

Air Dispersion Modeling Protocol Montour CT Project LLC

Submitted to the Pennsylvania Department of Environmental Protection

Project number: 60756454

May 26, 2026

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Montour CT Project LLC / Montour CCCT Project

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1. Introduction

1.1 Project Overview

Montour CT Project LLC (“Montour CT”) is proposing to construct and operate a new electric generating station located in Derry Township, Montour County, Pennsylvania. Montour CT Project LLC is a separate entity from Montour LLC which operates the existing Montour Steam Electric Station (“Montour SES”). Montour SES currently operates under Pennsylvania Department of Environmental Protection (PADEP) Bureau of Air Quality Title V Operating Permit No. 47-00001, issued to Montour, LLC on April 23, 2025. Montour SES recently converted from coal-firing to natural gas firing. The Montour CT and Montour SES facilities will be aggregated for purposes of major source applicability determinations as the facilities are located on contiguous properties, will operate under the same SIC code (4911 – Electric Services), and are under common control through common ownership and shared staffing. Even though Montour CT and Montour SES are aggregated, a separate Title V air permit is requested for Montour CT. This application includes emissions from both Montour CT and Montour SES in applicability evaluations.

Montour CT is proposing to install and operate two new identical (~655 MW) combined cycle combustion turbine trains (herein labeled as the CCCT Project), each of which consists of a natural gas fired combined cycle combustion turbine (CCCT) with a generator and a heat recovery steam generator (HRSG) with a dedicated steam turbine generator. Each HRSG has natural gas duct burners, oxidation catalyst, and Selective Catalytic Reduction (SCR). Cooling for condensing the steam in the HRSGs will be done using air-cooled condensers to reduce water demand. Natural gas for the project will be provided by the existing natural gas pipeline brought to the Montour SES property. The proposed turbines will be located within the existing facility property, which will allow for considerable utilization of existing site infrastructure including transmission connectivity. Montour CT is evaluating various models of CTs¹, but to be conservative and to submit the plan approval application, Montour has based all air emissions on the largest and most conservative emissions model, the GE 7HA.02 CT. If a different CT is selected, emissions and impacts will be less.

Montour SES is an existing major source under Title V and New Source Review (NSR). Thus, any new sources affecting air emissions at the site must be evaluated as aggregated sources in order to determine if Prevention of Significant Deterioration (PSD) or non-attainment New Source Review (NNSR) requirements are triggered. This project is defined as a major modification to an existing major stationary source and is subject to the NSR permitting program.

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 CCCT 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 1 contains the CCCT Project description, including information regarding project equipment, location, and the expected air emissions.
- Section 3 is a discussion of applicable air regulations.

¹ Should the turbine model change after the application is submitted, a revised application and modeling analysis will be provided.

- Section 1 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. Proposed CCCT Project

2.1 CCCT Project Location

The project is located in Montour County, approximately 2 kilometers (1.2 miles) northeast of the town of Washingtonville, 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 approximate size of the proposed Project footprint is shown in **Figure 2-3**.

2.2 CCCT Project Emission Sources

As stated in **Section 1**, Montour CT will install two (2) identical CCCTs. The CCCTs are proposed to be General Electric (GE) 7HA.02 units and are the primary sources of air emissions associated with the proposed project. Air cooled condensers will be used in place of cooling towers. Montour CT anticipates using the existing diesel generators and fire water pumps and no new ancillary sources will emit air emissions.

2.3 Source Data

2.3.1 Criteria Pollutant Emissions

The CCCT 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**, Montour SES has recently converted from coal to natural gas; therefore, Montour CT will use emission offsets associated with that project to net out of PSD review for sulfur dioxide (SO₂). As such, the CCCT Project will be subject to PSD requirements under the NSR program for emissions of carbon monoxide (CO), nitrogen oxides (NO_x), particulate matter (PM), PM with a diameter of 10 micrometers or less (PM₁₀), PM with a diameter of 2.5 micrometers or less (PM_{2.5}), volatile organic compounds (VOC), sulfuric acid mist (SAM, or H₂SO₄), and greenhouse gas (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** shows a comparison of the project emission increases relative to the PSD SERs. **Table 2-2** shows a comparison of the applicable Project emission increases to the NAA-NSR thresholds. As indicated in **Table 2-1**, the project is expected to be a major modification and subject to PSD review for CO, NO_x, PM₁₀, PM_{2.5}, H₂SO₄, and GHG. **Table 2-2** indicates the project triggers NAA-NSR for VOC.

Table 2-1. Preliminary Net Emission Increases Compared to PSD Significant Emission Rates

	PM ₁₀	PM _{2.5}	NO _x	CO	SO ₂	H ₂ SO ₄	Lead	CO _{2e}
Preliminary Net Emissions Increase (tons/yr)	212.23	212.23	293.14	271.37	-1,979.62	40.39	0.12	4,735,365
PSD Significance Emission Rate (tons/yr)	15	10	40	100	40	7	0.6	75,000
PSD Review Triggered?	Yes	Yes	Yes	Yes	No	Yes	No	Yes

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

	NO _x	VOC
Preliminary Net Emissions Increase (tons/yr)	293.14	80.4
NAA-NSR Significance Emission Rate (tons/yr)	100	50
NAA-NSR LAER Review Triggered?	Yes	Yes

2.3.2 Short Term Emission Rates

Table 2-3 lists the expected maximum hourly emission rates of criteria pollutants for type of turbine operation. The data shown below reflects the maximum hourly emissions for each individual turbine over a range of operating loads and ambient operating conditions.

Table 2-3. Preliminary Maximum Hourly Emission Rates of Criteria Pollutants from Each CCCT

Pollutant	Normal Operations Maximum Hourly Emission Rates (lb/hr) ^(1,2)	Start-up/Shutdown Maximum Hourly Emission Rates (lb/hr) ^(1,2,3)
PM ₁₀	24.1	12.2
PM _{2.5}	24.1	12.2
NO ₂	33.2	171.4
CO	20.2	711.4

- (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.
- (3) Cold Start-Up duration is 70 minutes, scaled lb/event emission rate by 60/70 for maximum hourly rate.

Figure 2-1. Project Location

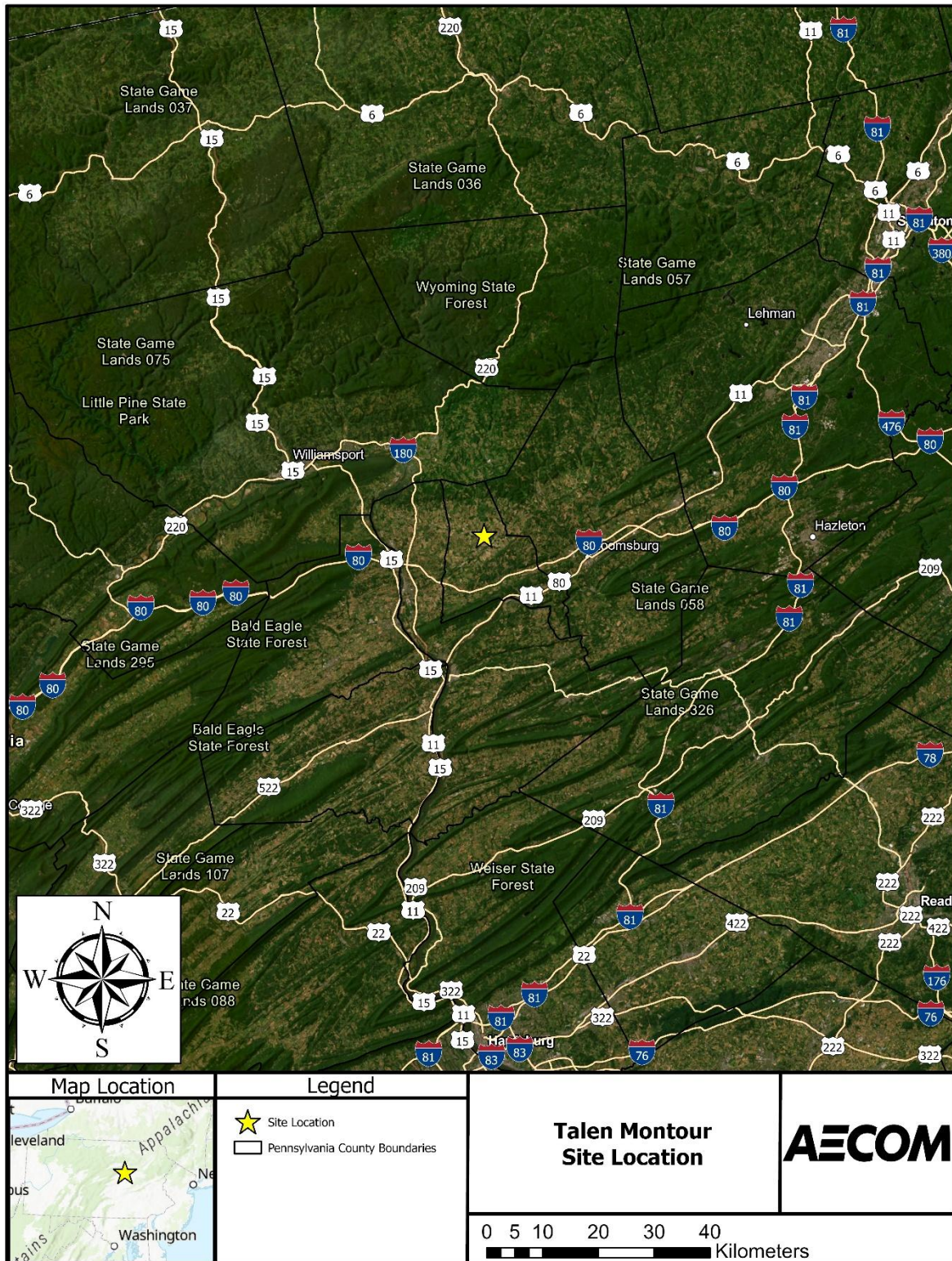
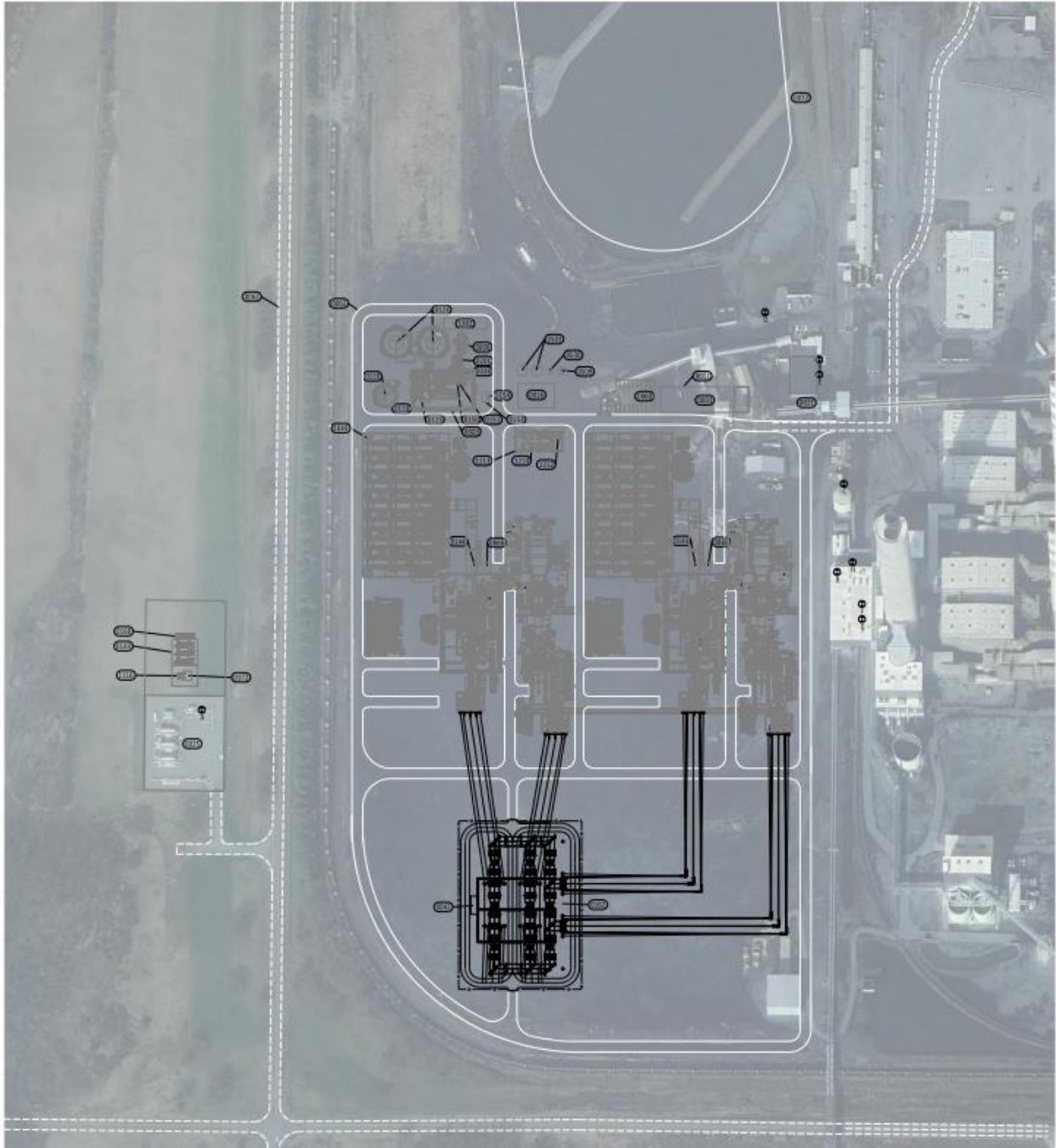


Figure 2-2. Aerial View of Project Site



Figure 2-3. Project Layout



3. Applicable Requirements

3.1 Federal Air Quality Standards

The Clean Air Act of 1970 required the U.S. EPA to establish ambient concentration thresholds for certain compounds based upon the identifiable effects that the compounds may have on public health and welfare. Subsequently, the U.S. EPA promulgated regulations that set NAAQS for several criteria compounds applicable to this Project: particulate matter (PM₁₀ and PM_{2.5}), Nitrogen Dioxide (NO₂), and Carbon Monoxide (CO). Two classes of ambient air quality standards have been established: (1) primary standards defining levels of air quality that the U.S. 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 proposed CCCT 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 µg/m ³	150 µg/m ³
PM _{2.5}	24-hour ⁽²⁾	35 µg/m ³	35 µg/m ³
	Annual ⁽³⁾	9 µg/m ³	15 µg/m ³
NO ₂	1-hour ⁽⁴⁾	100 ppb	--
	Annual ⁽⁵⁾	53 ppb	53ppb
CO	1-hour ⁽⁶⁾	35 ppm	--
	8-hour ⁽⁶⁾	9 ppm	--

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.
4. Annual 98th percentile (8th High) of 1-hour daily maximum concentrations, averaged over 3 years.
5. Annual Mean.
6. Not to be exceeded more than once per year.

Source: U.S. 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 U.S. 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 Montour County for each NAAQS for which the CCCT Project is subject to PSD permitting.

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

Compound	Attainment Status ⁽¹⁾
PM ₁₀	Unclassifiable/Attainment
PM _{2.5}	Unclassifiable/Attainment
NO ₂	Unclassifiable/Attainment
CO	Unclassifiable/Attainment

40 CFR §81.301 and U.S. 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 annual NO₂. It is assumed the proposed CCCT Project will be subject to a PSD increment consumption analysis for NO₂ and PM_{2.5}.

U.S. 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. U.S. 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. U.S. EPA recently updated the Class I and II SILs for PM_{2.5} (U.S. 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 CCCT Project is subject to PSD permitting.

Table 3-3. PSD Increments and Significant Impact Levels

Pollutant	Averaging Period	PSD Increments ($\mu\text{g}/\text{m}^3$)		Significant Impact Levels ($\mu\text{g}/\text{m}^3$)	
		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
NO ₂	1-hour	--	--	--	7.5
	Annual ⁽¹⁾	2.5	25	0.1	1
CO	1-hour ⁽²⁾	--	--	--	2000
	8-hour ⁽²⁾	--	--	--	500

1. Not to be exceeded (PSD Increment).

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

Source: U.S. 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 U.S. EPA's Guideline on Air Quality Models (GAQM), which is contained in 40 CFR Part 51, Appendix W (U.S. EPA, 2024a).

Based on preliminary understanding of the CCCT Project emission sources, the proposed project is expected to be subject to PSD review for NO_x, CO, PM₁₀, PM_{2.5}, H₂SO₄, and GHG. The project will also be subject to NAA-NSR for NO_x and VOC as ozone precursors. Therefore, associated dispersion modeling analyses will be conducted for CO, NO_x, 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 Configuration

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)

A summary of the exhaust data and emission rates for each ambient temperature and operating scenario for each GE 7HA.02 is provided in **Table 4-1**. 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 will be selected. **Table 4-2** summarize the worst-case emission parameters for the CCCTs. This data will be used to perform a load analysis for the turbines 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 are not the worst-case load, both the baseload and worst-case load will be included in the SIL and 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}	NO ₂	CO
Base Load 100% + DB	-20°F,	225	22	169.9	75.29	24.1	24.1	33.0	20.1
Base Load 100% + DB	20°F,	225	22	170.5	76.08	23.7	23.7	33.2	20.2
Base Load 100% + DB	52°F,	225	22	172.0	74.54	23.2	23.2	32.6	19.8
Base Load 100% + DB	59°F,	225	22	171.6	73.76	23.0	23.0	32.2	19.6
Base Load 100% + DB	70°F,	225	22	172.2	73.64	22.9	22.9	31.9	19.4
Base Load 100% + DB	70°F,	225	22	172.4	73.80	22.9	22.9	32.1	19.6
Base Load 100% + DB	90°F,	225	22	170.1	70.90	22.2	22.2	30.4	18.5
Base Load 100% + DB	90°F,	225	22	172.2	73.47	22.8	22.8	31.8	19.4
Base Load 100% + DB	105°F,	225	22	166.5	65.78	21.1	21.1	28.2	17.2
Base Load 100% + DB	105°F,	225	22	172.3	73.55	22.8	22.8	31.8	19.3
Base Load 100%	-20°F,	225	22	172.9	58.05	12.1	12.1	25.5	15.5
Base Load 100%	20°F,	225	22	171.8	75.29	12.2	12.2	25.9	15.8
Base Load 100%	52°F,	225	22	174.8	73.96	12.2	12.2	25.6	15.6
Base Load 100%	59°F,	225	22	174.6	73.21	12.1	12.1	25.3	15.4
Base Load 100%	70°F,	225	22	177.1	73.32	12.1	12.1	25.1	15.3
Base Load 100%	70°F,	225	22	177.2	73.45	12.1	12.1	25.3	15.4
Base Load 100%	90°F,	225	22	177.6	70.89	11.9	11.9	23.9	14.6
Base Load 100%	90°F,	225	22	179.6	73.42	12.1	12.1	25.0	15.2
Base Load 100%	105°F,	225	22	175.3	65.91	11.4	11.4	22.2	13.5
Base Load 100%	105°F,	225	22	180.4	73.59	12.1	12.1	25.0	15.2
Intermediate Load 75%	-20°F,	225	22	169.2	59.63	11.3	11.3	20.3	12.3
Intermediate Load 75%	20°F,	225	22	168.2	59.35	11.3	11.3	20.3	12.4
Intermediate Load 75%	52°F,	225	22	168.7	58.05	11.3	11.3	20.0	12.2
Intermediate Load 75%	59°F,	225	22	168.5	57.50	11.3	11.3	19.9	12.1
Intermediate Load 75%	70°F,	225	22	170.9	57.39	11.2	11.2	19.6	11.9
Intermediate Load 75%	90°F,	225	22	172.5	56.27	11.1	11.1	18.7	11.4
Intermediate Load 75%	105°F,	225	22	172.4	54.06	10.9	10.9	17.5	10.7
MECL 45%	-20°F,	225	22	163.8	44.91	10.4	10.4	14.7	8.9
MECL 30%	20°F,	225	22	162.8	38.37	9.9	9.9	11.6	7.0
MECL 30%	52°F,	225	22	162.3	37.74	9.9	9.9	11.3	6.9
MECL 30%	59°F,	225	22	162.6	37.50	9.9	9.9	11.2	6.8
MECL 30%	70°F,	225	22	164.9	37.44	9.9	9.9	11.0	6.7
MECL 30%	90°F,	225	22	166.7	37.34	9.8	9.8	10.7	6.5
MECL 30%	105°F,	225	22	167.3	38.22	9.8	9.8	11.0	6.7
Cold Start-Up ⁽³⁾	N/A	225	22	162.3	75.29	12.2	12.2	171.4	711.4

Note: Data are provided per CCCT 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.

(3) Cold Start-Up duration is 70 minutes, scaled lb/event emission rate by 60/70 for maximum hourly rate

Table 4-2. GE 7HA.02 Composite Worst-Case Data⁽¹⁾ Modeling Inputs

Parameter				
Load (%)	Base Load (100%) + DB	Base Load (100%)	Intermediate Load (75%)	Cold-Start-Up ¹
Stack Height (ft)	225.0	225.0	225.0	225.0
Stack Diameter (ft)	22.0	22.0	22.0	22.0
Exit Temperature (°F)	166.5	171.8	168.2	162.3
Exit Velocity (ft/sec)	65.8	65.9	54.1	37.3
Pollutant Emissions Per Unit (lb/hr)	PM ₁₀	24.10	19.00	14.90
	PM _{2.5}	24.10	19.00	14.90
	NO ₂	33.20	25.90	20.30
	CO	20.20	15.80	12.40

¹ The controlling scenario (i.e., lowest temperature and velocity) for MECL and cold-start-up are identical. Therefore, it is conservative to only evaluate cold-start-up as the emission rate would be higher.

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 U.S. EPA GAQM prescribes a set of approved models for regulatory applications for a wide range of source types and dispersion environments. AERMOD is U.S. 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) (U.S. EPA, 2024c) will be used to assess air quality impacts for the proposed CCCT Project. AERMOD will be used to assess air quality impacts of NO₂, CO, PM₁₀, and PM_{2.5} at receptors located within 50 km of the CCCT 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

U.S. 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* (U.S. 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 U.S. EPA’s ambient impact criteria.

A GEP stack height analysis will be performed for all point sources included in the modeling in accordance with U.S. EPA’s guidelines (U.S. 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.

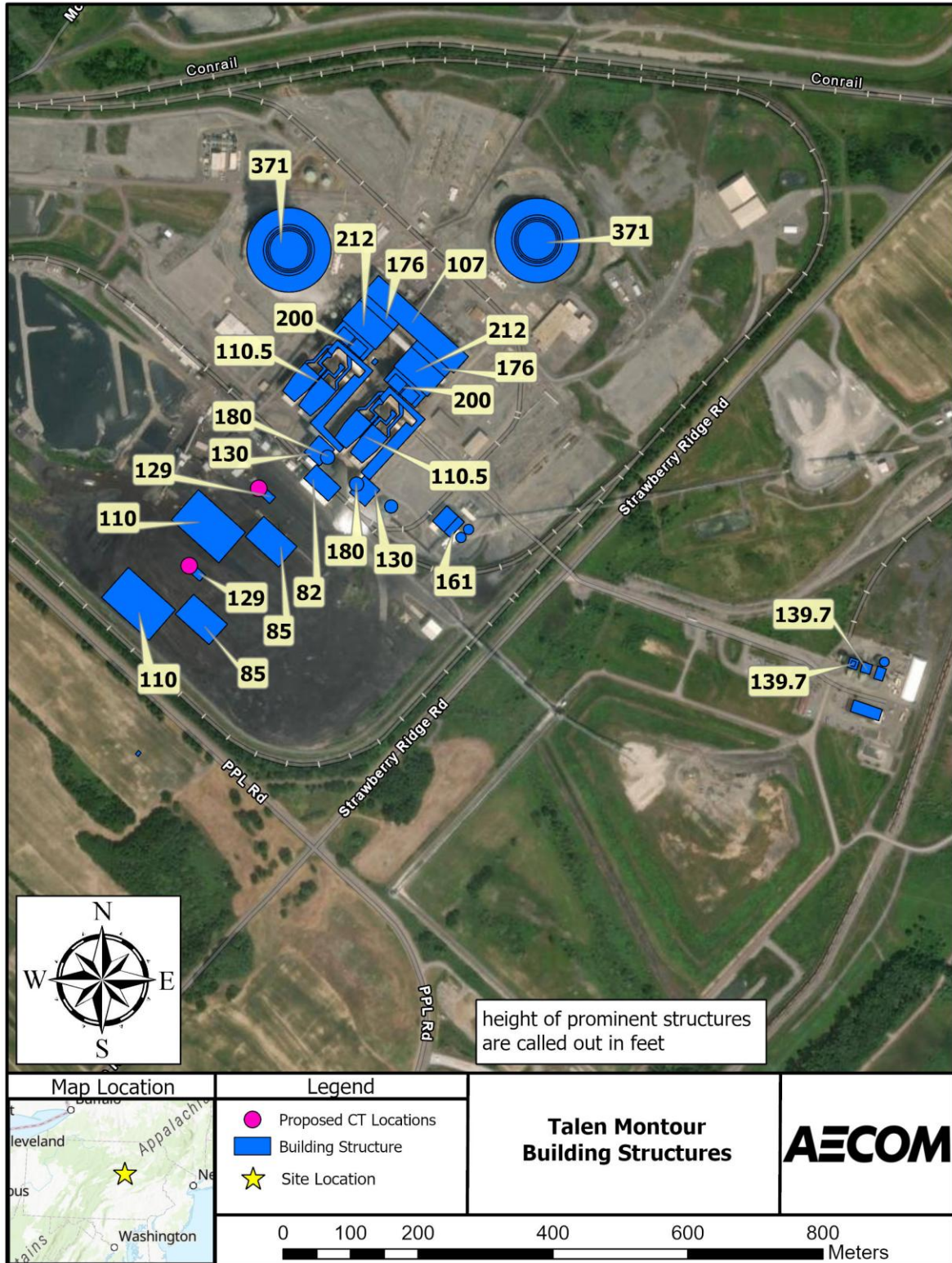
For a squat structure (*i.e.*, height less than projected width), the formula reduces to:

$$H_{GEP} = 2.5H$$

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. Where a stack is not influenced by nearby structures, the maximum GEP stack height is limited to 65 meters (m).

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. All building structures included in the modeling are shown in **Figure 4-1**.

Figure 4-1. Building Structures Included in the Modeling



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 U.S. EPA modeling guidelines (U.S. EPA, 2024a), if more than 50 percent of an area within a 3-km radius of the proposed CCCT 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 U.S. EPA (U.S. EPA, 2024a), urban land use types are classified as categories I1, I2, C1, R2, and R3. **Table 4-3** describes these categories and maps them to reasonably equivalent United States Geological Survey (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 2024 (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 2024. **Figure 4-2** displays the 2024 NLCD data superimposed over aerial imagery within 3 km of the Plant.

The NLCD data were processed with U.S. 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 are assumed to be NLCD categories 23 and 24: “Developed, Medium Intensity” and “Developed, High Intensity”, respectively. The pixel count for these categories was 7.21% of the total pixel count for all categories. Thus, the overwhelming majority (>90%) of the 3 km area around Montour can be classified as rural land use and AERMOD will not be applied with any urban source options. **Table 4-4** provides the pixel counts as reported in the AERSURFACE output along with respective percentages.

Table 4-3. Comparison of Auer and NLCD Land Use Categories

Type	Auer Urban Land Use Categories ⁽¹⁾		USGS NLCD Categories ⁽²⁾	
	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⁾ U.S. EPA, 2024a.

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

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

Table 4-4. AERSURFACE Surface Roughness Output

USGS NLCD Category	Description	Pixel counts	Percent of Total Pixels
0	Missing, Out-of-Bounds, or Undetermined	0	0%
11	Open Water	167	0.53%
12	Perennial Ice/Snow	0	0%
21	Developed, Open Space	1492	4.75%
22	Developed, Low Intensity	2954	9.41%
23	Developed, Medium Intensity	1569	5.00%
24	Developed, High Intensity	701	2.23%
31	Barren Land (Rock/Sand/Clay)	7	0.02%
32	Unconsolidated Shore	0	0%
41	Deciduous Forest	3834	12.21%
42	Evergreen Forest	1	0%
43	Mixed Forest	63	0.20%
51	Dwarf Scrub	0	0%
52	Shrub/Scrub	126	0.40%
71	Grasslands/Herbaceous	11	0.04%
72	Sedge/Herbaceous	0	0%
73	Lichens	0	0%
74	Moss	0	0%
81	Pasture/Hay	3691	11.75%
82	Cultivated Crops	16279	51.84%
90	Woody Wetlands	484	1.54%
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	23	0.07%
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		31402	

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

Source: AERSURFACE (U.S. EPA, 2024d)

4.5.2 Terrain

U.S. 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 4-3 provides a topographic map of the area in the vicinity of the CCCT Project site. The area near Montour is characterized as consisting of all terrain types relative to the modeled stacks.

Figure 4-2. NLCD Land Use (2024)

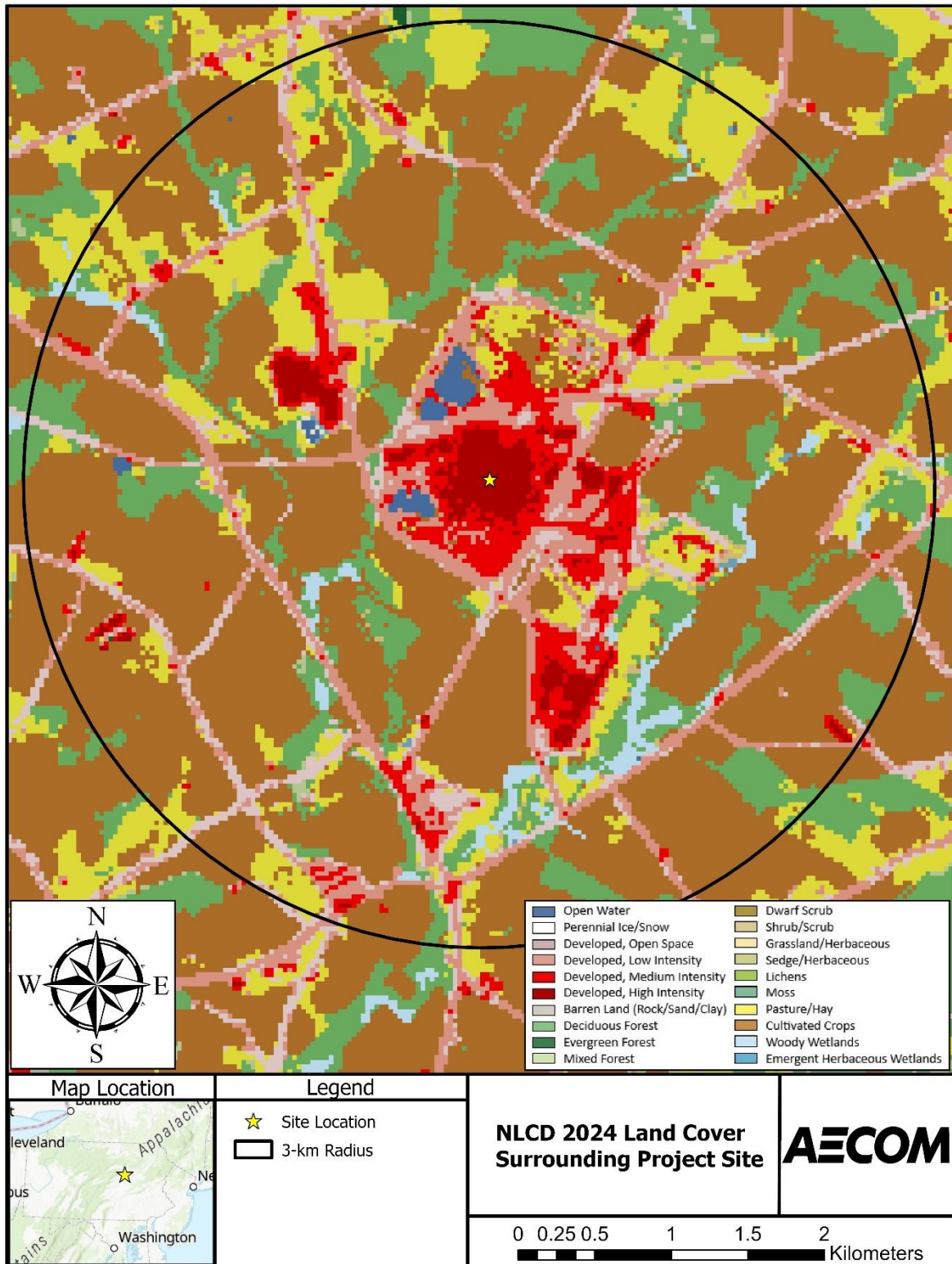
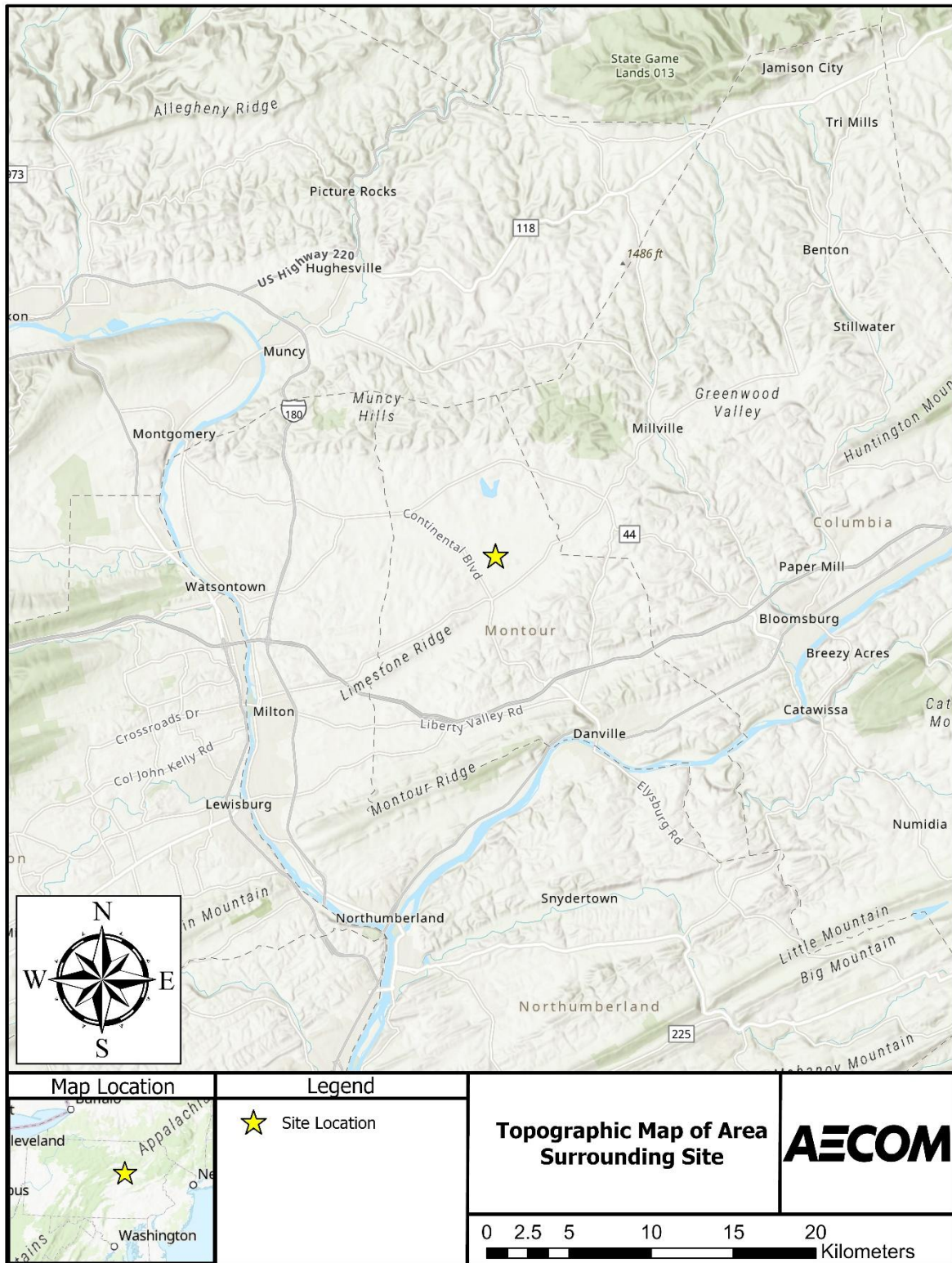


Figure 4-3. Topographic Map of CCCT Project Area



4.6 Meteorological Data

Montour CT is proposing to use five years (2020–2024) of near-surface meteorological data from the Selinsgrove Penn Valley Airport (Selinsgrove Airport) along with upper-level data from Pittsburgh International Airport for this modeling demonstration. The meteorological data from Selinsgrove Airport will be processed using AERMET version 24142 and regulatory default options. The PROFBASE keyword in AERMOD, representing the base elevation of the surface dataset will be set to 135.3 meters (NCEI, 2025). This is consistent with historical modeling conducted by PADEP and U.S. EPA using the Selinsgrove Airport meteorological station.

4.6.1 Review of Available Meteorological Data

Previous U.S. EPA-accepted air dispersion modeling (EPA, 2017) used meteorological data from the National Weather Service’s Automated Surface Observing Station (ASOS) at the Penn Valley/Selinsgrove Airport (Selinsgrove). As part of this acceptance, U.S. EPA concluded that the most representative meteorological site is Selinsgrove (paired with upper-air data from Pittsburgh) for dispersion modeling at Montour. Selinsgrove is located approximately 32 km southwest of the CCCT Project and is the closest meteorological site. A search of other available meteorological stations, within 100 km of the Montour, was conducted to determine if Selinsgrove would still be the most representative for this dispersion modeling demonstration. This search found two additional ASOS sites; (1) the Williamsport Regional Airport (Williamsport) located approximately 28 km northwest of Montour and (2) the Wilkes-Barre Scranton International Airport (Wilkes-Barre) located approximately 85 km northeast of Montour. **Figure 4-4** shows the relative location of the meteorological stations relative to the CCCT Project.

Five-years of recent (2020 – 2024) meteorological data is available from all three (3) ASOS sites. **Figure 4-5(a-c)** show the wind roses during this 5-year period for Selinsgrove (a), Wilkes-Barre (b), and Williamsport (c). All three (3) sites yield rather different wind patterns. Both Wilkes-Barre and Williamsport are located in valleys relative to surrounding terrain. The Wilkes-Barre valley has a mostly southwest to northeast orientation. The predominant flow at Wilkes-Barre is from the southwest (**Figure 4-5(a)**), which aligns well with the orientation of the terrain. The Williamsport valley orientation is primarily west to east with a significant elevated terrain feature to its immediate south. This west-to-east orientation is very prominent in the wind rose (**Figure 4-5(c)**). The Selinsgrove wind rose (**Figure 4-5(a)**) has a predominant flow from the south and a secondary flow from the northwest. The terrain surrounding Selinsgrove is generally flat with rolling hills. These same terrain features near Selinsgrove are similar to the terrain features surrounding Montour.

In 1989, Montour SES installed and operated an onsite 10-m tower with a SOnic Detection and Ranging (SODAR) that was located along the northern edge of the property boundary. This meteorological dataset can serve as another data-point by comparing the winds from the onsite tower to the nearby meteorological stations. Quarterly data capture from the onsite tower and SODAR dataset is summarized in **Table 4-5** from January 1, 1990 through December 31, 1990. Quarter 3 was the only quarter below 94% data capture as there were two separate multi-day outages that occurred in that quarter.

Table 4-5. Data Capture by Quarter and Tower/SODAR for 1990

Quarter	Months	% Data Capture ¹
1	January – March	99.72%
2	April – June	94.64%
3	July – September ²	60.73%
4	October – December	99.05%

¹ Data capture from AERMOD output.

² Multi-day outages in August and September.

Winds at 10-m from the 1990 onsite data were oriented west-to-east, as shown in **Figure 4-6**. This would suggest that it would be more in agreement with Williamsport. In PADEP’s comments to the SO₂ Data Requirements Rule (DRR) Draft Modeling Protocol submitted by Talen Energy on April 15, 2016, PADEP noted that, while the Williamsport Regional Airport matches closely with the 10-meter onsite tower data recorded in 1990, it does not match at the 210-meter SODAR level, a level corresponding to the Montour SES stack height. PADEP also noted that the Selinsgrove data “illustrated a high frequency of light winds” (average wind speed of 2.35 m/s and 1.61% calm winds); however, the 10-meter onsite tower also has a high frequency of light winds (average wind speed of 2.12 m/s and over 1.95% calm winds). Given these differences and the ability to analyze higher level wind patterns with the available onsite SODAR data, an analysis at plume height is warranted and is discussed on Section 4.6.2.

4.6.2 Wind Profiles at Plume Height

A key component of evaluating the representativeness of the meteorological data is the winds at plume height. The U.S. EPA’s SCREEN3 screening model (version 13043) (U.S. EPA, 2013) was used to estimate the plume rise and ultimately final plume height of the CCCT Project sources. An initial run of SCREEN3 was conducted for the project sources using the “full meteorological” option to initially identify the conditions that would produce the highest model concentrations. For this run, the final plume height was 1,203 meters above ground level. The meteorological conditions producing these results were wind speeds around one (1) m/s 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 produced a lower plume height compared to the low wind condition, with a max height of 393 meters. When comparing the base elevations of Selinsgrove (136 meters) and Montour (163 meters), there is a 27-m difference in elevation. The closest SODAR data level to the plume height obtained from the SCREEN3 run is at 390-m. To extract the plume height wind profile from the Selinsgrove meteorological data, AERMOD was run with the meteorological debug option (DEBUGOPT METEOR). This generated model-estimated vertical wind profiles based on the 10-m Selinsgrove station. Accounting for the slight difference in elevation between Montour and Selinsgrove of only 27-m, the closest upper-level wind height from AERMOD was 400-m. The data capture for wind speed and direction decreases as the height of the onsite SODAR measurement increases as noted in **Table 4-6**, below.

Table 4-6. Data Capture by Quarter and Tower/SODAR by Level for 1990

SODAR Height (m)	Q1	Q2	Q3	Q4	Annual
10	78.1%	79.3%	59.9%	70.1%	71.8%
90	97.8%	97.0%	97.3%	97.0%	97.3%
100	92.8%	95.8%	92.7%	93.9%	93.8%
120	97.6%	97.0%	97.4%	97.0%	97.2%
150	97.0%	96.5%	96.7%	96.5%	96.7%
180	96.5%	96.2%	96.1%	95.0%	95.9%
210	95.6%	95.7%	95.9%	94.0%	95.3%
240	94.1%	95.1%	95.6%	92.4%	94.3%
270	91.6%	94.0%	94.5%	89.7%	92.5%
300	85.5%	90.6%	88.9%	84.1%	87.3%
330	79.8%	86.7%	86.2%	77.5%	82.6%
360	73.0%	83.2%	82.3%	68.7%	76.8%
390	66.1%	78.8%	78.2%	59.1%	70.6%
420	58.2%	74.6%	73.8%	51.2%	64.5%
450	51.5%	68.6%	68.5%	42.8%	57.9%
480	44.2%	62.6%	62.4%	34.6%	51.0%
510	36.8%	57.3%	55.3%	28.0%	44.3%

540	30.3%	51.5%	48.2%	21.7%	37.9%
570	24.0%	45.0%	42.9%	17.2%	32.3%
600	22.0%	43.1%	40.8%	16.0%	30.5%

Figure 4-7 further illustrates the drop in data capture, on an annual basis, from the onsite SODAR with the 360-meter level dropping below 80%. As a result, a wind rose comparison was conducted for select levels, including those below the 400-meter plume height from the SCREEN3 run (“intermediate plume heights”). Wind roses from the 1990 tower at intermediate plume heights of 270 and 330-meter levels (**Figure 4-8(a,c)**), and the Selinsgrove 300 and 350-meter effective wind rose based on AERMOD’s profiling calculations (**Figure 4-8(b,d)**) are shown below. The Selinsgrove 300-m and 350-m wind roses pick up on a similar southerly flow pattern as seen in the 270-m and 330-m onsite wind roses. The predominant flow from Selinsgrove at these levels is from the west-northwest rather than westerly in the onsite wind rose, but it is generally in good agreement with direction.

The wind rose from the SCREEN3 calculated plume heights for the onsite SODAR, Selinsgrove, and Williamsport, respectively, are shown in **Figure 4-9**. The Selinsgrove wind rose is reasonably representative of the SODAR wind rose, with winds favored from the west or west-northwest and south for both meteorological data sets. The Williamsport wind rose continues to favor winds from the east and west due to the prominent terrain feature to the south. The wind speeds from Selinsgrove are generally lower compared to the onsite data at the wind rose levels analyzed, which would in turn lead to less dispersion and a more conservative modeled concentration. Based on this supplemental analysis at plume height, Selinsgrove is the most representative for air dispersion modeling of the CCCT Project sources.

4.6.3 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 (U.S. EPA, 2024f). U.S. 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. **Figure 4-10** and **Figure 4-11** illustrate the albedo and Bowen ratios for Selinsgrove and Montour, respectively, for calendar year 2023. For both parameters, the values are nearly identical between Selinsgrove and Montour.

The surface roughness was computed using the AERSURFACE tool and NLCD available from the USGS. NLCD files are released on an annual basis. At the time of this analysis, the calendar year 2023 is the most recent year with land cover, canopy, and impervious files. The comparison of the two sites for surface roughness was performed using these files.

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 4-10** illustrates the differences of surface roughness by season between Selinsgrove and Montour at intervals of 10-degree bins and for each season (winter, spring, summer, and fall). In general, surface roughness within 1 km of Montour is slightly higher than Selinsgrove Airport. This is attributed to a higher percentage of developed land cover pixels (56% for Montour compared to 36% at Selinsgrove Airport). Aerial images for both Selinsgrove Airport and Montour are shown in **Figure 4-16** and **Figure 4-17**, respectively. Based on visual inspection of aerial imagery of Montour (**Figure 4-16**), the amount of developed land is likely overstated, especially where the former coal piles resided and should instead be classified as barren land (a lower surface roughness category). Even so, the lower surface roughness at Selinsgrove compared to Montour would yield conservative dispersion parameters as less mixing would occur. Where surface roughness values deviate the most between the two sites are for winds between 80 degrees and 140 degrees. However, as illustrated by the wind rose (Figure 4-5(a)), the frequency of winds from that direction are relatively infrequent. Therefore, the surface conditions at Selinsgrove would be representative (and on the conservative side) for modeling of Montour.

Figure 4-4. Map of Candidate Meteorological Sites

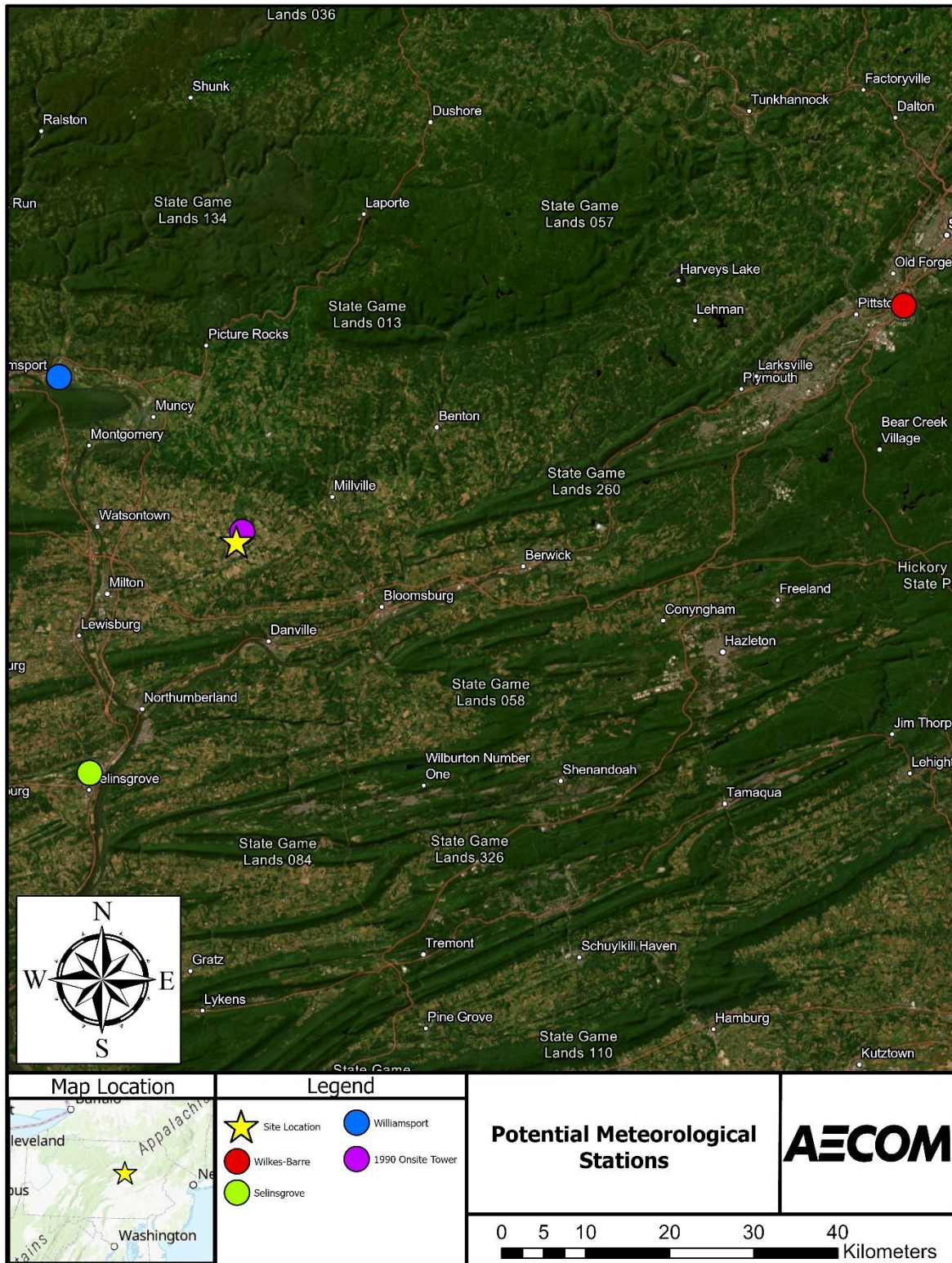
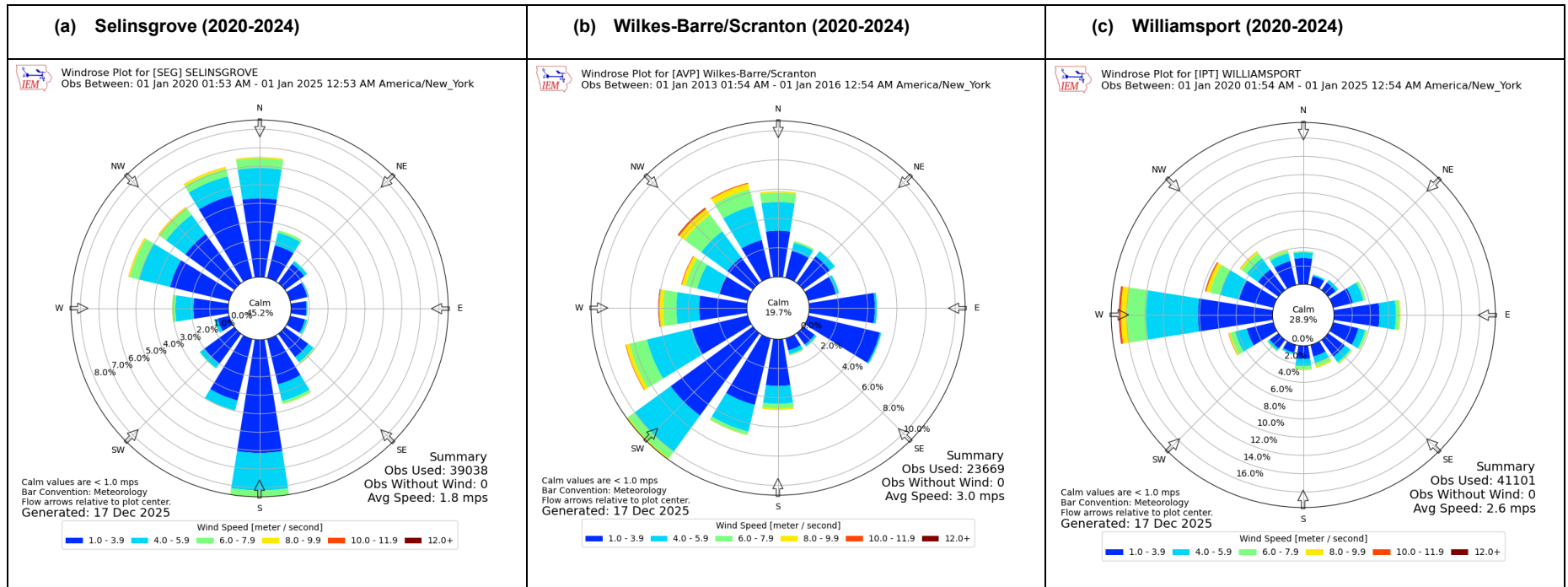


Figure 4-5. Nearby Meteorological Station 10-meter Wind Roses (2020-2024)



Source: <https://www.mesonet.agron.iastate.edu/sites/locate.php>

Figure 4-6. 10-meter Onsite Tower Wind Rose (1990)

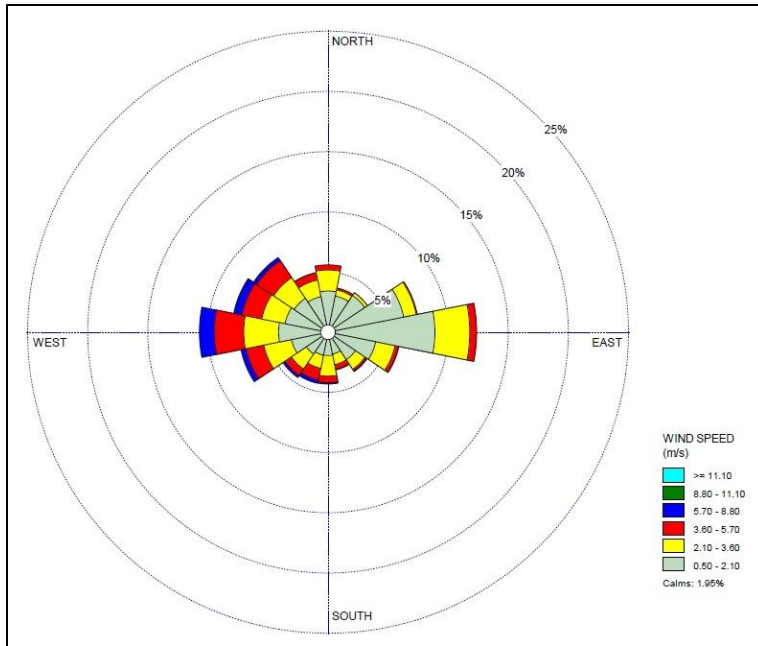


Figure 4-7. Bar Chart of Onsite SODAR Data Capture

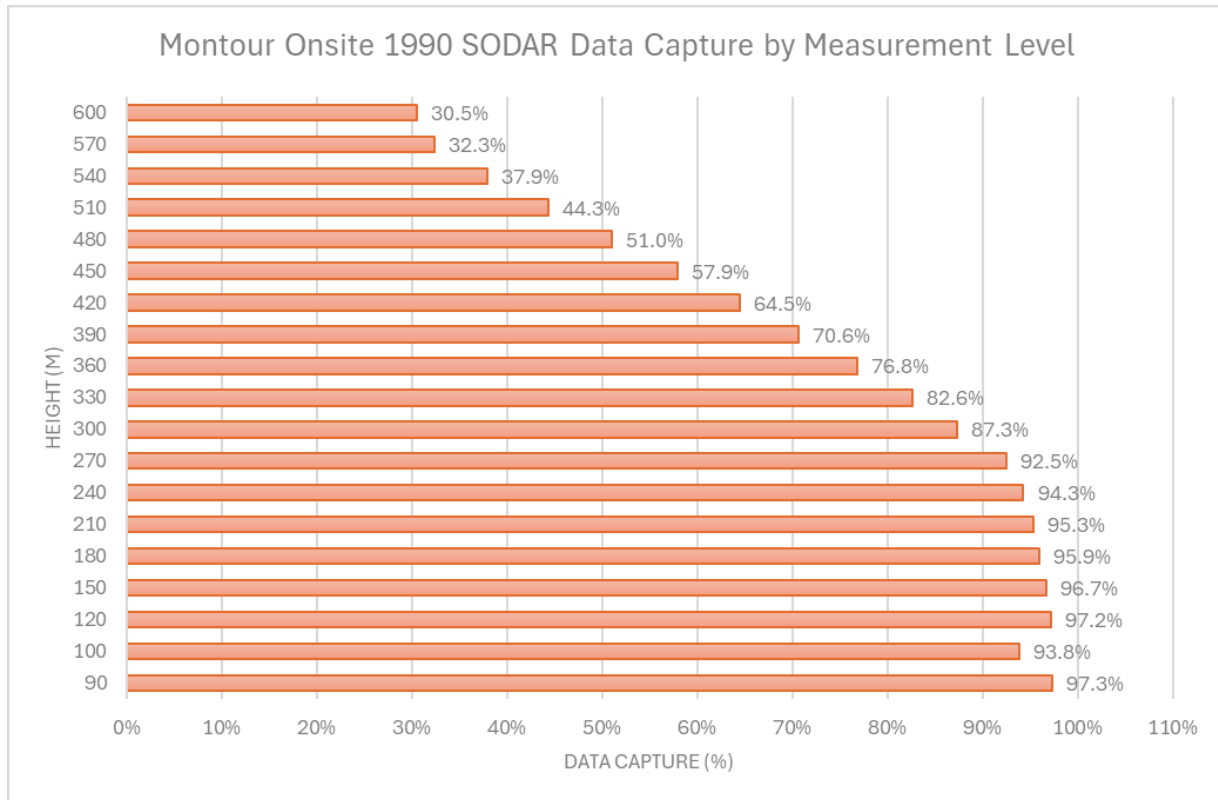


Figure 4-8. Wind Roses at Intermediate Plume Height of CCCT Project Sources

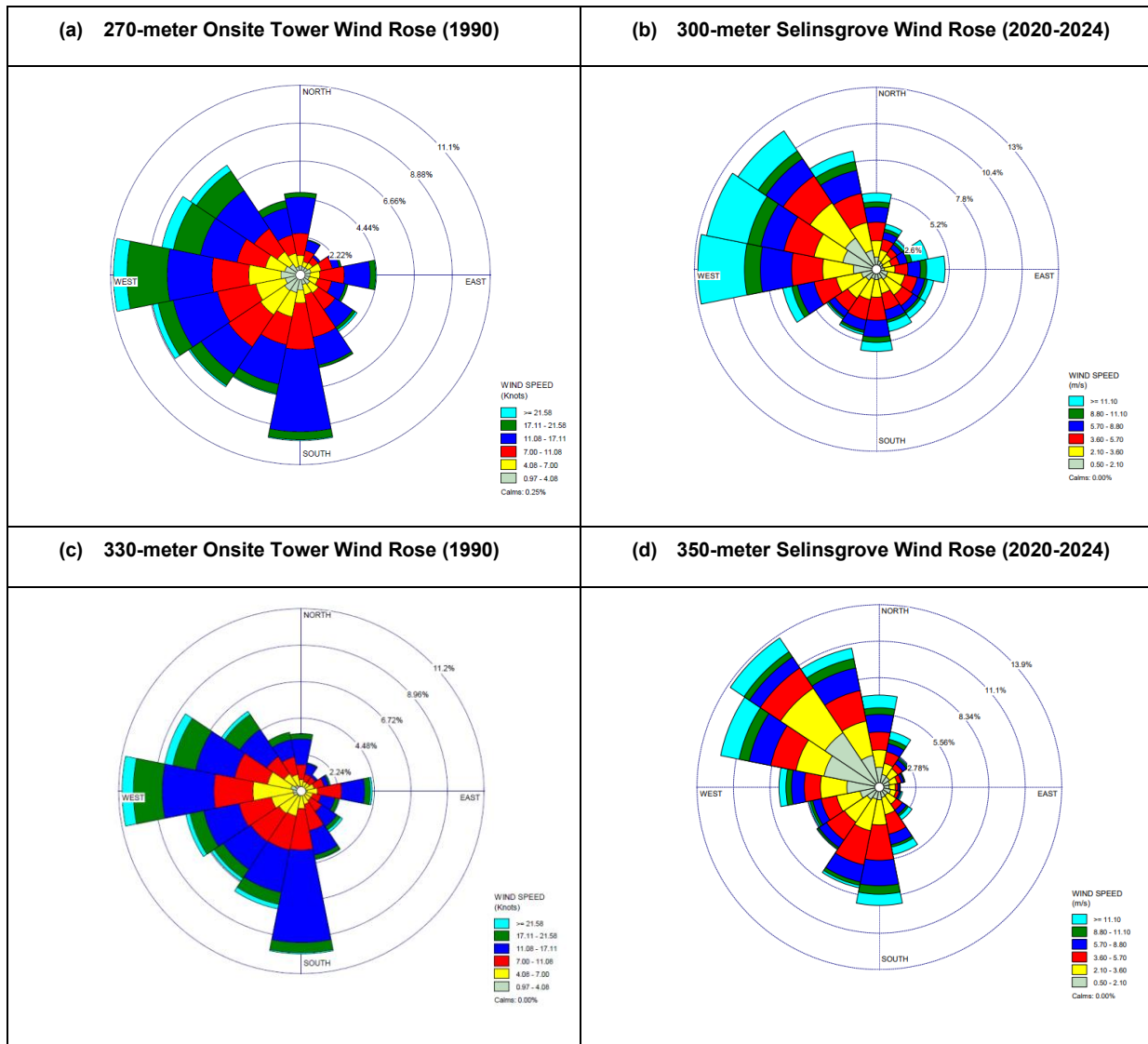


Figure 4-9. Wind Roses at Plume Height of CCCT Project Sources

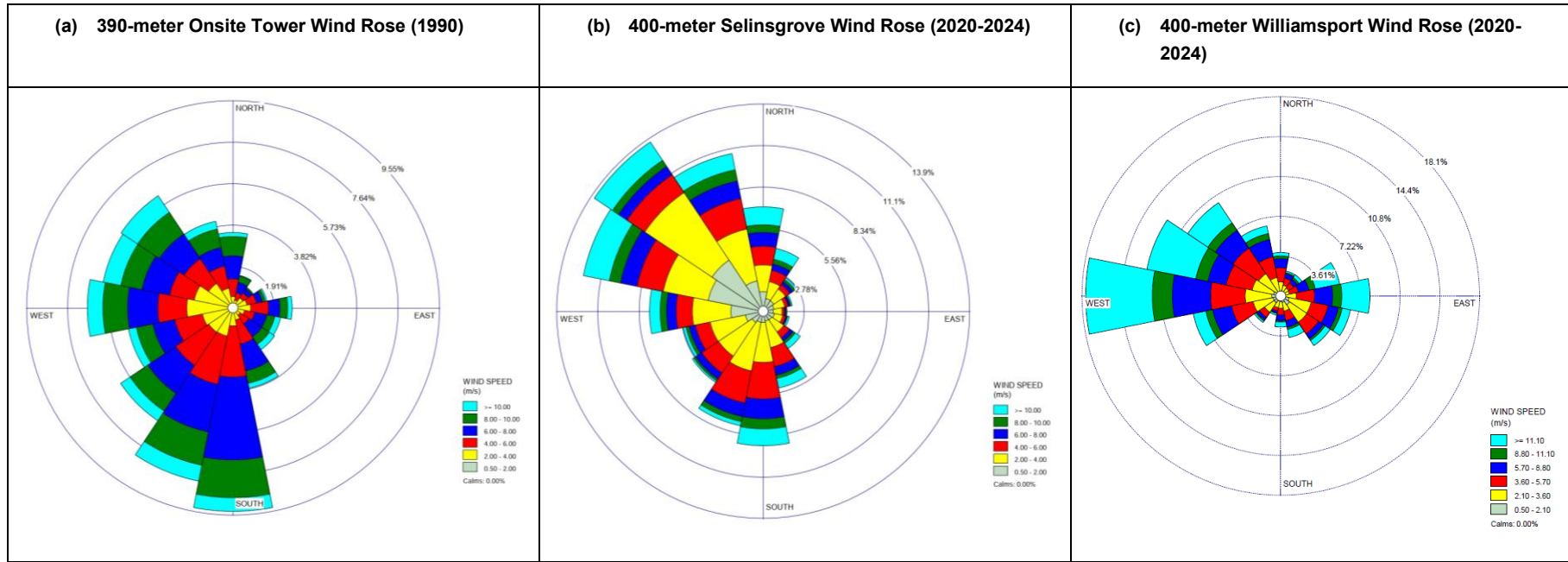


Figure 4-10. Albedo Comparison at Selinsgrove Airport (KSEG) and Montour 2023

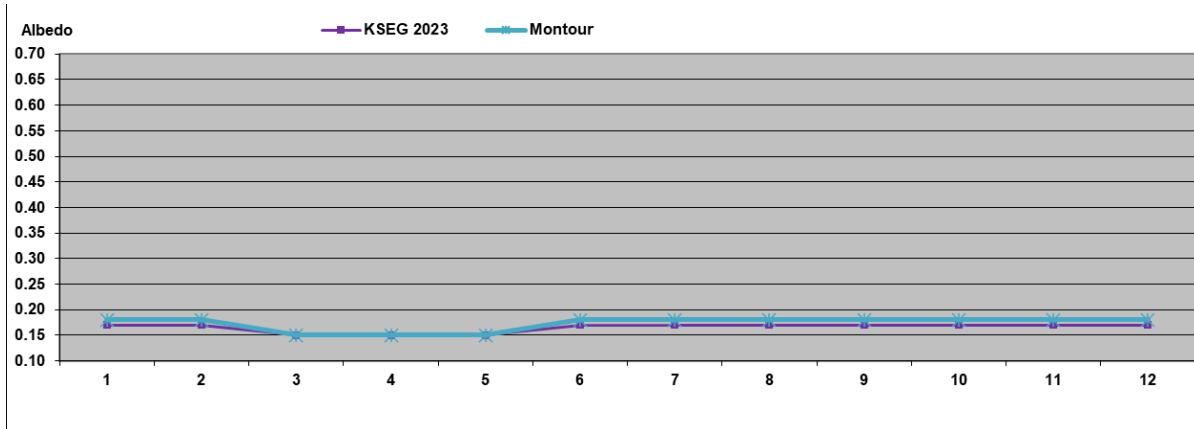


Figure 4-11. Bowen Ratio Comparison at Selinsgrove Airport (KSEG) and Montour 2023

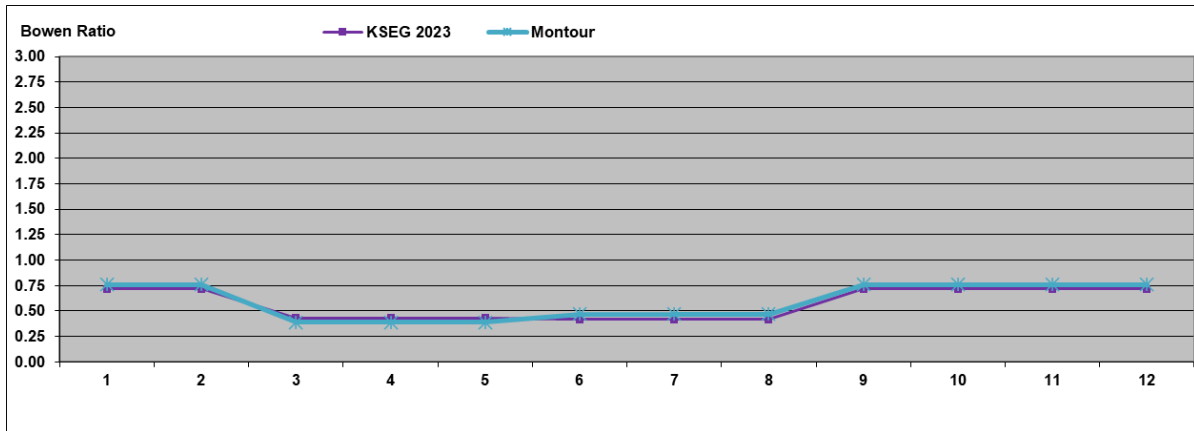


Figure 4-12. Surface Roughness Comparison at Selinsgrove Airport (KSEG) and Montour (Winter 2023)

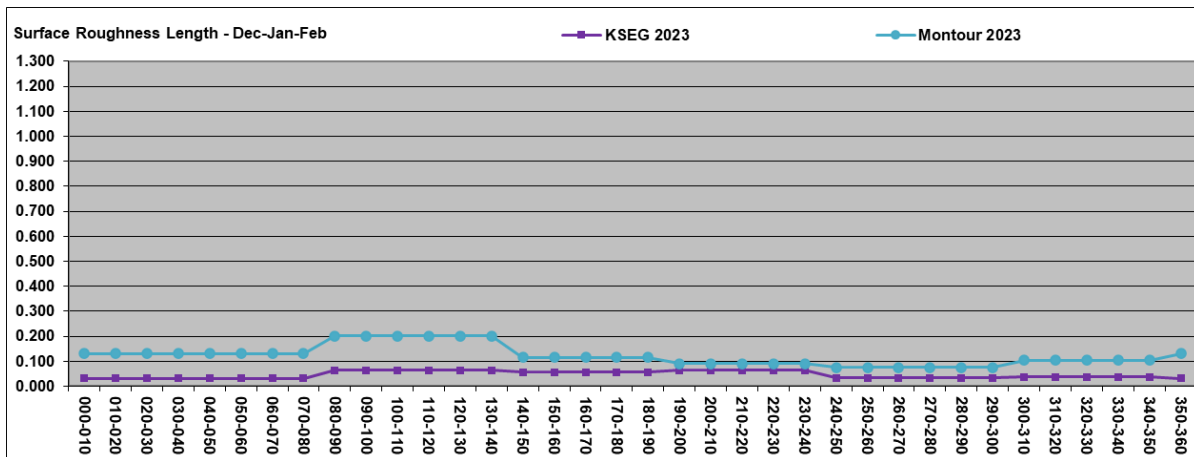


Figure 4-13. Surface Roughness Comparison at Selinsgrove Airport (KSEG) and Montour (Spring 2023)

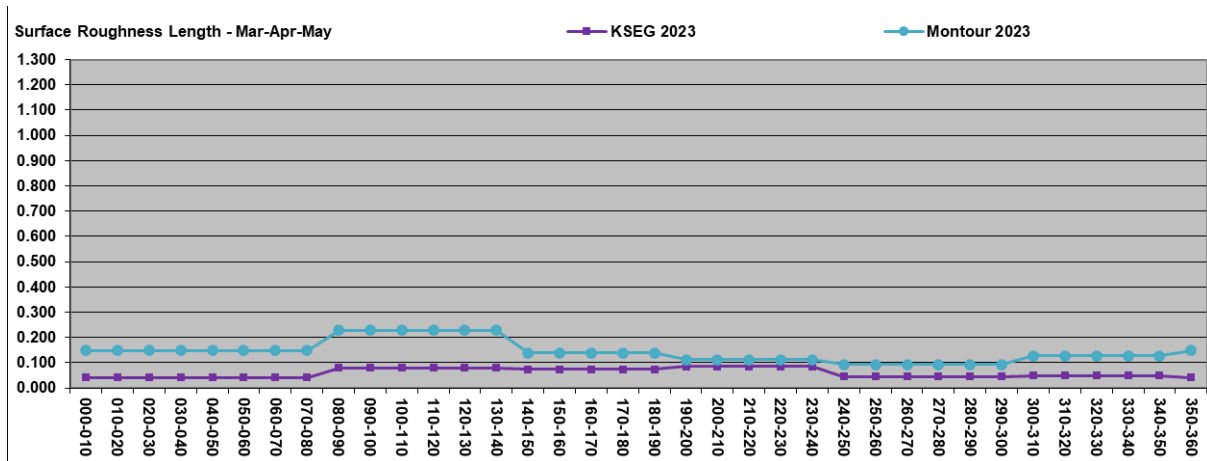


Figure 4-14. Surface Roughness Comparison at Selinsgrove Airport (KSEG) and Montour (Summer 2023)

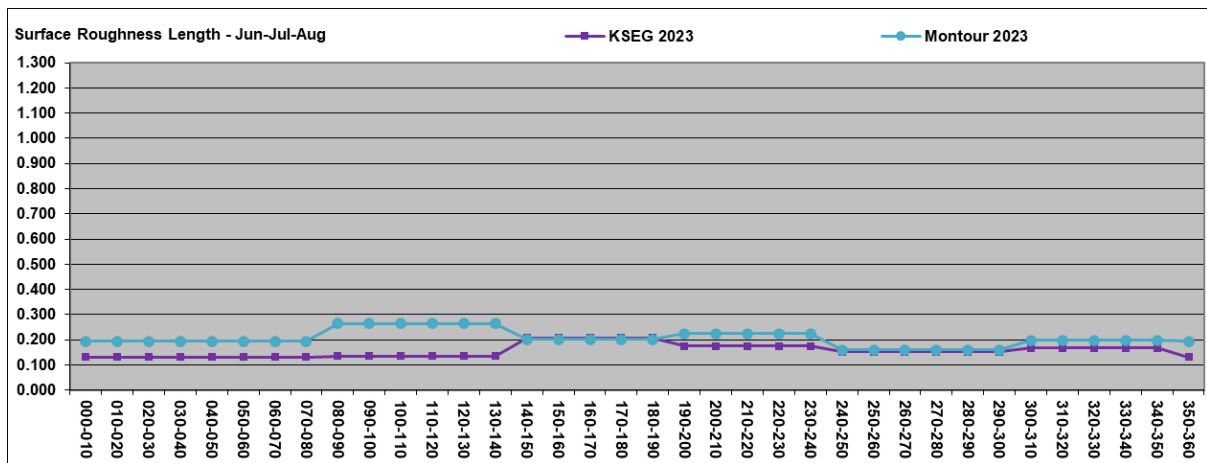


Figure 4-15. Surface Roughness Comparison at Selinsgrove Airport (KSEG) and Montour (Fall 2023)

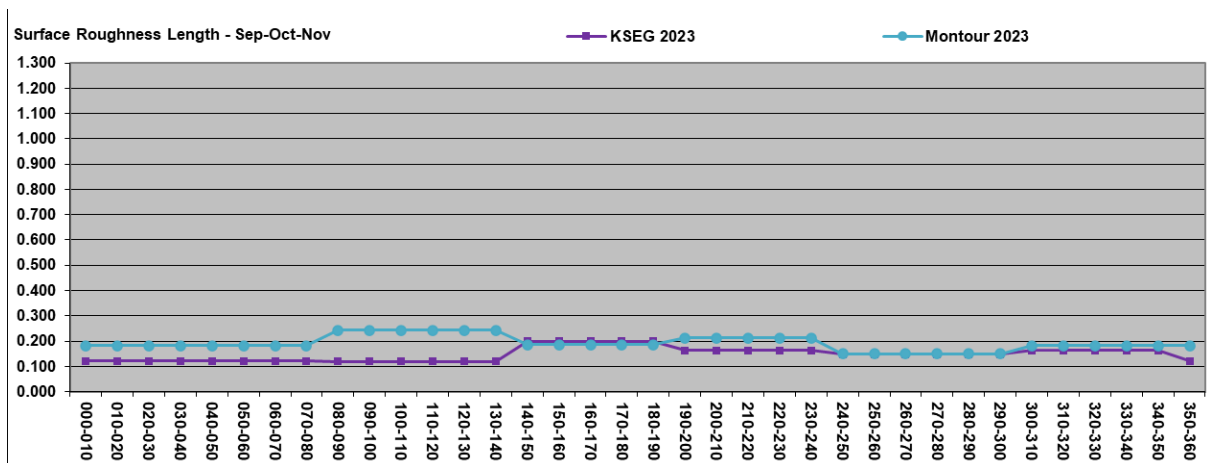


Figure 4-16. Aerial Image of Selingsgrove Airport



Figure 4-17. Aerial Image of Montour



4.7 Receptors and AERMAP

A Cartesian receptor grid extending approximately 50 km from the approximate centroid (Easting = 360079.00 m; Northing = 4547813.00 m) of the proposed CCCT Project will be used in the modeling. The receptor grid will consist of the following spacing:

- 25-m spaced receptors along the ambient boundary;
- 100-m spaced receptors extending from ambient boundary to 5 km;
- 250-m spaced receptors between 5 km and 10 km from the proposed project centroid;
- 500-m spaced receptors between 10 m and 20 km from the proposed project centroid; and
- 1,000-m spaced receptors between 20 m and 50 km from the proposed project centroid.

Far-field and near-field views of the receptor grid and ambient air boundary are shown in **Figure 4-18** and **Figure 4-19**, respectively. If CCCT Project modeled concentrations are less than the SILs, then the controlling SIL impact for each pollutant and averaging period will be adequately resolved. If project modeled concentrations 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 adequate receptor spacing.

Figure 4-19 also shows the ambient air boundary comprising effective barriers to general public access along Montour's property boundary. Consistent with U.S. EPA's Revised Policy on Exclusions from Ambient Air (U.S. 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 Montour property. The property is fenced along PP and L Road, McMichael Road, and Strawberry Ridge Road. However, the railroad running through the Plant property is accessible by the public. Because of this, receptors have been added to estimate concentrations along this rail line. Overall, Montour is very secure and limits public access to all areas of the property.

AERMAP (version 24142) (U.S. 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 18 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 (U.S. EPA, 2024g), 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 18). The NED files will be included in the electronic modeling archive that will be submitted along with the final modeling report.

Figure 4-18. Far-field Receptor Grid

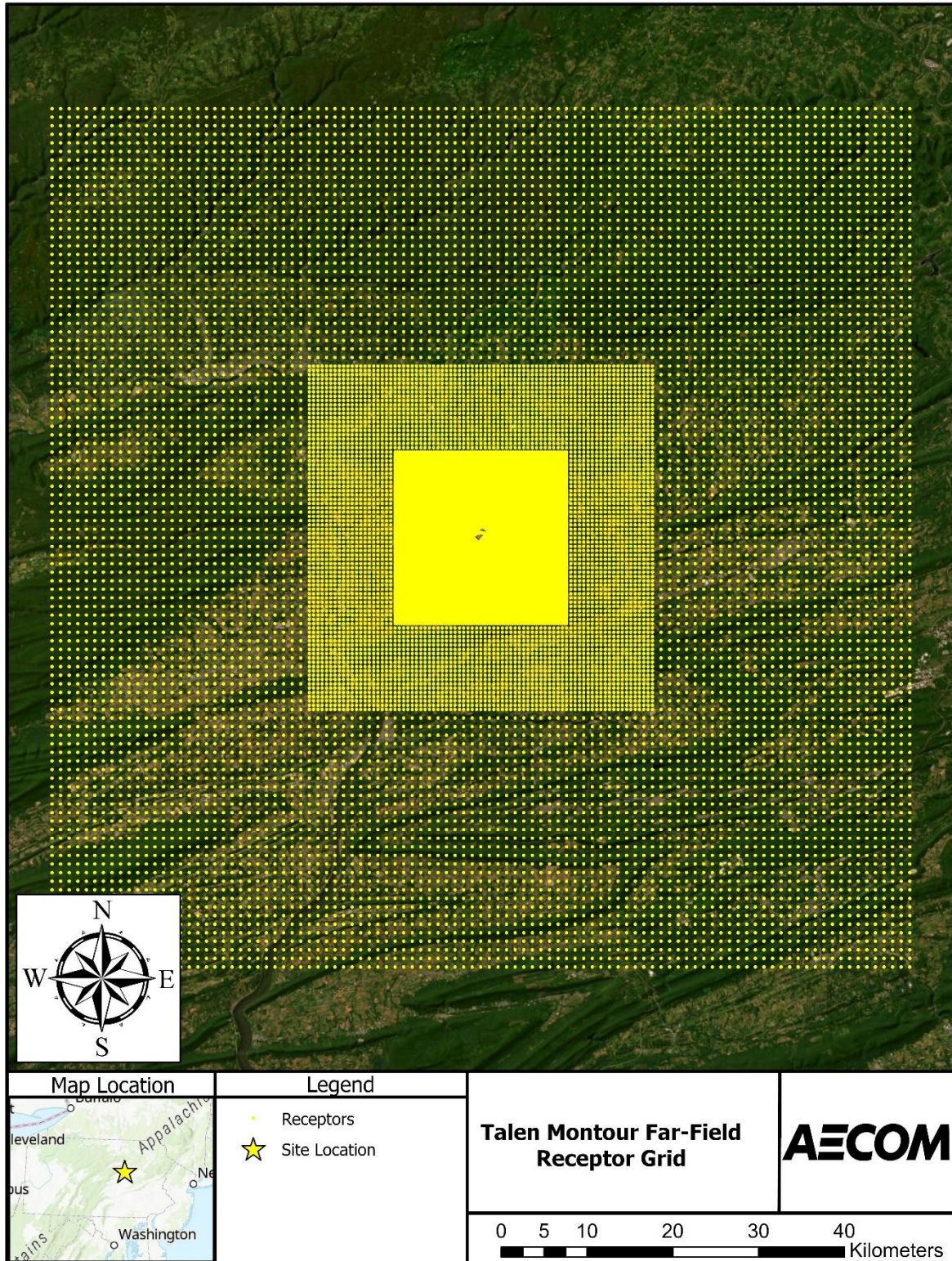
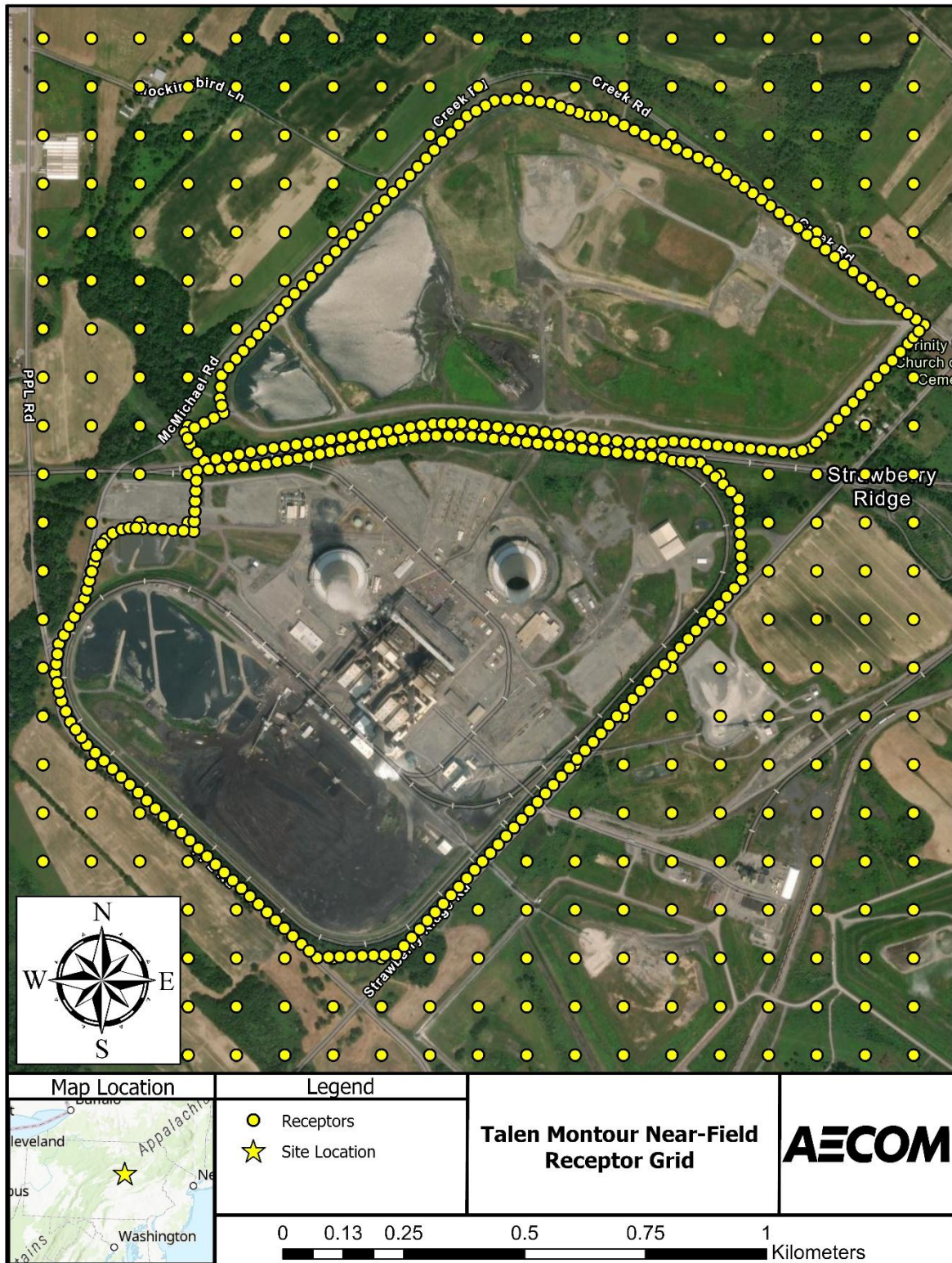


Figure 4-19. Near-field Receptors



4.8 Modeling of Secondary PM_{2.5}

In July 2022, U.S. EPA released their Final Guidance for Ozone and Fine Particulate Matter Permit Modeling and provided updates to the guidance in April 2024 to reflect changes to the PM_{2.5} SILs. The guidance from U.S. EPA recommends a tiered approach for determining which sources would be important to consider when assessing secondary PM_{2.5} concentrations.

The two cases presented by U.S. EPA include²:

- Case 1: If the PM_{2.5} emission increases < 10 tons per year (TPY) and NO_x and SO₂ emission increases < 40 TPY; then a PM_{2.5} compliance modeling demonstration IS NOT required.
- Case 2: If the PM_{2.5} emission increases > 10 TPY and/or NO_x or SO₂ emission increases > 40 TPY; then a PM_{2.5} compliance modeling demonstration IS required and secondary PM_{2.5} MUST BE accounted for from the Project sources.

Secondary PM_{2.5} modeling for the CCCT Project falls under Case 2 and a qualitative / quantitative analysis to address secondary PM_{2.5} will be required.

The Final Guidance provides recommendations on air quality modeling and related technical analyses to satisfy compliance demonstration requirements for PM_{2.5} for permit-related assessments under the PSD program; 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 (US EPA 2024h)³. The guidance and the accompanying online tool⁴ provide a Tier 1 demonstration tool for PM_{2.5}. The MERPs are screening thresholds for precursor emissions, where SO₂ and NO_x screening values are provided for PM_{2.5}, for projects that are expected to result in an insignificant increase in ambient PM_{2.5} relative to PSD Increment and the NAAQS; i.e., an impact less than the 24-hour PM_{2.5} SIL of 1.2 µg/m³ or annual PM_{2.5} SIL of 0.13 µg/m³. The MERP values were derived based on modeling conducted by U.S. EPA for locations across the U.S. For this project, since there is a large reduction in SO₂, zero (0) tons/year will be conservatively used for the MERP calculation with the NO_x project emission rate.

To estimate the CCCT Project impact of secondary PM_{2.5}, the list of hypothetical sources that were modeled by U.S. EPA were analyzed. The closest hypothetical site, modeled by U.S. EPA with modeled PM_{2.5} concentrations found in Appendix A of U.S. EPA's MERP Guidance, is 76 miles south-southwest of the project site, located in Adams County. Three (3) additional sites were considered but they are located further away in Warren County, New Jersey (87 miles east of the project site), Chester County, Pennsylvania (89 miles southeast of the project site), and Livingston County, New York (133 miles north northwest of the project site). The calculated secondary PM_{2.5} concentrations associated with CCCT Project emissions is shown in **Table 4-7** for each of the four nearby hypothetical MERP sites. **Table 4-8** provides a comparison of population density and NO_x emissions per square mile within the county where each of the four (4) candidate MERP sites are located relative to the CCCT Project. As the CCCT Project does not increase SO₂ emissions, a comparison of those emissions is not included.

The Livingston County, NY site is the furthest away from Montour County and the CCCT Project, has the lowest population density, and lowest County-wide emissions per square mile making it the least representative. The Adams County site is the closest site and most similar in terms of population density, but the Chester County site is comparable based on NO_x emissions per square mile. Climate summaries from the National Oceanic and Atmospheric Administration's (NOAA's) Online Weather products for Adams County indicate similar 30-year climate normals when compared to the location of the CCCT Project site. The weather monitor chosen to represent the CCCT Project site is located in Selinsgrove, PA since it was the closest in proximity to the project. A comparison of 30-year (1994-2024) average maximum and average minimum, temperatures and total precipitation for the project site and the Adams County hypothetical source is provided in **Figure 4-20**, **Figure 4-21**, and **Figure 4-22**. Data presented in these figures show similar annual average high temperatures in the mid-50s°F, and low temperatures around 51°F. In addition, mid-summer high temperatures were in the range of 72 – 80°F for both the project and

² Available at https://www.epa.gov/system/files/documents/2022-07/Guidance_for_O3_PM25_Permit_Modeling.pdf

³ Available at https://www.epa.gov/sites/default/files/2020-09/documents/epa-454_r-19-003.pdf

⁴ Available at: <https://www.epa.gov/scram/merps-view-glik>

Adams County locations. Precipitation averages are also similar with approximately 44 inches of rain per year for Adams County and 43 inches of rain per year at Selinsgrove. 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 emission sources for the project. **Section 4.6.1** references a plume height of 393 to 1,203 meters for the GE 7HA.02 stacks, this supports the use of the 90-meter MERP data.

Table 4-7. Project Estimated Secondary PM_{2.5} Concentrations

Averaging Period	NO _x				SO ₂				Project Estimated Secondary PM _{2.5} Concentration (µg/m ³)
	U.S. EPA Precursor Emissions (TPY)	U.S. EPA Modeled Concentration (µg/m ³)	Project Precursor Emissions (TPY)	Project Estimated Concentration (µg/m ³)	U.S. EPA Precursor Emissions (TPY)	U.S. EPA Modeled Concentration (µg/m ³)	Project Precursor Emissions (TPY)	Project Estimated Concentration (µg/m ³)	
Adams County, PA									
24-hour	500	0.0429	282	0.0242	500	0.1026	0	0	0.0242
Annual	500	0.0029	282	0.0016	500	0.0030	0	0	0.0016
Warren County, NJ									
24-hour	500	0.0249	282	0.0141	500	0.0672	0	0	0.0141
Annual	500	0.0017	282	0.0009	500	0.0025	0	0	0.0009
Chester County, PA									
24-hour	500	0.0516	282	0.0291	500	0.1386	0	0	0.0291
Annual	500	0.0023	282	0.0013	500	0.0036	0	0	0.0013
Livingston County, NY									
24-hour	500	0.1205	282	0.0680	500	0.1315	0	0	0.0680
Annual	500	0.0032	282	0.0018	500	0.0033	0	0	0.0018

Table 4-8. Comparison of County-Wide Statistics for Hypothetical MERPs Locations

Pollutant	County Level Statistics				
	Montour Co. PA + Project ¹	Adams Co., PA	Chester Co., PA	Livingston Co., NY	Warren Co., NJ
Population Density					
Population	18,136	103,852	560,745	61,561	112,031
County Area (mi ²)	132	522	759	640	363
Population Density (per mi ²)	137.4	199.0	738.8	96.2	308.6
County-Wide Emissions from All Sources					
NO _x (tons) ²	1254.34	2245.7	7005.2	1259.7	1601.2
County Area (mi ²)	132	522	759	640	363
NO _x (tons/mi ²)	9.50	4.30	9.23	1.97	4.41

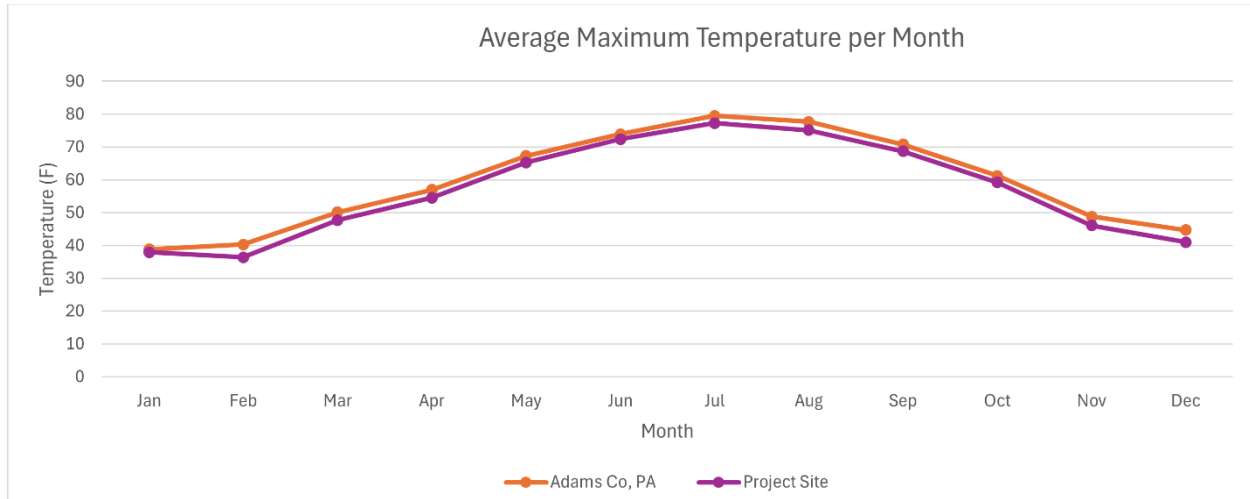
¹ Values from Table 2-1 and Montour County Level total emissions.

² Emissions from 2020 EPA's National Emissions Inventory (NEI) database. Available at: <https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data>

There are some mountains to the west and south of the CCCT Project whereas the Adams County hypothetical source has smaller mountains to the west and north. However, the difference in terrain features would not create a substantial difference in climate regimes between the project site and hypothetical source in Adams County. Both have similar elevations: 610 ft for Adams County and 536 ft for the project site. The Adams County hypothetical

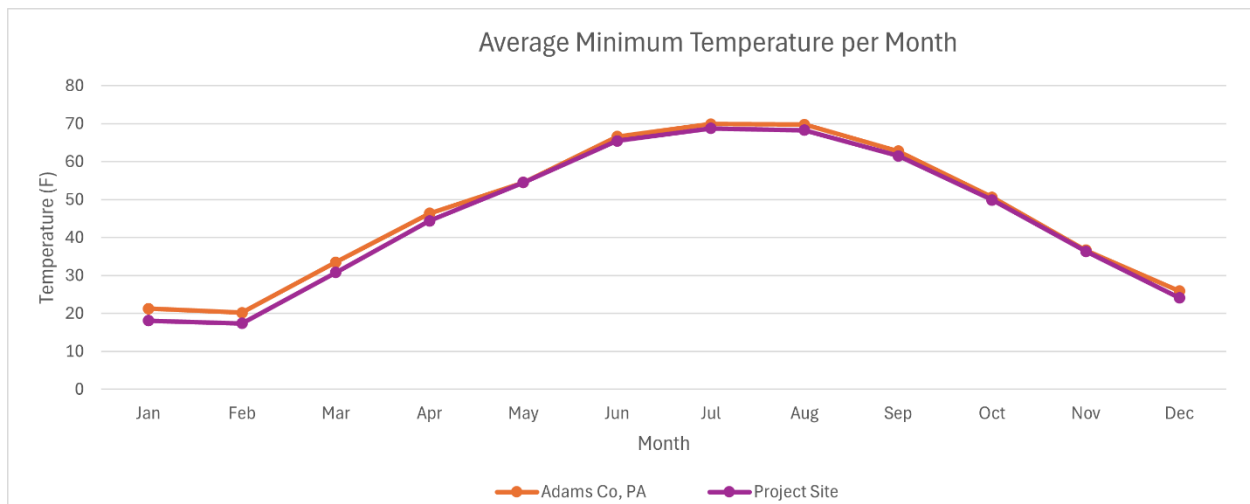
source also exhibits similar land use to the Project site. The project area is primarily rural while the Adams County site is somewhat more suburban, primarily residential. Based on the similarities in land use, climate, and overall terrain, the Adams County site is the most representative but based on emissions the Chester County site should also be considered. Therefore, to be conservative, the data associated with both MERP sites will be used for assessing the Project impact on secondary PM_{2.5} (Chester County site for 24-hour PM_{2.5} and Chester County site for annual PM_{2.5}).

Figure 4-20. 30-Year Average Maximum Temperature of Adams County and Plant per Month



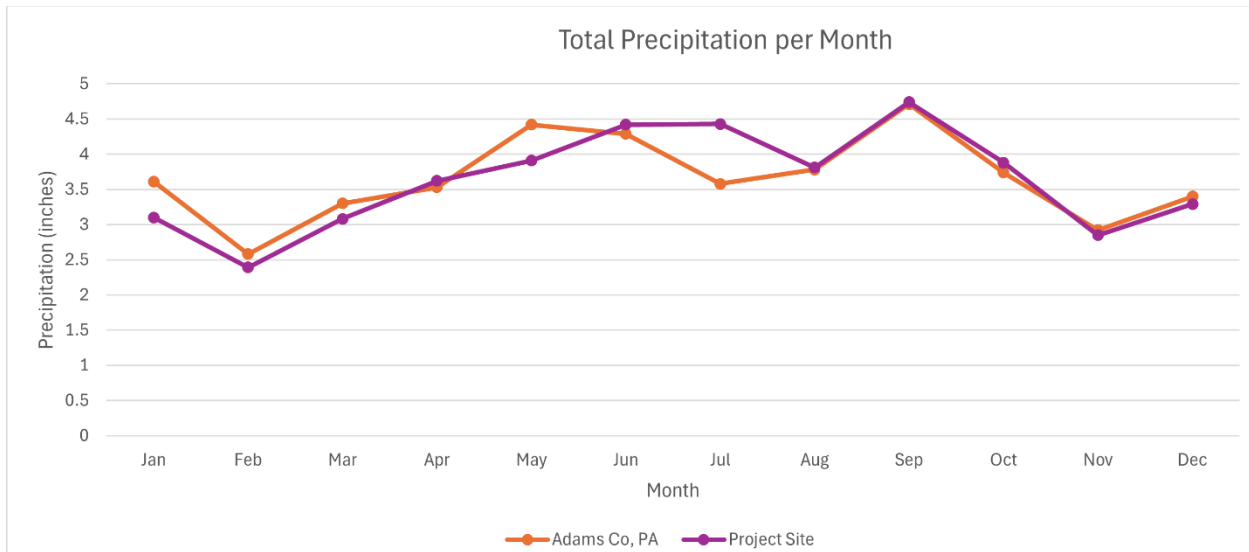
Source: Data from NOAA Online Weather Data, <https://weather.gov>

Figure 4-21. 30-Year Minimum Temperature of Adams County and Plant per Month



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

Figure 4-22. 30-Year Average Total Precipitation for Adams 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 CCCT Project emissions data. This modeling analysis will be used to determine project significance for PM₁₀, PM_{2.5}, NO₂, and CO.

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 be accounted for in the SIL modeling as discussed in **Section 4.8** as well as the NAAQS and PSD Increment modeled concentrations.

The SIL modeling will be performed in accordance with U.S. 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 CCCT 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.
- NO₂ 1-hour NAAQS – Highest 1-hour average modeled concentration averaged over 5 (five) years.
- NO₂ Annual NAAQS – Highest annual average modeled concentration per year taken over 5 (five) years.
- NO₂ Annual PSD Increment – Highest annual average modeled concentration per year taken over 5 (five) years.
- CO 1-hour NAAQS – Highest 1-hour average modeled concentration per year taken over 5 (five) years.
- CO 8-hour NAAQS – Highest 8-hour 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 anticipated.

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

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

Modeled concentrations attributable to the CCCT 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**.

5.2.1 NAAQS Analyses

Dispersion modeling using AERMOD will be conducted with the meteorological data discussed in **Section 4.6**, CCCT 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 Montour SES that have the potential to emit the pollutant of concern will be included in the NAAQS modeling, if applicable. The analysis will compare the modeled design short-term and annual concentrations from the proposed Project and existing 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 4.6** 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**, CCCT 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 Montour County. When the first complete application of the Montour CCCT Project would set the minor source baseline date as it has not yet been established.

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 NO₂ at nearby facilities that have begun operating or resulted in an emissions 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 increase of emissions after the major source baseline dates (NO₂ = February 8, 1988 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 Montour County and it is anticipated that the 24-hour and annual SIA for PM_{2.5} will extend outside of Montour County. The minor source baseline date for PM_{2.5} in Northumberland and Lycoming Counties was set on July 13, 2012. A minor source baseline date for PM_{2.5} has yet to be established for Columbia County. Should the CCCT Project's modeled annual PM_{2.5} concentration exceed 0.3 µg/m³ at receptors located in Columbia County, the minor source baseline date would be established per CFR 40 CFR 52.21(b)(15)(i).

5.2.3 NO₂ Modeling Options

Based on current guidance, NO₂ impacts can be determined by using a 3-tiered NO_x to NO₂ conversion rate system, where:

- Tier 1 assumes 100 percent NO_x to NO₂ conversion;
- Tier 2 utilizes the Ambient Ratio Method 2 (ARM2); and
- Tier 3 allows the use of refined techniques such as the Ozone Limiting Method (OLM), Plume Volume Molar Ratio Method Version 2 (PVMRM2), and the Generic Reaction Set Method (GRSM). All three options are in AERMOD.

For the CCCT Project, initial modeled concentrations will be assessed using the U.S. EPA default Tier 2 methodology for estimating NO₂ concentrations from total NO_x emissions under ARM2. Where the modeled concentrations exceed the SIL, these receptors will be carried forward in the cumulative modeling analysis. The NAAQS and PSD Increment modeling will be conducted using one of two approaches outlined below.

5.2.3.1 Option 1: ARM2 Using Default Minimum NO₂/NO_x Ratio

For cumulative NO₂ modeling, Montour CT proposes the use the Tier 2 ARM2 with default, regulatory option. The ARM2 uses a minimum NO₂/NO_x ratio of 0.5 and a maximum NO₂/NO_x ratio of 0.9. If the use of the Tier 2 ARM2 option is found to produce overly conservative results, then Montour CT would elect to use one of the Tier 3 regulatory options, as described in 5.2.3.2.

5.2.3.2 Option 2: Tier 3 Using OLM for Cumulative NO₂ Modeling

OLM and PVMRM in AERMOD account for ambient conversion of NO to NO₂ in the presence of ozone based on the basic chemical mechanism of ozone titration, the interaction of NO with ambient ozone to form NO₂ and O₂. OLM and PVMRM both assume that ambient ozone (as measured at a representative ambient monitor) is present and available to oxidize NO to NO₂ without consideration of competing reactions. For both methods, the degree to which NO is converted to NO₂ depends on the relative concentration of the modeled NO with respect to ambient ozone. The main distinction between PVMRM and OLM is the approach taken to estimate the ambient concentrations of NO from emission sources for which the ozone titration mechanism is applied. OLM applies the mechanism to the hourly modeled ground-level concentration of NO at each receptor and PVMRM applies the mechanism to the average NO concentrations in an elevated plume. The applicability of OLM versus PVMRM depends on the nature and number of modeled sources that contribute to local NO₂. Because it more realistically represents single, non-overlapping plumes, PVMRM is generally applicable when modeling isolated elevated point sources. When concentrations from numerous sources overlap, OLM is more appropriate as it accounts for the combined NO_x concentration from multiple sources. The GRSM NO₂ screening option addresses photolytic conversion of NO₂ to NO and addresses the time-of-travel necessary for NO_x plumes to convert the NO portion of the plume to NO₂ via titration and entrainment of ambient ozone. PVMRM and OLM do not address or provide for treatment of these mechanisms and have been shown to over-predict for some source characterizations and model configurations at project source ambient air boundaries and within the first 1 to 3 kilometers.

For 1-hour and annual NO₂ concentrations modeled for the CCCT Project above the SIL, a cumulative NAAQS analysis for 1-hour NO₂ will be conducted and a cumulative NAAQS and PSD Increment analysis will be conducted for annual NO₂. Due to the numerous project and background sources that would be considered in this analysis, it is anticipated that the OLM Tier 3 option would be applied for the cumulative modeling analyses. The modeling will apply OLM with the OLMGROUP ALL option as recommended by U.S. EPA for multiple stack applications.

For simplicity, NO₂ NAAQS and PSD Increment will be modeled using the same inventory for all sources. This is conservative for PSD Increment as Montour SES has reduced NO₂ emissions since the minor source baseline date in 1992. For 1-hour NO₂, only the receptors that exceed the SIL within the SIA will be modeled per U.S. EPA guidance. For the 1-hour NO₂ NAAQS analysis, the CCCT Project sources' potential emissions will be modeled interactively with emissions for all other existing Montour sources and off-site sources. The modeled design concentration would be summed with the NO₂ background concentrations discussed in Section 5.4.2 to represent non-modeled sources for comparison to the 1-hour NO₂ NAAQS. Note that there is no PSD increment for 1-hour NO₂.

There are two model inputs for OLM, the hourly ambient ozone concentrations (discussed below in Section 5.4.3) and the source-specific in-stack ratios of NO₂/NO_x emissions. For the in-stack ratios, Montour SES records NO₂ and NO_x emissions on an hourly basis for the Units 1 and 2 combined stack using continuous emissions monitoring systems (CEMS). The CEMS data for both units show zero (0) percent conversion from NO_x to NO₂. As a conservative assumption, Montour CT proposes to use 0.1 for these units. The Moxie Freedom Generation Plant (Freedom) located in Salem Township has identical CCCTs to those proposed as part of the CCCT Project at Montour. Relative Accuracy Test Audit (RATA) data from the Freedom units recorded in August 2024 show that the in-stack ratios are 0.32 and 0.31, respectively. Montour proposes using 0.32 for both units in the OLM modeling. Copies of the RATA data will be provided as part of the Plan Approval Application. The three (3) gas heaters and auxiliary boiler at Montour will be modeled using an in-stack ratio of 0.5. In-stack ratios for other sources within three (3) km will also be modeled using an in-stack ratio of 0.5. For modeled background sources beyond three (3) km (U.S. EPA, 2014), a default in-stack ratio of 0.2 will be applied.

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 U.S. EPA's *Guidance on Developing Background Concentrations for Use in Modeling Demonstrations* (Background Concentration Guidance), which was finalized November 20, 2024 (U.S. EPA, 2024i).

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 CCCT Project's significant impact area when determining the relevant sources to directly model. Based on U.S. EPA Guidance, the hypothetical example in Appendix C of the Background Concentration Guidance, generally sources with less than 25 tons per year of actual NO₂ and/or 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 CCCT Project anticipates having modeled concentrations exceeding the SIL for 1-hour NO₂ and 24-hour and annual PM_{2.5}. As such a list of nearby sources within approximately 50-km of the Project was obtained from PADEP. This list included sources in Montour, Columbia, Northumberland, Union, and Lycoming Counties. Of the sources provided, only three (3) sources had 2024 actual PM_{2.5} emissions greater than 25 TPY. These sources include: Hamilton Patriot Generation Plant, Sunbury Hummel Station Natural Gas Plant, and US Gypsum Washingtonville. These sources will be evaluated further for potential inclusion as direct modeled sources if they are not adequately captured by the background monitors. For NO₂, fourteen (14) sources had 2024 actual emissions greater than 25 TPY. These sources included: Hamilton Patriot Generation Plant, Sunbury Hummel Station Natural Gas Plant, Schuylkill Energy/St. Nicholas Cogeneration, Gilberton Power John B. Rich Memorial Power Station, Caithness Moxie Freedom Generation Plant (now owned by Talen Energy), Regency Marcellus Gas Gathering Quaker State Road Compressor Station, Transcontinental Gas Pipeline Compressor Stations 517 and 607, NextEra Renewable Fuels/Lyco Landfill, EQT Vargo Compressor Station, Northeast Pipeline Barto Compressor Station, Bucknell University Lewisburg Campus, and US Gypsum Washingtonville. **Figure 5-1** shows the locations of the background sources.

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 U.S. EPA design value spreadsheets.⁵

5.4.1 PM_{2.5} Background Monitor Selection

Using the U.S. EPA Air Quality Design Values interactive map, there are eight (8) PM_{2.5} monitors that were considered: State College (AQS Site ID: 42-027-0100), Salladasburg (AQS Site ID: 42-081-0419), Penn State (AQS Site ID: 42-117-4000), Towanda (AQS Site ID: 42-015-0011), Tunkhannock (AQS Site ID: 42-131-0010), Scranton (AQS Site ID: 42-069-2006), Allentown (AQS Site ID: 42-077-0004), and Freemansburg (AQS Site ID: 42-095-0025)

⁵ <https://www.epa.gov/air-trends/air-quality-design-values>

(see **Figure 5-2**). Factors considered when determining the most representative monitor include proximity to the Project, prevailing winds, and population density near the monitor vs. the source.

The Salladasburg, Penn State, Towanda, Tunkhannock, and Allentown monitors were quickly ruled out due to not meeting the minimum data requirements. The Freemansburg monitor, located 75 miles southeast of the project site, is in Northampton County which has a population density six (6) times larger than the population density of the project site located in Montour County. The State College monitor is the closest monitor to the Project site (65 miles west southwest) that meets the minimum data requirements and has a comparable population density to the Project site (see county population densities in **Figure 5-2**). The wind rose shown in **Figure 5-3** also indicates that the State College monitor is in an upwind direction of the Project. Based on these factors the State College monitor provides a good representation of background PM_{2.5} concentration in the vicinity of the Project. The monitor values are summarized in **Table 5-1**.

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

Pollutant	Averaging Period	AQS Site ID	Local Site Name	2022-2024 Design Value (µg/m ³)	2022 Concentration (µg/m ³)	2023 Concentration (µg/m ³)	2024 Concentration (µg/m ³)
PM _{2.5}	24-hour ⁽¹⁾	420270100	State College	20	15.1	31.3	13.3
	Annual			7.2	6.76	8.92	6.05

(1) Concentrations reflect the 98th percentile value.

Figure 5-1. Location of Background Sources

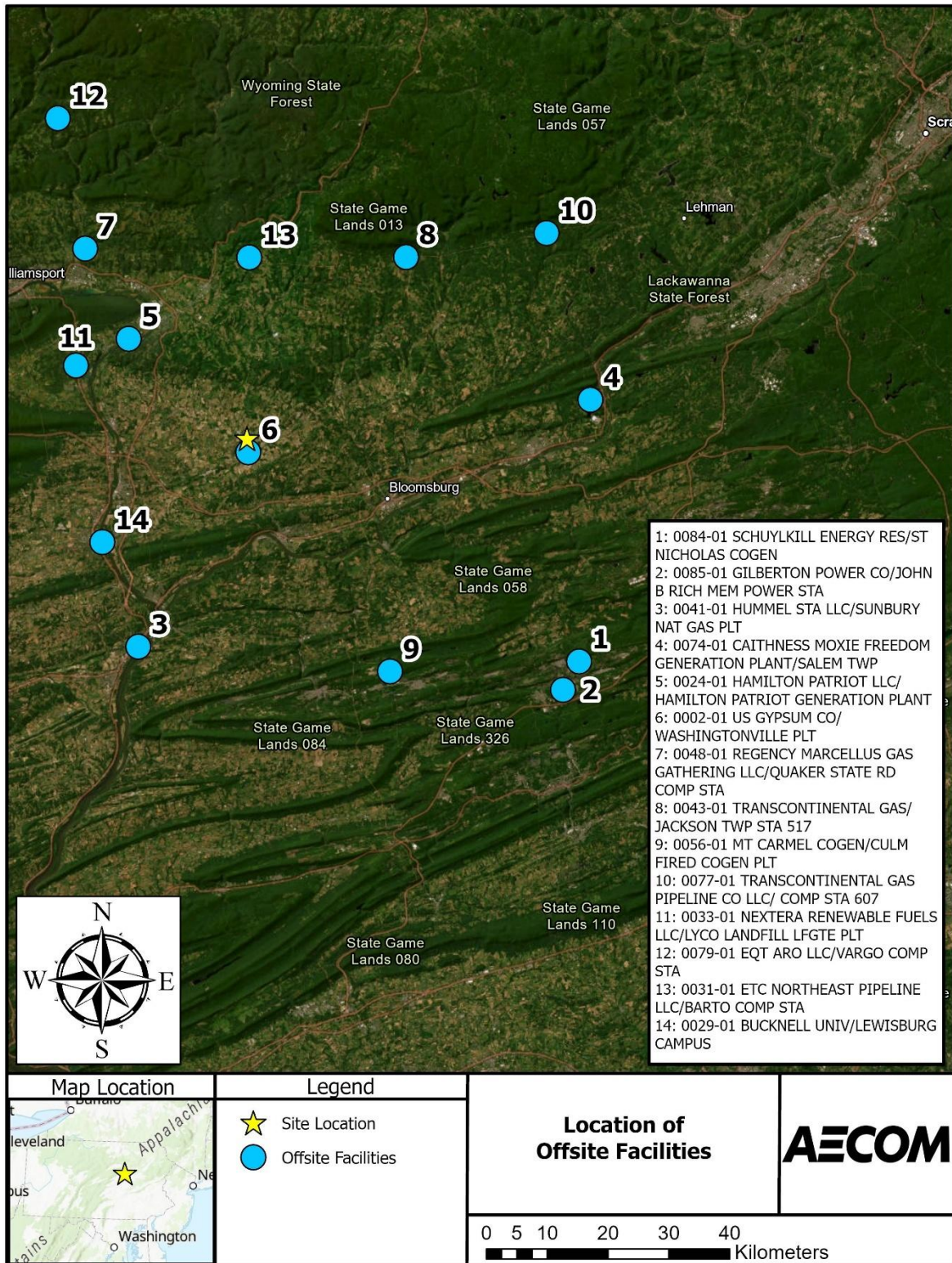
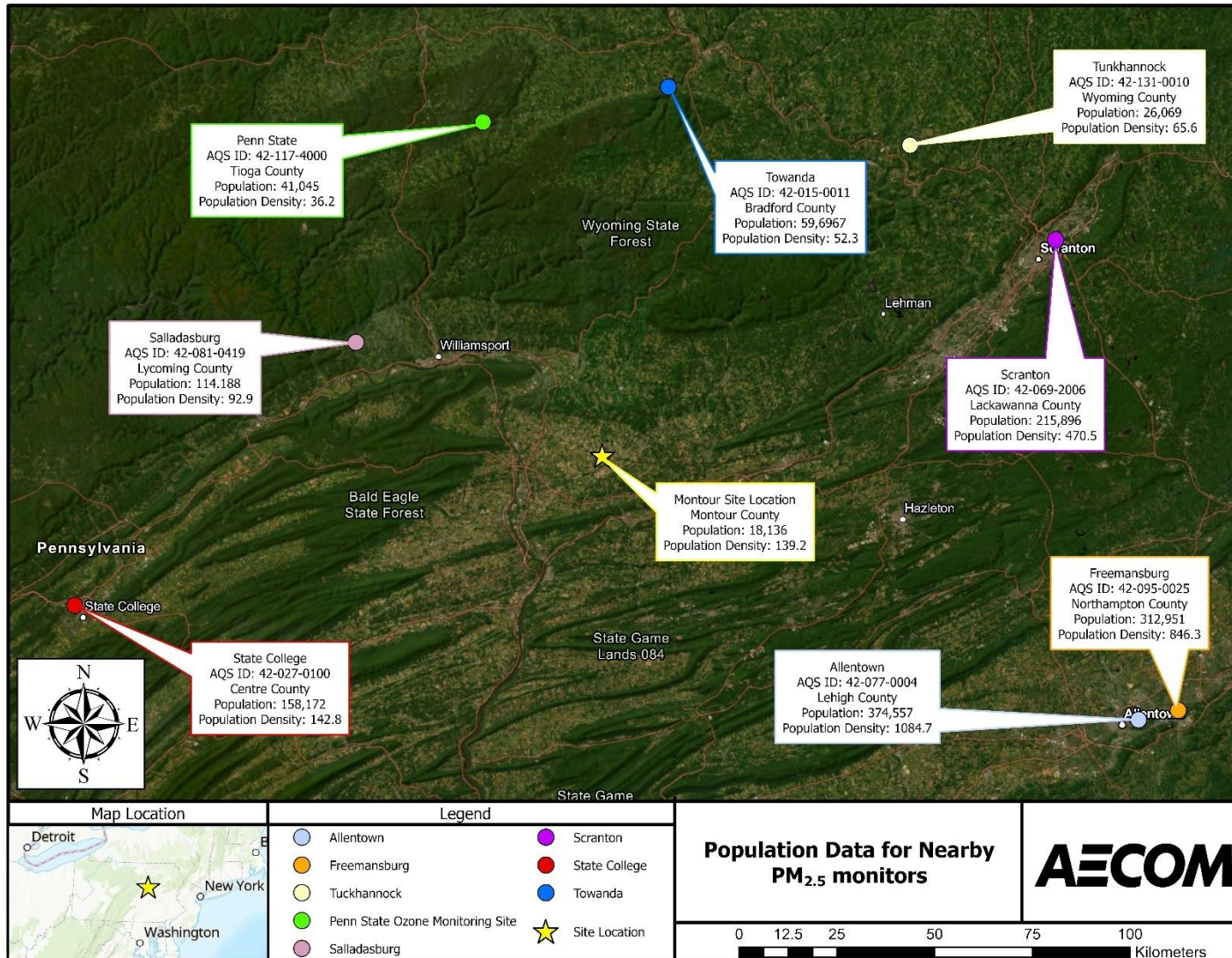
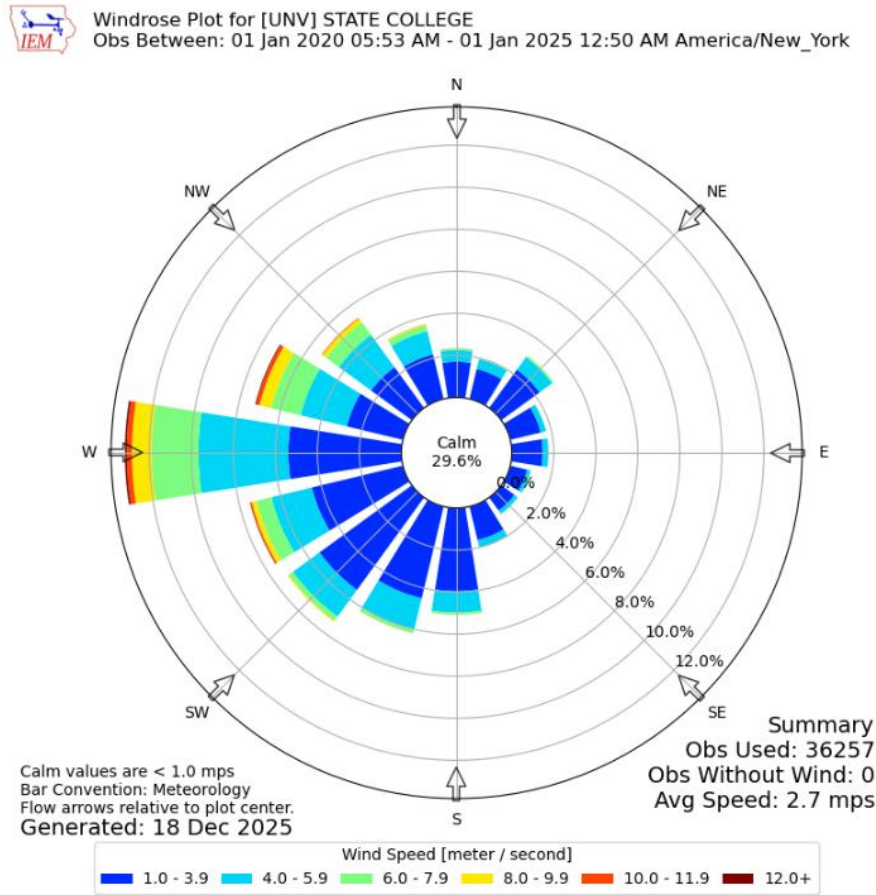


Figure 5-2. Location of Nearby PM_{2.5} Monitors



Source: US Census, 2020

Figure 5-3. Windrose Representative of Winds at State College PM_{2.5} Monitor



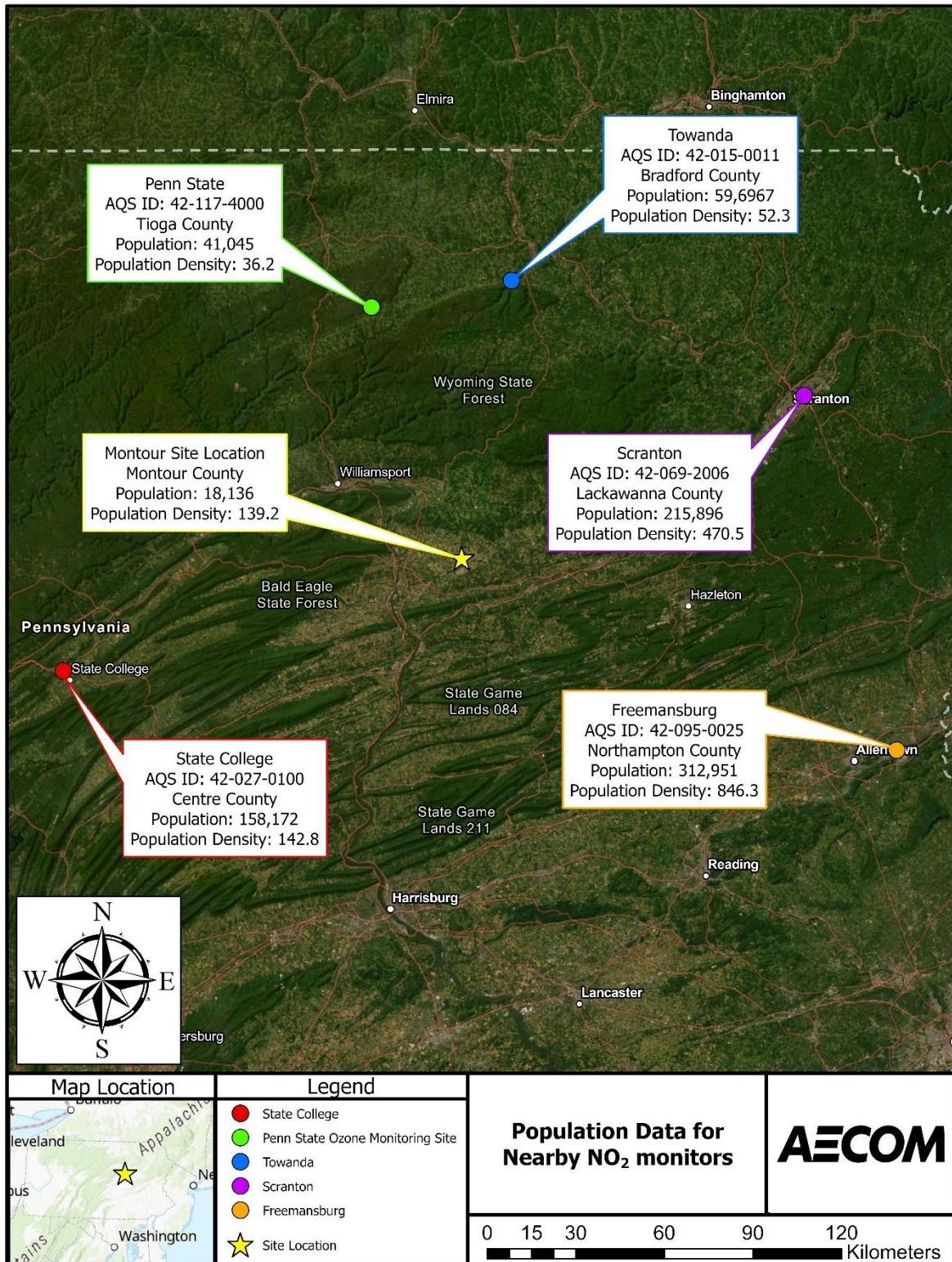
Source: <https://www.mesonet.agron.iastate.edu/sites/locate.php>

5.4.2 NO₂ Background Monitor Selection

Using the U.S. EPA Air Quality Design Values interactive map, there are five (5) NO₂ monitors considered: State College (AQS Site ID: 42-027-0100), Penn State (AQS Site ID: 42-117-4000), Towanda (AQS Site ID: 42-015-0011), Scranton (AQS Site ID: 42-069-2006), and Freemansburg (AQS Site ID: 42-095-0025) (see **Figure 5-4**). Factors considered when determining the most representative monitor include proximity to the CCCT Project, prevailing winds, and population density near the monitor vs. the source.

The Penn State and Towanda monitors were quickly ruled out due to not meeting the minimum data requirements. The Freemansburg monitor, located 75 miles southeast of the project site, is in Northampton County which has a population density six (6) times larger than the population density of the project located in Montour County. The State College monitor is the closest monitor to the project (65 miles west southwest) that meets the minimum data requirements and has a comparable population density to the project (see county population densities in **Figure 5-4**). The wind rose shown in **Figure 5-3** also indicates that the State College monitor is located in an upwind direction of the project. Based on these factors the State College monitor provides a good representation of background NO₂ concentration in the vicinity of the project. The data from 2022-2024 will be summarized by season and hour of day concentrations and used as an input in AERMOD.

Figure 5-4. Location of Nearby NO₂ Monitors



Source: US Census, 2020

5.4.3 O₃ Background Monitor Selection

The Montoursville monitoring station (AQS Site ID: 42-081-0100) is located approximately 30 kilometers northwest of the Project and was selected as the primary monitor for obtaining background ozone data. The Montoursville monitoring station did not collect hourly ozone data between November 1st and February 28th in the years 2021-2022, 2022-2023, and 2023-2024 due to staffing shortages. Due to the lapse in monitoring at Montoursville, ozone data from the Pinnacle State Park (Pinnacle) monitoring station (AQS Site ID: 36-101-0003) was compared to Montoursville for the months of March and October to determine if it was appropriate to use for the missing months of November through February. **Table 5-2** summarizes the average of the maximum daily 1-hour ozone concentrations for the Montoursville and Pinnacle monitoring stations for the years 2020 through 2024.

Table 5-2. Average of Maximum Daily 1-hour Ozone Concentrations at Montoursville and Pinnacle State Park Stations for March and October (ppb)

Year	Montoursville	Pinnacle
	March	
2020	38.77	40.45
2021	43.55	45.39
2022	42.74	46.77
2023	43.44	45.32
2024	43.94	43.35
Average 2020-2024	42.49	44.26
October		
2020	36.68	33.81
2021	33.97	36.23
2022	35.00	37.42
2023	35.86	37.03
2024	40.26	41.29
Average 2020-2024	36.35	37.15

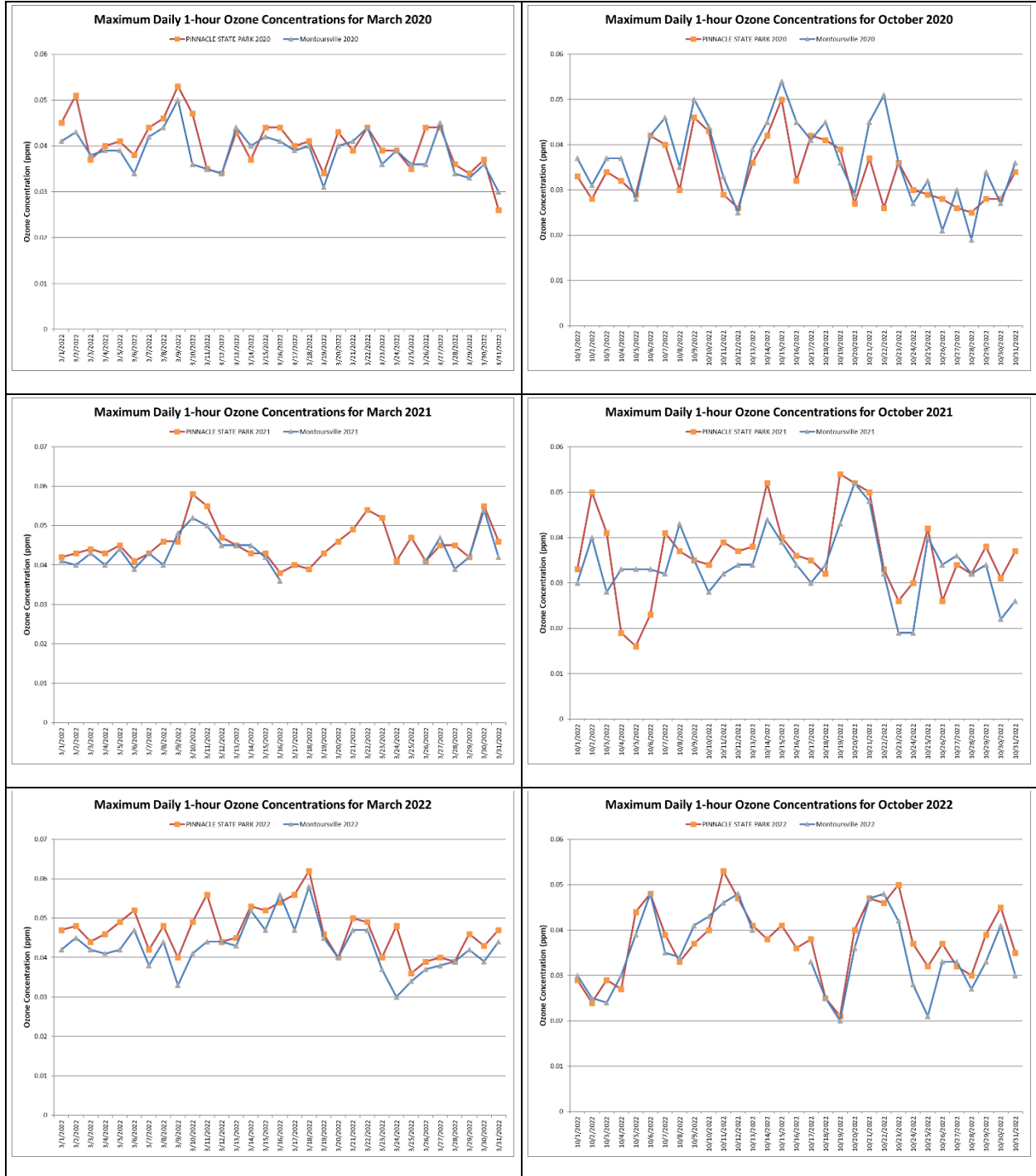
Ozone concentrations at Montoursville align with those at Pinnacle for the months of March and October, with the five (5)-year average concentrations having a difference of less than two (2) and one (1) ppb for March and October, respectively. **Figure 5-5** shows the maximum daily 1-hour ozone concentrations for March and October, for each of the five years, and **Figure 5-7** shows the locations of the monitoring stations in relation to the Project. The similarity between the 5-year average values in **Table 5-2** for March and October, indicate that ozone data from Pinnacle can be used in AERMOD to fill the missing months from Montoursville.

A supplemental analysis comparing ozone concentrations at the Montoursville and Pinnacle monitoring stations was conducted for the available winter months (see **Appendix A**) in 2020 and 2024. During periods when Montoursville data are available, the two monitors show good agreement in both the monthly average of maximum daily 1-hour ozone values and the maximum daily 1-hour concentrations. This further supports the use of Pinnacle data to fill the missing months.

If a single hour of data is missing from Montoursville, the average ozone value from the prior and subsequent hour will be used to fill the missing hour. This method importantly filled the 2nd hour of each day which is always missing. If the data is still missing after this step, missing hours (and hours with a concentration of zero [0]) will be filled with data from Pinnacle. Any remaining missing hours (and hours with a concentration of zero [0]), will be filled using the maximum (of both Montoursville and Pinnacle) hourly ozone concentration for that month by hour-of-day. The 2020 to 2024 period for hourly ozone values is concurrent with the meteorological data available at the time of the analysis,

consistent with U.S. EPA guidance. **Figure 5-6** shows the monthly maximum hour-of-day ozone concentrations that will be used to fill in missing hourly values.

Figure 5-5. Comparison of Maximum Daily 1-hour Ozone Concentrations (March and October, 2020–2024)



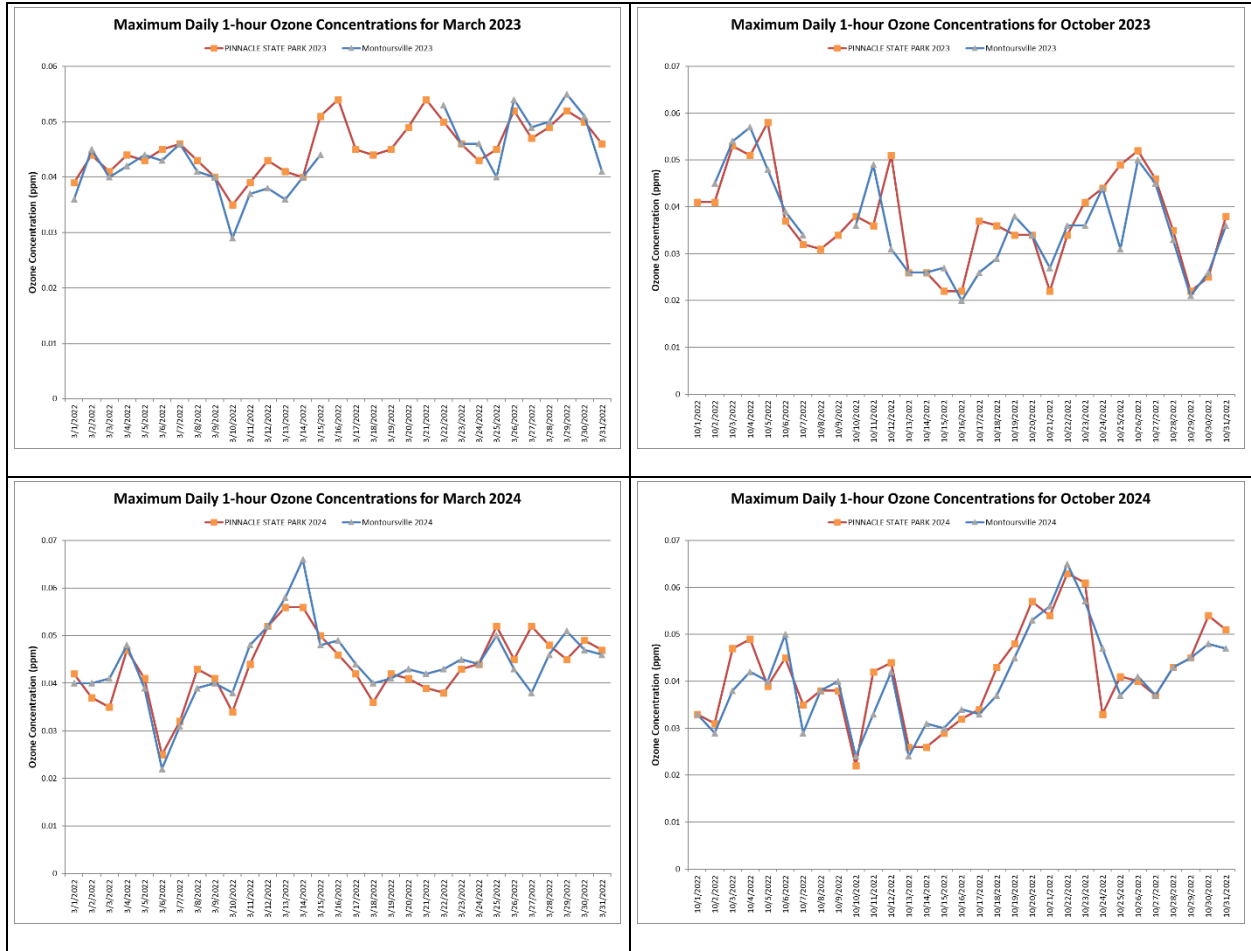


Figure 5-6. Maximum Monthly Hour of Day Ozone Concentrations

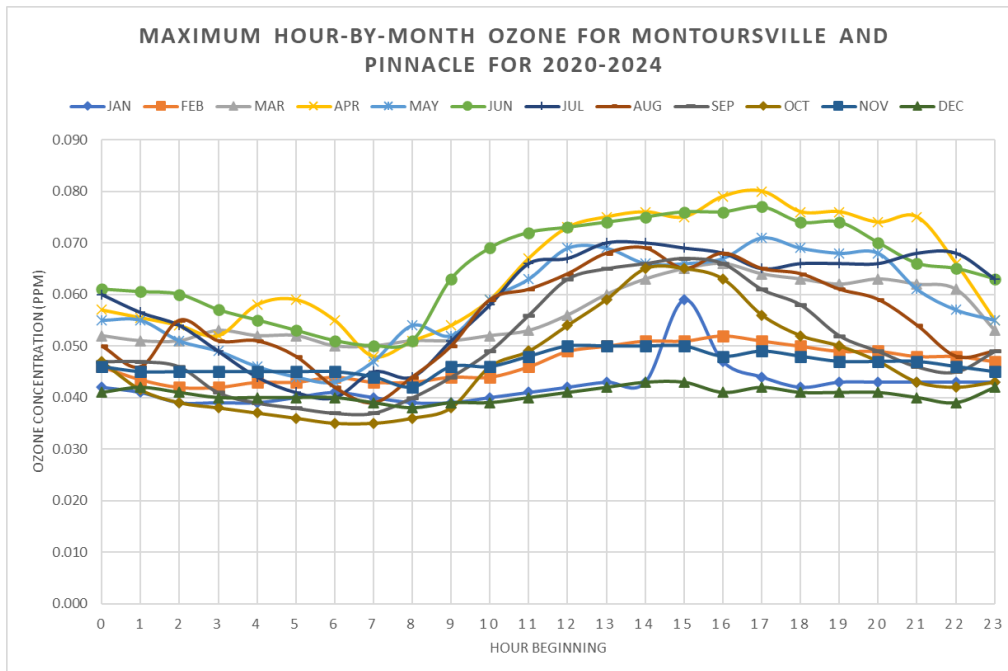
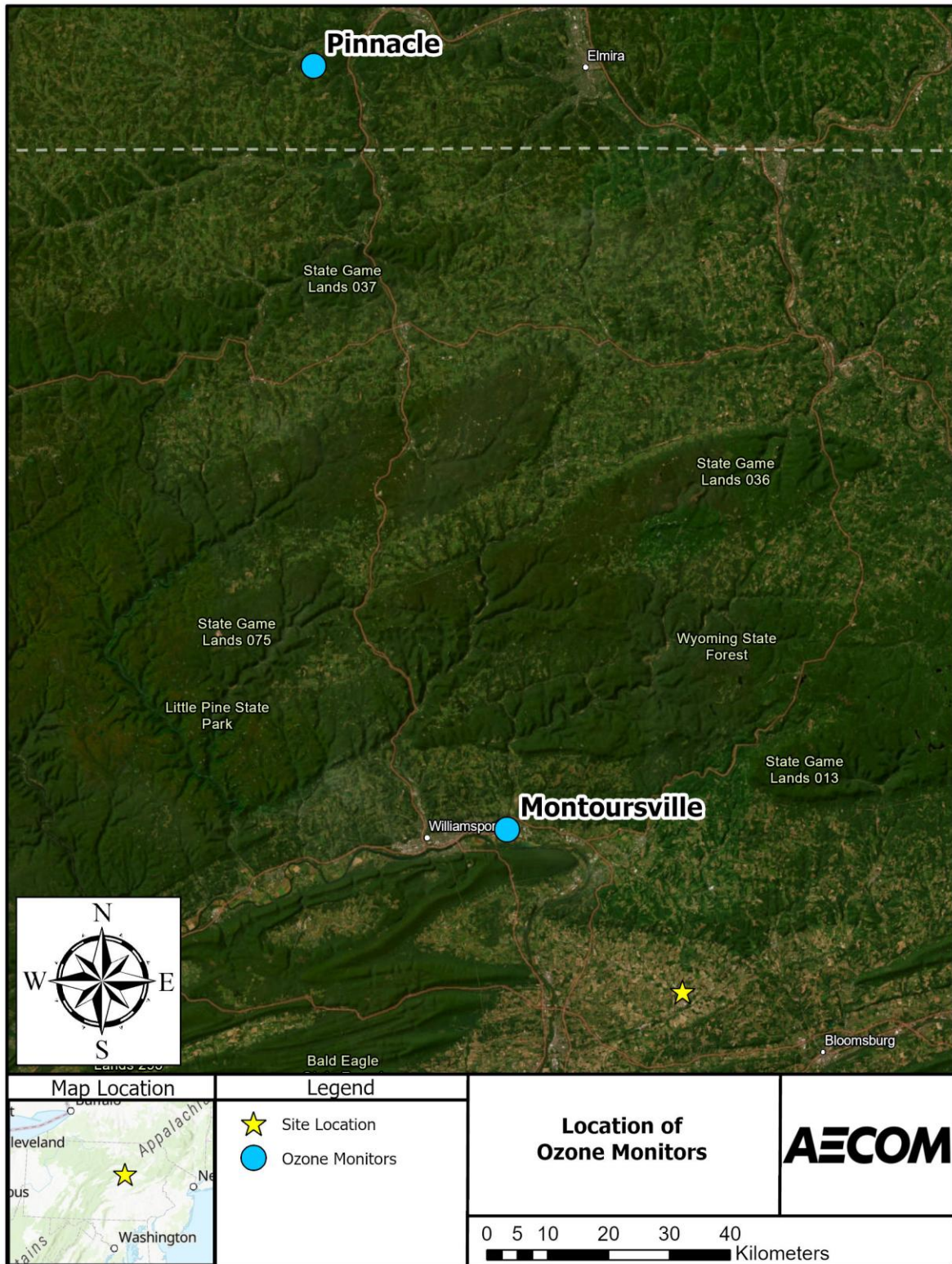


Figure 5-7. Locations of Ozone Monitoring Stations



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 two (2) PSD Class I areas located within 300 km of the CCCT Project are pictured in **Figure 6-1** and their approximate distances are:

- Brigantine Wilderness: 254 km
- Shenandoah National Park: 273 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 (NO_x, H₂SO₄ and PM₁₀ (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 screening calculation as shown in **Table 6-2**. 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.

Table 6-1. Q/D Screening Calculation

Averaging Period	NO _x (TPY)	PM ₁₀ (TPY)	SO ₂ (TPY) ⁽²⁾	H ₂ SO ₄ (TPY)	Distance (km)	Total Q/D
Brigantine Wilderness						
24-hour	341.27 ⁽¹⁾	212.23	0	40.39	254	2.34
Annual	293.14	212.23	0	40.39	254	2.14
Shenandoah National Park						
24-hour	341.27 ⁽¹⁾	212.23	0	40.39	273	2.18
Annual	293.14	212.23	0	40.39	273	2.00

(1) Emissions are TPY Equivalent. Assumes one cold start (171.4 lb/hr) and highest hourly emission rate (33.2 lb/hr) for 23 hours for both units and converted to TPY ((171.4 + (23*33.2))*2).

(2) Non-PSD pollutant.

6.1.2 Class I PSD Increments

In accordance with Appendix W (Section 4.2.c.i), because AERMOD is proposed for the CCCT Project's nearfield assessment, it can be utilized in a screening-level analysis to estimate the project's potential for a significant modeled concentration at the PSD Class I areas. As such, initially, AERMOD will be used to assess the Class I PSD increments for PM₁₀, PM_{2.5}, and NO₂. AERMOD will be applied with a ring of receptors placed at 50 km, the maximum distance at which AERMOD is considered 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 modeled concentrations associated with the project will be compared 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 for state parks and state historic sites located within the CCCT Project's vicinity. This analysis would be performed beginning with a screening procedure similar to that outlined in the U.S. EPA document *Workbook for Estimating Visibility Impairment* (U.S. EPA 1980a).

The closest state park, Milton State Park, is approximately 17 km to the west-southwest of the CCCT Project. A visibility analysis will be conducted with U.S. EPA's VISCREEN model. The analysis will be conducted in accordance with U.S. EPA's *Workbook for Plume Visual Impacts Screening and Analysis (Revised)* (U.S. 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 40 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, SO₄, and PM potential emission rates due to the CCCT 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 CCCT 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-construction 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, except for PM_{2.5}, if the net emissions increase of pollutants subject to PSD review will cause air quality impacts less than the significant monitoring concentrations (SMCs). In accordance with *Sierra Club v. EPA* 706 F.3d 428 (DC Cir. 2013), there is no exemption available for PM_{2.5}. Therefore, existing ambient monitoring data from PADEP's monitoring network will be used to satisfy the requirement for pre-construction monitoring, as described in Section 5.4.1. **Table 6-2** presents the applicable SMCs for the pollutants modeled.

Table 6-2. Significant Monitoring Concentrations

Pollutant	Averaging Period	Significant Monitoring Concentration ($\mu\text{g}/\text{m}^3$)
PM ₁₀	24-hour	10
NO ₂	Annual	14
CO	8-hour	575
PM _{2.5}	24-hour; Annual	0

Source: 40 CFR §52.21(i)(5)

6.4 Soil and Vegetation

The PSD regulations require an evaluation of the impact of the CCCT 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 U.S. 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 U.S. 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 U.S. EPA 1980 guidance, (beryllium and lead) will be performed.

The U.S. EPA screening guidance does not include any values for PM₁₀ or PM_{2.5}. As such, the highest predicted impacts from the CCCT Project used in the SIL analysis will be compared to the secondary NAAQS, which are summarized in **Table 6-3**, to demonstrate the Project will not have an adverse impact on soils and vegetation.

Table 6-3. Secondary NAAQS Values

Pollutants	Secondary NAAQS ($\mu\text{g}/\text{m}^3$)
PM ₁₀	150 (24-hour)
PM _{2.5}	35 (24-hour) and 15 (annual)
NO ₂	3,760 (4-hour), 564 (1-Month), and 100 (annual)

6.5 Growth-Related Impacts

The growth analysis required under PSD evaluates the impact associated with the CCCT Project and the general commercial, residential, and industrial growth associated with the project. No specific growth is expected as a result of the CCCT Project. It is being developed in response to the anticipated electric load growth caused by a variety of factors, including onshoring of manufacturing, new data center construction, and electrification, but any potential project is independent of the CCCT Project. Therefore, no analysis of secondary impacts from associated growth is needed for this project. Should this change in the near future, the need for an analysis will be re-evaluated.

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 CCCT 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 : Ozone Monitoring Comparison

Ozone Monitoring Comparison of Winter Months for Montoursville, PA and Pinnacle State Park, NY

The Montoursville monitoring station (AQS Site ID: 42-081-0100) did not collect hourly ozone data between November 1st and February 28th in 2021-2022, 2022-2023 and 2023-2024 due to staff shortages. As shown in **Table A-1**, there are some years when select months during these winter months, data was collected at Montoursville. This limited dataset provides an opportunity to further evaluate the representativeness of the alternate ozone monitor, Pinnacle State Park, NY, since Pinnacle collects data year-round.

Table A-1 summarizes the monthly averages of the maximum daily 1-hour ozone concentrations for the Montoursville and Pinnacle monitoring stations for the years 2020 through 2024. Months when Montoursville data were unavailable are denoted with "NA". Calendar year 2020 was the only year where all winter months (January, February, November, and December) reported ozone data.

Figure A-1 through Figure A-5 show the maximum daily 1-hour ozone concentrations for November through February for each of the 5 years. Charts comparing the concentrations from both monitoring stations are provided. If the line for Montoursville is not shown, this indicates the data were unavailable.

There is strong agreement between the monitor data based on the monthly average values shown in **Table 1** and the maximum daily 1-hour values shown in **Figure A-1 through Figure A-5**. Therefore, this analysis supports the use of Pinnacle State Park data for periods when Montoursville ozone data is missing for use in dispersion modeling of Montour.

Table A-1. Average of Maximum Daily 1-hour Ozone Concentrations at Montoursville and Pinnacle State Park Stations (ppb)

Year	Montoursville	PINNACLE
	January	
2020	32.23	34.45
2021	29.77	33.10
2022	NA	39.88
2023	NA	32.68
2024	29.81	32.87
Average 2020-2024	30.60	34.60
February		
2020	35.62	38.10
2021	39.67	42.89
2022	NA	41.57
2023	NA	40.89
2024	37.24	38.62
Average 2020-2024	37.51	40.42
November		
2020	32.50	33.57
2021	NA	36.90
2022	NA	35.90
2023	36.59	37.30
2024	32.57	33.03
Average 2020-2024	33.89	35.34
December		
2020	30.77	32.19
2021	NA	36.35
2022	NA	30.87
2023	28.87	31.84
2024	29.69	33.81
Average 2020-2024	29.78	33.01

NA = No data was available for the month.

Figure A-1. Comparison of Maximum Daily 1-hour Ozone Concentrations (2020)

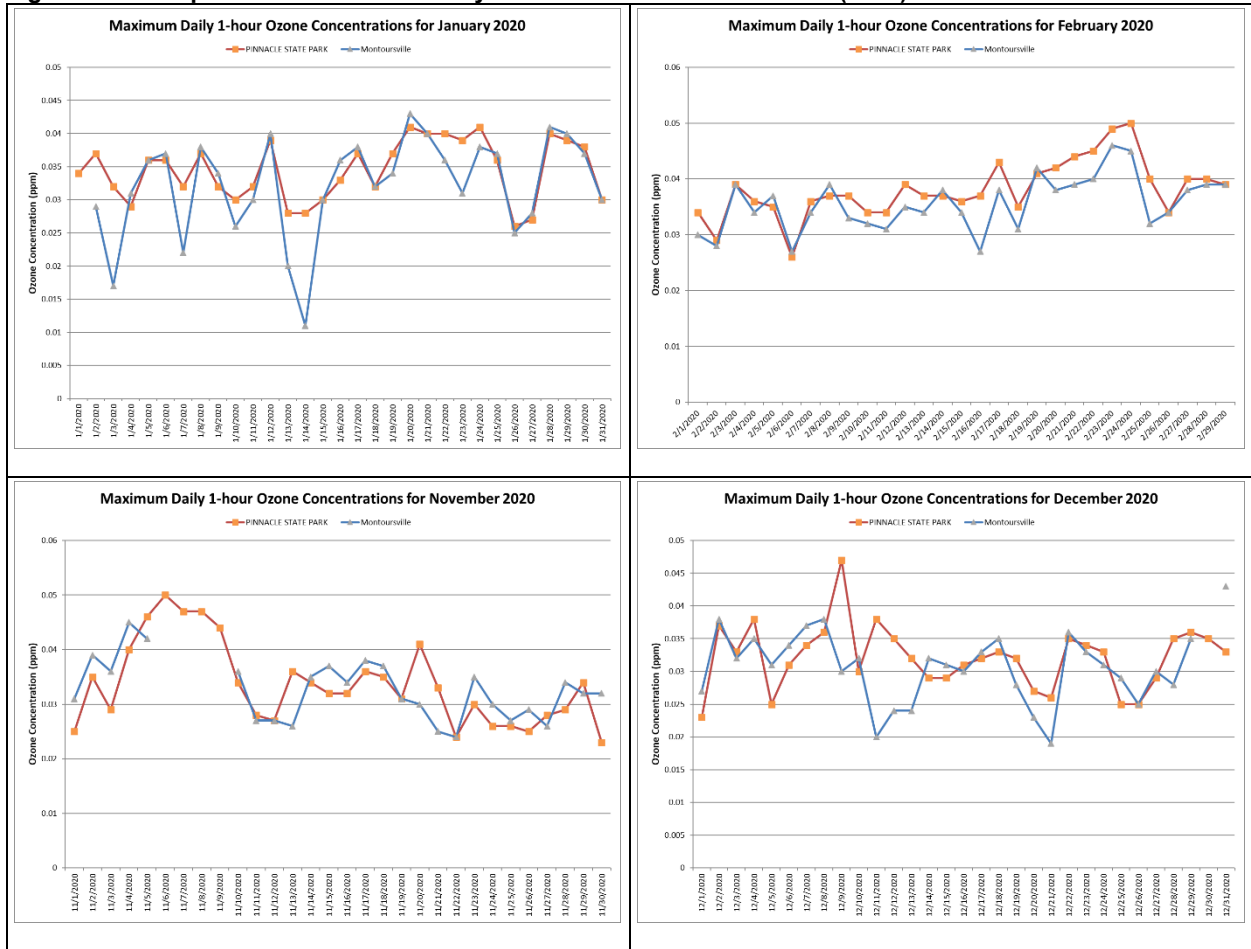


Figure A-2. Comparison of Maximum Daily 1-hour Ozone Concentrations (2021)

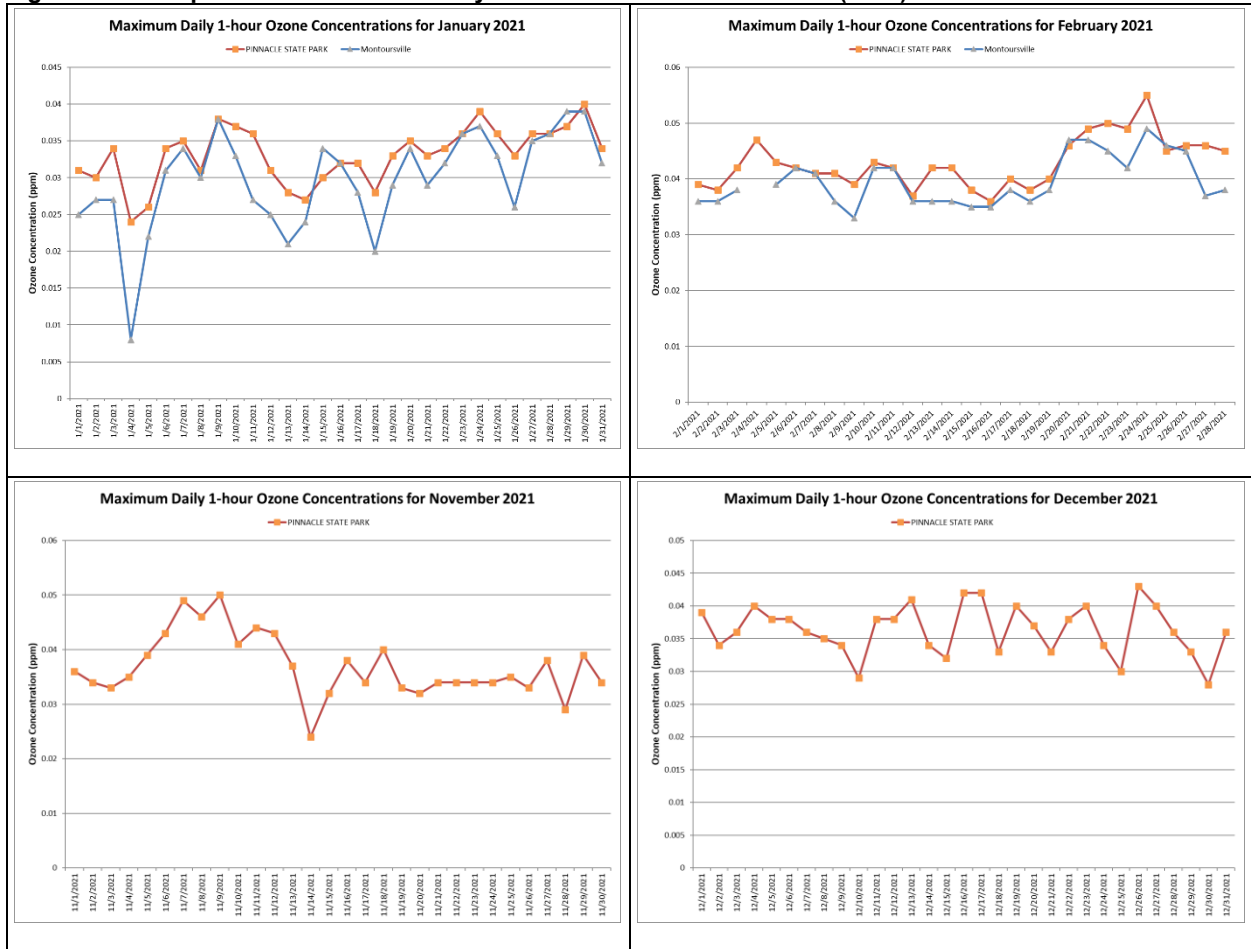


Figure A-3. Comparison of Maximum Daily 1-hour Ozone Concentrations (2022)

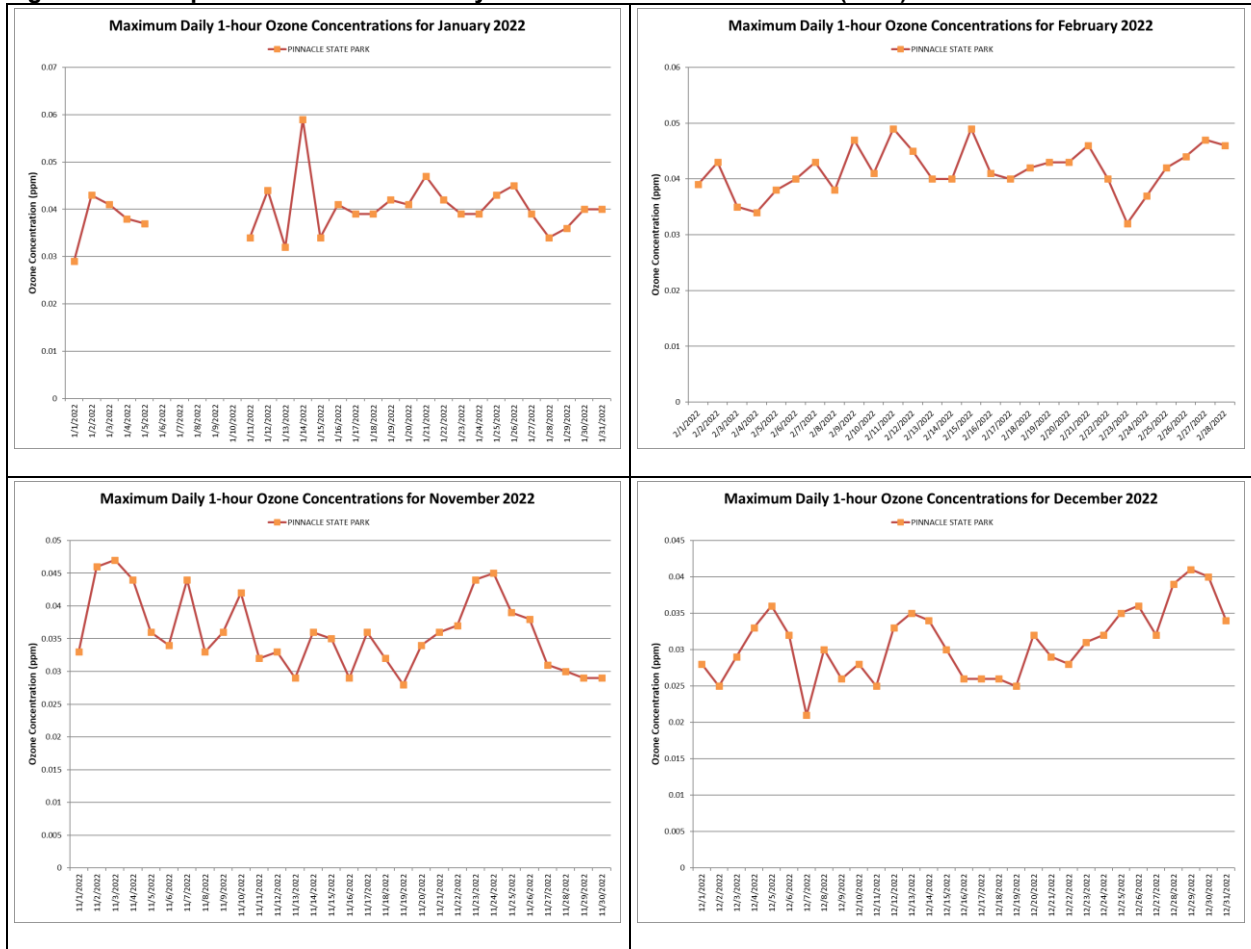


Figure A-4. Comparison of Maximum Daily 1-hour Ozone Concentrations (2023)

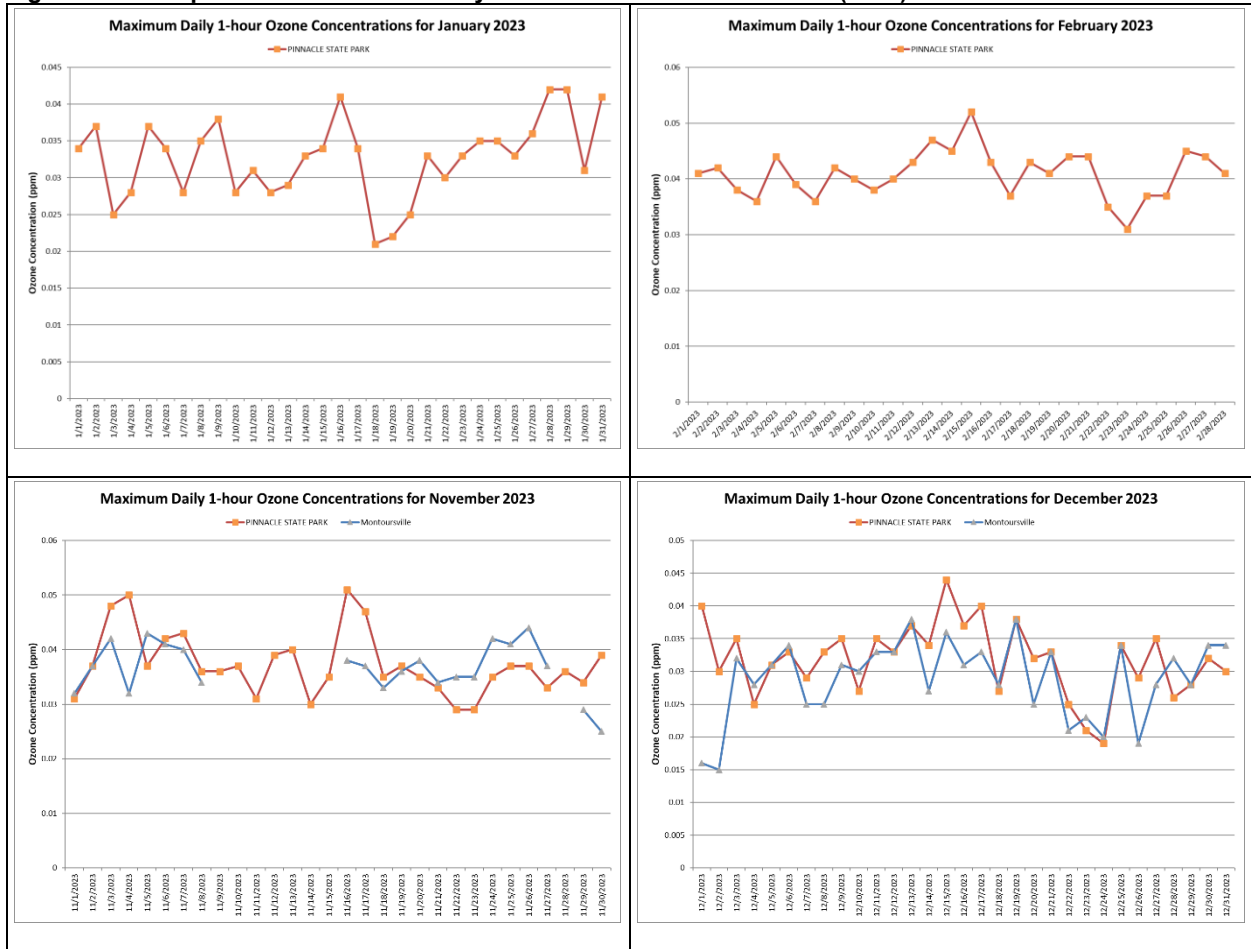


Figure A-5. Comparison of Maximum Daily 1-hour Ozone Concentrations (2024)

