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ALABAMA POWER
A SOUTHERN COMPANY

January 12, 2017

U. S. Environment Protection Agency, Region IV
Air Planning and Implementation Branch
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, AL 36110-2059

RE: Alabama Power Company – Gorgas Steam Electric Generating Plant
1-hour SO_2 Data Requirements Rule Modeling Report

Dear Sir/Madam,

The attached air dispersion modeling analysis was conducted in order to characterize sulfur dioxide (SO_2) air quality in the vicinity of Alabama Power Company's Gorgas Steam Electric Generating Plant (Plant Gorgas). This air dispersion modeling analysis is designed to fulfill any potentially applicable requirements of the United States Environmental Protection Agency's (EPA) final Data Requirements Rule (DRR) for the 2010 1-Hour SO_2 Primary NAAQS[1] related to Plant Gorgas.

The Alabama Department of Environmental Management (ADEM) provided EPA with documentation for removal of Plant Gorgas as a source subject to the DRR under the rule's criteria for identifying emission sources. In its justification, ADEM cited existing federally enforceable unit shut downs at Plant Gorgas that have resulted in large scale reductions in SO_2 emissions. Further, a review of the most recent emissions data shows Plant Gorgas actual emission rates for the past two years are well below 2,000 tons per year – the rate of emissions triggering applicability of the DRR, and are not expected to increase above that level in the future. EPA disagreed with ADEM and directed the State to characterize air quality in the vicinity of Plant Gorgas under the DRR.

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[1] 80 FR 51052, August 21, 2015 Federal Register Notice. Docket ID No. EPA–HQ–OAR–2013–0711.

The enclosed modeling report was prepared in order to present the model results along with the methodology used to characterize SO_2 air quality in the vicinity of Plant Gorgas. The modeling approach conforms to the applicable modeling procedures and guidance contained in the DRR, the draft EPA Modeling Technical Assistance Documents (TAD)[2], the final Plant Gorgas modeling protocol submitted to regulatory agencies on December 2, 2016, and direction otherwise received from ADEM.

The attached modeling report (along with the associated modeling files included via web link) is being submitted on behalf of ADEM and is electronically to the distribution list below.

Sincerely,

C. Mark Steele, Principal Engineer
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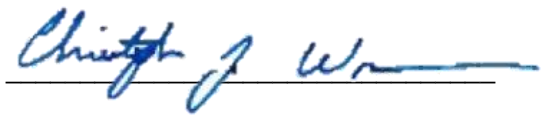
[2] Modeling Technical Assistance Document, EPA. 2014. Available at https://www.epa.gov/sites/production/files/2016-06/documents/so2modelingtad.pdf

Modeling Report
Gorgas Steam Electric Generating Plant
1-Hour SO_2 NAAQS Modeling

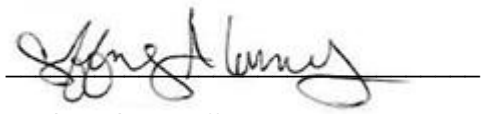
AECOM, Inc.
January 2017
Document No.: 60331751.9

AECOM

Modeling Report
Gorgas Steam Electric Generating Plant
1-Hour SO_2 NAAQS Modeling



Prepared By: Christopher Warren



Reviewed By: Jeffrey Connors

AECOM, Inc.
January 2017
Document No.: 60331751.9

AECOM

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1.0 Introduction

On June 2, 2010, the United States Environmental Protection Agency (i.e. the EPA) issued final revisions (75 FR 35520) to the primary National Ambient Air Quality Standards (NAAQS) for sulfur dioxide (SO_2). In the final rule, the EPA established a new primary 1-hour standard for SO_2 set at a level of 75 parts per billion (ppb). Also in the revision, the EPA revoked the two existing primary NAAQS (the 24-hour and annual standards) however; the secondary SO_2 NAAQS was not revised.

EPA is issuing area designations for the 1-hour SO_2 NAAQS in separate rounds. On August 10, 2015, as part of its implementation of the standard, the EPA issued the final Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide Primary NAAQS[1] (e.g. "SO_2 Data Requirements Rule," or the "DRR"). The DRR directs state and tribal air agencies to provide data to characterize air quality in the vicinity of large sources of SO_2 emissions to identify maximum 1-hour SO_2 concentrations in ambient air. The air quality data provided pursuant to the DRR presumably will be used by the Alabama Department of Environmental Management (ADEM) and EPA in future actions regarding area designations as the agencies continue implementing the 1-hour SO_2 NAAQS.

In part, the DRR required air agencies to submit to EPA by January 15, 2016, a list identifying the sources in the state around which SO_2 air quality is to be characterized. This list must include sources located in areas that have not been designated nonattainment and have emissions greater than 2000 tons per year (tpy) of SO_2 unless otherwise exempt (e.g. due to a unit retirement, fuel switch, permit limits, etc.). The DRR sets forth a process for two options air agencies may utilize to characterize air quality; by using either dispersion modeling of actual source emissions or by data from ambient air quality monitors. For each source on the list, air agencies are required to identify the approach (e.g. ambient monitoring or modeling) it will use to characterize air quality in the vicinity of the source unless the source chooses to adopt emission limits and thereby eliminate the requirement to characterize air quality.

In a letter to the EPA dated January 14, 2016, ADEM identified the sources in Alabama that have SO_2 emissions greater than 2000 tpy for the most recent year for which emissions data are available (2014) and subject to the DRR. ADEM did not identify Alabama Power Company's (Alabama Power) Gorgas Steam Electric Generating Plant (Plant Gorgas) as being subject to the DRR under the rule's criteria for identifying emission sources. EPA responded to ADEM in a March 22, 2016, letter identifying Plant Gorgas as a source applicable to the DRR. In a subsequent submittal dated July 1, 2016, ADEM provided EPA with documentation for removal of Plant Gorgas as a source subject to the DRR. In its justification, ADEM cited unit shut downs at Plant Gorgas that were already federally enforceable and resulting in large scale reductions in SO_2 emissions. Further, a review of the most recent emissions data for the past two years shows Plant Gorgas actual emission rates being well below 2000 tons per year – the rate of emissions triggering applicability of the DRR. EPA disagreed with ADEM and directed the State to characterize air quality in the vicinity of Plant Gorgas under the DRR. ADEM opted to characterize air quality in the vicinity of Plant Gorgas through modeling with respect to the 1-hour SO_2 NAAQS. Accordingly, a modeling protocol describing the proposed methodology for a 1-hour SO_2 NAAQS air quality dispersion modeling analysis was previously provided to EPA and ADEM on December 2, 2016.

EPA has issued[2] a non-binding draft Technical Assistance Document (TAD) for modeling that set forth procedures for the modeling pathway. The current version of the TAD references other EPA modeling guidance documents, including the following clarification memos; (1) the August 23, 2010, "*Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 NAAQS*", and (2) the March 1, 2011, "*Additional*

[1] 80 FR 51052, August 21, 2015, Federal Register Notice. Docket ID No. EPA–HQ–OAR–2013–0711.

[2] Modeling Technical Assistance Document; EPA, 2014. Available at https://www.epa.gov/sites/production/files/2016-06/documents/so2modelingtad.pdf

Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard" (hereafter referred to as the "additional clarification memo"). In the March 1, 2011, additional clarification memo, EPA declares that the memo applies equally to the 1-hour SO_2 NAAQS even though it was prepared primarily for the 1-hour nitrogen dioxide (NO_2) NAAQS.

EPA Region 4 provided comments on the protocol and all comments have been addressed or otherwise resolved in this final Plant Gorgas modeling report. The modeling utilized and described herein conforms to the applicable modeling procedures and guidance contained in the DRR, the August 2016, *"SO_2 NAAQS Designations Modeling Technical Assistance Document"*[2], and direction otherwise received from ADEM. This report presents the modeling results, methods and assumptions including model selection and options, meteorological data, and source parameters used in the modeling analyses that characterize 1-hour SO_2 air quality in the vicinity of Plant Gorgas.

This document consists of the following three additional sections:

Section 2 - Facility Description and Emission Sources

Section 3 - Modeling Approach

Section 4 - Analysis of Modeling Results

2.0 Facility Description and Emission Sources

Plant Gorgas is an existing Alabama Power Company electric power generating facility located in Parrish, Alabama, in Walker County. The location of Plant Gorgas is shown in Figure 2-1 and a near-field view of the plant is shown in Figure 2-2. The sources that were modeled for 1-hour SO_2 at Plant Gorgas are three coal-fired boiler electric generating units (Units 8, 9 and 10). The nominal rated electric generating capacities for Units 8, 9 and 10 are 175, 185 and 769 megawatts (MW), respectively.

The exhaust flue gases from Units 8, 9 and 10 pass through individual unit electrostatic precipitators (ESPs) for particulate matter (PM) control, and Unit 10's flue gases pass through a selective catalytic reduction (SCR) system for control of nitrogen oxides (NOx). The flue gases from all units then combine and pass through a common baghouse (coupled with dry sorbent and activated carbon injection systems) for additional PM control and mercury emission control, and a flue gas desulfurization (e.g. FGD, or scrubber) system for SO_2 control before exiting through a 755 foot tall FGD stack. The GEP stack height for the Units 8, 9 and 10 stack is 755 feet (see Appendix B).

Table 2-1 shows the physical stack parameters for the aforementioned equipment that was used in the modeling. Units 8, 9 and 10 were modeled using the exhaust temperatures and flow rates available from the continuous emissions monitoring systems (CEMS) database for 2013-2015. Flow rates were first converted from standard cubic feet per minute to actual cubic feet per minute. This data was used to model all units.

A facility plot plan is provided in Appendix A.

Table 2-1 Physical Stack Parameters of Plant Gorgas Modeled Emission Sources

Units	Location (UTM Zone 16 NAD 1983)		Basis for Modeled Emission Rate	Stack Base Elevation (ft)	Stack Height (ft)	Flue Diameter (ft)	Stack Exhaust Velocity (ft/s)	Stack Exit Temperature (ºF)
	Easting (meters)	Northing (meters)						
8, 9, and 10	481,446.0	3,722,950.0	Actual[(1)]	283	755	38	Actual[(2)]	Actual[(2)]

[1] Actual hourly emission rates are based on data from CEMS (2013-2015).

[2] Actual hourly velocity and temperature of exhaust are based on data from CEMS (2013-2015).

Figure 2-1 Location of Plant Gorgas

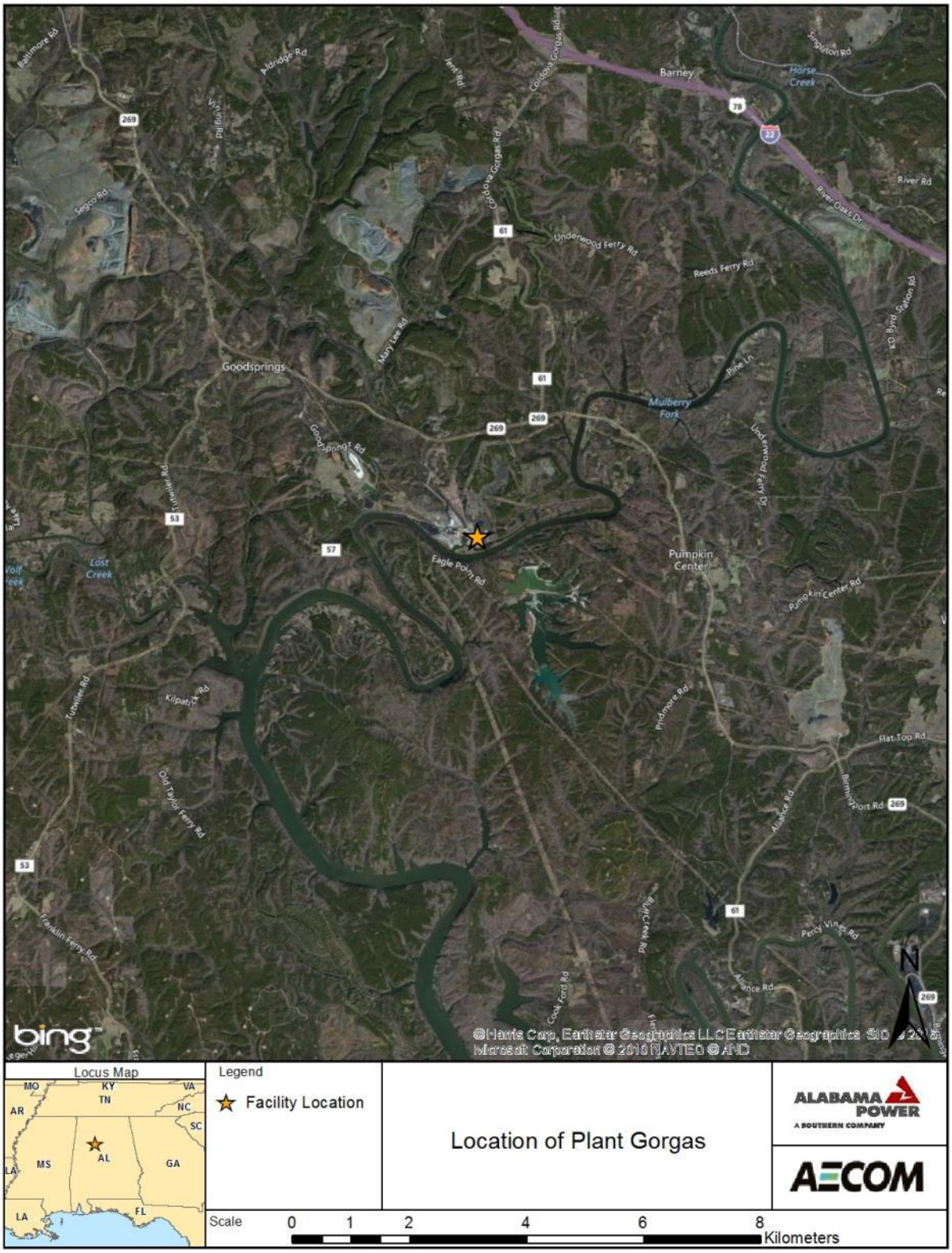
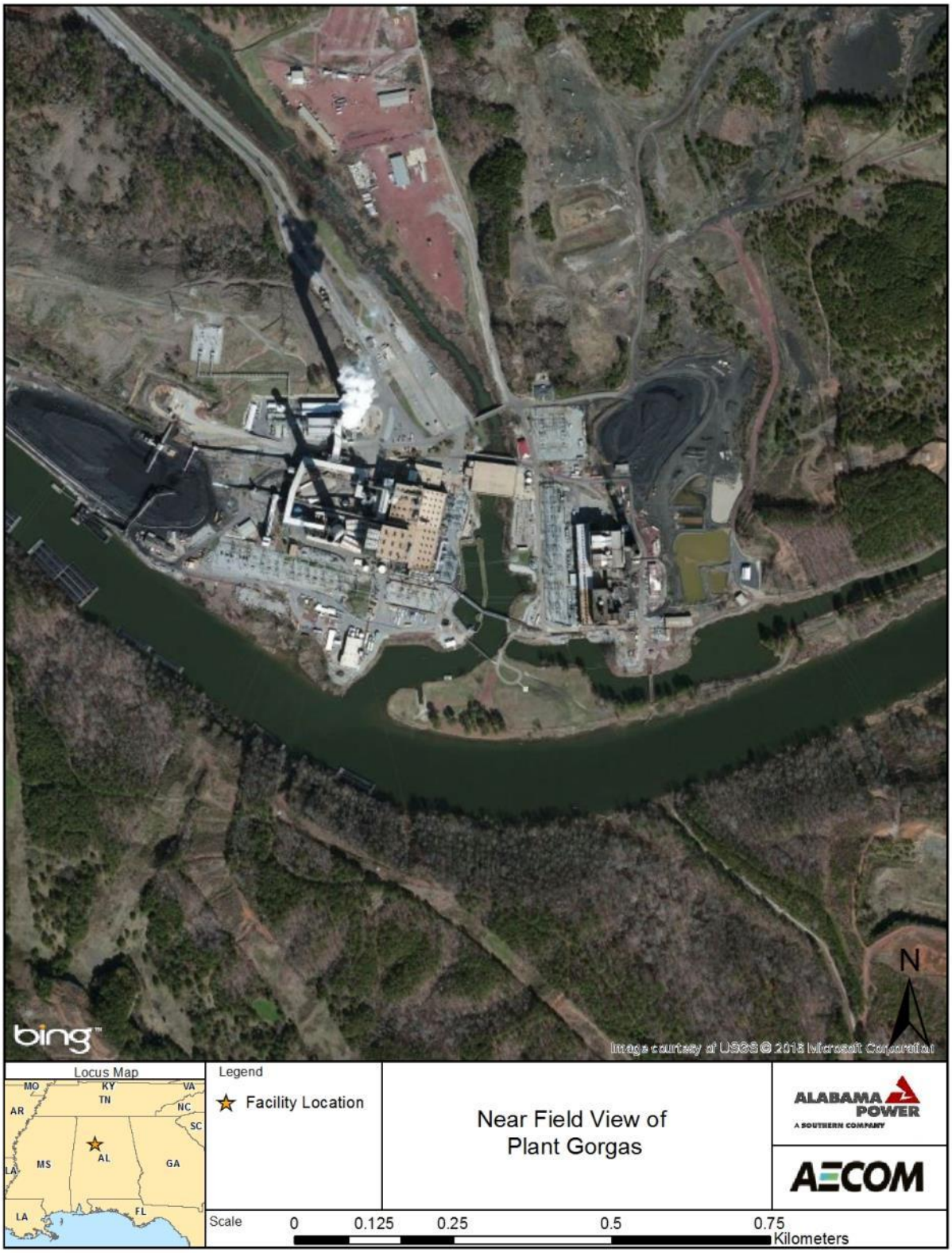


Figure 2-2 Near-Field View of Plant Gorgas



3.0 Modeling Approach

3.1 Overview

This section presents the approach to the dispersion modeling analysis that was used for the 1-hour SO_2 modeling for Plant Gorgas. The modeling approach was consistent with the guidance provided in the DRR, TAD where applicable, and direction received from ADEM. The following sections address each relevant portion of the modeling approach, including model selection, building downwash, terrain, meteorology, ambient air quality data, and background emission sources.

3.2 Model Selection and Options

AERMOD is EPA's recommended refined dispersion model for simple and complex terrain for receptors within 50 kilometers (km) of a modeled source. AERMOD is also capable of producing the statistical output required for the 1-hour SO_2 NAAQS. As such, AERMOD Version 15181 (released June 30, 2015) was used for this analysis using default model options.

Figure 3-1 shows that the area surrounding Plant Gorgas is predominantly rural, with the land use consisting of a mix of mostly residential areas, forested areas, farms, water and industrial areas. Therefore, the urban source options in AERMOD were not used.

3.3 Building Downwash

EPA modeling guidelines require the evaluation of the potential for physical structures to affect the dispersion of emissions from stack emission points. The exhaust from stacks that are located within specified distances of buildings, and whose physical heights are below specified levels, may be subject to "aerodynamic building downwash" under certain meteorological conditions. If this is the case, a model capable of simulating this effect must be employed.

The analysis used to evaluate the potential for building downwash is referred to as a physical "Good Engineering Practice" (GEP) stack height analysis. Stacks with heights below physical GEP are considered to be subject to building downwash.

The physical height of the stack servicing Plant Gorgas Units 8, 9 and 10 is 755 feet (ft). The Units 8, 9 and 10 stack is grandfathered as was established in a letter dated December 11, 1985, from Mr. W. L. Bowers of Alabama Power to Mr. Richard E. Grusnick of ADEM. A copy of this letter is attached in Appendix B.

The DRR and TAD allow modeling to be conducted using actual stack heights. Units 8, 9 and 10 were modeled using actual hourly emissions, and as such, were modeled using the physical stack height of 755 ft.

The effects of building downwash were incorporated into the modeling analysis using the latest version of EPA's Building Profile Input Program software (currently BPIP PRIME Dated 04274) to calculate the direction-specific building dimensions for input to AERMOD. Figure 3-2 shows the locations of the modeled stacks and buildings that were used as input to BPIP.

3.4 Terrain and Receptor Processing with AERMAP

EPA modeling guidelines require that the differences in terrain elevations between the stack base and model receptor locations be considered in the modeling analyses. There are three types of terrain:

- simple terrain – locations where the terrain elevation is at or below the exhaust height of the stacks to be modeled;

- intermediate terrain – locations where the terrain is between the top of the stack and the modeled exhaust "plume" centerline (this varies as a function of plume rise, which in turn, varies as a function of meteorological conditions);

- complex terrain – locations where the terrain is above the exhaust plume centerline.

Based on a review of the United States Geographical Survey (USGS) topographical maps, the area in the vicinity of Plant Gorgas is generally characterized as simple terrain relative to the modeled stacks.

A comprehensive Cartesian receptor grid extending to approximately 20 km from Plant Gorgas was used in the AERMOD modeling to assess ground-level SO_2 concentrations. The 20-km receptor grid was more than sufficient to resolve the maximum impacts and any significant impact area(s). Note all source locations and receptors were referenced to UTM Zone 16, NAD83.

The Cartesian receptor grid consisted of the following receptor spacing:

- From the center of the plant (UTM northing = 3,722,900 meters and UTM easting = 481,400 meters) out to a distance of 3000 meters (m) at 100-m increments

- Beyond 3000 m to 5000 m at 250-m increments

- Beyond 5000 m to 10,000 m at 500-m increments

- Beyond 10,000 m to 20,000 m at 1,000-m increments

Based on the location of the modeled maximum design concentration determined with the aforementioned receptor grid, additional fine-grid receptors (100-m spacing) were added in the area of maximum impacts to ensure that the maximum design concentration occurred within 100-m resolution spaced receptors.

The AERMAP domain corresponds to a 1.5-km buffer beyond the receptor grid and provides sufficient resolution of the hill height scale required for each receptor. A larger buffer was not necessary as there are no significant terrain features just beyond this distance. Terrain elevations from the NED acquired from USGS[3] was processed with the most recent version of AERMAP (currently version 11103) to develop the receptor terrain elevations and corresponding hill height scale required by AERMOD. The NED file is referenced to Datum NAD83. The NED files are included in the electronic modeling archive (see Appendix C) that is submitted along with this final modeling report. The extent of the receptor grid is shown in Figure 3-3.

3.5 Ambient Air Boundary and Excluded Receptors

No ambient air boundary was utilized for this modeling and as such, no receptors were excluded from within Plant Gorgas property. This assumption has no consequence in the overall conclusion of the modeling analysis because the highest modeled concentrations occurred well away from the Plant Gorgas property.

3.6 Meteorological Data for Modeling

No on-site meteorological data is available, so the application of a refined dispersion model requires multiple years of hourly meteorological data that are representative of the model application site. In addition to being representative, the data must meet quality and completeness requirements per EPA guidelines. Per Appendix B of ADEM's PSD Air Quality Analysis – AERMOD Modeling Guidelines, surface data from Birmingham-Shuttlesworth International Airport in Alabama was used in the modeling analysis. Birmingham-Shuttlesworth International Airport is located approximately 40 kilometers southeast of Plant Gorgas.

[3] http://seamless.usgs.gov/index.php

The following statement is taken from ADEM responses to EPA comments regarding 1-hour SO_2 DRR modeling. ADEM's justification for use of meteorological data from Birmingham-Shuttlesworth International Airport for modeling is as follows:

> *"This data has historically been used to characterize modeling for this facility for the past few years. There have not been any geographical changes in the area that would deem this NWS site unrepresentative. There are no other new datasets nearby that would better represent this location. NWS surface and upper air sites are limited in this area. Furthermore the data map below has been used to determine met data for PSD for decades. This data is typically determined on an application by application basis. Below is ADEM's section of the guidance document that addresses representativeness.*
>
> *The following Meteorological PSD Data Map [Figure 3-4] was used to identify the area of the State in which the proposed new source or modified source will be located to determine which National Weather Service (NWS) station data to use in the modeling. The station identification numbers are also indicated.*
>
> *The map of Alabama modeling domains was broken out into 12 sections. These sections were determined by average monthly precipitation, average monthly mean temperature and topography. In each county, a COOP weather station was chosen and a 30 year (some stations less than 30) monthly average rainfall and monthly mean temperature was compared to the 12 surrounding NWS stations monthly data. The NWS station that correlated the closest to the COOP station was linked to that county. Once all the counties were looked at, they were grouped together by NWS station. The regions were adjusted to account for the various topographical differences across the state of Alabama."*

Therefore, following ADEM guidance, three contiguous years of data from Birmingham-Shuttlesworth International Airport (2013-2015) with concurrent upper air data from Shelby County Airport in Alabaster, Alabama, as provided by ADEM, was used in the analysis. The pre-processed meteorological data (profile and surface files) for use with AERMOD has been provided by ADEM and were processed using AERMET (version 15181). The locations of Birmingham-Shuttlesworth International and Shelby County airports relative to the Plant Gorgas location is shown in Figure 3-5. The meteorological station information can be found in Table 3-1.

The meteorological years of 2013-2015 are being used as this is the most recent data available and because they coincide with the more representative emissions profile for Plant Gorgas.

Table 3-1 Meteorological Stations used for Modeling

Met Site	Latitude	Longitude	Base Elevation (ft)	Station Call Sign
Birmingham-Shuttlesworth International Airport	33.5639	86.7523	615.2	KBHM
Shelby County Airport	33.1778	86.7832	650.0	KEET

Source: AIRNAV.com

3.7 Ambient Monitoring Data

As part of the 1-hour SO_2 modeling analysis, ambient background was added to the modeled concentrations. For this analysis ADEM has directed the use of ambient data from the Centreville, Alabama monitor for the period of 2013-2015 to be consistent with the meteorological years used for modeling. From their response to EPA comments on the modeling protocol for Plant Gaston (which would also be applicable to Plant Gorgas), ADEM's justification for the use of the Centreville monitor is as follows:

> *"The 1-hour SO_2 background values used for this analysis were derived from data collected at the Centreville, Alabama, SEARCH site. The Centreville SEARCH site is considered to be representative of background SO_2 concentrations based on a number of factors. The data from this SEARCH site has very little impact from anthropogenic sources, therefore, it should be representative of background 1-hour SO_2 values for most areas of the State of Alabama. The purpose of adding the background value to the final model-predicted concentration is to account for the potential impact of sources outside the scope of the modeling analysis, such as natural and distant sources, which may minimally impact air quality in the area. Due to the fact that an inventory of sources is modeled in addition to the source under review, there is a high possibility that the air quality impacts from many sources could be double-counted when the background value is added to the final 1-hour SO_2 concentration predicted by the model.*
>
> *Other monitors located outside the State were considered as possible background sites, but due to the proximity of alternative monitors to urban areas and anthropogenic sources, these monitors would not provide an appropriate background concentration. Using concentrations from urbanized industrialized areas can unduly influence the monitors and not provide a value that is truly representative of background conditions in a rural area. These areas tend to be more populated and urbanized, which is not representative of rural areas such as the Gaston area. These monitors are likely impacted by urban influences and would not be representative of the rural background conditions in Gaston, Alabama.*
>
> *Additionally, due to the Centreville site's location relative to Gaston, the synoptic-scale weather conditions in the Centreville area would be very similar to the Gaston area. Most major weather systems that would impact the Gaston area would, in general, impact the Centreville area as well. Due to all the factors cited above, ADEM determined that the Centreville, Alabama, site was the appropriate background monitor to use for this analysis."*

Furthermore, ADEM provided the following concerning the representativeness of data from the Centreville, Alabama, site regarding its use in this modeling activity:

> *"In similar past analyses requested by EPA, it has been emphasized that representativeness of a site should be paramount in selecting background monitors as well as meteorological data instead of proximity. ADEM has justified the representativeness of the Centreville monitor in section 3.7 of the modeling protocol. ADEM considers the Fairfield SO_2 monitoring site to be in an urbanized industrial area which is not representative of the Gorgas Plant site. Due to Gorgas' rural location, ADEM selected Centreville as an appropriate background monitor for this modeling exercise. Attached are maps (see Figure 3-6) demonstrating the urban nature of the Fairfield site. Additional maps are included (see Figure 3-7) demonstrating the land use surrounding Centreville SEARCH site and Gorgas. EPA has suggested the use of the Fairfield monitor for use as a background monitor in the modeling regarding the DRR due to the EPA not recognizing the Centreville monitor as regulatory monitor. This goes against previous guidance from EPA supporting representativeness over proximity. ADEM has submitted numerous modeling exercises under the PSD program comparing final SO_2 concentrations, including Centreville background values, to the 1-hr NAAQS in which EPA requested that ADEM justify the use of the Centreville background monitor. In all of the cases that ADEM was asked to justify the use of the Centreville monitor, EPA has never disapproved of the use of this monitor for background values in regards to the 1-hr SO_2 NAAQS standard since its promulgation in 2010. ADEM feels that*

regardless of the program, whether PSD or DRR, this should not change the validity of the data collected at the monitor for the same 1-hour NAAQS standard."

Design concentrations for the period of 2013 through 2015 are provided for this monitor in Table 3-2. The design concentration is based on the 99th percentile of the peak daily 1-hour SO_2 concentrations averaged over three years as provided by ADEM.

Table 3-2 1-Hour SO_2 Design Concentrations for the Centreville Monitor

Monitor	Year	99th Percentile Concentration (ppb)	Design Concentration (3-year average)	
			ppb	µg/m^3
Centreville	2013	9	13	35
	2014	22		
	2015	9		

According to EPA guidance documents, the combining of the modeled plus monitored concentrations can consider the following options:

Option 1: The design concentration from Table 3-2 would be added to every hour of modeled concentrations to determine the total concentration, as referenced in Section 8 of the SO_2 Modeling TAD.

Option 2: Seasonal and hour of day varying background concentrations would be calculated in accordance with EPA guidance in the March 1, 2011, additional clarification memo[4]. The matrix of seasonal and hour of day varying background concentrations would be combined with the modeled concentrations on an hourly basis within the AERMOD modeling system using the SEASHR keyword in the SOURCE input pathway.

Option 3: Would include seasonal and hour of day varying background concentrations as described above, but hours in which the source clearly influence the monitor would be removed from the database prior to calculating the seasonal and hour of day varying background concentrations. This procedure would follow guidance in Section 8.2.2 of the Appendix W of the GAQM. Section 8.2.2 of Appendix W states *"Use air quality data in the vicinity of the source to determine the background concentration for the averaging times of concern. Determine the mean background concentration at each monitor by excluding concentrations when the source in question is impacting the monitor… For shorter time periods, the meteorological conditions accompanying concentrations of concern should be identified. Concentrations for meteorological conditions of concern, at monitors, not impacted by the source in question, should be averaged for separate averaging time to determine the average background value. Monitoring sites inside a 90° degree sector downwind of the source may be used to determine the area of impact."* This approach is also referenced in Section 8 of the SO_2 Modeling TAD. Similar to Option 2, the matrix of seasonal and hour of day varying background concentrations would be combined with the modeled concentrations on an hourly basis within the AERMOD modeling system using the SEASHR keyword in the SOURCE input pathway.

[4] http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_Appendix W_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

Option 2 was utilized in the 1-hour SO_2 modeling for Plant Gorgas. As such, three years (2013-2015) of hourly SO_2 monitoring data from the Centreville monitor were obtained from ADEM and then used to calculate season and hour of day varying background concentrations in accordance with the EPA guidance in the March 1, 2011, additional clarification memo. The database of seasonal and hour of day varying background concentrations includes a matrix of 96 hourly concentrations used as input to the model (96 = 4 seasons x 24 hours per day). Each of the 96 background concentrations was determined from a potential of 90-92 valid observations depending on the number of days in the season. After accounting for the invalid and missing data, the range of valid observations was 46 to 92 depending on the season and hour or day. Most season and hour of day values have 80+ valid observations per year with the exception of the fall of 2015 in which some hours had less than 80, but still more than 70 valid observations. Also, hour 21 for all four seasons and years had closer to 50 valid observations. Nonetheless, most of these counts in valid observations resulted in the 99th percentile equaling the 2nd highest observations for each season and hour to be consistent with the EPA March 1, 2011, guidance. Any season and hour with less than 50 valid observations used the 1st highest concentration. Table 3-3 shows the resultant seasonal and hour of day varying background used as input to AERMOD.

Table 3-3 Centreville Monitor – 2013-2015 Season and Hour of Day Ambient Background (ppb)

Hour of Day	Season 1 (Dec-Jan-Feb)	Season 2 (Mar-Apr-May)	Season 3 (Jun-Jul-Aug)	Season 4 (Sep-Oct-Nov)
1	3.6	2.4	1.7	2.0
2	3.9	2.0	2.5	1.7
3	3.1	1.9	2.8	2.1
4	2.6	1.8	2.7	3.6
5	3.3	1.9	2.0	6.4
6	5.0	1.9	3.3	8.2
7	6.7	2.0	5.9	8.3
8	7.5	2.7	7.7	8.7
9	6.8	4.6	7.4	8.7
10	4.1	3.7	4.0	6.2
11	4.5	3.2	5.2	4.2
12	5.6	2.3	2.9	4.6
13	4.4	2.2	3.3	2.3
14	3.9	3.1	3.1	1.9
15	4.0	3.4	2.8	1.8
16	3.9	3.2	2.0	2.0
17	4.1	3.0	2.0	1.3
18	3.5	3.0	2.9	1.3
19	4.2	2.3	2.4	1.2
20	3.4	2.4	2.3	1.0
21	6.0	2.4	2.4	1.7
22	8.9	1.6	1.2	1.7
23	4.2	2.5	1.3	2.1
24	4.5	2.7	1.2	3.1

3.8 Nearby Sources

The Jefferson County Department of Health and ADEM evaluated a list of background sources that had the potential to be included in the modeling. From their response to EPA comments on modeling protocols for Alabama sources, ADEM provided the following justification for the methodology used in the selection of sources near the modeled facility.

> *"ADEM evaluated sources within a 20 km area surrounding the eight facilities who elected to following the modeling pathway for compliance under the SO_2 1-hour Data Requirements Rule. ADEM believes that this is a reasonable starting point for evaluation of sources and does not preclude sources from choosing alternate screening criteria that include/exclude sources. A spreadsheet provided each facility with the facility(ies) that met the 2014 actual emissions (in tpy) divided by the distance of greater than 20 within a maximum distance of 20 km. This did include small sources at very close distances. This information will be well documented in the final submittals due to EPA by January 13, 2017. Again, the metric ADEM used to develop the preliminary additional source(s) to be evaluated for inclusion in the modeling for the eight DRR subject sources choosing to model is as follows:*
>
> *ADEM Metric: Q/D > 20 within 20 km*
>
> - *First, ALL sources within 20 km of each facility were pulled,*
> - *Next, a Q/D value was developed for each facility on the list, where Q represents the 2014 actual SO_2 tpy emissions totals, and D represents the distance between the two facilities*
> - *If the Q/D metric yielded a value of greater than 20, the facility was retained and additional QA/QC was performed on a unit by unit basis."*

Alabama Power agrees that the Jefferson County Department of Health and ADEM's methodology for nearby source selection is reasonable and an alternate screening criterion is not necessary. Based on their review utilizing the above criteria, one additional background source was identified and was included in the 1-hour SO_2 DRR modeling analysis for Plant Gorgas. The identified source is Alabama Power's Miller Steam Electric Generating Plant (Plant Miller), located in Quinton, Alabama, in Jefferson County, approximately 13 km east of Plant Gorgas. The location of this source relative to Plant Gorgas is depicted in Figure 3-8.

The sources that were modeled for 1-hour SO_2 at Plant Miller include the four coal-fired boiler electric generating units (Units 1, 2, 3 and 4, or i.e. "Units 1-4"). The exhaust flue gases from each Miller unit pass through individual unit ESPs for PM control, individual unit SCR systems for NOx control, and individual unit FGDs for SO_2 and mercury emissions control and additional PM control. Units 1 and 2 exhaust through a shared 700-foot FGD stack containing two separate liners, with each unit having a dedicated stack liner. Likewise, Units 3 and 4 exhaust through a second 700-foot FGD stack containing two separate liners, with each unit having a dedicated stack liner. During emergency situations or at times the operator deems necessary in order to adhere to good engineering practices, Units 1-4 may exhaust through one of two separate bypass stacks configured similarly to the FGD stacks. Units 1 and 2 have a shared 707-foot bypass stack with two separate and dedicated stack liners, and Units 3 and 4 have a shared 700-foot bypass stack with two separate and dedicated stack liners.

The GEP stack height for Plant Miller's Unit 1 and 2 stack is 735 feet. The GEP stack height is 701 feet for the Unit 3 and 4 stack. These GEP stack heights were established in a letter dated December 31, 1985, from Mr. W. L. Bowers of Alabama Power to Mr. Richard E. Grusnick of ADEM (see Appendix B). Since the stacks are less than GEP and the modeling is being performed using actual emissions data, the modeling was performed using actual stack heights at Plant Miller in accordance with the DRR and TAD.

Table 3-4 shows the physical stack parameters as applicable to the Plant Miller emission sources that were used in the 1-hour SO_2 DRR modeling analysis for Plant Gorgas. Units 1-4 were modeled using the exhaust temperatures and flow rates that were available from the CEMS database for 2013-2015 and used directly in

AERMOD after converting the flow rate from standard cubic feet per minute to actual cubic feet per minute. This data was used to model all units.

Table 3-4 Stack Parameters for Plant Miller

Units	Location (UTM Zone 16 NAD 1983)		Basis for Modeled Emission Rate	Stack Base Elevation (ft)	Stack Height (ft)	Flue Equivalent Diameter (ft)	Stack Exhaust Velocity (ft/s)	Stack Exit Temperature (ºF)
	Easting (meters)	Northing (meters)						
1 and 2 FGD	494,315.0	3,721,497.0	Actual[1]	280	700	43.84[3]	Actual[2]	Actual[2]
1 and 2 Bypass	494,452.0	3,721,361.0	Actual[1]	280	707	35.35[4]	Actual[2]	Actual[2]
3 and 4 FGD	494,417.0	3,721,624.0	Actual[1]	280	700	43.84[3]	Actual[2]	Actual[2]
3 and 4 Bypass	494,529.0	3,721,516.0	Actual[1]	280	700	35.35[4]	Actual[2]	Actual[2]

[1] Actual hourly emission rates are based on data from CEMS (2013-2015).

[2] Actual hourly velocity and temperature of exhaust are based on data from CEMS (2013-2015).

[3] Units 1 and 2 FGD stack and Units 3 and 4 FGD stack are comprised of two flues (or liners) each dedicated to a single boiler. The actual flue diameter servicing each boiler inside the shared stacks is 31 feet. For each stack, an equivalent stack diameter was calculated for input to the modeling analysis.

[4] Units 1 and 2 Bypass stack and Units 3 and 4 Bypass stack are comprised of two flues (or liners) each dedicated to a single boiler. The actual flue diameter servicing each boiler inside the shared stacks is 25 feet. For each stack, an equivalent stack diameter was calculated for input to the modeling analysis.

Figure 3-1 Land Use within 3 km of Plant Gorgas – Aerial Photo

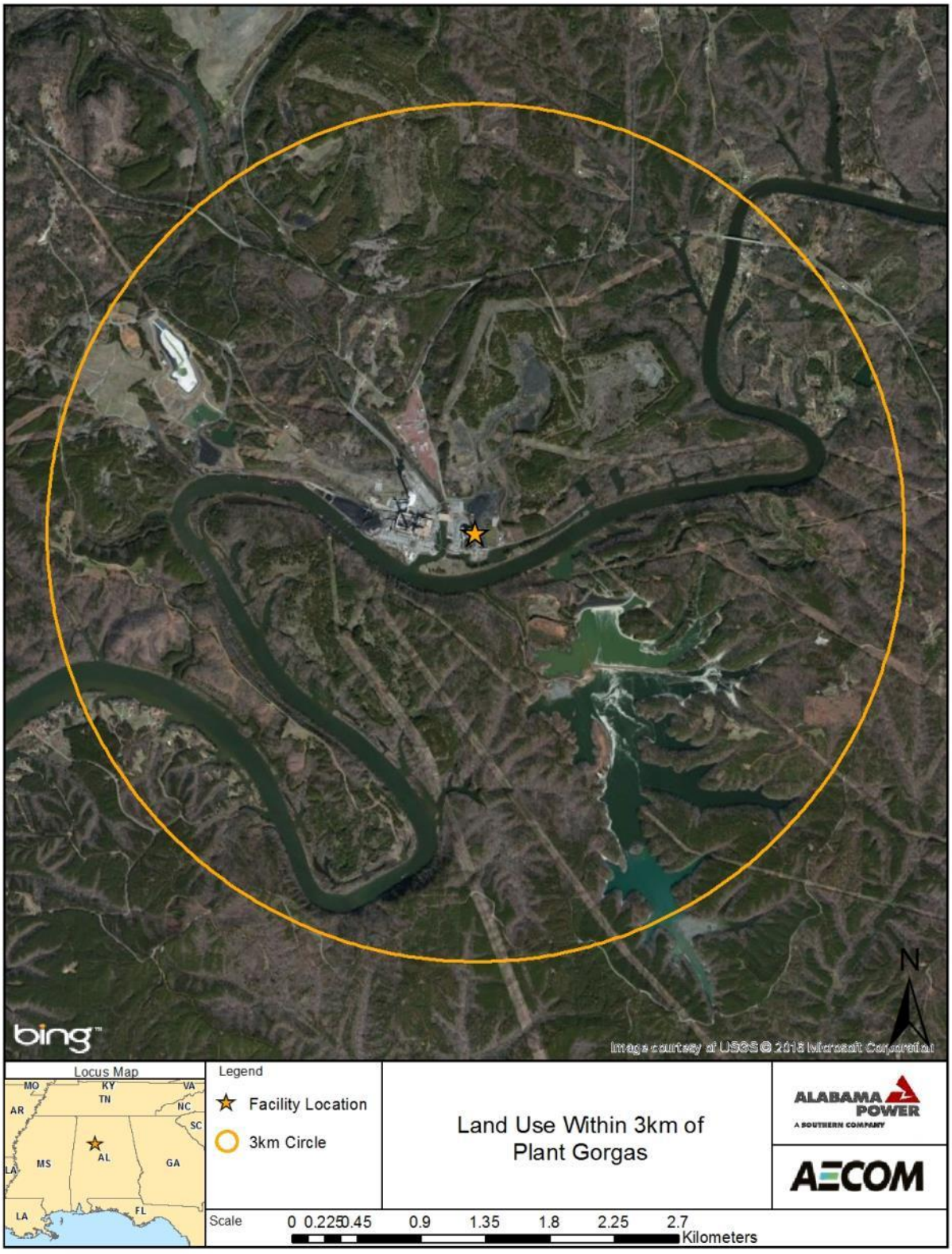


Figure 3-2 Plant Gorgas Buildings and Stacks used for the BPIP Analysis (looking south)

Figure 3-3 Far-Field Receptor Grid for Plant Gorgas

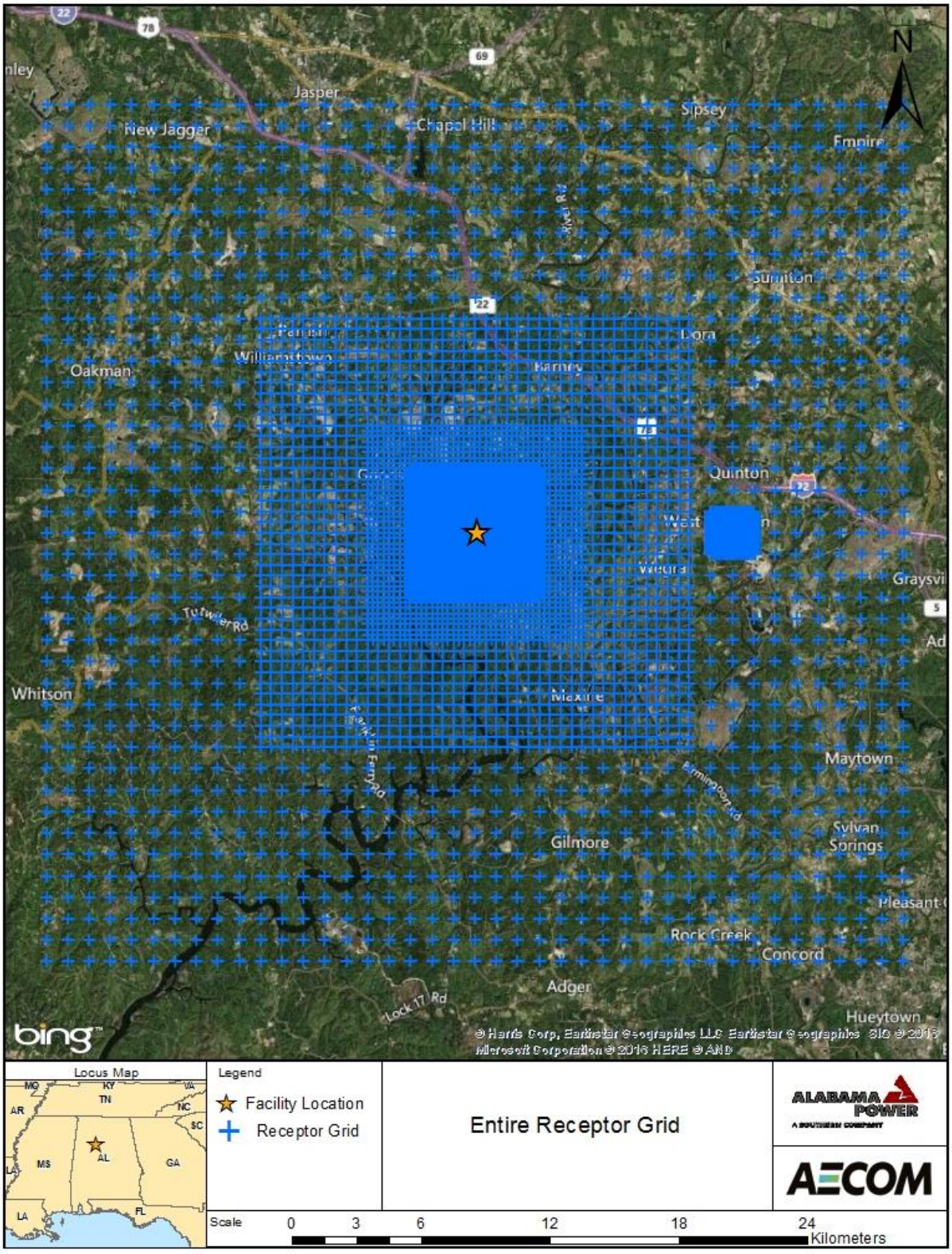


Figure 3-4 ADEM Recommended Meteorological Station for Modeling

Figure 3-5 Location of Meteorological Sites Relative to Plant Gorgas

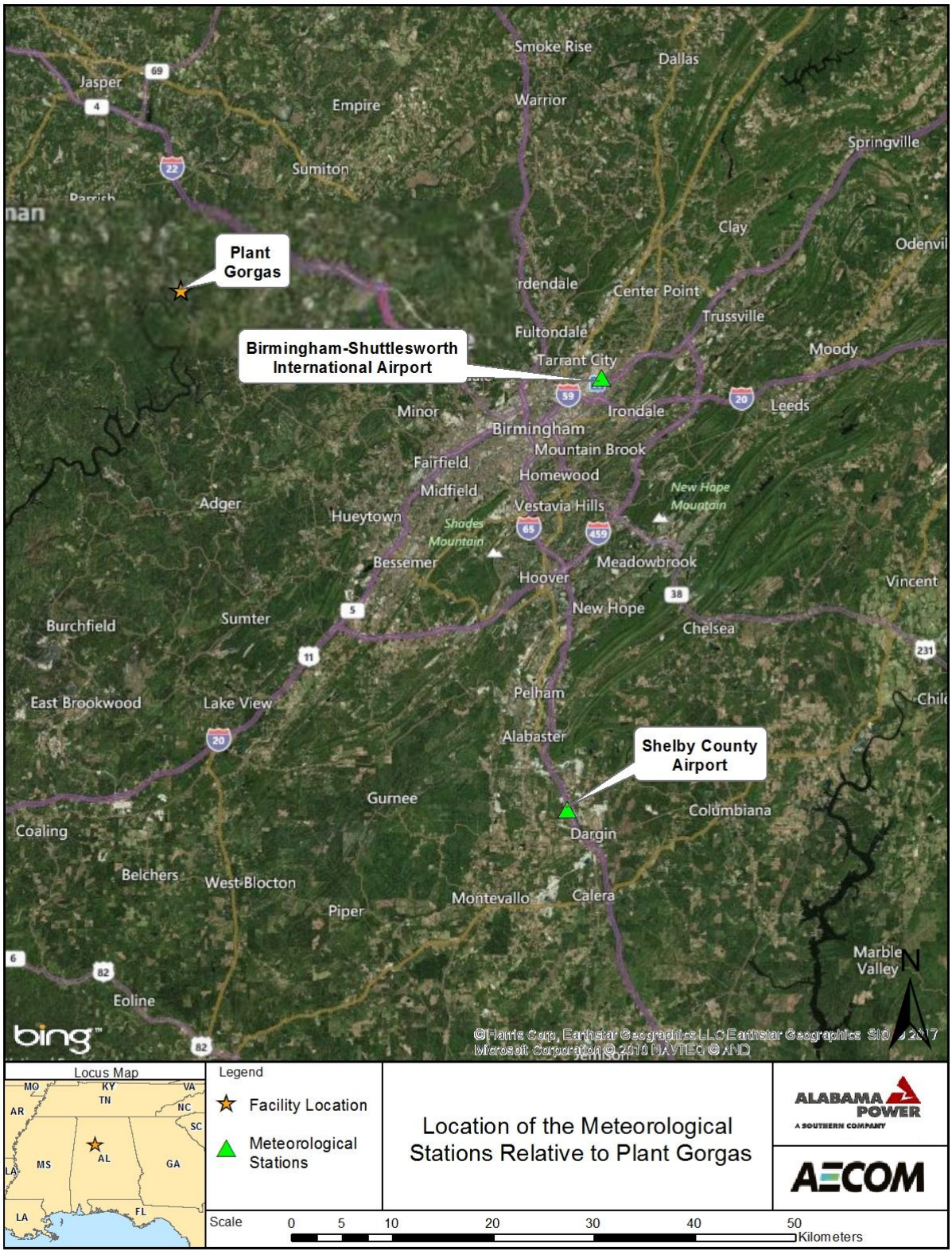


Figure 3-6 Monitor Location Maps (courtesy of ADEM)

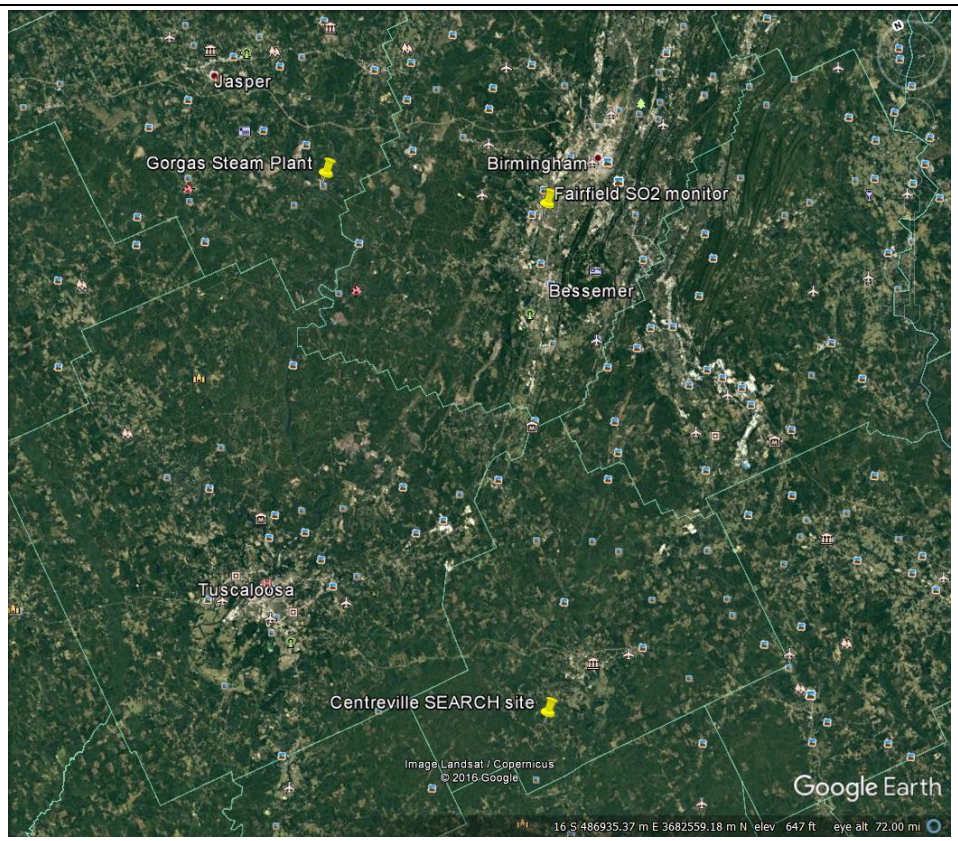


Figure 3-7 Land Use around Gorgas and Centreville (courtesy of ADEM)

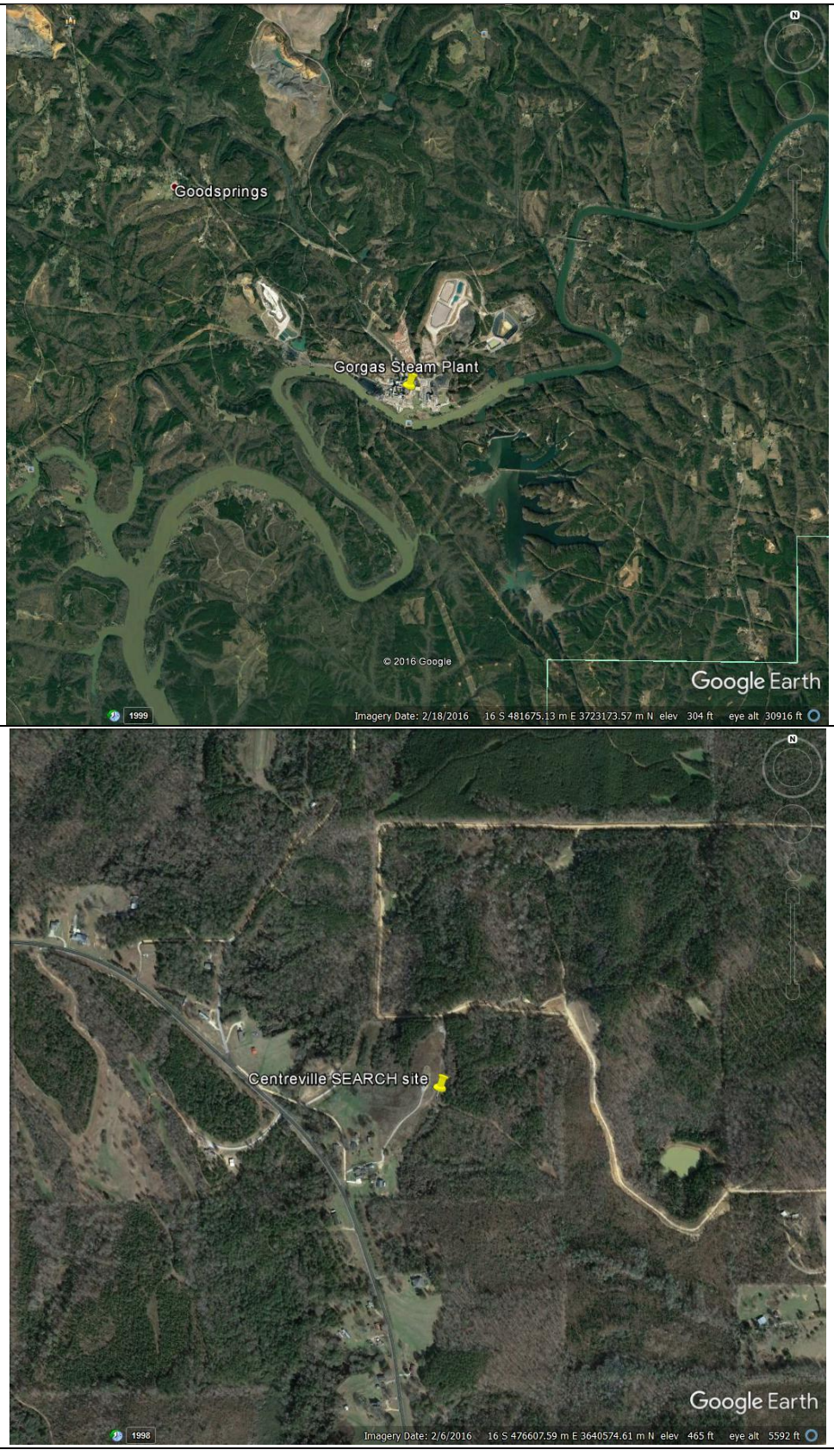
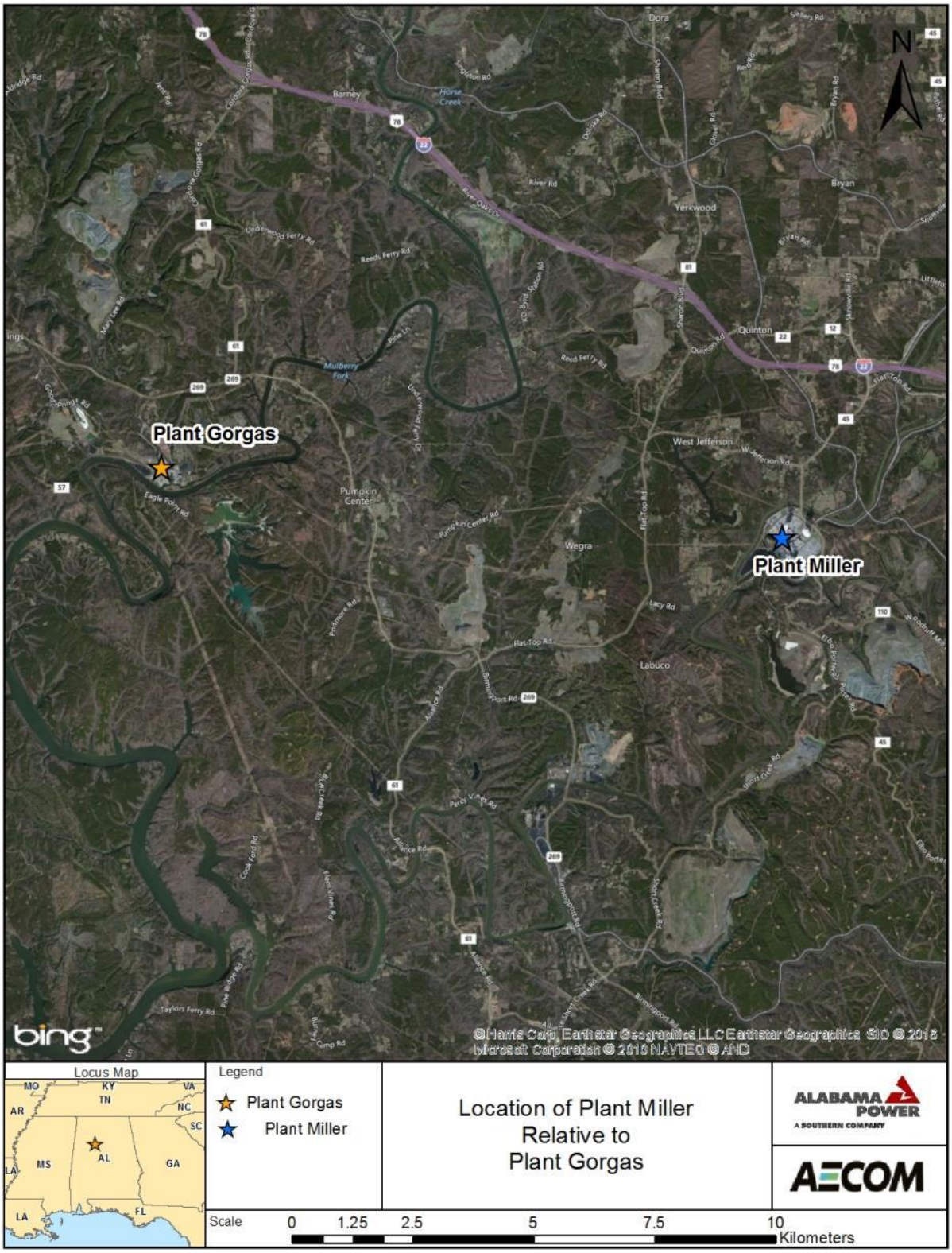


Figure 3-8 Location of Nearby SO_2 Source



4.0 Analysis of Modeling Results

The modeling results for 1-hour SO_2 concentrations are presented in Table 4-1 and are based on the sum of the modeled design concentration for Plant Gorgas using actual hourly emissions from 2013-2015 for Units 8, 9 and 10, concurrent actual hourly emissions from Plant Miller Units 1-4, and the ambient background concentration. The modeled design concentration was calculated by AERMOD and reflects the three-year average of the 99th percentile ranked peak daily 1-hour SO_2 concentration.

Table 4-1 compares the total concentration (modeled plus background) with the 1-hour SO_2 NAAQS of 196.5 $\mu g/m^3$. Figure 4-1 shows the location of the maximum modeled concentration, which is approximately 12 km east of Plant Gorgas. Refined-grid receptors were included in this area to ensure that the location of this maximum total design concentration was located in an area with 100-meter spaced receptor resolution.

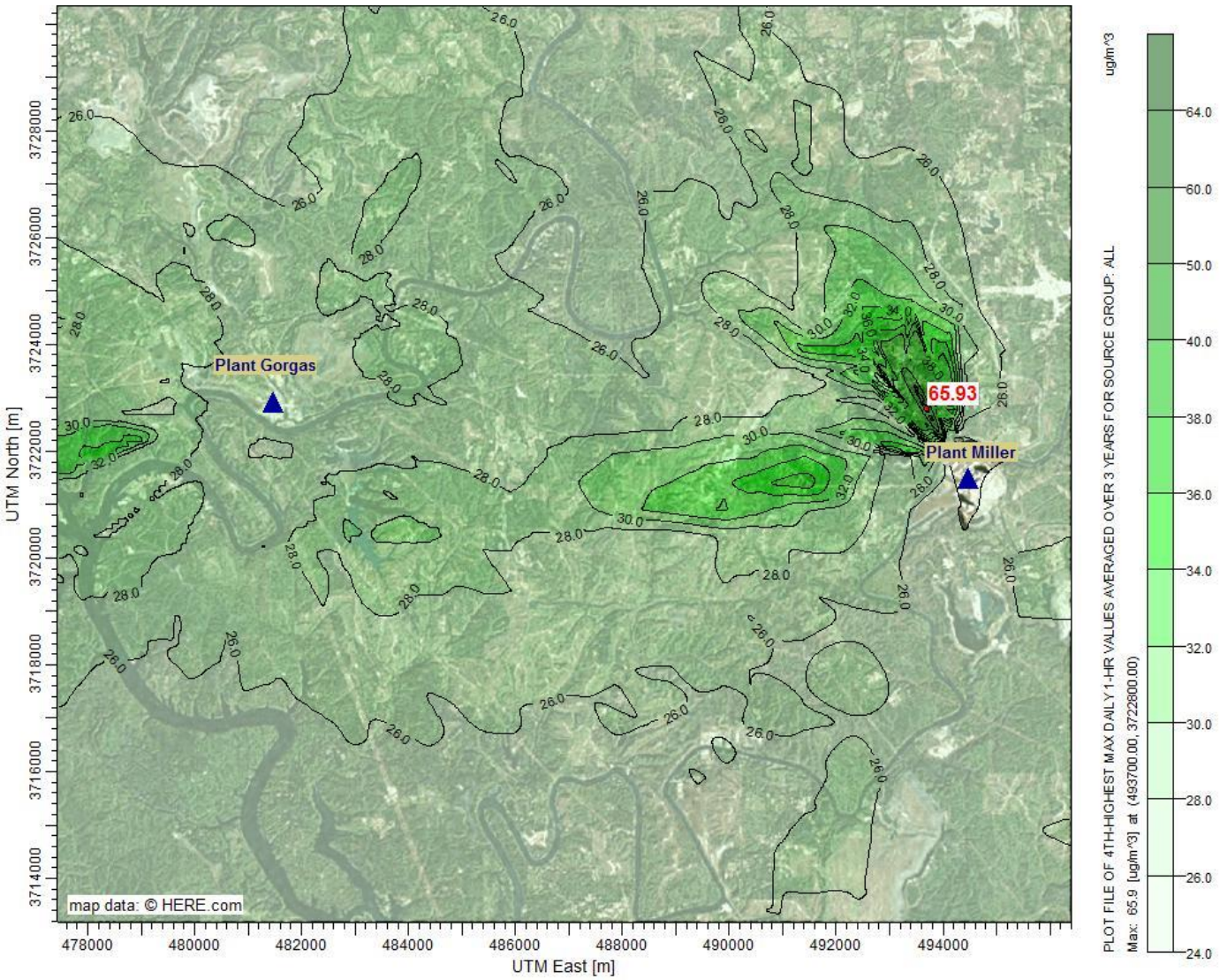
As shown in Table 4-1, the modeling results indicate that all areas surrounding the facility are in compliance with the applicable NAAQS standard and should be designated as attainment. In addition, given how low the results are relative to the NAAQS, additional future maintenance modeling should not be warranted.

The modeling archive (see Appendix C) contains all the electronic files needed to review and reproduce the results contained in this report.

Table 4-1 Summary of 1-hour SO_2 NAAQS Analysis

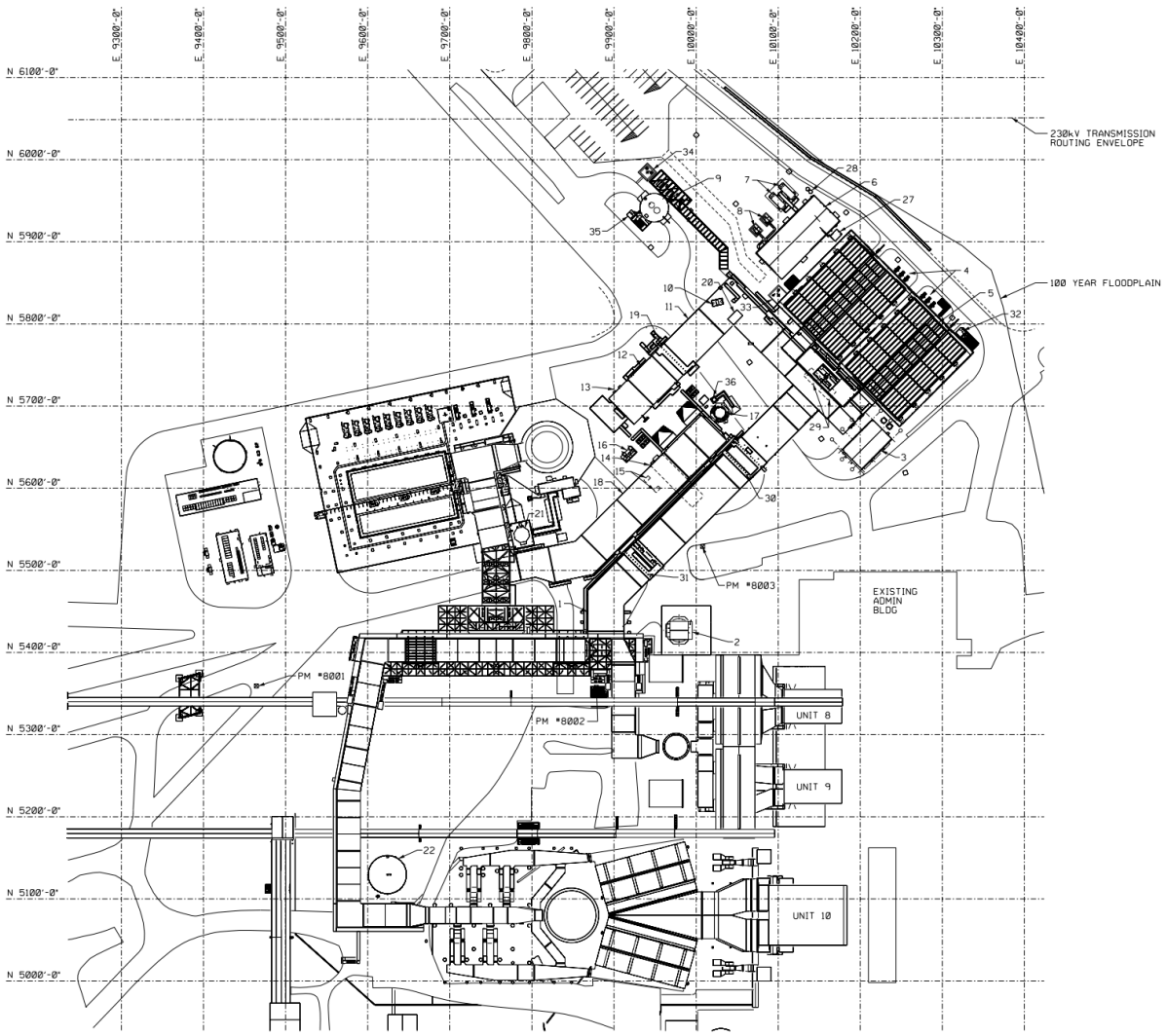
Pollutant	Averaging Period	Plant Gorgas Conc. ($\mu g/m^3$)	Plant Miller Conc. ($\mu g/m^3$)	Monitored Background Conc. ($\mu g/m^3$)	Total Model Design Conc. ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Below NAAQS (Yes/No)	Percent of NAAQS (%)
SO_2	1-hour	1.09	45.22	19.62	65.93	196.5	Yes	33.6%

Figure 4-1 Isopleth Map of 1-hour SO_2 NAAQS Total Concentrations (Modeled + Background)



Appendix A

Plant Gorgas – Facility Plot Plan



ENLARGED SITE PLAN

Appendix B

GEP Documentation for the Plant Gorgas Units 8, 9 and 10 Stack and the Plant Miller Units 1&2 Stack and the Units 3&4 Stack

Alabama Power Company
600 North 18th Street
Post Office Box 2641
Birmingham, Alabama 35291
Telephone 205 250-1000

Alabama Power
the southern electric system

December 11, 1985

Mr. Richard E. Grusnick, Chief
Air Division
Alabama Department of
Environmental Management
1751 Federal Drive
Montgomery, AL 36130

Dear Mr. Grusnick:

Reference is made to your letter of October 22, 1985 and our meeting of November 18, 1985 concerning the Stack Height Regulations promulgated by the Environmental Protection Agency on July 8, 1985. Attached are the following documents and data:

1. Determination of Good Engineering Practice stack heights for stacks greater than 65 meters APC 200 forms for Barry, Gadsden and Gorgas Steam Electric-Generating Plants.

2. Exceptions from restrictions on credit for merged stacks with attachments.

3. Air quality modeling analysis with attachments.

4. Emission inventory for Barry Steam Plant.

5. 1983 on-site meteorological data on computer tape for all Alabama Power Company coal-fired plants.

The stacks for Units 4 and 5 at the Barry Steam Plant and the stack for Units 8-10 at the Gorgas Steam Plant are grandfathered under the regulations. The stacks for Units 4 and 5 at the Barry Steam Plant were completed in May, 1969 and June, 1970, respectively. The stack for Units 8-10 at the Gorgas Steam Plant began construction in February, 1970.

It should be noted that the Gadsden and Gorgas Steam Plants will not require any additional modeling to prove compliance with the regulations. The stacks at these plants, as indicated on the APC 200 forms, are either grandfathered or less than Good Engineering Practice stack height.

The APC 200 forms and the emission inventory for the remaining affected plants will be submitted within two weeks. This information has been delayed due to a recheck of construction drawings by our surveyors.

I would appreciate a meeting to discuss this information as soon as possible. If you have any questions, please call me.

Sincerely,

W. L. Bowers, Manager
Environmental Compliance

WDH:dy

Attachment

DETERMINATION OF GOOD ENGINEERING PRACTICE STACK HEIGHT FOR STACKS GREATER THAN 65 METERS

1. Company ALABAMA POWER COMPANY

2. Address P. O. Box 2641, Birmingham, AL 35291

3. Permit Unit/Source Description Gorgas Steam Plant Units 8-10

   (a) Actual stack height above grade 755

   (b) List the air emission sources which utilize this stack. Describe the air pollution control system. Attach diagrams or further explanation as needed. Gorgas Steam Plant boilers 8, 9, and 10 all with electrostatic precipitators

4. Attach a top-view schematic drawing of the plant (drawn-to-scale) including geographical orientation. Label all buildings and stacks. Include height, width, and length of all buildings.

5. (a) GEP stack height Grandfathered

   (b) Date construction started on stack

   (c) In the space provided below or in attachments show the GEP calculations and indicate the building used.

See attached information on grandfathering.

6. Highest terrain elevation within ½ mile:

   (a) Height 500 feet

   (b) Distance and direction from stack 0.5 miles northwest (taken from U. S. Geological Map Goodsprings Quad)

W. L. Bowers
Name of Company Official

Signature

Date

Alabama Power Company
600 North 18th Street
Post Office Box 2641
Birmingham, Alabama 35291
Telephone 205 250-1000

To: Bryan Baldwin
SCS-R&D

Alabama Power

December 31, 1985

Mr. Richard E. Grusnick, Chief
Air Division
Alabama Department of Environmental Management
1751 Federal Drive
Montgomery, Alabama 36130

Dear Mr. Grusnick:

My letter of December 11, 1985 provided information for Barry, Gadsden and Gorgas Steam-Electric Generating Plants. Attached are the documents for Gaston, Greene County and Miller Steam-Electric Generating Plants concerning the Stack Height Regulations promulgated by the Environmental Protection Agency on July 8, 1985:

1. Determination of Good Engineering Practice Stack Heights for Stacks Greater than 65 Meter-APC200 forms for the Greene County, Gaston and Miller Steam-Electric Generating plants and supporting documentation.

2. Emission data for the Gaston and Greene County Plants.

As noted on the APC-200 forms, the stacks at the Miller Steam Plant are less than Good Engineering Practice stack height and no additional modeling will be required to prove compliance with the regulations.

We request a meeting to discuss this information and the modeling requirements as soon as possible. If you have any questions, please call me.

Sincerely,

W. L. Bowers

WDH:dy

Attachments

cc: Mr. Paul Pate - Jefferson County Health Department -
Miller Steam Plant

DETERMINATION OF GOOD ENGINEERING PRACTICE STACK HEIGHT FOR STACKS GREATER THAN 65 METERS

1. Company Alabama Power Company

2. Address P. O. Box 2641, Birmingham, Alabama 35291

3. Permit Unit/Source Description Miller Steam Plant Units 1 and 2

   (a) Actual stack height above grade 707

   (b) List the air emission sources which utilize this stack. Describe the air pollution control system. Attach diagrams or further explanation as needed. Miller Steam Plant boilers 1 and 2 both with electrostatic precipitators.

4. Attach a top-view schematic drawing of the plant (drawn-to-scale) including geographical orientation. Label all buildings and stacks. Include height, width, and length of all buildings.

5. (a) GEP stack height 735

   (b) Date construction started on stack April, 1975

   (c) In the space provided below or in attachments show the GEP calculations and indicate the building used.

   The precipitator enclosure was used to determine the GEP height. See attached drawing. $2.5H = (2.5)(294) = 735$

6. Highest terrain elevation within ½ mile:

   (a) Height 500 feet

   (b) Distance and direction from stack 0.5 miles northeast (from U. S. Geological Map - Dora Quad)

W. L. Bowers
Name of Company Official

Signature

Date

APC-200

DETERMINATION OF GOOD ENGINEERING PRACTICE STACK HEIGHT FOR STACKS GREATER THAN 65 METERS

1. Company Alabama Power Company

2. Address P. O. Box 2641, Birmingham, Alabama 35291

3. Permit Unit/Source Description Miller Steam Plants Units 3 and 4

   (a) Actual stack height above grade 700 (Under construction)

   (b) List the air emission sources which utilize this stack. Describe the air pollution control system. Attach diagrams or further explanation as needed. Miller Steam Plant boilers 3 and 4 both with electrostatic precipitators.

4. Attach a top-view schematic drawing of the plant (drawn-to-scale) including geographical orientation. Label all buildings and stacks. Include height, width, and length of all buildings.

5. (a) GEP stack height 701

   (b) Date construction started on stack December, 1985 (tenative)

   (c) In the space provided below or in attachments show the GEP calculations and indicate the building used.

   Unit 1 and 2 precipitator enclosure was used to determine the GEP height. See attached drawing. Projected width = 271' using 37° angle between building and stack liner. Since 271<294 (1.5x271) + 294 = 701 feet.

6. Highest terrain elevation within 1/2 mile:

   (a) Height 520 feet

   (b) Distance and direction from stack 0.5 miles east (from U.S. Geological Map - Dora Quad)

W. L. Bowers
Name of Company Official

Signature

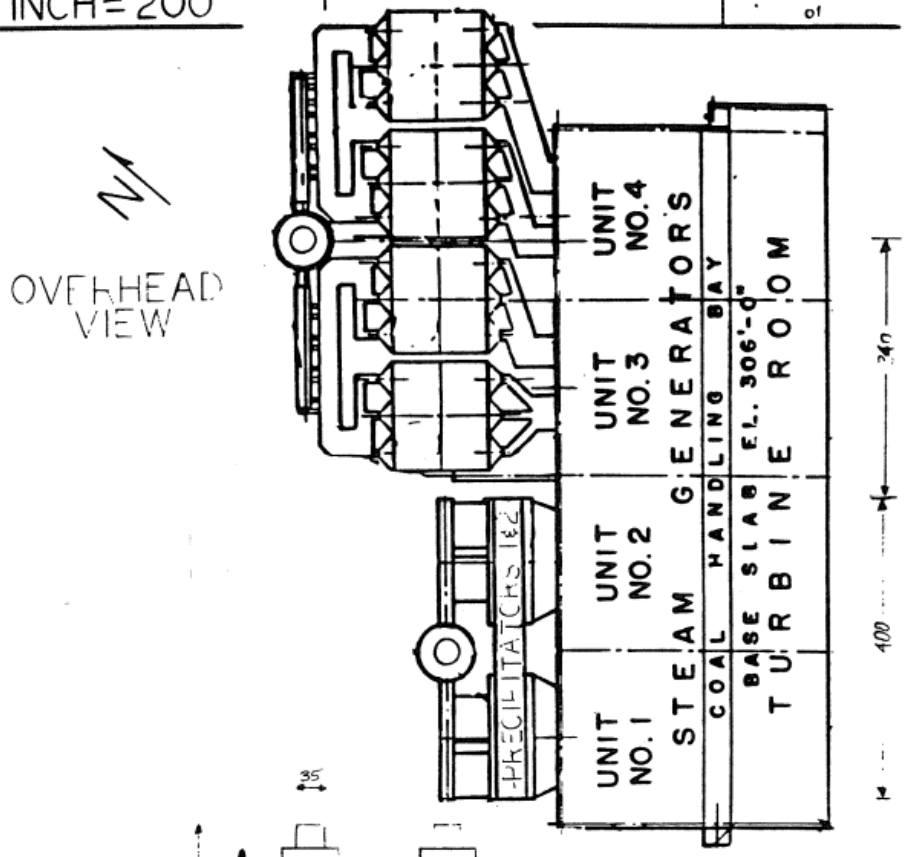
12/2/85
Date

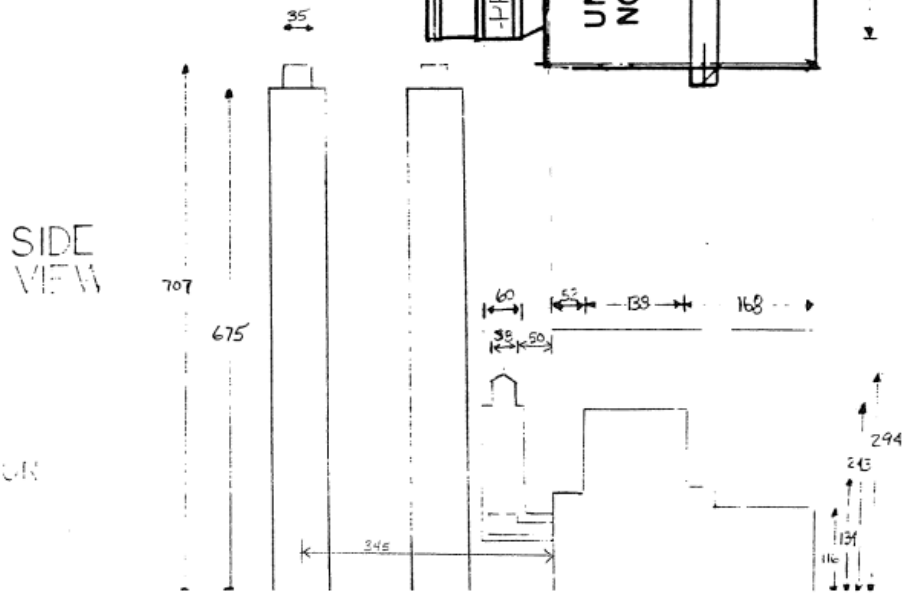
APC-200

Design Calculations

Alabama Power

Project MILLER STEAM PLANT	Prepared By	Date
Subject/Title GEP STACK HEIGHT	Reviewed By	Date
SCALE 1 INCH = 200'	Calculation Number	Sheet of





Appendix C

Electronic Modeling Archive

(See attached web link in transmittal email to download files)