

Air Dispersion Modeling Protocol Homer City Generation, L.P.

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1. Introduction

1.1 Project Overview

Homer City Generation, L.P. (Homer City) is considering a potential project to construct and operate up to seven (7) combined-cycle combustion turbines (CCs) along with up to ten (10) aeroderivative gas turbines (ADGTs) at the former Homer City Generating Station (“the Station”), located in Indiana County, Pennsylvania. Construction and operation of the new CCs and ADGTs will also include new ancillary equipment such as auxiliary boiler(s), emergency generator(s), emergency fire water pump engine(s), cooling towers, and fuel gas heater(s). The new CCs and ADGTs, in final configuration, along with all associated ancillary equipment, will be herein referred to as the “Project.” The new CCs and ADGTs will be fueled only by pipeline quality natural gas. Each CC and ADGT will be equipped with a selective catalytic reduction (SCR) to minimize nitrogen oxide (NO_x) emissions and an oxidation catalyst to minimize carbon monoxide (CO) and volatile organic compound (VOC) emissions.

The former Station was an existing “major source” of criteria air pollutants, and the Project constitutes a “major modification” under Prevention of Significant Deterioration (PSD) permitting requirements. As such, Homer City will be applying to the Pennsylvania Department of Environmental Protection (PADEP) for a Plan Approval authorizing construction and operation of the Project. Homer City will use emission offsets, associated with the retirement of the coal-fired boilers, to net out of PSD review for NO_x, CO, and sulfur dioxide (SO₂). Lead (Pb) emissions from the Project will not exceed the PSD Significant Emission Rate (SER) threshold. As such, the Project will be subject to PSD requirements under the New Source Review (NSR) program for emissions of particulate matter (PM), particulate matter (PM) equal to and less than 10 microns in diameter (PM₁₀), PM equal to and less than 2.5 microns in diameter (PM_{2.5}), VOC, sulfuric acid mist (SAM, or H₂SO₄), and greenhouse gases (GHG). Since Pennsylvania is in the Ozone Transport Region (OTR), emissions of ozone precursors (i.e., NO_x and VOC), would be subject to Non-attainment NSR (NAA-NSR) requirements and not PSD requirements.

The United States Environmental Protection Agency’s (US EPA) *Revision to the Guideline on Air Quality Models* (GAQM) (US EPA, 2024a), published on November 29, 2024, acknowledges that although a modeling protocol should be agreed upon by all involved parties, it is not meant to be a binding, formal legal document. This modeling protocol is meant to establish the basic methodology for the air dispersion modeling analyses and to present preliminary details of the proposed project. The methodology and project details may change as the analyses progress. This protocol follows the methods in the GAQM and guidance received from PADEP. The modeling protocol will address the air quality impact analyses required for those pollutants subject to the permitting action, PM, PM₁₀, PM_{2.5}, GHGs, and VOC. Please note, there are no modeling requirements for GHGs.

1.2 Purpose of Modeling Protocol

The purpose of this document is to present the proposed methodology for conducting the air dispersion modeling analyses that will be performed in support of the air permit application for the Project. Modeling methods and assumptions, including model selection and options, meteorological data, and source parameters to be used in the modeling analyses, are presented in this document for review and approval by PADEP.

1.3 Contents of Modeling Protocol

The modeling protocol consists of the following additional sections:

- Section 2 contains the Project description, including information regarding Project equipment, location, and the expected air emissions.
- Section 3 is a discussion of applicable air regulations.
- Section 4 presents a detailed description of the modeling approach proposed to be used in evaluating air quality impacts of the proposed Project, including model selection criteria, the good engineering practice stack height determination, refined modeling analyses, and ambient air quality compliance approaches.
- Section 5 presents elements for a Class II area modeling analysis.
- Section 6 is a discussion of Class I Area Quality Relative Values, Class I PSD Increments, Class II Visibility, Air Quality Review/Pre-Construction Monitoring, Soils and Vegetation, and Growth-related impacts.
- Section 7 provides a description of the results analysis that will be submitted to PADEP in support of the Plan Approval permit application for the Project, and
- Section 8 contains References.

2. Project Description

2.1 Project Location

The former Station and Project is located in Indiana County, approximately 4 kilometers (2.5 miles) southwest of the town of Homer City, Pennsylvania. **Figure 2-1** is an aerial map showing the location of the Station and **Figure 2-2** provides a closer view of the Station. **Figure 2-3** shows an overlay of a preliminary site layout of the proposed Project. The general area of the proposed Project is situated to the northwest of the former Station coal stacks and primary structures. The approximate size of the proposed Project footprint is shown in **Figure 2-3**.

2.2 Proposed Emission Sources

As stated in **Section 1.0**, the Project consists of seven (7) CCs along with up to ten (10) ADGTs. The CCs are proposed to be General Electric (GE) 7HA.02 unit and the ADGTs are proposed to be Mitsubishi Power FT8 Gas Turbine MOBILEPAC. The CCs and ADGTs are the primary sources of air emissions associated with the proposed Project. The ancillary pieces of equipment being proposed for the Project are listed below:

- Three (3) auxiliary boiler rated at approximately 67 million British thermal units per hour (MMBtu/hr) each, operating on pipeline quality natural gas;
- Ten (10) emergency generators (reciprocating internal combustion engines [RICE]) rated at approximately 2,500 kilowatts (kW) each, operating on ultra-low sulfur diesel fuel (ULSD);
- Two (2) emergency generators rated at approximately 1,000 kilowatts (kW) each, operating on ultra-low sulfur diesel fuel (ULSD);
- One (1) emergency fire-water pump (RICE) rated at approximately 400 brake horsepower (bhp), operating on ULSD;
- Seven (7) fuel gas heaters each rated at approximately 10 MMBtu/hr operating on pipeline quality natural gas; and
- Seven (7) cooling towers, with eight (8) cells each.

2.3 Source Data

2.3.1 Criteria Pollutant Emissions

The Project is located at an existing major stationary source. As such, the Project must be evaluated to determine whether it constitutes a major modification at a major stationary source. A major modification is defined as a physical change or change in the method of operation at a major source that results in a significant emissions increase and a significant net emissions increase of a regulated NSR pollutant that is greater than the PSD significant emission rate (SER).

As stated in **Section 1**, Homer City will use emission offsets, associated with the retirement of the coal-fired boilers, to net out of PSD review for NO_x, CO, and SO₂. As such, the Project will be subject to PSD requirements under the NSR program for emissions of PM, PM₁₀, PM_{2.5}, VOC, sulfuric acid mist (SAM, or H₂SO₄), and GHG. Since Pennsylvania is in the Ozone Transport Region (OTR), emissions of ozone precursors (i.e., NO_x and VOC), would be subject to Non-attainment NSR (NAA-NSR) requirements and not PSD requirements..

Table 2-1 lists the applicable expected annual emission increases resulting from the Project. Please note, these emissions are indicative, based on preliminary lowest achievable emission rate (LAER), best available

control technology (BACT), and best available technology (BAT). **Table 2-2** shows a comparison of the Project emission increases relative to the PSD SERs. **Table 2-3** shows a comparison of the applicable Project emission increases to the NAA-NSR thresholds. As indicated in **Table 2-2**, the Project is expected to be a major modification and subject to PSD review for PM₁₀, PM_{2.5}, H₂SO₄, and GHG. **Table 2-3** indicates the Project triggers NAA-NSR for VOC.

Table 2-1. Preliminary Project Emission Increases

	PM ₁₀	PM _{2.5}	NO _x	CO	VOC	SO ₂	H ₂ SO ₄	Lead	CO ₂ e
GE 7HA.02 (7 units total)	705.18	705.18	984.19	677.9	275.4	193.2	138.0	0.066	15,942,536.8
FT8 MOBILPAC (10 units total)	132.49	132.49	147.16	214.8	67.7	10.5	29.2	0.007	1,659,247.8
Auxiliary Boilers (3 units total)	0.33	0.33	2.16	3.63	0.24	0.06	0.0009	0.00002	5,237.3
Fuel Gas Heaters (7 units total)	1.59	1.59	9.92	12.23	1.65	0.463	0.0071	0.000162	39,328.9
Emergency Generators (2,500 kW) (10 units total)	0.41	0.40	10.00	52.26	2.84	0.110	0.0084	-	10,400.6
Emergency Generators (1,000 kW) (2 units total)	0.03	0.03	0.82	4.27	0.23	0.009	0.0007	-	849.1
Fire-water Pump Engine (1 unit total)	0.03	0.03	0.66	0.57	0.66	0.0012	0.00009	--	114.2
Cooling Towers	2.20	0.01	--	--	--	--	--	--	--
Facility Total	842.26	840.05	1,154.90	965.73	348.69	204.32	167.14	0.073	17,710,208.2
Emissions Reduction Credits/Netting	220.18	220.18	2,436.38	4,096.52	11.37	4,460.55	28.44	--	--
Facility Total Less ERCs/Netting	622.08	619.87	-963.69	-3,130.79	337.33	-4,256.23	138.70	0.073	17,710,208

Table 2-2. Preliminary Project Emission Increases Compared to PSD Significant Emission Rates

	PM ₁₀	PM _{2.5}	NO _x	CO	SO ₂	H ₂ SO ₄	Lead	CO ₂ e
Facility Total Less ERCs/Netting	622.08	619.87	-963.69	-3,130.79	-4,256.23	138.70	0.073	17,710,208
PSD Significance Emission Rate (ton/yr)	15	10	40	100	40	7	0.6	75,000
PSD Review Triggered?	Yes	Yes	No	No	No	Yes	No	Yes

Table 2-3. Preliminary Project Emission Increases Compared to NAA-NSR Significance Emission Rate

	NO _x	VOC
Facility Total Less ERCs/Netting	-963.69	337.33
NAA-NSR Significance Emission Rate (ton/yr)	40	40
NAA-NSR LAER Review Triggered?	No	Yes

2.3.2 Short Term Emission Rates

Table 2-4 lists the expected maximum hourly emission rates of criteria pollutants for turbine type. The data shown below reflects the maximum hourly emissions for each individual turbine over a range of operating loads and ambient operating conditions. **Table 2-5** lists the maximum hourly emission rates of criteria pollutants from each of the ancillary sources.

Table 2-4. Preliminary Maximum Hourly Emission Rates of Criteria Pollutants from each CCs and ADGTs

Pollutant	Maximum Hourly Emission Rates (lb/hr) ⁽¹⁾⁽²⁾	
	GE 7HA.02	FT8
PM ₁₀	24.1	3.0
PM _{2.5}	24.1	3.0

- (1) Hourly emission rates are based on vendor information. Pollutant emission rates shown represent maximum operation of a single unit over the proposed operating ranges and for all ambient temperatures.
- (2) Emission rates presented in this table are preliminary and are subject to change.

Table 2-5. Preliminary Maximum Hourly Emission Rates of Criteria Pollutants Ancillary Sources

Equipment	Pollutant Emission Rates for Ancillary Sources (lb/hr/unit) ^{(1), (4)}	
	PM ₁₀	PM _{2.5}
Auxiliary Boiler ⁽²⁾	0.50	0.50
Fuel Gas Heater ⁽²⁾	0.05	0.05
Emergency Generator ⁽²⁾ (2,500 kw)	0.17	0.16
Emergency Generator ⁽²⁾ (1,00 kw)	0.02	0.02
Fire-water Pump ⁽²⁾	0.12	0.12
Cooling Tower ⁽³⁾	0.50	0.0016

- (1) Hourly emission rates based on emission factors and vendor information.
- (2) Emission rates reflect each unit if multiple units are proposed as part of the project.
- (3) Emission rates reflect one 8-cell cooling tower.
- (4) Emission rates presented in this table are preliminary and are subject to change.

Figure 2-1. Project Location

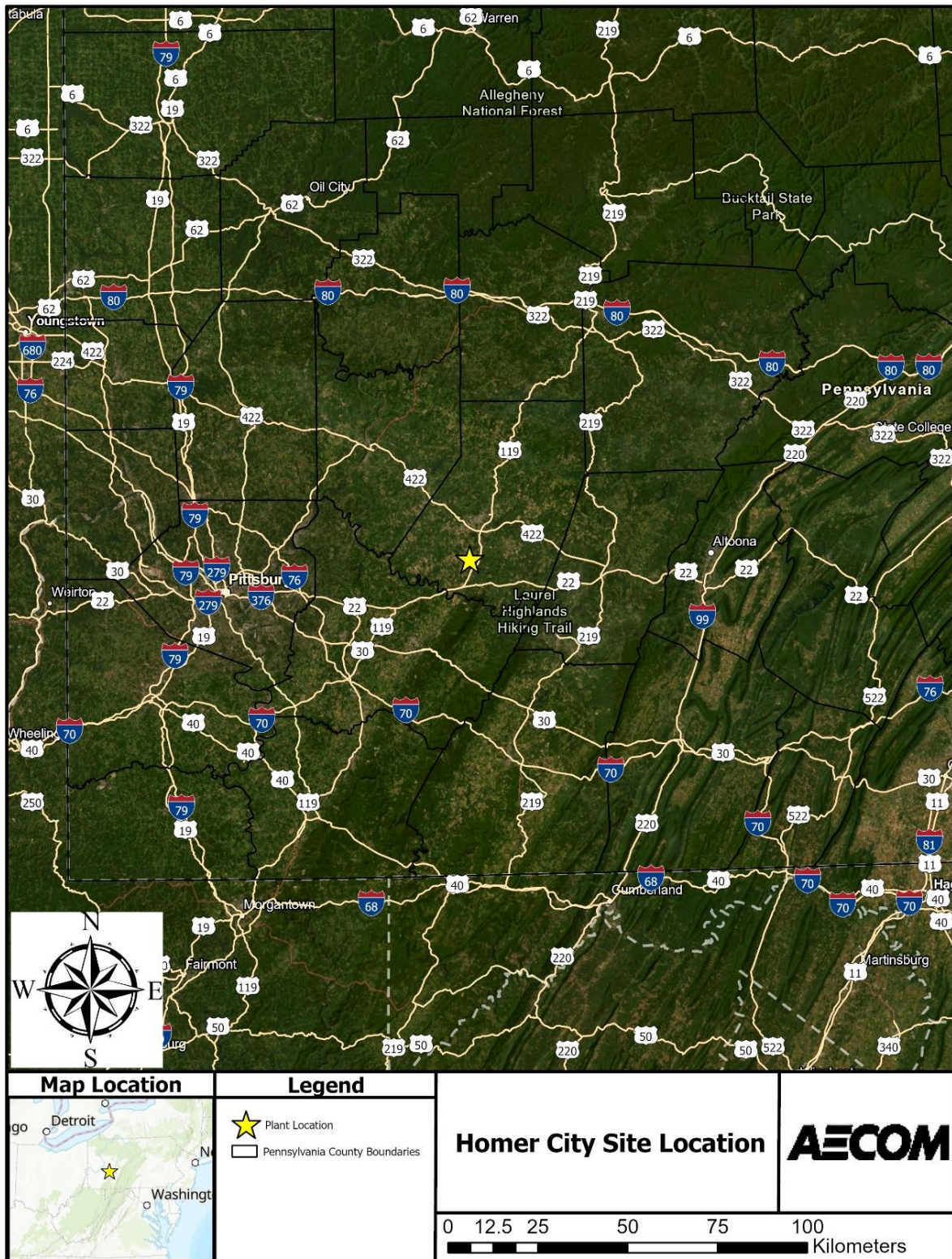
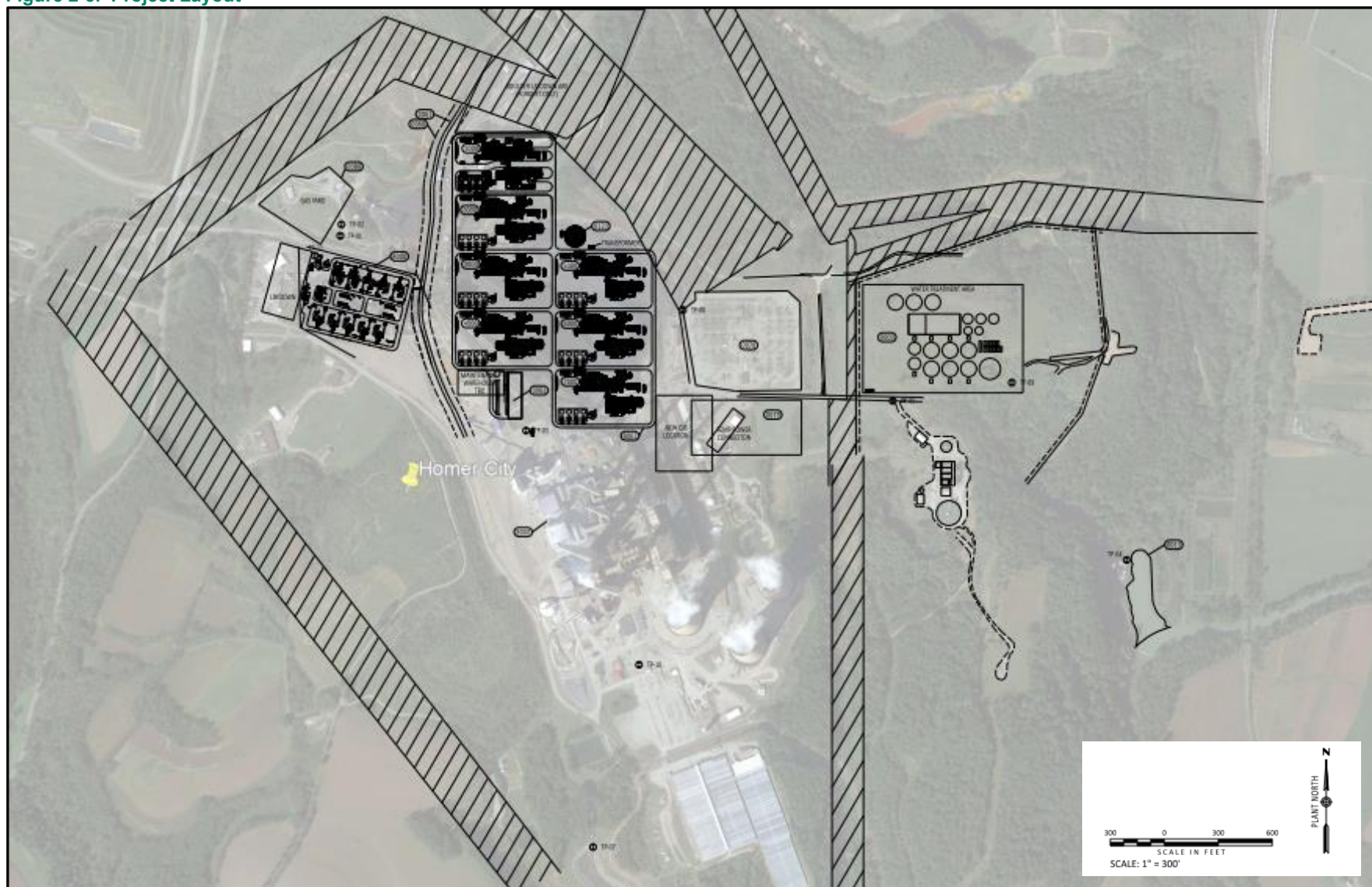


Figure 2-2. Aerial View of Project Site



Figure 2-3. Project Layout



3. Applicable Regulations

3.1 Federal Air Quality Standards

The Clean Air Act of 1970 required the US EPA to establish ambient concentration thresholds for certain compounds based upon the identifiable effects that the compounds may have on the public health and welfare. Subsequently, the US EPA promulgated regulations that set NAAQS for several criteria compounds applicable to this Project: particulate matter (PM₁₀ and PM_{2.5}). Two classes of ambient air quality standards have been established: (1) primary standards defining levels of air quality that the US EPA has judged as necessary to protect public health; and (2) secondary standards defining levels for protecting soils, vegetation, wildlife, and other aspects of public welfare. **Table 3-1** lists the currently applicable NAAQS for which the Project will be subject to PSD review. Pennsylvania has adopted all of the NAAQS.

Table 3-1. National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary Standard (µg/m ³)	Secondary Standard (µg/m ³)
PM ₁₀	24-hour ⁽¹⁾	150	150
PM _{2.5}	24-hour ⁽²⁾	35	35
	Annual ⁽³⁾	9	15

1. Not to be exceeded more than once per year on average over 3 years.
2. Compliance with the 24-hour standard is demonstrated when the 3-year average (5-year average in a modeling demonstration) of the 98th-percentile (8th High) 24-hour concentration is below the standard.
3. Not to be exceeded by the arithmetic average of the annual arithmetic averages from 3 successive years.

Source: EPA 40 CFR 50

Pursuant to the 1970 Clean Air Act, states were required to delineate air quality control regions (AQCRs) and to adopt State Implementation Plans (SIPs) to provide for attainment of the NAAQS as expeditiously as practical, within certain time limits. The 1977 Clean Air Act Amendments, in Section 107, required US EPA and states to identify, by category, those AQCRs (or portions thereof) meeting and not meeting the NAAQS. Areas meeting the NAAQS are termed attainment areas, and areas not meeting the NAAQS are termed non-attainment areas. Areas that have insufficient data to make a determination of attainment/non-attainment status are unclassified or are not designated but are treated as being attainment areas for permitting purposes. The designation of an area is made on a pollutant-by-pollutant basis. **Table 3-2** lists the attainment status for Indiana County for each NAAQS which the Project is subject to PSD permitting.

Table 3-2. Attainment Status of Indiana County, Pennsylvania

Compound	Attainment Status ⁽¹⁾
PM ₁₀	Unclassifiable/Attainment
PM _{2.5}	Unclassifiable/Attainment

40 CFR §81.301 and US EPA information available at <https://www.epa.gov/green-book>

(1) Pennsylvania is part of the Ozone Transport Region and thus will be subject to NAA-NSR for VOC.

3.2 Prevention of Significant Deterioration

The PSD regulations require that an owner or operator undertaking a major modification perform the following analyses for those pollutants triggering PSD:

- Analysis of existing air quality in the vicinity of the source;
- Application of best available control technology (BACT) to the modified or proposed source (not covered by this protocol);
- Assessment of air quality impacts resulting from pollutant emissions from the source relative to PSD Increments and NAAQS;
- PSD increment consumption, visibility, and air quality related values (AQRVs) impact analyses at PSD Class I areas (generally within 300 kilometers of the facility where the project is slated to take place);
- A Class II visibility analysis;
- Assessment of the effects of emitted pollutants on soils and vegetation in the source's impact areas; and
- Assessment of impacts associated with indirect economic growth.

The PSD regulations limit the amount that ambient air quality concentrations can be increased above existing ambient levels in attainment areas. These allowable increases in concentrations, called PSD increments, have only been established for PM₁₀, PM_{2.5}, SO₂ and NO₂. It is assumed the proposed Project will be subject to a PSD increment consumption analysis for PM_{2.5} and PM₁₀.

US EPA has defined concentrations, called significant impact levels (SILs), that are used to determine whether a major new source or modification causes or contributes to a violation of a NAAQS or exceedance of a PSD increment. US EPA has also proposed SILs for PSD Class I areas (July 23, 1996, Federal Register, Section IV.C.4), but these have not yet been finalized. US EPA recently established updated Class I and II SILs for PM_{2.5} (US EPA, 2024b). As detailed in **Section 5**, if modeled concentrations exceed the SILs described in **Table 3-3** below, additional cumulative modeling will be conducted using an inventory of major background sources to demonstrate compliance with the NAAQS and PSD increments. If modeled concentrations are less than or equal to the SILs, then no additional modeling will be performed, as the project would be deemed not to cause or contribute to a violation of a NAAQS or exceedance of a PSD increment. **Table 3-3** lists the applicable PSD increments and SILs which the Project is subject to PSD permitting.

Table 3-3. PSD Increments and Significant Impact Levels

Pollutant	Averaging Period	PSD Increments (µg/m³)		Significant Impact Levels (µg/m³)	
		Class I	Class II	Class I	Class II
PM ₁₀	24-hour ⁽²⁾	8	30	0.3	5
	Annual ⁽¹⁾	4	17	0.2	1
PM _{2.5}	24-hour ⁽²⁾	2	9	0.27	1.2
	Annual ⁽¹⁾	1	4	0.03	0.13

1. Not to be exceeded (PSD Increment).

2. Not to be exceeded more than once per year (PSD Increment).

Source: EPA 40 CFR 50

4. Dispersion Modeling Approach

4.1 Overview

This section presents the approach to the dispersion modeling analysis that will be conducted to assess compliance with the applicable state and federal ambient air quality regulations and guidelines. The analysis will be conducted in accordance with the US EPA's GAQM, which is contained in 40 CFR Part 51, Appendix W (US EPA, 2024a).

Based on preliminary understanding of the Project emission sources, the proposed Project is expected to be subject to PSD review for PM₁₀, PM_{2.5}, H₂SO₄, and GHG. The project will also be subject to NAA-NSR for VOC. Therefore, associated dispersion modeling analyses will be conducted only for PM₁₀ and PM_{2.5}. There are no modeling requirements for H₂SO₄, VOC (as NAA-NSR applies), and GHGs. The modeling analysis will address impacts associated with secondary PM_{2.5} as described further in **Section 4.8**.

4.2 Modeling Source Approach and Configurations

The air dispersion modeling analysis will be conducted with emission rates and flue gas exhaust characteristics (flow rate and temperature) expected to represent the worst-case parameters among the range of possible values considered for the proposed Project. Since emission rates and flue gas characteristics for a given operating load vary as a function of ambient temperature, data was derived for the following ambient temperatures and operating scenarios for each turbine:

GE 7HA.02

- 5 operating scenarios
 1. base load (~100 load) with duct burners (DB),
 2. base load (~100 load) no DB,
 3. intermediate load (~75% load),
 4. minimum emission compliance load (MECL, ~35-45% load)
 5. Startup and shutdown
- 7 ambient temperatures (105°F, 90°F, 70°F, 59°F, 52°F, 20°F, and -20°F)

FT8

- 3 operating scenarios
 1. base load (~100 load),
 2. intermediate load (~75% load),
 3. MECL, ~50% load)
 4. Startup and shutdown
- 3 ambient temperatures (90°F, 59°F, and 30°F)

A summary of the exhaust data and emission rates for each ambient temperature and operating scenario for each GE 7HA.02 and FT8 is provided in **Table 4-1** and

Table 4-2, respectively. In order to conservatively calculate ground-level concentrations, a composite “worst-case” set of emission rates and exhaust parameters will be used in the modeling as an initial approach for each turbine. For each turbine operating load, the highest pollutant-specific emission rate coupled with the lowest exhaust temperature and exhaust flow rate was selected. **Table 4-3** and **Table 4-4** summarize the worst-case emission parameters for the CCs and CTs, respectively. This data will be used to perform a load analysis for the turbines without any additional Project sources to determine which load results in the highest ground-level concentrations. The worst-case load scenario for each pollutant and averaging period will be used in subsequent SIL, NAAQS, and PSD increment modeling, as applicable unless that approach is deemed too conservative in which each case may be modeled explicitly to determine the worst-case operating load. If

baseload operations is not the worst-case load, both the baseload and worst-case load will be included in the SIL any subsequent cumulative modeling.

The turbine load analysis will also include the assessment of startup and shutdown operations to the extent that those emissions and stack parameters are worst-case relative normal operations.

Table 4-1. GE 7HA.02 Stack Exhaust Parameters and Emission Rates

Load/Scenario ⁽¹⁾	Ambient Temp. (°F)	Stack Height (ft)	Stack Dia. (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Maximum Hourly Emissions (lb/hr) ⁽²⁾	
						PM ₁₀	PM _{2.5}
Base Load 100% + DB	-20°F,	190.0	23.0	169.9	68.88	24.1	24.1
Base Load 100% + DB	20°F,	190.0	23.0	170.5	69.61	23.7	23.7
Base Load 100% + DB	52°F,	190.0	23.0	172.0	68.20	23.2	23.2
Base Load 100% + DB	59°F,	190.0	23.0	171.6	67.49	23.0	23.0
Base Load 100% + DB	70°F,	190.0	23.0	172.2	67.37	22.9	22.9
Base Load 100% + DB	70°F,	190.0	23.0	172.4	67.52	22.9	22.9
Base Load 100% + DB	90°F,	190.0	23.0	170.1	64.87	22.2	22.2
Base Load 100% + DB	90°F,	190.0	23.0	172.2	67.22	22.8	22.8
Base Load 100% + DB	105°F,	190.0	23.0	166.5	60.18	21.1	21.1
Base Load 100% + DB	105°F,	190.0	23.0	172.3	67.29	22.8	22.8
Base Load 100%	-20°F,	190.0	23.0	172.9	68.31	12.1	12.1
Base Load 100%	20°F,	190.0	23.0	171.8	68.88	12.2	12.2
Base Load 100%	52°F,	190.0	23.0	174.8	67.67	12.2	12.2
Base Load 100%	59°F,	190.0	23.0	174.6	66.98	12.1	12.1
Base Load 100%	70°F,	190.0	23.0	177.1	67.08	12.1	12.1
Base Load 100%	70°F,	190.0	23.0	177.2	67.21	12.1	12.1
Base Load 100%	90°F,	190.0	23.0	177.6	64.86	11.9	11.9
Base Load 100%	90°F,	190.0	23.0	179.6	67.17	12.1	12.1
Base Load 100%	105°F,	190.0	23.0	175.3	60.30	11.4	11.4
Base Load 100%	105°F,	190.0	23.0	180.4	67.33	12.1	12.1
Intermediate Load 75%	-20°F,	190.0	23.0	169.2	54.56	11.3	11.3
Intermediate Load 75%	20°F,	190.0	23.0	168.2	54.30	11.3	11.3
Intermediate Load 75%	52°F,	190.0	23.0	168.7	53.12	11.3	11.3
Intermediate Load 75%	59°F,	190.0	23.0	168.5	52.61	11.3	11.3
Intermediate Load 75%	70°F,	190.0	23.0	170.9	52.51	11.2	11.2
Intermediate Load 75%	90°F,	190.0	23.0	172.5	51.48	11.1	11.1
Intermediate Load 75%	105°F,	190.0	23.0	172.4	49.46	10.9	10.9
MECL 45%	-20°F,	190.0	23.0	163.8	41.09	10.4	10.4
MECL 35%	20°F,	190.0	23.0	162.8	35.11	9.9	9.9
MECL 30%	52°F,	190.0	23.0	162.3	34.53	9.9	9.9
MECL 30%	59°F,	190.0	23.0	162.6	34.31	9.9	9.9
MECL 30%	70°F,	190.0	23.0	164.9	34.25	9.9	9.9
MECL 30%	90°F,	190.0	23.0	166.7	34.17	9.8	9.8
MECL 30%	105°F,	190.0	23.0	167.3	34.97	9.8	9.8

Load/Scenario ⁽¹⁾	Ambient Temp. (°F)	Stack Height (ft)	Stack Dia. (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Maximum Hourly Emissions (lb/hr) ⁽²⁾	
						PM ₁₀	PM _{2.5}

Note: Data are provided per emission unit unless otherwise noted and are preliminary and subject to change.
 (1) Data presented are for multiple operating loads/conditions and several ambient temperatures.
 (2) Hourly emissions reflect operation of a single GE 7HA.02 unit firing natural gas.

Table 4-2. FT8 Stack Exhaust Parameters and Emission Rates

Load/Scenario ⁽¹⁾	Ambient Temp. (°F)	Stack Height (ft)	Stack Dia. (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Maximum Hourly Emissions (lb/hr) ⁽²⁾	
						PM ₁₀	PM _{2.5}
Base Load (100%)	30	90.0	13.0	800.0	56.57	3.0	3.0
Base Load (100%)	59	90.0	13.0	800.0	57.04	3.0	3.0
Base Load (100%)	90	90.0	13.0	800.0	55.39	3.0	3.0
Intermediate Load (75%)	30	90.0	13.0	796.0	45.37	3.0	3.0
Intermediate Load (75%)	59	90.0	13.0	800.0	46.39	3.0	3.0
Intermediate Load (75%)	90	90.0	13.0	800.0	45.70	3.0	3.0
MECL (50%)	30	90.0	13.0	744.0	36.63	3.0	3.0
MECL (50%)	59	90.0	13.0	800.0	36.31	3.0	3.0
MECL (50%)	90	90.0	13.0	800.0	36.05	3.0	3.0

Note: Data are provided per emission unit unless otherwise noted and are preliminary and subject to change.
 (1) Data presented are for multiple operating loads/conditions and several ambient temperatures.
 (2) Hourly emissions reflect operation of a single FT8 unit firing natural gas.

Table 4-3. GE 7HA.02 Composite Worst-Case Data⁽¹⁾ Modeling Inputs

Parameter		Value			
Load (%)		Base Load (100%) + DB	Base Load (100%)	Intermediate Load (75%)	MECL (50%)
Stack Height (ft)		190.0	190.0	190.0	190.0
Stack Diameter (ft)		23.0	23.0	23.0	23.0
Exit Temperature (°F)		166.5	171.8	168.2	162.3
Exit Velocity (ft/sec)		60.18	60.30	49.46	34.17
Pollutant Emissions Per Unit (lb/hr)	PM ₁₀	24.10	12.20	11.30	10.40
	PM _{2.5}	24.10	12.20	11.30	10.40

Note: Data are provided per emission unit unless otherwise noted and are preliminary and subject to change.
 (1) The values in the table represent the worst-case stack parameters and the emission rates for the operating loads taken from Table 4-1.

Table 4-4. FT8 Composite Worst-Case Data⁽¹⁾ Modeling Inputs

Parameter		Value		
Load (%)		Base Load (100%)	Intermediate Load (75%)	MECL (50%)
Stack Height (ft)		90.0	90.0	90.0
Stack Diameter (ft)		13.0	13.0	13.0
Exit Temperature (°F)		800.0	796.0	744.0
Exit Velocity (ft/sec)		54.05	44.28	35.18
Pollutant Emissions Per Unit (lb/hr)	PM ₁₀	3.0	3.0	3.0
	PM _{2.5}	3.0	3.0	3.0

Note: Data are provided per emission unit unless otherwise noted and are preliminary and subject to change.

(1) The values in the table represent the worst-case stack parameters and the emission rates for the three operating loads taken from Table 4-2.

The Project will also consist of three (3) auxiliary boilers and seven (7) natural gas heaters, which will be modeled as vertical, unobstructed point sources. Because the performance data for the auxiliary boilers and fuel gas heaters is not expected to be affected by ambient conditions, only one set of parameters will be modeled (e.g., stack parameters and emission rates associated with 100% load). The auxiliary boilers and fuel gas heaters will be modeled assuming a conservative 100% capacity factors. **Table 4-5** includes the stack parameters and emission rates for the auxiliary boilers and fuel gas heaters.

The Project will also include ten (10) 2,500 kW emergency generators, two (2) 1,000 kW emergency generators, and one (1) emergency fire-water pump engine, which will each be modeled as point sources. The emergency generators and fire-water pump engine are considered emergency units and will be operated for no more than 100 hours per year for routine testing and maintenance (i.e. non-emergency use) in accordance with 40 CFR 60.4230 JJJJ. For annual modeling, the emission rates will reflect the annual operating hour limitations. **Table 4-5** includes the emergency generators and fire-water pump engine stack parameters and emission rates.

Finally, the Project will also consist of seven (7) new cooling towers, each with eight (8) cells. Each cooling tower cell will be modeled as a vertical, unobstructed point source, and it is assumed emissions per cell is equivalent to one-eighth of total emissions from each of the seven (7) cooling tower units. **Table 4-5** includes the cooling tower stack parameters and emission rates.

Table 4-5. Source Parameters and Criteria Pollutant Emission Rates for Ancillary Sources

Source ID	Stack Height (ft)	Stack Diameter (ft)	Exit Temp. (°F)	Exit Velocity (fps)	Hourly Emissions (lb/hr/unit) ⁽¹⁾	
					PM ₁₀	PM _{2.5}
Auxiliary Boiler	55.0	4.00	344.0	28.17	0.4992	0.4992
Gas Heater	22.0	2.50	670.0	10.57	0.0469	0.0469
Emergency Generators (2,500 kW)	20.0	1.20	964.0	66.67	0.1656	0.1607
Emergency Generators (1,000 kW)	20.0	1.20	964.0	66.67	0.06765	0.0656
Fire Water Pumps	12.0	0.50	826.0	187.93	0.1219	0.1183
Cooling Towers ⁽²⁾	55.0	34.00	110.0	24.38	8.98E-03	2.88E-05

Note: Data are provided per emission unit and are preliminary and subject to change.

- (1) Hourly emission rates/calculations based on vendor information.
Emission rates presented in this table are preliminary and are subject to change.
- (2) Emissions represent per cell emissions - 1/8 total cooling tower emissions.

4.3 Model Selection

The suitability of an air quality dispersion model for a particular application is dependent upon several factors. The following selection criteria were evaluated:

- stack height relative to nearby structures;
- dispersion environment;
- representative meteorological data; and
- local terrain.

The US EPA GAQM prescribes a set of approved models for regulatory applications for a wide range of source types and dispersion environments. AERMOD is US EPA's recommended refined dispersion model for simple and complex terrain for receptors within 50 kilometers (km) of a modeled source and is capable of handling the source geometry, terrain, and dispersion environment associated with this proposed Project. Representative meteorological data with suitable data capture for various meteorological parameters is needed to run AERMOD.

Based on a review of the factors described in the following sections of this protocol, the latest version of AERMOD (version 24142) (US EPA, 2024c) will be used to assess air quality impacts for the proposed Project. AERMOD will be used to assess air quality impacts of PM₁₀, and PM_{2.5} at receptors located within 20 km of the Project site. AERMOD will be run with default model options in the CONTROL pathway, unless otherwise noted or discussed with PADEP. AERMOD will also be applied without using any urban source options as discussed in **Section 4.5**.

4.4 Building Downwash and GEP Height Analysis

US 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. In the absence of influencing structures, a “default” GEP stack height is creditable up to 65 meters (213 feet) per the *Guideline for Determination of Good Engineering Practice Stack Height* (US EPA, 1985). Any portion of a stack above the maximum of the physical or default GEP height cannot be used in the dispersion modeling analysis for purposes of comparison to US EPA’s ambient impact criteria.

A GEP stack height analysis will be performed for all point sources included in the modeling in accordance with US EPA’s guidelines (US EPA, 1985). Per the guidelines, the physical GEP height (“H_{GEP}”) is determined from the dimensions of all buildings that are within the region of influence using the following equation:

$$H_{GEP} = H + 1.5L$$

where:

H = height of the structure within 5L of the stack which maximizes H_{GEP}, and

L = lesser dimension (height or projected width) of the structure.

For a squat structure (*i.e.*, height less than projected width), the formula reduces to:

$$H_{GEP} = 2.5H$$

Both the height and width of the structure are determined from the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. In all instances, the GEP stack height is based on the plane projections of any nearby building which result in the greatest justifiable height. For purposes of the GEP analysis, nearby refers to the “sphere of influence,” defined as five times the height or width of the building, whichever is less, downwind from the trailing edge of the structure.

The current Project design has all modeled stacks less than 65 meters. As such, all Project stacks will be modeled using their actual stack height. In addition, the EPA’s Building Profile Input Program (BPIP-Version 04274) version that is appropriate for use with PRIME algorithms in AERMOD will be used to incorporate wind-direction-specific building dimensions for input to AERMOD. Building coordinates and stack locations will be developed using site plan drawings, aerial photographs, and GIS software. All relevant building structures will be included in the BPIP modeling for both new and existing stacks at the Plant, as applicable.

4.5 Dispersion Environment

4.5.1 Land Use Analysis

The application of AERMOD requires characterization of the local (within 3 km) dispersion environment as either urban or rural based on prevalent land use. According to US EPA modeling guidelines (US EPA, 2024a), if more than 50 percent of an area within a 3-km radius of the proposed project is classified as rural, then a rural modeling application is required. Conversely, if more than 50% of the area is urban, an urban dispersion adjustment can be used.

Using the Auer method recommended by the US EPA (US EPA, 2024a), urban land use types are classified as categories I1, I2, C1, R2, and R3. **Table 4-6** describes these categories and maps them to reasonably equivalent USGS 2016 National Land Cover Database (NLCD) categories. While the Auer method and NLCD do not use the same terms to define their categories, the similarities between the five Auer categories and NLCD categories 23 and 24 are apparent. Thus, it is reasonable to classify NLCD categories 23 and 24 as urban land use. A visual comparison of the 2023 (the most recent version) NLCD land use types to recent aerial imagery from Google™ Earth indicates only insignificant changes to the land use within 3 km since 2023. **Figure 4-1** displays the 2023 NLCD data superimposed over aerial imagery within 3 km of the Plant.

The NLCD data were processed with US EPA’s AERSURFACE processor (version 24142) to determine the different land use types within 3 km of the Station. AERSURFACE is typically used to process NLCD data for

input to AERMET, the AERMOD model's meteorological data processor. In this case, AERSURFACE output in the form of the pixel count for each of NLCD's land use types was used to determine the total pixel count of urban land use types within 3 km.

As noted above, urban land use types were assumed to be NLCD categories 23 and 24: "Developed, Medium Intensity" and "Developed, High Intensity", respectively. The pixel count for these categories was 2.59% of the total pixel count for all categories. Thus, the overwhelming majority (>90%) of the 3 km area around the Plant can be classified as rural land use and AERMOD will not be applied with any urban source options. **Table 4-7** provides the pixel counts as reported in the AERSURFACE output along with respective percentages.

Table 4-6. Comparison of Auer and NLCD Land Use Categories

<u>Auer Urban Land Use Categories⁽¹⁾</u>			<u>USGS 2016 NLCD Categories⁽²⁾</u>	
Type	Use and Structure	Vegetation	Category	Description
R2	Dense single/multi-family	< 30%	23	<u>Developed, Medium Intensity</u> – Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
R3	Multi-family, two story	< 35%	24	<u>Developed, High Intensity</u> – Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
I1	Heavy Industrial	< 5%		
I2	Light/moderate industrial	< 5%		
C1	Commercial	< 15%		

Notes:

⁽¹⁾ US EPA, 2024a.

⁽²⁾ Multi-Resolution Land Characteristics Consortium (MRLC).

<https://www.mrlc.gov/data/legends/national-land-cover-database-class-legend-and-description>

Table 4-7. AERSURFACE Surface Roughness Output

USGS 2016 NLCD Category	Description	Pixel counts	Percent of Total Pixels
0	Missing, Out-of-Bounds, or Undetermined	0	0%
11	Open Water	118	0.38%
12	Perennial Ice/Snow	0	0%
21	Developed, Open Space	1802	5.74%
22	Developed, Low Intensity	1488	4.74%
23	Developed, Medium Intensity	720	2.29%
24	Developed, High Intensity	95	0.30%
31	Barren Land (Rock/Sand/Clay)	2441	7.77%
32	Unconsolidated Shore	0	0%
41	Deciduous Forest	12860	40.94%
42	Evergreen Forest	2	0.01%
43	Mixed Forest	510	1.62%
51	Dwarf Scrub	0	0%
52	Shrub/Scrub	154	0.49%
71	Grasslands/Herbaceous	166	0.53%
72	Sedge/Herbaceous	0	0%
73	Lichens	0	0%

USGS 2016 NLCD Category	Description	Pixel counts	Percent of Total Pixels
74	Moss	0	0%
81	Pasture/Hay	4557	14.51%
82	Cultivated Crops	6437	20.49%
90	Woody Wetlands	61	0.19%
91	Palustrine Forested Wetland	0	0%
92	Palustrine Scrub/Shrub Wetland	0	0%
93	Estuarine Forested Wetland	0	0%
94	Estuarine Scrub/Shrub Wetland	0	0%
95	Emergent Herbaceous Wetland	1	0%
96	Palustrine Emergent Wetland	0	0%
97	Estuarine Emergent Wetland	0	0%
98	Palustrine Aquatic Bed	0	0%
99	Estuarine Aquatic Bed	0	0%
Total		31412	

Urban land use types are shown in red, bold text.

Source: AERSURFACE (US EPA, 2024d)

4.5.2 Terrain

US EPA's GAQM requires 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 condition);
- complex terrain – locations where the terrain is above the plume centerline.

Figure 4-2 provides a topographic map of the area in the vicinity of the Project site. The area near the Station is characterized as consisting of all terrain types relative to the modeled stacks.

Figure 4-1. NLCD Land Use (2023)

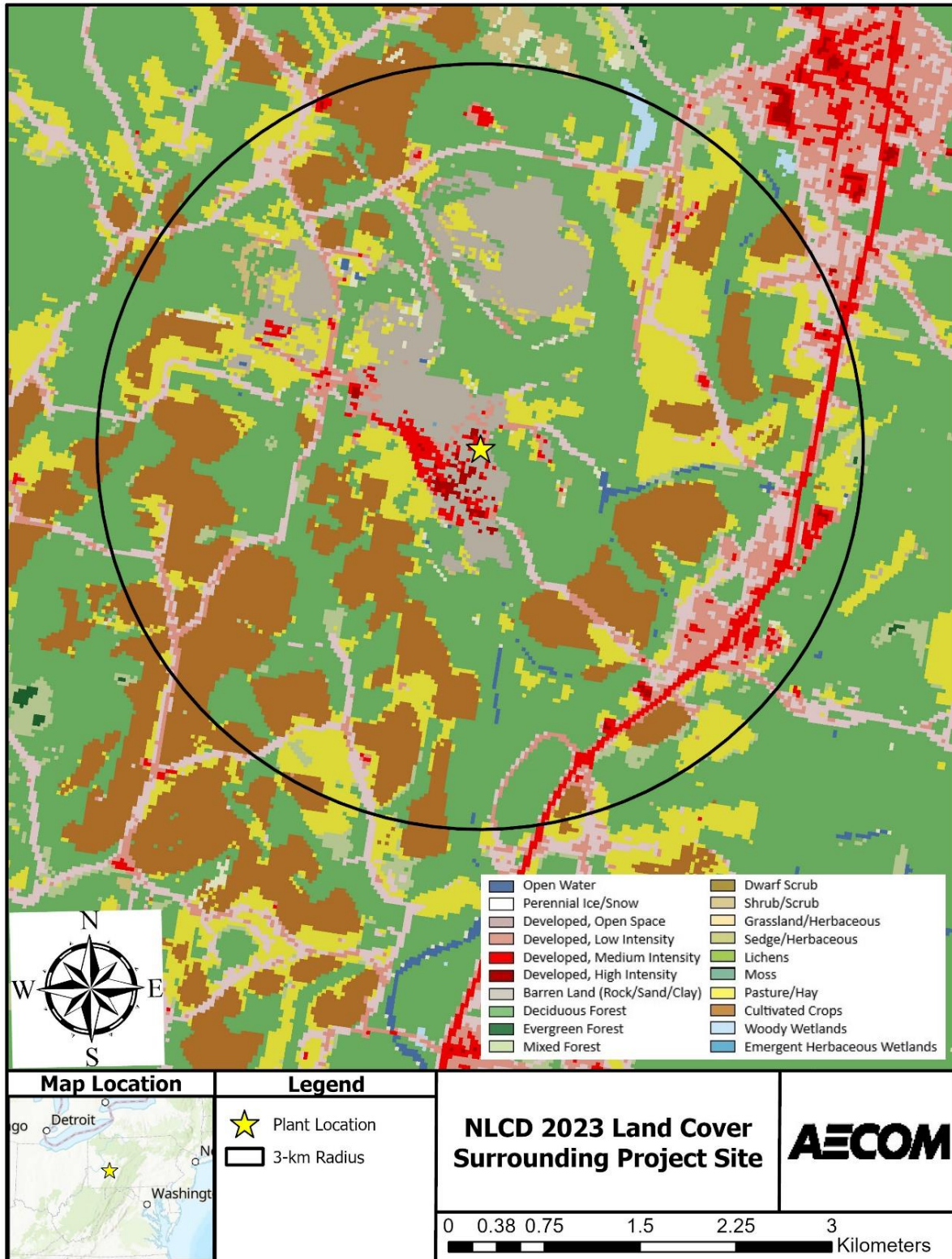
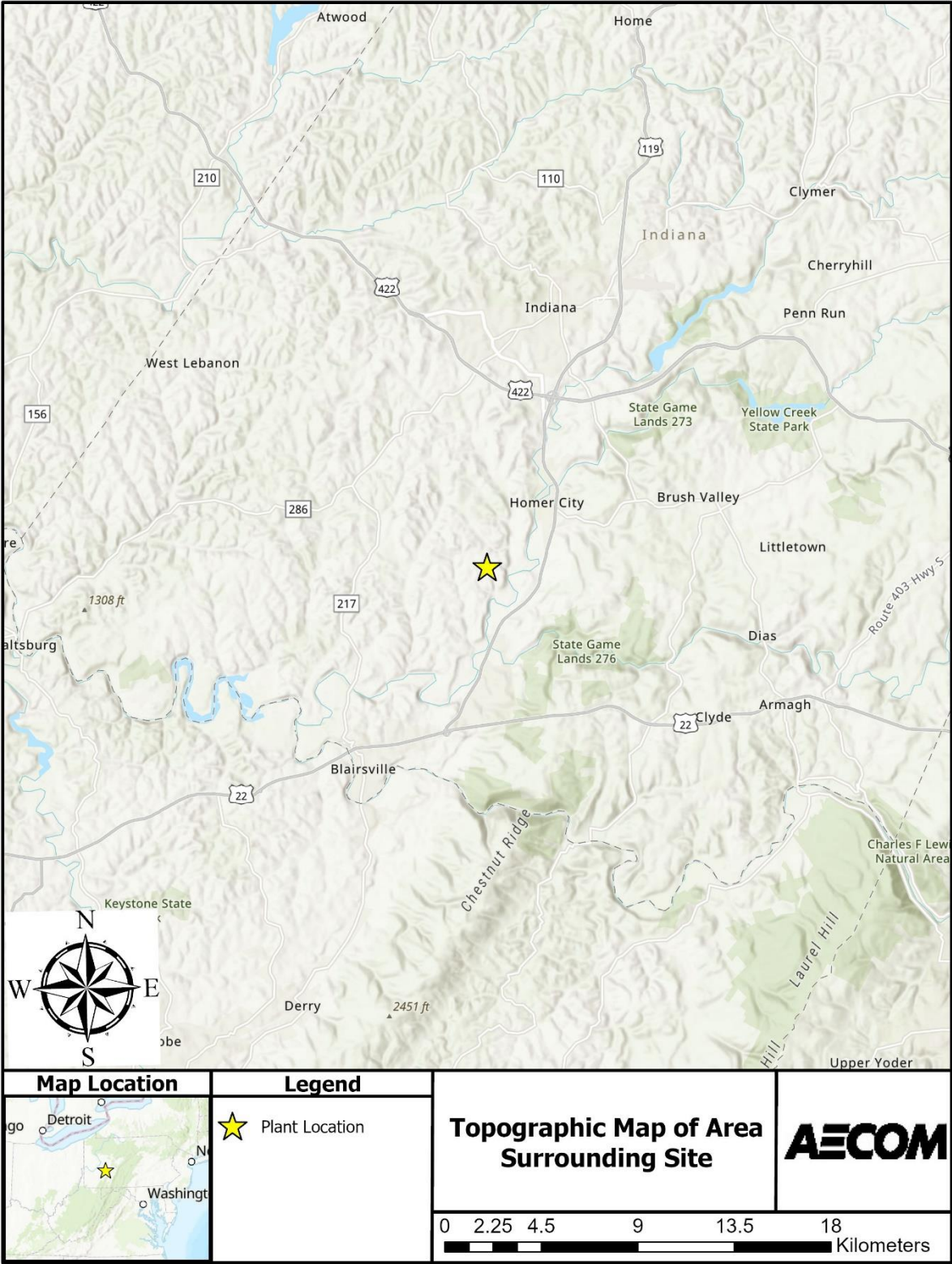


Figure 4-2. Topographic Map of Project Site Area



4.6 Meteorological Data

Homer City is proposing to use five years (2020-2024) of near-surface meteorological data from the John Murtha Johnstown-Cambria County Airport (Johnstown Airport) along with concurrent upper-level data from Pittsburgh International Airport for this modeling demonstration. The meteorological data from Johnstown Airport was processed by PADEP using AERMET version 24142 using regulatory options. The PROFBASE keyword in AERMOD, representing the base elevation of the surface dataset will be set to 696 m (NCEI, 2025). This is consistent with historical modeling conducted by PADEP and US EPA using the Johnstown Airport meteorological station.

Historically the Johnstown Airport meteorological data has been used for air dispersion modeling demonstrations at Homer City, including as recently as to support the redesignation of the Indiana County non-attainment area for 1-hour SO₂ to attainment (US EPA, 2024e). Past modeling has focused on dispersion from Homer City's approximately 800-foot coal-boiler stacks. In 2012, ERM conducted a robust evaluation (ERM, 2012) of nearby meteorological data for Homer City modeling and concluded that the Johnstown Airport was the most representative dataset available for modeling plumes emitted from the tall stacks. With it being more than 12 years removed from that evaluation and the lower stack heights from the Proposed Project compared to the coal stacks, an updated analysis was warranted. The following **Sections (4.6.1 through 4.6.3)** describes the updated analysis that was performed to identify the most representative meteorological dataset for use in dispersion modeling of the Proposed Project, consistent with Section 8.4 of US EPA's GAQM.

4.6.1 Review of Available Meteorological Data

The 2012 ERM report identified five locations of meteorological stations within approximately 80 kilometers (50 miles) of Homer City. These included Automated Surface Observing Systems (ASOS) at Pittsburgh International Airport and Johnstown Airport, an Automated Weather Observing System (AWOS) at Indiana County Airport, and two research-based multi-level towers (Ash Valley and Manor Tower). There has since been one additional meteorological dataset, Ash Site #1, located between Seward and Conemaugh Generating Stations in southeast Indiana County. The Ash Site #1 was a 1-year dataset from September 2015 through August 2016 that consisted of a 100-meter tower and SOUNd Detection And Ranging (SODAR) system (AECOM, 2015).

Table 4-8 provides the approximate distance to Homer City and most recent available data periods for each potential meteorological dataset. Both the Ash Valley and Ash Site #1 locations were sited to capture localized, terrain-driven effects in the vicinity of Conemaugh and Seward stations and would not be suitable for Homer City. Indiana County Airport has a history of reporting a higher number (greater than 30%) calm winds as it does not record sub-hourly measurements like ASOS sites. For these reasons, the Ash Valley, Ash Site #1, and Indiana County Airport sites would not be representative of conditions at Homer City. With other meteorological stations much closer in proximity to Homer City than Pittsburgh International Airport, this site is also not considered as the best fit. This leaves Manor Tower and Johnstown Airport as candidates to be further evaluated.

Table 4-8. Meteorological Stations Near Homer City

Meteorological Site	Distance (Direction) from Homer City	Recent Data Period Available
Pittsburgh Airport	85 km (west of Homer City)	2019-2023 (recent 5-years)
Johnstown Airport	38 km (southeast of Homer City)	2020-2024 (recent 5-years)
Indiana County Airport	15 km (northeast of Homer City)	2019-2023 (recent 5-years)
Ash Tower	17.8 km (southeast of Homer City)	August 1990 – July 1991
Manor Tower	9.9 km (northeast of Homer City)	August 1990 – July 1991
Ash Site #1	18 km (southeast of Homer City)	September 2015 – August 2016

Source: ERM, 2012; AECOM, 2015

4.6.2 Comparison of Surface Characteristics

Key data inputs to the processing of meteorological data for dispersion models include surface roughness, albedo, and Bowen ratio. According to Section 3.1.1 of AERMOD's Implementation Guide, the determination of representativeness should include a comparison of these key surface data inputs (US EPA, 2024f). US EPA has developed a tool, AERSURFACE, that can estimate these parameters for a given location based upon digitized land cover data and corresponding lookup tables. AERSURFACE User's Guide recommends a default radial distance of 1 km from the meteorological station or source location to evaluate surface roughness. Albedo and Bowen ratio are assessed within a 10 km by 10 km distance. **Table 4-9** lists the albedo, surface roughness, and Bowen ratios for Johnstown Airport, Homer City, and Manor Tower.

The surface roughness was computed using the AERSURFACE tool and National Land Cover Data (NLCD) available from the U.S. Geological Survey (USGS, 2024). In late 2024, USGS updated their NLCD files to new annual products. These newer NLCD products were used to generate the surface roughness values listed in **Table 4-9**. NLCD files for 2021 were used for the AERSURFACE processing of the Johnstown Airport and Homer City as it represented the most recent meteorological data year available for modeling. The 1991 NLCD file was used to process the AERSURFACE for Manor tower as that dataset spanned from August 1990 through July 1991.

It is well documented (Karvounis et al., 2007; Faulkner et al., 2008) that dispersion models are typically most sensitive to changes in surface roughness compared to albedo or Bowen ratios. **Figure 4-3** illustrates the differences of surface roughness by season between the Manor Tower and the other two sites (Johnstown Airport and Homer City). Due to the more forested surroundings at Manor Tower, the surface roughness values are approximately an order of magnitude higher than those at both Johnstown Airport and Homer City. The more forested surroundings of the Manor Tower location can also be seen in aerial imagery, as shown in **Figure 4-4**, **Figure 4-5**, and **Figure 4-6** for Manor Tower, Johnstown Airport, and Homer City, respectively. Given the vastly different surface roughness conditions compared to the Proposed Project location, the Manor Tower is not considered the most representative meteorological dataset for dispersion modeling at Homer City.

Table 4-9. Comparison of Surface Characteristics at Johnstown Airport, Homer City, and Manor Tower

Seasons	Johnstown Airport ¹			Homer City ¹			Manor Tower ²		
	Albedo	Surface Roughness (m)	Bowen Ratio	Albedo	Surface Roughness (m)	Bowen Ratio	Albedo	Surface Roughness (m)	Bowen Ratio
Winter	0.17	0.077	0.91	0.17	0.088	0.88	0.17	0.197	0.91
Spring	0.16	0.106	0.58	0.15	0.111	0.53	0.16	0.295	0.60
Summer	0.16	0.142	0.43	0.17	0.152	0.41	0.17	0.451	0.38
Fall	0.16	0.124	0.91	0.17	0.149	0.88	0.17	0.447	0.91

¹ Values based on land cover from 2021 (most recent meteorological year available for Johnstown)

² Values based on land cover from 1991

Figure 4-3. Surface Roughness by Season

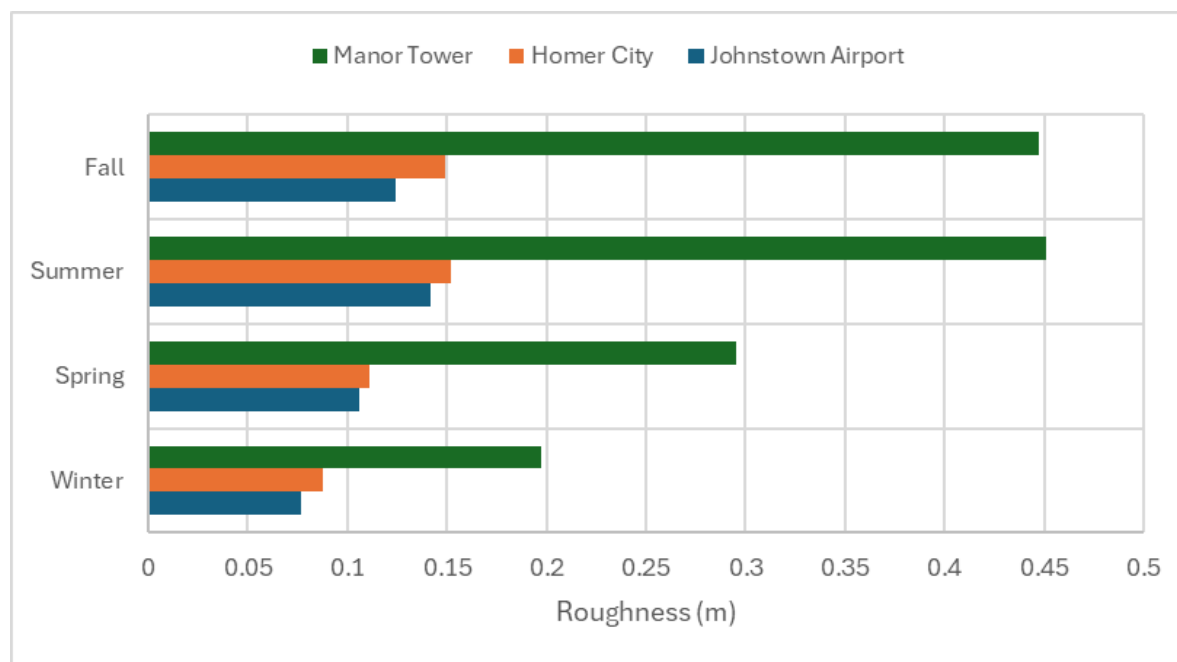


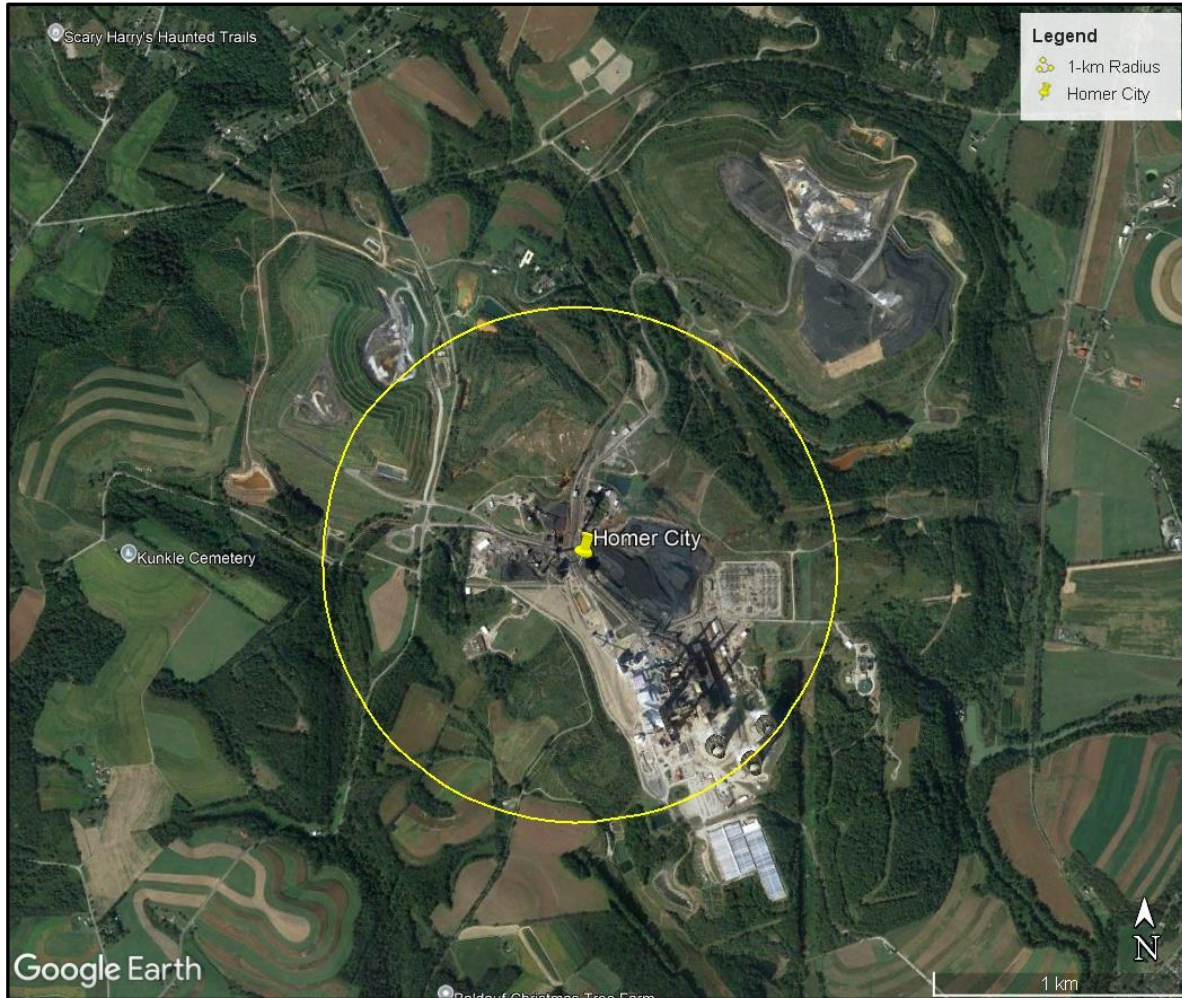
Figure 4-4. Aerial Image of Manor Tower



Figure 4-5. Aerial Image of Johnstown Airport



Figure 4-6. Aerial Image of Homer City



4.6.3 Evaluation of Winds at Plume Height of Modeled Sources

Another key component of evaluating the representativeness of the meteorological data for this proposed modeling demonstration is the winds at plume height. Historical modeling for Homer City has relied on the height of the 800-foot coal stacks as being sufficiently tall enough to clear regional terrain and therefore wind at that height (and higher) from Johnstown Airport would be comparable. As discussed in **Section 4.2**, the stack heights from the CCs are 190 feet, which is approximately 600 feet shorter as compared to the 800 foot coal stacks. However, with both the coal and CC stacks having good buoyancy and momentum rise, a quantified analysis to assess the plume heights of the CCs and coal stacks was performed, as opposed to focusing on just the physical stack heights.

EPA's SCREEN3 screening model (version 13043) (US EPA, 2013) was used to estimate the plume rise and ultimately final plume height generated from the 800-foot (243.8-m) coal stacks and 190-foot (57.9-m) CC stacks. SCREEN3 was identified as the most appropriate screening model for this purpose as it provides plume heights at various distances downwind. EPA's preferred screening model, AERSCREEN, was considered, but due to limitations in not having multiple downwind distances assessed for plume height and the inability to set static meteorological conditions, SCREEN3 proved to be the most suitable for a direct plume height comparison.

An initial run of SCREEN3 was conducted for both the coal stack and CC stack. **Table 4-10** provides a summary of the input parameters used in each of these runs. The “full meteorological” option was selected to initially identify the conditions that would produce the highest concentrations. For this run, the final plume height was 1,622 m and 1,237 m for the coal stack and CC stack, respectively. This yielded approximately a 24% difference in plume rise between the two stacks. The meteorological conditions producing these results were wind speeds under 1 m/s for both stacks, which would be typical of a low wind (< 2 m/s) condition and likely maximize the potential plume height. As a result, a second SCREEN3 run was performed to evaluate a more average wind speed of 3 m/s under neutral stability conditions. As anticipated, the 3 m/s SCREEN3 run for both coal and CC stacks showed lower plume heights compared to the low wind condition, with heights of 600 m and 400 m, respectively. These heights yield an approximate 33% difference in plume height between the two stacks. These two heights will serve as the basis for comparing wind data levels in **Section 4.6.3.3**. Printouts of the SCREEN3 3 m/s output files are provided in **Appendix A**.

Table 4-10. SCREEN3 Inputs for Full Meteorology Conditions

SIMPLE TERRAIN INPUTS	Coal Stack	CC Stack
SOURCE TYPE	POINT	POINT
EMISSION RATE (G/S)	100	100
STACK HEIGHT (M)	243.8	57.9 ¹
STK INSIDE DIAM (M)	7.32	7.01 ¹
STK EXIT VELOCITY (M/S)	25.51	18.38 ¹
STK GAS EXIT TEMP (K)	351.7	350.8 ¹
AMBIENT AIR TEMP (K)	293	293
RECEPTOR HEIGHT (M)	0	0
URBAN/RURAL OPTION	RURAL	RURAL

CC = Combined-cycle combustion turbines

¹ Base Load (100%) values from Table 4-3.

4.6.3.1 Surface Wind Rose Evaluation at Johnstown Airport

Prior to evaluating wind roses at plume height, an initial comparison was made between observed wind data from the Johnstown Airport and prognostic data. US EPA has been using the Weather Research and Forecasting (WRF) model to generate meteorological data for input into air quality models for several years. The US EPA recently revised Section A.1(b) of their GAQM to include prognostic data as meteorological input to AERMOD. US EPA now routinely processed annual WRF simulations for the entire contiguous U.S., with WRF output available for recent years (2019-2021). The WRF model (Skamarock et al., 2019) (version 4.1.1) was initialized with 0.25-degree Global Forecast System (GFS) analysis data, and a 12 km WRF nest was created using analysis data from the North American Mesoscale Model (NAM). For this application, the closest WRF grid cell to the Johnstown Airport was selected, with the grid cell center (40.309N, 78.880W) located approximately 4 km to the southwest of the Johnstown Airport. To generate wind roses at specific heights above ground level, the EPA's Mesoscale Model Interface Program (MMIF) version 4.1.1 was used to extract specific vertical levels from the WRF output (US EPA, 2024g).

Figure 4-7 shows the 3-year (2019-2021) wind roses for (a) Johnstown Airport from the anemometer height of 7.9-meters and (b) the WRF at 10-m above ground level. Both wind roses capture the predominant wind direction from the west and the secondary flow pattern from the southeast. The WRF data agrees well with the Johnstown Airport in capturing the regional wind flow and direction. The overall average wind speed over the period between the WRF is only slightly lower by 0.4 m/s as compared to the Johnstown Airport ASOS, as shown in **Table 4-11**. Minor differences between the two datasets are likely attributed to localized effects that ground-based sensors are better suited at resolving.

As a means of providing a quantitative evaluation comparing the near surface Johnstown Airport and WRF wind rose, a statistical analysis was performed. **Table 4-11** provides the mean, mean bias, fractional bias (Fb), root mean square error (RMSE) and the Pearson correlation coefficient (r-squared or R^2) statistics for key meteorological parameters over the 3-year period (2019-2021).

Table 4-11. Statistical Comparison of Observed KJST ASOS to KJST WRF for Near Surface

Variable	Mean of KJST ASOS	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R^2 (unitless)
Wind Speed (m/s)	4.36	3.95	-0.4088	-0.0984	1.3056	0.6670
Temp (°C)	283.20	283.28	0.0838	0.0003	1.6949	0.9710
Pressure (mb)	935.91	948.38	12.4782	0.0132	12.5035	0.9822
Relative Humidity (%)	68.86	78.47	9.6124	0.1305	14.9669	0.6539
Heat Flux	14.84	28.35	13.5095	0.6257	68.5387	0.5159
Surface Friction Velocity (m/s)	0.34	0.54	0.1992	0.4498	0.2761	0.6434

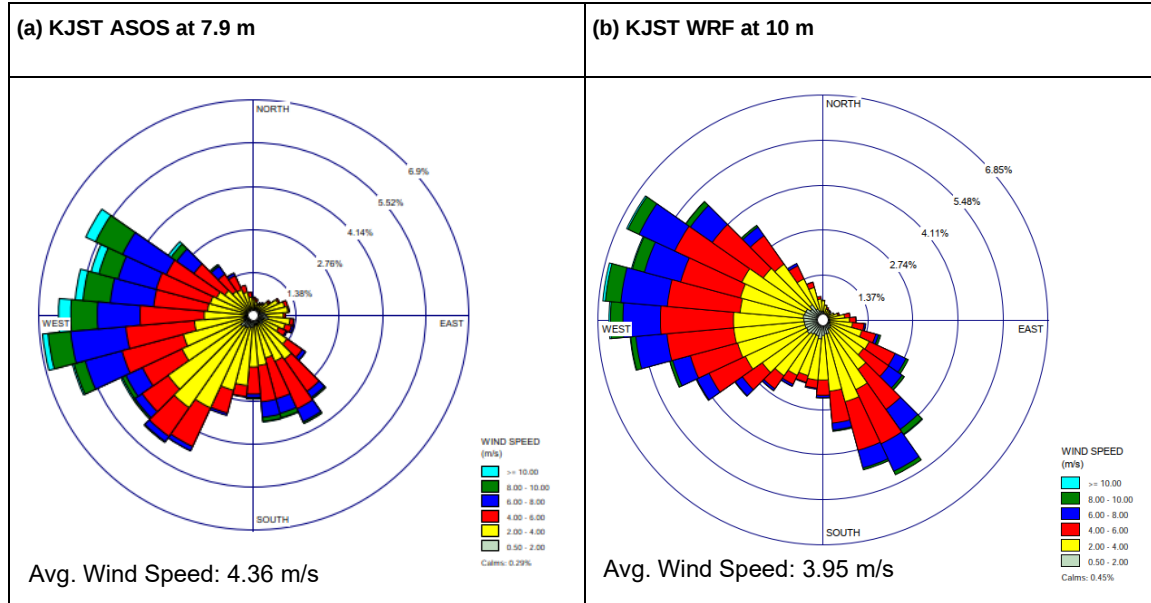
Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

The Fb serves as a good indicator in assessing the WRF's tendency to overestimate or underestimate the observed (ASOS) values. Values of the Fb range between -2.0 (extreme overprediction) and +2.0 (extreme underprediction) and are unitless. A Fb of 0 (zero) means no bias. Temperature and wind speed are the most critical variables, and both show near zero Fb, meaning minimal bias exists. The R^2 indicates the correlation of the two datasets, while the RMSE is used to evaluate the accuracy. R^2 values range from 0 to 1 and are unitless. An R^2 value closer to 1 indicates a good correlation between the two datasets. Most of the variables presented in Table 4-11 have an R^2 value around 0.65, with temperature and pressure near 1 (0.97 and 0.98, respectively). RMSE values range from zero to infinity. A low RMSE means less difference between the two datasets. For wind speed and temperature, RMSE are near 1, meaning better performance between the ASOS and WRF data. Similar seasonal-based statistical tables and wind roses are presented in **Appendix A**. These supplemental statistics show a relatively small variability between seasons, thus the annual data presented in **Table 4-11** and

Figure 4-7 serve as a good indicator for this location.

Based on this comparison, the WRF dataset should yield representative winds aloft for comparison of plume height levels at Johnstown Airport and Homer City. The results of the plume height level are presented in **Section 4.6.3.3**.

Figure 4-7. Near-Surface 3-year (2019-2021) Wind Roses for KJST ASOS vs. KJST WRF

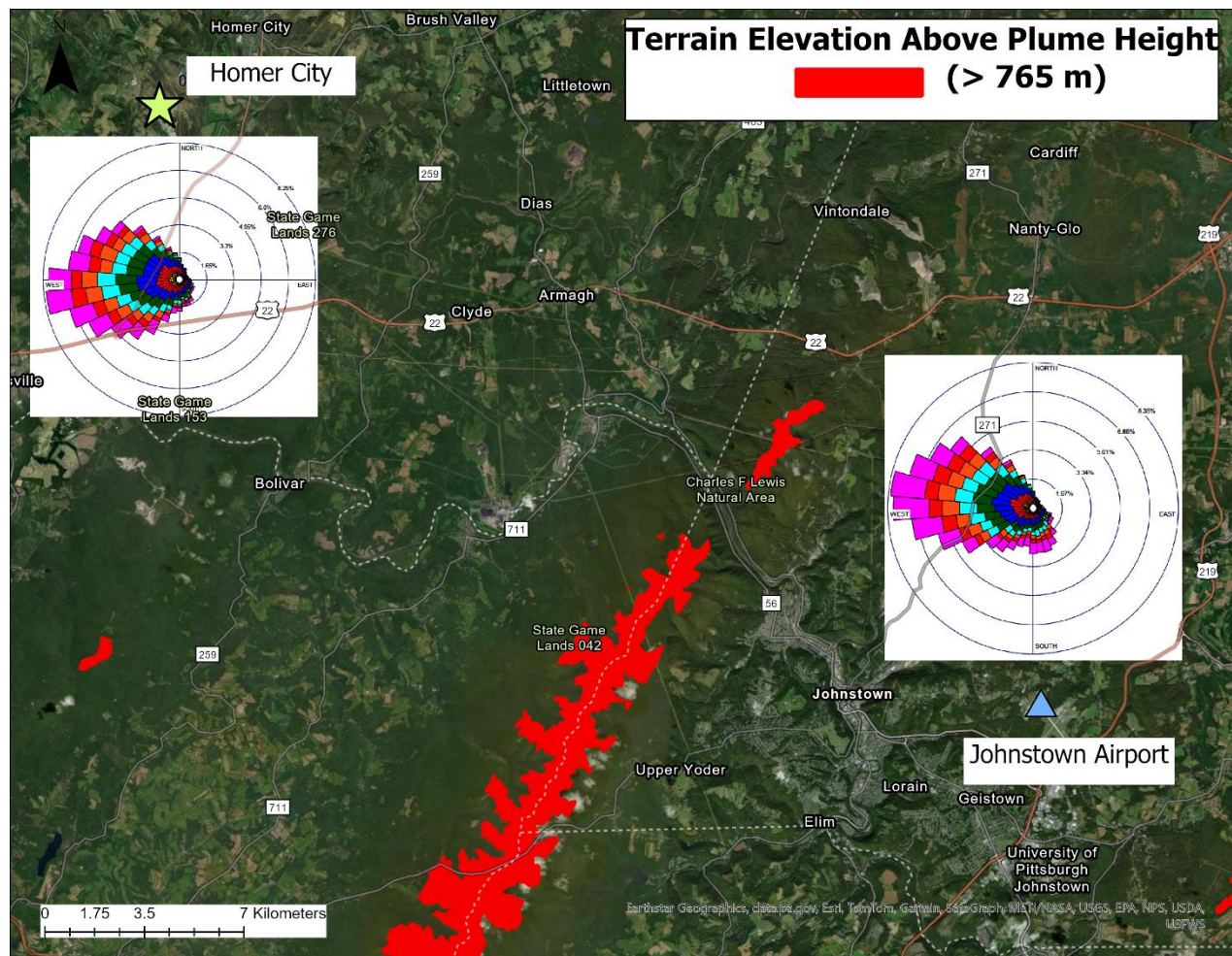


4.6.3.2 Plume Heights Relative to Nearby Terrain

A review of terrain elevations between Homer City and Johnstown Airport was conducted to assess whether there may be significant terrain interference of wind flow and/or plume transport between these two locations.

Figure 4-8 depicts the elevated terrain in the general vicinity of Homer City and the Johnstown Airport that exceed the plume height (805 m) of the CC stacks. The areas highlighted in “red” indicate the terrain that exceeds the plume height of 805 meters, which is primarily focused to the southwest of Johnstown Airport. With the exception of a few rogue peaks along Laurel Ridge near the Laurel Highlands Hiking Trails, the rest of the surrounding terrain is below this level. This analysis further supports the predominant westerly flow at plume height is not being heavily influenced by the terrain features.

Figure 4-8. Map of Terrain Heights Above Plume Height from CC Stacks



4.6.3.3 Wind Rose Comparison at Plume Heights

Figure 4-8 illustrates the wind rose comparison using the 2019-2021 WRF data at plume heights for the coal and CC stacks at Homer City to the equivalent height levels above ground at the Johnstown Airport. The grid cell for the Johnstown Airport in this analysis is the same as the one identified in **Section 4.6.3.1**. For Homer City, the closest grid cell center (40.586N, 79.244W) is approximately 8.5 km to the northwest of the Homer City, as shown in **Figure 4-9**.

As discussed in **Section 4.6.3**, the plume heights from the SCREEN3 analysis were 600 m and 440 m above ground for the coal and CC stacks, respectively. Accounting for the base elevation at Homer City of 365 m, the wind rose heights that were evaluated at Homer City are 965 m (365 + 600) and 765 m (365 + 400) for the coal and CC stacks, respectively. The closest WRF level was selected to generate the wind rose at Homer City. These corresponded to 1,000 m and 750 m. For the wind rose heights at the Johnstown Airport, which is situated at 330 m higher than Homer City, the above ground level heights would be 635 m and 435 m. This equates to WRF heights of 600 m and 450 m that the wind roses were generated for. As shown in **Figure 4-10**, there is a predominant westerly flow signature evident in all four wind roses. The average wind speeds were calculated to be within 5-6% between the two locations for the similar plume height levels.¹

Statistics on wind speed and temperature comparing the WRF at plume height for both the Johnstown Airport and Homer City locations are shown in **Table 4-12**. These statistics are based on the entire 3-year (2019-2021) period. The results presented in **Table 4-12** show good agreement between the WRF data at plume height between the two locations. Minor seasonal variations are noted, which are included in **Appendix A**. Based on this analysis, the Johnstown Airport the most representative dataset available for dispersion modeling at Homer City.

Table 4-12. Statistical Comparison of WRF at CC Plume Height for KJST and Homer City

Variable	Mean of KJST WRF	Mean of Homer City WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	10.36	9.77	-0.5950	-0.0591	2.0713	0.8794
Temp (°C)	8.16	7.56	-0.5976	-0.0760	1.2317	0.9882

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

¹ Average wind speed at 1,000 m level Homer City was 10.22 m/s compared to 10.68 m/s at Johnstown Airport 600 m level. Average wind speed at 750 m level Homer City was 9.77 m/s compared to 10.36 m/s at Johnstown Airport 450 m level.

Figure 4-9. Location of WRF Grid Nodes Relative to Homer City and KJST

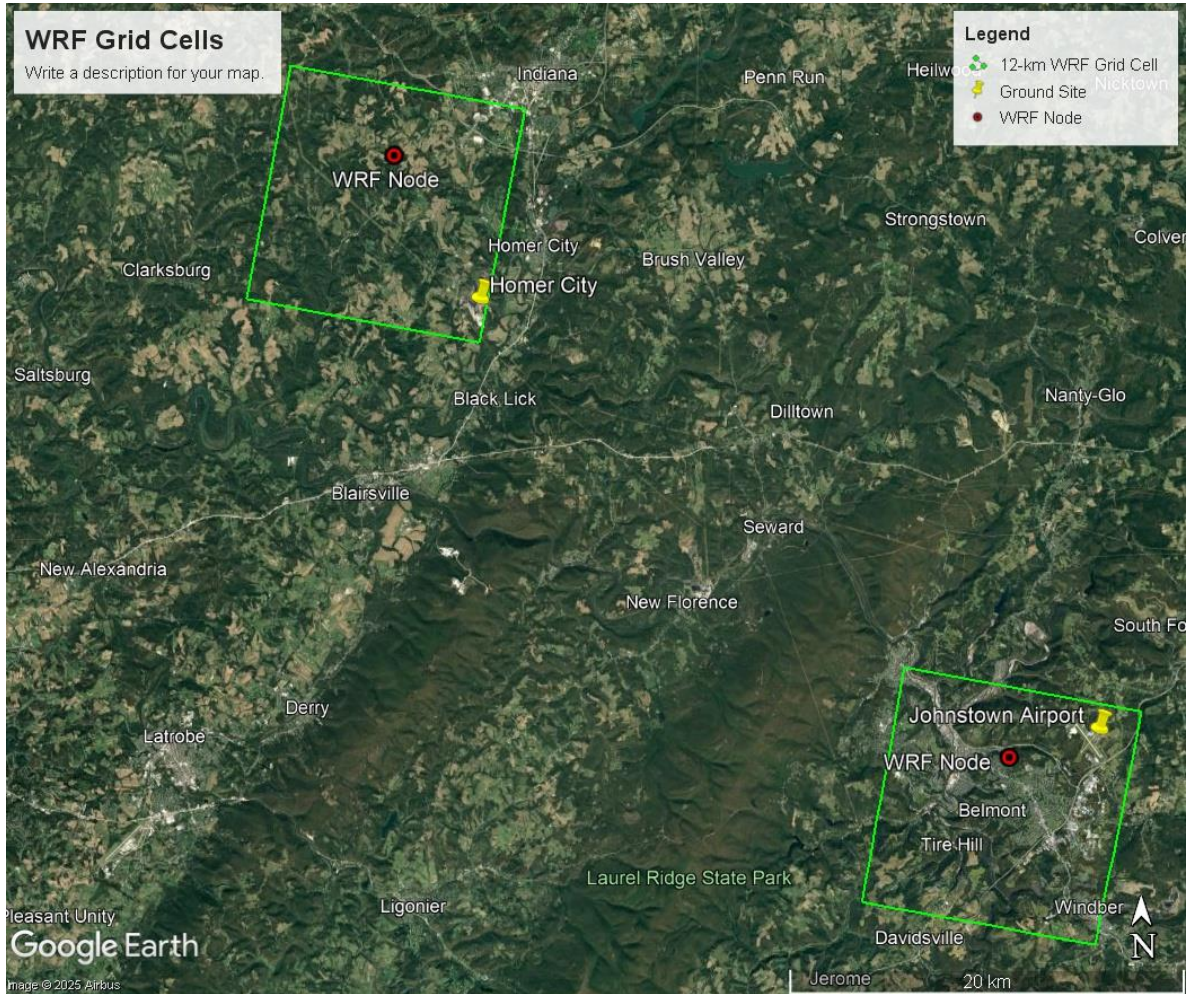
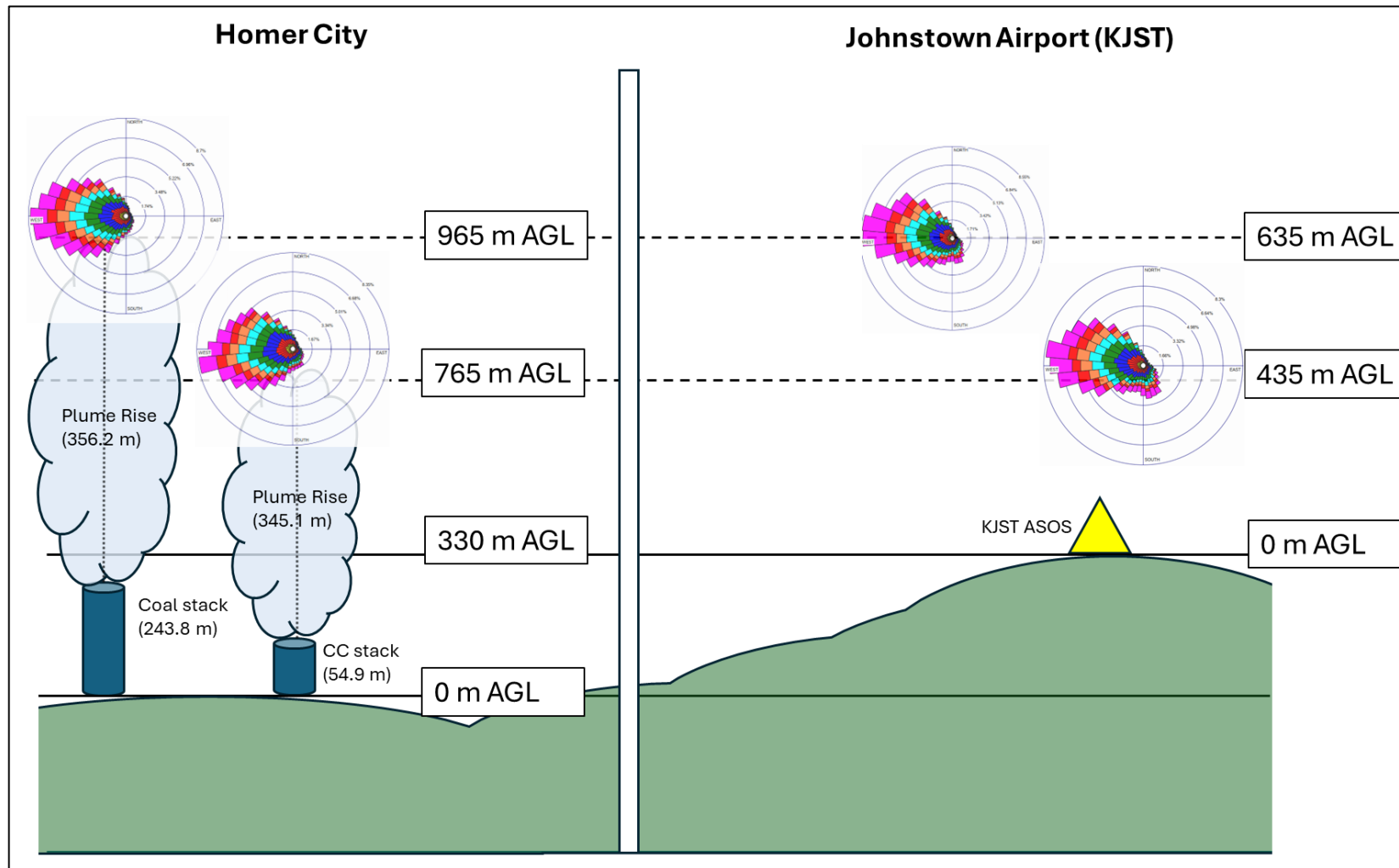


Figure 4-10: Johnstown WRF vs. Homer City WRF Schematic with Wind Roses at Plume Height



Note: Wind roses are generated based on closest WRF level (rounded to nearest 50 meters) to plume height shown. Therefore, wind roses shown for Homer City are at 1,000 m and 750 m. For Johnstown Airport, the heights of the winds depicted in the wind roses are 600 m and 450 m. Depiction of terrain is also not drawn to scale and does not account for the elevated terrain along Laurel Ridge between these two locations. Terrain relative to plume height is discussed in Section 4.6.3.2.

4.7 Receptors and AERMAP

A Cartesian receptor grid extending approximately 20 km from the approximate centroid (Easting = 652529.00 m; Northing = 4486825.00 m) of the proposed Project will be used in the modeling. The receptor grid will consist of the following spacing:

- 25-m spaced receptors along the ambient boundary;
- 50-m spaced receptors extending from ambient boundary to 200 m;
- 100-m spaced receptors between 200 m and 1 km from the proposed Project centroid;
- 250-m spaced receptors between 1 km and 2.5 km from the proposed Project centroid;
- 500-m spaced receptors between 2.5 m and 10 km from the proposed Project centroid; and
- 1,000-m spaced receptors between 10 m and 20 km from the proposed Project centroid.

Far-field and near-field views of the receptor grid and ambient air boundary are shown in **Figure 4-11** and **Figure 4-12**, respectively. If Project modeled concentrations are less than the SILs, then the controlling SIL impact for each pollutant and averaging period will be resolved with 50-m receptor spacing. If Project modeled concentration exceed the SILs, then the controlling concentration for each pollutant and averaging period associated with the NAAQS and PSD increment modeling will be resolved with 50-m spacing.

Figure 4-12 also shows the ambient air boundary comprising effective barriers to general public access along Homer City's property boundary. Consistent with US EPA's Revised Policy on Exclusions from Ambient Air (US EPA, 2019), effective barriers include physical obstacles (e.g., security fencing), active and passive deterrents (e.g., security patrols and surveillance), and natural barriers (e.g., dense vegetation, low lying water areas, ditches, creeks, and ponds) that collectively prevent reasonable access by unauthorized persons on Plant property. However, Pennsylvania State Route 3017 (Coal Road) running through the Plant property is accessible by the public. Because of this, receptors have been added to estimate concentrations along this road. Overall, the Plant is very secure and limits public access to all areas of the property.

AERMAP (version 24142) (US EPA 2024h), the AERMOD terrain preprocessor program, will be used to calculate terrain elevations and critical hill heights for the modeled receptors (NAD83 datum and Zone 17 using USGS National Elevation Data (NED). The dataset will consist of 1/3 arc second (~10 m) resolution. Consistent with the AERMAP User's Guide (US EPA, 2024h), the AERMAP domain will be sufficient to ensure that all significant nodes are included such that all terrain features that exceed a 10% elevation slope from any given receptor are considered. The NED files are referenced to Datum NAD83 (note all source locations and receptors will also be referenced to NAD83 UTM Zone 17. The NED files will be included in the electronic modeling archive that will be submitted along with the final modeling report.

Figure 4-11. Far-field Receptor Grid

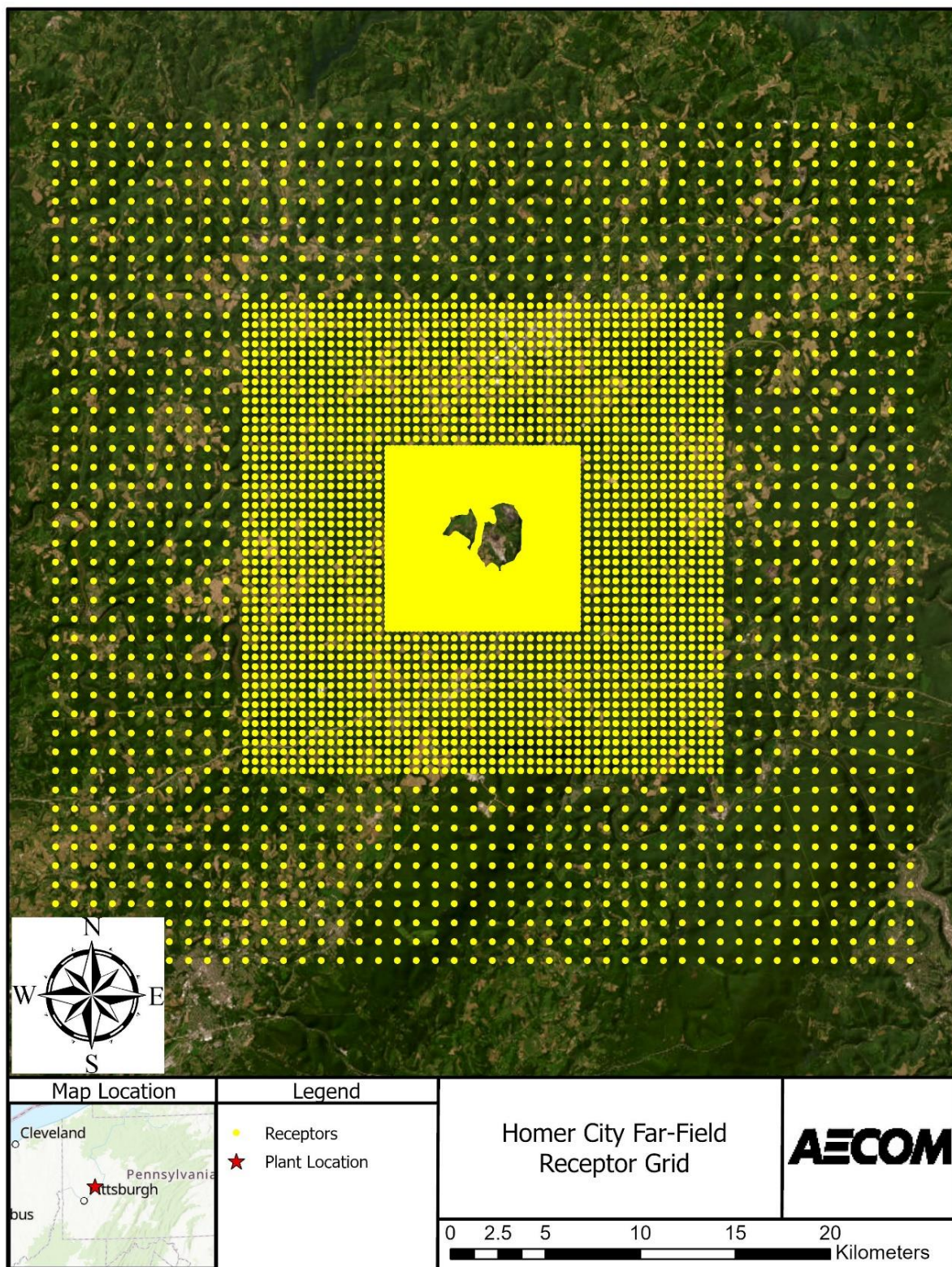
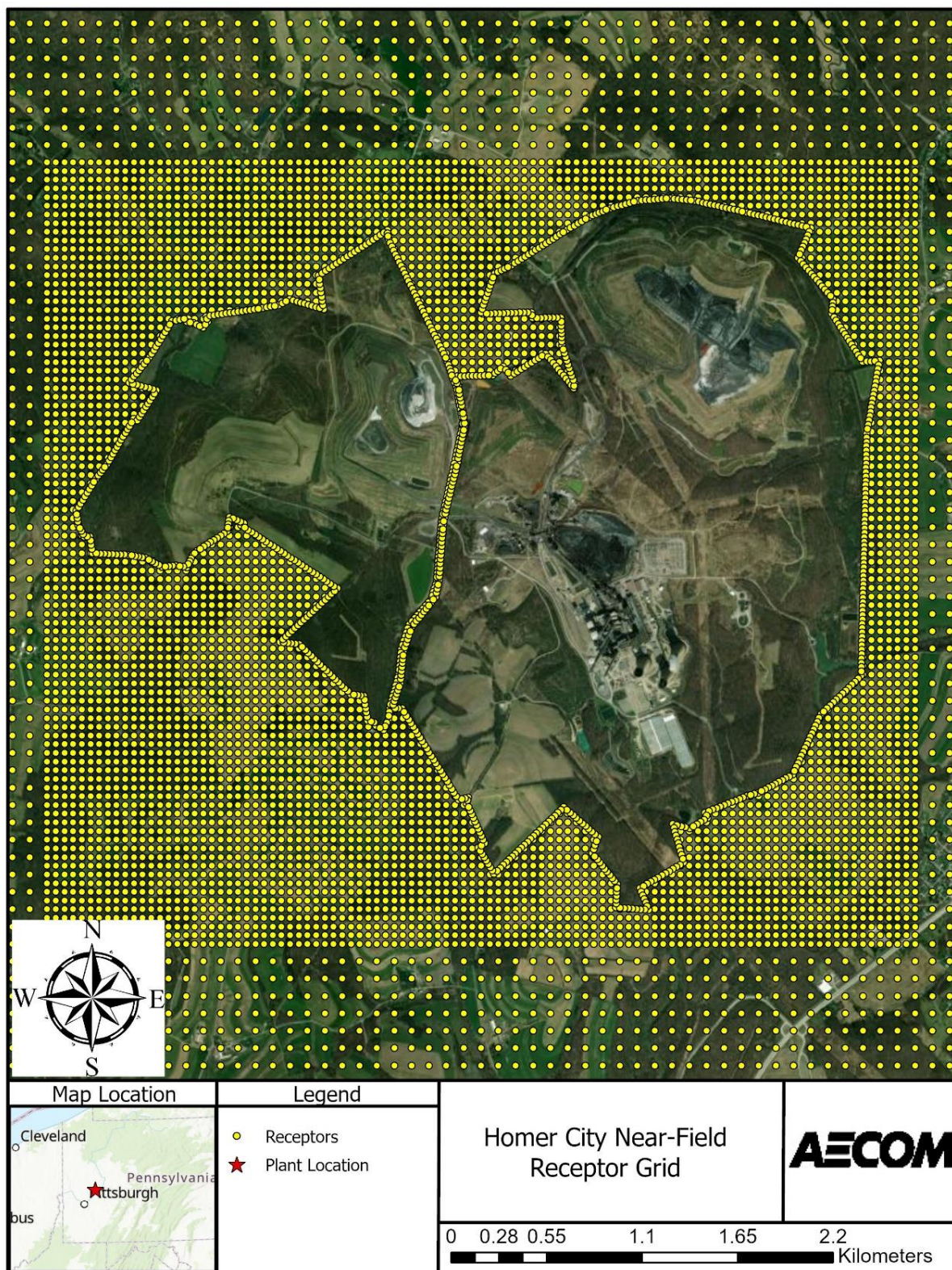


Figure 4-12. Near-field Receptor Grid



4.8 Secondary PM_{2.5}

As shown in **Table 2-1**, the Project will net out of PSD review for SO₂ and NO_x (PM_{2.5} precursor emissions). The net change in emissions of SO₂ and NO_x will be a large negative value. Due to these SO₂ and NO_x reductions, the Project overall impact on secondary PM_{2.5} would be a net benefit (i.e. result in reduction in secondary PM_{2.5}), as such, secondary PM_{2.5} will not be accounted for as part of the Project's SIL analysis. The NAAQS and PSD increment analysis will account for secondary PM_{2.5} due to emissions associated with the Project. This is a highly conservative approach given (1) the Project will expand PSD increment in Indiana Co. given the SO₂ and NO_x precursor reductions and (2) the PM_{2.5} monitor at Strongstown likely includes influence of primary and secondary PM_{2.5} associated with the coal plant operations which is no longer operating.

In April 2019, US EPA released the final "Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program" (EPA-454/R-19-003) (2019 EPA MERPs Guidance) (US EPA 2019). This guidance replaces the draft MERPs Guidance that was released in April 2016. MERP values expressed as an emission rate in the 2019 EPA MERPs Guidance represent an emission level that would result in a modeled concentration at or below specified SIL values. As such, if proposed Project emissions were less than MERP values, the project could be deemed to have an insignificant impact.

In February 2024, US EPA lowered the annual PM_{2.5} NAAQS from 12 to 9 µg/m³. As a result, in April 2024 US EPA issued supplemental guidance that included a new suggested SIL value for annual PM_{2.5}. In response to the updated SIL value for annual PM_{2.5}, US EPA also issued a "*Clarification on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program*" (US EPA 2024i). The purpose of this memo was to provide greater flexibility on the use of the MERPs as a direct comparison tool with critical air quality thresholds rather than direct comparison to emission rates considered equivalent to a significant air quality threshold. US EPA indicated that any MERP values presented as an emission rate published in the (2019) MERPs Guidance or through online tools should no longer be used for PSD permitting applications since the form of these values explicitly included a significant impact level that is no longer appropriate. In other words, since MERP values expressed as an emission rate in the 2019 guidance used SIL values relevant at the time the document was prepared, changes to the SIL values would essentially make any emission rate based MERP no longer valid. Therefore, US EPA has indicated that "*Any MERP values presented as an emission rate published in the MERPs Guidance or through online tools should no longer be used for PSD permitting applications since the form of these values explicitly included a significant impact level that is no longer appropriate.*"

For this application, the 2019 EPA MERPs Guidance will be used to develop air quality concentrations of secondary PM_{2.5} for comparison to critical air quality values. Specifically, Section 4.1.3 of the 2019 US EPA MERPs Guidance illustrates how the US EPA-model data used to develop the MERPs could be used as a Tier 1 demonstration tool to estimate air quality concentrations for PM_{2.5} based on Project emissions.

The methodology described in Section 4.1.3 of the 2019 US EPA MERPs Guidance will be used to assess the Project impacts for secondary PM_{2.5}. To estimate the Project impact of secondary PM_{2.5}, the list of hypothetical sources that were modeled by US EPA were analyzed. The closest hypothetical site is 43 miles west of the Project site, located in Allegheny County. Two additional sites were considered but they are located further away in Tuscarawas, Ohio (120 miles west of the Project site) and Doddridge, West Virginia (115 miles southwest of the Project site).

The calculated secondary PM_{2.5} concentrations associated with Project emissions is shown in **Table 4-13** for each of the three nearby hypothetical MERP sites. The most conservative of the three MERP sites happens to be the closest, located in Allegheny Co.

Table 4-13. Project Estimated Secondary PM_{2.5} Concentrations

Averaging Period	NO _x				SO ₂				Project Estimated Secondary PM _{2.5} Concentration (µg/m³)
	US EPA Precursor Emissions (TPY)	US EPA Modeled Concentration (µg/m³)	Project Precursor Emissions (TPY)	Project Estimated Concentration (µg/m³)	US EPA Precursor Emissions (TPY)	US EPA Modeled Concentration (µg/m³)	Project Precursor Emissions (TPY)	Project Estimated Concentration (µg/m³)	
Allegheny Co. PA									
24-hour	1,000	0.080	1,097	0.087	1000 ⁽¹⁾	0.251	202	0.051	0.138
Annual	1,000	0.006	1,097	0.007	1000 ⁽¹⁾	0.009	202	0.002	0.008
Doddridge, WV									
24-hour	1,000	0.037	1,097	0.0408	500	0.056	202	0.0224	0.063
Annual	1,000	0.001	1,097	0.0015	500	0.002	202	0.0009	0.002
Tuscarawas, OH									
24-hour	1,000	0.080	1,097	0.0875	500	0.084	202	0.0338	0.121
Annual	1,000	0.003	1,097	0.0038	500	0.004	202	0.0017	0.005

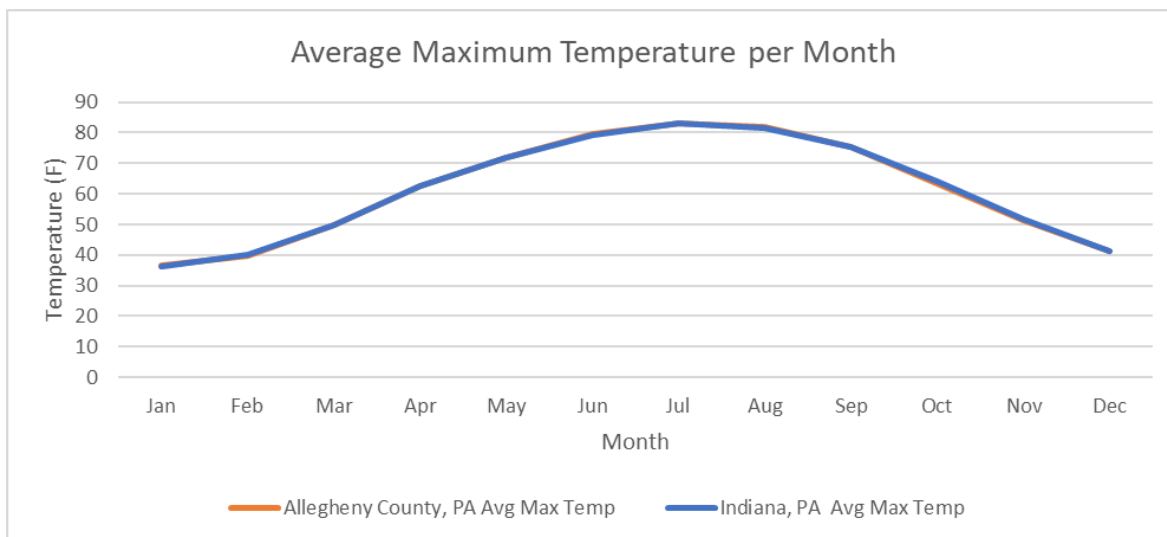
(1) A 500 TPY hypothetical SO_x source is not available in the MERPs data for this location. Therefore, the 1000 TPY was used.

Due to its proximity and the fact it is the most conservative of the three nearby hypothetical MERP sites, the Allegheny Co. site will be the primary site considered, as it best represents the airshed of the Project. Climate summaries from the National Oceanic and Atmospheric Administration's (NOAA's) Online Weather products for Allegheny Co. indicate very similar 30-year climate normals when compared to the location of the Project site. The weather monitor chosen to represent the Project site is located in Indiana, PA since it was the closest in proximity to the Project. A comparison of 30-year (1993-2023) average maximum and average minimum, temperatures and total precipitation for the Project site and the Allegheny Co. hypothetical source is provided in **Figure 4-13**, **Figure 4-14**, and **Figure 4-15**. Data presented in these figures show a very similar annual average high temperatures in the low 60s°F, and low temperatures around 40°F. In addition, mid-summer high temperatures were in the range of 71 – 82°F for both the Project and Allegheny Co. locations. Precipitation averages are also close with approximately 40 inches of rain per year for Allegheny Co. and 48 inches of rain per year for the Project site. In addition, the MERP data for the 90-meter stack will be used for this assessment as opposed to the 10-meter stack MERP data. The 90-meter stack data is more representative of a tall stack with buoyancy and momentum rise like the main emission sources for the Project. **Section 4.6.3** references a plume height of 1,237 meters for the GE 7HA.02 stacks, this supports the use of the 90-meter MERP data.

There are some hills to the southeast of the Project site whereas the Allegheny Co. hypothetical source does not. However, the difference in terrain features would not create a substantial difference in climate regimes between the Project site and hypothetical source in Allegheny Co. Both have similar elevations: 1272 ft for Allegheny Co. and 1200 ft for the Project site. The Allegheny Co. hypothetical source also exhibits similar land use to the Project site. The Project area is primarily rural while the Allegheny Co. site is somewhat more suburban, primarily residential.

Based on the similarities in land use, climate, and overall terrain, the data associated with US EPA's hypothetical source in Allegheny Co., PA will be used for assessing the Project impact on secondary PM_{2.5}. The Allegheny Co. sites also has the highest concentration of secondary PM_{2.5} of the three sites examined.

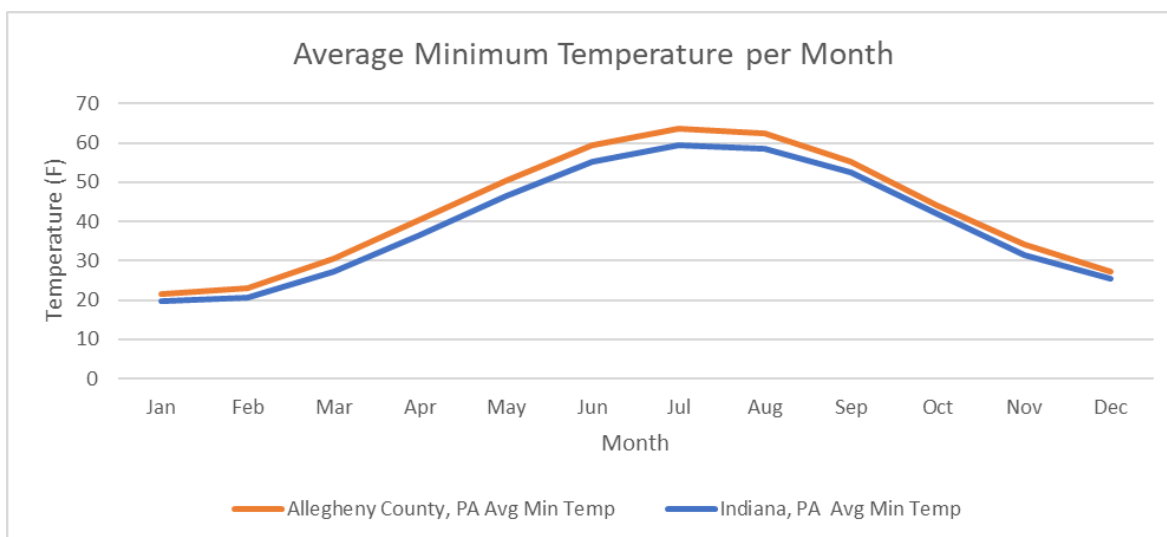
Figure 4-13. 30-Year Average Maximum Temperature of Allegheny County and Plant per Month



Note: Average maximum temperature at both sites are nearly identical, thus the plot shows Indiana on top of Allegheny.

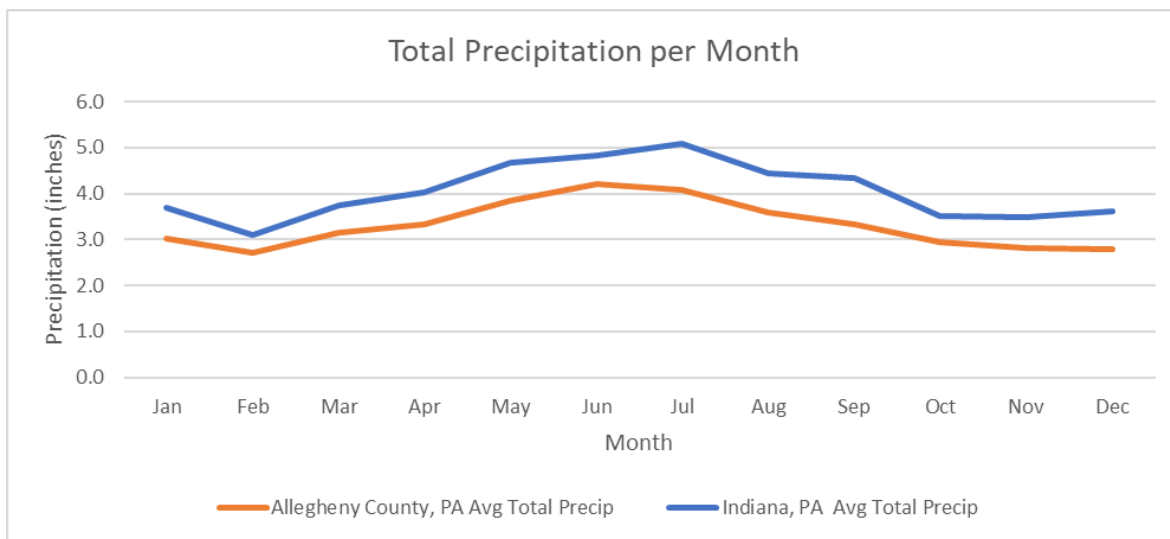
Source: Data from NOAA Online Weather Data, <https://weather.gov>

Figure 4-14. 30-Year Average Minimum Temperature of Allegheny County and Plant per Month



Source: Data from NOAA Online Weather Data, <https://weather.gov>

Figure 4-15. 30-Year Average Total Precipitation for Allegheny County and Plant per Month



Source: Data from NOAA Online Weather Data, <https://weather.gov>

5. Class II Area Impact Assessment

5.1 Significant Impact Level Modeling

The Class II Area SIL analysis will be conducted with AERMOD using five years of meteorological data as described in **Section 4.6** and the Project emissions data. This modeling analysis will be used to make a determination of significance for PM₁₀ and PM_{2.5}.

For those pollutants and averaging periods with modeled concentrations less than their SILs, no further modeling will be required because, by definition, those pollutants and averaging periods cannot cause or contribute to a violation of the NAAQS or exceedances of the PSD increments. For those pollutants and averaging periods with significant modeled concentrations, the significant impact area (SIA) will be determined, and a cumulative NAAQS and PSD Increment analysis will be conducted. For PM_{2.5}, the secondary PM_{2.5} will not be accounted for as discussed in **Section 4.8**.

The SIL modeling will be performed in accordance with US EPA guidance and the form of the design concentration consistent with the pollutants and averaging periods being modeled. Specifically, the determination of significance for the Project will be based on the following:

- PM_{2.5} 24-hour NAAQS – Highest 24-hour average modeled concentration averaged over 5 (five) years.
- PM_{2.5} Annual NAAQS – Highest annual average modeled concentration averaged over 5 (five) years.
- PM_{2.5} 24-hour PSD Increment – Highest 24-hour average modeled concentration per year taken over 5 (five) years.
- PM_{2.5} Annual PSD Increment – Highest annual average modeled concentration per year taken over 5 (five) years.
- PM₁₀ 24-hour NAAQS – Highest 24-hour average modeled concentration per year taken over 5 (five) years.
- PM₁₀ 24-hour PSD Increment – Highest 24-hour average modeled concentration per year taken over 5 (five) years.
- PM₁₀ Annual PSD Increment – Highest annual average modeled concentration per year taken over 5 (five) years.

5.2 NAAQS and PSD Increment Analysis

As stated previously, for those pollutants and averaging periods determined to have modeled concentrations less than the SILs, no further analysis will be performed. The discussion below applies only to those pollutants and averaging periods for which a significant impact is predicted with AERMOD.

Compliance with the PSD increments and NAAQS would be based on the sum of the following:

- Modeled concentrations attributable to the Project;
- Modeled concentrations from “nearby” sources; and
- Representative ambient background concentration (NAAQS only).

Modeled concentrations attributable to the Project and nearby sources will be estimated using AERMOD. Secondary PM_{2.5} will be accounted for in the NAAQS and PSD Increment analysis as described in **Section 4.8**. This is a highly conservative approach given the reductions associated with the project that have (1) expanded PSD increment in Indiana Co. given the SO₂ and NO_x precursor reductions and (2) the PM_{2.5} monitor at Strongstown likely includes influence of primary and secondary PM_{2.5} associated with the coal plant operations.

5.2.1 NAAQS Analyses

Dispersion modeling using AERMOD will be conducted with the meteorological data discussed in **Section 4.6**, Project source data, and the regional source inventory described in **Section 5.3** (below) to determine model concentrations to be compared to the NAAQS for the applicable averaging periods. In addition to Project sources modeled for the SIL analysis, any existing sources at the Plant that have the potential to emit the pollutant of concern will be included within the NAAQS modeling. The analysis will compare the modeled

design short-term and annual concentrations from the proposed Project and existing Plant sources, as well as influencing nearby emission sources, to the NAAQS. For the NAAQS analysis, the background concentration will be added to modeled design short-term and annual impacts. **Section 5.4** provides recommended background concentrations for this application.

5.2.2 PSD Increment Analyses

Dispersion modeling using AERMOD will be conducted with the meteorological data discussed in **Section 4.6**, Project source data including an inventory of regional sources to determine model concentrations to be compared to the PSD increment for the applicable averaging periods. The PSD increment analysis will consider sources of emissions that either consume or expand the available PSD increment. PSD increment consumption and expansion will be based on the major and minor source baseline dates established for Indiana County to be provided by PADEP.

Sources in operation prior to the minor source baseline date do not impact the available PSD increment and are part of the baseline and can thus be excluded from modeling as applicable. Other sources of emissions that began operations or had a project that resulted in an emission increase after the minor source baseline dates consume PSD increment and must be included in modeling. Therefore, existing sources of PM_{2.5} and PM₁₀ at nearby facilities that have begun operating or resulted in an emission increase after the minor source baseline dates will be included in any PSD increment modeling, if applicable. Major sources that have begun operating or resulted in an emission increase after the major source baseline dates (PM₁₀ = January 6, 1975 and PM_{2.5} = October 20, 2010) will be included in any PSD increment modeling, if applicable. This project will trigger the minor source baseline date for PM_{2.5} in Indiana Co. and it is not anticipated that the annual SIA for PM_{2.5} will extend outside of the county.

5.3 Regional Source Inventory

For PSD permitting, a cumulative impact analysis, if necessary, needs to appropriately characterize the spatial nature of air quality near a new or modifying PSD source to identify the potential for NAAQS or PSD increment violations. Characterization of local air quality around a new or modifying source for each pollutant and averaging period necessitates a full and comprehensive accounting for all source contributions. A cumulative impact analysis should account for the combined impacts of all direct and precursor emissions of a pollutant from:

- the new or modifying source,
- direct emissions from nearby sources, and
- monitored background concentrations accounting for primary and/or secondary impacts from regional background sources and nearby sources not explicitly modeled.

Appropriately accounting for all source contributions is an inherently discretionary exercise with use of best professional judgment in determining a representative background concentration and identifying nearby sources that need to be explicitly modeled. The development of the background source inventory for the proposed project will rely on US EPA's *Guidance on Developing Background Concentrations for Use in Modeling Demonstrations* (Background Concentration Guidance), which was finalized November 20, 2024 (US EPA, 2024j).

The regional source inventory development will include ambient background concentrations (see **Section 5.4**) to account for non-modeled sources and the modeling of direct source emissions which are not adequately represented by the background monitors. The regional source inventory will consider the extent of the Project's significant impact area when determining the relevant sources to directly model. Based on US EPA Guidance, the hypothetical example in Appendix C of the Background Concentration Guidance, generally sources with less than 25 tons per year of actual PM₁₀/PM_{2.5} emissions are likely represented in the selected regional

monitors and will be excluded from any modeling. Larger sources may be included if they are not adequately represented by the monitor.

The project anticipates having modeled concentrations exceeding the SIL for both PM₁₀ and PM_{2.5}. As such a list of nearby sources within approximately 25-km of the Project was obtained from PADEP. This list included sources in Indiana, Armstrong, and Westmoreland counties. Of the sources provided, only four (4) sources had 2023 actual PM₁₀/PM_{2.5} emissions greater than 25 TPY that are still operating. Those sources included: Keystone Generating Station, Conemaugh Generating Station, Seward Generating Station, and Armstrong Power. These sources will be evaluated further for potential inclusions as direct modeled sources if they are not adequately captured by the background monitors.

5.4 Ambient Background Concentrations

Ambient air quality data are used to represent the contribution to total ambient air pollutant concentrations from non-modeled sources. In accordance with 40 CFR 52.21(m), an application for a PSD permit must contain an analysis of ambient air quality in the vicinity of the proposed Project for each pollutant subject to PSD review. The objective of reviewing these data is to develop representative background concentrations which, when added to modeled impacts, are used in the NAAQS compliance analysis. This section summarizes the ambient background concentrations proposed to be used in the NAAQS analysis. The monitored concentrations presented in this section were obtained from values provided by US EPA design value spreadsheets.²

5.4.1 PM_{2.5} Background Monitor Selection

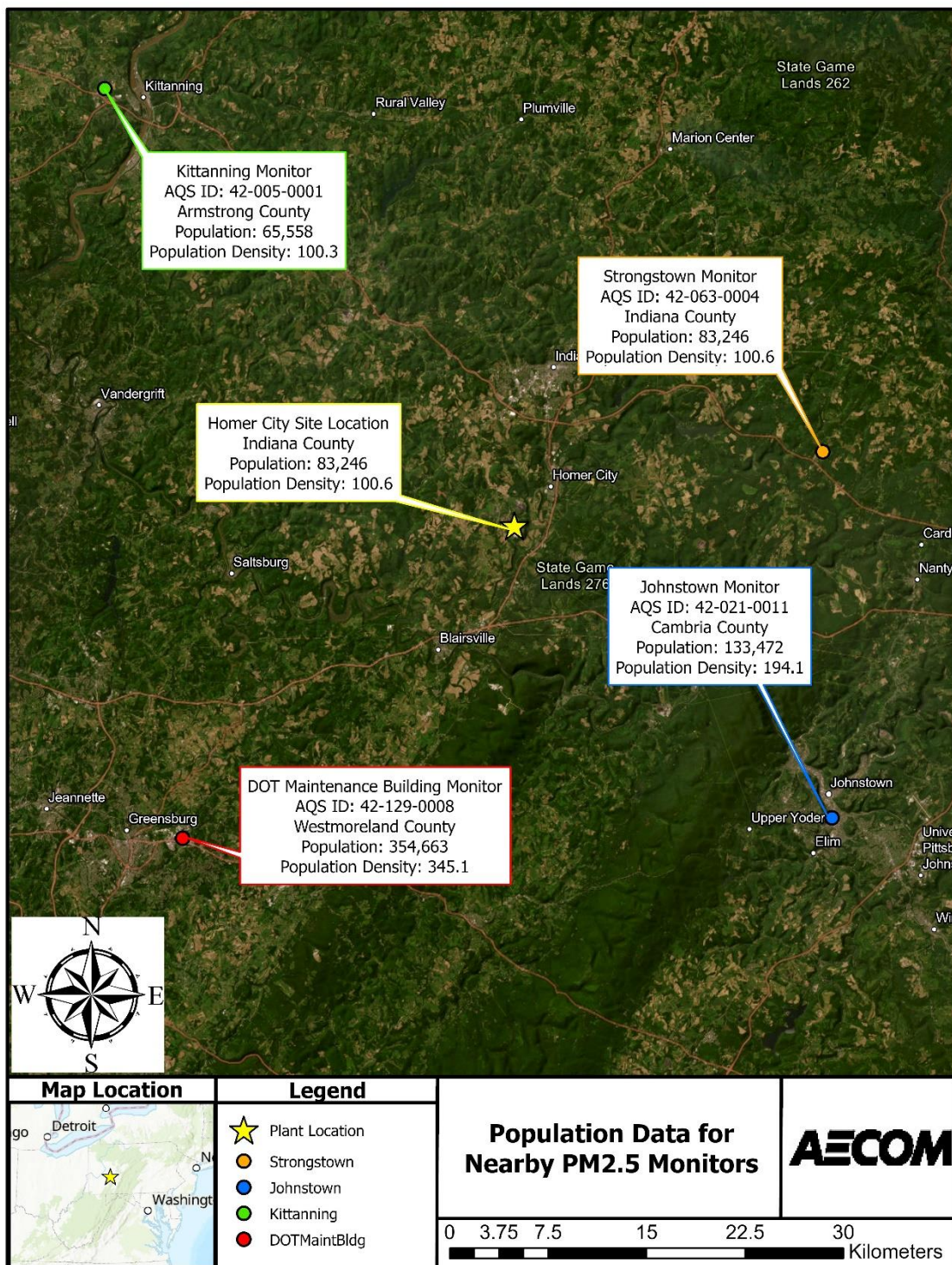
Using the EPA Air Quality Design Values interactive map, there are four (4) PM_{2.5} monitor that were considered; Strongstown (AQS Site ID: 42-063-0004), Johnstown (AQS Site ID: 42-021-0011), Kittanning (AQS Site ID: 42-005-0001), and DOT Maintenance Building in Greensburg (AQS Site ID: 42-124-0008) (see **Figure 5-1**). Factors considered when determining the most representative monitor include: proximity to the Project, prevailing winds, and emission levels / population density near the monitor vs the source.

The Strongstown monitor is the closest monitor to the Project site and is in the same county. As such the county population density (see **Figure 5-1**) and emission totals are the same between the Strongstown monitor location and Project location. The wind rose shown in **Figure 4-7** also indicates that the Strongstown monitor is located in a downwind direction of the Project. The other monitors are located further away, have a higher population density or are not in as good of a prevailing wind direction. Based on these factors the Strongstown monitor provides a good representation of background PM_{2.5} concentration in the vicinity of the Project and is likely conservative for the following reasons:

- The monitor is likely Influenced by Homer City primary and secondary PM_{2.5} emissions from coal operations that have since been deactivated (July 2023). **Figure 5-2** show the relative comparison of SO₂, NO_x and PM emissions from Homer City and other major sources in Indiana County from the 2020 NEI. Removing the Homer City emissions alone will result in a downward trend in emissions since 2020.
- **Table 5-1** shows the 2021-2023 PM_{2.5} design concentrations which were clearly influenced by the Canadian Wildfires from 2023.

² <https://www.epa.gov/air-trends/air-quality-design-values>

Figure 5-1. Location of Nearby PM_{2.5} Monitors



Source: US Census, 2020

Figure 5-2. 2020 NEI Emission Data from Indiana County

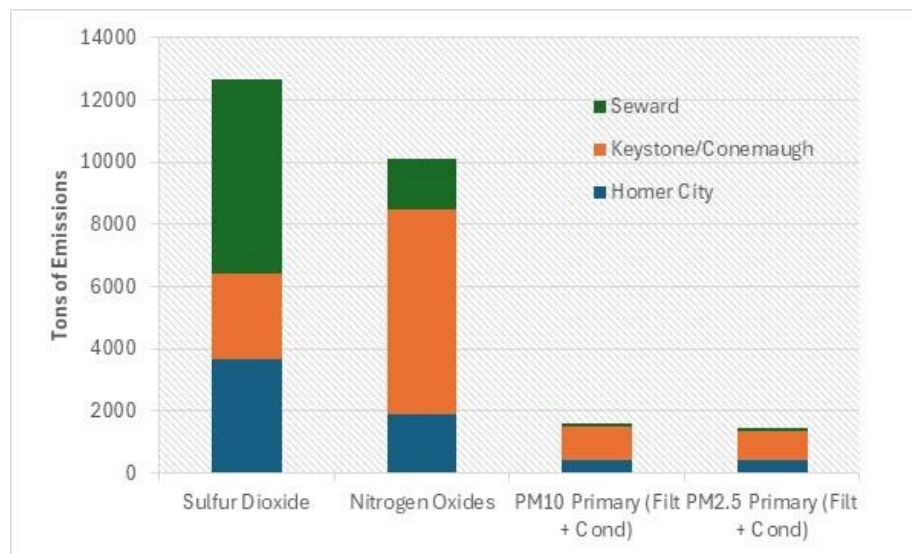


Table 5-1. PM_{2.5} Ambient Background Concentrations

Pollutant	Averaging Period	AQS Site ID	Local Site Name	2021-2023 Design Value (µg/m³)	2021 Concentration (µg/m³)	2022 Concentration (µg/m³)	2023 Concentration (µg/m³)
PM _{2.5}	24-hour ⁽¹⁾	420630004	Strongstown	21	20.1	13.5	29.2
	Annual			7.3	7.34	6.37	8.07

(1) Concentrations reflect the 98th percentile value.

5.4.2 PM₁₀ Background Monitor Selection

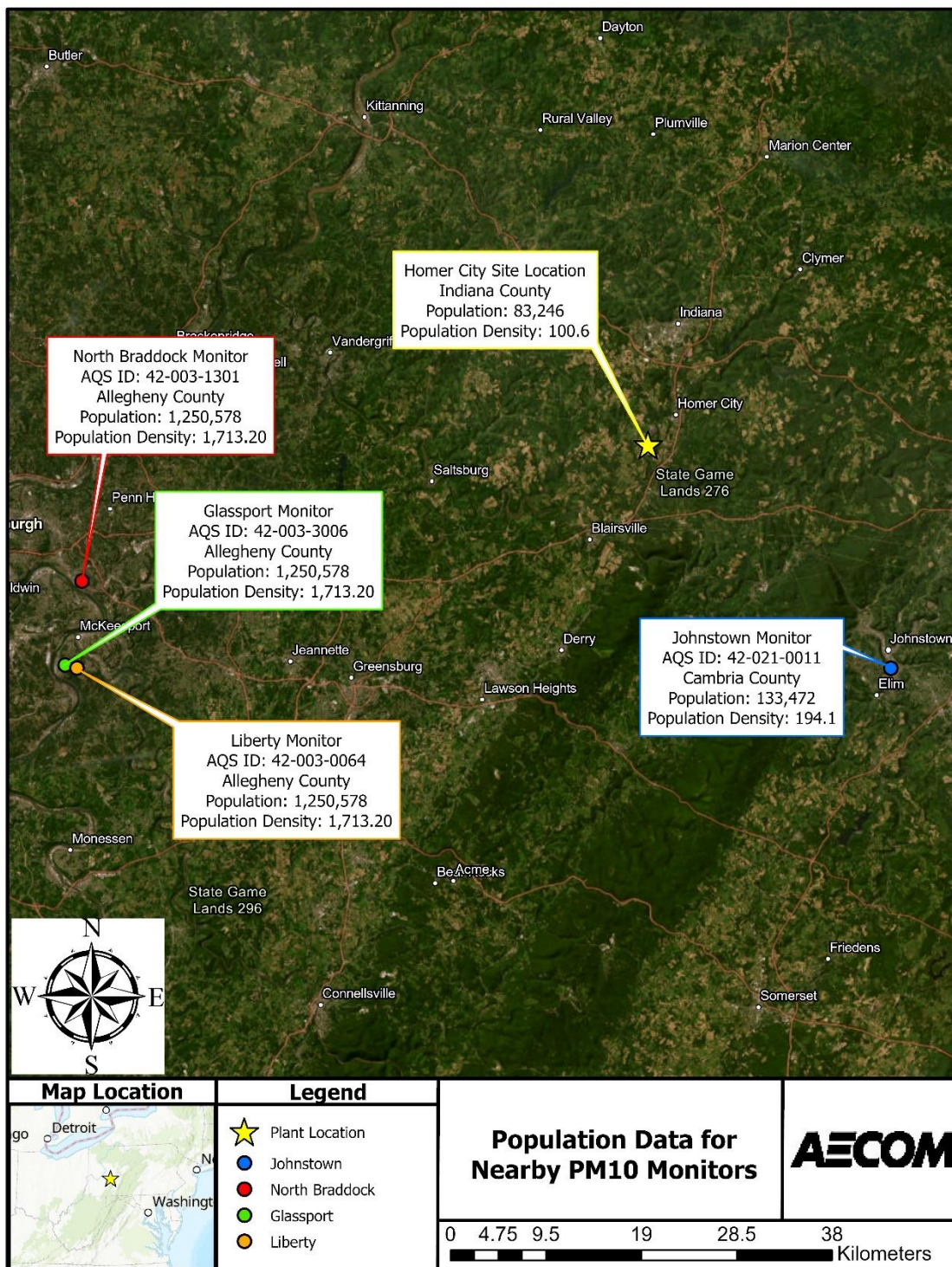
The monitors for PM₁₀ background concentrations in western Pennsylvania near the Plant are as follows: Johnstown (AQS ID: 42-021-0011), North Braddock (AQS ID: 42-003-1201), Glassport (AQS ID: 42-003-3006), and Liberty (AQS ID: 42-003-0064). As discussed for PM_{2.5}, Factors considered when determining the most representative monitor include: proximity to the Project, prevailing winds, and emission levels / population density near the monitor vs the source.

The Johnstown monitor is located 20 miles to the southeast of the Project site, however, is not in an ideal of a prevailing wind direction. The next closest monitors to the Project are North Braddock, Liberty, and Glassport which are 35, 37, and 39 miles west of the Plant, respectively, just outside of Pittsburgh and likely influenced by the Pittsburgh urban area. Given the urban influence on these monitors near Pittsburgh, the more comparable population density (see **Figure 5-3**), and comparable emissions between Cambria County and Indiana County (**Figure 5-4**), the Johnstown PM₁₀ monitor provides the best representation of background PM₁₀ concentrations in the vicinity of the Project.

The top ten (10) PM₁₀ background concentrations are provided in **Table 5-2**. The form of the PM₁₀ NAAQS is not to be exceeded more than once per year on average over 3 years. PADEP typically suggests using the highest 24-hour concentration over the latest complete 3-year period for PM₁₀ background concentrations in NAAQS analysis to represent non-modeled sources. For Johnstown the highest 24-hour concentration over the 2021-2023 period was 120 µg/m³. This value was measured on a date where wildfire smoke was impacting the state along with the next two highest 24-hour concentrations from the 2021-2023 dataset. PADEP has

identified these days (June 28-July 1, 2023) as part of the PM_{2.5} exceptional event analyses due to impacts from wildfire smoke. The exceptional event document can be found here (<https://www.ahs.dep.pa.gov/eComment/>). Based on the data presented, 54 μm^3 (the third highest value over the last three years) will be used as the PM₁₀ background concentration as part of the NAAQS assessment. This is still conservative in the sense that this day was also impacted by wildfire smoke.

Figure 5-3. Population Data for Nearby PM₁₀ Background Monitors



Source: US Census, 2020

Figure 5-4. 2020 NEI PM₁₀ Emission Data

Cambria, Indiana 2020 Total Point Source Emissions (tons)

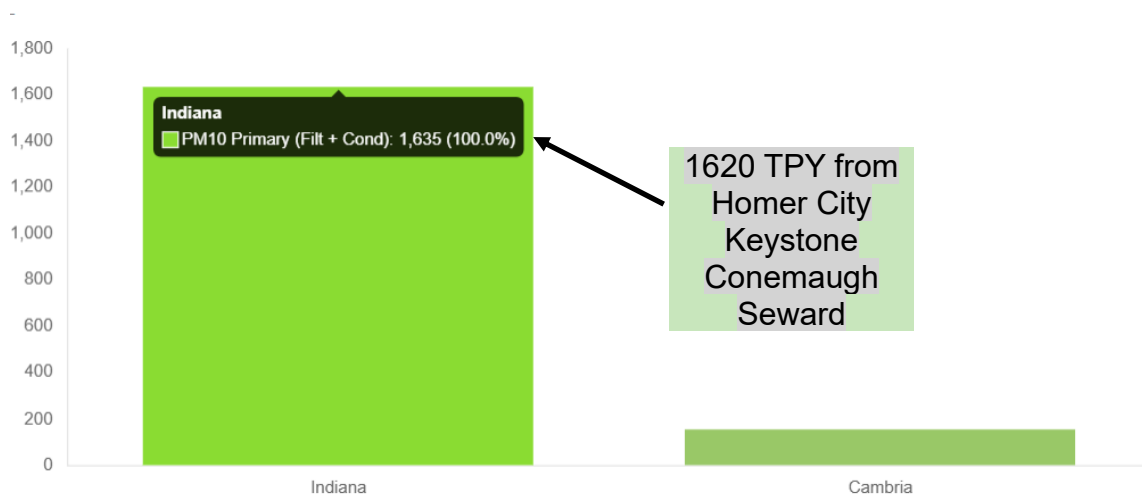


Table 5-2. PM₁₀ Ambient Background Concentrations (Top 10 Values 2021-2023)

Pollutant	Averaging Period	AQS Site ID	Local Site Name	Date	Concentration (µg/m ³)
PM ₁₀	24-hour	420210011	Johnstown	6/29/2023	120
				6/28/2023	84
				6/30/2023	54
				7/20/2021	52
				6/16/2022	43
				3/9/2021	42
				12/22/2023	38
				6/6/2023	37
				7/17/2023	36
				12/21/2023	35

6. Other Requirements

6.1 Class I Area Impacts

PSD Class I areas are areas of special national or regional value from a natural, scenic, recreational, or historical perspective. The PSD program provides special protection for such areas. According to 40 CFR §52.21(p), sources located within 300 km of a Class I area may be required to demonstrate that the Project will not cause or contribute to an exceedance of the PSD Class I increments or adversely affect certain air quality-related values. The three (3) PSD Class I areas located within 300 km of the Project site are pictured in **Figure 6-1** and their approximate distances are:

- | | |
|-----------------------------|--------|
| • Dolly Sods Wilderness: | 165 km |
| • Otter Creek Wilderness: | 166 km |
| • Shenandoah National Park: | 197 km |

6.1.1 Air Quality Related Values

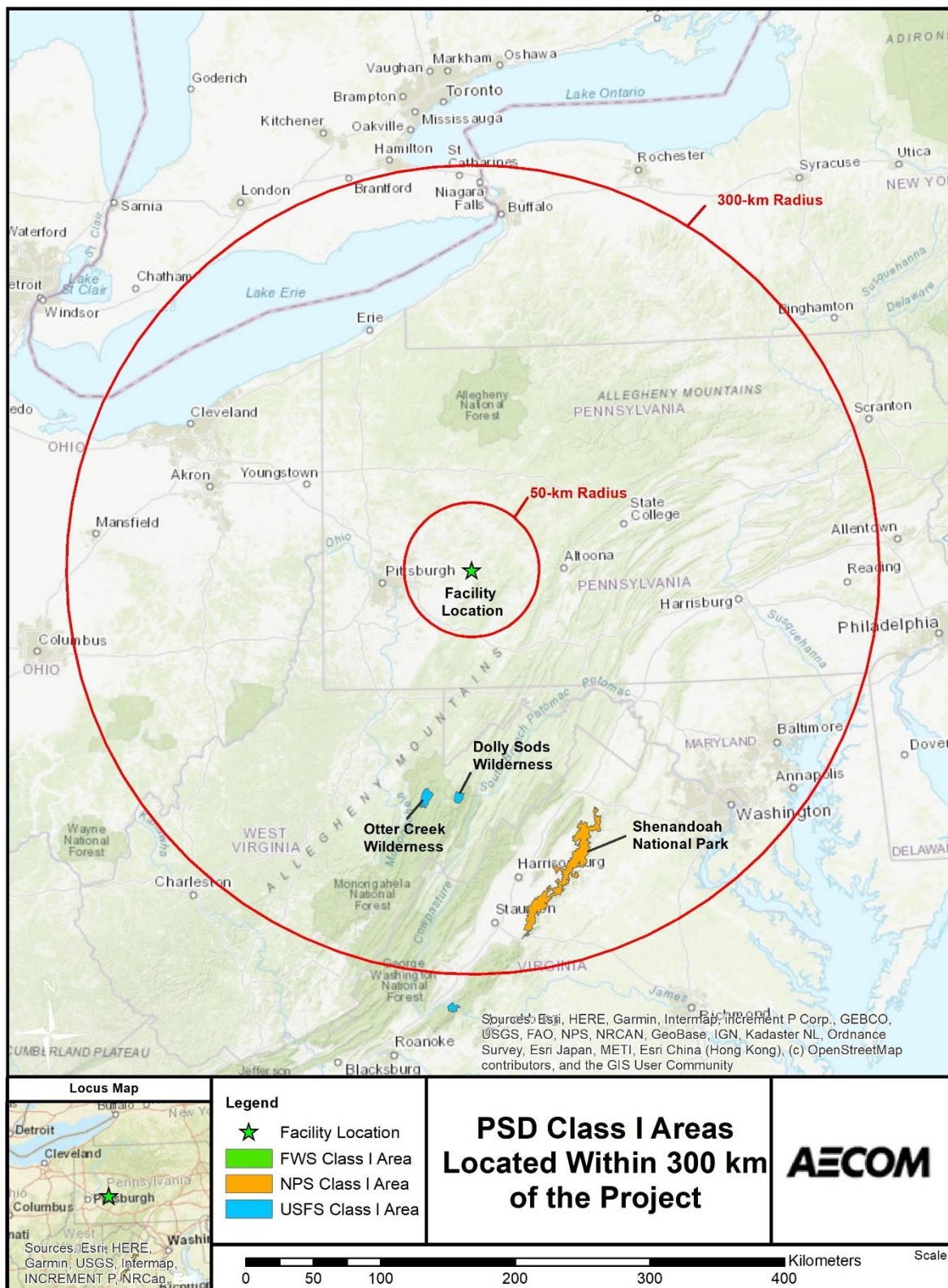
Per guidance in *Federal Land Managers' Air Quality Related Values Work Group* (NPS 2010), if the sum of short-term Project emissions for pollutants that trigger PSD Review (H_2SO_4 and PM_{10} (filterable)) expressed in tons per year is less than ten times the distance to the Class I area (in kilometers), the Federal Land Managers (FLM) will likely decide that an analysis of AQRVs (including regional haze and acid deposition) is not necessary (referred to as the "Q/D" screen).

The sum of the preliminary estimated Project emissions for the pollutants that trigger PSD review listed above will be used to perform a Q/D screen. If the Q/D is less than 10, a waiver from the FLMS will be requested to confirm that an AQRV analysis will not be required. Emissions for the Class I AQRV analysis should represent the annual maximum 24-hour average rate.

6.1.2 Class I PSD Increments

In accordance with Appendix W (Section 4.2.c.i), because AERMOD is proposed for the Project's nearfield assessment, it can be utilized in a screening-level analysis to estimate the Project's potential for a significant modeled impact at the PSD Class I areas. As such, initially, AERMOD will be used to assess the Class I PSD increments for PM_{10} and $\text{PM}_{2.5}$. AERMOD will be applied with a ring of receptors placed at 50 km, the maximum distance at which AERMOD is considered to be valid. Receptors will be limited to directions in which the plume could be transported from the source to the Class I area(s). At these receptors, the maximum concentrations associated with the Project will be modeled for comparison to the Class I PSD SILs (see **Table 3-3**). If the AERMOD concentrations at 50-km do not indicate insignificant impacts, the AERMOD modeling results will be extrapolated out to the Class I area distances.

Figure 6-1. PSD Class I Areas



6.2 Class II Visibility

A Class II visibility analysis is required to be completed for state parks and state historic sites located within the project's vicinity. This analysis would be performed beginning with a screening procedure similar to that outlined in the US EPA document *Workbook for Estimating Visibility Impairment* (US EPA 1980a).

The closest state park, Yellow Creek State Park, is approximately 13-14 km to the east-northeast. A visibility analysis will be conducted with US EPA's VISCREEN model. The analysis will be conducted in accordance with US EPA's *Workbook for Plume Visual Impacts Screening and Analysis* (Revised) (US EPA 1992).

The VISCREEN model Workbook offers two levels of analysis. The Level 1 screening analysis is the most simplified and conservative approach, employing worst-case default meteorological data, F stability (very stable) and 1 meter per second wind speed. The Level 2 analysis allows refinement of meteorological conditions and site-specific conditions such as complex terrain. In accordance with the Workbook, a visual range of 20-25 km will be used in the application of VISCREEN (see Figure 9 of the Workbook). VISCREEN will first be applied using the Level 1 approach and only be refined using a Level 2 approach if needed.

The VISCREEN model will be applied to estimate two visual impact parameters, plume perceptibility (ΔE) and plume contrast (C_p). Screening-level guidance indicates that values above 2.0 for ΔE and ± 0.05 for C_p are considered perceptible. The VISCREEN analysis requires maximum hourly emissions associated with Project sources as inputs. The analysis will be conservatively based on the maximum hourly future NO₂ and PM potential emission rates from the Project.

6.3 Air Quality Review and Pre-construction Monitoring

According to 40 CFR §52.21(m), an analysis of ambient air quality in the vicinity of the Project for each pollutant subject to PSD review must be conducted.

Air quality data are obtained from pre-construction monitoring or, under certain conditions, from existing monitoring data. Existing air quality may be used in lieu of pre-constructing monitoring if:

- The data are representative of the proposed facility's impact areas;
- The data are of similar quality as would be obtained if the applicant monitored according to the PSD requirements; and
- The data are current; that is, the data have been collected during the two-year period preceding the permit application, provided the data are still representative of current conditions.

As noted in 40 CFR §52.21(i)(5), PADEP may exempt the source from the PSD program's ambient air quality monitoring analysis requirements contained in 40 CFR §52.21(m) on a pollutant-by-pollutant basis if the net emissions increase of pollutants subject to PSD review will cause air quality impacts less than the significant monitoring concentrations (SMCs). **Table 6-1** presents the applicable SMCs for the pollutants modeled.

Table 6-1. Significant Monitoring Concentrations

Pollutant ⁽¹⁾	Averaging Period	Significant Monitoring Concentration (µg/m ³)
PM ₁₀	24-hour	10

6.4 Soils and Vegetation

The PSD regulations require an evaluation of the impact of Project emissions on soils and vegetation. If required, an analysis of the Project's potential impact on soils and vegetation in the vicinity of the facility will be performed. The analysis of a project's impact on soil and vegetation is typically performed by comparing the maximum modeled impacts from the project to the screening concentrations provided in US EPA's "A Screening Procedure for the impacts of Air Pollution Sources on Plants, Soils, and Animals" (December 12, 1980) as well as secondary NAAQS. Secondary NAAQS have been designed by US EPA to better protect public welfare against adverse effects caused by criteria air pollutants – including ecological effects such as damage to aquatic and terrestrial ecosystems. In addition, a comparison of Project modeled concentrations associated with non-criteria pollutants for which there are Project emissions and ambient air screening concentrations in Table 5-3 of US EPA 1980 guidance, (beryllium and lead) will be performed.

The US EPA screening guidance does not include any values for PM₁₀ or PM_{2.5}. As such, the highest predicted impacts from the Project used in the SIL analysis will be compared to the secondary NAAQS, which are summarized in **Table 6-2**, to demonstrate the Project will not have an adverse impact on soils and vegetation.

Additional since the project does not trigger PSD review for SO₂ and NO_x and has a net project decrease of those pollutants, a soil buffering capacity associated with acid deposition will not be performed.

Table 6-2. Secondary NAAQS Values

Pollutants	Secondary NAAQS (µg/m ³)
PM ₁₀	150 (24 hour)
PM _{2.5}	35 (24-hour) and 15 (annual)

6.5 Growth-Related Impacts

The growth analysis evaluates the impact associated with the project on the general commercial, residential, and industrial growth within the project vicinity. PSD requires an assessment of the secondary impacts from applicable projects. Negligible growth is expected to be associated with the Project, which only involves construction of new CCs, ADGTs, and associated ancillary equipment and infrastructure. Therefore, no analysis of secondary impacts from associated growth is needed for this project.

7. Submittal of Analysis Results

The findings of the air quality impact analyses will be submitted to PADEP in a formal report for review and approval. The report will address the following:

- Source Data: Source data required for evaluation of Project impacts will be provided. This will include criteria pollutant emission rates and stack exhaust parameters.
- Choice of Models: The chosen models, including version numbers and selected options, will be discussed.
- Receptor Data: A plot of the receptor grid used in the AERMOD analysis will be provided with the final application document.
- Meteorology: The meteorological conditions used in the analysis will be documented.
- Modeling Summary: Results of the modeling analyses for all operating scenarios will be documented and summarized.
- Compliance with NAAQS and PSD Increments: A demonstration of compliance with these standards will be presented and supported in the report in text, tabular, and/or graphical format.
- Additional impacts: The additional impacts analysis will consist of an analysis of visible plume impacts, a secondary growth analysis and an analysis on impacts of soils and vegetation.
- Model Output and Databases: The model input and output files will be provided via electronic submittal. Also, BPIP-Prime input and output files will be provided. The final modeling report will also include graphics (e.g., contour maps) that show the extent of the air quality impacts for the worst-case year for each pollutant and averaging period. The figures will utilize a base map that is readily understandable by the general public. Each map will clearly identify the proposed Project location relative to these air quality impacts.

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Appendix A : SCREEN3 Output and Supplemental Wind Analyses

SCREEN3 Output: Coal Stack

12/23/24

10:14:35

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

HOMERCITY POINT SOURCE COAL STACK

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 100.0000
STACK HEIGHT (M) = 243.8000
STK INSIDE DIAM (M) = 7.3200
STK EXIT VELOCITY (M/S) = 25.5100
STK GAS EXIT TEMP (K) = 351.7000
AMBIENT AIR TEMP (K) = 293.0000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 559.290 M**4/S**3; MOM. FLUX = 7262.371 M**4/S**2.

*** STABILITY CLASS 4 ONLY ***
*** ANEMOMETER HEIGHT WIND SPEED OF 3.00 M/S ONLY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	U10M STAB	MIX (M/S)	HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
5.	0.000	4	3.0	4.8	960.0	599.62	7.36 7.35	NO
100.	0.000	4	3.0	4.8	960.0	599.62	21.55 20.46	NO
200.	0.000	4	3.0	4.8	960.0	599.62	30.81 27.92	NO
300.	0.000	4	3.0	4.8	960.0	599.62	41.54 36.89	NO
400.	0.000	4	3.0	4.8	960.0	599.62	51.47 44.89	NO
500.	0.000	4	3.0	4.8	960.0	599.62	60.88 52.29	NO
600.	0.000	4	3.0	4.8	960.0	599.62	69.89 59.24	NO
700.	0.000	4	3.0	4.8	960.0	599.62	78.60 65.85	NO
800.	0.1066E-11	4	3.0	4.8	960.0	599.62	87.06 72.16	NO
900.	0.1558E-09	4	3.0	4.8	960.0	599.62	95.31 78.24	NO
1000.	0.7005E-08	4	3.0	4.8	960.0	599.62	103.38 84.12	NO
1100.	0.1249E-06	4	3.0	4.8	960.0	599.62	111.30 89.61	NO
1200.	0.1265E-05	4	3.0	4.8	960.0	599.62	119.08 94.94	NO
1300.	0.8408E-05	4	3.0	4.8	960.0	599.62	126.75 100.11	NO

1400.	0.4052E-04	4	3.0	4.8	960.0	599.62	134.30	105.16	NO
1500.	0.1440E-03	4	3.0	4.8	960.0	599.62	141.58	109.87	NO
1600.	0.1669E-03	4	3.0	4.8	960.0	599.62	145.79	110.55	NO
1700.	0.1933E-03	4	3.0	4.8	960.0	599.62	150.08	111.24	NO
1800.	0.2236E-03	4	3.0	4.8	960.0	599.62	154.46	111.94	NO
1900.	0.2584E-03	4	3.0	4.8	960.0	599.62	158.91	112.65	NO
2000.	0.2981E-03	4	3.0	4.8	960.0	599.62	163.42	113.36	NO
2100.	0.3434E-03	4	3.0	4.8	960.0	599.62	167.98	114.08	NO
2200.	0.3950E-03	4	3.0	4.8	960.0	599.62	172.60	114.80	NO
2300.	0.4536E-03	4	3.0	4.8	960.0	599.62	177.26	115.53	NO
2400.	0.5200E-03	4	3.0	4.8	960.0	599.62	181.96	116.26	NO
2500.	0.5950E-03	4	3.0	4.8	960.0	599.62	186.70	117.00	NO
2600.	0.6797E-03	4	3.0	4.8	960.0	599.62	191.46	117.74	NO
2700.	0.7751E-03	4	3.0	4.8	960.0	599.62	196.26	118.48	NO
2800.	0.8822E-03	4	3.0	4.8	960.0	599.62	201.08	119.23	NO
2900.	0.1002E-02	4	3.0	4.8	960.0	599.62	205.92	119.98	NO
3000.	0.1136E-02	4	3.0	4.8	960.0	599.62	210.78	120.73	NO
3500.	0.1980E-02	4	3.0	4.8	960.0	599.62	235.28	124.28	NO
4000.	0.3297E-02	4	3.0	4.8	960.0	599.62	260.01	127.83	NO
4500.	0.5262E-02	4	3.0	4.8	960.0	599.62	284.82	131.38	NO
5000.	0.8078E-02	4	3.0	4.8	960.0	599.62	309.64	134.91	NO
5500.	0.1196E-01	4	3.0	4.8	960.0	599.62	334.42	138.43	NO
6000.	0.1715E-01	4	3.0	4.8	960.0	599.62	359.13	141.92	NO
6500.	0.2387E-01	4	3.0	4.8	960.0	599.62	383.75	145.39	NO
7000.	0.3234E-01	4	3.0	4.8	960.0	599.62	408.27	148.84	NO
7500.	0.4276E-01	4	3.0	4.8	960.0	599.62	432.68	152.25	NO
8000.	0.5530E-01	4	3.0	4.8	960.0	599.62	456.98	155.64	NO
8500.	0.7011E-01	4	3.0	4.8	960.0	599.62	481.17	159.00	NO
9000.	0.8730E-01	4	3.0	4.8	960.0	599.62	505.24	162.33	NO
9500.	0.1069	4	3.0	4.8	960.0	599.62	529.19	165.63	NO
10000.	0.1290	4	3.0	4.8	960.0	599.62	553.04	168.90	NO
15000.	0.4272	4	3.0	4.8	960.0	599.62	785.82	197.80	NO
20000.	0.8089	4	3.0	4.8	960.0	599.62	1009.88	224.06	NO
25000.	1.168	4	3.0	4.8	960.0	599.62	1227.00	248.31	NO
30000.	1.457	4	3.0	4.8	960.0	599.62	1438.45	270.96	NO
40000.	1.741	4	3.0	4.8	960.0	599.62	1847.63	308.25	NO
50000.	1.844	4	3.0	4.8	960.0	599.62	2242.16	341.68	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 5. M:

54100.	1.855	4	3.0	4.8	960.0	599.62	2400.39	354.52	NO
--------	-------	---	-----	-----	-------	--------	---------	--------	----

DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
-----	-----	-----	-----

SIMPLE TERRAIN 1.855 54100. 0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

SCREEN3 Output: CC Stack

02/24/25

13:25:28

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

HOMERCITY POINT SOURCE COAL STACK WITHOUT BUILDING DOWNWASH

SIMPLE TERRAIN INPUTS:

SOURCE TYPE = POINT
EMISSION RATE (G/S) = 100.0000
STACK HEIGHT (M) = 57.9000
STK INSIDE DIAM (M) = 7.0100
STK EXIT VELOCITY (M/S) = 18.3800
STK GAS EXIT TEMP (K) = 350.8000
AMBIENT AIR TEMP (K) = 293.0000
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 0.0000
MIN HORIZ BLDG DIM (M) = 0.0000
MAX HORIZ BLDG DIM (M) = 0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 364.828 M**4/S**3; MOM. FLUX = 3466.371 M**4/S**2.

*** STABILITY CLASS 4 ONLY ***
*** ANEMOMETER HEIGHT WIND SPEED OF 3.00 M/S ONLY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
5.	0.000	4	3.0	3.9	960.0	399.53	6.46	6.45	NO
100.	0.000	4	3.0	3.9	960.0	399.53	19.80	18.62	NO
200.	0.000	4	3.0	3.9	960.0	399.53	32.57	29.85	NO
300.	0.000	4	3.0	3.9	960.0	399.53	43.78	39.40	NO
400.	0.2527E-11	4	3.0	3.9	960.0	399.53	54.14	47.92	NO
500.	0.1675E-07	4	3.0	3.9	960.0	399.53	63.91	55.79	NO
600.	0.3665E-05	4	3.0	3.9	960.0	399.53	73.26	63.19	NO
700.	0.1309E-03	4	3.0	3.9	960.0	399.53	82.28	70.20	NO
800.	0.1611E-02	4	3.0	3.9	960.0	399.53	91.03	76.92	NO
900.	0.1013E-01	4	3.0	3.9	960.0	399.53	99.56	83.37	NO
1000.	0.4069E-01	4	3.0	3.9	960.0	399.53	107.90	89.61	NO
1100.	0.1157	4	3.0	3.9	960.0	399.53	116.06	95.46	NO
1200.	0.2656	4	3.0	3.9	960.0	399.53	124.09	101.14	NO
1300.	0.4136	4	3.0	3.9	960.0	399.53	130.43	104.74	NO
1400.	0.4380	4	3.0	3.9	960.0	399.53	134.51	105.43	NO
1500.	0.4636	4	3.0	3.9	960.0	399.53	138.70	106.13	NO
1600.	0.4904	4	3.0	3.9	960.0	399.53	142.99	106.84	NO
1700.	0.5186	4	3.0	3.9	960.0	399.53	147.37	107.55	NO
1800.	0.5481	4	3.0	3.9	960.0	399.53	151.82	108.27	NO
1900.	0.5789	4	3.0	3.9	960.0	399.53	156.34	109.00	NO
2000.	0.6110	4	3.0	3.9	960.0	399.53	160.93	109.74	NO
2100.	0.6446	4	3.0	3.9	960.0	399.53	165.56	110.48	NO
2200.	0.6795	4	3.0	3.9	960.0	399.53	170.24	111.23	NO

2300.	0.7159	4	3.0	3.9	960.0	399.53	174.97	111.98	NO
2400.	0.7537	4	3.0	3.9	960.0	399.53	179.73	112.73	NO
2500.	0.7929	4	3.0	3.9	960.0	399.53	184.52	113.49	NO
2600.	0.8335	4	3.0	3.9	960.0	399.53	189.34	114.25	NO
2700.	0.8756	4	3.0	3.9	960.0	399.53	194.19	115.02	NO
2800.	0.9190	4	3.0	3.9	960.0	399.53	199.06	115.79	NO
2900.	0.9639	4	3.0	3.9	960.0	399.53	203.95	116.56	NO
3000.	1.010	4	3.0	3.9	960.0	399.53	208.85	117.33	NO
3500.	1.236	4	3.0	3.9	960.0	399.53	233.56	120.98	NO
4000.	1.485	4	3.0	3.9	960.0	399.53	258.45	124.63	NO
4500.	1.754	4	3.0	3.9	960.0	399.53	283.40	128.27	NO
5000.	2.038	4	3.0	3.9	960.0	399.53	308.33	131.88	NO
5500.	2.335	4	3.0	3.9	960.0	399.53	333.21	135.48	NO
6000.	2.640	4	3.0	3.9	960.0	399.53	358.00	139.05	NO
6500.	2.948	4	3.0	3.9	960.0	399.53	382.70	142.59	NO
7000.	3.258	4	3.0	3.9	960.0	399.53	407.28	146.10	NO
7500.	3.565	4	3.0	3.9	960.0	399.53	431.75	149.58	NO
8000.	3.866	4	3.0	3.9	960.0	399.53	456.10	153.02	NO
8500.	4.161	4	3.0	3.9	960.0	399.53	480.33	156.44	NO
9000.	4.445	4	3.0	3.9	960.0	399.53	504.44	159.82	NO
9500.	4.719	4	3.0	3.9	960.0	399.53	528.43	163.18	NO
10000.	4.981	4	3.0	3.9	960.0	399.53	552.31	166.50	NO
15000.	6.607	4	3.0	3.9	960.0	399.53	785.31	195.75	NO
20000.	7.222	4	3.0	3.9	960.0	399.53	1009.48	222.25	NO
25000.	7.258	4	3.0	3.9	960.0	399.53	1226.67	246.68	NO
30000.	7.009	4	3.0	3.9	960.0	399.53	1438.17	269.46	NO
40000.	6.163	4	3.0	3.9	960.0	399.53	1847.41	306.93	NO
50000.	5.366	4	3.0	3.9	960.0	399.53	2241.98	340.50	NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 5. M:
22811. 7.291 4 3.0 3.9 960.0 399.53 1132.39 236.21 NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, $X < 3 \times LB$

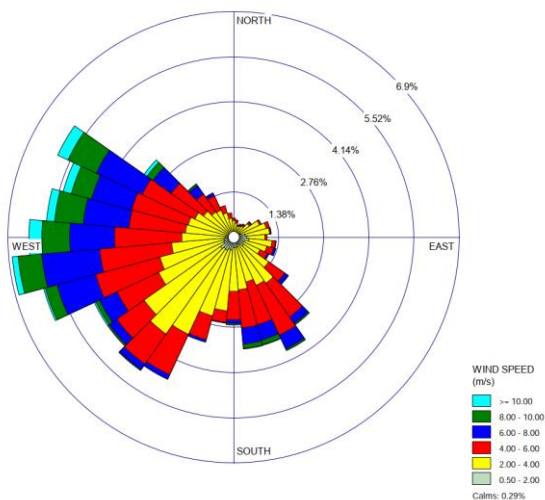
*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	7.291	22811.	0.

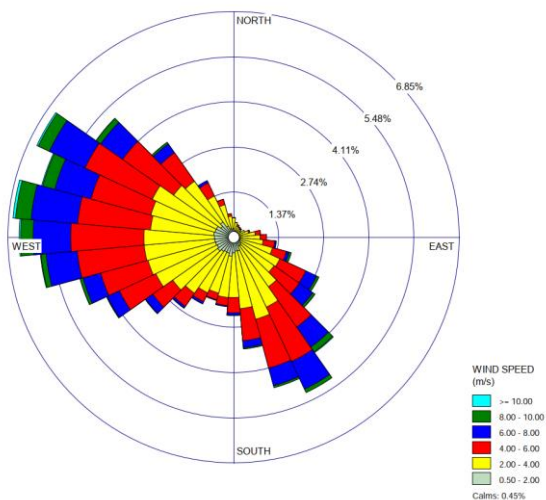
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

Annual Wind Roses – 2019–2021 (All Observations – Surface Level)

KJST ASOS (7.9 m)

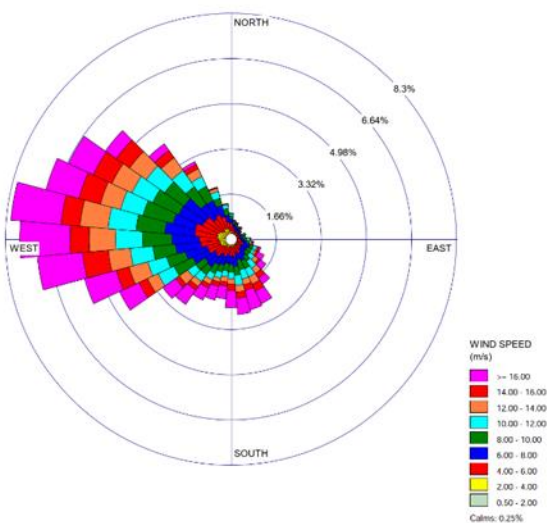


KJST WRF (10 m)

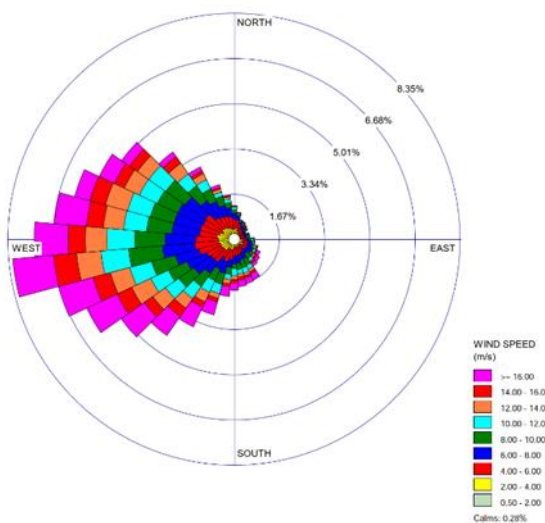


Annual Wind Roses – 2019–2021 (All Observations – KJST WRF and Homer City WRF – CC Stack Plume Level)

KJST WRF (450 m)

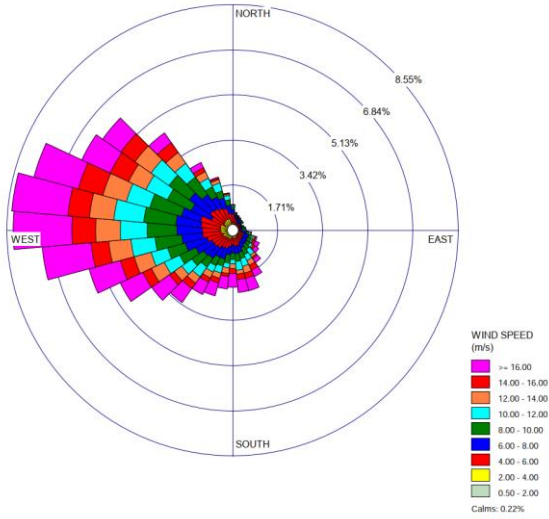


Homer City WRF (750 m)

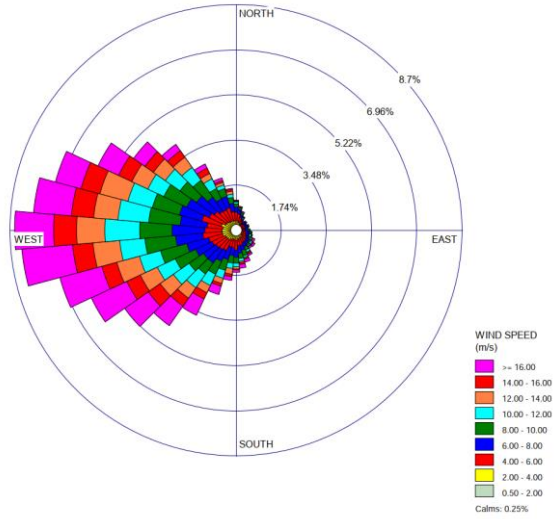


Annual Wind Roses – 2019-2021 (All Observations – KJST WRF and Homer City WRF – Coal Stack Plume Level)

KJST WRF (600 m)

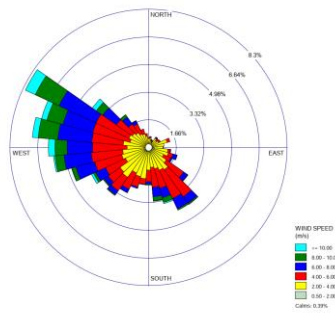


Homer City WRF (1000 m)

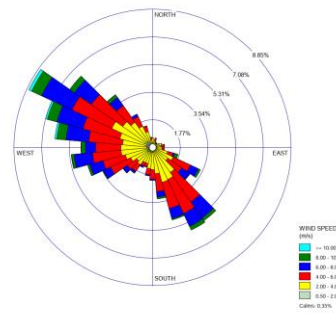


Seasonal Wind Roses 2019–2021 (Surface Level)

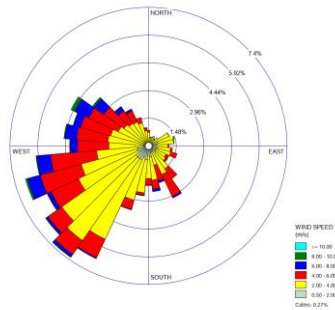
KJST ASOS (7.9 m) Spring



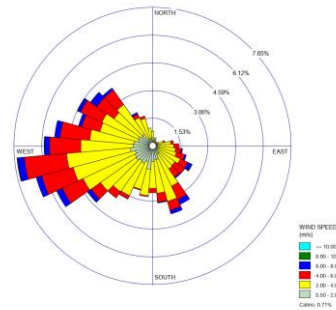
KJST WRF (10 m) Spring



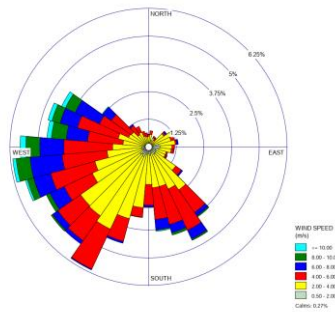
KJST ASOS (7.9 m) Summer



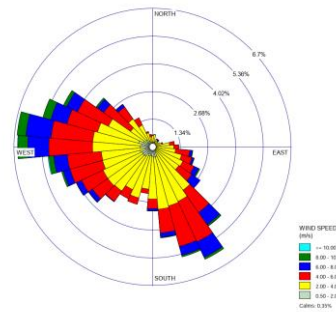
KJST WRF (10 m) Summer



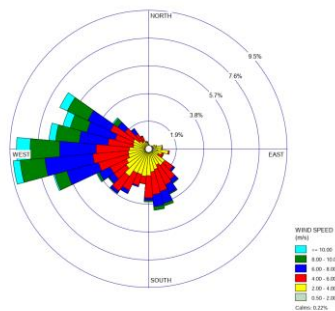
KJST ASOS (7.9 m) Autumn



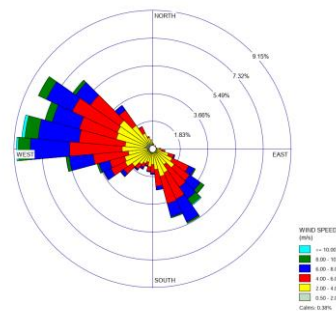
KJST WRF (10 m) Autumn



KJST ASOS (7.9 m) Winter

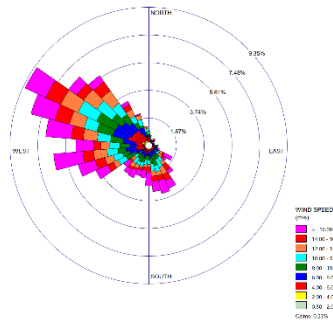


KJST WRF (10 m) Winter

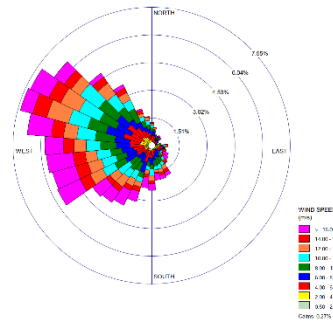


2019–2021 (Seasonal Breakdown – GE Stack Plume Level)

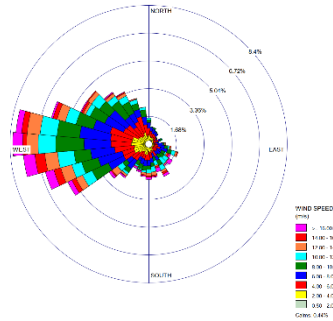
KJST (450 m) Spring



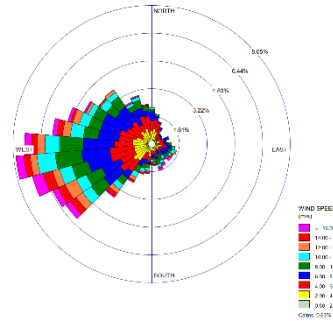
Homer City (750 m) Spring



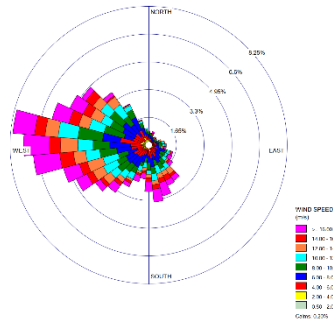
KJST (450 m) Summer



Homer City (750 m) Summer

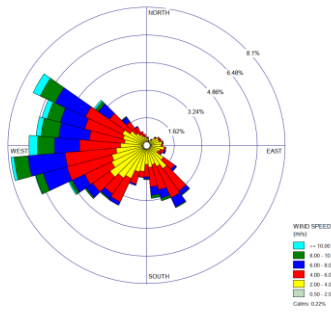


KJST (450 m) Autumn

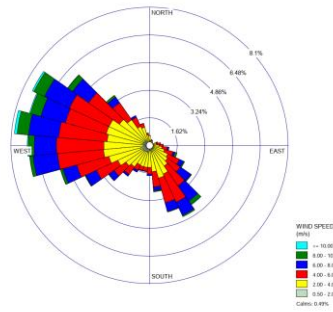


Day (7am-7pm) vs. Night (7pm-7am) Wind Roses 2019–2021

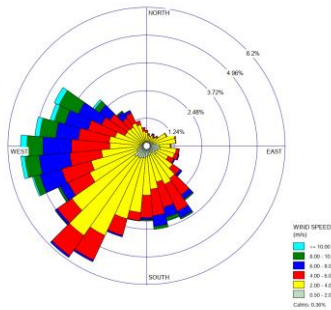
KJST ASOS (7.9 m) Day



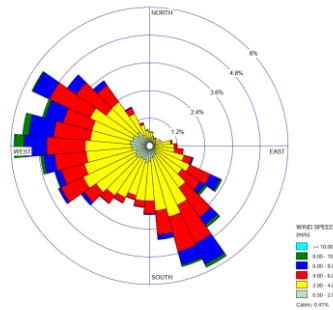
KJST MMIF (10 m) Day



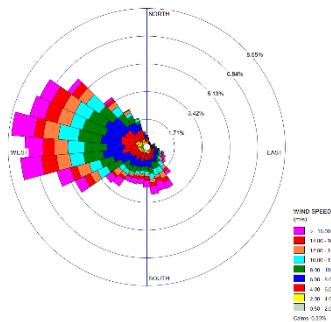
KJST ASOS (7.9 m) Night



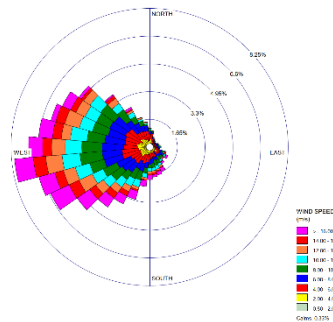
KJST MMIF (10 m) Night



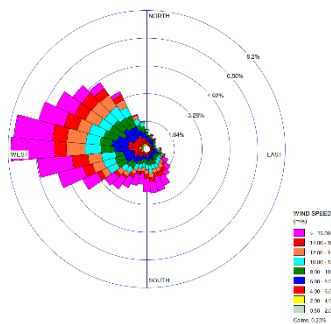
KJST (450 m) Day



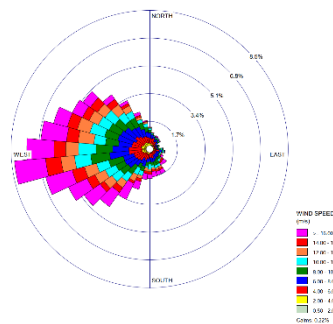
Homer City (750 m) Day



KJST (450 m) Night



Homer City (750 m) Night



Statistical Comparison of Observed KJST (ASOS) to KJST (WRF) for Near Surface – Spring (March – May)

Variable	Mean of KJST ASOS	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	4.77	4.39	-0.3823	-0.0835	1.4183	0.6316
Temp (°C)	281.96	282.18	0.2114	0.0007	1.9556	0.9339
Pressure (mb)	935.20	947.85	12.6540	0.0134	12.6729	0.9885
Relative Humidity (%)	64.12	71.70	7.5802	0.1116	15.2011	0.6779
Heat Flux	23.64	51.03	27.3886	0.7336	94.9723	0.5544
Surface Friction Velocity (m/s)	0.38	0.61	0.2319	0.4699	0.3086	0.6392

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Observed KJST (ASOS) to KJST (WRF) for Near Surface – Summer (June - August)

Variable	Mean of KJST ASOS	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	3.47	3.08	-0.3898	-0.1192	1.0683	0.5851
Temp (°C)	293.82	293.94	0.1129	0.0004	1.5478	0.8604
Pressure (mb)	936.76	948.63	11.8702	0.0126	11.8858	0.9760
Relative Humidity (%)	69.48	79.85	10.3692	0.1389	14.5425	0.6795
Heat Flux	36.22	35.49	-0.7314	-0.0204	58.2881	0.5741
Surface Friction Velocity (m/s)	0.30	0.43	0.1208	0.3313	0.2049	0.6202

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Observed KJST (ASOS) to KJST (WRF) for Near Surface – Autumn (September - November)

Variable	Mean of KJST ASOS	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	4.11	3.80	-0.3138	-0.0793	1.1572	0.6743
Temp (°C)	284.41	284.38	-0.0300	-0.0001	1.5783	0.9542
Pressure (mb)	937.34	949.64	12.2979	0.0130	12.3210	0.9825
Relative Humidity (%)	69.16	78.54	9.3833	0.1271	14.5031	0.6345
Heat Flux	13.21	19.06	5.8586	0.3631	54.4300	0.5327
Surface Friction Velocity (m/s)	0.33	0.51	0.1868	0.4432	0.2567	0.6555

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Observed KJST (ASOS) to KJST (WRF) for Near Surface – Winter (December - February)

Variable	Mean of KJST ASOS	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	5.09	4.54	-0.5512	-0.1144	1.5276	0.6517
Temp (°C)	272.40	272.44	0.0389	0.0001	1.6657	0.9219
Pressure (mb)	934.31	947.41	13.1006	0.0139	13.1119	0.9921
Relative Humidity (%)	72.75	83.89	11.1452	0.1423	15.6005	0.5501
Heat Flux	-14.29	7.33	21.6128	-6.2128	58.0355	0.3635
Surface Friction Velocity (m/s)	0.36	0.62	0.2582	0.5246	0.3197	0.6271

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Homer City (WRF) at KJST (WRF) at CC Plume Height – Spring (March – May)

Variable	Mean of Homer City WRF	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	11.05	10.43	-0.6140	-0.0572	2.1804	0.8669
Temp (°C)	6.68	6.07	-0.6030	-0.0946	1.2831	0.9787

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Homer City (WRF) at KJST (WRF) at CC Plume Height – Summer (June - August)

Variable	Mean of Homer City WRF	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	7.55	7.11	-0.4394	-0.0599	1.5534	0.8728
Temp (°C)	18.56	17.72	-0.8422	-0.0464	1.1016	0.9514

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Homer City (WRF) at KJST (WRF) at CC Plume Height – Autumn (September - November)

Variable	Mean of Homer City WRF	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R ² (unitless)
Wind Speed (m/s)	10.07	9.54	-0.5382	-0.0549	2.0339	0.8680
Temp (°C)	9.54	9.01	-0.5250	-0.0566	1.1844	0.9797

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

Statistical Comparison of Homer City (WRF) at KJST (WRF) at CC Plume Height – Winter (December - February)

Variable	Mean of Homer City WRF	Mean of KJST WRF	Mean Bias	Fb (unitless)	RMSE	R² (unitless)
Wind Speed (m/s)	12.83	12.04	-0.7916	-0.0637	2.4260	0.8621
Temp (°C)	-2.33	-2.75	-0.4158	0.1636	1.3455	0.9667

Notes: ASOS = Johnstown Airport ASOS; WRF = closest node to Johnstown Airport; Fb = fractional bias; RMSE = root mean square error

