Technical Support Document:

Chapter 7
Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for Colorado

1. Summary

Pursuant to section 107(d) of the Clean Air Act (CAA), the U.S. Environmental Protection Agency (the 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). 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 the CAA as any area that meets the NAAQS and does not contribute to a nearby area that does not meet the NAAQS. Unclassifiable areas are defined by the CAA as those that cannot be classified on the basis of available information as meeting or not meeting the NAAQS. In this action, the EPA has defined a nonattainment area as an area that the EPA has determined violates the 2010 SO_2 NAAQS or contributes to a violation in a nearby area, based on the most recent 3 years of air quality monitoring data, appropriate dispersion modeling analysis, and any other relevant information. An unclassifiable/attainment area is defined by the EPA as an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS[1]. An unclassifiable area is defined by EPA as an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

This technical support document (TSD) addresses designations for all remaining undesignated areas in Colorado for the 2010 SO_2 NAAQS. In previous final actions, the EPA has issued

[1] The term “designated attainment area” is not used in this document because the EPA uses that term only to refer to a previous nonattainment area that has been redesignated to attainment as a result of the EPA’s approval of a state-submitted maintenance plan.

designations for the 2010 SO_2 NAAQS for selected areas of the country.[2] The EPA is under a December 31, 2017, deadline to designate the areas addressed in this TSD as required by the U.S. District Court for the Northern District of California.[3] We are referring to the set of designations being finalized by the December 31, 2017 deadline as “Round 3” of the designations process for the 2010 SO_2 NAAQS. After the Round 3 designations are completed, the only remaining undesignated areas will be those where a state began operation of a new SO_2 monitoring network meeting EPA specifications referenced in EPA’s SO_2 Data Requirements Rule (DRR). (80 FR 51052). The EPA is required to designate those remaining undesignated areas by December 31, 2020.

Colorado submitted its first recommendation regarding designations for the 2010 1-hour SO_2 NAAQS on March 18, 2011. In this submittal, the state recommended that the EPA designate Air Quality Control Region (AQCR) 3 as attainment based on available monitoring data, and recommended a designation of unclassifiable/attainment for AQCRs 1-2 and 3-13, excluding portions of AQCR 9 that contain tribal lands belonging to the Ute Mountain Ute and/or Southern Ute Indian tribes. On May 18, 2011, the Southern Ute Indian Tribe submitted a designation recommendation of unclassifiable for the exterior boundaries of the Reservation based on a lack of available SO_2 monitoring data, while noting that there are no large sources of SO_2 on the Tribe’s lands. The state submitted updated air quality analysis and updated recommendations on March 23, 2017. In our intended designations, we have considered all the submissions from the state, except where a recommendation in a later submission regarding a particular area indicates that it replaces an earlier recommendation for that area we have considered the recommendation in the later submission.

For the areas in Colorado that are part of the Round 3 designations process, Table 1 identifies the EPA’s intended designations and the counties or portions of counties to which they would apply. It also lists Colorado’s current recommendations. The EPA’s final designation for these areas will be based on an assessment and characterization of air quality through ambient air quality data, air dispersion modeling, other evidence and supporting information, or a combination of the above.

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[2] A total of 94 areas throughout the U.S. were previously designated in actions published on August 5, 2013 (78 FR 47191), July 12, 2016 (81 FR 45039), and December 13, 2016 (81 FR 89870).

[3] *Sierra Club v. McCarthy*, No. 3-13-cv-3953 (SI) (N.D. Cal. Mar. 2, 2015).

Table 1. Summary of the EPA's Intended Designations and the Designation Recommendations by Colorado

Area/County	Colorado's Recommended Area Definition	Colorado's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Craig, Colorado Area	10 km radius around the Craig Generating Station	Unclassifiable/ Attainment	Same as State's Recommendation	Same as State's Recommendation
Hayden, Colorado Area	10 km radius around the Hayden Generating Station	Unclassifiable/ Attainment	Same as State's Recommendation	Same as State's Recommendation
North Denver Area (Adams (p), Denver (p), Jefferson (p))	10 km radius around the Cherokee Generating Station	Unclassifiable/ Attainment	Same as State's Recommendation	Same as State's Recommendation
Pueblo, Colorado Area	10 km radius around the Comanche Station with the additional incorporation of land within Pueblo city limits, St. Charles Mesa CCD, and census tract 29.03	Unclassifiable/ Attainment	Same as State's Recommendation	Same as State's Recommendation

Area/County	Colorado's Recommended Area Definition	Colorado's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Colorado Air Quality Control Region (AQCR) 03	Full AQCR	Attainment	Same as State's Recommendation	Unclassifiable/Attainment
Remaining Undesignated Areas to Be Designated in this Action*	Full AQCRs 1, 02, 04, 05, 06, 07, 08, 09 (excluding Southern Ute Indian Tribe and Ute Mountain Ute Tribe lands), 10, 11, 12 and 13	Unclassifiable/ Attainment	Same as State's Recommendation	Same as State's Recommendation

* The EPA intends to designate the remaining undesignated counties (or portions of counties) in Colorado as "unclassifiable/attainment" as these areas were not required to be characterized by the state under the DRR and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the areas may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These areas that we intend to designate as unclassifiable/attainment (those to which this row of this table is applicable) are identified more specifically in section 6 of this TSD.

Areas that the EPA previously designated unclassifiable in Round 1 (*See* 78 FR 47191) and Round 2 (*See* 81 FR 45039 and 81 FR 89870) are not affected by the designations in Round 3 unless otherwise noted. In Colorado, portions of El Paso and Morgan Counties were designated unclassifiable in Round 2.

2. General Approach and Schedule

Updated designations guidance documents were issued by the EPA through a July 22, 2016, memorandum and a March 20, 2015, memorandum from Stephen D. Page, Director, U.S. EPA, Office of Air Quality Planning and Standards, to Air Division Directors, U.S. EPA Regions I-X. These memoranda supersede earlier designation guidance for the 2010 SO_2 NAAQS, issued on March 24, 2011, and identify factors that the EPA intends to evaluate in determining whether areas are in violation of the 2010 SO_2 NAAQS. The documents also contain the factors that the EPA intends to evaluate in determining the boundaries for designated areas. These factors include: 1) air quality characterization via ambient monitoring or dispersion modeling results; 2) emissions-related data; 3) meteorology; 4) geography and topography; and 5) jurisdictional boundaries.

To assist states and other interested parties in their efforts to characterize air quality through air dispersion modeling for sources that emit SO_2, the EPA released its most recent version of a draft document titled, "SO_2 NAAQS Designations Modeling Technical Assistance Document" (Modeling TAD) in August 2016.[4]

Readers of this chapter of this TSD should refer to the additional general information for the EPA's Round 3 area designations in Chapter 1 (Background and History of the Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard) and Chapter 2 (Intended Round 3 Area Designations for the 2010 1-Hour SO_2 Primary National Ambient Air Quality Standard for States with Sources Not Required to be Characterized).

As specified by the March 2, 2015, court order, the EPA is required to designate by December 31, 2017, all "remaining undesignated areas in which, by January 1, 2017, states have not installed and begun operating a new SO_2 monitoring network meeting EPA specifications referenced in EPA's" SO_2 DRR. The EPA will therefore designate by December 31, 2017, areas of the country that are not, pursuant to the DRR, timely operating EPA-approved and valid monitoring networks. The areas to be designated by December 31, 2017, include the areas associated with 4 sources in Colorado meeting DRR emissions criteria that states have chosen to be characterized using air dispersion modeling, the areas associated with 3 sources in Colorado for which air agencies imposed emissions limitations on sources to restrict their SO_2 emissions to less than 2,000 tpy, an area associated with one DRR source which Colorado characterized based on its existing monitoring network, and other areas not specifically required to be characterized by the DRR.

Because many of the intended designations have been informed by available modeling analyses, this preliminary TSD is structured based on the availability of such modeling information. There is a section for each county for which modeling information is available. The remaining to-be-designated counties (grouped by AQCR) are then addressed together in section 6.

The EPA does not plan to revise this TSD after consideration of state and public comment on our intended designation. A separate TSD will be prepared as necessary to document how we have addressed such comments in the final designations.

The following are definitions of important terms used in this document:

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[2] https://www.epa.gov/sites/production/files/2016-06/documents/so2modelingtad.pdf. In addition to this TAD on modeling, the EPA also has released a technical assistance document addressing SO_2 monitoring network design, to advise states that have elected to install and begin operation of a new SO_2 monitoring network. See Draft SO_2 NAAQS Designations Source-Oriented Monitoring Technical Assistance Document, February 2016, https://www.epa.gov/sites/production/files/2016-06/documents/so2monitoringtad.pdf.

1) 2010 SO_2 NAAQS – The primary NAAQS for SO_2 promulgated in 2010. This NAAQS is 75 ppb, based on the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. See 40 CFR 50.17.
2) Design Value - a statistic computed according to the data handling procedures of the NAAQS (in 40 CFR part 50 Appendix T) that, by comparison to the level of the NAAQS, indicates whether the area is violating the NAAQS.
3) Designated nonattainment area – an area that, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined either: (1) does not meet the 2010 SO_2 NAAQS, or (2) contributes to ambient air quality in a nearby area that does not meet the NAAQS.
4) Designated unclassifiable/attainment area – an area that either: (1) based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined (i) meets the 2010 SO_2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.
5) Designated unclassifiable area – an area that either: (1) was required to be characterized by the state under 40 CFR 51.1203(c) or (d), has not been previously designated, and on the basis of available information cannot be classified as either: (i) meeting or not meeting the 2010 SO_2 NAAQS, or (ii) contributing or not contributing to ambient air quality in a nearby area that does not meet the NAAQS; or (2) was not required to be characterized under 40 CFR 51.1203(c) or (d) and the EPA does have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.
6) Modeled violation – a violation of the SO_2 NAAQS demonstrated by air dispersion modeling.
7) Recommended attainment area – an area that a state, territory, or tribe has recommended that the EPA designate as attainment.
8) Recommended nonattainment area – an area that a state, territory, or tribe has recommended that the EPA designate as nonattainment.
9) Recommended unclassifiable area – an area that a state, territory, or tribe has recommended that the EPA designate as unclassifiable.
10) Recommended unclassifiable/attainment area – an area that a state, territory, or tribe has recommended that the EPA designate as unclassifiable/attainment.
11) Violating monitor – an ambient air monitor meeting 40 CFR parts 50, 53, and 58 requirements whose valid design value exceeds 75 ppb, based on data analysis conducted in accordance with Appendix T of 40 CFR part 50.
12) We, our, and us – these refer to the EPA.

3. Technical Analysis for the Craig, Colorado Area

3.1. Introduction

The EPA must designate the Moffat County, Colorado, area by December 31, 2017, because the area has not been previously designated and Colorado has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any sources in Moffat County.

3.2. Air Quality Modeling Analysis for the Craig Area

3.2.1. Introduction

This section 3.2 presents all the available air quality modeling information for a portion of Moffat County that includes Craig Generating Station. (This portion of Moffat County will often be referred to as "the Craig area" within this section 3.2). This area contains the following SO_2 source, principally the source around which Colorado is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tons per year:

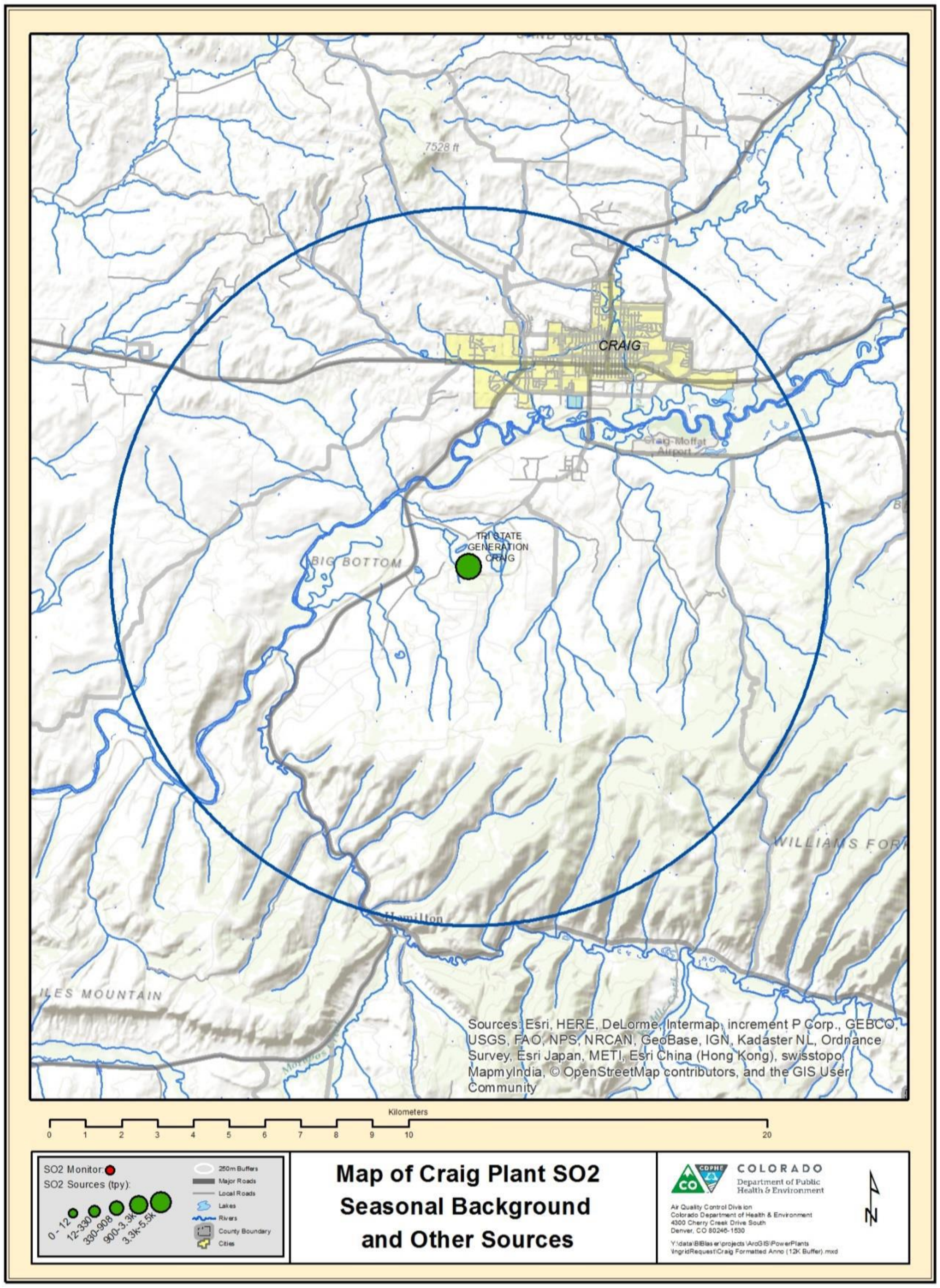
- The Craig Generating Station facility emits 2,000 tons or more annually. Specifically, Craig Generating Station emitted 3,763 tons of SO_2 in 2014 and 3,051 tons of SO_2 in 2015. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Colorado has chosen to characterize it via modeling.

In its submission, Colorado recommended that the area surrounding the Craig Generating Station be designated as unclassifiable/attainment based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. 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 south eastern Moffat County, where the Craig facility is located as seen in Figure 1 below.

Also included in the figure is the state's recommended area for the unclassifiable/attainment designation. The EPA's intended unclassifiable/attainment designation boundary for the Craig area is the same as that provided by the state below.

Figure 1. Map of the Craig, Colorado Area Addressing Craig Generating Station



The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

For this area, the EPA received and considered one assessment from the state.

3.2.2. *Modeling Analysis Provided by the State*

The Colorado Department of Public Health and Environment (CDPHE) provided an air quality modeling assessment for the Craig Generating Station in Moffat County, Colorado (CO), located near Craig, Colorado (CO). The Craig Generating Station is located near Craig, CO, in the northwest corner of Colorado.

3.2.2.1. *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

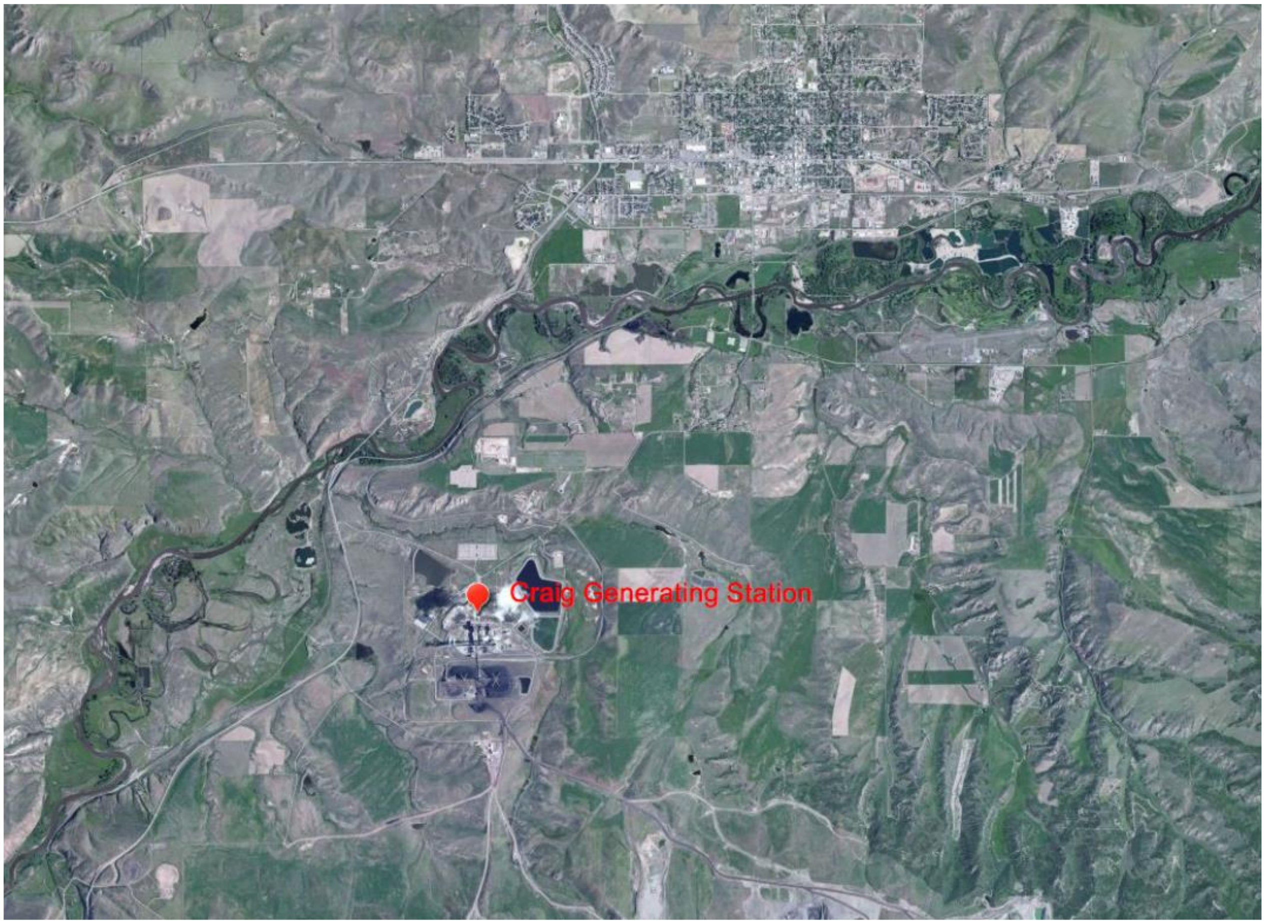
The state used AERMOD version 15181 in regulatory default mode, which was the most recent platform that was available to use at the time the state conducted the modeling. The currently approved AERMOD platform is version 16216r that includes updates. However, the updates made to the components of AERMOD version 16216r were not utilized in the air quality modeling assessment, such as ADJ_U*. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

3.2.2.2. *Modeling Parameter: Rural or Urban Dispersion*

For any dispersion modeling exercise, the "urban" or "rural" determination of a source 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 is urban or rural based on land use or population density.

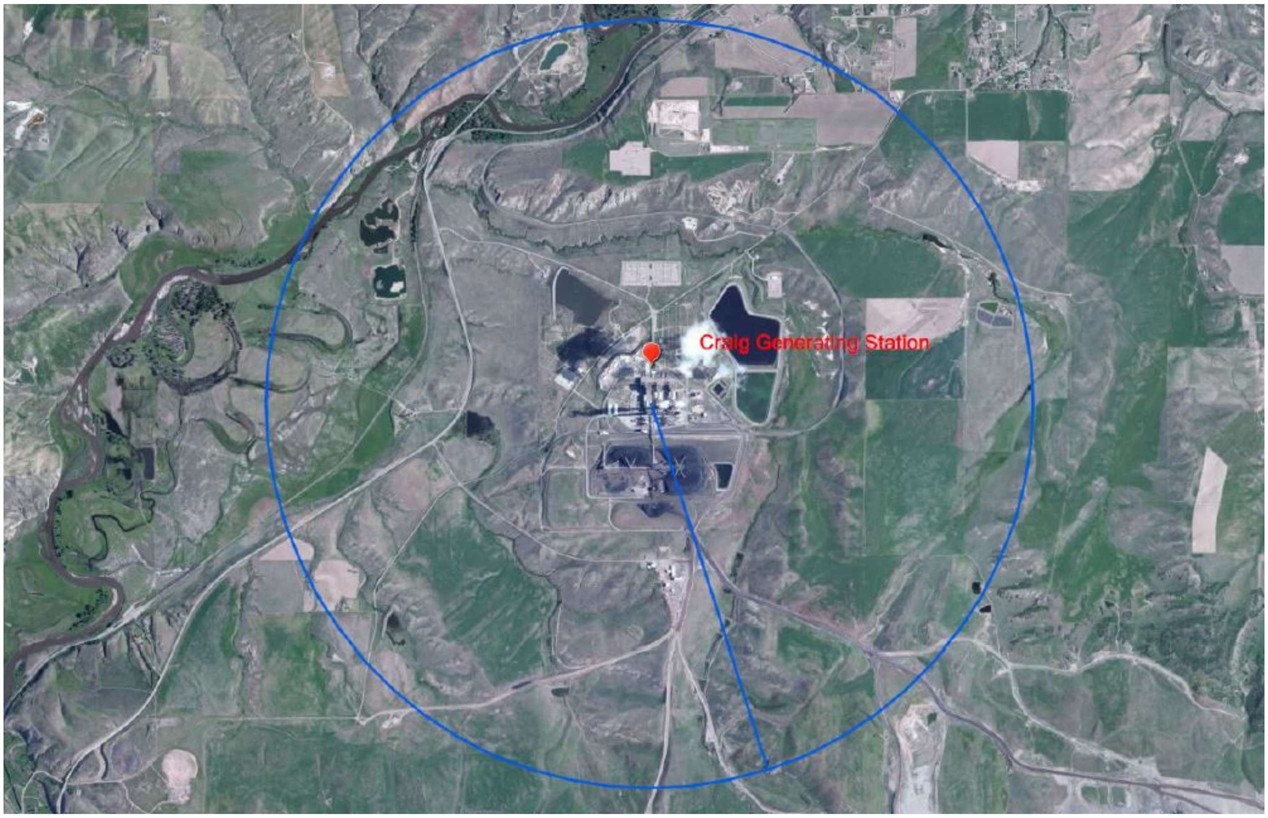
Craig Generating Station is about 7 km southwest of Craig, CO, and surrounded by complex terrain. Figure 2 shows the terrain surrounding the Craig generating station.

Figure 2. Aerial view of the Craig Generating Station and surrounding area.



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 site location was classified as rural using the land use procedure specified in Appendix W. By the definition in Appendix W, land that contains less than 50 percent of developed land use categories should be considered rural. Figure 3 shows the land cover within a 3-km radius of the Craig Generating Station, and shows that less than 50 percent of the land surrounding the station is covered by development. This information supports the rural classification. The EPA's assessment supports the State's analysis on the land use classification.

Figure 3. Land Use Surrounding the Craig Generating Station for Rural designations.



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

The 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 Craig area, the state did not include other emitters of SO_2 within 10 km of the Craig Generating Station. There is only one emitter of SO_2 within 10 km of the Craig facility, ELAM Construction Inc., which is located about 7 km northeast of Craig and emits about 5 tons of SO_2 per year. The state determined that 10 km 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. No other sources beyond 10 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. Figure 4 shows the facility fenceline and Unit. The EPA agrees with the state, as this distance is consistent with the Modeling TAD. Specifically, the Modeling TAD states that the model domain should cover the location where air quality modeling predicts a significant concentration gradient because the gradients associated with a particular source will generally be largest between the source and the maximum ground-level concentrations from the source. Beyond that distance, gradients tend to be smaller and more spatially uniform. The Modeling TAD also notes that the general guideline for the distance between a source and its maximum ground-level concentration is generally 10 times the stack height in most cases. The EPA agrees with the state that it is appropriate not to explicitly model the ELAM Construction facility as part of this modeling analysis the emissions from this source will be characterized using the monitored background concentrations, as described further below. Finally, the EPA agrees that there are no sources beyond 10 km with the potential to cause a significant concentration gradient, as the nearest source of SO_2 outside of the 10 km radius is located over 30 km from the Craig facility.

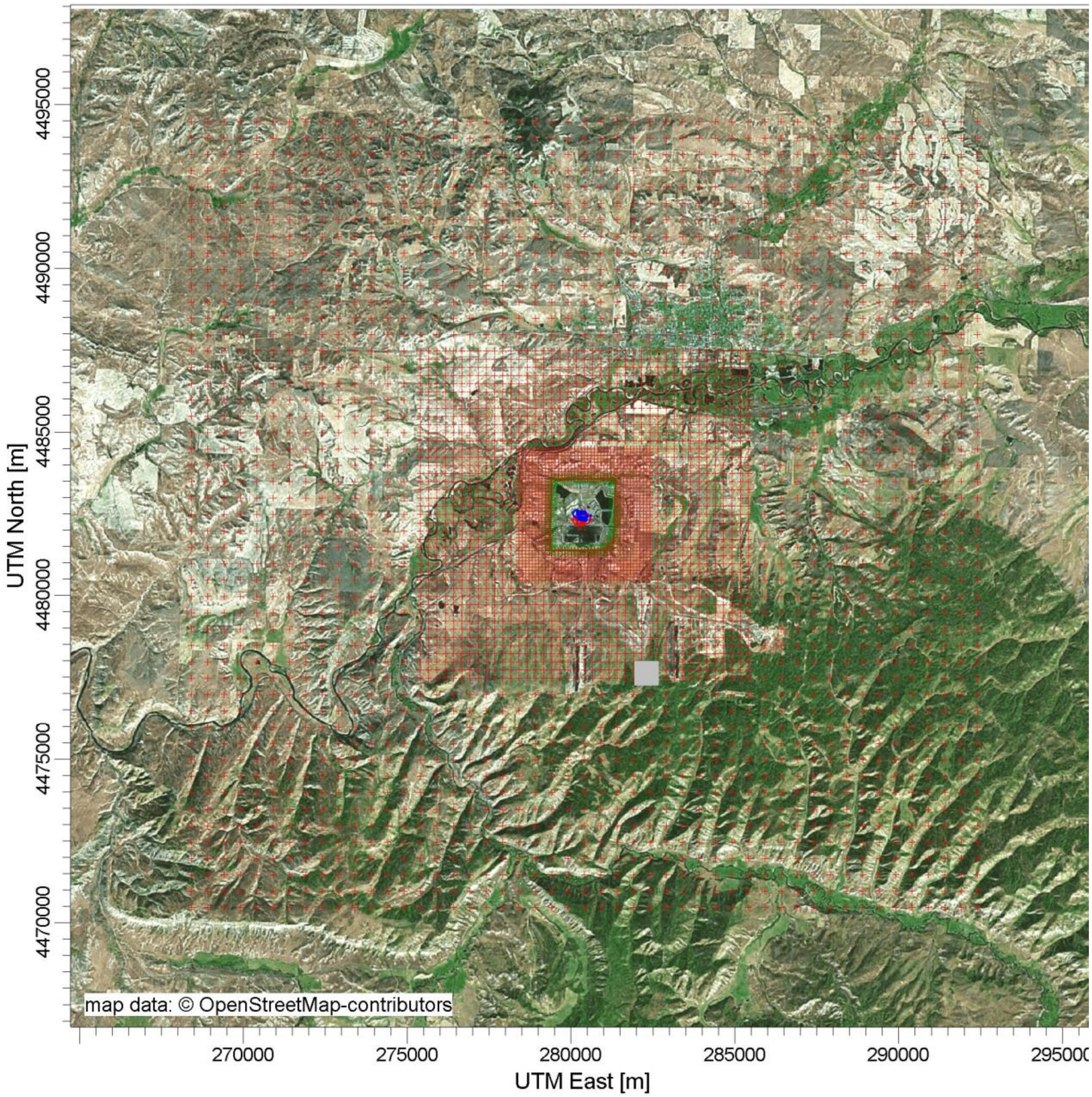
Figure 4. Craig Station Facility Fenceline and Units.

A Cartesian modeling receptor array was established to capture the 99th percentiles of the maximum daily one-hour average SO_2 impacts from the Craig Generating Station. The receptor grid is a relatively dense receptor array with the following spacing beyond the fence line:

- 50 m spacing around fenceline;
- 100 m spacing between the fenceline and 1 km from the fence line
- 250 m spacing between 1 km and 3 km from the facility
- 500 m spacing between 3 km and 10 km from the facility
- Additional receptors, with 500 m spacing, were placed over an area in the southern portion of the domain that was identified with maximum concentrations to ensure that the true maximum concentration was captured by the model.

No receptors were located within the facility fence line, as the facility's fence makes this area inaccessible to the public and therefore not ambient air. Figure 5 shows the receptor array grid used in the modeling. The gray area in Figure 5 illustrates a refined grid to ensure that the maximum concentration was captured adequately. A total of 5,010 receptors were used for the modeling, which includes the refined grid receptors and receptors placed throughout the rest of the domain.

Figure 5. Craig Generating Station Receptor Grid.



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 facility, including other facilities' property with the exceptions of locations described in Section 4.2 of the Modeling TAD. EPA supports the locations and coverage of receptors used in the state's air quality modeling assessment.

3.2.2.4. Modeling Parameter: Source Characterization

The Craig Generating Station is a coal-fired power plant, with the capability to burn natural gas or fuel oil for startup, shutdown or flame stabilization. Craig Station has a total net electric generating capacity of 1,304 megawatts (MW), consisting of three units. Units 1 and 2 are rated at 4,318 MMBtu/hr each and were first operational in 1980 and 1979, respectively. Unit 3 construction was initiated in 1979 and is rated at 4,600 MMBtu/hr. Units 1 and 2 are each equipped with fabric filter baghouses to control particulate matter (PM), wet limestone flue gas desulfurization (FGD) systems to control SO_2, and low nitrogen oxides (NOx) dual register burners with over-fired air to reduce NOx. A baghouse system was installed for Unit 3 to control PM, a dry lime scrubber system is used to control SO_2, low-NOx burners with overfired air control NOx, and an activated carbon injection (ACI) system is used to control mercury emissions in Unit 3. Other emission sources include cooling towers, coal handling systems, ash handling systems, and limestone handling systems. The only source of SO_2 emissions are the three boiler units.

In accordance with the Modeling TAD for the DRR, three years of actual emissions data for the 2013 to 2015 calendar years were used to conduct the SO_2 designation modeling for the Craig area. Actual stack temperatures and velocities were also used in the modeling from the valid CEMS data. The stack parameters that were used in modeling for Craig are provided in Table 2.

The plant structures, buildings, and tanks were included for AERMOD downwash calculations using BPIPPRM. A total of 35 structures were included in the modeling.

Table 2. Stack Parameters for Craig Generating Station.

Stack ID Number	NAD83 Zone 13 UTM Coordinates		Stack Height	Base Elevation	Stack Diameter	Exit Velocity	Exit Temperature
	Easting [m]	Northing [m]	m	M	m	m/s	K
Craig Generating Station							
Unit 1	280423	4482344	182.88	1934.28	7.62	varies	Varies
Unit 2	280317	4482346	182.88	1934.28	7.62	varies	Varies
Unit 3	280235	4482300	182.88	1934.28	7.62	varies	Varies

NAD83 = North American Datum 1983; UTM = Universal Transverse Mercator; m/s = meters per second; K = Kelvin degrees.

The state characterized the source within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized 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. The EPA supports the state's analysis of the source characterizations.

3.2.2.5.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, for a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state explicitly modeled only the Craig Generating Station in its analysis. The only other emitter of SO_2 within 10 km in the area of analysis emits a total of about 5.8 tons of SO_2 per year, and these emissions will be characterized using the monitored background concentrations from this modeling demonstration, as described further below. The state has chosen to model the Craig facility using actual emissions. The facility in the state's modeling analysis and their associated annual actual SO_2 emissions between 2013 and 2015 are summarized below.

For the Craig Generating Station, the state provided annual actual SO_2 emissions between 2013 and 2015. This information is summarized in Table 3. A description of how the state obtained hourly emission rates is given below this table.

Table 3. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Craig Area

Facility Name	**SO_2 Emissions (tpy)** 2013	2014	2015
Craig Generating Station	3,261	3,763	3,051
Total Emissions from All Modeled Facilities in the State's Area of Analysis	3,261	3,763	3,051

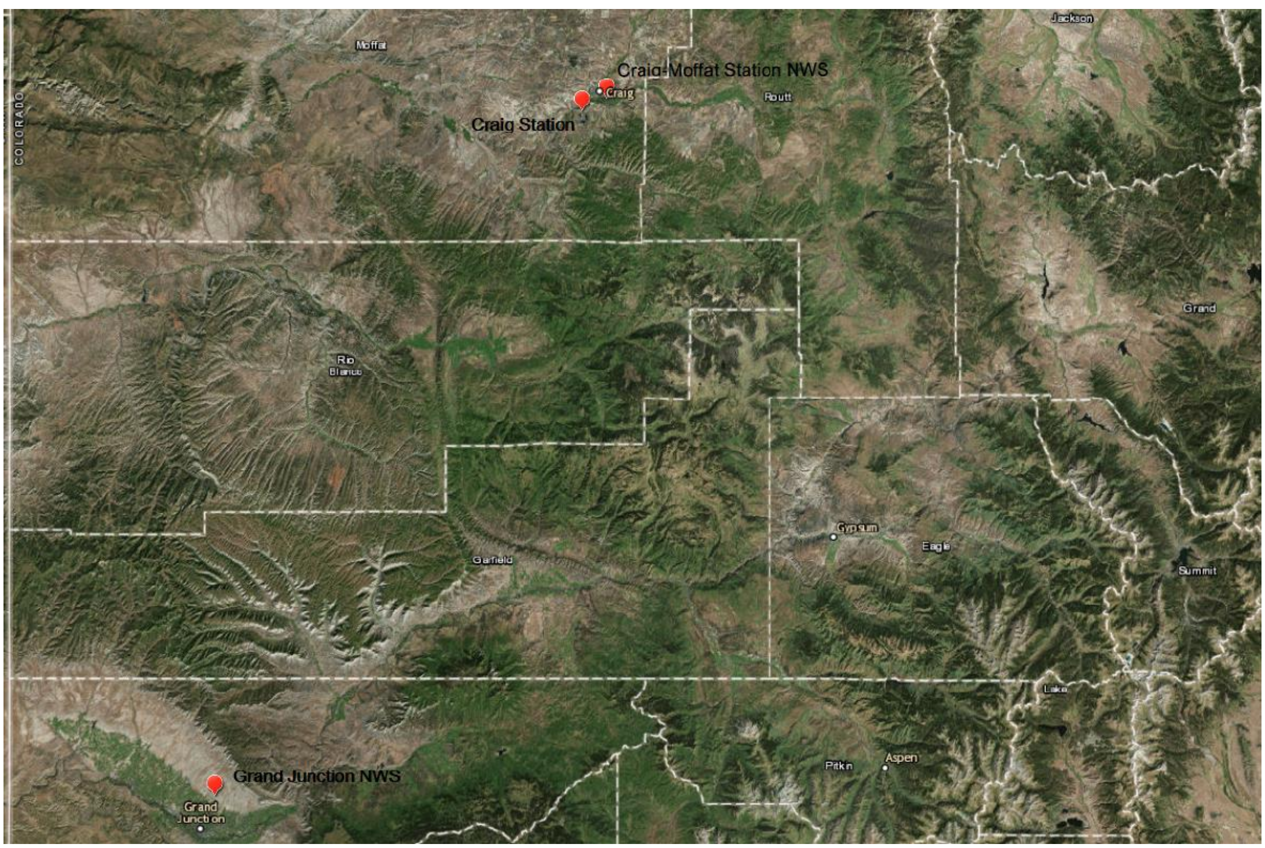
For Craig Generating Station, the actual hourly emissions data were obtained from CEMs. The EPA finds that the data used by the state in the modeling analysis are appropriate.

3.2.2.6. 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) 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.

On-site meteorological data were not available at the Craig Generating Station, so three years (2013-2015) of recent available NWS data were used in the modeling analysis. The Craig-Moffat County station (24046) located at 40.4930N and -107.5240W was used for the surface meteorology and the Grand Junction, CO (23066) upper air station located at 39.12N and 108.53Wwere selected as the closest representative stations. The Craig-Moffat County station is about 6.5 km to the northeast of the Craig Generating Station. The Grand Junction, CO, NWS monitor is about 170 km to the north of the facility. Figure 6 presents the location of the NWS station relative to the area of analysis. Figure 6 was generated by EPA.

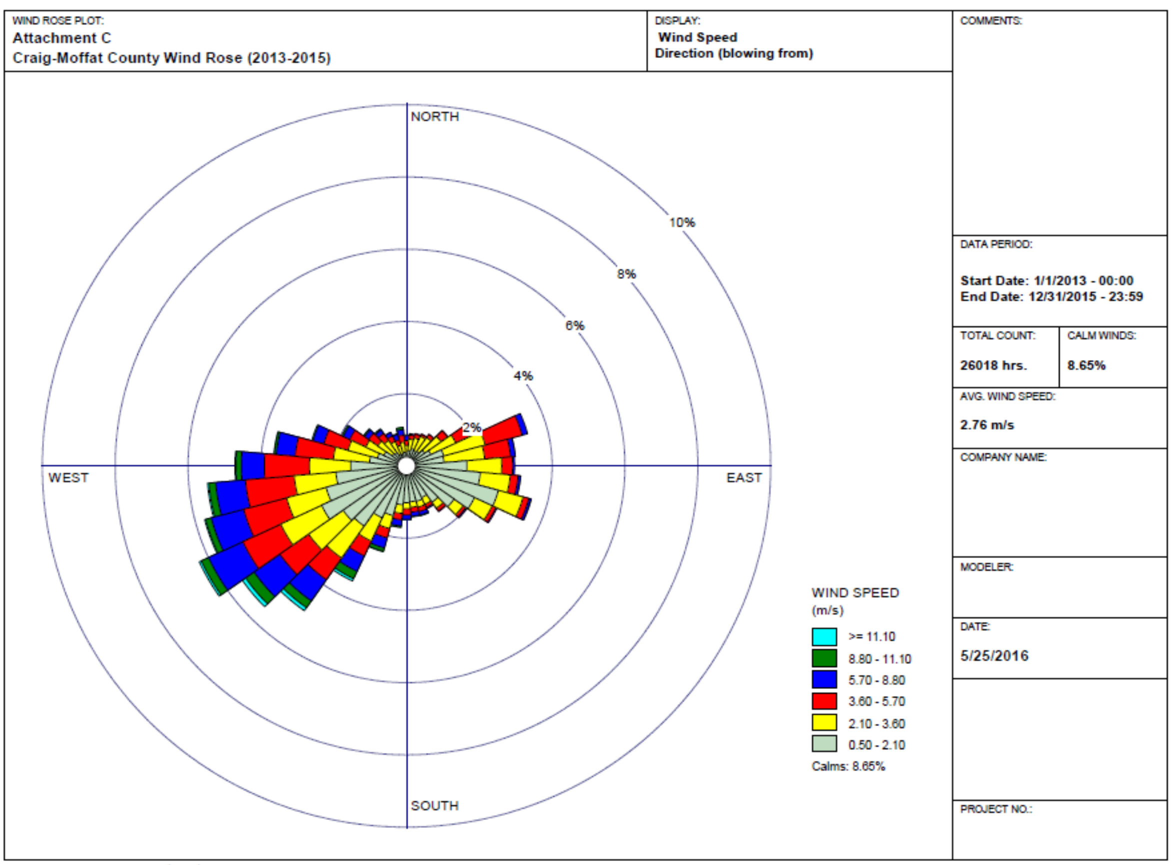
Figure 6. Craig Generating Station with Facilities and Monitoring Locations.



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, one-minute ASOS (Automated Surface Observing System) wind data from the Craig-Moffat station were processed using AERMINUTE (version 15272) into hourly data for input into AERMET (15181). 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 did not set a minimum threshold of 0.5 meters per second in processing meteorological data for use in AERMOD.

A surface wind rose for the entire 3-year period proposed for the modeling time period is shown in Figure 7. The wind rose shows that the dominate wind directions are from the south-southwest (about 7 percent of the time). The average wind speed is about 2.76 m s^{-1}, where calm winds are about 8.65 percent of the time.

Figure 7. Wind Rose for Craig-Moffat NWS, CO, 2013-2015.



AERSURFACE (version 13016) was used to calculate the surface characteristics values, including albedo, Bowen ratio, and surface roughness length, at the surface meteorological observing site for input into AERMET. The 1992 National Land Cover Dataset (NLCD92) file for input into AERSURFACE was downloaded from the United States Geological Society (USGS) website. The state estimated values in 30 degree sectors, equating to 12 spatial sectors out to a 1 km radius around the monitoring site for surface roughness. The surface parameters were determined on a monthly basis using default season assignments and average surface moisture.

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 Appendix W and the Modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. EPA supports the state's analysis as best representative of meteorological conditions within the area of analysis.

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

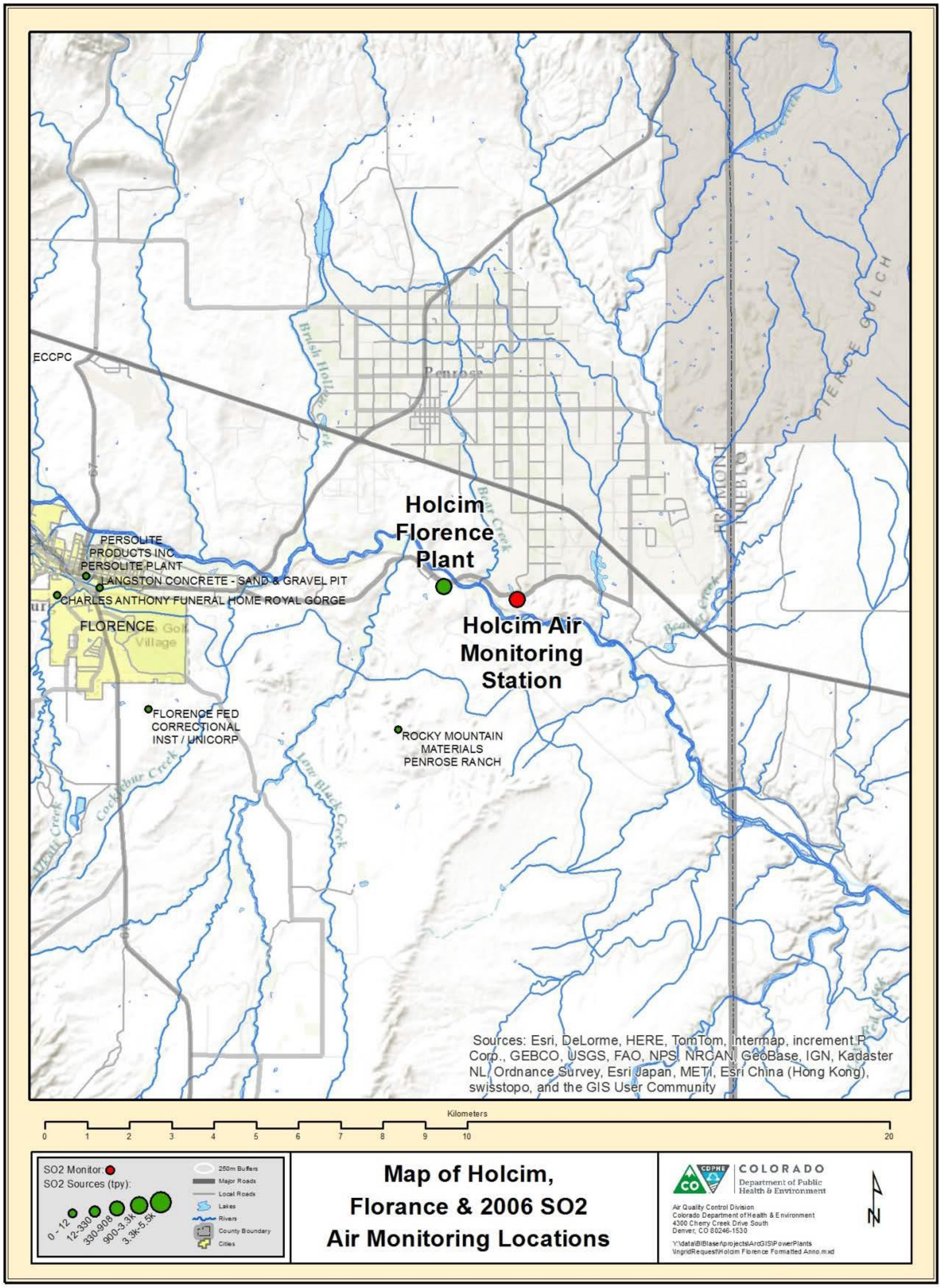
As illustrated above, the Craig Generating Station is surrounded by flat and complex terrain. To account for these terrain changes, the AERMAP terrain program (version 11103) was used to specify terrain elevations for all the receptors. The source of the elevation data incorporated into the model is from the USGS National Elevation Database. EPA supports the state's approach for defining the terrain.

3.2.2.8. 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 state utilized the tier 2 approach, where the background concentrations for this area of analysis were determined by the state to vary seasonally.

NAAQS compliance demonstrations require background ambient concentrations to be added to the cumulative impact from onsite and off-property sources. CDPHE determined that the Golden Energy – Holcim, Florence (Holcim) monitor, with only one year of data (September 2005 through September 2006), is conservative for use in this analysis and that the seasonal adjusted hourly data would be used in the modeling. Figure 8 shows the Holcim Florence Plant with the nearby off-site SO_2 monitoring station previously maintained by Holcim as well as additional SO_2 sources within 10 km of the monitor. As shown in the map, the air monitoring station is located in a rural area on the outskirts of Florence and Penrose. SO_2 sources are shown as green circles on the map.

Figure 8. Map of Holcim Air Monitoring Station and SO_2 Sources within 10 km of Monitor.



Other than Holcim, which is the most significant source of SO_2 in Fremont County, the nearby SO_2 sources are less than 1 tpy. Annual emissions from the six facilities located within 10 km of the Holcim monitor are presented in Table 4. Data from the years the monitor operated (2005-2006) are compared to current data (2013-2015).

Table 4. Annual SO_2 emissions from sources within 10 km of Holcim SO_2 monitor. Units: Tons per Year.

Facility	2005	2006	2013	2014	2015
Holcim Inc. Portland Plant	372.0	367.2	264.9	330.1	353.9
Rocky Mountain Materials – Penrose Ranch	0.8	0.8	0.8	0.8	0.8
Florence Fed. Correctional Institution/UNICOR	0.1	0.1	<0.1	<0.1	<0.1
Persolite Products Inc. Persolite Plant 043-0008	<0.1	<0.1	<0.1	<0.1	<0.1
Charles Anthony Funeral Home Royal Gorge 0128	0.1	0.1	<0.1	<0.1	<0.1
Langston Concrete – Sand and Gravel Pit 0062	<0.1	<0.1	<0.1	<0.1	<0.1
Totals	373	368	266	331	355

As shown in Table 4, emissions from the nearby SO_2 sources have decreased from the 2005/2006 levels. This indicates that the monitoring data from 2005/2006 is likely conservative (in the over-predicting sense) regarding background SO_2 levels around Holcim compared to more recent year emissions around Holcim. The State of Colorado has very limited ambient SO_2 data available because compared to the past National Ambient Air Quality Standards, the state has had ambient concentrations lower than the NAAQS. Therefore, ambient monitoring of SO_2 was rarely required. In the case of the Tri-State's Craig Generating Station, ambient SO_2 monitoring was last conducted in the 1980's. The 1980's monitoring was conducted using a wet chemistry method that has since been replaced with an updated methodology. Therefore, a "regional site" (one that is located away from the area of interest but is impacted by similar natural and distant man-made sources) will be used to determine an appropriate background concentration.

CDPHE has 1-hr SO_2 monitoring data from sites in Denver, Colorado Springs, Pueblo, a remote western slope site (Williams Energy Willow Creek), the Holcim Cement facility near Florence, a Tri-State monitoring location outside of Holly, Southwest Generation south of Colorado Springs, and the Rocky Mountain Steel Reservoir site. In CDPHE's view, it used best professional judgment to determine that data from large urban areas would not be representative of the area outside of Craig since Craig is a small community. Similarly, the Southwest Generation data has a value of 0.045 ppm, which is an extremely high value, relative to the Holcim monitor (i.e., 45 ppb vs 6 ppb) that is not representative for this area based on the information provided in this section. The Holly data are from a location on the plains of eastern Colorado, and are not representative of conditions in northwestern Colorado. The Rocky Mountain Steel Reservoir site represents a rural area that has some nearby major sources, which CDPHE determined inappropriate, as the Craig Generating Station is outside of a small community, and contains some urban development. The Williams Willow Creek data, although from the western slope, were collected in a remote area that did not have a nearby community and was not influenced by any sources of SO_2. Therefore, CDPHE determined that the Holcim monitor data are the most appropriate and most representative for use in this case based on the criteria listed below. CDPHE determined that the Holcim monitor is the most representative monitor for characterizing background concentrations of SO_2 at Craig Station due to the following factors:

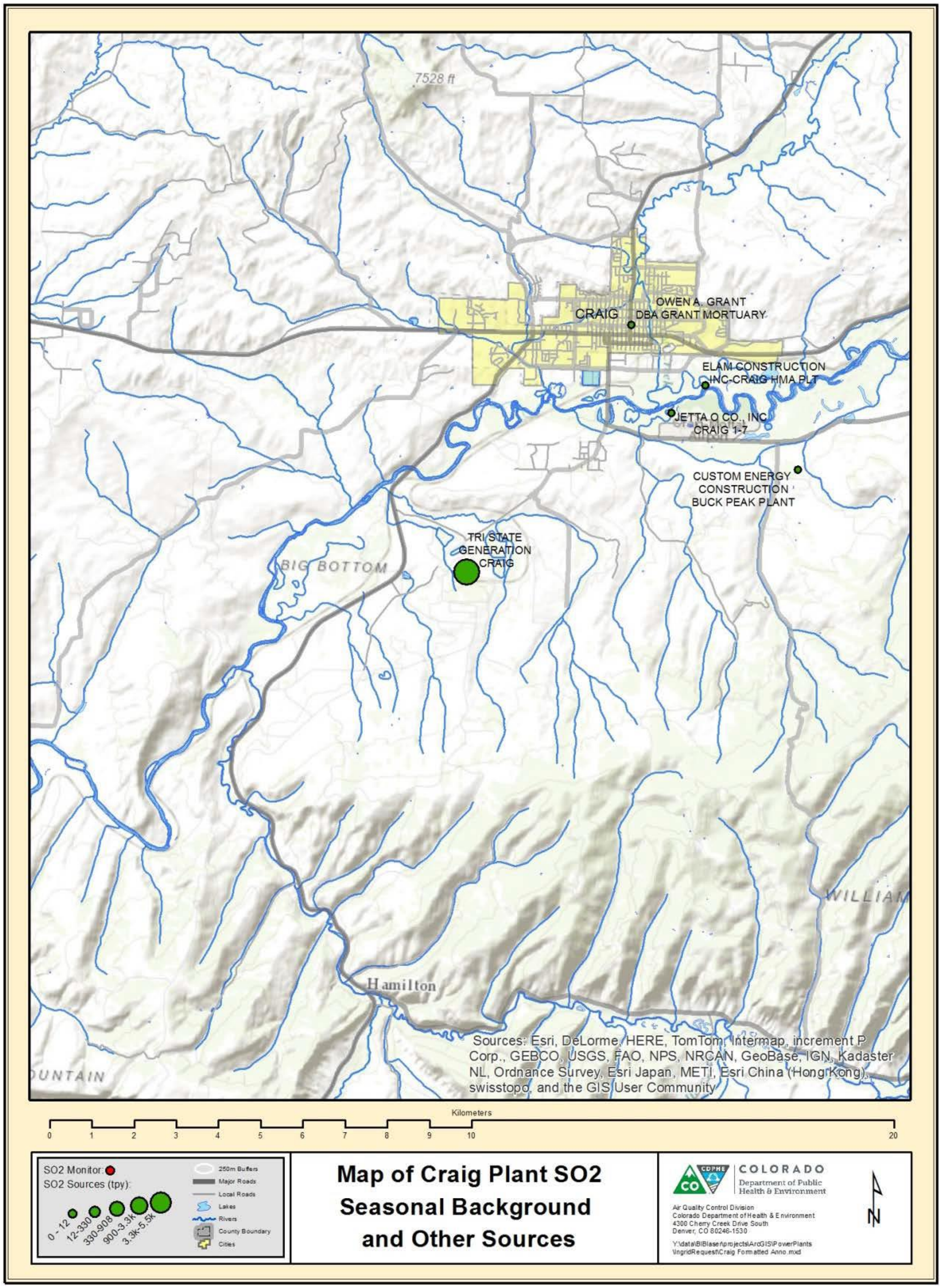
1. Both the Craig Station and the Holcim monitor are located near small communities in rural areas of the state. The Holcim monitor is within 20 km of the following cities:

Cannon City, Florence, Penrose, and Pueblo. The combined population of these cities is 132,000. Although the combined population of the area near the Holcim monitor is much greater than the population of the town of Craig (9,500), the Holcim monitor provides a conservative estimate of background SO2 concentration for sources near similar city populations.

2. Both Craig Station and the Holcim monitor are located in western Colorado in areas of similar topography, with complex terrain.

CDPHE determined that the Holcim monitor provides a conservative estimate of background SO_2 concentrations at Craig Station because of the nearby industrial sources of SO_2 emissions. There are seven industrial sources of SO_2 emissions at six facilities within 10 km of Holcim totaling approximately 355 tpy (as shown in Table 5), including Holcim. By contrast, there is one source of SO_2 emissions within 10 km of Craig Station which emits approximately 5.8 tpy (excluding SO_2 emissions from Craig Station itself for background concentration comparison purposes). The location of Craig Station in relation to surrounding SO_2 sources in show in Figure 9.

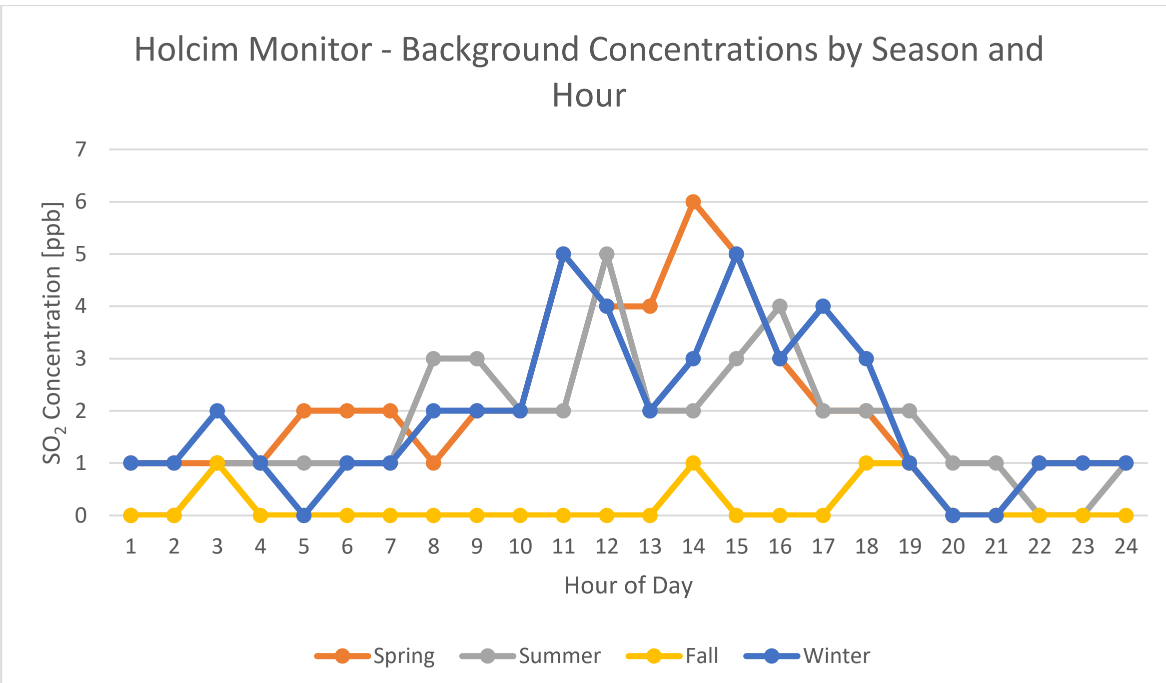
Figure 9. Map of Craig Station and SO_2 Sources within 10 km of Craig Station.



Because of the significantly higher source emissions around the Holcim monitor (355 tpy vs 6 tpy), the Holcim monitoring data provides a conservative estimate of the background SO_2

emissions that could be found near the Craig Station. In the absence of local data, in CDPHE's view it used best professional judgment to determine that this data is the best estimate of background concentrations at the Craig Station. The Holcim monitor could be overly conservative based on the above information and the fact that the Holcim cement plant, a large SO_2 source, is located predominantly up-wind of the monitor. Temporally varying background 1-hr SO_2 concentrations based on the 99th percentile monitored concentrations by hour of day and season was used in the modeling. These values were input into the model using the source pathway BACKGRND SEASHR. Figure 10 shows the seasonal and hourly background values in ppb.

Figure 10. Hourly Varying SO_2 Background Concentrations (ppb) by Season from Holcim Monitor.



While the Modeling TAD recommends using the three most recent years of monitoring data to determine the background concentration, the state does not have three years of monitoring data for this recommended approach. However, the state provided information to support the use of one year of monitoring data and demonstrated that the selected background concentration is conservative. EPA supports the state's approach for determining the background concentration.

3.2.2.1. Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Craig Generating Station modeling analysis are summarized below in Table 5.

Table 5: Summary of AERMOD Modeling Input Parameters for the Area of Analysis for the Craig Generating Station

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	35
Modeled Fencelines	1
Total receptors	5,010
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2013-2015
NWS Station for Surface Meteorology	Craig-Moffat Airport, CO
NWS Station Upper Air Meteorology	Grand Junction, CO
NWS Station for Calculating Surface Characteristics	Craig-Moffat Airport, CO
Methodology for Calculating Background SO_2 Concentration	Tier 2 Holcim Monitor
Calculated Background SO_2 Concentration	0 to 6 ppb

The results presented below in Table 6 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

Table 6. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentration Averaged Over Three Years for the Craig, Colorado Area of Analysis

Averaging Period	Data Period	Receptor Location [UTM zone 13]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM/Latitude	UTM/Longitude	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013 – 2015	282361.95	4477622.03	170.42	196.4*

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

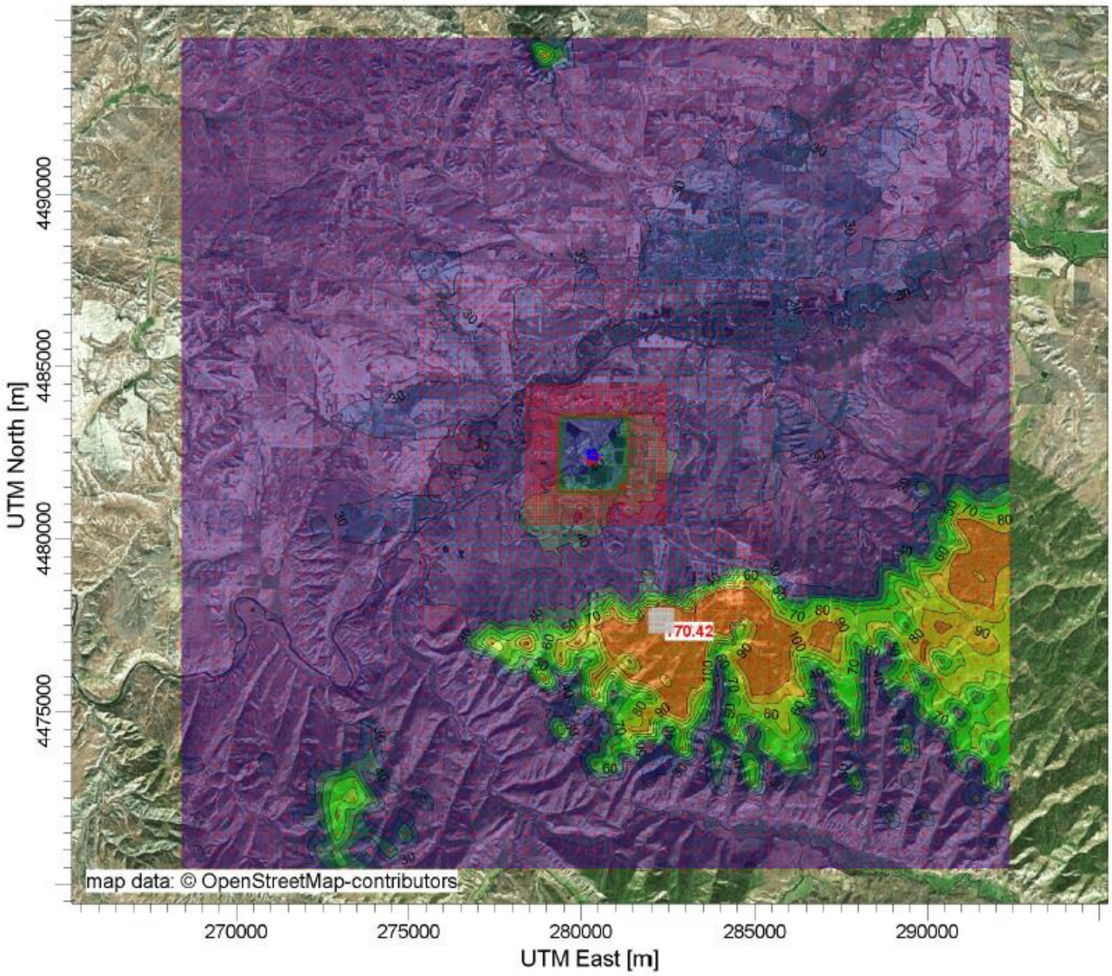
The state's modeling indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 170.42 μg/m^3, equivalent to 65.07 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. Figure 11 below was included as part of the state's recommendation, and indicates that the predicted value occurred about 5 km south of the Craig Generating Station.

Some concern occurred with the results presented in Figure 11 because it appears from Figure 11 that the receptors near the south-eastern edge of the 10 km domain could contain predicted design concentrations close to the NAAQS. In EPA's review of the model results in this 6 km by 4 km area near the edge of the domain, EPA found that the highest predicted SO_2 concentration is about 115 μg/m^3. This value is about 60 percent of the NAAQS. Given that there are no other SO_2 sources outside of the model domain within 30 km of the Craig facility and the complex terrain/high elevations within this area, concentrations beyond this area are unlikely to be higher than inside this area. Further, if there is a chance of higher design concentrations beyond the model domain, the higher design concentrations are not expected to result in concentrations to violate the NAAQS because the concentrations would have to be about double the current concentrations. Therefore, the EPA has concluded that there would be no significantly higher concentrations beyond the model grid that would significantly increase the reported overall maximum concentration, 170 μg/m^3, or threaten the NAAQS.

Figure 11: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Craig, Colorado Area of Analysis

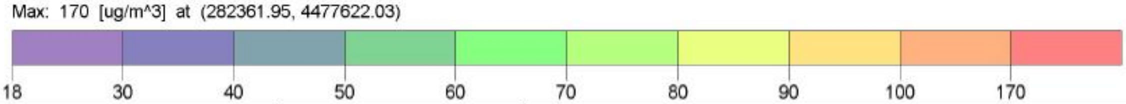
PROJECT TITLE:

Attachment F
Craig Station 1H SO2 H4H Concentration Contour Plot



PLOT FILE OF 4TH-HIGHEST MAX DAILY 1-HR VALUES AVERAGED OVER 3 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 170 [ug/m^3] at (282361.95, 4477622.03)



COMMENTS:	SOURCES:	COMPANY NAME:	
	3		
	RECEPTORS: 5010	MODELER:	
	OUTPUT TYPE: Concentration	SCALE: 1:188,806 (0 — 5 km)	
	MAX: 170 ug/m^3	DATE: 1/9/2017	PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\Model\Tri-State\Craig\SO2_1hr_Bkg Included\SO2_1hr_Bkg Included.isc

The modeling submitted by the state does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The state's approach to conducting the dispersion modeling for EPA's 1-hour SO_2 designations appears to align with the TAD. The state has also provided sufficient information to the EPA to determine that the modeling assessment is sufficient for supporting designation decisions. While the state used AERMOD v15181, the state elected to use regulatory default options (i.e., ADJ_U* was not used in the modeling) which should not significantly impact the predicted SO_2 concentrations. The EPA supports the platform used for the modeling assessment because AERMOD updates are is not anticipated to cause significant differences in the model results using such options.

3.2.3. Modeling Analysis Provided by Other Organizations

As of July 2017, Region 8 has not received any modeling assessments from a 3rd party.

3.3. Emissions and Emissions-Related Data, Meteorology, Geography, and Topography for the Craig, Colorado 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.

The other SO_2 emissions source within 10 km of Craig Station totals approximately 5.8 tpy. In Moffat County overall, the Craig Station comprised 98.6% of the county's overall emissions. There are also no SO_2 sources near the borders of Moffat County. Therefore, the EPA finds that emissions from smaller sources in the area are adequately accounted for in the modeled background concentration.

The Craig Generating Station is located on a side wall of the Yampa River valley about 100 meters above the valley floor. The local winds are a combination of the mountain/valley winds in the Yampa River valley and large scale weather features (synoptic winds). Because the power plant is located on the valley wall, there are periods where it will be outside of the mountain/valley wind regime and will have flows up or down the valley side wall. The orientation of the valley determines the wind direction caused by the mountain/valley wind system. The mountain/valley wind will flow down valley during the night and early morning and up valley from late morning into the late afternoon. The winds in the Yampa Valley are most likely enhanced by synoptic conditions. Generally, over a year, a variety of synoptic type forcings cause southwest winds in the valley, with stronger winds at the power plant. A wind rose for the metrological data utilized is presented in Figure 7.

Craig Station is located approximately 3 miles southwest of Craig in an east-west oriented valley. To the north of the facility the terrain slopes gently downward about 100 feet, then quickly rises to a narrow ridge standing approximately 150 feet above the valley floor. The slope to the south of Craig Station is a gentler climb initially, but does become steeper approximately 1.5 miles south of the facility, climbing from 6,500 to 7,500 feet over 1.75 miles. There is also complex terrain to the east of the facility, with a gradual climb of about 200 feet over 3 miles. To the west of the facility there is a fairly gentle downward slope of about 200 feet to the Yampa River.

3.4. Jurisdictional Boundaries in the Craig, Colorado Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the Craig Area. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

The Craig Generating Station is not located within any defined town or city boundaries, but rather within the rural areas of Moffat County. The closest town is Craig (population 8,981 as of 2013), which is located approximately three miles (4.8 km) to the northeast. As of 2013, the population of Moffat County was 13,103 people.[5] The population of Craig comprises about 70% of Moffat County's population.

As noted, the state recommended applying a radius of 10 km (6.2 miles) around the Craig Generating Station as the boundary for the attainment/unclassifiable area designation. This area includes the nearby town of Craig in this proposed radius.

3.5. The EPA's Assessment of the Available Information for the Craig, Colorado Area

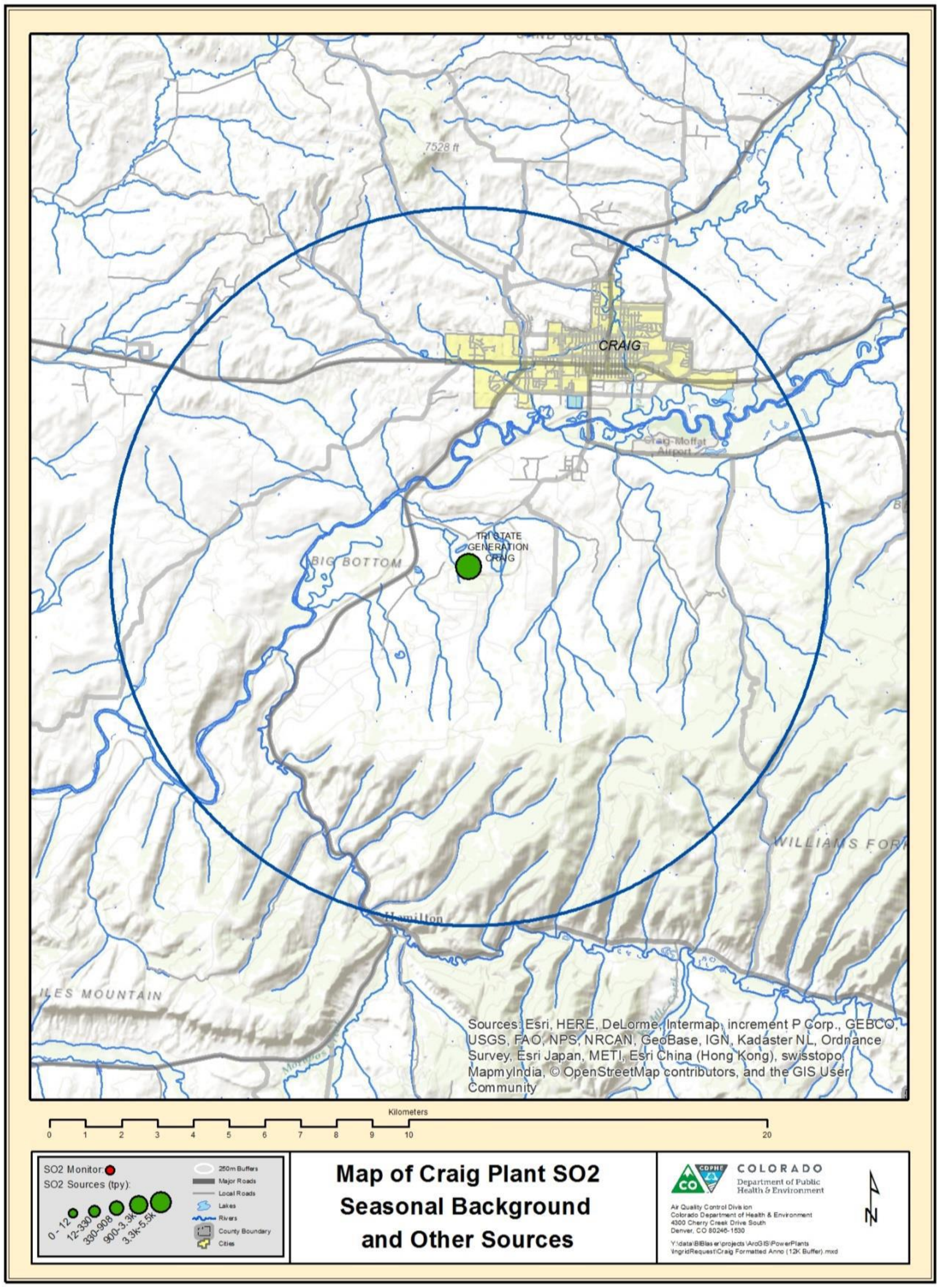
The EPA believes that our intended unclassifiable/attainment area, bounded by a 10 km radius around the Craig Generating Station, form a suitable basis for defining our intended unclassifiable/attainment area. As described in further detail in section 6, the EPA intends to designate the remainder of Moffat County (outside of the 10 km radius around the Craig facility) as unclassifiable/attainment for the 2010 SO_2 NAAQS. There will be no remaining areas in Moffat County that will need to be addressed.

3.6. Summary of Our Intended Designation for the Craig, Colorado Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the Craig, Colorado, area as unclassifiable/attainment for the 2010 SO_2 NAAQS. This is based on the fact that the modeling information provided by the state indicates that Craig Generating Station meets the 2010 SO_2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS, as there are no such areas near the facility. Specifically, the boundaries are comprised of a ten km radius around the Craig facility.

Figure 12 shows the boundary of this intended designated area.

Figure 12. Boundary of the Intended Craig Unclassifiable/Attainment Area



4. Technical Analysis for the Hayden, Colorado Area

4.1. Introduction

The EPA must designate all of Routt County, Colorado, by December 31, 2017, because the area has not been previously designated and Colorado has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any sources in Routt County.

4.2. Air Quality Modeling Analysis for the Hayden, Colorado Area Addressing Hayden Generating Station

4.2.1. Introduction

This section 4.2 presents all the available air quality modeling information for a portion of Routt County that includes Hayden Generating Station. (This portion of Routt County will often be referred to as "the Hayden area" within this section 4.2). This area contains the following SO_2 sources, principally the sources around which Colorado is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tons per year:

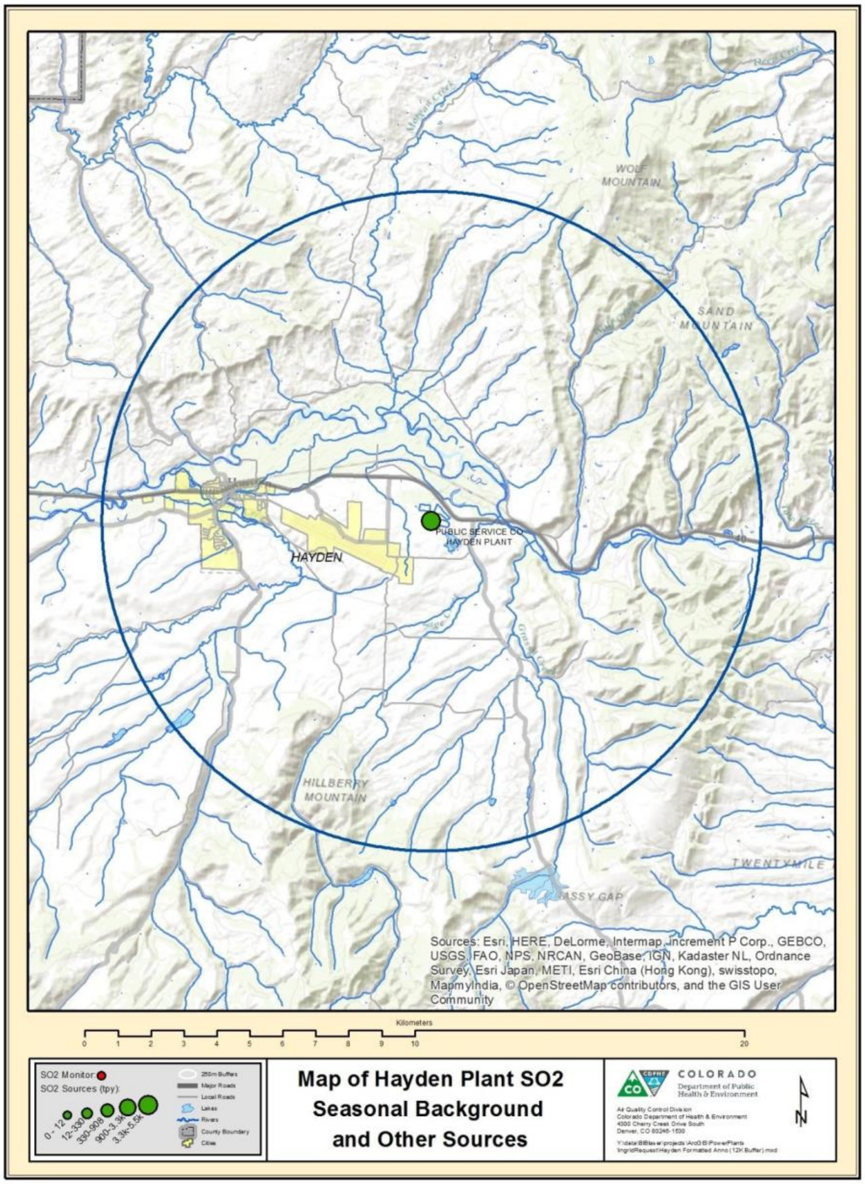
- The Hayden Generating Station facility emits 2,000 tons or more annually. Specifically, emitted 2,227 tons of SO_2 in 2014. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Colorado has chosen to characterize it via modeling.

In its submission, Colorado recommended that the area surrounding the Hayden Generating Station be designated as attainment/unclassifiable based in part on an assessment and characterization of air quality impacts from this facility. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing actual emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. 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 western Routt County. As seen in Figure 13 below, the Hayden facility is located nearly 6 km west of the town of Hayden, Colorado.

Also included in the figure is the state's recommended area for the Hayden designation. The EPA's intended unclassifiable/attainment designation boundary is the same as that provided by the state.

Figure 13. Map of the Hayden Area Addressing Hayden Generating Station



The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

For this area, the EPA received and considered one assessment from the state.

4.2.2. Modeling Analysis Provided by the State

CDPHE provided an air quality modeling assessment for the Hayden Generating Station in Routt County, CO. The Hayden Generating Station is located in the town of Hayden, CO, in the northwest corner of Colorado.

4.2.2.1. 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 state used AERMOD version 15181 in regulatory default mode, which was the most recent platform that was available to use at the time of the modeling. The currently approved AERMOD platform is version 16216 that includes updates. However, the updates made to the components of AERMOD version 16216 were not utilized in the air quality modeling assessment, such as ADJ_U*. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

4.2.2.2. Modeling Parameter: Rural or Urban Dispersion

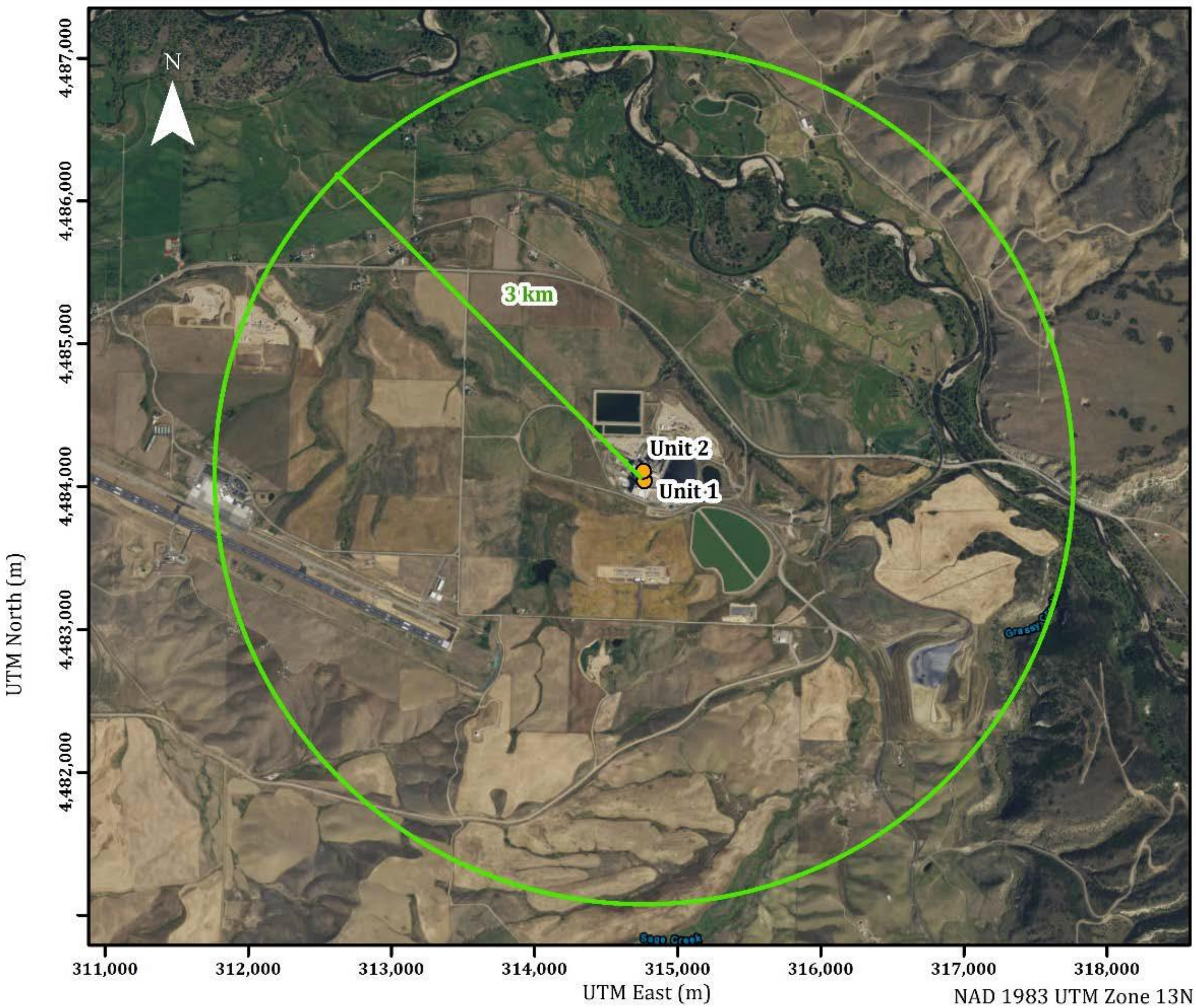
For any dispersion modeling exercise, the "urban" or "rural" determination of a source is important in determining the boundary layer characteristics that affect the model's prediction of downwind concentrations. For SO_2 modeling, the urban/rural determination is important because AERMOD invokes a 4-hour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

The Hayden Generating Station is located approximately 6.5 km east of the city of Hayden, Colorado, and approximately 30 km west of Steamboat Springs, Colorado. The facility is approximately 2 km south of the Yampa River and is located in the Yampa River Valley. The valley is between the Elkhead Mountains to the north and the Flat Tops mountains to the south. The area receives a significant amount of snow (approximately 110 inches annually) during the winter.

In order to categorize the area as rural or urban for modeling purposes, National Land Cover Dataset (NLCD) 1992 (CONUS) Land Cover data was obtained from the Multi-Resolution Land Use Consortium (MRLC). Data within a 3-km radius of each source was analyzed using the

AERSURFACE tool (version 13016). A source is considered urban if the land use types I1 (heavy industrial), I2 (light-moderate industrial), C1 (commercial), R2 (common residential), and R3 (compact residential) are 50 percent or more of the area within the 3-km radius circle. Otherwise, the source is considered a rural source. Based on the analysis using NLCD 1992 Land Cover data, only approximately 1 percent of the land within 3-km of the facility falls into the land use type categories. Although some land development has occurred in the area since the 1992 data was published, it is clear from the aerial images provided in Figure 14 that land within 3-km of the sources can be considered rural because the development has not reached the 50 percent coverage threshold. As such, the sources were considered rural for the modeling analysis.

Figure 14. Aerial Image – Hayden Facility Area.



The EPA's assessment supports the state's analysis on the land use classification.

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

The 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 Hayden Generating Station, the state did not include any other emitters of SO_2, as there are none within 10 km of the facility apart from the Yampa Valley Airport, which emits about 1.6 tons of SO_2 per year and will be characterized using the modeled background monitor concentrations which are impacted by SO_2 sources as described below. 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. The EPA agrees with the state, as this distance is consistent with the Modeling TAD. Specifically, the Modeling TAD states that the model domain should cover the location where air quality modeling predicts a significant concentration gradient because the gradients associated with a particular source will generally be largest between the source and the maximum ground-level concentrations from the source. Beyond that distance, gradients tend to be smaller and more spatially uniform. The Modeling TAD also notes that the general guideline for the distance between a source and its maximum ground-level concentration is generally 10 times the stack height in most cases.

The dispersion modeling uses a combination of a Cartesian grid system centered on the facility and discrete receptor points along the facility fence line. Receptors were placed at 25 meter intervals along the fence line for the facility, 100 meter intervals out to a distance of at least 1 kilometer (km) from the facility, 250 meter intervals out to a distance of at least 3 km from the facility, and at 500 meter intervals out to at least 10 km from the facility. On-site receptors (i.e., those located within the Hayden facility fence line) were removed, as the facility's fence precludes public access to these areas. In accordance with Section 4.2 of the Modeling TAD, receptors located on other facilities' property were included in the analysis. The receptor locations, as well as modeled sources, are depicted in Figure 15 and Figure 16. A total of 3,320 receptors were used for the modeling.

Figure 15. Hayden Generating Station Near-Field Receptor Array.

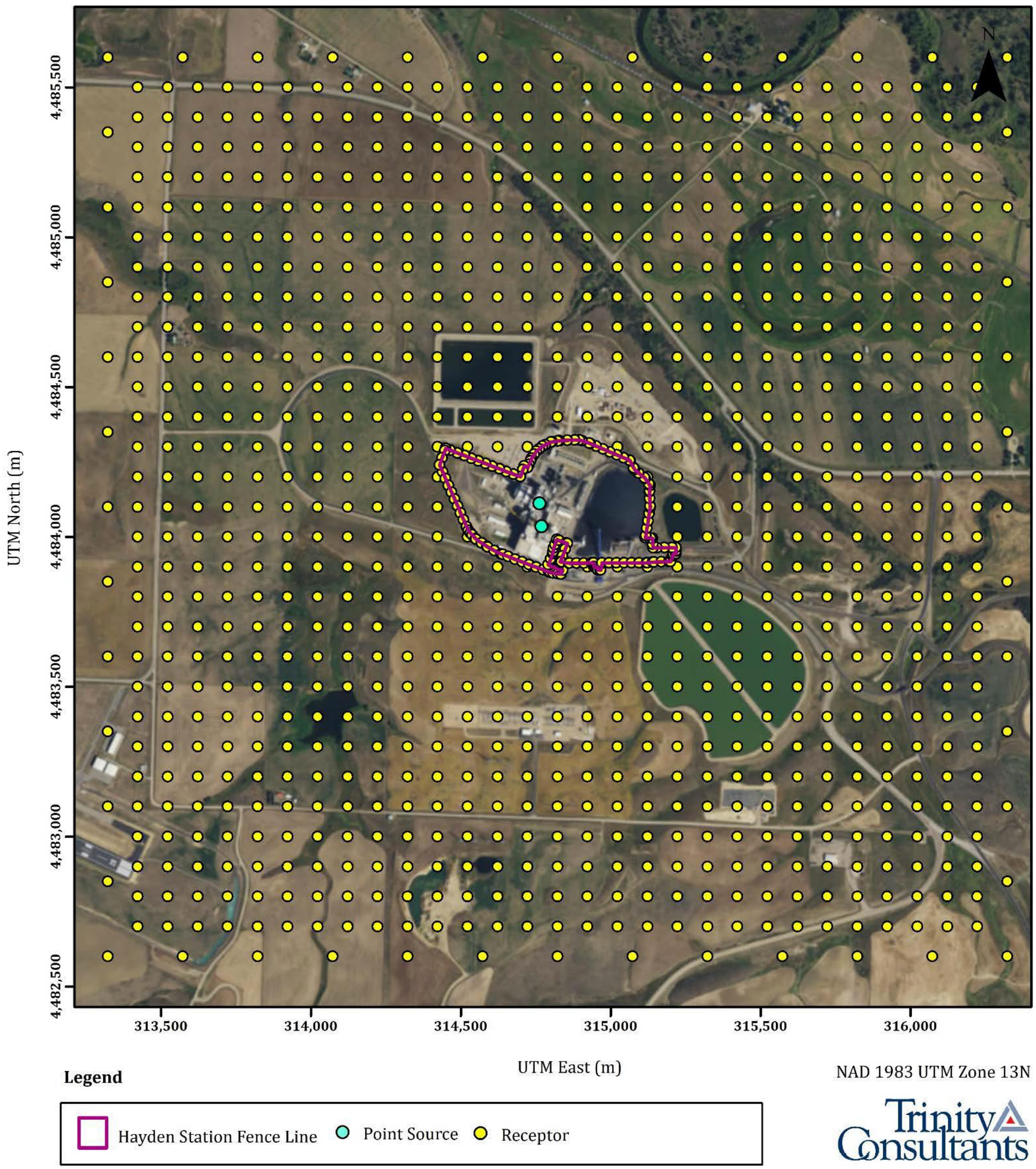
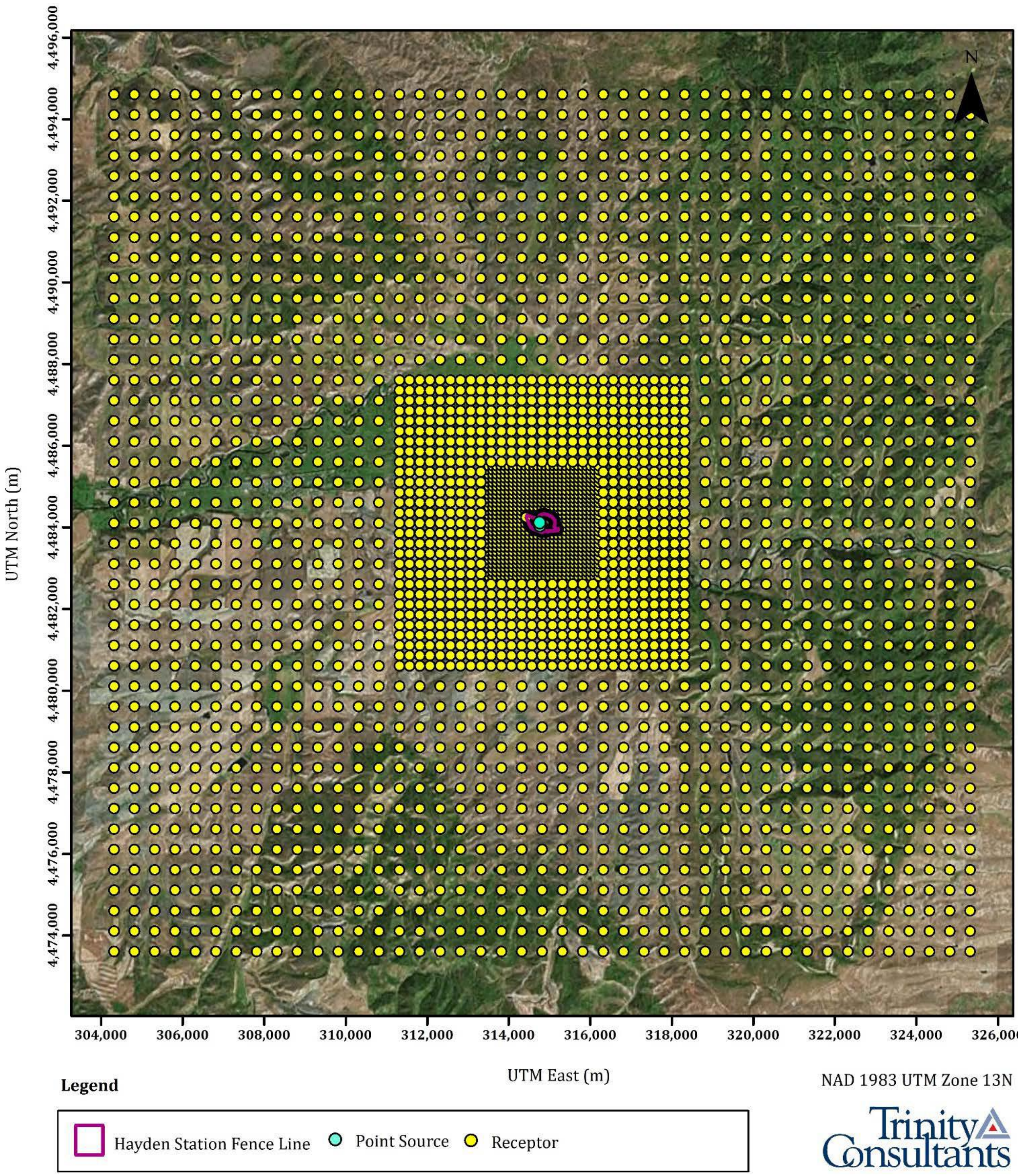


Figure 16. Hayden Generating Station Far-Field Receptor Array.



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 facility, including other facilities' property with the exceptions of locations described in Section 4.2 of the Modeling TAD. The EPA supports the locations and coverage of receptors used in the state's air quality modeling assessment.

4.2.2.4. Modeling Parameter: Source Characterization

The analysis included the two unit coal-fired electric utility. Hourly CEMS data from the EPA Air Market Program have been prepared for the years 2013, 2014, and 2015 for each of the units. This three-year period is representative of normal operations for the two units. Actual (not GEP) stack heights for the utility units were used in the modeling analysis.

The flow monitors at the Hayden Generating Station were changed from a pitot tube type monitor to an ultrasonic type monitor within the last several years. The replacement ultrasonic type monitors do not have a temperature reading and measure flow in standard cubic feet per hour (scfh), while the old pitot tube type monitors recorded stack velocity in feet per second (fps) and did record stack temperatures. The monitor for Unit 1 was switched in 2012. As such, the stack temperature used in the analysis was set to 165 °F, based on a review of historical data. The monitor on Unit 2 was switched out in April of 2014. Actual hourly temperature data was used for the hours between January of 2013 and April of 2014. Based on a review of the January 2013 – April 2014 temperature data, a stack temperature of 162.7 °F was modeled for the remaining hours (i.e. May 2014 – December 2015). Additionally, since the ultrasonic type monitors record flow rates in scfh, flow parameters from the ultrasonic monitors were corrected to actual conditions (based on stack temperature, barometric pressure from a nearby weather station, and an assumed standard temperature of 68 °F). The stack parameters that were used in modeling for the Hayden Generating Station are provided in Table 7.

The plant structures, buildings, and tanks were included for AERMOD downwash calculations using BPIPPRM. A total of 9 structures were included in the modeling.

Table 7. Stack Parameters for Hayden Generating Station.

Stack ID Number	**NAD83 Zone 13 UTM Coordinates**		**Stack Height**	**Base Elevation**	**Stack Diameter**	**Exit Velocity**	**Exit Temperature**
	Easting [m]	**Northing [m]**	**m**	**m**	**m**	**m/s**	**K**
Hayden Generating Station							
Unit 1	314769.26	4484035.1	76.2	1986.71	6.7	varies	varies
Unit 2	314762.59	4484111.47	120.396	1985.64	7.3	varies	varies

NAD83 = North American Datum 1983; UTM = Universal Transverse Mercator; m/s = meters per second; K = Kelvin degrees.

The state characterized the source within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions. The state also adequately characterized 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. The EPA supports the state’s analysis of the source characterizations.

4.2.2.5.Modeling Parameter: Emissions

The EPA’s Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, a facility that has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state included Hayden Generating Station and did not include other emitters of SO_2, as there are none in the area of analysis. The state has chosen to model this facility using actual emissions. The facility in the state's modeling analysis and its associated annual actual SO_2 emissions between 2013 and 2015 are summarized below.

For Hayden Generating Station, the state provided annual actual SO_2 emissions between 2013 and 2015. This information is summarized in Table 8. A description of how the state obtained hourly emission rates is given below this table.

Table 8. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Area

	SO_2 Emissions (tpy)		
Facility Name	**2013**	**2014**	**2015**
Hayden Generating Station	2331	2227	1987
Total Emissions from All Modeled Facilities in the State's Area of Analysis	2331	2227	1987

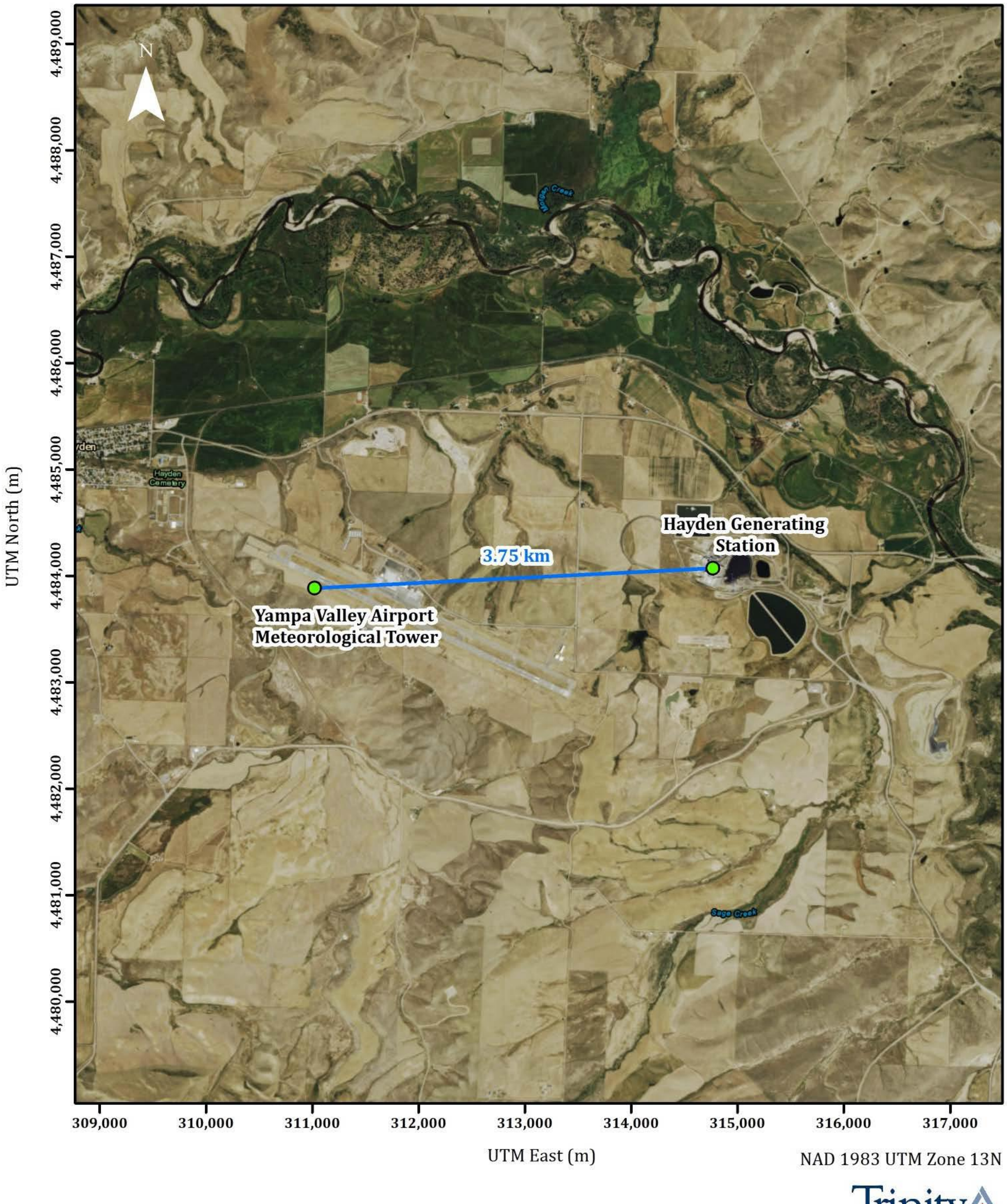
For Hayden Generating Station, the actual hourly emissions data were obtained from CEMs.

4.2.2.6.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) 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.

The state used surface meteorological data collected at the Yampa Valley Airport meteorological tower located at 40.4842N, 107.2297W as input to the AERMOD model. A determination of whether the meteorological data from the Yampa Valley Airport is appropriate for use in this modeling analysis is considered by determining whether the data were representative of the location of the modeled sources. Both the Yampa Valley Airport meteorological tower and the Hayden Generating Station are located in the Yampa River Valley, near Hayden, Colorado. The relative locations of the Yampa Valley Airport meteorological tower and the Hayden Generating Station are shown in Figure 17. As shown in the figure, the meteorological tower is approximately 3.75 km from the Hayden Generating Station, and there are no significant terrain features separating the Hayden Generating Station from the meteorological tower. The close proximity of the airport with respect to the sources (less than 4 km distance), in addition to the similarity in the climatology and topography, support that the meteorological conditions at the airport are representative of the meteorological conditions at the sources.

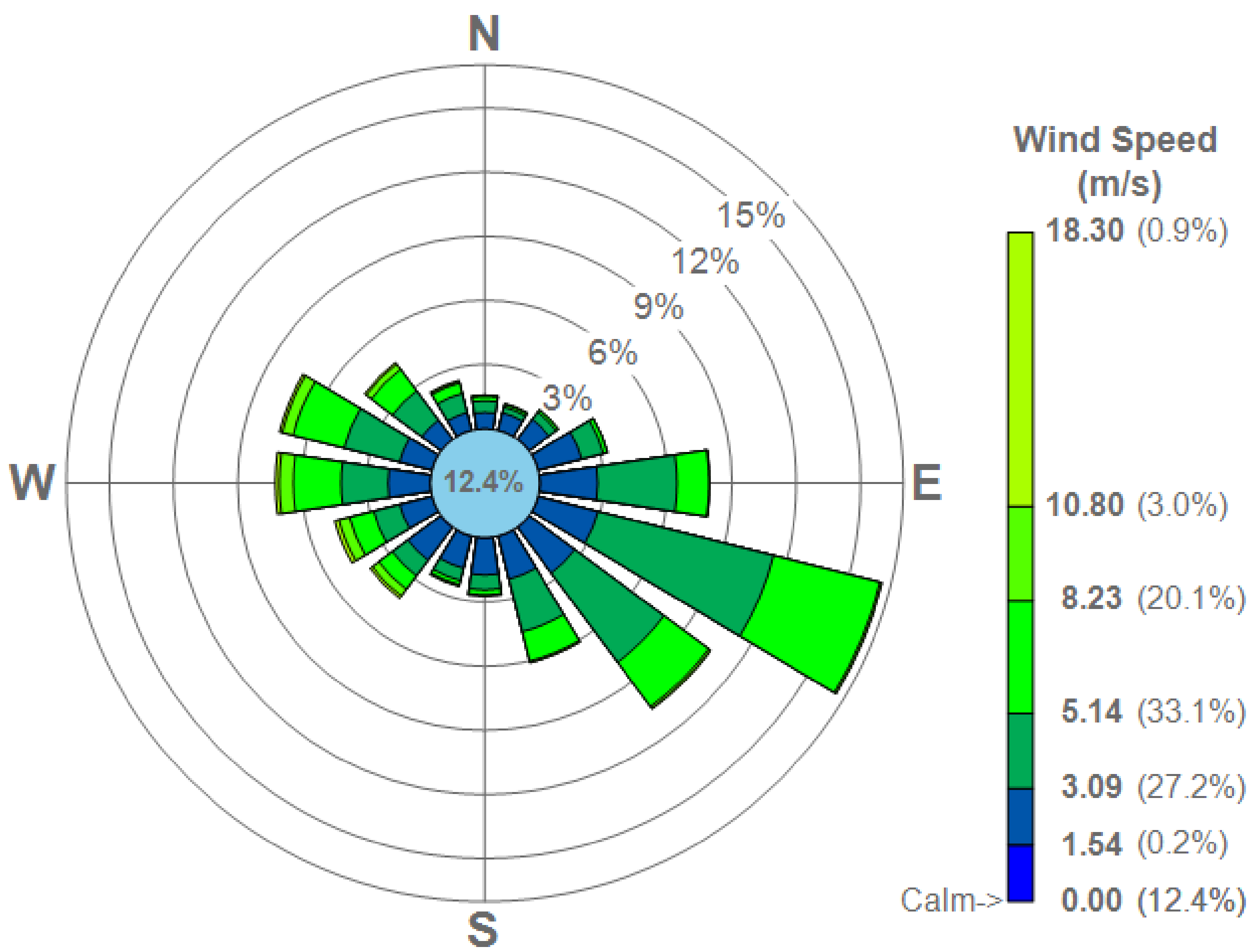
Figure 17. Yampa Valley Airport Meteorological Tower Location



AERMOD-ready meteorological data was prepared using version 15181 of the AERMET meteorological processing utility. Standard U.S. EPA meteorological data processing guidance was used. This station does not have TD-6405 (i.e., 1-minute) wind data or TD-6401 (i.e., 5-minute) wind data.

An evaluation of the data from the Yampa Valley Airport tower indicated that data for the 2015 does not meet the data requirement of at least 90 percent complete on a quarterly basis. Data from 2012 also does not meet the completeness requirement. As such, the state processed hourly data from the tower for the years 2011, 2013 and 2014. Per the Modeling TAD, dates of the 2011 dataset were adjusted to match the dates of the 2015 actual hourly emissions data. A wind rose is depicted in Figure 18. The wind rose shows that the dominate wind directions are from the southeast (about 20 percent of the time). The average wind speed is about 3.75 m s^{-1}, where calm winds are about 12.4 percent of the time.

Figure 18. Wind Rose Plot for Yampa Valley Airport Meteorological Data



In addition to surface meteorological data, AERMET requires the use of data from a sunrise-time upper air sounding to estimate daytime mixing heights. Upper air data from the nearest U.S. National Weather Service (NWS) upper-air balloon station, located at 39.77N, 104.88W in Denver, Colorado (KDNR), was obtained from the National Oceanic and Atmospheric

Administration (NOAA) in Forecast Systems Laboratory (FSL) format. The period of the upper air data is concurrent with the period of the surface data.

AERSURFACE (version 13016) was used to calculate the surface characteristics values, including albedo, Bowen ratio, and surface roughness length, at the surface meteorological observing site for input into AERMET. The 1992 National Land Cover Dataset (NLCD92) file for input into AERSURFACE was downloaded from the United States Geological Society (USGS) website. EPA guidance dictates that on at least an annual basis, soil moisture at a surface site should be classified as wet, dry, or average in comparison to the 30-year climatological record at the site. This determination is used to set the Bowen ratio estimated by AERSURFACE. To make the determination, annual precipitation in each modeled year (2011, 2013, and 2014), was compared to the historical climatological record for the area surrounding the Yampa Valley Airport tower. Specifically, precipitation of a modeled period was compared to 1981-2010 precipitation record. Precipitation data for station KHDN is not available. As such, precipitation from the Hayden, Colorado meteorological station (approximately 3.5 km from KHDN and 6 km from the facility) was obtained for the moisture determination. The 30th and 70th percentile values of the annual precipitation distribution from the dataset were calculated. Each modeled year was classified for AERSURFACE processing as “wet” if its seasonal precipitation was higher than the 70th percentile value, “dry” if its seasonal precipitation was lower than the 30th percentile value, and “average” if it was between the 30th and 70th percentile values.

Climate Normal snow records for 1981-2010 were reviewed to determine whether the area had continuous winter snow cover. Continuous winter snow cover was assumed for months in which at least 10 days had a snow depth of at least 1 inch. Based on temperature data, the period of November to March was determined to be winter. Snow depth was equal to or greater than 1 inch for each of these months for the 2011 – 2015. As such, continuous winter snow cover was assumed in the AERSURFACE runs.

The state estimated values in 30 degree sectors, equating to 12 spatial sectors out to a 1 km radius around the monitoring site for surface roughness. The surface parameters were determined on a monthly basis using default season assignments.

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 Appendix W and the Modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. EPA supports the state’s analysis as best representative of meteorological conditions within the area of analysis.

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

The Hayden Generating Station is surrounded by both flat and complex terrain. To account for these terrain changes, the AERMAP terrain program (version 11103) was used to specify terrain elevations for all the receptors. The terrain elevation for each receptor, building, and emission source was determined using USGS 1/3 arc-second National Elevation Data (NED). The NED, obtained from the USGS, has terrain elevations at 10-meter intervals. Using the AERMOD terrain processor, AERMAP (version 11103), the terrain height for each receptor, building, and emission source included in the model was determined by assigning the interpolated height from the digital terrain elevations surrounding each source. In addition, AERMAP was used to compute the hill height scales for each receptor. AERMAP searches all NED points for the terrain height and location that has the greatest influence on each receptor to determine the hill height scale for that receptor. AERMOD then uses the hill height scale in order to select the correct critical dividing streamline and concentration algorithm for each receptor.

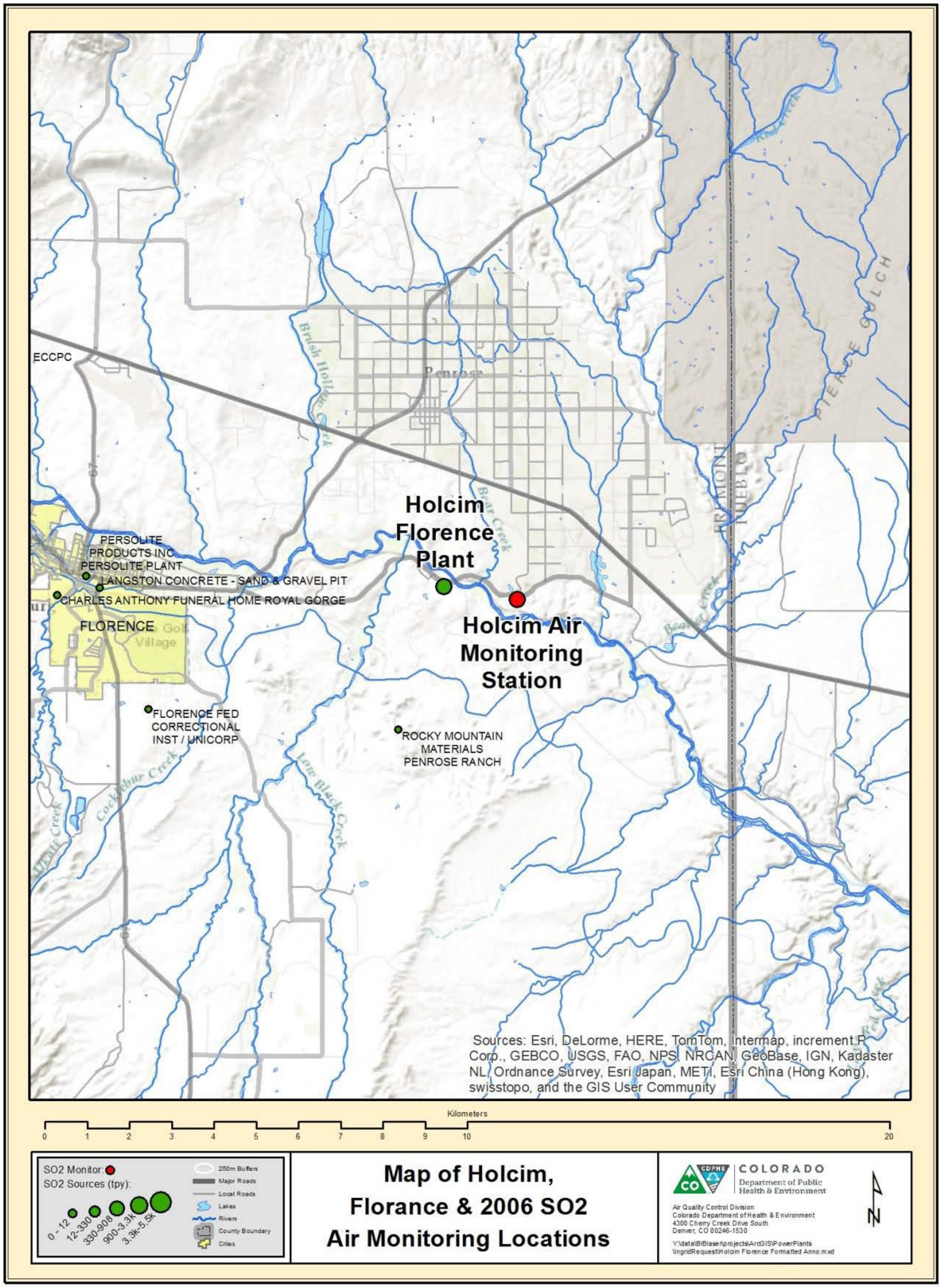
The EPA supports the state's approach for defining the terrain.

4.2.2.8.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 state utilized the tier 2 approach, where the background concentrations for this area of analysis were determined by the state to vary from seasonally.

NAAQS compliance demonstrations require background ambient concentrations to be added to the cumulative impact from onsite and off-property sources. CDPHE determined that the Golden Energy – Holcim, Florence (Holcim) monitor, with only one year of data (September 2005 through September 2006), is more conservative for use in this analysis and that the seasonal adjusted hourly data would be used in the modeling. Figure 19 shows the Holcim Florence Plant with the nearby off-site SO_2 monitoring station previously maintained by Holcim as well as additional SO_2 sources within 10 km of the monitor. As shown in the map, the air monitoring station is located in a rural area on the outskirts of Florence and Penrose. SO_2 sources are shown as green circles on the map.

Figure 19. Map of Holcim Air Monitoring Station and SO_2 Sources within 10 km of Monitor.



Other than Holcim, which is the largest source of SO_2 in Fremont county, the nearby SO_2 sources are very small (less than 1 tpy). Annual emissions from the six facilities located within 10 km of the Holcim monitor are presented in Table 9. Data from the years the monitor operated (2005-2006) are compared to current data (2013-2015).

Table 9. Annual SO_2 emissions from sources within 10 km of Holcim SO_2 monitor. Units: Tons per Year.

Facility	2005	2006	2013	2014	2015
Holcim Inc. Portland Plant	372.0	367.2	264.9	330.1	353.9
Rocky Mountain Materials – Penrose Ranch	0.8	0.8	0.8	0.8	0.8
Florence Fed. Correctional Institution/UNICOR	0.1	0.1	<0.1	<0.1	<0.1
Persolite Products Inc. Persolite Plant 043-0008	<0.1	<0.1	<0.1	<0.1	<0.1
Charles Anthony Funeral Home Royal Gorge 0128	0.1	0.1	<0.1	<0.1	<0.1
Langston Concrete – Sand and Gravel Pit 0062	<0.1	<0.1	<0.1	<0.1	<0.1
Totals	373	368	266	331	355

As shown in Table 9, emissions from the nearby SO_2 sources have decreased from the 2005/2006 levels. This indicates that the monitoring data from 2005/2006 is likely conservative (in the over-predicting sense) regarding background SO_2 levels around Holcim compared to more recent year emissions around Holcim.

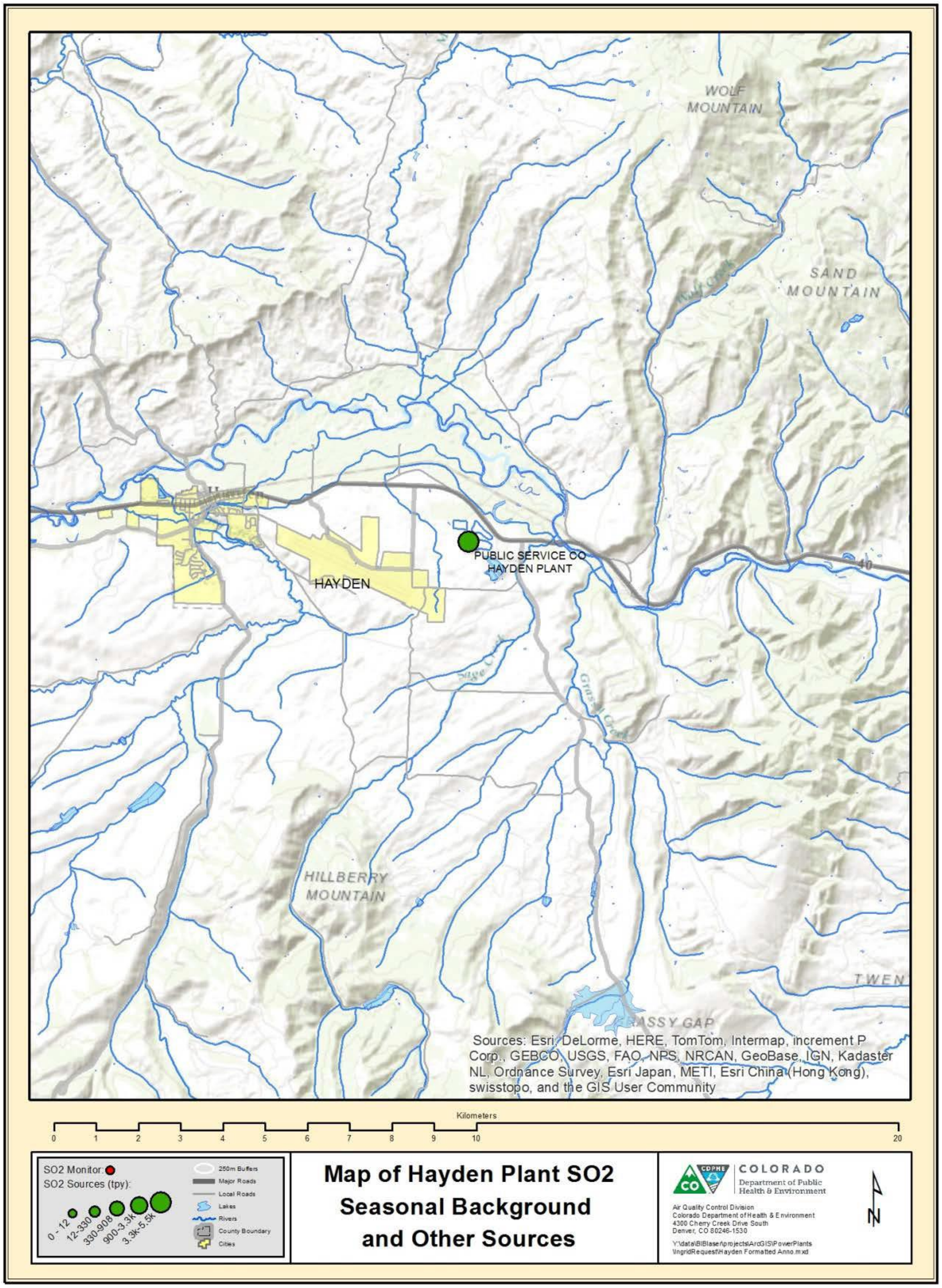
The State of Colorado has very limited ambient SO_2 data available because compared to the past National Ambient Air Quality Standards, the state has had ambient concentrations below the NAAQS. Therefore, ambient monitoring of SO_2 was rarely required and a "regional site" (one that is located away from the area of interest but is impacted by similar natural and distant man-made sources) were used to determine an appropriate background concentration. CDPHE has 1-hr SO_2 monitoring data from sites in Denver, Colorado Springs, Pueblo, a remote western slope site (Williams Energy Willow Creek), the Holcim Cement facility near Florence, a Tri-State monitoring location outside of Holly, Southwest Generation south of Colorado Springs, and the Rocky Mountain Steel Reservoir site. In CDPHE's view, it used best professional judgment to determine that data from large urban areas would not be representative of the area outside of Hayden since Hayden is a small community. Similarly, the Southwest Generation data has a value of 0.045 ppm, which is an extremely high value, relative to the Holcim monitor (i.e., 45 ppb vs 6 ppb) that is not representative for this area based on the information provided in this section. The Holly data are from a location on the plains of eastern Colorado, and are not representative of conditions in northwestern Colorado. The Rocky Mountain Steel Reservoir site represents a rural area that has some nearby major sources, which CDPHE determined inappropriate, as the Hayden Generating Station is outside of a small community, and contains some urban development. The Williams Willow Creek data, although from the western slope, were collected in a remote area that is less representative. Therefore, CDPHE determined that the Holcim monitor data are the most appropriate and most representative for use in this case based on the criteria listed below.

CDPHE determined that the Holcim monitor is the most representative monitor for characterizing background concentrations of SO_2 at Hayden Generating Station due to the following factors:

1. Both the Hayden Generating Station and the Holcim monitor are located near small communities in rural areas of the state. The Holcim monitor is within 10 km of Florence and Penrose, while Hayden Generating Station is within 10 km of Hayden. The combined population of these cities is 7,500 the population of Hayden is approximately 1,800.
2. Both Hayden Generating Station and the Holcim monitor are located in western Colorado in areas of similar topography, with complex terrain.

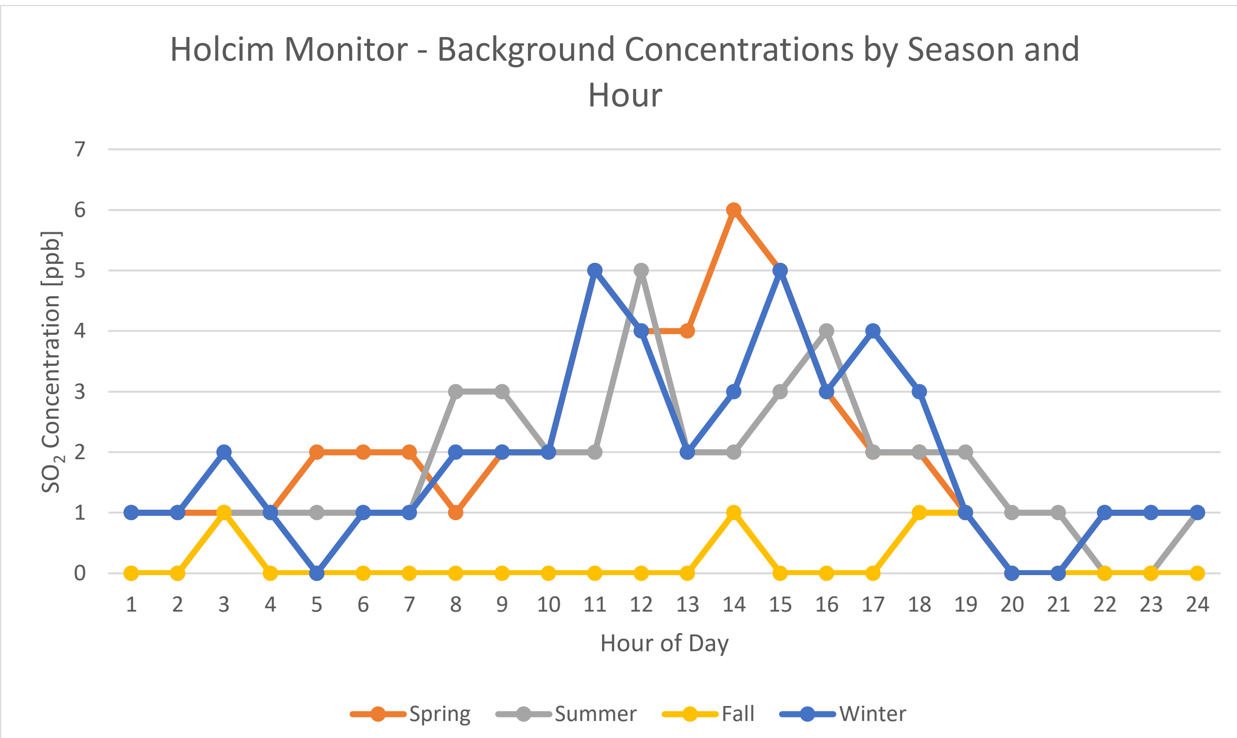
Furthermore, CDPHE determined that the Holcim monitor provides a conservative estimate of background SO_2 concentrations at Hayden Generating Station because of the nearby industrial sources of SO_2 emissions. There are seven industrial sources of SO_2 emissions at six facilities within 10 km of Holcim totaling approximately 355 tpy (as shown in the table above), including Holcim. By contrast, there is one source of SO_2 emissions which emits about 1.6 tons of SO_2 per year within 10 km of Hayden Generating Station (excluding SO_2 emissions from Hayden Generating Station itself for background concentration comparison purposes). The location of Hayden Generating Station is show in Figure 20 below.

Figure 20. Map of Hayden Generating Station and SO_2 Sources within 10 km of the facility.



Because of the significantly higher source emissions around the Holcim monitor (355 tpy vs 1.6 tpy), the Holcim monitoring data provides a conservative estimate of the background SO_2 emissions that could be found near the Hayden Generating Station. In the absence of local data, CDPHE used best professional judgment to determine that this data is the best estimate of background concentrations at the Hayden Generating Station. The Holcim monitor could be overly conservative based on the above information and the fact that the Holcim cement plant, a large SO_2 source, is located predominantly up-wind of the monitor. Therefore, in consideration of the fact that the Holcim data includes impacts from its large cement plant, a source that is not present outside of Hayden Colorado, CDPHE provided more refined, seasonal estimates of background SO_2 values. CDPHE provided Xcel Energy with the temporally varying background 1-hr SO_2 concentrations based on the 99th percentile monitored concentrations by hour of day and season. These values were input into the model using the source pathway BACKGRND SEASHR. The temporally varying background concentrations were processed internally in the model and combined in the model with the impacts from the Hayden Generating Station sources to provide the overall 99th percentile impact of Hayden Generating Station plus background. Figure 21 shows the seasonal and hourly background values in ppb.

Figure 21. Hourly Varying SO_2 Background Concentrations (ppb) by Season from Holcim Monitor.



The EPA supports the state’s approach for determining the background concentration.

4.2.2.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Hayden Generating Station analysis are summarized below in Table 10.

Table 10: Summary of AERMOD Modeling Input Parameters for the Hayden, Colorado Area of Analysis

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	1
Modeled Stacks	2
Modeled Structures	9
Modeled Fencelines	1
Total receptors	3320
Emissions Type	Actual
Emissions Years	2013-2015
Meteorology Years	2011,2013, 2014
NWS Station for Surface Meteorology	Yampa Valley Airport, CO
NWS Station Upper Air Meteorology	Denver, CO
NWS Station for Calculating Surface Characteristics	Yampa Valley Airport, CO
Methodology for Calculating Background SO_2 Concentration	Tier 2 Holcim Monitor
Calculated Background SO_2 Concentration	0 to 6 ppb

The results presented below in Table 11 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

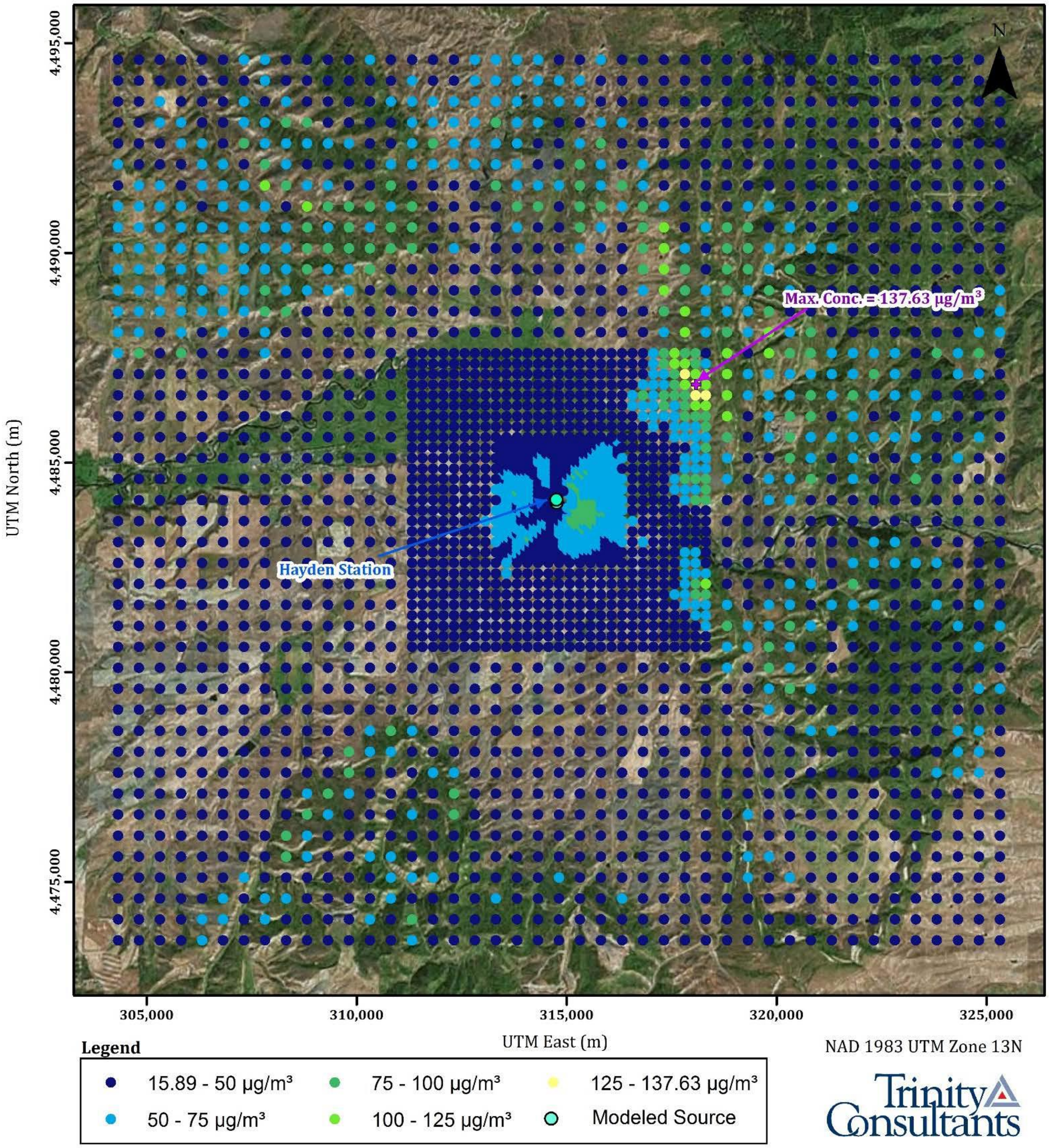
Table 11. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Hayden, Colorado Area of Analysis

Averaging Period	Data Period	Receptor Location [UTM zone 13]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM/Latitude	UTM/Longitude	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013 - 2015	318073.00	4486850.00	137.63	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 indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 137.63 $\mu g/m^3$, equivalent to 52.55 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. Figure 22 below was included as part of the state's recommendation, and indicates that the predicted value occurred about 4.2 km northeast of the Hayden Generating Station.

Figure 22: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Hayden, Colorado Area of Analysis



The modeling submitted by the state does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The state's approach to conducting the dispersion modeling for EPA's 1-hour SO_2 designations appears to align with the TAD. The state has also provided sufficient information to the EPA to determine that the modeling assessment is sufficient for supporting designation decisions. The state used AERMOD version 15181 in regulatory default mode, which was the most recent platform that was available to use at the time the modeling was conducted. The currently approved AERMOD platform is version 16216r that includes updates. However, the updates made to the components of AERMOD version 16216r were not utilized in the air quality modeling assessment, such as ADJ_U*. The EPA supports the platform used for the modeling assessment because it is not anticipated to cause significant differences in the model results.

4.2.3. Modeling Analysis Provided by Other Organizations

As of July 2017, Region 8 has not received any modeling assessments from a 3rd party.

4.3. Jurisdictional Boundaries in the Hayden, Colorado Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the Hayden, Colorado area. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

The Hayden Generating Station is not located within any defined town or city boundaries, but rather within the rural areas of Routt County. The closest town is Hayden (population 1,801 as of 2013), which is located approximately three and a half miles (5.6 km) to the west. The closest city is Steamboat Springs (population 12,100 as of 2013), located approximately 28 km to the east. As of 2013, the population of Routt County was 23,513 people. The populations of these two nearby communities comprise about 60% of Routt County's population.

CDPHE recommended an attainment/unclassifiable area designation consisting of a radius of 10 km (6.2 miles) around the Hayden Generating Station.

4.4. The EPA's Assessment of the Available Information for the Hayden, Colorado Area

The state's approach to conducting the dispersion modeling for EPA's 1-hour SO_2 designations appears to align with the TAD. The state has also provided sufficient information to the EPA to determine that the modeling assessment is sufficient for supporting designation decisions, and demonstrates that the area is attaining the 2010 SO_2 NAAQS. There is no ambient air monitoring information available for the area, and so none was reviewed as part of this assessment.

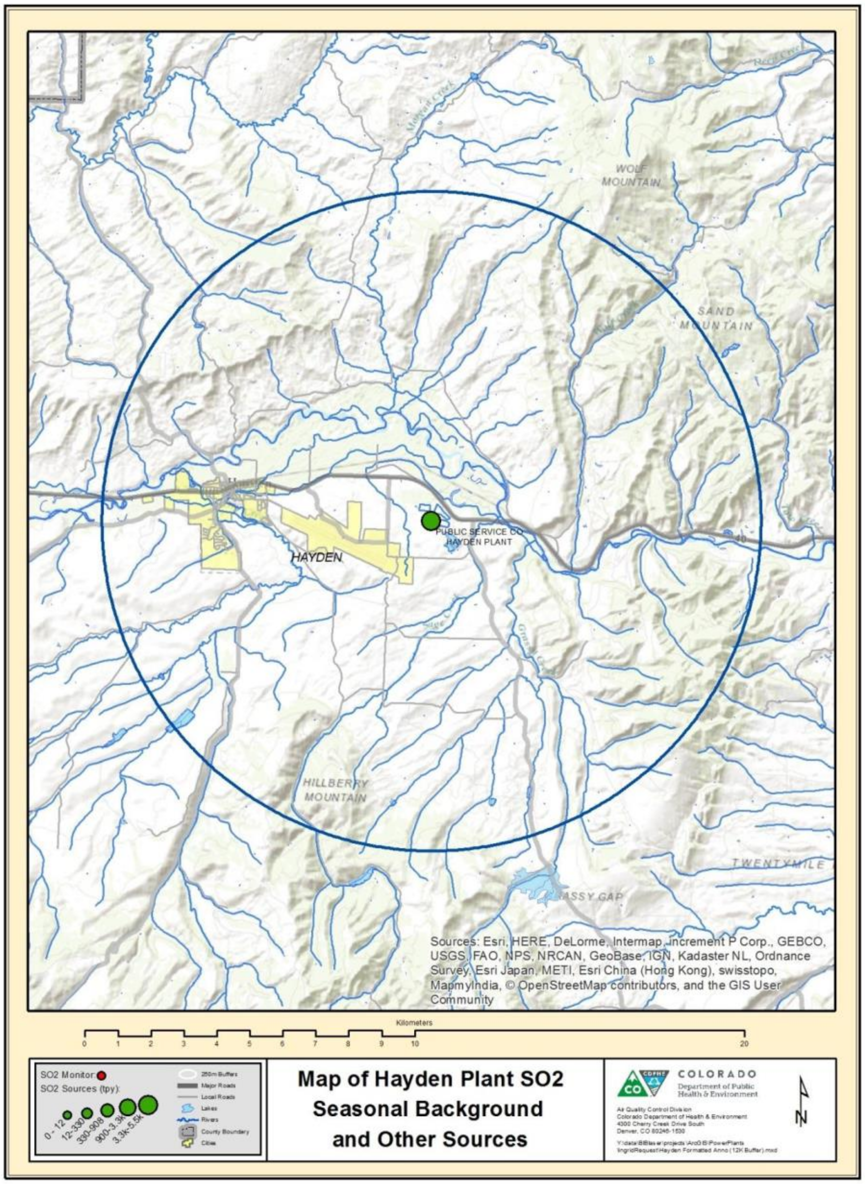
The EPA believes that our intended unclassifiable/attainment area (a 10 km radius around the Hayden facility) is consistent with that recommended by the state, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area. This is based on the modeling results provided by the state which indicate attainment of the NAAQS.

4.5. Summary of Our Intended Designation for the Hayden, Colorado Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area around the Hayden Generating station as unclassifiable/attainment as it meets the 2010 SO_2 NAAQS and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS, as there are no such areas near the facility. Specifically, the boundaries are comprised of a radius of 10 km (6.2 miles) around the Hayden Generating Station. As described in further detail in section 6, the EPA intends to designate the remainder of Routt County (outside of the 10 km radius around the Hayden facility) as unclassifiable/attainment for the 2010 SO_2 NAAQS. There will be no remaining areas in Routt County that will need to be addressed.

Figure 23 shows the boundary of this intended designated area.

Figure 23. Boundary of the Intended Hayden Unclassifiable/Attainment Area



At this time, our intended designations for the state only apply to this area.

5. Technical Analysis for the Pueblo, Colorado Area

5.1. Introduction

The EPA must designate the Pueblo County, Colorado, area by December 31, 2017, because the area has not been previously designated and Colorado has not installed and begun timely operation of a new, approved SO_2 monitoring network to characterize air quality in the vicinity of any sources in Pueblo County.

5.2. Air Quality Monitoring Data for the Pueblo Area

This factor considers the SO_2 air quality monitoring data in the Pueblo area. The state included monitoring data from the following monitors:

- Rocky Mountain Steel Mill (RMSM) Reservoir Monitor. This monitor is located at 38.187205, -104.638470 in Pueblo. Data collected at this monitor indicates that the 99^{th} % value for 2014-2015 at this site was 10 ppb of SO_2. The state did not reach any conclusions based on data from this monitor.
- RMSM Print Shop. This monitor is located at 38.239580, -104.612900 in Pueblo. Data collected at this monitor indicates that the 99^{th} % value for 2013-2015 at this site was 12 ppb of SO_2. The state did not reach any conclusions based on data from this monitor.

The EPA is not using this monitoring data to inform the designation for the Pueblo area, as these monitors have not been demonstrated to be sited in locations where peak 1-hour SO_2 concentrations are expected to occur.

5.3. Air Quality Modeling Analysis for the Pueblo, Colorado Area Addressing Comanche Generating Station

5.3.1. Introduction

This section 5.3 presents all the available air quality modeling information for a portion of Pueblo County that includes Comanche Generating Station. (This portion of Pueblo County will often be referred to as "the Pueblo area" within this section 5.3). This area contains the following SO_2 sources, principally the sources around which Colorado is required by the DRR to characterize SO_2 air quality, or alternatively to establish an SO_2 emissions limitation of less than 2,000 tons per year:

- The Comanche Generating Station facility emits 2,000 tons or more annually. Specifically, Comanche Generating Station emitted 3,157 tons of SO_2 in 2014, and 3,295 tons of SO_2 in 2015. This source meets the DRR criteria and thus is on the SO_2 DRR Source list, and Colorado has chosen to characterize it via modeling.

- The RMSM facility (311 tpy in 2015) and the GCC Rio Grande Cement Plant (9 tpy in 2015) are not on the SO_2 DRR Source list, but were included in the modeling analysis due to their proximity to the Comanche facility.

In its submission, Colorado recommended that an area that includes the area surrounding the Comanche Generating Station, including the RMSM and GCC Rio Grande Cement Plant be designated as attainment based in part on an assessment and characterization of air quality impacts from these facilities. This assessment and characterization was performed using air dispersion modeling software, i.e., AERMOD, analyzing a mixture of actual and allowable emissions. After careful review of the state's assessment, supporting documentation, and all available data, the EPA agrees with the state's recommendation for the area, and intends to designate the area as unclassifiable/attainment. 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 the city of Pueblo and the area to the south and east of the city out to 10 km from the Comanche Generating Station.

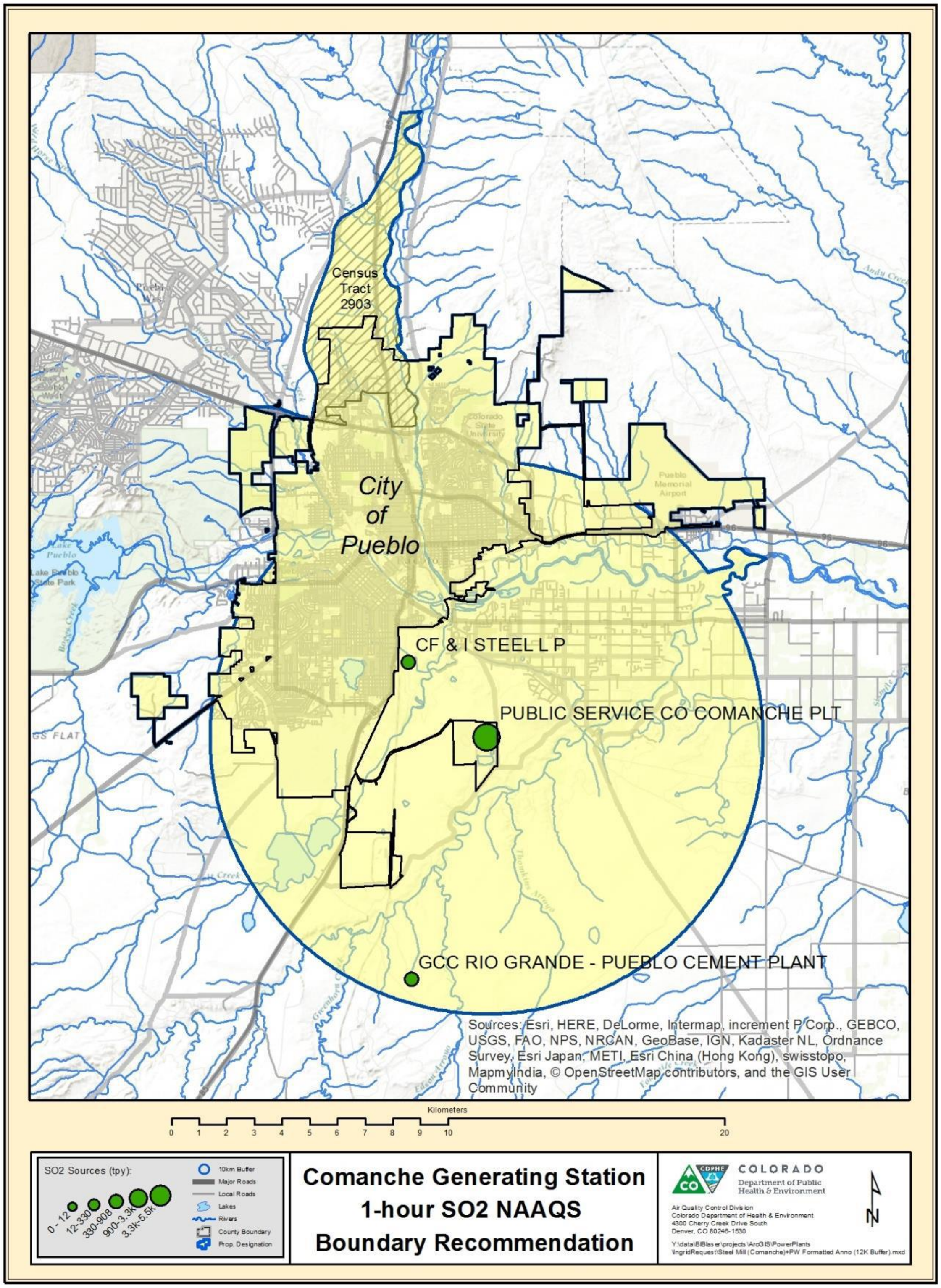
As seen in Figure 24 below, the Comanche facility is located within the city limits of Pueblo however it is an outlying incorporation that is over a mile from the main city limits and surrounded by rural areas of Pueblo County. The majority of the city of Pueblo (population 108,249 as of 2013) is located approximately three miles (4.8 km) to the northwest.

Included in the figure are other nearby emitters of SO_2.[5] These are RMSM and GCC Rio Grande Cement Plant.

Also included in the figure is the state's recommended area for the unclassifiable/attainment designation. The EPA's intended unclassifiable/attainment designation boundary is the same as that recommended by the state.

[5] All SO2 emitters modeled by the state are shown in Figure 24.

Figure 24. Map of the Pueblo Area Addressing the Comanche Generating Station and Nearby Sources



The discussion and analysis that follows below will reference the Modeling TAD and the factors for evaluation contained in the EPA's July 22, 2016, guidance and March 20, 2015, guidance, as appropriate.

For this area, the EPA received and considered one assessment from the state.

5.3.2. Modeling Analysis Provided by the State

The Colorado Department of Public Health and Environment (CDPHE) provided an air quality modeling assessment for the Comanche Generating Station located south of Pueblo, Colorado.

5.3.2.1.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 state used AERMOD version 15181 in regulatory default mode, which was the most recent platform that was feasible to use at the time of the modeling. The currently approved AERMOD platform is version 16216 that includes updates. However, the updates made to the components of AERMOD version 16216 were not utilized in the air quality modeling assessment, such as ADJ_U*. A discussion of the state's approach to the individual components is provided in the corresponding discussion that follows, as appropriate.

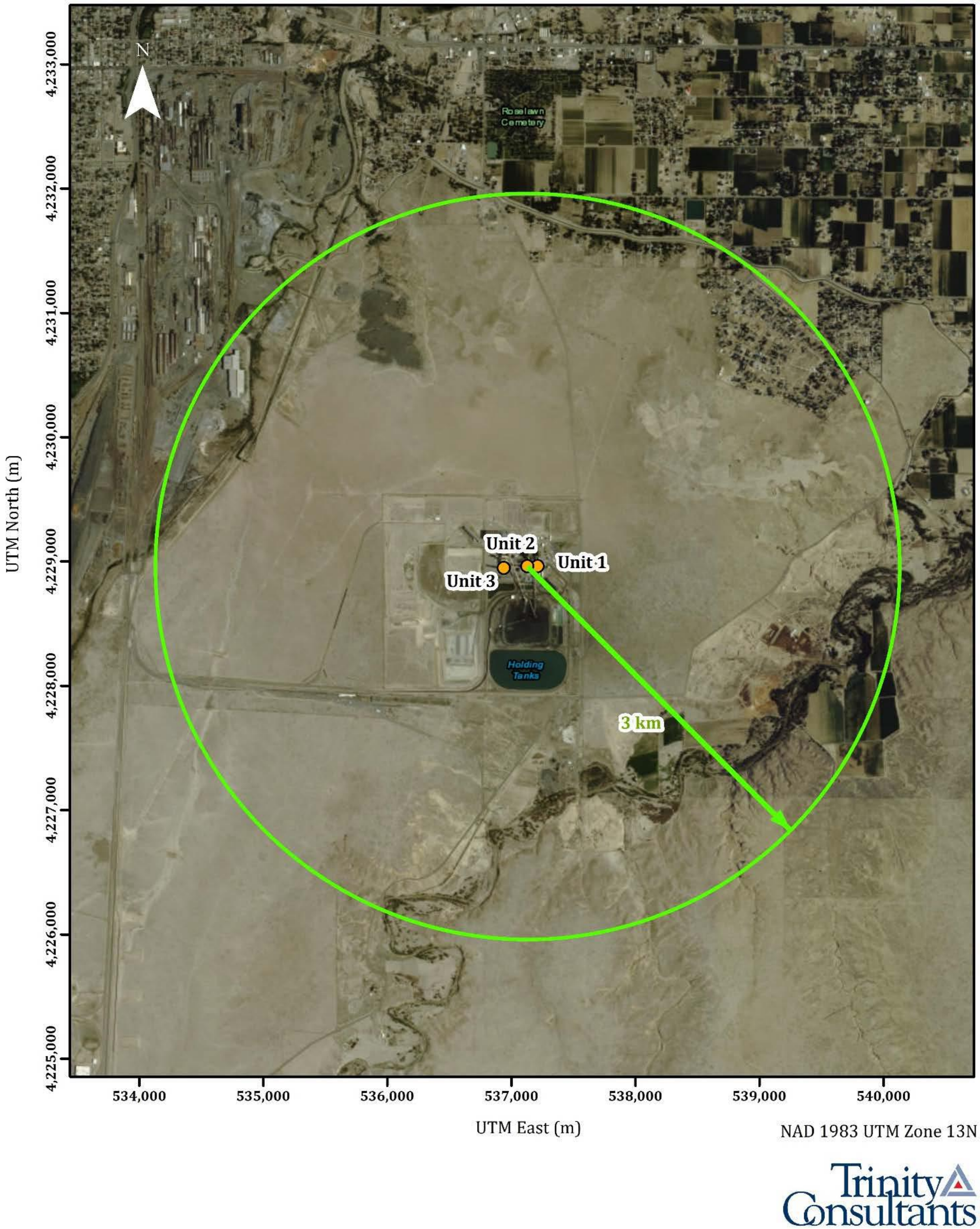
5.3.2.2.Modeling Parameter: Rural or Urban Dispersion

For any dispersion modeling exercise, the "urban" or "rural" determination of a source 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 is urban or rural based on land use or population density.

The Comanche Generating Station is located approximately 5 km southeast of the city of Pueblo, Colorado. The area is in a high desert area of terrain and has a semi-arid climate. The area receives some snow during the winter, but periods of snow cover are brief. The sources are located on relatively flat terrain between Pueblo and the Royal Gorge.

In order to categorize the area as rural or urban for modeling purposes, National Land Cover Dataset (NLCD) 1992 (CONUS) Land Cover data was obtained from the Multi-Resolution Land Use Consortium (MRLC). Data within a 3-km radius of each source was analyzed using the EPA AERSURFACE tool (version 13016). A source is considered urban if the land use types I1 (heavy industrial), I2 (light-moderate industrial), C1 (commercial), R2 (common residential), and R3 (compact residential) are 50 percent or more of the area within the 3-km radius circle. Otherwise, the source is considered a rural source. Based on the analysis using NLCD 1992 Land Cover data, only approximately 3.5 percent of the land within 3 km of the facility falls into the land use type categories listed above. Although some land development has occurred in the area since the 1992 data was published, it is clear from the aerial image provided in Figure 25 that the sources should be considered rural for the modeling analysis.

Figure 25. Aerial view of the Comanche Generating Station surrounding area.



The EPA's assessment supports the state's analysis on the land use classification.

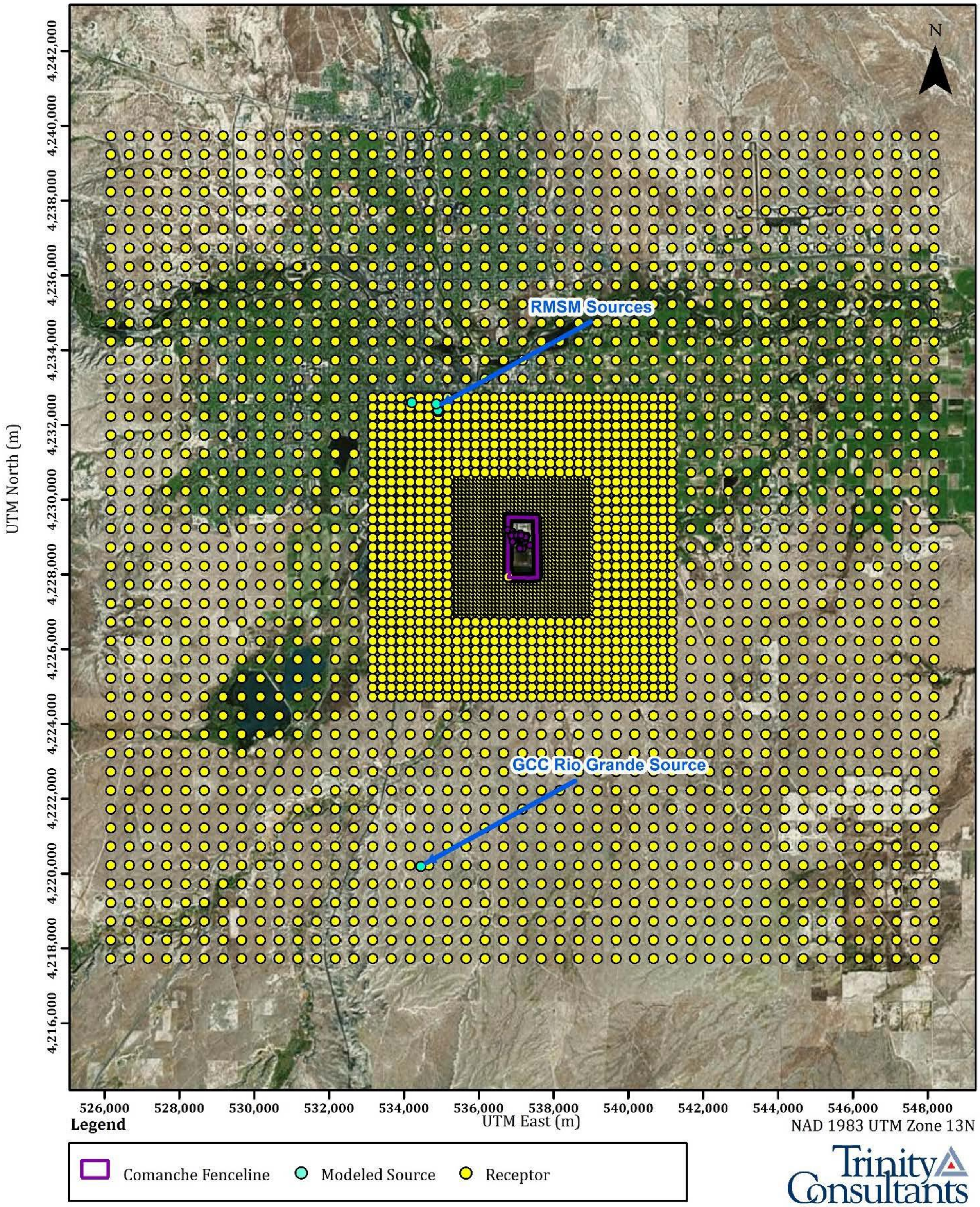
5.3.2.3.Modeling Parameter: Area of Analysis (Receptor Grid)

The 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 Comanche Generating Station, the state has included two other emitters of SO_2 within 10 km of the facility. No other sources beyond 10 km were determined by the state to have the potential to cause concentration gradient impacts within the area of analysis. The EPA agrees with the state, as this distance is consistent with the Modeling TAD. Specifically, the Modeling TAD states that the model domain should cover the location where air quality modeling predicts a significant concentration gradient because the gradients associated with a particular source will generally be largest between the source and the maximum ground-level concentrations from the source. Beyond that distance, gradients tend to be smaller and more spatially uniform. The Modeling TAD also notes that the general guideline for the distance between a source and its maximum ground-level concentration is generally 10 times the stack height in most cases

The dispersion modeling used a combination of a Cartesian grid system centered on the facility and discrete receptor points along the facility fence line. Receptors were placed at 25-meter intervals along the fence line for the facility, 100-meter intervals out to a distance of at least 1 kilometer (km) from the facility, 250-meter intervals out to a distance of at least 3 km from the facility, and at 500 meter intervals out to at least 10 km from the facility. On-site receptors (i.e., those located within the Comanche facility fence line) were removed, as the facility’s fence precludes public access to these areas. A total of 4,210 receptors were used in the modeling. In accordance with the Modeling TAD, receptors located on other facilities’ property were included in the analysis. The receptor locations are depicted in Figure 26.

Figure 26. Comanche Generating Station Receptor Array.



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 facility, including other facilities' property with the exceptions of locations described in Section 4.2 of the Modeling TAD. EPA supports the locations and coverage of receptors used in the state's air quality modeling assessment.

5.3.2.4.Modeling Parameter: Source Characterization

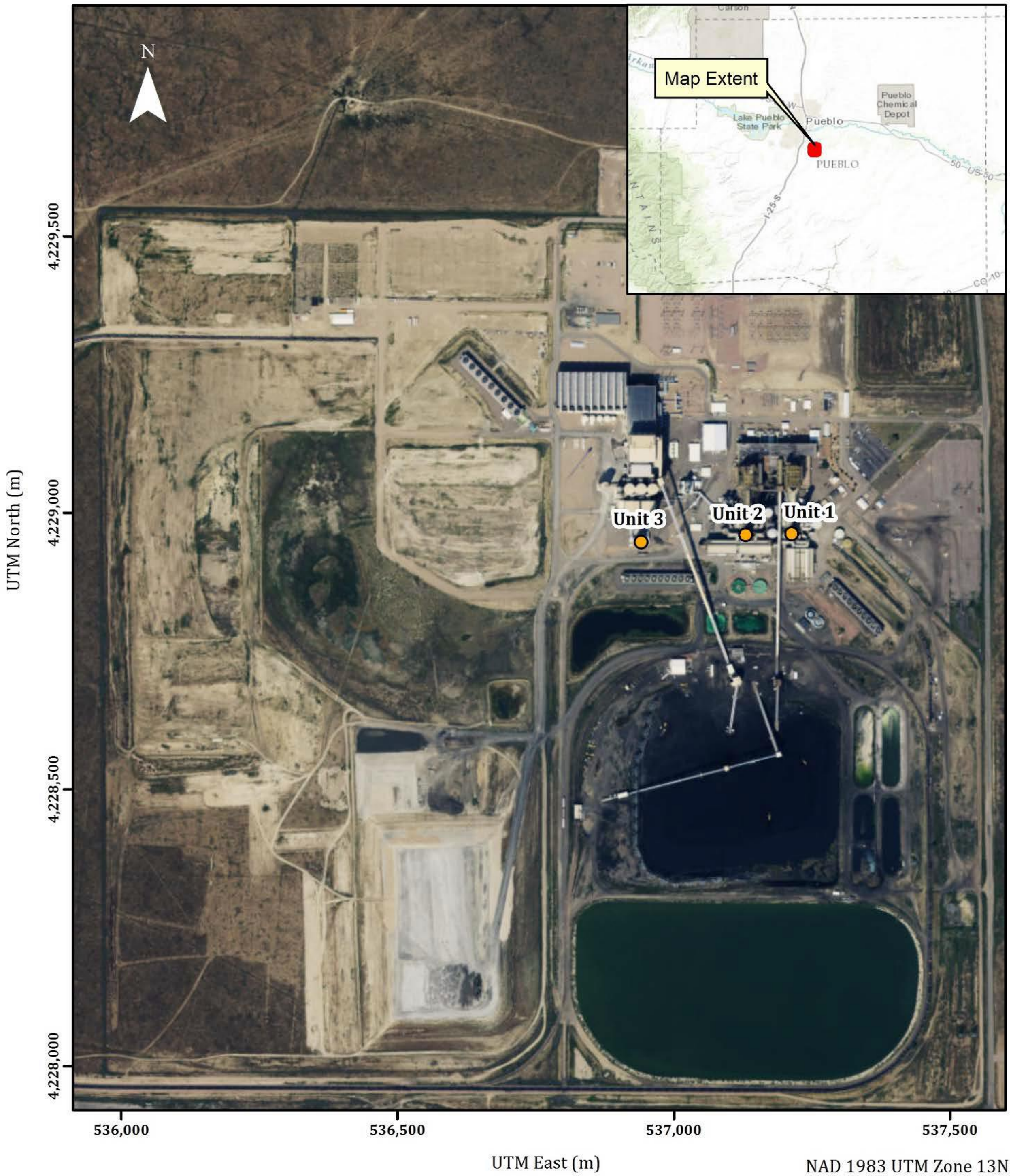
The Comanche Generating Station contains three coal-fired utility units, and all three units have SO_2 air pollution control systems. Table 12 outlines the sizes of the units and air pollution control equipment.

Table 12. Utility units included in modeling analysis

Unit	Size (MW)	Controls
Unit 1	325	Dry Scrubber and Fabric Filter
Unit 2	335	Dry Scrubber and Fabric Filter
Unit 3	750	Dry Scrubber, Selective Catalytic Reduction, and Fabric Filter

Figure 27 shows an aerial image of the location of the three units, as well as the location of the Comanche Generating Station relative to the surrounding area.

Figure 27. Location of Comanche Generating Station



Trinity Consultants

In accordance with the Modeling TAD, three years of actual emissions data for the 2013 to 2015 calendar years were used to conduct the SO_2 designation modeling for the Comanche Generating Station. Actual stack temperatures and velocities were also used in the modeling from the valid CEMS data.

Two other facilities included in the modeling analysis were the Rocky Mountain Steel Mill (RMSM) and the GCC Rio Grande Cement Plant (GCC). The CDPHE provided actual annual emissions from 2014 and 2015 for the RMSM and the GCC Rio Grande Cement Plant, respectively, as well as emissions submitted for the RMSM from March 1, 2008, through February 28, 2009. Of the two data sets provided by the CDPHE, the latter emissions were greater than the actual emissions. As a conservative measure, the higher emissions were used in the modeling. Modeled parameters for these sources (both GCC and RMSM) were taken from the CDPHE-provided RMSM modeling file. The annual emissions for RMSM and GCC were calculated using the modeled emission rate assuming 8,760 hours of operation per year, and average actual annual emissions were based on actual emissions from 2013, 2014, and 2015 (with the exception of 2013 for RMSM SRC005, where emissions data were obtained using CEMS). Actual 2013 emissions for the RMSM SRC005 was based on the most recent stack test data for the source paired with actual 2013 production data. Stack heights for these sources follow the GEP stack height policy. Note that the stack heights of all RMSM and GCC sources included in the analysis are below the GEP stack height. As such, actual stack heights are used in the analysis.

The stack parameters that were used in modeling are provided in Table 13. The plant structures, buildings, and tanks were included for AERMOD downwash calculations using BPIPPRM. A total of 60 structures were included in the modeling.

Table 13. Stack Parameters for Comanche Generating Station, RMSM, and GCC.

Stack ID Number	NAD83 Zone 13 UTM Coordinates		Stack Height	Base Elevation	Stack Diameter	Exit Velocity	Exit Temperature	Emission Rate
	Easting [m]	Northing [m]	m	m	m	m/s	K	g/s
Comanche Generating Station								
Unit 1	537213.7	4228962.2	151.79	1474.39	7.47	varies	varies	varies
Unit 2	537130.7	4228960.2	151.79	1473.16	7.28	varies	varies	varies
Unit 3	536941.2	4228947.2	152.4	1468.25	8.84	varies	varies	varies
RMSM								
SRC001	534927.1	4232345.7	20.4	1451.60	11.89	2.12	310.9	1.34
SRC003	534913.1	4232385.7	33.78	1450.89	4.88	8.04	377.6	1.573
SRC020	534216.9	4232593.2	54	1453.45	2.29	9.87	688.6	0.007249
SRC005	534867.4	4232553.7	18.59	1450.85	1.76	20.466	314.8	10.2225
GCC								
Unit 1	534452.1	4220189.7	115.7	1536.30	3.12	18.87	478	27.1

NAD83 = North American Datum 1983; UTM = Universal Transverse Mercator; m/s = meters per second; K = Kelvin degrees.

The state characterized these sources within the area of analysis in accordance with the best practices outlined in the Modeling TAD. Specifically, the state used actual stack heights in conjunction with actual emissions for the Comanche Generating Station, as well as actual stack heights for the other facilities because these heights were below GEP in all cases. The state also adequately characterized 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. The EPA supports the state's analysis of the source characterizations.

5.3.2.5.Modeling Parameter: Emissions

The EPA's Modeling TAD notes that for the purpose of modeling to characterize air quality for use in designations, the recommended approach is to use the most recent 3 years of actual emissions data and concurrent meteorological data. However, the TAD also indicates that it would be acceptable to use allowable emissions in the form of the most recently permitted (referred to as PTE or allowable) emissions rate that is federally enforceable and effective.

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 sources.

In certain instances, states and other interested parties may find that it is more advantageous or simpler to use PTE rates as part of their modeling runs. For example, where a facility has recently adopted a new federally enforceable emissions limit or implemented other federally enforceable mechanisms and control technologies to limit SO_2 emissions to a level that indicates compliance with the NAAQS, the state may choose to model PTE rates. These new limits or conditions may be used in the application of AERMOD for the purposes of modeling for designations, even if the source has not been subject to these limits for the entirety of the most recent 3 calendar years. In these cases, the Modeling TAD notes that a state should be able to find the necessary emissions information for designations-related modeling in the existing SO_2 emissions inventories used for permitting or SIP planning demonstrations. In the event that these short-term emissions are not readily available, they may be calculated using the methodology in Table 8-1 of Appendix W to 40 CFR Part 51 titled, "Guideline on Air Quality Models."

As previously noted, the state included Comanche and two other emitters of SO_2 within 10 km in the area of analysis. For this area of analysis, the state has opted to use a hybrid approach, where emissions from certain facilities are expressed as actual emissions, and those from other facilities are expressed as PTE rates. The facilities in the state's modeling analysis and their associated actual or PTE rates are summarized below.

For Comanche, the state provided annual actual SO_2 emissions between 2013 and 2015. This information is summarized in Table 14. A description of how the state obtained hourly emission rates is given below this table.

Table 14. Actual SO_2 Emissions Between 2013 – 2015 from Facilities in the Pueblo, Colorado Area of Analysis

Facility Name	SO_2 Emissions (tpy)		
	2013	**2014**	**2015**
Comanche Generating Station	3,496	3,157	3,295
Total Emissions from All Facilities in the Area of Analysis Modeled Based on Actual Emissions	3,496	3,157	3,295

For Comanche, the actual hourly emissions data were obtained from CEMs.

For RMSM and GCC Rio Grande Cement Plant, the state provided PTE values. This information is summarized in Table 15. A description of how the state obtained hourly emission rates is given below this table.

Table 15. SO_2 Emissions based on PTE from Facilities in the Pueblo, Colorado Area of Analysis

Facility Name	SO_2 Emissions (tpy, based on PTE)	Actual 2015 SO_2 Emissions
Rocky Mountain Steel Mill (RMSM)	456.7	311
GCC Rio Grande Cement Plant	942.1	9
Total Emissions from Facilities in the Area of Analysis Modeled Based on PTE	1398.8	320

All of these limits reflect current permitted PTE values (Construction Permit 93PB1073-8 for RMSM; Construction Permit 98PB0893 for GCC Rio Grande) apart from unit SRC5 at the RMSM. CDPHE used a PTE rate for RMSM SRC5 which came from a permit dated August 23, 2011. This limit has since been made more stringent (by 31%) when incorporated into Construction Permit 93PB1073-8, issued May 8, 2014.

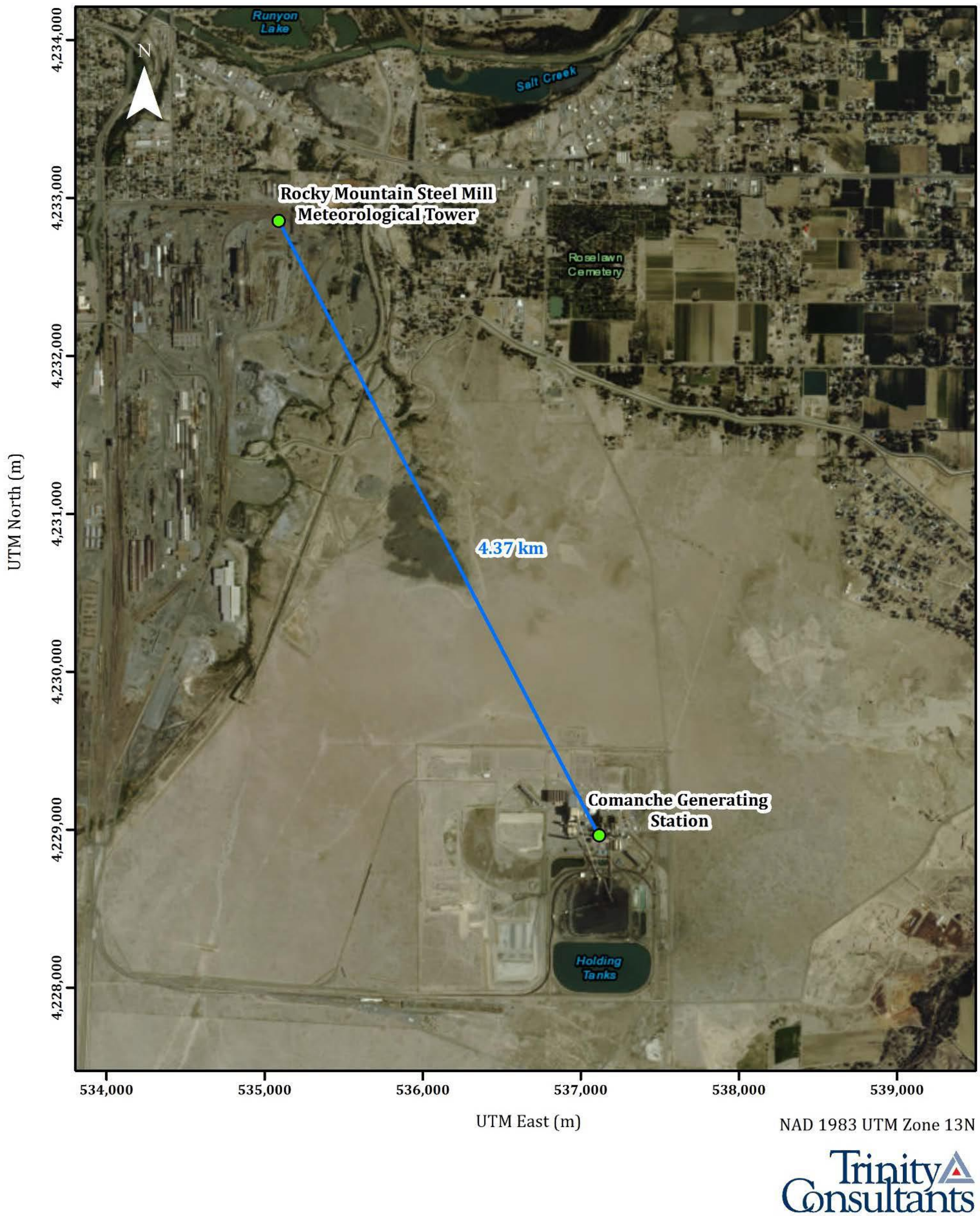
The EPA finds that these allowable emission limits are appropriate, as they are federally enforceable and effective (or more conservative than the federally enforceable rate in the case of RMSM SRC5), and much higher than actual emissions, which the state could also have used instead of PTE.

5.3.2.6.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) 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.

The state used surface meteorological data collected at the Rocky Mountain Steel Mill (RMSM) meteorological tower at 38.243N, 104.599W as an input to the AERMOD model. Both the Rocky Mountain Steel Mill meteorological tower and the Comanche Generating Station are located between the St. Charles River and the Arkansas River, southwest of Pueblo, Colorado. The relative locations of the Rocky Mountain Steel Mill meteorological tower and the Comanche Generating Station are shown in Figure 28. As shown in the figure, the meteorological tower is approximately 4 km from the Comanche Generating Station, and there are no significant terrain features separating the Comanche Generating Station from the meteorological tower. The close proximity of the RMSM with respect to the sources (less than 5 km distance) and the similarity in the climatology and topography both support that the meteorological conditions at the RMSM are representative of the meteorological conditions at the Comanche sources. Furthermore, since the elevation of the Comanche Generating Station is slightly higher than that of the RMSM, the Comanche sources are more exposed than the RMSM tower and therefore the dispersion characteristics at the facility are expected to be slightly better than at the RMSM. This makes the use of RMSM data a conservative choice.

Figure 28. Comanche Generating Station and Monitoring Locations.

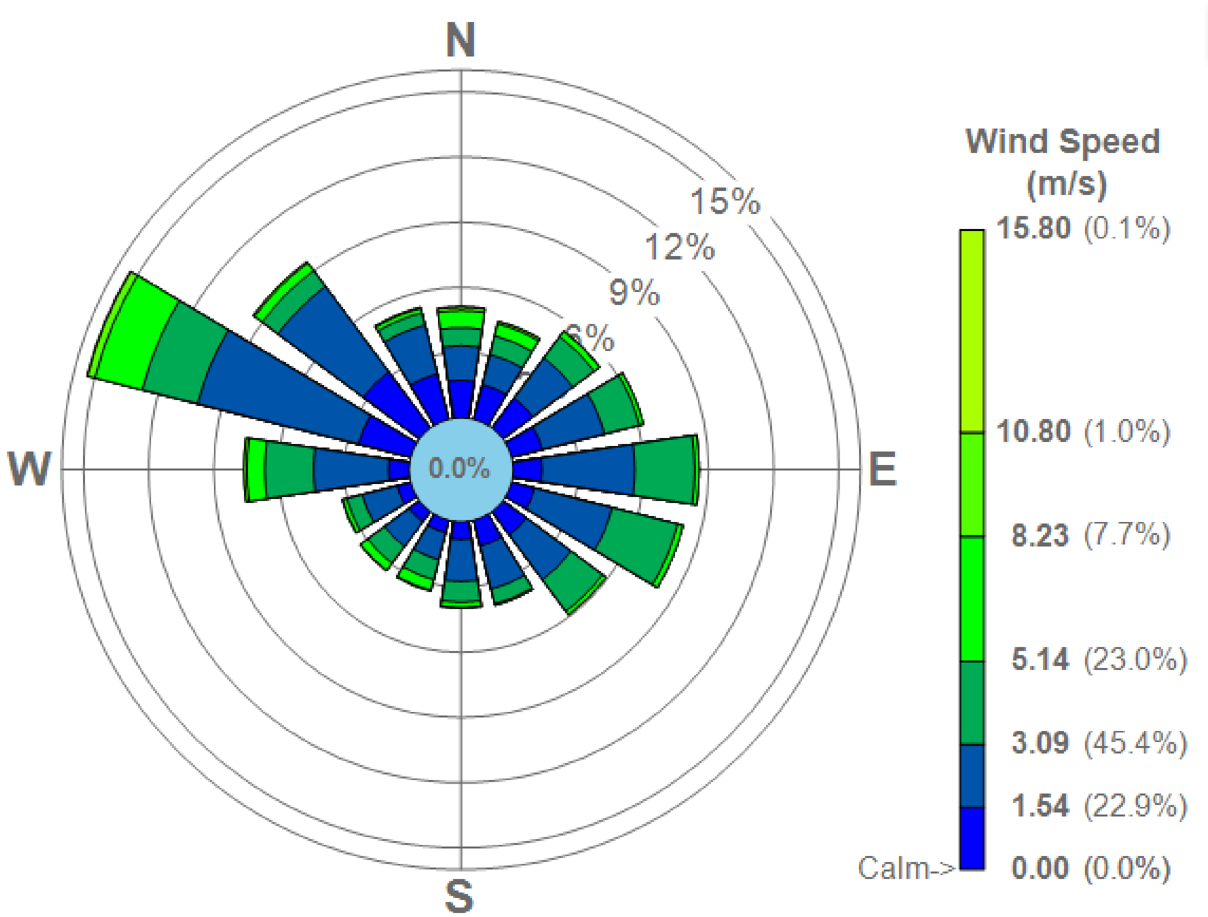


The exposure and siting of the meteorological tower at the Rocky Mountain Steel Mill is appropriate for the area. The meteorological tower is not located near terrain features or structures that would have the potential to influence data collected at the monitor. Data from the RMSM is available for the period of March 2008 to February 2009, and July 2013 to December 2015. Since RMSM data is not available for January to June 2013, data for this missing period was filled with data for the corresponding months from 2008 and 2009 from the RMSM. Per the Modeling TAD, dates of the 2008 and 2009 data were adjusted to match the dates of the 2013 actual hourly emissions data.

Processed data for 2013, 2014, and 2015 collected at the National Weather Service (NWS) ASOS meteorological station located at 38.2887N, 104.5057W at the Pueblo Memorial Airport in Pueblo, Colorado (KPUB) was used during hours that on-site data from the RMSM tower is missing. After the substitution described in the preceding paragraph, there are very few missing hours in the RMSM data, thus data from the NWS station was used for less than 1 percent of the hours in the analysis. A determination of whether the meteorological data from the Pueblo Memorial Airport is appropriate for use in this modeling analysis is considered by determining whether the data were representative of the location of the modeled sources. The proximity of the airport with respect to the sources (approximately 11 km distance), in addition to the similarity in the climatology and topography (the airport elevation is approximately 4,680 feet and source elevations are approximately 4,830 feet) support that the meteorological conditions at the airport are also representative of the meteorological conditions at the sources.

AERMOD-ready meteorological data was prepared using version 15181 of the AERMET meteorological processing utility. Standard U.S. EPA meteorological data processing guidance was applied. A wind rose is included below in Figure 29.

Figure 29. Wind Rose Plot for RMSM Meteorological Data



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, one-minute ASOS (Automated Surface Observing System) wind data were processed using AERMINUTE (version 15272) into hourly data for input into AERMET (15181). 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 0.25 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.

The wind rose shows that the dominate wind directions are from the west (about 15 percent of the time) and east (about 9 percent of the time). The average wind speed is about 2.75 $m\ s^{-1}$, where calm winds are about 0.18 percent of the time.

In addition to surface meteorological data, AERMET requires the use of data from a sunrise-time upper air sounding to estimate daytime mixing heights. Upper air data from the nearest U.S. National Weather Service (NWS) upper-air balloon station, located at 39.77N, 104.88W in Denver, Colorado (KDNR), was obtained from the National Oceanic and Atmospheric Administration (NOAA) in Forecast Systems Laboratory (FSL) format. The period of the upper air data is concurrent with the period of the surface data.

AERSURFACE (version 13016) was used to calculate the surface characteristics values, including albedo, Bowen ratio, and surface roughness length, at the surface meteorological observing site for input into AERMET. National Land Cover Dataset (NLCD) 1992 (CONUS) Land Cover data that were used in AERSURFACE processing was obtained from the Multi-Resolution Land Use Consortium (MRLC). EPA guidance dictates that on at least an annual basis, soil moisture at a surface site should be classified as wet, dry, or average in comparison to the 30-year climatological record at the site. This determination is used to set the Bowen ratio estimated by AERSURFACE. To make the determination, annual precipitation in each modeled year (2013, 2014, and 2015) was compared to the historical climatological record for the area surrounding the RMSM and KPUB towers. Specifically, precipitation of a modeled period was compared to 1981-2010 precipitation record.

Precipitation data for station KPUB was obtained. The 30th and 70th percentile values of the annual precipitation distribution from the dataset were calculated. Each modeled year was classified for AERSURFACE processing as “wet” if its seasonal precipitation was higher than the 70th percentile value, “dry” if its seasonal precipitation was lower than the 30th percentile value, and “average” if it was between the 30th and 70th percentile values.

Climate Normal snow records for 1981-2010 were also reviewed to determine whether the area had continuous winter snow cover. Continuous winter snow cover was assumed for months in which at least 10 days had a snow depth of at least 1 inch.

The state estimated values in 30 degree sectors, equating to 12 spatial sectors out to a 1 km radius around the monitoring site for surface roughness. The surface parameters were determined on a monthly basis using default season assignments.

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 Appendix W and the Modeling TAD in the processing of the raw meteorological data into an AERMOD-ready format, and used AERSURFACE to best represent surface characteristics. The EPA supports the state's analysis as best representative of meteorological conditions within the area of analysis.

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

The terrain elevation for each receptor, building, and emission source were determined using USGS 1/3 arc-second National Elevation Data (NED). The NED, obtained from the USGS, has terrain elevations at 10-meter intervals. Using the AERMOD terrain processor, AERMAP (version 11103), the terrain height for each receptor, building, and emission source included in the model was determined by assigning the interpolated height from the digital terrain elevations surrounding each source.

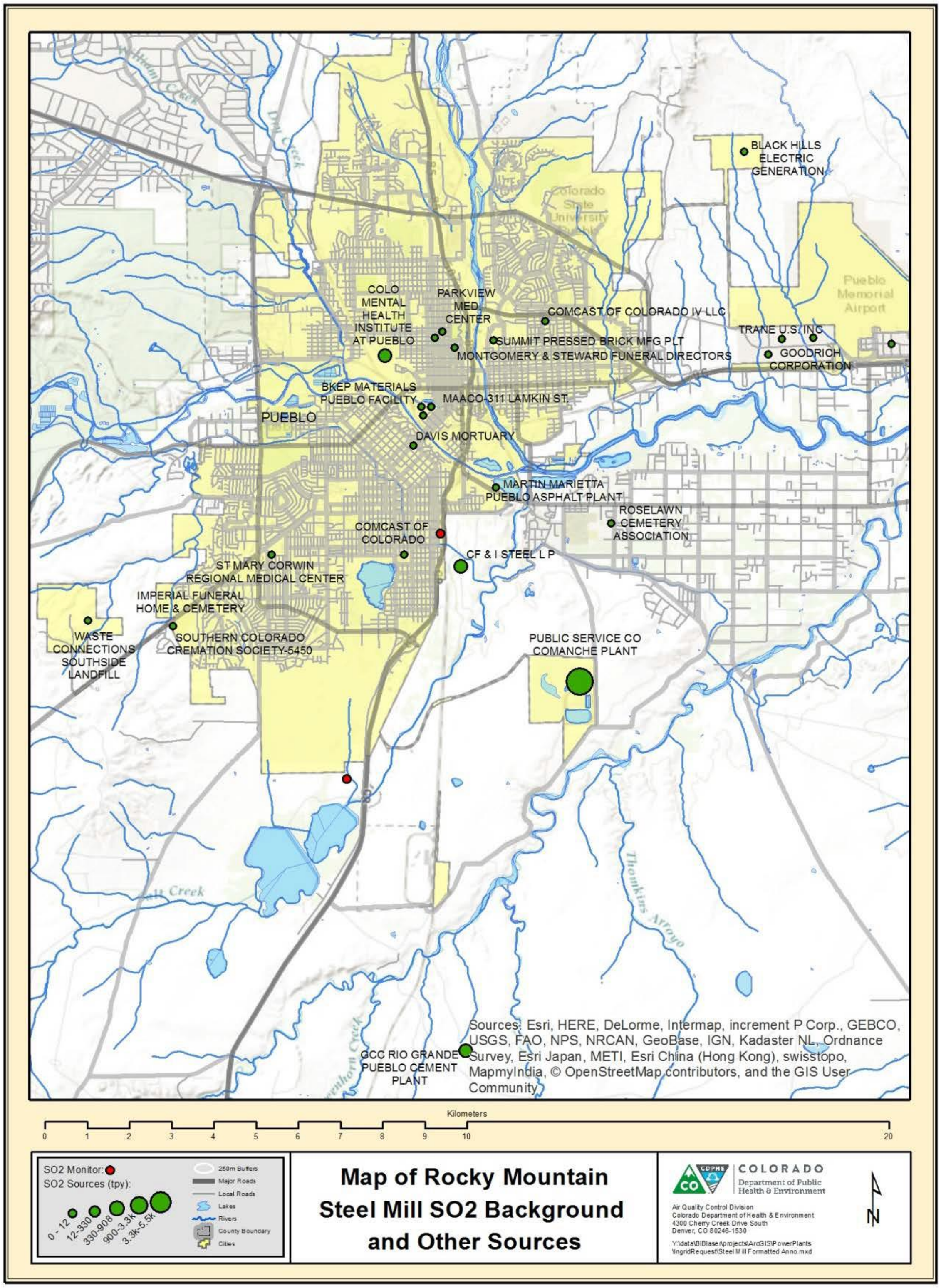
In addition, AERMAP was used to compute the hill height scales for each receptor. AERMAP searches all NED points for the terrain height and location that has the greatest influence on each receptor to determine the hill height scale for that receptor. AERMOD then uses the hill height scale in order to select the correct critical dividing streamline and concentration algorithm for each receptor.

5.3.2.8.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 99^{th} percentile monitored concentrations by hour of day and season or month. For this area of analysis, the state utilized the tier 1 approach, where the background concentrations for this area of analysis were determined by the state.

Figure 30 shows the Evraz - Rocky Mountain Steel Mill Facility (RMSM) with the two nearby off-site SO_2 monitoring stations previously maintained by RMSM, as well as additional SO_2 sources within 10 km of the RM Reservoir monitor. As shown in the map, the RMSM Print Shop monitor is located within the city of Pueblo, near the highway. The RM Reservoir monitor is located south of the city, and is isolated from the city's impacts. The RM Reservoir location is believed to be the most representative location for an estimate of SO_2 background in the area of the Comanche Generating Station which also included in the map. The SO_2 sources are shown as green circles on the map.

Figure 30. Map of Monitoring Location and Sources



Other than Comanche Generating Station, the GCC Rio Grande Cement Plant, and the RMSM facility, which are the largest sources of SO_2 in Pueblo county, all SO_2 sources apart from the Colorado Mental Health Institute at Pueblo (30 tpy in 2014) emit 5 tpy or less of SO_2. These emissions from sources in the area apart from the Comanche Generating Station, the GCC Rio Grande Cement Plant, and the RMSM facility, were not included in the modeling analysis. The state considers this appropriate because, as described further below, the background monitor used in the modeling analysis was influenced by the large amount of SO_2 emissions from sources in the area.

The State of Colorado has very limited ambient SO_2 data available because compared to the past National Ambient Air Quality Standards, the state has had ambient concentrations below the NAAQS. Therefore, ambient monitoring of SO_2 was rarely required and a "regional site" (one that is located away from the area of interest but is impacted by similar natural and distant man-made sources) was used to determine an appropriate background concentration.

The RMSM Reservoir Site, which the state feels is most representative of conditions at Comanche, only has two years of data (2014-2015). These data were collected voluntarily by RMSM, in anticipation of a permit application requiring preconstruction monitoring under Prevention of Significant Deterioration (PSD) regulations. From 2013 – 2015, the Print Shop site showed 0.012 ppm as the 99th percentile, as opposed to the Reservoir site with 0.010 ppm for two years. The Print Shop site is within Pueblo, west of the RMSM Plant, and on the other side of I-25; this site is more influenced by local urban and highway sources than the Reservoir Site. The Reservoir Site is south of Pueblo, outside the city limits. The RMSM Reservoir site represents a rural area, and Colorado feels it is representative in this case, as it is a rural plains location outside of Pueblo, with the inclusion of regional highway impacts, for the area surrounding the Comanche Power Plant.

CDPHE has 1-hr SO_2 monitoring data from sites in Denver, Colorado Springs, Pueblo, a remote western slope site (Williams Energy Willow Creek), the Holcim Cement facility near Florence, a Tri-State monitoring location outside of Holly, Southwest Generation south of Colorado Springs, and the RM Reservoir site. CDPHE used best professional judgment to determine that data from large urban areas would not be representative of the area around the Comanche Generating Station since Comanche is not located inside a large urban area. Similarly, the Southwest Generation data has a value of 0.045 ppm, which is an extremely high value that is non-representative. The Holly data are from a location on the plains of eastern Colorado, and are not representative of conditions along the Front Range of Colorado. The Williams Willow Creek data were collected in a remote area and the Holcim data were collected in a rural area of the state outside of a small city both of which are less representative of the area around the Comanche Generating Station. Therefore, CDPHE determined that the RM Reservoir monitor data are the most appropriate and most representative for use in this case based on the following factors:

1. Both the Comanche Generating Station and the RM Reservoir monitor are located in rural areas within 10 km of Pueblo, Colorado, a large urban center. The population of Pueblo is approximately 106,600.
2. Both Comanche Generating Station and the RM Reservoir monitor are located along the Front Range of Colorado in areas of similar topography.

3. Both the Comanche Generating Station and the RM Reservoir monitor are located south of the city of Pueblo, and are isolated from the city's impacts.
4. The Comanche Generating Station and the RM Reservoir monitor are within 4 miles of each other.

Furthermore, the RM Reservoir monitor provides a conservative estimate of background SO_2 concentrations at Comanche Generating Station because of the nearby industrial sources of SO_2 emissions. There are thirteen industrial sources of SO_2 emissions within 10 km of the RM Reservoir monitor totaling approximately 3,620 tpy, including Comanche and RMSM. By contrast, there are twenty sources of SO_2 emissions within 10 km of Comanche Generating Station totaling approximately 351 tpy (excluding SO_2 emissions from Comanche Generating Station itself for background concentration comparison purposes). The location of Comanche Generating Station in relation to surrounding SO_2 sources in show in the figure above.

Because of the significantly higher source emissions around the RM Reservoir monitor (3,620 tpy vs 351 tpy), the RM Reservoir monitoring data provides a conservative estimate of the background SO_2 emissions that could be found near the Comanche Generating Station. CDPHE used best professional judgment to determine that this data is the best estimate of background concentrations at the Comanche Generating Station. The RM Reservoir monitor could be overly conservative based on the above information and the fact that the Comanche Generating Station itself, a large SO_2 source, is located near the monitor.

CDPHE has provided a 1-hour SO_2 background concentration of 10 ppb (based on the design value) that is representative of the background concentration in the vicinity of the Comanche Generating Station. The design value is from the RM Reservoir Site, and is the 99th percentile two-year average (2014-2015). Note that this background concentration is conservative since the data were collected at or near the sources modeled in this analysis and likely includes contributions from these sources. Consistent with EPA air quality modeling guidance, the constant background concentration was added to the modeling results and was not explicitly included in the model.

The EPA supports the state's approach for determining the background concentration.

5.3.2.9.Summary of Modeling Inputs and Results

The AERMOD modeling input parameters for the Comanche Generating Station analysis are summarized below in Table 16.

Table 16: Summary of AERMOD Modeling Input Parameters for the Pueblo, Colorado Area of Analysis

Input Parameter	Value
AERMOD Version	15181 (regulatory options)
Dispersion Characteristics	Rural
Modeled Sources	3
Modeled Stacks	8
Modeled Structures	60
Modeled Fencelines	1
Total receptors	4210
Emissions Type	Actual
Emissions Years	2013-2013
Meteorology Years	January 2008 to June 2009, July 2013 to December 2015
NWS Station for Surface Meteorology	RMSM in Colorado
NWS Station Upper Air Meteorology	Denver, CO
NWS Station for Calculating Surface Characteristics	RMSM and Pueblo Memorial Airport in Colorado
Methodology for Calculating Background SO_2 Concentration	Tier 1 using data from RMSM
Calculated Background SO_2 Concentration	10 ppb / 26.19 $\mu g/m^3$

The results presented below in Table 17 show the magnitude and geographic location of the highest predicted modeled concentration based on the input parameters.

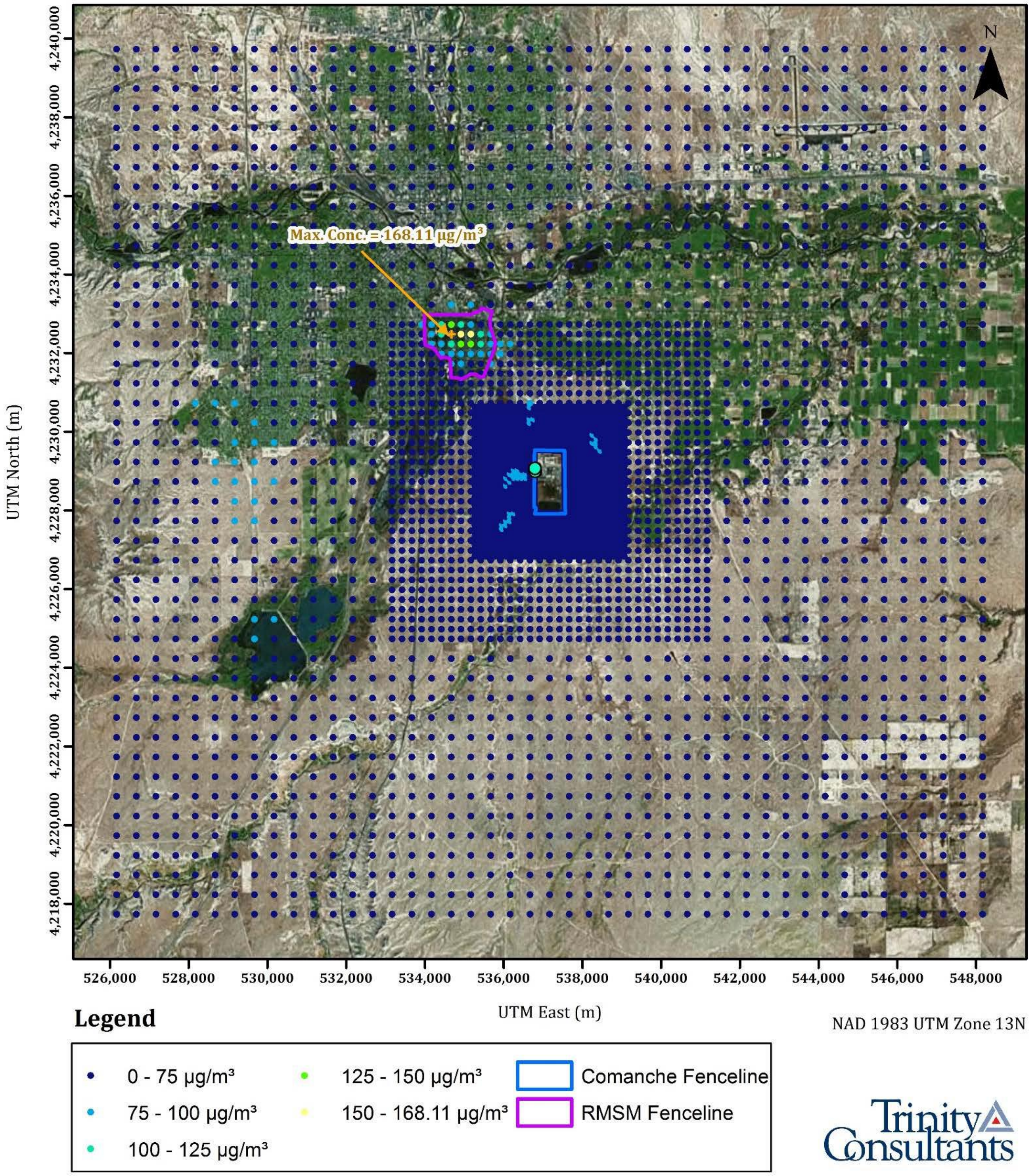
Table 17. Maximum Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Pueblo, Colorado Area of Analysis

Averaging Period	Data Period	Receptor Location [UTM zone 13]		99th percentile daily maximum 1-hour SO_2 Concentration ($\mu g/m^3$)	
		UTM/Latitude	UTM/Longitude	Modeled concentration (including background)	NAAQS Level
99th Percentile 1-Hour Average	2013 – 2015	534671.00	4232474.00	168.2	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 indicates that the highest predicted 99th percentile daily maximum 1-hour concentration within the chosen modeling domain is 168.2 $\mu g/m^3$, equivalent to 64.229 ppb. This modeled concentration included the background concentration of SO_2, and is based on actual emissions from the facility. Figure 31 below was included as part of the state's recommendation, and indicates that the predicted value occurred about 4.6 km northwest of the Comanche Generating Station.

Figure 31: Predicted 99th Percentile Daily Maximum 1-Hour SO_2 Concentrations Averaged Over Three Years for the Pueblo, Colorado Area of Analysis



The modeling submitted by the state does not indicate that the 1-hour SO_2 NAAQS is violated at the receptor with the highest modeled concentration.

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

The state's approach to conducting the dispersion modeling for EPA's 1-hour SO_2 designations appears to align with the TAD. The state has also provided sufficient information to the EPA to determine that the modeling assessment is sufficient for supporting designation decisions. While the state used AERMOD v15181, the state elected to use regulatory default options (i.e., ADJ_U* was not used in the modeling), which should not significantly impact the predicted SO_2 concentrations. The EPA supports the platform used for the modeling assessment because it is not anticipated to cause significant differences in the model results.

5.3.3. Modeling Analysis Provided by Other Organizations

The EPA has not received any modeling assessments from a 3rd party.

5.4 Jurisdictional Boundaries in the Pueblo Area

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for city/county/parish. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

The Comanche Generating Station is located within the city limits of Pueblo however it is an outlying incorporation that is over a mile from the main city limits and surrounded by rural areas of Pueblo County. The majority of the city of Pueblo (population 108,249 as of 2013) is located approximately three miles (4.8 km) to the northwest. As of 2013, the population of Pueblo County was 161,451 people. The population of the city of Pueblo comprises about 70% of Pueblo County's population.

CDPHE recommended applying a general radius of 10 km (6.2 miles) around the Comanche Generating Station, with the additional incorporation of land within Pueblo city limits, St. Charles Mesa CCD, and census tract 29.03 as the boundary for the unclassifiable/attainment area designation, as shown in Figure 15.

5.5 The EPA's Assessment of the Available Information for the Pueblo, Colorado Area

The EPA has determined, based on our review of the modeling data provided by the state, that the Pueblo area meets the 2010 SO_2 NAAQS and do not contribute to any nearby area that does not meet the NAAQS, as there are no such areas nearby. For this reason, we intend to designate the area as unclassifiable/attainment. The available SO_2 monitoring data in the area recorded a design value of 12 for 2013-2015. These monitoring data were available to EPA for consideration in the designations process, however, since it is unclear if these monitors are located in areas of maximum concentration, it is unclear if the data are representative of the area's actual air quality.

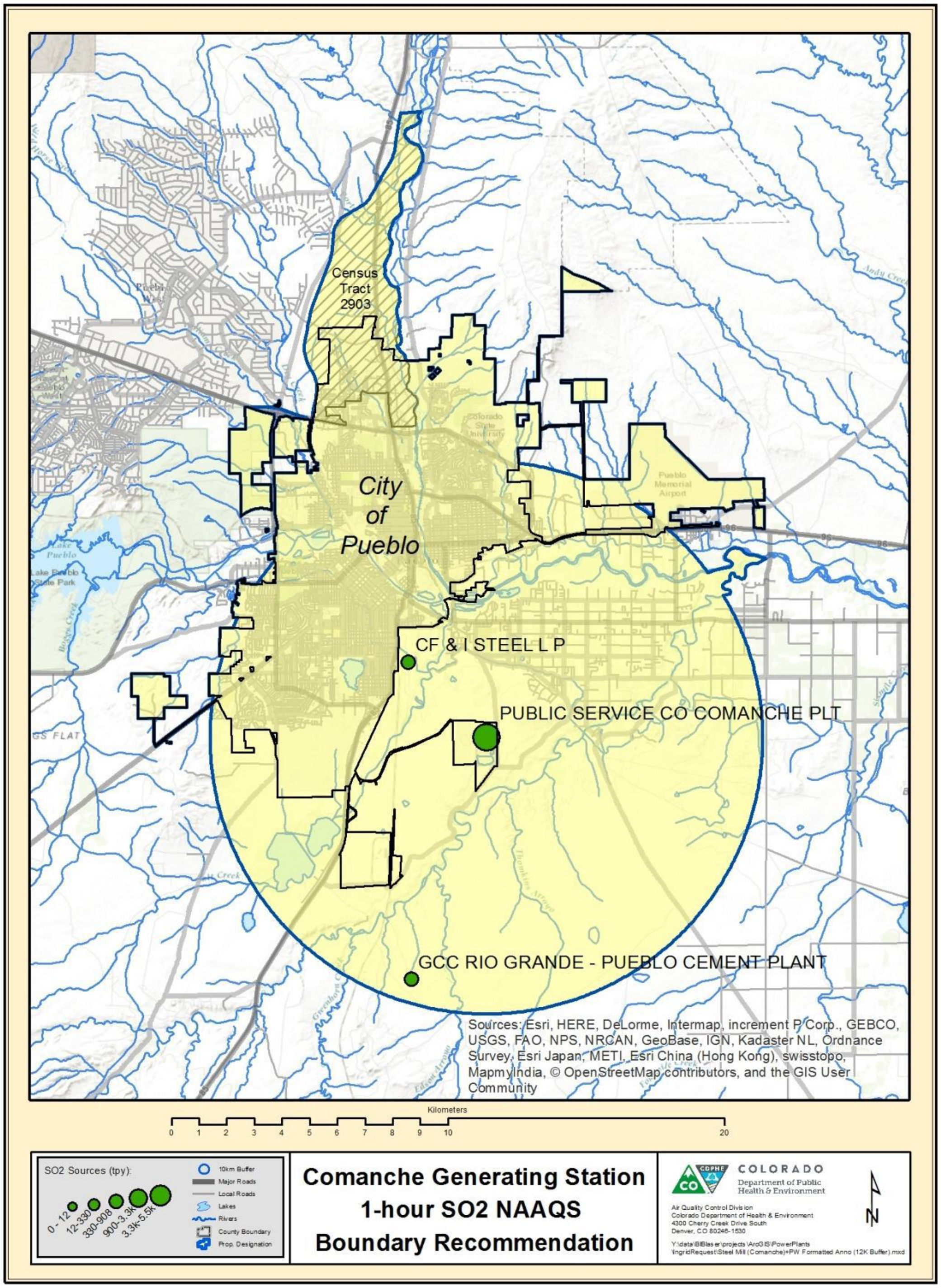
The EPA believes that our intended unclassifiable/attainment area is consistent with that recommended by the state, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area. This is based on the modeling results provided by the state which include the Comanche plant and other nearby sources in the Pueblo area which indicated attainment of the NAAQS.

5.6 Summary of Our Intended Designation for the Pueblo, Colorado Area

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the Pueblo area as defined by the state (10 km around the Comanche Generating Station, with the additional incorporation of land within Pueblo city limits, St. Charles Mesa CCD, and census tract 29.03) as unclassifiable/attainment for the 2010 SO_2 NAAQS. This is based on the modeling information provided by the state demonstrating that the Pueblo area meets the 2010 SO_2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS. As described in further detail in section 7, the EPA intends to designate the remainder of Pueblo County (outside of our intended unclassifiable/attainment designation area as described above) as unclassifiable/attainment for the 2010 SO_2 NAAQS. There will be no remaining areas in Pueblo County that will need to be addressed.

Figure 32 shows the boundary of this intended designated area.

Figure 32. Boundary of the Intended Pueblo, Colorado Unclassifiable/Attainment Area



6 Technical Analysis for the Area Surrounding the Cherokee Generating Station

6.1 Introduction

The EPA must designate the area surrounding the Cherokee Generating Station in unincorporated Adams County, Colorado, by December 31, 2017, because the area has not been previously designated and Colorado has not installed and begun timely operation of a new, approved SO_2 monitoring network for the area surrounding this source. Rather, the state has justified the placement of its existing monitoring network, which indicates attainment of the 2010 SO_2 NAAQS for emissions from Cherokee and surrounding sources for the 2013-2015 design value period.

In its recommendation, the state recommended that the area around the Cherokee Station be designated as unclassifiable/attainment for the 2010 SO_2 NAAQS, based on monitored air quality from 2013-2015. Specifically, the state's recommended boundaries consist of a ten km radius surrounding the Cherokee facility. The state also submitted technical information to verify that the monitoring network sufficiently characterizes ambient SO_2 air quality conditions from the Cherokee Station and nearby sources, which will be discussed in greater detail later in this section. The EPA agrees with Colorado's recommendation as to the designation category, and intends to designate this area, as described below, as unclassifiable/attainment for the 2010 SO_2 NAAQS based upon currently available information for the period 2013-2015. Our intended boundaries are consistent with the state's recommended boundaries and are described below.

6.2 Air Quality Monitoring Data

This factor considers SO_2 air quality monitoring data. The 2013-2015 maximum design value for the area around the Cherokee Station (including portions of Adams and Denver County) is 22 ppb.[6] This is based on monitors located in both Adams County (3174 E. 78th Ave.) and Denver County (2105 Broadway Ave.). Table 22 below shows information related to these monitors, as well as other ambient air quality monitors within the area.[7]

Table 22: Air Quality Data for the EPA's Intended Unclassifiable/Attainment Designation for the Area Surrounding the Cherokee Generating Station

County	Air Quality Systems (AQS) Monitor ID	Monitor Name	Monitor Location	2013 – 2015 SO_2 Design Value (ppb)
Adams	08-001-3001	Welby	3174 E. 78th Ave., Denver, CO	21
Denver	08-031-0002	CAMP	2105 Broadway, Denver, CO	22
Denver	08-031-0026	La Casa	4545 Navajo Street, Denver, CO	14 (2014-2016)*

* The La Casa monitor did not begin operation until April 2013, therefore the 13-15 dv is not complete.

Based on ambient air quality collected between 2013 and 2016, the area near Cherokee Generating Station attains the 2010 SO_2 NAAQS at all of its monitors.

6.3 Emissions and Emissions-Related Data for the Area Surrounding the Cherokee Generating Station

Cherokee is located in the industrial metropolitan area (unincorporated Adams County) north of Denver, Colorado, and has been in operation since the 1950's. It has been operating under the Title V Operating Permit 96OPAD130 since 2002. Currently, there is only one coal-fired electric utility boiler operating at this facility but historically, there were four operating units. The other units have been permanently retired as required by the EPA-approved BART Alternative in Colorado's Regional Haze SIP (77 FR 76871, December 31, 2012). These units have been replaced with two natural gas turbines and one steam turbine. The remaining coal-fired unit, Cherokee Unit 4, utilizes a Lime Spray Dryer and low-sulfur coal to reduce SO_2 emissions. Table 23 provides available SO_2 emissions data for Cherokee as reported to the EPA Air Markets Program Data system. As indicated in the table below, the decommissioning of coal-fired units over the past five years has resulted in significant SO_2 emission reductions. Additional reductions

[6] Using a conversion factor of 2.619 $\mu g/m^3$.
[7] The 2013 – 2015 design values for this and other SO_2 monitors are available in a data file posted at https://www.epa.gov/air-trends/air-quality-design-values.

will occur when Unit 4 ceases burning coal.[8] Unit 4 will operate exclusively on natural gas after December 31, 2017, as required by Colorado's EPA-approved Regional Haze SIP. Cherokee's SO_2 emissions have decreased over the past several years as the plant has decommissioned its older coal-fired units and shifted to natural gas powered units but it remains the largest SO_2 source in metro Denver, pending conversion of Unit 4 to natural gas.

Table 23. Historic Cherokee SO_2 Emissions Data

Year	Coal EGU Operating Time (hours)	SO_2 Annual Emissions (tons/year)	SO_2 Annual Emission Rate (lb/MMBtu)	Unit(s) Decommissioned
2011	28,435	7,405	0.41	Unit 2 (10/15/11)
2012	17,963	3,254	0.34	Unit 1 (4/30/12)
2013	15,359	2,584	0.16	None
2014	15,703	2,779	0.16	None
2015	11,814	2,439	0.19	Unit 3 (8/19/15)
2016	8,520	1,906	-	None

There are several smaller SO_2 sources in close proximity to Cherokee as shown in Table 24, below. Table 24 displays information on all permitted SO_2 sources within 10 kilometers (km) or 6.2 miles (mi) of Cherokee.

Table 24. Sources Near the Cherokee Generating Station

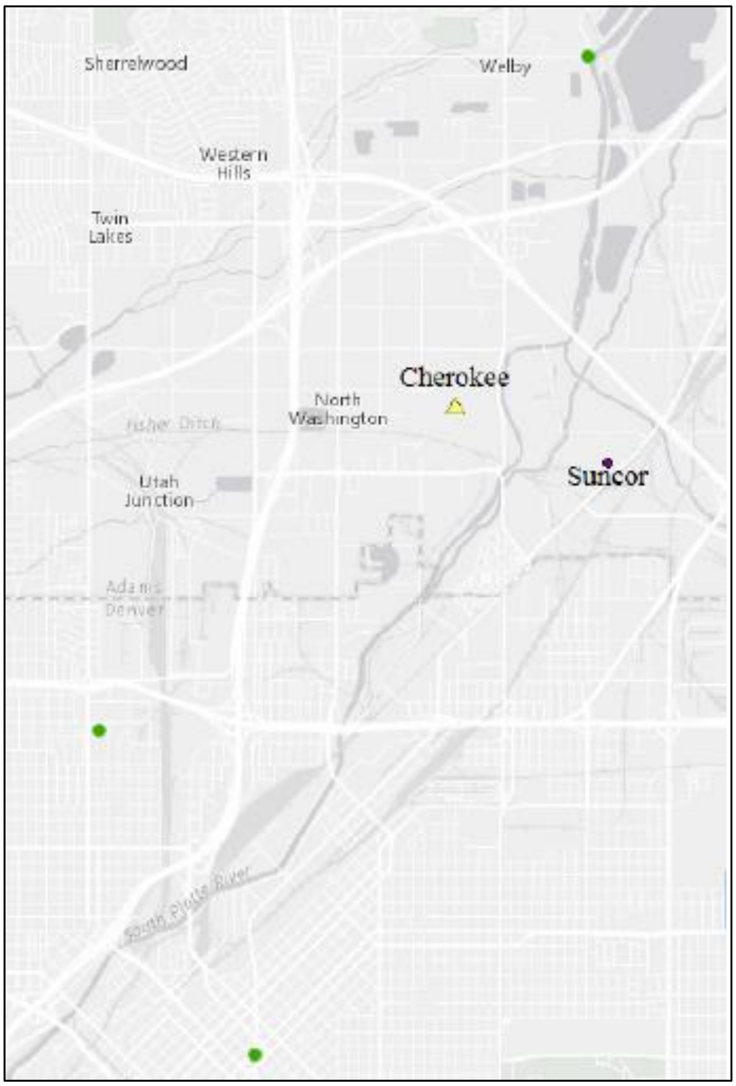
Source Name	Distance (km/mi)	Emissions (tpy)
Metro Wastewater	0.8/0.5	55 tpy
Suncor Energy	1.6/1.0	249 tpy
Colorado Asphalt Services	2.4/1.5	2 tpy
Brannan Sand and Gravel	2.4/1.5	25 tpy
Owens Corning-Trumbull Asphalt Plant	2.9/1.8	69 tpy
Nestle Purina Petcare Co	3.2/2.0	45 tpy
Chemtrade Solutions LLC	3.9/2.4	19 tpy
Aggregate Industries	4.3/2.7	23 tpy
St Anthony Hospital North	6.6/4.1	6 tpy
Denver Museum of Nature and Science	7.1/4.4	2 tpy
Rose Medical Center	8.9/5.5	2 tpy
SO_2 Emissions Total in 10 km Radius of Cherokee (Cherokee emissions not included)		**497 tpy**

As shown, just over half of these SO_2 emissions were from Suncor Energy, which is located approximately 1 mile to the southeast of the Cherokee Station and reported producing 249 tpy

[8] The Cherokee Station generally fires bituminous coal that has an average sulfur content of 0.46 percent. The coal has been sourced from a variety of coal mines, including Twenty Mile, West Elk, and Bowie, located in western Colorado, based on 2010-2015 data.

SO_2 in 2015. Figure 33 shows the location of the Suncor facility in relation to the Cherokee Station, as well as the locations of the three monitors in the network (shown as green dots). In addition to being close to the Cherokee Station, the Suncor facility is also located very close to the South Platte River, which runs between the two facilities. The following section on meteorology describes the importance of the South Platte River Drainage on wind patterns in the area, and indicates that SO_2 emissions from the Suncor facility would be expected to follow a similar path to those from the Cherokee Station.

Figure 33. Suncor Energy in Relation to Cherokee Station and Monitor Network

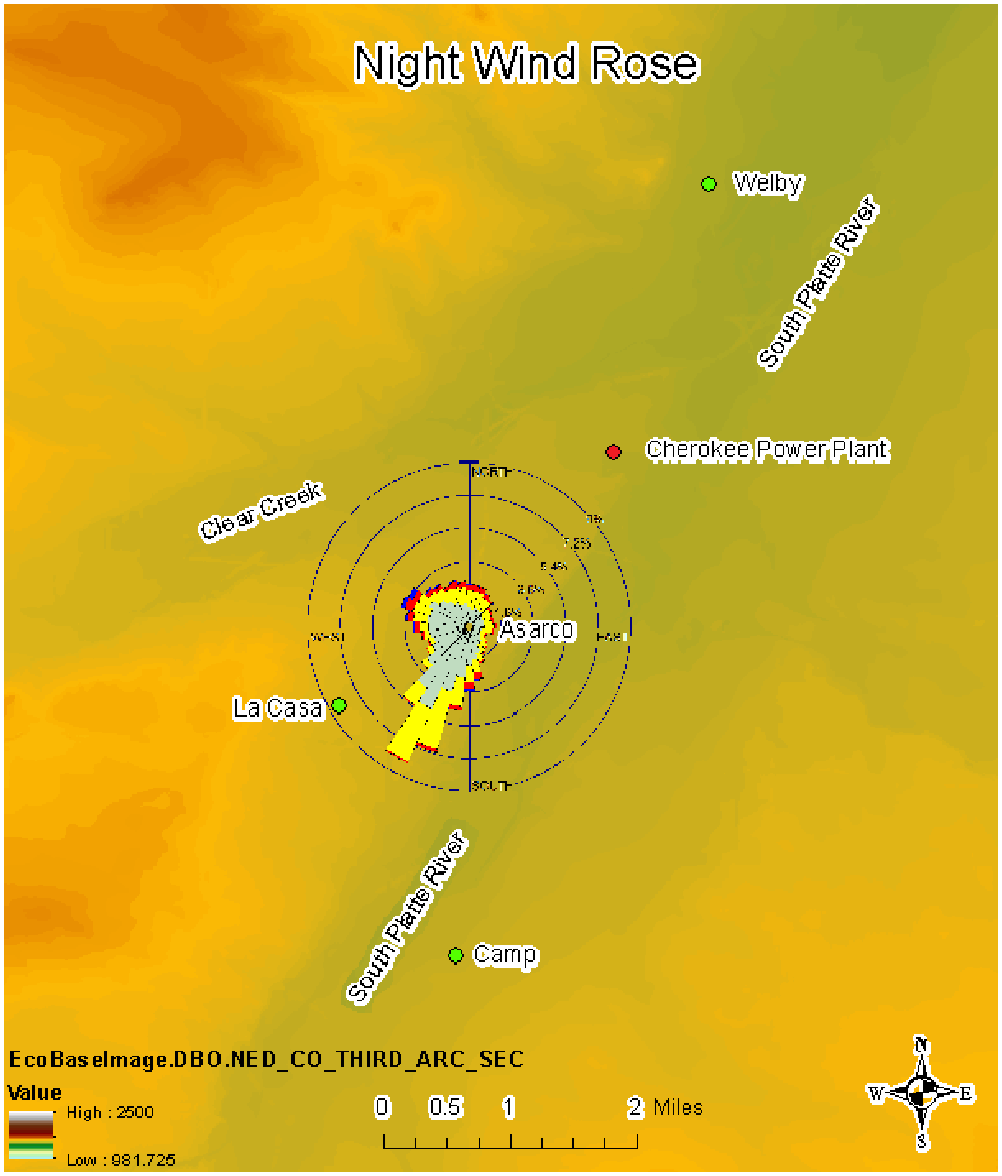


The most current comprehensive emission inventory (2013) available from CDPHE records for Denver and the North Front Range (Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer and Weld Counties) indicates that approximately 87% of SO2 emissions in this region are from point sources. As indicated above, Cherokee began decommissioning coal-fired electrical generating units in 2011 and is scheduled to convert the last coal fired unit to natural gas in 2017. In 2013, Cherokee contributed about 94% of the SO_2 emissions in Adams County and 32% of the SO_2 emissions in the entire Denver Metro/North Front Range region.

6.4 Meteorology for the Area Surrounding the Cherokee Generating Station

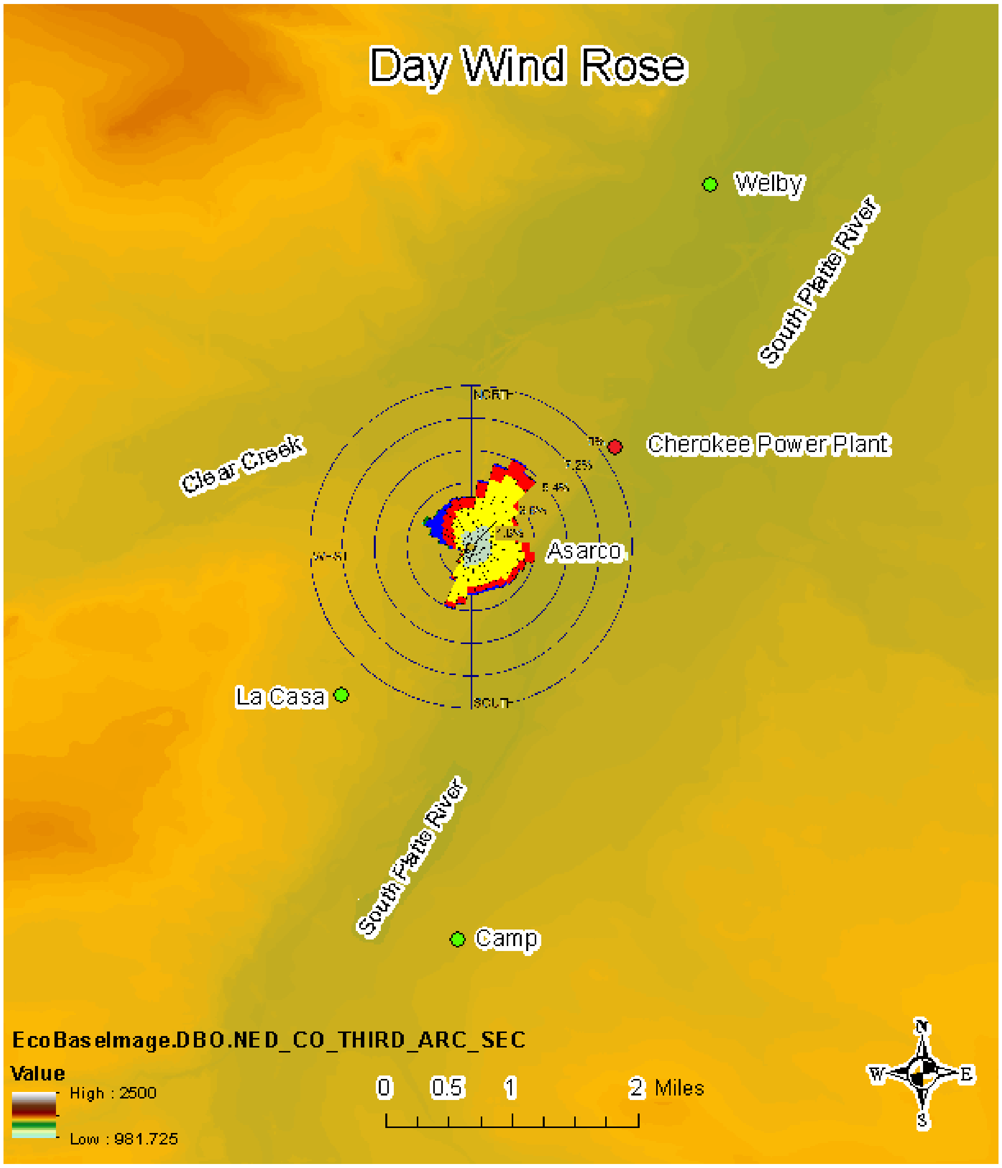
As noted in the EPA's 2016 Monitoring TAD, "Understanding the influence of meteorology on an SO2 source is critical in understanding how SO2 emissions may most often be dispersed and where the location or locations of maximum ground-level concentrations may be expected to occur." In order to adequately address the influence of meteorology on the dispersion of SO2 emissions from the Cherokee facility, the state reviewed information gathered at the Asarco meteorological station, located roughly 1.7 miles southwest of Cherokee (see Figure 34 below). Wind roses collected from the Asarco station indicate that the general air flow pattern around Cherokee on days where the synoptic flow is weak (light winds) follows the drainage of the South Platte River. Light southwest winds typically move down the South Platte River Valley, past Cherokee, and out to the plains during the night into the early morning. A wind rose showing this trend in the Denver metro area is presented in Figure 34 below. The state did not include wind rose information on days where synoptic flow is strong (high winds), as during these periods conditions for dispersion are improved and peak SO2 concentrations are not expected.

Figure 34. Night Wind Rose for the Area Near Cherokee



As shown, the predominant air flow along the South Platte River Drainage during the night makes the Welby monitor well positioned to capture peak nighttime SO_2 concentrations from the Cherokee facility. This air flow reverses during the day, leading to light east or northeast winds carrying air from the plains back up the South Platte River Valley through Denver, past Cherokee, and into the foothills during the morning and through the afternoon. For this reason, the La Casa and CAMP monitors are well positioned to capture peak SO_2 concentrations during the daytime. A wind rose depicting the daytime airflow trends in the Denver metro area is presented in Figure 35.

Figure 35. Day Wind Rose for the Area Near Cherokee



These trends are seen year round and result in airflows traveling past the monitors and Cherokee regularly, since Cherokee and all three monitors are located in close proximity to the South Platte River as shown in the wind rose depictions above. Based on the review of these monitoring data, the state concluded that this monitoring network is located where peak SO_2 concentrations from the Cherokee facility are likely to occur. The EPA agrees with the state's conclusion. We therefore intend to designate the area surrounding the Cherokee Station based on the existing data from this monitoring network.

6.5 Geography and Topography for the Area Surrounding the Cherokee Station

Cherokee Station is located approximately 6.4 km north of downtown Denver along the western bank of the South Platte River. Near this location Clear Creek flows northeast from Golden and joins the South Platte River as it flows north towards Greeley. The station is situated just over a mile south of where Clear Creek and the South Platte merge. The terrain around the Station is relatively flat.

6.6 Jurisdictional Boundaries in the Area Surrounding the Cherokee Station

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for the area near Cherokee. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

Cherokee Station is located north of Denver in Adams County. The city and county of Denver constitutes the largest city in Colorado by population (649,495 as of 2013), which is located approximately a half mile (0.8 km) to the south. As of 2013, the population of Adams County was 469,193 people, comprising approximately 10% of the state's population.[9]

The state recommended a designation boundary that consists of a circle with 10 km radius extending from the Cherokee Generating Station. The state determined that this was appropriate because this boundary includes impacts from Cherokee as well as the nearby Suncor Energy facility.

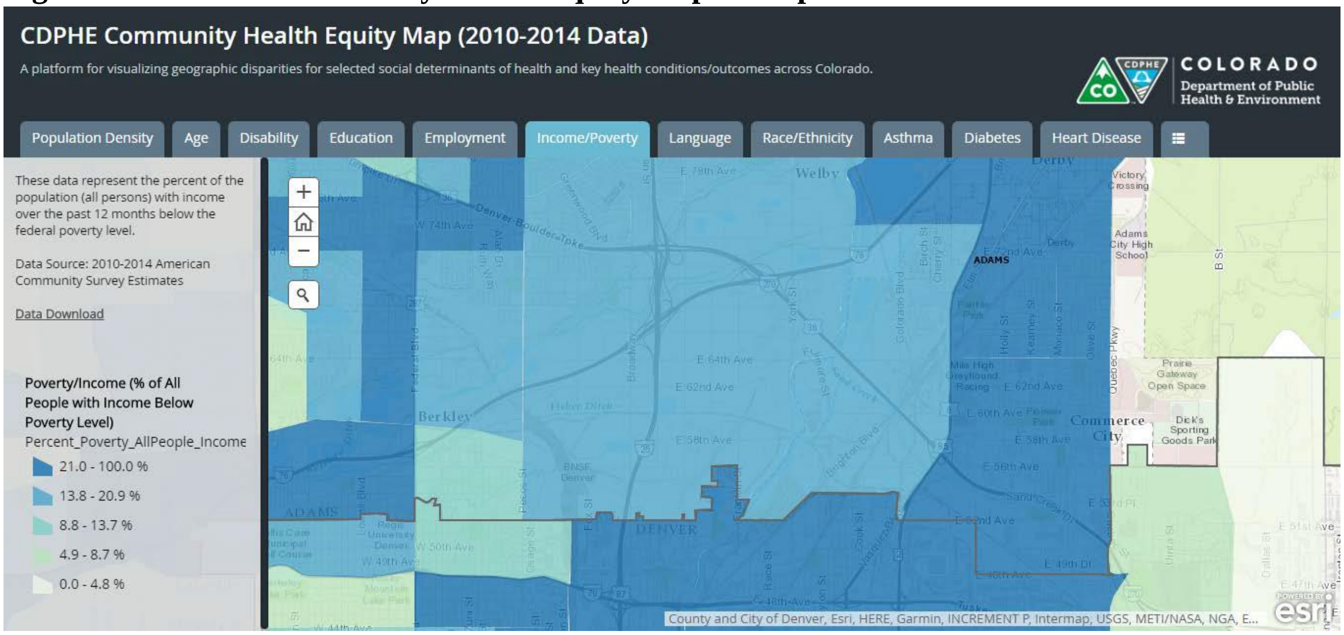
6.7 Other Information Relevant to the Designations for the Area Surrounding the Cherokee Station

The state used their public-facing Community Health Equity Map (2010-2014 data)[10] to examine census-tract level geographic disparities for selected social determinants of health, including income/poverty levels and race/ethnicity population percentages, and key health conditions and outcomes, including asthma-related hospitalization rates, heart disease mortality rates, and preventable conditions. An example of these maps (income/poverty rates) is shown below in Figure 36. Cherokee and many of the surrounding areas show above average minority populations and poverty, as well as higher than state averages for asthma-related hospitalization rates, and preventable condition hospitalization rates. Although the heart disease mortality rates are not above average for the census tract Cherokee is in, many neighboring census tracts have high heart disease mortality rates. The state also reviewed population density using this map to incorporate appropriate potentially affected populations and assess population density around Cherokee. This

[9] All population statistics are from the United States Census Bureau.
[10] http://www.cohealthmaps.dphe.state.co.us/cdphe_community_health_equity_map/

information is important in considering boundary area recommendations for a source located in an urbanized area with varied population factors.

Figure 36: CDPHE Community Health Equity Map Example for Cherokee Station



6.8 EPA's Assessment of the Available Information for the Area Surrounding the Cherokee Station

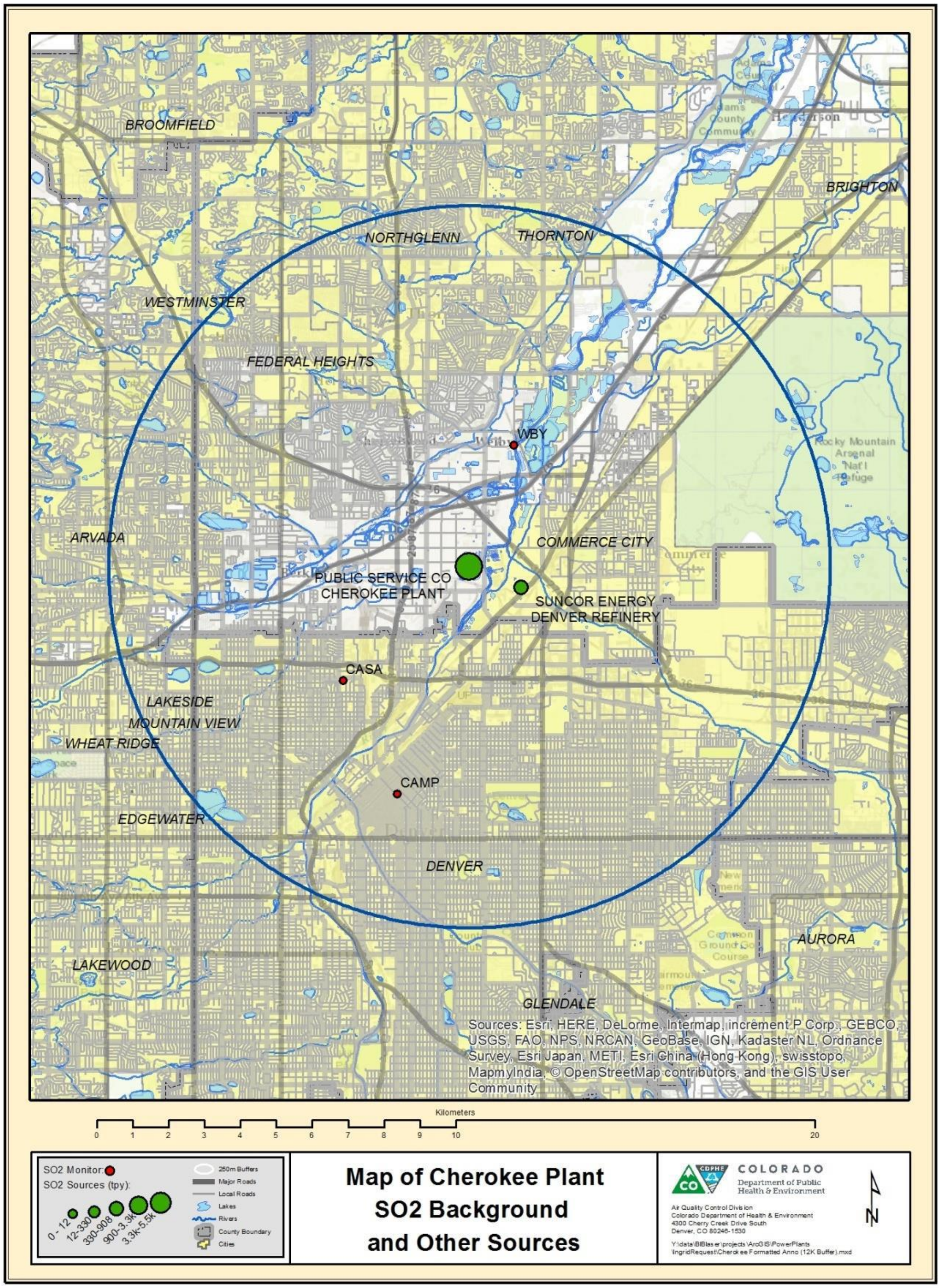
The EPA finds that the state has provided sufficient data to show that the monitoring network surrounding the Cherokee Station (and nearby sources) is adequately sited to determine maximum concentrations in this area. For this reason, we intend to use the 2013-2015 design values at the nearby Welby and CAMP monitors as a valid means by which to designate this area. As shown in Table 25 above, these monitors indicate that emissions from the Cherokee facility and surrounding sources do not approach or violate the 2010 SO_2 NAAQS. Though the 2014-016 La Casa monitor design value (14 ppb) is not being relied upon for the purposes of this designation, this monitor provides additional evidence to indicate that the area around the Cherokee Station attains the NAAQS. Therefore, the EPA is determining that the area meets the 2010 SO2 NAAQS, and does not contribute to ambient air quality in a nearby area that does not meet the NAAQS, as there are no such areas nearby.

6.9 Summary of Our Intended Designation for the Area Surrounding the Cherokee Station

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate the area near Cherokee as unclassifiable/attainment for the 2010 SO_2 NAAQS because, based on available information including (but not limited to) appropriate modeling analyses and/or monitoring data, the EPA has determined that the area (i) meets the 2010 SO2 NAAQS, and (ii) does not contribute to ambient air quality in a nearby area that does not meet the

NAAQS. Specifically, the boundaries are comprised of a circle with a 10 km radius extending from the Cherokee Generating Station. Figure 37 shows the boundary of this intended designated area.

Figure 37. Boundary of the Intended Cherokee Facility Unclassifiable/Attainment Area



7 Technical Analysis for All Other Areas in Colorado

7.1 Introduction

The state has not installed and begun timely operation of a new, approved SO_2 monitoring network meeting EPA specifications referenced in EPA's SO_2 DRR for any sources of SO_2 emissions in the counties and portions of counties identified in Table 31. Accordingly, the EPA must designate these counties by December 31, 2017. At this time, there are no air quality modeling results available to the EPA for these counties and portions of counties. In addition, there is no air quality monitoring data that indicate any violation of the 1-hour SO_2 NAAQS. The EPA is designating the counties and portions of counties in Table 34 in the state as "unclassifiable/attainment" since these counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS.

Table 34. Counties and Portions of Counties that the EPA Intends to Designate Unclassifiable/Attainment

County or Partial County (p)	Colorado's Recommended Area Definition	Colorado's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
State Air Quality Control Region (AQCR) 01: Logan, Morgan (part)[1], Phillips, Sedgwick, Washington and Yuma Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 02: Larimer and Weld Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 03: Adams (part)[2], Arapahoe, Boulder, Broomfield, Clear Creek,	Full AQCR	Attainment	Same as State's Recommendation	Unclassifiable/ Attainment

County or Partial County (p)	Colorado's Recommended Area Definition	Colorado's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Denver (part)[2], Douglas, Jefferson (part)[2], and Gilpin Counties				
AQCR 04: El Paso, Park, and Teller Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 05: Cheyenne, Elbert, Kit Carson, and Lincoln Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 06: Baca, Bent, Crowley, Kiowa, Otero, and Prowers Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 07: Huerfano and Las Animas Counties, Pueblo County (part)[3]	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 08: Alamosa, Conejos, Costilla, Mineral, Rio Grande, and Saguache Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 09: Archuleta (part), La Plata (part), and	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment

County or Partial County (p)	Colorado's Recommended Area Definition	Colorado's Recommended Designation	EPA's Intended Area Definition	EPA's Intended Designation
Montezuma (part) Counties excluding the Southern Ute Indian Tribe Lands in each of the 3 Counties, Dolores County, San Juan County				
AQCR 10: Delta, Gunnison, Hinsdale, Montrose, Ouray, and San Miguel Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 11: Garfield, Mesa, Moffat (part)[4], and Rio Blanco Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 12: Eagle, Grand, Jackson, Pitkin, Routt[5], and Summit Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment
AQCR 13: Chaffee, Custer, Fremont, and Lake Counties	Full AQCR	Unclassifiable/ Attainment	Same as State's Recommendation	Unclassifiable/ Attainment

[1] The state recommended that the EPA redesignate the Fort Morgan area as a separate unclassifiable/attainment area. This area was designated unclassifiable in round 2. The EPA does not intend to act on this redesignation request as part of these designations.
[2] The state recommended that the EPA designate the area around the Cherokee Station as a separate unclassifiable/attainment area, as discussed in section 6.
[3] The state recommended that the EPA designate the Pueblo area as a separate unclassifiable/attainment area, as discussed in section 5.

[4] The state recommended that the EPA designate the area around the Craig Station as a separate unclassifiable/attainment area, as discussed in section 3.
3

[5] The state recommended that the EPA designate the area around the Hayden Station as a separate unclassifiable/attainment area, as discussed in section 4.

Table 31 also summarizes Colorado's recommendations for these areas. Counties previously designated unclassifiable in Round 2 (*See* 81 *Federal Register* 45039) will remain unchanged unless otherwise noted. In Figure 38, the light green figures indicate the areas that were designated as unclassifiable in Round 2 and are not being addressed in this round of designations. The dark blue figures indicate the areas the EPA intends to designate as their own distinct unclassifiable/attainment areas in this round of designations, as discussed in detail in previous sections. The EPA intends to designate all other areas of the state (those shown in grey) as unclassifiable/attainment as divided into State Air Quality Control Regions (AQCRs). Figure 39 shows the different AQCRs in the state.

Figure 38. The EPA's Intended Unclassifiable/Attainment Designations for All Other Areas in Colorado.

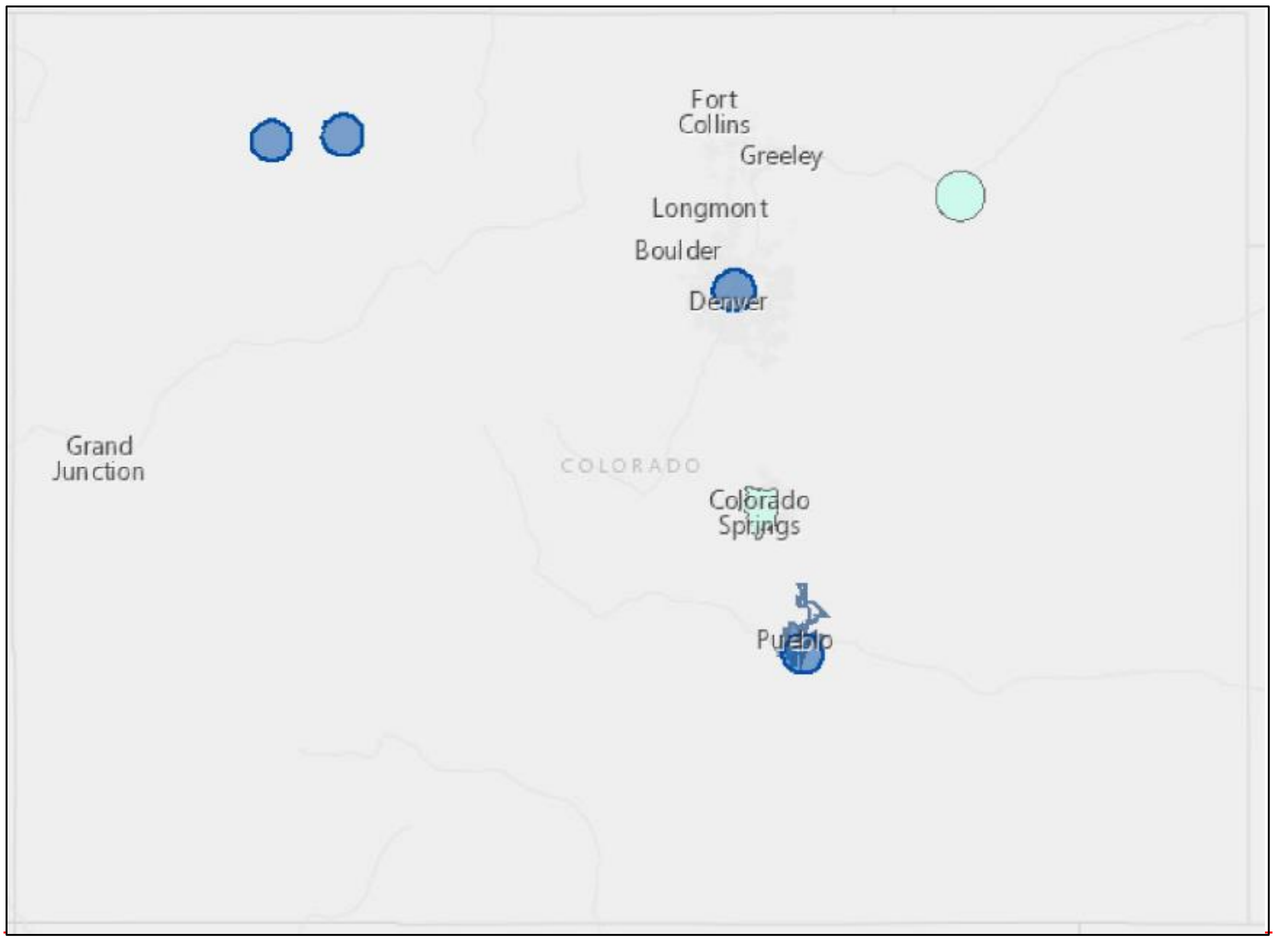
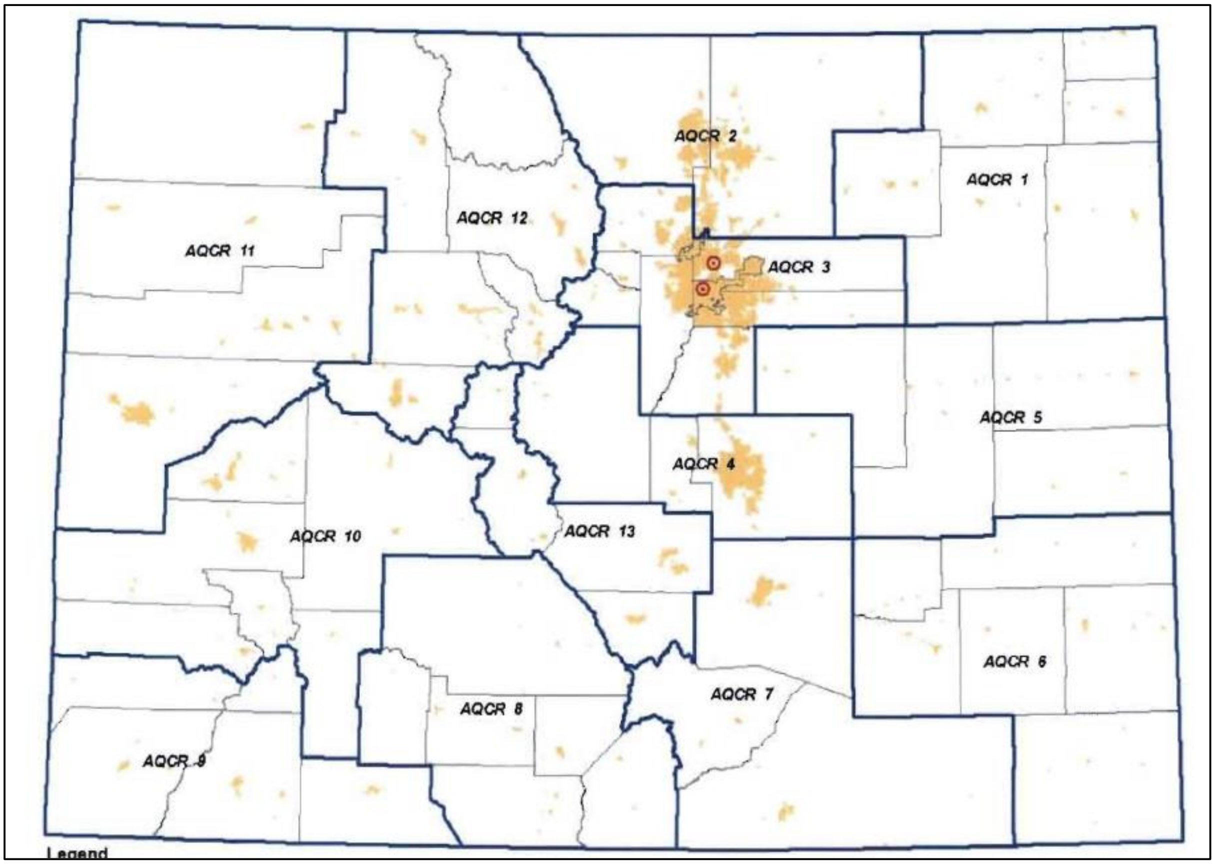


Figure 39. Colorado Air Quality Control Regions



7.2 Jurisdictional Boundaries for All Other Areas in Colorado

Existing jurisdictional boundaries are considered for the purpose of informing the EPA's designation action for each city or county. Our goal is to base designations on clearly defined legal boundaries, and to have these boundaries align with existing administrative boundaries when reasonable.

The state recommended that the AQCRs listed in Table 31 be designated unclassifiable/attainment in the state's March 18, 2011, submittal, and has not changed that recommendation. The EPA believes using the existing AQCR boundaries is appropriate.

7.3 The EPA's Assessment of the Available Information for All Other Areas in Colorado

These counties were not required to be characterized under 40 CFR 51.1203(c) or (d) and EPA does not have available information including (but not limited to) appropriate modeling analyses and/or monitoring data that suggests that the area may (i) not be meeting the NAAQS, or (ii) contribute to ambient air quality in a nearby area that does not meet the NAAQS. These counties therefore meet the definition of an "unclassifiable/attainment" area. Therefore, the EPA intends to designate the areas in the above Table 34 as unclassifiable/attainment for the 2010 SO_2 NAAQS.

Our intended unclassifiable/attainment areas, bounded by the county boundaries (with the exceptions listed in Table 34), will have clearly defined legal boundaries, and we intend to find these boundaries to be a suitable basis for defining our intended unclassifiable/attainment area. No portions of the state will remain undesignated after the finalization of these proposed designations.

7.4 Summary of Our Intended Designation for All Other Areas in Colorado

After careful evaluation of the state's recommendation and supporting information, as well as all available relevant information, the EPA intends to designate all areas in Table 31 as unclassifiable/attainment for the 2010 SO_2 NAAQS. Specifically, the boundaries are comprised of the county borders with the exceptions described in Table 34.

Figure 38 above shows the location of these areas within Colorado.

At this time, our intended designations for the state only apply to these areas and the other areas presented in this chapter of this technical support document.