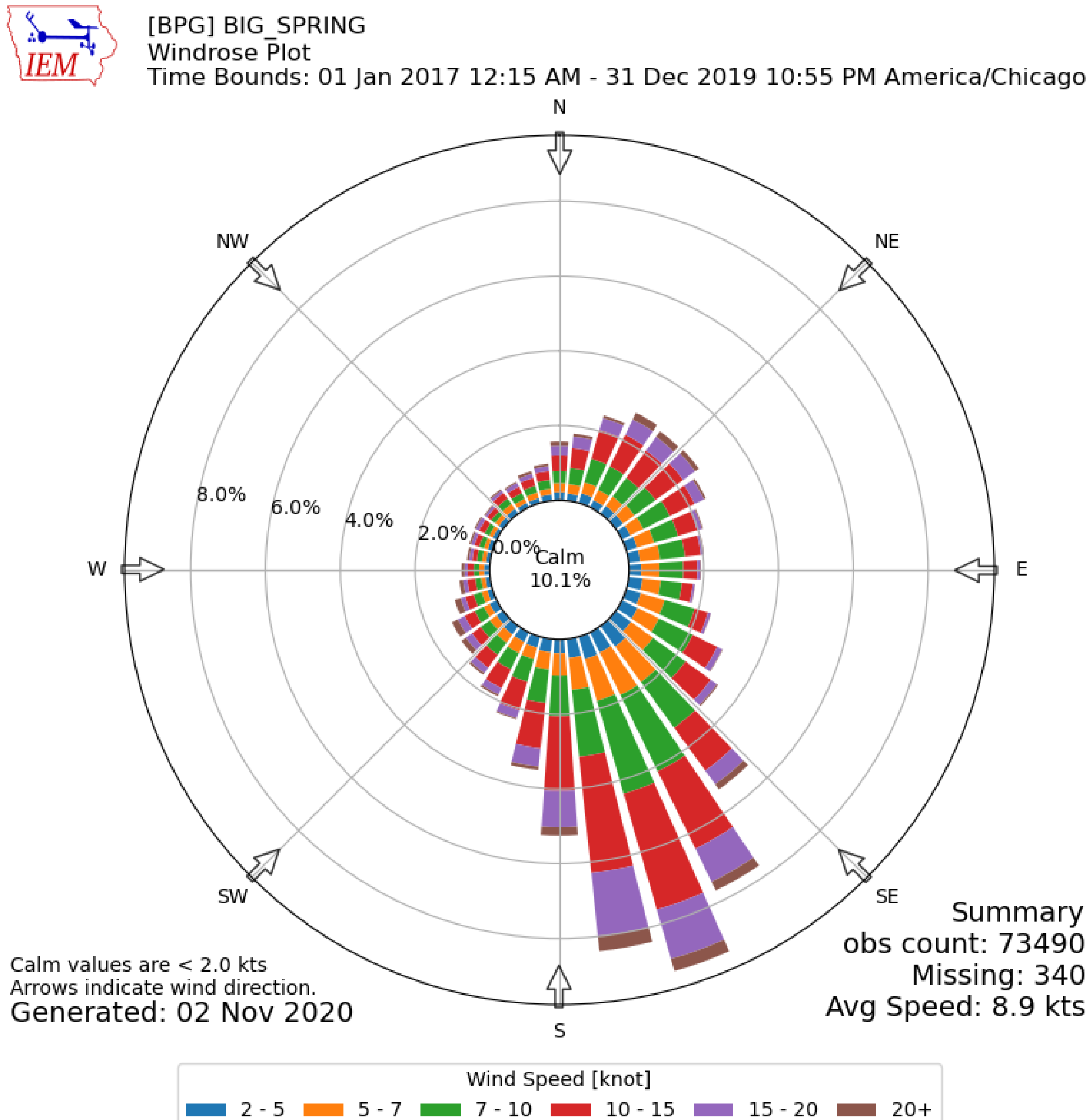


Figure 3-13. Wind Rose for the ASOS data from Big Springs Airport for the 2017-2019 Period.



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The State followed the methodology and settings presented in the DRR Modeling TAD and Appendix W in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Midland International Airport but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the State set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

In summary, EPA finds that the State followed the guidance of the modeling TAD in processing the meteorological data, and that the site chosen, while not the closest acceptable (for data availability) site for the upper air and surface date available, was very similar to the closest site in winds and was collocated with the upper air data collection. EPA finds that the winds modeled are representative of the local winds. However, the State included only 3 years of meteorological data (2017-2019) for the dispersion modeling rather than the 5 years recommended for an attainment demonstration for an area with a violating monitor.

3.4.1.7.Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as moderately complex. As shown in Figures 4-13 and 4-14, the Tokai Carbon Black Plant is located on the north side of river valley with terrain about 100m higher occurring to the south within 10 km of the facility. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Figure 3-14. Terrain contour map of the State's area of analysis.

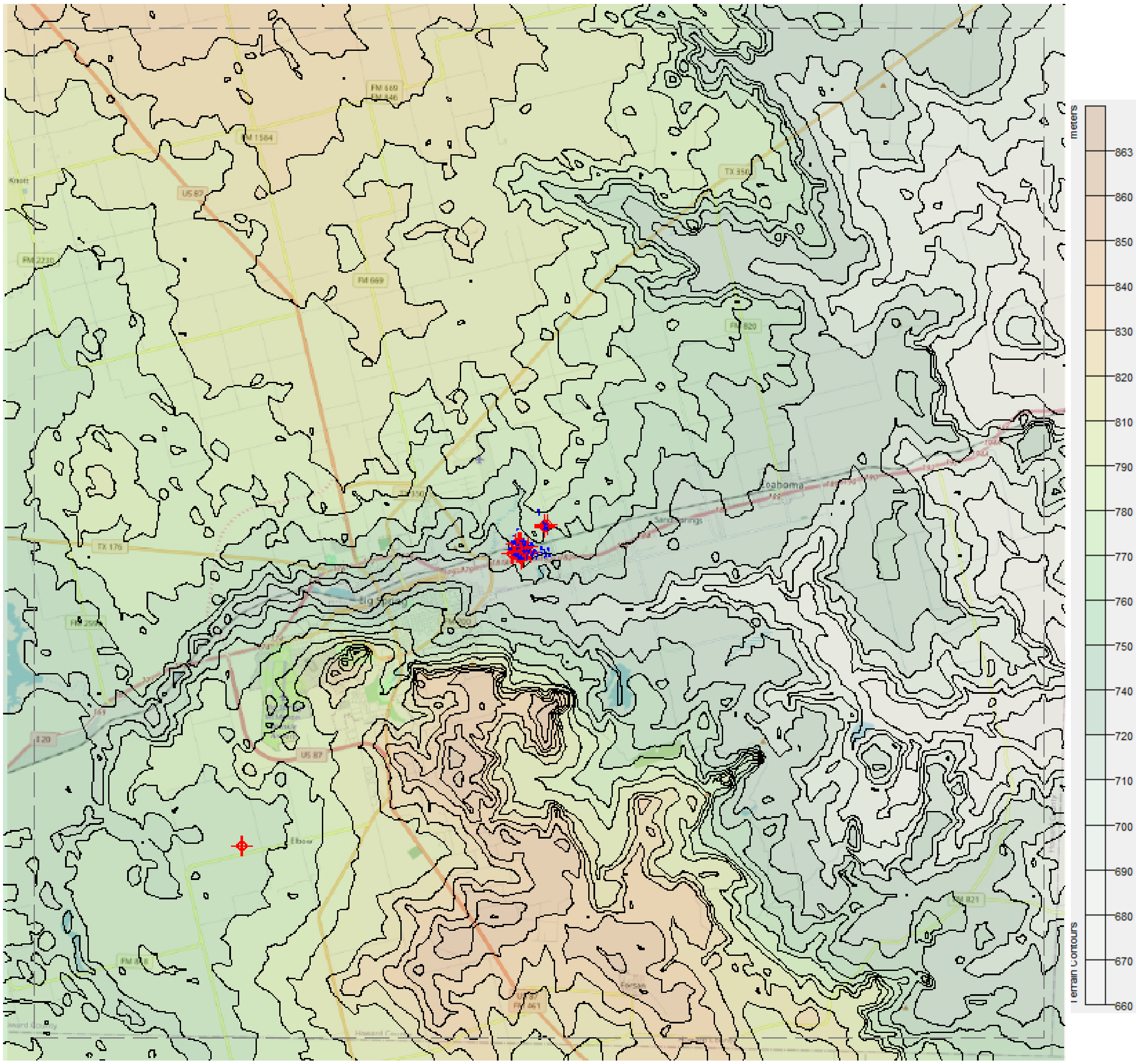
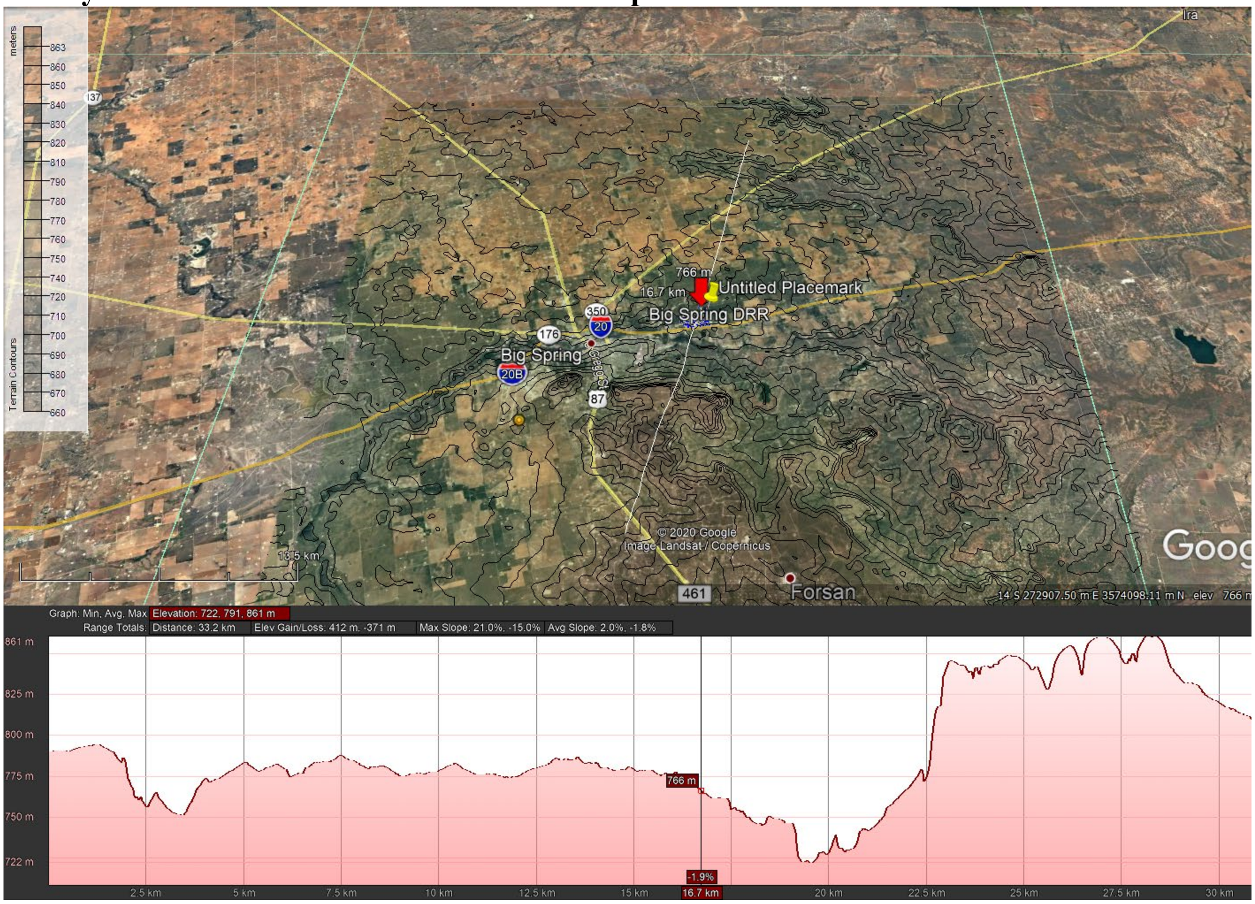


Figure 3-15. Terrain Transect from NNE To SSW Through the Location of the Tokai Carbon Black Plant. The location of the transect is denoted by the white line on the map and by the vertical black line on the elevation profile.



In summary, EPA finds that the State followed the guidance of the modeling TAD and Appendix W in processing the geographical data.

3.4.1.8.Modeling Parameter: Background Concentrations of SO_2

Appendix W offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State chose to use a tier 1 approach based on the monitored design value for the monitor (AQS ID# 48-453-0014) in Austin Texas, describing it as the closest population exposure monitor not influenced by nearby SO_2 sources. This monitor is located approximately 406 km from the Tokai Black Carbon Plant while the closest SO_2 population exposure monitor from the plant (AQS ID# 48-375-1025) is 319 km to the north near Amarillo, Texas with a 2017-2019 design value of 12 ppb, which the State describes as being influenced by the nearby Harrington Power Plant.

The State also evaluated the Howard County DRR monitor data to see if by excluding wind directions from Tokai Carbon Black Plant if background concentrations could be derived from the monitor itself. However, the resulting background value was 59 ppb, unrealistically high. The background concentration for this area of analysis was determined by the State to be 6.8 micrograms per cubic meter ($\mu g/m^3$), equivalent to 3 ppb when expressed in 1 significant figure, and that value was incorporated into the final AERMOD results.

Although the monitor selected for background determination is over 400 km from the Howard County DRR sources and has the lowest design value of any monitor in the State of Texas, EPA believes that the State exercised good engineering judgement in its selection of the monitor to be used for the background determination without requiring removing any wind directions. The background value is representative of the contribution of distant sources to the SO_2 concentrations at the DRR monitor.

3.4.1.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Howard County, Texas area of analysis are summarized below in Table 3-11

Table 3-11: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Howard County, Texas Area

Input Parameter	Value
AERMOD Version	19191
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	60
Modeled Structures	142
Modeled Fencelines	10
Total receptors	37,748
Emissions Type	Estimated Hourly
Emissions Years	2017-2019
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Midland International Airport
NWS Station Upper Air Meteorology	Midland International Airport
NWS Station for Calculating Surface Characteristics	Midland International Airport
Methodology for Calculating Background SO_2 Concentration	Tier 1 based on design value at AQS Site 48-453-0014, Austin Northwest, for 2017-2019
Calculated Background SO_2 Concentration	2.6 ppb or 6.8 $\mu g/m^3$

The results presented below in Table 3-12 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 3-12. State Submitted Modeling - Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Howard County, Texas Area

Averaging Period	Data Period	Receptor Location UTM zone 14		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM East	UTM North	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2017-2019	273140.39	3574521.86	185.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor.

The State's modeling produces a highest predicted 99th percentile daily maximum 1-hour concentration averaged over the modeled period within the chosen modeling domain of 185.5 $\mu g/m^3$, equivalent to 70.8 ppb. This modeled concentration included the background concentration of SO_2 and is based on annualized actual emissions from the facilities. Figures 4-16 and 4-17 below were generated by EPA from the modeling files included as part of the State's recommendation, and indicates that the predicted value occurred about 0.5 km to the north of Tokai Carbon Black plant, in the direction of the prevailing winds for the region. The maximum is on the boundary of Delek property with concentrations increasing toward the unmodeled property. The State's receptor grid and the modeled concentrations at the receptors is also shown in Figure 3-17, which shows the zoomed in view near the point of the maximum modeled design value.

Figure 3-16. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Howard County, Texas Area in µg/m3

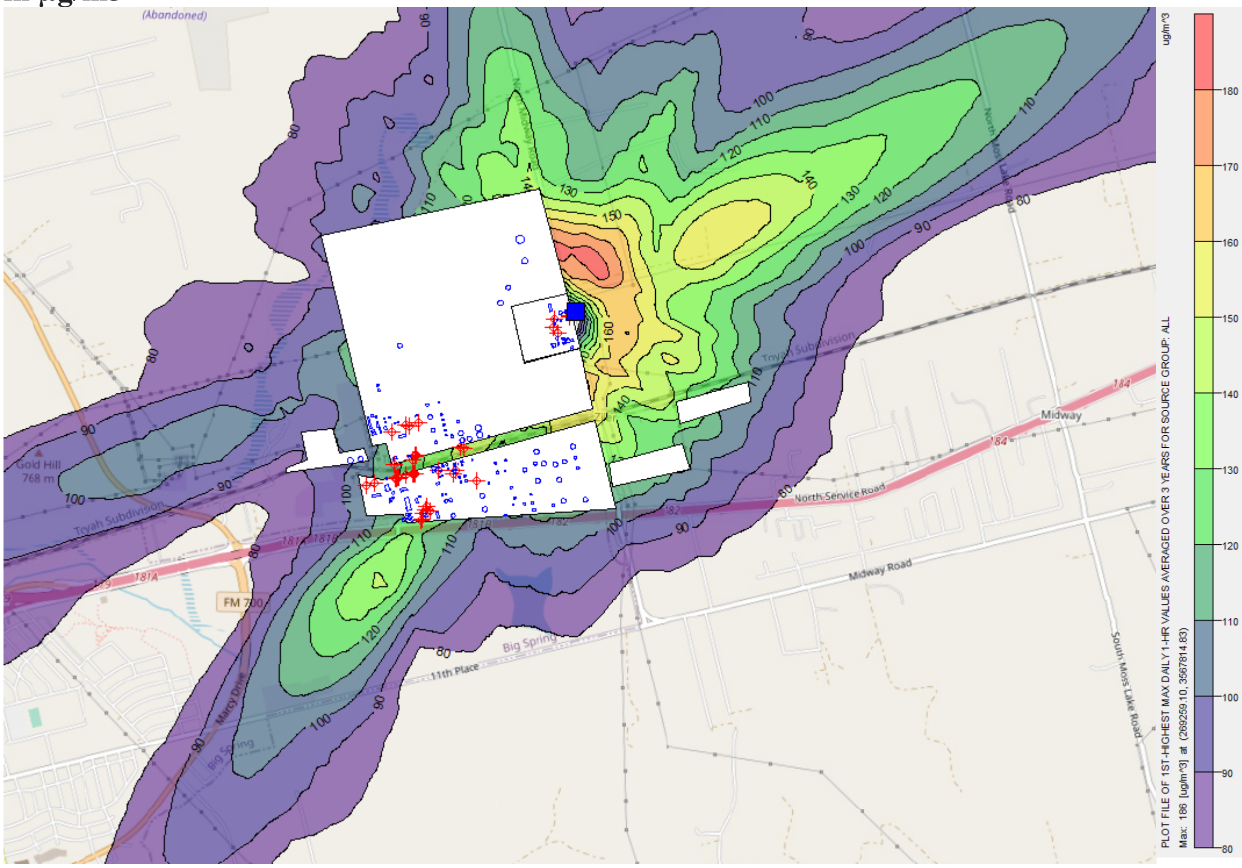
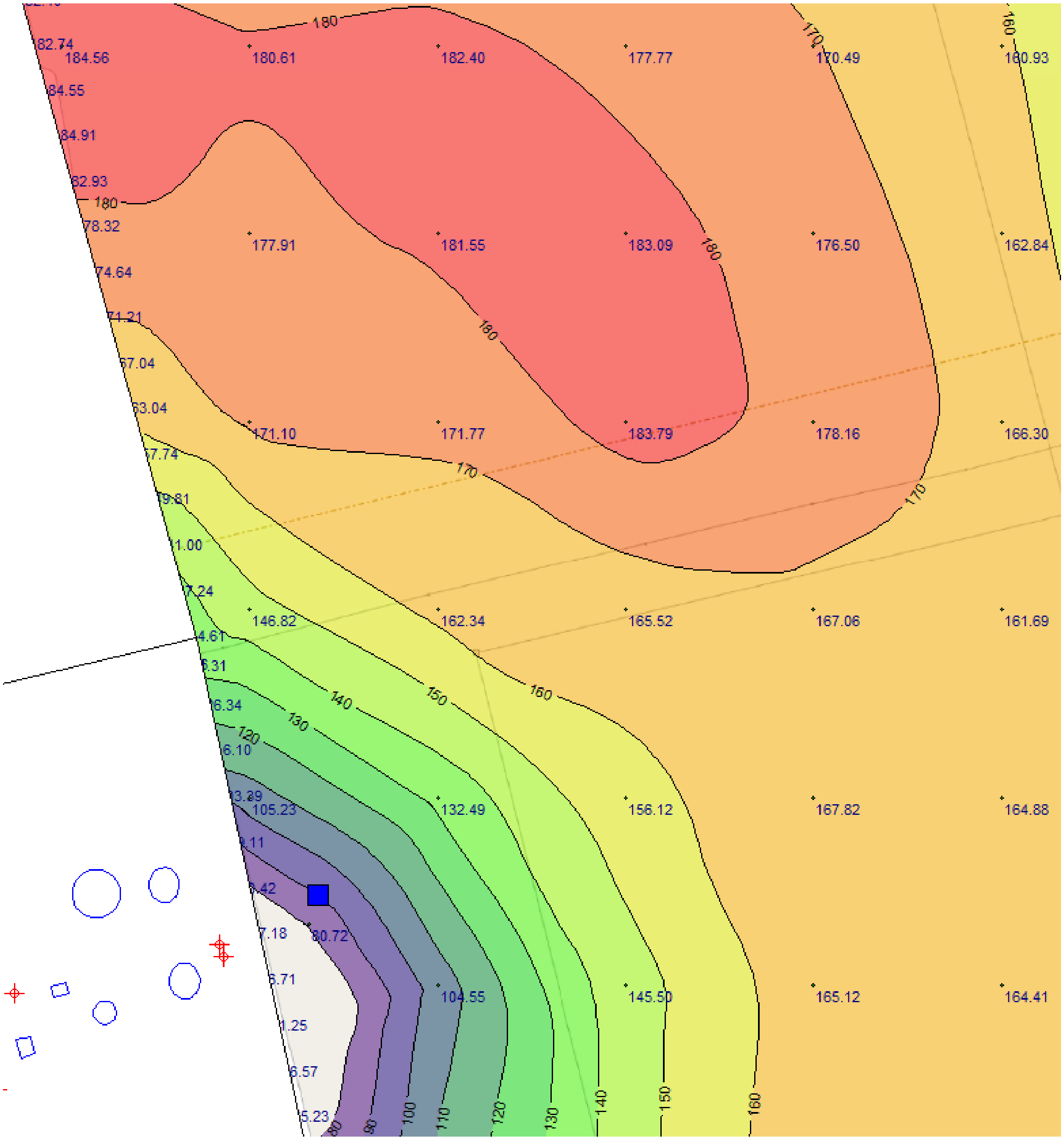


Figure 3-17: Zoomed in View of the Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Howard County, Texas Area in µg/m³. The blue square is the location of the monitor.



The modeling submitted by the State does not indicate that 2010 SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

3.4.1.10. The EPA's Assessment of the Modeling Information Provided by the State

The State's modeling contained several assumptions that would tend to reduce the predicted 99th percentile daily maximum 1-hour SO_2 concentrations averaged over three years for the area of analysis for the Howard County, Texas area. As a check on whether these assumptions may have in fact influenced the modeled concentrations EPA examined the State's comparison of the maximum modeled design value to the concentrations recorded at the monitor. In the State's modeling the maximum modeled design value at the monitor, to the east of the plant, was only 26.7 ppb while the actual design value measured at the monitor was 89 ppb, a factor of 3.33 difference. In its comparison, the State points out that the maximum modeled design value, matching more closely to the monitor values, is only about 0.5 km from the monitor and matches more closely with the measured values at the monitor and that small shifts in local winds could affect the values at the monitor. However, we note that the modeled design value is to the north of the Tokai Carbon Black plant in the direction of the prevailing winds and in alignment with the stacks at Tokai whereas the monitor, which recorded the violation, is located to the east. Even though by distance the location of the modeled maximum is near the monitor, because of the proximity of the monitor and the maximum design value receptor to the plant, the locations are in significantly different directions, with large differences in the wind speed distribution and frequencies of occurrence. The State believes that since the surface station Midland Airport is 84 km southwest, and being so far from the facility, it is possible the winds are different locally than what the station measures. However, the EPA compared in Section 3.4.1.6 the wind frequencies for the Midland Airport to that for the Big Spring Airport which is 13 km from the DRR monitor and found that the winds are very similar. We determined that the winds modeled are representative of the local winds for modeling the emissions from the sources.

While the severe underprediction at the monitor location supports the possibility that the assumptions in the State's modeling caused an underestimate in the modeled concentrations, we note that the monitor is located such that the modeled gradients are very steep so that the concentrations can vary significantly over a small distance. EPA examined the modeled concentrations in the same direction of the monitor to determine the maximum modeled concentration near the monitor. The maximum modeled concentration in roughly the same direction from the Tokai sources as the monitor was about 180 ppb but was located about 0.5 km from the furnaces stack, while the monitor location is only 0.17 km, about 3 times the distance away. This disparity and the sharp gradients may indicate that the monitor, while violating the 2010 SO_2 NAAQS, is not located at the point of maximum impact.

Since the form of the 2010 1-hour SO_2 NAAQS standard is the 99^{th} percentile (High Fourth High) values, the modeling and resulting DVs are very sensitive and are biased low when temporal variability is not addressed. The EPA's Modeling TAD advises in Section 5.2 that "in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used." When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall, the uncertainty in the modeled emission rates and the known bias low issues is a significant concern.

It is important to note that for a short-term standard such as the 2010 1-hour SO_2 NAAQS, where an air agency is considering developing a longer term-averaged limit for a SIP in order to bring a violating area into attainment, that after identifying and modeling a 1-hour limit that would provide for attainment if constantly met by the source EPA strongly recommends that the stringency of any longer-term limit should be tightened by applying an adjustment factor so as to account for short-term variability in the emission rate and thereby make the longer term limit comparably stringent to an attaining constant 1-hour limit. This guidance (including EPA's 2014 SO2 modeling for Attainment Demonstrations)[27] implies, conversely, that a variable set of emissions can cause significantly worse air quality than constant emissions at the average rate of the variable emissions set. The guidance addresses averaging times up to 30 days; the difference between variable emissions impacts and constant emissions impacts is likely to be greater with annual average emissions. This short-term variability is not considered in the State's modeling, which causes the modeled impacts to be prone to underestimate the magnitude of concentrations and the geographic extent of likely violations. This further illustrates the need to increase the size of the nonattainment area to address the concern of not addressing or including temporally varying emissions.

The assumptions made by the State, as detailed above which tend to reduce modeled concentrations are:

- Omission of buildings in locations which could have caused modeled downwash. Downwash effects are likely to be important given the disparity between the model and the observations at the monitor which is just outside the fenceline of the facility.
- Omission of ambient air receptors assessing the impact of a facility on neighboring facilities. This may be important since the highest modeled design value is to the north of Tokai at the fenceline of the Delek Refinery.
- Reduced modeled emission rates caused by
    - Omission of permitted flare emissions
    - Use of annual average actual emission rates rather than the Appendix W recommended allowable emission rate
    - Assumption of full-time operations rather than actual hours of operation reduced the true average actual emission rate.
    - Omission of short-term variability in emission rates

EPA noted in Section 3.4.1.5 that due solely to the assumption of full-time operations (that is 8760 hours per year) rather than the actual hours of operation that the average emission rate, used in the modeling for Tokai was estimated to be 6% too low. Since the modeling analysis maximum design value occurs to the north of the Tokai facility where no other modeled sources would align, this modeled design value is due to Tokai's emissions and would increase by about 6% if more realistic emission rates were used. The modeled design value for this location is 184 µg/m3 in the absence of background, the adjusted design value would then be 195 $\mu g/m^3$. The background used in the modeling analysis is 6.8 $\mu g/m^3$, yielding an estimated adjusted design value of 201.8 $\mu g/m^3$, in excess of the NAAQS level of 196.4 $\mu g/m^3$. This adjustment, for the purposes of establishing a nonattainment boundary, is solely to account for annual hours of

[27] EPA "Guidance for 1-Hour SO2 Nonattainment Area Sip Submissions" April 2014. In the docket and available at https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf.

operation and does not include the effects of short-term variability which would be expected to further increase the proper modeled concentration. The use of more realistic emission rates would then most likely result in modeled violation of the 2010 SO_2 NAAQS.

The State followed the EPA guidance contained in the Modeling TAD for receptors, surface processing, and meteorology. The default options for the version of AERMOD employed were set and a reasonable methodology for estimating the background concentrations for the facility and an appropriate rural land use characterization were used. However, the State did not follow Appendix W and Round 4 guidance to use allowable emission rates for areas with violating monitors to support a designation other than nonattainment, and the annualized assumed actual rates modeled did not comport with EPA's underlying guidance on representing short-term variability in emission rates and were biased low relative to what would be expected if true actual rates had been modeled. The omission of buildings near some of the largest emission sources at Tokai may have reduced the peak modeled concentrations near the plant boundary.

3.4.2. Modeling Analysis Provided by Industry

3.4.2.1.Differences Between and Relevance of the Modeling Assessments Submitted by Industry

Though both Tokai and Delek submitted comments on EPA's intended designation of Howard County, Texas as nonattainment, the modeling information and files submitted were both from the same modeling analysis which was compiled by DiSorbo Engineering. This modeling analysis is discussed below. The Industry's modeling was intended to follow Appendix W because the Industry was attempting to support a designation other than nonattainment by following EPA's September 5, 2019, Round 4 guidance memorandum.

3.4.2.2.Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

Industry used AERMOD version 19191, the most recent version. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

3.4.2.3.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Appendix W and Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, industry determined that it was most appropriate to run the model in rural mode. Industry did not explain the characterization of the area as rural. Figure 3-5, given earlier, shows the land use around the DRR facilities. EPA concurs that the area around the facilities is rural in character and that the use of the rural dispersion option is appropriate.

3.4.2.4.Modeling Parameter: Area of Analysis (Receptor Grid)

The Modeling TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Howard County, Texas area, industry has included 1 other emitter of SO_2 within 2 km of the DRR Facility in any direction. Industry determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any 2010 SO_2 NAAQS exceedances in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. Other sources of SO_2 emissions in the area are presumed to have no significant impact on modeled concentration gradients near the areas of peak impact. In addition to Tokai Carbon Black Plant, the other emitter of SO_2 included in the area of analysis is the Delek Refinery. No other sources were determined by industry to have the potential to cause significant concentration gradients within the area of analysis.

The grid receptor spacing for the area of analysis chosen by industry is as follows:
Receptors were placed at approximately intervals of 25 m fenceline, 100 m to 3 km, 100 m to 5 km, 250 m to 10 km, and 1000 meters to 50 km at sufficient densities to capture concentration gradients in the vicinity of peak ground-level impacts. The receptor network contained 7,333 receptors, and the network covered the entirety of Howard County and portions of surrounding counties.

Figures 4-18, generated by EPA from industry's modeling files, and 4-19, included in industry's modeling report, show industry's chosen area of analysis surrounding the Tokai Carbon Black Plant, as well as the receptor grid for the area of analysis.

Figure 3-18. Area of Analysis for the Howard County, Texas Area. The solid gray rectangle represents the boundary of Howard County.

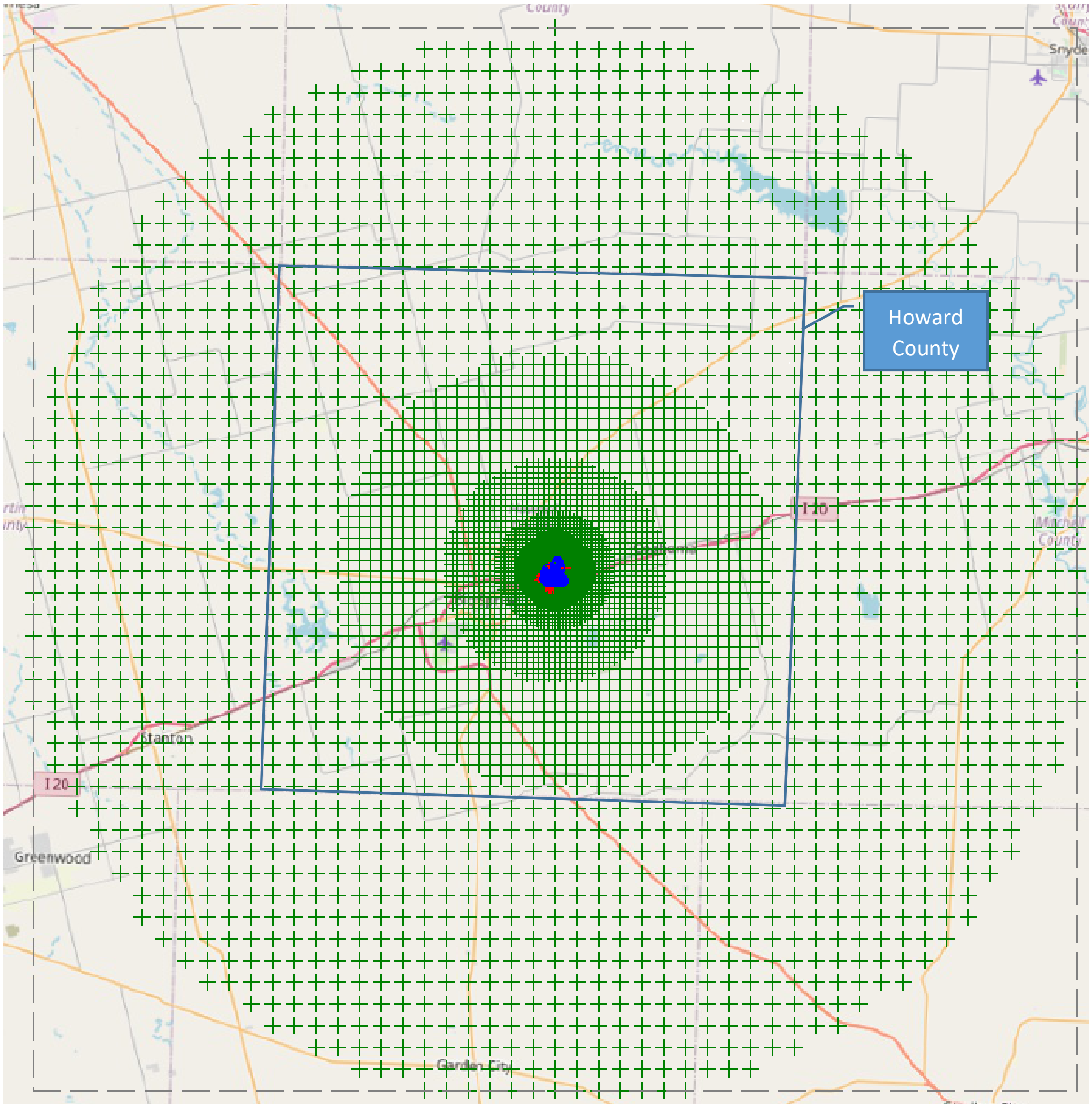
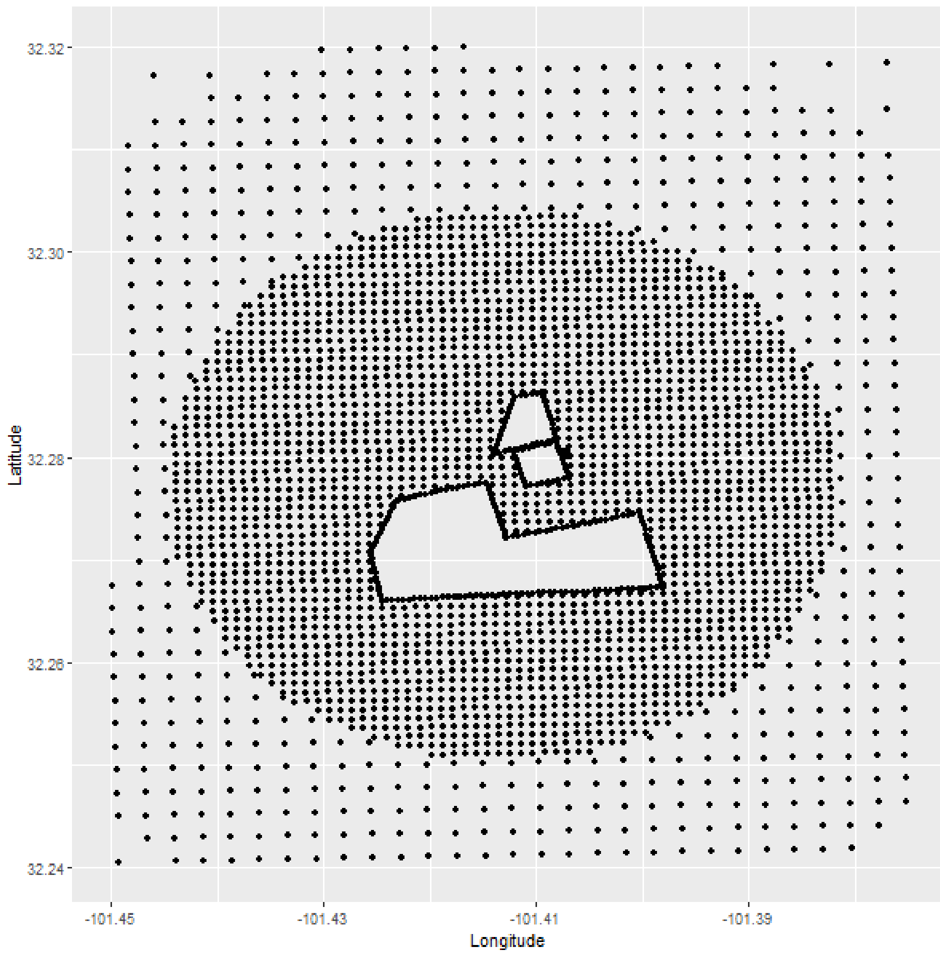


Figure 3-19. Detail of Area of Analysis for the Howard County, Texas Area Showing Receptor Placement (Dense portion of Receptor Grid) including fenceline receptors and areas without receptors.



Industry placed receptors for the purposes of this designation effort in some but not all locations that would be considered ambient air relative to each modeled facility, including other facilities' property. Industry excepted locations described in Section 4.2 of the Modeling TAD as not being feasible locations for placing a monitor from placing a receptor. These locations are denoted in Figure 3-19 by the white areas which have no receptors placed.

Industry also excluded receptors in other locations that it considered to not be ambient air relative to each modeled facility. For purposes of this analysis the general guidance in the Modeling TAD to place receptors wherever it is feasible to locate a monitor has been adhered to. However, Industry incorrectly did not treat all locations within Delek's operating boundary as "ambient air" with respect to Tokai emissions (and vice versa), because they believed that it would not be feasible to place a monitor in those locations.

The TAD guidance on placing receptors was specific to Round 3 where modeling was being used in place of monitoring at the state's option. In the present circumstance a monitor has recorded violations of the standard and we are evaluating the full extent of modeled violations in order to ascertain the boundaries of a potential nonattainment area. Industry claims that the modeling demonstrates that the area would have attained if not for specific emission events. This requires modeling at all ambient air locations, not just those where it is feasible to place a monitor.

The receptor grid used was of sufficient density and coverage to ensure that the locations of maximum concentrations were captured when modeling the contribution of all sources. However, there were no receptors placed in some areas that are required to enable the complete modeling of individual facility concentrations on a neighboring facility's property.

3.4.2.5.Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions.

Industry characterized one other source, Delek Refinery, in addition to the DRR source, Tokai Carbon Black plant. Although there is another major SO_2 source within 20km of the DRR monitor, other sources of SO_2 emissions in the area are presumed to have no significant impact on modeled concentration gradients near the areas of peak impact. We note that the other major source in Howard County, WTG – South Feagan, was included in the State's modeling for Howard County. In the State's modeling WTG sources had an average emission rate for the 3-year period of 2.69 gm/s (93.5 tpy) and is located about 18 km from the violating monitor.

The stack parameters that industry used for modeling the Tokai sources differed from those used by the State for the same sources. Table 3-13 below compares the Industry stack parameters and emission rates to those used by the State's modeling.

Table 4-13. Comparison of State and Industry Emissions Related Data for Tokai

State's Modeling ID	Industry's Modeling ID	Emission Rate (gm/s)		Temperature (K)		Velocity (m/s)	
		State	Industry	State	Industry	State	Industry
PR1002, PR1004, PR1007	TOKAI13A	87.63	87.63	504.26	616.48	13.72	11.49
DRY1006	TOKAI12A	14.53	14.53	560.93	588.71	28.04	20.51
DRYER22, DRYER23, DRYER24	TOKAI7A	31.89	31.90	560.93	588.71	28.04	22.46
Not included	FLARE1	-	2.1	-	1273	-	20
Not included	FLARE2	-	1.6	-	1273	-	20
Not included	FLARE3	-	1.6	-	1273	-	20

Industry attempted to characterize the sources included in the modeling within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, industry used actual stack heights in conjunction with actual emissions. Industry also characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. However, as shown in Table 3-13 Tokai sources' exit temperatures and velocities were significantly different from State's modeling. Industry did not indicate the source of their exit parameters whereas the State uses previous submissions by industry to develop their stack parameters. Industry did have a more complete inventory of the buildings at Tokai, including a building "U1&2MIX" (24.4 m height, 40 m X 8 m), not included in the State's modeling, which could cause downwash from stack TOKAI7A (60.4 m) which releases the emissions from 3 of the 4 dryers at the facility. The stack is located within the zone of influence of the building and the height is 1.5 times the characteristic length (40 m) for wind directions perpendicular to the longest side of the building. Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash.

EPA has concerns about how industry characterized the Tokai sources; the stack parameters for those Tokai sources in common with the State's modeling had significantly different exit parameters. Industry did not give information on how their stack parameters were determined. Industry did have two important advances on the State's characterization for the Tokai sources: they included buildings in addition to those included by the state and they included the flare sources.

The stack parameters for the Delek sources were also different from those from the State. Since the modeling analyses had different modeling ID's for sources, development of a complete crosswalk for corresponding sources is problematic. EPA has cross matched some of the larger emissions points at the Delek Refinery.

In our review, EPA noticed that several of the sources at Delek had very small diameters in the modeling files and that these diameters did not correspond to the diameters specified for these sources in the modeling report, Table 3. The sources which do not correspond are all flares. In the TCEQ flare modeling methodology the temperature for any flare is fixed as 1273°K and the velocity is fixed as 20 m/s. The diameter is calculated from the heat content of the flared gas; the greater the heat released by burning the gas stream, the larger the calculated diameter and thus the greater the modeled plume rise. The discrepancy of the flare diameters points to inconsistency in either the data or the method of calculating the diameter between the State and industry. These inconsistencies would result in differences in the location and amount of the modeled impacts from the flare sources. In Table 3-14 we compare the industry stack diameters both from their report and from the modeling files to the State diameters for selected Delek sources.

Table 3-14. Comparison of Modeled Stack Diameters to diameters specified in Modeling Report Table 3 and State Modeled Stack Diameters for Selected Delek Sources. Flare Source ID's Are Given in Red Font.

Model ID	Industry Modeling File Diameter	Industry Modeling Report Table 3 Diameter	State Model ID	State Modeling Diameter
FLARE1	2.197608	2.193851	-	-
FLARE2	1.84404	1.858679	-	-
FLARE3	2.261616	2.254791	-	-
CRUFLR	0.231648	2.071971	CRUDEF02	0.6696
NORFLR	0.231648	1.736799	NEASTF14	0.7052
REFFLR	0.231648	1.736799	REFMRF05	0.3172
SOUFLR	0.231648	4.326762	SOUTHF16	1.1192
SRU1	0.9144	0.914105	TGINC69	0.91
SRU2	0.4572	0.457052	TGINC71	0.43
FCCU	1.9812	1.98056	REGENP06	1.9812
-	-	-	PMGTRF37	0.295

Industry gives their calculation of flare diameter in Table 4 of the modeling report. There they state that since annual average emission rates were used for the four Delek flares (the ones with a diameter of 0.23 m), the heat release was set at 1 MMBtu/hr to result in a conservative effective stack diameter (that is one which would tend to reduce the rise of the plume in the model). Industry also states that (emphasis added by EPA) "*Intermittent releases* of SO_2 from flares affect the monitored design value. However, flares have been *modeled as continuous sources* in order to reasonably characterize how their emissions affect air quality." The need to increase the calculated heat release from the flares to a minimum value, 1 MMBtu/hr, emphasizes the deficiency of using average parameters, including emission rates and heat release, in modeling episodic sources. The average value used falls far short of the rates during actual operation of the source – to the extent that a correction was used to insure at least some plume rise for the flares. However, industry continued to use the annual-average emission rate. Selectively adjusting the heat rate while retaining the average emission rate would tend to underestimate the modeled concentrations. EPA guidance is that for intermittent sources which need to be modeled should have emission rates and stack parameters representative of actual conditions.[28]

3.4.2.6.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, for areas without monitoring data, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. Round 4 memorandum guidance is that, for areas with violating monitors, to overcome that monitored violation and avoid a nonattainment designation, allowable emissions need to be used. Industry characterized the emissions from the sources in their modeling by a hybrid approach using annualized average actual emissions for some sources and allowable emissions for other sources.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. Three of the sources at Delek (FCCU, SRU1, and SRU2) used hourly emissions data from CEMs. Four other Delek sources (CRUFLR, NORFLR, REFFLR, and SOURFLR) used annual actual emissions from the annual emissions inventory to calculate hourly emission rates. All other Delek sources (15 minor sources) used allowable emission rates. All Tokai sources (TOKAI7A, TOKAI12A, TOKAI13A, FLARE1, FLARE2, and FLARE3) used annual actual emissions from the annual emissions inventory to calculate hourly emission rates.

The hourly rates calculated for Delek and Tokai sources from the annual actual emissions was characterized as either annual average emission rates (flares), CEM rates (FCCU), or allowable rates (minor sources). We reviewed the emission rates from the flares because of the heat rate issue noted in the previous section for Delek.

In Section 4.3.1.4, when discussing the annual average emission rates used for the State's modeling for Tokai we found that by assuming the full 8760 hours per year rather than the actual annual operating hours that in 2017 the average emission rate was underestimated by 6%. The State did not include the Tokai flare emissions while industry's modeling does. The use of annual average emission rates for episodic sources, that is sources that emit for only a small fraction of the time, would greatly underestimate the emissions when the source is actually operating.

CEMS data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS, or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

As previously noted, industry included Tokai Carbon Black Plant and 1 other emitter of SO_2 within 2 km in the area of analysis. Industry has chosen to model these facilities using a hybrid

[28] Insert reference for modeling episodic source's stack parameters

of actual and allowable emissions. The facilities in industry's modeling analysis and their associated annual SO_2 emissions between 2017 and 2019 are summarized below.

For Tokai Carbon Black and Delek Refinery, industry calculated hourly emission rates based on annual actual SO_2 emissions between 2017 and 2019. This information is summarized in Table 3-15. A description of how industry obtained hourly emission rates is given below this table.

Table 3-15 Actual SO_2 Emissions Between 2017 – 2019 from Facilities in the Howard County, Texas Area.

Facility Name	SO_2 Emissions (tpy)		
	2017	2018	2019
Tokai Carbon Black Plant	5476	4842	4218
Delek Refinery	897	1028	761
Total Emissions from All Modeled Facilities in industry's Area of Analysis	6373	5870	4979

Representative 2017–2019 annual average routine emissions were used for Tokai and Delek flares; representative hourly 2017-2019 measured emissions were used for Delek's FCCU and SRUs; and allowable emission rates were used for the minor Delek sources.

For point sources from the Tokai Carbon Black facility, annual average emission rates were used as determined from 2017–2019 Emissions Inventory Questionnaires (EIQs). Emissions from a natural gas-fired feed preheater (0.002 tpy of SO_2) were omitted.

Model inputs were obtained by converting the annual emission rate to units of grams per second, assuming continuous operation throughout the entire year. The emission rates are termed by industry as "representative average emission rates".

For minor refinery sources, 1-hour allowable emission limits were used for all sources considered in the analysis. The Modeling TAD provides users discretion to depart from the use of actuals alone, where such departure would tend to overstate results, For the FCC regenerator (FCCU), Sulfur Recovery Units (SRUs) and the four flares, 2017-2019 actual emission rates have been modeled. For the four flares annual average emission rates were used as determined from 2017–2019 EIQs. Actual hourly emission rates were used for the FCCU and two SRU sources were CEMS measured parameters that are used to calculate an actual emission rate.

EPA compiled Table 3-15 below by averaging the emission rates from the hourly modeling emissions files in grams per second and converting to tons per year for the sources included in the hourly data files, that is, those either with data from the emissions inventory and from the CEMS. Only the sources with CEMS data show hourly variability, the EI sources vary only by year. The allowable emissions rates were used as stated in the Industry modeling report Table 3.

Table 4-15. EPA Computed Annual Emission Rates in Tons per Year by Emissions Point from Industry's Modeling Files.

Facility	EPN	Model ID	Source Name	SO_2 Emission Rate					
				3-yr Avg (lb/hr)	3-yr Avg (tpy)	2017 (tpy)	2018 (tpy)	2019 (tpy)	Data Source
Tokai	7A	TOKAI7A	Dryer Stack Units 1 and 2	253.2	1109	1246	1107	973	EI
Tokai	12A	TOKAI12A	Dryer Stack Unit 3	115.3	505	600	496	419	EI
Tokai	13A	TOKAI13A	Incinerator (with HRSG)	695.5	3046	3482	3026	2631	EI
Tokai	Flare-1	FLARE1	Flare 1 for MSS	16.5	72	57	73	86	EI
Tokai	Flare-2	FLARE2	Flare 2 for MSS	13	57	48	69	55	EI
Tokai	Flare-3	FLARE3	Flare 3 for MSS	12.7	56	43	71	54	EI
Delek	02CRUDEFLR	CRUFLR	Crude Unit Flare	1	4	5	5	5	EI
Delek	14NEASTFLR	NORFLR	Northeast Flare	4.4	19	19	19	19	EI
Delek	05REFMRFLR	REFFLR	Reformer Flare	1.4	6	6	6	6	EI
Delek	16SOUTHFLR	SOUFLR	South Flare	3.8	17	17	17	17	EI
Delek	69TGINC	SRU1	No. 1 SRU Incinerator Vent	1.3	6	4	8	4	CEMS
Delek	71TGINC	SRU2	No. 2 SRU Incinerator Vent	5.1	22	6	52	9	CEMS
Delek	06ESPPCV	FCCU	FCCU	166.1	728	747	828	608	CEMS

Facility	EPN	Model ID	Source Name	SO2 Emission Rate					
				3-yr Avg (lb/hr)	3-yr Avg (tpy)	2017 (tpy)	2018 (tpy)	2019 (tpy)	Data Source
Delek	04CHRGHTR	04CHARGE	Naphtha Charge Heater	0.6	3	3	3	3	Allowable
Delek	04DEC5HTR	04DECHTR	Naphtha HDS Depent Reboiler	2.3	10	10	10	10	Allowable
Delek	05DEC5HTR	05DECHTR	Reformer Depent Reboiler	1.7	7	7	7	7	Allowable
Delek	05RFHTRCAP	05REFHTR	Reformer Heaters	10.4	46	46	46	46	Allowable
Delek	80STABLRBL	80STABHT	DHT Stabilizer Heater	0.6	3	3	3	3	Allowable
Delek	80CHRGHTR	80CHARGE	DHT Charge Heater	1.7	7	7	7	7	Allowable
Delek	25CLAYHTR	25CLAYHT	Clay Tower Heater	0.4	2	2	2	2	Allowable
Delek	06CHRGHTR	06CHARGE	FCCU Charge Heater	1.8	8	8	8	8	Allowable
Delek	37PMGTRFLR	37PMFLR	Process VaporCombustor	0.2	1	1	1	1	Allowable
Delek	37PMGTHTR	37HTR	Process Heater	0.3	1	1	1	1	Allowable
Delek	77STRBRHTR	77HTR	Naphtha StripperReboiler	0.4	2	2	2	2	Allowable
Delek	77HYDGNHTR	77H2HTR	Hydrogen PreheatHeater	0.62	3	3	3	3	Allowable

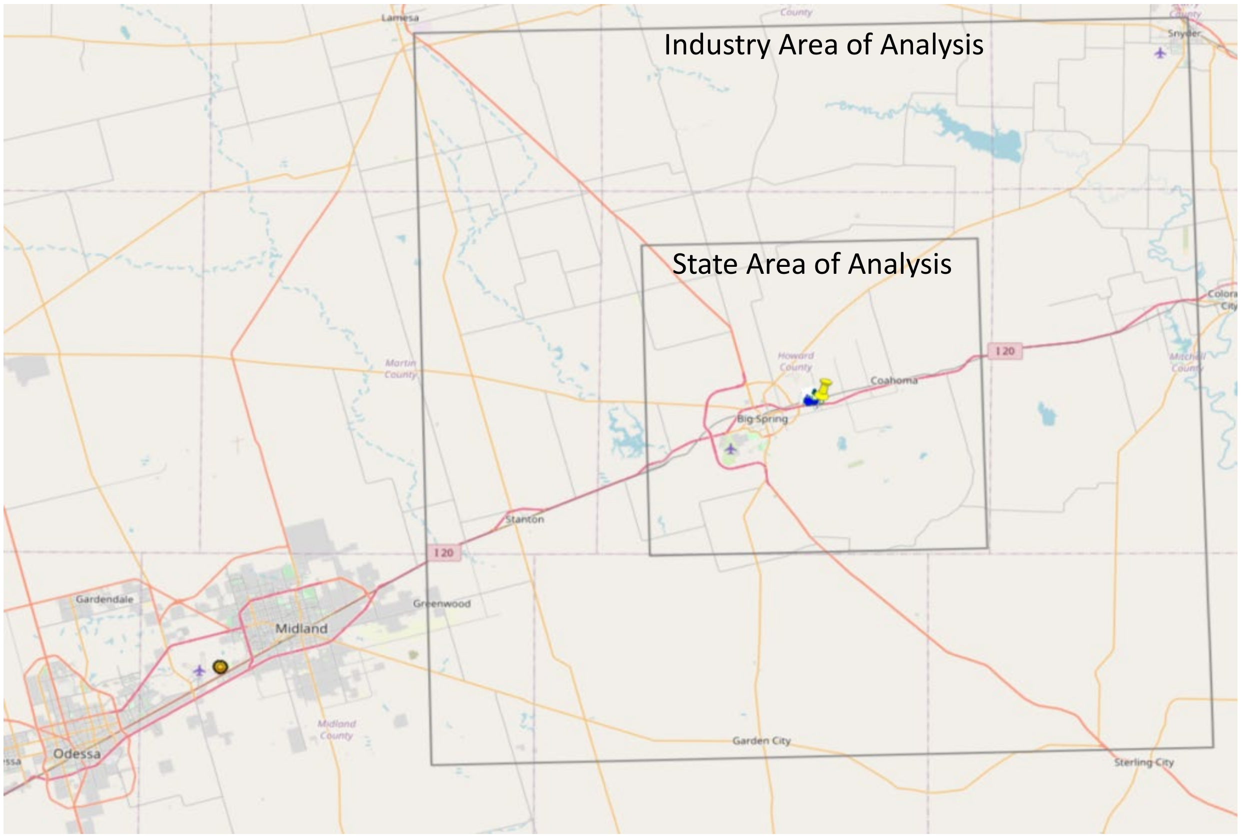
The emission rates used by industry are a complex hybrid of PTE and actual annual average emission rates. Since the area contains a violating monitor, under the Round 4 guidance in order to model to demonstrate attainment of the standard, Industry would have had to use allowable rates for all sources as explained in our Round 4 guidance. EPA does allow for the use of actual emission rates for determining the boundary of a nonattainment area. For those sources whose actual rates are based on the annual emissions inventory, industry made assumptions when converting to hourly emission rates that significantly underestimate the rates compared to the rates that EPA recommends.

3.4.2.7.Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data, for sources modeled with actual emissions where there is no violating monitor) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

EPA notes that the meteorology used by industry was identical to that used by the State for its modeling, refer to Section 3.4.1.6 for the details of the meteorology. In Figure 3-20, generated by the EPA, the location of this NWS station is shown relative to the areas of analysis for both industry's and the State's modeling analyses.

Figure 3-20. Areas of Analysis and the NWS stations in the Howard County, Texas Area.



In summary, EPA finds that industry followed the guidance of the Modeling TAD in processing the meteorological data, and the site chosen, while not the closest acceptable (for data availability) site for the upper air and surface date available, was very similar to the closest site in winds and was collocated with the upper air data collection. EPA finds that the winds modeled are representative of the local winds. However, industry included only 3 years of meteorological data (2017-2019) for the dispersion modeling rather than the 5 years recommended for a demonstration of attainment for an area with a violating monitor.

3.4.2.8.Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

The terrain in the area of analysis is best described as moderately complex, as some elevated terrain is present but not near the sources. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. Plots of the terrain in the area of analysis are given in Section 4.3.1.6.

EPA finds that industry's modeling adequately accounted for the topography within the area of analysis and the area of analysis included portions of the surrounding counties.

3.4.2.9.Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, Industry characterized the background concentration by the tier 1 approach using the Baytown Garth monitor data (AQS ID# 48-201-1017), located approximately 670 km to the southeast of the Howard County DRR monitor in Harris County, TX, and near the Gulf of Mexico. Industry selected this site based on an analysis of relative county-wide populations, county-wide SO_2 emission rates. While the county-wide 2017 SO_2 emission rates are similar 9,356 tpy of SO_2 for Harris County versus 6,842 tpy of SO_2 for Howard County, the population of Harris County is more than 100 times greater than that of Howard County and the location of the background monitor would be expected to receive relatively low SO_2 concentrations from off the Gulf of Mexico under prevailing wind conditions.

The background concentration for this area of analysis was determined by industry to be 13.9 micrograms per cubic meter ($\mu g/m^3$), equivalent to 5.3 ppb when expressed in 1 significant figure, and that value was incorporated into the final AERMOD results.

The choice of a monitor in geographically and meteorologically very different location from the violating monitor to characterize the background concentration was not the best choice given that there are closer, more representative monitoring locations, such as the one chosen by the State (48-453-0014) and explained in Section 3.4.1.9. We note that Industry's choice increased background concentration relative to that used by the State.

3.4.2.10. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Howard County, Texas area of analysis are summarized below in Table 2.

Table 3-16. Summary of AERMOD Modeling Input Parameters for Industry's Area of Analysis for the Howard County, Texas Area

Input Parameter	Value
AERMOD Version	19191
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	25 (18 non-flare)
Modeled Structures	246
Modeled Fencelines	3
Total receptors	7,115
Emissions Type	Mixed/Hybrid
Emissions Years	2017-2019 for actuals
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Midland International Airport (KMAF)
NWS Station Upper Air Meteorology	Midland International Airport (KMAF)
NWS Station for Calculating Surface Characteristics	Midland International Airport (KMAF)
Methodology for Calculating Background SO_2 Concentration	AQS Site 48-201-1017, Tier 1 based on design value
Calculated Background SO_2 Concentration	5.3 ppb

The results presented below in Table 3-17 and Figure 3-23 show the geographic extent of the predicted modeled violations based on the input parameters.

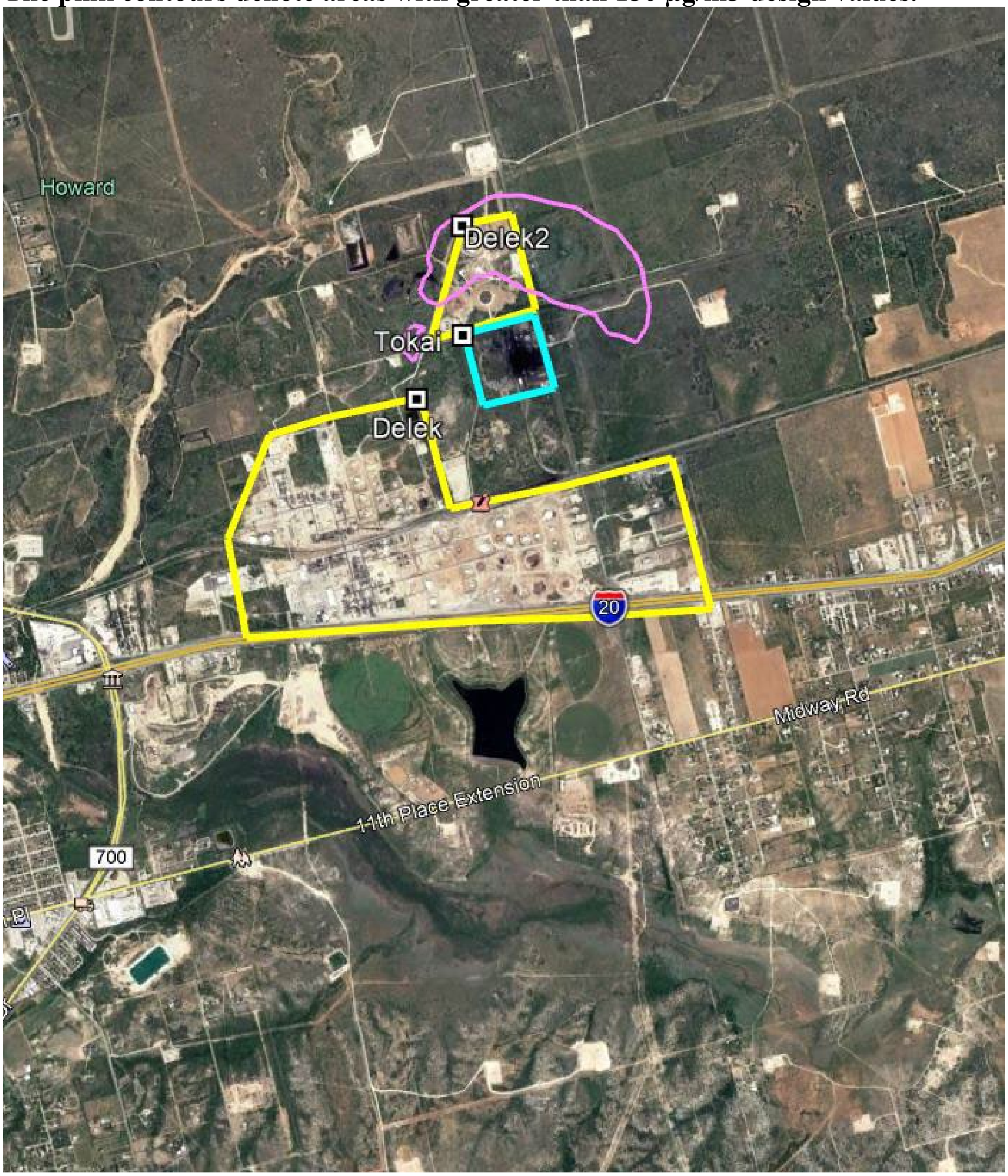
Table 3-17. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for Industry's Area of Analysis for the Howard County, Texas Area

Averaging Period	Data Period	Receptor Location UTM zone 14		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM Easting	UTM Northing	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2017-2019	273128.15	3574542.85	194.8	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor

The modeling submitted by industry does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration. Figure 3-21 was included as part of industry's recommendation and indicates that the highest modeled concentrations occur well within industry's area of analysis and in the same general location as in the State's analysis.

Figure 3-21: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Howard County, Texas Area The pink contours denote areas with greater than 150 µg/m3 design values.



3.4.2.11. The EPA's Assessment of the Modeling Information Provided by industry

Industry's modeling did not follow the EPA Round 4 and Appendix W guidance for modeling for demonstrating attainment in areas with violating monitors for receptors and emissions. The modeling followed EPA's guidance for surface processing, and meteorological processing. The default options for the version of AERMOD employed were set and a questionable methodology for estimating the background concentrations for the facility and an appropriate rural land use characterization were used. For the receptors, industry did not fully estimate ambient air impacts of one facility on the property of the other facility by placing receptors as recommended by the Appendix W.

The emissions that Industry used in the modeling were deficient because Industry included the flare sources at Tokai Carbon Black Plant in the modeling but omitted WTG-South Feagan, a major SO_2 source within 20 km of the violating monitor. Moreover, the EPA's Round 4 and Appendix W guidance for modeling areas with monitored NAAQS violations should have been followed. The main points of departure from our Round 4 and Appendix W guidance is the use of annualized assumed average actual emission rates rather than the allowable emission rates used for areas with violating monitors intending to support a designation as other than nonattainment. When using modeling to evaluate the extent of the violating area, modeling of actual emissions can be used to help inform boundaries of the nonattainment area, however, the rates modeled were biased low relative to what would be expected if realistic actual emissions rates had been utilized to support a nonattainment boundary determination.

The need to increase the calculated annual-average heat release from the Delek Refinery flares to a minimum value, 1 MMBtu/hr, emphasizes the deficiency of using average parameters, including emission rates and heat release, in modeling episodic sources. The average value used falls far short of the rates during actual operation of the source – to the extent that a correction was used to insure at least some plume rise for the flares. However, industry continued to use the annual-average emission rate. Selectively adjusting the heat rate while retaining the average emission rate is not conservative, that is would not tend to overestimate the modeled concentrations. EPA guidance is that for intermittent sources which need to be modeled should have emission rates and stack parameters representative of actual conditions.

Both the State's and industry's modeling used estimated actual emission rates derived from annual emissions (low-biased) rather than short-term allowable emission rates in modeling attainment around the sources and used the same 3-years of meteorology, 2017-2019.

Table 3-17. Comparison of State and Industry Emissions-Related Data for Tokai

TCEQ ID	Industry ID	State Emission Rate (gm/s)	Industry Emission Rate (gm/s)	State Temperature (K)	Industry Temperature (K)	State Velocity (m/s)	Industry Velocity (m/s)
PR1002, PR1004, PR1007	TOKAI13A	87.63	87.63	504.26	616.48	13.72	11.49
DRY1006	TOKAI12A	14.53	14.53	560.93	588.71	28.04	20.51
DRYER22, DRYER23, DRYER24	TOKAI7A	31.89	31.90	560.93	588.71	28.04	22.46
-	FLARE1	-	2.1	-	1273	-	20
-	FLARE2	-	1.6	-	1273	-	20
-	FLARE3	-	1.6	-	1273	-	20

3.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Howard County, Texas Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

3.6. Jurisdictional Boundaries in the Howard County, Texas Area

EPA considers existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary for carrying out the air quality planning and enforcement functions for the area. Our goal is to base designations on clearly defined legal boundaries that align with existing administrative boundaries when reasonable. Existing jurisdictional boundaries used to define a nonattainment area must encompass the area that has been identified as meeting the nonattainment definition.

Texas commented on our intended designation stating that Howard County, Texas should be designated unclassifiable rather than nonattainment because it claimed that the air monitoring data from 2017- 2019 are not representative of current or near-term air quality conditions due to significant changes that have and will continue to occur in those areas. Also, that the significant SO_2 sources in Howard County, the Big Spring Refinery and Big Spring Carbon Black Plant, have already made and continue to make enforceable reductions. However, TCEQ proposed that if EPA did decide to finalize a nonattainment an area encompassing Howard County that a partial boundary encompassing the geographic area limited to containing the SO_2 sources modeled should be used.

3.7. Other Information Relevant to the Designation of the Howard County, Texas Area

EPA received additional comments regarding the intended designation for the Howard County, Texas area. These comments are addressed in the Response to Comment (RTC) document associated with this final action.

3.8. EPA's Assessment of the Available Information for the Howard County, Texas Area

A monitor in the Howard County, Texas area is violating the NAAQS based on the 2017-2019 design value. However, as described in the preceding sections, Texas and industry submitted demonstrations consisting of (a) air dispersion modeling and (b) analyses of the monitor data purporting to demonstrate that new enforceable and in effect attain the NAAQS and are now more representative of current air quality than the violating design value. Neither the State's nor industry's modeling fully considered ambient air impacts of one facility on another facility's property. Since the maximum modeled design value occurred at the fenceline of the Delek refinery property to the north of Tokai Carbon Black, we cannot tell if higher concentrations may have occurred on the Delek property in this area. The significant differences between the State's modeling and industry's modeling were that industry included modeling for the flare sources at Tokai; did not include the major source WTG-Feagan; the characterization of the sources included in both analyses was different (see Table 3-17); and the Tier 1 background concentrations were significantly different (2.6 ppb for the State and 5.3 ppb for Industry).

The EPA's Modeling TAD advises in Section 5.2 that "in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used.". When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall, the uncertainty in the modeled emission rates and the known bias low are issues of a significant concern.

EPA's analysis of the modeling submitted found flaws that would lead the models to tend to underestimate concentrations. First, the modeling for attainment relies on the use of annualized average emission rates including non-operational hours rather than maximum allowable rates.[29] While true actual rates can be used to determine the boundaries of a nonattainment area, Appendix W and EPA's Round 4 designations guidance are clear that allowable emission rates should be used to support a designation other than nonattainment for an area which contains a violating monitor. Thus, we cannot rely on the modeling as submitted to demonstrate that the area is and will be attainment in the future. However, EPA has used the results of this modeling as a starting point to inform our final boundary for the nonattainment area.

In our intended designation EPA proposed that all of Howard County should be designated nonattainment in the absence of modeling information and due to the presence of complex terrain in the county. EPA examined the modeling to determine if it could be used to help determine the boundaries of a nonattainment area. We found an additional issue in the modeling which would tend to bias the model results low, preventing a straightforward/complete reliance on the modeling to establish the boundaries of the nonattainment area. The issue is that the average assumed hourly emission rates used were based on annualized actual emissions leading to two separate concerns in underestimating emission rates (a) the average rate is estimated as the annual total divided by 8760 rather than by the actual hours of operation and (b) short-term variability of the emission rate is not considered.

We were able to use aspects of the modeling and modeled concentrations available in the information from TCEQ and Industry to reduce the size of EPA's intended nonattainment area (all of Howard County) even though we have concerns that the modeling is biased low and does not model violations. In an effort to account for the deficiencies in the modeling, EPA has used a reduced design value threshold level to define the borders of the nonattainment area with a buffer to address the concerns discussed above that lead to uncertainties in the modeling. We used a value of 98.2 µg/m3 (37.5 ppb) or ½ the NAAQS level. We believe that given the concerns about hours of operation and variability of short-term emissions this level of adjustment is reasonable. This concern of the low bias in the State's modeled design value is corroborated at the DRR monitor where the observed concentration was underestimated by a factor of 3.33 (26.7 ppb vs 89 ppb). We note these model to monitor comparisons but the reason to adjust the nonattainment area is because of our concerns about hours of operation and variability of short-term emissions and the impacts on modeled DVs. While EPA is unable to make a precise estimate of the degree of uncertainty in the State's analysis or of the degree of underestimation that the State's analysis may have, EPA considers a factor of 2 reduction in the threshold to be a reasonable approximation Thus, the use of a factor of 2 reduction in the threshold is reasonable and ensures

[29] It is important to note that for a short-term standard such as the 1-hour SO_2 standard, where an air agency is considering developing a longer term-averaged limit for a SIP in order to bring a violating area into attainment, that after identifying and modeling a 1-hour limit that would provide for attainment if constantly met by the source EPA strongly recommends that the stringency of any longer-term limit should be tightened by applying an adjustment factor so as to account for short-term variability in the emission rate and thereby make the longer term limit comparably stringent to an attaining constant 1-hour limit. This guidance (including EPA's 2014 SO2 modeling for Attainment Demonstrations) implies, conversely, that a variable set of emissions can cause significantly worse air quality than constant emissions at the average rate of the variable emissions set. The guidance addresses averaging times up to 30 days; the difference between variable emissions impacts and constant emissions impacts is likely to be greater with annual average emissions. This short-term variability is not considered in the State's modeling, which causes the modeled impacts to be prone to underestimate the magnitude of concentrations and the geographic area of likely violations.

with a high degree of certainty that all areas of possible exceedances are included in the nonattainment area. Boundary modeling could have also been done with allowables and we note that Attainment Demonstration modeling will have to model allowable emission rates in accordance with 40 CFR Part 51 Appendix W, and, therefore, modeling allowables would also expand the nonattainment area compared to the State and industry modeling. So, we are using a general factor of 2 to yield a reasonable area of nonattainment for designation.

EPA has addressed concerns about using longer term average emission rates and other uncertainties in emission rates used in modeling for 1-Hour SO2 NAAQS issues in other designation actions[30] and EPA has also done some technical analysis previously documenting the technical concerns with using longer term average emission rates that do not take into account variability and that can lead to underestimations for 1-Hour SO2 NAAQS for regulatory actions such as designations, attainment demonstrations, and permitting.[31] Much of EPA's technical analyses has been on the impacts being biased low if not accounting for the difference/variability between 30-day average limits and 1-hour limits with 1-hour limits resulting in larger impacts (DVs), and the difference would be larger between annual average limits/emission rates and 1-hour emission rates and would result in an even larger nonattainment area than modeling the 1-hour equivalent (CEV) of a 30-day limit . EPA notes that the facts of each situation are unique and case-specific in how a boundary is determined in these situations.

To determine the new boundary with a buffer to address concerns/uncertainties in the modeling boundaries, EPA plotted the resulting design value fields with new concentration contour values from the State's modeling files and considered four factors (1) the geographic extent of modeled annual 4th high (99th percentile) hourly values above the threshold, (2) the locations of the sources which contribute to the elevated values, (3) the locations of any previously designated areas, and (4) contribution to any nearby nonattainment areas.

Since there are no nearby nonattainment areas to be considered for Howard County, EPA constructed boundaries based on the adjusted modeling to ensure that considerations 1 and 2 are encompassed. Considerations 3 and 4 did not impact the determination of the boundaries.

The EPA believes that our final nonattainment area bounded by the lines connecting the UTM coordinates in Table 3-6, will have clearly defined legal boundaries. Figure 3-22 gives the EPA final nonattainment boundary along with the State's recommended nonattainment area boundary.

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[30] EPA Round 2 Designations (Docket ID NO. EPA–HQ–OAR–2014–0464), Maryland TSD, (add others) available in the docket and at *https://www.epa.gov/sulfur-dioxide-designations/epa-completes-second-round-sulfur-dioxide-designations*. EPA is also adjusting boundaries in another final designation in this action (Madrid County, Missouri designation) - See intended designation TSD in the docket and available at *https://www.epa.gov/sites/production/files/2020-08/documents/05-mo-rd4_intended_so2_designations_tsd.pdf* and Final TSD available in the docket for this action.

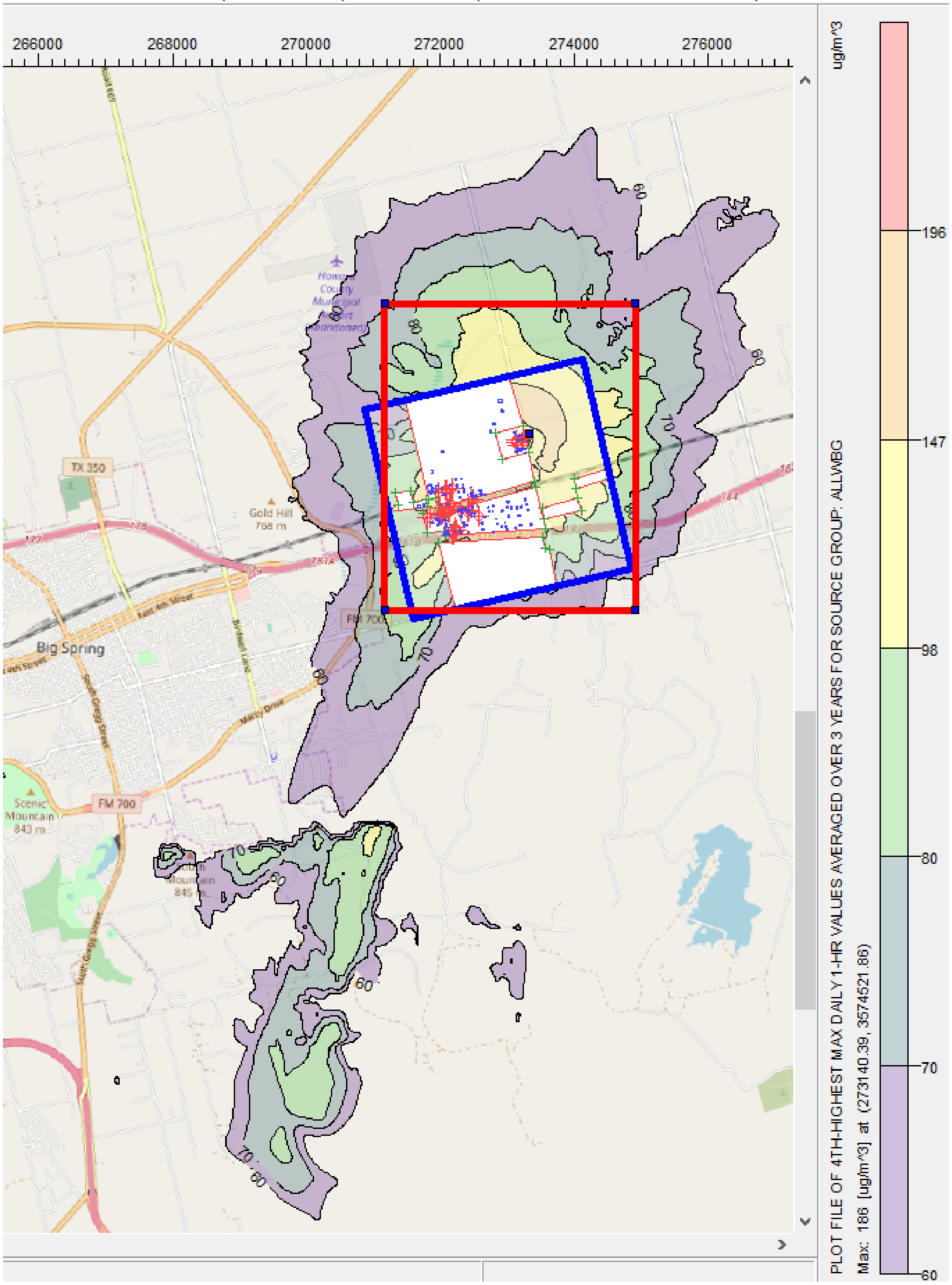
[31] EPA 2014 "Guidance for 1-Hour Sulfur Dioxide (SO_2) Nonattainment Area State Implementation Plans (SIP) Submissions" available at *https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf*

Table 3-6. UTM Coordinates (zone 14) for EPA's Final Nonattainment Area

Vertices	Easting (m)	Northing (m)
SW	271177.6	3571453.5
SE	274913.8	3571453.5
NE	274913.8	3576035.9
NW	271177.6	3576035.9

EPA has no evidence to suggest that violations are occurring in the remainder of Howard County or that there are sources outside the nonattainment area that are contributing to the violations in the nonattainment area. Specifically, the remainder of Howard County does not contain any sources that emitted greater than 50 tons per year of SO_2. For these reasons, EPA is designating the remainder of Howard County as attainment/unclassifiable.

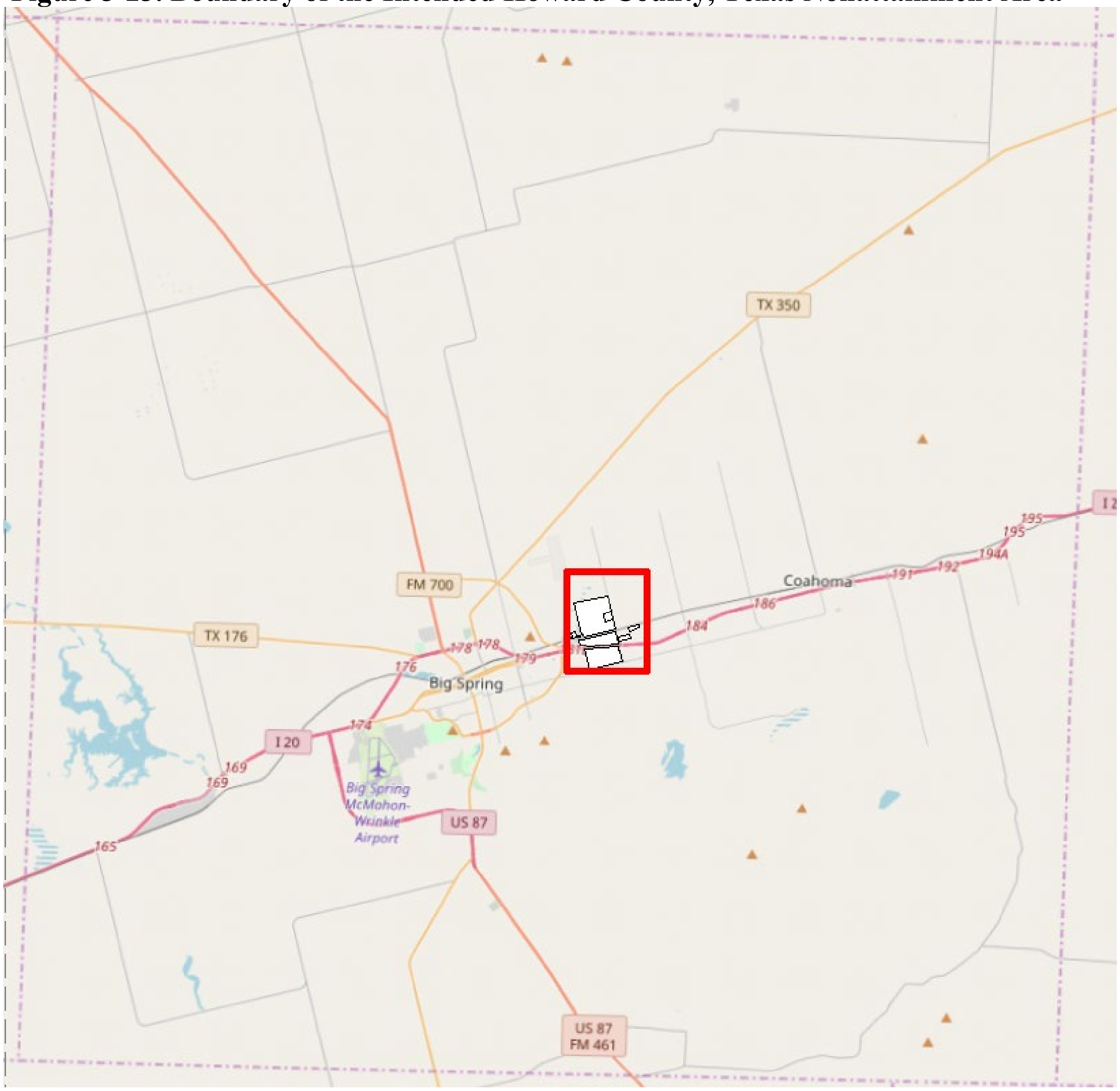
Figure 3-22. The Boundary of the Final Nonattainment Area for Howard County, Texas are shown in Red (EPA final) and Blue (State Recommendation).



3.9. Summary of EPA's Final Designation for the Howard County, Texas Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, EPA is designating a portion of Howard County, Texas as nonattainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the rectangle bounded by the UTM coordinates in Table 3-6. Additionally, EPA is designating the remainder of Howard County, Texas as attainment/unclassifiable. Figure 3-23 shows the boundary of our final designated nonattainment area with the rest of Howard County that is being designated attainment/unclassifiable.

Figure 3-23. Boundary of the Intended Howard County, Texas Nonattainment Area



4. Technical Analysis for the Hutchinson County, Texas Area

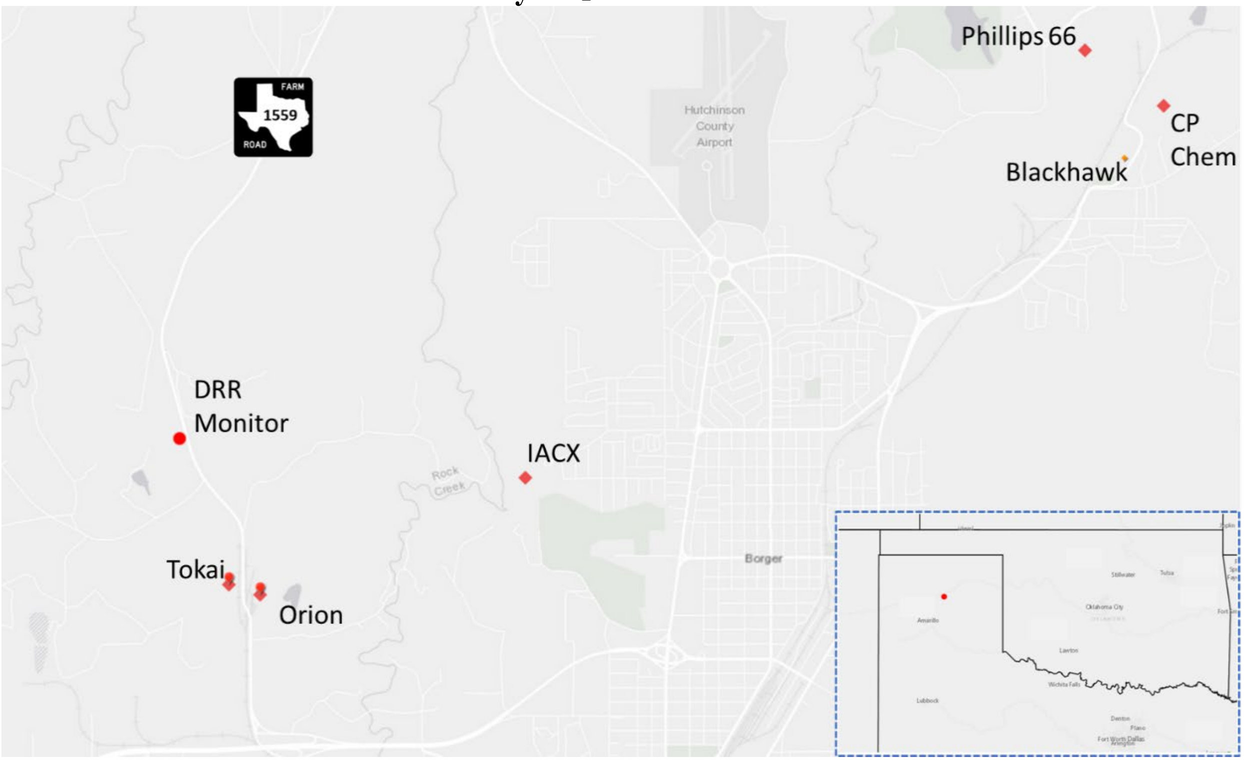
4.1. Introduction

The EPA must designate the Hutchinson County, Texas area by December 31, 2020, because the area has not been previously designated and Texas installed and began operating a new EPA-approved monitor pursuant to the DRR. This section presents all the available air quality information for the portion of Hutchinson County, Texas that includes the following SO_2 source around which the DRR required the State to characterize air quality:

- The Orion Carbon Black facility emits 2,000 tons or more of SO_2 annually. Specifically, Orion emitted 3,108 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Texas has chosen to characterize it via monitoring.
- The Tokai Carbon Black facility, formerly known as Sid Richardson, emits 2,000 tons or more of SO_2 annually. Specifically, Tokai emitted 4,863 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Texas has chosen to characterize it via monitoring.

As seen in Figure 4-1 below, the Orion and Tokai facilities are located in the panhandle of Texas, about 2.2 kilometers (km) west of the city of Borger, Texas on a secondary state road, named FM1559. FM1559 divides the two facilities with Borger on the east and Tokai on the west. The DRR monitor, AQS ID# 48-233-1073, is located about 1.1 km to the NNW of the nearest emission source at the two facilities, also on FM1559. Several other nearby Hutchinson County SO_2 sources are also shown in Figure 4-1, including IACX, Phillips 66, Blackhawk, and CP Chem. These sources are discussed in Section 4.4

Figure 4-1. Map of the Hutchinson County, Texas Area Addressing Orion and Tokai Carbon Black Plants and other nearby SO_2 sources.



4.2. Summary of Information Reviewed in the TSD for the Intended Round 4 Area Designations

In its September 18, 2015 recommendation letter, Texas recommended that the entire Hutchinson County area, as one of the Texas counties without an SO_2 monitor, be designated as unclassifiable/attainment for the 2010 SO_2 NAAQS. Texas, however, provided EPA with this recommendation prior to the installation and operation of an EPA-approved monitor and before the State had monitoring data for the 2017-2019 period. Texas did not update its recommendation after this monitoring data became available nor before EPA sent our 120-day letter to the State. EPA did not agree with Texas's September 2015 recommendation as to the designation category and intended to designate all of Hutchinson County, Texas as nonattainment for the 2010 SO_2 NAAQS based upon the available monitoring information for the 2017-2019 period.

In a letter dated October 16, 2020, Texas disagreed with our intended designation saying that our nonattainment designation is not necessary and is therefore inappropriate.[1] Texas revised its recommendation for Hutchinson County to unclassifiable because it claimed that the 2017-2019 air monitoring data was not representative of the current and near-future conditions. Texas stated that the ongoing progress toward attainment of the 2010 SO_2 NAAQS will occur sooner than would occur through development and implementation of emission limits added to a state

[1] October 16, 2020 Letter from Governor Abbot to Administrator Andrew Wheeler.

implementation plan. Texas also conditionally revised its boundary recommendation. As part of Texas's comments they submitted new modeling analyzing air quality in the area surrounding the Orion and Tokai Carbon Black Plants in the Hutchinson County, Texas area to inform their comments on the size of the nonattainment boundary. Texas indicated that if EPA designated Hutchinson County as nonattainment, the nonattainment boundary should be limited to the geographical areas that violate the standard based the State's modeling.

4.3. Air Quality Monitoring Data for the Hutchinson County, Texas Area

In the TSD for the intended area designations, EPA considered design values for the air quality monitor in the Hutchinson County, Texas area. Specifically, EPA determined that the monitor (AQS ID# 48-233-1073) violated the 2010 SO_2 NAAQS with 2017-2019 design value of 209 ppb. EPA has no new quality assured monitoring information that warrants revising our prior analysis of available monitoring data.

4.4. Assessment of a New Technical Information for the Hutchinson County, Texas Area Addressing Orion Carbon Black Plant and Tokai Carbon Black Plant

On October 16, 2020, Texas submitted new modeling analyzing air quality in the area surrounding the Orion and Tokai Carbon Black Plants in the Hutchinson County, Texas area. Texas performed its assessment and characterization using air dispersion modeling software, i.e., AERMOD, analyzing an annual average of estimated hourly emissions based on total annual emissions for each year divided by assumed operation of 8760 hours of the year. After careful review of Texas' new assessment, supporting documentation, and all available data, EPA is revising its intended designation and designating a portion of the County as nonattainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

The discussion and analysis that follows below will reference the "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and the factors for evaluation contained in the EPA's September 5, 2019 guidance; July 22, 2016 guidance; and March 20, 2015 guidance as appropriate that can be found in the docket for this action.[2]

For this area, the EPA received and considered 2 different modeling assessments, including 1 assessment from the state and 1 other assessment from other parties. To avoid confusion in referring to these assessments, the following table lists them, indicates when they were received, provides an identifier for the assessment that is used in the discussion of the assessments that follow, and identifies any distinguishing features of the modeling assessments.

[2] *https://www.epa.gov/sites/production/files/2016-04/documents/so2modelingtad.pdf*.

Table 4-2. Modeling Assessments for the Hutchinson County, Texas Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
Texas	October 16, 2020	TCEQ modeling	Smaller Receptor Grid
Phillips 66 and IACX	September 21, 2020	Industry Modeling	Partial on-facility ambient air analysis, partial contribution to nonattainment analysis

Phillips 66 included the modeling report and files from their consultant, DiSorbo, to EPA in its comments, and IACX also included the same modeling report in their comments. Since multiple industry groups included the same modeling analysis, EPA is referring to it as the "Industry Modeling."

4.4.1. Modeling Analysis Provided by the State

In its 2020 recommendation letter, Texas provided an air quality modeling analysis for the area to support a smaller nonattainment area boundary.

Texas' assessment and characterization analyzed total annual emissions averaged over assumed 8760 hours of operational and non-operational source hours using air dispersion modeling software, i.e., AERMOD, rather than either actual hourly emissions resulting from source operational hours or maximum federally enforceable allowable emissions rates.

The area that the state has assessed via air quality modeling is located in southwestern to southcentral Hutchinson County extending about 6km south into neighboring Custer County.

Also included in Figure 4-1 are other nearby emitters of SO_2That are included in the State's modeling. These are Chevron Phillips Chemical Company LP - Philtex Ryton Plant (CP Chem), Phillips 66 Company - Borger Refinery (Phillips 66), IACX - Rock Creek Gas Plant (IACX), Borger Energy Associates LP - Blackhawk Power Plant (Blackhawk), and Solvay. All of these sources are located to the northeast of the Tokai and Orion carbon black plants with IACX being the nearest at about 2 km while the others are clustered together at about 6.5 to 8.5 km.

The discussion and analysis that follows below will reference the "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and the factors for evaluation contained in the EPA's September 5, 2019, guidance, July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.[3]

4.4.1.1.Model Selection and Modeling Components

[3] *https://www.epa.gov/sites/production/files/2016-04/documents/so2modelingtad.pdf*.

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The State used AERMOD version 19191, the most recent version. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

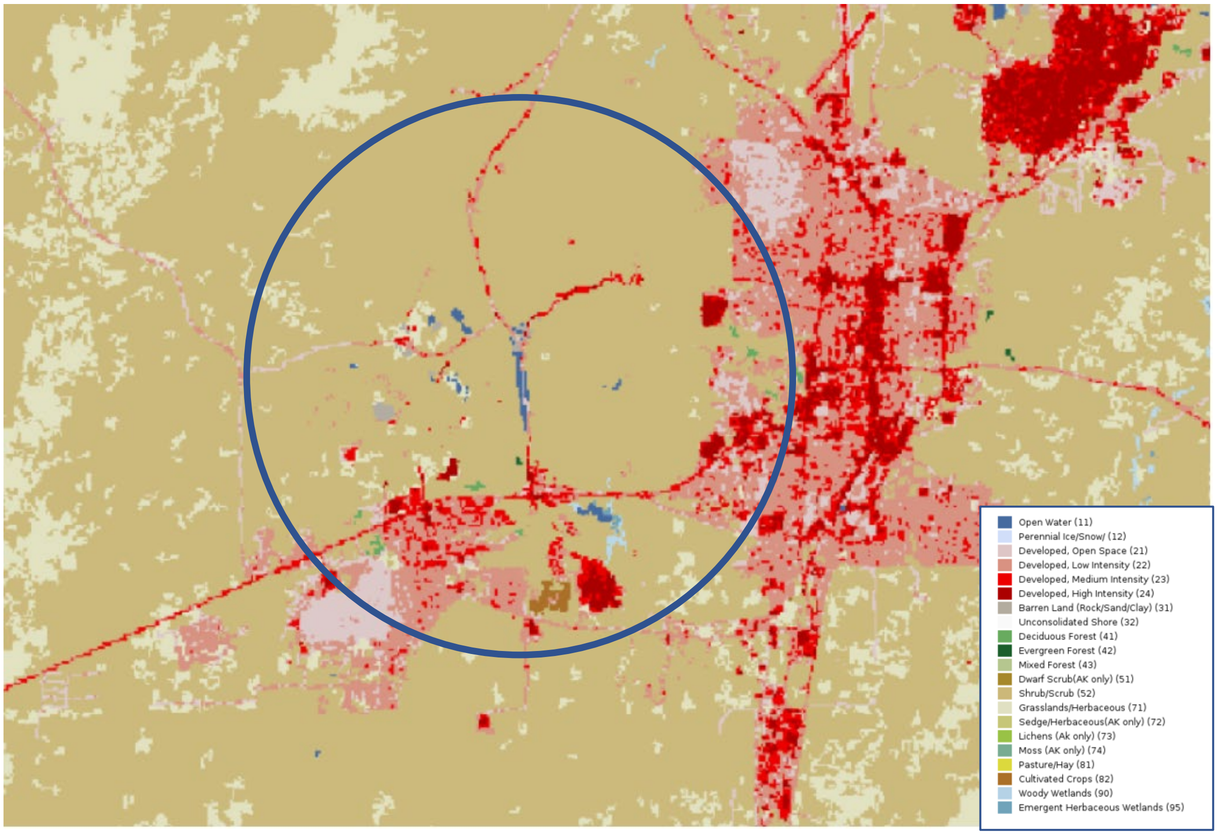
4.4.1.2.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, the State determined that it was most appropriate to run the model in rural mode.

The State did not explain the characterization of the area as rural. Figure 4-2 is a plot made by EPA of 2016 NLCD Land Cover type with a circle depicting a 3km radius around the facility. The vast majority of the land use within 3km is not one of the developed types. EPA concurs that the area around the facilities is rural in character and that the use of the rural dispersion option is appropriate.

Figure 4-2. 2016 Land Use Around the Tokai and Orion Carbon Black Plants with a Circle of Radius 3 kilometers.



4.4.1.3.Modeling Parameter: Area of Analysis (Receptor Grid)

The Modeling TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Hutchinson County, Texas area modeling, the State included 5 other emitters of SO_2 within 8.6 km of the carbon black plants in any direction. The State determined that this was the appropriate distance to adequately characterize the potential extent of any 2010 SO_2 NAAQS violations in the area and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to the carbon black plants, the other emitters of SO_2 included in the area of analysis are: Phillips 66, IACX, Solvay, Blackhawk, CP Chem. The State determined that no other sources beyond 8.6 km had the potential to cause significant concentration gradients within the area of analysis.

The grid receptor spacing for the area of analysis chosen by the State is as follows. The receptors consist of 2 nested grids centered approximately midway between the Tokai/Orion facilities and the CP Chem/Phillips 66 facilities.

- The inner most nest goes from the modeling center out to 8 km with a grid spacing of 100 meters encompassing all three facilities. This nest extends beyond the Tokai and Orion sites by at least 4 km and the eastern edge of the Phillips 66 site by 2.8 km.
- The second and outermost grid goes from 8 km to 20 km with a grid spacing of 500 meters.
- In addition to the nested grids, there are receptor points added at the location of the nearby monitor and receptor points located at 25-meter intervals along all property lines. The State noted that for Phillips 66, the receptors were placed at 25-meter intervals along a somewhat smaller boundary

All nested receptors within these property boundaries have been removed. Figures 4-3 and 4-4, included in the State's modeling report detail the receptor fields near the Tokai and Orion facilities and the CP Chem and Phillips 66 facilities respectively. Figure 4-5 shows the far field receptors.

Figure 4-3. Receptor Field Near the Tokai and Orion Carbon Black Facilities

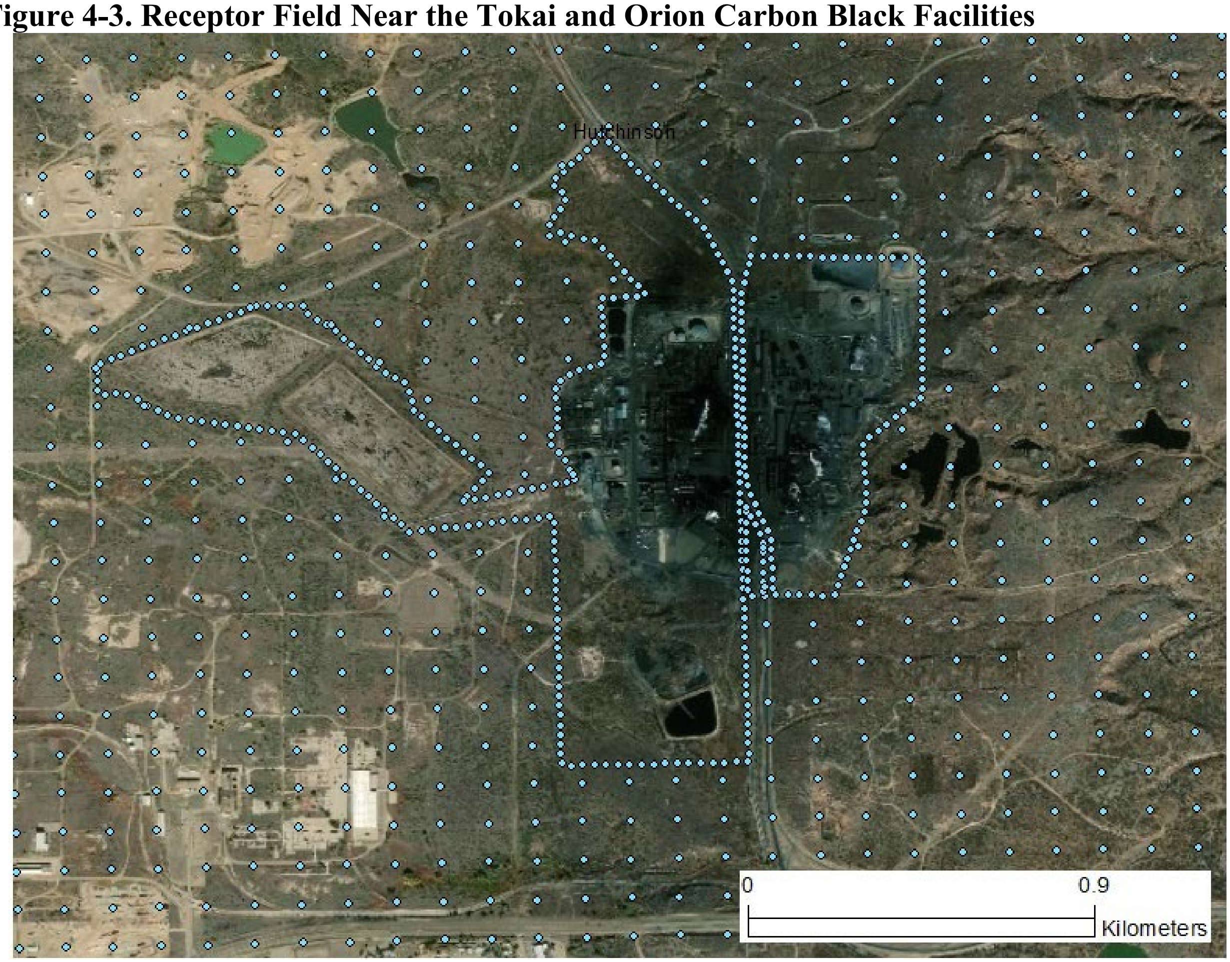


Figure 4-4. Receptor Field Near the CP Chem and Phillips 66 Facilities

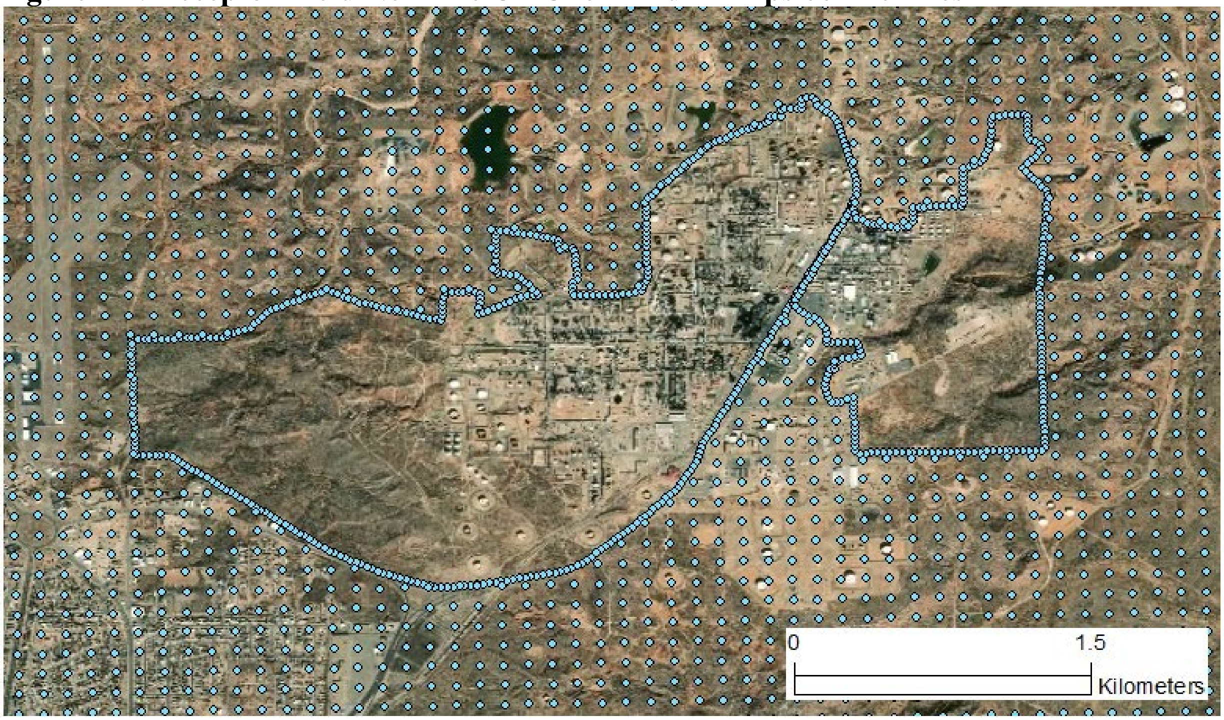
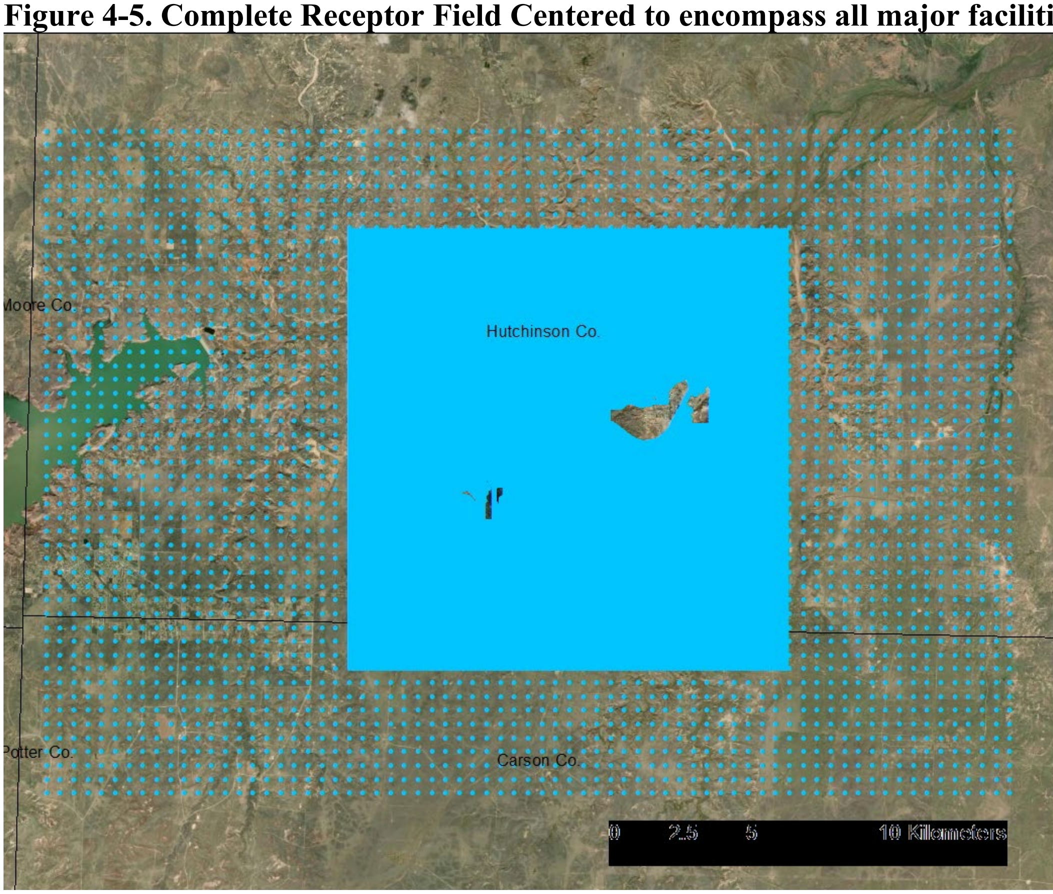


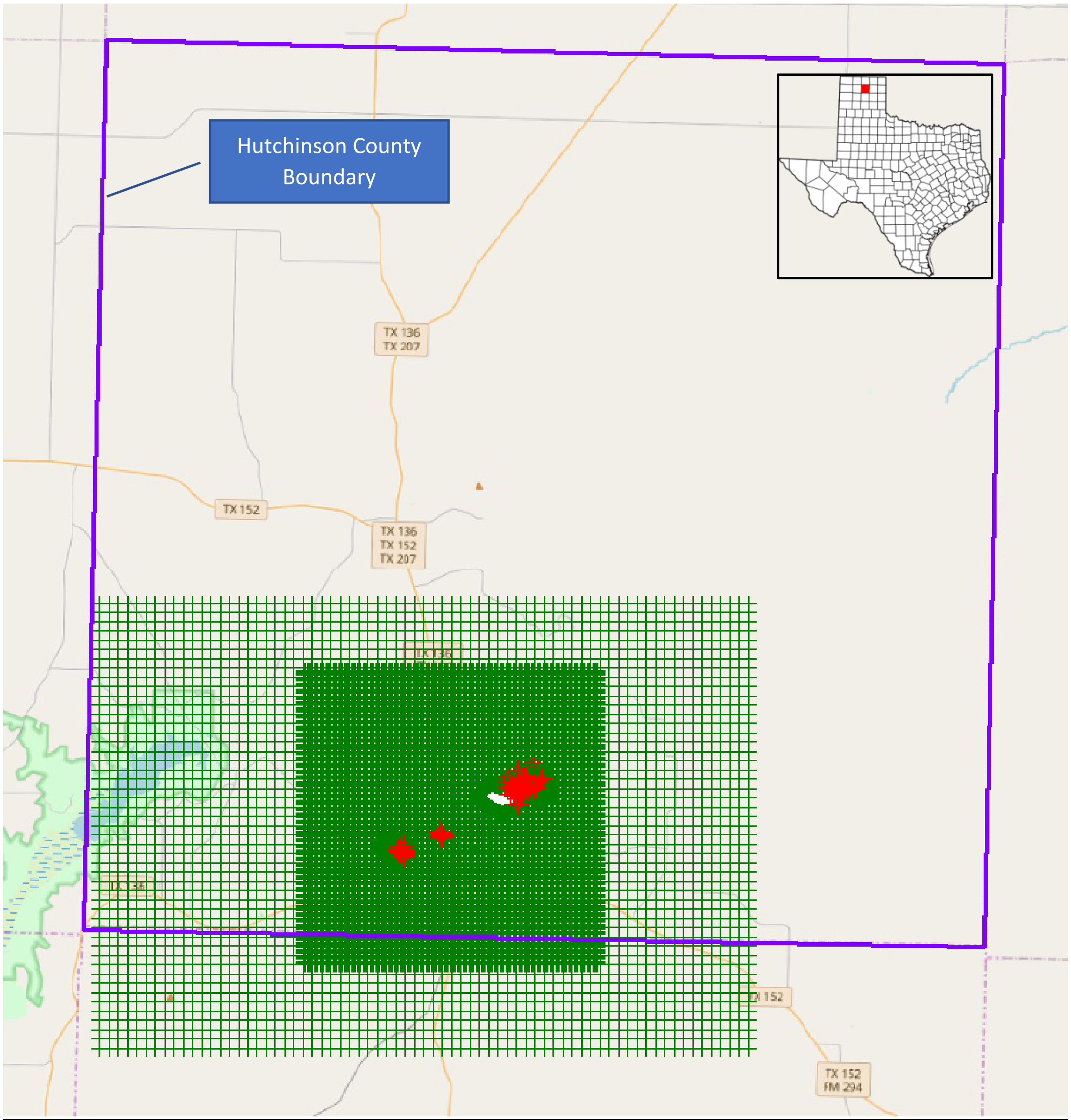
Figure 4-5. Complete Receptor Field Centered to encompass all major facilities



The receptor network contained 28,632 receptors and the network covered southwestern to southcentral Hutchinson County extending about 6 km south into neighboring Custer County.

Figure 4-6 generated by EPA from the State's modeling files, show the State's chosen area of analysis surrounding the carbon black plants, as well as the receptor grid for the area of analysis.

Figure 4-6. Area of Analysis for the Hutchinson County, Texas Area Showing Receptor Grid.



The Modeling TAD advised that receptors be placed for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property with the exceptions of locations described in Section 4.2 of the Modeling

TAD as not being feasible locations for placing a monitor. The State removed all receptors within these property boundaries and did not conduct a full ambient air analysis. In the case of Phillips 66, the State used a smaller property boundary to remove receptors than the boundary that Phillips 66 claims. The State has indicated that the boundary was based on facility boundaries used in previous permit modeling.[4]

The lack of ambient air analyses for the impacts of a facility on other facilities' property may be a problem in interpreting the results of the modeling if it is unclear, based on other information, whether the area is modeled as attainment; or if modeled as nonattainment, where the boundary of the nonattainment area should be placed. The State's receptor grid does not cover all of EPA's intended nonattainment area, that is, the entirety of Hutchinson County. Depending on the results of the modeling there may be a problem in interpreting the boundary of any modeled nonattainment area if it is unclear whether portions of the county external to the grid would be modeled as attaining the standard. Extending the grid from 8 km to 20 km from the DRR facilities would better ensure that the maximum design values are captured and that concentrations are declining to the edge of the receptor grid.

4.4.1.4.Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions.

The Tokai and Orion facilities have a large number of SO_2 sources. In addition, the State of Texas Air Reporting System (STARS) data was searched within 20 km of the Tokai and Orion facilities to identify any other potential sources. The State included any facility with total annual emissions greater than 100 tpy. Based on this criterion the State included four additional facilities in the modeling – Blackhawk Power Plant, Phillips 66, CP Chem, and IACX. We note that the sources at the Agrium facility to the south of the carbon black plants, aligned to contribute at the same time at the DRR monitor, were not modeled by the State though they were included in industry's modeling. The Agrium sources are not large sources so they would have a very small modeled impact.

Each of these facilities have multiple sources of SO_2 that were modeled. The source parameters for the 158 point sources that were modeled are shown in State's modeling report Table 9 and the three area sources in Table 10. Table 11 of the report gives the 10 point sources not modeled due to low actual emission rates (threshold not specified) for the three-year modeling period.

With caveats, the State characterized these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD with the exception of assumed emission rates and inclusion of non-operational hours modeled discussed below. Specifically, the State used

[4] As part of modeling performed by Phillips 66 and other Hutchinson County industries in Spring/Summer 2020 that EPA and TCEQ reviewed, Phillips 66's made claims based on property ownership and exclusion of the public by means of signs and patrols. EPA reviewed the information provided by Phillips 66 that did include some materials submitted as Confidential Business Information (CBI) but EPA did not finalize approval of the larger property boundary exclusion area that Phillips 66 was requesting at the time.

actual stack heights in conjunction with an estimate of hourly emissions. The State also addressed the sources' building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash. However, as noted below the buildings at the Tokai Carbon Black Plant were not fully represented when compared to Industry's modeling, and the flare sources were not modeled. The State included all the facilities in the modeling expected other than Agrium. However, the treatment of building downwash may be deficient due to the omission of buildings adjacent to stacks, and to the omission of the flare emissions at Tokai Carbon Black Plant.

4.4.1.5.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations where there is no violating monitor, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. EPA's September 5, 2019, Round 4 designations guidance memorandum, allows either for the use of actual or allowable emission rates for determining the boundary of a nonattainment area.[5] We note in the memo that allowable emission rates will be required for modeling for a SIP attainment demonstration, since boundaries determined using actual emission rates may not be sufficient to capture all sources that would need to be modeled in an attainment demonstration to show that all sources in the area modeled with allowable emissions provide for NAAQS attainment.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. These data are available for many electric generating units. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS, or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

As previously noted, the State included the Orion Carbon Black Plant and Tokai Carbon Black Plant and 4 other emitters of SO_2 within 20 km in the area of analysis. The State has chosen to model these facilities using an estimate of actual emissions rather than true actual emissions or allowable emissions. The facilities in the State's modeling analysis and their associated total annual SO_2 emissions between 2017 and 2019 are summarized below.

For all point sources, the State provided annual total SO_2 emissions between 2017 and 2019. This information is summarized by facility in Table 4-3. A description of how the State obtained estimated hourly emission rates is given below this table.

[5] *See* "Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard – Round 4," memorandum to Regional Air Division Directors, Regions 1-10, from Peter Tsirigotis, dated September 5, 2019, available at *https://www.epa.gov/sites/production/files/2019-09/documents/round_4_so2_designations_memo_09-05-2019_final.pdf*

Table 4-3. Total SO_2 Emissions Between 2017 – 2019 from Facilities in the Hutchinson County, Texas Area Calculated from State's Modeling Report Table 12, Except Where Noted.

Facility Name	SO_2 Emissions (tpy)		
	2017	2018	2019
Orion Carbon Black Plant	3706	3512	3605
Tokai Carbon Black Plant	6950	5792	5049
Phillips 66	204	218	208
Solvay*	0.188	0.176	0.111
Blackhawk Power*	71.8	82.4	68.5
IACX	183	201	114
CP Chem	517	451	411
Total Emissions from All Modeled Facilities in the State's Area of Analysis	11560	10174	9387

*State did not characterize emission rates from Solvay and Blackhawk Power in Table 12 of their report but did include in the modeling. The annual emissions for these two sources are taken from the Phillips 66 modeling report.

The State modeled these facilities (including Solvay and Blackhawk) using estimates of hourly emission rates based on annual emission totals and not on either actual hourly emissions rates or federally enforceable PTE limits for SO_2 emissions. For all facilities except Blackhawk Power the estimated hourly emissions data were obtained from the annual emissions reported to STARS. An hourly emission rate for these sources was calculated using each year's annual emissions from STARS and an operating schedule assuming uniform operation for all hours (8,760) of the year to calculate an annual average emission rate. Although the companies provided to the State hourly emissions data for a subset of sources, the company data included emissions events and unpermitted scheduled maintenance, startup and shutdown emissions and the State determined that they could not be used because they included MSS emission. For Blackhawk Power, the hourly emissions were obtained from the CEMS data.

The State used 3-years of assumed smoothed hourly emissions rates in the modeling for Tokai assuming full-time (8760 hours per year) operations corresponding to the annual tons per year for all sources excepting the flares for each of the three years to result in a specific annual average emission rate for each year. For the flares, the State assumed zero emissions, whereas the industry modeling averaged 185 tpy of SO_2 emissions for the flare sources at Tokai. Emissions were varied for each modeled year according to the annual emissions for that year.

EPA believes that the method used by the State to estimate the hourly emission rates used for modeling underestimates the true average hourly emission rate by a significant fraction. The assumption of full-time operations rather than actual hours of operation would tend to reduce the average hourly emission rate since facilities typically will have outages for repair and maintenance.

Moreover, considering only the annual tpy emissions divided by an assumed 8760 hours of operation to yield an assumed annual average emission rate for modeling does not account for short-term variability in emissions which would need to be included in modeling for a one-hour standard to assure protection of the NAAQS. The State did not present any data on short-term variability of emissions, but the EPA's recommendation is that modeled emission rates should account for temporal varying emissions and such data should be collected to estimate a factor to be used to increase the modeled emission rate that didn't take into account variabilty to ensure protection of the NAAQS.

More detail on the underestimation of emissions, common to the approach taken by State and Industry, is given in Section 4.4.2.5.

The use of undervalued emissions will tend to underestimate the extent of modeled nonattainment. In the case of this modeling analysis the emissions are undervalued because of the use of annual average emission rates using an assumed 8760 hours of operation instead of actual hours of operation; (b) not addressing variability of emission rates for sources; and (c) (a the use of annual average emission rates, (b the omission of short-term variability in emission rates, and (c the omission of the flare emissions at Tokai. In addition, the omission of short term variability of emissions is prone to understate the impact of these emissions and the extent of nonattainment.

4.4.1.6.Modeling Parameter: Meteorology and Surface Characteristics

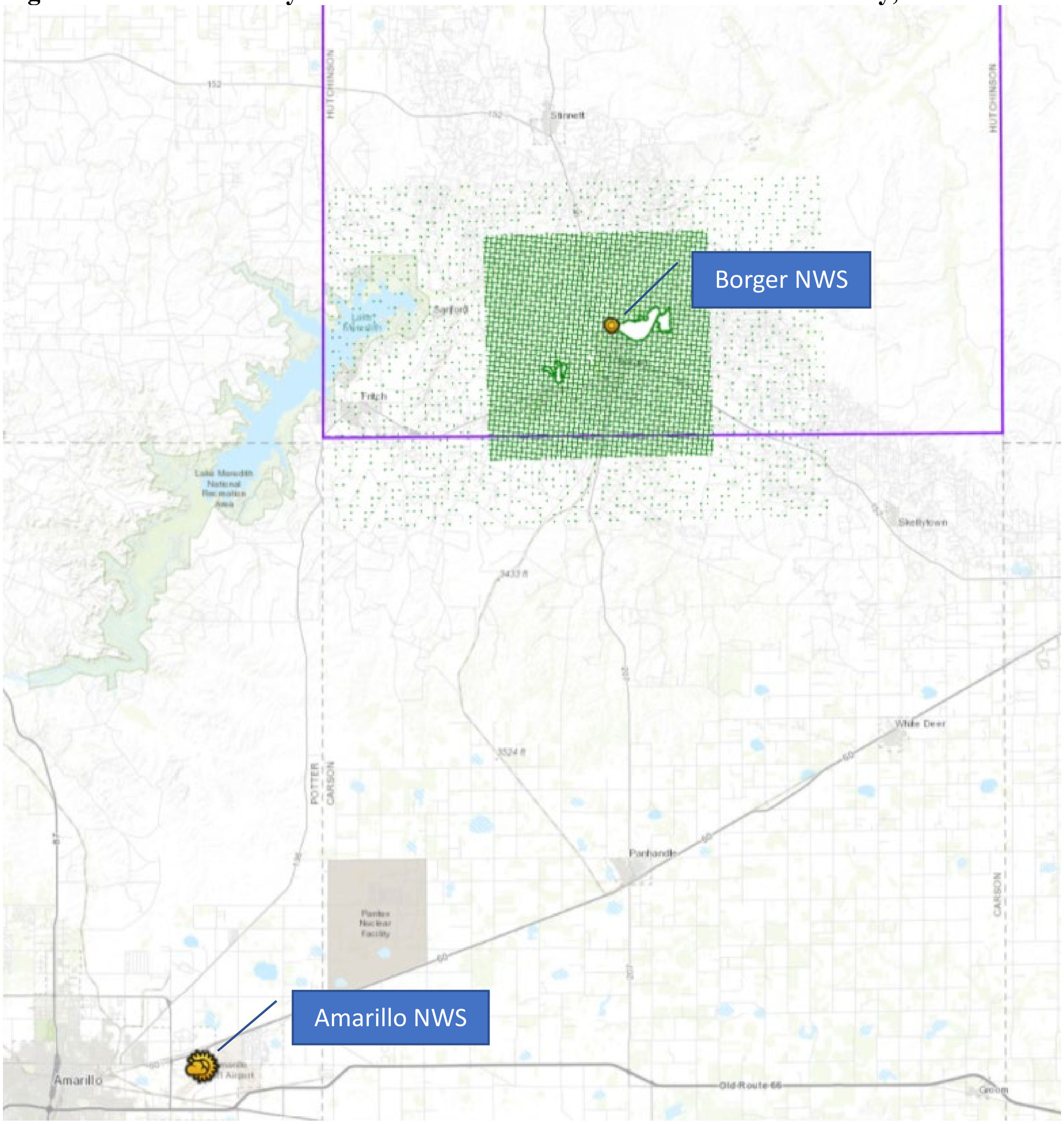
As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data, for sources modeled with actual emissions) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Hutchinson County, Texas area, the State selected the surface meteorology from the NWS ASOS station at Borger Hutchinson County Airport in Borger, Texas, located at 35.695, -101.395, 5.4 km to the northeast of the source, and coincident upper air observations from a different NWS station, located in Amarillo, Texas, located at 35.23, -101.7, 55 km to the southwest of the source as best representative of meteorological conditions within the area of analysis.

The state used AERSURFACE version v20060 using data from Borger Hutchinson County Airport to estimate the surface characteristics of the area of analysis. The state estimated values of surface roughness length (sometimes referred to as "Zo" and is related to the height of obstacles to the wind flow, which is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer) for 12 spatial sectors out to 1 km from the meteorological tower at a monthly temporal resolution. The State also estimated values for albedo (the fraction of solar energy reflected from the earth back into space) and Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance) for annual-average moisture conditions within a 10km by 10 km area centered on the meteorological tower.

In the figure below, generated by the EPA, the locations of these NWS stations are shown relative to the area of analysis (the area covered by the green receptors).

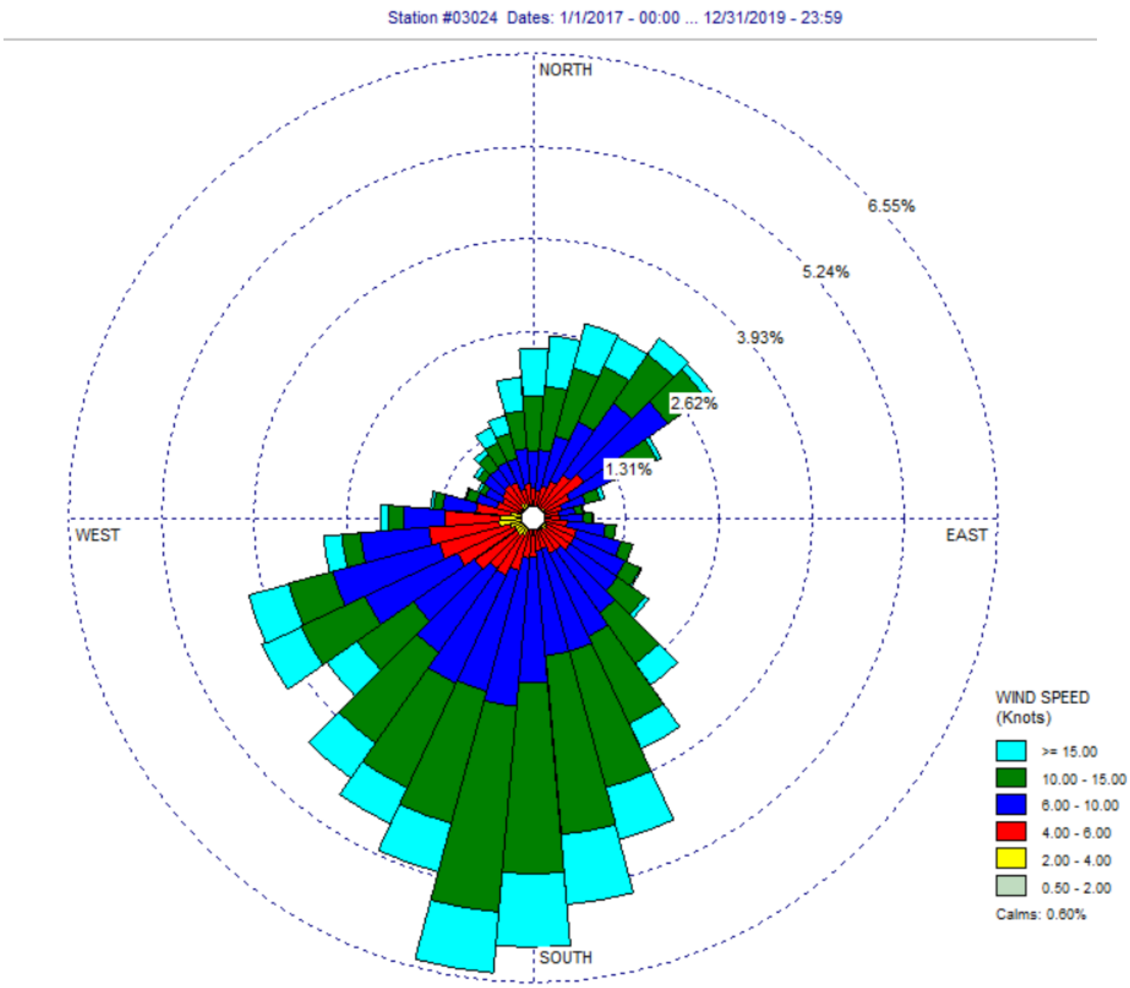
Figure 4-7. Area of Analysis and the NWS stations in the Hutchinson County, Texas Area



EPA generated the 3-year surface wind rose for Borger Hutchinson County Airport with the WRPLOT program using the meteorological data in the modeling files provided by the State. In

Figure 4-8, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Typical of this region the winds are predominantly from the south, towards the monitor from the carbon black plants, and with a significant fraction of the winds 15 knots or better in speed and very little frequency of winds less than 4 knots. There is also a significant fraction of winds from the northeast, toward the other Hutchinson County SO_2 sources, dropping rapidly in frequency as they veer to the east. The processed wind data have very low calms at less than 1%.

Figure 4-8. Hutchinson County, Texas Cumulative Annual Wind Rose for Years 2017 – 2019.



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The State followed the methodology and settings presented in the DRR Modeling TAD and Appendix W in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

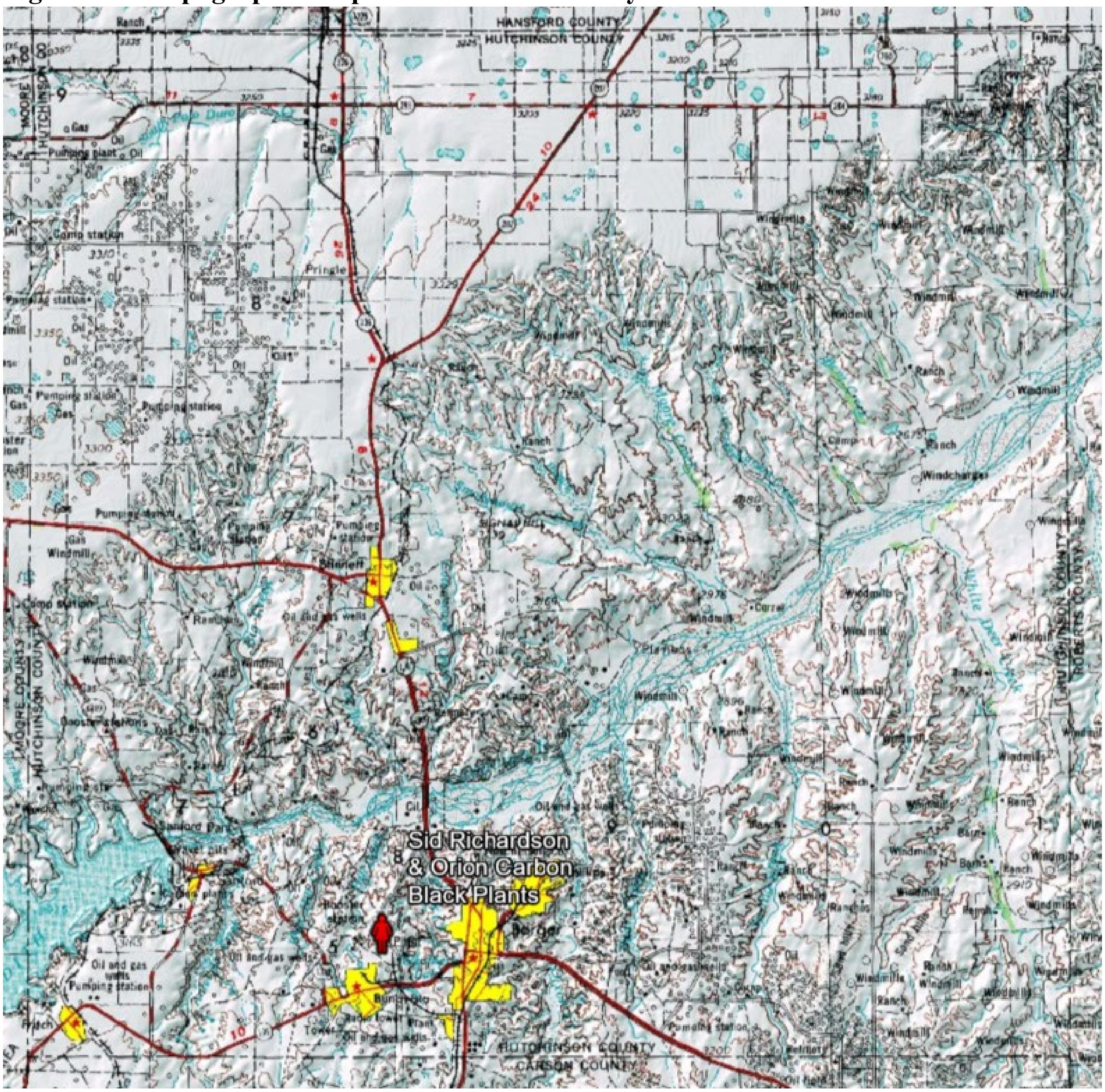
Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Borger Hutchinson County Airport but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the State set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

In summary, the EPA finds that the State followed the guidance of the modeling TAD in processing the meteorological data, and that the surface and upper air sites chosen were the nearest sites available.

4.4.1.7.Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

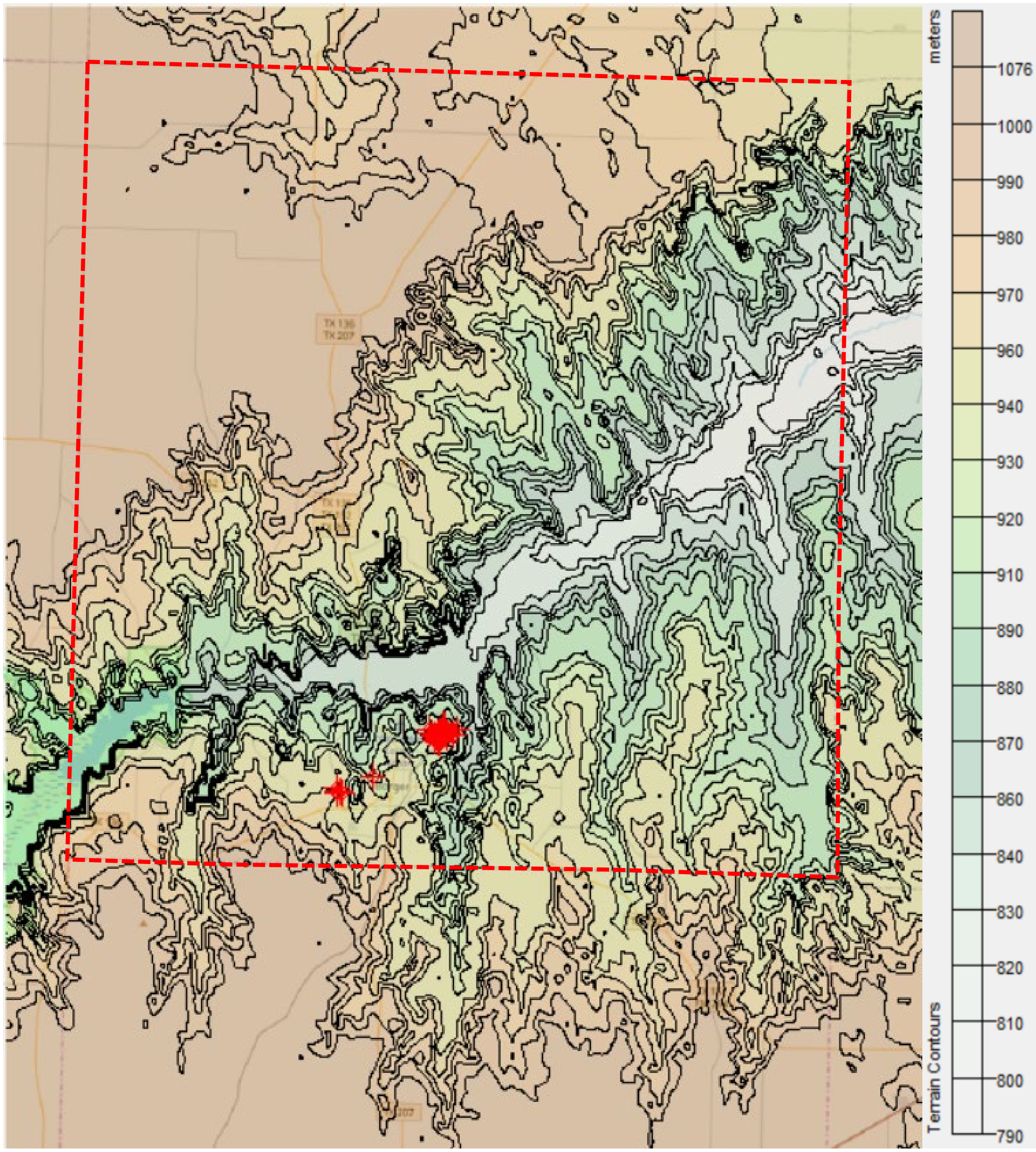
Texas did not provide an analysis of the geography and topography of the Hutchinson County area. EPA examined the physical features of the land that may affect the distribution of emissions and may help define nonattainment area boundaries. As shown in Figure 4-9, Hutchinson County is marked by a high plain with an elevation over 1000 meters (m) in the northern part with stream eroded canyons over 35 m deep. South Palo Dura Creek runs across the northwestern part of the plain. Further south, complex north to south hills occur over the lower 2/3 of the county with peaks at about 910 m and with varying depths. These hills are bisected by the Canadian River Valley at a depth of about 840 m in the area nearest to the carbon black plants. Lake Meredith, elevation 839 m, is found in the southwest corner of the county. The carbon black plants are located near the southern boundary of the county and are at an elevation of about 945 m.

Figure 4- 9. Topographic Map of Hutchinson County Texas.



There is also elevated terrain above 1000 m (over 55 m higher than the Tokai and Orion elevations) within 5 km to the south of the facilities in neighboring Carson County as shown in Figure 4-21. The proximity to the higher terrain could potentially cause elevated concentrations of SO_2 in Carson County. There are no SO_2 point sources in Carson County included in the modeling.

Figure 4-10. Topographic Map Hutchinson County and Portions of Surrounding Counties. The county border is the dotted red line and the SO_2 sources as denoted by the red crosses, from left to right: Tokai and Orion Carbon Black Plants; IACX - Rock Creek Gas Plant; Chevron Phillips Chemical Company LP - Philtex Ryton Plant; Phillips 66 Company - Borger Refinery; and Borger Energy Associates LP - Blackhawk Power Plant.



The terrain in the area of analysis is best described as complex with some elevated terrain features in the modeling domain. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

In summary, EPA finds that the State followed the guidance of the modeling TAD and Appendix W in processing the geographical data.

4.4.1.8.Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State attempted to use the data from the DRR monitor (monitor 1073) by excluding wind directions from the carbon black plants. All hourly monitored values where the monitor was downwind of the facilities were removed by the State (meaning a 90-degree range around the direction directly downwind) and then the 99th percentile values were recalculated. For monitor 1073, any wind direction between 100 and 190 degrees was removed as the monitor is north-northwest of the facilities. A total of 8,165 hours (32%) were removed as being affected by the nearby sources. The resulting design value was 58.7 ppb. The State inferred that the resulting design value being 58.7 ppb must still be impacted by local sources. Therefore, the State determined that monitor 1073 is not a representative background site.

The State then looked at Texas monitors specifically purposed to measure population exposure. The closest one to the facility was monitor 1025. However, this monitor was near the Harrington Power Plant and the State determined it was not representative of background values. The next closest monitor is located in Austin, Texas (monitor 0014). The State determined that this monitor was not affected by any nearby SO_2 sources and has acceptable capture rates. Based on this monitor data, a Tier 1 background value of 2.6 ppb, equivalent to 6.8 $\mu g/m^3$ when expressed in 1 significant figure, and that value was incorporated into the final AERMOD results.

The State's methodology for background concentration was appropriate and consistent with the Modeling TAD.

4.4.1.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Hutchinson County, Texas area of analysis are summarized below in Table 4-4.

Table 4-4: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Hutchinson County, Texas Area

Input Parameter	Value
AERMOD Version	19191
Dispersion Characteristics	Rural
Modeled Sources	7
Modeled Stacks	158 (plus 3 area sources)
Modeled Structures	433
Modeled Fencelines	5
Total receptors	28,632
Emissions Type	Estimated Hourly
Emissions Years	2017-2019
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Borger Hutchinson County Airport
NWS Station Upper Air Meteorology	Amarillo
NWS Station for Calculating Surface Characteristics	Borger Hutchinson County Airport
Methodology for Calculating Background SO_2 Concentration	Tier 1 based on design value for Austin-Round Rock, TX Monitor # 48-453-0014
Calculated Background SO_2 Concentration	2.6 ppb or 6.8 μg/m^3

The results presented below in Table 4-5 and Figure 4-11 show the geographic extent of the predicted modeled violations based on the input parameters.

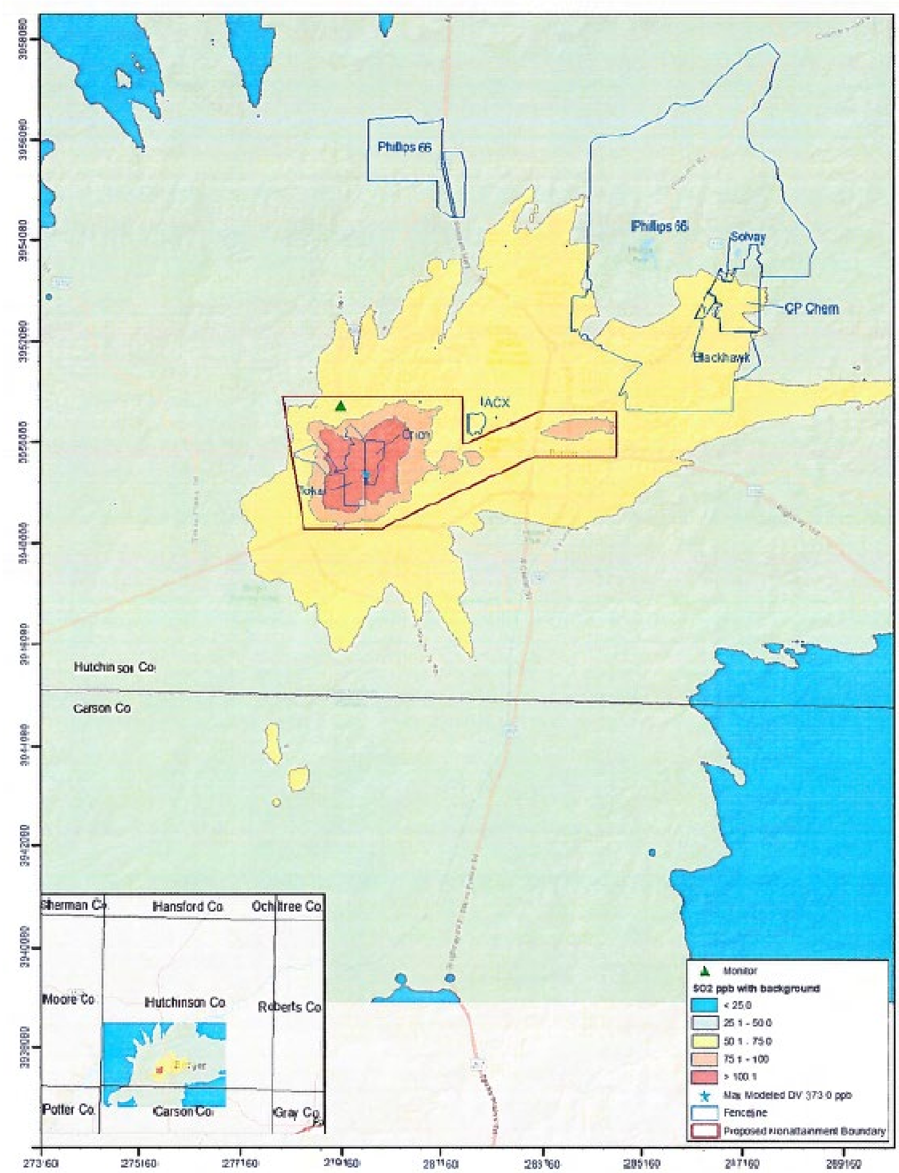
Table 4-5. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Hutchinson County, Texas Area

Averaging Period	Data Period	Receptor Location UTM zone 14		99th percentile daily maximum 1-hour SO_2 Concentration (μg/m^3)	
		UTM East	UTM North	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2017-2019	279651.12	3949445.07	970.4	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 μg/m^3 conversion factor

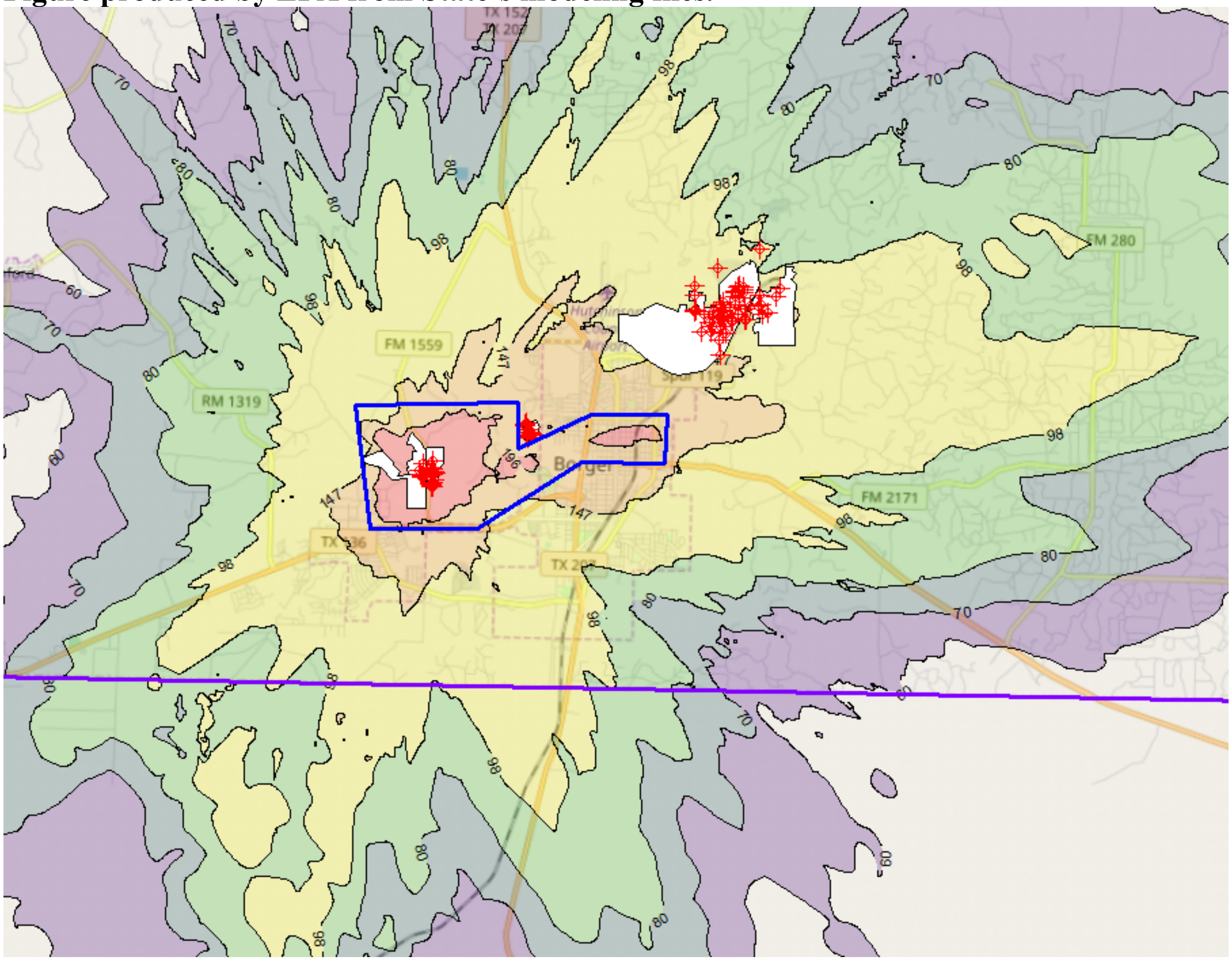
Figure 4-11 was included as part of the State's recommendation and indicates that the predicted modeled violations to the extent identified by the State are fully contained within the state's recommended nonattainment area boundary. The State's receptor grid is also shown in the figure.

Figure 4-11: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Area of Analysis for the Hutchinson County, Texas Area.



The modeling submitted by the State indicates that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration. The modeling results also include the area in which a NAAQS violation was modeled, information that is relevant to the selection of the boundaries of the area being designated. The State's recommended nonattainment area boundary, in blue in Figure 4-12, encompasses the modeled contour greater than the NAAQS.

Figure 4-12. The State's modeled 99th Percentile Concentration Average for the Years 2017-2019 and their Proposed Boundary of the Hutchinson County Nonattainment Area. Figure produced by EPA from State's modeling files.



4.4.1.10. The EPA's Assessment of the Modeling Information Provided by the State

The State's modeling analysis used the latest versions of the AERMOD system components, correctly characterized the dispersion characteristics of the area, included all facilities considered to influence the concentration gradients in the area. The State followed the methodology and settings presented in the Modeling TAD and Appendix W in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics. The State followed the guidance of the modeling TAD and Appendix W in processing the geographical data. The State's methodology for background concentration was appropriate and consistent with the Modeling TAD.

However, the State did not include the flare sources at Tokai which were included in Industry's modeling and which emitted over 100 tons each year and did not fully represent all buildings potentially relevant to building downwash at Tokai. The State's emission modeled design values, area with modeled violations and emission rates were biased low because (a) the use of assumed 8760 hours of operation for averaging the annual emission rates instead of using actual operational hours, (b) the omission of short-term variability in emission rates, and (c) the omission of the flare emissions at Tokai. Because of the low-biased emission rates, the nonattainment boundary as recommended by the State may be too small to encompass the area of nonattainment.

4.4.2. Modeling Analysis Provided by the Industry

In its 2020 public comments, Phillips 66 and IACX provided an air quality modeling analysis performed by DiSorbo Environmental Consulting Firm for the area surrounding the DRR sources to support a nonattainment area boundary.

This assessment and characterization were performed using air dispersion modeling software, i.e., AERMOD, analyzing emissions using multiple ways (annual actuals, maximum annual actuals, CEM data based, and allowables). After careful review of the industry's assessment, supporting documentation, and all available data, the EPA does not agree with the industry's boundary recommendation for the area, and is designating a portion of Hutchinson County as nonattainment. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

The area that the industry has assessed via air quality modeling is located in southwestern to southcentral Hutchinson County extending about 6km south into neighboring Custer County.

Also included in the Figure 4-13 are other nearby emitters of SO_2. These are Chevron Phillips Chemical Company LP - Philtex Ryton Plant (CP Chem), Phillips 66 Company - Borger Refinery (Phillips 66), IACX - Rock Creek Gas Plant (IACX), Borger Energy Associates LP - Blackhawk Power Plant (Blackhawk), and Solvay. All of these sources are located to the northeast of the carbon black plants with IACX being the nearest at about 2 km while the others are clustered together at about 6.5 to 8.5 km.

The discussion and analysis that follows below will reference the "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) and the factors for evaluation contained in the EPA's September 5, 2019, guidance, July 22, 2016, guidance and March 20, 2015, guidance, as appropriate. Since some industry commenters indicated that EPA should designate the area unclassifiable based on new or future-effective limits, etc.; EPA also is referring to 40 CFR Part 51 Appendix W – Guideline on Air Quality Models (Appendix W).

4.4.2.1.Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO_2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor

- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

The industry used AERMOD version 19191. A discussion of the industry's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

4.4.2.2.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

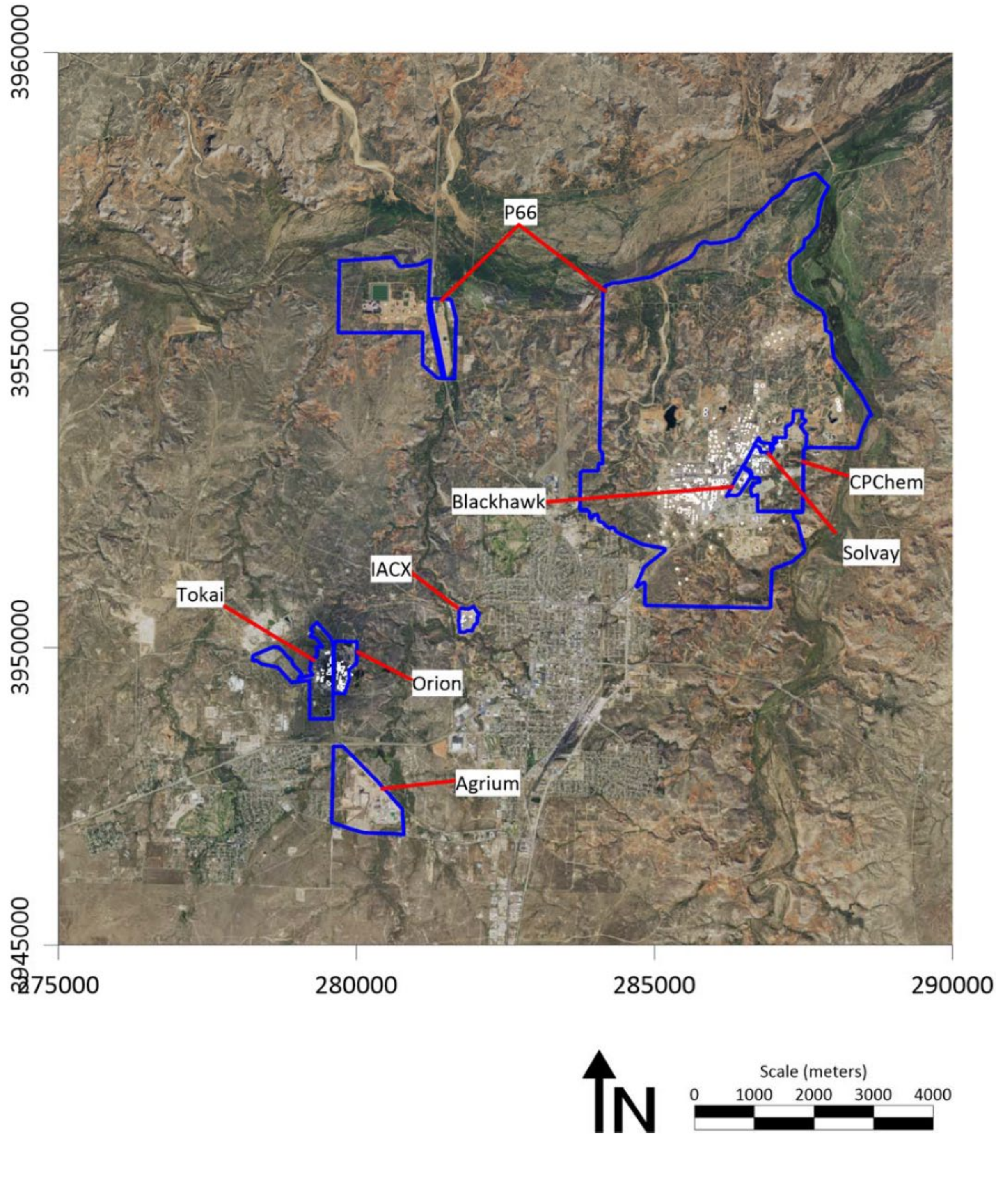
For the purpose of performing the modeling for the area of analysis, the industry determined that it was most appropriate to run the model in rural mode.

EPA has two methods for determining if urban or rural dispersion should be selected. The first method is to evaluate land use in a 3 km radius of the source using meteorological land using the Auer land use classifications. If the land within 3 km is 50% or more urban then the source is considered to be urban, otherwise it is rural. The second method uses population density within 3 km radius of the source. If population density with the circle is greater than 750 people per km2, then the source is considered urban, otherwise it is rural.

Industry did not do a formal review of the land use with a 3 km radius of the DRR sources. They provided a general map of the area with the sources listed and indicated that the sources are located outside of Borger, Texas and in rural areas. They also indicated the City of Borger has a population density of 554.51 people/km2. See Figure 4-2 for an overview of the land use types for the area.

We note that the two DRR sources (Orion and Tokai) are about 2 km west of the western edge of the populated area of Borger and from the satellite image it can be seen that most of the area around the two DRR sources are rural and the City of Borger does not take up much of the modeled area that encompasses part of the area modeled. The determination of the use of the rural dispersion follows EPA's guidance and EPA concurs with characterization of the area around the sources and in the modeling domain as rural.

Figure 4-13. Area of Analysis for the Hutchinson County, Texas Area



4.4.2.3.Modeling Parameter: Area of Analysis (Receptor Grid)

Appendix W and the Modeling TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in the Modeling TAD include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The sources of SO_2 emissions subject to the DRR in this area are described in the introduction to this section. For the Hutchinson County, Texas area, the industry has included 6 other emitters of SO_2 within 9 kilometers (km) of the Orion Facility in any direction. The industry determined that this was the appropriate distance to adequately characterize the potential extent of any SO_2 NAAQS violations in the area and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to Tokai and Orion, the other emitters of SO_2 included in the area of analysis are Phillips 66 Refinery (Phillips 66), CP Chem, Blackhawk, Solvay, IACX, and Agrium. Industry reviewed the area and determined that no other sources out to 30 km were determined by the industry to have the potential to cause significant concentration gradients within the area of analysis.

Industry modeling treated the Phillips 66 Refinery, CP Chem, Blackhawk and Solvay as one facility in the modeling of all sources. Industry cited to EPA memorandum "Interpretation of "Ambient Air" in Situations Involving Leased Land Under the Regulations for Prevention of Significant Deterioration (PSD)" (June 22, 2007). Phillips 66 indicated that CP Chem, Solvay, and Blackhawk lease their facility site from Phillips 66 and each facility has sole control over their property and a guard gate that precludes public access to the complex. Phillips 66 indicated that based on these issues and EPA's guidance that one outer fenceline for the whole Phillips 66, CP Chem, Solvay, and Blackhawk complex was used in the base modeling scenario. See Figures 4-12 and 4-13 for the receptor grid used in the base modeling scenario area of analysis.

Industry modeling also included facility specific ambient analysis runs for 5 facilities (Phillips 66, CP Chem, Blackhawk, Solvay, and IACX facilities). These facility specific ambient runs are performed with receptors on a specific facility and then modeling all sources except for the facility with receptors to show all the other sources plus background monitor value does not cause a violation at the facility with receptors. The Phillips 66 ambient facility run included receptors spaced at 25 m on the Phillips 66 boundary and receptors spaced 100 m within the Phillips 66 property and no receptors outside of the Phillips 66 property (See Figure 4- 14). No explanation or modeling analysis was provided to justify not using 25-meter grid throughout the Phillips 66 property. The receptor grid within CP Chem, Blackhawk, Solvay, and IACX each had a grid spacing of 25 m for the boundary receptors and within the specific facility's property and no receptors outside of the specific property. For CP Chem facility specific ambient run see Figure 4-15, Blackhawk facility specific ambient run see Figure 4-16, Solvay facility specific ambient run see Figure 4-17, IACX facility specific ambient run see Figure 4-18.

The grid receptor spacing for the area of analysis chosen by the industry for the base modeling scenario is as follows:

- spacing of 100 meters out to a distance of 8 km from all sources and then
- spacing of 1000 meters from that point out to a distance of 20 km from the source

The receptor network contained 54,076 receptors, and the network covered most of southern portion of Hutchinson County with the fine grid covering most of south central to southwest part of Hutchinson County.

Consistent with Appendix W and the Modeling TAD, the industry placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled facility, including other facilities' property with the exception of Phillips 66 facility ambient analysis. The grid for the facility ambient run on Phillips 66 property used a grid spacing of 25 m and given the close proximity of Blackhawk, CP Chem and Solvay, a finer receptor grid of 25 meters should have been used from the southern fenceline of Phillips 66 to at least 1 km from the southern fenceline after which either continue the 25 meter grid or potentially go to 50 meter spacing if concentrations are such that a 25 meter grid is not necessary. The industry report refers to modeling conducted in Spring/Summer of 2020 that EPA and TCEQ reviewed and based on that older modeling we do have some concern that a finer 25 meter receptor grid on Phillips 66 property may show higher impacts and creates uncertainty in the facility ambient analysis results for Phillips 66.

The industry did exclude receptors in other locations that it considered to not be ambient air relative to each modeled facility. Industry referred to previous modeling performed with TCEQ and EPA input earlier in 2020 for the area. In this earlier work there was information provided to EPA and TCEQ to support the proposed fenceline ambient air boundaries. EPA and TCEQ reviewed information provided by Phillips 66 that included some CBI information and although there was significant back and forth and refinement of property boundary, EPA did not finalize review at that time on the area excluded based on fenced and controlled access. For this analysis the proposed facility boundaries are reasonable and would not likely have an impact on this analysis for determining the area to designate.

Figure 4-14. Area of Analysis for the Hutchinson County, Texas Area

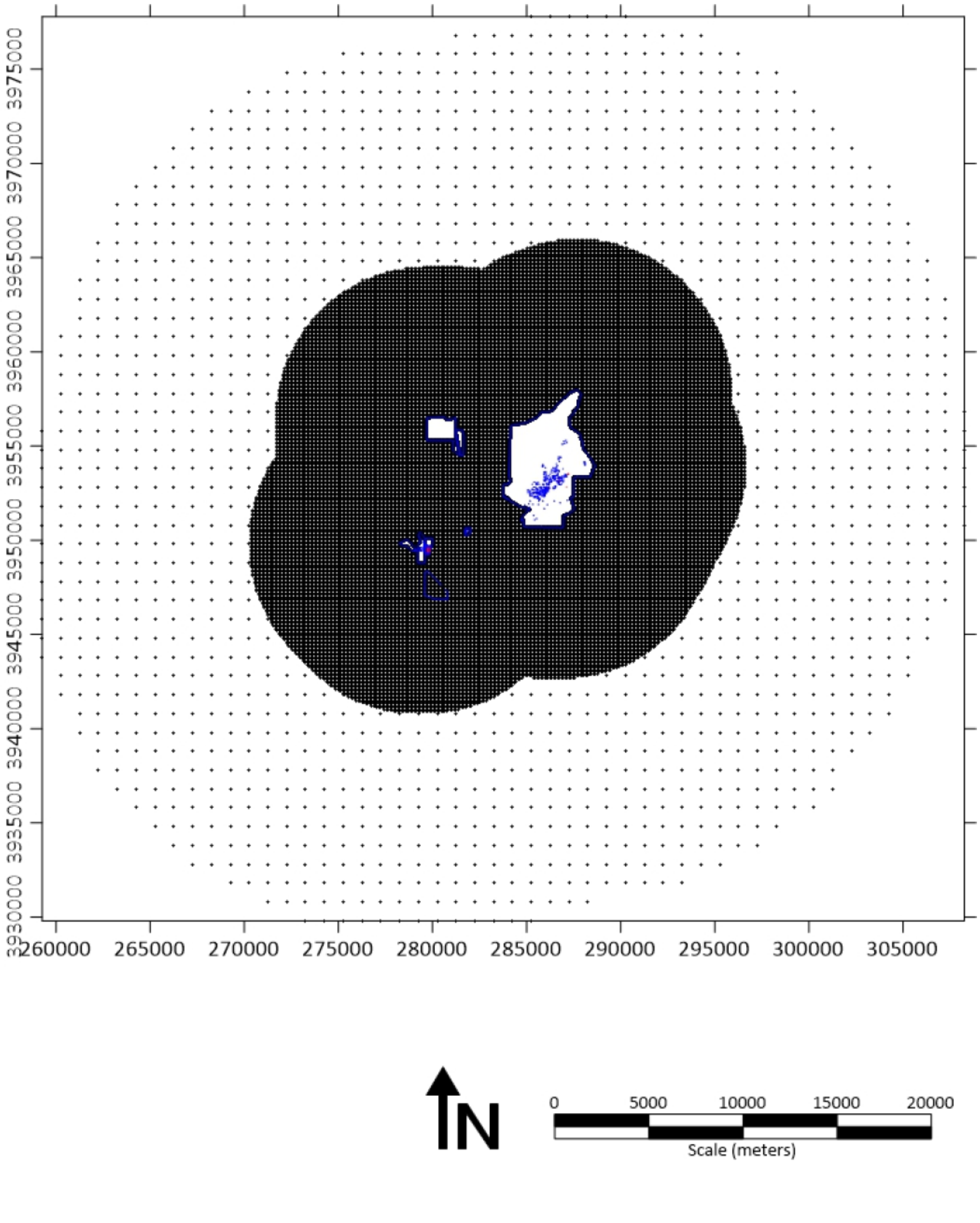


Figure 4-15. Receptor Grid for the Hutchinson County, Texas Area

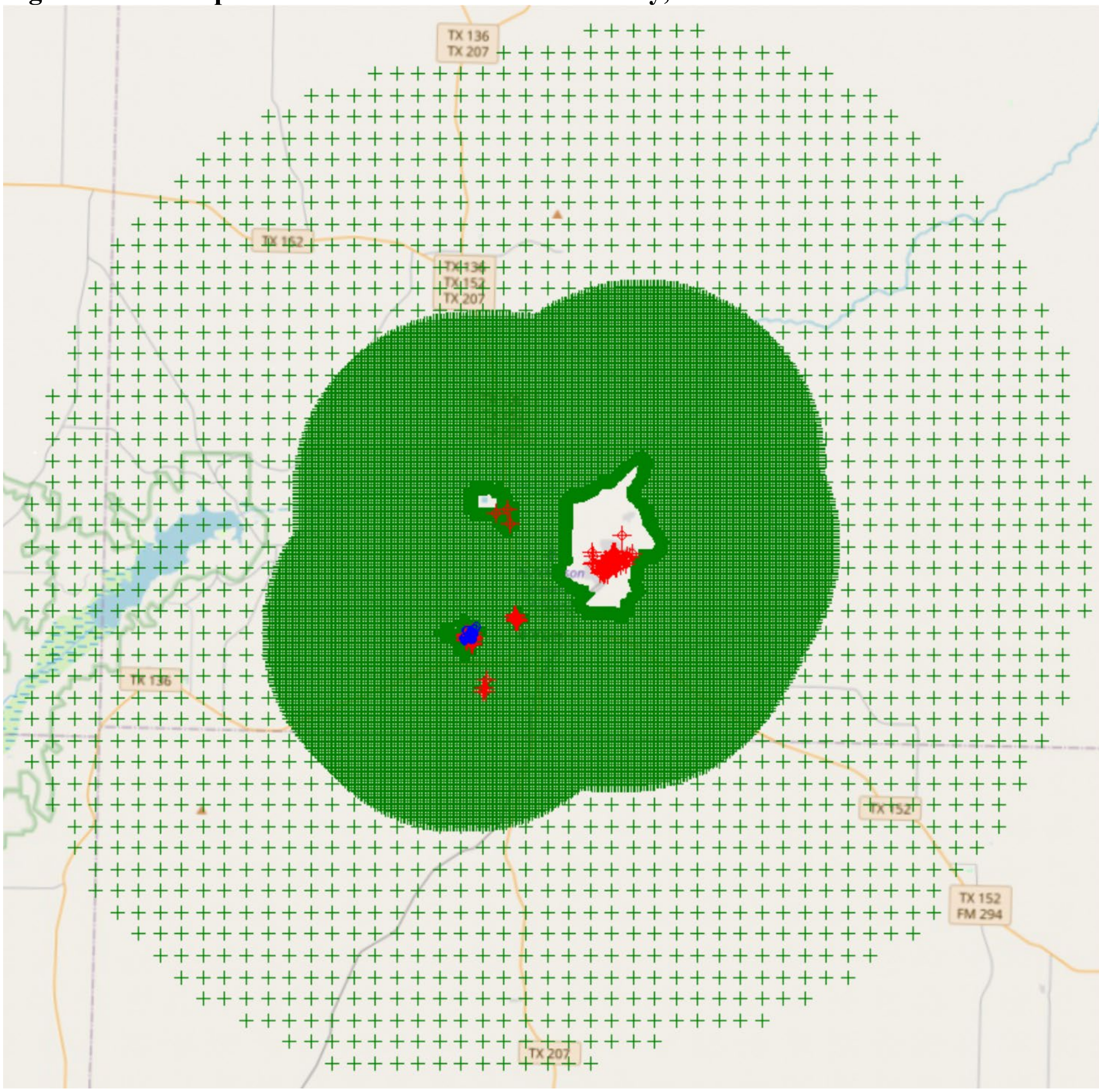


Figure 4-16. Receptor Grid for ambient air facility analysis for Phillips 66 Refinery.

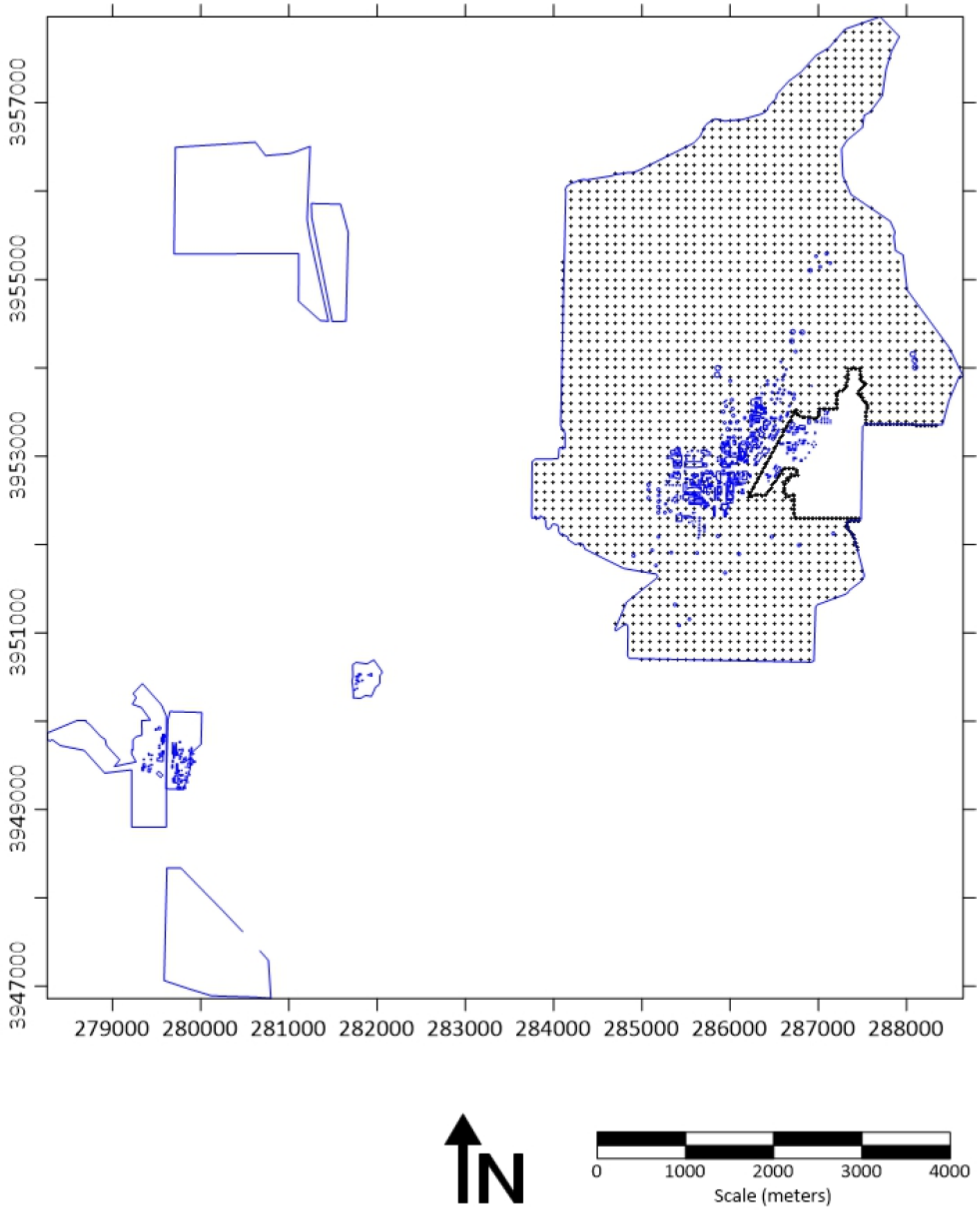


Figure 4-17. Receptor Grid for ambient air facility analysis for CP Chem.

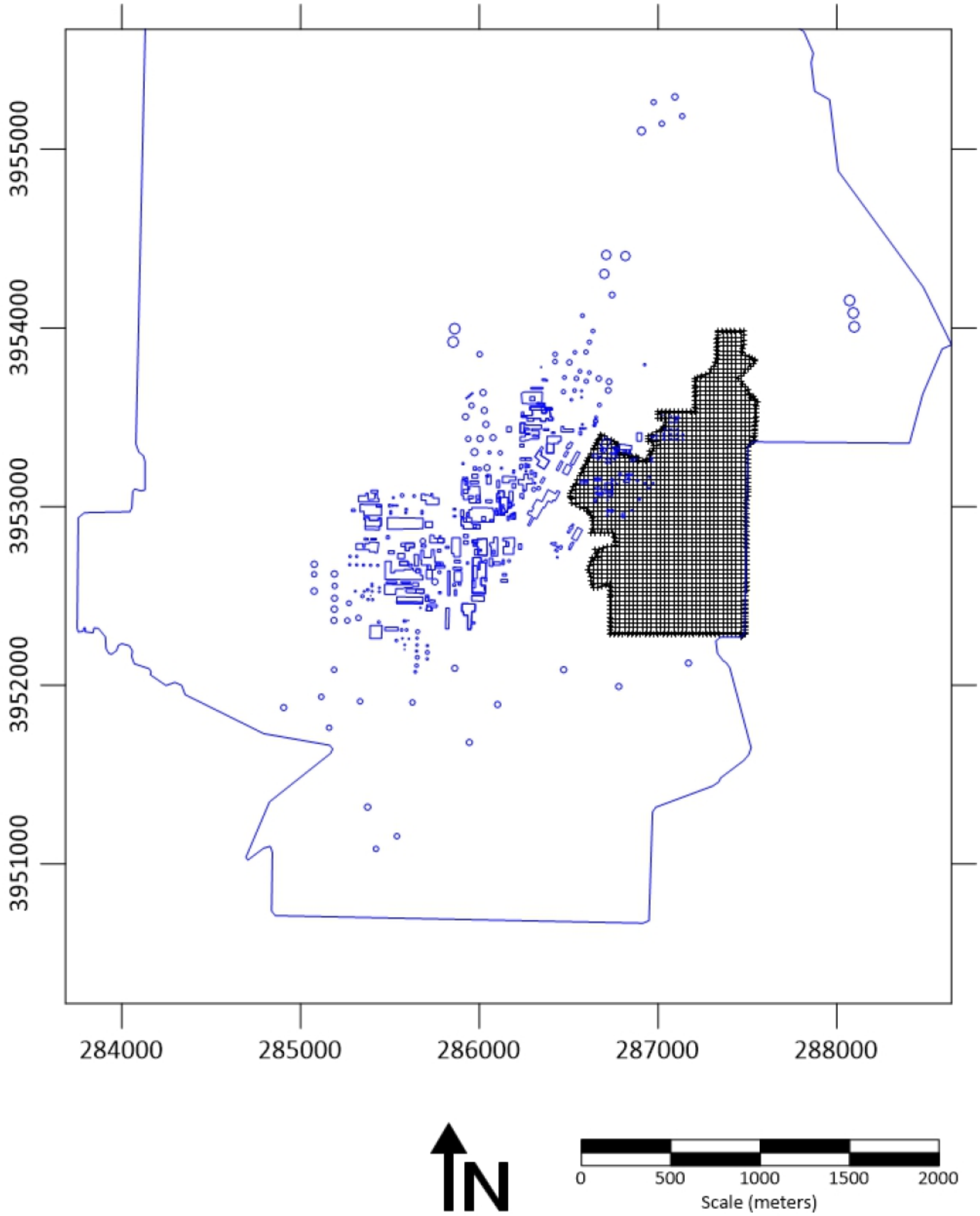


Figure 4-18. Receptor Grid for ambient air facility analysis for Blackhawk.

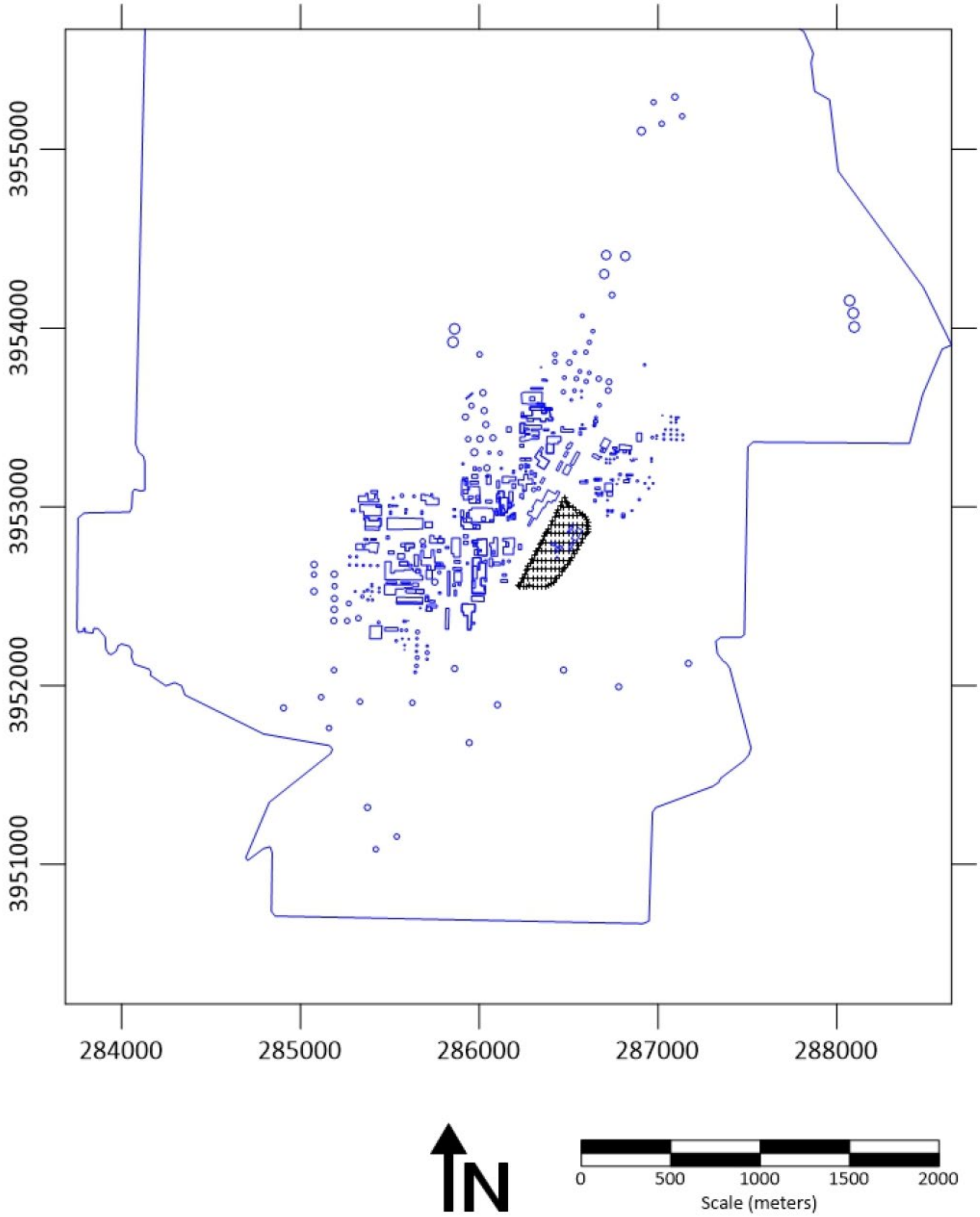


Figure 4-19. Receptor Grid for ambient air facility analysis for Solvay.

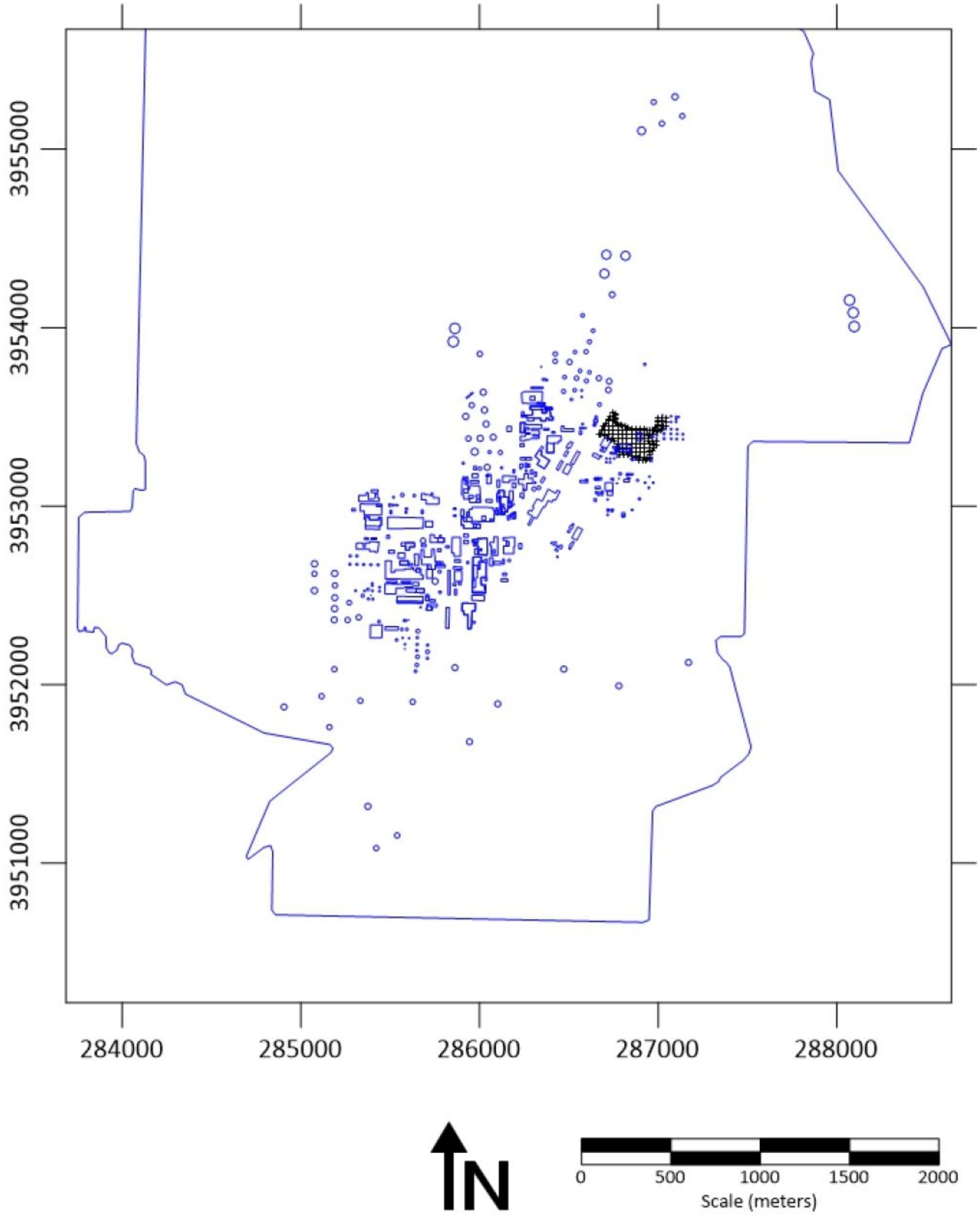
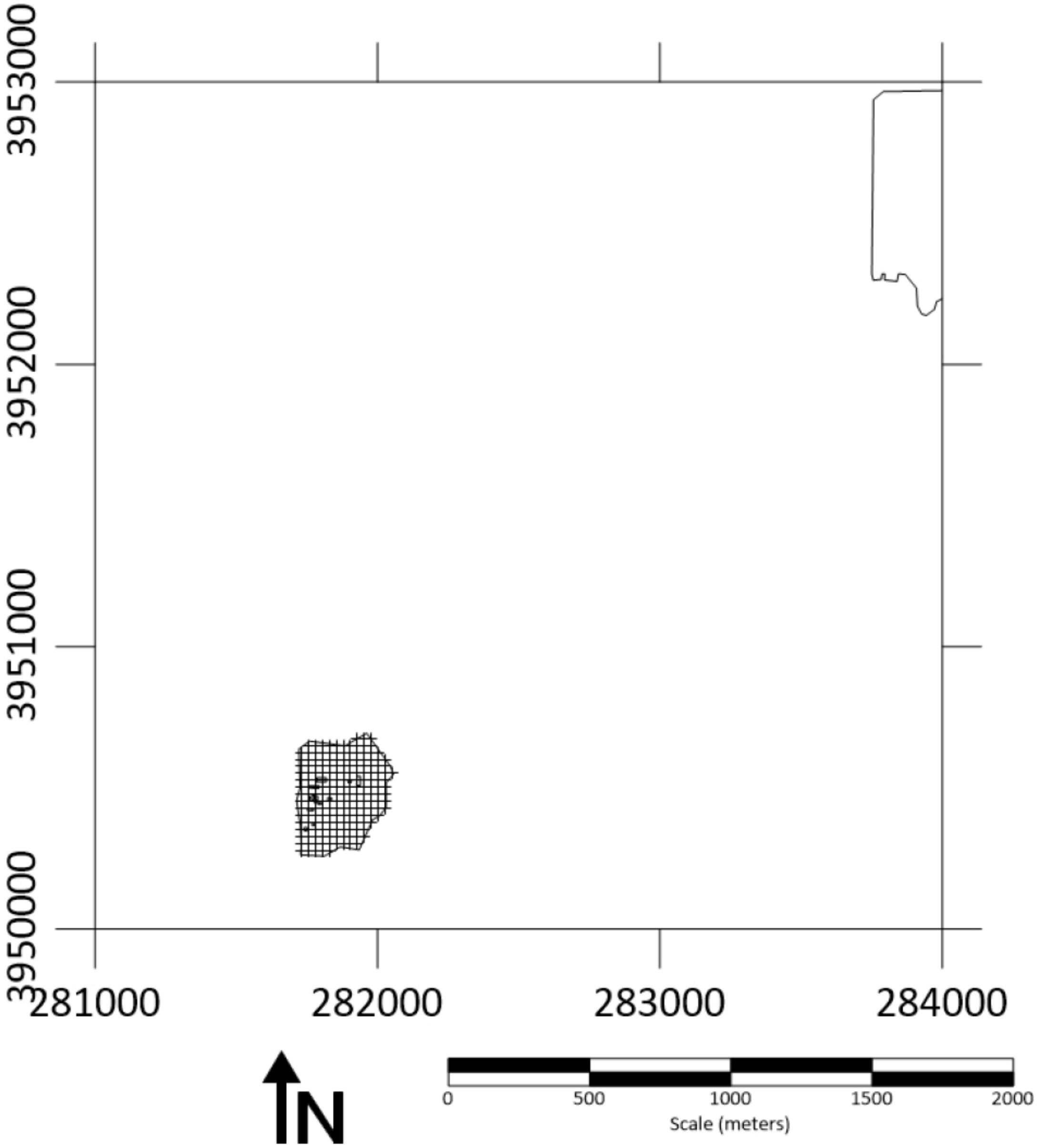


Figure 4-20. Receptor Grid for ambient air facility analysis for IACX.



4.4.2.4.Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and the use of actual stack heights with actual emissions.

The industry included the DRR sources, Orion and Tokai, as well as other SO_2 sources (sources are sources with over 10 tpy of actual SO_2 emissions) located within 20 km of the DRR sources. Besides the Orion and Tokai facilities, industry included sources at the nearby IACX, Phillips 66 Refinery, CP Chem, Blackhawk, Solvay, and Agrium facilities. The modeling parameters for these sources are shown in Tables 4-6 and 4-7 for all 8 facilities.

The industry characterized these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD and Appendix W in general. Specifically, the industry used actual stack heights in conjunction with a mixture of 2017-2019 estimated hourly emissions and allowable emissions that will be further discussed in the next section along with our concerns in the emission rates chosen for modeling. The industry adequately characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash.

The industry did not model some of the smallest sources at facilities because they had low annual emissions of less than 1 tpy. EPA agrees that the sources chosen to be modeled are generally adequate except for the concern about how the modeled emissions rates were derived for this analysis that is discussed further in the next section.

Table 4-6. Point Source Parameters.

Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Modeled Stack Parameters: Stack Height	Temperature	Exit Velocity	Stack Diameter	Note	Effective Flare Diameter Data: Average Flow Rate	Lower Heating Value (BTU/SCF)	Molecular Weight
						(m)	(m)	(m)	(ft)	(°F)	(ft/sec)	Ft		(MSCF/min	(Btu/scf)	(lb/lbmol)
Tokai	1867A	119	119	Point	Tokai Merged Boilers Stack	279,480	3,949,603	958.74	160	500	54.0	9.90	[1]			
Tokai	1867A	121	121	Point	Tokai Plant 1 Dryer Stack	279,534	3,949,484	959.59	198	800	43.90	7.50	[1]			
Tokai	1867A	122	122	Point	Tokai Plant 2 Dryer Stack	279,573	3,949,763	957.72	198	800	38.80	9.00	[1]			
Tokai	1867A	FLARE-1	T_FLR_1	Flare	U1-PBF FLARE	279,498	3,949,447	959.01	65.00	1832.00	65.62	7.03	[2]	21.70	65	22.0
Tokai	1867A	FLARE-2	T_FLR_2	Flare	U2 PBF FLARE	279,519	3,949,457	959.14	65.00	1832.00	65.62	6.94	[2]	21.00	65	21.0
Tokai	1867A	FLARE-3	T_FLR_3	Flare	U3 PBF FLARE	279,495	3,949,667	957.74	65.00	1832.00	65.62	7.61	[2]	25.40	65	22.0
Tokai	1867A	FLARE-4	T_FLR_4	Flare	U4 PBF FLARE	279,506	3,949,741	957.15	65.00	1832.00	65.62	7.71	[2]	26.10	65	22.0
Tokai	1867A	1	1	Point	#1 #2 DRYER, E. PURGE FR.	279,559	3,949,458	958.98	57.00	200.00	40.70	1.46				
Tokai	1867A	3	3	Point	#3 #4 DRYER, W. PURGE FR.	279,551	3,949,458	959.07	57.00	200.00	42.00	1.46				
Tokai	1867A	21	21	Point	PREHEATER STACK, PLT. 1	279,502	3,949,519	959.57	15.00	800.00	1.40	1.65				
Orion		E-100H	E_100H	Point	Main Tank Preheater	279,775	3,949,825	965	20.00	263.00	11.59	1.17				
Orion		E-101H	E_101H	Point	Small Tank Preheater	279,775	3,949,825	965	20.00	263.00	11.59	1.17				
Orion	8780	E-10D	E_10D	Point	B-1 Dryers Stack A	279,753	3,949,323	954	25.00	600.00	34.10	1.67				
Orion	8780	E-10D	E_10DF	Point	B-1 Dryer Bag Filter Stack A	279,762	3,949,343	954	78.00	450.00	30.00	2.50	[4]			
Orion	8780	E-11D	E_11D	Point	B-1 Dryers Stack B	279,753	3,949,318	954	25.00	600.00	34.10	1.67				
Orion	8780	E-11D	E_11DF	Point	B-1 Dryer Bag Filter Stack B	279,762	3,949,338	954	78.00	450.00	30.00	2.50	[4]			
Orion	8780	E-20D	E_20D	Point	B-2 Dryers Stack A	279,800	3,949,410	952	25.00	600.00	34.10	1.67				
Orion	8780	E-20D	E_20DF	Point	B-2 Dryer Bag Filter Stack A	279,800	3,949,410	952	82.00	450.00	30.00	2.50	[4]			
Orion	8780	E-21D	E_21D	Point	B-2 Dryers Stack B	279,800	3,949,415	952	25.00	600.00	34.10	1.67				
Orion	8780	E-21D	E_21DF	Point	B-2 Dryer Bag Filter Stack B	279,800	3,949,415	952	82.00	450.00	30.00	2.50	[4]			
Orion	8780	E-40D	E_40D	Point	B-4 Dryers Stack A	279,751	3,949,312	954	40.00	600.00	34.10	1.67	[4]			
Orion	8780	E-40D	E_40DF	Point	B-4 Dryer Bag Filter Stack A	279,754	3,949,275	953	80.00	450.00	30.00	2.50	[4]			
Orion	8780	E-41D	E_41D	Point	B-4 Dryers Stack B	279,751	3,949,308	954	40.00	600.00	34.10	1.67	[4]			
Orion	8780	E-41D	E_41DF	Point	B-4 Dryer Bag Filter Stack B	279,764	3,949,275	952	80.00	450.00	30.00	2.50	[4]			
Orion	8780	E-50R	E_50R	Point	Thermal Unit 1 Reactor Stack A	279,788	3,949,573	957	50.00	800.00	60.00	5.00				
Orion	8780	E-51R	E_51R	Point	Thermal Unit 1 Reactor Stack B	279,788	3,949,579	958	50.00	800.00	60.00	5.00				
Orion	8780	E-53P	E_53P	Point	Orion TPE Bag Filter	279,781	3,949,634	959.97	120	306	30	5	[4]			
Orion	8780	E-5B	E_5B	Point	Thermal Boiler	279,828	3,949,552	956	22.00	600.00	19.40	1.67				
Orion	8780	E-6B	E6B	Point	Orion Waste Heat Boiler	279,761	3,949,817	963.76	98	421	70	8.40	[4]			

Table 4-6 (continued). Point Source Parameters

									Modeled Stack Parameters					Effective Flare Diameter Data		
Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	Note	Average Flow Rate	Lower Heating Value (BTU/SCF)	Molecular Weight
						(m)	(m)	(m)	(ft)	(° F)	(ft/sec)	Ft		(MSCF/min	(Btu/scf)	(lb/lbmol)
Orion	8780	P-60P	P_60P	Point	FD Fan Vent Stack	279,775	3,949,537	957	40.00	450.00	10.00	0.67				
Orion	8780	E-10FL	E_10Fl	Flare	B1 FLARE	279,725	3,949,568	958.22	105.00	1832.00	65.62	2.22	[2]	2.00	70	21.4
Orion	8780	E-20FL	E_20Fl	Flare	B2 FLARE	279,740	3,949,657	961.57	105.00	1832.00	65.62	2.22	[2]	2.00	70	21.4
Orion	8780	E-40FL	E_40Fl	Flare	B4 FLARE	279,718	3,949,501	957.58	105.00	1832.00	65.62	2.22	[2]	2.00	70	21.4
Agrium		2	2	Point	REFRM. STACK	280,404	3,947,106	943	105.00	310.00	72.00	10.50				
Agrium		E-2	E_2	Point	UREA EMERGENCY GENERATOR	280,345	3,947,238	944	15.00	1100.00	16.00	0.50				
Agrium		H-5	H_5	Point	START-UP HTR. STK. ""102B""	280,294	3,947,107	945	76.00	400.00	13.40	4.25				
Agrium		PKGB	PKGB	Point	HEAT, STEAM, & POWER	280,445	3,947,600	939	25.00	115.00	2.06	2.50				
Agrium		FL-1	A_FL_1	Flare	NH3 PLT EMERGENCY FLARE STACK	280,308	3,947,278	942.86	82.90	1832.00	65.62	10.06	[2]	6.58	424	17.0
Agrium		FL-2	A_FL_2	Flare	UREA PLANT FLARE	280,329	3,947,233	944.27	50.00	1832.00	65.62	9.39	[2]	3.50	800	40.0
Blackhawk	32096	EPN1-1	EPN1_1	Point	BLACKHAWK STATION Unit 1, combustion turbine w. HRSG	286,456	3,952,838	923.38	130	570	65	18				
Blackhawk	32096	EPN2-1	EPN2_1	Point	BLACKHAWK STATION Unit 2, Combustion Turbine W. HRSG	286,490	3,952,823	923.24	130	570	65	18				
CPChem	21918	FL-1	FL_1	Flare	North Flare	287,109	3,953,316	910.7	200	1832.00	65.62	7.24	[2], [3]	0.10	1000	35.0
CPChem	21918	FL-2	FL_2	Flare	South Flare	286,937	3,952,991	903.27	176	1832.00	65.62	5.82	[2], [3]	0.16	1000	35.0
CPCHem		G-PBIA	G_PBIA	Point	North Paint Yard Air Compressor (Sandblasting)	287,212	3,953,502	922	30.00	500.00	10.00	2.00				
CPCHem		G-SB2A	G_SB2A	Point	South Paint Yard Air Compressor (Sandblasting)	286,574	3,953,116	926	6.00	500.00	1.00	0.21				
CPCHem	21918	H-2	H_2	Point	CPU Dutch Oven	286,892	3,953,174	922	22	1000	6.0	2.0				
CPCHem	21918	H-3	H_3	Point	CPU East Dowtherm Furnace	286,772	3,953,152	919	83	700	4.0	3.5				
CPCHem		ICE-03	ICE_03	Point	East Fire Water Engine	286,406	3,953,529	924	25.00	500.00	10.00	0.50				
CPCHem		ICE-04	ICE_04	Point	West Fire Water Engine	286,406	3,953,529	924	25.00	500.00	10.00	0.50				
CPCHem		ICE-05	ICE_05	Point	East Test Engine – RON	286,406	3,953,429	928	20.00	500.00	10.00	0.25				
CPCHem		ICE-06	ICE_06	Point	West Test Engine – MON	286,406	3,953,429	928	20.00	500.00	10.00	0.25				
CPCHem	21918	SP5C	SP5C	Point	Vapor Combustor	286,677	3,952,917	917	10.00	70.00	10.00	1.00				
CPCHem	21918	M2A1	M2A1	Point	MPU REGENERATIVE THERMAL OXIDIZER	286,782	3,953,143	918.87	35	151	27.2	1.4		1.50	973	28.5
CPCHem	21918	M2A1 MSS	M2A1_MSS	Point	SUFOLENE FLAKER SCRUBBER RTO MSS	286,782	3,953,143	918.87	35	151	27.2	1.4		1.50	973	28.5
CPCHem	21918	TB-13	TB_13	Point	TB-13 Unloading Hose Vent	286,733	3,953,391	928.4	155	70	20.0	0.3				

Table 4-6 (continued). Point Source Parameters

									Modeled Stack Parameters					Effective Flare Diameter Data		
Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	Note	Average Flow Rate	Lower Heating Value (BTU/SCF)	Molecular Weight
						(m)	(m)	(m)	(ft)	(°F)	(ft/sec)	Ft		(MSCF/min	(Btu/scf)	(lb/lbmol)
IACX	3131A	BLRSTK1	BLRSTK1	Point	18.56 MM BTU/HR Boiler Stack #1	281,867	3,950,374	923	35.00	320.00	29.00	2.00				
IACX	3131A	BLRSTK2	BLRSTK2	Point	25.69 MM BTU/HR Boiler Stack #2	281,878	3,950,374	922	35.00	320.00	40.00	2.00				
IACX	3131A	ENG8A	ENG8A	Point	Superior 6G825	281,755	3,950,579	922	15.00	750.00	105.90	0.83				
IACX	3131A	ICIN1	GASINCIN	Point	IACX Acid Gas Incinerator	281,856	3,950,424	923.85	213	500	25	2				
IACX	3131A	HOH1	HOH1	Point	North Hot Oil Heater	281,779	3,950,642	919	20.00	625.00	24.75	1.33				
IACX	3131A	HOH2	HOH2	Point	South Hot Oil Heater	281,811	3,950,321	923	20.00	625.00	24.75	1.33				
IACX	3131A	HTRSTK3	HTRSTK3	Point	Regen. Heater Stk. 3	281,890	3,950,408	924	39.00	440.00	12.49	2.00				
IACX		PUMP	PUMP	Point	Caterpillar G-3306	281,836	3,950,457	923	12.00	600.00	60.00	0.25				
IACX	3131A	STK4	STK4	Point	Cooper GMV-10	281,762	3,950,351	924	30.00	800.00	114.00	1.00				
IACX	3131A	STK5	STK5	Point	Superior 8G825	281,785	3,950,351	924	13.00	750.00	128.00	0.83				
IACX	3131A	STK6A	STK6A	Point	31,050 HP GE Gas Turbine Stack	281,838	3,950,492	922	42.00	800.00	200.00	10.00				
IACX	3131A	STK6B	STK6B	Point	31,050 HP GE Gas Turbine Stack	281,838	3,950,492	922	42.00	500.00	200.00	10.00				
IACX	3131A	STK6C	STK6C	Point	31,050 HP GE Gas Turbine Stack	281,796	3,950,492	922	39.00	500.00	200.00	7.00				
IACX	3131A	STK6D	STK6D	Point	31,050 HP GE Gas Turbine Stack	281,762	3,950,351	924	39.00	500.00	200.00	7.00				
IACX	3131A	STK7	STK7	Point	Gas Turbine 7A	281,740	3,950,594	923	33.00	825.00	45.40	3.33				
IACX	3131A	FLR1	FLR1	Flare	ACID GAS FLARE 1	281,877	3,950,404	923.94	220.00	1832.00	65.62	0.25	[2]	0.002	1000	20.0
P66	9868A	7E1	7E1	Point	Unit 7 Plat Engine #1	285,429	3,953,082	922	65.00	700.00	17.60	1.00				
P66	9868A	12E1	12E1	Point	Engine	285,865	3,952,665	932	30.00	733.00	8.58	1.00				
P66	9868A	7E2	7E2	Point	Unit 7 Plat Engine #2	285,425	3,953,082	922	65.00	700.00	17.60	1.00				
P66	9868A	93E1	93E1	Point	Engine No. 37	285,882	3,952,503	934	50.00	650.00	11.10	2.00				
P66	9868A	12E2	12E2	Point	Engine	285,871	3,952,665	932	30.00	733.00	8.58	1.00				
P66	9868A	7E3	7E3	Point	Unit 7 Plat Engine #3	285,420	3,953,082	922	65.00	700.00	17.60	1.00				
P66	9868A	93E2	93E2	Point	Engine No. 38	285,931	3,952,684	930	50.00	650.00	11.10	2.00				
P66	9868A	12E3	12E3	Point	Engine	285,878	3,952,665	932	30.00	733.00	8.58	1.00				
P66	9868A	7E4	7E4	Point	Unit 7 Plat Engine #4	285,416	3,953,082	922	65.00	700.00	17.60	1.00				
P66	9868A	12E4	12E4	Point	Engine	285,884	3,952,664	932	30.00	733.00	8.58	1.00				
P66	9868A	7E5	7E5	Point	Unit 7 Plat Engine #5	285,411	3,953,082	923	65.00	700.00	17.60	1.00				
P66	9868A	12E5	12E5	Point	Engine	285,890	3,952,664	932	30.00	733.00	8.58	1.00				
P66	9868A	7E6	7E6	Point	Unit 7 Plat Engine #6	285,407	3,953,082	923	65.00	700.00	17.60	1.00				
P66	9868A	12E6	12E6	Point	Engine	285,892	3,952,658	932	30.00	733.00	6.06	1.00				
P66	9868A	12E7	12E7	Point	Engine	285,898	3,952,658	932	30.00	733.00	6.06	1.00				
P66	9868A	10H1	10H1	Point	P66 Crude Oil Heater	286,404	3,953,539	924.1	93	344.75	11	8				

Table 4-6 (continued). Point Source Parameters

									Modeled Stack Parameters					Effective Flare Diameter Data		
Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	Note	Average Flow Rate	Lower Heating Value (BTU/SCF)	Molecular Weight
						(m)	(m)	(m)	(ft)	(°F)	(ft/sec)	Ft		(MSCF/min	(Btu/scf)	(lb/lbmol)
P66	9868A	12H1	12H1	Point	Mol Sieve Regen Gas Heater	285,813	3,952,672	934	43.00	586.00	3.69	2.00				
P66	9868A	19B1/19H1	19B119H1	Point	P66 U19.2, Charge Furnace, #2 & #3	286,239	3,953,458	920.12	100	330.01	71	5				
P66	9868A	19B1/19H2	19B119H2	Point	P66 19.2 #2 Reheater	286,239	3,953,458	920.12	100	330.01	71	5				
P66	9868A	19B2/19H4	19B219H4	Point	P66 U19.3 Charge. & Fractionator Furnace	286,235	3,953,320	919.4	65	330.01	67	4				
P66	9868A	19H3	19H3	Point	P66 19.1 Charge Furnace	286,248	3,953,412	919.9	100	467.00	16	7				
P66	9868A	19H5	19H5_1	Point	Unit 19.2, #1 Reboiler	286,249	3,953,336	920	49.00	586.00	11.60	2.00				
P66	9868A	19H5	19H5_2	Point	P66 U19.2, #2 Reboiler	286,249	3,953,336	919.8	49	586.00	21	3				
P66	9868A	19H6	19H6	Point	P66 U19.2 #1 Reheater	286,244	3,953,451	920.08	110	500.00	14	10				
P66	9868A	22H1	22H1	Point	P66 Alky Reboiler Furnace	286,233	3,953,165	923.13	30	500.00	15	4				
P66	9868A	26H1	26H1	Point	P66 Unit 26 Debutanizer Reboiler	286,345	3,953,292	925.33	70	385.00	27	4				
P66	9868A	28H1	28H1	Point	P66 Unit 28 Heater	286,337	3,953,570	923.91	96	325.00	15	4				
P66	9868A	29H4	29H4	Point	P66 Unit 29 Debutanizer Reboiler	285,971	3,952,912	926.08	135	403.00	20	5				
P66	9868A	29P1	29P1	Point	P66 Unit 29 FCCU	285,959	3,952,884	926.54	176	503		8.00				
P66	9868A	2H1	2H1	Point	P66 Unit 2-2 HDS Charge Heater	285,373	3,953,033	923.44	100	500.00	15	5				
P66	9868A	2H2	2H2	Point	P66 Deoiler Furnace	285,783	3,952,891	927.58	69	350.00	12	5				
P66	9868A	34I1	34I1	Point	P66 Unit 34 Incinerator	285,740	3,952,696	933.91	199	848		4.00				
P66	9868A	36H1	36H1	Point	P66 HDS Unit Charge Heater	285,367	3,953,569	900.44	90	500.00	17	5				
P66	9868A	40H1	40H1	Point	P66 Unit 40 Superheater No. 1	285,963	3,953,024	926.47	111	635.00	37	3				
P66	9868A	40H3	40H3	Point	P66 Unit 40 Superheater	285,942	3,953,025	926.73	81	55.00	31	4				
P66	9868A	40H4	40H4	Point	P66 Unit 40 Preheater Furnace	285,953	3,953,027	926.6	130	530.01	25	8				
P66	9868A	40P1	40P1	Point	P66 Unit 40 FCCU	285,926	3,953,098	928.11	176	460		9.00				
P66	9868A	41H1	41H1	Point	P66 Unit 41 Reformer Furnace	285,991	3,952,813	929.41	150	325.00	64	8				
P66	9868A	42H1	42H1	Point	P66 Unit 42 Reactor Charge Heater	286,043	3,952,536	929.42	151	325.00	66	3				
P66	9868A	42H2	42H2	Point	P66 Unit 42 Reactor Charge Heater	285,972	3,952,554	929.5	151	325.00	66	3				
P66	9868A	42H3	42H3	Point	Unit 42 Fractionator Feed Heater	285,972	3,952,575	930	171.00	75.00	0.01	2.00				
P66	9868A	43I1	43I1	Point	P66 Unit 43 Incinerator	286,145	3,952,814	929.43	150	350		3.50				

Table 4-6 (continued). Point Source Parameters

									Modeled Stack Parameters					Effective Flare Diameter Data		
Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	Note	Average Flow Rate	Lower Heating Value (BTU/SCF)	Molecular Weight
						(m)	(m)	(m)	(ft)	(°F)	(ft/sec)	Ft		(MSCF/min	(Btu/scf)	(lb/lbmol)
P66	9868A	4H2	4H2	Point	Unit 4 Dehydrator Heater	285,779	3,953,016	926	37.00	450.00	1.55	2.00				
P66	9868A	50H1	50H1	Point	P66 Unit 50 Charge Furnace	286,292	3,952,955	929.18	190	469.99	29	7				
P66	9868A	50HT1	50HT1	Point	Coker Heater Tank 1	286,761	3,954,350	908	30.00	289.00	10.92	2.00				
P66	9868A	50HT2	50HT2	Point	Coker Heater Tank 2	286,765	3,954,350	908	30.00	322.00	10.92	2.00				
P66	9868A	50HT3	50HT3	Point	Coker Heater Tank 3	286,768	3,954,349	908	30.00	296.00	10.92	2.00				
P66	9868A	51H1	51H1	Point	P66 VDU Heater	286,446	3,953,065	928.81	190	390.00	28	8				
P66	9868A	5H1	5H1	Point	P66 Unit 5-A Feed Heater	285,758	3,953,012	924.97	44	500.00	12	4				
P66	9868A	5H3	5H3	Point	Unit 5-C Feed Heater	285,763	3,953,012	925	45.00	586.00	6.22	4.00				
P66	155341	66FL10	66FL10	Flare	100M Swt Brine Flare Pit	280,852	3,955,343	853	30.00	1832.00	65.62	5.20	[2]	1.00	760	20.0
P66	155341	66FL11	66FL11	Flare	30M Swt Brine Flare Pit	281,556	3,954,895	851	35.00	1832.00	65.62	5.20	[2]	1.00	760	20.0
P66	9868A	66FL12	66FL12	Flare	P66 GOHDS Flare	285,381	3,953,345	911.29	140	1832.00	65.62	4.93	[2]	0.90	760	20.0
P66	9868A	66FL13	66FL13	Flare	P66 Derrick Flare	286,198	3,952,810	929.38	213	1832.00	65.62	0.90	[2]	0.03	760	20.0
P66	155341	66FL8	66FL8	Flare	100M Sour Brine Flare Pit	281,443	3,955,571	848	30.00	1832.00	65.62	0.37	[2]	0.01	760	20.0
P66	9868A	6H1	6H1	Point	BHU Reduction Furnace	285,375	3,953,004	923	51.00	600.00	4.06	2.00				
P66	9868A	7H1-4	7H14	Point	P66 Unit 7 Charge Furnace	285,395	3,953,042	923.47	147	330.00	15	7				
P66	85872	81B17	81B17	Point	P66 Boiler 2.4	286,170	3,952,970	925.66	65	320.00	66	4				
P66	9868A	85B2	85B2	Point	P66 Unit 40 Boiler	285,930	3,953,146	928.28	247	350.00	35	12				
P66	9868A	98H1	98H1	Point	P66 SMR Charge Heater	285,931	3,952,684	930.02	130	375.00	52	6				
P66	9868A	9H1	9H1	Point	P66 Crude Oil Heater	286,304	3,953,540	923.83	85	330.01	18	7				
P66	85872	BLR12	BLR12	Point	P66 Boiler 12	285,927	3,952,878	926.81	130	250.00	60	8				
P66	PBR	ENG-EB1	ENG_EB1	Point	Unregistered PBR 106.511 from 2015	286,120	3,953,092	922	4.00	899.00	40.00	0.67				
P66	PBR	ENG-EB2	ENG_EB2	Point	Unregistered PBR 106.511 from 2015	286,120	3,953,092	922	4.00	899.00	40.00	0.67				
P66	PBR	ENG-EB4	ENG_EB4	Point	Unregistered PBR 106.511 from 2015	286,120	3,953,092	922	4.00	899.00	40.00	0.67				
P66	PBR	ENG-EB6	ENG_EB6	Point	Unregistered PBR 106.511 from 2015	286,120	3,953,092	922	4.00	899.00	40.00	0.67				
P66	PBR	ENG-EB7	ENG_EB7	Point	Unregistered PBR 106.511 from 2015	286,120	3,953,092	922	4.00	899.00	40.00	0.67				
P66	PBR	ENG-EB9	ENG_EB9	Point	Unregistered PBR 106.511 from 2015	286,120	3,953,092	922	4.00	899.00	40.00	0.97				
P66		FWP1	FWP1	Point	Fire Water Pump 1 - #8 ARDS Fire Water Pump, 67-H463	285,977	3,953,216	926	20.00	733.00	8.58	1.00				
P66		FWP2	FWP2	Point	Fire Water Pump 2 - #7 ARDS Fire Water Pump, 67-H464	285,987	3,953,216	926	20.00	733.00	8.58	1.00				

Table 4-6 (continued). Point Source Parameters

Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Modeled Stack Parameters: Stack Height	Temperature	Exit Velocity	Stack Diameter	Note	Effective Flare Diameter Data: Average Flow Rate	Lower Heating Value (BTU/SCF)	Molecular Weight
						(m)	(m)	(m)	(ft)	(°F)	(ft/sec)	Ft		(MSCF/min	(Btu/scf)	(lb/lbmol)
P66		FWP3	FWP3	Point	Fire Water Pump 3 - South NGL Fire Water Pump, 67-H741	285,691	3,952,775	932	20.00	733.00	8.58	1.00				
P66		FWP4	FWP4	Point	Fire Water Pump 4 - N Refinery Fire Water Pump, 67-V371	285,698	3,952,774	932	20.00	700.00	8.58	1.00				
P66		FWP5	FWP5	Point	Fire Water Pump 5 - S Refinery Fire Water Pump, 67-V372	285,720	3,952,571	936	20.00	700.00	8.58	1.00				
P66	85872	SKDBLR	SKDBLR	Point	P66 Skid Boiler	285,892	3,952,884	927.38	78	291.99	46	9				
Solvay	7719A	H-10	H_10	Point	No. 3 Dowtherm Furnace	286,766	3,953,401	928	156.00	605.00	15.00	7.70				
Solvay	7719A	H-8	H_8	Point	No. 1 Dowtherm Furnace	286,985	3,953,349	922	60.00	850.00	25.00	3.00				
Solvay	7719A	H-9	H_9	Point	No. 2 Dowtherm Furnace	286,986	3,953,337	921	60.00	850.00	25.00	3.00				

[1] Except for exit velocity, stack parameters were revised using TCEQ Table 1a dated 12/12/2016. Exit velocity based on flowrate of 175,900 scfm.

[2] Temperature and exit velocity are from TCEQ guidance for modeling flares. The diameters is the calculated effective diameter based on heat input and molecular weight of the stream routed to the flare.

[3] Effective diameter provided by Chevron Phillips Chemical.

[4] Stack parameters were revised using TCEQ Table 1a dated 6/12/2014.

Table 4-7. Area Source Parameters

RN	Company	Permit	EPN	Model ID	Source Type	Source Description	UTM (E)	UTM (N)	Base Elevation	Release Height	Easterly Length	Northerly Length	Angle from North
							(m)	(m)	(m)	(ft)	(ft)	(ft)	(°)
RN102320850	CPChem	21918	F-M2A	FM2A_1	Area	Sulfolene handling area fugitive (Building + 1 trailer)	286,702	3,953,171	922.23	20	90	70	0
RN102320850	CPChem	21918	F-M2A	FM2A_2	Area	Sulfolene handling area fugitive (4-trailer storage)	287,109	3,952,842	912.68	10	65	25	66
RN102320850	CPCHem		ICE-01	ICE_01	Area	Maintenance Compressor (Painting)	287,205	3,953,502	922.4	10.000	100.000	100.000	0
RN102320850	CPCHem		ICE-02	ICE_02	Area	Maintenance Compressor (Sandblasting)	287,205	3,953,502	922.4	10.000	50.000	50.000	0
RN100209659	Orion	8780	FURN-FUG	FURN_FUG	Area	Furnace Area Fugitives	279,734	3,949,382	955.4	4.000	350.000	700.000	1
RN102495884	P66	9868A	F-43WHB	F_3WHB	Area	Waste Heat Boiler Fugitives	286,168	3,952,778	928.0	5	10.000	10.000	0

4.4.2.5.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations where there is no violating monitor to inform the designation, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data.

The EPA believes that continuous emissions monitoring systems (CEMS) data provide acceptable historical emissions information, when they are available. There may need to be an assessment of source emissions over time to ensure the modeled emission rates are representative of "normal" operations at the facility or projected future operations. These data are available for many electric generating units and for some large SO_2 sources. In the absence of CEMS data, the EPA's Modeling TAD highly encourages the use of AERMOD's hourly varying emissions keyword HOUREMIS, or through the use of AERMOD's variable emissions factors keyword EMISFACT. When choosing one of these methods, the EPA recommends using detailed throughput, operating schedules, and emissions information from the impacted source(s).

As previously noted, the industry included Orion and Tokai DRR Facilities and 6 other emitters of SO_2 within 8 km in the area of analysis. For this area of analysis, the industry has opted to use a hybrid approach, where emissions from certain facilities are expressed as estimated actual emissions based on CEMS, actual maximum annual tpy emission values, actual annual tpy emission rate, and allowables (also expressed as PTE rates). The facilities in the industry's modeling analysis and their associated emission rates are summarized below.

For Orion, Tokai, Phillips 66, CP Chem, Blackhawk, Solvay, IACX, and Agrium facilities the industry provided annual actual SO_2 emissions between 2017-2019 on a source specific basis that has been summarized by EPA. This information is summarized in Table 4-8. A description of how the industry obtained hourly emission rates for each facility is given below this table.

Table 4-8. Actual SO_2 Emissions Between 2017 – 2019 from Facilities in the Area of Analysis for the Hutchinson County, Texas Area

Facility Name	SO_2 Emissions (tpy)		
	2017	2018	2019
Orion Carbon Black Plant	3706	3512	3605
Tokai Carbon Black Plant	6950	5792	5049
Phillips 66	204	218	208
Solvay	0.188	0.176	0.111
Blackhawk Power	71.8	82.4	68.5
IACX	183	201	114
CP Chem	517	451	411
Agrium	0.2783	0.244	0.189
Total Emissions from All Modeled Facilities in the Industry's Area of Analysis	11,632.3	10,256.8	9,455.8

See Table 4-9 for detailed annual tpy emissions for 2017-2019, maximum emission rates, permit emission rates, and modeled emission rates for each of the sources included in the modeling.

For Tokai, the annual tpy emissions data from the State's database (STARS) and from facility specific emission inventories for each year were used and an assumed operation of 8760 hours was used to calculate an estimated constant hourly emission rate for the Tokai sources included in the modeling. This modeling of an annual average emission rate based on tpy and 8760 hrs does not take into emission variability at the plant for the primary sources and the flares; nor does it account for non-operational hours when no emissions occurred at all that should have been left out of the averaging in order to devise a true average of operational hourly emissions. To illustrate this concern we note that prior to future reductions (post 12/31/2020) at the Tokai and in their older permit the SO_2 allowable lb/hr for the Boilers, Dryer stacks and four flares combined is 3607.9 lb/hr on a short term basis and also had an annual SO_2 tpy limit of 14,814 tpy. The actual modeled emission rate for these sources is 1602.7 lb/hr in 2017, 1329.5 lb/hr in 2018, and 1197.9 lb/hr in 2019; we note that for all three years the lb/hr modeled emission rate for these large sources that are most of the SO_2 emissions at Tokai is approximately half to 1/3rd the permit limit at the time. For sources that operated less than 8760 hours per year, the use of an annual total emissions divided over 8760 hours underestimates the emission rate expected during operation of the source. Regarding the adequacy of these modeled emission rates for boundary modeling, this approach does not take into account temporally varying emission rates. Carbon black plants such as Tokai are known to have variability in sulfur content in the feedstock used that leads to variability in SO_2 emission rates. This variability would lead to higher DVs and a larger area modeled above the standard. We note that the industry indicated in their modeling report that they did not think using the annual tpy emission rate and averaging over 8760 hours would impact the modeling but they did note that the peak concentration at any receptor in the modeling grid would be biased downward. EPA's assessment is the use of annual emission rates averaged over 8760 hours and not actual operating hours and also not considering the variability in emission rate does lead to an underestimation in the maximum DV and the area predicted to be above the standard and does not fully comport with EPA's Modeling TAD. The modeled emission rates also do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to outweigh the evidence of a violating monitor.

For Orion, Industry used a mixture of methodologies to derive emission rates for the modeling. For the large SO_2 sources at the facility (sources greater than 5 tpy actual emissions) the actual annual tpy emissions data from the State's database (STARS) and from facility specific emission inventories for each year were used and an assumed operation of 8760 hours was used to calculate an hourly emission rate for the sources included in the modeling. For sources at Orion with less than 5 tpy actual emissions either the maximum actual tpy of the three years was modeled averaged over 8760 hours or the permit allowable was modeled. EPA's assessment is that the sources modeled at allowables total to 1.77 lb/hr (7.75 tpy) and are a small fraction of the total annual emissions at Orion. For the Orion Waste Heat Boiler, which is the largest single source at Orion with annual emissions ranging from 1226.8 to 3197.9 tpy of SO_2, the use of an average hourly emission rate based on tpy and division by 8760 hrs; EPA's assessment is that this does not take into account emission temporal variability. The flares with annual emissions ranging from 398.4 to 2471.8 tpy of SO_2 also uses an average hourly emission rate based on tpy and division by 8760 hrs does not take into account emission temporal variability as EPA recommends. To illustrate this concern we note the allowable lb/hr for the Waste Heat Boiler and the three flares combined is 4399.4 lb/hr on a short term basis and also has a tpy limit of 8476.88 tpy. The actual modeled emission rate for all four sources is 844.4 lb/hr in 2017, 800.5 lb/hr in 2018 and 821 lb/hr in 2019; so for all three years the lb/hr modeled emission rate for these 4 large sources that are most of the SO_2 emissions is approximately $1/5^{th}$ the permit limit. For sources that operated less than 8760 hours per year the use of averaging over 8760 hours underestimates the hourly annual average lb/hr emission rate. Regarding the adequacy of these modeled emission rates for boundary modeling, this approach does not take into account temporally varying emission rates. Carbon black plants such as Orion are known to have variability in sulfur content in the feedstock used that leads to variability in SO_2 emission rates. This variability would lead to higher DVs and a larger area modeled above the standard and also does not fully comport with EPA's Modeling TAD. The modeled emission rates do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to overcome the issue of a violating monitor.

For Phillips 66, a mixture of methodologies was used to derive emission rates for the modeling using information from Phillips 66 annual emission inventories. For the largest sources at Phillips 66 that have CEMS the actual hourly emission rates were modeled for the two FCCUs, the Unit 35 and Unit 43 Incinerators and the GOHDS flare. For most of the other sources at Phillips 66 the allowable emission rate was modeled based on proposed new limits for sources based on modeling this Spring and Summer that EPA and TCEQ reviewed. The small engines and fire water pump engines were modeled at their actual maximum annual tpy divided by 8760 hours of operation. For the large sources with CEMS, the modeling uses actual hourly data but not new allowable emission rates, which were lowered significantly from past permit limits. For modeling for informing the designation boundary, it is acceptable to use CEM data but EPA's guidance for Round 4 designating areas with a violating monitor indicates that the new allowables should be modeled if intended to overcome a violating monitor. It is not clear that the new modeled allowables have been incorporated into a permit and made federally enforceable at this time. The Phillips 66 has a number of sources under a flexible permitted emissions cap. The contribution of individual sources was allocated based on each source's PTE limit in a relative sense to each other. For boundary modeling assessments the emissions rates modeled for Phillips 66 sources is generally acceptable with the exception that a different allocation of emissions under the facility's emission cap for some sources could result in different modeling results and conclusions. The modeled emission rates do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to outweigh the evidence from a violating monitor.

For CP Chem, a mixture of methodologies were used to derive emission rates for the modeling using information from CP Chem annual emission inventories. For some of the smaller sources (mostly less than 0.1 lb/hr with one source just under 2 lb/hr) were modeled using allowable emission rates. For all the other sources the maximum annual tpy emissions data (2017-2019) were used and an assumed operation of 8760 hours was used to calculate an hourly emission rate for the CP Chem sources included in the modeling. This modeling of an average hourly emission rate based on tpy and averaging over 8760 hours does not take into emission variability at the plant for the primary sources and the flares or account for non-operational hours. For sources that operated less than 8760 hours per year, the averaging over 8760 hours underestimates the hourly annual average lb/hr emission rate during operating times. In regards to the adequacy of these modeled emission rates for boundary modeling, this approach does not take into account temporally varying emission rates that leads to variability in SO_2 emission rates and this variability would lead to higher DVs and a larger area modeled above the standard and does not fully comport with EPA's Modeling TAD. The modeled emission rates also do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to outweigh the evidence of a violating monitor.

For Blackhawk, the two emission units have CEMS and the maximum hourly CEMS data from 2017-2019 for the two units (27.24 lb/hr and 27.82 lb/hr) was used in the boundary modeling. We note that the allowable emission rate for each unit is 102 lb/hr. In regards to the adequacy of these modeled emission rates for boundary modeling this approach is acceptable and slightly conservative in that the highest hourly emission rate was modeled so these emissions are in accordance with the Modeling TAD. The modeled emission rates do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to overcome a violating monitor.

For Solvay, the allowable emission rate was modeled for the three sources (2.98 lb/hr total). In regards to the adequacy of these modeled emission rates for boundary modeling this approach is acceptable and in accordance with the Modeling TAD. The modeled emission rates do comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to overcome the issue of a violating monitor.

For IACX, the annual tpy emissions data from the State's database (STARS) and from facility specific emission inventories for each year were used for the only large SO_2 source (Acid Gas Incinerator). For the Acid Gas Incinerator the maximum tpy of the three years (2017-2019) was used and then assumed operation 8760 hours/year was used to calculate an hourly emission rate for the Acid Gas Incinerator. All the other IACX sources (except one) were modeled at their allowable emission rate that were each less than 1 lb/hr for a total emission rate from all these sources of 3.23 lb/hr. This modeling of an average hourly emission rate based on tpy and averaging over 8760 hrs for the Acid Gas Incinerator does not take into account emission variability for this source or account for non-operational hours. To illustrate this concern we note the allowable lb/hr for the Acid Gas Incinerator is 441.98 lb/hr and the modeled emission rate is 45.60 lb/hr so the SO_2 emissions modeled is approximately 1/9th the permit limit. For sources that operated less than 8760 hours per year the averaging over 8760 hours underestimates the hourly annual average lb/hr emission rate. In regards to the adequacy of these modeled emission rates for boundary modeling this approach does not take into account temporally varying emission rates that leads to variability in SO_2 emission rates and this variability would lead to higher DVs and a larger area modeled above the standard and does not fully comport with EPA's Modeling TAD. The modeled emission rates also do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to overcome a violating monitor.

For Agrium, the maximum annual tpy emissions data (highest of 2017-2019 annual tpy data) from the State's database (STARS) were used and an assumed operation of 8760 hours was used to calculate an hourly emission rate for the Agrium sources included in the modeling. This modeling of an average hourly emission rate based on tpy and division by 8760 hrs does not take into account emission variability at the plant or account for non-operational hours. In regards to the adequacy of these modeled emission rates for boundary modeling this approach is not acceptable and in accordance with the Modeling TAD. The modeled emission rates also do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to overcome the issue of a violating monitor.

In Conclusion, the modeled emission rates at many emission sources, especially the large sources at Orion, Tokai, and IACX do not take into account temporally varying emission rates or operational hours, inclusion of which would lead to higher DVs and a larger area modeled above the standard, and therefore, does not fully comport with EPA's Modeling TAD. The permits in effect at this time for Orion, Tokai, and IACX larger SO2 emission sources have federally enforceable allowable emission rates much higher than the modeled emission rates. Based on the current modeling these sources (Orion, Tokai, and IACX) are driving modeled values near and above the 1-hour SO_2 NAAQS and increases in impacts due to variability in emission rates would increase the size of modeled area violating the standard. The overall modeled emissions to do not comport with EPA's Modeling TAD in regards to modeling to inform boundary decisions.

Some industry commented that based on the new limits and future controls that the area should be designated unclassifiable. The modeled emission rates do not comport with the modeling of federally enforceable existing allowables at the time of designation as our Round 4 guidance and Appendix W indicates in order to outweigh the evidence of a violating monitor. Therefore, Industry's suggestion cannot be accepted.

Table 4-9. SO_2 Emissions for each source (tpy, and emission rate modeled) at Facilities in the Area of Analysis for the Hutchinson County, Texas Area.

						Actual Annual SO2 Emissions						
Company	Permit	EPN	Model ID	Source Type	Source Description	2017	2018	2019	Max. Actual (lb/hr)	Allowable Permit Limit	Emission Rate Basis	Boundary Modeling Rate
						(tpy)	(tpy)	(tpy)	(lb/hr)	(lb/hr)		(lb/hr)
Tokai	1867A	119	119	Point	Tokai Merged Boilers Stack	5066.2497	4225.4477	3680.843			Actual for Each Year	(see hourly file)
Tokai	1867A	121	121	Point	Tokai Plant 1 Dryer Stack	755.29	660.9223	610.246			Actual for Each Year	(see hourly file)
Tokai	1867A	122	122	Point	Tokai Plant 2 Dryer Stack	1112.6343	892.1847	745.625			Actual for Each Year	(see hourly file)
Tokai	1867A	FLARE-1	T_FLR_1	Flare	U1-PBF FLARE	1.6532	3.144	94.139			Actual for Each Year [1]	(see hourly file)
Tokai	1867A	FLARE-2	T_FLR_2	Flare	U2 PBF FLARE	7.619	10.086	17.114			Actual for Each Year [1]	(see hourly file)
Tokai	1867A	FLARE-3	T_FLR_3	Flare	U3 PBF FLARE	44.7778	31.5825	16.891			Actual for Each Year [1]	(see hourly file)
Tokai	1867A	FLARE-4	T_FLR_4	Flare	U4 PBF FLARE	31.7357	0	82.055			Actual for Each Year [1]	(see hourly file)
Tokai	1867A	1	1	Point	#1 #2 DRYER, E. PURGE FR.	8.425	7.0139	6.476	1.924		Actual Max Year	1.92
Tokai	1867A	3	3	Point	#3 #4 DRYER, W. PURGE FR.	6.9891	6.4743	5.978	1.596		Actual Max Year	1.60
Tokai	1867A	21	21	Point	PREHEATER STACK, PLT. 1	0.0061	0.0061	0.006	0.001	0.01	Allowable	0.010
Orion		E-100H	E_100H	Point	Main Tank Preheater	0.0012	0.0012	0.001	0.0003		Actual Max Year	0.0003
Orion		E-101H	E_101H	Point	Small Tank Preheater	0.001	0.001	0.001	0.0003		Actual Max Year	0.0003
Orion	8780	E-10D	E_10D	Point	B-1 Dryers Stack A	0.025	0.0254	0.023	0.006	0.02	Allowable	0.020
Orion	8780	E-10D	E_10DF	Point	B-1 Dryer Bag Filter Stack A	0.025	0.0254	0.023	0.006	0.01	Allowable	0.010
Orion	8780	E-11D	E_11D	Point	B-1 Dryers Stack B	0.25	0.0254	0.023	0.057	0.02	Allowable	0.020
Orion	8780	E-11D	E_11DF	Point	B-1 Dryer Bag Filter Stack B	0.25	0.0254	0.023	0.057	0.01	Allowable	0.010
Orion	8780	E-20D	E_20D	Point	B-2 Dryers Stack A	0.024	0.024	0.022	0.005	0.02	Allowable	0.020
Orion	8780	E-20D	E_20DF	Point	B-2 Dryer Bag Filter Stack A	0.024	0.024	0.022	0.005	0.01	Allowable	0.010
Orion	8780	E-21D	E_21D	Point	B-2 Dryers Stack B	0.024	0.024	0.022	0.005	0.02	Allowable	0.020
Orion	8780	E-21D	E_21DF	Point	B-2 Dryer Bag Filter Stack B	0.024	0.024	0.022	0.005	0.01	Allowable	0.010
Orion	8780	E-40D	E_40D	Point	B-4 Dryers Stack A	0.021	0.022	0.022	0.005	0.02	Allowable	0.020
Orion	8780	E-40D	E_40DF	Point	B-4 Dryer Bag Filter Stack A	0.021	0.022	0.022	0.005	0.01	Allowable	0.010
Orion	8780	E-41D	E_41D	Point	B-4 Dryers Stack B	0.021	0.022	0.022	0.005	0.02	Allowable	0.020
Orion	8780	E-41D	E_41DF	Point	B-4 Dryer Bag Filter Stack B	0.021	0.022	0.022	0.005	0.01	Allowable	0.010
Orion	8780	E-50R	E_50R	Point	Thermal Unit 1 Reactor Stack A	1.782	1.5007	2.247	0.5129	0.69	Allowable	0.69
Orion	8780	E-51R	E_51R	Point	Thermal Unit 1 Reactor Stack B	1.782	1.5007	2.247	0.5129	0.69	Allowable	0.69
Orion	8780	E-53P	E_53P	Point	Orion TPE Bag Filter	3.55	2.9797	4.461	1.02	1.37	Allowable	1.37
Orion	8780	E-5B	E_5B	Point	Thermal Boiler	0	0	0.013	0.002945	0.01	Allowable	0.01
Orion	8780	E-6B	E6B	Point	Orion Waste Heat Boiler	1226.777	2090.2508	3197.893			Actual for Each Year	(see hourly file)

Table 4-9 (continued). SO_2 Emissions for each source (tpy, and emission rate modeled) at Facilities in the Area of Analysis for the Hutchinson County, Texas Area.

Company	Permit	EPN	Model ID	Source Type	Source Description	Actual Annual SO2 Emissions			Max. Actual (lb/hr)	Allowable Permit Limit	Emission Rate Basis	Boundary Modeling Rate
						2017	2018	2019				
						(tpy)	(tpy)	(tpy)	(lb/hr)	(lb/hr)		(lb/hr)
Orion	8780	P-60P	P_60P	Point	FD Fan Vent Stack	0	0	0.000	9.13E-05	0.21	Allowable	0.21
Orion	8780	E-10FL	E_10Fl	Flare	B1 FLARE	761.417	535.8808	135.502			Actual for Each Year	(see hourly file)
Orion	8780	E-20FL	E_20Fl	Flare	B2 FLARE	823.765	449.3738	126.012			Actual for Each Year	(see hourly file)
Orion	8780	E-40FL	E_40Fl	Flare	B4 FLARE	886.636	430.6647	136.891			Actual for Each Year	(see hourly file)
Agrium		2	2	Point	REFRM. STACK	0.4622	0.7288	0.715	0.17		Actual Max Year	0.166
Agrium		E-2	E_2	Point	UREA EMERGENCY GENERATOR	0	0	0.000	2.28E-05		Actual Max Year	0.00002
Agrium		H-5	H_5	Point	START-UP HTR. STK. ""102B""	0.0011	0.0034	0.006	0.0013		Actual Max Year	0.00128
Agrium		PKGB	PKGB	Point	HEAT, STEAM, & POWER	0.1859	0.1592	0.179	0.04		Actual Max Year	0.0424
Agrium		FL-1	A_FL_1	Flare	NH3 PLT EMERGENCY FLARE STACK	0.0334	0.0334	0.001	0.008		Actual Max Year	0.008
Agrium		FL-2	A_FL_2	Flare	UREA PLANT FLARE	0.048	0.048	0.003	0.011		Actual Max Year	0.011
Blackhawk	32096	EPN1-1	EPN1_1	Point	BLACKHAWK STATION Unit 1, combustion turbine w. HRSG	41.5	39.2	37.000	9.47	102	Actual Max Hour	27.24
Blackhawk	32096	EPN2-1	EPN2_1	Point	BLACKHAWK STATION Unit 2, Combustion Turbine W. HRSG	30.3	43.2	31.500	9.86	102	Actual Max Hour	27.82
CPChem	21918	FL-1	FL_1	Flare	North Flare	485.9455	446.1825	402.055	110.95	413.79	Actual Max Year	110.95
CPChem	21918	FL-2	FL_2	Flare	South Flare	20.8522	4.2917	8.488	4.76	78.45	Actual Max Year	4.76
CPCHem		G-PBIA	G_PBIA	Point	North Paint Yard Air Compressor (Sandblasting)	0.0025	0.0019	0.005	0.001		Actual Max Year	0.001
CPCHem		G-SB2A	G_SB2A	Point	South Paint Yard Air Compressor (Sandblasting)	0.0139	0.0294	0.040	0.01		Actual Max Year	0.01
CPCHem	21918	H-2	H_2	Point	CPU Dutch Oven	0.0006	0.0008	0.001	0.0002	0.01	Allowable	0.01
CPCHem	21918	H-3	H_3	Point	CPU East Dowtherm Furnace	0.0544	0.0471	0.041	0.01	0.02	Allowable	0.02
CPCHem		ICE-03	ICE_03	Point	East Fire Water Engine	0.0098	0.0195	0.003	0.004		Actual Max Year	0.00
CPCHem		ICE-04	ICE_04	Point	West Fire Water Engine	0.02	0.0376	0.005	0.009		Actual Max Year	0.01
CPCHem		ICE-05	ICE_05	Point	East Test Engine – RON	0.0006	0.0008	0.001	0.0002		Actual Max Year	0.00
CPCHem		ICE-06	ICE_06	Point	West Test Engine – MON	0.0006	0.0007	0.001	0.0002		Actual Max Year	0.00
CPCHem	21918	SP5C	SP5C	Point	Vapor Combustor	0.002	0.002	0.003	0.0006	0.01	Allowable	0.01
CPCHem	21918	M2A1	M2A1	Point	MPU REGENERATIVE THERMAL OXIDIZER	0.001	0.001	0.001	0.0002	0.05	Allowable	0.05
CPCHem	21918	M2A1 MSS	M2A1_MSS	Point	SUFOLENE FLAKER SCRUBBER RTO MSS	0.01	0.01	0.010	0.002	0.01	Allowable	0.01
CPCHem	21918	TB-13	TB_13	Point	TB-13 Unloading Hose Vent	10.43	0.01	0.011	2.38	0.64	Allowable	0.64

Table 4-9 (continued). SO_2 Emissions for each source (tpy, and emission rate modeled) at Facilities in the Area of Analysis for the Hutchinson County, Texas Area.

Company	Permit	EPN	Model ID	Source Type	Source Description	Actual Annual SO2 Emissions 2017	2018	2019	Max. Actual (lb/hr)	Allowable Permit Limit	Emission Rate Basis	Boundary Modeling Rate
						(tpy)	(tpy)	(tpy)	(lb/hr)	(lb/hr)		(lb/hr)
IACX	3131A	BLRSTK1	BLRSTK1	Point	18.56 MM BTU/HR Boiler Stack #1	0.0466	0.0478	0.048	0.01	0.01	Allowable	0.01
IACX	3131A	BLRSTK2	BLRSTK2	Point	25.69 MM BTU/HR Boiler Stack #2	0.0231	0.0662	0.066	0.015	0.02	Allowable	0.02
IACX	3131A	ENG8A	ENG8A	Point	Superior 6G825	0.0034	0.0032	0.005	0.001	0.02	Allowable	0.02
IACX	3131A	ICIN1	GASINCIN	Point	IACX Acid Gas Incinerator	180.8293	199.71	112.167	45.60	441.98	Actual Max Year	45.60
IACX	3131A	HOH1	HOH1	Point	North Hot Oil Heater	0.0212	0.0245	0.025	0.006	0.01	Allowable	0.01
IACX	3131A	HOH2	HOH2	Point	South Hot Oil Heater	0.0225	0.0245	0.025	0.006	0.01	Allowable	0.01
IACX	3131A	HTRSTK3	HTRSTK3	Point	Regen. Heater Stk. 3	0.0206	0.0212	0.021	0.005	0.01	Allowable	0.01
IACX		PUMP	PUMP	Point	Caterpillar G-3306	0.0058	0.0008	0.009	0.002		Actual Max Year	0.00
IACX	3131A	STK4	STK4	Point	Cooper GMV-10	0.0168	0.0146	0.005	0.004	0.03	Allowable	0.03
IACX	3131A	STK5	STK5	Point	Superior 8G825	0.0109	0.0099	0.010	0.002	0.02	Allowable	0.02
IACX	3131A	STK6A	STK6A	Point	31,050 HP GE Gas Turbine Stack	0.6678	0.4838	0.660	0.15	0.74	Allowable	0.74
IACX	3131A	STK6B	STK6B	Point	31,050 HP GE Gas Turbine Stack	0.6678	0.4838	0.660	0.15	0.74	Allowable	0.74
IACX	3131A	STK6C	STK6C	Point	31,050 HP GE Gas Turbine Stack	0.6678	0.4838	0.660	0.15	0.74	Allowable	0.74
IACX	3131A	STK6D	STK6D	Point	31,050 HP GE Gas Turbine Stack	0.6678	0.4838	0.660	0.15	0.74	Allowable	0.74
IACX	3131A	STK7	STK7	Point	Gas Turbine 7A	0.4717	0.3626	0.029	0.11	0.14	Allowable	0.14
IACX	3131A	FLR1	FLR1	Flare	ACID GAS FLARE 1	0	0	0.000	0		Actual Max Year	0.00
P66	9868A	7E1	7E1	Point	Unit 7 Plat Engine #1	0.2101	0.2284	0.184	0.052		Actual Max Year	0.052
P66	9868A	12E1	12E1	Point	Engine	0.0127	0.0101	0.011	0.003		Actual Max Year	0.003
P66	9868A	7E2	7E2	Point	Unit 7 Plat Engine #2	0.2101	0.2284	0.184	0.052		Actual Max Year	0.052
P66	9868A	93E1	93E1	Point	Engine No. 37	0.0115	0.0065	0.007	0.003		Actual Max Year	0.003
P66	9868A	12E2	12E2	Point	Engine	0.0127	0.0101	0.011	0.003		Actual Max Year	0.003
P66	9868A	7E3	7E3	Point	Unit 7 Plat Engine #3	0.2101	0.2284	0.184	0.052		Actual Max Year	0.052
P66	9868A	93E2	93E2	Point	Engine No. 38	0.0115	0.0065	0.007	0.003		Actual Max Year	0.003
P66	9868A	12E3	12E3	Point	Engine	0.0127	0.0101	0.011	0.003		Actual Max Year	0.003
P66	9868A	7E4	7E4	Point	Unit 7 Plat Engine #4	0.2101	0.2284	0.184	0.052		Actual Max Year	0.052
P66	9868A	12E4	12E4	Point	Engine	0.0127	0.0101	0.011	0.003		Actual Max Year	0.003
P66	9868A	7E5	7E5	Point	Unit 7 Plat Engine #5	0.2101	0.2284	0.184	0.052		Actual Max Year	0.052
P66	9868A	12E5	12E5	Point	Engine	0.0127	0.0101	0.011	0.003		Actual Max Year	0.003
P66	9868A	7E6	7E6	Point	Unit 7 Plat Engine #6	0.2101	0.2284	0.184	0.052		Actual Max Year	0.052
P66	9868A	12E6	12E6	Point	Engine	0.0094	0.0075	0.008	0.002		Actual Max Year	0.002
P66	9868A	12E7	12E7	Point	Engine	0.0094	0.0075	0.008	0.002		Actual Max Year	0.002
P66	9868A	10H1	10H1	Point	P66 Crude Oil Heater	0.0164	0.0163	0.020	0.005	3.07	Allowable	3.07

Table 4-9 (continued). SO_2 Emissions for each source (tpy, and emission rate modeled) at Facilities in the Area of Analysis for the Hutchinson County, Texas Area.

Company	Permit	EPN	Model ID	Source Type	Source Description	Actual Annual SO2 Emissions 2017	2018	2019	Max. Actual (lb/hr)	Allowable Permit Limit	Emission Rate Basis	Boundary Modeling Rate
						(tpy)	(tpy)	(tpy)	(lb/hr)	(lb/hr)		(lb/hr)
P66	9868A	12H1	12H1	Point	Mol Sieve Regen Gas Heater	0	0	0	0	0.01	Allowable	0.01
P66	9868A	19B1/19H1	19B119H1	Point	P66 U19.2, Charge Furnace, #2 & #3	0.001	0.001	0.002	0.0005	4.54	Allowable	4.54
P66	9868A	19B1/19H2	19B119H2	Point	P66 19.2 #2 Reheater	0.0037	0.0032	0.008	0.002	1.6	Allowable	1.60
P66	9868A	19B2/19H4	19B219H4	Point	P66 U19.3 Charge. & Fractionator Furnace	0.0315	0.0401	0.084	0.02	2.68	Allowable	2.68
P66	9868A	19H3	19H3	Point	P66 19.1 Charge Furnace	1.0672	1.2311	0.704	0.28	3.05	Allowable	3.05
P66	9868A	19H5	19H5_1	Point	Unit 19.2, #1 Reboiler	0.0213	0.0155	0.036	0.01	0.46	Allowable	0.46
P66	9868A	19H5	19H5_2	Point	P66 U19.2, #2 Reboiler	0.0213	0.0155	0.036	0.008	0.42	Allowable	0.42
P66	9868A	19H6	19H6	Point	P66 U19.2 #1 Reheater	0.247	0.2278	0.167	0.06	2.56	Allowable	2.56
P66	9868A	22H1	22H1	Point	P66 Alky Reboiler Furnace	0.2621	0.2397	0.208	0.06	0.54	Allowable	0.54
P66	9868A	26H1	26H1	Point	P66 Unit 26 Debutanizer Reboiler	0.087	0.097	0.105	0.02	2.05	Allowable	2.05
P66	9868A	28H1	28H1	Point	P66 Unit 28 Heater	3.4157	2.6397	3.210	0.78	5.06	Allowable	5.06
P66	9868A	29H4	29H4	Point	P66 Unit 29 Debutanizer Reboiler	0.0049	0.0042	0.015	0.003	2.05	Allowable	2.05
P66	9868A	29P1	29P1	Point	P66 Unit 29 FCCU	15.0764	11.5866	12.304		175	Actual CEMS Data	(see hourly file)
P66	9868A	2H1	2H1	Point	P66 Unit 2-2 HDS Charge Heater	0.0037	0.0039	0.003	0.0009	1.19	Allowable	1.19
P66	9868A	2H2	2H2	Point	P66 Deoiler Furnace	0.0202	0.0165	0.002	0.005	1.11	Allowable	1.11
P66	9868A	34I1	34I1	Point	P66 Unit 34 Incinerator	16.7574	26.1074	24.583		44.82	Actual CEMS Data	(see hourly file)
P66	9868A	36H1	36H1	Point	P66 HDS Unit Charge Heater	0.0006	0.0006	0.002	0.0004	1.52	Allowable	1.52
P66	9868A	40H1	40H1	Point	P66 Unit 40 Superheater No. 1	0.4896	0.4082	0.454	0.11	0.92	Allowable	0.92
P66	9868A	40H3	40H3	Point	P66 Unit 40 Superheater	0	0	0.270	0.06	1.14	Allowable	1.14
P66	9868A	40H4	40H4	Point	P66 Unit 40 Preheater Furnace	0	0	0.000	0	3.41	Allowable	3.41
P66	9868A	40P1	40P1	Point	P66 Unit 40 FCCU	27.2229	29.8974	28.842	6.83	175	Actual CEMS Data	(see hourly file)
P66	9868A	41H1	41H1	Point	P66 Unit 41 Reformer Furnace	0	0	0	0	17.89	Allowable	17.89
P66	9868A	42H1	42H1	Point	P66 Unit 42 Reactor Charge Heater	0.271	0.1723	0.120	0.06	2.12	Allowable	2.12
P66	9868A	42H2	42H2	Point	P66 Unit 42 Reactor Charge Heater	0.8822	0.5608	0.371	0.20	2.12	Allowable	2.12
P66	9868A	42H3	42H3	Point	Unit 42 Fractionator Feed Heater	0	0	0	0	0.42	Out of Service	0.00
P66	9868A	43I1	43I1	Point	P66 Unit 43 Incinerator	35.6354	46.4138	47.448	10.83	37	Actual CEMS Data	(see hourly file)

Table 4-9 (continued). SO_2 Emissions for each source (tpy, and emission rate modeled) at Facilities in the Area of Analysis for the Hutchinson County, Texas Area.

Company	Permit	EPN	Model ID	Source Type	Source Description	Actual Annual SO2 Emissions 2017	2018	2019	Max. Actual (lb/hr)	Allowable Permit Limit	Emission Rate Basis	Boundary Modeling Rate
						(tpy)	(tpy)	(tpy)	(lb/hr)	(lb/hr)		(lb/hr)
P66	9868A	4H2	4H2	Point	Unit 4 Dehydrator Heater	0.0371	0.0296	0.011	0.008	0.1	Allowable	0.10
P66	9868A	50H1	50H1	Point	P66 Unit 50 Charge Furnace	0.1602	0.131	0.343	0.08	7.21	Allowable	7.21
P66	9868A	50HT1	50HT1	Point	Coker Heater Tank 1	0.2613	0.2613	0.261	0.06	0.06	Allowable	0.06
P66	9868A	50HT2	50HT2	Point	Coker Heater Tank 2	0.2613	0.2613	0.261	0.06	0.06	Allowable	0.06
P66	9868A	50HT3	50HT3	Point	Coker Heater Tank 3	0.2613	0.2613	0.261	0.06	0.06	Allowable	0.06
P66	9868A	51H1	51H1	Point	P66 VDU Heater	0	0	0	0	8.52	Allowable	8.52
P66	9868A	5H1	5H1	Point	P66 Unit 5-A Feed Heater	0	0.0137	0.032	0.007	0.48	Allowable	0.48
P66	9868A	5H3	5H3	Point	Unit 5-C Feed Heater	0	0	0.000	0	0.3	Out of Service	0.00
P66	155341	66FL10	66FL10	Flare	100M Swt Brine Flare Pit	0	0	0.000	0	0.0003	Allowable	0.0003
P66	155341	66FL11	66FL11	Flare	30M Swt Brine Flare Pit	0	0	0.000	0	0.01	Allowable	0.01
P66	9868A	66FL12	66FL12	Flare	P66 GOHDS Flare	2.4636	0	0.000		100.14	Actual CEMS Data	(see hourly file)
P66	9868A	66FL13	66FL13	Flare	P66 Derrick Flare	59.4048	59.568	59.568	13.6	100.14	Actual Max Year	13.60
P66	155341	66FL8	66FL8	Flare	100M Sour Brine Flare Pit	0	0	0	0	0.01	Allowable	0.01
P66	9868A	6H1	6H1	Point	BHU Reduction Furnace	0.0518	0.0359	0.048	0.01	0.22	Allowable	0.22
P66	9868A	7H1-4	7H14	Point	P66 Unit 7 Charge Furnace	0.0256	0.0253	0.025	0.006	1.1	Allowable	1.10
P66	85872	81B17	81B17	Point	P66 Boiler 2.4	0	0	0.000	0	15.94	Allowable	15.94
P66	9868A	85B2	85B2	Point	P66 Unit 40 Boiler	15.2663	12.4838	3.548	3.49	18.68	Allowable	18.68
P66	9868A	98H1	98H1	Point	P66 SMR Charge Heater	1.8985	1.5525	2.500	0.57	8.07	Allowable	8.07
P66	9868A	9H1	9H1	Point	P66 Crude Oil Heater	0.0126	0.0119	0.013	0.003	3.26	Allowable	3.26
P66	85872	BLR12	BLR12	Point	P66 Boiler 12	0	1.2494	0.000	0.29	19.31	Allowable	19.31
P66	PBR	ENG-EB1	ENG_EB1	Point	Unregistered PBR 106.511 from 2015	0.396	0.396	0.396	0.09		Actual Max Year	0.090
P66	PBR	ENG-EB2	ENG_EB2	Point	Unregistered PBR 106.511 from 2015	0.396	0.396	0.396	0.09		Actual Max Year	0.09
P66	PBR	ENG-EB4	ENG_EB4	Point	Unregistered PBR 106.511 from 2015	0.396	0.396	0.396	0.09		Actual Max Year	0.09
P66	PBR	ENG-EB6	ENG_EB6	Point	Unregistered PBR 106.511 from 2015	0.396	0.396	0.396	0.09		Actual Max Year	0.09
P66	PBR	ENG-EB7	ENG_EB7	Point	Unregistered PBR 106.511 from 2015	0.396	0.396	0.396	0.09		Actual Max Year	0.09
P66	PBR	ENG-EB9	ENG_EB9	Point	Unregistered PBR 106.511 from 2015	0.396	0.396	0.396	0.09		Actual Max Year	0.09
P66		FWP1	FWP1	Point	Fire Water Pump 1 - #8 ARDS Fire Water Pump, 67-H463	0.0077	0.0077	0.008	0.002		Actual Max Year	0.002
P66		FWP2	FWP2	Point	Fire Water Pump 2 - #7 ARDS Fire Water Pump, 67-H464	0.0077	0.0077	0.008	0.002		Actual Max Year	0.002

Table 4-9 (continued). SO_2 Emissions for each source (tpy, and emission rate modeled) at Facilities in the Area of Analysis for the Hutchinson County, Texas Area.

Company	Permit	EPN	Model ID	Source Type	Source Description	Actual Annual SO2 Emissions 2017	2018	2019	Max. Actual (lb/hr)	Allowable Permit Limit	Emission Rate Basis	Boundary Modeling Rate
						(tpy)	(tpy)	(tpy)	(lb/hr)	(lb/hr)		(lb/hr)
P66		FWP3	FWP3	Point	Fire Water Pump 3 - South NGL Fire Water Pump, 67-H741	0.0077	0.0077	0.008	0.002		Actual Max Year	0.002
P66		FWP4	FWP4	Point	Fire Water Pump 4 - N Refinery Fire Water Pump, 67-V371	0.0077	0.0077	0.008	0.002		Actual Max Year	0.002
P66		FWP5	FWP5	Point	Fire Water Pump 5 - S Refinery Fire Water Pump, 67-V372	0.0077	0.0077	0.008	0.002		Actual Max Year	0.002
P66	85872	SKDBLR	SKDBLR	Point	P66 Skid Boiler	0	0	0	0	12.57	Allowable	12.57
Solvay	7719A	H-10	H_10	Point	No. 3 Dowtherm Furnace	0.0871	0.0767	0.047	0.02	1.24	Allowable	1.24
Solvay	7719A	H-8	H_8	Point	No. 1 Dowtherm Furnace	0.0545	0.0538	0.034	0.01	0.87	Allowable	0.87
Solvay	7719A	H-9	H_9	Point	No. 2 Dowtherm Furnace	0.046	0.0457	0.030	0.01	0.87	Allowable	0.87
CPChem	21918	F-M2A	FM2A_1	Area	Sulfolene handling area fugitive (Building + 1 trailer)	2.30	2.30	2.30	0.52	4.88	Actual Max Year	0.525
CPChem	21918	F-M2A	FM2A_2	Area	Sulfolene handling area fugitive (4-trailer storage)	8.58	8.58	8.58	1.96		Actual Max Year	1.959
CPCHem		ICE-01	ICE_01	Area	Maintenance Compressor (Painting)	0.0194	0.0171	0.0246	0.006		Actual Max	0.006
CPCHem		ICE-02	ICE_02	Area	Maintenance Compressor (Sandblasting)	0.0008	0.0008	0.0053	0.001		Actual Max	0.001
Orion	8780	FURN-FUG	FURN_FUG	Area	Furnace Area Fugitives	0.003	0.0031	0.0031	0.0007		Actual Max	0.001
P66	9868A	F-43WHB	F_3WHB	Area	Waste Heat Boiler Fugitives	0	0	0		0.01	Allowable	0.01

[1] The emissions for the Tokai EPNs: FLARE-1, FLARE-2, FLARE-3, and FLARE-4, were taken from the "SMSS" category in the emission inventories.

4.4.2.6.Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent 3 years of meteorological data (concurrent with the most recent 3 years of emissions data, for sources modeled with actual emissions) should be used in designations efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, the Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Hutchinson County, Texas area, the industry selected the same met data stations as the State. Specifically they selected surface meteorology from the NWS ASOS station at Borger Hutchinson County Airport in Borger, Texas, located at 35.695, -101.395, 5.4 km to the northeast of the source, and coincident upper air observations from a different NWS station, located in Amarillo, Texas, located at 35.23, -101.7, 55 km to the southwest of the source as best representative of meteorological conditions within the area of analysis.

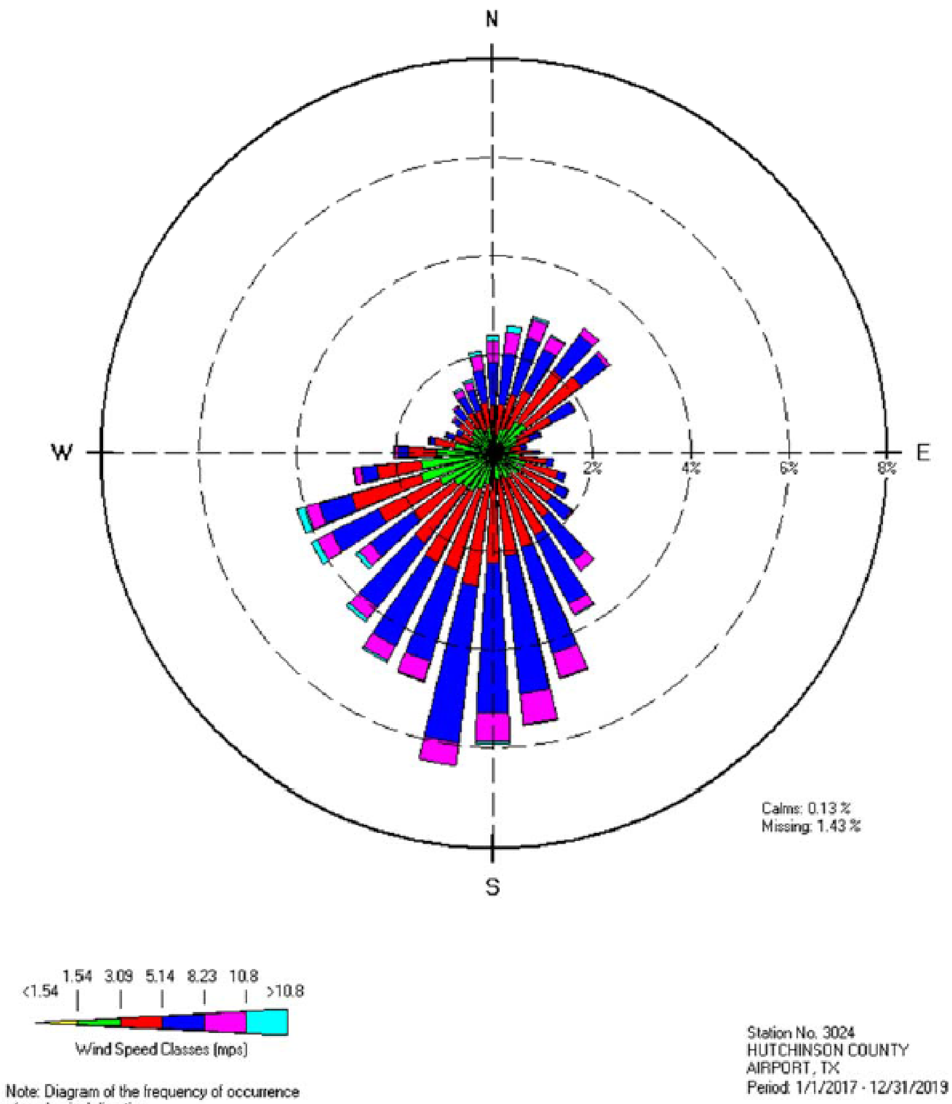
The industry modeling used AERSURFACE version v20060 using data from Borger Hutchinson County Airport to estimate the surface characteristics of the area of analysis. The industry estimated values of surface roughness length (sometimes referred to as "Zo" and is related to the height of obstacles to the wind flow, which is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer) for 12 spatial sectors out to 1km from the meteorological tower at a monthly temporal resolution. The industry also estimated values for albedo (the fraction of solar energy reflected from the earth back into space) and Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance) for a 10 km by 10 km area centered on the meteorological tower for annual average moisture conditions.

In in the discussion of Texas modeling above is Figure 4-7 that was generated by the EPA, the location of this NWS stations is shown relative to the area of analysis for the State's modeling and we note that it is the same general area analyzed in the Industry modeling.

As part of its recommendation, the industry provided the 3-year surface wind rose for Borger Hutchinson County Airport. In Figure 4-21, the frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. EPA generated the 3-year surface wind rose for Borger Hutchinson County Airport with the WRPLOT program using the meteorological data in the modeling files provided by the State in Figure 4-8 above and the Industry Modeling wind rose look the same. The frequency and magnitude of wind speed and direction are defined in terms of from where the wind is blowing. Typical of this region, the winds are predominantly from the south, towards the monitor from the carbon black plants, and with a significant fraction of the winds 15 knots or better in speed and very little winds less than 4 knots. There is also a significant fraction of winds from the northeast, toward the other

Hutchinson County SO_2 sources, dropping rapidly in frequency as the veer to the east. The processed wind data have very low calms at less than 1%.

Figure 4-21. Hutchinson County, Texas Cumulative Annual Wind Rose for Years 2017 – 2019.



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The industry followed the methodology and settings presented in in the DRR Modeling TAD and Appendix W in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from the Borger Hutchinson County Airport, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the industry set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

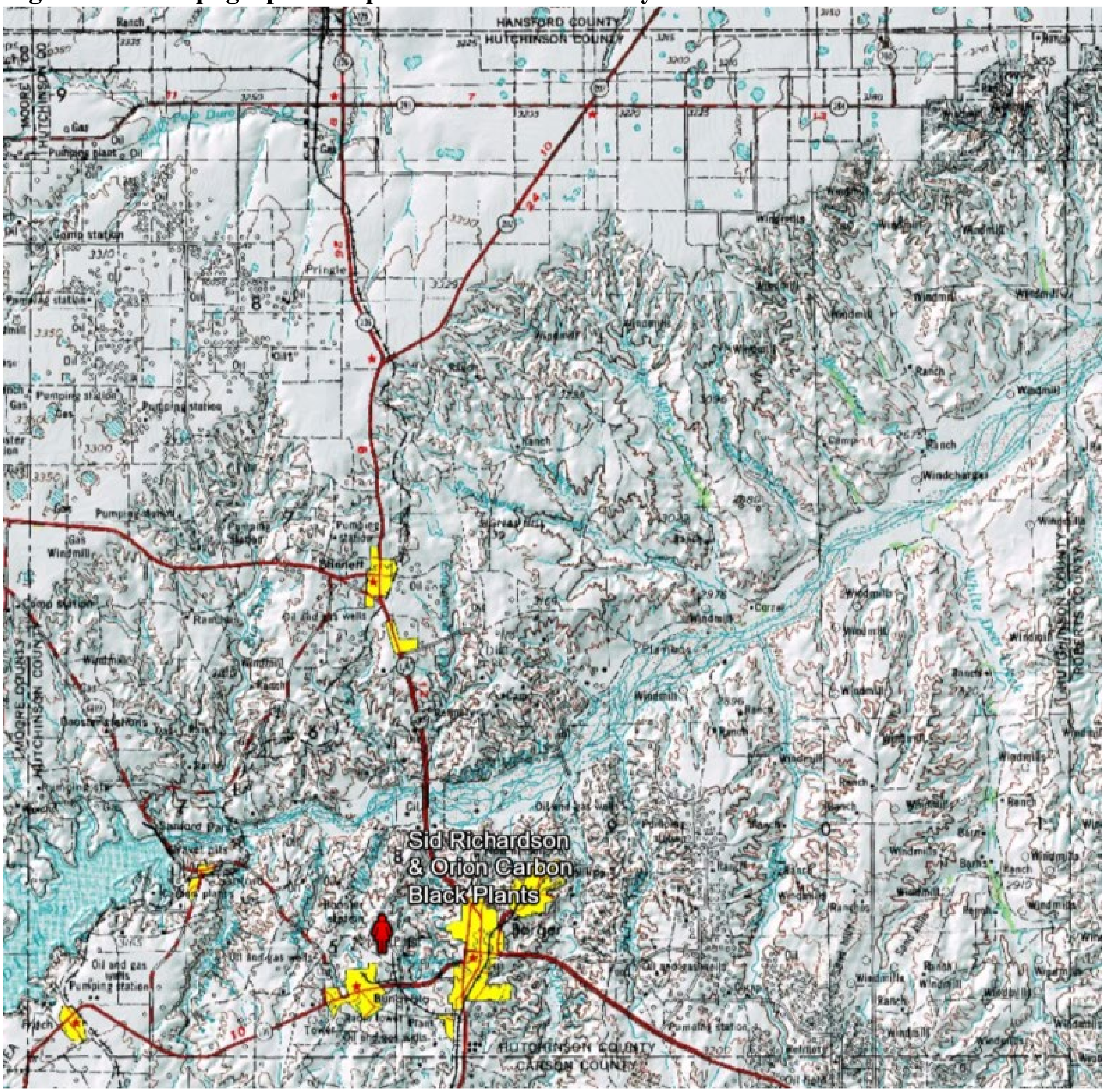
In summary, the EPA finds that the Industry modeling followed the guidance of the modeling TAD in processing the meteorological data, and that the surface and upper air sites chosen were the nearest sites available.

4.4.2.7.Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

Industry did not provide a detailed analysis of the geography and topography of the Hutchinson County area. EPA examined the physical features of the land that may affect the distribution of emissions and may help define nonattainment area boundaries. As shown in Figures 4-22 below, Hutchinson County is marked by a high plain with an elevation over 1000 meters (m) in the northern part with stream eroded canyons over 35 m deep. South Palo Dura Creek runs across the northwestern part of the plain. Further south, complex north to south hills occur over the lower 2/3 of the county with peaks at about 910 m and with varying depths. These hills are bisected by the Canadian River Valley at a depth of about 840 m in the area nearest to the carbon black plants. Lake Meredith, elevation 839 m, is found in the southwest corner of the county. The carbon black plants are located near the southern boundary of the county and are at an elevation of about 945 m.

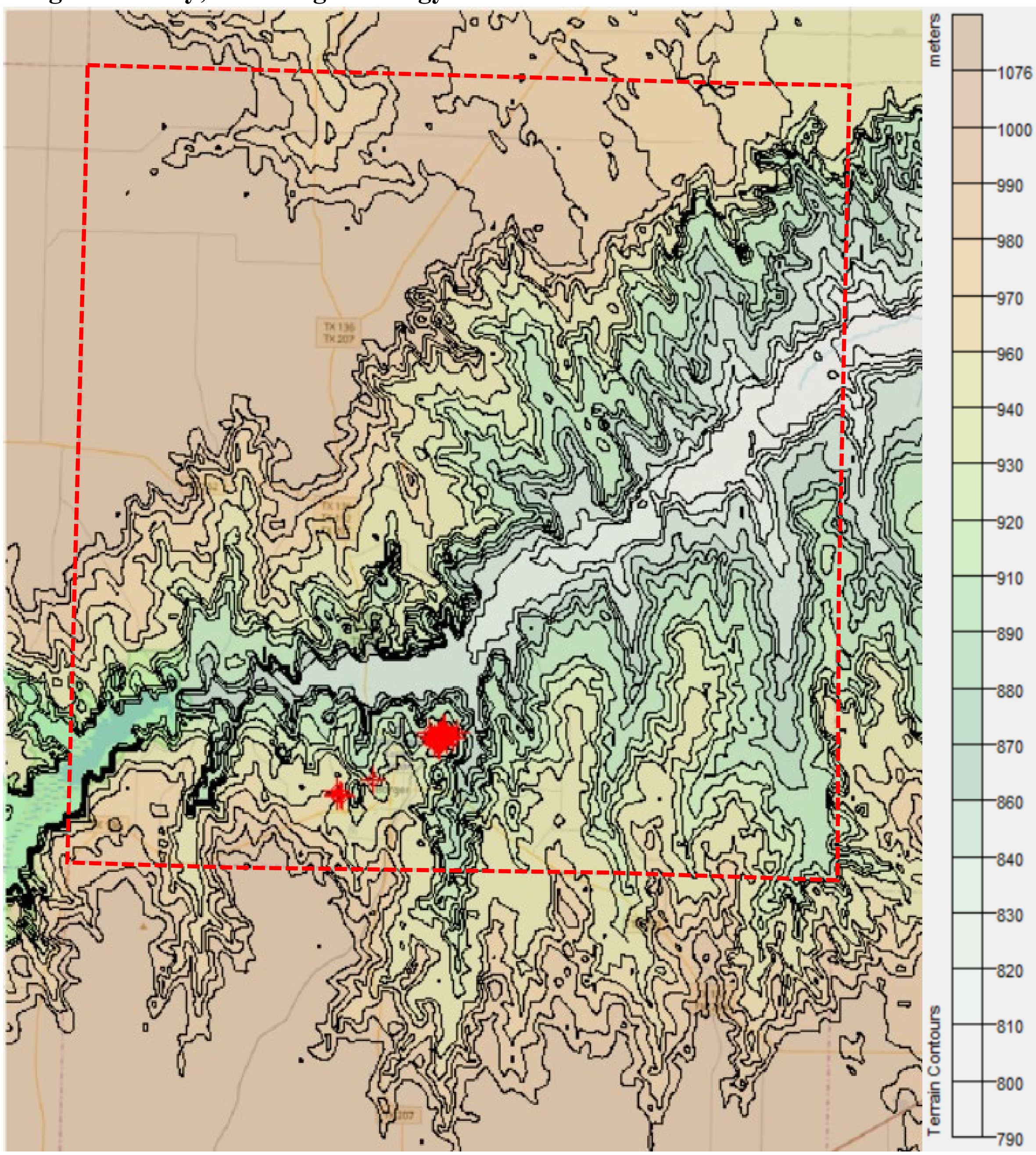
The terrain in the area of analysis is best described as complex with some elevated terrain features in the modeling domain. To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database.

Figure 4- 22. Topographic Map of Hutchinson County Texas.



There is also elevated terrain above 1000 m (over 55 m higher than the Tokai and Orion elevations) within 5 km to the south of the facilities in neighboring Carson County as shown in Figure 4-23. The proximity to the higher terrain could potentially cause elevated concentrations of SO_2 in Carson County. There are no SO_2 point sources in Carson County included in the modeling.

Figure 4-23. Topographic Map Hutchinson County and Portions of Surrounding Counties. The county border is the dotted red line and the SO_2 sources as denoted by the red crosses, from left to right: Tokai and Orion Carbon Black Plants; IACX - Rock Creek Gas Plant; Chevron Phillips Chemical Company LP - Philtex Ryton Plant; Phillips 66 Company - Borger Refinery; and Borger Energy Associates LP - Blackhawk Power Plant.



4.4.2.8.Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a “tier 1” approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the industry chose a tier 2 approach. Initially when performing modeling for the area in Spring/Summer 2020 the industry considered using DRR monitor (CAMS1073) located north of the two carbon black facilities (Orion and Tokai) and removing wind directions where the monitor was impacted by local sources. A couple of issues raised concern with using this monitor including removing data for wind directions transporting local sources did not leave enough data to be representative, the monitor only started collecting data in the end of 2016 and the 2019 data had not been Quality Assured and Quality Controlled at the time.

Industry started looking for other SO_2 monitors in the area that might provide data for a representative background concentration. Ultimately the CAMS1025 monitor in Amarillo was selected by industry as the background monitor since it was in the region and was further away from the Harrington Generating Station. Being further away meant the wind sector where data would be excluded for local source impacts would be smaller so less data would be removed that would potentially allow for a tier 2 approach. Harrington Generating Station is on a vector 25 degrees from east of North from the CAMS1025 monitor. See Figure 4-24 for location of monitor and Harrington Generating Station power plant.

The impact of the Harrington Generating Station needs to be screened out when using the CAMS1025 monitor. Industry used the wind directions of $25^0 \pm 45^0$ to omit monitoring data, which means the SO_2 concentration data with the wind direction between 340^0 - 70^0 CW was removed from the data set for the 2017-2019 monitored period. Industry used the wind directions of $25^0 \pm 45^0$ to omit monitoring data, which means the SO_2 concentration data with the wind direction between 340^0-70^0 CW was removed from the data set for the 2017-2019 monitored period. The SO_2 concentration data within the wind sector 71^0-339^0 CW was sorted by season and by hour-of-day in each year, then the 2nd highest hourly concentration for each season and hour-of-day for each year was selected. The 3-year average (2017-2019) concentration for each season and hour-of-day, shown on Table 4-10, was used as the final background concentration for the modeling analysis.

Figure 4-24. Map of CAMS1025 SO_2 Monitor in Amarillo, TX and the alignment with Harrington Station.

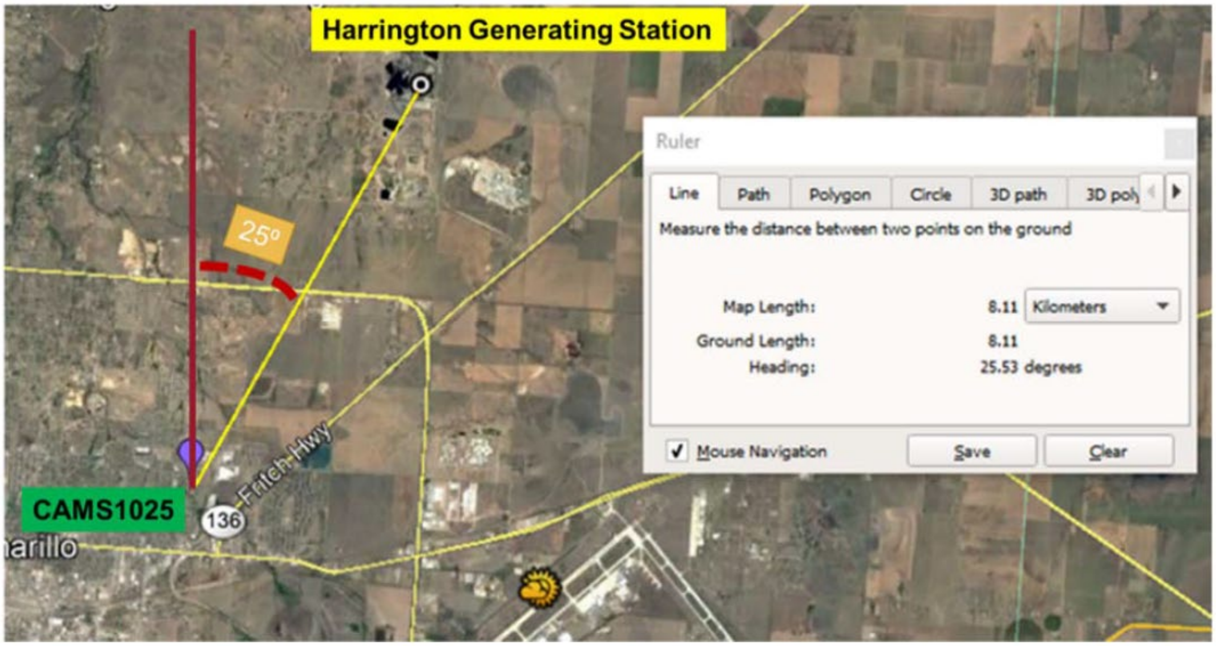


Table 4-10. Tier 2 – Temporally Varying Background Concentration for CAMS1025 With Data from +/- 45 Degrees on a Direction Towards Harrington Generating Station (25 Degree Vector)

Hour	Winter	Spring	Summer	Fall
0	1.2	0.73	0.6	1.07
1	1.2	0.8	0.63	1.1
2	1.03	1	0.7	0.97
3	0.9	1.13	0.7	0.83
4	0.97	0.9	0.83	0.77
5	1.13	0.83	1.13	0.87
6	1.17	0.97	1.03	0.87
7	1.07	1.1	1.03	0.97
8	1.07	1.1	1.27	1.2
9	0.97	1.13	1.4	1.2
10	1.27	1.2	1.43	0.83
11	3.07	1.5	1.43	2.4
12	4	0.97	1.4	1
13	1.83	1.43	1.83	0.97
14	1.2	1.6	1.07	0.93
15	0.83	1.23	1	1.03
16	0.97	1.07	0.97	0.93
17	0.93	1.03	1.03	0.87
18	0.87	0.77	0.93	0.83
19	1.5	0.73	0.9	1.03
20	1.23	0.8	0.7	0.77
21	1.3	0.73	0.83	0.9
22	1.13	0.97	0.6	0.77
23	1.47	0.93	0.8	0.83

All concentrations reported in the table are in ppb of SO_2.

The State used a different methodology and used a monitor in the Austin area for a background value of 2.6 ppb (8.6 μg/m^3). This is further discussed above in discussion of background monitoring data for the State's modeling.

The EPA finds that the industry's methodology for background concentration is appropriate and consistent with the Modeling TAD.

4.4.2.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Hutchinson County, Texas area of analysis are summarized below in Table 4-11.

Table 4-11: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Hutchinson County, Texas Area

Input Parameter	Value
AERMOD Version	19191
Dispersion Characteristics	Rural
Modeled Sources	151
Modeled Stacks	145 (plus 6 area sources)
Modeled Structures	85
Modeled Fencelines	5
Total receptors	54,076
Emissions Type	Annual Avg. Hourly for most of the larger SO_2 sources and Mixed for other sources
Emissions Years	2017-2019
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Borger Hutchinson County Airport
NWS Station Upper Air Meteorology	Amarillo
NWS Station for Calculating Surface Characteristics	Borger Hutchinson County Airport
Methodology for Calculating Background SO_2 Concentration	Tier II – Temporally Varying Based on Hour of Day and Season
Calculated Background SO_2 Concentration	Range from 0.6 – 4 ppb

The results presented below in Table 4-12 and Figure 4-25 show the geographic extent of the predicted modeled violations based on the industry's input parameters.

Table 4-12. Industry Modeled 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Hutchinson County, Texas Area

Averaging Period	Data Period	Receptor Location UTM zone 14		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM East	UTM North	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2017-2019	279610.50	3949490.80	743.03	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 $\mu g/m^3$ conversion factor

Figures 4-23 and 4-26 were included as part of the industry's recommendation and indicates that the predicted modeled violations to the extent identified by industry are fully contained within the industry's recommended nonattainment area boundary.

Figure 4-25. Industry Modeled 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for Zoomed in Area of Analysis for the Hutchinson County, Texas Area

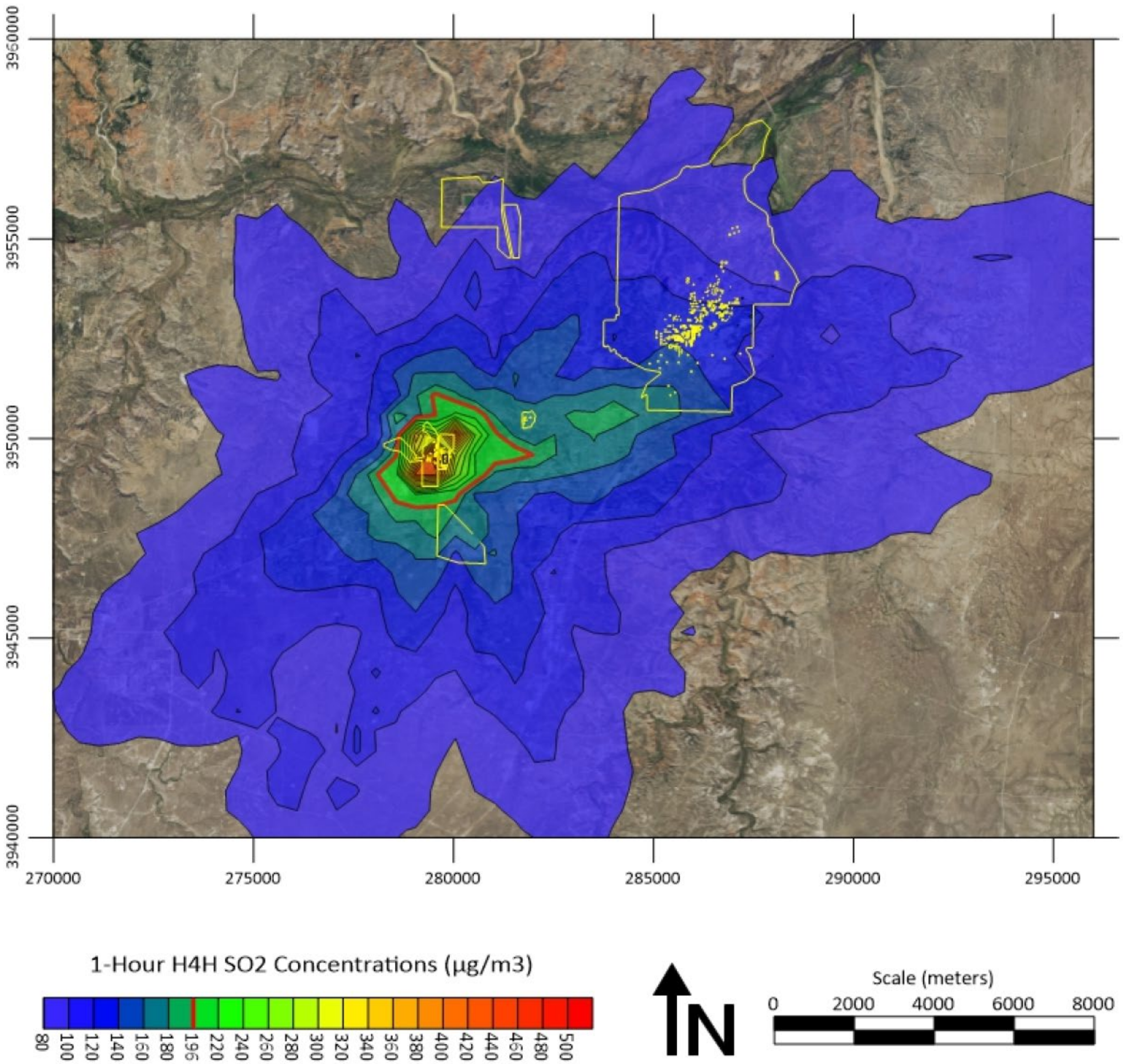
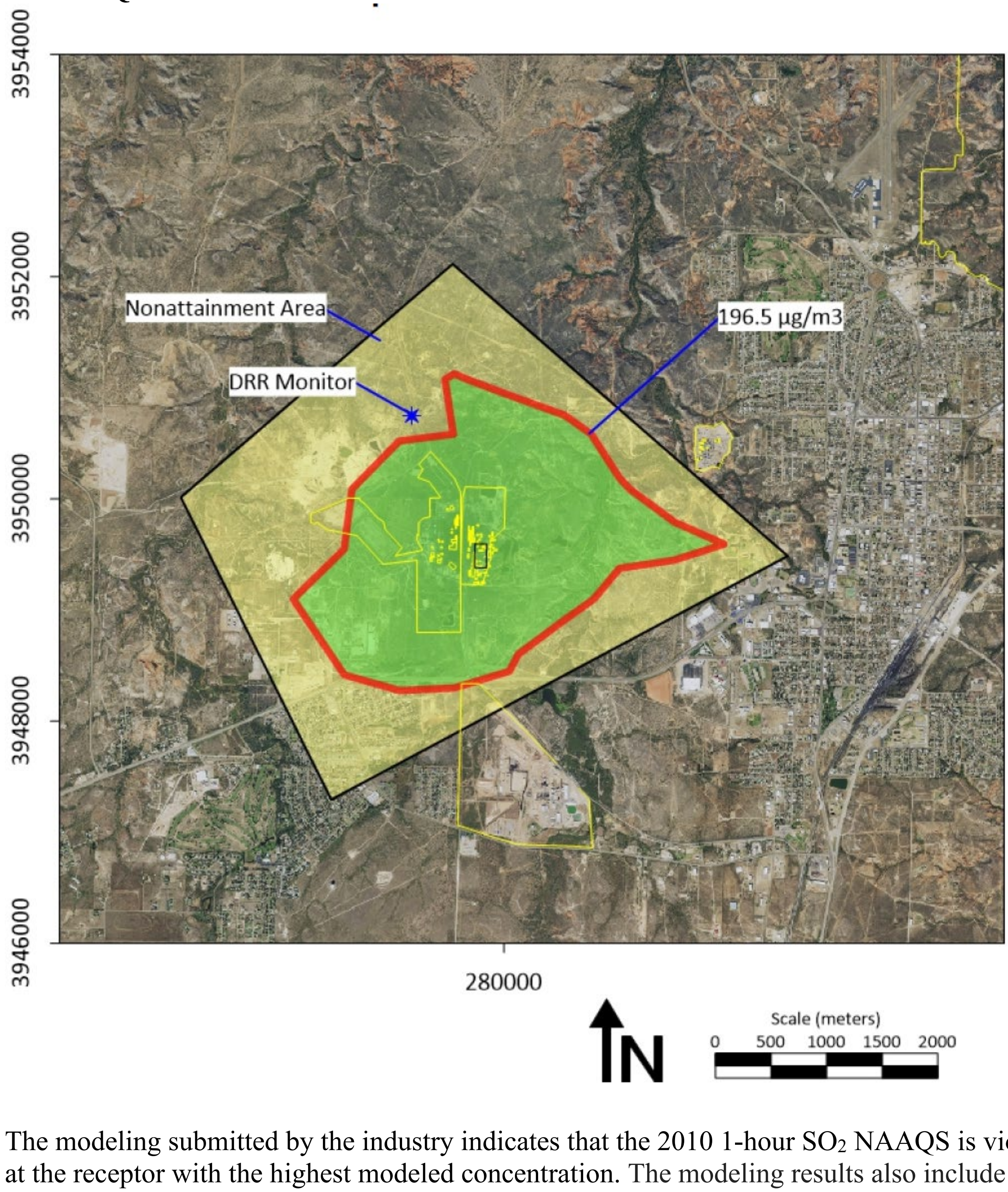
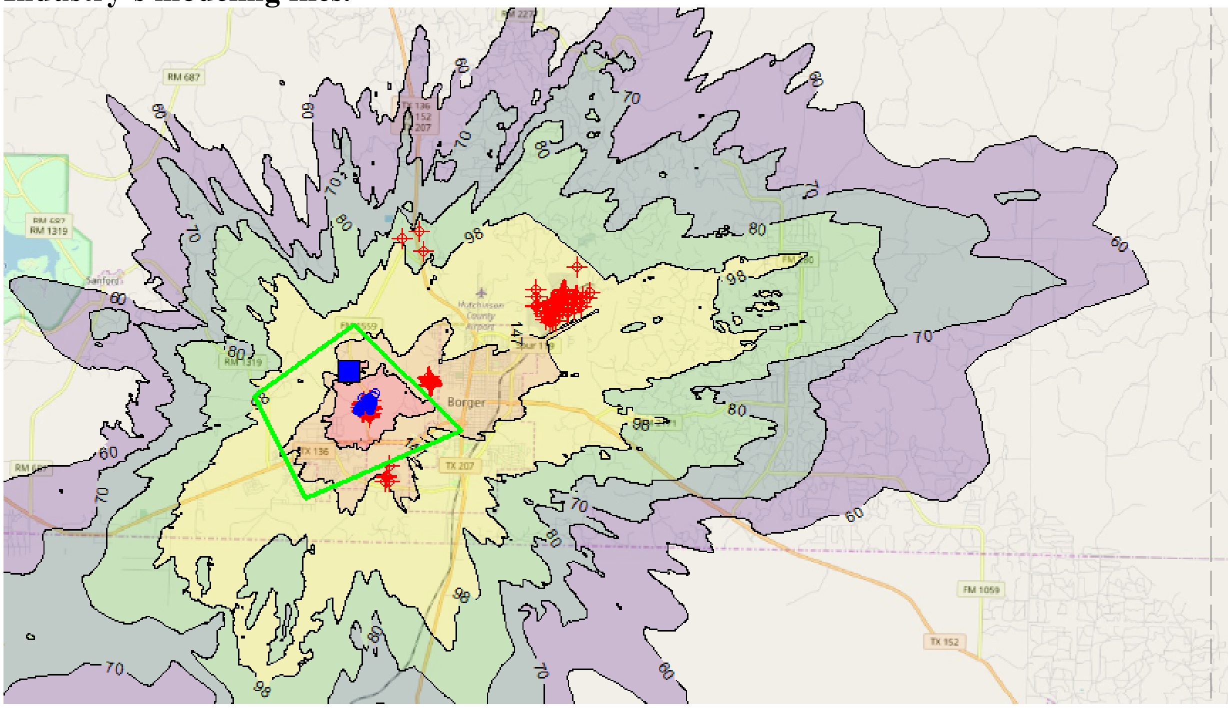


Figure 4-26. Industry Modeled 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Zoomed in Area of Analysis for the Hutchinson County, Texas Area – Proposed NAA Boundary and Identification of Area Predicted above the NAAQS.



The modeling submitted by the industry indicates that the 2010 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration. The modeling results also include the area in which a NAAQS violation was modeled and information that is relevant to the selection of the boundaries of the area being designated.

Figure 4-27. Industry's modeled 99th Percentile Concentration Averaged Over Three Years for the Years 2017-2019 and Approximately Their Proposed Boundary of the Hutchinson County Nonattainment Area Shown in Green Polygon. Figure produced by EPA from Industry's modeling files.



Industry modeling also included an assessment of potential contribution of emissions from facilities in the nearby areas to the violations predicted by the dispersion modeling. Industry modeling used the MAXDCONT function of AERMOD in a separate modeling run that included only the receptors with modeled values above the NAAQS to assess contribution from sources other than the two carbon black plants (Orion and Tokai). Table 4-13 replicates the Industry's modeling report Table 8-1. The industry's MAXDCONT function looked at all modeled DVs above the NAAQS from the High Fourth High (H4H) to the High Fiftieth High (H50H) values that are above 196.4 $\mu g/m^3$. When doing a contribution analysis, it is appropriate to drill down through the modeling to the point that there is not a violation, so assessing contribution to values below the H4H and down to the H50H is appropriate for all modeled violations. The purpose of this contribution analysis is to assess whether these non-carbon facilities (IACX, Phillips 66, CP Chem, Blackhawk, Solvay, and Agrium) could either individually contribute to a modeled violation or if the group of non-carbon facilities could collectively contribute to a modeled violation of the 1-hour SO_2 NAAQS. Industry concluded in their report that the values they modeled did not constitute contribution to a modeled violation and the non-carbon facilities impacts did not exacerbate nonattainment caused by Orion and Tokai's emissions.

Table 4-13. From Industry Modeling Report (their Table 8-1); Maximum Contribution of Individual Facilities and the Group of all Non Carbon to Receptors Modeled With NAAQS violations.

Source Group	Maximum Concentration Contribution for Source Group to H4H Concentration (µg/m3)	Total H4H Concentration from All Sources (µg/m3)	Maximum Concentration Contribution for Source Group to H4H Through H50H Concentration (µg/m3)	Total Concentration from All Sources (µg/m3)	Rank
P66	8.6	208.9	11.6	198.2	6TH
CPChem	3.1	196.7	4.1	198.2	6TH
Agrium	0.01	358.3	0.04	305.5	48TH
IACX	5.3	437.2	6.2	363.6	9TH
Blackhawk	1.0	196.7	1.3	198.2	6TH
Solvay	0.2	330.4	0.3	245.1	5TH
Non Carbon Plant	16.1	208.9	23.1	198.2	6TH

1. • Phillips 66 Borger Refinery, Chevron Phillips Chemical, Blackhawk, Solvay, IACX, Agrium

EPA notes – The 'Non Carbon Plant' group is Phillips 66 Borger Refinery, CP Chem, Blackhawk, Solvay, IACX and Agrium facilities.

Industry modeling did provide a facility specific ambient air analysis for the 5 non-Carbon black facilities as discussed previously. The results of thaire facility specific ambient air analysis are summarized in the Industry modeling report Table 8-2. But upon review of the modeling files provided by industry, there appears to be some errors in the values in the report's Table 8-2. Specifically, the maximum concentrations for CP Chem, Phillips 66 (P66 in the report), and Solvay and the table does not include the IACX Ambient Air facility run. Based on the modeling files, EPA has corrected the values and added IACX modeling to our Table 4-14 below. For example, in the Phillips Ambient Air facility run all of Phillips 66 sources are excluded and all other Facility sources are modeled and receptors are placed on Phillips 66 property as discussed previously.

Table 4-14. Facility Ambient Air Runs

Receptor Grid	Maximum Concentration (µg/m^3)
Phillips 66	182.2
CP Chem	125.2
Blackhawk	126
Solvay	131.6
IACX	173.4

4.4.2.10. The EPA's Assessment of the Modeling Information Provided by the Industry

The Industry's modeling analysis used the latest versions of the AERMOD system components, correctly characterized the dispersion characteristics of the area, included all facilities considered to influence the concentration gradients in the area. The Industry followed the methodology and settings presented in the DRR Modeling TAD and Appendix W in the processing of the raw meteorological data into an AERMOD-ready format and used AERSURFACE to best represent surface characteristics. The Industry followed the guidance of the modeling TAD and Appendix W in processing the geographical data. The Industry's methodology for background concentration was appropriate and consistent with the Modeling TAD.

The Industry's modeled design values, size of the area with modeled violation and modeled emission rates are biased low because (a) the use of tpy emissions averaged over 8760 hours of assumed operation results in a biased low average hourly emission rates for many sources including the primary/largest SO_2 sources at Orion, Tokai, and IACX; (b) the omission of short-term variability in emission rates for many modeled sources including most of the large sources; calculation of regular intermittent sources such as the flares were averaged over 8760 hours; and (c) the lack of alternate scenarios that address alternate allocation of Phillips capped emission source group and alternate operating scenarios at Orion and Tokai. In addition, the omission of short-term variability in emission rates for many modeled sources, including most of the large sources, is prone to lead to an underestimation of air quality impacts. Because of these low-biases, the EPA cannot state with a high degree of certainty that the nonattainment boundary as recommended by Industry is sufficient to encompass the area of nonattainment.

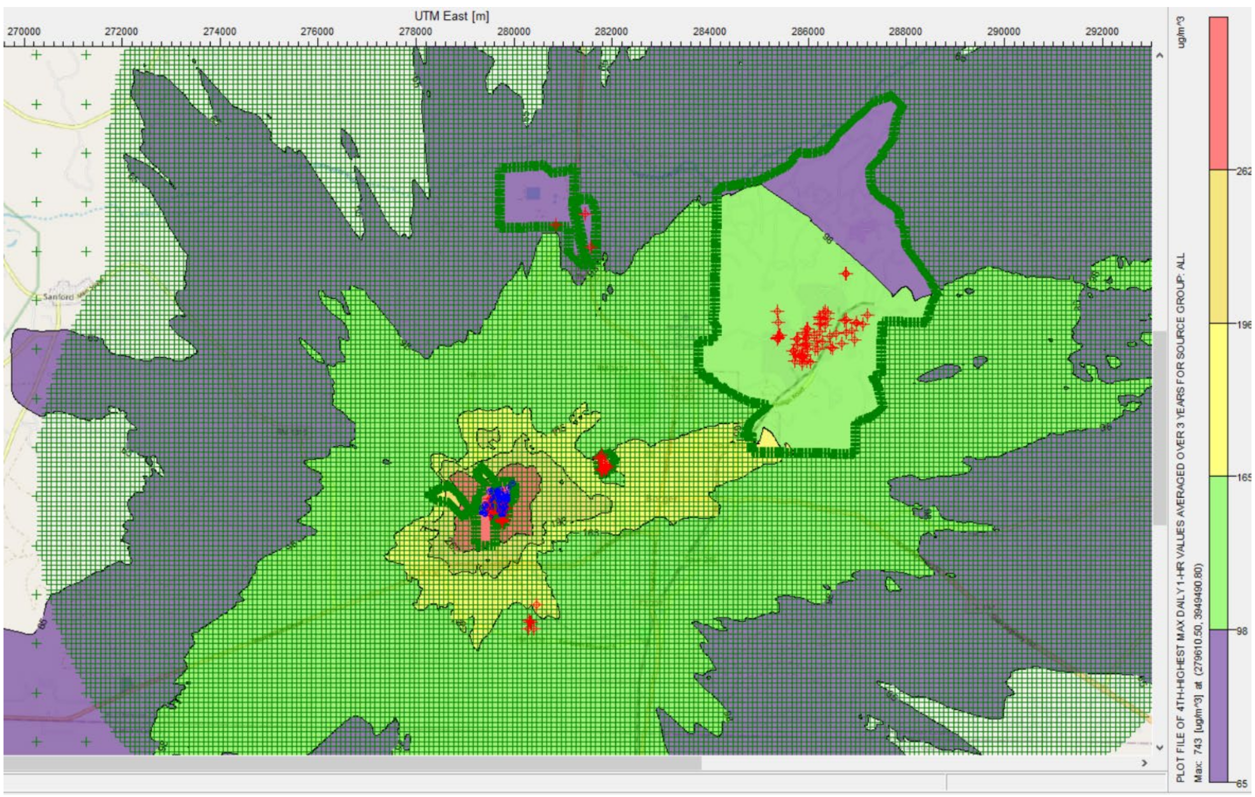
The use of annual emissions and then dividing by 8760 hours a year, despite reduced hours of operation, and the lack of addressing temporal variability of emissions at Orion, Tokai, and IACX prevents complete reliance on the modeling results to determine the area violating the 1-hour SO_2 NAAQS. Since the form of the standard is to use the 99th percentile (High Fourth High) values, the modeling and resulting DVs are very sensitive and are biased low when temporal variability is not addressed. This results in the modeling values being biased low throughout the domain and Industry's modeling report also indicated that using annual tpy emission rates and averaging over 8760 hours would bias the results low in the domain.

As discussed above, the Industry modeling does not take into account temporally varying emission rates and Carbon black plants such as Tokai are known to have variability in sulfur content in the feedstock used that leads to variability in SO_2 emission rates and this variability would lead to higher DVs and a larger area modeled above the standard. For example, Tokai's and Orion's short-term PTE emissions limits (in effect 2017-2019) for their larger SO_2 sources is approximately 3 times the rate modeled and IACX's limit is approximately 9 times the rate modeled

The Industry's modeling indicates the values around IACX are in the 165+ $\mu g/m^3$ range (within 10-20% of the standard). Because the modeled DVs would increase by addressing the factors that bias low the modeled emissions, the area around IACX and downwind of IACX would be expected to be above the NAAQS and IACX would have to be part of the nonattainment area, including parts or all of the Phillips complex. EPA has generated another contour plot (Figure 4-

28) using Industry's modeling files with yellow being values between 165 μg/m^3 to 195 μg/m^3 and bright green for modeled values between 98.2 μg/m^3 and 164 μg/m3. We have done this for context of what impact having a larger modeled emission rate that accounts for temporal variability could have on the area above the standard. It is unclear what the exact modeled emission rate would be, but this provides context at a couple of alternate points. The background value adds 0.6 to 4 ppb (1.57 μg/m^3 to 10.48 μg/m^3) so all modeling has a small portion of the value from background but most of the impact is from the modeled sources. Therefore, changes in emission rates would change the modeled values almost linearly neglecting the unchanged background concentration.

Figure 4-28. Revised Plot With Contours Added



In evaluating this modeling, if modeled emission rates for Orion, Tokai, and IACX were increased on the order of 20%, the Industry's modeling would likely show that IACX and sources in the Phillips 66 complex would be part of the violating area. If impacts were doubled (light green contour) then IACX, and most of the area of the Phillips 66 complex and even downwind to the east of the complex would be above the NAAQS. This just highlights the concern and given permit limits and known significant variability at carbon black plants in their hourly SO_2 emissions, IACX has short term lb/hr limits that are enough higher than the modeled rates to accommodate substantial variability in its SO_2 emissions.

The EPA's Modeling TAD does say in Section 5.2 that when using actual emissions, it is important to represent the variability and CEMS data meets this criterion. When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall the uncertainty in the modeled emission rates and the known bias low are issues of significant concern.

It is important to note that for a short-term standard such as the 2010 1-hour SO_2 NAAQS, where an air agency is considering developing a longer term-averaged limit for a SIP in order to bring a violating area into attainment, that after identifying and modeling a 1-hour limit that would provide for attainment if constantly met by the source EPA strongly recommends that the stringency of any longer-term limit should be tightened by applying an adjustment factor so as to account for short-term variability in the emission rate and thereby make the longer term limit comparably stringent to an attaining constant 1-hour limit. This guidance (including EPA's 2014 SO2 modeling for Attainment Demonstrations)[6] implies, conversely, that a variable set of emissions can cause significantly worse air quality than constant emissions at the average rate of the variable emissions set. The guidance addresses averaging times up to 30 days; the difference between variable emissions impacts and constant emissions impacts is likely to be greater with annual average emissions. This short-term variability is not considered in the State's modeling, which causes the modeled impacts to be prone to underestimate the magnitude of concentrations and the geographic extent of likely violations. This further illustrates the need to increase the size of the nonattainment area to address the concern of not addressing or including temporally varying emissions.

Industry performed a contribution analysis indicating the maximum impacts to High 4th High values to modeled exceedances and the maximum modeled impact from Phillips 66 emissions is 8.6 $\mu g/m^3$ and the maximum modeled impacts from all Non Carbon facilities is16.1 $\mu g/m^3$ to a modeled exceedance value of 208.9 $\mu g/m^3$ at a receptor on the west-southwest side of the Orion/Tokai facilities. While Industry asserts that this level does not reach a contribution or exacerbation level, EPA disagrees because without the 16.1 $\mu g/m^3$ (Agrium's 0.01 $\mu g/m^3$ does not change the value) from all the facilities outside the Industry's recommended Nonattainment Area the modeled value would be 192.8 $\mu g/m^3$ (208.9 $\mu g/m^3$ -16.1 $\mu g/m^3$). For this modeled value, the impact of emissions from Industry outside the Industry's recommended NAA does result in a modeled exceedance that would not occur without their impacts. In this case, the impacts from IACX, Phillips 66, CP Chem, Blackhawk, and Solvay are causing a modeled violation to occur and the impacts are large enough to be considered contributing to a violation (8.6 and 16.1 $\mu g/m^3$). This is just one example of a contribution assessment. In a full contribution analysis, one evaluates all modeled violations from the 4th High down to the point that the modeled value is below the standard. Industry only assessed modeled exceedances down to the 50th High. Industry indicated that for the 6th High value at a modeled violation of 198.2 $\mu g/m^3$, the contribution from Phillips 66 was 11.6 $\mu g/m^3$ and for all the facilities outside the Industry's recommended NAA the impact was 23.1 $\mu g/m^3$ (Agrium's 0.04 $\mu g/m^3$ impact does not change the value). In this case, if the Phillips 66 impacts are removed the modeled value would be 186.6 $\mu g/m^3$ (not above the NAAQS) so Phillips contribution is causing/contributing to a modeled violation. The impacts from IACX, Phillips 66, CP Chem, Blackhawk, and Solvay

[6] EPA "Guidance for 1-Hour SO2 Nonattainment Area Sip Submissions" April 2014. In the docket and available at https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf.

combined are also causing a modeled violation to occur (modeled value without their contribution is 175.1 μg/m^3). The impacts are large enough to be considered causing/contributing to a modeled violation (11.6 and 23.1 μg/m^3). There are other contributions that are in the industry's modeling that we are not discussing, but there are further instances in the modeling files and analysis of the modeling where the impacts of one of the facilities (IACX and Phillips Complex facilities) or the combined impact of these facilities contribute to modeled violations. We note that this assessment is based on the existing modeled emission rates that are known to be low biased as discussed elsewhere, and if more appropriate emissions were modeled, then there would be more modeled violations and more areas to analyze for contribution analysis and it would be expected to find higher values for the contributions to modeled violations.

EPA also reviewed the Facility Ambient Air runs and have the same concerns about emission rates modeled not taking into account temporally varying emissions. Regarding Phillips 66, we note that the Phillips 66 analysis did not include as many receptors as the other grids without a reason given and a finer grid of 25 m spacing should have been used for the southern part/half of the Phillips 66 receptor grid. There were errors in the Phillips 66 analysis and we evaluated the modeling file results and it indicated that the maximum concentration from all other sources on Phillips 66 property was 182.2 μg/m^3 which is close to the standard. With the low-bias uncertainties of the emissions and the lack of a higher resolution grid we cannot ascertain if there are modeled violations on Phillips 66 property, but it is likely the case. Regarding IACX, EPA notes that the modeling report did not include the IACX Facility Ambient Air run, but we evaluated the modeling files provided and the maximum modeled concentration on IACX's property was 173.4 μg/m^3. With the low-bias uncertainties of the emissions we cannot ascertain if there are modeled violations on IACX's property, but it is most likely the case given the close proximity of modeled violation due to emissions from the two carbon black facilities.

4.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Hutchinson County, Texas Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. The EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

4.6. Jurisdictional Boundaries in the Hutchinson County, Texas Area

The State's and Industry's modeling provide analyses to limit the geographic extent of the violating area to less than the boundaries of our intended nonattainment area defined by the jurisdictional boundaries of Hutchinson County. EPA considers existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary for carrying out the air quality planning and enforcement functions for the area. Our goal is to base designations on clearly defined legal boundaries that align with existing administrative boundaries when reasonable. Existing jurisdictional boundaries used to define a nonattainment area must encompass the area that has been identified as meeting the nonattainment definition.

In its 2015 designation recommendations, prior to the installation of the DRR monitor, Texas recommended the county boundary for those counties which did not have SO_2 monitoring data and recommended these to be designated as Attainment. In its 2020 comment letter on our intended designation Texas recommended that the extent of the nonattainment area should be limited to the geographical areas that exceed the standard based on modeling and provided a boundary polygon. The polygon as shown in Figure 4-11 included the two DRR carbon black facilities and the violating monitor but excluded all other SO2 sources that were modeled.

4.7. Other Information Relevant to the Designation of the Hutchinson County, Texas Area

The EPA received additional information relevant to the designation of this area.
IACX Rock Creek, LLC is asking the EPA for the adoption of a partial nonattainment boundary that is smaller than the entire county, excluding the IACX Rock Creek Gas Plant as well as the Phillips 66 Complex Sources. The DiSorbo modeling analysis showed that the violating monitor (CAMS 2017) is west, near, and downwind from the only two DRR sources in Hutchinson County. In contrast, the DiSorbo Modeling Analysis shows that the IACX Rock Creek Gas Plant (as well as the Phillips 66 Complex Sources) are shown outside of the area violating the NAAQS, and the asserts that their modeling demonstrates that these sources do not make a significant contribution to or exacerbate a NAAQS violation.

P66 is asking the EPA to adopt a partial nonattainment boundary that is smaller than the entire county. The proposed nonattainment boundary therefore captures both the violating receptors and the source of the violations (Tokai and Orion) based on the Industry modeling. The remainder of the county is most appropriately designated as Attainment/Unclassifiable. The modeling performed by P66 asserts that non-DRR sources do not exacerbate or cause the violations caused by Tokai and Orion.

Tokai is asking EPA to use its discretion to support a finding of Unclassifiable to allow the sources in the entire Hutchinson County to work towards County-wide attainment by 2022. For approximately 18 months, Tokai worked closely with a coalition of all the Hutchinson County SO_2 sources along with EPA and TCEQ to develop a technical demonstration which showed that once certain federally enforceable SO_2 limits are fully implemented in 2022, no area of Hutchinson County will exceed the SO_2 NAAQS. However, this demonstration, supported by reductions in current permitted emissions and commitments made pursuant to federally enforceable consent decrees which are in place now, but which have control compliance dates in 2021 and 2022, will not be fully in place by time of this designation in December 2020; all commitments will be in place within two to four years before the SIP process would conclude.

4.8. EPA's Assessment of the Available Information for the Hutchinson County, Texas Area

A monitor in the Hutchinson County, Texas area is violating the NAAQS based on the 2017-2019 design value. The State of Texas and Industry submitted air dispersion modeling to demonstrate the extent of the NAAQS violations and to establish a nonattainment boundary.

Neither the State or Industry modeling has included modeling of new short-term allowable emission rates for all sources as recommended by EPA's Round 4 guidance, Modeling TAD and Appendix W for how to outweigh the evidence of monitored violations, therefore EPA cannot support a unclassifiable/attainment designation other than nonattainment.

As discussed in more detail above, EPA examined the State and Industry modeling to determine if it could be used to help determine the boundaries of a nonattainment area. The EPA found both models tended to bias the model results low, preventing a straightforward/complete reliance on either model to establish the boundaries of the nonattainment area. Specifically, both models calculated hourly emission rates based on annual emissions averaged over 8760 hours (total hours in a year) for all/many sources in the State/Industry modeling leading to two separate concerns in underestimating emission rates variability (a) the average hourly emissions rates are estimated as the annual total actual emissions divided by 8760 (total number of hours in a year) rather than by the actual hours of operation when emissions occurred which artificially drives the average hourly rate down by including hours when no emissions could have occurred at all; and (b) short-term variability of the emission rate is not considered which masks actual hourly peaks of emissions that could yield concentrations that exceed the level of the NAAQS when the modeled average hourly rate using annual emissions would not.[7]

The EPA's Modeling TAD advises in Section 5.2 that "in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used.". When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall, the uncertainty in the modeled emission rates and the known bias low are issues of a significant concern.

We were able to use aspects of the modeling and modeled concentrations available in the information from the State and Industry to promulgate a final designation smaller than EPA's

[7]It is important to note that for a short-term standard such as the 1-hour SO_2 standard, where an air agency is considering developing a longer term-averaged limit for a SIP in order to bring a violating area into attainment, that after identifying and modeling a 1-hour limit that would provide for attainment if constantly met by the source EPA strongly recommends that the stringency of any longer-term limit should be tightened by applying an adjustment factor so as to account for short-term variability in the emission rate and thereby make the longer term limit comparably stringent to an attaining constant 1-hour limit. This guidance (including EPA's 2014 SO2 modeling for Attainment Demonstrations) implies, conversely, that a variable set of emissions can cause significantly worse air quality than constant emissions at the average rate of the variable emissions set. The guidance addresses averaging times up to 30 days; the difference between variable emissions impacts and constant emissions impacts is likely to be greater with annual average emissions. This short-term variability is not considered in the State's modeling, which causes the modeled impacts to be prone to underestimate the magnitude of concentrations and the geographic area of likely violations.

intended nonattainment area (all of Hutchinson County) even though we have concerns and data indicating the modeling is biased low and underestimates the area with modeled violations. In an effort to account for the concerns in both models, the EPA has used a reduced design value threshold level to define the borders of the nonattainment area with a buffer to address our concerns discussed above. We used a value of 98.2 µg/m3 (37.5 ppb) or ½ the NAAQS level. We believe that given the concerns about hours of operation and variability of short-term emissions this level of adjustment is reasonable. The low bias in the State's modeled design value is corroborated at the DRR monitor where the observed concentration is underestimated by a factor of 3.4 (158.44 $\mu g/m^3$ modeled vs observed 548 $\mu g/m^3$). The low bias in the Industry's modeled design value is also corroborated at the DRR monitor where the observed concentration is underestimated by a factor of 3.25 (168.3944 $\mu g/m^3$ modeled vs observed 548 $\mu g/m^3$). We note these model to monitor comparisons but the reason to adjust the nonattainment area is because of our concerns about hours of operation and variability of short-term emissions and the impacts on modeled DVs. While EPA is unable to make a precise estimate of the degree of uncertainty in the State's analysis or of the degree of underestimation that the State's analysis may have, EPA considers a factor of 2 reduction in the threshold to be a reasonable approximation Thus, the use of a factor of 2 reduction in the threshold is reasonable and ensures with a high degree of certainty that all areas of possible exceedances are included in the nonattainment area. Boundary modeling could have also been done with allowables and we note that Attainment Demonstration modeling will have to model allowable emission rates in accordance with 40 CFR Part 51 Appendix W, and, therefore, modeling allowables would also expand the nonattainment area compared to the State and industry modeling. So, we are using a general factor of 2 to yield a reasonable area of nonattainment for designation.

We also note that Industry performed contribution analysis indicating the maximum impacts to High 4th High values to modeled exceedances. The maximum modeled impact from Phillips 66 emissions is 8.6 $\mu g/m^3$ and the combined maximum modeled contribution from all facilities outside the Industry's recommended NAA is 16.1 $\mu g/m^3$ both contributing to a modeled exceedance value of 208.9 $\mu g/m^3$ at a receptor on the west-southwest side of the Orion/Tokai facilities. While Industry asserts that this level does not reach a contribution or exacerbation level, we disagree because without the 16.1 $\mu g/m^3$ (Agrium's 0.01 $\mu g/m^3$ does not change the value) from all the facilities outside the Industry's recommended NAA the modeled value would be 192.8 $\mu g/m^3$ (208.9 $\mu g/m^3$ -16.1 $\mu g/m^3$), below the 2010 SO_2 NAAQS of 196.4 $\mu g/m^3$. In this case the contribution from IACX, Phillips 66, CP Chem, Blackhawk, and Solvay are causing a modeled violation to occur and the contributions are large enough to be considered contributing to a violation (8.6 and 16.1 $\mu g/m^3$). This is just one of the contribution assessments. In a full contribution analysis all modeled violations from the 4th High down to the point that the modeled value is below the standard would be evaluated. Industry assessed modeled exceedances down to the 50th High. Industry indicated that for the 6th High value at a modeled violation of 198.2 $\mu g/m^3$, the modeled contribution from Phillips 66 was 11.6 $\mu g/m^3$ and the combined modeled contribution from all Non Carbon facilities was 23.1 $\mu g/m^3$ (Agrium's 0.04 $\mu g/m^3$ impact does not change the value). In the 6th High Value case, if the Phillips 66 contributions are removed the modeled value would be 186.6 $\mu g/m^3$ (below the 196.4 $\mu g/m^3$ NAAQS), evidence Phillips is contributing to a modeled violation. Likewise, the facilities outside the Industry NAA boundary are also causing a modeled violation to occur (modeled value without their contribution is 175.1 $\mu g/m^3$). The contributions are large enough to be considered causing/contributing to a modeled violation (11.6 and 23.1 μg/m^3). There are other contributions that are shown in the modeling files and analysis of the modeling where the contributions of one of the facilities (IACX and Phillips Complex facilities) or the combined impact of these facilities contribute to modeled violations. We note that this assessment is based on the existing modeled emission rates that are known to be low biased as discussed elsewhere, and if more appropriate emissions were modeled then there would be more modeled violations and more areas to analyze for contribution analysis and it would be expected to find higher values for the contributions to modeled violations. This contribution analysis supports including the IACX, Phillips 66, CP Chem, Blackhawk, and Solvay facilities in the nonattainment area because they cause/contribute to modeled violations.

EPA has addressed concerns about using longer term average emission rates and other uncertainties in emission rates used in modeling for 1-Hour SO_2 NAAQS issues in other designation actions[8] and EPA has also done some technical analysis previously documenting the technical concerns with using longer term average emission rates that do not take into account variability and that can lead to underestimations for 1-Hour SO_2 NAAQS for regulatory actions such as designations, attainment demonstrations, and permitting.[9] Much of EPA's technical analyses has been on the impacts being biased low if not accounting for the difference/variability between 30-day average limits and 1-hour limits with 1-hour limits resulting in larger impacts (DVs), and the difference would be larger between annual average limits/emission rates and 1-hour emission rates and would result in an even larger nonattainment area than modeling the 1-hour equivalent (CEV) of a 30-day limit . EPA notes that the facts of each situation are unique and case-specific in how a boundary is determined in these situations.

To determine the new boundary with a buffer to address concerns/uncertainties in the modeling boundaries EPA plotted the resulting design value fields with new concentration contour values from the State's modeling files and considered four factors (1) the extent of modeled annual 4th high (99th percentile) hourly values above the threshold, (2) the locations of the sources which contribute to the elevated values, (3) the locations of any previously designated areas, and (4) contribution to any nearby nonattainment areas. There are no nearby nonattainment areas and surrounding counties have been previously designated so factors 1 and 2 will inform our final designation. See Figure 4-29 for EPA's revised modeling plot with yellow values indicates receptors with modeling values above 98.2 μg/m^3. The new rectangular boundary is colored red and is sized to capture all receptors with modeled DVs above 98.2 μg/m^3. Texas's recommended boundary indicated in blue is also included.

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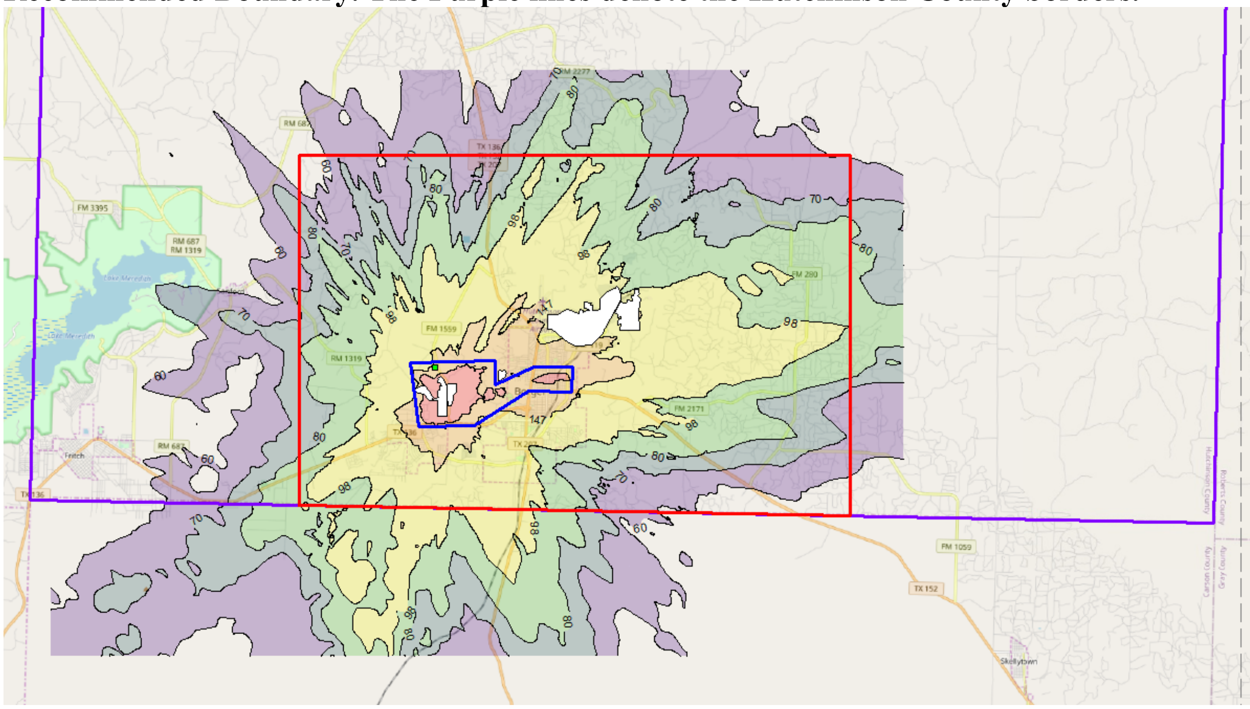
[8] EPA Round 2 Designations (Docket ID NO. EPA–HQ–OAR–2014–0464), Maryland TSD, (add others) available in the docket and at *https://www.epa.gov/sulfur-dioxide-designations/epa-completes-second-round-sulfur-dioxide-designations*. EPA is also adjusting boundaries in another final designation in this action (Madrid County, Missouri designation). See intended designation TSD in the docket and available at *https://www.epa.gov/sites/production/files/2020-08/documents/05-mo-rd4_intended_so2_designations_tsd.pdf* and the final designations TSD available in the docket for this action.

[9] EPA 2014 "Guidance for 1-Hour Sulfur Dioxide (SO_2) Nonattainment Area State Implementation Plans (SIP) Submissions" available at *https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf*.

Figure 4-29. Map of State's Modeled 99th Percentile Contours with EPA's Final Nonattainment Area Boundary (Red Polygon) for Hutchinson County and the State's Recommended Boundary. The Purple lines denote the Hutchinson County borders.



A portion of Hutchinson County is being designated as nonattainment that is adjacent to a previously designated unclassifiable/attainment area, Carson County, Texas.

The EPA concludes that our final nonattainment area, bounded by those portions of Hutchinson County encompassed by the rectangle with the vertices using Universal Traverse Mercator (UTM) coordinates in UTM zone 14 with datum NAD83 as follows:

(1) Vertices—UTM Easting (m) 273540.5, UTM Northing (m) 3945147.6,
(2) vertices—UTM Easting (m) 296187.4, UTM Northing (m) 3944698.5,
(3) vertices—UTM Easting (m) 296187.4, UTM Northing (m) 3959485.8,
(4) vertices—UTM Easting (m) 273540.5, UTM Northing (m) 3959499.4

It has clearly defined legal boundaries, and we find these boundaries to be a suitable basis for defining our final nonattainment area. Figure 4-29 gives EPA's final nonattainment boundary along with the State's recommended nonattainment area boundary.

EPA has no evidence to suggest that violations are occurring in the remainder of Hutchinson County or that there are sources outside the nonattainment area that are contributing to the violations in the nonattainment area. Specifically, the remainder of Hutchinson County does not contain any sources that emitted SO_2 in amounts greater than 50 tons per year in 2016-2018. For these reasons, EPA is designating the remainder of Hutchinson County, Texas outside of the defined nonattainment area as attainment/unclassifiable.

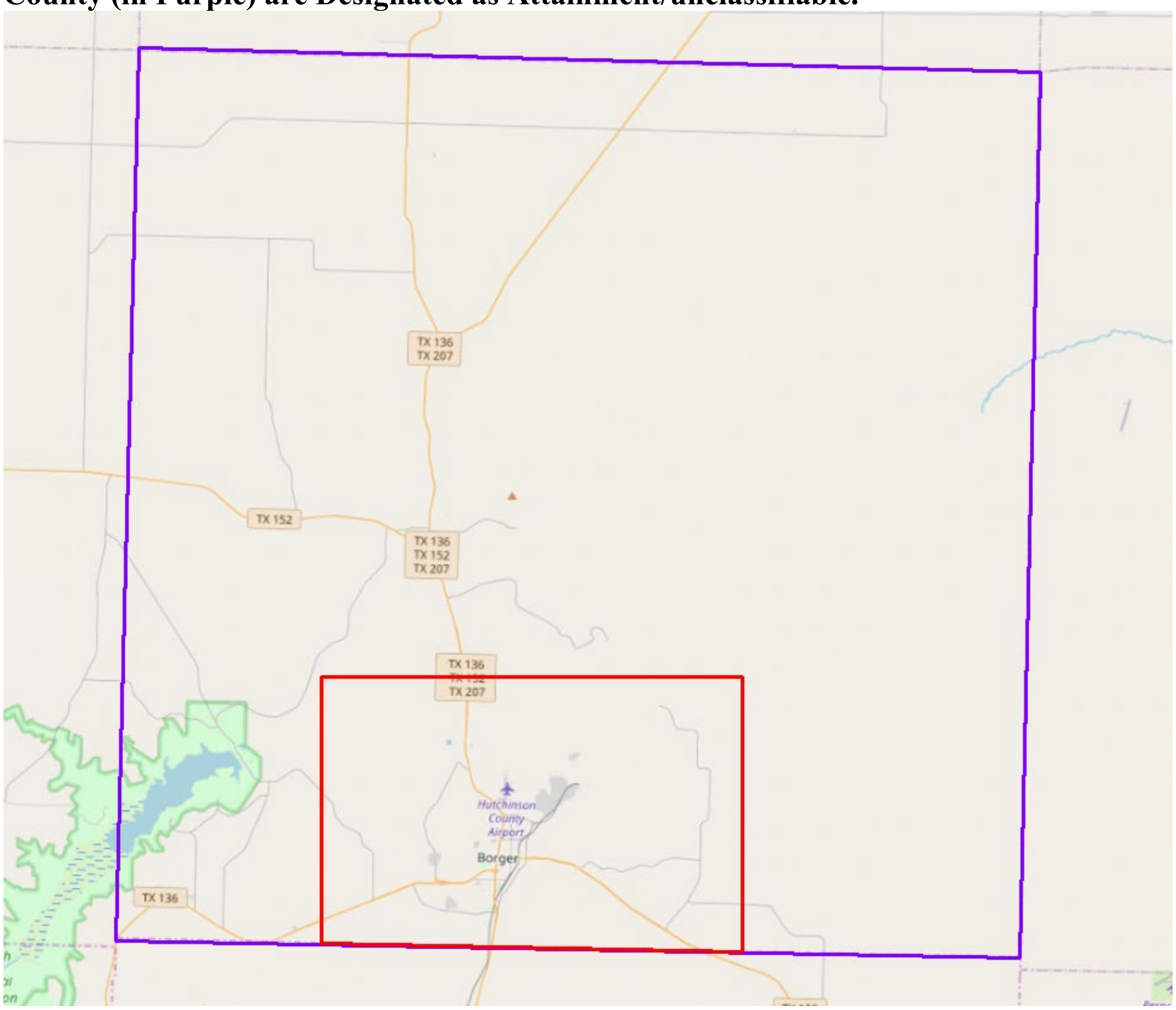
4.9. Summary of EPA's Final Designation for the Hutchinson County, Texas Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA is designating portions of Hutchison County, Texas as nonattainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of those portions of Hutchinson County encompassed by the rectangle with the vertices using Universal Traverse Mercator (UTM) coordinates in UTM zone 14 with datum NAD83 as follows:

(1) Vertices—UTM Easting (m) 273540.5, UTM Northing (m) 3945147.6,
(2) vertices—UTM Easting (m) 296187.4, UTM Northing (m) 3944698.5,
(3) vertices—UTM Easting (m) 296187.4, UTM Northing (m) 3959485.8,
(4) vertices—UTM Easting (m) 273540.5, UTM Northing (m) 3959499.4

Figure 4-30 shows the boundary of this final designated nonattainment area as a red rectangle.

Figure 4-30. Boundary of Hutchinson County, Texas Nonattainment Area is Shown in Red. The Area outside the Nonattainment Boundary and Inside the Borders of Hutchinson County (in Purple) are Designated as Attainment/unclassifiable.



Additionally, the EPA is designating the remainder of Hutchinson County, Texas as attainment/unclassifiable.

5. Technical Analysis for the Navarro County, Texas Area

5.1. Introduction

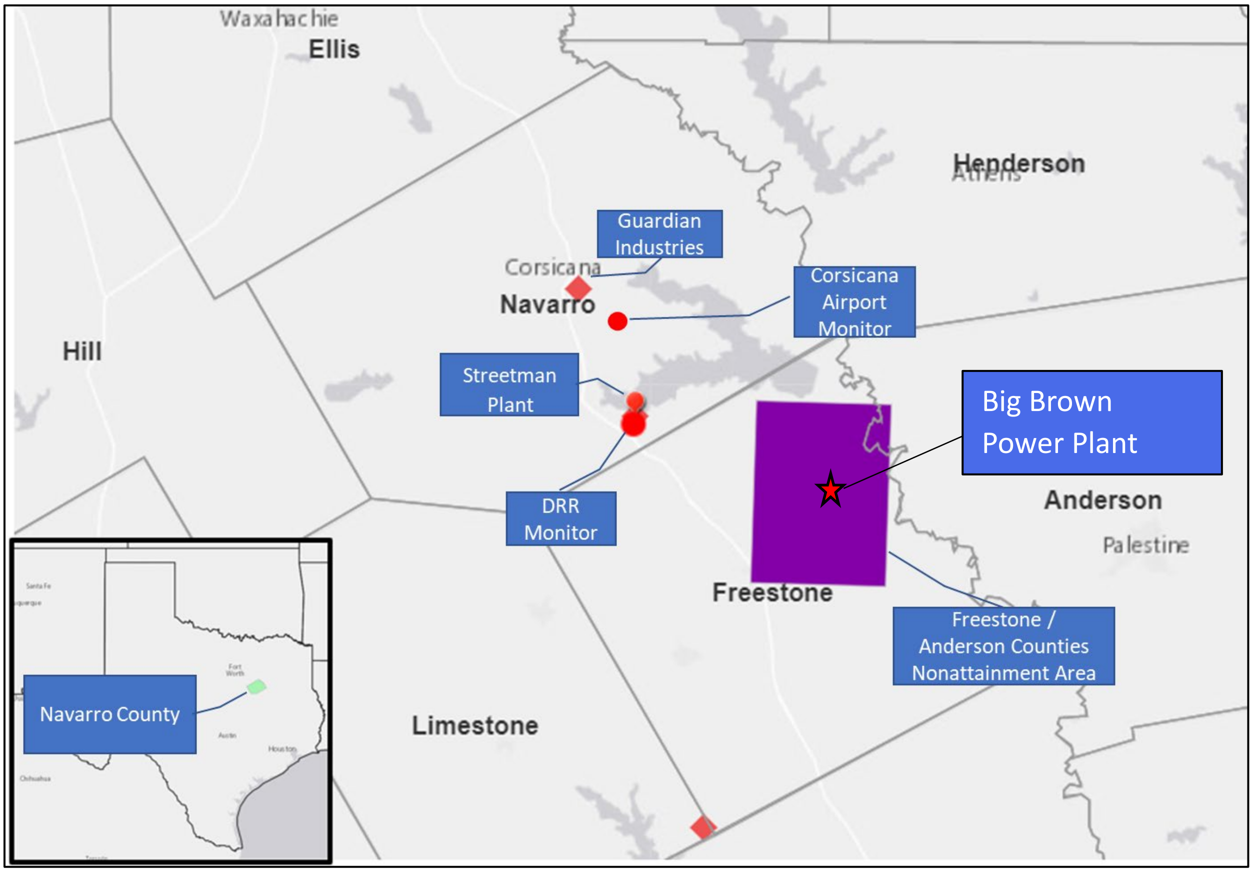
The EPA must designate the Navarro County, Texas area by December 31, 2020, because the area has not been previously designated, and Texas installed and began operating a new EPA-approved monitor pursuant to the DRR. This section presents all the available air quality information for the portion of Navarro County, Texas that includes the following SO_2 source around which the DRR required the State to characterize air quality:

- The Streetman Plant emits 2,000 tons or more of SO_2 annually. Specifically, Streetman emitted 3,350 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Texas has chosen to characterize it via monitoring.

As seen in Figure 5-1 below, the Streetman Plant is located on the southern shore of the Richland Chambers Reservoir, toward the western end. It is about 4.2 km north of the boundary with Freestone County and about 16 km west of the Freestone/Anderson Counties SO_2 nonattainment area.[1] As shown in Figure 5-2, the DRR monitor is located about 1.2 km to the SSW of the Streetman Plant.

[1] A portion of Freestone and Anderson Counties, Texas was designated as nonattainment in Round 2 of the SO2 designations, 81 FR 89870 (December 13, 2016). We note that the Big Brown power plant, the primary source of SO_2 in this area, ceased operation and permanently retired in early 2018.

Figure 5-1. Map of the Navarro County, Texas Area Addressing the Streetman Plant. The purple rectangle demarks the previously designated Freestone/Anderson County SO_2 nonattainment area.



5.2. Summary of Information Reviewed in the TSD for the Intended Round 4 Area Designations

In its September 18, 2015 recommendation letter, Texas recommended that Navarro County be designated as attainment for the 2010 SO_2 NAAQS. Specifically, the State's recommended boundaries consisted of Navarro County. Texas, however, provided EPA with this recommendation prior to the installation and operation of the EPA-approved monitor and before the State had monitoring data for the 2017-2019 period. As explained in EPA's intended designations TSD, the EPA did not agree with Texas's recommendation as to the designation category, and EPA intended to designate all of Navarro County, Texas as nonattainment for the 2010 SO_2 NAAQS based upon currently available monitoring information for the 2017-2019 period.

A DRR monitor in the Navarro County area was violating the 2010 SO_2 NAAQS based on the 2017-2019 design value. In our intended designations TSD, EPA evaluated its recommended five factors and all available information to determine the geographic extent of the violations. A DRR source, the Streetman Plant, is located about 1.2 km to the north of the violating monitor and there is one other major SO_2 source in Navarro County located 19 km to the north of the monitor that could contribute to nonattainment at unmonitored locations. The southern border of Navarro County abuts Freestone County and is approximately 4 km south of the Streetman Plant. There are no major SO_2 sources currently permitted to operate in Freestone County that would be expected to contribute to the Navarro nonattainment area. In Round 2, EPA designated a portion of Freestone County around the Big Brown Steam Electric Generating Station (about 16 km south of the Streetman Plant) as nonattainment while designating the remaining area as attainment/unclassifiable. With the permanent and enforceable shutdown of the Big Brown Station in 2018, there are no currently operating major SO_2 sources in Freestone County. Currently, the largest source in Freestone County is Freestone Energy Center, with 11.7 tons of SO_2 per year located 22.6 km south of the Streetman Plant.

The prevailing winds are from the south, so the monitor location to the south of the Streetman Plant is not exposed to the impacts of the plant's plumes most of the time. However, there is still a significant incidence of winds from the north during which the Streetman Plant emissions have direct impacts on the monitor. The high wind speeds (> 20 knots) coincident with maximum 1-hour concentrations at the monitor indicate that an elevated buoyant plume such as from the Streetman Plant kiln may contribute to the violating monitor. Also, the highest concentrations occur for wind directions from the Streetman Plant. For other wind directions the high wind speeds, associated with the highest monitored concentrations, are also frequent from the south but not for westerly winds or easterly winds. This presents the possibility that emissions from the Streetman Plant could combine with the emissions from the other Navarro County SO_2 sources to the north thus contributing to a violation of the 2010 SO_2 NAAQS downwind of those sources. The hilltop elevations in the northern and western parts of the county are about 100 feet higher than at the Streetman Plant, potentially leading to enhanced concentrations from the Streetman Plant plume and other Navarro County sources.

EPA concluded that our intended nonattainment area, bounded by the borders of Navarro County, had clearly defined legal boundaries, and we intended to find these boundaries to be a suitable basis for defining our intended nonattainment area.

5.3. Air Quality Monitoring Data for the Navarro County, Texas

In the TSD for the intended area designations, EPA considered design values for air quality monitors in the Navarro County, Texas area. Specifically, EPA determined that the Richland Southeast 1220 Road monitor (AQS ID# 48-349-1081), which was sited to characterize the air quality around the Streetman Plant, violated the 2010 SO_2 NAAQS with a 2017-2019 design value of 165 ppb. The Corsicana Airport monitor (AQS ID# 48-439-1051) in Navarro County is attaining the 2010 SO_2 NAAQS with a 2017-2019 design value of 43 ppb. EPA has no new monitoring information of any other type that warrants revising our prior analysis of available monitoring data. Figure 5-2 shows the location of the violating monitor in relation to the Streetman Plant.

Figure 5-2. Satellite Image of Streetman Plant and DRR Monitor Showing Direction and Distance to the Monitor

5.4. Assessment of New Technical Information for the Navarro County, Texas Area Addressing the Streetman Plant.

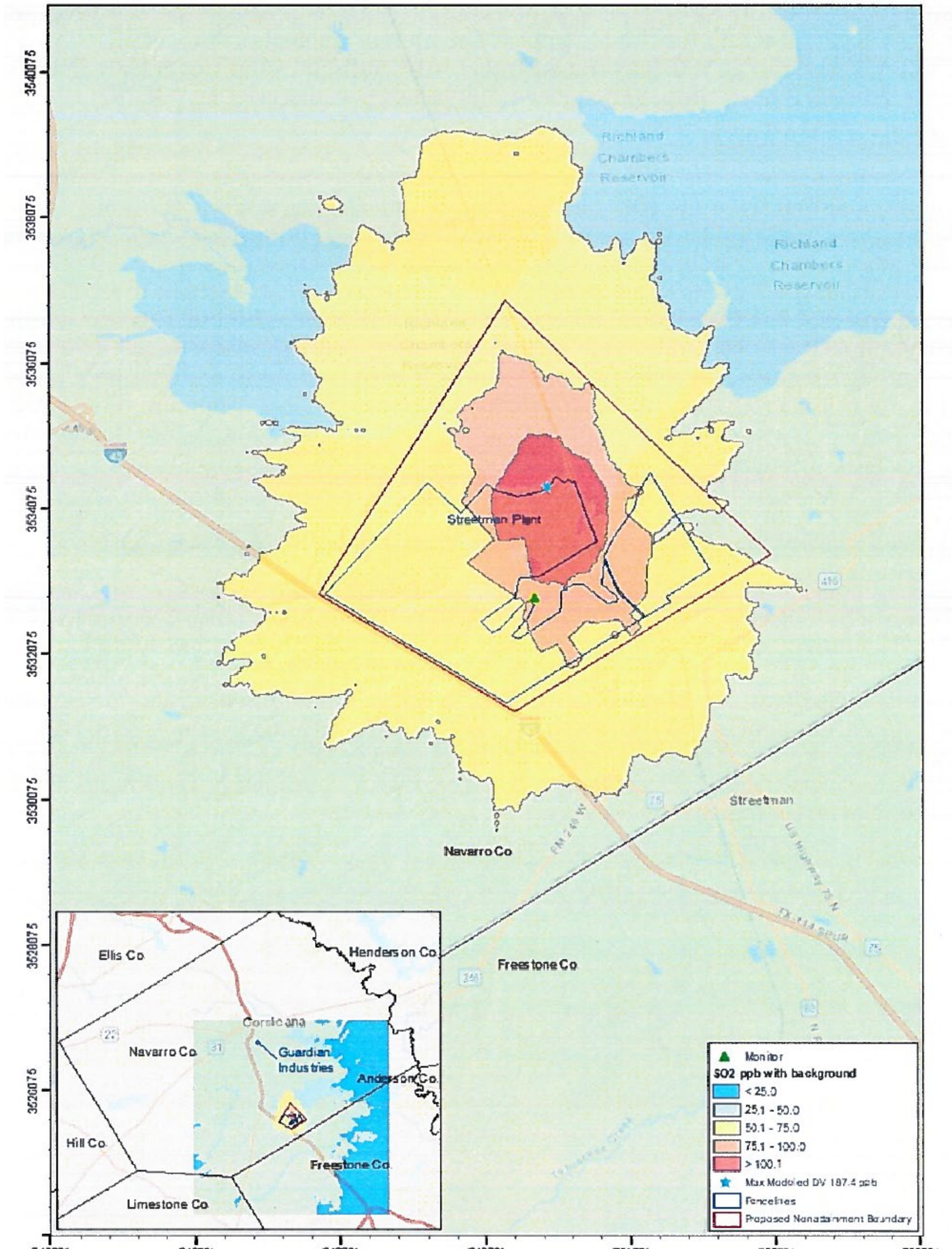
On October 16, 2020, the State of Texas provided comments on EPA's intended nonattainment designation for Navarro County and indicated that if EPA designates the area nonattainment, the size of the nonattainment should be limited to the area (a small portion of Navarro County) that violates the standard based on modeling the State submitted with its comments. Texas submitted new modeling analyzing air quality in the area surrounding the Streetman Plant in the Navarro County area. This assessment and characterization were performed using air dispersion modeling software, i.e., AERMOD, analyzing annual actual tpy emissions in 2017, 2018, and 2019 and averaging the annual SO_2 emissions in tons per year (tpy) over 8760 hours. The area that the State has assessed via air quality modeling is located Navarro County, Texas covering south central and southeastern portions as shown in Figures 5-3 and 5-4. Texas provided the modeling analysis to support a nonattainment boundary different from EPA's intended nonattainment boundary. EPA intended to designate the entirety of Navarro County as nonattainment, whereas Texas's analysis attempted to support a smaller nonattainment area.

EPA does not agree with Texas's 2015 recommendation as to the designation category, and is designating a portion of Navarro County, Texas, as described below, as nonattainment for the 2010 SO_2 NAAQS based upon currently available monitoring and modeling information for the 2017-2019 period. After careful review of the State's assessment, supporting documentation, and all available data, the EPA does not agree with the State's October 2020 boundary recommendation, and our boundaries are different than the State's recommended boundaries and are described below. Our reasoning for this conclusion is explained in a later section of this TSD, after all the available information is presented.

In its 2020 recommendation letter, Texas provided an air quality modeling analysis for the area surrounding Streetman facility to support a smaller nonattainment area boundary. The area that the state has assessed via air quality modeling is located Navarro County, Texas covering south central and southeastern portions as shown in Figures 5-3 and 5-4.

Figure 5-3. The State's area of Analysis for Navarro County, Texas. Plot produced by EPA from the State's Modeling Files.

Figure 5-4. Detail of the Streetman Plant Showing the Location of the Area of Analysis and Results of the State's Modeling Analysis as Provided in the State's October 2020 Recommendation Letter.



Also included in the figures are other nearby emitters of SO_2. The only nearby emitter is Guardian Industries. Nearby sources' annual tpy emissions of SO_2 for 2016-2019 are included in Table 5-1. As discussed above the Big Brown Facility was permanently shut down in 2018.

Table 5-1. SO_2 Emissions of Other Nearby Sources Near the Navarro County, Texas DRR Monitor during the 2016-2019 period.

County	Facility Name	Distance from Violating Monitor (km)	2016 SO_2 Emissions (tons)	2017 SO_2 Emissions (tons)	2018 SO_2 Emissions (tons)	2019 SO_2 Emissions (tons)
Navarro	Guardian Industries Corsicana	19.1	296.8	298.7	278.8	279.5
Freestone	Big Brown	29.7	42,470	47,633	6,659	0

The discussion and analysis that follows below will reference the *Guideline on Air Quality Models* (Appendix W to 40 CFR part 51) and the factors for evaluation contained in the EPA's September 5, 2019, guidance, July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

For this area, the EPA received and considered one modeling assessment from the State. To avoid confusion in referring to this assessment, the following table indicates when it was received, provides an identifier for the assessment that is used in the discussion of the assessment that follows, and identifies any distinguishing features of the modeling assessment.

Table 5-2. Modeling Assessments for the Navarro County, Texas Area

Assessment Submitted by	Date of the Assessment	Identifier Used in this TSD	Distinguishing or Otherwise Key Features
TCEQ	10/16/2020	TCEQ	N/A

5.4.2. Modeling Analysis Provided by the State

5.4.1.2.Differences Between and Relevance of the Modeling Assessments Submitted by the State

There was no modeling assessed for this area in the intended designations TSD. The State's modeling analysis provided was compiled by Atmospheric and Environmental Research (AER) and consisted of a modeling report and the modeling files. AER performed initial modeling for 2016-2018 and then updated the modeling to use 2017-2019 emissions and meteorology. Texas's October 2020 revised recommendation relied on the updated modeling using 2017-2019 emissions and meteorology. EPA's review is focused on the State's modeling analysis using the 2017-2019 emissions and meteorology. To reduce confusion, we note where the information modeling report departs from the data contained in the modeling files.

5.4.1.3.Model Selection and Modeling Components

The EPA's Modeling TAD notes that for area designations under the 2010 SO2 NAAQS, the AERMOD modeling system should be used, unless use of an alternative model can be justified. The AERMOD modeling system contains the following components:

- AERMOD: the dispersion model
- AERMAP: the terrain processor for AERMOD
- AERMET: the meteorological data processor for AERMOD
- BPIPPRM: the building input processor
- AERMINUTE: a pre-processor to AERMET incorporating 1-minute automated surface observation system (ASOS) wind data
- AERSURFACE: the surface characteristics processor for AERMET
- AERSCREEN: a screening version of AERMOD

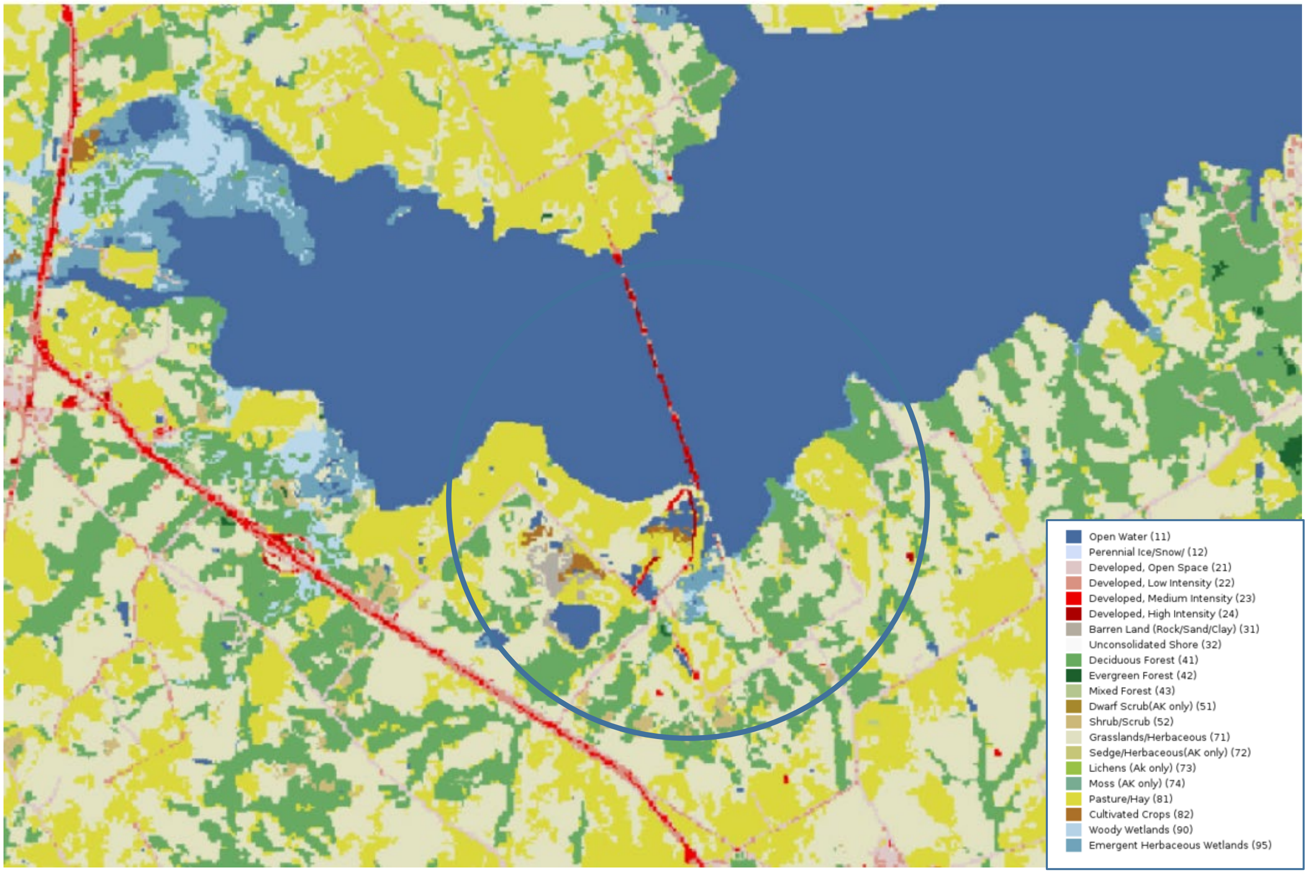
The State used AERMOD version 19191. A discussion of the State's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

5.4.1.4.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the determination of whether a source area is "urban" or "rural" is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour half-life for urban SO_2 sources. Section 6.3 of the Modeling TAD details the procedures used to determine if a source area is urban or rural based on land use or population density.

For the purpose of performing the modeling for the area of analysis, the State determined that it was most appropriate to run the model in rural mode. The State did not explain its basis for the characterization of the area as rural. Figure 5-5 is a plot of 2016 NLCD Land Cover type with a circle depicting a 3 km radius around the facility. The vast majority of the land use within 3 km is not one of the developed types. EPA concurs that the area around the facilities is rural in character and that the use of the rural dispersion option is appropriate.

Figure. 5-5. 2016 Land Use Around the Streetman Plant with a Circle of Radius 3 kilometers.



5.4.1.5.Modeling Parameter: Area of Analysis (Receptor Grid)

The Modeling TAD recommends that the first step towards characterization of air quality in the area around a source or group of sources is to determine the extent of the area of analysis and the spacing of the receptor grid. Considerations presented in Appendix W include but are not limited to: the location of the SO_2 emission sources or facilities considered for modeling; the extent of significant concentration gradients due to the influence of nearby sources; and sufficient receptor coverage and density to adequately capture and resolve the model predicted maximum SO_2 concentrations.

The source of SO_2 emissions subject to the DRR in this area is described in the introduction to this section. For the Navarro County, Texas area, the State included other emitters of SO_2 within 19 km of Streetman Plant in any direction. The State determined that this was the appropriate distance to adequately characterize air quality through modeling to include the potential extent of any 2010 SO_2 NAAQS violations in the area of analysis and any potential impact on SO_2 air quality from other sources in nearby areas. In addition to the Streetman Plant, the other emitter of SO_2 included in the area of analysis is Guardian Industries. No other sources beyond 20 km were determined by the State to have the potential to cause significant concentration gradients within the area of analysis. EPA notes that the State did not include the emissions from the Big Brown

Power Plant that is located in Freestone County and approximately 23 km to the east-southeast of the Streetman Plant. EPA previously designated the area around the Big Brown Power Plant as nonattainment for 2010 SO_2 NAAQS, and the facility later shut down in 2018.

The State's grid receptor spacing for the area of analysis is as follows:
The receptors consist of 2 nested grids centered around the Streetman Plant. The inner most nest goes from the center of the Plant out to 5 kilometers with a grid spacing of 100 meters. The second and outermost grid goes from 5 km to 20 km with a grid spacing of 500 meters. In addition to the nested grid there are receptor points added at the locations of the nearby monitor and receptor points located at 25-meter intervals along the property line shown in Figures 5-5 and 5-6. All nested receptors within this property boundary have been removed. The receptor network contained 16,604 receptors and covered the southern portion of Navarro County, Texas including parts of Freestone County to the south and southeast.

Figures 5-5, 5-6 and 5-7, included in the State's recommendation, show the State's chosen area of analysis surrounding the Streetman Plant, as well as the receptor grid for the area of analysis.

Figure 5-5: Area of Analysis for the Navarro County Area Showing the Complete Receptor Field Centered on the Streetman Plant.

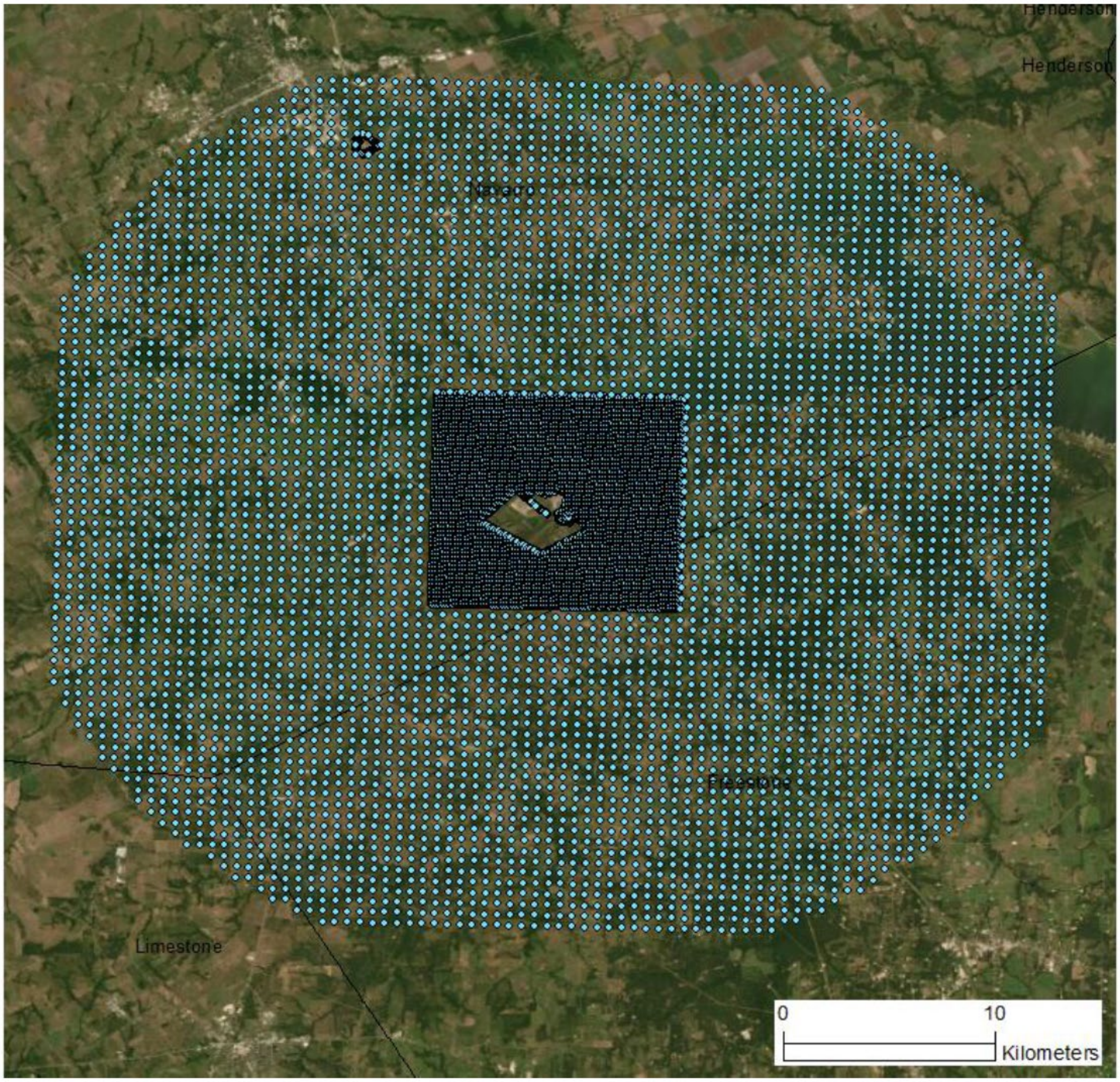


Figure 5-6: Zoomed-in Receptor Field Near the Streetman Plant Showing Fenceline Receptors

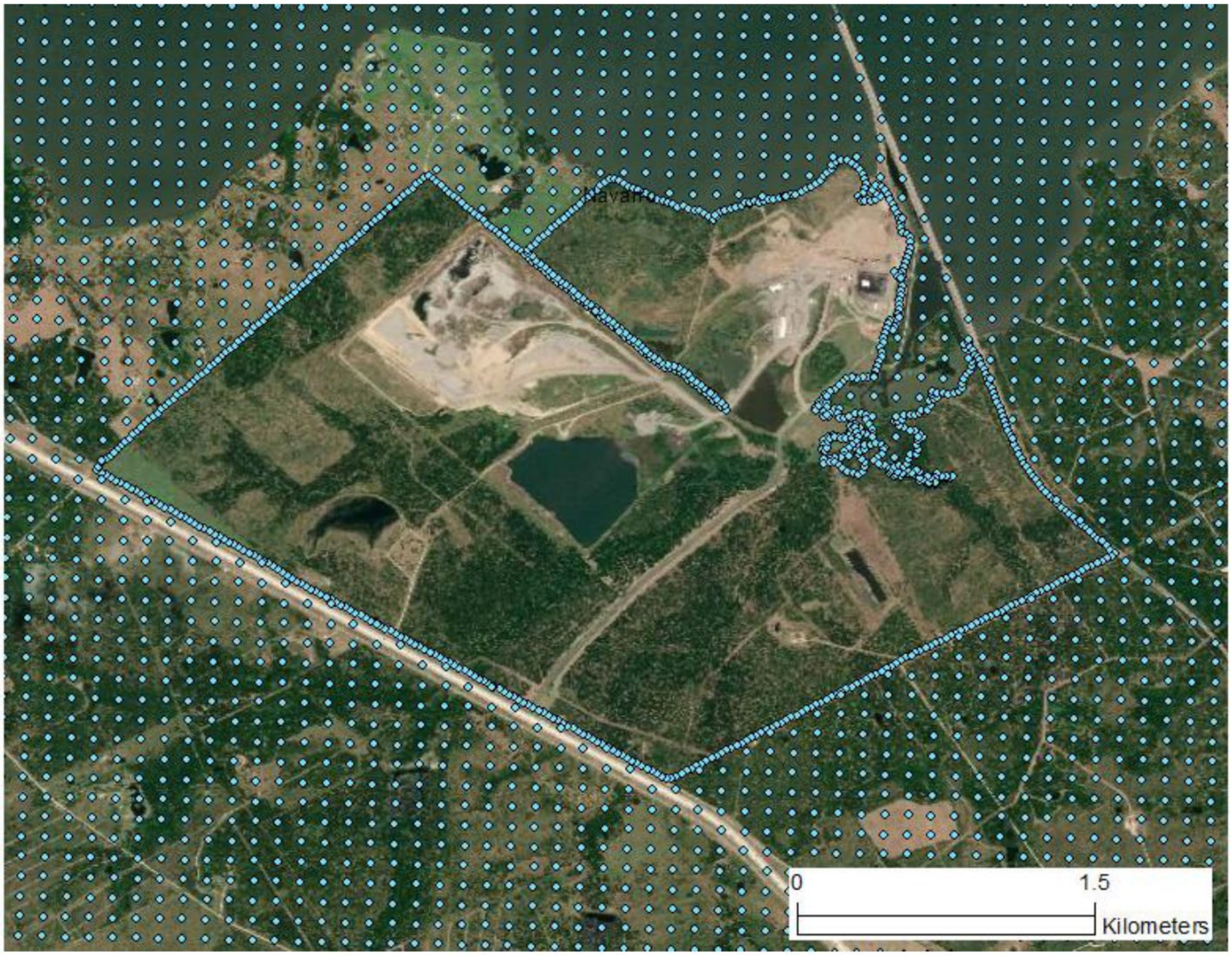


Figure 5-7: Zoomed-in Receptor Field Near the Guardian Plant Showing Fenceline Receptors

Consistent with the Modeling TAD, the State placed receptors for the purposes of this designation effort in locations that would be considered ambient air relative to each modeled Plant. Due to the distance between the Streetman Plant and the Guardian facility, the State did not do a facility on facility impact analysis (*i.e.,* treating the Guardian facility as ambient to Streetman). EPA concurs that this was not necessary based on distance and modeled impacts in the analysis. The State excluded receptors in other locations that it considered to not be ambient air relative to each modeled facility. The State used data from permitting actions and satellite imagery to establish fencelines and areas of each facility that should be considered access limited (*i.e.*, only facility employees allowed) and non-ambient. EPA has reviewed satellite imagery and agrees with the fenceline and exclusion areas.

The receptor grid covered a sufficient distance from the Streetman Plant at a sufficient density to capture the gradients around the facility and to determine the maximum concentration. The State excluded receptors within fenced company property which excluded access by the general public. EPA agrees that the receptor grid is adequate to inform the boundary decision in this designation and is consistent with the Modeling TAD.

5.4.1.6.Modeling Parameter: Source Characterization

Section 6 of the Modeling TAD offers recommendations on source characterization including source types, use of accurate stack parameters, inclusion of building dimensions for building downwash (if warranted), and additional details regarding good engineering practices (GEP) policy to be used when modeling allowable emissions.

The State included the DRR source, Streetman Plant, as well as other major SO_2 sources (major sources are sources with over 100 tpy of actual SO_2 emissions) located within 20 km of the DRR source. Besides the Streetman Plant, Texas included sources at the nearby Guardian facility. The modeling parameters for these sources are shown in Tables 5-3 and 5-4 for all 5 sources.

Table 5-3. Point Sources Modeled.

Facility	Model ID	Latitude	Longitude	HT (m)	Diameter (m)	Temp (K)	Velocity (m/s)	Type
Guardian	S1002	32.064139	-96.428392	90.826	2.591	687.594	10.241	Stack
Guardian	S776	32.064099	-96.428055	6.096	0.457	798.706	17.105	Stack
Guardian	S788	32.063952	-96.42885	7.62	0.396	366.483	15.309	Stack
Streetman	KILNSTAC	31.913817	-96.349294	35.05	1.524	340.372	20.329	Stack

Table 5-4. Area/Fugitive Source Modeled.

Facility	Model ID	Latitude	Longitude	Height (m)	Width (m)	Length (m)	Angle from N (deg)
Guardian	F1	32.061639	-96.426931	4.57	30.48	30.48	0

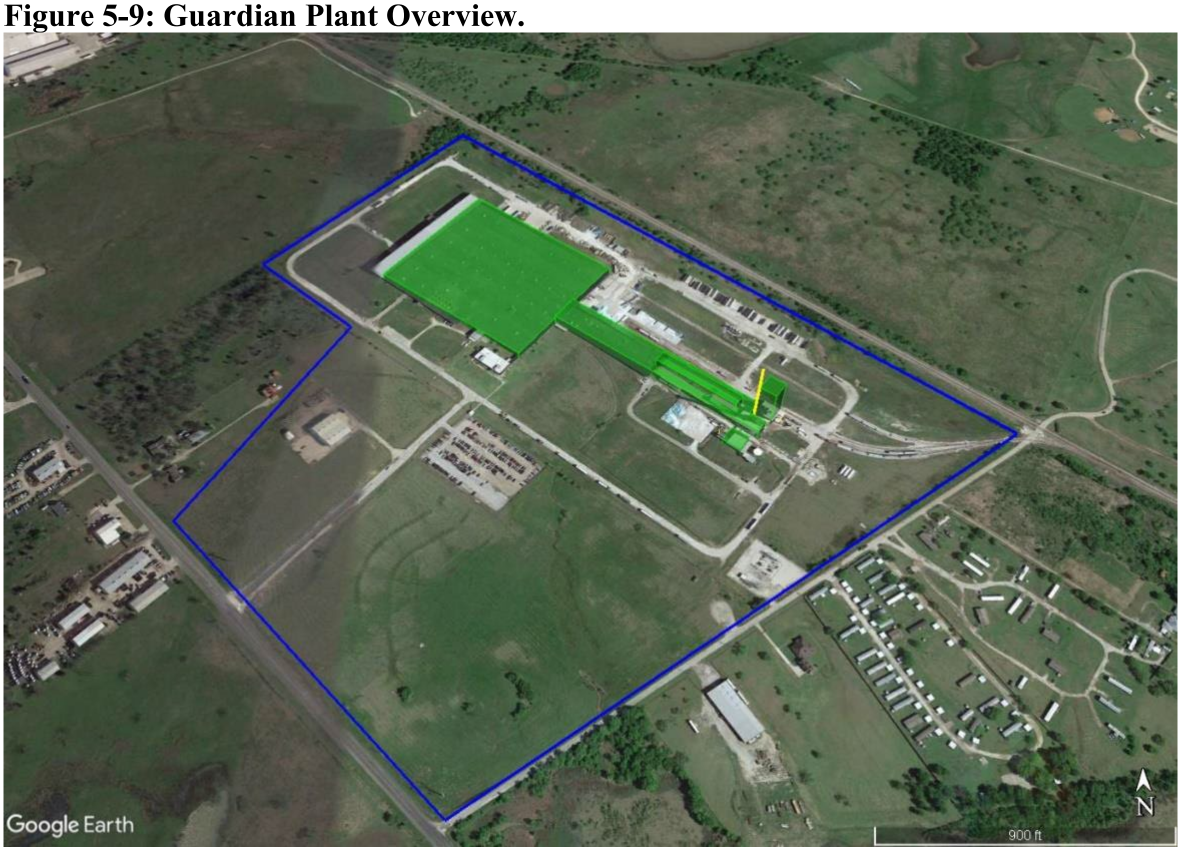
The State characterized these sources within the area of analysis in accordance with the Modeling TAD and Appendix W. The State characterized the source's building layout and location, as well as the stack parameters, e.g., exit temperature, exit velocity, location, and diameter. The State did not model one source (HTRS) at Guardian facility because it had actual annual emissions less than 2 tpy for the 2017-2019 period. EPA agrees that the sources chosen to be modeled are adequate for this analysis.

EPA notes that the State did not include emissions from the Big Brown Power Plant located in Freestone County approximately 29.7 km to the east-southeast of the violating monitor (see Figure 5-1 above). EPA previously designated the area around the Big Brown Power Plant as nonattainment and the facility permanently shut down in early 2018. The Big Brown Power Plant had annual SO_2 emissions of 47,633 tons in 2017 and 6,659 tons in 2018 before shutting down and surrendering its operating permit in 2018 for the coal fired boilers at the facility.

Where appropriate, the AERMOD component BPIPPRM was used to assist in addressing building downwash. Figures 5-8 and 5-9 below shows the site plot for the 2 facilities modeled including location of the buildings that were assessed with BPIPPRM. EPA agrees that building downwash has been addressed appropriately in this analysis.

Figure 5-8: Streetman Plant Overview.

Figure 5-9: Guardian Plant Overview.



5.4.1.7.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations where there is no properly sited monitor, the recommended approach is to use the most recent 3 years of actual emission data and concurrent meteorological data. The TAD also indicates that modeling can be performed with allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and in effect.

As previously noted, the State included the Streetman Plant and the Guardian as the major emitters of SO_2 within 20 km in the area of analysis. The State has chosen to model these facilities using a form of estimated actual emissions. The facilities in the State's modeling analysis and their associated estimate of an annual average of actual SO_2 emissions between 2017 and 2019 are summarized below.

For all modeled sources at Streetman and Guardian facilities, the State provided modeled emission rates (gram/second) based on actual annual SO_2 emissions between 2017 and 2019 with an assumed 8760 hours of operation to calculate an assumed average hourly emission rate. EPA has calculated the 2017 thru 2019 tpy emission rates based on the State's modeled emission rates. The modeled emission rates and annual tpy information for the point sources are summarized in Table 5-5 and the modeled emission rates and annual tpy information for area sources are summarized in Table 5-6. The State calculated the gram/second emission rate to be modeled using the annual emission rate from the TCEQ's State of Texas Air Reporting System (STARS) data and dividing by 8760 hours per year. This methodology did not take into account any operational information, including actual hours of operation for the year. The State's justification for this is that in a review of the STARS emissions data it was noted that the day/week values are not always updated. The State noticed that some *other* facilities/sources that have non-zero annual emissions have 0 hours operated, creating doubt to the accuracy of the data. Also, annual operating hours were only provided for 2018 (though they are included in the EPA's NEI 2017 database).[2] The State believes that assuming the same for the other years (2016-2017) as for 2018 can lead to over- or underestimated emissions values. The State did not address this issue for the 2019 emissions, so it is unclear if it had hours of operation for these sources in 2019. The State believes that while this methodology may slightly underestimate final concentration values, without more detailed hourly operational data there is no defensible way to say which hours the source did not operate.

[2] Available at https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data

Table 5-5. SO_2 Emissions Modeled Emission Rates (g/s) and Actual Annual Emissions 2017-2019 TPY for Point Sources at Facilities in the Navarro County, Texas Area.

Facility	Model ID	Average Emissions (g/s)		
		2017	2018	2019
Guardian	S1002	8.129446	7.591895	7.794412
Guardian	S776	0.002652	0.006326	0.005656
Guardian	S788	0.431499	0.391744	0.20046
Streetman	KILNSTAC	100.48477	99.263328	96.518106
Facility	**Model ID**	**Annual Average Emissions (tpy)**		
Guardian	S1002	282.60	263.91	270.95
Guardian	S776	0.09	0.22	0.20
Guardian	S788	15.00	13.62	6.97
Streetman	KILNSTAC	3493.12	3450.66	3355.23

Table 5-6. SO_2 Emissions Modeled Emission Rates (g/s) and Actual Annual Emissions 2017-2019 TPY for Area Sources at Facilities in the Navarro County, Texas Area.

Facility	Model ID	Average Emissions (g/s-m^2)		
		2017	2018	2019
Guardian	F1	0.000032	0.000032	0.000042
Facility	**Model ID**	**Annual Average Emissions (tpy)**		
Guardian	S1002	1.03	1.03	1.36

To estimate the degree of underestimation of emission rates based on annual emissions that may occur through the use of the State's methodology which divides the annual emissions by the total number of hours in a year, 8,760, EPA used the actual hours of operation (8267 hours) for the one Streetman Plant in the NEI 2017 inventory to calculate an average hourly emission rate for the hours actually operated. The use of 8760 hours instead of 8267 hours in 2017 results in a 6% reduction in the modeled emission rate in 2017.

The EPA's Modeling TAD advises in Section 5.2 that "in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used.". When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall, the uncertainty in the modeled emission rates and the known bias low issues is a significant concern.

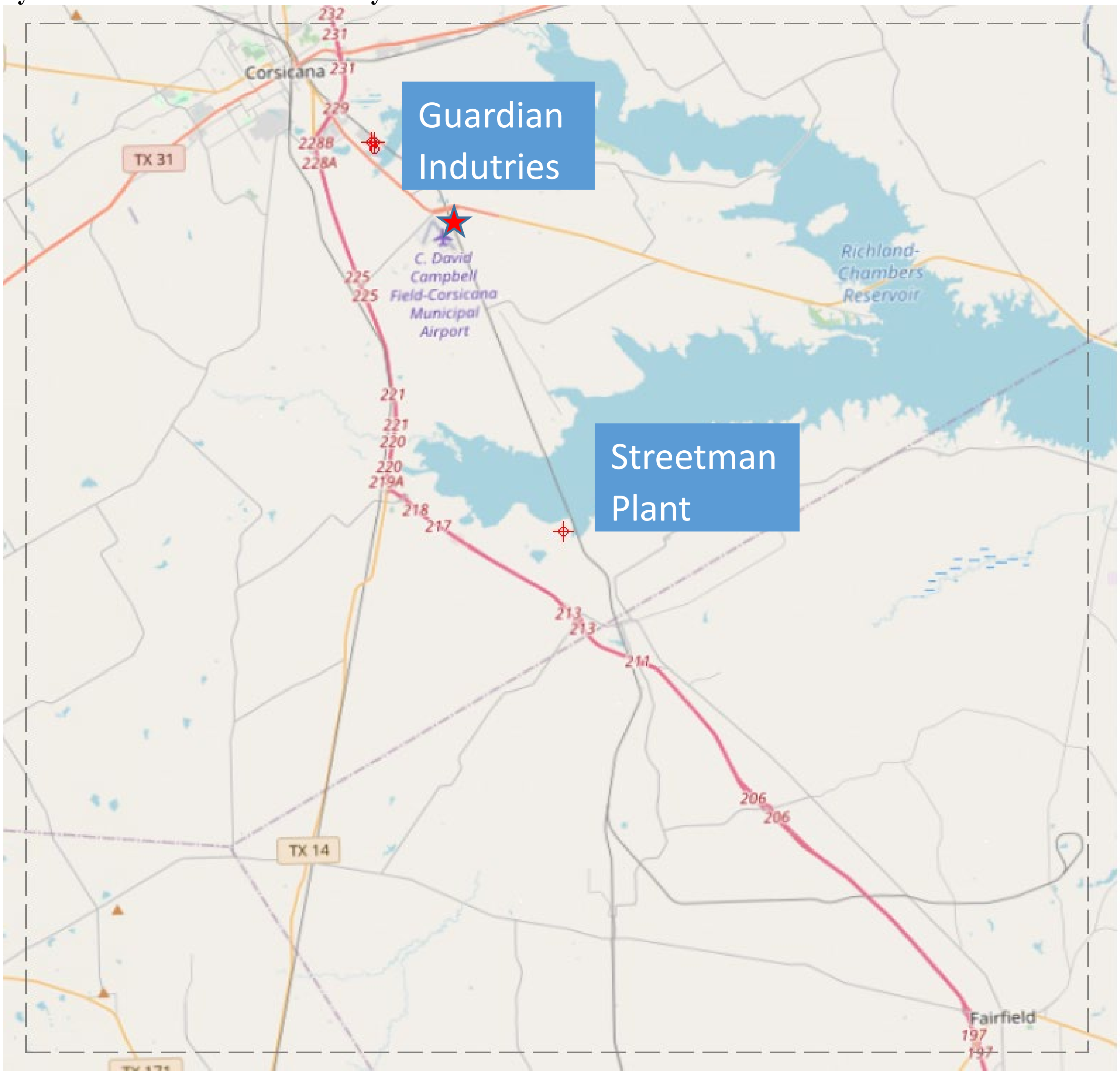
5.4.1.8.Modeling Parameter: Meteorology and Surface Characteristics

As noted in the Modeling TAD, the most recent (or most representative) 3 years of meteorological data (concurrent with the most recent 3 years of emission data, for sources modeled with actual emissions) should be used for designation efforts. The selection of data should be based on spatial and climatological (temporal) representativeness. The representativeness of the data is determined based on: 1) the proximity of the meteorological monitoring site to the area under consideration, 2) the complexity of terrain, 3) the exposure of the meteorological site, and 4) the period of time during which data are collected. Sources of meteorological data include National Weather Service (NWS) stations, site-specific or onsite data, and other sources such as universities, Federal Aviation Administration (FAA), and military stations.

For the area of analysis for the Navarro County, Texas area, the State selected the surface meteorology from the Corsicana Campbell Field (WBAN 53912) located approximately 14 km to the north-northwest of the Streetman Plant (See Figure 5-10). The Corsicana Campbell Field was deemed the most representative NWS site having the appropriate surface based hour-by-hour and one-minute meteorological data sets that can be used in the dispersion modeling as well as being located in the same geographical setting as the Streetman Plant. The State selected upper air data from Shreveport (WBAN 13957).

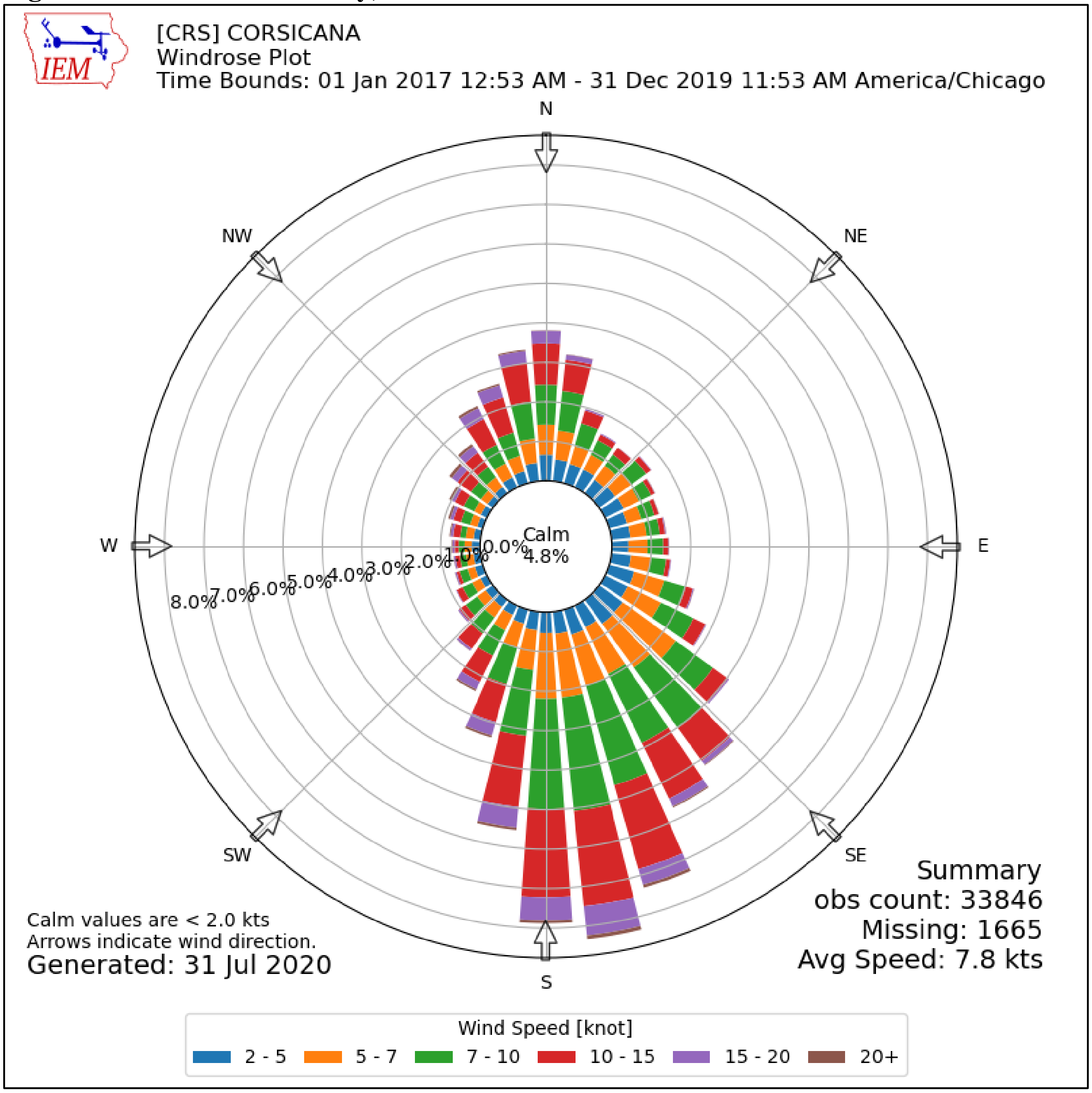
The State used AERSURFACE version 20060 with 1992 National Land Cover Data for Corsicana Campbell Field to estimate the surface characteristics of the area of analysis. The State estimated values for surface roughness length (sometimes referred to as “Zo” and is related to the height of obstacles to the wind flow, which is an important factor in determining the magnitude of mechanical turbulence and the stability of the boundary layer) for 12 spatial sectors out to1 km from the meteorological tower at a monthly temporal resolution. The State also estimated values for albedo (the fraction of solar energy reflected from the earth back into space) and Bowen ratio (the method generally used to calculate heat lost or heat gained in a substance) for a 10 km by 10 km area centered on the meteorological tower for surface moisture classifications which varied by month.

Figure 5-10: Generated by the EPA, the location of this NWS station (Red Star) is shown by the relative to the area of analysis.



Texas did not provide an analysis of the meteorology (*e.g.,* weather and transport patterns) or a wind rose for the Navarro County area other than the modeling analysis. EPA evaluated meteorological data used in the State's modeling to determine how weather conditions, including wind speed and direction, affect the plume of sources contributing to the ambient SO_2 concentrations. As shown in Figure 5-11, meteorological records for the nearest NWS meteorological station at the Corsicana Airport indicate winds blow predominantly from the south.[3] The southerly winds include wind speeds equal to and greater than the speeds noted below as corresponding with the highest average concentrations at the DRR monitor. This indicates that the elevated concentrations from the Streetman plant would be expected to extend to the north as predicted by the State's modeling.

Figure 5-11: Navarro County, Texas Cumulative Annual Wind Rose for Years 2017 – 2019



Meteorological data from the above surface and upper air NWS stations were used in generating AERMOD-ready files with the AERMET processor. The output meteorological data created by the AERMET processor is suitable for being applied with AERMOD input files for AERMOD modeling runs. The State followed the methodology and settings presented in Modeling TAD, User's Guide for the AERMOD Meteorological Preprocessor (AERMET) and Appendix W in

[3] Figure obtained from the Iowa State University Iowa Environmental Mesonet website (https://mesonet.agron.iastate.edu/)

the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics.

Hourly surface meteorological data records are read by AERMET and include all the necessary elements for data processing. However, wind data taken at hourly intervals may not always portray wind conditions for the entire hour, which can be variable in nature. Hourly wind data may also be overly prone to indicate calm conditions, which are not modeled by AERMOD. In order to better represent actual wind conditions at the meteorological tower, wind data of 1-minute duration was provided from Corsicana Campbell Field, but in a different formatted file to be processed by a separate preprocessor, AERMINUTE. These data were subsequently integrated into the AERMET processing to produce final hourly wind records of AERMOD-ready meteorological data that better estimate actual hourly average conditions and that are less prone to over-report calm wind conditions. This allows AERMOD to apply more hours of meteorology to modeled inputs, and therefore produce a more complete set of concentration estimates. As a guard against excessively high concentrations that could be produced by AERMOD in very light wind conditions, the State set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD. In setting this threshold, no wind speeds lower than this value would be used for determining concentrations. This threshold was specifically applied to the 1-minute wind data.

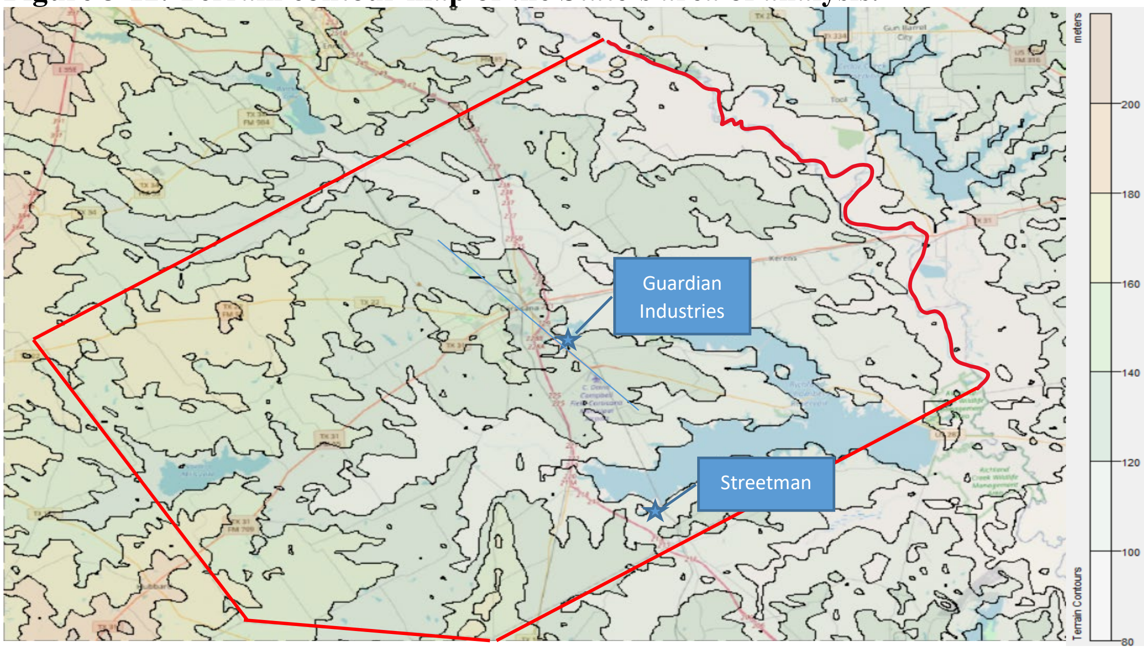
In summary, EPA finds that the State followed the guidance of the Modeling TAD and Appendix W in processing the meteorological data for the surface and upper air sites chosen. EPA finds that the winds modeled are representative of the local winds. However, the State included only 3 years of meteorological data (2017-2019) for the dispersion modeling, as allowed for designations modeling. EPA notes that future attainment demonstration modeling will need to include 5 years of meteorological data.

5.4.1.9.Modeling Parameter: Geography, Topography (Mountain Ranges or Other Air Basin Boundaries) and Terrain

Figure 5-12 shows the terrain contours of Navarro County and portions of surrounding counties. The terrain around the Streetman Plant is at an elevation of about 110 m. The remainder of Navarro County is hilly and bisected with numerous streams and reservoirs. The northern and western parts of the county have hills located about 38 km distant with crests of over 180 m, about 50 m higher than at the monitor. The boundary with Ellis County is about 69 km to the north. There is the potential for slightly enhanced impacts at large distances from the source because of the elevated terrain that shows up in the State's modeling to the west of the plant (see Figures 5-12 and 5-13).

To account for these terrain changes, the AERMAP terrain program within AERMOD was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database with a 30-meter resolution.

Figure 5-12. Terrain contour map of the State's area of analysis.



In summary, EPA finds that the State followed the guidance of the modeling TAD and Appendix W in processing the geographical data.

5.4.1.10. Modeling Parameter: Background Concentrations of SO_2

The Modeling TAD offers two mechanisms for characterizing background concentrations of SO_2 that are ultimately added to the modeled design values: 1) a "tier 1" approach, based on a monitored design value, or 2) a temporally varying "tier 2" approach, based on the 99th percentile monitored concentrations by hour of day and season or month. For this area of analysis, the State chose to use a tier 1 approach based on the monitored design value for the monitor (AQS ID# 48-453-0014) in Austin Texas, describing it as the closest population exposure monitor not influenced by nearby SO_2 emissions sources. This monitor is located approximately 220 km from the Streetman Plant. The background concentration for this area of analysis was determined by the state to be 6.8 micrograms per cubic meter (μg/m^3), equivalent to 2.6 ppb when expressed in 2 significant figures, and that value was incorporated into the final AERMOD results.

Although the monitor selected for background determination is over 200 km from the DRR source and has the lowest design value of any monitor in the State of Texas, EPA believes that the State monitor value selected is acceptable to be used as a background value in accordance with the Modeling TAD because there are no other large SO_2 sources nearby that have not been included in the modeling. The background value may be slightly low compared to upwind sources in the Streetman area but is close enough to be considered representative of the contribution of distant sources to the SO_2 concentrations at the DRR monitor.

5.4.1.11. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Navarro County, Texas area of analysis are summarized below in Table 5-7

Table 5-7. Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Navarro County, Texas Area

Input Parameter	Value
AERMOD Version	19191
Dispersion Characteristics	Rural
Modeled Sources	2
Modeled Stacks	4 + 1 Area Source
Modeled Structures	10
Modeled Fencelines	2
Total receptors	16,604
Emissions Type	Estimated Hourly
Emissions Years	2017-2019
Meteorology Years	2017-2019
NWS Station for Surface Meteorology	Corsicana Campbell Field
NWS Station Upper Air Meteorology	Shreveport
NWS Station for Calculating Surface Characteristics	Corsicana Campbell Field
Methodology for Calculating Background SO_2 Concentration	Tier 1 based on design value at AQS Site 48-453-0014, Austin Northwest, for 2017-2019,
Calculated Background SO_2 Concentration	2.6 ppb or 6.8 μg/m^3

The results presented below in Table 5-8 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 5-8. Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Area of Analysis for the Navarro County, Texas Area

Averaging Period	Data Period	Receptor Location UTM zone 14		99th percentile daily maximum 1-hour SO_2 Concentration (μg/m^3)	
		UTM Easting	UTM Northing	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2017-2019	750576.24	3534366.91	484.5	196.4*

*Equivalent to the 2010 SO_2 NAAQS of 75 ppb using a 2.619 μg/m^3 conversion factor.

The State's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration averaged over the modeled period within the chosen modeling domain is 485.5 μg/m^3, equivalent to 185.0 ppb.[4] This modeled concentration included the background concentration of SO_2 and is based on annual tpy emission rates divided by 8760 hours regardless of hours of actual operation from the facilities and without considering the frequency or magnitude of any hourly emissions peaks. Figures 5-13 and 5-14 below were generated by EPA from modeling files included as part of the State's recommendation and indicates that the predicted value occurred on the north central part of the Streetman Plant fenceline. The State's receptor grid is also shown in the figure.

[4] Texas's October 2020 recommendation indicated the maximum modeled DV at this receptor was 484.5 μg/m^3 (from Texas's modeling files) which Texas was indicated to be converted to 187.4 ppb according to Texas's letter.

Figure 5-13: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations (μg/m³) Averaged Over Three Years for the Area of Analysis for the Navarro County, Texas Area

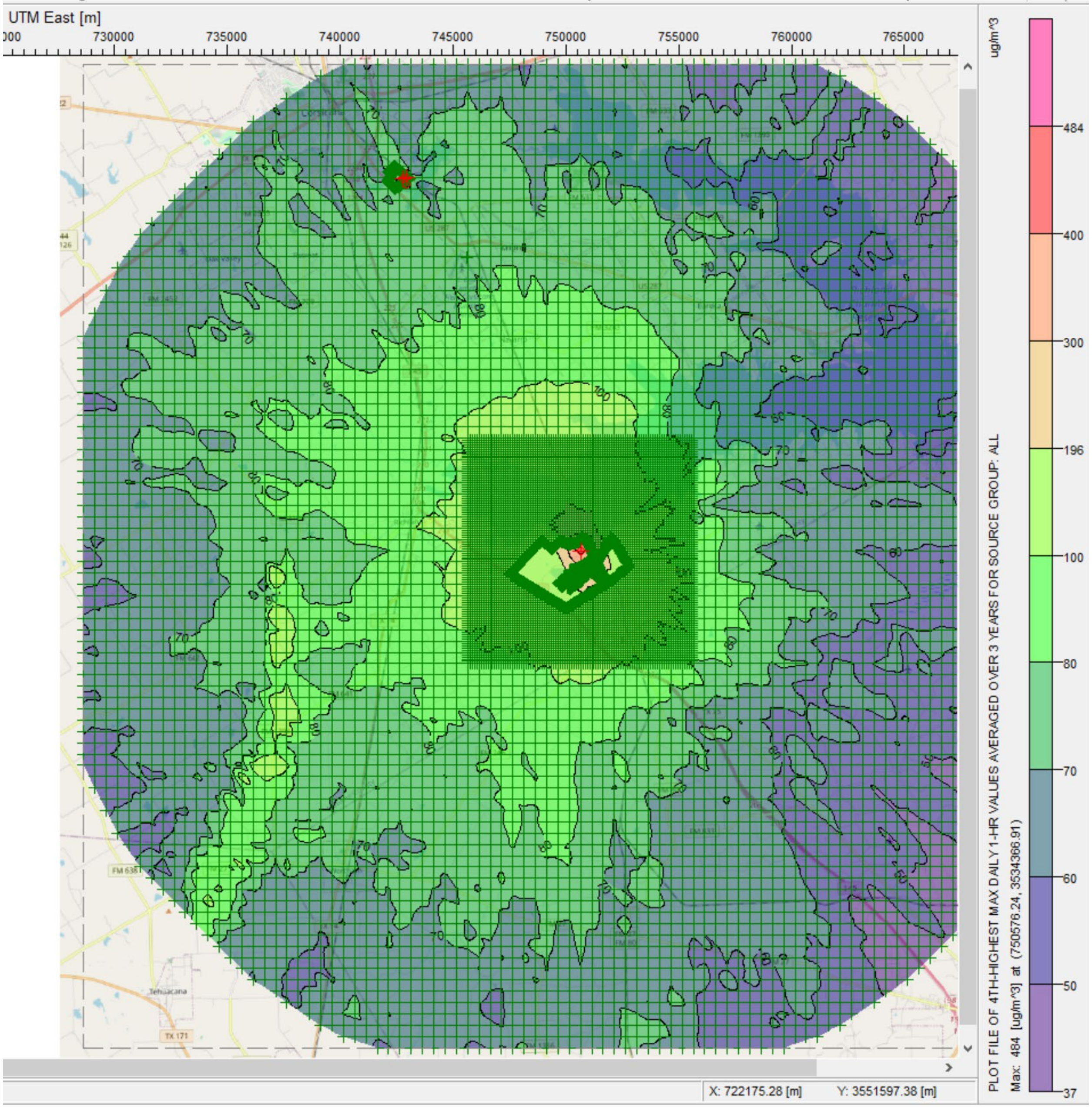
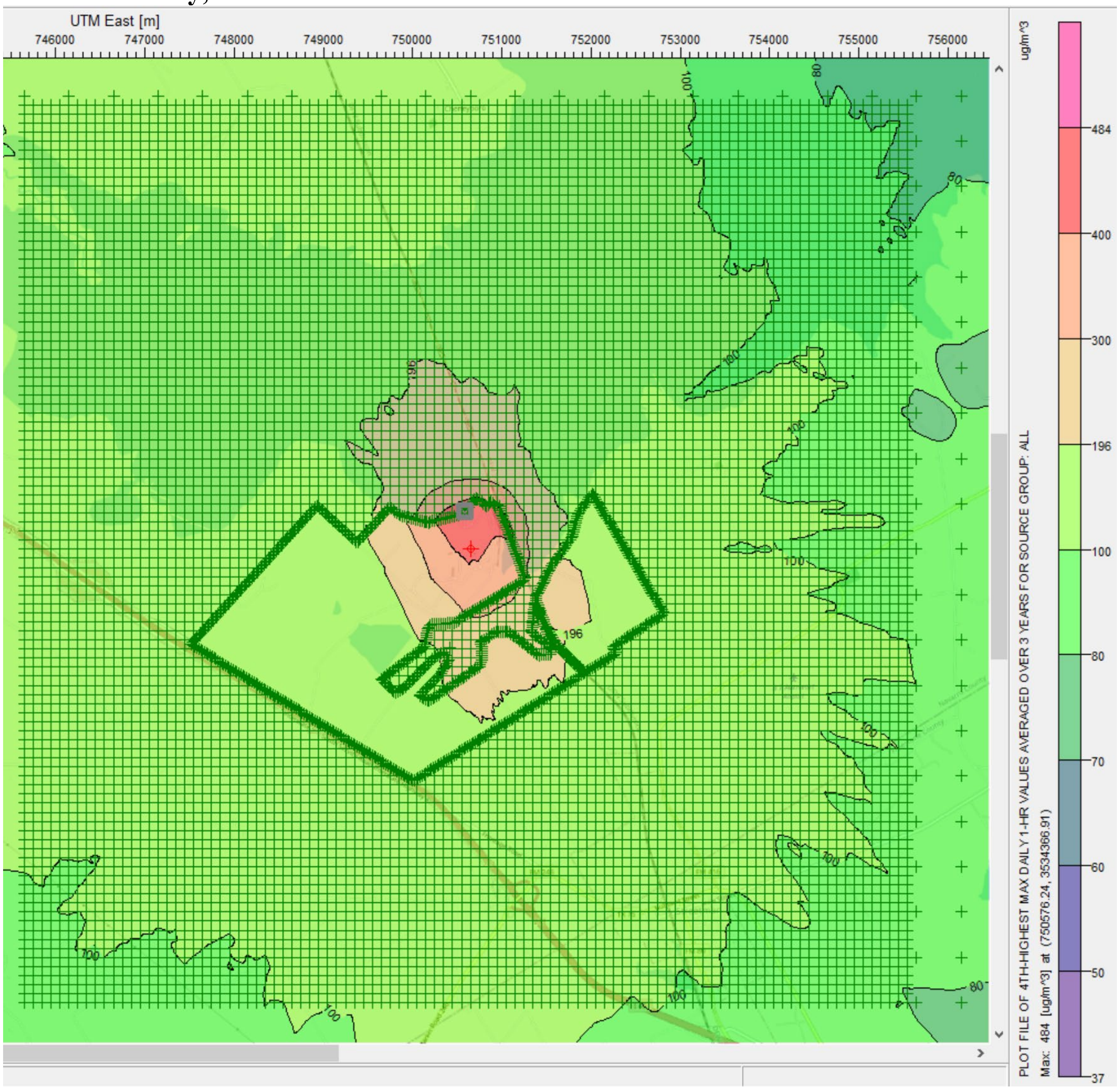


Figure 5-14: Zoomed In - Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations (µg/m^3) Averaged Over Three Years for the Area of Analysis for the Navarro County, Texas Area.



The modeling submitted by the state indicates that the 2010 SO_2 NAAQS is violated on the north side of the facility, specifically the northside fenceline of the plant has the receptor with the highest modeled design concentration of 484.5.8 µg/m^3. EPA notes that the modeled violations extend out to over 500 meters from Streetman's north property line. The modeling results also include the area in which a 2010 SO_2 NAAQS violation was modeled, information that is relevant to the selection of the boundaries of the area being designated. There may be some terrain impacts to the west and southwest of the Streetman Plant, but those maximum DVs appear to be between 100 -196.4 µg/m^3, which is less than the 2010 SO_2 NAAQS.

5.4.1.12. The EPA's Assessment of the Modeling Information Provided by the State

EPA's Modeling TAD guidance for designations purposes allows more flexibility and the State's modeling met most of EPA's guidance as further discussed below with the exceptions of some concerns on how emissions were included in the modeling (*e.g.,* the use of an assumed hourly average based on dividing each year's annual emissions by 8760). Additionally, the modeling followed EPA guidance for surface processing, and meteorological processing (Appendix W recommends 5 years whereas the Modeling TAD allows for 3 years of meteorology). Texas used the default options for the current version of AERMOD and an acceptable background concentration. EPA concurs with the rural land use characterization.

The emissions used in the modeling were the biggest concern because it introduces uncertainty in the size of the boundary, which is dependent on the geographic extent of the violations. The main points of departure from Appendix W and the Modeling TAD are: use of assumed hourly emission rates derived by dividing each year's annual emissions by 8760, rather than using true actual emissions (or allowable emissions if trying to overcome a violating monitor according to EPA's Round 4 guidance). The use of tpy emissions averaged over 8760 hours without accounting for hours of operation or variability in short term emission rates inherently underestimates the true actual hourly emissions; we note that the underlying guidance for determining a nonattainment area boundary using modeling does allow for the use of actual emissions but recommends using short-term actual emission rates especially for sources that have variable emissions.

EPA's first concern is that Texas underestimated its hourly modeled emissions rates by calculating the emissions using reported annual tpy and total number of hours in a year instead of actual operating hours. As discussed above, using the reported hours of operation (8267 hours) for the Streetman Plant in 2017 underestimates actual hourly emissions by 6%. This would lead to an underestimation of modeled impacts of approximately 6% for 2017 and this issue is also a concern for the other years modeled (2018 and 2019). Overall, the impact of using 8760 hours instead of actual operating hours leads to underestimation of impacts and underestimation of the geographic extent of the violations in the State's modeling, which results in an underestimation of the size of the State's recommended nonattainment area. The second concern is that the Streetman Plant has one large SO_2 source that has the ability to burn coke and coal with varying levels of sulfur content based on their current permits, so short term emission rates could be highly variable depending on the fuel used. For sources that combust coke, the sulfur content of the coke tends to be more variable than the sulfur content of the coal, so EPA expects that there is a higher degree of variability in short term emission rates than if the plant just combusted coal. Regardless, the ability to burn different fuels with varying sulfur content yields more variability in short term hourly SO_2 emissions. This variability in short term 1-hour emission rates would lead to greater DVs at receptors and a greater size of the area that violates the 2010 SO_2 NAAQS than is estimated with constant (unvarying) emission rates.

Since the form of the 2010 1-hour SO_2 NAAQS standard is the 99th percentile (High Fourth High) values, the modeling and resulting DVs are very sensitive and are biased low when temporal variability is not addressed. The EPA's Modeling TAD advises in Section 5.2 that "in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used." When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall, the uncertainty in the modeled emission rates and the known bias low issues is a significant concern.

It is important to note that for a short-term standard such as the 2010 1-hour SO_2 NAAQS, where an air agency is considering developing a longer term-averaged limit for a SIP in order to bring a violating area into attainment, that after identifying and modeling a 1-hour limit that would provide for attainment if constantly met by the source EPA strongly recommends that the stringency of any longer-term limit should be tightened by applying an adjustment factor so as to account for short-term variability in the emission rate and thereby make the longer term limit comparably stringent to an attaining constant 1-hour limit. This guidance (including EPA's 2014 SO2 modeling for Attainment Demonstrations)[5] implies, conversely, that a variable set of emissions can cause significantly worse air quality than constant emissions at the average rate of the variable emissions set. The guidance addresses averaging times up to 30 days; the difference between variable emissions impacts and constant emissions impacts is likely to be greater with annual average emissions. This short-term variability is not considered in the State's modeling, which causes the modeled impacts to be prone to underestimate the magnitude of concentrations and the geographic extent of likely violations. This further illustrates the need to increase the size of the nonattainment area to address the concern of not addressing or including temporally varying emissions.

EPA recognizes that the Streetman and Guardian sources do not have Continuous Emissions Monitor (CEM) data. No evaluation was provided to compare the modeled emission rate to the short term permitted allowable emissions or an estimate of a short term maximum actual emission rate to provide a bounding of how much variability could occur and how that would impact model results and the size of the area of modeled nonattainment. EPA concludes that these concerns show that the State's recommended nonattainment area is biased small and an expanded nonattainment area is necessary to address these concerns, leading to an expanded area.

5.5. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Navarro County, Texas Area

These factors have been incorporated into the air quality modeling efforts and results discussed above. EPA is giving consideration to these factors by considering whether they were properly incorporated and by considering the air quality concentrations predicted by the modeling.

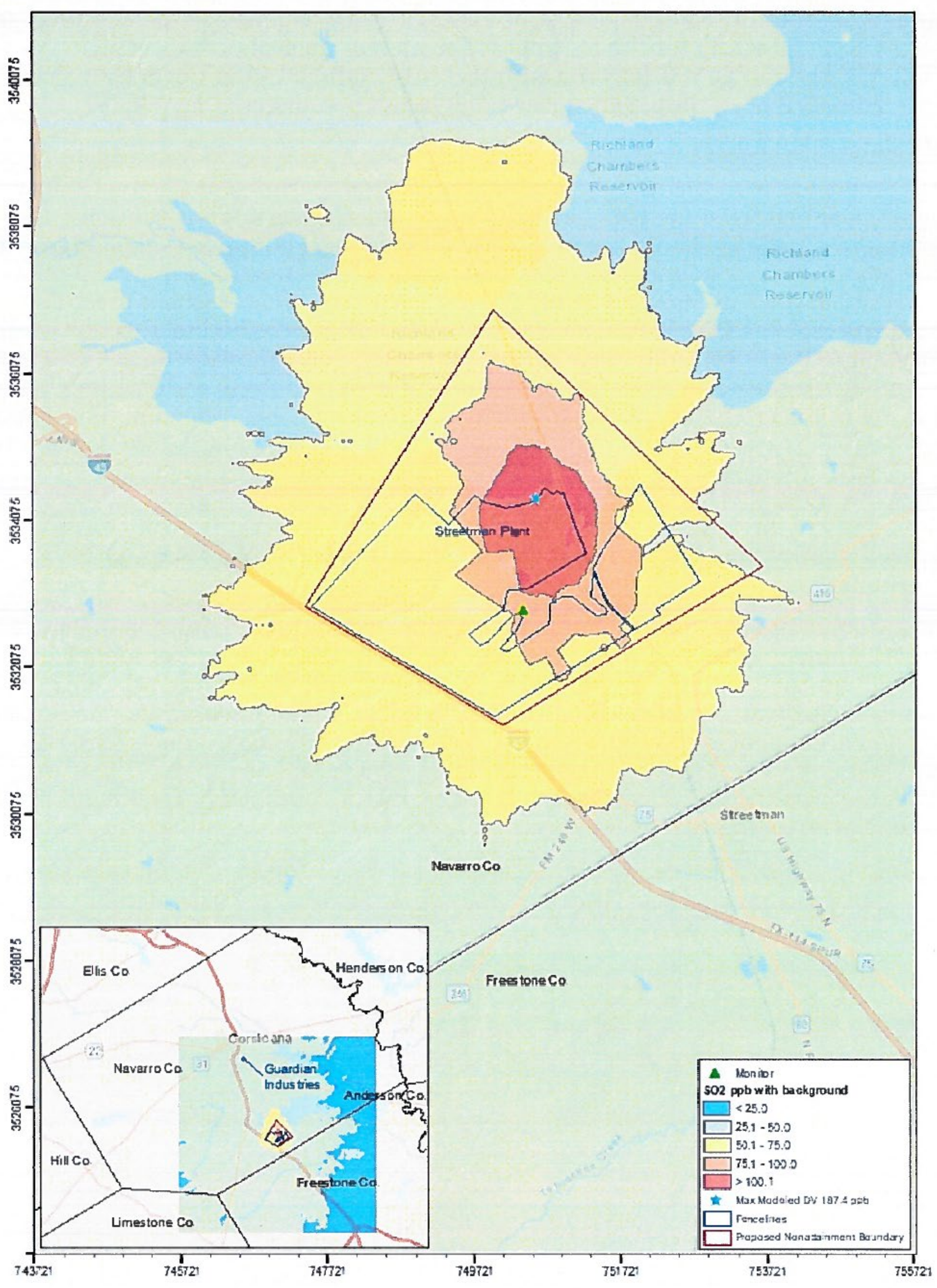
[5] EPA "Guidance for 1-Hour SO2 Nonattainment Area Sip Submissions" April 2014. In the docket and available at https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf.

5.6. Jurisdictional Boundaries in the Navarro County, Texas Area

EPA considers existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary for carrying out the air quality planning and enforcement functions for the area. Our goal is to base designations on clearly defined legal boundaries that align with existing administrative boundaries when reasonable. Existing jurisdictional boundaries used to define a nonattainment area must encompass the area that has been identified as meeting the nonattainment definition.

Texas's October 2020 comments on our intended designation asserted that only a small part of Navarro County surround the Streetman Plant should be designated nonattainment and EPA should not designate the entire Navarro County nonattainment as EPA indicated in the intended designation. The State provided modeling and recommended a small area based on capturing the receptors with modeled DVs violating the standard; specifically they recommended nonattainment boundaries demarcated by permanent physical figures such as Interstate 45 roadway, Streetman Plant property lines, and a rail crossing. As shown in Figure 5-15, Texas recommended the Navarro County nonattainment area is enclosed by the following UTM coordinates (NAD 83 Datum, UTM Zone 14): 750006, 3536931; 753657, 3533451; 750126, 3531273; 747444, 3532904.

Figure 5-15: Texas's Model Results and Recommended Navarro County Nonattainment Area.



5.7. Other Information Relevant to the Designation of the Navarro County, Texas Area

The EPA did not receive additional information relevant to the designation of this area.

5.8. EPA's Assessment of the Available Information for the Navarro County, Texas Area

A monitor in the Navarro County area, specifically the monitor sited to characterize air quality around the Streetman Plant, is violating the 2010 SO_2 NAAQS based on the 2017-2019 design value. There is also a monitor in Corsicana in Navarro County that is attaining the 2010 SO_2 NAAQS but is 20 km from the Streetman Plant. As explained in our intended designations TSD, EPA proposed to designate all of Navarro County as nonattainment.

As described in the preceding sections, Texas submitted air dispersion modeling to attempt to demonstrate that EPA's intended designation of the entirety of Navarro County should be limited to a small portion of Navarro County based Texas's modeling discussed above. Texas's modeling indicates nonattainment values extend to approximately 0.5 km from the Streetman Plant and Texas recommended a small area to encapsulate the modeled nonattainment receptors.

EPA examined the modeling to determine if it could be used to help determine the boundaries of a nonattainment area. We found 2 issues in the modeling which would tend to bias the model results low, preventing a straightforward/complete reliance on the modeling to establish the boundaries of the nonattainment area. The assumed hourly emission rates used were based on yearly annual average emissions leading to two separate concerns in underestimating emission rates (a) the average hourly rate is estimated as the annual total divided by an assumed 8760 hours of operations/emissions rather than by the actual hours of operation when emissions occurred, which artificially drives the assumed average hourly rate down by including hours when no emissions could have occurred at all; and (b) short-term variability of the emission rate is not considered, which masks actual hourly peaks of emissions that could yield concentrations that exceed the level of the 2010 SO_2 NAAQS even if the annual average hourly rate does not.

The EPA's Modeling TAD advises in Section 5.2 that "in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) is not an accurate representation of actual emissions for sources that experience emissions rate variability throughout the year and should not be used.". When CEMS data are not available, varying emission factors can be used to represent some level of temporal variability. It also explicitly states in the absence of CEMS data, simply dividing the annual emissions by the number of hours in the year (8,760 for non-leap years or 8,784 for leap years) should not be used. Overall, the uncertainty in the modeled emission rates and the known bias low are issues of a significant concern.

To further understand potential impacts of these two concerns we further discuss these two issues below.

First, the modeling relies on the use of average hourly emission rates based on annual tpy values for each year averaged over 8760 hours, whereas reported data indicates some sources ran for less than 8760 hours. EPA's 2017 NEI data indicates that the only SO_2 emission source at Streetman ran for 8269 hours in 2017 which would indicate that even the modeled assumed hourly average emission rate for 2017 is underestimated by 6% which would correlate to 2017 impacts from Streetman to be underestimated by a similar amount. We do not have the reported hours of operation for 2018 and 2019 so a similar estimate cannot be done but the actual hours of operation could be lower/higher and yield more uncertainty in how much the use of 8760 to average the hours could be underestimating the violation in the modeling and the size of the area of violation.

Since the maximum modeled DV is to the north of Streetman Plant and the concentrations above the standard are mostly due to the Kiln source at Streetman, EPA concentrated on Streetman and did not include Guardian in this analysis. For 2017, for the one source at the Streetman Plant, the modeled emission rate is 6% lower than the true average annual emission rate based on just the actual number of hours of operation.[6] This is an estimate only for one year of the 3-year period, but if this is typical of the full period, the maximum modeled design value and other high values near the standard due to Streetman in the absence of background concentration would be increased by a similar amount if the modeled emission rates were corrected just to account for the actual operating hours. Since the modeling analysis maximum design value occurs to the north of the Streetman Plant where no other modeled sources would align, this modeled design value is due to Streetman's emissions and would also increase by about 6%. Assuming the same 6% differential exists for the hours of operation in 2018 and 2019 we evaluate what could be the potential impact on the maximum modeled concentration. The maximum modeled design value for this location is 477.7 $\mu g/m^3$ which does not include the 6.8 $\mu g/m^3$ background monitor value added which yields a design value of 484.5 $\mu g/m^3$. The adjusted modeled design value using a 6% adjustment to the 477.7 $\mu g/m^3$ value would be 506.2 $\mu g/m^3$ without the addition of the background value and 513.0 $\mu g/m^3$ with background added, which is in excess of the NAAQS level of 196.4 $\mu g/m^3$. This adjustment would be needed for receptors throughout the domain and would lead to an expanded area with modeled violations. This adjustment is solely to account for annual hours of operation and does not include the effects of short-term variability which would further increase the proper modeled concentration. Taking into account this one year of hours of operation and assuming it applies for other years would indicate the area of modeled exceedances should be expanded. This adjustment is to demonstrate that the State's modeling showing violations and their proposed boundary are underestimating the area above the NAAQS

[6] It is important to note that for a short-term standard such as the 1-hour SO_2 standard, where an air agency is considering developing a longer term-averaged limit for a SIP in order to bring a violating area into attainment, that after identifying and modeling a 1-hour limit that would provide for attainment if constantly met by the source EPA strongly recommends that the stringency of any longer-term limit should be tightened by applying an adjustment factor so as to account for short-term variability in the emission rate and thereby make the longer term limit comparably stringent to an attaining constant 1-hour limit. This guidance (including EPA's 2014 SO2 modeling for Attainment Demonstrations) implies, conversely, that a variable set of emissions can cause significantly worse air quality than constant emissions at the average rate of the variable emissions set. The guidance addresses averaging times up to 30 days; the difference between variable emissions impacts and constant emissions impacts is likely to be greater with annual average emissions. This short-term variability is not considered in the State's modeling, which causes the modeled impacts to be prone to underestimate the magnitude of concentrations and the geographic area of likely violations.

and that the boundary needs to be made larger to capture all of the potentially violating area. This analysis does not fully capture all the factors that would increase the potential violating area but is illustrative of the need to increase the area to address the factors of actual hours of operation and also the lack of assessment of variability in emission rates throughout the year that results from using any averaged hourly value rather than true hourly emissions rates that occurred in the period.

Second, the Streetman Plant has one large SO_2 source that has the ability to burn coke and coal with varying levels of sulfur content based on their current permits and short-term emission rates can be highly variable depending on the fuel used. While actual emission rates can be used to determine the boundaries of a nonattainment area[7], EPA recommends to model short term actual emissions and Texas's analysis did not include any evaluation comparing the modeled assumed average hourly emission rate to the short term permit allowable or an estimate of short term maximum actual emission rate to provide a bounding of how much variability could occur and how it could impact model results. In analysis of other sources that combust coke the sulfur content of the coke tends to be more variable than the sulfur content of the coal so EPA expects that there is a higher degree of variability in short term emission rates than if the Plant just combusted coal. Regardless, the ability to burn different fuels with varying sulfur content yields more variability in short term hourly SO_2 emissions. Failure to consider lack of variability in short term 1-hour emission rates would lead to underestimation of the DVs at receptors that would cause underestimation of the size of the area that violates the NAAQS. We understand that the Streetman and Guardian sources do not have CEM data, but no evaluation was provided to compare the modeled emission rate to the short term permit allowable or an estimate of short term maximum actual emission rate to provide a bounding of how much variability could occur and how that would impact model results and the size of the area of modeled nonattainment. TCEQ could have provided some evaluation to estimate a maximum actual emision rate or modeling of short term maximum allowables could have been done or factored in to better inform the potential area that would be modeling DVs above the standard. EPA's review is that these concerns indicate the State's modeled area of nonattainment is biased small and addressing these concerns leads to an expanded violating area.

We were able to use aspects of the modeling and modeled concentrations available in the information from TCEQ to reduce the size of EPA's intended nonattainment area (all of Navarro County) even though we have concerns that the modeling is biased low and underestimates the area with modeled violations. In an effort to account for the deficiencies in the modeling, EPA has used a reduced design value threshold level to define the borders of the nonattainment area with a buffer to address the concerns discussed above that lead to uncertainties in the modeling. We used a value of 98.2 µg/m3 (37.5 ppb) or ½ the NAAQS level. We believe that given the concerns about hours of operation and variability of short-term emissions this level of adjustment is reasonable. This concern of the low bias in the State's modeled design value is corroborated at the DRR monitor where the observed concentration was underestimated by a factor of 2.02 (81.61 vs 165 ppb).[8] We note these model to monitor comparisons but the reason to adjust the nonattainment area is because of our concerns about hours of operation and variability of short-

[7] Round 4 memo.

[8] We note that in Texas's Modeling report they indicated the monitor DV for 2017-2019 was 141.05 ppb but EPA's data indicates the official 2017-2019 DV is 165 ppb.

term emissions and the impacts on modeled DVs. While EPA is unable to make a precise estimate of the degree of uncertainty in the State's analysis or of the degree of underestimation that the State's analysis may have, EPA considers a factor of 2 reduction in the threshold to be a reasonable approximation Thus, the use of a factor of 2 reduction in the threshold is reasonable and ensures with a high degree of certainty that all areas of possible exceedances are included in the nonattainment area. Boundary modeling could have also been done with allowables and we note that Attainment Demonstration modeling will have to model allowable emission rates in accordance with 40 CFR Part 51 Appendix W, and, therefore, modeling allowables would also expand the nonattainment area compared to the State and industry modeling. So, we are using a general factor of 2 to yield a reasonable area of nonattainment for designation.

EPA has addressed concerns about using longer term average emission rates and other uncertainties in emission rates used in modeling for 1-Hour SO2 NAAQS issues in other designation actions[9] and EPA has also done some technical analysis previously documenting the technical concerns with using longer term average emission rates that do not take into account variability and that can lead to underestimations for 1-Hour SO2 NAAQS for regulatory actions such as designations, attainment demonstrations, and permitting.[10] Much of EPA's technical analyses has been on the impacts being biased low if not accounting for the difference/variability between 30-day average limits and 1-hour limits with 1-hour limits resulting in larger impacts (DVs), and the difference would be larger between annual average limits/emission rates and 1-hour emission rates and would result in an even larger nonattainment area than modeling the 1-hour equivalent (CEV) of a 30-day limit . EPA notes that the facts of each situation are unique and case-specific in how a boundary is determined in these situations.

To determine the new boundary with a buffer to address concerns/uncertainties in the modeling boundaries EPA plotted the resulting design value fields with new concentration contour values from the State's modeling files and considered four factors (1) the extent of modeled annual 4th high (99th percentile) hourly values above the threshold, (2) the locations of the sources which contribute to the elevated values, (3) the locations of any previously designated areas, and (4) contribution to any nearby nonattainment areas. See Figure 5-16 for a revised modeling plot with yellow values indicates receptors with modeling values above 98.2 ug/m^3. The new polygon boundary is colored red and is sized to capture all receptors with modeled DVs above 98.2 ug/m^3. Texas's recommended boundary indicated in blue is also included.

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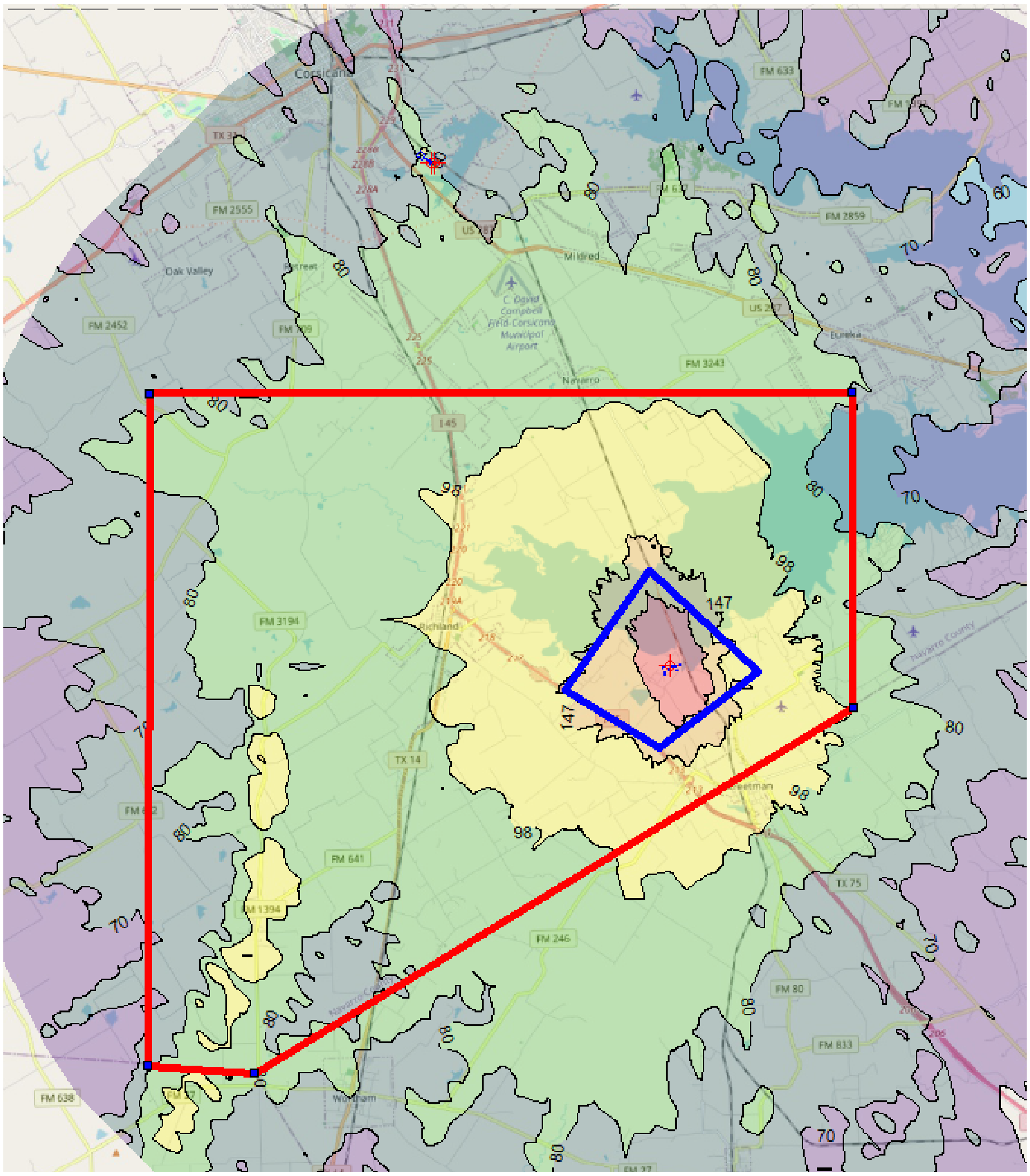
[9] EPA Round 2 Designations (Docket ID NO. EPA–HQ–OAR–2014–0464), Maryland TSD, (add others) available in the docket and at https://www.epa.gov/sulfur-dioxide-designations/epa-completes-second-round-sulfur-dioxide-designations. EPA is also adjusting boundaries in another final designation in this action (Madrid County, Missouri designation) - See intended designation TSD in the docket and available at https://www.epa.gov/sites/production/files/2020-08/documents/05-mo-rd4_intended_so2_designations_tsd.pdf and Final TSD available in the docket for this action.

[10] EPA 2014 "Guidance for 1-Hour Sulfur Dioxide (SO2) Nonattainment Area State Implementation Plans (SIP) Submissions" available at https://www.epa.gov/sites/production/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf

Figure 5-16: Modeling Plot adjusted to show areas above 98.2 ug/m3 and other color contours that also exceed 98.2 ug/m3



While there is an existing nearby nonattainment area (around Big Brown power plant in Freestone County), based on the facility being now shutdown we did not consider it for inclusion for the Navarro County Nonattainment Area. EPA constructed a new boundary based on the adjusted modeling to ensure that considerations 1 and 2 are encompassed. Considerations 3 and 4 did not impact the determination of the boundaries. Given that there is uncertainty in the geographic extent of the current NAAQS violations, EPA's boundary provides a high level of confidence that it encompasses the area of Navarro County where violations of the NAAQS are likely to occur. We note that EPA's boundary does not include any additional major sources of SO_2.

The EPA concludes that our final nonattainment area is a 5-sided polygon bounded by UTM Zone 14 with datum NAD83 as follows:

Vertices	Easting (m)	Northing (m)
SW	734940.8	3520745.2
SC	737000.0	3520585.9
SE	756678.9	3532601.9
NE	756678.9	3542866.0
NW	734940.8	3542866.0

It has clearly defined legal boundaries and we find these boundaries to be a suitable basis for defining our final nonattainment area. Figure 5-17 gives EPA's final nonattainment boundary along with the State's recommended nonattainment area boundary.

EPA has no evidence to suggest that violations are occurring in the remainder of Navarro County or that there are sources outside the nonattainment area that are contributing to the violations in the nonattainment area. There is a monitor in Corisicana Airport Monitor (north of the Streetman Plant and in the lower center area of Navarro County) that has a 2017-2019 DV of 43 ppb Specifically, the remainder of Navarro County does not contain any sources that emitted greater than 100 tons per year of SO_2 in 2016-2018 other than the Guardian Industries facility that was included in the State's modeling and is outside the nonattainment area. For these reasons, EPA is designating the remainder of Navarro County as attainment/unclassifiable.

5.9. Summary of EPA's Final Designation for the Navarro County, Texas Area

After careful evaluation of the State's recommendation and supporting information, as well as all available relevant information, the EPA is designating part of Navarro County (5-sided polygon see vertices below) as nonattainment, for the 2010 SO_2 NAAQS. Specifically, the boundaries form a 5-sided polygon that is comprised of 5 UTM Zone 14 coordinates:

(1) Vertices—UTM Easting (m) 734940.8, UTM Northing (m) 3520745.2,
(2) vertices—UTM Easting (m) 737000.0, UTM Northing (m) 3520585.9,
(3) vertices—UTM Easting (m) 756678.9, UTM Northing (m) 3532601.9,
(4) vertices—UTM Easting (m) 756678.9, UTM Northing (m) 3542866.0
(5) vertices—UTM Easting (m) 734940.8, UTM Northing (m) 3542866.0

Figure 5-17 shows the boundary of this designated area.

Additionally, the EPA is designating the remainder of Navarro County, Texas as attainment/unclassifiable.

Figure 5-17 Boundary of the Final Navarro County, Texas Nonattainment Area (Indicated in Red)