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May 28, 2025

Alexander Sandy
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Bureau of Air Quality - Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

**Re: Shell Chemical Appalachia LLC
Shell Polymers Monaca
Potter and Center Townships, Beaver County
Response to DEP Technical Review Comments – PSD Air Quality Analyses and Inhalation
Risk Assessment**

Dear Mr. Sandy:

On September 13, 2024, Shell Chemical Appalachia LLC (“Shell”) submitted a plan approval application to the Pennsylvania Department of Environmental Protection (DEP) proposing the Wastewater Treatment Plant (WWTP) Permanent Controls Project and Ethylene Maximum Achievable Control Technology (EMACT) Project at Shell Polymers Monaca (“SPM”), as well as Plan Approval Reconciliations for SPM’s current plan approval. On December 20, 2024, DEP provided Shell with comments on Shell’s PSD air quality analyses and inhalation risk assessment, which included itemized requests for additional information. Shell submitted a letter responding to the comments on March 22, 2025. Additionally, Shell proposed to submit a revised Appendix D to the Plan Approval Application incorporating the updates requested in the Technical Review Comments. The revised Appendix D attachments are attached to this cover letter.

If you have any questions regarding this response to the December 20, 2024 technical review letter, please contact Kimberly Kaal at kimberly.kaal@shell.com.

Sincerely,

Kimberly Kaal

Kimberly Kaal
SPM Environmental Manager

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Enclosures

Appendix D-1 – Air Dispersion Modeling and Class II Visibility Analysis
Appendix D-2 – Additional Impacts Analysis: Potential Growth Impacts and Impairment to Soils and
Vegetation
Appendix D-3A – Emission Estimates for the Inhalation Risk Assessment
Appendix D-3B - Dispersion Modeling Analysis for the Inhalation Risk Assessment
Appendix D-3C - Inhalation Risk Assessment

APPENDIX D-1

AIR DISPERSION MODELING AND CLASS II VISIBILITY ANALYSIS FOR SHELL POLYMERS MONACA BEAVER COUNTY, PENNSYLVANIA



September 2024 (Revised May 2025)



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1.0 INTRODUCTION AND SUMMARY OF RESULTS

This document presents the results of the air quality dispersion modeling analysis conducted for Shell Polymers Monaca (SPM), which is owned and operated by Shell Chemical Appalachia LLC (Shell) and located in Beaver County, Pennsylvania. The initial analysis was submitted to the Pennsylvania Department of Environmental Protection (DEP) in April of 2014, prior to construction of the facility. Subsequent revisions to the analysis were required due to changes to the facility design configuration, associated emissions, as well as updates to the EPA-approved dispersion models, supporting software, off-site source information, meteorological data, background concentrations, and modeling procedures.

This revised analysis serves two purposes. First, it presents the results of the modeling analysis completed for the Ethylene Maximum Achievable Control Technology (EMACT) Project, which is described in more detail later in Section 2. Shell determined the EMACT Project will be a PSD major modification because it was estimated to result in a significant net emissions increase of carbon monoxide (CO) and nitrogen oxides (NO_x). Additionally, because the EMACT Project was estimated to result in a significant net emissions increase of NO_x, which is regulated as a precursor to particulate matter (PM) with an aerodynamic diameter less than or equal to 2.5 microns (PM_{2.5}), Shell has also evaluated PM_{2.5} in the modeling analysis completed for the EMACT Project.

Second, this revised analysis provides an updated air quality compliance demonstration for SPM, including a National Ambient Air Quality Standards (NAAQS) analysis, Prevention of Significant Deterioration (PSD) increment analysis, and Class II visibility analysis, to address the Plan Approval Reconciliations and Wastewater Treatment Plant (WWTP) Permanent Controls Project impacts on the most recent analysis completed for SPM. The Plan Approval Reconciliations and WWTP Permanent Controls Project are described in more detail in Section 2 of this document. This revised analysis addressing the impacts of the Plan Approval Reconciliations and WWTP Permanent Controls Project only evaluates those pollutants – CO, NO₂ and PM with an aerodynamic diameter less than or equal to 10 microns (PM₁₀) – that were required to be evaluated as part of the air quality compliance demonstration previously completed



for the construction of SPM. This analysis includes several changes to the most recent modeling demonstration that was completed for SPM in 2020. A list of the changes made to the model since the last update is provided in Section 1.1 below.

The air quality analyses performed for the EMACT Project and the Plan Approval Reconciliations and WWTP Permanent Controls Project, respectively, address the emissions of the criteria pollutants regulated under the PSD regulations of 40 CFR 52.21 as implemented under 25 Pa. Code Chapter 127, Subchapter D. These analyses were conducted to ensure that the EMACT Project does not cause or contribute to air pollution in excess of a NAAQS or PSD increment and to ensure that the Plan Approval Reconciliations and WWTP Permanent Controls Project, in conjunction with the EMACT Project, do not change the overall results of the previous air quality analyses completed for the construction of SPM, which demonstrated compliance with the applicable NAAQS and PSD increments. An updated analysis was also performed to address potential impacts on soils and vegetation; general commercial, residential, industrial and other growth; visibility; and Class I Air Quality Related Values (AQRVs) as required under 40 CFR 52.21(o) and (p), respectively. The additional impacts analysis, which includes the soils, vegetation, and growth analyses, is included in Appendix D-2.

Two separate significant impact analyses were conducted: one for the EMACT Project and one for the Plan Approval Reconciliations and WWTP Permanent Controls Project. For the EMACT Project, only the emissions increases from project-impacted emission sources at SPM were evaluated to determine if the project would significantly impact local air quality. Alternatively, the proposed facility-wide potential to emit rates, including the emissions changes caused by the Plan Approval Reconciliations and WWTP Permanent Controls Project but excluding the emissions changes caused by the EMACT Project, were evaluated to determine if the initial construction of SPM would significantly impact local air quality. The resultant modeled concentrations for each of the significant impact analyses were compared to the ambient Significant Impact Levels (SILs) for Class I and Class II areas.

The results of the significant impacts analysis for the EMACT Project demonstrate that the project will not result in ambient impacts in excess of the Class II or Class I SILs for



NO₂, CO, or PM_{2.5}. Therefore, a cumulative air quality analysis was not required for the EMACT Project.

The significant impacts analysis conducted for the Plan Approval Reconciliations and WWTP Permanent Controls Project results in ambient impacts in excess of the Class II SILs for NO₂, CO, and PM₁₀. Therefore, a cumulative air quality analysis to calculate concentrations for comparison to the NAAQS and PSD Class II increments was required for these pollutants.¹ The results of the cumulative impact analysis (also referred to as the “as-built analysis”), which includes emissions associated with the EMACT Project, demonstrate compliance with the NO₂, CO, and PM₁₀ NAAQS and PSD Class II increment standards for NO₂ and PM₁₀. The analysis also demonstrates insignificant Class I impacts for NO₂ and PM₁₀ for the Plan Approval Reconciliations and WWTP Permanent Controls Project.

Class I AQRVs were also evaluated for SPM using the Federal Land Manager’s (FLM’s) Q/d screening and determined to be less than the screening threshold of 10. The total facility emissions used in the Q/d screening included the emissions increases from the EMACT Project and updates associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project. In addition, visibility impacts were evaluated at the nearby Racoon Creek State Park and it was concluded that SPM is not expected to negatively impact visibility at the park.

The analysis conforms with the modeling procedures outlined in the Environmental Protection Agency’s Guideline on Air Quality Models (“Guideline”) and associated EPA modeling policy and guidance.² It also conforms with the modeling protocol for the EMACT Project submitted on June 5, 2024 and approved by the DEP on June 6, 2024.

1.1 Modeling Revisions

- Included latest versions of AERMOD and AERMET (Versions 24142);

¹ There are no PSD increments for CO; therefore, modeling was only performed to demonstrate compliance with the CO NAAQS.

² *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, January 2017.



- Included most recent 1/3 arc second Three-Dimensional Elevation Program (3DEP) data obtained from the National Map from the U.S. Geological Survey (USGS);
- Updated the model with the most current version of 2018-2022 meteorological data provided by DEP;
- Updated the off-site emissions inventory;
- Updated background pollutant concentrations based on data from 2020-2022;
- Removed emergency generator nos. 5 and 6 which have been permanently removed from SPM; and,
- Updated emission rates for numerous sources (See Section 1.7 of the plan approval application for more details).



2.0 FACILITY AND PROJECT DESCRIPTION

SPM consists of an ethylene manufacturing unit, three polyethylene manufacturing units, three cogeneration units (Cogen Units), and a variety of ancillary equipment required to support its operations. The major sources of emissions include ethane cracking furnaces, combustion turbines, cooling towers, polyethylene transfer activities, flares, and thermal oxidizers.

This modeling report has been prepared in support of the plan approval application submitted by Shell to DEP in accordance with the Pennsylvania Air Pollution Control Act and 25 Pa. Code §127.12 for the following changes.

- The WWTP Permanent Controls Project, which will improve the oils, grease, and volatile organic compound (VOC) removal efficiency of the primary treatment section of SPM's WWTP. Shell is currently using temporary equipment to achieve improved removal efficiencies and is now proposing to install permanent equipment.
- The EMACT Project, which is necessary to comply with the 40 Code of Federal Regulations (CFR) 63 Subpart YY pressure-assisted multi-point flare minimum net heating value of flare combustion zone gas (NHV_{cz}) requirement that recently became applicable to the Totally Enclosed Ground Flare (TEGF) A and TEGF B. Supplemental gas will be utilized as necessary in order to achieve compliance with the minimum NHV_{cz} currently required by 40 CFR 63 Subpart YY for the two TEGFs.
- After a thorough review of SPM's as-built operations and plan approval source inventory, potential emissions calculations, and conditions, Shell is proposing to reconcile specific plan approval source descriptions, conditions, and supporting potential to emit calculations. These proposed reconciliations are collectively referred to by Shell as the "Plan Approval Reconciliations". A detailed description of all proposed reconciliations is provided in the plan approval application.



Shell has retrospectively evaluated the Plan Approval Reconciliations and WWTP Permanent Controls Project together as part of the initial construction of SPM for the following reasons:

- The relatively close timing between the Plan Approval Reconciliations and WWTP Permanent Controls Project and the recently completed initial construction of the facility;
- The Plan Approval Reconciliations represent as-built changes to the facility's initial construction plan approvals; and
- The WWTP Permanent Controls Project represents needed improvements to the initial construction of the facility's WWTP.

On the other hand, Shell has evaluated the EMACT Project separately from the Plan Approval Reconciliations, WWTP Permanent Controls Project, and initial construction of SPM because the EMACT Project is a regulatory driven project that is only being implemented at the facility to comply with newly effective federal regulatory requirements that are applicable to ethylene production units across the country.

The attainment status designations for SPM's location contemporaneous with DEP's issuance of PA-04-00740A, which authorized the initial construction and operation of SPM, are the relevant designations for the retrospective NSR applicability analysis performed for the Plan Approval Reconciliations and WWTP Permanent Controls Project. Although Beaver County is currently designated as attainment for PM_{2.5}, the county was designated as nonattainment for PM_{2.5} when DEP issued PA-04-00740A to Shell. The remaining currently effective attainment status designations for SPM's location are unchanged from the attainment status designations that were in effect when DEP issued PA-04-00740A. Thus, Shell evaluated the Plan Approval Reconciliations and WWTP Permanent Controls Project in regard to DEP's Nonattainment NSR (NNSR) regulations (25 Pa. Code §§127.201 to 127.218) for ozone (NO_x and VOC), PM_{2.5}, SO₂, and lead, while Shell evaluated the same changes in regard to DEP's PSD regulations (25 Pa. Code §§127.81 to 127.83) for CO, NO₂ (NO_x), PM₁₀, and all other regulated PSD pollutants.



The Plan Approval Reconciliations and WWTP Permanent Controls Project will not retrospectively cause the initial construction of SPM to require PSD permitting under 25 Pa. Code §127.83 for any additional regulated PSD pollutants relative to the PSD applicability determinations that were made contemporaneous with DEP's authorization of the initial construction of SPM. However, Shell has updated the most recent air quality analysis that was completed for the initial construction of SPM due to the proposed changes to the CO, NO_x, and PM₁₀ potential to emit rates of specific emission sources due to the Plan Approval Reconciliations and WWTP Permanent Controls Project.

As mentioned previously, the EMACT Project is a separate, standalone project with respect to the NSR permitting programs. Because SPM is currently a PSD major stationary source, PSD permitting requirements are applicable to the EMACT Project because the project will result in significant net emissions increases of NO_x and CO. Additionally, although the EMACT Project will not result in a significant net emissions increase in direct emissions of PM_{2.5}, the project is subject to PSD review for PM_{2.5} because it will result in a significant net emissions increase in NO_x, which is regulated as a precursor to PM_{2.5} per 40 CFR 52.21 (b)(23)(i). Therefore, this analysis addresses the emissions increases of NO_x, CO, and PM_{2.5} due to the EMACT Project.



3.0 SITE DESCRIPTION

SPM occupies approximately 400 acres adjacent to the Ohio River in Center and Potter Townships, Pennsylvania in Beaver County. The approximate Universal Transverse Mercator (UTM) coordinates of the facility are 556,129 meters east and 4,502,450 meters north (UTM Zone 17, NAD 83). Figure 1 shows the general location of SPM.

The facility is classified under the regulations governing PSD (40 CFR 52.21) and Title V (40 CFR 70.2) as a major source of air pollution. The portion of Beaver County where SPM is located is currently designated as attainment or unclassifiable for all regulated pollutants with the exception of ozone, sulfur dioxide (SO₂), and lead (Pb).³

³ A portion of Beaver County is designated nonattainment for the 2010 1-hr SO₂ standard and the 2008 lead (Pb) standard.

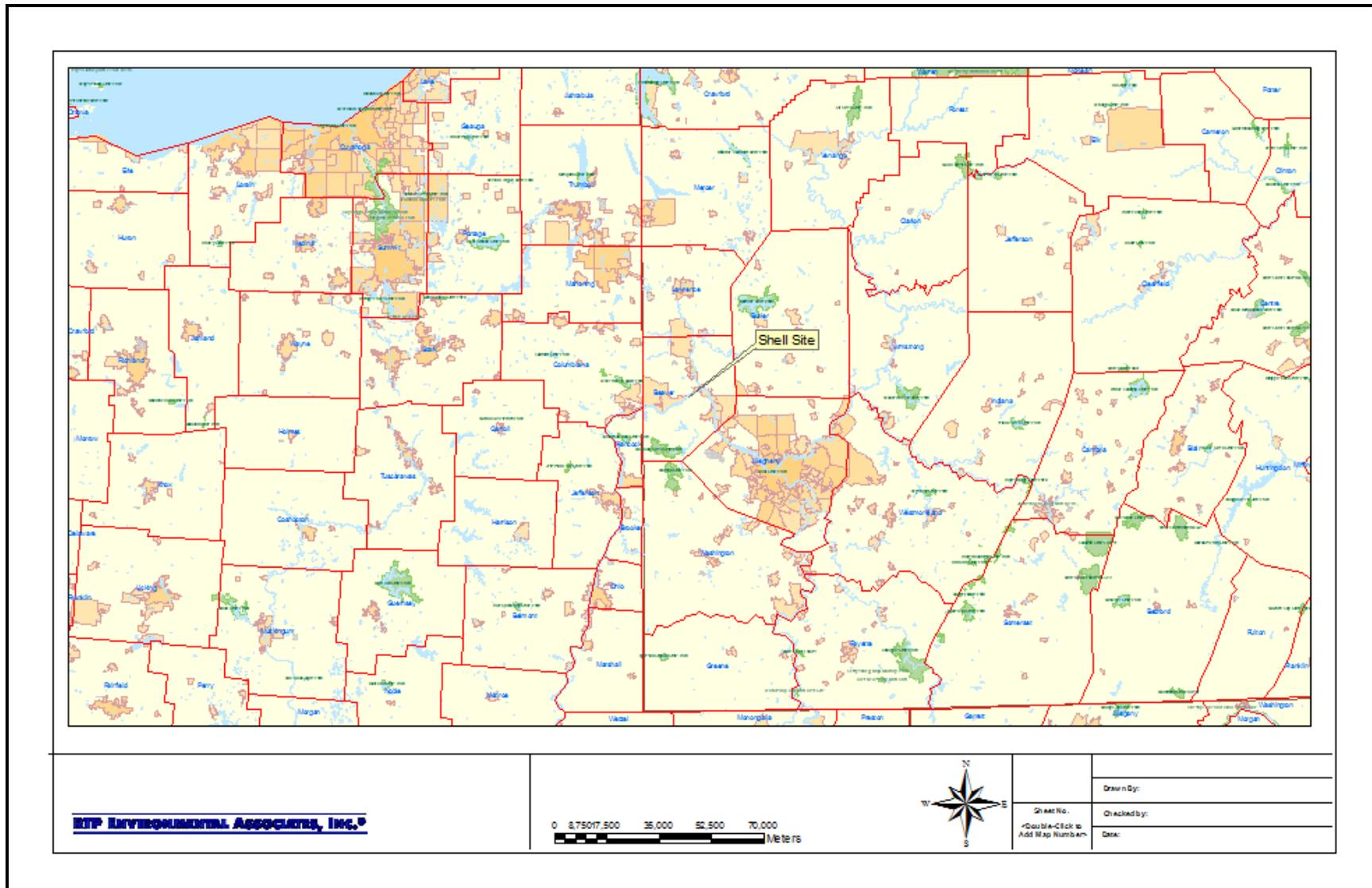


Figure 1. General Location of SPM



4.0 MODEL SELECTION AND MODEL INPUT

4.1 Model Selection

The latest version of the AMS/EPA Regulatory Model (AERMOD, Version 24142) was used to conduct the dispersion modeling analysis. AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD is a modeling system with three components: AERMAP is the terrain preprocessor program, AERMET is the meteorological data preprocessor and AERMOD includes the dispersion modeling algorithms.

AERMOD is the most appropriate model for calculating ambient concentrations near SPM based on the model's ability to incorporate multiple sources and source types. The model can also account for convective updrafts and downdrafts and meteorological data throughout the plume depth. The model also provides parameters required for use with up-to-date planetary boundary layer parameterization. The model also has the ability to incorporate building wake effects and to calculate concentrations within the cavity recirculation zone. All model options were selected as recommended in the EPA Guideline on Air Quality Models (Appendix W to 40 CFR 51).⁴ Model runs were completed using the EPA executable available for download from the Support Center for Regulatory Atmospheric Modeling (SCRAM).⁵

4.2 Model Control Options and Land Use

AERMOD was run in the regulatory default mode for all pollutants. The NO₂ significant impact modeling included the Tier 2 Ambient Ratio Method (ARM2) with the EPA recommended minimum and maximum ambient NO₂/NO_x ratios of 0.5 and 0.9, respectively. The Plume Volume Molar Ratio Method (PVMRM) was used in the NO₂ NAAQS analysis. This option is discussed in more detail in Section 5.7. The PSD

⁴ *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, November 2024.

⁵ <https://www.epa.gov/scram>



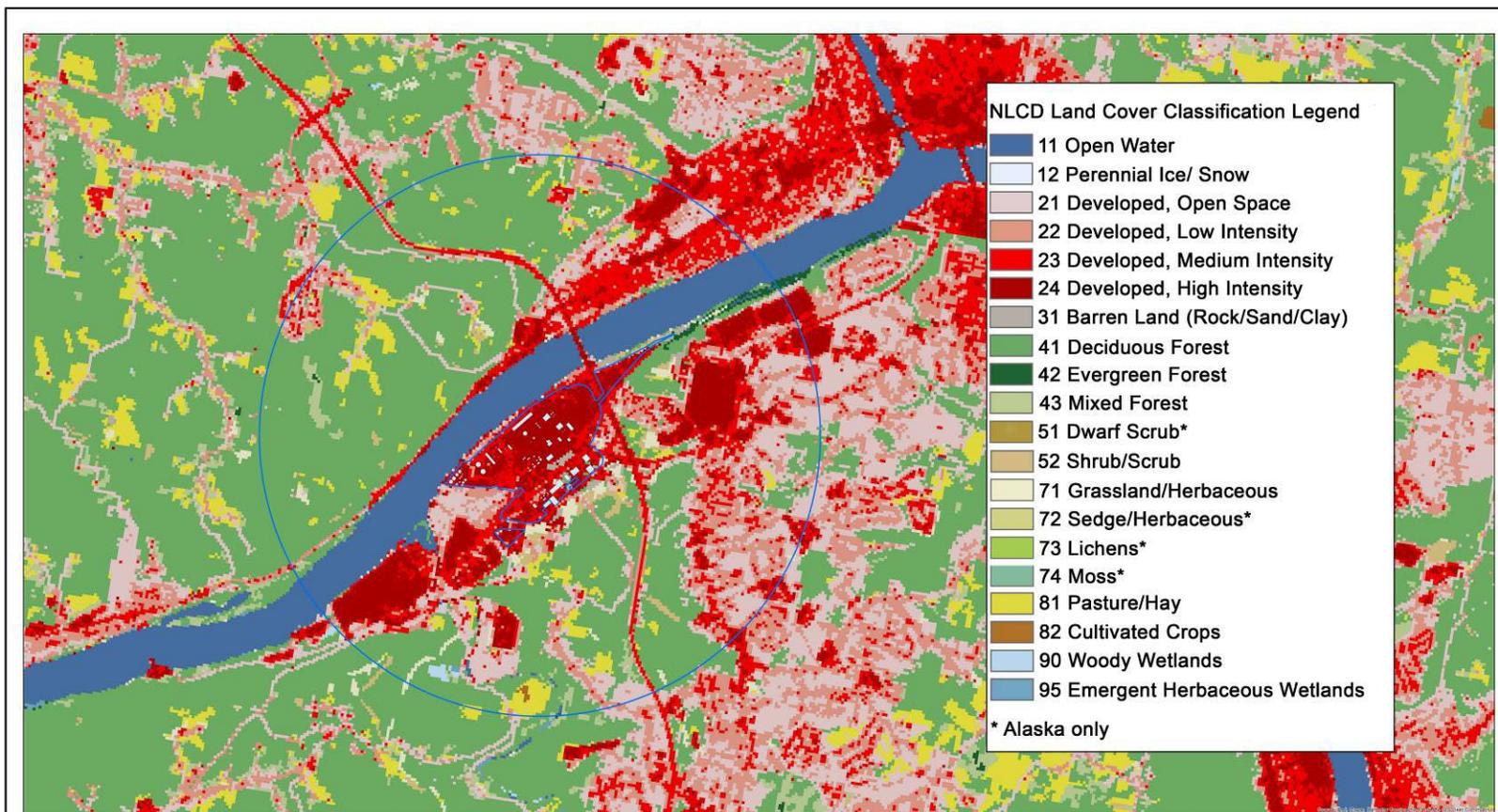
Class II increment modeling conservatively assumes 100% conversion of NO_x to NO₂.

The default rural dispersion coefficients in the model were used. This is supported by the Land Use Procedure consistent with subsection 7.2.1.1 of the Guideline and Section 5.1 of the AERMOD Implementation Guide.^{6,7} The USGS 2021 National Land Cover Database (NLCD) Land Cover Data within 3 km of SPM were converted to Auer 1978 land use types. NLCD Categories 23 and 24, were considered as urban.⁸ It was determined that the land use in the vicinity of SPM is predominantly rural (22% of the area is classified as urban - Figure 2). A spreadsheet providing the results of the land use analysis is provided with the modeling input and output files electronically. The potential for urban heat island effects, which are regional in character, was considered and determined not to be of concern.

⁶ *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, November 2024.

⁷ *AERMOD Implementation Guide*, EPA-454-B-24-009, November 20, 2024.

⁸ Auer, Jr., A.H. "Correlation of Land Use and Cover with Meteorological Anomalies." *Journal of Applied Meteorology*, 17:636-643, 1978.



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0 500 1,000 2,000 3,000 4,000 Meters



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Figure 2. Land Use within Three Kilometers of SPM (Three Kilometer Radius Circle Shown in Blue)



4.3 Source and Monitoring Data

Detailed release parameters and model inputs can be found in Attachment A to this document. The sections below provide additional details on how the model inputs were determined.

Point Sources and Flares

Most emission sources at SPM vent to stacks with a well defined opening. These sources were modeled as point sources in AERMOD. In addition, there are several flares at the facility: two TEGFs, an elevated high pressure candlestick flare, and a multi-point ground flare (MPGF). Some flaring events will only occur during periods of malfunction. Malfunction emissions are not required to be modeled per Appendix W Section 8.2.2(d).⁹ The flares are also used for startup or shutdown (i.e., non-emergency flaring), which is considered in short-term modeled emission rates. The flares have been modeled using the procedures outlined below as presented in Section 2.1.2 of the AERSCREEN User's Guide.¹⁰

The effective flare diameter (D , in meters) and height (h_{eff} , in meters) for each flare were computed as a function of heat release rate according to the following equations, where HR is the heat release rate of the flare in calories per second, HL is the heat loss fraction, and H_s is the physical height of the flare in meters:

$$D = 9.88 \times 10^{-4} \times \sqrt{HR \times (1 - HL)}$$

$$h_{eff} = H_s + 4.56 \times 10^{-3} \times HR^{0.478}$$

The MPGF was represented by one flare stack. The effective flare diameter and height for an individual flare was used for the representative flare stack and was calculated using the equivalent individual heat release rate, which was estimated as the total heat release rate (88.4 MMBtu/hr) divided by the total number of flare heads (38).

⁹ *Guideline on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, November 2024.

¹⁰ *AERSCREEN User's Guide*, EPA-454/B-21-005, April 2021.



An exit temperature of 1273 Kelvin (K) and velocity of 20 meters per second (m/s) were assumed for all flares, consistent with the AERSCREEN default values.¹¹

Volume Sources

Haul roads were modeled pursuant to procedures adopted by the EPA Haul Road Workgroup as outlined in the six steps below:¹²

Step 1: The adjusted width of the “road” was calculated as the actual road width plus 6 meters. The additional width represents turbulence caused by the vehicle as it moves along the road.

Step 2: The number of volume sources was calculated by dividing the length of the road by the adjusted width. This was the maximum number of volume sources modeled.

Step 3: The height of the volume was set equal to 1.7 times the height of the vehicle generating the emissions.

Step 4: The initial horizontal sigma for each volume was calculated by dividing the adjusted width by 2.15.

Step 5: The initial vertical sigma was calculated by dividing the height of the volume determined in Step 3 by 2.15.

Step 6: The release point height was calculated as the height of the volume determined in Step 3 divided by two. This point is in the center of the volume.

All source locations were based upon a NAD83, UTM Zone 17 projection.

Good Engineering Practice Stack Height Analysis

A Good Engineering Practice (GEP) stack height evaluation was conducted to determine the direction-specific building dimensions to include in the model. Since flares are not subject to the GEP regulations, there is no requirement to calculate the GEP formula stack height for flares. The formula height is used to justify stack height

¹¹ *Ibid.*

¹² *Haul Road Workgroup Final Report*, EPA Region 5, December 6, 2011.



credit for stacks constructed in excess of 65 m. Procedures used were in accordance with those described in the EPA Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations-Revised).¹³ GEP formula stack height, as defined in 40 CFR 51, is expressed as $GEP = H_b + 1.5L$, where H_b is the building height and L is the lesser of the building height or maximum projected width. Point source and building/structure locations were determined from a facility plot plan. The locations and heights were input to the EPA's Building Profile Input Program (BPIP-PRIME) computer program to calculate the direction-specific building dimensions needed for AERMOD. Multi-tiered buildings (i.e. PE12, PE3, PERAIL) were represented as multi-tiered structures in the BPIP-PRIME input file, consistent with the EPA User's Guide to the Building Profile Input Program.¹⁴ A three dimensional rendering of the facility is shown in Figure 3 and a plot plan for SPM is shown in Figure 4. Downwash parameters for all point sources were included in the model runs.

¹³ *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for Stack Height Regulations (Revised))*. EPA-450/4-80-023R, U.S. Environmental Protection Agency, June 1985.

¹⁴ *User's Guide to the Building Profile Input Program*. EPA-454/R-93-038, U.S. Environmental Protection Agency, April 2004

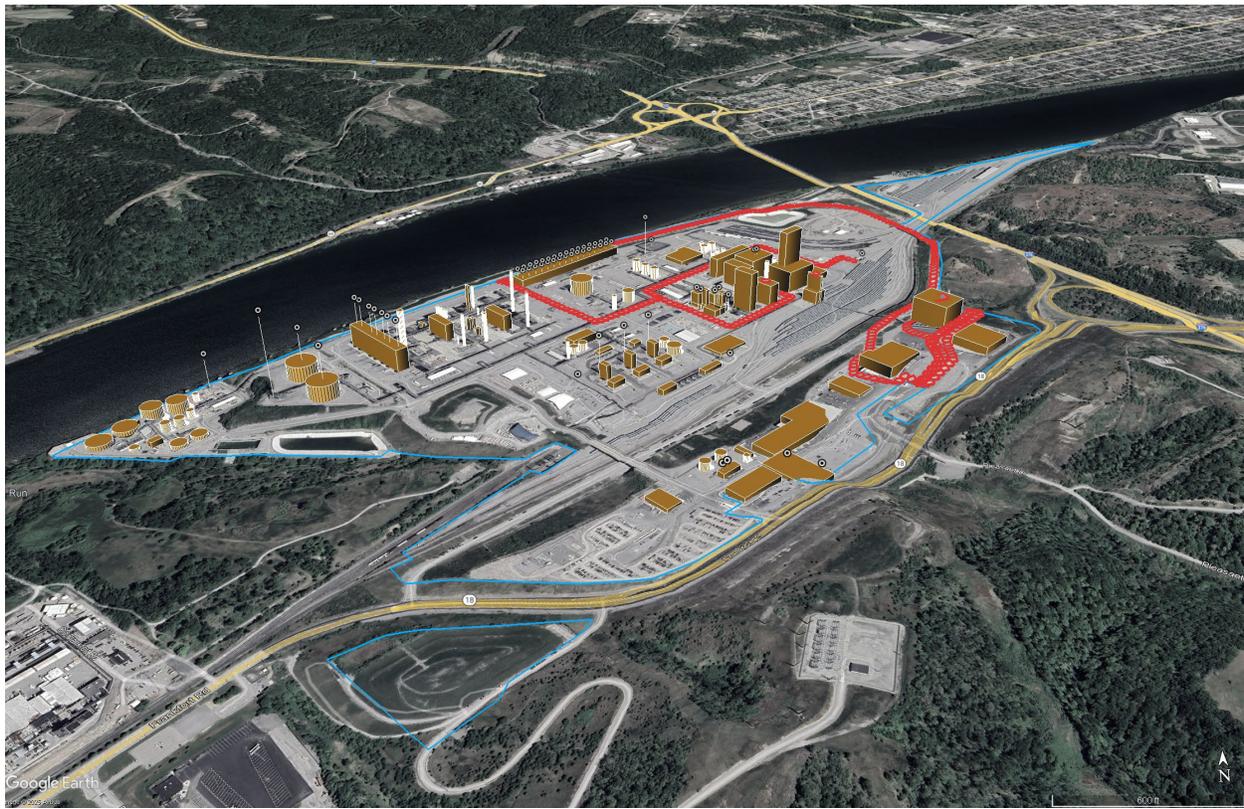


Figure 3. SPM Three-Dimensional Plot Plan (View from SW)



Figure 4. SPM Plot Plan



Monitored Background Data

Ambient background pollutant concentrations of PM_{2.5}, PM₁₀, NO₂, ozone, and CO are needed to establish a representative background concentration to fulfill the PSD pre-construction monitoring requirements and/or to establish background concentrations for use in the NAAQS analysis. In the NAAQS analysis, the ozone background concentrations are used in the PVMRM analysis and the PM₁₀, NO₂, and CO background concentrations are added to the modeled concentrations to assess NAAQS compliance.

There are two ambient monitors in the vicinity (within 10 km) of SPM (Figure 5). The Brighton Township monitor, on Sebring Road (AQS #42-007-0005), is located across the river from SPM to the north. However, only SO₂ and ozone are monitored at this location. The second monitor is located in Beaver Falls (AQS #42-007-0014). PM₁₀, PM_{2.5}, NO₂, ozone, and SO₂ are monitored at this location. There are no CO monitors in Beaver County (Please note that CO was historically monitored at the Beaver Falls monitor location; however, the CO monitor was deactivated in 2008). The nearest CO monitor is the Lawrenceville monitor in Allegheny County (AQS# 42-003-0008).

The most recently available, quality assured data (2020-2022) from the Beaver Falls monitor provided by DEP were used to establish representative PM₁₀ and NO₂ background concentrations for SPM and to satisfy the preconstruction monitoring requirements under 40 CFR 52.21(m)(1) for PM_{2.5}. The hourly data from 2018-2022 from the Brighton Township (a.k.a. Sebring) monitor was used for ozone, as hourly ozone values are needed in the PVMRM analysis to allow for the model to convert NO_x to NO₂, as discussed in Section 5.7. The 2020-2022 CO data from the Lawrenceville monitor was used. The existing monitoring data satisfy the criteria provided in EPA's Ambient Monitoring Guidelines as being representative of the ambient air quality in the vicinity of SPM.¹⁵ DEP has approved use of data from these monitors in previous PSD air dispersion modeling analyses conducted by Shell.

¹⁵ *Ambient Monitoring Guidelines for Prevention of Significant Deterioration*, EPA-450/4-87-007, USEPA, May 1987.



Monitor Location

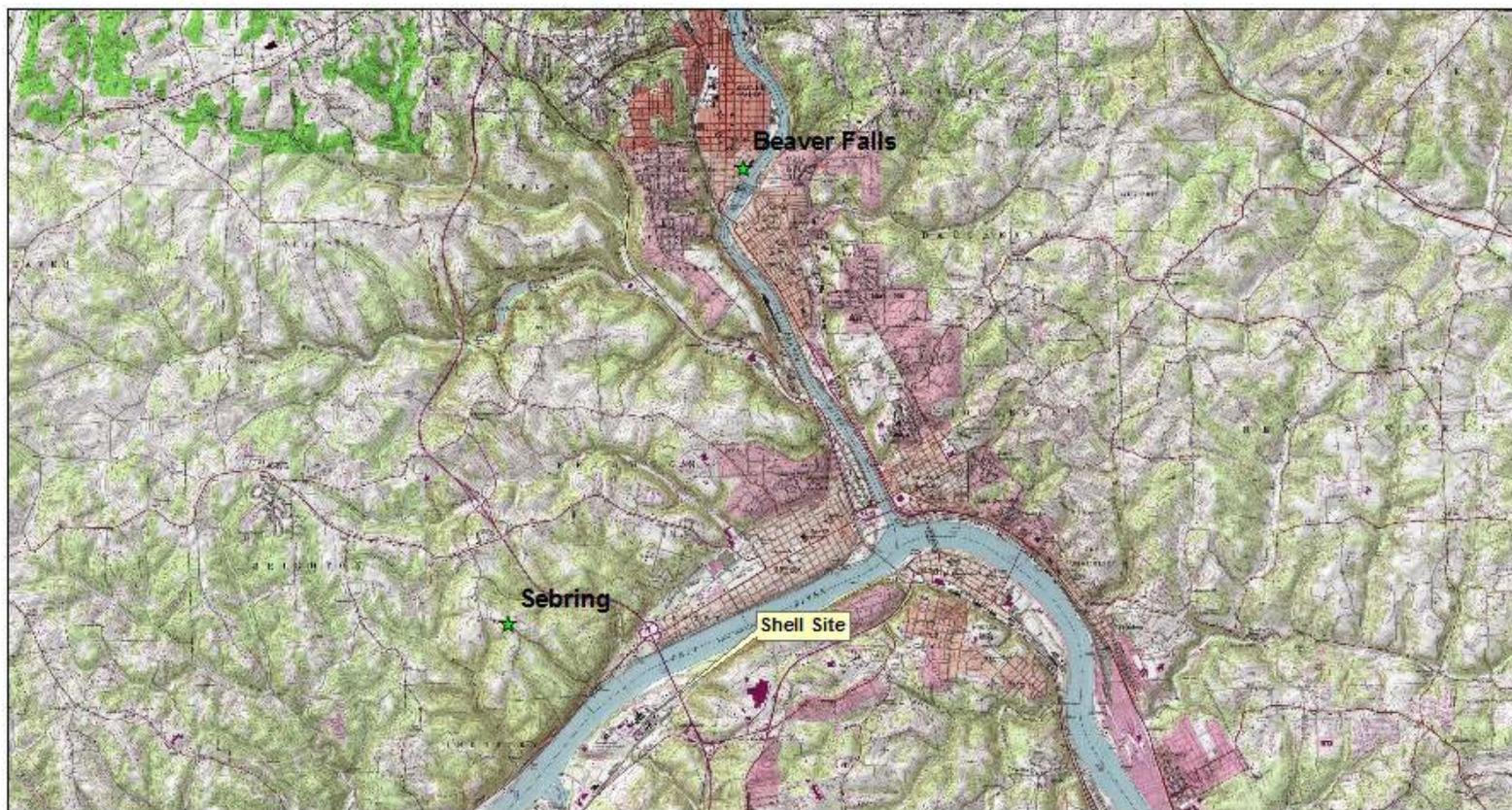
The Beaver Falls and Brighton Township (a.k.a. Sebring) monitors are located less than 9 km from SPM (Figure 5). The Beaver Falls monitor is in an adjacent river valley, absent the influence of any major, localized industry, while the Brighton Township monitor is across the river from SPM. These monitors best represent background concentrations in the modeling domain as they are the closest monitors with data for the pollutants of concern in the vicinity of SPM. The Lawrenceville CO monitor is the closest CO monitor to SPM, and it likely overestimates CO concentrations near SPM because it is in a more urban setting.

Data Quality

The data were collected and quality assured by DEP. DEP has submitted a certification letter to EPA and EPA has no unresolved reservations about data quality after reviewing the letter.

Currentness of Data

The data were collected during 2020-2022, which represents the most recent DEP-certified data available at the time of submission of the plan approval application for use in assessing compliance with the NAAQS and preconstruction monitoring requirements.



RTP ENVIRONMENTAL ASSOCIATES, INC.

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Meters



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Figure 5. Ambient Air Quality Monitors in the Vicinity of SPM



Monitor Data Usage

Except for the 1-hr NO₂ NAAQS assessment, and as suggested by DEP, the maximum monitored value (from 2020-2022), as presented in Table 1, for each averaging time was added to the modeled concentration to assess NAAQS compliance. Use of the maximum monitored value in lieu of the monitored design value is conservative. A range of monitored background NO₂ values that consider seasonal and diurnal variation was used to assess compliance with the 1-hr NO₂ NAAQS. These seasonal values are presented in Table 2 and reflect the three-year average (2020-2022) of the 98th percentile value by hour of day and by season. These seasonal NO₂ values were added to the modeled concentrations within AERMOD. All other monitored concentrations were added to the modeled concentrations external to the model prior to comparison to the NAAQS. DEP provided monitored data for PM_{2.5}; however, a NAAQS analysis was not required for PM_{2.5} because the model-predicted concentrations from the EACT Project were less than the SIL.

Table 1. Existing Air Quality and Background Concentrations

| Pollutant | Averaging Time | Monitored Value (2020-2022)¹ (µg/m³) | Monitor Site Location |
|-------------------|-----------------------|---|------------------------------|
| PM _{2.5} | 24-hour | 21.9 | Beaver Falls |
| | Annual | 8.6 | |
| PM ₁₀ | 24-hour | 66.0 | |
| NO ₂ | Annual | 16.1 | |
| CO | 1-hour | 2,648 | Lawrenceville |
| | 8-hour | 1,602 | |

1. The PM_{2.5} value is the design value while the PM₁₀, NO₂, and CO values are maximum monitored values.



Table 2. Beaver Falls 98% Hourly NO₂ (ppb) By Season and Hour of Day

| Model Ending Hour | Winter | Spring | Summer | Fall |
|--------------------------|---------------|---------------|---------------|-------------|
| 01 | 32.2 | 28.1 | 18.6 | 25.9 |
| 02 | 32.3 | 28.7 | 17.5 | 24.6 |
| 03 | 31.4 | 31.9 | 21.6 | 25.8 |
| 04 | 31.8 | 31.8 | 20.2 | 24.2 |
| 05 | 32.3 | 29.5 | 19.9 | 25.0 |
| 06 | 31.2 | 31.6 | 19.8 | 23.7 |
| 07 | 34.1 | 31.2 | 18.6 | 22.3 |
| 08 | 33.7 | 30.4 | 18.8 | 23.0 |
| 09 | 34.5 | 28.8 | 16.0 | 23.8 |
| 10 | 32.6 | 28.2 | 14.1 | 25.4 |
| 11 | 32.5 | 21.2 | 9.1 | 26.9 |
| 12 | 31.0 | 15.8 | 6.3 | 21.5 |
| 13 | 24.2 | 11.9 | 5.9 | 15.6 |
| 14 | 24.3 | 9.9 | 5.5 | 12.5 |
| 15 | 23.3 | 7.9 | 5.3 | 12.5 |
| 16 | 24.3 | 8.8 | 5.4 | 13.5 |
| 17 | 25.7 | 8.4 | 5.0 | 15.9 |
| 18 | 28.3 | 10.1 | 5.8 | 24.4 |
| 19 | 30.0 | 14.8 | 10.3 | 24.0 |
| 20 | 30.4 | 20.2 | 13.0 | 26.1 |
| 21 | 31.7 | 20.2 | 14.1 | 27.6 |
| 22 | 31.7 | 24.7 | 14.9 | 27.9 |
| 23 | 33.0 | 28.1 | 18.1 | 25.7 |
| 24 | 33.1 | 26.3 | 18.5 | 25.9 |

1. Concentrations are not measured during Hour 01 due to scheduled daily calibration implemented on all monitors operated by DEP. The average of the preceding and subsequent hour was calculated and substituted for each Hour 01 during the measurement period (2020-2022).

4.4 Receptor Data

Modeled receptors were placed in all areas considered "ambient air" pursuant to 40 CFR 50.1(e) and the EPA's December 2, 2019 "Revised Policy on Exclusions from Ambient Air".¹⁶ Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access. There is a fence which precludes public access to the entire SPM property. The fencing is placed around the entire facility perimeter as well as along each side of the railroad track that transects the facility. Entrances are secured by gate with cameras and remote-controlled access for

¹⁶ *Revised Policy on Exclusions from "Ambient Air"*, memorandum from Andrew Wheeler to Regional Administrators, EPA, December 2, 2019.



truck deliveries. Gate, guard shack, and cameras are used for contractor and personnel vehicle entrances. In addition, security maintains a 24/7 presence on-site to ensure that unauthorized public access is not permitted.

Approximately 25,000 receptors were used in the AERMOD significant impacts analyses. The receptor grid consists of four cartesian grids and receptors spaced at 25 m intervals along SPM's fenceline and the railroad that transects the facility. The first cartesian grid extends to approximately 1 km from the fence in all directions. Receptors in this region were spaced at 50 m intervals. The second grid extends to 3 km. Receptor spacing in this region is 100 m. The third grid extends to 10 km with a spacing of 500 m. The fourth grid extends to 50 km with a receptor spacing of 1,000 m. Receptors with flagpole elevations were also placed along the Highway 376 bridge east of SPM. The receptor grid was designed such that maximum facility impacts fall within the 50 m spaced receptors. The receptor grid spacing is presented in Table 3.

Table 3. Receptor Grid Spacing

| Receptor Spacing (m) | Distance from Facility Fence (m) |
|-----------------------------|---|
| 50 | 1,000 |
| 100 | 3,000 |
| 500 | 10,000 |
| 1,000 | 50,000 |

SPM is located in western Pennsylvania. Terrain within 10 km of the site is gently rolling; however, there is terrain in excess of stack top elevation. Receptor elevations and hill height scale factors were calculated with AERMAP (version 24142). The elevation data were obtained from the USGS 1/3 arc second Three-Dimensional Elevation Program (3DEP) data obtained from the National Map from the USGS. Locations were based upon a NAD83, UTM Zone 17 projection. The near-field receptor grid is presented in Figure 6. Note, only those receptors that exceeded the respective SILs were included in the NAAQS and PSD increment runs.

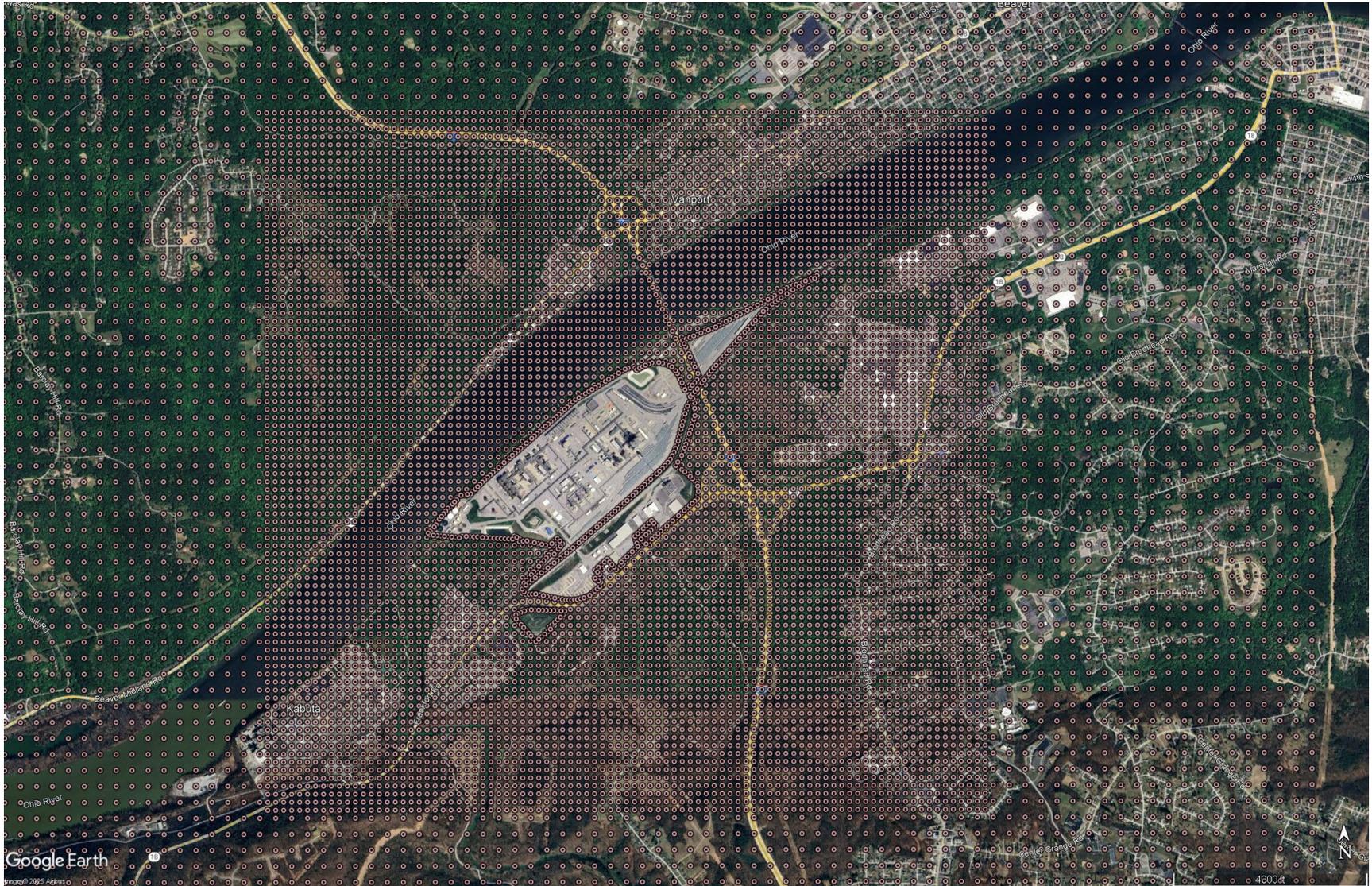


Figure 6. SPM Near-field Receptor Grid



4.5 Meteorological Data

Data Selection and Representativeness

The 2018-2022, 5-year sequential hourly primary surface meteorological data collected at the Vistra Beaver Valley Nuclear Generating Station (Beaver Valley) and supplemental surface and upper air data from the Pittsburgh International Airport (KPIT, WBAN 94823) were used in the analysis. The Beaver Valley meteorological station surface data were collected as part of a continuous data collection program required by the U.S. Nuclear Regulatory Commission and were processed under the ONSITE pathway in Stage 1 of AERMET. For reasons discussed below, the Beaver Valley meteorological station data adequately represent atmospheric boundary layer conditions within the SPM analysis domain for AERMOD to properly characterize the transport and dispersion of plumes from SPM. A profile base elevation of 228.6 m (750 feet) was employed which corresponds to the base elevation of the Beaver Valley meteorological station tower.

The Beaver Valley meteorological station is located approximately 8 km downstream of SPM, also on the Ohio River. This meteorological station and SPM also share a similar orientation in relation to the Ohio River (Figure 7). The river flows from the northeast to southwest relative to both the Beaver Valley meteorological station and SPM. The topography is also similar at each location. The wind patterns are therefore expected to be similar at each location. Wind speed and direction are measured at three levels at the Beaver Valley meteorological station (10.7 m, 45.7 m, and 152.4 m) (See the wind roses for each level in Figure 8). Temperature is also measured at the 10.7 m level. These three levels provide adequate representation of plume behavior at the various release heights at SPM. The adjust u^* option was applied in Stage 2 of AERMET because there is no measured on-site turbulence data.

According to the EPA AERMOD Implementation Guide, the surface characteristics should be similar for the meteorological station and the study site.¹⁷ As a result, Shell performed a comparison of the surface characteristics at the Beaver Valley meteorological station and SPM. The AERSURFACE program (version 24142) was run

¹⁷ *AERMOD Implementation Guide*, EPA-454-B-23-009, October 12, 2023.



to determine the characteristics for comparison. The results of the albedo and Bowen ratio comparison by month are shown in Figure 9. The surface roughness comparison, by season, are shown in Figure 10.

The Pittsburgh International Airport meteorological station is located approximately 21 km southeast of SPM. Station pressure, cloud cover, and twice daily sounding data from this meteorological tower were used. These meteorological parameters are of synoptic scale and are adequately representative of the Beaver Valley area. Upper air data are also collected at the Pittsburgh International Airport meteorological station (Figure 7).

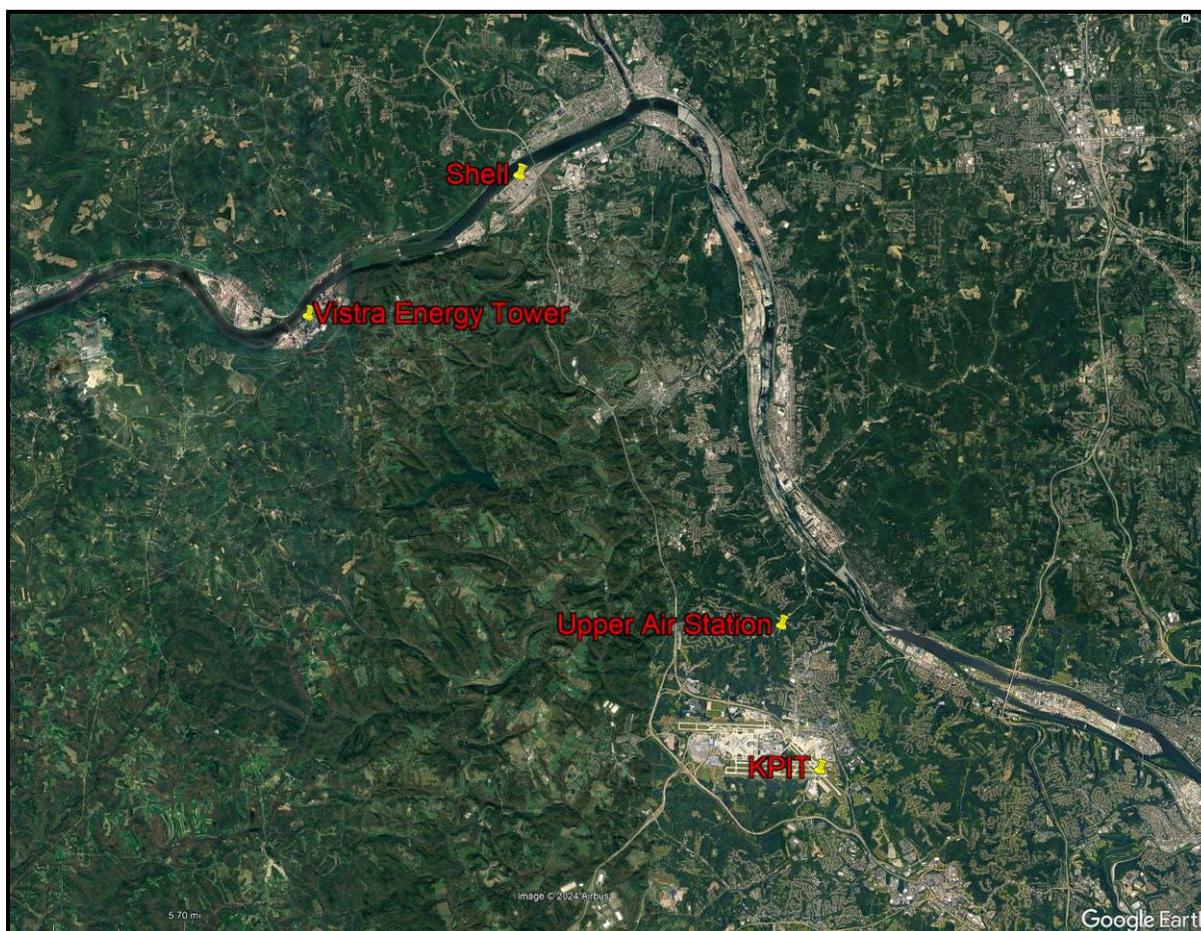


Figure 7. Beaver Valley (Vistra) Meteorological Tower and Pittsburgh Surface and Upper Air Station Locations Relative to SPM

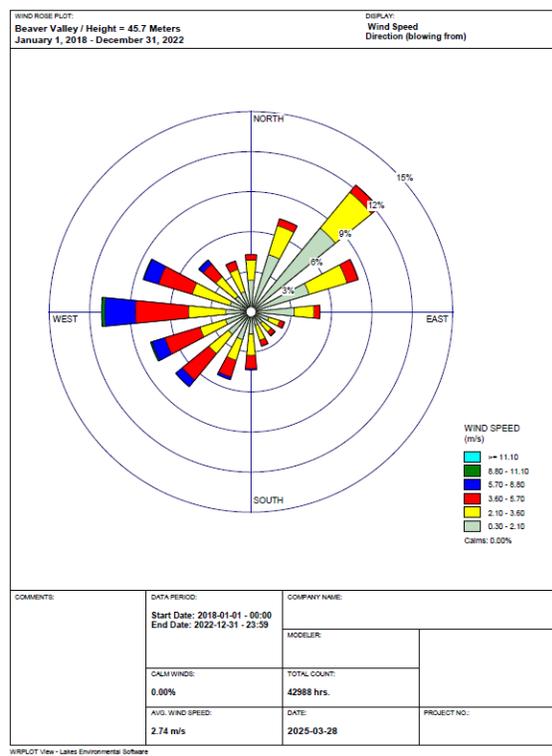
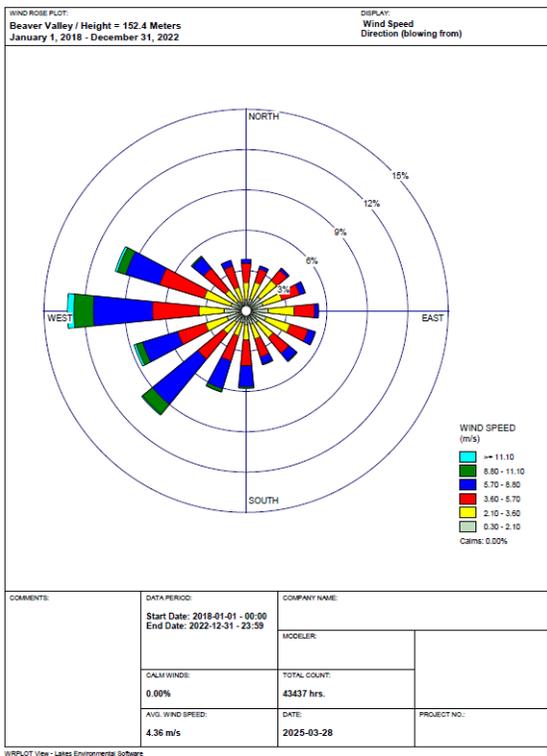
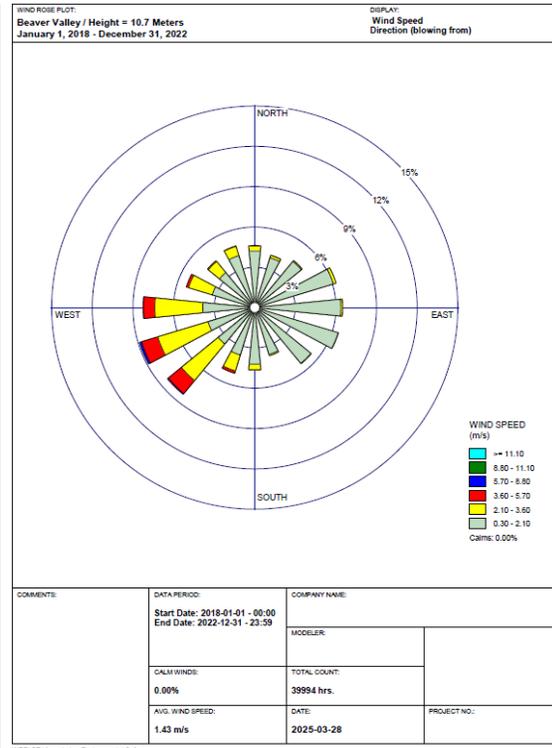
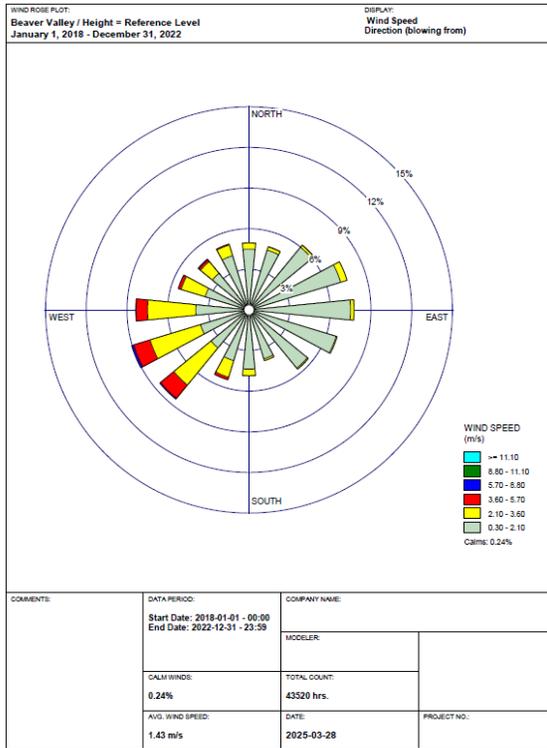
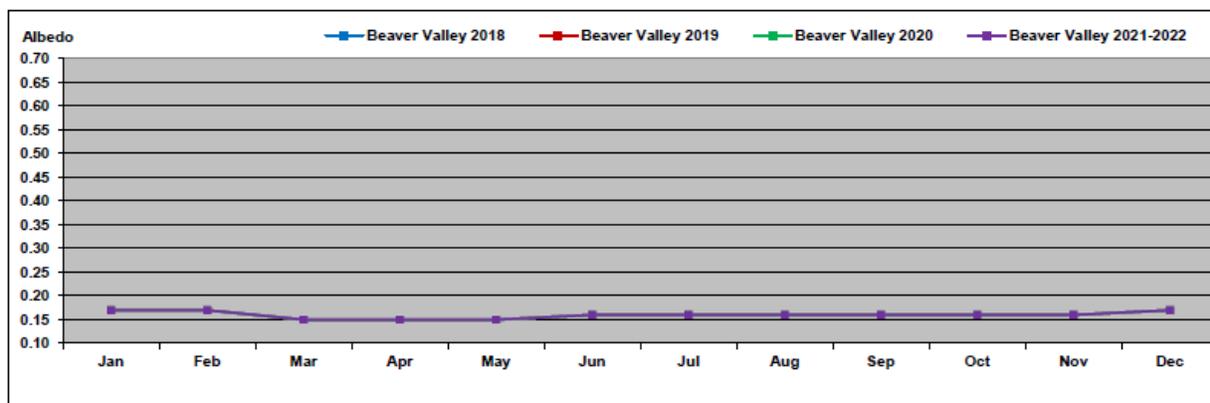


Figure 8. Beaver Valley Windrose 2018-2022



Albedo



Bowen Ratio

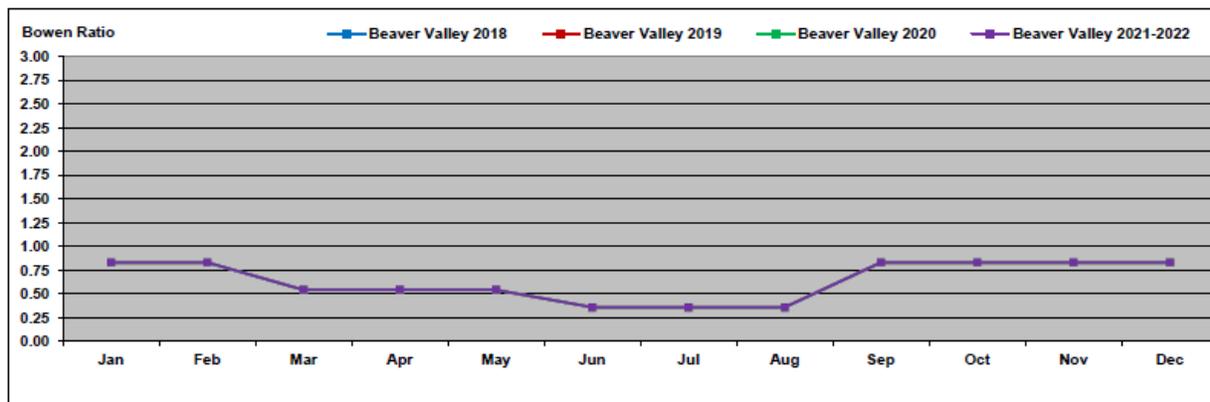


Figure 9. Albedo and Bowen Ratio Comparison Results



Surface Roughness Length

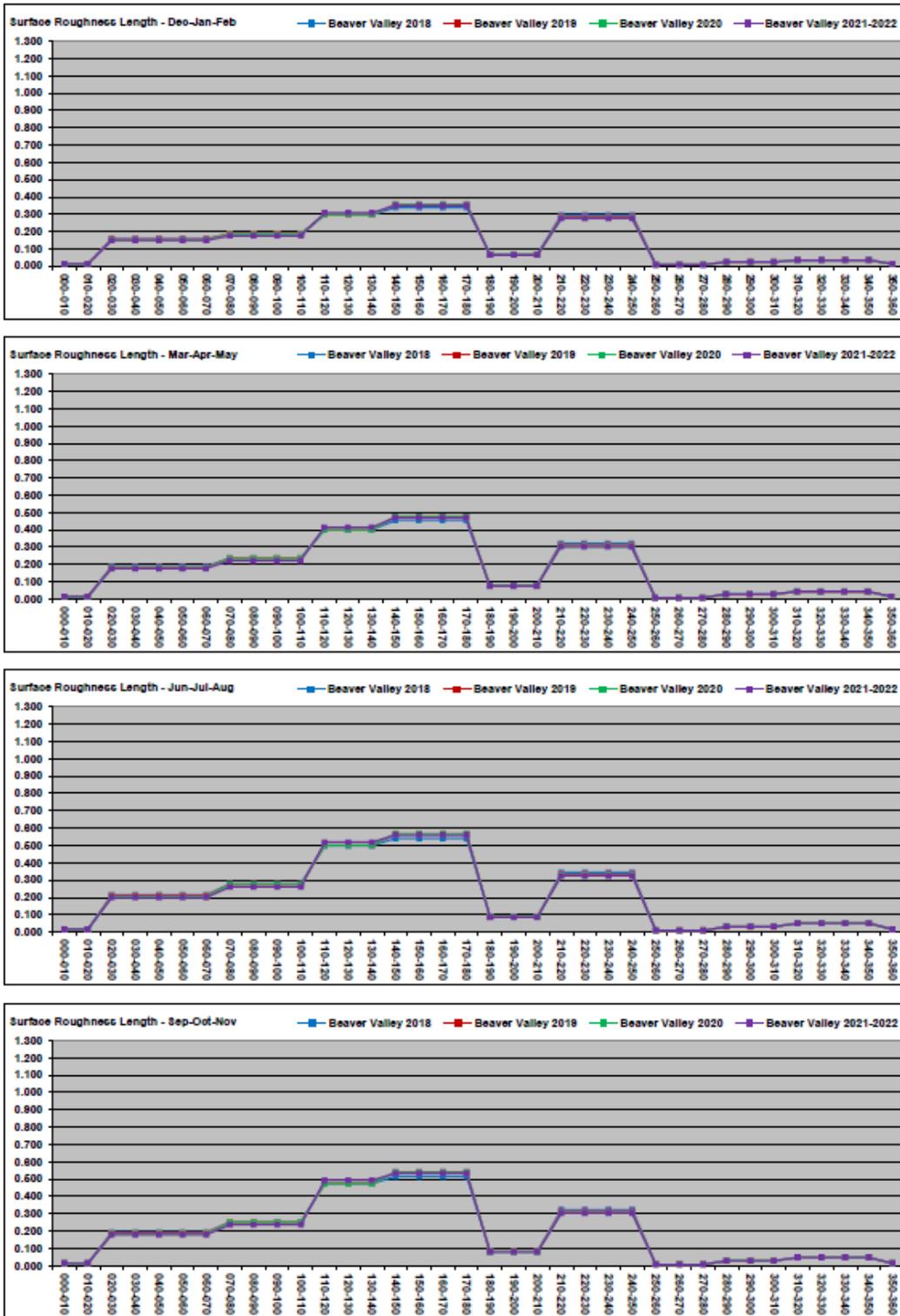


Figure 10. Surface Roughness Comparison Results



Data Processing

The meteorological data were provided to Landau Associates, Inc. (Landau) by DEP. DEP processed the Beaver Valley surface data, Pittsburgh International Airport (KPIT) surface data, and KPIT upper air data using the meteorological preprocessor AERMET (version 24142). In AERMET Stage 1, KPIT surface meteorological data in the Integrated Surface Data (ISD) format were extracted. KPIT upper air meteorological data in the Integrated Global Radiosond Archive (IGRA) format were also extracted.

Also, the MODIFY keyword was entered to fill missing temperatures in the upper air data with interpolated values. In AERMET Stage 2, values of the surface characteristics (noon-time albedo, Bowen ratio, and surface roughness length) representative of the Beaver Valley surface meteorological site were entered. These surface characteristics values were calculated by AERSURFACE (version 24142) using USGS National Land Cover Database (NLCD) land cover, impervious surface, tree canopy cover data for 2018, 2019, 2020, and 2021.¹⁸ The following options were selected in AERSURFACE: default 1-km radius and ten user-defined sectors defined as “High Z0” for developed areas and “Low Z0” for undeveloped areas for the surface roughness length study area, the default method for determining surface roughness length (ZORAD), monthly temporal resolution with default season assignment, and non-arid region.

AERSURFACE was executed for each surface moisture condition (average, dry, and wet), assuming both no continuous snow cover and continuous snow cover during the winter (i.e., AERSURFACE was executed six times). AERMET Stage 2 was then executed for each set of surface characteristics to produce six surface (.sfc) files. The final AERMET surface file was assembled by month based on actual estimates of surface moisture condition and snow cover during the meteorological data period. Estimates of surface moisture condition were based on precipitation data for Pennsylvania Climate Division 9. Snow cover was based on National Centers for Environmental Information (NCEI) Local Climatological Data from KPIT.

¹⁸ 2018 NLCD data was used for processing meteorological data from 2018, 2019 NLCD data was used for processing meteorological data from years 2019, 2020 NLCD data was used for processing meteorological data from years 2020, and 2021 NLCD data was used for processing meteorological data from years 2021 and 2022.



5.0 MODELING METHODOLOGY

5.1 Pollutants Modeled

NO_x, CO, and PM_{2.5} were evaluated for the EMACT Project. TEGF A and TEGF B are the only emission sources affected by the EMACT Project. Therefore, only those two sources were included in the EMACT Project's significant impact analysis modeling.

As detailed in Section 2, NO_x, CO, and PM₁₀ were evaluated for the Plan Approval Reconciliations and WWTP Permanent Controls Project. PM_{2.5} was not a regulated PSD pollutant when DEP issued PA-04-00740A to Shell to authorize the construction of SPM because the area was designated as PM_{2.5} nonattainment.

5.2 Combustion Turbine Load Analysis

The combustion turbines occasionally operate at a reduced load. Therefore, prior to construction and operation of the combustion turbines at SPM, a range of load conditions and operating modes representing potential combustion turbine operations were evaluated to identify the condition resulting in the worst-case impact for each averaging period of concern. Three load conditions were evaluated for each turbine: 100%, 75%, and 45%. A unit (i.e., 1 lb/hr) emission rate was assumed to represent the 100% load condition for each turbine. The emission rates and exhaust flow rates for the other loads and operating modes were scaled from the 100% load condition. The emission rates used in the load condition modeling analysis were scaled linearly with load (i.e., the 75% load emission rate was set equal to 75% of the 100% load emission rate and so on). Alternatively, the exhaust flow rates used in the load condition modeling analysis were scaled based on proprietary information provided by GE for the GE Frame 6B combustion turbines. Specifically, the 75% load flow rate (i.e., 297,771 actual cubic feet per minute [acfm]) is 80% of the 100% load flow rate and the 45% load flow rate (i.e., 223,406 acfm) is 60% of the 100% load flow rate.

To confirm the above load condition modeling analysis assumptions that were made before the combustion turbines became operational, Shell evaluated actual emissions and operating data measured by continuous emission monitoring systems (CEMS) and continuous operations monitoring systems equipped on the combustion turbines. As



shown in Figure 11 below, 2023 and 2024 NO_x CEMS data indicate that the actual NO_x emission rates of the combustion turbines are linear between the 75% and 100% loads, which is consistent with the prior load condition analysis modeled emission rates.

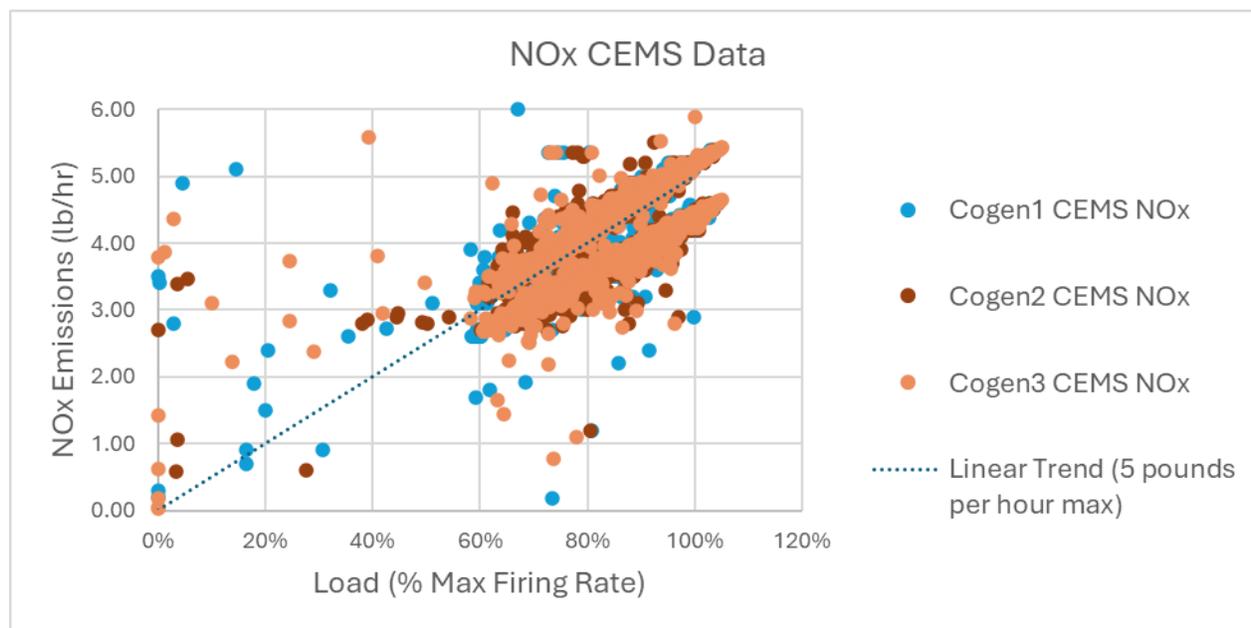


Figure 11. 2023 and 2024 NO_x CEMS Data for Cogen Units 1, 2, and 3

Additionally, as shown in Figure 12 below, 2023 and 2024 CO CEMS data indicate that the actual CO emission rates at 75% load and 100% load are essentially the same and do not increase with load as initially anticipated. Finally, as shown in Figures 11 and 12, the combustion turbines rarely operate in startup or shutdown mode (i.e., 45% load) and each combustion turbine is only permitted to operate for a total of 7 hours per year in startup and shutdown modes; thus, limited data is available at the 45% load.

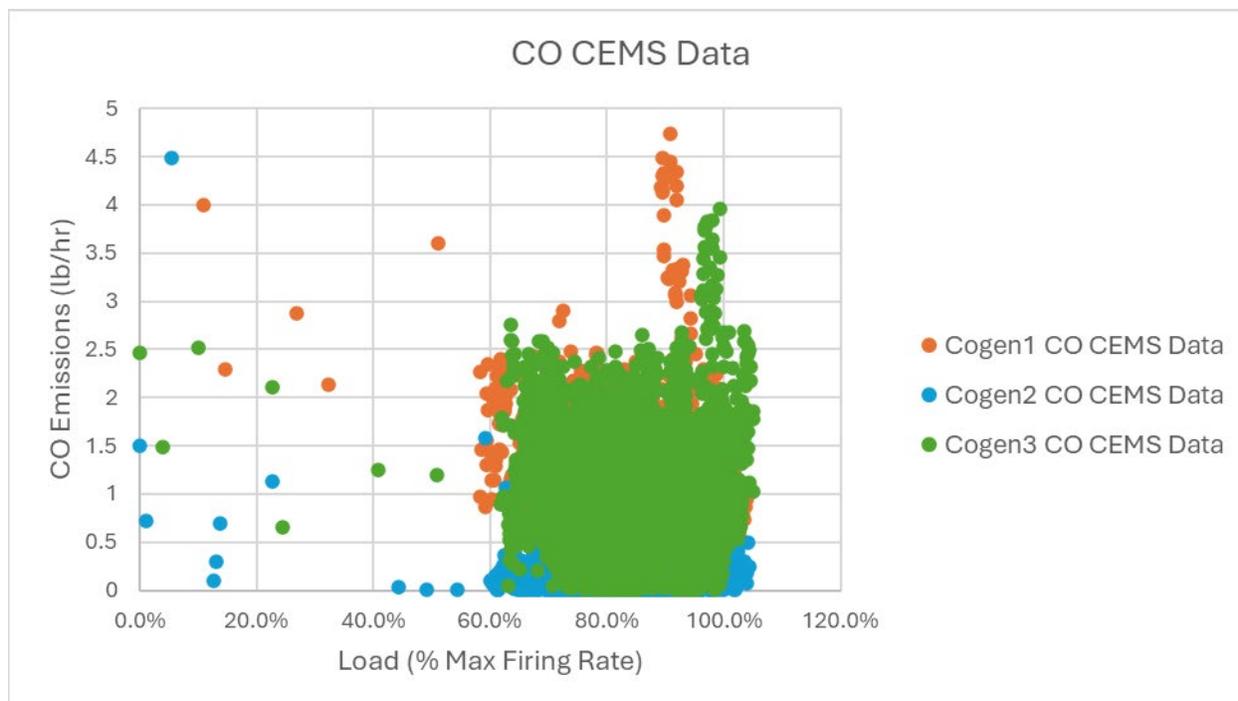


Figure 12. 2023 and 2024 CO CEMS Data for Cogen Units 1, 2, and 3

Actual exhaust flow rates/velocities for the three combustion turbines are not directly measured, but are instead calculated using an F-factor consistent with Method 19 as allowed under 40 CFR 60 Subpart KKKK. As shown in Figure 13 below, the actual exhaust flow rates calculated for 2023 and 2024 indicate that the combustion turbine exhaust flow rates are effectively steady between the 75% and 100% loads. Additionally, it should be noted that the actual flow rates at 75% load are approximately 30% greater than the modeled flow rates at 75% load, and the actual flow rates at 100% load are approximately 12 percent greater than the modeled flow rates at 100% load. Because the actual exhaust flow rates of the combustion turbines are greater than those used in the load analysis and modeling, and the fact that the CO emission rates are essentially equal at the 75% and 100% loads, the combustion turbine load analysis is considered conservative and over-predicts ambient air impacts of the combustion turbines at the different operating rates. Thus, for conservatism, Shell proposes to retain the current load analysis.

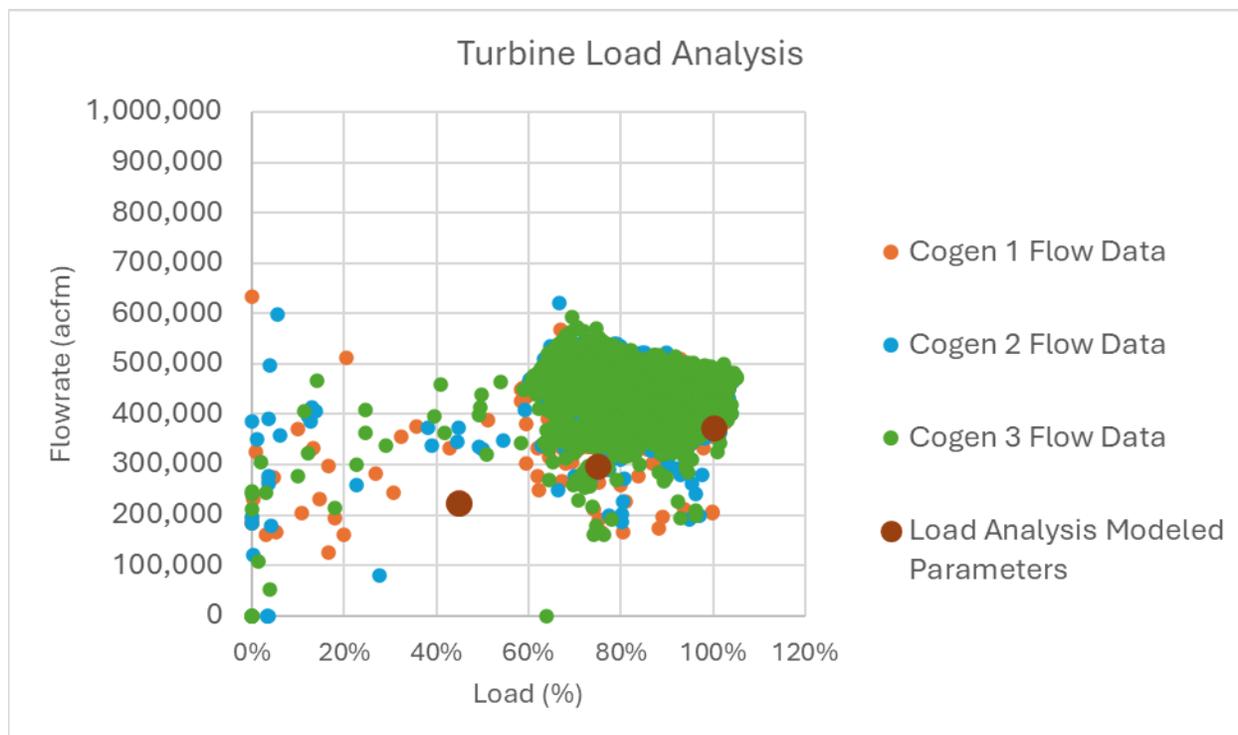


Figure 13. 2023 and 2024 Outlet Flowrate Data for Cogen Units 1, 2, and 3

The load condition resulting in the worst-case impacts (i.e., 100% load) was carried forward in the SIL, NAAQS, and PSD increment analyses. The results of the load analysis are presented in Section 6.1. Note, CO emissions are significantly higher during startup. As such, the maximum hourly emission rate, which occurs during startup, was conservatively modeled for all three combustion turbines for 1-hour and 8-hour CO despite the fact that all three turbines are not started up simultaneously and startup does not last for 8 hours.

5.3 Ethane Cracking Furnace Modes and Worst-Case Operating Conditions

The ethane cracking furnaces have the following modes of operation: maximum normal, minimum normal, decoking, feed in/feed out, hot steam standby, and startup/shutdown. Both the maximum and minimum of the range of normal operation were evaluated. Ethane cracking furnace emissions are highest during normal operation for all pollutants except CO. Per Condition # 007 in Section E of PA-04-00740C, hourly NO_x emissions from the ethane cracking furnaces are limited to 6.2 lb/hr, except two furnaces are



authorized by Condition # 009 to operate simultaneously at a higher rate. Note, the maximum non-startup/shutdown hourly emission rate for the ethane cracking furnaces is 9.3 lb/hr and occurs during normal operation (refer to the potential emissions calculations included in the plan approval application). Pursuant to the March 1, 2011 EPA guidance on treatment of intermittent emissions, startup/shutdown was not modeled for 1-hour NO₂ as this mode is intermittent based on the frequency of occurrence and duration of events and will not contribute to an exceedance of the 1-hour NO₂ NAAQS.¹⁹

Since the ethane cracking furnace exhaust gas temperatures and velocities vary by mode, it was necessary to determine the mode of operation that results in worst-case impacts. Each ethane cracking furnace operating mode was modeled for each pollutant/averaging period with corresponding emission rates and exhaust characteristics. The mode of operation with the worst-case modeled impacts for that pollutant/averaging period was then used in the SIL, NAAQS, and PSD increment analyses. Note that all modes of operation except for normal operation modes occur infrequently (between 1 and 12 times per year) and only for short durations (between 2 to 60 hours per event). As such, all annual modeling analyses were based on maximum normal operation which, as shown in Table 10, is also worst-case for the annual averaging period for both NO₂ and PM₁₀.

CO emissions are significantly higher during decoking. In addition, as stated above, two ethane cracking furnaces are authorized to operate simultaneously at an elevated NO_x emission rate. It was therefore also necessary to identify furnaces with worst-case short-term impacts during decoking and elevated NO_x emissions. For this worst-case determination, each ethane cracking furnace was modeled with a unit emission rate. The two ethane cracking furnaces that generated the worst-case impacts were assigned the corresponding worst-case operating mode for the CO and 1-hour NO₂ runs. The results of the worst-case ethane cracking furnace operating mode analysis and worst-case ethane cracking furnace analysis are presented in Section 6.2.

¹⁹ U.S. EPA, *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard*, March 1, 2011.



5.4 Significant Impact Analysis

The criteria pollutant air quality analysis was conducted in two phases: an initial or significant impact analysis, and a cumulative impact analysis including both a NAAQS and PSD increment analysis. As previously described, two separate significant impact analyses were conducted: one for the EACT Project and one for the Plan Approval Reconciliations and WWTP Permanent Controls Project. The predicted maximum impacts were determined for each significant impact analysis. The maximum modeled concentration from across the five individual years of meteorological data were compared to the pollutant-specific significance levels for each pollutant and averaging time except for 1-hr NO₂. The maximum five-year average was used to assess significance for 1-hr NO₂ impacts. Normally, for PM_{2.5}, the maximum five-year average concentration is used to assess significance for the NAAQS and the maximum concentration over all five years is used to assess significance for the PSD increment. To avoid two separate PM_{2.5} SIL analyses, the maximum PM_{2.5} impacts from across the five individual years were used for comparison to the SILs.

The PM_{2.5} SILs were vacated on January 22, 2013; however, the court decision did not preclude the use of SILs for PM_{2.5} but required that EPA correct errors in the regulations for PM_{2.5}.²⁰ EPA has advised that permitting authorities may continue to apply SILs for PM_{2.5} but must ensure their use is consistent with the requirements of Section 165(a)(3) of the Clean Air Act (CAA). In response to the promulgation of the revised annual PM_{2.5} NAAQS, on April 30, 2024, EPA released "Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program", which establishes a revised PM_{2.5} annual SIL of 0.13 µg/m³.²¹ EPA did not recommend any changes to the 24-hour PM_{2.5} SIL. The most recent EPA recommended PM_{2.5} SILs were used for this analysis. In the 2018 SIL guidance and accompanying documents, EPA provides the necessary policy, technical, and legal

²⁰ *Sierra Club v. EPA*, 705 F.3d 458, 463-66 (D.C. Cir. 2013).

²¹ *Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*, memorandum from Richard Wayland to Regional Air Directors, April 30, 2024.



analyses that permitting authorities may choose to adopt in supporting the use of the SILs.^{22,23,24}

Pollutants with impacts that exceed their respective SILs were included in both the NAAQS and PSD increment analyses. In these latter analyses, the cumulative impacts from SPM and other nearby sources were assessed. For the NAAQS compliance demonstration, a regional background concentration was also added to the modeled concentrations to capture the impact of sources not explicitly modeled (e.g., mobile sources, natural background, etc.). The resultant total concentrations were compared to the NAAQS and PSD increments to determine compliance. The PSD Class II SILs are listed in Table 4.

Five years of meteorological data were used in the significant impact analyses. The radius of the significant impact area (SIA), equal to the maximum distance from SPM at which a modeled concentration exceeds the SIL, was determined for each pollutant and averaging period. After the radius of the SIA is determined, the NAAQS and PSD increment inventories were established using best professional judgment to identify and select nearby sources to explicitly model. As discussed further in Section 5.8, the off-site inventory was developed by DEP and provided to RTP for use in these analyses.

²² *Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*, Peter Tsirigotis, OAQPS. April 17, 2018.

²³ *Technical Basis for the EPA's Development of the Significant Impact Thresholds for PM_{2.5} and Ozone*, EPA-454/R-18-001, April 2018.

²⁴ *Legal Memorandum: Application of Significant Impact Levels in the Air Quality Demonstration for Prevention of Significant Deterioration Permitting under the Clean Air Act*, April 2018.



Table 4. PSD Class II SILs

| Pollutant | Averaging Time | PSD Class II SILs ($\mu\text{g}/\text{m}^3$)^a |
|-------------------|-----------------------|--|
| PM ₁₀ | 24-hour | 5.0 |
| | Annual | 1.0 |
| PM _{2.5} | 24-hour | 1.2 |
| | Annual | 0.13 |
| NO ₂ | 1-hour | 7.5 ^b |
| | Annual | 1.0 |
| CO | 1-hour | 2,000 |
| | 8-hour | 500 |

^a EPA recommends that the PM_{2.5} SIL values apply to the NAAQS everywhere, regardless of the class of the airshed.²⁵ The DEP is following this guidance for PM_{2.5} as well as other pollutants. The difference between Beaver Falls background values and the NAAQS were evaluated and determined to be greater than the SILs (Please compare Tables 1 and 7).

^b Please note that there is no 1-hr NO₂ SIL promulgated at 40 CFR 51.165. Consistent with the June 28, 2010 EPA Policy Memorandum from Anna Marie Wood to the Regional Air Directors, an interim 1-hr NO₂ SIL of 4 ppb (7.5 $\mu\text{g}/\text{m}^3$) is suggested for use by the DEP.

Emissions due to the EMACT Project used in the project’s SIL analysis are summarized in Table 5. The detailed calculations are provided in Appendix B.

Table 5. EMACT Project SIL Emission Rates

| Pollutant | Averaging Time | Emission Rates (lb/hr/flare) |
|-------------------|-----------------------|---|
| PM _{2.5} | 24-hour | 2.56 |
| | Annual | 0.94 |
| NO ₂ | 1-hour | 23.33 |
| | Annual | 8.59 |
| CO | 1-hour/8-hour | 106.36 |

The Plan Approval Reconciliations and WWTP Permanent Controls Project short-term SIL and cumulative analyses use the short-term potentials to emit of relevant pollutants from the TEGF A and TEGF B because these retrospective air quality analyses are for a new stationary source (i.e., the initial construction of SPM). The short-term potential to emit heat input basis of 3,900 MMBtu/hr per TEGF is based on the heat input during SU/SD operations, which may not require elevated supplemental gas combustion at the

²⁵ Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program, memorandum from Richard Wayland to Regional Air Directors, April 30, 2024.



TEGFs to maintain compliance with the EMAX's currently applicable minimum NHVcz requirements due to the high heat content of the waste gas streams that can be routed to the TEGFs during SU/SD operations. Therefore, the 3,900 MMBtu/hr heat input per TEGF is considered the short-term potential to emit heat input basis irrespective of the separate EMAX Project. Alternatively, the short-term maximum total supplemental gas heat input accounted for in the EMAX Project SIL analysis is for venting scenarios that do require elevated amounts of supplemental gas to maintain compliance with the EMAX's currently applicable minimum NHVcz requirements.

5.5 Preconstruction Monitoring

Pursuant to 40 CFR 52.21(i)(5), as adopted at 25 Pa. Code Chapter 127, Subchapter D, requirements for preconstruction ambient monitoring may be waived by the permitting authority if projected increases in ambient concentrations due to the project are less than the Significant Monitoring Concentrations (SMC) in Table 6. However, in light of the decision of the D.C. Circuit Court of Appeals *Sierra Club v. EPA* in 2013, Shell has elected not to request such a waiver.²⁶ If an applicant can demonstrate that existing monitoring data is representative of the project site, this can be used in lieu of conducting preconstruction monitoring. Shell has elected to use existing ambient data in lieu of preconstruction monitoring data and this approach has previously been approved by DEP for SPM. As discussed in detail in Section 4.3, existing monitors have previously been determined to be representative of the area surrounding SPM.

Table 6. PSD SMCs

| Pollutant | Averaging Time | SMCs ($\mu\text{g}/\text{m}^3$) |
|-------------------|-----------------------|---|
| CO | 8-hour | 575 |
| NO ₂ | Annual | 14 |
| PM ₁₀ | 24-hour | 10 |
| PM _{2.5} | 24-hour, Annual | 0 |

²⁶ *Sierra Club v. EPA*, 705 F.3d 458 (D.C. Cir. 2013).



5.6 Secondary PM_{2.5} Analyses

On July 29, 2022, EPA issued its final guidance for ozone and fine particulate matter modeling.²⁷ An update was subsequently issued in April 2024 to address the updates to recommended PM_{2.5} SILs.²⁸ The guidance addresses both primary and secondary PM_{2.5} impacts. Primary PM_{2.5} impact refers to the impacts due to direct emissions of PM_{2.5}. Secondary impacts refer to the PM_{2.5} impacts attributable to nitrates and sulfates formed due to potential precursor NO_x and SO₂ emissions. EPA outlines their recommended approaches for conducting PM_{2.5} air quality analyses for two assessment cases. The appropriate approach to use in each case depends on the magnitude of direct PM_{2.5} and precursor NO_x and SO₂ emissions. Under Assessment Case 1, the emissions increases of both direct PM_{2.5} and all precursor (i.e., NO_x and SO₂) emissions are below their respective PSD significant emission rate thresholds. Under Assessment Case 2, either the direct PM_{2.5} emissions increase is greater than or equal to the PSD significant emission rate threshold or the NO_x and/or SO₂ emissions increase is greater than the respective PSD significant emission rate threshold.

The EMACT Project falls under Assessment Case 2, as the direct PM_{2.5} emissions increases are less than the PSD significant emission rate threshold, but the NO_x emissions increases exceed the PSD significant emission rate threshold. In this case, a PM_{2.5} compliance demonstration is required for the direct PM_{2.5} emissions using approved dispersion modeling techniques. The potential impact of the precursor emissions, both NO_x and SO₂, also requires evaluation.

Consistent with EPA's recommended approach for Assessment Case 2, the EMACT Project's direct PM_{2.5} emissions were evaluated using AERMOD and secondary PM_{2.5} concentrations resulting from the precursor NO_x and SO₂ emissions were estimated in accordance with EPA's recently revised MERPs guidance.²⁹ The EPA's "MERPs VIEW Qlik" site was queried for all of the 500 tpy hypothetical sources located in the Northeast

²⁷ U.S. EPA, *Guidance for Ozone and Fine Particulate Matter Permit Modeling*, EPA-454-R-22-005, July 29, 2022.

²⁸ *Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*, memorandum from Richard Wayland to Regional Air Directors, April 30, 2024.

²⁹ *Clarification on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM_{2.5} under the PSD Permitting Program*, EPA-454-R-19-003, April 2024.



and Ohio Valley Climate Zones.³⁰ To estimate the secondary PM_{2.5} concentrations for use in the Class II SIL analysis for the EMACT Project, the highest modeled NO_x and SO₂ concentrations across all stack heights (i.e., 10 and 90 m) were then divided by the 500 tpy modeled hypothetical source emission rate and multiplied by the project-related precursor NO_x and SO₂ emissions increases. This total secondary PM_{2.5} contribution from the precursor NO_x and SO₂ was then added to the modeled primary PM_{2.5} concentrations to determine whether the project impacts exceed the Class II SILs.

The MERPs VIEW Qlik tool also provides illustrative hypothetical single source modeled impacts of maximum daily average PM_{2.5} concentrations by distance from the source for use in Class I PSD compliance demonstrations. Similar to the Class II analysis, the MERPs VIEW Qlik tool was queried for all 500 tpy hypothetical sources located in the Northeast and Ohio Valley Climate Zones. The closest Class I area to SPM, Otter Creek Wilderness, is located approximately 189 km away. As such, the maximum concentrations across all stack heights at a distance of 180 km from the hypothetical source were obtained from MERPs View Qlik for use in the Class I SIL analysis for the EMACT Project. The NO_x and SO₂ concentrations were divided by the hypothetical source emission rate of 500 tpy and then multiplied by the project-related emissions increases in tpy. Calculated secondary PM_{2.5} concentrations are summarized in Tables 12 and 13.

As previously stated, impacts from the EMACT Project are less than the Class I and II PM_{2.5} SILs, and PM_{2.5} modeling is not required for the Plan Approval Reconciliations and WWTP Permanent Controls Project because these changes are related to SPM's initial construction and the area was designated nonattainment for PM_{2.5} at the time of the original PSD permitting for the facility. As such, modeling is not required to assess compliance with the PM_{2.5} NAAQS and PSD increments for the EMACT Project or the Plan Approval Reconciliations and WWTP Permanent Controls Project.

³⁰ <https://www.epa.gov/scram/merps-view-qlik>



5.7 NO₂ Analyses

The SIL modeling employed the Tier 2 Ambient Ratio Method (ARM2) with the EPA recommended minimum and maximum ambient NO₂/NO_x ratios of 0.5 and 0.9, respectively. Tier 3 (discussed below) was used to assess 1-hr and annual NO₂ NAAQS compliance. Tier 3 accounts for the chemical reactions that convert NO_x to NO₂ in the presence of ozone. 100% NO_x to NO₂ conversion was conservatively assumed in assessing compliance with the annual NO₂ PSD Class II increment.

Tier 3 Option

There are two regulatory non-default Tier 3 methods currently available in AERMOD for simulating the conversion of NO_x to NO₂: the Ozone Limiting Method (OLM) and PVMRM. Shell employed PVMRM. The EPA's conservative, default NO₂/NO_x in-stack ratio of 0.50 was used for all sources located within 3 km of SPM. An in-stack ratio of 0.2 was used for more distant sources.

Use of the Tier 3 PVMRM modeling approach requires an understanding of ozone concentrations in the project area. The AERMOD model uses either a single representative background ozone value for all hours of simulation or varying hourly background ozone data as collected from representative ozone monitors.

Hourly background ozone data was obtained from the Brighton Township ozone monitor (AQS # 42-007-0005), located 1.6 miles to the northwest, for the years 2018-2022. This monitor operated year-round from 2018-2020. In 2021 it was operated from January through October. During 2022 it was only operated during the ozone season (i.e., March-October). Therefore, a suitable year-round monitor was needed to substitute data for the missing periods.

The closest year-round monitor that is at an elevation similar to the Brighton Township monitor is the South Fayette monitor (AQD # 42-003-0067), located 22 miles to the south-southeast. Three other nearby monitors, including Harrison Township, Beaver Falls, and Lawrenceville were also considered. The data from these four monitors were compared with the Brighton Township monitor. Figure 14 displays scatter plots of



hourly ozone monitor data, paired in time, from the Brighton Township monitor and the other four monitors. A simple linear regression analysis of each scatter plot data set was performed to analyze the linear relationship between the data of the two monitors. Among the other four monitors, the South Fayette monitor exhibited the best linear relationship with the Brighton Township monitor, showing the highest R^2 value of 0.81 and a slope of 0.8894. Consequently, the South Fayette monitor's data was selected to substitute for the Brighton Township monitor's missing data.

A three-step process was used to fill in missing data from the Brighton Township monitor. In step 1, any single missing hour of data was filled in with the average of the ozone concentrations from the hour before and the hour after the missing hour. In step 2, a missing hour of data was filled in with the adjusted South Fayette monitor data for that day and hour. In step 3, any remaining missing hours of data were filled in with the average monthly/hourly concentrations from the Brighton Township monitor. This was accomplished by determining the average concentration for each hour for each month.

Intermittent Emissions

Emissions from intermittent emission sources (i.e., emergency generators, firewater pumps) or intermittent operations (i.e., ethane cracking furnace operating modes, startups and shutdowns) required evaluation. These emissions were modeled in the 1-hr NO_2 analysis pursuant to the March 1, 2011 EPA guidance.³¹ Pursuant to this guidance, any source with emissions that do not have the potential to contribute significantly to the annual distribution of the daily maximum concentrations was modeled with emissions based on an average hourly rate, rather than the maximum hourly rate. Sources that are not likely to contribute include those with emission duration of less than 24-hours and with operational frequency of less than seven occurrences per year.

³¹ U.S. EPA, *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard*, March 1, 2011.

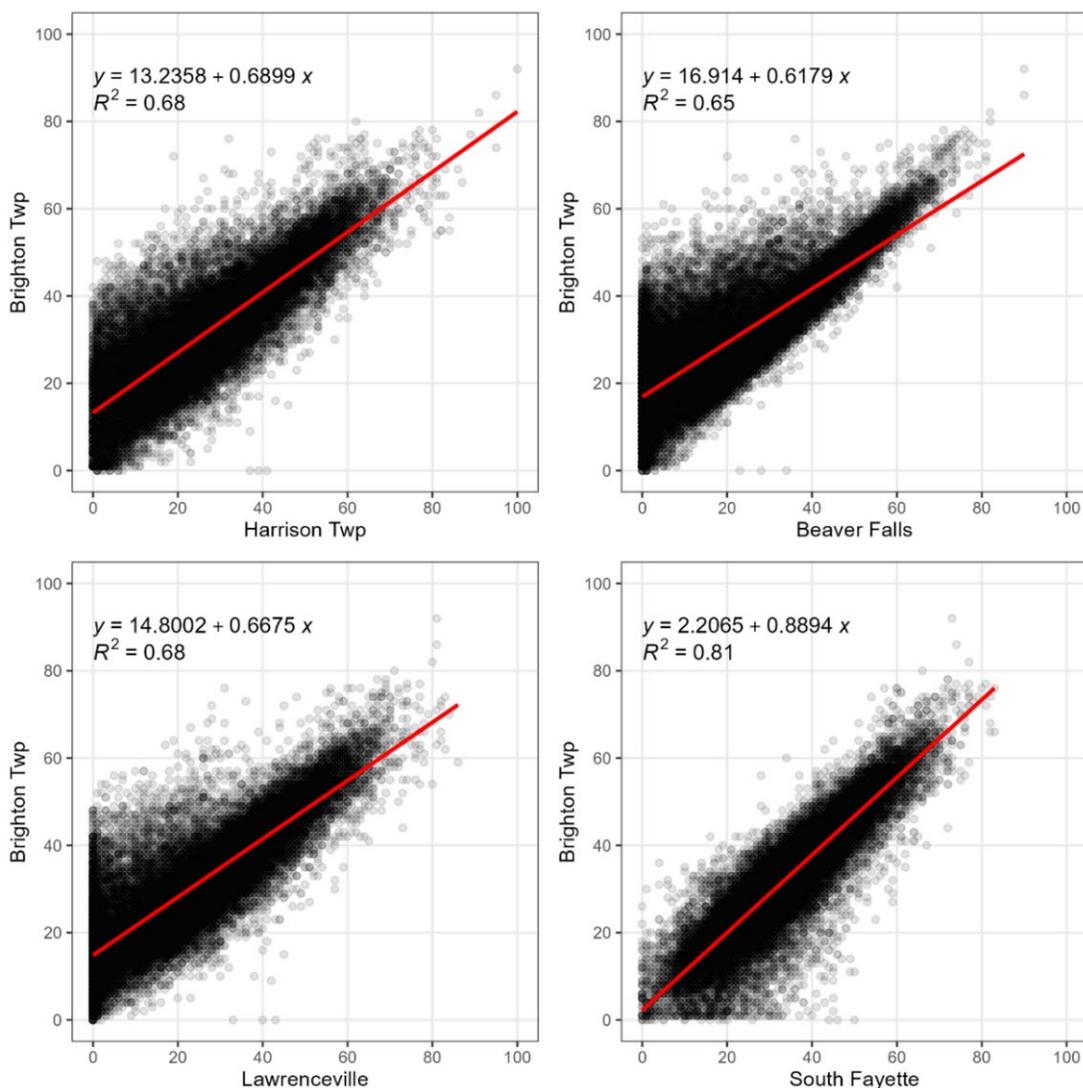


Figure 14. Comparison of Ozone Concentrations at the Four Sites

5.8 NAAQS Analysis and Increment Analyses

Following the determination of significant impacts, a cumulative air quality analysis to determine compliance with the NAAQS was conducted. A cumulative analysis was conducted to determine compliance with the NAAQS and PSD increments only for pollutants with modeled concentrations above the SILs in the significant impact analysis. The receptors modeled were limited to those showing a significant impact for each pollutant. Each source's potential emission rate was used. Five years of meteorological data was again used in this analysis.



Nearby Source Inventory

Off-site sources were included in the NAAQS and PSD increment modeling. Pursuant to the Guideline and EPA's 2023 Draft Guidance on Developing Background Concentrations for Use in Modeling Demonstrations, the nearby sources under consideration will typically be within the first 10 to 20 km from the project source and the area where the project source's impacts equal or exceed the SIL.^{32,33}

The inventory of off-site sources was provided by DEP and is based on a thorough review of facility permits. Although Appendix W (Table 8-2) allows for use of actual operations in developing the emissions inputs for nearby sources for the cumulative impacts analysis, potential emissions were conservatively modeled for all off-site sources. Model inputs for nearby sources were updated by DEP to reflect current information obtained from each facility.

NAAQS Compliance Assessment

Appropriate ambient background concentrations (as discussed in more detail in Section 4.3) were then added to the modeled concentrations to demonstrate NAAQS compliance. As previously described, the maximum monitored concentrations were conservatively used in lieu of the actual design value for all pollutants/averaging periods except 1-hour NO₂. The high-second-high (H2H) modeled concentrations for CO were added to the maximum monitored values to assess NAAQS compliance. The maximum modeled annual NO₂ impacts were added to the maximum monitored NO₂ concentration to assess compliance with the annual standard. The five-year average of the 98th percentile maximum daily 1-hr NO₂ modeled concentration was added to the three-year average of the 98th percentile NO₂ monitor value by season and hour of day within AERMOD. The resultant total concentration was compared to the 1-hr NO₂ NAAQS. The high-sixth-high (H6H) modeled PM₁₀ concentration from the five-years of meteorology was added to the maximum monitored PM₁₀ concentration. The NAAQS

³² *Guideline on Air Quality Models*, Appendix W of 40 CFR Part 51, U.S. Environmental Protection Agency, January 2017.

³³ *Draft Guidance on Developing Background Concentrations for Use in Modeling Demonstrations*, EPA-454/P-23-001, October 2023.



are shown in Table 7. Note that NAAQS modeling was not required for PM_{2.5} as impacts from the EMACT Project were shown to be less than the SILs.

Table 7. National Ambient Air Quality Standards

| Pollutant | Averaging Time | National Ambient Air Quality Standards (µg/m ³) | |
|-------------------|----------------|---|-----------|
| | | Primary | Secondary |
| PM _{2.5} | 24-hour | 35 | -- |
| | Annual | 9 | -- |
| PM ₁₀ | 24-hour | 150 | 150 |
| NO ₂ | 1-hour | 188 | -- |
| | Annual | 100 | 100 |
| CO | 1-hour | 40,000 | -- |
| | 8-hour | 10,000 | -- |

PSD Increment Compliance Assessment

A PSD increment compliance demonstration was also conducted. All sources, including the off-site sources, were conservatively assumed to consume increment at their potential to emit rates. Compliance with the PSD increments was based on the cumulative impacts of SPM and other off-site sources identified by DEP in the nearby source emissions inventory. All off-site sources included in the NAAQS inventory were included in the PSD increment inventory and assumed to be increment consuming.

The resultant modeled impacts were compared to the PSD Class II increment levels. The highest modeled annual averages were used for evaluating compliance with the annual increments and the high-second-high values were used for evaluating compliance with the short-term PM₁₀ PSD Class II increment. The PSD Class II increments are shown in Table 8.



Table 8. PSD Class II Increments

| Pollutant | Averaging Time | PSD Class II Increment ($\mu\text{g}/\text{m}^3$) |
|------------------|-----------------------|---|
| PM ₁₀ | 24-hour | 30 |
| | Annual | 17 |
| NO ₂ | Annual | 25 |

Note: There are no PSD increments for CO or for 1-hr NO₂.



6.0 RESULTS

The following summarizes the results of the air quality modeling analyses. AERMOD input and output files, including the BPIP-PRIME files, will be provided electronically.

6.1 Combustion Turbine Load Analysis Results

The results of the combustion turbine load analysis are presented in Table 9. As shown, the 100% load scenario for each combustion turbine was found to generate the highest impacts. The 100% load case was therefore used in the SIL, NAAQS, and PSD increment analyses.

6.2 Ethane Cracking Furnace Mode and Worst-Case Operating Condition Results

The results of the worst-case ethane cracking furnace operating mode and worst-case ethane cracking furnace analyses are presented in Tables 10 and 11, respectively. As shown, decoking results in the worst-case furnace impacts for CO. The maximum normal mode of operation results in the worst-case impacts for all other pollutants. This normal mode of furnace operation was therefore used to model all but two of the furnaces. The other two furnaces were modeled with elevated CO and NO_x emissions to represent decoking and the short-term reduced NO_x control efficiency. The higher NO_x emission rate was paired with stack parameters from normal operations because this results in worst-case impacts. Only the short-term CO emissions are elevated during decoking. Annual emissions were therefore not evaluated for this operating mode (i.e., decoking). Table 10 demonstrates that Ethane Cracking Furnace #1 and Ethane Cracking Furnace #2 were found to generate the highest short-term impacts. These two furnaces were therefore assigned the elevated emissions for 1-hour NO₂ and CO and 8-hour CO.

As previously discussed, all modes of operation, except for normal operation modes, occur infrequently (between 1 and 12 times per year) and only for short durations (between 2 to 60 hours per event). As such, all annual modeling analyses were based on maximum normal operation which, as shown in Table 10, is also worst-case for the annual averaging period for both NO₂ and PM₁₀.



6.3 Secondary PM_{2.5} Analysis Results

The results of the MERPs analysis for secondary PM_{2.5} are presented in Tables 12 and 13. The results were calculated from the highest modeled concentrations from the 500 tpy sources in the Northeast and Ohio Valley climate zones. As shown, the Class II secondary PM_{2.5} contributions due to the precursor NO_x and SO₂ emissions increases from the EMACT Project are 0.046 and 0.0018 µg/m³ for the 24 hour and annual averaging periods, respectively. The Class I secondary PM_{2.5} impacts due to the NO_x and SO₂ emissions increases associated with the EMACT Project for the 24-hour and annual averaging periods are 0.0068 µg/m³ and 1.90E-04 µg/m³, respectively.



Table 9. Combustion Turbine Load Analysis Results

| Averaging Period | Source Name | Modeled Concentration (µg/m³) | Source Description |
|-------------------------|--------------------|---|-----------------------------|
| 1-hr | CT1_100 | 1.42 | Turbine 1, 100% load |
| | CT1_75 | 1.21 | Turbine 1, 75% load |
| | CT1_45 | 0.85 | Turbine 1, 45% load |
| | CT2_100 | 1.46 | Turbine 2, 100% load |
| | CT2_75 | 1.24 | Turbine 2, 75% load |
| | CT2_45 | 0.86 | Turbine 2, 45% load |
| | CT3_100 | 1.49 | Turbine 3, 100% load |
| | CT3_75 | 1.27 | Turbine 3, 75% load |
| | CT3_45 | 0.91 | Turbine 3, 45% load |
| 8-hr | CT1_100 | 0.72 | Turbine 1, 100% load |
| | CT1_75 | 0.63 | Turbine 1, 75% load |
| | CT1_45 | 0.45 | Turbine 1, 45% load |
| | CT2_100 | 0.70 | Turbine 2, 100% load |
| | CT2_75 | 0.62 | Turbine 2, 75% load |
| | CT2_45 | 0.45 | Turbine 2, 45% load |
| | CT3_100 | 0.64 | Turbine 3, 100% load |
| | CT3_75 | 0.57 | Turbine 3, 75% load |
| | CT3_45 | 0.43 | Turbine 3, 45% load |
| 24-hr | CT1_100 | 0.24 | Turbine 1, 100% load |
| | CT1_75 | 0.21 | Turbine 1, 75% load |
| | CT1_45 | 0.15 | Turbine 1, 45% load |
| | CT2_100 | 0.26 | Turbine 2, 100% load |
| | CT2_75 | 0.22 | Turbine 2, 75% load |
| | CT2_45 | 0.15 | Turbine 2, 45% load |
| | CT3_100 | 0.27 | Turbine 3, 100% load |
| | CT3_75 | 0.23 | Turbine 3, 75% load |
| | CT3_45 | 0.16 | Turbine 3, 45% load |
| Annual | CT1_100 | 0.015 | Turbine 1, 100% load |
| | CT1_75 | 0.013 | Turbine 1, 75% load |
| | CT1_45 | 0.009 | Turbine 1, 45% load |
| | CT2_100 | 0.014 | Turbine 2, 100% load |
| | CT2_75 | 0.012 | Turbine 2, 75% load |
| | CT2_45 | 0.009 | Turbine 2, 45% load |
| | CT3_100 | 0.013 | Turbine 3, 100% load |
| | CT3_75 | 0.012 | Turbine 3, 75% load |
| | CT3_45 | 0.009 | Turbine 3, 45% load |



Table 10. Worst-Case Ethane Cracking Furnace Mode Analysis Results

| Pollutant | Average | Mode | Modeled Concentration (µg/m³) |
|------------------|-------------------------------|--------------------------|---|
| CO | 1-HR | Normal (Max Rate) | 33.3 |
| | | Normal (Min Rate) | 29.6 |
| | | Decoking | 81.6 |
| | | Feed in/out | 15.7 |
| | | Hot Standby | 10.4 |
| | | Startup/Shutdown | 55.8 |
| | 8-HR | Normal (Max Rate) | 16.0 |
| | | Normal (Min Rate) | 12.5 |
| | | Decoking | 37.6 |
| | | Feed in/out | 7.17 |
| | | Hot Standby | 4.59 |
| | | Startup/Shutdown | 23 |
| NO ₂ | 1ST-HIGHEST MAX DAILY 1-HR | Normal (Max Rate) | 12.9 |
| | | Normal (Min Rate) | 10.14 |
| | | Decoking | 3.8 |
| | | Feed in/out | 6.0 |
| | | Hot Standby | 6.7 |
| | | Startup/Shutdown | N/A |
| | ANNUAL | Normal (Max Rate) | 0.14 |
| | | Normal (Min Rate) | 0.12 |
| | | Decoking | N/A |
| | | Feed in/out | 2.80E-04 |
| | | Hot Standby | 0.0096 |
| | | Startup/Shutdown | 0.0014 |
| PM10 | 24-HR | Normal (Max Rate) | 1.13 |
| | | Normal (Min Rate) | 0.74 |
| | | Decoking | 0.70 |
| | | Feed in/out | 0.53 |
| | | Hot Standby | 0.35 |
| | | Startup/Shutdown | 0.18 |
| | ANNUAL | Normal (Max Rate) | 0.072 |
| | | Normal (Min Rate) | 0.054 |
| | | Decoking | N/A |
| | | Feed in/out | 1.04E-04 |
| | | Hot Standby | 0.0021 |
| | | Startup/Shutdown | 4.41E-05 |

N/A – Not applicable. Startup/Shutdown mode not modeled for the 1-hr NO₂ average as this mode is considered intermittent and will not contribute to an exceedance of the 1-hr standard. Decoking only occurs up to 12 times per year (no more than 432 hours per year). This is not a long-term operating scenario and was thus not evaluated for annual averaging periods.



Table 11. Worst-Case Ethane Cracking Furnace Analysis Results

| Averaging Period | Source Name | Modeled Concentration ($\mu\text{g}/\text{m}^3$) | Source Description |
|------------------|-------------|--|-----------------------------------|
| 1-hr | EC#1 | 1.564 | Ethane Cracking Furnace #1 |
| | EC#2 | 1.546 | Ethane Cracking Furnace #2 |
| | EC#3 | 1.499 | Ethane Cracking Furnace #3 |
| | EC#4 | 1.481 | Ethane Cracking Furnace #4 |
| | EC#5 | 1.459 | Ethane Cracking Furnace #5 |
| | EC#6 | 1.436 | Ethane Cracking Furnace #6 |
| | EC#7 | 1.382 | Ethane Cracking Furnace #7 |
| 8-hr | EC#1 | 0.720 | Ethane Cracking Furnace #1 |
| | EC#2 | 0.713 | Ethane Cracking Furnace #2 |
| | EC#3 | 0.673 | Ethane Cracking Furnace #3 |
| | EC#4 | 0.655 | Ethane Cracking Furnace #4 |
| | EC#5 | 0.637 | Ethane Cracking Furnace #5 |
| | EC#6 | 0.628 | Ethane Cracking Furnace #6 |
| | EC#7 | 0.612 | Ethane Cracking Furnace #7 |

Table 12. EMAX Project PM_{2.5} Class II SIL MERP Calculation Results

| Precursor | EMAX Project Emissions Increase ^a (tpy) | 24-Hour Modeled Impact from Hypothetical Source ^b ($\mu\text{g}/\text{m}^3$) | Annual Modeled Impact from Hypothetical Source ^b ($\mu\text{g}/\text{m}^3$) | Modeled Emission Rate from Hypothetical Source ^b (tpy) | 24-Hour Secondary PM _{2.5} from EMAX Project ($\mu\text{g}/\text{m}^3$) | Annual Secondary PM _{2.5} from EMAX Project ($\mu\text{g}/\text{m}^3$) |
|--|--|---|--|---|--|---|
| NO _x | 75.3 | 0.27 | 0.012 | 500 | 0.041 | 1.73E-03 |
| SO ₂ | 1.63 | 1.52 | 0.025 | 500 | 4.94E-03 | 8.16E-05 |
| Total Secondary PM_{2.5} ($\mu\text{g}/\text{m}^3$): | | | | | 0.046 | 1.82E-03 |

^a Emissions increases associated with the EMAX Project.

^b Hypothetical source with the highest modeled concentration from the 500 tpy sources in the Northeast and Ohio Valley climate zones. Data obtained from EPA's MERPs View Qlik.



Table 13. EMACT Project PM_{2.5} Class I SIL MERP Calculation Results

| Precursor | EMACT Project Emissions Increases^a (tpy) | 24-Hour Modeled Impact from Hypothetical Source^b (µg/m³) | Annual Modeled Impact from Hypothetical Source^b (µg/m³) | Modeled Emission Rate from Hypothetical Source^b (tpy) | 24-Hour Secondary PM_{2.5} from EMACT Project (µg/m³) | Annual Secondary PM_{2.5} from EMACT Project (µg/m³) |
|---|--|---|--|---|---|--|
| NO _x | 75.3 | 0.043 | 0.0012 | 500 | 6.51E-03 | 1.86E-04 |
| SO ₂ | 1.63 | 0.090 | 0.0014 | 500 | 2.94E-04 | 4.71E-06 |
| Total Secondary PM_{2.5} (µg/m³): | | | | | 0.0068 | 1.90E-04 |

^a Emissions increases associated with the EMACT Project.

^b Hypothetical source with the highest modeled concentration from the 500 tpy sources in the Northeast and Ohio Valley climate zones. Data obtained from EPA's MERPs View Qlik.

^c The closest Class I area, Otter Creek Wilderness, is located approximately 189 km from SPM.

Concentration from MERPs View Qlik are based on a distance of 180 km from the hypothetical source.



6.4 EMACT Project Significant Impact Analysis Results

The EMACT Project is expected to result in insignificant impacts for all pollutants and averaging periods. The EMACT Project Class II significant impact analysis results are presented in Table 14.

Table 14. EMACT Project Class II Significant Impact Analysis Results

| Pollutant | Avg Period | Maximum Modeled Impact ($\mu\text{g}/\text{m}^3$) | Secondary $\text{PM}_{2.5}$ Conc. ($\mu\text{g}/\text{m}^3$) | Total Concentration ($\mu\text{g}/\text{m}^3$) | PSD Significant Class II Impact Level ($\mu\text{g}/\text{m}^3$) |
|------------------------------|-------------------|---|---|--|--|
| PM _{2.5} | 24-hr | 0.014 | 0.046 | 0.060 | 1.2 |
| | Annual | 5.34E-04 | 1.82E-03 | 2.35E-03 | 0.13 |
| NO ₂ ^a | 1-hr | 0.96 | N/A | 0.96 | 7.5 |
| | Annual | 4.39E-03 | N/A | 4.39E-03 | 1.0 |
| CO | 1-hr | 12.8 | N/A | 12.8 | 2,000 |
| | 8-hr | 4.07 | N/A | 4.07 | 500 |

^a NO₂ impacts include ARM2 with minimum and maximum ambient ratios of 0.5 and 0.9, respectively.
N/A – not applicable.

Based on the results of the significant impacts analysis for the EMACT Project, a cumulative analysis for assessing NAAQS and PSD increment compliance is not required.



6.5 Plan Approval Reconciliations and WWTP Permanent Controls Project Significant Impact Analysis Results

The significant impact analysis results for the Plan Approval Reconciliations and WWTP Permanent Controls Project are shown in Table 15. As shown, the project results in significant impacts for all modeled pollutants and averaging periods.

Table 15. Plan Approval Reconciliations and WWTP Permanent Controls Project Class II Significant Impact Analysis Results

| Pollutant | Avg Period | Maximum Modeled Impact ($\mu\text{g}/\text{m}^3$) | PSD Class II SIL ($\mu\text{g}/\text{m}^3$) | Maximum Distance to Significant Impact (km) |
|------------------------------|------------|---|---|---|
| PM ₁₀ | 24-hr | 21.7 | 5.0 | 2.8 |
| | Annual | 2.14 | 1.0 | 0.85 |
| NO ₂ ^a | 1-hr | 114 | 7.5 | 37.4 |
| | Annual | 3.12 | 1.0 | 2.8 |
| CO | 1-hr | 3,146 | 2,000 | 1.3 |
| | 8-hr | 1,117 | 500 | 2.1 |

^a NO₂ impacts include ARM2 with minimum and maximum ambient ratios of 0.5 and 0.9, respectively.

6.6 NAAQS Analysis Results

Following the determination of significant impacts, an analysis was conducted to assess compliance with the PM₁₀, CO, and NO₂ NAAQS. All major and minor sources located within 20 km of SPM were conservatively modeled in conjunction with SPM in assessing compliance with the PM₁₀, CO, and annual NO₂ NAAQS. Sources of NO_x located within 37 km were modeled with SPM in assessing compliance with the 1-hr NO₂ NAAQS based on the radius of the 1-hr NO₂ SIA. Background concentrations were added to the model results to assess compliance. Evaluation of compliance with the 1-hour NO₂ NAAQS was based on the five-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations. Compliance with the CO short-term standards was based on the maximum of the H2H from the five-year



meteorological dataset. Compliance with the 24-hour PM₁₀ NAAQS was based on the H6H as modeled over the full five-year meteorological dataset.

The results of the NAAQS analysis are presented in Table 16. As can be seen below, the modeling demonstrates compliance for all pollutants and averaging periods.

Table 16. NAAQS Analysis Results

| Pollutant | Averaging Period | Modeled Concentration (µg/m ³) | Background Concentration (µg/m ³) | Total Concentration (µg/m ³) | Standard (µg/m ³) |
|------------------|------------------|--|---|--|-------------------------------|
| NO ₂ | 1-hour | 177 ^{a,b} | N/A | 177 | 188 |
| | Annual | 4.78 ^b | 16.1 | 20.9 | 100 |
| CO | 1-hour | 3,070 | 2,648 | 5,728 | 40,000 |
| | 8-hour | 904 | 1,602 | 2,506 | 10,000 |
| PM ₁₀ | 24-hour | 17.5 | 66.0 | 83.5 | 150 |

^a Based on the 98th percentile of the annual distribution of maximum daily 1-hour concentrations, averaged across the 5 years of meteorological data modeled.

^b PVMRM was employed.

N/A- Not applicable. Background NO₂ concentration is added within AERMOD run and therefore is included in the modeled concentration.

6.7 PSD Class II Increment Analysis Results

Evaluation of compliance with the short-term PSD Class II increments was based on the H2H value from the five years of meteorology. The maximum annual concentrations were used to assess compliance with the annual PSD increments. All sources identified in the NAAQS inventory were conservatively assumed to consume increment at their potential to emit rates. The results of the PSD Class II increment analysis are presented in Table 17. As shown below, the modeling demonstrates compliance for all pollutants and averaging periods.



Table 17. PSD Class II Increment Analysis Results

| Pollutant | Averaging Period | Modeled Concentration ($\mu\text{g}/\text{m}^3$) | Standard ($\mu\text{g}/\text{m}^3$) |
|------------------|-------------------------|--|---|
| PM ₁₀ | 24-hour ^a | 20.6 | 30 |
| | Annual | 3.36 | 17 |
| NO ₂ | Annual ^b | 5.26 | 25 |

^a Based on the maximum H2H high value from the five years of meteorology.

^b 100% NO_x to NO₂ conversion conservatively assumed.



7.0 CLASS II VISIBILITY ANALYSIS

The CAA Amendments of 1977 require new and modified emission sources to assess potential impacts on visibility. In accordance with 40 CFR 52.21(o)(1), visibility impacts were assessed for nearby sensitive Class II areas. Emissions were evaluated as described in the EPA Workbook for Plume Visual Impact Screening and Analysis to determine potential contribution to atmospheric discoloration and visual range reduction.³⁴

Generally, atmospheric discoloration occurs when NO emissions from combustion sources react in the presence of atmospheric oxygen to form NO₂, a reddish-brown gas. Another form of atmospheric discoloration may be caused by particulate emissions and secondary aerosols formed by gaseous precursor emissions. The visual range reduction (increased haze) is caused primarily by particulate emissions and secondary aerosols such as sulfates and nitrates. SPM does emit a small amount of primary sulfate in the form of sulfuric acid mist (H₂SO₄); therefore, these emissions were also included in the analysis. Emissions of other pollutants do not materially affect visibility.

EPA visibility impairment analysis guidelines were followed in conducting the analysis. The analysis was performed for the Raccoon Creek State Park, located a minimum of 16 km and a maximum of 23 km southwest of SPM. Figure 15 presents the location of SPM and Raccoon Creek State Park.

The Federal Land Managers' Air Quality Related Values Work Group (FLAG) 2010 Guidance³⁵, the VISCREEN model conservatively assumes that multiple emission sources with significantly different exhaust plume heights will have overlapping plumes resulting in a combined impact on visibility. The FLAG 2010 Guidance further states that in specific instances where sources have significantly different plume heights, they should be treated separately as the visibility impacts from the plumes would not overlap. Using the Briggs plume rise equation³⁶ and exhaust temperatures and flow rates from

³⁴ *Workbook for Plume Visual Impact Screening and Analysis (Revised)*. EPA-454/R-92-023. RTP, NC. October 1992.

³⁵ *Phase 1 Report – Revised (2010)*. Page 39.

<https://www.fws.gov/guidance/sites/guidance/files/documents/FLAG%20Air%20Quality%20Phase%201%20report.pdf>

³⁶ *EPA Workbook for Estimating Visibility Impairment*. EPA-450/4-80-031. RTP, NC. November 1980



each source, Shell calculated plume heights for all sources included in the Level-1 VISCREEN analysis. Table 18 below summarizes the estimated plume heights for sources at the facility.

Table 18. Calculated Plume Heights

| Source | Plume Height (m) |
|----------------------------------|-------------------------|
| TEGFs and HP Elevated Flare | 4,886 – 4,955 |
| Cooling Towers | 1,013 – 1,100 |
| Combustion Turbines/Duct Burners | 943 |
| Continuous Vent Thermal Oxidizer | 810 |
| Ethane Cracking Furnaces | 495-539 |
| Spent Caustic Thermal Oxidizer | 142 |
| Pellet Dryer Vent | 137 |
| Filter Vents | 18-75 |
| Fire Water Pumps | 65 |
| Multipoint Ground Flare | 39 |
| Emergency Generators | 7-21 |
| Rail to Truck Talc Transfer | 4 |

Based on these calculations the two TEGFs and HP Elevated Flare have estimated plume heights ranging from 4,886 meters to 4,955 meters, while the remaining sources have drastically lower plume heights with a maximum being 1,100 meters and an average plume height of less than 275 meters. The plume heights from these three flares are approximately 4.5 times greater than the next highest plume height (Cooling Towers) and over 18 times higher than the average plume height of the other emission sources. As such, Shell's revised Level-1 VISCREEN analysis consists of two separate analyses, one for the two TEGFs and HP Elevated Flare and a second for the rest of the emission sources at the facility which were conservatively grouped together. Consistent with the FLAG 2010 Guidance, because the probability of these plumes overlapping from a visibility perspective is extremely unlikely, the two sets of results are individually compared to the visibility screening criteria.

This analysis requires inputs of emission rates (PM₁₀, NO_x, and H₂SO₄), regional background visual range, distance between the source and the object of study, and



worst-case dispersion parameters (i.e., wind speed and stability). Outputs from the model include:

- Plume contrast against the sky and terrain; and,
- Perceptibility of the plume (Delta E criteria).

The total annualized maximum daily emissions of PM₁₀, NO_x, and H₂SO₄ (primary sulfate) from the two TEGFs and HP Elevated Flare were input to one VISCREEN model run [i.e., 153 tpy, 284, and 2 tpy, respectively].³⁷ Total annualized maximum daily emissions of PM₁₀, NO_x, and H₂SO₄ from all other sources at the facility were input to a second VISCREEN model run [i.e., 183 tpy, 360, and 1 tpy, respectively]. These rates include the emissions increases associated with the EACT Project.

The background visual range was set to 20 km, which was determined from Figure 9 of the VISCREEN manual. The VISCREEN default screening values for Delta E (2.0) and contrast (0.05) were assumed.

As shown in Tables 19 and 20, the modeled visibility impacts inside Raccoon Creek State Park are below the screening thresholds. As such, it was determined SPM will not negatively impact visibility at Raccoon Creek State Park and no further analysis was performed. The VISCREEN modeling files are provided electronically.

³⁷ Annual emissions were calculated based on the 24-hour maximum allowable emissions in accordance with Federal Land Manager's (FLM's) AQRV Work Group (FLAG) 2010 guidance.



Table 19. Level-1 Class II Maximum Visibility Impacts Inside Raccoon Creek State Park for TEGFs and HP Elevated Flare

| Viewing Background | Theta (degrees) | Azimuth (degrees) | Distance (km) | Alpha (degrees) | Delta E | | Green Contrast | |
|--------------------|-----------------|-------------------|---------------|-----------------|-----------|-------|----------------|--------|
| | | | | | Criterion | Plume | Criterion | Plume |
| SKY | 10 | 120 | 18.4 | 49 | 2.0 | 1.559 | 0.05 | 0.010 |
| SKY | 140 | 120 | 18.4 | 49 | 2.0 | 0.453 | 0.05 | -0.010 |
| TERRAIN | 10 | 84 | 16 | 84 | 2.0 | 1.211 | 0.05 | 0.015 |
| TERRAIN | 140 | 84 | 16 | 84 | 2.0 | 0.219 | 0.05 | 0.009 |

Table 20. Level-1 Class II Maximum Visibility Impacts Inside Raccoon Creek State Park for Rest of SPM

| Viewing Background | Theta (degrees) | Azimuth (degrees) | Distance (km) | Alpha (degrees) | Delta E | | Green Contrast | |
|--------------------|-----------------|-------------------|---------------|-----------------|-----------|-------|----------------|--------|
| | | | | | Criterion | Plume | Criterion | Plume |
| SKY | 10 | 115 | 18 | 54 | 2.0 | 1.935 | 0.05 | 0.012 |
| SKY | 140 | 115 | 18 | 54 | 2.0 | 0.573 | 0.05 | -0.012 |
| TERRAIN | 10 | 84 | 16 | 84 | 2.0 | 1.408 | 0.05 | 0.017 |
| TERRAIN | 140 | 84 | 16 | 84 | 2.0 | 0.256 | 0.05 | 0.011 |

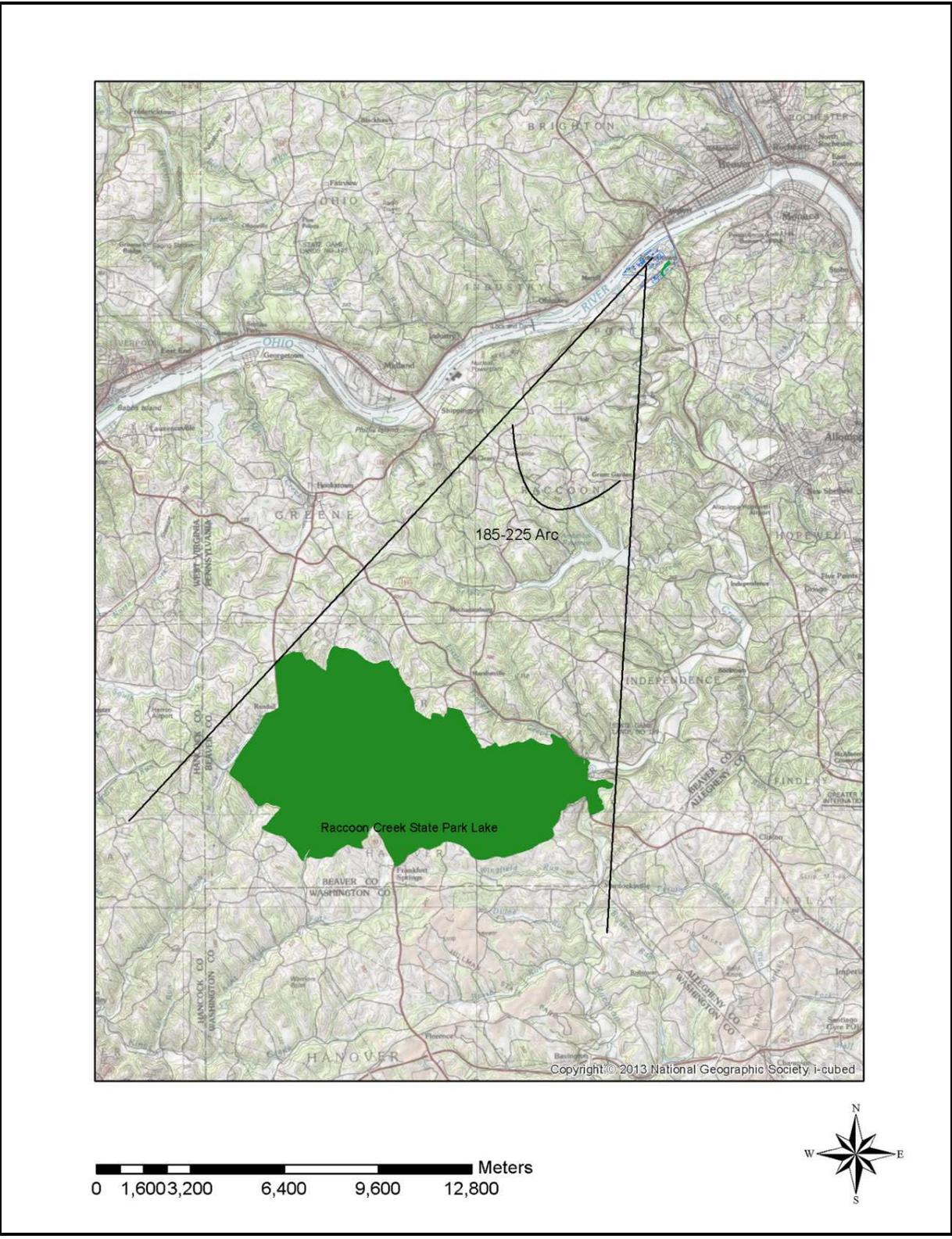


Figure 15. Location of Raccoon Creek State Park Relative to SPM



8.0 CLASS I AREA IMPACTS

8.1 Class I AQRV Analysis

The Federal Land Managers (FLM) are responsible for protecting AQRV at Class I areas and have the authority to determine whether a proposed project is expected to have a negative impact on AQRV. In general, the primary concerns associated with air emissions include visibility impairment, ozone effects on vegetation, and the impact of pollutant deposition on soils and surface waters.

There are three Class I areas located within 300 km of SPM.³⁸ Each Class I area is located in excess of 50 km from SPM. A Q/d screening analysis was therefore conducted for each of the three Class I areas to evaluate SPM's potential impacts, consistent with the Federal Land Manager's (FLM's) AQRV Work Group (FLAG) 2010 guidance. The ratio of the sum of emissions of SO₂, NO_x, PM₁₀, and H₂SO₄ to the distance between SPM and each nearby Class I area was determined and compared to a threshold of 10. Per the FLAG guidance, if the Q/d is less than or equal to 10 the facility is presumed to have no adverse impact. Annual emissions for use in the Q/d screening analysis for SPM were calculated based on the 24-hour maximum allowable emissions in accordance with FLAG 2010 guidance and include the emissions increases associated with the EACT Project and updates associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project. Table 21 presents the calculated emission rates for the Q/d analysis.

As shown in Table 22 below, the maximum Q/d value calculated for SPM is 5.6 (Q= 1,059 tpy, D = 189 km for Otter Creek). As such, SPM is presumed to have no adverse impact on AQRVs at any Class I area. A Q/d evaluation for the 2015 Plan Approval Application was presented to the FLMs which had an emissions increase of 816 tpy and a resultant Q/d of 4.3. The FLMs reviewed the Q/d evaluation and stated that no Class I AQRV evaluation was required for SPM.^{39,40,41} A preliminary Q/d analysis was

³⁸ Class I areas are pristine areas (e.g., National Parks and Wilderness Areas) that have been designated by Congress and are afforded a greater degree of air quality protection. All other areas are designated as Class II areas.

³⁹ February 11, 2014, email from Melanie Pitrolo, US Forest Service, to David Keen, RTP Environmental.

⁴⁰ February 12, 2014, email from Don Shepard, National Parks Service, to David Keen, RTP Environmental.



submitted to the FLMs on September 6, 2024 and a copy of the submittal is included in Attachment B for reference. The FLMs determined that an AQRV analysis was not required for any Class I area.

Table 21. SPM Annual Emissions (Q)

| Pollutant | Facility-wide Annual Emissions ^a (tpy) | SPM Annual Emissions (Q) (tpy) |
|--------------------------------|---|--------------------------------|
| SO ₂ | 74.8 | 1,059 |
| NO _x | 645 | |
| PM ₁₀ | 336 | |
| H ₂ SO ₄ | 3.68 | |

^a Annual emissions in tons per year, based on 24-hour maximum allowable emissions in accordance with FLAG 2010.

Table 22. SPM Class I Q/d Evaluation

| Class I Area | FLM | Approx. Distance from SPM d (km) | SPM Annual Emissions Q ^a (tpy) | Q/d | AQRV Required? (Y/N?) |
|------------------|------|----------------------------------|---|-----|-----------------------|
| Otter Creek | USFS | 189 | 1,059 | 5.6 | N |
| Dolly Sods | USFS | 200 | | 5.3 | N |
| Shenandoah | NPS | 269 | | 3.9 | N |
| James River Face | USFS | 347 | | 3.1 | N |

^a Q is based on the total SO₂, NO_x, PM₁₀, and H₂SO₄ annual emissions in tons per year, based on 24-hour maximum allowable emissions in accordance with FLAG 2010.

8.2 Class I Significant Impacts Analysis

The air quality impacts at each Class I area within 300 km were determined using AERMOD. An arc of receptors spaced at 1 degree, located in the direction of the Class I areas, was placed at 50 km from SPM, as presented on Figure 16. To account for the variation in receptor elevations within each Class I area, flagpole heights were modeled at each receptor. Three flagpole height categories were established by subtracting the actual receptor elevation at 50 km from the minimum, maximum and average receptor elevations for each Class I area obtained from the National Park Service (NPS) Air Resources Division.⁴²

⁴¹ February 13, 2014, email from Claire O'Dea, US Forest Service, to David Keen, RTP Environmental.

⁴² Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2249830>



As with the Class II SIL analyses discussed above, two separate Class I SIL analyses were conducted: one for the EMACT Project and one for the Plan Approval Reconciliations and WWTP Permanent Controls Project. Modeled emission rates and operating scenarios were consistent with the Class II SIL analyses. The model-predicted concentrations were compared to the Class I SILs.⁴³ Secondary PM_{2.5} concentrations determined in accordance with EPA's revised MERPs guidance were added to the modeled primary PM_{2.5} concentrations prior to comparison to the Class I SILs.⁴⁴ As presented in Tables 23 and 24, the Class I SIL analyses indicate impacts less than the Class I SILs. As a result, SPM will not cause or contribute to an exceedance of a PSD Class I increment.

In conducting the Class I SIL analysis for the Plan Approval Reconciliations and WWTP Permanent Controls Project, a single day (September 6, 2022) from the five years of meteorology showed a PM₁₀ 24-hour concentration that was approximately twice as high as any other day. This was discussed with the DEP and, as a result, an additional AERMOD run was performed for 2022 with rings of receptors placed at distances of 10, 20, 30, 40, and 50 km from SPM. The maximum PM₁₀ 24-hour concentration at each distance and flagpole height category (e.g., average, minimum and maximum) was determined. Given that modeled concentrations decrease exponentially with increasing distance from the source, a logarithmic regression analysis was then performed to calculate the concentration change over distance for each flagpole height category, as presented on Figure 17. The concentration at each Class I Area was then calculated for each of the three flagpole heights based on the resulting equation and presented in Table 25. The maximum concentration across the three flagpole heights was then determined. The Class I area with the predicted maximum concentration (Otter Creek) was used to compare to the Class I SIL for 24-hour PM₁₀. All modeling files are provided electronically.

⁴³ See 61 FR 38249 (July 23, 1996) for the proposed Class I SILs.

⁴⁴ *Supplement to the Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program*, memorandum from Richard Wayland to Regional Air Directors, April 30, 2024.

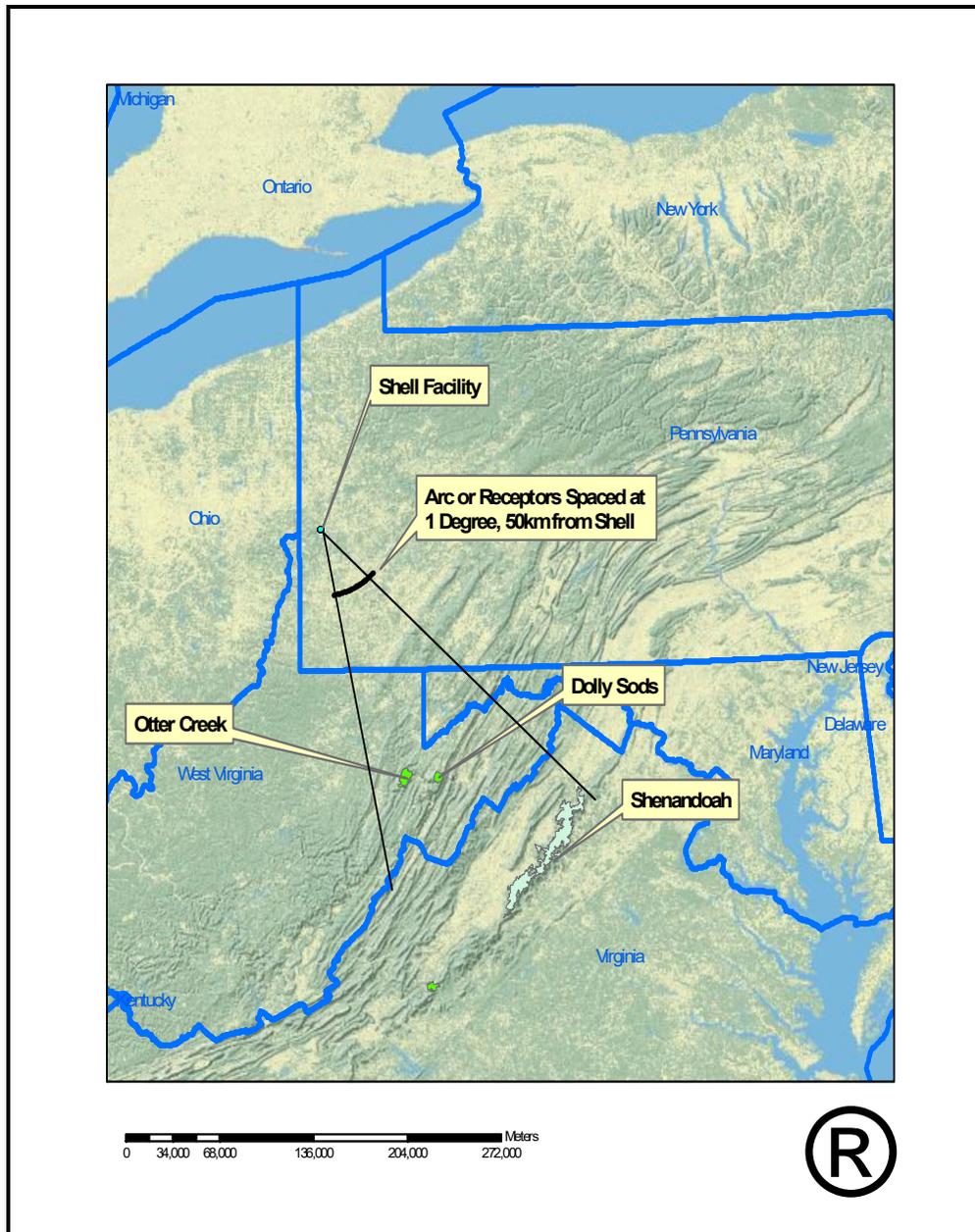


Figure 16. Class I Areas Located within Three Hundred Kilometers of SPM and Modeled Receptors



Table 23. EMACT Project Class I Significant Impact Analysis Results

| Pollutant | Averaging Period | Maximum Modeled Conc. ($\mu\text{g}/\text{m}^3$) | Secondary $\text{PM}_{2.5}$ Conc. ($\mu\text{g}/\text{m}^3$) | Total Conc. ($\mu\text{g}/\text{m}^3$) | Class I SIL ($\mu\text{g}/\text{m}^3$) |
|-------------------|------------------|--|--|--|--|
| $\text{PM}_{2.5}$ | 24-hr | 0.020 | 0.0068 | 0.026 | 0.27 |
| | Annual | 4.91E-04 | 1.90E-04 | 6.79E-04 | 0.03 |
| NO_2 | Annual | 4.03E-03 ^a | N/A | 4.02E-03 | 0.10 |

^a ARM2 was employed.

N/A – Not applicable.

Table 24. Plan Approval Reconciliations and WWTP Permanent Controls Project Class I Significant Impact Analysis Results

| Pollutant | Averaging Period | Total Facility Maximum Modeled Conc. ^a ($\mu\text{g}/\text{m}^3$) | Class I SIL ($\mu\text{g}/\text{m}^3$) |
|------------------|------------------|--|--|
| PM_{10} | 24-hr | 4.80E-03 | 0.30 |
| | Annual | 0.015 | 0.20 |
| NO_2 | Annual | 0.026 | 0.10 |

^a ARM2 was employed.

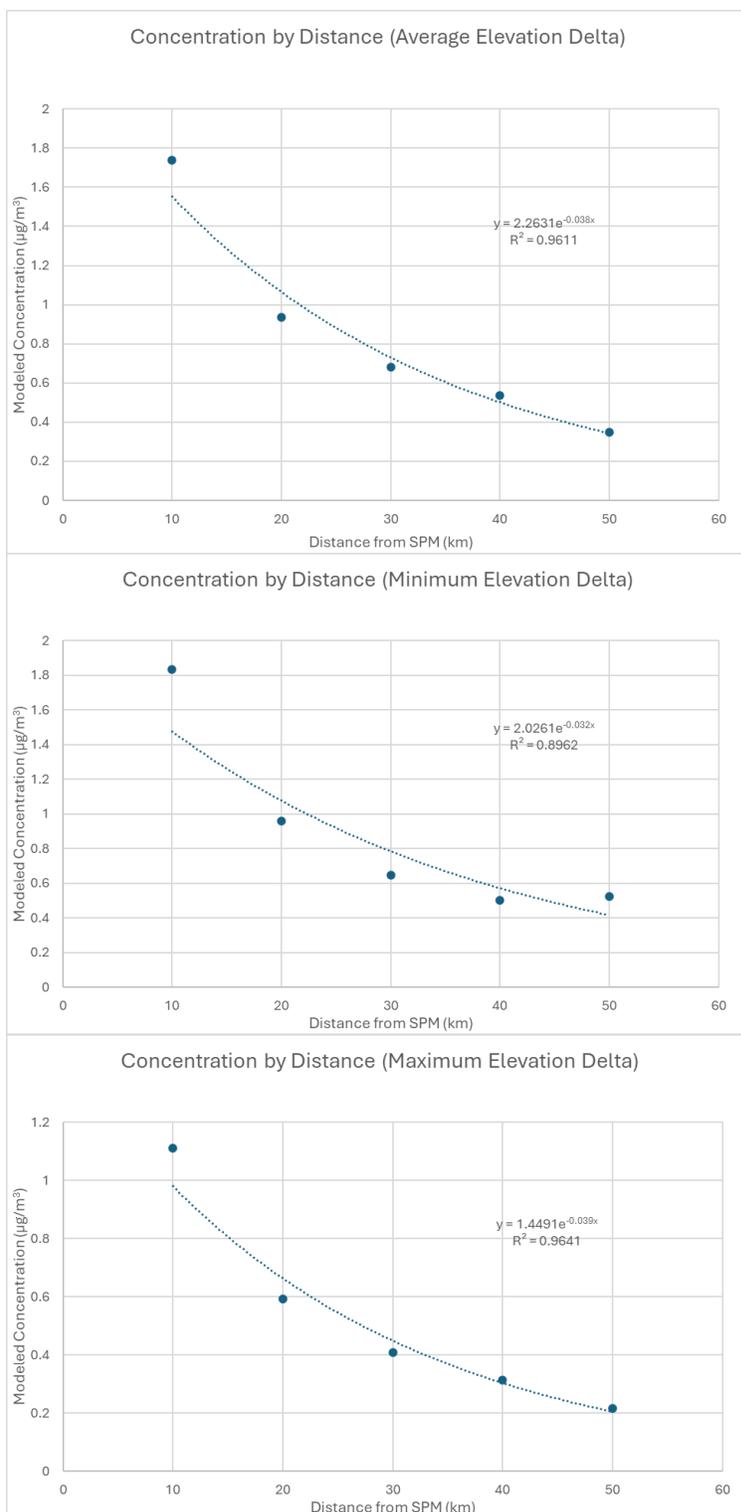


Figure 17. PM₁₀ Impact Change Over Distance for Each Flagpole Height Category



Table 25. Calculation of 24-Hour PM₁₀ Concentrations for Each of the Three Flagpole Heights

| Class I Area | Distance from SPM (km) | Calculated Concentration (µg/m ³) | | |
|-------------------------|------------------------|---|-------------------|-------------------|
| | | Average Elevation | Minimum Elevation | Maximum Elevation |
| Otter Creek (USFS) | 189 | 1.73E-03 | 4.80E-03 | 9.15E-04 |
| Dolly Sods (USFS) | 200 | 1.14E-03 | 3.40E-03 | 6.00E-04 |
| Shenandoah (NPS) | 269 | 8.36E-05 | 3.75E-04 | 4.09E-05 |
| James River Face (USFS) | 347 | 4.24E-06 | 3.04E-05 | 1.92E-06 |



ATTACHMENT A
MODELED SOURCE INPUT DATA



Modeled Point Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) |
|-----------|--|------------------------------|-------------------------------|---------------|------------------|-----------------------|---------------------|--------------------|
| EC#1 | Ethane Cracking Furnace #1 | 555502.11 | 4502199.00 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#1 | Ethane Cracking Furnace #1 - Decoking | 555502.11 | 4502199.00 | 242.32 | 83.82 | 449.15 | 9.11 | 2.59 |
| EC#2 | Ethane Cracking Furnace #2 | 555512.76 | 4502186.65 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#2 | Ethane Cracking Furnace #2 - Decoking | 555512.76 | 4502186.65 | 242.32 | 83.82 | 449.15 | 9.11 | 2.59 |
| EC#3 | Ethane Cracking Furnace #3 | 555534.48 | 4502160.24 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#4 | Ethane Cracking Furnace #4 | 555545.98 | 4502148.32 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#5 | Ethane Cracking Furnace #5 | 555561.73 | 4502131.29 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#6 | Ethane Cracking Furnace #6 | 555572.81 | 4502118.51 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#7 | Ethane Cracking Furnace #7 | 555590.27 | 4502098.92 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| CT1 | Combustion Turbine/Duct Burner Unit #1 | 555945.76 | 4502058.51 | 242.32 | 64.92 | 428.15 | 24.08 | 3.05 |
| CT2 | Combustion Turbine/Duct Burner Unit #2 | 555991.73 | 4502098.68 | 242.32 | 64.92 | 428.15 | 24.08 | 3.05 |
| CT3 | Combustion Turbine/Duct Burner Unit #3 | 556038.01 | 4502138.02 | 242.32 | 64.92 | 428.15 | 24.08 | 3.05 |
| GFLARE1 | TEGF A | 555472.50 | 4502011.25 | 237.74 | 82.66 | 1273.15 | 20.00 | 10.96 |
| GFLARE2 | TEGF B | 555421.71 | 4502085.72 | 237.74 | 82.66 | 1273.15 | 20.00 | 10.96 |
| HPFLARE | HP Elevated Flare | 555385.33 | 4502007.13 | 237.74 | 151.24 | 1273.15 | 20.00 | 10.96 |
| MPFLARE | Multipoint Ground Flare (MPGF) | 556083.87 | 4502666.73 | 242.32 | 4.46 | 1273.15 | 20.00 | 0.27 |
| INCIN | Continuous Vent Thermal Oxidizer (CVTO) | 556066.31 | 4502619.14 | 242.32 | 76.20 | 1144.26 | 56.76 | 1.37 |
| COI | Spent Caustic Thermal Oxidizer (SCTO) | 555256.39 | 4502075.62 | 217.63 | 60.96 | 1144.26 | 13.71 | 0.61 |
| FWP1 | Fire Water Pump 1 | 556126.22 | 4501713.44 | 259.08 | 9.97 | 692.59 | 36.88 | 0.30 |
| FWP2 | Fire Water Pump 2 | 556118.30 | 4501706.53 | 259.08 | 9.97 | 692.59 | 36.88 | 0.30 |
| GEN1 | Diesel-Fired Emergency 1 - Parking Garage | 556228.46 | 4501766.08 | 259.08 | 1.52 | 687.59 | 68.82 | 0.08 |
| GEN2 | Diesel-Fired Emergency Generator 2 - Telecom Hut | 556275.53 | 4501732.18 | 259.08 | 1.83 | 763.15 | 42.62 | 0.06 |
| GEN3 | Natural Gas-Fired Emergency Generator 3 - Lift Station | 556186.33 | 4502105.90 | 242.32 | 1.83 | 949.82 | 90.66 | 0.09 |
| GEN4 | Natural Gas-Fired Emergency Generator 4 - Lift Station | 555907.33 | 4502035.53 | 242.32 | 1.83 | 960.93 | 37.26 | 0.06 |
| TALC | Rail to Truck Talc Transfer | 556541.50 | 4502557.60 | 242.32 | 3.66 | 0.00 | 0.01 | 0.18 |
| COLTW1a | Process Cooling Tower | 555788.46 | 4502467.84 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW1b | Process Cooling Tower | 555799.66 | 4502454.71 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW2a | Process Cooling Tower | 555801.28 | 4502478.95 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW2b | Process Cooling Tower | 555812.45 | 4502465.82 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW3a | Process Cooling Tower | 555814.09 | 4502490.07 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW3b | Process Cooling Tower | 555825.24 | 4502476.93 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW4a | Process Cooling Tower | 555826.90 | 4502501.19 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW4b | Process Cooling Tower | 555838.03 | 4502488.04 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW5a | Process Cooling Tower | 555839.72 | 4502512.30 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW5b | Process Cooling Tower | 555850.81 | 4502499.15 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW6a | Process Cooling Tower | 555852.53 | 4502523.42 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW6b | Process Cooling Tower | 555863.60 | 4502510.26 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW7a | Process Cooling Tower | 555865.34 | 4502534.53 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW7b | Process Cooling Tower | 555876.39 | 4502521.37 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW8a | Process Cooling Tower | 555878.16 | 4502545.65 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW8b | Process Cooling Tower | 555889.18 | 4502532.48 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW9a | Process Cooling Tower | 555890.97 | 4502556.77 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW9b | Process Cooling Tower | 555901.97 | 4502543.59 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW10a | Process Cooling Tower | 555903.79 | 4502567.88 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW10b | Process Cooling Tower | 555914.76 | 4502554.70 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW11a | Process Cooling Tower | 555916.60 | 4502579.00 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW11b | Process Cooling Tower | 555927.55 | 4502565.81 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |



Modeled Point Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) |
|-----------|---|------------------------------|-------------------------------|---------------|------------------|-----------------------|---------------------|--------------------|
| COLTW12a | Process Cooling Tower | 555929.41 | 4502590.12 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW12b | Process Cooling Tower | 555940.34 | 4502576.92 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW13a | Process Cooling Tower | 555942.23 | 4502601.23 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW13b | Process Cooling Tower | 555953.12 | 4502588.03 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW14a | Cogeneration Plant Cooling Tower | 555955.04 | 4502612.35 | 242.32 | 21.64 | 294.82 | 6.50 | 11.50 |
| COLTW14b | Cogeneration Plant Cooling Tower | 555965.91 | 4502599.14 | 242.32 | 21.64 | 294.82 | 6.50 | 11.50 |
| COLTW15a | Cogeneration Plant Cooling Tower | 555967.85 | 4502623.47 | 242.32 | 21.64 | 294.82 | 6.50 | 11.50 |
| COLTW15b | Cogeneration Plant Cooling Tower | 555978.70 | 4502610.25 | 242.32 | 21.64 | 294.82 | 6.50 | 11.50 |
| COLTW16a | Cogeneration Plant Cooling Tower | 555980.67 | 4502634.58 | 242.32 | 21.64 | 294.82 | 6.50 | 11.50 |
| COLTW16b | Cogeneration Plant Cooling Tower | 555991.49 | 4502621.37 | 242.32 | 21.64 | 294.82 | 6.50 | 11.50 |
| CAH1 | PE Unit 1 Catalyst Vent Filter Vent | 556294.39 | 4502493.32 | 242.32 | 45.72 | 473.15 | 10.67 | 0.41 |
| CAH2 | PE Unit 2 Catalyst Vent Filter Vent | 556289.38 | 4502488.95 | 242.32 | 45.72 | 473.15 | 10.67 | 0.41 |
| CAA | PE Unit 3 Catalyst Activator A Filter (External) Vent | 556151.35 | 4502347.38 | 242.32 | 23.87 | 473.15 | 7.20 | 0.20 |
| CAB | PE Unit 3 Catalyst Activator B Filter (External) Vent | 556158.56 | 4502339.12 | 242.32 | 23.87 | 473.15 | 7.20 | 0.20 |
| AUSA | Additive Unloading Station A Filter Vent | 556183.65 | 4502329.83 | 242.32 | 35.05 | 288.15 | 11.25 | 0.15 |
| AUSB | Additive Unloading Station B Filter Vent | 556183.42 | 4502329.63 | 242.32 | 35.05 | 288.15 | 11.25 | 0.15 |
| AUSC | Additive Unloading Station C Filter Vent | 556183.24 | 4502329.47 | 242.32 | 35.05 | 288.15 | 11.25 | 0.15 |
| AUSD | Additive Unloading Station D Filter Vent | 556183.01 | 4502329.27 | 242.32 | 35.05 | 288.15 | 11.25 | 0.15 |
| FIBC | FIBC Compactor Filter Vent | 556182.66 | 4502308.22 | 242.32 | 35.81 | 288.15 | 32.15 | 0.15 |
| AFEEDA | Additive Feeder A Filter Vent | 556192.58 | 4502325.85 | 242.32 | 17.53 | 288.15 | 1.21 | 0.15 |
| AFEEDB | Additive Feeder B Filter Vent | 556192.40 | 4502326.06 | 242.32 | 17.53 | 288.15 | 1.21 | 0.15 |
| AFEEDC | Additive Feeder C Filter Vent | 556192.24 | 4502326.25 | 242.32 | 17.53 | 288.15 | 1.21 | 0.15 |
| AFEEDD | Additive Feeder D Filter Vent | 556192.06 | 4502326.45 | 242.32 | 17.53 | 288.15 | 1.21 | 0.15 |
| EXTRUD | Extruder Filter Vent | 556194.85 | 4502323.26 | 242.32 | 25.60 | 288.15 | 33.27 | 0.10 |
| PELTDRY | Pellet Dryer Vent | 556189.76 | 4502305.88 | 242.32 | 42.67 | 353.15 | 19.46 | 0.76 |
| VACLEAN | Vacuum Cleaning System Filter Vent | 556210.64 | 4502312.58 | 242.32 | 23.77 | 288.15 | 24.52 | 0.10 |

¹ Coordinates reflect UTM NAD83, Zone 17.



Effective Release Heights and Diameters for Flares

| Flare | Total Heat Release Rate (MMBtu/hr) | Effective Diameter ² (ft) | Actual Height (ft) | Effective Height ³ (ft) |
|-------------------|------------------------------------|--------------------------------------|--------------------|------------------------------------|
| TEGF A | 3,900 | 35.95 | 110 | 271 |
| TEGF B | 3,900 | 35.95 | 110 | 271 |
| HP Elevated Flare | 3,900 | 35.95 | 335 | 496 |
| MPGF ⁴ | 2.33 | 0.89 | 10.0 | 14.6 |

¹Parameters calculated based on Section 2.1.2 of the AERSCREEN User's Guide.

²Effective diameter (ft) = $9.88 \times 10^{-4} \times \sqrt{\text{heat release [cal/sec]} \times (1 - \text{default heat loss fraction [0.55]})}$

³Effective height (ft) = actual height + $4.56 \times 10^{-3} \times (\text{heat release [cal/sec]})^{0.478}$

⁴The MPGF was represented by one flare stack. The effective flare diameter and height for an individual flare was used for the representative flare stack and was calculated using the equivalent individual heat release rate, which was estimated as the total heat release rate (88.4 MMBtu/hr) divided by the total number of flare heads (38).



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|--|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| PEBLD | PE Blending Silos | 556290.17 | 4502354.40 | 242.32 | 42.98 | 7.80 | 19.99 |
| PERC | PE Railcar Handling and Storage Silos, Railcar Loading | 556389.00 | 4502348.93 | 242.32 | 57.00 | 6.97 | 26.51 |
| PETK | PE Truck Handling and Storage Silos, Truck Loading | 556573.49 | 4502153.59 | 259.08 | 46.02 | 14.52 | 21.41 |
| PEU1 | PE Unit 1 Process Vents | 556400.47 | 4502491.96 | 242.32 | 13.72 | 12.44 | 6.38 |
| PEU2 | PE Unit 2 Process Vents | 556287.18 | 4502495.70 | 242.32 | 13.72 | 12.44 | 6.38 |
| PELRD001 | Plant Roadways (Transport Trucks) | 556486.06 | 4501923.37 | 260.47 | 3.89 | 6.38 | 3.62 |
| PELRD002 | Plant Roadways (Transport Trucks) | 556496.66 | 4501931.91 | 260.81 | 3.89 | 6.38 | 3.62 |
| PELRD003 | Plant Roadways (Transport Trucks) | 556507.27 | 4501940.46 | 261.21 | 3.89 | 6.38 | 3.62 |
| PELRD004 | Plant Roadways (Transport Trucks) | 556517.87 | 4501949.00 | 261.40 | 3.89 | 6.38 | 3.62 |
| PELRD005 | Plant Roadways (Transport Trucks) | 556528.48 | 4501957.55 | 261.38 | 3.89 | 6.38 | 3.62 |
| PELRD006 | Plant Roadways (Transport Trucks) | 556539.08 | 4501966.09 | 261.82 | 3.89 | 6.38 | 3.62 |
| PELRD007 | Plant Roadways (Transport Trucks) | 556548.54 | 4501975.33 | 261.90 | 3.89 | 6.38 | 3.62 |
| PELRD008 | Plant Roadways (Transport Trucks) | 556551.04 | 4501988.71 | 262.07 | 3.89 | 6.38 | 3.62 |
| PELRD009 | Plant Roadways (Transport Trucks) | 556553.54 | 4502002.10 | 262.49 | 3.89 | 6.38 | 3.62 |
| PELRD010 | Plant Roadways (Transport Trucks) | 556556.05 | 4502015.49 | 262.19 | 3.89 | 6.38 | 3.62 |
| PELRD011 | Plant Roadways (Transport Trucks) | 556558.55 | 4502028.88 | 262.33 | 3.89 | 6.38 | 3.62 |
| PELRD012 | Plant Roadways (Transport Trucks) | 556561.06 | 4502042.27 | 262.36 | 3.89 | 6.38 | 3.62 |
| PELRD013 | Plant Roadways (Transport Trucks) | 556563.56 | 4502055.65 | 262.53 | 3.89 | 6.38 | 3.62 |
| PELRD014 | Plant Roadways (Transport Trucks) | 556570.07 | 4502066.80 | 262.54 | 3.89 | 6.38 | 3.62 |
| PELRD015 | Plant Roadways (Transport Trucks) | 556580.17 | 4502075.94 | 262.60 | 3.89 | 6.38 | 3.62 |
| PELRD016 | Plant Roadways (Transport Trucks) | 556590.27 | 4502085.08 | 262.53 | 3.89 | 6.38 | 3.62 |
| PELRD017 | Plant Roadways (Transport Trucks) | 556600.36 | 4502094.22 | 262.83 | 3.89 | 6.38 | 3.62 |
| PELRD018 | Plant Roadways (Transport Trucks) | 556610.46 | 4502103.37 | 263.10 | 3.89 | 6.38 | 3.62 |
| PELRD019 | Plant Roadways (Transport Trucks) | 556620.56 | 4502112.51 | 262.84 | 3.89 | 6.38 | 3.62 |
| PELRD020 | Plant Roadways (Transport Trucks) | 556630.65 | 4502121.65 | 262.75 | 3.89 | 6.38 | 3.62 |
| PELRD021 | Plant Roadways (Transport Trucks) | 556640.75 | 4502130.79 | 262.86 | 3.89 | 6.38 | 3.62 |
| PELRD022 | Plant Roadways (Transport Trucks) | 556650.84 | 4502139.93 | 263.88 | 3.89 | 6.38 | 3.62 |
| PELRD023 | Plant Roadways (Transport Trucks) | 556654.83 | 4502152.05 | 264.51 | 3.89 | 6.38 | 3.62 |
| PELRD024 | Plant Roadways (Transport Trucks) | 556655.78 | 4502165.63 | 267.28 | 3.89 | 6.38 | 3.62 |
| PELRD025 | Plant Roadways (Transport Trucks) | 556652.66 | 4502178.07 | 272.73 | 3.89 | 6.38 | 3.62 |
| PELRD026 | Plant Roadways (Transport Trucks) | 556644.76 | 4502189.17 | 273.59 | 3.89 | 6.38 | 3.62 |
| PELRD027 | Plant Roadways (Transport Trucks) | 556636.86 | 4502200.26 | 273.99 | 3.89 | 6.38 | 3.62 |
| PELRD028 | Plant Roadways (Transport Trucks) | 556628.96 | 4502211.36 | 274.40 | 3.89 | 6.38 | 3.62 |
| PELRD029 | Plant Roadways (Transport Trucks) | 556620.53 | 4502221.65 | 271.50 | 3.89 | 6.38 | 3.62 |
| PELRD030 | Plant Roadways (Transport Trucks) | 556607.23 | 4502224.57 | 268.57 | 3.89 | 6.38 | 3.62 |
| PELRD031 | Plant Roadways (Transport Trucks) | 556594.02 | 4502226.91 | 265.24 | 3.89 | 6.38 | 3.62 |
| PELRD032 | Plant Roadways (Transport Trucks) | 556582.52 | 4502219.62 | 263.85 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|-----------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| PELRD033 | Plant Roadways (Transport Trucks) | 556571.01 | 4502212.33 | 262.89 | 3.89 | 6.38 | 3.62 |
| PELRD034 | Plant Roadways (Transport Trucks) | 556561.03 | 4502203.11 | 262.85 | 3.89 | 6.38 | 3.62 |
| PELRD035 | Plant Roadways (Transport Trucks) | 556551.28 | 4502193.61 | 262.76 | 3.89 | 6.38 | 3.62 |
| PELRD036 | Plant Roadways (Transport Trucks) | 556541.53 | 4502184.10 | 262.80 | 3.89 | 6.38 | 3.62 |
| PELRD037 | Plant Roadways (Transport Trucks) | 556531.77 | 4502174.59 | 262.79 | 3.89 | 6.38 | 3.62 |
| PELRD038 | Plant Roadways (Transport Trucks) | 556524.42 | 4502163.62 | 262.33 | 3.89 | 6.38 | 3.62 |
| PELRD039 | Plant Roadways (Transport Trucks) | 556520.42 | 4502150.60 | 262.07 | 3.89 | 6.38 | 3.62 |
| PELRD040 | Plant Roadways (Transport Trucks) | 556518.13 | 4502137.47 | 262.89 | 3.89 | 6.38 | 3.62 |
| PELRD041 | Plant Roadways (Transport Trucks) | 556520.45 | 4502124.05 | 262.80 | 3.89 | 6.38 | 3.62 |
| PELRD042 | Plant Roadways (Transport Trucks) | 556523.14 | 4502110.75 | 262.88 | 3.89 | 6.38 | 3.62 |
| PELRD043 | Plant Roadways (Transport Trucks) | 556529.10 | 4502098.50 | 262.51 | 3.89 | 6.38 | 3.62 |
| PELRD044 | Plant Roadways (Transport Trucks) | 556535.05 | 4502086.25 | 262.55 | 3.89 | 6.38 | 3.62 |
| PELRD045 | Plant Roadways (Transport Trucks) | 556538.87 | 4502073.21 | 262.52 | 3.89 | 6.38 | 3.62 |
| PELRD046 | Plant Roadways (Transport Trucks) | 556542.34 | 4502060.04 | 262.37 | 3.89 | 6.38 | 3.62 |
| PELRD047 | Plant Roadways (Transport Trucks) | 556542.92 | 4502046.57 | 262.22 | 3.89 | 6.38 | 3.62 |
| PELRD048 | Plant Roadways (Transport Trucks) | 556542.21 | 4502032.97 | 262.19 | 3.89 | 6.38 | 3.62 |
| PELRD049 | Plant Roadways (Transport Trucks) | 556541.50 | 4502019.37 | 261.91 | 3.89 | 6.38 | 3.62 |
| PELRD050 | Plant Roadways (Transport Trucks) | 556540.80 | 4502005.77 | 262.10 | 3.89 | 6.38 | 3.62 |
| PELRD051 | Plant Roadways (Transport Trucks) | 556538.90 | 4501992.48 | 261.93 | 3.89 | 6.38 | 3.62 |
| PELRD052 | Plant Roadways (Transport Trucks) | 556532.70 | 4501980.36 | 261.88 | 3.89 | 6.38 | 3.62 |
| PELRD053 | Plant Roadways (Transport Trucks) | 556525.86 | 4501968.72 | 261.57 | 3.89 | 6.38 | 3.62 |
| PELRD054 | Plant Roadways (Transport Trucks) | 556515.60 | 4501959.77 | 261.34 | 3.89 | 6.38 | 3.62 |
| PELRD055 | Plant Roadways (Transport Trucks) | 556505.34 | 4501950.82 | 261.14 | 3.89 | 6.38 | 3.62 |
| PELRD056 | Plant Roadways (Transport Trucks) | 556494.61 | 4501942.43 | 260.83 | 3.89 | 6.38 | 3.62 |
| PELRD057 | Plant Roadways (Transport Trucks) | 556483.84 | 4501934.09 | 260.65 | 3.89 | 6.38 | 3.62 |
| TLCRD001 | Plant Roadways (Talc Trucks) | 556478.05 | 4501932.62 | 260.53 | 3.89 | 6.38 | 3.62 |
| TLCRD002 | Plant Roadways (Talc Trucks) | 556488.26 | 4501941.65 | 260.75 | 3.89 | 6.38 | 3.62 |
| TLCRD003 | Plant Roadways (Talc Trucks) | 556498.46 | 4501950.67 | 260.99 | 3.89 | 6.38 | 3.62 |
| TLCRD004 | Plant Roadways (Talc Trucks) | 556508.66 | 4501959.70 | 261.23 | 3.89 | 6.38 | 3.62 |
| TLCRD005 | Plant Roadways (Talc Trucks) | 556518.86 | 4501968.72 | 261.48 | 3.89 | 6.38 | 3.62 |
| TLCRD006 | Plant Roadways (Talc Trucks) | 556526.46 | 4501979.11 | 261.73 | 3.89 | 6.38 | 3.62 |
| TLCRD007 | Plant Roadways (Talc Trucks) | 556528.08 | 4501992.63 | 261.88 | 3.89 | 6.38 | 3.62 |
| TLCRD008 | Plant Roadways (Talc Trucks) | 556529.70 | 4502006.16 | 261.90 | 3.89 | 6.38 | 3.62 |
| TLCRD009 | Plant Roadways (Talc Trucks) | 556531.32 | 4502019.68 | 261.79 | 3.89 | 6.38 | 3.62 |
| TLCRD010 | Plant Roadways (Talc Trucks) | 556532.94 | 4502033.20 | 262.05 | 3.89 | 6.38 | 3.62 |
| TLCRD011 | Plant Roadways (Talc Trucks) | 556534.56 | 4502046.73 | 262.05 | 3.89 | 6.38 | 3.62 |
| TLCRD012 | Plant Roadways (Talc Trucks) | 556536.17 | 4502060.25 | 262.21 | 3.89 | 6.38 | 3.62 |
| TLCRD013 | Plant Roadways (Talc Trucks) | 556545.14 | 4502069.94 | 262.59 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD014 | Plant Roadways (Talc Trucks) | 556555.30 | 4502079.01 | 262.79 | 3.89 | 6.38 | 3.62 |
| TLCRD015 | Plant Roadways (Talc Trucks) | 556565.47 | 4502088.07 | 262.90 | 3.89 | 6.38 | 3.62 |
| TLCRD016 | Plant Roadways (Talc Trucks) | 556575.64 | 4502097.14 | 262.92 | 3.89 | 6.38 | 3.62 |
| TLCRD017 | Plant Roadways (Talc Trucks) | 556585.80 | 4502106.20 | 262.80 | 3.89 | 6.38 | 3.62 |
| TLCRD018 | Plant Roadways (Talc Trucks) | 556595.97 | 4502115.27 | 262.78 | 3.89 | 6.38 | 3.62 |
| TLCRD019 | Plant Roadways (Talc Trucks) | 556606.13 | 4502124.33 | 262.85 | 3.89 | 6.38 | 3.62 |
| TLCRD020 | Plant Roadways (Talc Trucks) | 556616.30 | 4502133.40 | 262.76 | 3.89 | 6.38 | 3.62 |
| TLCRD021 | Plant Roadways (Talc Trucks) | 556626.46 | 4502142.46 | 262.93 | 3.89 | 6.38 | 3.62 |
| TLCRD022 | Plant Roadways (Talc Trucks) | 556636.63 | 4502151.53 | 263.11 | 3.89 | 6.38 | 3.62 |
| TLCRD023 | Plant Roadways (Talc Trucks) | 556628.46 | 4502144.26 | 263.03 | 3.89 | 6.38 | 3.62 |
| TLCRD024 | Plant Roadways (Talc Trucks) | 556618.29 | 4502135.20 | 262.80 | 3.89 | 6.38 | 3.62 |
| TLCRD025 | Plant Roadways (Talc Trucks) | 556608.12 | 4502126.14 | 262.86 | 3.89 | 6.38 | 3.62 |
| TLCRD026 | Plant Roadways (Talc Trucks) | 556597.95 | 4502117.08 | 262.82 | 3.89 | 6.38 | 3.62 |
| TLCRD027 | Plant Roadways (Talc Trucks) | 556587.78 | 4502108.02 | 262.79 | 3.89 | 6.38 | 3.62 |
| TLCRD028 | Plant Roadways (Talc Trucks) | 556577.61 | 4502098.97 | 262.89 | 3.89 | 6.38 | 3.62 |
| TLCRD029 | Plant Roadways (Talc Trucks) | 556567.44 | 4502089.91 | 262.92 | 3.89 | 6.38 | 3.62 |
| TLCRD030 | Plant Roadways (Talc Trucks) | 556557.27 | 4502080.85 | 262.82 | 3.89 | 6.38 | 3.62 |
| TLCRD031 | Plant Roadways (Talc Trucks) | 556547.10 | 4502071.79 | 262.65 | 3.89 | 6.38 | 3.62 |
| TLCRD032 | Plant Roadways (Talc Trucks) | 556537.35 | 4502062.50 | 262.26 | 3.89 | 6.38 | 3.62 |
| TLCRD033 | Plant Roadways (Talc Trucks) | 556535.58 | 4502049.00 | 262.06 | 3.89 | 6.38 | 3.62 |
| TLCRD034 | Plant Roadways (Talc Trucks) | 556533.80 | 4502035.50 | 262.09 | 3.89 | 6.38 | 3.62 |
| TLCRD035 | Plant Roadways (Talc Trucks) | 556532.02 | 4502021.99 | 261.85 | 3.89 | 6.38 | 3.62 |
| TLCRD036 | Plant Roadways (Talc Trucks) | 556530.24 | 4502008.49 | 261.83 | 3.89 | 6.38 | 3.62 |
| TLCRD037 | Plant Roadways (Talc Trucks) | 556528.46 | 4501994.99 | 261.91 | 3.89 | 6.38 | 3.62 |
| TLCRD038 | Plant Roadways (Talc Trucks) | 556526.68 | 4501981.48 | 261.76 | 3.89 | 6.38 | 3.62 |
| TLCRD039 | Plant Roadways (Talc Trucks) | 556519.94 | 4501970.58 | 261.51 | 3.89 | 6.38 | 3.62 |
| TLCRD040 | Plant Roadways (Talc Trucks) | 556509.86 | 4501961.42 | 261.28 | 3.89 | 6.38 | 3.62 |
| TLCRD041 | Plant Roadways (Talc Trucks) | 556499.78 | 4501952.26 | 261.00 | 3.89 | 6.38 | 3.62 |
| TLCRD042 | Plant Roadways (Talc Trucks) | 556489.69 | 4501943.10 | 260.78 | 3.89 | 6.38 | 3.62 |
| TLCRD043 | Plant Roadways (Talc Trucks) | 556479.97 | 4501938.57 | 260.60 | 3.89 | 6.38 | 3.62 |
| TLCRD044 | Plant Roadways (Talc Trucks) | 556471.44 | 4501949.18 | 258.98 | 3.89 | 6.38 | 3.62 |
| TLCRD045 | Plant Roadways (Talc Trucks) | 556462.90 | 4501959.79 | 259.71 | 3.89 | 6.38 | 3.62 |
| TLCRD046 | Plant Roadways (Talc Trucks) | 556452.51 | 4501952.95 | 259.64 | 3.89 | 6.38 | 3.62 |
| TLCRD047 | Plant Roadways (Talc Trucks) | 556441.94 | 4501944.36 | 259.39 | 3.89 | 6.38 | 3.62 |
| TLCRD048 | Plant Roadways (Talc Trucks) | 556432.75 | 4501953.60 | 259.71 | 3.89 | 6.38 | 3.62 |
| TLCRD049 | Plant Roadways (Talc Trucks) | 556423.63 | 4501963.71 | 259.71 | 3.89 | 6.38 | 3.62 |
| TLCRD050 | Plant Roadways (Talc Trucks) | 556414.50 | 4501973.83 | 259.37 | 3.89 | 6.38 | 3.62 |
| TLCRD051 | Plant Roadways (Talc Trucks) | 556405.38 | 4501983.94 | 259.38 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD052 | Plant Roadways (Talc Trucks) | 556396.25 | 4501994.05 | 259.14 | 3.89 | 6.38 | 3.62 |
| TLCRD053 | Plant Roadways (Talc Trucks) | 556387.13 | 4502004.16 | 259.09 | 3.89 | 6.38 | 3.62 |
| TLCRD054 | Plant Roadways (Talc Trucks) | 556389.74 | 4502016.84 | 259.34 | 3.89 | 6.38 | 3.62 |
| TLCRD055 | Plant Roadways (Talc Trucks) | 556393.80 | 4502029.84 | 259.43 | 3.89 | 6.38 | 3.62 |
| TLCRD056 | Plant Roadways (Talc Trucks) | 556397.87 | 4502042.84 | 259.52 | 3.89 | 6.38 | 3.62 |
| TLCRD057 | Plant Roadways (Talc Trucks) | 556405.66 | 4502053.60 | 259.63 | 3.89 | 6.38 | 3.62 |
| TLCRD058 | Plant Roadways (Talc Trucks) | 556415.22 | 4502063.31 | 259.80 | 3.89 | 6.38 | 3.62 |
| TLCRD059 | Plant Roadways (Talc Trucks) | 556424.78 | 4502073.01 | 259.44 | 3.89 | 6.38 | 3.62 |
| TLCRD060 | Plant Roadways (Talc Trucks) | 556434.34 | 4502082.71 | 258.64 | 3.89 | 6.38 | 3.62 |
| TLCRD061 | Plant Roadways (Talc Trucks) | 556438.77 | 4502095.54 | 257.73 | 3.89 | 6.38 | 3.62 |
| TLCRD062 | Plant Roadways (Talc Trucks) | 556443.03 | 4502108.48 | 257.00 | 3.89 | 6.38 | 3.62 |
| TLCRD063 | Plant Roadways (Talc Trucks) | 556447.29 | 4502121.41 | 256.20 | 3.89 | 6.38 | 3.62 |
| TLCRD064 | Plant Roadways (Talc Trucks) | 556451.54 | 4502134.35 | 255.88 | 3.89 | 6.38 | 3.62 |
| TLCRD065 | Plant Roadways (Talc Trucks) | 556455.80 | 4502147.29 | 255.80 | 3.89 | 6.38 | 3.62 |
| TLCRD066 | Plant Roadways (Talc Trucks) | 556460.06 | 4502160.23 | 256.07 | 3.89 | 6.38 | 3.62 |
| TLCRD067 | Plant Roadways (Talc Trucks) | 556467.56 | 4502171.15 | 256.47 | 3.89 | 6.38 | 3.62 |
| TLCRD068 | Plant Roadways (Talc Trucks) | 556477.26 | 4502180.71 | 257.00 | 3.89 | 6.38 | 3.62 |
| TLCRD069 | Plant Roadways (Talc Trucks) | 556486.97 | 4502190.27 | 257.46 | 3.89 | 6.38 | 3.62 |
| TLCRD070 | Plant Roadways (Talc Trucks) | 556496.67 | 4502199.82 | 257.99 | 3.89 | 6.38 | 3.62 |
| TLCRD071 | Plant Roadways (Talc Trucks) | 556506.38 | 4502209.38 | 258.35 | 3.89 | 6.38 | 3.62 |
| TLCRD072 | Plant Roadways (Talc Trucks) | 556516.08 | 4502218.94 | 258.53 | 3.89 | 6.38 | 3.62 |
| TLCRD073 | Plant Roadways (Talc Trucks) | 556525.78 | 4502228.49 | 258.63 | 3.89 | 6.38 | 3.62 |
| TLCRD074 | Plant Roadways (Talc Trucks) | 556535.49 | 4502238.05 | 258.45 | 3.89 | 6.38 | 3.62 |
| TLCRD075 | Plant Roadways (Talc Trucks) | 556545.19 | 4502247.61 | 258.24 | 3.89 | 6.38 | 3.62 |
| TLCRD076 | Plant Roadways (Talc Trucks) | 556554.90 | 4502257.16 | 257.98 | 3.89 | 6.38 | 3.62 |
| TLCRD077 | Plant Roadways (Talc Trucks) | 556564.60 | 4502266.72 | 257.78 | 3.89 | 6.38 | 3.62 |
| TLCRD078 | Plant Roadways (Talc Trucks) | 556574.31 | 4502276.28 | 257.57 | 3.89 | 6.38 | 3.62 |
| TLCRD079 | Plant Roadways (Talc Trucks) | 556584.01 | 4502285.83 | 257.37 | 3.89 | 6.38 | 3.62 |
| TLCRD080 | Plant Roadways (Talc Trucks) | 556593.71 | 4502295.39 | 257.18 | 3.89 | 6.38 | 3.62 |
| TLCRD081 | Plant Roadways (Talc Trucks) | 556601.92 | 4502306.06 | 256.92 | 3.89 | 6.38 | 3.62 |
| TLCRD082 | Plant Roadways (Talc Trucks) | 556608.32 | 4502318.09 | 256.72 | 3.89 | 6.38 | 3.62 |
| TLCRD083 | Plant Roadways (Talc Trucks) | 556614.72 | 4502330.11 | 256.48 | 3.89 | 6.38 | 3.62 |
| TLCRD084 | Plant Roadways (Talc Trucks) | 556621.11 | 4502342.13 | 256.24 | 3.89 | 6.38 | 3.62 |
| TLCRD085 | Plant Roadways (Talc Trucks) | 556627.51 | 4502354.16 | 255.98 | 3.89 | 6.38 | 3.62 |
| TLCRD086 | Plant Roadways (Talc Trucks) | 556633.91 | 4502366.18 | 255.76 | 3.89 | 6.38 | 3.62 |
| TLCRD087 | Plant Roadways (Talc Trucks) | 556640.31 | 4502378.21 | 255.55 | 3.89 | 6.38 | 3.62 |
| TLCRD088 | Plant Roadways (Talc Trucks) | 556646.64 | 4502390.26 | 255.32 | 3.89 | 6.38 | 3.62 |
| TLCRD089 | Plant Roadways (Talc Trucks) | 556650.90 | 4502403.19 | 255.09 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD090 | Plant Roadways (Talc Trucks) | 556655.17 | 4502416.13 | 254.85 | 3.89 | 6.38 | 3.62 |
| TLCRD091 | Plant Roadways (Talc Trucks) | 556659.43 | 4502429.06 | 254.65 | 3.89 | 6.38 | 3.62 |
| TLCRD092 | Plant Roadways (Talc Trucks) | 556663.69 | 4502442.00 | 254.44 | 3.89 | 6.38 | 3.62 |
| TLCRD093 | Plant Roadways (Talc Trucks) | 556667.96 | 4502454.94 | 254.21 | 3.89 | 6.38 | 3.62 |
| TLCRD094 | Plant Roadways (Talc Trucks) | 556672.22 | 4502467.87 | 253.97 | 3.89 | 6.38 | 3.62 |
| TLCRD095 | Plant Roadways (Talc Trucks) | 556676.48 | 4502480.81 | 253.70 | 3.89 | 6.38 | 3.62 |
| TLCRD096 | Plant Roadways (Talc Trucks) | 556680.75 | 4502493.74 | 253.48 | 3.89 | 6.38 | 3.62 |
| TLCRD097 | Plant Roadways (Talc Trucks) | 556685.01 | 4502506.68 | 253.27 | 3.89 | 6.38 | 3.62 |
| TLCRD098 | Plant Roadways (Talc Trucks) | 556689.27 | 4502519.61 | 253.03 | 3.89 | 6.38 | 3.62 |
| TLCRD099 | Plant Roadways (Talc Trucks) | 556693.44 | 4502532.58 | 252.78 | 3.89 | 6.38 | 3.62 |
| TLCRD100 | Plant Roadways (Talc Trucks) | 556697.33 | 4502545.63 | 252.54 | 3.89 | 6.38 | 3.62 |
| TLCRD101 | Plant Roadways (Talc Trucks) | 556701.22 | 4502558.68 | 252.29 | 3.89 | 6.38 | 3.62 |
| TLCRD102 | Plant Roadways (Talc Trucks) | 556705.11 | 4502571.74 | 252.06 | 3.89 | 6.38 | 3.62 |
| TLCRD103 | Plant Roadways (Talc Trucks) | 556709.00 | 4502584.79 | 251.81 | 3.89 | 6.38 | 3.62 |
| TLCRD104 | Plant Roadways (Talc Trucks) | 556712.90 | 4502597.84 | 251.56 | 3.89 | 6.38 | 3.62 |
| TLCRD105 | Plant Roadways (Talc Trucks) | 556716.79 | 4502610.89 | 251.32 | 3.89 | 6.38 | 3.62 |
| TLCRD106 | Plant Roadways (Talc Trucks) | 556718.49 | 4502624.37 | 251.10 | 3.89 | 6.38 | 3.62 |
| TLCRD107 | Plant Roadways (Talc Trucks) | 556719.74 | 4502637.93 | 250.85 | 3.89 | 6.38 | 3.62 |
| TLCRD108 | Plant Roadways (Talc Trucks) | 556718.74 | 4502651.23 | 250.58 | 3.89 | 6.38 | 3.62 |
| TLCRD109 | Plant Roadways (Talc Trucks) | 556714.35 | 4502664.12 | 250.26 | 3.89 | 6.38 | 3.62 |
| TLCRD110 | Plant Roadways (Talc Trucks) | 556709.96 | 4502677.01 | 250.08 | 3.89 | 6.38 | 3.62 |
| TLCRD111 | Plant Roadways (Talc Trucks) | 556705.57 | 4502689.91 | 239.06 | 3.89 | 6.38 | 3.62 |
| TLCRD112 | Plant Roadways (Talc Trucks) | 556700.13 | 4502702.37 | 239.55 | 3.89 | 6.38 | 3.62 |
| TLCRD113 | Plant Roadways (Talc Trucks) | 556694.19 | 4502714.62 | 239.42 | 3.89 | 6.38 | 3.62 |
| TLCRD114 | Plant Roadways (Talc Trucks) | 556688.25 | 4502726.88 | 239.26 | 3.89 | 6.38 | 3.62 |
| TLCRD115 | Plant Roadways (Talc Trucks) | 556682.31 | 4502739.14 | 239.19 | 3.89 | 6.38 | 3.62 |
| TLCRD116 | Plant Roadways (Talc Trucks) | 556676.37 | 4502751.39 | 239.15 | 3.89 | 6.38 | 3.62 |
| TLCRD117 | Plant Roadways (Talc Trucks) | 556670.42 | 4502763.65 | 248.45 | 3.89 | 6.38 | 3.62 |
| TLCRD118 | Plant Roadways (Talc Trucks) | 556664.48 | 4502775.90 | 248.11 | 3.89 | 6.38 | 3.62 |
| TLCRD119 | Plant Roadways (Talc Trucks) | 556658.54 | 4502788.16 | 247.86 | 3.89 | 6.38 | 3.62 |
| TLCRD120 | Plant Roadways (Talc Trucks) | 556652.60 | 4502800.41 | 247.54 | 3.89 | 6.38 | 3.62 |
| TLCRD121 | Plant Roadways (Talc Trucks) | 556646.66 | 4502812.67 | 247.14 | 3.89 | 6.38 | 3.62 |
| TLCRD122 | Plant Roadways (Talc Trucks) | 556640.72 | 4502824.93 | 246.63 | 3.89 | 6.38 | 3.62 |
| TLCRD123 | Plant Roadways (Talc Trucks) | 556634.78 | 4502837.18 | 246.03 | 3.89 | 6.38 | 3.62 |
| TLCRD124 | Plant Roadways (Talc Trucks) | 556628.70 | 4502849.36 | 245.39 | 3.89 | 6.38 | 3.62 |
| TLCRD125 | Plant Roadways (Talc Trucks) | 556621.25 | 4502860.76 | 244.76 | 3.89 | 6.38 | 3.62 |
| TLCRD126 | Plant Roadways (Talc Trucks) | 556613.79 | 4502872.16 | 244.10 | 3.89 | 6.38 | 3.62 |
| TLCRD127 | Plant Roadways (Talc Trucks) | 556606.33 | 4502883.56 | 243.50 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD128 | Plant Roadways (Talc Trucks) | 556596.17 | 4502892.45 | 242.83 | 3.89 | 6.38 | 3.62 |
| TLCRD129 | Plant Roadways (Talc Trucks) | 556585.41 | 4502900.80 | 242.20 | 3.89 | 6.38 | 3.62 |
| TLCRD130 | Plant Roadways (Talc Trucks) | 556574.65 | 4502909.15 | 241.54 | 3.89 | 6.38 | 3.62 |
| TLCRD131 | Plant Roadways (Talc Trucks) | 556563.72 | 4502917.19 | 240.87 | 3.89 | 6.38 | 3.62 |
| TLCRD132 | Plant Roadways (Talc Trucks) | 556550.71 | 4502921.20 | 240.24 | 3.89 | 6.38 | 3.62 |
| TLCRD133 | Plant Roadways (Talc Trucks) | 556537.69 | 4502925.20 | 239.56 | 3.89 | 6.38 | 3.62 |
| TLCRD134 | Plant Roadways (Talc Trucks) | 556524.67 | 4502929.20 | 238.94 | 3.89 | 6.38 | 3.62 |
| TLCRD135 | Plant Roadways (Talc Trucks) | 556511.58 | 4502932.68 | 238.27 | 3.89 | 6.38 | 3.62 |
| TLCRD136 | Plant Roadways (Talc Trucks) | 556497.97 | 4502932.21 | 237.59 | 3.89 | 6.38 | 3.62 |
| TLCRD137 | Plant Roadways (Talc Trucks) | 556484.36 | 4502931.75 | 236.95 | 3.89 | 6.38 | 3.62 |
| TLCRD138 | Plant Roadways (Talc Trucks) | 556470.75 | 4502931.28 | 236.31 | 3.89 | 6.38 | 3.62 |
| TLCRD139 | Plant Roadways (Talc Trucks) | 556457.13 | 4502930.81 | 235.74 | 3.89 | 6.38 | 3.62 |
| TLCRD140 | Plant Roadways (Talc Trucks) | 556444.56 | 4502926.42 | 235.10 | 3.89 | 6.38 | 3.62 |
| TLCRD141 | Plant Roadways (Talc Trucks) | 556432.50 | 4502920.09 | 234.45 | 3.89 | 6.38 | 3.62 |
| TLCRD142 | Plant Roadways (Talc Trucks) | 556420.43 | 4502913.77 | 233.78 | 3.89 | 6.38 | 3.62 |
| TLCRD143 | Plant Roadways (Talc Trucks) | 556408.37 | 4502907.44 | 233.15 | 3.89 | 6.38 | 3.62 |
| TLCRD144 | Plant Roadways (Talc Trucks) | 556396.31 | 4502901.12 | 232.51 | 3.89 | 6.38 | 3.62 |
| TLCRD145 | Plant Roadways (Talc Trucks) | 556384.14 | 4502895.00 | 231.99 | 3.89 | 6.38 | 3.62 |
| TLCRD146 | Plant Roadways (Talc Trucks) | 556371.07 | 4502893.63 | 231.47 | 3.89 | 6.38 | 3.62 |
| TLCRD147 | Plant Roadways (Talc Trucks) | 556357.53 | 4502895.12 | 231.04 | 3.89 | 6.38 | 3.62 |
| TLCRD148 | Plant Roadways (Talc Trucks) | 556344.00 | 4502896.62 | 231.01 | 3.89 | 6.38 | 3.62 |
| TLCRD149 | Plant Roadways (Talc Trucks) | 556331.54 | 4502893.22 | 231.64 | 3.89 | 6.38 | 3.62 |
| TLCRD150 | Plant Roadways (Talc Trucks) | 556319.90 | 4502886.14 | 232.23 | 3.89 | 6.38 | 3.62 |
| TLCRD151 | Plant Roadways (Talc Trucks) | 556308.27 | 4502879.07 | 232.60 | 3.89 | 6.38 | 3.62 |
| TLCRD152 | Plant Roadways (Talc Trucks) | 556296.63 | 4502871.99 | 232.97 | 3.89 | 6.38 | 3.62 |
| TLCRD153 | Plant Roadways (Talc Trucks) | 556284.99 | 4502864.92 | 233.31 | 3.89 | 6.38 | 3.62 |
| TLCRD154 | Plant Roadways (Talc Trucks) | 556273.35 | 4502857.84 | 233.66 | 3.89 | 6.38 | 3.62 |
| TLCRD155 | Plant Roadways (Talc Trucks) | 556261.71 | 4502850.77 | 234.00 | 3.89 | 6.38 | 3.62 |
| TLCRD156 | Plant Roadways (Talc Trucks) | 556250.08 | 4502843.69 | 234.35 | 3.89 | 6.38 | 3.62 |
| TLCRD157 | Plant Roadways (Talc Trucks) | 556238.44 | 4502836.62 | 234.59 | 3.89 | 6.38 | 3.62 |
| TLCRD158 | Plant Roadways (Talc Trucks) | 556226.80 | 4502829.54 | 234.72 | 3.89 | 6.38 | 3.62 |
| TLCRD159 | Plant Roadways (Talc Trucks) | 556215.16 | 4502822.47 | 234.88 | 3.89 | 6.38 | 3.62 |
| TLCRD160 | Plant Roadways (Talc Trucks) | 556203.52 | 4502815.39 | 235.00 | 3.89 | 6.38 | 3.62 |
| TLCRD161 | Plant Roadways (Talc Trucks) | 556191.89 | 4502808.31 | 235.14 | 3.89 | 6.38 | 3.62 |
| TLCRD162 | Plant Roadways (Talc Trucks) | 556180.25 | 4502801.24 | 235.22 | 3.89 | 6.38 | 3.62 |
| TLCRD163 | Plant Roadways (Talc Trucks) | 556168.61 | 4502794.16 | 235.42 | 3.89 | 6.38 | 3.62 |
| TLCRD164 | Plant Roadways (Talc Trucks) | 556156.97 | 4502787.09 | 235.74 | 3.89 | 6.38 | 3.62 |
| TLCRD165 | Plant Roadways (Talc Trucks) | 556145.33 | 4502780.01 | 236.03 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD166 | Plant Roadways (Talc Trucks) | 556133.70 | 4502772.94 | 236.32 | 3.89 | 6.38 | 3.62 |
| TLCRD167 | Plant Roadways (Talc Trucks) | 556122.06 | 4502765.86 | 236.58 | 3.89 | 6.38 | 3.62 |
| TLCRD168 | Plant Roadways (Talc Trucks) | 556110.42 | 4502758.79 | 236.88 | 3.89 | 6.38 | 3.62 |
| TLCRD169 | Plant Roadways (Talc Trucks) | 556098.78 | 4502751.71 | 237.09 | 3.89 | 6.38 | 3.62 |
| TLCRD170 | Plant Roadways (Talc Trucks) | 556087.14 | 4502744.64 | 237.18 | 3.89 | 6.38 | 3.62 |
| TLCRD171 | Plant Roadways (Talc Trucks) | 556075.50 | 4502737.56 | 237.21 | 3.89 | 6.38 | 3.62 |
| TLCRD172 | Plant Roadways (Talc Trucks) | 556063.87 | 4502730.49 | 237.23 | 3.89 | 6.38 | 3.62 |
| TLCRD173 | Plant Roadways (Talc Trucks) | 556052.23 | 4502723.41 | 237.20 | 3.89 | 6.38 | 3.62 |
| TLCRD174 | Plant Roadways (Talc Trucks) | 556040.59 | 4502716.34 | 237.20 | 3.89 | 6.38 | 3.62 |
| TLCRD175 | Plant Roadways (Talc Trucks) | 556028.95 | 4502709.26 | 237.18 | 3.89 | 6.38 | 3.62 |
| TLCRD176 | Plant Roadways (Talc Trucks) | 556017.31 | 4502702.19 | 237.21 | 3.89 | 6.38 | 3.62 |
| TLCRD177 | Plant Roadways (Talc Trucks) | 556005.68 | 4502695.11 | 237.31 | 3.89 | 6.38 | 3.62 |
| TLCRD178 | Plant Roadways (Talc Trucks) | 555994.33 | 4502687.64 | 237.42 | 3.89 | 6.38 | 3.62 |
| TLCRD179 | Plant Roadways (Talc Trucks) | 555984.01 | 4502678.74 | 237.61 | 3.89 | 6.38 | 3.62 |
| TLCRD180 | Plant Roadways (Talc Trucks) | 555973.70 | 4502669.84 | 237.67 | 3.89 | 6.38 | 3.62 |
| TLCRD181 | Plant Roadways (Talc Trucks) | 555963.39 | 4502660.95 | 237.76 | 3.89 | 6.38 | 3.62 |
| TLCRD182 | Plant Roadways (Talc Trucks) | 555953.07 | 4502652.05 | 237.99 | 3.89 | 6.38 | 3.62 |
| TLCRD183 | Plant Roadways (Talc Trucks) | 555942.76 | 4502643.16 | 238.27 | 3.89 | 6.38 | 3.62 |
| TLCRD184 | Plant Roadways (Talc Trucks) | 555932.45 | 4502634.26 | 238.47 | 3.89 | 6.38 | 3.62 |
| TLCRD185 | Plant Roadways (Talc Trucks) | 555922.13 | 4502625.37 | 238.57 | 3.89 | 6.38 | 3.62 |
| TLCRD186 | Plant Roadways (Talc Trucks) | 555911.82 | 4502616.47 | 238.80 | 3.89 | 6.38 | 3.62 |
| TLCRD187 | Plant Roadways (Talc Trucks) | 555901.51 | 4502607.57 | 238.98 | 3.89 | 6.38 | 3.62 |
| TLCRD188 | Plant Roadways (Talc Trucks) | 555891.19 | 4502598.68 | 239.23 | 3.89 | 6.38 | 3.62 |
| TLCRD189 | Plant Roadways (Talc Trucks) | 555880.88 | 4502589.78 | 239.44 | 3.89 | 6.38 | 3.62 |
| TLCRD190 | Plant Roadways (Talc Trucks) | 555870.57 | 4502580.89 | 239.62 | 3.89 | 6.38 | 3.62 |
| TLCRD191 | Plant Roadways (Talc Trucks) | 555860.25 | 4502571.99 | 239.82 | 3.89 | 6.38 | 3.62 |
| TLCRD192 | Plant Roadways (Talc Trucks) | 555849.94 | 4502563.09 | 240.08 | 3.89 | 6.38 | 3.62 |
| TLCRD193 | Plant Roadways (Talc Trucks) | 555839.63 | 4502554.20 | 240.30 | 3.89 | 6.38 | 3.62 |
| TLCRD194 | Plant Roadways (Talc Trucks) | 555829.31 | 4502545.30 | 240.44 | 3.89 | 6.38 | 3.62 |
| TLCRD195 | Plant Roadways (Talc Trucks) | 555819.00 | 4502536.41 | 240.71 | 3.89 | 6.38 | 3.62 |
| TLCRD196 | Plant Roadways (Talc Trucks) | 555808.69 | 4502527.51 | 240.92 | 3.89 | 6.38 | 3.62 |
| TLCRD197 | Plant Roadways (Talc Trucks) | 555798.37 | 4502518.61 | 241.13 | 3.89 | 6.38 | 3.62 |
| TLCRD198 | Plant Roadways (Talc Trucks) | 555788.06 | 4502509.72 | 241.33 | 3.89 | 6.38 | 3.62 |
| TLCRD199 | Plant Roadways (Talc Trucks) | 555777.75 | 4502500.82 | 241.54 | 3.89 | 6.38 | 3.62 |
| TLCRD200 | Plant Roadways (Talc Trucks) | 555767.43 | 4502491.93 | 241.87 | 3.89 | 6.38 | 3.62 |
| TLCRD201 | Plant Roadways (Talc Trucks) | 555757.12 | 4502483.03 | 242.08 | 3.89 | 6.38 | 3.62 |
| TLCRD202 | Plant Roadways (Talc Trucks) | 555750.12 | 4502473.95 | 242.24 | 3.89 | 6.38 | 3.62 |
| TLCRD203 | Plant Roadways (Talc Trucks) | 555759.36 | 4502463.93 | 242.39 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD204 | Plant Roadways (Talc Trucks) | 555768.59 | 4502453.92 | 242.83 | 3.89 | 6.38 | 3.62 |
| TLCRD205 | Plant Roadways (Talc Trucks) | 555777.83 | 4502443.91 | 243.19 | 3.89 | 6.38 | 3.62 |
| TLCRD206 | Plant Roadways (Talc Trucks) | 555787.06 | 4502433.90 | 243.27 | 3.89 | 6.38 | 3.62 |
| TLCRD207 | Plant Roadways (Talc Trucks) | 555796.29 | 4502423.89 | 243.28 | 3.89 | 6.38 | 3.62 |
| TLCRD208 | Plant Roadways (Talc Trucks) | 555805.53 | 4502413.88 | 243.26 | 3.89 | 6.38 | 3.62 |
| TLCRD209 | Plant Roadways (Talc Trucks) | 555814.76 | 4502403.86 | 242.95 | 3.89 | 6.38 | 3.62 |
| TLCRD210 | Plant Roadways (Talc Trucks) | 555824.00 | 4502393.85 | 242.70 | 3.89 | 6.38 | 3.62 |
| TLCRD211 | Plant Roadways (Talc Trucks) | 555833.23 | 4502383.84 | 242.70 | 3.89 | 6.38 | 3.62 |
| TLCRD212 | Plant Roadways (Talc Trucks) | 555842.46 | 4502373.83 | 242.80 | 3.89 | 6.38 | 3.62 |
| TLCRD213 | Plant Roadways (Talc Trucks) | 555851.70 | 4502363.82 | 242.76 | 3.89 | 6.38 | 3.62 |
| TLCRD214 | Plant Roadways (Talc Trucks) | 555860.93 | 4502353.80 | 242.70 | 3.89 | 6.38 | 3.62 |
| TLCRD215 | Plant Roadways (Talc Trucks) | 555870.17 | 4502343.79 | 242.75 | 3.89 | 6.38 | 3.62 |
| TLCRD216 | Plant Roadways (Talc Trucks) | 555879.40 | 4502333.78 | 242.68 | 3.89 | 6.38 | 3.62 |
| TLCRD217 | Plant Roadways (Talc Trucks) | 555888.64 | 4502323.77 | 242.58 | 3.89 | 6.38 | 3.62 |
| TLCRD218 | Plant Roadways (Talc Trucks) | 555897.87 | 4502313.76 | 242.78 | 3.89 | 6.38 | 3.62 |
| TLCRD219 | Plant Roadways (Talc Trucks) | 555907.10 | 4502303.75 | 242.87 | 3.89 | 6.38 | 3.62 |
| TLCRD220 | Plant Roadways (Talc Trucks) | 555916.34 | 4502293.73 | 242.78 | 3.89 | 6.38 | 3.62 |
| TLCRD221 | Plant Roadways (Talc Trucks) | 555925.57 | 4502283.72 | 243.01 | 3.89 | 6.38 | 3.62 |
| TLCRD222 | Plant Roadways (Talc Trucks) | 555934.81 | 4502273.71 | 242.90 | 3.89 | 6.38 | 3.62 |
| TLCRD223 | Plant Roadways (Talc Trucks) | 555944.04 | 4502263.70 | 243.03 | 3.89 | 6.38 | 3.62 |
| TLCRD224 | Plant Roadways (Talc Trucks) | 555954.21 | 4502266.65 | 243.19 | 3.89 | 6.38 | 3.62 |
| TLCRD225 | Plant Roadways (Talc Trucks) | 555964.78 | 4502275.24 | 243.09 | 3.89 | 6.38 | 3.62 |
| TLCRD226 | Plant Roadways (Talc Trucks) | 555975.35 | 4502283.82 | 242.86 | 3.89 | 6.38 | 3.62 |
| TLCRD227 | Plant Roadways (Talc Trucks) | 555985.92 | 4502292.41 | 242.80 | 3.89 | 6.38 | 3.62 |
| TLCRD228 | Plant Roadways (Talc Trucks) | 555996.50 | 4502301.00 | 242.73 | 3.89 | 6.38 | 3.62 |
| TLCRD229 | Plant Roadways (Talc Trucks) | 556007.07 | 4502309.58 | 242.72 | 3.89 | 6.38 | 3.62 |
| TLCRD230 | Plant Roadways (Talc Trucks) | 556017.64 | 4502318.17 | 242.80 | 3.89 | 6.38 | 3.62 |
| TLCRD231 | Plant Roadways (Talc Trucks) | 556028.21 | 4502326.76 | 242.85 | 3.89 | 6.38 | 3.62 |
| TLCRD232 | Plant Roadways (Talc Trucks) | 556038.79 | 4502335.34 | 242.79 | 3.89 | 6.38 | 3.62 |
| TLCRD233 | Plant Roadways (Talc Trucks) | 556049.36 | 4502343.93 | 242.82 | 3.89 | 6.38 | 3.62 |
| TLCRD234 | Plant Roadways (Talc Trucks) | 556059.93 | 4502352.52 | 242.92 | 3.89 | 6.38 | 3.62 |
| TLCRD235 | Plant Roadways (Talc Trucks) | 556070.50 | 4502361.10 | 242.77 | 3.89 | 6.38 | 3.62 |
| TLCRD236 | Plant Roadways (Talc Trucks) | 556076.34 | 4502370.38 | 242.83 | 3.89 | 6.38 | 3.62 |
| TLCRD237 | Plant Roadways (Talc Trucks) | 556068.69 | 4502381.65 | 242.78 | 3.89 | 6.38 | 3.62 |
| TLCRD238 | Plant Roadways (Talc Trucks) | 556061.04 | 4502392.92 | 242.84 | 3.89 | 6.38 | 3.62 |
| TLCRD239 | Plant Roadways (Talc Trucks) | 556053.39 | 4502404.18 | 242.88 | 3.89 | 6.38 | 3.62 |
| TLCRD240 | Plant Roadways (Talc Trucks) | 556063.41 | 4502413.17 | 242.81 | 3.89 | 6.38 | 3.62 |
| TLCRD241 | Plant Roadways (Talc Trucks) | 556073.67 | 4502422.13 | 242.89 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD242 | Plant Roadways (Talc Trucks) | 556083.92 | 4502431.09 | 242.93 | 3.89 | 6.38 | 3.62 |
| TLCRD243 | Plant Roadways (Talc Trucks) | 556094.18 | 4502440.05 | 242.95 | 3.89 | 6.38 | 3.62 |
| TLCRD244 | Plant Roadways (Talc Trucks) | 556104.44 | 4502449.01 | 242.94 | 3.89 | 6.38 | 3.62 |
| TLCRD245 | Plant Roadways (Talc Trucks) | 556114.70 | 4502457.97 | 242.88 | 3.89 | 6.38 | 3.62 |
| TLCRD246 | Plant Roadways (Talc Trucks) | 556124.96 | 4502466.93 | 242.95 | 3.89 | 6.38 | 3.62 |
| TLCRD247 | Plant Roadways (Talc Trucks) | 556135.21 | 4502475.89 | 242.97 | 3.89 | 6.38 | 3.62 |
| TLCRD248 | Plant Roadways (Talc Trucks) | 556145.47 | 4502484.85 | 242.97 | 3.89 | 6.38 | 3.62 |
| TLCRD249 | Plant Roadways (Talc Trucks) | 556155.73 | 4502493.81 | 242.97 | 3.89 | 6.38 | 3.62 |
| TLCRD250 | Plant Roadways (Talc Trucks) | 556165.99 | 4502502.77 | 242.90 | 3.89 | 6.38 | 3.62 |
| TLCRD251 | Plant Roadways (Talc Trucks) | 556176.25 | 4502511.73 | 243.06 | 3.89 | 6.38 | 3.62 |
| TLCRD252 | Plant Roadways (Talc Trucks) | 556186.51 | 4502520.69 | 242.99 | 3.89 | 6.38 | 3.62 |
| TLCRD253 | Plant Roadways (Talc Trucks) | 556196.76 | 4502529.65 | 242.97 | 3.89 | 6.38 | 3.62 |
| TLCRD254 | Plant Roadways (Talc Trucks) | 556207.02 | 4502538.61 | 242.93 | 3.89 | 6.38 | 3.62 |
| TLCRD255 | Plant Roadways (Talc Trucks) | 556217.28 | 4502547.57 | 242.86 | 3.89 | 6.38 | 3.62 |
| TLCRD256 | Plant Roadways (Talc Trucks) | 556227.54 | 4502556.53 | 242.80 | 3.89 | 6.38 | 3.62 |
| TLCRD257 | Plant Roadways (Talc Trucks) | 556237.80 | 4502565.49 | 242.86 | 3.89 | 6.38 | 3.62 |
| TLCRD258 | Plant Roadways (Talc Trucks) | 556248.06 | 4502574.45 | 242.89 | 3.89 | 6.38 | 3.62 |
| TLCRD259 | Plant Roadways (Talc Trucks) | 556258.31 | 4502583.41 | 242.92 | 3.89 | 6.38 | 3.62 |
| TLCRD260 | Plant Roadways (Talc Trucks) | 556268.57 | 4502592.37 | 242.81 | 3.89 | 6.38 | 3.62 |
| TLCRD261 | Plant Roadways (Talc Trucks) | 556278.83 | 4502601.32 | 242.79 | 3.89 | 6.38 | 3.62 |
| TLCRD262 | Plant Roadways (Talc Trucks) | 556289.09 | 4502610.28 | 242.95 | 3.89 | 6.38 | 3.62 |
| TLCRD263 | Plant Roadways (Talc Trucks) | 556299.35 | 4502619.24 | 243.01 | 3.89 | 6.38 | 3.62 |
| TLCRD264 | Plant Roadways (Talc Trucks) | 556309.60 | 4502628.20 | 242.90 | 3.89 | 6.38 | 3.62 |
| TLCRD265 | Plant Roadways (Talc Trucks) | 556319.86 | 4502637.16 | 242.94 | 3.89 | 6.38 | 3.62 |
| TLCRD266 | Plant Roadways (Talc Trucks) | 556329.69 | 4502637.28 | 242.92 | 3.89 | 6.38 | 3.62 |
| TLCRD267 | Plant Roadways (Talc Trucks) | 556339.03 | 4502627.37 | 242.92 | 3.89 | 6.38 | 3.62 |
| TLCRD268 | Plant Roadways (Talc Trucks) | 556348.37 | 4502617.46 | 242.87 | 3.89 | 6.38 | 3.62 |
| TLCRD269 | Plant Roadways (Talc Trucks) | 556357.71 | 4502607.54 | 242.82 | 3.89 | 6.38 | 3.62 |
| TLCRD270 | Plant Roadways (Talc Trucks) | 556367.06 | 4502597.63 | 242.63 | 3.89 | 6.38 | 3.62 |
| TLCRD271 | Plant Roadways (Talc Trucks) | 556376.40 | 4502587.72 | 242.58 | 3.89 | 6.38 | 3.62 |
| TLCRD272 | Plant Roadways (Talc Trucks) | 556385.74 | 4502577.81 | 242.57 | 3.89 | 6.38 | 3.62 |
| TLCRD273 | Plant Roadways (Talc Trucks) | 556395.08 | 4502567.89 | 242.65 | 3.89 | 6.38 | 3.62 |
| TLCRD274 | Plant Roadways (Talc Trucks) | 556404.42 | 4502557.98 | 242.66 | 3.89 | 6.38 | 3.62 |
| TLCRD275 | Plant Roadways (Talc Trucks) | 556413.76 | 4502548.07 | 242.64 | 3.89 | 6.38 | 3.62 |
| TLCRD276 | Plant Roadways (Talc Trucks) | 556423.10 | 4502538.16 | 242.63 | 3.89 | 6.38 | 3.62 |
| TLCRD277 | Plant Roadways (Talc Trucks) | 556432.44 | 4502528.25 | 242.67 | 3.89 | 6.38 | 3.62 |
| TLCRD278 | Plant Roadways (Talc Trucks) | 556441.78 | 4502518.33 | 242.64 | 3.89 | 6.38 | 3.62 |
| TLCRD279 | Plant Roadways (Talc Trucks) | 556451.16 | 4502518.31 | 242.39 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|--------------------|-----------------------|------------------------|
| TLCRD280 | Plant Roadways (Talc Trucks) | 556460.56 | 4502528.16 | 240.41 | 3.89 | 6.38 | 3.62 |
| TLCRD281 | Plant Roadways (Talc Trucks) | 556469.97 | 4502538.01 | 240.41 | 3.89 | 6.38 | 3.62 |
| TLCRD282 | Plant Roadways (Talc Trucks) | 556479.38 | 4502547.86 | 240.43 | 3.89 | 6.38 | 3.62 |
| TLCRD283 | Plant Roadways (Talc Trucks) | 556488.78 | 4502557.71 | 240.29 | 3.89 | 6.38 | 3.62 |
| TLCRD284 | Plant Roadways (Talc Trucks) | 556498.29 | 4502561.59 | 240.42 | 3.89 | 6.38 | 3.62 |
| TLCRD285 | Plant Roadways (Talc Trucks) | 556508.01 | 4502552.06 | 240.45 | 3.89 | 6.38 | 3.62 |
| TLCRD286 | Plant Roadways (Talc Trucks) | 556517.74 | 4502542.52 | 240.21 | 3.89 | 6.38 | 3.62 |
| TLCRD287 | Plant Roadways (Talc Trucks) | 556078.33 | 4502367.46 | 242.83 | 3.89 | 6.38 | 3.62 |
| TLCRD288 | Plant Roadways (Talc Trucks) | 556087.54 | 4502357.43 | 242.79 | 3.89 | 6.38 | 3.62 |
| TLCRD289 | Plant Roadways (Talc Trucks) | 556096.75 | 4502347.39 | 242.68 | 3.89 | 6.38 | 3.62 |
| TLCRD290 | Plant Roadways (Talc Trucks) | 556105.96 | 4502337.36 | 242.62 | 3.89 | 6.38 | 3.62 |
| TLCRD291 | Plant Roadways (Talc Trucks) | 556115.17 | 4502327.32 | 242.63 | 3.89 | 6.38 | 3.62 |
| TLCRD292 | Plant Roadways (Talc Trucks) | 556124.38 | 4502317.29 | 242.60 | 3.89 | 6.38 | 3.62 |
| TLCRD293 | Plant Roadways (Talc Trucks) | 556133.59 | 4502307.25 | 242.58 | 3.89 | 6.38 | 3.62 |
| TLCRD294 | Plant Roadways (Talc Trucks) | 556142.80 | 4502297.22 | 242.53 | 3.89 | 6.38 | 3.62 |
| TLCRD295 | Plant Roadways (Talc Trucks) | 556152.01 | 4502287.19 | 242.51 | 3.89 | 6.38 | 3.62 |
| TLCRD296 | Plant Roadways (Talc Trucks) | 556161.22 | 4502277.15 | 242.52 | 3.89 | 6.38 | 3.62 |
| TLCRD297 | Plant Roadways (Talc Trucks) | 556170.43 | 4502267.12 | 242.52 | 3.89 | 6.38 | 3.62 |
| TLCRD298 | Plant Roadways (Talc Trucks) | 556179.64 | 4502257.08 | 242.48 | 3.89 | 6.38 | 3.62 |
| TLCRD299 | Plant Roadways (Talc Trucks) | 556188.85 | 4502247.05 | 242.53 | 3.89 | 6.38 | 3.62 |
| TLCRD300 | Plant Roadways (Talc Trucks) | 556198.06 | 4502237.01 | 242.60 | 3.89 | 6.38 | 3.62 |
| TLCRD301 | Plant Roadways (Talc Trucks) | 556207.57 | 4502232.94 | 242.66 | 3.89 | 6.38 | 3.62 |
| TLCRD302 | Plant Roadways (Talc Trucks) | 556217.76 | 4502241.97 | 242.65 | 3.89 | 6.38 | 3.62 |
| TLCRD303 | Plant Roadways (Talc Trucks) | 556227.95 | 4502251.01 | 242.56 | 3.89 | 6.38 | 3.62 |
| TLCRD304 | Plant Roadways (Talc Trucks) | 556238.14 | 4502260.05 | 242.49 | 3.89 | 6.38 | 3.62 |
| TLCRD305 | Plant Roadways (Talc Trucks) | 556248.33 | 4502269.09 | 242.54 | 3.89 | 6.38 | 3.62 |
| TLCRD306 | Plant Roadways (Talc Trucks) | 556258.52 | 4502278.12 | 242.53 | 3.89 | 6.38 | 3.62 |
| TLCRD307 | Plant Roadways (Talc Trucks) | 556268.71 | 4502287.16 | 242.55 | 3.89 | 6.38 | 3.62 |
| TLCRD308 | Plant Roadways (Talc Trucks) | 556278.90 | 4502296.20 | 242.79 | 3.89 | 6.38 | 3.62 |
| TLCRD309 | Plant Roadways (Talc Trucks) | 556289.09 | 4502305.24 | 242.89 | 3.89 | 6.38 | 3.62 |
| TLCRD310 | Plant Roadways (Talc Trucks) | 556299.28 | 4502314.27 | 242.87 | 3.89 | 6.38 | 3.62 |
| TLCRD311 | Plant Roadways (Talc Trucks) | 556309.47 | 4502323.31 | 242.71 | 3.89 | 6.38 | 3.62 |
| TLCRD312 | Plant Roadways (Talc Trucks) | 556319.66 | 4502332.35 | 242.68 | 3.89 | 6.38 | 3.62 |
| TLCRD313 | Plant Roadways (Talc Trucks) | 556329.85 | 4502341.38 | 242.66 | 3.89 | 6.38 | 3.62 |
| TLCRD314 | Plant Roadways (Talc Trucks) | 556340.04 | 4502350.42 | 242.69 | 3.89 | 6.38 | 3.62 |
| TLCRD315 | Plant Roadways (Talc Trucks) | 556345.36 | 4502359.64 | 242.72 | 3.89 | 6.38 | 3.62 |
| TLCRD316 | Plant Roadways (Talc Trucks) | 556335.85 | 4502369.39 | 242.53 | 3.89 | 6.38 | 3.62 |
| TLCRD317 | Plant Roadways (Talc Trucks) | 556326.34 | 4502379.14 | 242.09 | 3.89 | 6.38 | 3.62 |



Modeled Volume Source Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Release Height (m) | Initial Lat. Dim. (m) | Initial Vert. Dim. (m) |
|-----------|------------------------------|---------------------------------|----------------------------------|------------------|-----------------------|--------------------------|---------------------------|
| TLCRD318 | Plant Roadways (Talc Trucks) | 556316.84 | 4502388.89 | 242.30 | 3.89 | 6.38 | 3.62 |

¹ Coordinates reflect UTM NAD83, Zone 17.



Non-Road Volume Source Parameter Calculations

| Model ID | Source Description | Source Dimensions | | | | Release Height (ft) | Initial Dispersion Coefficients | | Footnote |
|----------|------------------------|-------------------|------------|--------------------------|--|---------------------|--|--|----------|
| | | Length (ft) | Width (ft) | Square Root of Area (ft) | Structure Height/Vertical Dimension (ft) | | Initial Horizontal Dimension σ_y (ft) | Initial Vertical Dimension σ_z (ft) | |
| PEBLD | PE Blending Silos | 147.6 | 82.0 | 110.0 | 141.0 | 141.0 | 25.58 | 65.6 | 1, 2, 3 |
| PERC | PE Rail Loading Silos | 98.4 | 98.4 | 98.4 | 187.0 | 187.0 | 22.88 | 87.0 | 1, 2, 3 |
| PETK | PE Truck Loading Silos | 213.2 | 196.8 | 204.8 | 151.0 | 151.0 | 47.64 | 70.2 | 1, 2, 3 |
| PEU1 | LDPE Vents | 313.2 | 98.4 | 175.6 | 45.0 | 45.0 | 40.83 | 20.9 | 1, 2, 3 |
| PEU2 | LDPE Vents | 213.2 | 164.0 | 187.0 | 145.0 | 145.0 | 43.49 | 67.4 | 1, 2, 3 |
| PEU3 | HDPE Vents | 213.2 | 164.0 | 187.0 | 150.0 | 150.0 | 43.49 | 69.8 | 1, 2, 3 |

¹ Release height equal to top of structure as process is aspirated and emissions occur at the top of the structure.

² Sigma Y value calculated as the square root of the area divided by 4.3 (Table 3-1 of AERMOD User's Guide for single volume source).

³ Sigma Z values for elevated sources on or adjacent to a building calculated as the building height divided by 2.15 (Table 3-1 of AERMOD User's Guide for Elevated Source on or Adjacent to Building).

Truck Roadway Volume Source Parameter Calculation

| | | | |
|--|-----------------------------|------------------------------|-------------|
| Step 1: Adjusted Width of Road | Two Lane Road Width (ft) of | $25 + 20 \text{ ft (6 m)} =$ | 45 feet |
| Step 2: Volume Source Spacing | Pellet Truck Length (ft) of | $2,587 / 45 =$ | 57 sources |
| | Talc Truck Length (ft) of | $14,310 / 45 =$ | 318 sources |
| Step 3: Height of Volume | Vehicle height (ft) of | $15 * 1.7 =$ | 25.5 feet |
| Step 4: Initial Sigma Y (Horizontal Dimension) | Adjusted road width (ft) of | $45 / 2.15 =$ | 20.93 feet |
| Step 5: Initial Sigma Z (Vertical Dimension) | Height of volume (ft) of | $25.5 / 2.15 =$ | 11.86 feet |
| Step 6: Height of Release | Height of volume (ft) of | $25.5 / 2 =$ | 13 feet |



Combustion Turbine Load Analysis

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) | Modeled Emission Rate (g/s) |
|-----------|------------------------------|------------------------------|-------------------------------|---------------|------------------|-----------------------|---------------------|--------------------|-----------------------------|
| CT1_100 | Combustion Turbine 100% Load | 555945.76 | 4502058.51 | 242.32 | 64.92 | 428.15 | 24.08 | 3.048 | 1.26E-01 |
| CT1_75 | Combustion Turbine 75% Load | 555945.76 | 4502058.51 | 242.32 | 64.92 | 428.15 | 19.26 | 3.048 | 9.45E-02 |
| CT1_45 | Combustion Turbine 45% Load | 555945.76 | 4502058.51 | 242.32 | 64.92 | 428.15 | 14.45 | 3.048 | 5.67E-02 |
| CT2_100 | Combustion Turbine 100% Load | 555991.73 | 4502098.68 | 242.32 | 64.92 | 428.15 | 24.08 | 3.048 | 1.26E-01 |
| CT2_75 | Combustion Turbine 75% Load | 555991.73 | 4502098.68 | 242.32 | 64.92 | 428.15 | 19.26 | 3.048 | 9.45E-02 |
| CT2_45 | Combustion Turbine 45% Load | 555991.73 | 4502098.68 | 242.32 | 64.92 | 428.15 | 14.45 | 3.048 | 5.67E-02 |
| CT3_100 | Combustion Turbine 100% Load | 556038.01 | 4502138.02 | 242.32 | 64.92 | 428.15 | 24.08 | 3.048 | 1.26E-01 |
| CT3_75 | Combustion Turbine 75% Load | 556038.01 | 4502138.02 | 242.32 | 64.92 | 428.15 | 19.26 | 3.048 | 9.45E-02 |
| CT3_45 | Combustion Turbine 45% Load | 556038.01 | 4502138.02 | 242.32 | 64.92 | 428.15 | 14.45 | 3.048 | 5.67E-02 |

¹ Coordinates reflect UTM NAD83, Zone 17.



Ethane Cracking Furnace Operating Mode Analysis – Modeled Stack Parameters

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) | Event Duration (hr/event) | Frequency (events/yr) |
|-------------------|-------------------------------|------------------------------|-------------------------------|---------------|------------------|-----------------------|---------------------|--------------------|---------------------------|-----------------------|
| MAX_NORM | Furnace Normal Mode (Max Ops) | 555502.11 | 4502199.00 | 242.32 | 83.82 | 396.26 | 12.25 | 2.591 | - | - |
| MIN_NORM | Furnace Normal Mode (Min Ops) | 555502.11 | 4502199.00 | 242.32 | 83.82 | 383.15 | 6.55 | 2.591 | - | - |
| DECOKE | Furnace Decoking Mode | 555502.11 | 4502199.00 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 36 | 12 |
| FEDINOUT | Furnace Feed in Feed out Mode | 555502.11 | 4502199.00 | 242.32 | 83.82 | 417.65 | 9.81 | 2.591 | 2 | 12 |
| HOTSTNBY | Furnace Hot Steam Standby | 555502.11 | 4502199.00 | 242.32 | 83.82 | 439.15 | 7.50 | 2.591 | 60 | 12 |
| SUSD ² | Furnace Startup Shutdown | 555502.11 | 4502199.00 | 242.32 | 83.82 | 347.26 | 9.88 | 2.591 | 24 | 1 |

¹ Location of Furnace #1 was modeled for all scenarios. Coordinates reflect UTM NAD83, Zone 17.

² Startups and shutdowns only occur once per year and typically last 24 hours. This mode was not evaluated for 1-hour NO₂ given the limited frequency and duration.

Ethane Cracking Furnace Operating Mode Analysis – Modeled Emission Rates

| AERMOD ID | Description | CO (lb/hr) | CO (g/s) | Hourly NO ₂ ¹ (lb/hr) | Hourly NO ₂ ¹ (g/s) | Annual NO _x ¹ (lb/hr) | Annual NO _x ¹ (g/s) | 24-Hour PM ₁₀ (lb/hr) | 24-Hour PM ₁₀ (g/s) | Annual PM ₁₀ (lb/hr) | Annual PM ₁₀ (g/s) |
|-------------------|-------------------------------|------------|----------|---|---|---|---|----------------------------------|--------------------------------|---------------------------------|-------------------------------|
| MAX_NORM | Furnace Normal Mode (Max Ops) | 21.70 | 2.73E+00 | 9.30 | 1.17E+00 | 5.91 | 7.45E-01 | 3.10 | 3.91E-01 | 2.83 | 3.57E-01 |
| MIN_NORM | Furnace Normal Mode (Min Ops) | 13.58 | 1.71E+00 | 5.16 | 6.50E-01 | 3.55 | 4.47E-01 | 1.65 | 2.08E-01 | 1.41 | 1.78E-01 |
| DECOKE | Furnace Decoking Mode | 52.20 | 6.58E+00 | 2.70 | 3.40E-01 | 0.13 | 1.68E-02 | 1.85 | 2.34E-01 | 0.09 | 1.16E-02 |
| FEDINOUT | Furnace Feed in Feed out Mode | 9.70 | 1.22E+00 | 4.16 | 5.24E-01 | 0.01 | 1.43E-03 | 1.39 | 1.75E-01 | 0.004 | 4.78E-04 |
| HOTSTNBY | Furnace Hot Steam Standby | 6.06 | 7.63E-01 | 4.33 | 5.45E-01 | 0.36 | 4.50E-02 | 0.87 | 1.09E-01 | 0.07 | 9.00E-03 |
| SUSD ² | Furnace Startup Shutdown | 25.09 | 3.16E+00 | - | - | 0.04 | 5.37E-03 | 0.43 | 5.45E-02 | 0.001 | 1.49E-04 |

¹ The pollutant "NO₂" represents worst-case short-term emissions. The pollutant "NO_x" represents annual emissions.

² Startups and shutdowns only occur once per year and typically last 24 hours. This mode was not evaluated for 1-hour NO₂ given the limited frequency and duration.



Worst-Case Ethane Cracking Furnace Analysis

| AERMOD ID | Description | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) | Modeled Emission Rate (g/s) |
|-----------|----------------------------|------------------------------|-------------------------------|---------------|------------------|-----------------------|---------------------|--------------------|-----------------------------|
| EC#1 | Ethane Cracking Furnace #1 | 555502.11 | 4502199.00 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |
| EC#2 | Ethane Cracking Furnace #2 | 555512.76 | 4502186.65 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |
| EC#3 | Ethane Cracking Furnace #3 | 555534.48 | 4502160.24 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |
| EC#4 | Ethane Cracking Furnace #4 | 555545.98 | 4502148.32 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |
| EC#5 | Ethane Cracking Furnace #5 | 555561.73 | 4502131.29 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |
| EC#6 | Ethane Cracking Furnace #6 | 555572.81 | 4502118.51 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |
| EC#7 | Ethane Cracking Furnace #7 | 555590.27 | 4502098.92 | 242.32 | 83.82 | 449.15 | 9.11 | 2.591 | 1.26E-01 |

¹ Coordinates reflect UTM NAD83, Zone 17.



Off-Site Inventory for NAAQS Analysis - CO

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | CO Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|------------------------|
| BASF_S01 | BASF Thermal Oxidation Unit | POINT | 555260.00 | 4501187.00 | 226.60 | 22.86 | 953.71 | 4.71 | 1.46 | 2.96E-01 |
| BASF_S032 | BASF Cleaver Brooks Boiler #2 | POINT | 555223.82 | 4501190.03 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 1.46E-01 |
| BASF_S031 | BASF Cleaver Brooks Boiler #1 | POINT | 555230.83 | 4501184.04 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 1.46E-01 |
| BS_S031 | BVPV BOILERS 1-6 STACK | POINT | 554357.37 | 4500741.91 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 3.26E-01 |
| BS_S037 | BVPV BOILERS 7-12 STACK | POINT | 554359.98 | 4500738.23 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 3.26E-01 |
| BS_S112 | BVPV DIRECT FIRED T/O BACKUP | POINTCAP | 553885.07 | 4500511.25 | 230.12 | 19.81 | 1033.15 | 8.13 | 3.35 | 2.11E+00 |
| SG_S13 | Stoelzle FIRE SUPPRESSION BOILER STACK | POINT | 560538.00 | 4504631.00 | 226.47 | 6.00 | 422.04 | 1.72 | 0.61 | 2.77E-02 |
| SG_S103 | Stoelzle MELT TANK CADF STACK | POINT | 560668.00 | 4504653.00 | 224.64 | 15.24 | 521.48 | 17.00 | 1.13 | 3.15E-01 |
| SG_OTH01 | Stoelzle | POINT | 560712.40 | 4504613.69 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH03 | Stoelzle | POINT | 560720.59 | 4504602.26 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH02 | Stoelzle | POINT | 560715.80 | 4504612.65 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH14 | Stoelzle | POINT | 560711.83 | 4504654.06 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 1.89E-02 |
| SG_OTH13 | Stoelzle | POINT | 560713.01 | 4504658.75 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 1.89E-02 |
| SG_OTH15 | Stoelzle | POINT | 560717.96 | 4504652.30 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 1.89E-02 |
| SG_OTH04 | Stoelzle | POINT | 560741.41 | 4504604.06 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH11 | Stoelzle | POINT | 560726.46 | 4504636.77 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH10 | Stoelzle | POINT | 560730.20 | 4504636.07 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH16 | Stoelzle | POINT | 560723.84 | 4504650.57 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 1.89E-02 |
| SG_OTH12 | Stoelzle | POINT | 560718.42 | 4504664.22 | 224.64 | 17.74 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH06 | Stoelzle | POINT | 560743.59 | 4504613.34 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH05 | Stoelzle | POINT | 560751.24 | 4504601.68 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH17 | Stoelzle | POINT | 560729.72 | 4504649.43 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 1.89E-02 |
| SG_OTH08 | Stoelzle | POINT | 560746.21 | 4504623.56 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH18 | Stoelzle | POINT | 560736.22 | 4504647.83 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 1.89E-02 |
| SG_OTH07 | Stoelzle | POINT | 560753.48 | 4504610.65 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| SG_OTH09 | Stoelzle | POINT | 560748.38 | 4504632.31 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.13E-02 |
| NGC_S09 | Gold Bond Board Dryer | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 370.37 | 15.52 | 2.38 | 1.35E+00 |



Off-Site Inventory for NAAQS Analysis - CO

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | CO Emission Rate (g/s) |
|-----------|---|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|------------------------|
| NGC_S100 | Gold Bond IMP Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 449.82 | 16.18 | 0.61 | 2.31E-01 |
| NGC_S11 | Gold Bond Cage Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 6.10 | 366.48 | 18.71 | 1.74 | 2.73E-01 |
| FEBV_S01 | Energy Harbor Beaver Valley Aux Boil A | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 2.13E-01 |
| FEBV_S02 | Energy Harbor Beaver Valley Aux Boil B | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 2.13E-01 |
| FEBVS101 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 608.15 | 0.01 | 0.30 | 4.24E+00 |
| FEBVS102 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 608.15 | 0.01 | 0.30 | 4.24E+00 |
| FEBVS103 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 755.37 | 0.01 | 0.30 | 4.70E+00 |
| FEBVS104 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 755.37 | 0.01 | 0.30 | 4.70E+00 |
| FEBVS105 | Energy Harbor Beaver Valley Emg Res Gen | POINT | 548011.90 | 4497013.10 | 223.87 | 3.05 | 810.93 | 0.01 | 0.30 | 4.24E+00 |
| USGYP_S1 | US Gypsum S1 | POINT | 564090.67 | 4497863.46 | 225.77 | 16.46 | 368.15 | 15.30 | 2.59 | 2.77E+00 |
| USGYP_S2 | US Gypsum #1 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.57 | 588.71 | 42.37 | 0.43 | 2.72E-01 |
| USGYP_S3 | US Gypsum #2 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.87 | 588.71 | 42.37 | 0.43 | 2.72E-01 |
| USGYP_S4 | US Gypsum #1 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 3.23E-01 |
| USGYP_S5 | US Gypsum #2 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 3.23E-01 |
| USGYP_S6 | US Gypsum Gauging Water Heater | POINT | 564090.67 | 4497863.46 | 225.77 | 7.62 | 588.71 | 15.97 | 0.27 | 5.17E-02 |
| JEWLS206 | Allegheny & Tsingshan Annealing | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 7.26E-01 |
| JEWLS209 | Allegheny & Tsingshan Boiler 1 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 449.82 | 0.01 | 0.30 | 3.04E-01 |
| JEWLS210 | Allegheny & Tsingshan Boiler 2 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 310.37 | 0.01 | 0.30 | 3.46E-01 |
| JEWLZ050 | Allegheny & Tsingshan Heaters | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 2.08E-01 |
| PADEP7 | IPSCO Koppel Rot Hearth | POINT | 565068.00 | 4495454.00 | 228.74 | 38.10 | 699.98 | 0.17 | 3.29 | 1.91E+00 |
| PADEP8 | IPSCO Koppel Quench | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 3.94E-01 |
| PADEP9 | IPSCO Koppel Temper Furnace | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 4.36E-01 |
| PADEP10 | IPSCO Koppel Reheat | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 918.98 | 0.04 | 1.22 | 3.11E-01 |
| PADEP11 | IPSCO Koppel Misc Heaters | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 4.29 | 1.22 | 8.32E-02 |
| PADEP12 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | -0.02 | 0.00 | 0.00 | 4.78E-01 |
| DOM_S01 | Eastern Gas Transmission Eng 1 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 2.31E+00 |
| DOM_S02 | Eastern Gas Transmission Eng 2 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 2.31E+00 |



Off-Site Inventory for NAAQS Analysis - CO

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | CO Emission Rate (g/s) |
|-----------|------------------------------------|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|------------------------|
| DOM_S03 | Eastern Gas Transmission Eng 3 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 2.31E+00 |
| DOM_S04 | Eastern Gas Transmission Eng 4 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 2.31E+00 |
| PADEP23 | EASTERN GAS TRANSMISSION & STORAGE | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 1.64E-02 |
| IPSC_S05A | IPSCO Koppel Melt Shop | POINT | 557297.50 | 4520629.10 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05B | IPSCO Koppel Melt Shop | POINT | 557303.60 | 4520629.42 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05C | IPSCO Koppel Melt Shop | POINT | 557309.70 | 4520629.74 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05D | IPSCO Koppel Melt Shop | POINT | 557315.80 | 4520630.07 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05E | IPSCO Koppel Melt Shop | POINT | 557321.90 | 4520630.39 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05F | IPSCO Koppel Melt Shop | POINT | 557328.00 | 4520630.71 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05G | IPSCO Koppel Melt Shop | POINT | 557334.10 | 4520631.03 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05H | IPSCO Koppel Melt Shop | POINT | 557340.20 | 4520631.36 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05I | IPSCO Koppel Melt Shop | POINT | 557346.30 | 4520631.68 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S05J | IPSCO Koppel Melt Shop | POINT | 557352.40 | 4520632.00 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 6.30E+00 |
| IPSC_S02 | IPSCO Koppel Aus Furnace | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 3.10 | 1.22 | 1.26E-02 |
| IPSC_S03 | IPSCO Koppel Var Heaters | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 4.29 | 1.22 | 2.70E-01 |
| IPSC_S04 | IPSCO Koppel Temper Furnace | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 4.29 | 1.22 | 2.77E-02 |

¹ Coordinates reflect UTM NAD83, Zone 17.



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – PM₁₀

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | PM ₁₀ Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--------------------------------------|
| BASF_S01 | BASF Thermal Oxidation Unit | POINT | 555260.00 | 4501187.00 | 226.60 | 22.86 | 953.71 | 4.71 | 1.46 | 2.65E-02 |
| BASF_S032 | BASF Cleaver Brooks Boiler #2 | POINT | 555223.82 | 4501190.03 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 5.17E-02 |
| BASF_S031 | BASF Cleaver Brooks Boiler #1 | POINT | 555230.83 | 4501184.04 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 5.17E-02 |
| BS_S031 | BVPV BOILERS 1-6 STACK | POINT | 554357.37 | 4500741.91 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 6.55E-02 |
| BS_S037 | BVPV BOILERS 7-12 STACK | POINT | 554359.98 | 4500738.23 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 6.55E-02 |
| BS_S112 | BVPV DIRECT FIRED T/O BACKUP | POINTCAP | 553885.07 | 4500511.25 | 230.12 | 19.81 | 1033.15 | 8.13 | 3.35 | 7.43E-02 |
| SG_S13 | Stoelzle FIRE SUPPRESSION BOILER STACK | POINT | 560538.00 | 4504631.00 | 226.47 | 6.00 | 422.04 | 1.72 | 0.61 | 5.72E-04 |
| SG_S103 | Stoelzle MELT TANK CADF STACK | POINT | 560668.00 | 4504653.00 | 224.64 | 15.24 | 521.48 | 17.00 | 1.13 | 7.41E-01 |
| SG_OTH01 | Stoelzle | POINT | 560712.40 | 4504613.69 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH03 | Stoelzle | POINT | 560720.59 | 4504602.26 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH02 | Stoelzle | POINT | 560715.80 | 4504612.65 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH14 | Stoelzle | POINT | 560711.83 | 4504654.06 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 4.23E-04 |
| SG_OTH13 | Stoelzle | POINT | 560713.01 | 4504658.75 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 4.23E-04 |
| SG_OTH15 | Stoelzle | POINT | 560717.96 | 4504652.30 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 4.23E-04 |
| SG_OTH04 | Stoelzle | POINT | 560741.41 | 4504604.06 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH11 | Stoelzle | POINT | 560726.46 | 4504636.77 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH10 | Stoelzle | POINT | 560730.20 | 4504636.07 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH16 | Stoelzle | POINT | 560723.84 | 4504650.57 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 4.23E-04 |
| SG_OTH12 | Stoelzle | POINT | 560718.42 | 4504664.22 | 224.64 | 17.74 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH06 | Stoelzle | POINT | 560743.59 | 4504613.34 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH05 | Stoelzle | POINT | 560751.24 | 4504601.68 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH17 | Stoelzle | POINT | 560729.72 | 4504649.43 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 4.23E-04 |
| SG_OTH08 | Stoelzle | POINT | 560746.21 | 4504623.56 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH18 | Stoelzle | POINT | 560736.22 | 4504647.83 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 4.23E-04 |
| SG_OTH07 | Stoelzle | POINT | 560753.48 | 4504610.65 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| SG_OTH09 | Stoelzle | POINT | 560748.38 | 4504632.31 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 2.44E-04 |
| PADEP1 | SHERWIN WILLIAMS CO/ROCHESTER | POINT | 560136.00 | 4506973.00 | 277.00 | 1.01 | 343.98 | 0.00 | 0.00 | 2.33E-01 |
| PADEP2 | SHERWIN WILLIAMS CO/ROCHESTER | POINT | 560136.00 | 4506973.00 | 359.55 | 9.14 | 449.98 | 0.29 | 0.46 | 3.52E-02 |
| NGC_S09 | Gold Bond Board Dryer | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 370.37 | 15.52 | 2.38 | 2.90E-01 |
| NGC_S100 | Gold Bond IMP Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 449.82 | 16.18 | 0.61 | 4.79E-01 |
| NGC_S11 | Gold Bond Cage Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 6.10 | 366.48 | 18.71 | 1.74 | 6.31E-01 |
| NGC_S201 | Gold Bond Board Trim | POINT | 548962.00 | 4497373.00 | 235.33 | 17.98 | 294.26 | 11.87 | 0.52 | 1.65E-01 |
| NGC_S202 | Gold Bond Riser Maker | POINT | 548962.00 | 4497373.00 | 235.33 | 17.98 | 294.26 | 3.96 | 0.52 | 2.77E-02 |
| NGC_S203 | Gold Bond Catenary | POINT | 548962.00 | 4497373.00 | 235.33 | 17.98 | 294.26 | 14.09 | 0.46 | 2.77E-02 |



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – PM₁₀

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | PM ₁₀ Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--------------------------------------|
| NGC_S204 | Gold Bond Board Plant | POINT | 548962.00 | 4497373.00 | 235.33 | 13.72 | 294.26 | 18.97 | 0.46 | 3.65E-02 |
| NGC_S205 | Gold Bond Starch Storage | POINT | 548962.00 | 4497373.00 | 235.33 | 18.29 | 294.26 | 5.17 | 0.30 | 3.78E-03 |
| NGC_SZ01 | Gold Bond Raw Material Storage | POINT | 548962.00 | 4497373.00 | 235.33 | 3.05 | 297.04 | 0.01 | 0.30 | 2.39E-01 |
| NGC_SZ10 | Gold Bond Roads | POINT | 548962.00 | 4497373.00 | 235.33 | 3.05 | 294.26 | 0.01 | 0.30 | 3.94E-01 |
| NGCSZ206 | Gold Bond Mat Hand Fugitives | POINT | 548962.00 | 4497373.00 | 235.33 | 0.30 | 294.26 | 0.01 | 0.30 | 2.55E-01 |
| FEBV_S01 | Energy Harbor Beaver Valley Aux Boil A | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 8.44E-02 |
| FEBV_S02 | Energy Harbor Beaver Valley Aux Boil B | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 8.44E-02 |
| FEBVS101 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 608.15 | 0.01 | 0.30 | 1.38E+00 |
| FEBVS102 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 608.15 | 0.01 | 0.30 | 1.38E+00 |
| FEBVS103 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 755.37 | 0.01 | 0.30 | 1.53E+00 |
| FEBVS104 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 755.37 | 0.01 | 0.30 | 1.53E+00 |
| FEBVS105 | Energy Harbor Beaver Valley Emg Res Gen | POINT | 548011.90 | 4497013.10 | 223.87 | 3.05 | 810.93 | 0.01 | 0.30 | 1.38E+00 |
| FEBVS106 | Energy Harbor Beaver Valley Shot Blast | POINT | 548011.90 | 4497013.10 | 223.87 | 3.05 | 294.26 | 0.01 | 0.30 | 7.70E-01 |
| USGYP_S1 | US Gypsum S1 | POINT | 564090.67 | 4497863.46 | 225.77 | 16.46 | 368.15 | 15.30 | 2.59 | 3.57E+00 |
| USGYP_S2 | US Gypsum #1 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.57 | 588.71 | 42.37 | 0.43 | 1.01E-01 |
| USGYPS20 | US Gypsum End Saw | POINT | 564090.67 | 4497863.46 | 225.77 | 20.73 | 294.26 | 28.75 | 0.46 | 4.32E-01 |
| USGYS200 | US Gypsum #1 DC Balance | POINT | 564090.67 | 4497863.46 | 225.77 | 30.18 | 333.15 | 0.01 | 0.61 | 1.21E+00 |
| USGYPS21 | US Gypsum #1 Dunnage | POINT | 564090.67 | 4497863.46 | 225.77 | 20.73 | 294.26 | 28.75 | 0.46 | 4.32E-01 |
| USGYP_S3 | US Gypsum #2 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.87 | 588.71 | 42.37 | 0.43 | 1.01E-01 |
| USGYP_S4 | US Gypsum #1 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 6.94E-01 |
| USGYP_S5 | US Gypsum #2 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 6.94E-01 |
| USGYP_S6 | US Gypsum Gauging Water Heater | POINT | 564090.67 | 4497863.46 | 225.77 | 7.62 | 588.71 | 15.97 | 0.27 | 2.52E-01 |
| USGYP_Z01 | US Gypsum Paved Road Fug Emissions | POINT | 564090.67 | 4497863.46 | 225.77 | 3.05 | 294.26 | 0.01 | 0.30 | 1.26E-02 |
| JEWLS202 | Allegheny & Tsingshan Shot Blaster | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 297.04 | 0.01 | 0.30 | 1.51E-02 |
| JEWLS205 | Allegheny & Tsingshan Cold Reduction | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 366.48 | 0.01 | 0.30 | 2.65E-01 |
| JEWLS206 | Allegheny & Tsingshan Annealing | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 1.39E-01 |
| JEWLS209 | Allegheny & Tsingshan Boiler 1 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 449.82 | 0.01 | 0.30 | 2.77E-02 |
| JEWLS210 | Allegheny & Tsingshan Boiler 2 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 310.37 | 0.01 | 0.30 | 3.15E-02 |
| JEWLZ050 | Allegheny & Tsingshan Heaters | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 1.89E-02 |
| JEWLZ182 | Allegheny & Tsingshan Roads | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 293.15 | 0.01 | 0.30 | 6.39E-01 |
| PADEP7 | IPSCO Koppel Rot Hearth | POINT | 565068.00 | 4495454.00 | 228.74 | 38.10 | 699.98 | 0.17 | 3.29 | 1.73E-01 |
| PADEP8 | IPSCO Koppel Quench | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 3.53E-02 |
| PADEP9 | IPSCO Koppel Temper Furnace | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 3.91E-02 |



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – PM₁₀

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | PM ₁₀ Emission Rate (g/s) |
|-----------|---|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--------------------------------------|
| PADEP10 | IPSCO Koppel Reheat | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 918.98 | 0.04 | 1.22 | 2.77E-02 |
| PADEP11 | IPSCO Koppel Misc Heaters | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 4.29 | 1.22 | 7.56E-03 |
| PADEP12 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | -0.02 | 0.00 | 0.00 | 4.28E-02 |
| PADEP15 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 9.58E-03 |
| PADEP16 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 9.58E-03 |
| PADEP17 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 2.67E-01 |
| DOM_S01 | Eastern Gas Transmission Eng 1 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.44E-01 |
| DOM_S02 | Eastern Gas Transmission Eng 2 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.44E-01 |
| DOM_S03 | Eastern Gas Transmission Eng 3 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.44E-01 |
| DOM_S04 | Eastern Gas Transmission Eng 4 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.44E-01 |
| PADEP23 | EASTERN GAS TRANSMISSION & STORAGE | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 7.56E-03 |
| IPSC_S05A | IPSCO Koppel Melt Shop | POINT | 557297.50 | 4520629.10 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05B | IPSCO Koppel Melt Shop | POINT | 557303.60 | 4520629.42 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05C | IPSCO Koppel Melt Shop | POINT | 557309.70 | 4520629.74 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05D | IPSCO Koppel Melt Shop | POINT | 557315.80 | 4520630.07 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05E | IPSCO Koppel Melt Shop | POINT | 557321.90 | 4520630.39 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05F | IPSCO Koppel Melt Shop | POINT | 557328.00 | 4520630.71 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05G | IPSCO Koppel Melt Shop | POINT | 557334.10 | 4520631.03 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05H | IPSCO Koppel Melt Shop | POINT | 557340.20 | 4520631.36 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05I | IPSCO Koppel Melt Shop | POINT | 557346.30 | 4520631.68 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S05J | IPSCO Koppel Melt Shop | POINT | 557352.40 | 4520632.00 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 2.17E-01 |
| IPSC_S02 | IPSCO Koppel Aus Furnace | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 3.10 | 1.22 | 1.51E+00 |
| IPSC_S03 | IPSCO Koppel Var Heaters | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 4.29 | 1.22 | 2.52E-02 |
| IPSC_S04 | IPSCO Koppel Temper Furnace | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 4.29 | 1.22 | 8.57E-01 |
| IPSCS09B | IPSCO Koppel Mill Piercing | POINT | 557458.00 | 4520772.00 | 270.42 | 3.05 | 533.15 | 0.01 | 0.30 | 2.47E+00 |
| PADEP34 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 12.19 | 435.98 | 20.12 | 1.22 | 1.32E+00 |
| PADEP35 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 1.21E-01 |
| PADEP36 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 7.43E-03 |
| PADEP37 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 7.43E-03 |
| PADEP38 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 7.43E-03 |
| PADEP39 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 7.43E-03 |
| PADEP40 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 1.89E-03 |



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – PM₁₀

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | PM ₁₀ Emission Rate (g/s) |
|-----------|--------------------------------------|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--------------------------------------|
| PADEP41 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 1.01 | -0.02 | 0.00 | 0.00 | 2.39E-03 |
| PADEP42 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 12.19 | 532.98 | 34.75 | 0.61 | 4.66E-03 |
| PADEP43 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 12.19 | 532.98 | 34.75 | 0.61 | 4.66E-03 |
| PADEP44 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 1.01 | 365.98 | 0.00 | 0.00 | 1.26E-04 |
| PADEP46 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 0.30 | 292.98 | 0.01 | 0.30 | 1.01E-03 |

¹Coordinates reflect UTM NAD83, Zone 17.



Off-Site Inventory for NAAQS Analysis – 1-hour NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | 1-hour NO ₂ Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--|
| BASF_S01 | BASF Thermal Oxidation Unit | POINT | 555260.00 | 4501187.00 | 226.60 | 22.86 | 953.71 | 4.71 | 1.46 | 9.45E-01 |
| BASF_S032 | BASF Cleaver Brooks Boiler #2 | POINT | 555223.82 | 4501190.03 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 1.27E-01 |
| BASF_S031 | BASF Cleaver Brooks Boiler #1 | POINT | 555230.83 | 4501184.04 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 1.27E-01 |
| BS_S031 | BVPV BOILERS 1-6 STACK | POINT | 554357.37 | 4500741.91 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 1.29E-01 |
| BS_S037 | BVPV BOILERS 7-12 STACK | POINT | 554359.98 | 4500738.23 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 1.29E-01 |
| BS_S112 | BVPV DIRECT FIRED T/O BACKUP | POINTCAP | 553885.07 | 4500511.25 | 230.12 | 19.81 | 1033.15 | 8.13 | 3.35 | 7.56E-01 |
| SG_S13 | Stoelzle FIRE SUPPRESSION BOILER STACK | POINT | 560538.00 | 4504631.00 | 226.47 | 6.00 | 422.04 | 1.72 | 0.61 | 3.28E-02 |
| SG_S103 | Stoelzle MELT TANK CADF STACK | POINT | 560668.00 | 4504653.00 | 224.64 | 15.24 | 521.48 | 17.00 | 1.13 | 2.14E+00 |
| SG_OTH01 | Stoelzle | POINT | 560712.40 | 4504613.69 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH03 | Stoelzle | POINT | 560720.59 | 4504602.26 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH02 | Stoelzle | POINT | 560715.80 | 4504612.65 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH14 | Stoelzle | POINT | 560711.83 | 4504654.06 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH13 | Stoelzle | POINT | 560713.01 | 4504658.75 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH15 | Stoelzle | POINT | 560717.96 | 4504652.30 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH04 | Stoelzle | POINT | 560741.41 | 4504604.06 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH11 | Stoelzle | POINT | 560726.46 | 4504636.77 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH10 | Stoelzle | POINT | 560730.20 | 4504636.07 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH16 | Stoelzle | POINT | 560723.84 | 4504650.57 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH12 | Stoelzle | POINT | 560718.42 | 4504664.22 | 224.64 | 17.74 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH06 | Stoelzle | POINT | 560743.59 | 4504613.34 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH05 | Stoelzle | POINT | 560751.24 | 4504601.68 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH17 | Stoelzle | POINT | 560729.72 | 4504649.43 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH08 | Stoelzle | POINT | 560746.21 | 4504623.56 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH18 | Stoelzle | POINT | 560736.22 | 4504647.83 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH07 | Stoelzle | POINT | 560753.48 | 4504610.65 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH09 | Stoelzle | POINT | 560748.38 | 4504632.31 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| PADEP2 | SHERWIN WILLIAMS CO/ROCHESTER | POINT | 560136.00 | 4506973.00 | 359.55 | 9.14 | 449.98 | 0.29 | 0.46 | 4.64E-01 |
| NGC_S09 | Gold Bond Board Dryer | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 370.37 | 15.52 | 2.38 | 2.58E+00 |
| NGC_S100 | Gold Bond IMP Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 449.82 | 16.18 | 0.61 | 4.79E-01 |
| NGC_S11 | Gold Bond Cage Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 6.10 | 366.48 | 18.71 | 1.74 | 1.52E+00 |
| FEBV_S01 | Energy Harbor Beaver Valley Aux Boil A | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 8.49E-01 |
| FEBV_S02 | Energy Harbor Beaver Valley Aux Boil B | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 8.49E-01 |
| USGYP_S1 | US Gypsum S1 | POINT | 564090.67 | 4497863.46 | 225.77 | 16.46 | 368.15 | 15.30 | 2.59 | 9.40E-01 |



Off-Site Inventory for NAAQS Analysis – 1-hour NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | 1-hour NO ₂ Emission Rate (g/s) |
|-----------|---|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--|
| USGYP_S2 | US Gypsum #1 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.57 | 588.71 | 42.37 | 0.43 | 5.30E-01 |
| USGYP_S3 | US Gypsum #2 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.87 | 588.71 | 42.37 | 0.43 | 5.30E-01 |
| USGYP_S4 | US Gypsum #1 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 2.18E-01 |
| USGYP_S5 | US Gypsum #2 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 2.18E-01 |
| USGYP_S6 | US Gypsum Gauging Water Heater | POINT | 564090.67 | 4497863.46 | 225.77 | 7.62 | 588.71 | 15.97 | 0.27 | 6.17E-02 |
| JEWLS209 | Allegheny & Tsingshan Boiler 1 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 449.82 | 0.01 | 0.30 | 3.69E-01 |
| JEWLS210 | Allegheny & Tsingshan Boiler 2 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 310.37 | 0.01 | 0.30 | 4.22E-01 |
| JEWLZ050 | Allegheny & Tsingshan Heaters | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 2.39E-01 |
| PADEP7 | IPSCO Koppel Rot Hearth | POINT | 565068.00 | 4495454.00 | 228.74 | 38.10 | 699.98 | 0.17 | 3.29 | 3.97E+00 |
| PADEP8 | IPSCO Koppel Quench | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 4.37E-01 |
| PADEP9 | IPSCO Koppel Temper Furnace | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 4.37E-01 |
| PADEP10 | IPSCO Koppel Reheat | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 918.98 | 0.04 | 1.22 | 4.37E-01 |
| PADEP11 | IPSCO Koppel Misc Heaters | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 4.29 | 1.22 | 5.41E-01 |
| PADEP12 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | -0.02 | 0.00 | 0.00 | 2.52E-01 |
| PADEP15 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 1.26E-01 |
| PADEP16 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 1.26E-01 |
| PADEP17 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 2.52E-01 |
| PADEP18 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | -0.02 | 0.00 | 0.00 | 2.52E-01 |
| DOM_S01 | Eastern Gas Transmission Eng 1 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| DOM_S02 | Eastern Gas Transmission Eng 2 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| DOM_S03 | Eastern Gas Transmission Eng 3 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| DOM_S04 | Eastern Gas Transmission Eng 4 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| PADEP23 | EASTERN GAS TRANSMISSION & STORAGE INC/BEAVER | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 1.89E-01 |
| PADEP24 | EASTERN GAS TRANSMISSION & STORAGE INC/BEAVER | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 3.78E-02 |
| PADEP25 | EASTERN GAS TRANSMISSION & STORAGE INC/BEAVER | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 1.89E-02 |
| PADEP26 | EASTERN GAS TRANSMISSION & STORAGE INC/BEAVER | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 5.04E-04 |
| PADEP27 | HERITAGE THERMAL SERVICE | POINT | 538346.17 | 4497947.28 | 213.57 | 1.01 | -0.18 | 0.00 | 0.00 | 3.89E-01 |
| PADEP28 | HERITAGE THERMAL SERVICE | POINT | 538346.17 | 4497947.28 | 213.57 | 1.01 | -0.18 | 0.00 | 0.00 | 3.57E+00 |



Off-Site Inventory for NAAQS Analysis – 1-hour NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | 1-hour NO ₂ Emission Rate (g/s) |
|-----------|--------------------------------------|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--|
| PADEP29 | IPSCO KOPPEL TUBULARS LLC/KOPPEL | POINT | 557468.00 | 4520732.00 | 269.89 | 30.48 | 338.98 | 17.43 | 3.05 | 7.56E+00 |
| PADEP30 | IPSCO KOPPEL TUBULARS LLC/KOPPEL | POINT | 557468.00 | 4520732.00 | 269.89 | 16.46 | 754.98 | 4.29 | 1.22 | 3.28E-01 |
| PADEP31 | IPSCO KOPPEL TUBULARS LLC/KOPPEL | POINT | 557468.00 | 4520732.00 | 269.89 | 16.46 | 754.98 | 3.10 | 1.22 | 3.78E-01 |
| PADEP32 | IPSCO KOPPEL TUBULARS LLC/KOPPEL | POINT | 557468.00 | 4520732.00 | 269.89 | 16.46 | 754.98 | 4.29 | 1.22 | 2.14E-01 |
| PADEP33 | IPSCO KOPPEL TUBULARS LLC/KOPPEL | POINT | 557468.00 | 4520732.00 | 269.89 | 16.46 | 365.98 | 4.29 | 0.61 | 3.28E-01 |
| PADEP34 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 12.19 | 435.98 | 20.12 | 1.22 | 3.78E+00 |
| PADEP40 | Lindy Paving Inc/Koppel | POINT | 553473.00 | 4521245.00 | 366.13 | 1.01 | -0.02 | 0.00 | 0.00 | 2.52E-02 |
| PADEP41 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 1.01 | -0.02 | 0.00 | 0.00 | 3.15E-02 |
| PADEP42 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 12.19 | 532.98 | 34.75 | 0.61 | 4.56E+00 |
| PADEP43 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 12.19 | 532.98 | 34.75 | 0.61 | 4.56E+00 |
| PADEP45 | COLUMBIA GAS TRANS CORP/ELLWOOD CITY | POINT | 562988.00 | 4520462.00 | 262.53 | 0.30 | 292.98 | 0.01 | 0.30 | 1.26E-02 |
| PADEP47 | NALCO Co. North/South | POINT | 561169.00 | 4521433.00 | 268.51 | 7.62 | 365.98 | 13.00 | 0.21 | 1.61E-01 |
| PADEP48 | NALCO Co. North/South | POINT | 561169.00 | 4521433.00 | 268.51 | 7.62 | 365.98 | 13.00 | 0.21 | 1.23E-01 |
| PADEP49 | NALCO Co. North/South | POINT | 561169.00 | 4521433.00 | 268.51 | 7.62 | 365.98 | 13.00 | 0.21 | 1.23E-01 |
| PADEP51 | KAWNEER CO INC/CRANBERRY | POINT | 575169.00 | 4506646.00 | 315.20 | 1.01 | 446.98 | 0.00 | 0.00 | 1.10E-01 |
| PADEP52 | KAWNEER CO INC/CRANBERRY TWP | POINT | 575169.00 | 4506646.00 | 315.20 | 1.01 | 475.98 | 0.00 | 0.00 | 6.55E-02 |
| PADEP53 | KAWNEER CO INC/CRANBERRY | POINT | 575169.00 | 4506646.00 | 315.20 | 1.01 | 419.98 | 0.00 | 0.00 | 9.07E-02 |
| PADEP54 | KAWNEER CO INC/CRANBERRY TWP | POINT | 575169.00 | 4506646.00 | 315.20 | 1.01 | 293.98 | 0.00 | 0.00 | 6.30E-02 |
| PADEP55 | KAWNEER CO INC/CRANBERRY | POINT | 575169.00 | 4506646.00 | 315.20 | 1.52 | 321.98 | 0.00 | 0.00 | 9.95E-01 |
| PADEP56 | KAWNEER CO INC/CRANBERRY TWP | POINT | 575169.00 | 4506646.00 | 315.20 | 10.36 | 699.98 | 15.67 | 0.24 | 3.53E-02 |
| PADEP57 | KAWNEER CO INC/CRANBERRY | POINT | 575169.00 | 4506646.00 | 315.20 | 1.83 | 321.98 | 0.00 | 0.00 | 6.30E-01 |
| PADEP60 | NALCO Co. North/South | POINT | 561165.00 | 4522487.00 | 265.69 | 7.62 | 365.98 | 13.00 | 0.21 | 2.43E-01 |
| PADEP61 | NALCO Co. North/South | POINT | 561165.00 | 4522487.00 | 265.69 | 1.01 | 365.98 | 0.00 | 0.00 | 1.21E-02 |
| PADEP62 | NALCO Co. North/South | POINT | 561165.00 | 4522487.00 | 265.69 | 1.01 | 365.98 | 0.00 | 0.00 | 1.21E-02 |
| PADEP63 | BUCKEYE PIPELINE/CORAOPOLIS | POINT | 569590.00 | 4486476.00 | 215.82 | 10.67 | 294.98 | 6.55 | 0.43 | 8.06E-03 |
| PADEP64 | BUCKEYE PIPELINE/CORAOPOLIS | POINT | 569590.00 | 4486476.00 | 215.82 | 13.72 | 1271.98 | 21.08 | 0.21 | 6.01E-01 |
| BNZ_21 | BNZ Materials | POINT | 571798.00 | 4516012.00 | 274.90 | 8.53 | 338.71 | 45.28 | 0.30 | 2.72E-01 |
| BNZ_29 | BNZ Materials | POINT | 571798.00 | 4516012.00 | 274.90 | 10.06 | 463.71 | 6.47 | 0.30 | 3.35E-01 |
| BNZ_31 | BNZ Materials | POINT | 571798.00 | 4516012.00 | 274.90 | 21.34 | 463.71 | 10.74 | 0.98 | 8.69E-02 |
| BNZ_33 | BNZ Materials | POINT | 571798.00 | 4516012.00 | 274.90 | 10.67 | 463.71 | 6.21 | 0.76 | 1.26E-02 |
| BNZ_34 | BNZ Materials | POINT | 571798.00 | 4516012.00 | 274.90 | 9.14 | 477.59 | 2.24 | 0.52 | 3.65E-02 |
| PADEP65 | BNZ MATERIALS INC/ZELIENOPLE | POINT | 571798.00 | 4516012.00 | 273.07 | 1.52 | 477.98 | 0.00 | 0.00 | 2.65E-02 |



Off-Site Inventory for NAAQS Analysis – 1-hour NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | 1-hour NO ₂ Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--|
| PADEP66 | BNZ MATERIALS INC/ZELIENOPE | POINT | 571798.00 | 4516012.00 | 273.07 | 1.52 | 463.98 | 0.00 | 0.00 | 1.29E-01 |
| PADEP67 | BNZ MATERIALS INC/ZELIENOPE | POINT | 571798.00 | 4516012.00 | 273.07 | 10.06 | 463.98 | 6.47 | 0.30 | 8.82E-02 |
| PADEP68 | ELLWOOD CITY FORGE/ELLWOOD CITY | POINT | 559518.00 | 4523532.00 | 271.60 | 7.62 | 365.98 | 13.00 | 0.21 | 7.77E-02 |
| PADEP69 | ELLWOOD CITY FORGE/ELLWOOD CITY | POINT | 559518.00 | 4523532.00 | 271.60 | 12.19 | 310.98 | 12.80 | 0.61 | 1.26E-02 |
| PADEP70 | ELLWOOD CITY FORGE/ELLWOOD CITY | POINT | 559518.00 | 4523532.00 | 271.60 | 53.34 | 921.98 | 70.71 | 1.16 | 3.06E-01 |
| PADEP71 | ELLWOOD CITY FORGE/ELLWOOD CITY | POINT | 559518.00 | 4523532.00 | 271.60 | 25.30 | 421.98 | 2.44 | 0.79 | 2.35E-01 |
| PADEP72 | ELLWOOD CITY FORGE/ELLWOOD CITY | POINT | 559518.00 | 4523532.00 | 271.60 | 11.58 | 477.98 | 5.17 | 0.91 | 4.19E-01 |
| PADEP73 | ELLWOOD CITY FORGE/ELLWOOD CITY | POINT | 559518.00 | 4523532.00 | 271.60 | 11.58 | 1032.98 | 52.96 | 0.61 | 7.43E-01 |
| INME_03 | INMETCO Ellwood City | POINT | 560998.00 | 4523212.00 | 277.36 | 21.03 | 330.37 | 19.34 | 1.01 | 1.25E+01 |
| INME_04 | INMETCO Ellwood City | POINT | 560998.00 | 4523212.00 | 277.36 | 21.03 | 330.37 | 19.34 | 1.01 | 1.59E-01 |
| INME_05 | INMETCO Ellwood City | POINT | 560998.00 | 4523212.00 | 277.36 | 22.25 | 347.04 | 21.90 | 1.46 | 5.67E+00 |
| INME_10 | INMETCO Ellwood City | POINT | 560998.00 | 4523212.00 | 277.36 | 9.14 | 322.04 | 65.70 | 0.24 | 5.29E-02 |
| INME_12 | INMETCO Ellwood City | POINT | 560998.00 | 4523212.00 | 277.36 | 3.05 | 310.93 | 0.01 | 0.30 | 2.90E-02 |
| INME_13 | INMETCO Ellwood City | POINT | 560998.00 | 4523212.00 | 277.36 | 3.05 | 294.26 | 0.01 | 0.30 | 5.67E-02 |
| PADEP74 | INMETCO ELLWOOD CITY | POINT | 560998.00 | 4523212.00 | 275.86 | 12.19 | 310.98 | 12.80 | 0.61 | 5.70E-02 |
| PADEP75 | INMETCO ELLWOOD CITY | POINT | 560998.00 | 4523212.00 | 275.86 | 21.03 | 329.98 | 19.34 | 1.01 | 4.24E-01 |
| PADEP76 | INMETCO ELLWOOD CITY | POINT | 560998.00 | 4523212.00 | 275.86 | 22.25 | 346.98 | 21.88 | 1.46 | 2.77E-01 |
| PADEP77 | INMETCO ELLWOOD CITY | POINT | 560998.00 | 4523212.00 | 275.86 | 21.95 | 402.98 | 11.00 | 3.05 | 2.77E-01 |
| PADEP78 | INMETCO ELLWOOD CITY | POINT | 560998.00 | 4523212.00 | 275.86 | 12.19 | 310.98 | 12.80 | 0.61 | 2.90E-02 |
| PADEP79 | INMETCO ELLWOOD CITY | POINT | 560998.00 | 4523212.00 | 275.86 | 21.03 | 329.98 | 19.34 | 1.01 | 5.67E-02 |
| PADEP80 | WAMPUM CEMENT | POINT | 556907.10 | 4525518.70 | 259.10 | 105.19 | 513.98 | 18.70 | 3.99 | 2.46E+01 |
| PADEP81 | GEOPETRO LLC/PATTERSON COM | POINT | 549729.00 | 4526823.00 | 338.68 | 0.30 | 292.98 | 0.01 | 0.30 | 9.58E-02 |
| PADEP82 | GEOPETRO LLC/PATTERSON COM | POINT | 549729.00 | 4526823.00 | 338.68 | 0.30 | 292.98 | 0.01 | 0.30 | 1.26E-02 |
| PADEP83 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 0.91 | 504.98 | 0.00 | 0.00 | 4.79E-02 |
| PADEP84 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 0.30 | 310.98 | 0.00 | 0.00 | 3.15E-02 |
| PADEP85 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 6.10 | 365.98 | 34.75 | 0.46 | 1.26E+01 |
| PADEP86 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 1.01 | -0.02 | 0.00 | 0.00 | 1.72E+00 |
| PADEP87 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 1.01 | -0.02 | 0.00 | 0.00 | 1.91E+00 |
| PADEP88 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 1.01 | -0.02 | 0.00 | 0.00 | 1.37E+00 |
| PADEP89 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 1.52 | -0.02 | 169.16 | 0.00 | 7.03E-01 |
| PADEP90 | SENECA LANDFILL/SENECA | POINT | 577711.00 | 4518290.00 | 295.40 | 1.01 | 563.98 | 0.00 | 0.00 | 7.03E-01 |
| PADEP91 | NEW CASTLE POWER LLC/NEW CASTLE GENERATING STATION | POINT | 553209.00 | 4532062.00 | 244.51 | 228.60 | 422.04 | 46.68 | 5.82 | 1.30E+01 |
| PADEP92 | NEW CASTLE POWER LLC/NEW CASTLE GENERATING STATION | POINT | 553209.00 | 4532062.00 | 244.51 | 228.60 | 422.04 | 46.68 | 5.82 | 1.30E+01 |



Off-Site Inventory for NAAQS Analysis – 1-hour NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | 1-hour NO ₂ Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--|
| PADEP93 | NEW CASTLE POWER LLC/NEW CASTLE GENERATING STATION | POINT | 553209.00 | 4532062.00 | 244.51 | 228.60 | 422.04 | 46.68 | 5.82 | 1.97E+01 |
| PADEP94 | NEW CASTLE POWER LLC/NEW CASTLE GENERATING STATION | POINT | 553209.00 | 4532062.00 | 244.51 | 5.79 | 669.98 | 30.80 | 1.07 | 1.24E+00 |
| PADEP95 | NEW CASTLE POWER LLC/NEW CASTLE GENERATING STATION | POINT | 553209.00 | 4532062.00 | 244.51 | 16.46 | 477.98 | 5.24 | 0.55 | 1.50E-01 |
| PADEP96 | NEW CASTLE POWER LLC/NEW CASTLE GENERATING STATION | POINT | 553209.00 | 4532062.00 | 244.51 | 5.79 | 477.98 | 5.24 | 0.55 | 9.20E-02 |
| PADEP97 | EAST FAIRFIELD COAL COMPANY | POINT | 540080.83 | 4530324.90 | 329.44 | 1.01 | -0.02 | 0.00 | 0.00 | 4.86E+00 |
| PADEP98 | MAHONING LANDFILL, INC. | POINT | 535165.00 | 4529756.31 | 345.57 | 1.01 | -0.02 | 0.00 | 0.00 | 1.13E+00 |
| PADEP99 | MAHONING LANDFILL, INC. | POINT | 535165.00 | 4529756.31 | 345.57 | 1.01 | -0.02 | 0.00 | 0.00 | 4.62E-01 |
| WVA_66 | ARCELORMITTAL WEIRTON INC. | POINT | 533700.00 | 4474500.00 | 220.49 | 76.20 | 885.93 | 10.67 | 3.66 | 2.92E+01 |
| WVA_80 | ARCELORMITTAL WEIRTON INC. | POINT | 533700.00 | 4474500.00 | 220.49 | 52.43 | 487.59 | 15.85 | 3.05 | 1.26E+01 |
| WVA_81 | ARCELORMITTAL WEIRTON INC. | POINT | 533700.00 | 4474500.00 | 220.49 | 63.09 | 313.15 | 8.23 | 4.88 | 1.26E+01 |
| WVA_82 | ARCELORMITTAL WEIRTON INC. | POINT | 533700.00 | 4474500.00 | 220.49 | 54.86 | 455.37 | 17.98 | 3.35 | 1.40E+01 |
| PADEP100 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 23.47 | 338.98 | 25.50 | 2.74 | 9.58E-01 |
| PADEP101 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 30.48 | 324.98 | 14.68 | 2.44 | 1.08E+00 |
| PADEP102 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 1.52 | 547.98 | 0.00 | 0.00 | 1.39E-01 |
| PADEP103 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 10.97 | 527.98 | 4.06 | 0.70 | 2.52E-01 |
| PADEP104 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 1.01 | -0.02 | 0.00 | 0.00 | 1.31E-01 |
| PADEP105 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 1.01 | -0.02 | 0.00 | 0.00 | 1.26E-02 |
| PADEP106 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 1.01 | -0.02 | 0.00 | 0.00 | 1.26E-02 |
| PADEP107 | ELLWOOD QUALITY STEEL CO./NEW CASTLE | POINT | 554606.00 | 4538045.00 | 236.56 | 23.47 | 338.98 | 25.50 | 2.74 | 7.56E-02 |
| PADEP108 | ELLWOOD MILL PROD | POINT | 554922.00 | 4538219.00 | 239.68 | 1.01 | -0.02 | 0.00 | 0.00 | 1.25E-01 |
| PADEP109 | ELLWOOD MILL PROD | POINT | 554922.00 | 4538219.00 | 239.68 | 12.19 | 365.98 | 12.80 | 0.61 | 3.77E+00 |
| PADEP110 | ELLWOOD MILL PROD | POINT | 554922.00 | 4538219.00 | 239.68 | 1.01 | -0.02 | 0.00 | 0.00 | 1.25E-01 |
| PADEP111 | ELLWOOD MILL PROD | POINT | 554922.00 | 4538219.00 | 239.68 | 1.01 | -0.02 | 0.00 | 0.00 | 2.42E-01 |

¹Coordinates reflect UTM NAD83, Zone 17.



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – Annual NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | NO _x Annual Emission Rate (g/s) |
|-----------|--|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--|
| BASF_S01 | BASF Thermal Oxidation Unit | POINT | 555260.00 | 4501187.00 | 226.60 | 22.86 | 953.71 | 4.71 | 1.46 | 9.45E-01 |
| BASF_S032 | BASF Cleaver Brooks Boiler #2 | POINT | 555223.82 | 4501190.03 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 1.27E-01 |
| BASF_S031 | BASF Cleaver Brooks Boiler #1 | POINT | 555230.83 | 4501184.04 | 226.60 | 4.57 | 512.59 | 17.22 | 0.61 | 1.27E-01 |
| BS_S031 | BVPV BOILERS 1-6 STACK | POINT | 554357.37 | 4500741.91 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 1.29E-01 |
| BS_S037 | BVPV BOILERS 7-12 STACK | POINT | 554359.98 | 4500738.23 | 230.12 | 11.28 | 430.93 | 6.31 | 0.98 | 1.29E-01 |
| BS_S112 | BVPV DIRECT FIRED T/O BACKUP | POINTCAP | 553885.07 | 4500511.25 | 230.12 | 19.81 | 1033.15 | 8.13 | 3.35 | 7.56E-01 |
| SG_S13 | Stoelzle FIRE SUPPRESSION BOILER STACK | POINT | 560538.00 | 4504631.00 | 226.47 | 6.00 | 422.04 | 1.72 | 0.61 | 3.28E-02 |
| SG_S103 | Stoelzle MELT TANK CADF STACK | POINT | 560668.00 | 4504653.00 | 224.64 | 15.24 | 521.48 | 17.00 | 1.13 | 2.14E+00 |
| SG_OTH01 | Stoelzle | POINT | 560712.40 | 4504613.69 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH03 | Stoelzle | POINT | 560720.59 | 4504602.26 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH02 | Stoelzle | POINT | 560715.80 | 4504612.65 | 224.64 | 22.71 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH14 | Stoelzle | POINT | 560711.83 | 4504654.06 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH13 | Stoelzle | POINT | 560713.01 | 4504658.75 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH15 | Stoelzle | POINT | 560717.96 | 4504652.30 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH04 | Stoelzle | POINT | 560741.41 | 4504604.06 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH11 | Stoelzle | POINT | 560726.46 | 4504636.77 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH10 | Stoelzle | POINT | 560730.20 | 4504636.07 | 224.64 | 23.29 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH16 | Stoelzle | POINT | 560723.84 | 4504650.57 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH12 | Stoelzle | POINT | 560718.42 | 4504664.22 | 224.64 | 17.74 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH06 | Stoelzle | POINT | 560743.59 | 4504613.34 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH05 | Stoelzle | POINT | 560751.24 | 4504601.68 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH17 | Stoelzle | POINT | 560729.72 | 4504649.43 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH08 | Stoelzle | POINT | 560746.21 | 4504623.56 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH18 | Stoelzle | POINT | 560736.22 | 4504647.83 | 224.64 | 17.77 | -0.18 | 10.48 | 1.74 | 2.27E-02 |
| SG_OTH07 | Stoelzle | POINT | 560753.48 | 4504610.65 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| SG_OTH09 | Stoelzle | POINT | 560748.38 | 4504632.31 | 224.64 | 17.13 | -0.18 | 10.33 | 1.31 | 1.39E-02 |
| PADEP2 | SHERWIN WILLIAMS CO/ROCHESTER | POINT | 560136.00 | 4506973.00 | 359.55 | 9.14 | 449.98 | 0.29 | 0.46 | 4.64E-01 |
| PADEP3 | SHERWIN WILLIAMS CO/ROCHESTER | POINT | 560136.00 | 4506973.00 | 359.55 | 1.01 | 365.98 | 0.00 | 0.00 | 3.02E-01 |
| NGC_S09 | Gold Bond Board Dryer | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 370.37 | 15.52 | 2.38 | 1.84E-01 |



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – Annual NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | NOx Annual Emission Rate (g/s) |
|-----------|---|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--------------------------------|
| NGC_S100 | Gold Bond IMP Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 9.14 | 449.82 | 16.18 | 0.61 | 4.75E-01 |
| NGC_S11 | Gold Bond Cage Mill | POINT | 548962.00 | 4497373.00 | 235.33 | 6.10 | 366.48 | 18.71 | 1.74 | 3.46E-01 |
| FEBV_S01 | Energy Harbor Beaver Valley Aux Boil A | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 8.49E-01 |
| FEBV_S02 | Energy Harbor Beaver Valley Aux Boil B | POINT | 548011.90 | 4497013.10 | 223.87 | 37.19 | 589.26 | 5.21 | 2.13 | 8.49E-01 |
| FEBVS101 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 608.15 | 0.01 | 0.30 | 6.07E-01 |
| FEBVS102 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 608.15 | 0.01 | 0.30 | 6.07E-01 |
| FEBVS103 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 755.37 | 0.01 | 0.30 | 6.77E-01 |
| FEBVS104 | Energy Harbor Beaver Valley Emg Dies Eng | POINT | 548011.90 | 4497013.10 | 223.87 | 6.10 | 755.37 | 0.01 | 0.30 | 6.77E-01 |
| FEBVS105 | Energy Harbor Beaver Valley Emg Res Gen | POINT | 548011.90 | 4497013.10 | 223.87 | 3.05 | 810.93 | 0.01 | 0.30 | 6.07E-01 |
| USGYP_S1 | US Gypsum S1 | POINT | 564090.67 | 4497863.46 | 225.77 | 16.46 | 368.15 | 15.30 | 2.59 | 9.40E-01 |
| USGYP_S2 | US Gypsum #1 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.57 | 588.71 | 42.37 | 0.43 | 5.30E-01 |
| USGYP_S3 | US Gypsum #2 Kettle | POINT | 564090.67 | 4497863.46 | 225.77 | 29.87 | 588.71 | 42.37 | 0.43 | 5.30E-01 |
| USGYP_S4 | US Gypsum #1 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 2.18E-01 |
| USGYP_S5 | US Gypsum #2 Dryer Mill | POINT | 564090.67 | 4497863.46 | 225.77 | 30.48 | 377.59 | 15.73 | 1.55 | 2.18E-01 |
| USGYP_S6 | US Gypsum Gauging Water Heater | POINT | 564090.67 | 4497863.46 | 225.77 | 7.62 | 588.71 | 15.97 | 0.27 | 6.17E-02 |
| JEWLS206 | Allegheny & Tsingshan Annealing | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 6.43E-01 |
| JEWLS208 | Allegheny & Tsingshan Pickle | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 5.42E-01 |
| JEWLS209 | Allegheny & Tsingshan Boiler 1 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 449.82 | 0.01 | 0.30 | 3.62E-01 |
| JEWLS210 | Allegheny & Tsingshan Boiler 2 | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 310.37 | 0.01 | 0.30 | 4.13E-01 |
| JEWLZ050 | Allegheny & Tsingshan Heaters | POINT | 545579.00 | 4498791.00 | 236.22 | 3.05 | 422.04 | 0.01 | 0.30 | 2.47E-01 |
| PADEP7 | IPSCO Koppel Rot Hearth | POINT | 565068.00 | 4495454.00 | 228.74 | 38.10 | 699.98 | 0.17 | 3.29 | 3.97E+00 |
| PADEP8 | IPSCO Koppel Quench | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 4.69E-01 |
| PADEP9 | IPSCO Koppel Temper Furnace | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 0.04 | 1.22 | 5.18E-01 |
| PADEP10 | IPSCO Koppel Reheat | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 918.98 | 0.04 | 1.22 | 3.70E-01 |
| PADEP11 | IPSCO Koppel Misc Heaters | POINT | 565068.00 | 4495454.00 | 228.74 | 16.46 | 754.98 | 4.29 | 1.22 | 9.83E-02 |
| PADEP12 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | -0.02 | 0.00 | 0.00 | 5.68E-01 |
| PADEP15 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 1.26E-01 |



Off-Site Inventory for NAAQS and PSD Class II Increment Analyses – Annual NO₂

| AERMOD ID | Description | Source Type | UTM Easting ¹ (m) | UTM Northing ¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) | NOx Annual Emission Rate (g/s) |
|-----------|---|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|---------------------|--------------------|--------------------------------|
| PADEP16 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 1.26E-01 |
| PADEP17 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | 365.98 | 0.00 | 0.00 | 2.52E-01 |
| PADEP18 | BEAVER FALLS TUBULAR PRODLLC/BEAVER FALLS | POINT | 556288.00 | 4514679.00 | 281.26 | 1.01 | -0.02 | 0.00 | 0.00 | 2.52E-01 |
| DOM_S01 | Eastern Gas Transmission Eng 1 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| DOM_S02 | Eastern Gas Transmission Eng 2 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| DOM_S03 | Eastern Gas Transmission Eng 3 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| DOM_S04 | Eastern Gas Transmission Eng 4 | POINT | 558671.00 | 4518753.00 | 373.29 | 15.85 | 644.26 | 7.19 | 0.91 | 1.78E+00 |
| PADEP23 | EASTERN GAS TRANSMISSION & STORAGE | POINT | 558671.00 | 4518753.00 | 375.66 | 1.01 | -0.18 | 0.00 | 0.00 | 1.89E-01 |
| IPSC_S05A | IPSCO Koppel Melt Shop | POINT | 557297.50 | 4520629.10 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05B | IPSCO Koppel Melt Shop | POINT | 557303.60 | 4520629.42 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05C | IPSCO Koppel Melt Shop | POINT | 557309.70 | 4520629.74 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05D | IPSCO Koppel Melt Shop | POINT | 557315.80 | 4520630.07 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05E | IPSCO Koppel Melt Shop | POINT | 557321.90 | 4520630.39 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05F | IPSCO Koppel Melt Shop | POINT | 557328.00 | 4520630.71 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05G | IPSCO Koppel Melt Shop | POINT | 557334.10 | 4520631.03 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05H | IPSCO Koppel Melt Shop | POINT | 557340.20 | 4520631.36 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05I | IPSCO Koppel Melt Shop | POINT | 557346.30 | 4520631.68 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S05J | IPSCO Koppel Melt Shop | POINT | 557352.40 | 4520632.00 | 271.09 | 30.48 | 338.71 | 17.43 | 3.05 | 7.56E-01 |
| IPSC_S02 | IPSCO Koppel Aus Furnace | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 3.10 | 1.22 | 2.46E-01 |
| IPSC_S03 | IPSCO Koppel Var Heaters | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 4.29 | 1.22 | 3.21E-01 |
| IPSC_S04 | IPSCO Koppel Temper Furnace | POINT | 557468.00 | 4520732.00 | 270.64 | 16.46 | 755.37 | 4.29 | 1.22 | 9.70E-02 |

¹Coordinates reflect UTM NAD83, Zone 17.



ATTACHMENT B
FLM NOTIFICATION

Request for Applicability of Class I Area Modeling Analysis

| | |
|---|---|
| <i>Facility Name (Company Name)</i> | Shell Polymers Monaca (“SPM”) owned and operated by Shell Chemical Appalachia LLC (“Shell”) |
| <i>New Facility or Modification?</i> | Modification |
| <i>Source Type/BART Applicability</i> | Major Modification to Existing Major Source |
| <i>Project Location (County/State/ Lat. & Long. in decimal degrees)</i> | Beaver County, Pennsylvania, 40.671, -80.336 |

Application Contacts

| <i>Applicant</i> | | <i>Consultant</i> | | <i>Air Agency Permit Engineer</i> | |
|------------------|---|-------------------|---|-----------------------------------|---|
| Company | Shell Chemical Appalachia | Company | Landau Associates, Inc. | Agency | PADEP |
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Briefly Describe the Proposed Project

Shell Chemical Appalachia LLC (“Shell”) owns and operates Shell Polymers Monaca (“SPM”), which is an ethylene and polyethylene production facility in Monaca, Beaver County, Pennsylvania. Shell is in the process of preparing a plan approval application for submittal to the Pennsylvania Department of Environmental Protection (DEP) in accordance with the Pennsylvania Air Pollution Control Act and 25 Pa. Code §127.12 to propose the following projects and plan approval reconciliations:

- Shell is proposing to implement the Wastewater Treatment Plant (WWTP) Permanent Controls Project at SPM to improve the oils, grease, and volatile organic compound (VOC) removal efficiency of the primary treatment section of SPM’s WWTP. Shell is currently using temporary equipment to achieve improved removal efficiencies and is now proposing to install permanent equipment.
- Shell is proposing the Ethylene Maximum Achievable Control Technology (EMACT) Project at SPM to comply with the 40 Code of Federal Regulations (CFR) 63 Subpart YY pressure-assisted multi-point flare minimum net heating value of flare combustion zone gas (NHV_{cz}) requirement that recently became applicable to the HP Ground Flare #1 and HP Ground Flare #2 (also referred to as “TEGF A” and “TEGF B”). Supplemental gas will be utilized as necessary in order to achieve compliance with the minimum net heating value for the totally enclosed ground flares (TEGFs).
- After a thorough review of SPM’s as-built operations and plan approval source inventory, potential emissions calculations, and conditions, Shell is proposing to reconcile specific plan approval source descriptions, potential emissions calculations, and conditions. These proposed reconciliations are collectively referred to by Shell as the “Plan Approval Reconciliations.” A detailed description of all

proposed reconciliations will be provided in the plan approval application which Shell anticipates will be submitted to DEP in September 2024.

Shell has retrospectively evaluated the Plan Approval Reconciliations and WWTP Permanent Controls Project together as part of the initial construction of SPM because these changes are related to the facility's initial construction since they represent as-built changes to the facility's initial construction plan approval and necessary improvements to the initial design and construction of the facility's WWTP, respectively. Shell has evaluated the EMACT Project separately from the initial construction of SPM because the project is only required to comply with newly effective federal regulatory requirements that are applicable to ethylene production units across the country.

The Plan Approval Reconciliations and WWTP Permanent Controls Project will not retrospectively cause the initial construction of SPM to require Prevention of Significant Deterioration (PSD) permitting under 25 Pa. Code §127.83 for any additional regulated PSD pollutants relative to the PSD applicability determinations that were made contemporaneous with DEP's authorization of the initial construction of SPM. However, Shell will be updating the most recent air quality analysis that was completed for the initial construction of SPM due to proposed changes to emissions unit-specific and facility-wide potential emissions of carbon monoxide (CO), nitrogen oxide (NO_x), and particulate matter (PM) with an aerodynamic diameter less than or equal to 10 micrometers (PM₁₀) associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project.

As discussed above, the EMACT Project is a separate, standalone project with respect to the NSR permitting programs. Because SPM is currently a PSD major stationary source, PSD permitting requirements will be applicable to the EMACT Project because the project will result in significant net emissions increases of NO_x and CO. Additionally, although the EMACT Project will not result in a significant net emissions increase in direct emissions of PM with an aerodynamic diameter less than or equal to 2.5 micrometers (PM_{2.5}), the project is subject to PSD review for PM_{2.5} because it will result in a significant net emissions increase in NO_x, which is regulated as a precursor to PM_{2.5}.

SPM is located adjacent to the Ohio River in the Borough of Monaca. The approximate Universal Transverse Mercator (UTM) coordinates of the facility are 556,129 meters east and 4,502,450 meters north (UTM Zone 17, NAD 83).

The proposed emissions below represent the total facility-wide emissions, including the emissions increases associated with the EMACT Project and updates associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project.

Proposed Emissions and BACT

| <i>Criteria Pollutant</i> | <i>Emissions</i> | | <i>Emission Factor (AP-42, Stack Test, Other?)</i> | <i>Proposed BACT</i> |
|---------------------------|---------------------------------------|--|--|----------------------|
| | <i>Maximum hourly (lb/hr)</i> | <i>Proposed Annual (tons/yr)</i> | | |
| Nitrogen Oxides | 159 | 695 | Various | Various |
| Sulfur Dioxide | 17.4 | 76.1 | NA | NA |
| Particulate Matter | 77.9 | 341 | Various | Various |
| Sulfuric Acid Mist | 0.84 | 3.69 | NA | NA |

Proximity to Class I Areas

| | | | |
|------------------------------------|------------------|--|--|
| <i>Class I Area</i> | See table below. | | |
| <i>Distance from Facility (km)</i> | See table below. | | |

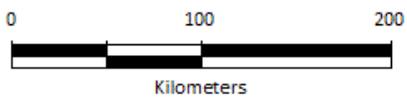
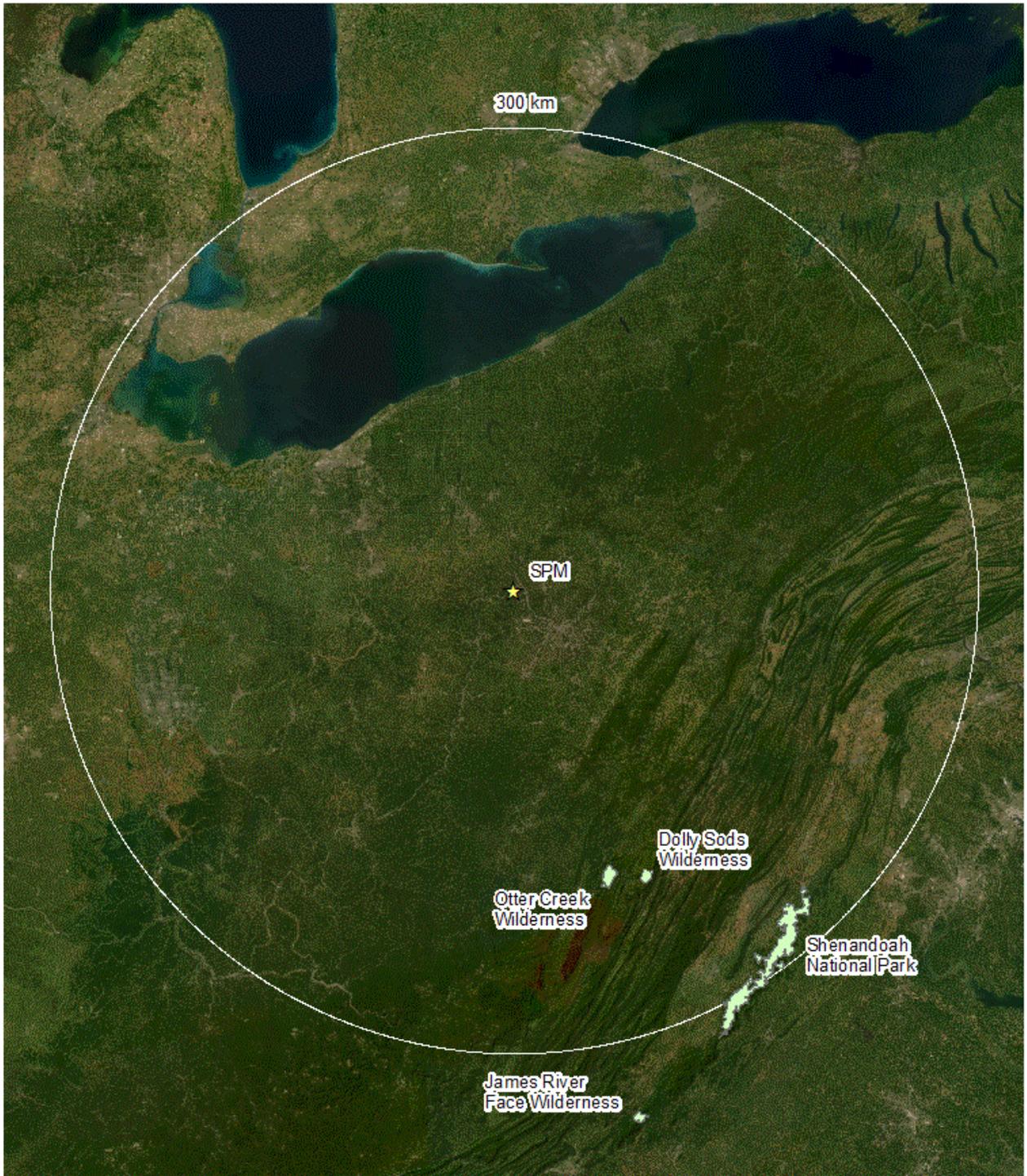
| Pollutant | Facility-wide Annual Emissions (tpy) | SPM Annual Emissions Q (tpy) |
|--------------------------------|---|-------------------------------------|
| SO ₂ | 76.1 | 1,116 |
| NO _x | 695 | |
| PM ₁₀ | 341 | |
| H ₂ SO ₄ | 3.69 | |

| Class I Area | FLM | Approx. Distance from SPM (km) | SPM Annual Emissions Q¹ (tpy) | Q/D | AQRV Required? (Y/N?) |
|---------------------|------------|---------------------------------------|---|------------|------------------------------|
| Otter Creek | USFS | 189 | 1,116 | 5.9 | N |
| Dolly Sods | USFS | 200 | | 5.6 | N |
| Shenandoah | NPS | 269 | | 4.1 | N |
| James River Face | USFS | 347 | | 3.2 | N |

1. Q/D screening analysis is based on the total SO₂, NO_x, PM₁₀, and H₂SO₄ annual emissions in tons per year, calculated based on 24-hour maximum allowable emissions in accordance with FLAG 2010 guidance.

A Q/D screening analysis was conducted to evaluate SPM's potential impacts on federally protected Class I areas, consistent with the Federal Land Manager's (FLM's) Air Quality Related Value (AQRV) Work Group (FLAG) 2010 guidance. The ratio of the sum of emissions of sulfur dioxide (SO₂), NO_x, PM₁₀, and sulfuric acid mist (H₂SO₄) to the distance between SPM and each nearby Class I area was determined and compared to a threshold of 10. Annual emissions were calculated based on the 24-hour maximum allowable emissions in accordance with FLAG 2010 guidance. Per the guidance, if Q/D is less than or equal to 10, the facility is presumed not to have an adverse impact. As shown in the table above, the ratio of Q/D is less than 10 for each Class I area within 300 km of SPM. As such, SPM is not expected to have a significant impact on any AQRV at the above Class I areas. Shell does not plan to conduct an AQRV analysis for SPM and requests that the FLM provide written concurrence of the finding of no impact based on the results of the Q/D screening presented above.

As detailed in the modeling protocol dated June 5, 2024 and approved by DEP on June 6, 2024, Class I significance will be evaluated using an arc of receptors spaced at 1 degree intervals located 50 km from SPM. The receptors will be placed between the three Class I areas that are located within 300 km of SPM. AERMOD will be run to derive a conservative estimate of impacts. If impacts are insignificant when compared to the Class I significant impact levels, no additional evaluation will be conducted. Preliminary modeling indicates insignificant Class I impacts for both the EMACT Project and Plan Approval Reconciliations and WWTP Permanent Controls Project.



| | |
|---|----------------------------|
| <p>Location of SPM and Nearby Class I Areas</p> | <p>Figure 1</p> |
|---|----------------------------|

For Additional Information or Questions, Contact Melanie Pitrolo
(828) 257-4213 or mpitrolo@fs.fed.us

APPENDIX D-2

ADDITIONAL IMPACTS ANALYSIS: POTENTIAL GROWTH IMPACTS AND IMPAIRMENT TO SOILS AND VEGETATION FOR SHELL POLYMERS MONACA BEAVER COUNTY, PENNSYLVANIA



September 2024 (Revised May 2025)

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Executive Summary

This document presents the additional impacts analysis conducted for Shell Polymers Monaca (SPM) in Beaver County, Pennsylvania. This analysis is required by 25 Pa. Code §127.83, which incorporates by reference the “additional impacts analysis” requirements found in the federal Prevention of Significant Deterioration (PSD) program at 40 CFR §52.21(o).

Shell Chemical Appalachia LLC (Shell) submitted RTP’s initial analysis to the Pennsylvania Department of Environmental Protection (DEP) in April of 2014, as part of its preconstruction plan approval application for SPM. The 2014 analysis included those pollutants that were required to be evaluated as part of the initial plan approval application, including carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM) with an aerodynamic diameter less than or equal to 10 microns (PM₁₀). A revised additional impacts analysis is now necessary to address the following changes.

- The Wastewater Treatment Plant (WWTP) Permanent Controls Project, which will improve the oils, grease, and volatile organic compound (VOC) removal efficiency of the primary treatment section of SPM’s WWTP. Shell is currently using temporary equipment to achieve improved removal efficiencies and is now proposing to install permanent equipment.
- The Ethylene Maximum Achievable Control Technology (EMACT) Project, which is necessary to comply with the 40 Code of Federal Regulations (CFR) 63 Subpart YY pressure-assisted multi-point flare minimum net heating value of flare combustion zone gas (NHV_{cz}) requirement that recently became applicable to the Totally Enclosed Ground Flare (TEGF) A and TEGF B. Supplemental gas will be utilized as necessary in order to achieve compliance with the minimum NHV_{cz} currently required by 40 CFR 63 Subpart YY for the two TEGFs.
- After a thorough review of SPM’s as-built operations and plan approval source inventory, potential emissions calculations, and conditions, Shell is proposing to reconcile specific plan approval source descriptions, conditions, and supporting

potential to emit calculations. These proposed reconciliations are collectively referred to by Shell as the “Plan Approval Reconciliations”. A detailed description of all proposed reconciliations is provided in the plan approval application.

Shell has retrospectively evaluated the Plan Approval Reconciliations and WWTP Permanent Controls Project together as part of the initial construction of SPM for the following reasons:

- The relatively close timing between the Plan Approval Reconciliations and WWTP Permanent Controls Project and the recently completed initial construction of the facility;
- The Plan Approval Reconciliations represent as-built changes to the facility’s initial construction plan approvals; and
- The WWTP Permanent Controls Project represents needed improvements to the initial construction of the facility’s WWTP.

On the other hand, Shell has evaluated the EMACT Project separately from the Plan Approval Reconciliations, WWTP Permanent Controls Project, and initial construction of SPM because the EMACT Project is a regulatory driven project that is only being implemented at the facility to comply with newly effective federal regulatory requirements that are applicable to ethylene production units across the country.

The attainment status designations for SPM’s location contemporaneous with DEP’s issuance of PA-04-00740A, which authorized the initial construction and operation of SPM, are the relevant designations for the retrospective New Source Review (NSR) applicability analysis performed for the Plan Approval Reconciliations and WWTP Permanent Controls Project. Although Beaver County is currently designated as attainment for PM_{2.5}, the county was designated as nonattainment for PM_{2.5} when DEP issued PA-04-00740A to Shell. The remaining currently effective attainment status designations for SPM’s location are unchanged from the attainment status designations that were in effect when DEP issued PA-04-00740A. Thus, Shell evaluated the Plan

Approval Reconciliations and WWTP Permanent Controls Project in regard to DEP's Nonattainment NSR (NNSR) regulations (25 Pa. Code §§127.201 to 127.218) for ozone (NO_x and VOC), PM with an aerodynamic diameter less than or equal to 2.5 micrometers (PM_{2.5}), sulfur dioxide (SO₂), and lead, while Shell evaluated the same changes in regard to DEP's PSD regulations (25 Pa. Code §§127.81 to 127.83) for CO, nitrogen dioxide (NO₂) (NO_x), PM₁₀, and all other regulated PSD pollutants.

The Plan Approval Reconciliations and WWTP Permanent Controls Project will not retrospectively cause the initial construction of SPM to require PSD permitting under 25 Pa. Code §127.83 for any additional regulated PSD pollutants relative to the PSD applicability determinations that were made contemporaneous with DEP's authorization of the initial construction of SPM. However, with this submittal Shell has updated the most recent additional impacts analysis that was completed for the initial construction of SPM due to the proposed changes to emissions unit-specific and facility-wide potential emissions of CO, NO_x, and PM₁₀ associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project.

As mentioned previously, the EACT Project is a separate, standalone project with respect to the NSR permitting programs. Because SPM is currently a PSD major stationary source, PSD permitting requirements are applicable to the EACT Project because the project will result in significant net emissions increases of NO_x and CO. Additionally, although the EACT Project will not result in a significant net emissions increase in direct emissions of PM_{2.5}, the project is subject to PSD review for PM_{2.5} because it will result in a significant net emissions increase in NO_x, which is regulated as a precursor to PM_{2.5} per 40 CFR 52.21 (b)(23)(i). As such, PM_{2.5} has been added to this revised additional impacts analysis.

This revised additional impacts analysis considers total facility-wide emissions from SPM and reflects both the Plan Approval Reconciliations and WWTP Permanent Controls Project as well as the EACT Project. The results of this revised additional impacts analysis show that SPM remains unlikely to cause adverse impacts due to growth, or impairment of soils or vegetation. Because the total emissions from SPM,

which include the EMACT Project, show no adverse impact or impairment, the EMACT Project was not separately evaluated. However, because the EMACT Project's emissions increases are small in comparison to SPM as a whole, the EMACT Project's smaller emissions increases would individually show no adverse impact or impairment.

1.0 Potential Impacts Due to Growth

1.1 Overview

SPM is a major stationary source (major source) subject to PSD program requirements, including the requirement to analyze general commercial, residential, industrial, and other growth associated with the major source in accordance with 40 CFR 52.21(o). Permit applicants use the growth analysis, in conjunction with the analysis of air quality impacts, to assess the impacts of activities that are not a part of the major source but can reasonably be expected to occur because of the major source.

The growth analysis focuses on the permanent impacts during the operational phase of a project. Aggregate air quality impacts during the construction phase of the project are small in relation to the impacts during the operational phase, and permit applicants are not required to consider these emissions in the growth analysis.¹ Furthermore, the proposed Plan Approval Reconciliations and WWTP Permanent Controls Project and EMACT Project will only require minimal on-site construction activities.

For SPM, quantifiable growth includes commercial and residential growth related to growth in the workforce. Shell expects no industrial growth in the immediate area because existing markets for SPM's products already exist within the area. Moreover, SPM does not produce the primary raw material (ethane), but instead receives ethane by pipeline from remote locations. No further processing of SPM's products is required; therefore, no quantifiable industrial growth is expected to occur in the area because of the projects. This conclusion remains unchanged since the 2014 application.

1.2 Growth in Commuter Population

SPM is located in Beaver County, Potter Township, Pennsylvania, approximately 35 miles northwest of Pittsburgh. The County is bordered on five sides by Allegheny,

¹ EPA interpretive policy expressly calls for consideration of only "permanent residential, commercial, and industrial growth," excluding "temporary sources," in the growth analysis under 40 CFR § 52.21(o). See, e.g., *Prevention of Significant Deterioration Workshop Manual* (EPA-450/2-80-081), Oct. 1980, at page I-D-5.

Butler, Lawrence, and Washington Counties in Pennsylvania; Hancock County in West Virginia; and Columbiana County in Ohio. A 24-mile radius (the largest impact area) from the site also includes Brooke County in West Virginia, and Jefferson and Mahoning County in Ohio. The study area is comprised of this ten-county area, consistent with the 2014 analysis.

Shell originally estimated that upon completion of construction, SPM would employ approximately 400-600 skilled workers to maintain operations. This estimate proved accurate; after completion of construction, Shell employs approximately 600 skilled workers.² Shell filled most of these permanent jobs from the local population.³ As the plant converted from zinc smelting to cracker operations, no net change in the permanent workforce occurred, because Horsehead Corporation formerly employed approximately 600 workers at the site. Thus, no residential growth was expected due to direct job growth in Potter Township. The U.S. Census Bureau confirms that the total number of housing units in Potter Township has not significantly increased since 2010.⁴

When considering indirect and induced job growth, Shell estimated that SPM would increase local employment by as much as 2,000-8,000. A recent study, completed by Robert Morris University, revised that estimate to 10,127 jobs in the Southwestern Pennsylvania area with a large majority occurring in Beaver County.⁵

In 2014, RTP used commuter flow patterns from the U.S. Census Bureau to estimate motor vehicle emissions related to indirect job growth. With this submittal, the 2014 analysis was updated for the 10 surrounding counties, and also considers other parts of

² Francis, Thomas, "Pennsylvania Plant Brings Jobs, Skills and Opportunity," Shell News and Insights, Oct. 12, 2022. (available at: <https://www.shell.com/news-and-insights/inside-energy-stories/western-pennsylvania-plant-brings-jobs-skills-and-opportunity.html>; last accessed May 15, 2024).

³ Minutolo, Marcel C., et.al, "Updated Economic Impact Analysis: Petrochemical Facility in Beaver County, Pennsylvania," Robert Morris University, April 2021.

⁴ U.S. Census Bureau, Occupancy Status (available at <https://data.census.gov/table/DECENNIALPL2020.H1?q=060XX00US4200762352>; last accessed May 15, 2024).

⁵ *Id.* at 3.

Southwestern Pennsylvania noted in the Robert Morris University study, assuming all workers commute to Beaver County.⁶

According to census data from 2016-2020, of the people who worked in Beaver County, approximately 70% of the commuters also live in Beaver County.⁷ The remaining 30% of commuters primarily commute from Allegheny, Butler, and Lawrence Counties in Pennsylvania, and Columbiana County in Ohio. See Table 1. Consistent with the methodology used in the 2014 analysis, counties with one percent or less commuting to Beaver County were excluded from further consideration in this growth analysis.⁸

Table 1. Commuter Flow of Beaver County Workers⁹

| County and State of Residence | Number Commuting to Beaver County | Margin of Error (+ or -) | Percent from County |
|--------------------------------------|--|---------------------------------|----------------------------|
| Allegheny, PA | 5,783 | 485 | 10% |
| Beaver, PA | 41,285 | 1,164 | 71% |
| Butler, PA | 1,883 | 373 | 3% |
| Columbiana, OH | 2,612 | 331 | 4% |
| Lawrence, PA | 3,818 | 377 | 6% |

1.3 Growth in Air Pollutant Emissions

Based on job growth of 10,127 individuals, SPM’s operations are not expected to cause significant indirect pollution growth in Beaver County or surrounding counties. The following updates our previous growth projections in the 2014 application.

A. Stationary Source Emissions

In 2014, RTP predicted that no quantifiable industrial growth would occur as a direct result of SPM; no increase in air pollutant emissions from stationary sources would

⁶ The 10 counties addressed in the original 2014 analysis include Allegheny, Beaver, Butler, Lawrence, and Washington Counties in Pennsylvania; Columbiana and Mahoning Counties in Ohio; and Brooke, Jefferson, and Hancock Counties in West Virginia.

⁷ Counties with a margin of error greater than the estimated number of commuters were excluded.

⁸ See Table 2 Residence County to Workplace County Flows for the United States and Puerto Rico Sorted by Workplace Geography: 2006-2010. Available at: <https://www.census.gov/data/tables/2020/demo/metro-micro/commuting-flows-2020.html>

⁹Data from U.S. Census Bureau; American Community Survey Data 2016-2020 5- Year ACS Commuting Flows, Table DP03(available at: Source: 2016-2020 5-Year ACS Commuting Flows <https://www.census.gov/data/tables/2020/demo/metro-micro/commuting-flows-2020.html>; last accessed May 15, 2024.)

occur within the area; and that even if significant growth occurred, emissions offsets would mitigate any impact for criteria air pollutants of particular concern. To re-confirm these conclusions, a comparison of the 2014 and 2020 National Emission Inventory (NEI) was completed and no new stationary sources attributable to SPM were identified. In fact, there is a substantial decline in emissions in Beaver County due to a shutdown of the Bruce Mansfield and AES Beaver Valley Electrical Generation Stations.

According to EPA interpretive policy relating to the recommended elements of the growth analysis required by 40 CFR § 52.21(o), mobile source tailpipe emissions may be excluded from consideration.¹⁰ RTP, nonetheless, included motor vehicle exhaust emissions in its 2014 growth analysis to ensure a conservative analysis, because mobile source emissions were predicted to be the single largest cause of area source emissions growth associated with the project. The previous mobile source emissions impact projections have been revised and show lower impacts from indirect job growth than originally estimated. This is consistent with an overall decline in mobile source emissions nationally due to more stringent motor vehicle emission standards and resulting mobile source emissions controls.

i. Tank Trucks

SPM uses tank trucks to transport a portion of the facility's product output and incoming supplies. RTP originally estimated these emissions using the following methodology and conservative assumptions; the number of truck trips has been reduced from 60 roundtrips per day to 45 roundtrips per day:

- Approximately 16,425 roundtrips are anticipated annually.¹¹
- Truck roundtrips are expected to include an average of approximately 100 miles each, with an expected total travel of 1.6 million miles per year. Most of these miles occur outside the impact area, but RTP included the total mileage within the analysis as a conservative approach.

¹⁰ See, e.g., *Prevention of Significant Deterioration Workshop Manual* (EPA-450/2-80-081), Oct. 1980, at page I-D-5.

¹¹ Based on an estimated 90 total trips per day and 45 roundtrips per day.

- Using EPA's average ratio of 3.031 brake horsepower-hour per mile for heavy duty diesel vehicles,¹² the total annual energy output of tanker trucks in the affected area is 5.0 million brake horsepower hours.
- RTP used the exhaust emission standards for model 2007 and later diesel heavy-duty engines at 40 CFR § 86.007-11 to calculate emissions of each pollutant.

Table 2 shows the estimated emissions from tank truck exhaust.

Table 2. Tank Truck Exhaust Emissions Increase

| Pollutant | Emission Factor (g/bhp-hr) | Emissions (tons/yr) |
|--------------------------------------|-----------------------------------|----------------------------|
| CO | 15.5 | 85 |
| NOx | 0.2 | 1.1 |
| PM ₁₀ , PM _{2.5} | 0.01 | 0.055 |
| VOC (NMHC) | 0.14 | 0.77 |

ii. Passenger Vehicles

Job growth in the impact area would lead to increased commuter motor vehicle use. In the 2014 analysis, RTP reported that the U.S. Census bureau estimated a 25.5 minute average commute time for American workers, but that no information on the average distance commuters travel was readily available.¹³ RTP estimated emissions increases using 2008 EPA emissions factors for heavy duty gasoline vehicles and light duty gasoline vehicles by proportionally growing the population and mobile emissions inventory in the nine counties (excluding Jefferson County, West Virginia) in proportion to the estimated increase in jobs.

Enhanced data availability now allows for a more refined analysis of mobile source impacts from job growth. Data available through the Federal Highway Administration reports that an average person drives 6,256 miles per year to work and an additional

¹² *Update Heavy-Duty Engine Emission Conversion Factors for MOBILE6: Analysis of BSFCs and Calculation of Heavy-Duty Engine Emission Conversion Factors* (EPA-420/R-02-005), Jan. 2002, at p. 16. The factor provided is for Class 8B trucks, which are those with a gross vehicle weight in excess of 60,000 lbs.

¹³ See "Megacommuters: 600,000 in U.S. Travel in 90 Minutes and 50 miles to Work, and 10.8 Million travel an hour each way, Census Bureau Reports," U.S. Census Newsroom, Mar. 5, 2013.

2,078 miles for work-related travel.¹⁴ The U.S. Census Bureau includes county-level data on the mode of transportation to work¹⁵, and both Pennsylvania Department of Transportation (PennDOT) and Ohio Department of Public Safety report vehicle registration data by type of vehicle.¹⁶ Using an average emission factor (grams per mile) by type of vehicle, RTP estimated mobile source emissions using total annual mileage estimates and emissions factors developed based on EPA’s MOVES4.0 mobile emissions simulator model, for each vehicle type (gasoline and diesel passenger, light duty trucks, and heavy duty trucks, and electric vehicles).¹⁷ The following assumptions were used:

- Each additional job resulted in 8,334 miles per year if traveling alone to work; 4,167 miles per year if carpooling; and 2,778 if using public transportation.
- Workers who work at home; use other means of transport; or walk were treated as traveling alone to work to assure conservatism in the estimate.¹⁸
- Statewide percent of electric vehicle registrations were used for all counties (2.68% Pennsylvania, 2.0% Ohio).¹⁹ Note, vehicles are assumed to be hybrid vehicles rather than full electric vehicles.
- After considering electric vehicles, the remaining vehicle use was split between diesel and gasoline use in proportion to the 2020 NEI: light duty passenger cars

¹⁴ “Average Annual Person-Trips, Person-Miles, and Trip Length per Household by Purpose,” U.S. Department of Transportation, Bureau of Transportation and Statistics, Sept. 7, 2016 (reporting on information from the Federal Highway Administration.) Available at: https://www.bts.gov/archive/publications/passenger_travel_2016/tables/fig2_3; last accessed May 17, 2024.)

¹⁵ U.S. Census Bureau; American Community Survey 2016-2020, data sheet DP0; available at: <https://data.census.gov/table/ACSDP1Y2014.DP03?g=050XX00US42007>; last accessed May 15, 2024.

¹⁶ “Annual Report of Registrations,” PennDOT Driver and Vehicle Services, 2023; available at: <https://www.dot.state.pa.us/public/DVSPubsForms/BMV/Registration%20Reports/ReportofRegistration2023.pdf>; last accessed May 14, 2024; and “Tax Distribution – Detailed State of Motor Vehicle Registrations for year 2023, OH Dept of Public Safety, 2023; available at: <https://bmv.ohio.gov/links/2023-Taxing-District-Breakdown-by-Vehicle-Type.pdf>; last accessed May 15, 2024.

¹⁷ “Estimated National Average Vehicle Emissions Rates per Vehicle by Vehicle Type Using Gasoline and Diesel (grams per mile),” U.S. Department of Transportation, Bureau of Transportation Statistics, undated; available for download at: [Estimated U.S. Average Vehicle Emissions Rates per Vehicle by Vehicle Type Using Gasoline and Diesel | Bureau of Transportation Statistics \(bts.gov\)](https://www.bts.gov/publications/tables/Estimated_National_Average_Vehicle_Emissions_Rates_per_Vehicle_by_Vehicle_Type_Using_Gasoline_and_Diesel); last accessed May 17, 2024.

¹⁸ U.S. Census Bureau; American Community Survey 2016-2020, data sheet DP0; available at: <https://data.census.gov/table/ACSDP1Y2014.DP03?g=050XX00US42007>; last accessed May 15, 2024.

¹⁹ “Vehicle Registration Counts by State,” Alternate Fuels Data Center, U.S. Department of Energy, 2022; available at <https://afdc.energy.gov/vehicle-registration>; last accessed May 17, 2025.

and trucks (gasoline 84%; diesel 16%), and heavy duty trucks (gasoline 8%; diesel 92%).²⁰

Table 3 shows emissions growth from indirect commuter traffic by vehicle type over the five counties with greater than 1% of the population commuting to Beaver County (Allegheny, Beaver, Butler, Lawrence, Columbiana) and Table 4 displays the change in total emissions between the 2014 and 2024 estimates. This revised analysis shows a smaller increase in mobile source emissions (with the exception of PM_{2.5}) which is attributable to the refined analysis applying current emissions factors based on vehicle type, and improved emissions controls on mobile sources.

Table 3. Motor Vehicle Emissions Increase Related to Employment Growth in Beaver County, Pennsylvania by Vehicle Type

| Emission Type | Gasoline (tpy) | | | | | Diesel (tpy) | | Electric Hybrid (tpy) | Emissions Total (tpy) |
|------------------------------|----------------|------------------|--------|--------------------|------------|----------------|------------------|-----------------------|-----------------------|
| | Light Duty Car | Light Duty Truck | Buses | Heavy Duty Vehicle | Motorcycle | Light Duty Car | Light Duty Truck | Light Duty Car | |
| Total VOC | 13.9 | 2.23 | 0.44 | 0.30 | 0.82 | 1.03 | 0.43 | 0.43 | 19.6 |
| Exhaust CO | 169 | 28.3 | 10.2 | 2.13 | 3.75 | 4.79 | 3.06 | 5.22 | 226 |
| Exhaust NO _x | 7.20 | 1.68 | 0.13 | 0.11 | 0.18 | 0.59 | 2.34 | 0.22 | 12.5 |
| Exhaust PM _{2.5} | 0.091 | 0.023 | 0.0063 | 0.0042 | 0.0059 | 0.0012 | 0.10 | 0.0028 | 0.24 |
| Brake Wear PM _{2.5} | 0.14 | 0.023 | 0.0021 | 0.0015 | 0.0006 | 3.54E-06 | 0.0044 | 0.0013 | 0.17 |
| Tire Wear PM _{2.5} | 0.045 | 0.0076 | 0.0007 | 0.0006 | 0.0003 | 3.50E-09 | 0.0029 | 0.0013 | 0.058 |

Table 4. Comparison of 2014 and 2024 Revised Estimates of Project-Related Motor Vehicle Emissions from Indirect Employment Growth (2014 vs. 2024)

| Pollutant | 2014 Estimated Emissions Increases (tpy) | 2024 Revised Estimated Emissions Increases (tpy) |
|-------------------|--|--|
| CO | 1,243 | 390 |
| NO _x | 85 | 19 |
| PM ₁₀ | 0.58 | 0.58* |
| PM _{2.5} | 0.54 | 0.55 |
| VOC | 137 | 33 |

*Revised emission factors for PM₁₀ are unavailable; therefore, PM₁₀ is conservatively assumed equal to the estimated increase in 2014.

²⁰ Available at: <https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-data>

B. Other Area Source Emissions

Residential and commercial growth in an area can cause increased emissions from various categories of area sources. These categories include residential and commercial fuel combustion, solvent usage, and waste disposal, commercial cooking, commercial marine vessels, and gas stations. RTP originally projected emissions increases in these categories by applying an estimated population growth rate (0.04%) to the existing inventory for the nine counties in proportion to each county's expected contribution to growth (as represented by the commuter patterns).²¹ Table 5 reflects our original 2014 estimate.

Table 5. Other Area Source Emissions Increases Compared to Current Inventory

| Pollutant | 2011 Emissions from Other Area Sources (tpy) | Emissions Increases (tpy) |
|-------------------|---|----------------------------------|
| CO | 30,046 | 133 |
| NOx | 8,535 | 46 |
| PM ₁₀ | 5,802 | 28 |
| PM _{2.5} | 4,365 | 23 |
| VOC | 19,000 | 80 |

Since the 2014 analysis, Beaver County has experienced a 2% decline in population (2014-2024), and each of the ten counties included in the study area are expected to experience continued population decline over the coming decades.²² Accordingly, the original estimates have been revised to include no emissions growth from other area source emissions, as existing resources are likely able to meet population demands.

C. Total Emissions Growth

Table 6 summarizes the anticipated increases in emissions due to residential and commercial growth associated with SPM. With refinements in the analysis, the revised

²¹ "Beaver County, Pennsylvania Population 2024 165,525," World Population Review, undated; available at: [Beaver County, Pennsylvania Population 2024 \(worldpopulationreview.com\)](https://www.worldpopulationreview.com/countries/pennsylvania-population-2024); last accessed May 17, 2024.

²² "Pennsylvania Population Projections 2050: A First Look," Center for Rural Pennsylvania, October 2023; available at https://www.rural.pa.gov/getfile.cfm?file=Resources/PDFs/Access%20PASS%20Final%20Population%20Projections%20Fact%20Sheet_.pdf&view=true; last accessed May 17,2024.

emissions estimates across the five counties with greater than 1% of the population commuting to Beaver County (Allegheny, Beaver, Butler, Lawrence, and Columbiana) remain small in comparison to the total emissions inventory for these areas. No changes to these estimates are predicted for the EMACT Project because the project is not expected to directly or indirectly affect job growth.

Table 6. Emissions Increases from Residential and Commercial Growth Due to SPM

| Pollutant | Previous Estimate (2014) Total Emissions Increase (tpy) | Revised Estimate (2024) Total Emissions Increase (tpy) |
|-------------------|--|---|
| CO | 1,490 | 505 |
| NOx | 133 | 20.5 |
| PM ₁₀ | 29 | 1.28 |
| PM _{2.5} | 24 | 1.25 |
| VOC | 218 | 1.33 |

Residential and commercial growth associated with SPM may result in slight increases in air pollutant emissions in the surrounding area. Because the anticipated emissions increases are very small in relation to the existing emissions inventory and direct project emissions, the impact on ambient air pollutant concentrations will not be significant and no adverse impacts are anticipated.

2.0 Potential Impacts to Soils and Vegetation

2.1 Overview

SPM is a major source subject to PSD program requirements, including an analysis of impairment to soils and vegetation that might occur because of the emissions from the proposed projects per 40 CFR 52.21(o)(1). In 2014, Shell estimated that operation of SPM would result in significant emissions increases of NO_x, CO, and PM₁₀. The EMACT Project will result in a significant net emissions increase for NO_x and CO. Because NO_x is now regulated as a precursor to PM_{2.5} under 40 CFR 52.21, and Beaver County was redesignated as a PM_{2.5} maintenance area in October 2015, PM_{2.5} was also included in this revised analysis. NO_x is also a precursor to the formation of ozone, but Pennsylvania is in the ozone transport region and must comply with nonattainment requirements for ozone rather than PSD. Ozone (O₃), therefore, is not addressed in this analysis.

The results of the soils and vegetation impact analyses show that no significant impairment will occur because of the as-built facility, including the Plan Approval Reconciliations and WWTP Permanent Controls Project and EMACT Project. Specific findings are documented in the following subsections.

2.2 Potential Acidification of Soils

For purposes of the soil analysis, information related to soils in the Beaver County area was reviewed. The Natural Resources Conservation Service (NRCS) has published soil survey data collectively covering Beaver and Lawrence counties.²³ The total land area in Beaver County covered by this analysis is approximately 447 square miles. This

²³ "Soil Survey of Beaver and Lawrence Counties, Pennsylvania," USDA Soil Conservation Service in cooperation with Penn. State University, Issued April 192. Available at <https://archive.org/details/BeaverLawrencePA1982/mode/2up> (last accessed May 14, 2024).

exceeds the scope suggested by EPA guidance, which is limited to the area within approximately 10 kilometers of the facility.²⁴

The assessment of potential impacts on soil shows no likelihood of impairment from SPM. The basis for this conclusion is summarized below. This conclusion is likely representative of the lack of impairment throughout the larger 10-county area. This is because greater levels of deposition to soil and a higher potential for impairment occur closer to the source. Having found no likelihood of impairment within Beaver County, there is no likelihood of impairment further from SPM.

At least 10 different soil types exist in the Beaver County area.²⁵ Some of these soils are moderate to well-drained, while others exhibit poor drainage characteristics. Most of the soils in the NRCS maps units are classified as various varieties of silt loam, with the surface soil pH ranging from 4.6 to 7.0.

Deposition of NO_x and other nitrogen compounds into soils in the impact area could result from facility emissions. In the 2014 analysis, RTP considered whether some marginal acidification of the soils might occur because of SPM and concluded that no impairment to soil was likely to result. Current information shows a decrease in local acidification indicators.

Changes in soil acidity caused by nitrogen deposition can affect tree growth and lake and stream acidification through nitrate (NO₃-) leaching. In 2007, the U.S. Department of Agriculture (USDA) Forest Service undertook an assessment to estimate critical acid loads (CAL) and exceedances for forest soils in the United States.²⁶ A critical load (CL) is an estimate of ecosystem exposure to a pollutant below which harmful ecosystem effects do not occur, and above which there is an increased risk of adverse effects. A soil's acid neutralizing capacity (ANC) will affect an area's CL. The ANC is the ability of

²⁴ See, e.g., *Prevention of Significant Deterioration Workshop Manual* (EPA-450/2-80-081), Oct. 1980, at page I-D-6, expressly limiting the soils and vegetation impairment analysis to the "impact area." See, also, the same document at page I-C-12, defining the impact area as "a circular area whose radius is equal to the greatest distance from the source to which approved dispersion modeling shows the proposed emissions will have a significant impact."

²⁵ Beaver River Conservation and Management Plan, Penn. Environmental Council, August 2008.

²⁶ "Estimates of critical acid loads and exceedances for forest soils across the conterminous United States," Steven G. McNulty, *et. al.*, *Environmental Pollution* 149 (2007) 281-292.

the soil to buffer acids. Critical loads are typically expressed in terms of kilograms per hectare per year (kg/ha/yr) of wet or total (wet + dry) deposition and consider the soil's ANC. For acidification, CAL is a function of both nitrogen and sulfur deposition. The 2007 assessment reported areas in Western Pennsylvania as having a CAL between 1000-2000 eq/ha/yr, with exceedances in the area between 250-500 eq/ha/yr based on 1994-2000 data.

Importantly, however, the study concluded that these findings were preliminary, and that additional research was needed before a CAL exceedance should be used as a tool for identifying areas of potential concern. There is "no simple dose-response relationship between acid loads and soil or water chemistry."²⁷ Target loads (a policy decision on the level of acceptable load) have not been defined for Western Pennsylvania, nor were any updated CAL values specific to the area location.

The CAL exceedance estimates in the 2007 study were based on 1994-2000 data which occurred before NO_x and SO₂ emissions reductions occurred due to the Acid Rain Program, the Clean Air Interstate Rule (CAIR), the Cross-State Air Pollution Rule (CSAPR), the NO_x SIP call, and other 1990 Clean Air Act Amendment emissions reductions programs. In fact, the EPA reports a 65% decline in national average NO₂ ambient air concentrations (based on annual 98th percentile of daily maximum 1-hour average values) and a 94% decline in national average SO₂ ambient air concentrations (based on the annual 99th percentile of daily maximum 1-hour averages) between the years 1980-2022.²⁸ Beaver County, specifically, has seen large decreases in NO_x and SO_x due to closure of two coal-fired power plants.

It is, however, generally recognized that broad areas of the entire eastern U.S. are likely exceeding empirical CL estimates for nitrogen for some vegetative species. Studies for the broad Northeastern U.S. region have shown that nitrogen leaching begins to increase in some forest soils at atmospheric nitrogen deposition rates greater than 8-12

²⁷ "Critical Loads for Air Pollution: Measuring the Risks to Ecosystems," New York State Energy Research and Development Authority (NYSERDA), Report Number 14-24, May 2014.

²⁸ See EPA emissions trends reports available at <http://www.epa.gov/airtrends/>.

kg N/ha/yr,²⁹ Leaching, however, does not directly equate to an adverse effect, as the effect is related to the CAL/ANC, and can be both positive or negative, depending on the species affected (e.g. stunted growth of an invasive species would be a positive effect.)

EPA reported recommended CL values in its “Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur and Particulate Matter” for eastern temperate forests ranging between less than 3 kg N/ha/yr (for lichens) to 21 kg N/ha/yr (for herbaceous plants).³⁰ (Notably, the lichen CL was developed in the Western U.S. and extrapolated nationwide and may not be representative of Western Pennsylvania.) The U.K. recommended critical load levels for broadleaved, deciduous woodlands, like those found in Beaver County, are 10-20 kg N/ha/yr; for coniferous woodland is 5-15 kg N/ha/yr; and for mountain hay, and low and medium hay meadows are 10-20 kg N/ha/yr and 20-30 kg N/ha/yr, respectively. Although these are recommended values, EPA also acknowledges that there is no “definitive’ CL for an ecological effect”; considerable uncertainty continues to remain with respect to CL science and establishing a target load for acceptable levels of deposition.³¹

Improvements (decreases) in acid loading in Western Pennsylvania can be seen in monitoring data from the National Atmospheric Deposition Program (NADP).³² The NADP collects pollutant deposition data from several national monitoring networks. Data collected at the Allegheny Portage Monitoring Station, located 115 miles east of Beaver County, show measured improvements in the 3-year average pH from 4.85 to 5.34 occurring between 2012 and 2022. Similarly, there is a marked decrease in nitrogen deposition between 2012 and 2022 from 15.67 kg/ha to 7.735 kg/ha.

Four additional monitoring sites located in Western Pennsylvania show improvements in nitrogen deposition loading since the 2014 analysis. The sites include the New Site

²⁹ “Setting Limits: Using Air Pollution Thresholds to Protect and Restore U.S. Ecosystems,” Issues in Ecology, Report No. 14, Fall 2011. Available at: <http://www.esa.org/esa/wp-content/uploads/2013/03/issuesinecology14.pdf>.

³⁰ “Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur and Particulate Matter,” EPA/600R-20/278, p. ES-17, September 2020.

³¹ *Id.*

³² <https://nadp.slh.wisc.edu/networks/national-trends-network/>

Piney Reservoir (approximately 95 miles southeast), Goddard State Park (approximately 62 miles, north), Laurel Hill State Park (approximately 87 miles, southeast), Crooked Creek Lake (approximately 55 miles, east). The 2012 monitoring data from these sites recorded annual NO₃ deposition rates of 7.23 kg/ha, 12.49 kg/ha, 15.57 kg/ha, and 10.67 kg/ha, respectively. The 2022 annual weighted mean NO₃ measured from Piney Reservoir declined to 5.15 kg/ha. The other monitors shut down in 2017 but showed similar declines in nitrogen deposition through 2016. This downward trend is consistent with earlier trends reported by Penn State Associate Professor Dr. Elizabeth Boyner that indicated there was a significant downward trend in nitrate concentration in stream and lakes in Western Pennsylvania.³³

Additionally, since the 2014 assessment, the EPA has undertaken soil analysis within SPM's potential impact area related to the February 3, 2023 train derailment in East Palestine, Ohio, which occurred approximately 20 miles from the facility. In March and April 2023, EPA conducted sampling at 146 locations, taking both surface and core samples, to assess the effects of a vent and burn event on nearby soils. EPA found that, "the vast majority of results fell within typical background ranges for rural and urban/suburban soil."³⁴ These samples were taken after the facility began operating, with samples showing no immediate signs of adverse effects from operations.

After reviewing this information and recognizing that "[t]here is no single 'definitive' critical load for a natural resource," it was concluded that SPM will not cause additional impairment of soils in this area.³⁵ This finding is based on the decreasing levels of acid deposition and nitrogen deposition in the area. And, to the extent that any of the identified acid and nitrogen CL values have meaning for the Beaver County area, it should be noted that the 2022 NADP monitored values are just below the point at which

³³"Atmospheric Deposition in Pennsylvania & Impacts on Watersheds," Penn State Water Resources Extension Webinar Series, Sept. 4, 2013.

³⁴ "Phase One Residential, Commercial, and Agricultural Soil Sampling Results," EPA, April 19, 2024; available at: <https://www.epa.gov/east-palestine-oh-train-derailment/phase-one-residential-commercial-and-agricultural-soil-sampling>; last accessed May 17, 2024.

³⁵ "Integrated Science Assessment" at p 250.

leaching (but not necessarily adverse effects) begin to occur, and they are close to or well below levels of recommended CLs for many species.

Finally, the initial construction of SPM, the Plan Approval Reconciliations and WWTP Permanent Controls Project, and the EMACT Project required/require an associated net reduction in NOx emissions to be demonstrated. These required NOx emissions reductions further contribute to the likelihood that the initial construction of SPM and the referenced changes at SPM will not cause impairment to soil.

2.3 Potential Impairment of Vegetation

The assessment of potential impacts on vegetation shows no likelihood of impairment from SPM. The basis for this conclusion is summarized below.

A. Identification of Vegetation with Significant Commercial Value

This analysis of impacts to commercial vegetation covers the entire ten-county area. This exceeds the scope suggested by EPA guidance, which is limited to the area within the impact area of the proposed facility (10 km).³⁶ As explained below, since the 2014 analysis, corn, soybean, and forage remain the top commercial crops in Beaver and surrounding counties. In this analysis, Northern Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), Black Cherry (*Prunus serotina*), and White Ash (*Fraxinus americana*) have also been identified as commercially significant vegetation.

The 2014 analysis used 2007 USDA Census of Agriculture data to identify the following as the principal crops for study in the analysis:

- Corn for grain (*Zea mays*)
- Corn for silage or greenchop
- Oats for grain (*Avena sativa*)

³⁶ See, e.g., *Prevention of Significant Deterioration Workshop Manual* (EPA-450/2-80-081), Oct. 1980, at page I-D-6, expressly limiting the soils and vegetation impairment analysis to the “impact area.” See, also, the same document at page I-C-12, defining the impact area as “a circular area whose radius is equal to the greatest distance from the source to which approved dispersion modeling shows the proposed emissions will have a significant impact.”

- Vegetables for harvest
- Other forage (other hay, etc.)
- Soybean for beans

The more recent 2022 Census of Agriculture data shows some shifts in production with wheat for grain outpacing production of oats for grain, and a decline in the acres of vegetables for harvest. Production in forage was also lower, but it remains the principal crop by acreage for the region. Soybeans and corn both saw increases in production volume between the 2007 and 2022 Census of Agriculture data. Table 7 lists the commercially significant vegetation in the ten-county study area by county.

In 2007, approximately 14% of the land area in the ten-county study area was used for harvested crops; this remains unchanged in the 2022 Census of Agriculture with some counties losing harvested acreage, while others gained. In 2007, approximately 92% of this farmland was used for corn as grain, corn as silage, other forage (e.g. hay), and soybeans. This percentage dropped to 90% in 2022, but these crops remain the three principal crops by acreage.

In addition to vegetative crops, timber harvest in southwest Pennsylvania includes Northern Red Oak, White Oak, Black Cherry, and to a lesser extent White Ash.³⁷

³⁷ "Pennsylvania Timber Market Report, First Quarter, 2024," PennState Extension, May 20, 2024; available at: [Pennsylvania Timber Market Report, First Quarter, 2024 \(psu.edu\)](https://www.psu.edu/newsroom/2024/05/20/pennsylvania-timber-market-report-first-quarter-2024); last accessed May 29, 2024.

Table 7. Commercially Significant Vegetation (Acres) in Ten-County Study Area

| Pennsylvania Counties | | | | | | |
|--|------------|-----------|---------|-----------|------------|-----------|
| Category | Beaver | Allegheny | Butler | Lawrence | Washington | Total |
| Total land area | 278,214 | 467,251 | 504,704 | 229,235 | 548,473 | 2,027,877 |
| Harvested cropland | 20,995 | 7,838 | 72,543 | 53,290 | 63,214 | 217,8808 |
| Corn for grain | 4,410 | 273 | 22,176 | 17,100 | 4,410 | 48,369 |
| Corn for silage or greenchop | 235 | 30 | 2,524 | 1,412 | 1,227 | 5,428 |
| Wheat for grain (all) | 195 | 78 | 3,455 | 2,961 | 71 | 6,760 |
| Oats for grain | 720 | 87 | 3,262 | 1,227 | 363 | 5,659 |
| Barley for grain | 92 | W | 296 | W | 87 | 475 |
| Vegetables harvested for sale | 81 | 547 | 786 | 253 | 401 | 2,068 |
| Cut Christmas trees | 1,157 | 172 | 285 | 30 | 447 | 2,091 |
| Other forage (other hay, haylage, grass silage, and greenchop) | 11,121 | 6,378 | 28,077 | 13,851 | 54,259 | 113,686 |
| Soybean for beans | 2,603 | 60 | 12,569 | 16,369 | 1,407 | 33,008 |
| Blueberries, Raspberries, Strawberries | 17 | 18 | 47 | 13 | 15 | 110 |
| Land in Orchards | 184 | 134 | 132 | 209 | 117 | 776 |
| Ohio and West Virginia Counties | | | | | | |
| Category | Columbiana | Mahoning | Brooke | Jefferson | Hancock | Total |
| Total Land Area | 339,840 | 263,040 | 56,960 | 134,169 | 52,870 | 846,879 |
| Harvested cropland | 93,585 | 46,635 | 2,813 | 36,405 | 2,105 | 181,543 |
| Corn for grain | 27,424 | 13,475 | 106 | - | W | 41,005 |
| Corn for silage or greenchop | 4,469 | 2,124 | 112 | 905 | - | 7,610 |
| Wheat for grain (all) | 6,071 | 2,538 | - | 1,772 | - | 10,381 |
| Oats for grain | 709 | 265 | W | - | - | 974 |
| Barley for grain | 483 | 113 | - | W | - | 569 |
| Vegetables harvested for sale | 723 | 422 | 9 | 75 | W | 1,229 |
| Cut Christmas trees | 223 | 223 | W | 48 | - | 494 |
| Other forage (other hay, haylage, grass silage, and greenchop) | 22,906 | 9,713 | 2,515 | 12,587 | 2,003 | 49,724 |
| Soybean for beans | 31,284 | 17,786 | W | 10,372 | - | 59,442 |
| Blueberries, Raspberries, Strawberries | 120 | 50 | 2 | 4 | W | 176 |
| Land in Orchards | 403 | 205 | W | 730 | - | 1,338 |

Source: 2022 Census of Agriculture, USDA, National Agricultural Statistic Service.

W – Withheld in the 2022 Census of Agriculture to avoid disclosing data for individual farms.

B. Identification of Vegetation with Potential Recreational Value

In the 2014 analysis, RTP reviewed the 1993 Beaver County Natural Heritage Inventory (NHI) produced by the Pennsylvania Natural Heritage Program (PNHP) to identify vegetation with potential recreational value. The NHI identified areas within the county of importance for the biological diversity and ecological integrity of the county that included the Raccoon Creek State Park and Wildflower Reserve, (located approximately 17 miles northwest of SPM).

After the original 2014 assessment, PNHP updated the Beaver County NHI, using new techniques, and identified 37 natural heritage areas (NHAs) in Beaver County. These areas contain species of concern at a state or federal level, important communities, or areas of “exceptional native biological diversity.”³⁸ Of these NHAs, 16 contain plant species of interest because the state has designated the species as threatened, endangered, rare, vulnerable, a population of special concern, tentatively undetermined, or the PNHP designated the species for further study.³⁹ Table 8 lists the identified plant species and the state listing status. No federally threatened or endangered plant species were identified by PNHP within Beaver County.

Table 8. Beaver County Vegetation of Interest

| Vegetation | Location | State Status |
|--|--|--------------------------|
| Bog Goldenrod (<i>Solidago uliginosa</i>) | North Fork Little Beaver Creek | Threatened |
| Crepis Rattlesnake-root (<i>Prenanthes crepidinea</i>) | Raccoon Creek Valley Raccoon Creek Wildflower Reserve | Not listed |
| Grass-leaved Rush (<i>Juncus biflorus</i>) | Painter Run | Rare |
| Great St. John’s-wort (<i>Hypericum pyramidatum</i>) | Monaca Bluffs | Not Listed |
| Harbinger-of-spring (<i>Erigenia bulbosa</i>) | Raccoon Creek Valley Raccoon Creek Wildflower Reserve | Threatened |
| Hartford Fern (<i>Lycogodium palatum</i>) | Patterson Road | Rare |
| Heartleaf Meehania (<i>Meehania cordata</i>) | Brady’s Run County Park | Not Listed |
| Purple Rocket (<i>Iodanthus pinnatifidus</i>) | Beaver River Connoquenessing Creek North Fork Little Beaver Creek Raccoon Creek Valley | Endangered |
| Rock Skullcap (<i>Scutellaria saxatilis</i>) | Monaca Bluffs | Tentatively Undetermined |
| Short-awn Foxtail (<i>Alopecurus aequalis</i>) | Little Beaver Creek at New Galilee | Not listed |

³⁸ “Beaver County Natural Heritage Inventory,” Johnson, Anna and Christopher Tracey, editors, Pennsylvania Natural Heritage Program, 2021.

³⁹ See state listings at 17 Pa. Code §45.11-21.

| Vegetation | Location | State Status |
|---|---|--------------------------|
| Spring Blue-eyed Mary (<i>Collinsia verna</i>) | Noarth Fork Little Beaver Creek | Not listed |
| Stalked Bulrush (<i>Scirpus pedicellatus</i>) | Little Beaver Creek at New Galilee | Threatened |
| Torrey's Bulrush (<i>Schoenoplectus torreyi</i>) | Big Beaver Borough Wetlands Darlington Swamp and North Fork Little Beaver Creek | Endangered |
| Vase-vine Leather-flower (<i>Clematis viorna</i>) | Cottage Road Raccoon Creek Wildflower Reserve | Endangered |
| White Trout-lily (<i>Erythronium albidum</i>) | Lower Raccoon Creek North Fork Little Beaver Raccoon Creek Wildflower Reserve Raccoon Creek Valley | Rare |
| Wild Kidney Bean (<i>Phaseolus polystachios</i>) | North Branch Brady Run | Not listed |
| Yellow Water-crowfoot (<i>Ranunculus flabellaris</i>) | Darlington Swamp and North Fork Little Beaver Creek Raccoon Creek Wildflower Reserve | Not listed |
| Declined Trillium (<i>Trillium flexipes</i>) | Not identified* | Tentatively Undetermined |
| Snow Trillium (<i>Trillium nivale</i>) | Not identified* | Rare |

Source: "Beaver County Natural Heritage Inventory," Johnson, Anna and Christopher Tracey, editors, Pennsylvania Natural Heritage Program, 2021.

* Sensitive species, not identified at the site level.

PNHP described the principal threats to these species of concern as overgrazing, landscape fragmentation through development, and invasive plant species. A few species were at risk from loss of forest canopy, but pollutant effects were not identified as a principal concern.

In the surrounding counties, two federally listed species are known to occur 1) Eastern prairie fringe orchid (threatened) in Columbiana and Mahoning counties, and 2) Northern wild monkshood (threatened) in Mahoning County.⁴⁰

Also of interest, the Rocky Bend Nature Preserve is located approximately one mile from SPM. This preserve was formed through a collaborative partnership between Potter Township and local conservation groups to provide a protected area of green space for recreational and educational uses. The land was part of the Horsehead Corporation and was bought by Potter Township during the Horsehead Corporation bankruptcy proceedings.

⁴⁰ "Map:U.S. Threatened and Endangered Species by County," Center for Biological Diversity search tool; available at https://www.biologicaldiversity.org/programs/population_and_sustainability/T_and_E_map/; last accessed may 24, 2024.

Historically, butadiene and styrene production occurred on the land as part of a covert World War II operation. Potter Township plans to use the land for canoeing, fishing, weddings, reunions, graduations, and other special events.⁴¹ The area includes a forested bend of Raccoon Creek impacted by erosion.⁴² The land, however, is not identified as including threatened or endangered vegetation.

In the 2014 analysis, RTP reviewed the 2009 Environmental report produced by the Nuclear Regulatory Commission (NRC) to support approval of the license renewal for the Beaver Valley Nuclear Plant (BVNP).⁴³ There has been no updated report since that time.

BVNP is located 7 miles west of SPM. The NRC identified 11 Pennsylvania-listed plant species that have the potential to occur within the vicinity (50 mile radius) of BVNP, but no federally listed species. The NRC noted that none of the state-listed plants were found during a 2002 survey of the area.

The NRC concluded that tall larkspur (*Delphinium exaltatum*) was the only species of plant that had the potential to occur in the impact area in the future. No records exist that document tall larkspur historical occurrence in the Beaver County area, however, there is a record of occurrence before 1980 in Allegheny and Butler Counties, and after 1980 in Washington County.⁴⁴ Table 9 shows the identified plant species and state listing status.

⁴¹ "Rocky Bend Nature Preserve: A Community Partnership Project of Potter Township and Independence Conservancy," undated; available at: <https://pottertwp-pa.gov/rocky-bend-nature-preserve/>.

⁴² "Independence Conservancy," undated; available at <https://pottertwp-pa.gov/wp-content/uploads/2023/04/IC-Brochure-2019-w-QR-Code.pdf>.

⁴³ "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, Supplement 36, Nuclear Regulatory Commission, p 81, May 2009.

⁴⁴ *Id.*, and Tall Larkspur (*Delphinium exaltatum*) Fact Sheet, Pennsylvania Natural Heritage Program.

Table 9. Pennsylvania-Listed Plant Species with Potential to Occur in Vicinity of Beaver Valley Nuclear (BVN) Plant (~7-mile distance from SPM)

| Species | Common Name | State Listing Status |
|---|------------------------------|-----------------------------|
| <i>Carex typhina</i> | Cattail sedge | Endangered |
| <i>Clematis viorna</i> | Leather flower | Endangered |
| <i>Delphinium exaltatum</i> | tall larkspur | Endangered* |
| <i>Helianthemum bicknellii</i> | Bicknell's Hoary Rockrose | Endangered |
| <i>Juncus torreyi</i> | Torrey's rush | Threatened |
| <i>Lithospermum latifolium</i> | American Grumwell | Endangered |
| <i>Matelea obliqua</i> | Climbing milkvine | Endangered |
| <i>Myriophyllum sibiricum</i> | Northern water-milfoil | Endangered |
| <i>Potamogeton tennesseensis</i> | Tennessee pondweed | Endangered |
| <i>Cypripedium calceolus</i> <i>var. parviflorum</i> | Lesser yellow lady's slipper | Not listed |

*Only species determined by NRC with potential to occur within vicinity of BVN plant.

C. Identification of Pollutants of Concern

As discussed below, there is substantial scientific data characterizing the effects of air pollutant emissions on certain crops (e.g., common wheat), whereas there is limited data available for other crops. Air pollutants can affect crops through two principal means:

- Direct phytotoxic effects from air concentrations of pollutants; and
- Indirect phytotoxic effects due to deposition of pollutants in soils in which the crops are growing.

Of the gaseous air pollutants covered by this analysis, only NO_x (i.e., NO and NO₂) is known to be toxic to some plants at moderate to high concentrations in the ambient air. Although carbon monoxide and beryllium are not phytotoxic, modeled ambient concentrations were conservatively compared against EPA screening thresholds and

found to be well below; therefore, these pollutants were not considered further in this analysis.^{45,46,47,48,49,50,51}

NO_x can also serve as a precursor to PM_{2.5} formation and cause direct effects on biota through deposition on plant surfaces, or indirect effects through uptake by roots of trace metals bound in the particulate matter or by altering soil biogeochemistry and microbiology.⁵² This analysis considers deposition of PM and trace metals as part of the toxic pollutant assessment.

D. Determination of Effects Concentrations

i. Direct Phytotoxic Effects

As is customary for this type of analysis, the assessment relied on the screening criteria in the EPA report, *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals* (“Screening Procedure”).⁵³ This document establishes the air pollutant concentrations that are generally viewed by EPA to be protective of soils and vegetation having significant commercial or recreational value, including agricultural crops, based on a broad review of pertinent scientific literature. This analysis also relies on the secondary National Ambient Air Quality Standards (NAAQS)⁵⁴ which are established by EPA at levels that are protective of the public welfare, including

⁴⁵ Smith, A.E., and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA-450/2-81-078)*. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 1980. p. 11.

⁴⁶ *Air Quality Criteria for Carbon Monoxide*. U.S. Department of Health, Education, and Welfare, Public Health Service, National Air Pollution Control Administration. Washington, DC. March 1970. pp. 7-1 through 7-3.

⁴⁷ *Air Quality Criteria for Hydrocarbons*. U.S. Department of Health, Education, and Welfare, Public Health Service, National Air Pollution Control Administration. Washington, DC. March 1970. pp. 6-1 through 6-9.

⁴⁸ E.M. Hulzebos et al. “Phytotoxicity Studies with *Lactuca Sativa* in Soil and Nutrient Solutions.” *Environmental Toxicology and Chemistry*. Volume 12. 1993. pp. 1079-1094.

⁴⁹ Smith, A.E., and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA-450/2-81-078)*. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 1980.

⁵⁰ The maximum 1-hour CO concentration from the NAAQS analysis, which reflects cumulative impacts from SPM, nearby off-site sources, and regional background, is 5,728 µg/m³. This is well below the screening threshold of 1,800,000 µg/m³ (weekly average) from EPA’s *Screening Procedure*.

⁵¹ The maximum model-predicted annual concentration of beryllium from the inhalation health risk assessment is 5.7E-07 µg/m³. This is well below the screening threshold of 0.01 µg/m³ (monthly average) from Table 1 of EPA’s *Screening Procedure*.

⁵² 2020 ISA at 15-2.

⁵³ Smith, A.E., and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA-450/2-81-078)*. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 1980.

⁵⁴ See, 40 CFR part 50.

agriculture. For most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS will not result in harmful effects.⁵⁵

Studies linking gaseous species of nitrogen (N) to plant foliar damage have been conducted well above concentration levels occurring in the United States. Thus, there is little evidence to show that current U.S. concentrations of gaseous phase N cause phytotoxic effects.⁵⁶ In the 2020 review of the secondary NO₂ NAAQS, EPA confirmed this finding when it concluded that while agricultural ecosystems are sensitive to high levels of N concentrations, these levels are above the ambient air concentrations found in the U.S.⁵⁷

ii. Indirect Deposition Effects

Two general approaches have been used in establishing deposition rate limits and soil concentration limits: a) preventing accumulation of pollutants in soils; and b) maximizing the capacity of soils to assimilate, attenuate, and detoxify pollutants. The first approach is based on the premise that soil can be used without any undue restriction if it is maintained free of contamination. If pollutants are artificially introduced and are allowed to accumulate in the soil, then over the long term the potential uses of the soil may become limited. The second approach is based on the premise that soils have a capacity to detoxify pollutants. This approach has been applied by the EPA and by the World Health Organization (WHO).⁵⁸ Section 2.2 considered thresholds for soil acidification while the remainder of this chapter looks at the secondary NAAQS and screening concentrations from the *Screening Procedures*.

⁵⁵ “New Source Review Workshop Manual, Draft”. EPA, October 1990. EPA never finalized this document but often refers to the document for an explanation of policy and procedures.

⁵⁶ “Integrated Science Assessment for Oxides of Nitrogen, Oxides of Sulfur and Particulate Matter- Ecological Criteria,” EPA, EPA/600/R-20/278, September 2020; and “Executive Summary Integrated Science Assessment Oxides of Nitrogen and Sulfur Ecological Criteria.” EPA/600/R-08/082F, Dec. 2008.

⁵⁷ 2020 ISA at 3-11.

⁵⁸ A.C. Chang, et al. *Developing Human Health-related Chemical Guidelines for Reclaimed Water and Sewage Sludge Applications in Agriculture*. World Health Organization. Copenhagen, Denmark. May 2002. pp. 19-41.

E. Potential Phytotoxic NOx Effects

This section presents the results of NOx dispersion modeling for each air pollutant and assesses modeled concentrations with respect to effects levels. NOx includes both nitric oxide (NO) and nitrogen dioxide (NO₂), and much of the scientific literature treats these two gases separately.

Based on the results of the air quality impacts analysis, the maximum predicted ambient NOx concentration due to emissions from SPM is 4.78 µg/m³ (annual average). This value represents total NOx, including both NO and NO₂. This impact is orders of magnitude below the secondary NAAQS for NO₂ of 100 µg/m³ (annual average)⁵⁹ and the minimum EPA screening value of 94 µg/m³ (annual average).⁶⁰ Both the secondary NAAQS and the screening value are expressed in terms of NO₂; there are no NAAQS or screening values for NO.⁶¹ Thus, even assuming all NOx is NO₂, the ambient air concentrations are well-below the secondary NAAQS. Furthermore, the maximum annual concentration from the NAAQS analysis, which reflects cumulative impacts from SPM, nearby off-site sources, and regional background, is only 21% of the annual NAAQS (20.9 µg/m³).

The agricultural crops for which the minimum EPA screening value is listed as being protective include barley, corn, oats, and vegetables (carrot, lettuce, leek, broccoli, radish, peas). The principal crops identified in Section A that are not specifically listed in the Screening Procedures report are soybean and forage (e.g. hay).⁶²

The literature was reviewed to ascertain whether there is any basis in the scientific literature for concluding that: a) the secondary NAAQS and the minimum EPA screening value are not protective of any of the identified crops; or b) the facility's NOx emissions

⁵⁹ 40 CFR § 50.11(c).

⁶⁰ Smith, A.E., and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA-450/2-81-078)*. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 1980. p. 11.

⁶¹ *Ibid.*

⁶² *Ibid* at p. 68.

will have an unacceptable, adverse impact on agricultural crops in the study area. A summary of our findings follows.

In April 2012, EPA issued a final rule retaining and affirming the secondary NO₂ NAAQS of 100 µg/m³ (annual average) and has not revised the secondary NAAQS since.⁶³ This action reflected both the EPA Administrator’s finding that this standard is “adequate to protect against direct phytotoxic effects on vegetation”⁶⁴ and her judgment that an alternative standard to protect against deposition-related effects is not supported by currently available data.⁶⁵ The data relied upon by EPA with respect to direct phytotoxic effects are summarized in the 2008 *Integrated Science Assessment*,⁶⁶ including the following observations:

- An analysis of over 50 peer-reviewed reports on the effects of NO₂ on foliar injury indicated that plants are relatively resistant to NO₂. With few exceptions, visible injury was not reported at concentrations below 377 µg/m³, and these occurred when the cumulative duration of exposures extended to 100 hours or longer.
- Soybeans, peas (*Pisum sativum L.*), and andradish (*Raphanus sativus L.*) are among numerous plant species for which no phytotoxic effects were documented based on exposure to NO₂ at 189 µg/m³.⁶⁷

In 2000, the WHO instituted a NO_x guideline concentration value of 30 µg/m³ on an annual average (including both NO and NO₂, expressed as NO_x). The maximum modeled concentration of NO_x is below this level. The WHO declined to institute a short-term value, saying “[t]here are insufficient data to provide these levels with confidence at present,” but indicated that current evidence would suggest a guideline NO_x concentration value of about 75 µg/m³ on a daily average. The annual guideline

⁶³ See, generally, 77 *Fed. Reg.* 20218. April 3, 2012.

⁶⁴ *Ibid* at p. 20241.

⁶⁵ *Ibid* at pp. 20262-63.

⁶⁶ *Integrated Science Assessment for Oxides of Nitrogen and Sulfur – Ecological Criteria (EPA-600/R-08-082F)*. EPA, Office of Research and Development. Research Triangle Park, NC. December 2008.

⁶⁷ *Ibid* at pp. 3-200 through 3-201.

concentration value is intended to be protective of all classes of vegetation under all environmental conditions.⁶⁸

In 2020, EPA revised the Integrated Science Assessment and indicated that, “[n]o clear dose-response relationship for exposure to NO₂ and reduction in growth and/or yield of plants emerged from experiments and explained that few additional studies have occurred since the 2008 Integrated Science Assessment.”⁶⁹

With respect to soybean exposure, EPA noted that, “soybeans (*Glycine max*) exposed 7 hours/day for 5 days showed an increase in photosynthesis at a concentration of 0.2 ppm but a decrease in net photosynthesis at a concentration of 0.5 ppm. Short-term exposures of soybean to 0.6 ppm NO₂ for 2 to 3 hours also had no effect on net photosynthesis.” Also, soybean plants grown in Australia had decreased NO₃ uptake by roots and reduced growth of plants exposed to 1.1 ppm of NO₂ for 7 days.” Additionally, “no effects of NO₂ were observed on soybeans grown in field plots subjected to a series of 10 episodic exposures averaging 0.4 ppm for 2.5 or 3 hours.”⁷⁰

Similarly, negative effects to forestry at existing ambient air concentrations and deposition rates are not expected. EPA reports that N deposition broadly stimulates tree growth forest productivity, with northern red oak showing increased growth even at a 50 kg N/ha/yr deposition rate.⁷¹ With respect to trees of commercial value in Beaver County, researchers reported positive growth of northern red and white oak, white ash, and black cherry at increasing nitrogen deposition rates.⁷² Research into potential causes of northern red oak mortality in Southwestern Pennsylvania concluded that soil

⁶⁸ *Air Quality Guidelines for Europe, 2nd Ed.* World Health Organization, Regional Office for Europe. Copenhagen, Denmark. 2000. pp. 230-233.

⁶⁹ 2020 ISA at 3-10 through 3-11.

⁷⁰ *Id.*

⁷¹ 2020 ISA at 6-17.

⁷² Thomas, Quinn *et. al.*, “Increased tree carbon storage in response to nitrogen deposition in the U.S.,” *Nature Geoscience*, Vol. 3, January 2010.

nutrient deficiency in combination with aluminum toxicity, rather than soil acidity was the likely cause of the northern red oak mortality.⁷³

Tall Larkspur is the only federally endangered plant species NRC identified with potential to occur within the vicinity of the BVN plant. It grows in meadows, at high elevations, and is poisonous to cattle. Efforts to develop an effective herbicide program to protect against harm during grazing has led to experiments with a high rate of N application on the plant. A variety of these studies demonstrate that Tall Larkspur is generally resistant to high concentration N application, and that herbicide mortality is linked to salt concentrations, not N concentrations.⁷⁴

In summary, the scientific literature affirms that the secondary NAAQS and the minimum annual EPA screening value are protective of the crops and vegetation identified herein. The maximum predicted NO_x concentration is well below the secondary NAAQS, the minimum EPA screening value, guideline concentration values established by foreign governmental agencies, and concentrations that are identified in the literature as being harmful to commercially significant vegetation in the ten-county study area. As such, no adverse phytotoxic effects are expected to result from the SPM facility.

2.4 Potential Impairment to Soil, Vegetation, and Animals from Toxic Metals Deposition

A six-step process following the guidance provided in EPA's *Screening Procedure*, was used to evaluate effects of trace metal deposition using modeled concentrations from the inhalation health risk assessment (HRA), where available.⁷⁵ A detailed discussion of the modeling conducted in support of the inhalation HRA is provided in Appendix D-3 of the plan approval application.

⁷³ "The effect of soil nutrition, soil acidity, and drought on northern red oak (*Quercus rubra* L.) growth and nutrition on Pennsylvania sites with high and low red oak mortality," *Forest Ecology and Management*, Volume 136, Issues 1-3, 1 October 2000, Pages 199-207.

⁷⁴ "Mechanism by which ammonium fertilizer kill tall larkspur," Woolsey, *et.al.*, *Journal of Range Management*, 56, 524-528, Sept 2003. (citing results of various historical studies).

⁷⁵ Smith, A.E., and J.B. Levenson. *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals (EPA-450/2-81-078)*. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 1980. p. 26-27.

Steps for Evaluating Trace Metal Effects based on Modeled Ambient Air Concentrations

1. Calculate the deposited concentration (DC) using the following equation assuming that all deposited metals are soluble.

Equation 1: Computation of Deposited Concentration

$$DC \text{ (ppmw)} = 21.5 * \left(\frac{N}{d}\right) X$$

Where:

DC = deposited concentration (ppmw)

N = expected lifetime of source (yr)

d = depth of soil through which deposited material is distributed (cm); and

X = maximum annual average ambient concentration from the source ($\mu\text{g}/\text{m}^3$)

For purposes of this analysis, the EPA recommended value of 40 years for the expected source lifetime and 3 centimeters for the depth of soil through which deposited material is distributed were used.⁷⁶ The deposited concentrations calculated based on results from air dispersion modeling performed using AERMOD are summarized in Table 10 below. Concentrations are based on the total facility-wide emissions from SPM, including the updates associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project and EMACT Project.⁷⁷

⁷⁶ Ibid. p. 35

⁷⁷ Refer to the Inhalation Risk Assessment submitted under separate cover for details on the AERMOD modeling analysis.

Table 10. Trace Metal Deposition Concentrations from SPM Calculated from Ambient Air Modeling Concentrations

| Pollutant | Modeled Maximum Annual Ambient Air Concentration ($\mu\text{g}/\text{m}^3$) | Deposited Concentration (DC) (ppmw) |
|------------------|---|--|
| Arsenic | 9.93E-06 | 2.85E-03 |
| Cadmium | 5.46E-05 | 1.57E-02 |
| Chromium | 8.89E-05 | 2.55E-02 |
| Cobalt | 4.17E-06 | 1.20E-03 |
| Manganese | 1.89E-05 | 5.41E-03 |
| Mercury | 1.29E-05 | 3.70E-03 |
| Nickel | 1.04E-04 | 2.99E-02 |
| Selenium | 1.19E-06 | 3.42E-04 |
| Lead | 2.48E-05 | 7.10E-03 |
| Vanadium | 1.14E-04 | 3.27E-02 |
| Zinc | 1.44E-03 | 4.13E-01 |

2. Compare the DC to Soil Screening Concentrations (SSC)

The calculated deposited concentrations of trace metals from Table 10 were then compared against the soil screening concentrations from Table 3.4 of the *Screening Procedure*, as summarized in Table 11 below.

Table 11. Trace Metal Deposition Concentrations from SPM Compared to Screening Values

| Pollutant | Deposited Concentration (DC) (ppmw) | Soil Screening Concentration (SSC) (ppmw) | DC Below SSC? |
|------------------|--|--|----------------------|
| Arsenic | 2.85E-03 | 3 | Yes |
| Cadmium | 1.57E-02 | 2.5 | Yes |
| Chromium | 2.55E-02 | 8.4 | Yes |
| Cobalt | 1.20E-03 | Not Available | - |
| Manganese | 5.41E-03 | 2.5 | Yes |
| Mercury | 3.70E-03 | 455 | Yes |
| Nickel | 2.99E-02 | 500 | Yes |
| Selenium | 3.42E-04 | 13 | Yes |
| Lead | 7.10E-03 | 1,000 | Yes |
| Vanadium | 3.27E-02 | 2.5 | Yes |
| Zinc | 4.13E-01 | Not Available | - |

3. Compare the DC to the endogenous soil concentration (EC) to determine whether the DC represents less than a 10 percent increase.

Per the *Screening Procedure*, an increase over the soil’s endogenous (i.e., background) concentration of more than 10 percent over the lifetime of the source could be a possible cause for concern. Per the guidance, this is intended to be used as a supporting indicator and not a primary decision parameter. The percent increase was calculated using the following equation from the *Screening Procedure*:

Equation 2. Percent Increase from Existing Soil Concentration

$$\% \text{ Increase} = \frac{DC \text{ (ppmw)}}{EC} * 100$$

Where:

DC = deposited concentration (ppmw)

EC = average soil endogenous concentration (ppmw)

To determine soil endogenous concentrations, data for Beaver County were used where available, or Table 3.5 of the *Screening Procedure* in the absence of Beaver County-specific data. The estimated percent increases are summarized in Table 12 below.

Table 12. Trace Metal Average Percent Increase in Endogenous Soil Concentration

| Pollutant | Deposited Concentration (DC) (ppmw) | Average Endogenous Soil Concentration (EC) (ppmw) | Percent Increase (%) | Less Than 10%? | EC Source* |
|------------------|--|--|-----------------------------|-----------------------|-----------------------------------|
| Arsenic | 2.85E-03 | 6 | 0.05 | Yes | Table 3.5 |
| Cadmium | 1.57E-02 | 4.61 | 0.34 | Yes | Metal Data for Pennsylvania Soils |
| Chromium | 2.55E-02 | 17.8 | 0.14 | Yes | Metal Data for Pennsylvania Soils |
| Cobalt | 1.20E-03 | 8 | 0.015 | Yes | Table 3.5 |
| Manganese | 5.41E-03 | 850 | 0.0006 | Yes | Table 3.5 |
| Mercury | 3.70E-03 | 0.05 | 7.40 | Yes | Metal Data for Pennsylvania Soils |
| Nickel | 2.99E-02 | 22.76 | 0.13 | Yes | Metal Data for Pennsylvania Soils |
| Selenium | 3.42E-04 | 0.5 | 0.068 | Yes | Table 3.5 |
| Lead | 7.10E-03 | 103.24 | 0.0069 | Yes | Metal Data for Pennsylvania Soils |
| Vanadium | 3.27E-02 | 100 | 0.033 | Yes | Table 3.5 |
| Zinc | 4.13E-01 | 274.18 | 0.15 | Yes | Metal Data for Pennsylvania Soils |

* Average EC based on data for Beaver County from the Penn State Environmental Chemistry Laboratory; Ciolkosz, Edward J., *et al.*, "Metal Data for Pennsylvania Soils," Pennsylvania State University Agronomy Department, June 1998, or Table 3.5 of the *Screening Procedure* in the absence of Beaver County specific data.

4. Calculate the potential vegetation tissue concentrations (TC) based on potential plant uptake from soil assuming all DC is soluble and available for uptake

The concentration in plant tissue was estimated using the following equation from the *Screening Procedure*:

Equation 3. Potential Tissue Concentration (ppmw)

$$TC \text{ (ppmw)} = DC \text{ (ppmw)} * \text{Default Soil Concentration Ratio}$$

Default soil concentration ratios were obtained from Table 3.6 of the *Screening Procedure*. This equation conservatively assumes that all deposited material is soluble and available for uptake by plants. In reality, a significant portion may be unavailable for uptake by plants depending on a number of factors, including but not limited to, the chemical form of the trace metal, temperature, presence of other elements, selective uptake by plants, soil pH, soil moisture content, and composition of the soil. Table 13 below summarizes the estimated vegetation tissue concentrations of trace metals resulting from SPM emissions.

Table 13. Estimated Vegetation Trace Metal Tissue Concentration

| Pollutant | Deposited Concentration (DC) (ppmw) | Soil Concentration Ratio | Vegetation Tissue Concentration (TC) (ppmw) |
|------------------|--|---------------------------------|--|
| Arsenic | 2.85E-03 | 0.14 | 3.98E-04 |
| Cadmium | 1.57E-02 | 10.7 | 1.67E-01 |
| Chromium | 2.55E-02 | 0.02 | 5.10E-04 |
| Cobalt | 1.20E-03 | 0.11 | 1.31E-04 |
| Manganese | 5.41E-03 | 0.066 | 3.57E-04 |
| Mercury | 3.70E-03 | 0.5 | 1.85E-03 |
| Nickel | 2.99E-02 | 0.045 | 1.34E-03 |
| Selenium | 3.42E-04 | 1.0 | 3.42E-04 |
| Lead | 7.10E-03 | 0.45 | 3.20E-03 |
| Vanadium | 3.27E-02 | 0.01 | 3.27E-04 |
| Zinc | 4.13E-01 | 0.64 | 2.64E-01 |

5. Compare the TC to vegetation screening concentrations (VSC).

The estimated vegetation tissue concentrations were then compared to the vegetation screening concentrations from Table 3.4 of the *Screening Procedure*. The results of this comparison are summarized in Table 14 below:

Table 14. Estimated Vegetation Trace Metal Tissue Concentrations Compared to Screening Concentrations

| Pollutant | Vegetation Tissue Concentration (TC) (ppmw) | Vegetation Tissue Screening Concentration (VSC) (ppmw) | TC Below VSC? |
|------------------|--|---|----------------------|
| Arsenic | 3.98E-04 | 0.25 | Yes |
| Cadmium | 1.67E-01 | 3 | Yes |
| Chromium | 5.10E-04 | 1 | Yes |
| Cobalt | 1.31E-04 | 19 | Yes |
| Manganese | 3.57E-04 | 400 | Yes |
| Mercury | 1.85E-03 | Not Available | - |
| Nickel | 1.34E-03 | 60 | Yes |
| Selenium | 3.42E-04 | 100 | Yes |
| Lead | 3.20E-03 | 126 | Yes |
| Vanadium | 3.27E-04 | Not Available | - |
| Zinc | 2.64E-01 | 300 | Yes |

6. Compare the TC to animal toxicity screen concentrations (Screening Procedure, Table 3.7) assuming animals feed only on vegetation in maximum deposition area.

The estimated vegetation tissue concentrations were also compared against animal toxicity screening concentrations obtained from Table 3.7 of the *Screening Procedure* to assess the potential for negative impacts on animals. Where a range is specified in Table 3.7, the minimum value was used for the comparison. This analysis conservatively assumes that the animals would feed only on vegetation in the area where maximum deposition occurs. The results of the comparison are summarized in Table 15 below.

Table 15. Trace Metals Vegetative Tissue Concentrations Compared to Animal Toxicity Screening Concentrations

| Pollutant | Vegetation Tissue Concentration (TC) (ppmw) | Animal Toxicity Screening Concentration (ATC) (ppmw) | TC Below ATC? |
|------------------|--|---|----------------------|
| Arsenic | 3.98E-04 | 3 | Yes |
| Cadmium | 1.67E-01 | 15 | Yes |
| Chromium | 5.10E-04 | Not Available | - |
| Cobalt | 1.31E-04 | 1 | Yes |
| Manganese | 3.57E-04 | 500 | Yes |
| Mercury | 1.85E-03 | Not Available | - |
| Nickel | 1.34E-03 | 1,000 | Yes |
| Selenium | 3.42E-04 | 5 | Yes |
| Lead | 3.20E-03 | 80 | Yes |
| Vanadium | 3.27E-04 | 10 | Yes |
| Zinc | 2.64E-01 | 500 | Yes |

As shown in Tables 10 through 15, all SPM-related concentrations are well below the *Screening Procedure's* screening values. The screening values provide a conservative estimate of potential impacts. Values resulting from SPM are orders of magnitude less than the screening values. Based on this, SPM is unlikely to result in adverse effects from toxic metal deposition.

2.5 Conclusion

Based on the effects analysis, SPM's emissions are unlikely to adversely affect soil or vegetation with significant commercial value or potential recreational value, plant species of concern within the vicinity of the project site, or animals. For each pollutant of concern, the predicted ambient concentration or the predicted deposition rate is well below the secondary NAAQS and the minimum screening values established by EPA. Nothing in the scientific literature identified during this review indicates that the secondary NAAQS and the minimum EPA screening values are not protective of the identified vegetation. Finally, the only federally identified plant species of concern, tall larkspur, is resistant to nitrogen application in experimental studies, and thus is unlikely to be affected by NOx or PM deposition.

APPENDIX D-3A

EMISSION ESTIMATES FOR THE INHALATION RISK ASSESSMENT FOR SHELL POLYMERS MONACA BEAVER COUNTY, PENNSYLVANIA



September 2024 (Revised May 2025)

Emission Estimates for Shell Polymers Monaca (SPM) Inhalation Risk Assessment

1.0 General Discussion

The methodologies used in this updated analysis to estimate emission rates for the compounds of potential concern (COPC) are consistent with the methodologies previously used. A summary of the COPCs addressed in this analysis is presented in Table 1. Detailed emissions calculations are provided in Appendix B of the plan approval application.

A summary of the one-hour emission rate estimates used in the chronic exposure analysis are presented in Tables 2a and 2b, and a summary of the one-hour emission rates used in the acute exposure analysis are presented in Tables 3a and 3b. The following subsections provide background on the calculation methodologies used for each type of emissions unit. References to hazardous air pollutants (HAPs) are for plan approval purposes and should be considered synonymous with COPCs for this analysis.

1.1 Combustion Sources

COPC emission rates from the combustion sources at SPM (*i.e.*, cracking furnaces, combustion turbines, emergency engines, flares, and thermal oxidizers) are based on stack test data or the application of the appropriate AP-42 or other publicly available emission factors and the firing rate of the combustion source. Emissions from waste gas combustion by flares and thermal oxidizers are based on actual process data and engineering judgement. Refer to Appendix B of the plan approval application for detailed calculations.

1.2 Polyethylene Units

The COPCs emitted from the polyethylene manufacturing units are hexavalent chromium (CrVI) from the catalyst heaters and n-hexane from equipment leaks. CrVI emissions result from the catalyst activation process. To activate the catalyst, hot air produced via electrical heaters is passed through the catalyst heater where it contacts the catalyst. After passing through the catalyst heater, the air exhausts through a filter-controlled stack to the atmosphere. Catalyst particulate entrained in the hot exhaust contains trace amounts of CrVI.

1.3 Storage Tanks

Uncontrolled COPC emission rates from certain fixed roof atmospheric storage tanks are presented in Appendix B of the plan approval application. These emission rates are estimated using the methodology outlined in AP-42, Chapter 7, Section 1. No routine emissions, other than fugitive emissions from equipment components, are estimated from pressurized storage tanks (*i.e.*, the C3+ storage spheres).¹ These tanks are sealed and pressurized so working and breathing losses do not occur. Emissions from storage tanks with vents routed to the thermal oxidizer headers are accounted for in the estimated emission rates from the Continuous Vent Thermal Oxidizer (CVTO) and Spent Caustic Thermal Oxidizer (SCTO).

1.4 Process Cooling Tower

COPC emissions from the Process Cooling Tower are estimated by speciating the potential volatile organic compound (VOC) emissions based on sampling data and engineering judgement. The VOC emissions are based on the Process Cooling Tower's VOC lowest achievable emission rate (LAER) limit and the tower's design cooling water circulation rate. The Process Cooling Tower VOC emission rate estimate is presented in Appendix B of the plan approval application.

¹ In Tables 2 and 3 below, fugitive emissions from storage tanks are included in the "outside the boundary limits" (OSBL) fugitives.

1.5 Wastewater Treatment Plant

The Wastewater Treatment Plant's potential emissions calculation model was revised from WATER9 to Toxchem, which is a widely recognized calculation tool used for estimating emissions from wastewater collection, preliminary/primary/secondary treatment, and disposal facilities. Controlled emissions are accounted for in the emission rate estimates from the SCTO. The updated Wastewater Treatment Plant emission rate estimates are presented in Appendix B of the plan approval application.

1.6 Fugitive Emissions from Equipment Leaks

EPA's 1995 Protocol for Equipment Leak Emission Estimates (EPA-453-R-95-017) is used to estimate emissions from equipment leaks. SPM's leak detection and repair program actual average leak rates for component types and the correlation emission factor approach for the synthetic organic chemical manufacturing industry are used to estimate fugitive emissions. To determine the emission rate for an individual COPC, process knowledge of the chemical composition of the lines is applied to the VOC emission rate. Refer to Appendix B of the plan approval application for detailed calculations.

Table 1. Identified Compounds of Potential Concern¹

| | |
|--------------------------------|--|
| Acenaphthene | Fluoranthene |
| Acenaphthylene | Fluorene |
| Acetaldehyde | Formaldehyde |
| Acrolein | Heptane |
| Ammonia | Hexane |
| Anthracene | Indeno(1,2,3-cd)pyrene |
| Arsenic | Lead |
| Barium | Manganese |
| Benzene | Methylcyclohexane |
| Benzo(a)anthracene | Methylene Chloride |
| Benzo(a)pyrene | Mercury |
| Benzo(b)fluoranthene | Methanol |
| Benzo(e)pyrene | 2-Methylnaphthalene |
| Benzo(g,h,i)perylene | 3-Methylchloranthrene |
| Benzo(k)fluoranthene | Molybdenum |
| Beryllium | Naphthalene |
| Biphenyl | Nickel |
| 1,3-Butadiene | n-Nonane |
| Butane | n-Octane |
| Cadmium | Polycyclic Aromatic Hydrocarbons (PAH) |
| Carbon Tetrachloride | Pentane |
| Chlorobenzene | Perchloroethylene |
| Chloroethane | Phenanthrene |
| Chloroform | Phenol |
| Chromium VI ² | Propane |
| Chromium III ² | Propylene |
| Chrysene | Propylene Oxide |
| Cobalt | Pyrene |
| Copper | Selenium |
| Cyclopentane | Styrene |
| Dibenzo(a,h)anthracene | 1,1,2,2-Tetrachloroethane |
| Dibutylphthalate | 1,1,2-Trichloroethane |
| Dichlorobenzene | 1,2,3-Trimethylbenzene |
| 1,1-Dichloroethane | 1,2,4-Trimethylbenzene |
| 1,2-Dichloroethane | 1,3,5-Trimethylbenzene |
| 1,2-Dichloropropane | 2,2,4-Trimethylpentane |
| 1,3-Dichloropropene | Toluene |
| 7,12-Dimethylbenz(a)anthracene | Vanadium |
| Ethane | Vinyl Chloride |
| Ethylbenzene | Xylenes |
| Ethylene Dibromide | Zinc |

¹ Compounds of Potential Concern were identified from EPA's Compilation of AP-42 Emission Factors for combustion of natural gas and from process knowledge.

² Chromium emissions from natural gas/process gas combustion sources were estimated to equal 4% chromium VI and 96% chromium III.

Table 2a. Annual Average COPC Emission Rates

| Pollutant | Ethane Cracking Furnaces (per furnace) (lb/hr) | Cogen Units (per unit) (lb/hr) | TEGF A (lb/hr) | TEGF B (lb/hr) | HP Elevated Flare (lb/hr) | CVTO (lb/hr) | MPGF (lb/hr) | SCTO (lb/hr) | PE3 Fugitives (lb/hr) | Total Ethane Cracking Fugitives ² (lb/hr) | Total OSBL Fugitives ² (lb/hr) | Emergency Generator Engines (total for all engines) (lb/hr) | Firewater Pump Engines (per engine) (lb/hr) | WWTP (lb/hr) | Process Cooling Tower (per cell) (lb/hr) | PE1 and PE2 (lb/hr) | PE3 (lb/hr) | Total |
|------------------------|--|--------------------------------|----------------|----------------|---------------------------|--------------|--------------|--------------|-----------------------|--|---|---|---|--------------|--|---------------------|-------------|----------|
| Acenaphthene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 3.35E-05 | -- | -- | -- | 1.93E-08 | 5.54E-08 | 3.23E-05 | -- | -- | -- | 7.14E-05 |
| Acenaphthylene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 2.56E-05 | -- | -- | -- | 6.87E-08 | 1.97E-07 | 1.64E-05 | -- | -- | -- | 4.79E-05 |
| Acetaldehyde | -- | 2.00E-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.12E-05 | 2.99E-05 | -- | -- | -- | -- | 6.03E-02 |
| Acrolein | -- | 3.20E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.57E-05 | 3.61E-06 | -- | -- | -- | -- | 9.74E-03 |
| Ammonia | 2.39E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.67E+01 |
| Anthracene | 7.91E-07 | -- | 3.32E-07 | 3.32E-07 | 3.32E-07 | 4.26E-07 | 2.08E-07 | 7.35E-06 | -- | -- | -- | 2.54E-08 | 7.29E-08 | 1.62E-05 | -- | -- | -- | 3.09E-05 |
| Arsenic | 6.59E-05 | -- | 2.77E-05 | 2.77E-05 | 2.77E-05 | 3.55E-05 | 1.73E-05 | 2.17E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.00E-04 |
| Barium | 1.45E-03 | -- | 6.09E-04 | 6.09E-04 | 6.09E-04 | 7.81E-04 | 3.81E-04 | 4.77E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.32E-02 |
| Benzene | 6.92E-04 | 1.12E-03 | 7.80E-02 | 7.80E-02 | 7.80E-02 | 3.03E-03 | 2.22E-03 | 1.42E-02 | -- | 3.93E-02 | 2.04E-02 | 4.01E-05 | 3.64E-05 | 8.41E-03 | 1.58E-03 | -- | -- | 4.31E-01 |
| Benzo(a)anthracene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 1.95E-08 | -- | -- | -- | 2.28E-08 | 6.55E-08 | -- | -- | -- | -- | 5.57E-06 |
| Benzo(a)pyrene | 3.96E-07 | -- | 1.66E-07 | 1.66E-07 | 1.66E-07 | 2.13E-07 | 1.04E-07 | 1.30E-08 | -- | -- | -- | 2.55E-09 | 7.33E-09 | -- | -- | -- | -- | 3.62E-06 |
| Benzo(b)fluoranthene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 1.95E-08 | -- | -- | -- | 1.35E-09 | 3.86E-09 | -- | -- | -- | -- | 5.41E-06 |
| Benzo(e)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.77E-09 | -- | -- | -- | -- | -- | 1.77E-09 |
| Benzo(g,h,i)perylene | 3.96E-07 | -- | 1.66E-07 | 1.66E-07 | 1.66E-07 | 2.13E-07 | 1.04E-07 | 1.30E-08 | -- | -- | -- | 6.64E-09 | 1.91E-08 | -- | -- | -- | -- | 3.65E-06 |
| Benzo(k)fluoranthene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 1.95E-08 | -- | -- | -- | 2.11E-09 | 6.04E-09 | -- | -- | -- | -- | 5.41E-06 |
| Beryllium | 3.96E-06 | -- | 1.66E-06 | 1.66E-06 | 1.66E-06 | 2.13E-06 | 1.04E-06 | 1.30E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.60E-05 |
| Biphenyl | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.24E-08 | 9.03E-07 | -- | -- | -- | -- | -- | 1.89E-06 |
| 1,3-Butadiene | -- | 2.15E-04 | 4.50E-01 | 4.50E-01 | 4.50E-01 | 2.77E-05 | 2.12E-05 | 1.50E-03 | -- | 5.94E-02 | 2.82E-02 | 1.24E-05 | 1.52E-06 | -- | 6.84E-03 | -- | -- | 1.71E+00 |
| Butane | 6.92E-01 | -- | 6.98E-01 | 6.98E-01 | 6.98E-01 | 1.91E+00 | 1.36E+00 | 2.28E-02 | -- | -- | -- | 2.31E-06 | -- | -- | -- | -- | -- | 1.02E+01 |
| Butyr/Isobutyraldehyde | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.22E-06 | -- | -- | -- | -- | -- | 1.22E-06 |
| Cadmium | 3.63E-04 | -- | 1.52E-04 | 1.52E-04 | 1.52E-04 | 1.95E-04 | 9.54E-05 | 1.19E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.30E-03 |
| Carbon Tetrachloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.43E-07 | -- | -- | -- | -- | -- | 8.85E-07 |
| Chlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.38E-07 | -- | -- | -- | -- | -- | 6.76E-07 |
| Chloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.97E-09 | -- | -- | -- | -- | -- | 1.59E-08 |
| Chloroform | -- | -- | -- | -- | -- | -- | -- | 6.61E-07 | -- | -- | -- | 3.43E-07 | -- | 3.33E-05 | -- | -- | -- | 3.46E-05 |
| Chromium III | 4.61E-04 | -- | 1.94E-04 | 1.94E-04 | 1.94E-04 | 2.48E-04 | 1.18E-04 | 1.52E-05 | -- | -- | -- | -- | -- | -- | -- | 8.20E-07 | 3.03E-05 | 4.22E-03 |
| Chromium IV | 1.85E-05 | -- | 7.75E-06 | 7.75E-06 | 7.75E-06 | 9.94E-06 | 4.73E-06 | 6.08E-07 | -- | -- | -- | -- | -- | -- | -- | 8.20E-07 | 3.03E-05 | 1.99E-04 |
| Chrysene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 1.95E-08 | -- | -- | -- | 4.80E-09 | 1.38E-08 | -- | -- | -- | -- | 5.43E-06 |
| Cobalt | 2.77E-05 | -- | 1.16E-05 | 1.16E-05 | 1.16E-05 | 1.49E-05 | 7.28E-06 | 9.11E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.52E-04 |
| Copper | 2.80E-04 | -- | 1.18E-04 | 1.18E-04 | 1.18E-04 | 1.51E-04 | 7.37E-05 | 9.22E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.55E-03 |
| Cyclopentane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.67E-07 | -- | -- | -- | -- | -- | 1.93E-06 |
| Dibenzo(a,h)anthracene | 3.96E-07 | -- | 1.66E-07 | 1.66E-07 | 1.66E-07 | 2.13E-07 | 1.04E-07 | 1.30E-08 | -- | -- | -- | 7.92E-09 | 2.27E-08 | -- | -- | -- | -- | 3.66E-06 |
| Dibutylphthalate | -- | -- | -- | -- | -- | -- | -- | 9.70E-05 | -- | -- | -- | -- | -- | 2.01E-07 | -- | -- | -- | 9.72E-05 |
| Dichlorobenzene | 3.96E-04 | -- | 1.66E-04 | 1.66E-04 | 1.66E-04 | 2.13E-04 | 1.04E-04 | 1.30E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.60E-03 |
| 1,1-Dichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.83E-07 | -- | -- | -- | -- | -- | 5.67E-07 |

| Pollutant | Ethane Cracking Furnaces (per furnace) (lb/hr) | Cogen Units (per unit) (lb/hr) | TEGF A (lb/hr) | TEGF B (lb/hr) | HP Elevated Flare (lb/hr) | CVTO (lb/hr) | MPGF (lb/hr) | SCTO (lb/hr) | PE3 Fugitives (lb/hr) | Total Ethane Cracking Fugitives ² (lb/hr) | Total OSBL Fugitives ² (lb/hr) | Emergency Generator Engines (total for all engines) (lb/hr) | Firewater Pump Engines (per engine) (lb/hr) | WWTP (lb/hr) | Process Cooling Tower (per cell) (lb/hr) | PE1 and PE2 (lb/hr) | PE3 (lb/hr) | Total |
|--------------------------------|--|--------------------------------|----------------|----------------|---------------------------|--------------|--------------|--------------|-----------------------|--|---|---|---|--------------|--|---------------------|-------------|----------|
| 1,2-Dichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.83E-07 | -- | -- | -- | -- | -- | 5.67E-07 |
| 1,2-Dichloropropane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.25E-07 | -- | -- | -- | -- | -- | 6.50E-07 |
| 1,3-Dichloropropene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.18E-07 | -- | -- | -- | -- | -- | 6.36E-07 |
| 7,12-Dimethylbenz(a)anthracene | 5.27E-06 | -- | 2.22E-06 | 2.22E-06 | 2.22E-06 | 2.84E-06 | 1.39E-06 | 1.74E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.80E-05 |
| Ethane | -- | -- | -- | -- | -- | -- | -- | 3.36E-02 | -- | -- | -- | 1.59E-03 | -- | -- | -- | -- | -- | 3.68E-02 |
| Ethylbenzene | -- | 1.60E-02 | 2.01E-04 | 2.01E-04 | 2.01E-04 | 1.07E-04 | 8.25E-05 | 8.11E-04 | -- | 9.36E-04 | 7.25E-04 | 5.70E-07 | -- | 1.35E-03 | 4.39E-06 | -- | -- | 5.44E-02 |
| Ethylene Dibromide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.33E-07 | -- | -- | -- | -- | -- | 1.07E-06 |
| Fluoranthene | 9.89E-07 | -- | 4.15E-07 | 4.15E-07 | 4.15E-07 | 5.32E-07 | 2.60E-07 | 1.15E-05 | -- | -- | -- | 1.08E-07 | 2.97E-07 | 2.77E-06 | -- | -- | -- | 2.40E-05 |
| Fluorene | 9.23E-07 | -- | 3.88E-07 | 3.88E-07 | 3.88E-07 | 4.97E-07 | 2.43E-07 | 2.91E-05 | -- | -- | -- | 4.21E-07 | 1.14E-06 | 1.32E-05 | -- | -- | -- | 5.38E-05 |
| Formaldehyde | 2.47E-02 | 1.65E-01 | 1.04E-02 | 1.04E-02 | 1.04E-02 | 1.33E-02 | 6.50E-03 | 8.14E-04 | -- | -- | -- | 5.73E-04 | 4.60E-05 | -- | -- | -- | -- | 7.20E-01 |
| Heptane | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.76E-04 | -- | -- | -- | -- | -- | -- | -- | 5.53E-04 |
| Hexane | 1.37E-01 | -- | 6.74E-02 | 6.74E-02 | 6.74E-02 | 5.45E-03 | 2.74E-03 | 3.15E-04 | 1.31E-02 | -- | 5.01E-02 | 4.73E-06 | -- | -- | -- | -- | -- | 1.28E+00 |
| Indeno(1,2,3-cd)pyrene | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 1.95E-08 | -- | -- | -- | 5.09E-09 | 1.46E-08 | -- | -- | -- | -- | 5.44E-06 |
| Lead | 1.65E-04 | -- | 6.92E-05 | 6.92E-05 | 6.92E-05 | 8.87E-05 | 4.34E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.49E-03 |
| Manganese | 1.25E-04 | -- | 5.26E-05 | 5.26E-05 | 5.26E-05 | 6.74E-05 | 3.29E-05 | 4.12E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.14E-03 |
| Methylcyclohexane | 8.57E-05 | -- | 3.60E-05 | 3.60E-05 | 3.60E-05 | 4.61E-05 | 2.25E-05 | 2.82E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.79E-04 |
| Methylene Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.41E-02 | 7.42E-03 | 6.01E-05 | -- | -- | -- | -- | -- | 4.32E-02 |
| Mercury | 5.93E-07 | -- | 2.49E-07 | 2.49E-07 | 2.49E-07 | 3.19E-07 | 1.56E-07 | 1.95E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.40E-06 |
| Methanol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.24E-06 | -- | -- | -- | -- | -- | 1.05E-05 |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.52E-07 | -- | -- | -- | -- | -- | 1.50E-06 |
| 3-Methylchloranthrene | 7.91E-06 | -- | 3.32E-06 | 3.32E-06 | 3.32E-06 | 4.26E-06 | 2.08E-06 | 2.60E-07 | -- | -- | -- | 1.41E-07 | -- | -- | -- | -- | -- | 7.22E-05 |
| Molybdenum | 3.63E-04 | -- | 1.52E-04 | 1.52E-04 | 1.52E-04 | 1.95E-04 | 9.54E-05 | 1.19E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.30E-03 |
| Naphthalene | 2.01E-04 | 6.50E-04 | 8.45E-05 | 8.45E-05 | 8.45E-05 | 1.28E-04 | 6.79E-05 | 9.77E-04 | -- | 4.92E-03 | 5.82E-03 | 3.04E-06 | 3.31E-06 | 2.10E-04 | -- | -- | -- | 2.65E-02 |
| Nickel | 6.92E-04 | -- | 2.91E-04 | 2.91E-04 | 2.91E-04 | 3.73E-04 | 1.82E-04 | 2.28E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.29E-03 |
| n-Nonane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.69E-07 | -- | -- | -- | -- | -- | 9.38E-07 |
| n-Octane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.50E-06 | -- | -- | -- | -- | -- | 2.99E-06 |
| PAH ¹ | -- | 1.10E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.68E-06 | 6.55E-06 | -- | -- | -- | -- | 3.32E-03 |
| Pentane | 8.57E-01 | -- | -- | -- | -- | 1.33E+00 | 1.77E+00 | 2.82E-02 | -- | -- | -- | 1.11E-05 | -- | -- | -- | -- | -- | 1.29E+01 |
| Perchloroethylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.06E-08 | -- | -- | -- | -- | -- | 2.11E-08 |
| Phenanthrene | 5.60E-06 | -- | 2.35E-06 | 2.35E-06 | 2.35E-06 | 3.02E-06 | 1.47E-06 | 3.72E-05 | -- | -- | -- | 3.99E-07 | 1.15E-06 | 8.45E-06 | -- | -- | -- | 9.95E-05 |
| Phenol | -- | -- | -- | -- | -- | -- | -- | 2.29E-04 | -- | -- | -- | 1.02E-07 | -- | 1.28E-07 | -- | -- | -- | 2.30E-04 |
| Propane | 5.27E-01 | -- | 5.63E-01 | 5.63E-01 | 5.63E-01 | 2.84E-01 | 1.39E-01 | 1.74E-02 | -- | 9.67E-02 | 4.36E-02 | 1.79E-04 | -- | -- | -- | -- | -- | 6.10E+00 |
| Propylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.57E-02 | 1.96E-02 | 3.50E-05 | 1.01E-04 | -- | -- | -- | -- | 9.09E-02 |
| Propylene Oxide | -- | 1.45E-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.35E-02 |
| Pyrene | 1.65E-06 | -- | 6.92E-07 | 6.92E-07 | 6.92E-07 | 8.87E-07 | 4.34E-07 | 1.15E-05 | -- | -- | -- | 7.07E-08 | 1.86E-07 | 1.65E-06 | -- | -- | -- | 2.86E-05 |
| Selenium | 7.91E-06 | -- | 3.32E-06 | 3.32E-06 | 3.32E-06 | 4.26E-06 | 2.08E-06 | 2.60E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.19E-05 |
| Styrene | -- | -- | -- | -- | -- | 6.29E-04 | 4.83E-04 | 1.32E-03 | -- | 1.24E-03 | 2.36E-03 | 2.93E-07 | -- | 2.53E-02 | -- | -- | -- | 3.49E-02 |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.80E-07 | -- | -- | -- | -- | -- | 1.16E-06 |

| Pollutant | Ethane Cracking Furnaces (per furnace) (lb/hr) | Cogen Units (per unit) (lb/hr) | TEGF A (lb/hr) | TEGF B (lb/hr) | HP Elevated Flare (lb/hr) | CVTO (lb/hr) | MPGF (lb/hr) | SCTO (lb/hr) | PE3 Fugitives (lb/hr) | Total Ethane Cracking Fugitives ² (lb/hr) | Total OSBL Fugitives ² (lb/hr) | Emergency Generator Engines (total for all engines) (lb/hr) | Firewater Pump Engines (per engine) (lb/hr) | WWTP (lb/hr) | Process Cooling Tower (per cell) (lb/hr) | PE1 and PE2 (lb/hr) | PE3 (lb/hr) | Total |
|------------------------|--|--------------------------------|----------------|----------------|---------------------------|--------------|--------------|--------------|-----------------------|--|---|---|---|--------------|--|---------------------|-------------|----------|
| Toluene | 1.12E-03 | 1.75E-01 | 4.71E-03 | 4.71E-03 | 4.71E-03 | 1.75E-03 | 1.17E-03 | 7.36E-03 | -- | 1.28E-02 | 9.69E-03 | 1.63E-05 | 1.59E-05 | 2.58E-02 | -- | | | 6.27E-01 |
| 1,1,2-Trichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.83E-07 | -- | -- | -- | | | 7.66E-07 |
| 1,2,3-Trimethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.80E-08 | -- | -- | -- | | | 1.96E-07 |
| 1,2,4-Trimethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.09E-08 | -- | -- | -- | | | 1.22E-07 |
| 1,3,5-Trimethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.44E-07 | -- | -- | -- | | | 2.88E-07 |
| 2,2,4-Trimethylpentane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.07E-06 | -- | -- | -- | -- | -- | 2.13E-06 |
| Vanadium | 7.58E-04 | -- | 3.18E-04 | 3.18E-04 | 3.18E-04 | 4.08E-04 | 1.99E-04 | 2.50E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.89E-03 |
| Vinyl Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.80E-07 | -- | -- | -- | | | 3.59E-07 |
| Xylenes | -- | 3.20E-02 | -- | -- | -- | 1.00E-04 | 7.67E-05 | 7.76E-04 | -- | 2.25E-03 | 2.47E-04 | 7.81E-06 | 1.11E-05 | 3.70E-03 | -- | -- | -- | 1.06E-01 |
| Zinc | 9.56E-03 | -- | 4.02E-03 | 4.02E-03 | 4.02E-03 | 5.15E-03 | 2.51E-03 | 3.15E-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 8.69E-02 |

¹AP-42 factors for stationary combustion turbines are not available for individual PAH compounds. For the purposes of the risk assessment, the PAH emissions were assumed to be that of the individual PAH COPC with the highest cancer and non-cancer impact.

² Emission rates for each Ethane Cracking and OSBL fugitive source are presented in Table 2b.

Table 2b. Annual Average COPC Emission Rates – Ethane Cracking and OSBL Component Fugitives

| Pollutant | Ethane Cracking (ECFUG1) (lb/hr) | Fuel Gas and Regeneration System (ECFUG2) (lb/hr) | Wash Water System (ECFUG3) (lb/hr) | Cracked Gas Compression (ECFUG4) (lb/hr) | Caustic Wash (ECFUG5) (lb/hr) | Gas Redistillation (ECFUG6) (lb/hr) | C2/C3 Separation (ECFUG7) (lb/hr) | C2 Hydrogenation (ECFUG8) (lb/hr) | C1/C2 Separation (ECFUG9) (lb/hr) | Spent Caustic Treatment (ECFUG10) (lb/hr) | Flare Condensate (ECFUG11) (lb/hr) | 590 (ECFUG12) (lb/hr) | Recovered Oil and Truck Loadout (OSBLFUG1) (lb/hr) | Rail for C3+ (OSBLFUG2) (lb/hr) | Diesel Tanks (OSBLFUG3) (lb/hr) | C3+ (OSBLFUG4) (lb/hr) | 236LR (OSBLFUG5) (lb/hr) | 646 (OSBLFUG6) (lb/hr) | 642 (OSBLFUG7) (lb/hr) | Each Flare Header Segment 1-7 (OSBLFUG8-14) (lb/hr) |
|---------------|----------------------------------|---|------------------------------------|--|-------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|------------------------------------|-----------------------|--|---------------------------------|---------------------------------|------------------------|--------------------------|------------------------|------------------------|---|
| 1,3-Butadiene | 3.98E-03 | 3.36E-03 | 2.56E-03 | 7.85E-03 | 3.45E-03 | 2.89E-03 | 1.54E-02 | 1.36E-03 | 1.46E-02 | -- | 3.01E-03 | 9.68E-04 | -- | -- | -- | 5.60E-03 | -- | -- | 2.82E-03 | 2.82E-03 |
| Benzene | 3.37E-03 | 2.31E-03 | 1.51E-03 | 5.46E-03 | 5.17E-03 | 7.04E-03 | 4.68E-03 | 6.91E-04 | 7.10E-03 | 1.04E-04 | 1.23E-03 | 6.59E-04 | 2.52E-04 | -- | -- | 2.53E-03 | -- | -- | 2.20E-03 | 2.20E-03 |
| Biphenyl | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.24E-08 | -- | -- | -- | -- | -- |
| Ethylbenzene | 7.66E-05 | 2.27E-05 | 3.50E-06 | 1.74E-04 | 1.13E-04 | 2.30E-04 | 4.71E-05 | 5.19E-05 | 1.57E-04 | 7.69E-07 | 2.95E-05 | 3.07E-05 | 1.93E-06 | -- | 1.26E-06 | 1.10E-04 | -- | -- | 7.64E-05 | 7.64E-05 |
| Hexane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.89E-02 | -- | -- | 1.41E-03 | 1.41E-03 |
| Methanol | -- | 1.19E-03 | -- | -- | 8.76E-03 | -- | 8.62E-04 | 2.25E-03 | -- | -- | 1.07E-03 | -- | -- | -- | -- | -- | -- | -- | 9.27E-04 | 9.27E-04 |
| Naphthalene | 6.32E-04 | 2.93E-05 | 1.55E-05 | 4.42E-05 | 2.57E-04 | 2.22E-03 | -- | 1.82E-04 | 1.31E-03 | 2.27E-05 | 4.15E-05 | 1.73E-04 | 1.45E-05 | -- | 7.31E-08 | 1.02E-03 | -- | -- | 5.97E-04 | 5.97E-04 |
| Propane | 4.12E-03 | 1.22E-02 | 2.28E-04 | 6.04E-04 | 6.88E-04 | 1.24E-03 | 1.90E-03 | 7.60E-04 | 7.32E-02 | 5.97E-05 | 1.47E-03 | 2.07E-04 | 1.08E-04 | -- | -- | 6.43E-04 | 1.37E-03 | 3.69E-05 | 5.18E-03 | 5.18E-03 |
| Propylene | 1.14E-03 | 1.48E-03 | 1.07E-03 | 3.37E-03 | 1.28E-03 | 8.33E-04 | 1.01E-02 | 3.32E-04 | 4.28E-03 | -- | 1.22E-03 | 6.67E-04 | -- | -- | -- | 3.91E-03 | -- | 3.69E-06 | 1.96E-03 | 1.96E-03 |
| Styrene | 7.56E-05 | 2.85E-05 | 5.94E-06 | 1.85E-05 | 1.11E-04 | 7.15E-04 | -- | 1.82E-05 | 1.31E-04 | 8.67E-06 | 2.95E-05 | 1.01E-04 | 3.05E-06 | -- | -- | 4.07E-04 | -- | -- | 2.44E-04 | 2.44E-04 |
| Toluene | 8.54E-04 | 6.61E-04 | 2.22E-04 | 1.94E-03 | 2.68E-03 | 4.56E-03 | 6.35E-04 | 3.74E-04 | 4.97E-04 | 2.40E-05 | 6.64E-05 | 2.90E-04 | 6.09E-05 | -- | 1.34E-07 | 7.43E-04 | -- | -- | 1.11E-03 | 1.11E-03 |
| Xylenes | 6.47E-05 | 1.05E-04 | 1.06E-06 | 6.47E-04 | 4.08E-05 | 8.64E-05 | 4.91E-04 | 3.71E-04 | 3.98E-04 | 4.54E-08 | 2.95E-05 | 1.08E-05 | 2.89E-08 | -- | -- | 4.11E-05 | -- | -- | 2.57E-05 | 2.57E-05 |

Table 3a. Maximum Hourly COPC Emission Rates

| Pollutant | Ethane Cracking Furnaces (per furnace) (lb/hr) | Cogen Units (per unit) (lb/hr) | TEGF A (lb/hr) | TEGF B (lb/hr) | HP Elevated Flare (lb/hr) | CVTO (lb/hr) | MPGF (lb/hr) | SCTO (lb/hr) | PE3 Fugitives (lb/hr) | Total Ethane Cracking Fugitives ² (lb/hr) | Total OSBL Fugitives ² (lb/hr) | Emergency Generator Engines (total for all engines) (lb/hr) | Firewater Pump Engines (per engine) (lb/hr) | WWTP (lb/hr) | Process Cooling Tower (lb/hr) | PE1 and PE2 (lb/hr) | PE3 (lb/hr) | Total |
|------------------------|--|--------------------------------|----------------|----------------|---------------------------|--------------|--------------|--------------|-----------------------|--|---|---|---|--------------|-------------------------------|---------------------|-------------|----------|
| Acenaphthene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 3.35E-05 | -- | -- | -- | 2.16E-06 | 4.85E-06 | 3.23E-05 | -- | -- | -- | 1.04E-04 |
| Acenaphthylene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 2.56E-05 | -- | -- | -- | 8.09E-06 | 1.73E-05 | 1.64E-05 | -- | -- | -- | 1.10E-04 |
| Acetaldehyde | -- | 2.00E-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.99E-03 | 2.62E-03 | -- | -- | -- | -- | 7.33E-02 |
| Acrolein | -- | 3.20E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.76E-03 | 3.16E-04 | -- | -- | -- | -- | 1.60E-02 |
| Ammonia | 2.39E+00 | 4.88E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.13E+01 |
| Anthracene | 7.91E-07 | -- | 9.18E-06 | 9.18E-06 | 9.18E-06 | 4.68E-07 | 9.20E-07 | 7.35E-06 | -- | -- | -- | 2.23E-06 | 6.39E-06 | 1.62E-05 | -- | -- | -- | 7.30E-05 |
| Arsenic | 6.59E-05 | -- | 7.65E-04 | 7.65E-04 | 7.65E-04 | 3.90E-05 | 7.67E-05 | 2.17E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.87E-03 |
| Barium | 1.45E-03 | -- | 1.68E-02 | 1.68E-02 | 1.68E-02 | 8.59E-04 | 1.69E-03 | 4.77E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.32E-02 |
| Benzene | 6.92E-04 | 1.12E-03 | 3.68E+00 | 3.68E+00 | 3.68E+00 | 3.07E-03 | 5.40E-02 | 1.42E-02 | -- | 3.93E-02 | 2.04E-02 | 3.51E-03 | 3.19E-03 | 8.41E-03 | 1.58E-03 | -- | -- | 1.12E+01 |
| Benzo(a)anthracene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 1.95E-08 | -- | -- | -- | 2.00E-06 | 5.74E-06 | -- | -- | -- | -- | 3.93E-05 |
| Benzo(a)pyrene | 3.96E-07 | -- | 4.59E-06 | 4.59E-06 | 4.59E-06 | 2.34E-07 | 4.60E-07 | 1.30E-08 | -- | -- | -- | 2.24E-07 | 6.42E-07 | -- | -- | -- | -- | 1.87E-05 |
| Benzo(b)fluoranthene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 1.95E-08 | -- | -- | -- | 1.80E-07 | 3.39E-07 | -- | -- | -- | -- | 2.67E-05 |
| Benzo(e)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.55E-07 | -- | -- | -- | -- | -- | 1.55E-07 |
| Benzo(g,h,i)perylene | 3.96E-07 | -- | 4.59E-06 | 4.59E-06 | 4.59E-06 | 2.34E-07 | 4.60E-07 | 1.30E-08 | -- | -- | -- | 7.36E-07 | 1.67E-06 | -- | -- | -- | -- | 2.13E-05 |
| Benzo(k)fluoranthene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 1.95E-08 | -- | -- | -- | 1.84E-07 | 5.29E-07 | -- | -- | -- | -- | 2.71E-05 |
| Beryllium | 3.96E-06 | -- | 4.59E-05 | 4.59E-05 | 4.59E-05 | 2.34E-06 | 4.60E-06 | 1.30E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.72E-04 |
| Biphenyl | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.24E-08 | 7.91E-05 | -- | -- | -- | -- | -- | 7.92E-05 |
| 1,3-Butadiene | -- | 2.15E-04 | 2.05E+01 | 2.05E+01 | 2.05E+01 | 2.77E-05 | 5.53E-04 | 1.50E-03 | -- | 5.94E-02 | 2.82E-02 | 1.09E-03 | 1.34E-04 | -- | 6.84E-03 | -- | -- | 6.17E+01 |
| Butane | 6.92E-01 | -- | 1.63E+02 | 1.63E+02 | 1.63E+02 | 1.95E+00 | 3.16E+01 | 2.28E-02 | -- | -- | -- | 2.02E-04 | -- | -- | -- | -- | -- | 5.28E+02 |
| Butyr/Isobutyraldehyde | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.07E-05 | -- | -- | -- | -- | -- | 1.07E-05 |
| Cadmium | 3.63E-04 | -- | 4.21E-03 | 4.21E-03 | 4.21E-03 | 2.15E-04 | 4.22E-04 | 1.19E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.58E-02 |
| Carbon Tetrachloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.88E-05 | -- | -- | -- | -- | -- | 3.88E-05 |
| Chlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.96E-05 | -- | -- | -- | -- | -- | 2.96E-05 |
| Chloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.98E-07 | -- | -- | -- | -- | -- | 6.98E-07 |
| Chloroform | -- | -- | -- | -- | -- | -- | -- | 6.61E-07 | -- | -- | -- | 3.00E-05 | -- | 3.33E-05 | -- | -- | -- | 6.40E-05 |
| Chromium III | 4.61E-04 | -- | 5.35E-03 | 5.35E-03 | 5.35E-03 | 2.73E-04 | 4.98E-04 | 1.52E-05 | -- | -- | -- | -- | -- | -- | -- | 1.05E-04 | 1.05E-04 | 2.03E-02 |
| Chromium VI | 1.85E-05 | -- | 5.35E-03 | 5.35E-03 | 5.35E-03 | 1.09E-05 | 1.99E-05 | 6.08E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.62E-02 |
| Chrysene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 1.95E-08 | -- | -- | -- | 6.79E-07 | 1.21E-06 | -- | -- | -- | -- | 2.90E-05 |
| Cobalt | 2.77E-05 | -- | 3.21E-04 | 3.21E-04 | 3.21E-04 | 1.64E-05 | 3.22E-05 | 9.11E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.21E-03 |
| Copper | 2.80E-04 | -- | 3.25E-03 | 3.25E-03 | 3.25E-03 | 1.66E-04 | 3.26E-04 | 9.22E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.22E-02 |
| Cyclopentane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 8.47E-05 | -- | -- | -- | -- | -- | 8.47E-05 |
| Dibenzo(a,h)anthracene | 3.96E-07 | -- | 4.59E-06 | 4.59E-06 | 4.59E-06 | 2.34E-07 | 4.60E-07 | 1.30E-08 | -- | -- | -- | 6.94E-07 | 1.99E-06 | -- | -- | -- | -- | 2.19E-05 |
| Dibutylphthalate | -- | -- | -- | -- | -- | -- | -- | 9.70E-05 | -- | -- | -- | -- | -- | 2.01E-07 | -- | -- | -- | 9.72E-05 |
| Dichlorobenzene | 3.96E-04 | -- | 4.59E-03 | 4.59E-03 | 4.59E-03 | 2.34E-04 | 4.60E-04 | 1.30E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.72E-02 |
| 1,1-Dichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.48E-05 | -- | -- | -- | -- | -- | 2.48E-05 |

| Pollutant | Ethane Cracking Furnaces (per furnace) (lb/hr) | Cogen Units (per unit) (lb/hr) | TEGF A (lb/hr) | TEGF B (lb/hr) | HP Elevated Flare (lb/hr) | CVTO (lb/hr) | MPGF (lb/hr) | SCTO (lb/hr) | PE3 Fugitives (lb/hr) | Total Ethane Cracking Fugitives ² (lb/hr) | Total OSBL Fugitives ² (lb/hr) | Emergency Generator Engines (total for all engines) (lb/hr) | Firewater Pump Engines (per engine) (lb/hr) | WWTP (lb/hr) | Process Cooling Tower (lb/hr) | PE1 and PE2 (lb/hr) | PE3 (lb/hr) | Total |
|--------------------------------|--|--------------------------------|----------------|----------------|---------------------------|--------------|--------------|--------------|-----------------------|--|---|---|---|--------------|-------------------------------|---------------------|-------------|----------|
| 1,2-Dichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.48E-05 | -- | -- | -- | -- | -- | 2.48E-05 |
| 1,2-Dichloropropane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.85E-05 | -- | -- | -- | -- | -- | 2.85E-05 |
| 1,3-Dichloropropene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.78E-05 | -- | -- | -- | -- | -- | 2.78E-05 |
| 7,12-Dimethylbenz(a)anthracene | 5.27E-06 | -- | 6.12E-05 | 6.12E-05 | 6.12E-05 | 3.12E-06 | 6.14E-06 | 1.74E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.30E-04 |
| Ethane | 1.02E+00 | -- | 4.98E+02 | 4.98E+02 | 4.98E+02 | 1.50E+00 | 1.31E+01 | 3.36E-02 | -- | -- | -- | 1.39E-01 | -- | -- | -- | -- | -- | 1.52E+03 |
| Ethylbenzene | -- | 1.60E-02 | 1.91E-02 | 1.91E-02 | 1.91E-02 | 1.07E-04 | 2.15E-03 | 8.11E-04 | -- | 9.36E-04 | 7.25E-04 | 7.11E-05 | -- | 1.35E-03 | 4.39E-06 | -- | -- | 1.12E-01 |
| Ethylene Dibromide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.09E-03 | -- | -- | -- | -- | -- | 4.09E-03 |
| Fluoranthene | 9.89E-07 | -- | 1.15E-05 | 1.15E-05 | 1.15E-05 | 5.86E-07 | 1.15E-06 | 1.15E-05 | -- | -- | -- | 9.47E-06 | 2.60E-05 | 2.77E-06 | -- | -- | -- | 1.19E-04 |
| Fluorene | 9.23E-07 | -- | 1.07E-05 | 1.07E-05 | 1.07E-05 | 5.47E-07 | 1.07E-06 | 2.91E-05 | -- | -- | -- | 3.69E-05 | 9.97E-05 | 1.32E-05 | -- | -- | -- | 3.19E-04 |
| Formaldehyde | 2.47E-02 | 1.65E-01 | 2.87E-01 | 2.87E-01 | 2.87E-01 | 1.46E-02 | 2.88E-02 | 8.14E-04 | -- | -- | -- | 5.02E-02 | 4.03E-03 | -- | -- | -- | -- | 1.63E+00 |
| Heptane | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.76E-04 | -- | -- | -- | -- | -- | -- | -- | 2.76E-04 |
| Hexane | 1.37E-01 | -- | 7.35E-01 | 7.35E-01 | 7.35E-01 | 5.96E-03 | 1.71E-02 | 3.15E-04 | 1.31E-02 | -- | 5.01E-02 | 4.14E-04 | -- | -- | -- | -- | -- | 3.25E+00 |
| Indeno(1,2,3-cd)pyrene | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 1.95E-08 | -- | -- | -- | 4.46E-07 | 1.28E-06 | -- | -- | -- | -- | 2.89E-05 |
| Lead | 1.65E-04 | -- | 1.91E-03 | 1.91E-03 | 1.91E-03 | 9.76E-05 | 1.92E-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.18E-03 |
| Manganese | 1.25E-04 | -- | 1.45E-03 | 1.45E-03 | 1.45E-03 | 7.42E-05 | 1.46E-04 | 4.12E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.46E-03 |
| Methylcyclohexane | 8.57E-05 | -- | 9.94E-04 | 9.94E-04 | 9.94E-04 | 5.08E-05 | 9.97E-05 | 2.82E-06 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.74E-03 |
| Methylene Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.41E-02 | 7.42E-03 | 5.27E-03 | -- | -- | -- | -- | -- | 2.68E-02 |
| Mercury | 5.93E-07 | -- | 6.88E-06 | 6.88E-06 | 6.88E-06 | 3.51E-07 | 6.90E-07 | 1.95E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.59E-05 |
| Methanol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.59E-04 | -- | -- | -- | -- | -- | 4.59E-04 |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6.58E-05 | -- | -- | -- | -- | -- | 6.58E-05 |
| 3-Methylchloranthrene | 7.91E-06 | -- | 9.18E-05 | 9.18E-05 | 9.18E-05 | 4.68E-06 | 9.20E-06 | 2.60E-07 | -- | -- | -- | 1.24E-05 | -- | -- | -- | -- | -- | 3.57E-04 |
| Molybdenum | 3.63E-04 | -- | 4.21E-03 | 4.21E-03 | 4.21E-03 | 2.15E-04 | 4.22E-04 | 1.19E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.58E-02 |
| Naphthalene | 2.01E-04 | 6.50E-04 | 2.33E-03 | 2.33E-03 | 2.33E-03 | 1.39E-04 | 6.24E-04 | 9.77E-04 | -- | 4.92E-03 | 5.82E-03 | 2.66E-04 | 2.90E-04 | 2.10E-04 | -- | -- | -- | 2.39E-02 |
| Nickel | 6.92E-04 | -- | 8.03E-03 | 8.03E-03 | 8.03E-03 | 4.10E-04 | 8.05E-04 | 2.28E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.02E-02 |
| n-Nonane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.11E-05 | -- | -- | -- | -- | -- | 4.11E-05 |
| n-Octane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.31E-04 | -- | -- | -- | -- | -- | 1.31E-04 |
| PAH ¹ | -- | 1.10E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.10E-04 | 5.74E-04 | -- | -- | -- | -- | 4.86E-03 |
| Pentane | 8.57E-01 | -- | 3.14E+02 | 3.14E+02 | 3.14E+02 | 1.38E+00 | 1.80E+02 | 2.82E-02 | -- | -- | -- | 9.71E-04 | -- | -- | -- | -- | -- | 1.13E+03 |
| Perchloroethylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.26E-07 | -- | -- | -- | -- | -- | 9.26E-07 |
| Phenanthrene | 5.60E-06 | -- | 6.50E-05 | 6.50E-05 | 6.50E-05 | 3.32E-06 | 6.52E-06 | 3.72E-05 | -- | -- | -- | 3.89E-05 | 1.00E-04 | 8.45E-06 | -- | -- | -- | 5.29E-04 |
| Phenol | -- | -- | -- | -- | -- | -- | -- | 2.29E-04 | -- | -- | -- | 8.96E-06 | -- | 1.28E-07 | -- | -- | -- | 2.38E-04 |
| Propane | 5.27E-01 | -- | 7.29E+01 | 7.29E+01 | 7.29E+01 | 3.12E-01 | 6.14E-01 | 1.74E-02 | -- | 9.67E-02 | 4.36E-02 | 1.56E-02 | -- | -- | -- | -- | -- | 2.24E+02 |
| Propylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.57E-02 | 1.96E-02 | 3.07E-03 | 8.81E-03 | -- | -- | -- | -- | 6.60E-02 |
| Propylene Oxide | -- | 1.45E-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.35E-02 |
| Pyrene | 1.65E-06 | -- | 1.91E-05 | 1.91E-05 | 1.91E-05 | 9.76E-07 | 1.92E-06 | 1.15E-05 | -- | -- | -- | 6.20E-06 | 1.63E-05 | 1.65E-06 | -- | -- | -- | 1.24E-04 |
| Selenium | 7.91E-06 | -- | 9.18E-05 | 9.18E-05 | 9.18E-05 | 4.68E-06 | 9.20E-06 | 2.60E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.45E-04 |
| Styrene | -- | -- | -- | -- | -- | 6.29E-04 | 1.26E-02 | 1.32E-03 | -- | 1.24E-03 | 2.36E-03 | 2.57E-05 | -- | 2.53E-02 | -- | -- | -- | 4.35E-02 |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.08E-05 | -- | -- | -- | -- | -- | 5.08E-05 |

| Pollutant | Ethane Cracking Furnaces (per furnace) (lb/hr) | Cogen Units (per unit) (lb/hr) | TEGF A (lb/hr) | TEGF B (lb/hr) | HP Elevated Flare (lb/hr) | CVTO (lb/hr) | MPGF (lb/hr) | SCTO (lb/hr) | PE3 Fugitives (lb/hr) | Total Ethane Cracking Fugitives ² (lb/hr) | Total OSBL Fugitives ² (lb/hr) | Emergency Generator Engines (total for all engines) (lb/hr) | Firewater Pump Engines (per engine) (lb/hr) | WWTP (lb/hr) | Process Cooling Tower (lb/hr) | PE1 and PE2 (lb/hr) | PE3 (lb/hr) | Total |
|------------------------|--|--------------------------------|----------------|----------------|---------------------------|--------------|--------------|--------------|-----------------------|--|---|---|---|--------------|-------------------------------|---------------------|-------------|----------|
| Toluene | 1.12E-03 | 1.75E-01 | 4.02E-01 | 4.02E-01 | 4.02E-01 | 1.81E-03 | 2.42E-02 | 7.36E-03 | -- | 1.28E-02 | 9.69E-03 | 1.43E-03 | 1.40E-03 | 2.58E-02 | 8.73E-05 | -- | -- | 1.83E+00 |
| 1,1,2-Trichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.35E-05 | -- | -- | -- | -- | -- | 3.35E-05 |
| 1,2,3-Trimethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 8.59E-06 | -- | -- | -- | -- | -- | 8.59E-06 |
| 1,2,4-Trimethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.34E-06 | -- | -- | -- | -- | -- | 5.34E-06 |
| 1,3,5-Trimethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.26E-05 | -- | -- | -- | -- | -- | 1.26E-05 |
| 2,2,4-Trimethylpentane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.33E-05 | -- | -- | -- | -- | -- | 9.33E-05 |
| Vanadium | 7.58E-04 | -- | 8.79E-03 | 8.79E-03 | 8.79E-03 | 4.49E-04 | 8.82E-04 | 2.50E-05 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.30E-02 |
| Vinyl Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.57E-05 | -- | -- | -- | -- | -- | 1.57E-05 |
| Xylenes | -- | 3.20E-02 | -- | -- | -- | 1.00E-04 | 2.00E-03 | 7.76E-04 | -- | 2.25E-03 | 2.47E-04 | 6.84E-04 | 9.74E-04 | 3.70E-03 | -- | -- | -- | 1.08E-01 |
| Zinc | 9.56E-03 | -- | 1.11E-01 | 1.11E-01 | 1.11E-01 | 5.66E-03 | 1.11E-02 | 3.15E-04 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.17E-01 |

¹ AP-42 factors for stationary combustion turbines are not available for individual PAH compounds. For the purposes of the risk assessment, the PAH emissions were assumed to be that of the individual PAH COPC with the highest cancer and non-cancer impact.

² Emission rates for each Ethane Cracking and OSBL fugitive source are presented in Table 3b.

Table 3b. Maximum Hourly COPC Emission Rates – Ethane Cracking and OSBL Component Fugitives

| Pollutant | Ethane Cracking (ECFUG1) (lb/hr) | Fuel Gas and Regeneration System (ECFUG2) (lb/hr) | Wash Water System (ECFUG3) (lb/hr) | Cracked Gas Compression (ECFUG4) (lb/hr) | Caustic Wash (ECFUG5) (lb/hr) | Gas Redistillation (ECFUG6) (lb/hr) | C2/C3 Separation (ECFUG7) (lb/hr) | C2 Hydrogenation (ECFUG8) (lb/hr) | C1/C2 Separation (ECFUG9) (lb/hr) | Spent Caustic Treatment (ECFUG10) (lb/hr) | Flare Condensate (ECFUG11) (lb/hr) | 590 (ECFUG12) (lb/hr) | Recovered Oil and Truck Loadout (OSBLFUG1) (lb/hr) | Rail for C3+ (OSBLFUG2) (lb/hr) | Diesel Tanks (OSBLFUG3) (lb/hr) | C3+ (OSBLFUG4) (lb/hr) | 236LR (OSBLFUG5) (lb/hr) | 646 (OSBLFUG6) (lb/hr) | 642 (OSBLFUG7) (lb/hr) | Each Flare Header Segment 1-7 (OSBLFUG8-14) (lb/hr) |
|---------------|----------------------------------|---|------------------------------------|--|-------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|---|------------------------------------|-----------------------|--|---------------------------------|---------------------------------|------------------------|--------------------------|------------------------|------------------------|---|
| 1,3-Butadiene | 3.98E-03 | 3.36E-03 | 2.56E-03 | 7.85E-03 | 3.45E-03 | 2.89E-03 | 1.54E-02 | 1.36E-03 | 1.46E-02 | -- | 3.01E-03 | 9.68E-04 | -- | -- | -- | 5.60E-03 | -- | -- | 2.82E-03 | 2.82E-03 |
| Benzene | 3.37E-03 | 2.31E-03 | 1.51E-03 | 5.46E-03 | 5.17E-03 | 7.04E-03 | 4.68E-03 | 6.91E-04 | 7.10E-03 | 1.04E-04 | 1.23E-03 | 6.59E-04 | 2.52E-04 | -- | -- | 2.53E-03 | -- | -- | 2.20E-03 | 2.20E-03 |
| Biphenyl | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.24E-08 | -- | -- | -- | -- | -- |
| Ethylbenzene | 7.66E-05 | 2.27E-05 | 3.50E-06 | 1.74E-04 | 1.13E-04 | 2.30E-04 | 4.71E-05 | 5.19E-05 | 1.57E-04 | 7.69E-07 | 2.95E-05 | 3.07E-05 | 1.93E-06 | -- | 1.26E-06 | 1.10E-04 | -- | -- | 7.64E-05 | 7.64E-05 |
| Hexane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3.89E-02 | -- | -- | 1.41E-03 | 1.41E-03 |
| Methanol | -- | 1.19E-03 | -- | -- | 8.76E-03 | -- | 8.62E-04 | 2.25E-03 | -- | -- | 1.07E-03 | -- | -- | -- | -- | -- | -- | -- | 9.27E-04 | 9.27E-04 |
| Naphthalene | 6.32E-04 | 2.93E-05 | 1.55E-05 | 4.42E-05 | 2.57E-04 | 2.22E-03 | -- | 1.82E-04 | 1.31E-03 | 2.27E-05 | 4.15E-05 | 1.73E-04 | 1.45E-05 | -- | 7.31E-08 | 1.02E-03 | -- | -- | 5.97E-04 | 5.97E-04 |
| Propane | 4.12E-03 | 1.22E-02 | 2.28E-04 | 6.04E-04 | 6.88E-04 | 1.24E-03 | 1.90E-03 | 7.60E-04 | 7.32E-02 | 5.97E-05 | 1.47E-03 | 2.07E-04 | 1.08E-04 | -- | -- | 6.43E-04 | 1.37E-03 | 3.69E-05 | 5.18E-03 | 5.18E-03 |
| Propylene | 1.14E-03 | 1.48E-03 | 1.07E-03 | 3.37E-03 | 1.28E-03 | 8.33E-04 | 1.01E-02 | 3.32E-04 | 4.28E-03 | -- | 1.22E-03 | 6.67E-04 | -- | -- | -- | 3.91E-03 | -- | 3.69E-06 | 1.96E-03 | 1.96E-03 |
| Styrene | 7.56E-05 | 2.85E-05 | 5.94E-06 | 1.85E-05 | 1.11E-04 | 7.15E-04 | -- | 1.82E-05 | 1.31E-04 | 8.67E-06 | 2.95E-05 | 1.01E-04 | 3.05E-06 | -- | -- | 4.07E-04 | -- | -- | 2.44E-04 | 2.44E-04 |
| Toluene | 8.54E-04 | 6.61E-04 | 2.22E-04 | 1.94E-03 | 2.68E-03 | 4.56E-03 | 6.35E-04 | 3.74E-04 | 4.97E-04 | 2.40E-05 | 6.64E-05 | 2.90E-04 | 6.09E-05 | -- | 1.34E-07 | 7.43E-04 | -- | -- | 1.11E-03 | 1.11E-03 |
| Xylenes | 6.47E-05 | 1.05E-04 | 1.06E-06 | 6.47E-04 | 4.08E-05 | 8.64E-05 | 4.91E-04 | 3.71E-04 | 3.98E-04 | 4.54E-08 | 2.95E-05 | 1.08E-05 | 2.89E-08 | -- | -- | 4.11E-05 | -- | -- | 2.57E-05 | 2.57E-05 |

APPENDIX D-3B

DISPERSION MODELING ANALYSIS FOR THE INHALATION RISK ASSESSMENT FOR SHELL POLYMERS MONACA BEAVER COUNTY, PENNSYLVANIA



**Initial Submittal January 2015
First Submittal Update February 2020
Second Submittal Update September 2020
Third Submittal Update September 2024 (Revised May 2025)**

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1.0 INTRODUCTION

This document presents the procedures used in the dispersion modeling analysis conducted to calculate the ground-level concentrations that were employed in the inhalation risk assessment for Shell Polymers Monaca (SPM), owned and operated by Shell Chemical Appalachia LLC (Shell) located in Beaver County, Pennsylvania. An initial analysis was submitted to the Pennsylvania Department of Environmental Protection (DEP) in January of 2015. At DEP's request, revisions to the 2015 analysis were made to account for updates to the facility configuration and emissions, as well as updates to the EPA-approved dispersion model, supporting software, and modeling procedures. The first update was submitted in February of 2020. The second update, submitted in September 2020, incorporated corrections to the modeled hexane emission rate, exit diameters for the facility cooling towers, and included removal of a diesel fired emergency generator. In response to DEP comments, this is a revision to the third update that was submitted in September 2024 to address the Plan Approval Reconciliations, Wastewater Treatment Plant (WWTP) Permanent Controls Project, and Ethylene Maximum Achievable Control Technology (EMACT) Project at SPM. The assessment evaluates the potential cancer and non-cancer inhalation risks from the compounds of potential concern (COPCs) emitted from SPM. The air quality dispersion modeling conforms with the modeling procedures outlined in Appendix W to 40 Code of Federal Regulations (CFR) 51, also referred to as the Environmental Protection Agency's (EPA's) Guideline on Air Quality Models (Guideline), and associated EPA modeling policy and guidance.¹

¹ *Guidelines on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, November 2024

2.0 FACILITY AND PROJECT DESCRIPTION

SPM consists of an ethylene manufacturing unit, three polyethylene manufacturing units, three cogeneration units (Cogen Units), and a variety of ancillary equipment required to support its operations. The major sources of emissions include ethane cracking furnaces, diesel engines that drive emergency generators and fire water pumps, flares, thermal oxidizers, cooling towers, catalyst activation heaters, and combustion turbines with heat recovery systems that provide steam and electricity to SPM and electricity for sale.

This inhalation risk assessment has been prepared in support of the plan approval application submitted by Shell to DEP in accordance with the Pennsylvania Air Pollution Control Act and 25 Pa. Code §127.12 for the following changes.

- The Wastewater Treatment Plant (WWTP) Permanent Controls Project, which will improve the oils, grease, and volatile organic compound (VOC) removal efficiency of the primary treatment section of SPM's WWTP. Shell is currently using temporary equipment to achieve improved removal efficiencies and is now proposing to install permanent equipment.
- The Ethylene Maximum Achievable Control Technology (EMACT) Project, which is necessary to comply with the 40 Code of Federal Regulations (CFR) 63 Subpart YY pressure-assisted multi-point flare minimum net heating value of flare combustion zone gas (NHV_{cz}) requirement that recently became applicable to the Totally Enclosed Ground Flare (TEGF) A and TEGF B. Supplemental gas will be utilized as necessary in order to achieve compliance with the minimum NHV_{cz} currently required by 40 CFR 63 Subpart YY for the two TEGFs.
- After a thorough review of SPM's as-built operations and plan approval source inventory, potential emissions calculations, and conditions, Shell is proposing to reconcile specific plan approval source descriptions, conditions, and supporting potential to emit calculations. These proposed reconciliations are collectively referred to by Shell as the "Plan Approval Reconciliations". A detailed

description of all proposed reconciliations is provided in the plan approval application.

Shell has retrospectively evaluated the Plan Approval Reconciliations and WWTP Permanent Controls Project together as part of the initial construction of SPM for the following reasons:

- The relatively close timing between the Plan Approval Reconciliations and WWTP Permanent Controls Project and the recently completed initial construction of the facility;
- The Plan Approval Reconciliations represent as-built changes to the facility's initial construction plan approvals; and
- The WWTP Permanent Controls Project represents needed improvements to the initial construction of the facility's WWTP.

For purposes of this inhalation risk assessment, the proposed facility-wide emissions are evaluated, including the revisions associated with the Plan Approval Reconciliations and WWTP Permanent Controls Project and emissions increases associated with the EMACT Project.

3.0 SITE DESCRIPTION

SPM occupies approximately 400 acres adjacent to the Ohio River in the Center and Potter Townships, Pennsylvania in Beaver County. The approximate Universal Transverse Mercator (“UTM”) coordinates of the facility are 556,129 meters east and 4,502,450 meters north (UTM Zone 17, NAD 83). Figure 1 shows the general location of the facility.

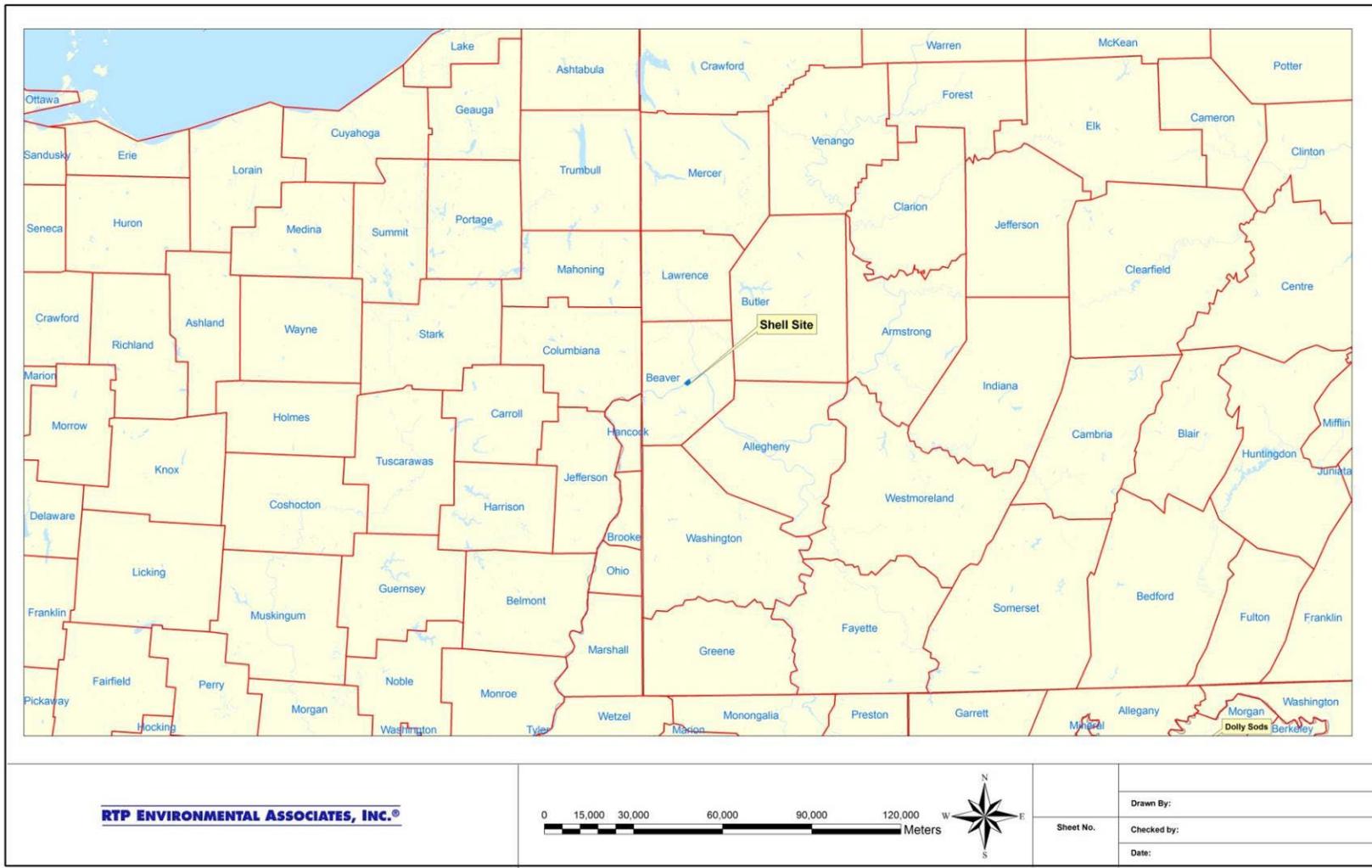


Figure 1. General Location of SPM

4.0 MODEL SELECTION AND MODEL INPUT

4.1 Model Selection

The latest version of the AMS/EPA Regulatory Model (AERMOD, Version 24142) was used to conduct the dispersion modeling analysis. AERMOD is a Gaussian plume dispersion model that is based on planetary boundary layer principles for characterizing atmospheric stability. The model evaluates the non-Gaussian vertical behavior of plumes during convective conditions with the probability density function and the superposition of several Gaussian plumes. AERMOD is a modeling system with three components: AERMAP is the terrain preprocessor program, AERMET is the meteorological data preprocessor and AERMOD includes the dispersion modeling algorithms.

AERMOD is the most appropriate model for calculating ambient concentrations near SPM based on the model's ability to incorporate multiple sources and source types. The model can also account for convective updrafts and downdrafts and meteorological data throughout the plume depth. The model also provides parameters required for use with up-to-date planetary boundary layer parameterization. The model also has the ability to incorporate building wake effects and to calculate concentrations within the cavity recirculation zone. All model options were selected as recommended in the EPA Guideline on Air Quality Models (Appendix W to 40 CFR 51).² Model runs were completed using the EPA executable available for download from the Support Center for Regulatory Atmospheric Modeling (SCRAM).³

4.2 Model Control Options and Land Use

AERMOD was run in the regulatory default mode. The default rural dispersion coefficients in the model were used. This is supported by the Land Use Procedure consistent with subsection 7.2.1.1 of the Guideline and Section 5.1 of the AERMOD

² *Guidelines on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, November 2024.

³ <https://www.epa.gov/scram>

Implementation Guide.^{4,5}

The USGS 2021 National Land Cover Data (“NLCD”) within 3 km of SPM were converted to Auer 1978 land use types. NLCD Categories 23 and 24, were considered as urban.⁶ It was determined that the land use in the vicinity of SPM is predominantly rural (22% of the area is classified as urban, Figure 2). A spreadsheet providing the results of the landuse analysis is provided with the modeling input and output files electronically. The potential for urban heat island affects, which are regional in character, was considered and determined not to be of concern.

4.3 Source Data

Source Characterization

Point Sources

Most emission sources at SPM vent to stacks with a well defined opening. These sources were modeled as point sources in AERMOD. The model source characteristics for the point sources are presented in Table 1. The emission rates evaluated for each point source can be found in Table 2 of Appendix D-3A. The location of each point source is shown in Figure 3.

⁴ *Guidelines on Air Quality Models*, Appendix W to 40 CFR Part 51, U.S. Environmental Protection Agency, November 2024.

⁵ *AERMOD Implementation Guide*, EPA-454-B-23-009, October 12, 2023.

⁶ Auer, Jr., A.H. "Correlation of Land Use and Cover with Meteorological Anomalies." Journal of Applied Meteorology, 17:636-643, 1978.

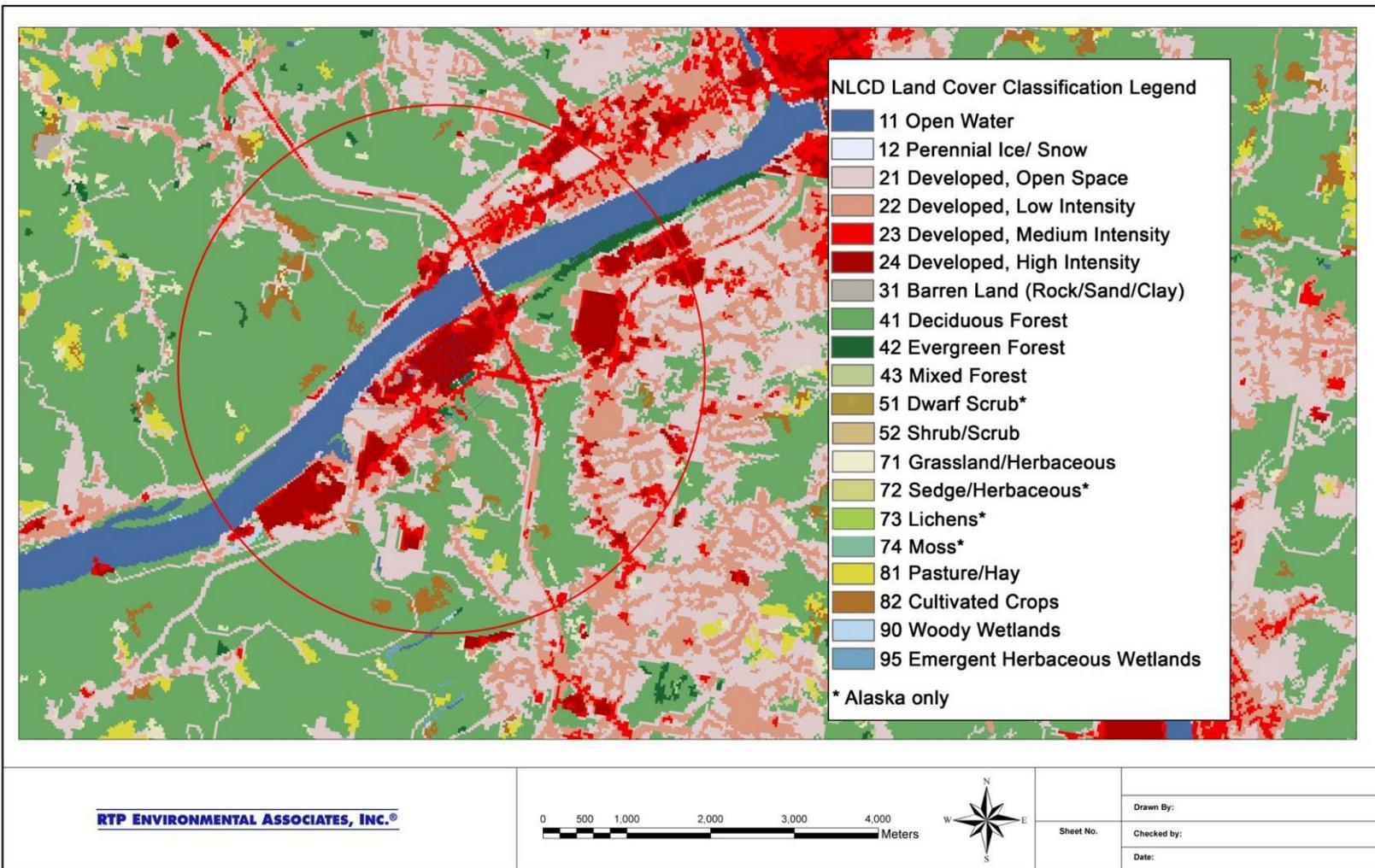


Figure 2. Land Use within Three Kilometers of SPM

Table 1. Point Source Input Parameters

| AERMOD ID | Description | UTM Easting¹ (m) | UTM Northing¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) |
|------------------|--|------------------------------------|-------------------------------------|----------------------|-------------------------|------------------------|----------------------------|---------------------------|
| EC#1 | Ethane Cracking Furnace #1 | 555502.11 | 4502199.00 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#2 | Ethane Cracking Furnace #2 | 555512.76 | 4502186.65 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#3 | Ethane Cracking Furnace #3 | 555534.48 | 4502160.24 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#4 | Ethane Cracking Furnace #4 | 555545.98 | 4502148.32 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#5 | Ethane Cracking Furnace #5 | 555561.73 | 4502131.29 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#6 | Ethane Cracking Furnace #6 | 555572.81 | 4502118.51 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| EC#7 | Ethane Cracking Furnace #7 | 555590.27 | 4502098.92 | 242.32 | 83.82 | 396.26 | 12.25 | 2.59 |
| CT1 | Combustion Turbine/Duct Burner Unit #1 | 555945.76 | 4502058.51 | 242.32 | 64.92 | 428.15 | 24.08 | 3.05 |
| CT2 | Combustion Turbine/Duct Burner Unit #2 | 555991.73 | 4502098.68 | 242.32 | 64.92 | 428.15 | 24.08 | 3.05 |
| CT3 | Combustion Turbine/Duct Burner Unit #3 | 556038.01 | 4502138.02 | 242.32 | 64.92 | 428.15 | 24.08 | 3.05 |
| GFLARE1 | Totally Enclosed Ground Flare (TEGF) A | 555472.50 | 4502011.25 | 237.74 | 82.66 | 1273.15 | 20.00 | 10.96 |
| GFLARE2 | TEGF B | 555421.71 | 4502085.72 | 237.74 | 82.66 | 1273.15 | 20.00 | 10.96 |
| HPFLARE | HP Elevated Flare | 555385.33 | 4502007.13 | 237.74 | 151.24 | 1273.15 | 20.00 | 10.96 |
| MPFLARE | Multipoint Ground Flare (MPGF) | 556083.87 | 4502666.73 | 242.32 | 4.46 | 1273.15 | 20.00 | 0.27 |
| INCIN | Continuous Vent Thermal Oxidizer (CVTO) | 556066.31 | 4502619.14 | 242.32 | 76.20 | 1144.26 | 56.76 | 1.37 |
| COI | Spent Caustic Thermal Oxidizer (SCTO) | 555256.39 | 4502075.62 | 217.63 | 60.96 | 1144.26 | 13.71 | 0.61 |
| FWP1 | Fire Water Pump 1 | 556126.22 | 4501713.44 | 259.08 | 9.97 | 692.59 | 36.88 | 0.30 |
| FWP2 | Fire Water Pump 2 | 556118.30 | 4501706.53 | 259.08 | 9.97 | 692.59 | 36.88 | 0.30 |
| GEN1 | Diesel-Fired Emergency 1 - Parking Garage | 556228.46 | 4501766.08 | 259.08 | 1.52 | 687.59 | 68.82 | 0.08 |
| GEN2 | Diesel-Fired Emergency Generator 2 - Telecom Hut | 556275.53 | 4501732.18 | 259.08 | 1.83 | 763.15 | 42.62 | 0.06 |
| GEN3 | Natural Gas-Fired Emergency Generator 3 - Lift Station | 556186.33 | 4502105.90 | 242.32 | 1.83 | 949.82 | 90.66 | 0.09 |
| GEN4 | Natural Gas-Fired Emergency Generator 4 - Lift Station | 555907.33 | 4502035.53 | 242.32 | 1.83 | 960.93 | 37.26 | 0.06 |
| COLTW1a | Process Cooling Tower | 555788.46 | 4502467.84 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW1b | Process Cooling Tower | 555799.66 | 4502454.71 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW2a | Process Cooling Tower | 555801.28 | 4502478.95 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW2b | Process Cooling Tower | 555812.45 | 4502465.82 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW3a | Process Cooling Tower | 555814.09 | 4502490.07 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW3b | Process Cooling Tower | 555825.24 | 4502476.93 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW4a | Process Cooling Tower | 555826.90 | 4502501.19 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW4b | Process Cooling Tower | 555838.03 | 4502488.04 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW5a | Process Cooling Tower | 555839.72 | 4502512.30 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW5b | Process Cooling Tower | 555850.81 | 4502499.15 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW6a | Process Cooling Tower | 555852.53 | 4502523.42 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW6b | Process Cooling Tower | 555863.60 | 4502510.26 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW7a | Process Cooling Tower | 555865.34 | 4502534.53 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW7b | Process Cooling Tower | 555876.39 | 4502521.37 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW8a | Process Cooling Tower | 555878.16 | 4502545.65 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW8b | Process Cooling Tower | 555889.18 | 4502532.48 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW9a | Process Cooling Tower | 555890.97 | 4502556.77 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW9b | Process Cooling Tower | 555901.97 | 4502543.59 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |

| AERMOD ID | Description | UTM Easting¹ (m) | UTM Northing¹ (m) | Elevation (m) | Stack Height (m) | Stack Temp. (K) | Exit Velocity (m/s) | Stack Diameter (m) |
|------------------|---|--|---|--------------------------|-----------------------------|----------------------------|--------------------------------|-------------------------------|
| COLTW10a | Process Cooling Tower | 555903.79 | 4502567.88 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW10b | Process Cooling Tower | 555914.76 | 4502554.70 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW11a | Process Cooling Tower | 555916.60 | 4502579.00 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW11b | Process Cooling Tower | 555927.55 | 4502565.81 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW12a | Process Cooling Tower | 555929.41 | 4502590.12 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW12b | Process Cooling Tower | 555940.34 | 4502576.92 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW13a | Process Cooling Tower | 555942.23 | 4502601.23 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| COLTW13b | Process Cooling Tower | 555953.12 | 4502588.03 | 242.32 | 21.64 | 294.82 | 7.88 | 11.20 |
| CAH1 | PE Unit 1 Catalyst Vent Filter Vent | 556294.39 | 4502493.32 | 242.32 | 45.72 | 473.15 | 10.67 | 0.41 |
| CAH2 | PE Unit 2 Catalyst Vent Filter Vent | 556289.38 | 4502488.95 | 242.32 | 45.72 | 473.15 | 10.67 | 0.41 |
| CAA | PE Unit 3 Catalyst Activator A Filter (External) Vent | 556151.35 | 4502347.38 | 242.32 | 23.87 | 473.15 | 7.20 | 0.20 |
| CAB | PE Unit 3 Catalyst Activator B Filter (External) Vent | 556158.56 | 4502339.12 | 242.32 | 23.87 | 473.15 | 7.20 | 0.20 |

¹UTM NAD83, Zone 17.

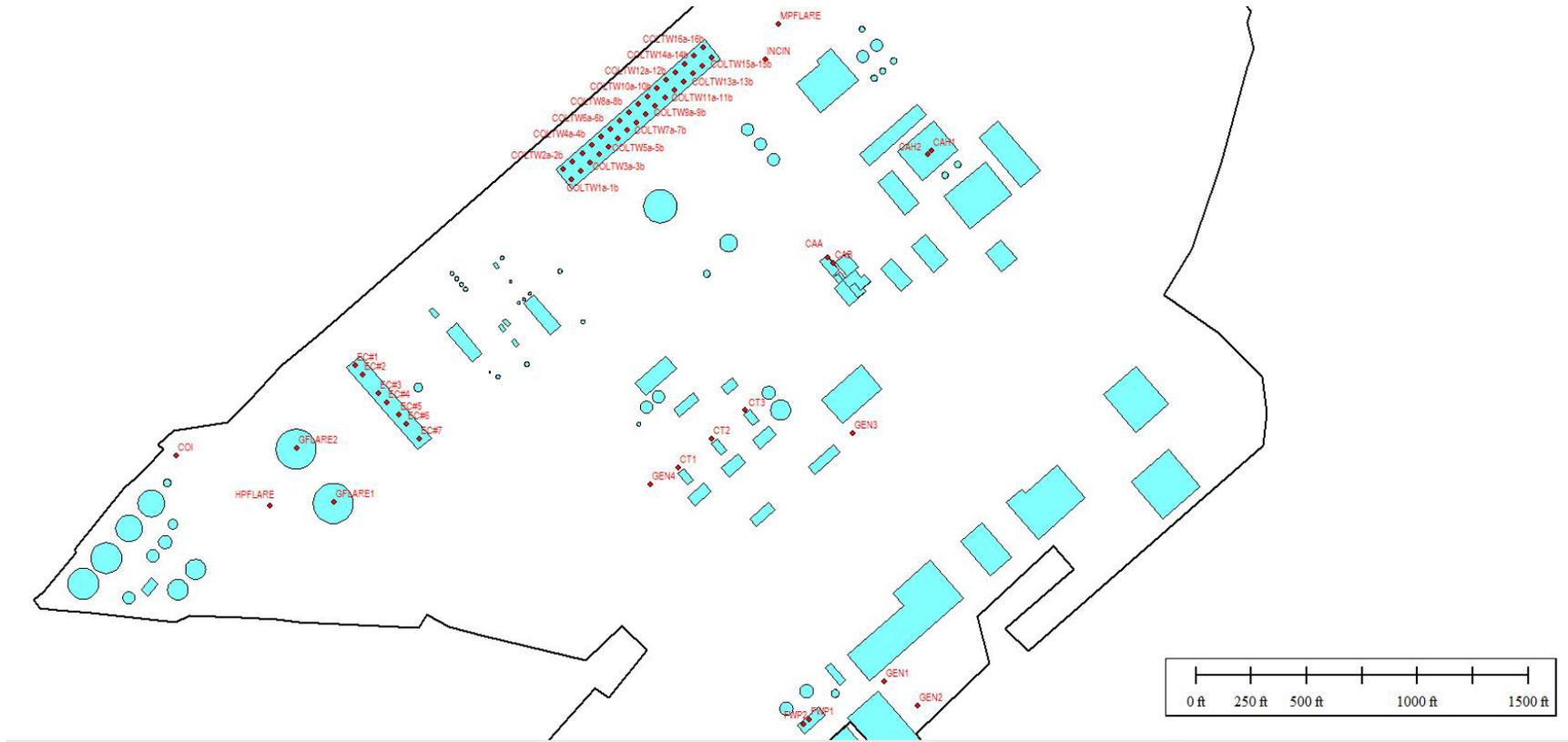


Figure 3. Modeled Point Source Locations

Flares

There is an elevated high pressure candlestick flare, two TEGFs, and an MPGF. These flares were modeled using the procedures outlined below as presented in Section 2.1.2 of the AERSCREEN User's Guide.⁷

The effective flare diameter (D , in meters) and height (h_{eff} , in meters) were computed as a function of heat release rate according to the following equations, where HR is the heat release rate of the flare in calories per second, HL is the heat loss fraction, and H_s is the physical height of the flare in meters:

$$D = 9.88 \times 10^{-4} \times \sqrt{HR \times (1 - HL)}$$

$$h_{eff} = H_s + 4.56 \times 10^{-3} \times HR^{0.478}$$

The MPGF was represented by one flare stack. The effective flare diameter and height for an individual flare was used for the representative flare stack and was calculated using the equivalent individual heat release rate, which was estimated as the total heat release rate (88.4 MMBtu/hr) divided by the total number of flare heads (38).

An exit temperature of 1273 Kelvin (K) and velocity of 20 meters per second (m/s) were assumed, consistent with the AERSCREEN default values.⁸

Fugitive Emissions from Tanks and Equipment Leaks

Fugitive emissions from tanks and equipment leaks were modeled as volume sources. For equipment leaks, the emission rate for a given COPC was determined by applying process area component speciation data to the VOC emission rate associated with the equipment components contained within known process areas. The initial dispersion coefficients (σ_y and σ_z) were calculated based upon the dimensions of the area of release and the equations contained in Table 3-3 of the AERMOD User's

⁷ AERSCREEN User's Guide, EPA-454/B-21-005, April 2021.

⁸ Ibid.

Guide.⁹

The volume source parameter calculations can be found in Table 2. The emission rates evaluated for each volume source are presented in Table 2 of Appendix D-3A. The location of each modeled volume source is shown in Figure 4. All source locations are based on a NAD83, UTM Zone 17 projection. Source elevations were determined from facility survey data, not from AERMAP.

⁹ *AERMOD User's Guide*, EPA-454-B-24-007, November 2024.

Table 2. SPM Non-Road Volume Source Parameter Calculations

| Model ID | Source Description | Source Dimensions | | | | Initial Dispersion Coefficients | | | | Footnote |
|-----------|----------------------------------|-------------------|------------|--------------------------|--|---------------------------------|---|---------------------------------------|---------|----------|
| | | Length (ft) | Width (ft) | Square Root of Area (ft) | Structure Height/Vertical Dimension (ft) | Release Height (ft) | Initial Horizontal Dimension s_y (ft) | Initial Vertical Dimension s_z (ft) | | |
| PEBLD | PE3 Fugitives | 147.6 | 82.0 | 110.0 | 141.0 | 141.0 | 25.58 | 65.6 | 1, 2, 3 | |
| C3RAIL | Railcar Loading of C3+ | 98.4 | 98.4 | 98.4 | 187.0 | 187.0 | 22.88 | 87.0 | 1, 2, 3 | |
| ROTRUCK | Truck Loading Recovered Oil | 213.2 | 196.8 | 204.8 | 151.0 | 151.0 | 47.64 | 70.2 | 1, 2, 3 | |
| ECFUG1 | Ethane Cracking | 492.0 | 78.7 | 196.8 | 140.0 | 70.0 | 45.77 | 65.12 | 2, 4 | |
| ECFUG2 | Fuel Gas and Regeneration System | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG3 | Wash Water System | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG4 | Cracked Gas Compression | 425.0 | 425.0 | 425.0 | 82.0 | 41.0 | 98.84 | 38.14 | 2, 4 | |
| ECFUG5 | Caustic Wash | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG6 | Gas Redistillation | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG7 | C2/C3 Separation | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG8 | C2 Hydrogenation | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG9 | C1/C2 Separation | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG10 | Spent Caustic Treatment | 300.0 | 300.0 | 300.0 | 40.0 | 20.0 | 69.77 | 18.60 | 2, 4 | |
| ECFUG11 | Flare Condensate | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| ECFUG12 | 590 | 100.0 | 100.0 | 100.0 | 15.0 | 7.5 | 23.26 | 6.98 | 2, 4 | |
| OSBLFUG1 | Recovered Oil and Truck Loadout | 300.0 | 300.0 | 300.0 | 48.0 | 24.0 | 69.77 | 22.33 | 2, 4 | |
| OSBLFUG2 | Rail for C3+ | 300.0 | 300.0 | 300.0 | 52.0 | 26.0 | 69.77 | 24.19 | 2, 4 | |
| OSBLFUG3 | Diesel Tanks | 300.0 | 300.0 | 300.0 | 52.0 | 26.0 | 69.77 | 24.19 | 2, 4 | |
| OSBLFUG4 | C3+ | 164.0 | 98.4 | 127.0 | 83.0 | 41.5 | 29.54 | 38.60 | 2, 4 | |
| OSBLFUG5 | 236LR | 500.0 | 50.0 | 158.1 | 40.0 | 20.0 | 36.77 | 18.60 | 2, 4 | |
| OSBLFUG6 | 646 | 200.0 | 200.0 | 200.0 | 15.0 | 7.5 | 46.51 | 6.98 | 2, 4 | |
| OSBLFUG7 | 642 | 300.0 | 300.0 | 300.0 | 82.0 | 41.0 | 69.77 | 38.14 | 2, 4 | |
| OSBLFUG8 | Flare Header Segment 1 | 640.0 | 40.0 | 160.0 | 35.0 | 17.5 | 37.21 | 16.28 | 2, 4 | |
| OSBLFUG9 | Flare Header Segment 2 | 475.0 | 40.0 | 137.8 | 35.0 | 17.5 | 32.06 | 16.28 | 2, 4 | |
| OSBLFUG10 | Flare Header Segment 3 | 150.0 | 40.0 | 77.5 | 35.0 | 17.5 | 18.01 | 16.28 | 2, 4 | |
| OSBLFUG11 | Flare Header Segment 4 | 450.0 | 40.0 | 134.2 | 35.0 | 17.5 | 31.20 | 16.28 | 2, 4 | |
| OSBLFUG12 | Flare Header Segment 5 | 480.0 | 40.0 | 138.6 | 35.0 | 17.5 | 32.22 | 16.28 | 2, 4 | |
| OSBLFUG13 | Flare Header Segment 6 | 630.0 | 40.0 | 158.7 | 35.0 | 17.5 | 36.92 | 16.28 | 2, 4 | |
| OSBLFUG14 | Flare Header Segment 7 | 510.0 | 40.0 | 142.8 | 35.0 | 17.5 | 33.22 | 16.28 | 2, 4 | |

Table 2. SPM Non-Road Volume Source Parameter Calculations

| Model ID | Source Description | Source Dimensions | | | | Initial Dispersion Coefficients | | | Footnote |
|----------|---------------------------------|-------------------|------------|--------------------------|--|---------------------------------|--|--|----------|
| | | Length (ft) | Width (ft) | Square Root of Area (ft) | Structure Height/Vertical Dimension (ft) | Release Height (ft) | Initial Horizontal Dimension σ_y (ft) | Initial Vertical Dimension σ_z (ft) | |
| WWTP | Waste Water Treatment Fugitives | 225.0 | 225.0 | 225.0 | 30.0 | 15.0 | 52.33 | 13.95 | 2, 4 |

¹ Release height equal to top of structure as process is aspirated and emissions occur at the top of the structure.

² Sigma Y value calculated as the square root of the area divided by 4.3 (Table 3-3 of AERMOD User's Guide for single volume source).

³ Sigma Z values for elevated sources on or adjacent to a building calculated as the building height divided by 2.15 (Table 3-3 of AERMOD User's Guide for Elevated Source on or Adjacent to Building).

⁴ Sigma Z values for surface-based source calculated as the vertical dimension of source divided by 2.15 (Table 3-3 of AERMOD Manual for Surface Based Source).

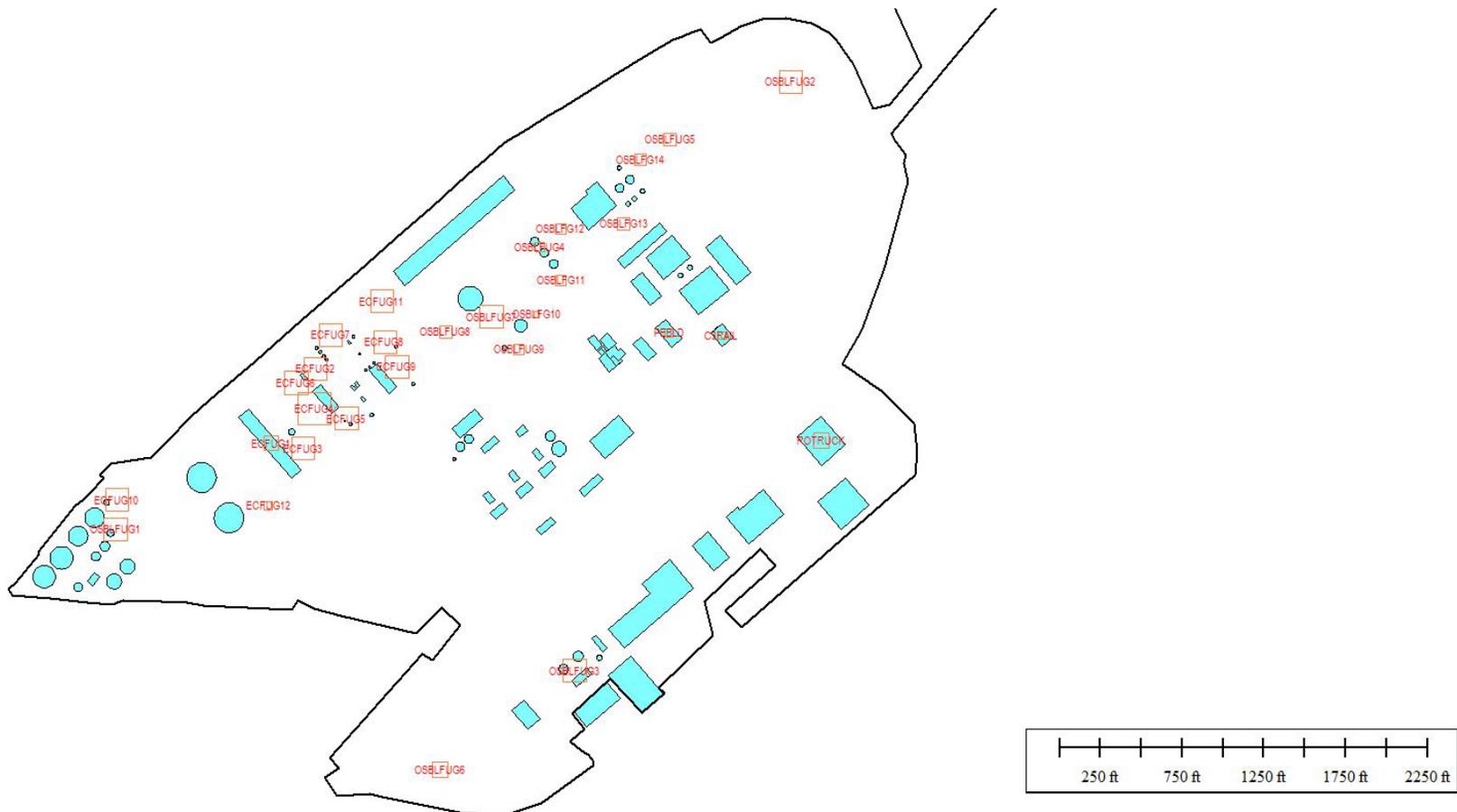


Figure 4. Modeled Volume Source Locations

Combustion Turbine Loads

Refer to Section 5.2 of Appendix D-1 for a discussion of the load conditions that were evaluated for the combustion turbines at SPM to identify the load condition resulting in the worst-case impact for each averaging period of concern. The load condition resulting in the worst-case impacts (i.e., 100% load) was carried forward for the final AERMOD runs. The results of the load analysis are presented in Section 5.1 and supporting AERMOD input and output files will be provided electronically.

Good Engineering Practice Stack Height Analysis

A Good Engineering Practice (GEP) stack height evaluation was conducted to determine the direction-specific building dimensions to include in the model. Since flares are not subject to the GEP regulations, there is no requirement to calculate the GEP formula stack height for flares. The formula height is used to justify stack height credit for stacks constructed in excess of 65 m. Procedures used were in accordance with those described in the EPA Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations-Revised).^j GEP formula stack height, as defined in 40 CFR 51, is expressed as $GEP = H_b + 1.5L$, where H_b is the building height and L is the lesser of the building height or maximum projected width. Point source and building/structure locations were determined from a facility plot plan. The locations and heights were input to the EPA's Building Profile Input Program (BPIP-PRIME) computer program to calculate the direction-specific building dimensions needed for AERMOD. Multi-tiered buildings (i.e. PE12, PE3, PERAIL) were represented as multi-tiered structures in the BPIP-PRIME input file, consistent with the EPA User's Guide to the Building Profile Input Program.^k A plot plan for SPM is shown in Figure 5. A three dimensional rendering of the facility is shown in Figure 6. Downwash parameters for all point sources were included in the model runs.

^j *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for Stack Height Regulations (Revised))*. EPA-450/4-80-023R, U.S. Environmental Protection Agency, June 1985.

^k *User's Guide to the Building Profile Input Program*. EPA-454/R-93-038, U.S. Environmental Protection Agency, April 2004

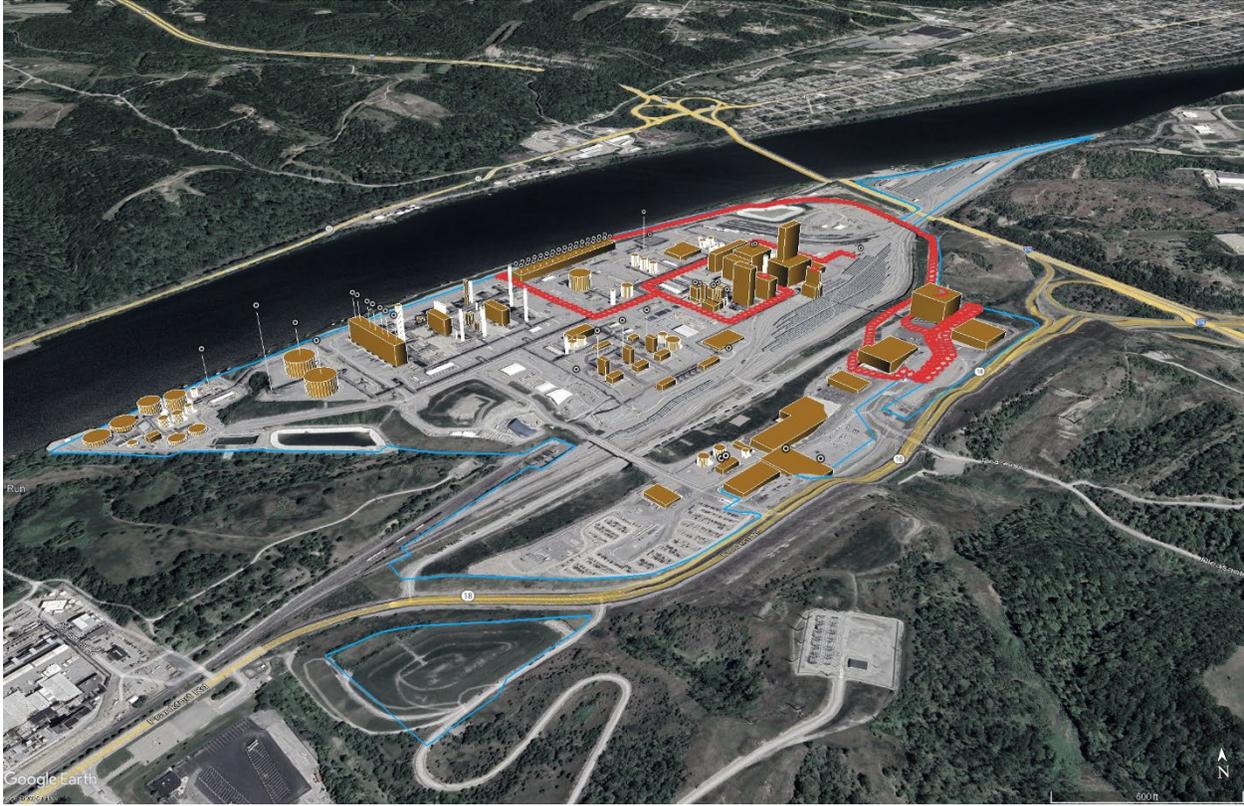


Figure 6. SPM Three-Dimensional Plot Plan (View from SW)

4.4 Receptor Data

Two receptor grids were developed for this analysis: one for assessing acute impacts and one for assessing chronic impacts. For the acute impacts assessment, modeled receptors were placed in all areas considered "ambient air" pursuant to 40 CFR 50.1(e) and the EPA's December 2, 2019 "Revised Policy on Exclusions from Ambient Air".¹² Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access. There is a fence which precludes public access to the entire SPM property. The fencing is placed around the entire facility perimeter as well as along each side of the railroad track that transects the facility. Entrances are secured by gate with cameras and remote-controlled access for truck deliveries. Gate, guard shack, and cameras are used for contractor and personnel vehicle entrances. In addition, security maintains a 24/7 presence on-site to ensure that unauthorized public

¹² *Revised Policy on Exclusions from "Ambient Air"*, memorandum from Andrew Wheeler to Regional Administrators, EPA, December 2, 2019.

access is not permitted.

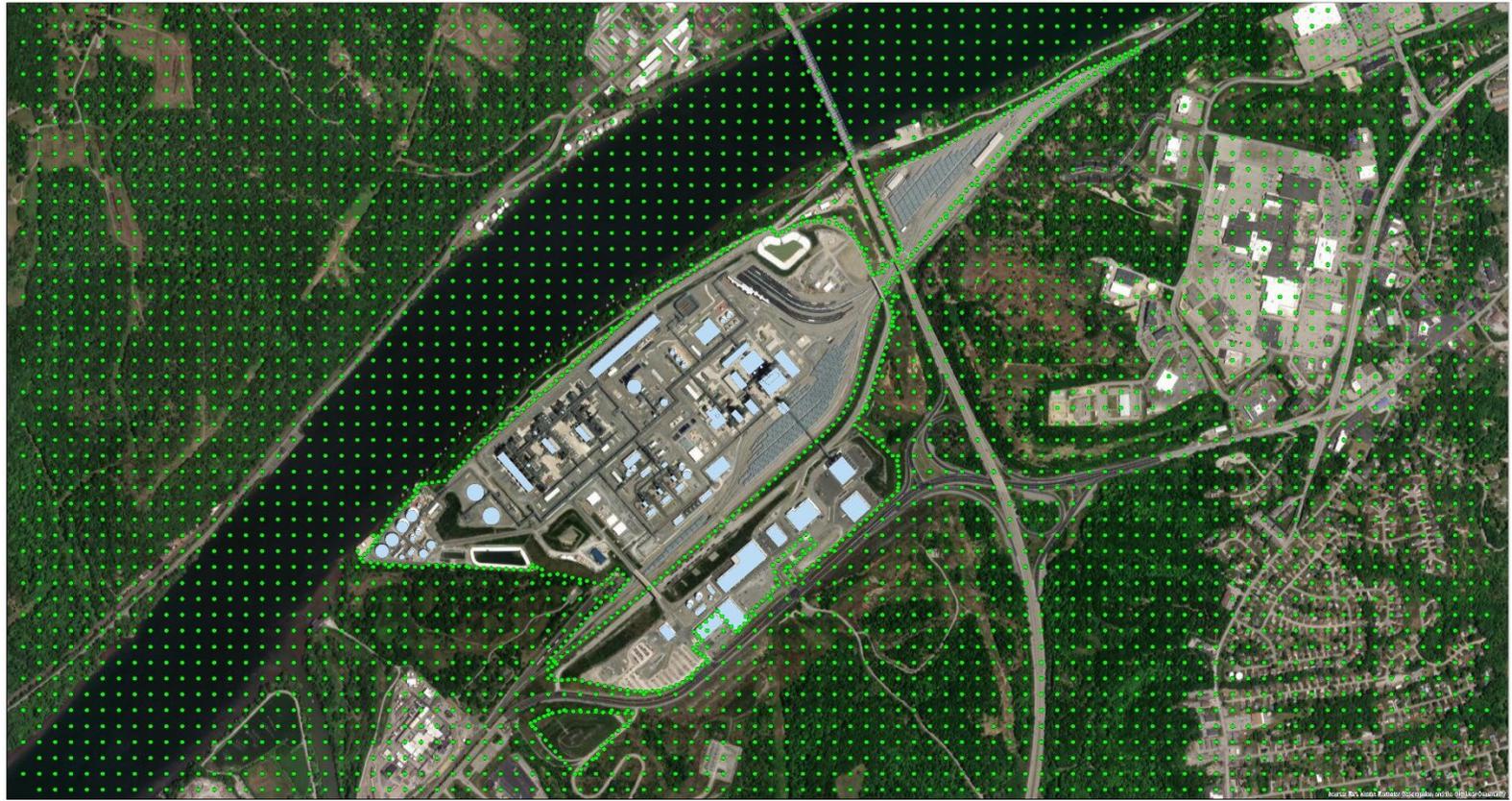
The receptor grid consisted of three Cartesian grids and receptors spaced at 25 m intervals along SPM's fenceline and the railroad that transects the facility. The first cartesian grid extends approximately 1 km from the fence in all directions. Receptors in this region were spaced at 50 m intervals. The second grid extends to 3 km. Receptor spacing in this region is 100 m. The third grid extends to approximately 5 km with a spacing of 500 m. Receptors with flagpole elevations were also placed along the Highway 376 bridge east of SPM. The receptor grid was designed such that maximum facility impacts fall within the 50 m spacing of receptors. The receptor grid spacing is presented in Table 3.

Table 3. Receptor Grid Spacing

| Receptor Spacing (m) | Distance from Facility Fence (m) |
|-----------------------------|---|
| 50 | 1,000 |
| 100 | 3,000 |
| 500 | 5,000 |

A second grid was used for assessment of chronic impacts. This grid does not include receptors located on the Ohio River, facility property adjacent to the river, the Highway 376 bridge, or the railroad that transects the facility. These receptors were excluded from the assessment of chronic impacts as exposure in these areas is limited to the short-term.

SPM is located in western Pennsylvania. Terrain within 5 km of the site is gently rolling; however, there is terrain in excess of stack top elevation. Receptor elevations and hill height scale factors were calculated with AERMAP (version 24142). The elevation data were obtained from the USGS 1/3 arc second Three-Dimensional Elevation Program (3DEP) data obtained from the National Map from the USGS. Locations were based on a NAD83, UTM Zone 17 projection. The near-field receptor grids used in the acute and chronic assessments are shown in Figures 7 and 8, respectively.



RTP ENVIRONMENTAL ASSOCIATES, INC.®

0 150 300 600 900 1,200 Meters



Sheet No.

Drawn By:

Checked by:

Date:

Figure 7. SPM Acute Analysis Receptor Grid



RTP ENVIRONMENTAL ASSOCIATES, INC.®

0 150 300 600 900 1,200 Meters



Sheet No.

Drawn By:

Checked by:

Date:

Figure 8. SPM Chronic Analysis Receptor Grid

4.5 Meteorological Data

Data Selection and Representativeness

The 2018-2022, 5-year sequential hourly surface meteorological data collected at the Vistra Beaver Valley Nuclear Generating Station (Beaver Valley) and supplemental surface and upper air data from the Pittsburgh International Airport (KPIT, WBAN 94823) were used in the analysis. The Beaver Valley meteorological station surface data were collected as part of a continuous data collection program required by the U.S. Nuclear Regulatory Commission and were processed under the ONSITE pathway in Stage 1 of AERMET. For reasons discussed below, the Beaver Valley meteorological station data adequately represent atmospheric boundary layer conditions within the SPM analysis domain for AERMOD to properly characterize the transport and dispersion of plumes from SPM. A profile base elevation of 228.6 m (750 feet) was employed which corresponds to the base elevation of the Beaver Valley meteorological station tower.

The Beaver Valley meteorological station is located approximately 8 km downstream of SPM, also on the Ohio River. This meteorological station and SPM also share a similar orientation in relation to the Ohio River (Figure 9). The river flows from the northeast to southwest relative to both the Beaver Valley meteorological station and SPM. The topography is also similar at each location. The wind patterns are therefore expected to be similar at each location. Wind speed and direction are measured at three levels at the Beaver Valley meteorological station (10.7 m, 45.7 m, and 152.4 m) (See the wind roses for each level in Figure 10). Temperature is also measured at the 10.7 m level. These three levels provide adequate representation of plume behavior at the various release heights at SPM. The adjust u^* option was applied in Stage 2 of AERMET because there is no measured on-site turbulence data.

According to the EPA AERMOD Implementation Guide, the surface characteristics should be similar for the meteorological station and the study site.¹³ As a result, Shell performed a comparison of the surface characteristics at the Beaver Valley

¹³ *AERMOD Implementation Guide*, EPA-454-B-23-009, October 12, 2023.

meteorological station and SPM. The AERSURFACE program (version 24142) was run to determine the characteristics for comparison. The results of the albedo and Bowen ratio comparison by month are shown in Figure 11. The surface roughness comparison, by season, are shown in Figure 12.

The Pittsburgh International Airport meteorological station is located approximately 21 km southeast of SPM. Station pressure, cloud cover, and twice daily sounding data from this meteorological tower were used. These meteorological parameters are of synoptic scale and are adequately representative of the Beaver Valley area. Upper air data are also collected at the Pittsburgh International Airport meteorological station (Figure 9).



Figure 9. Beaver Valley (Vistra) Meteorological Tower and Pittsburgh Surface and Upper Air Station Locations Relative to SPM

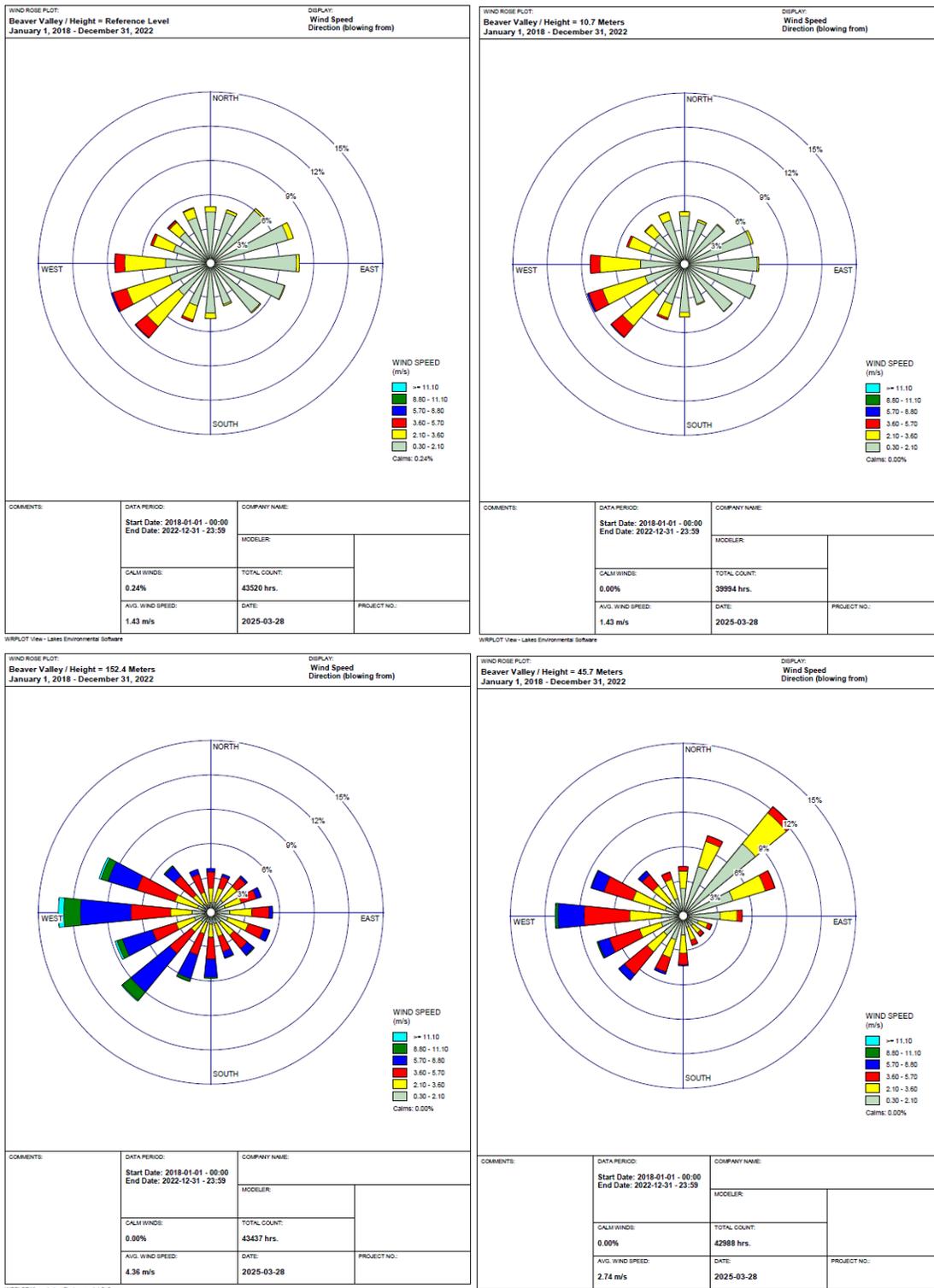
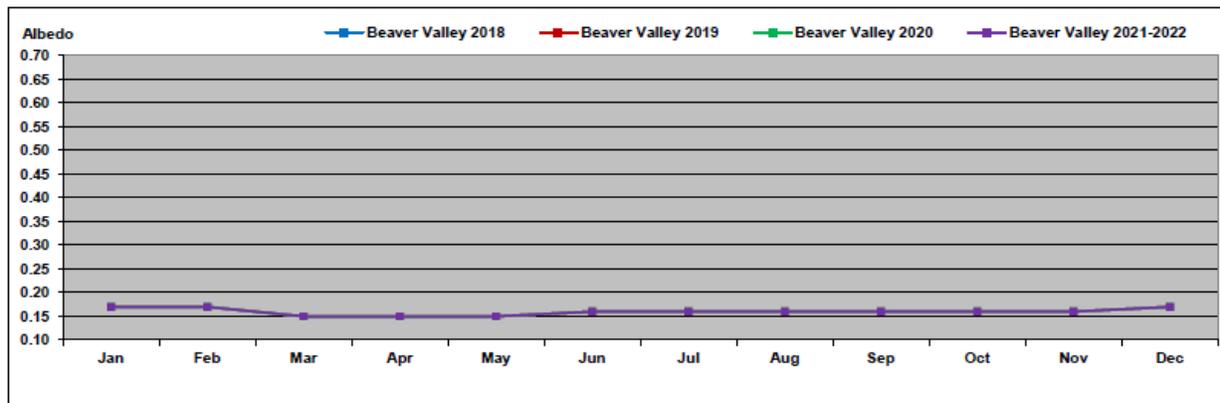


Figure 10. Beaver Valley Windrose 2018-2022

Albedo



Bowen Ratio

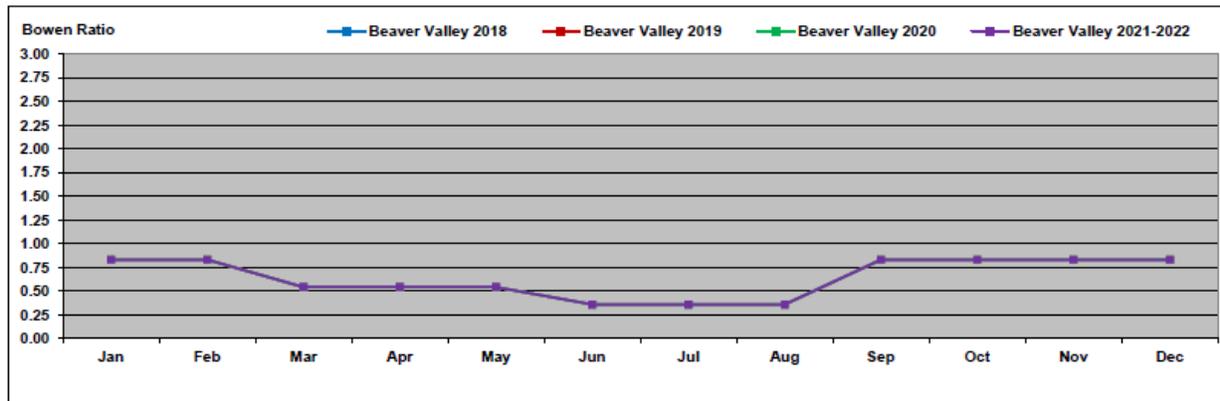


Figure 11. Albedo and Bowen Ratio Comparison Results

Surface Roughness Length

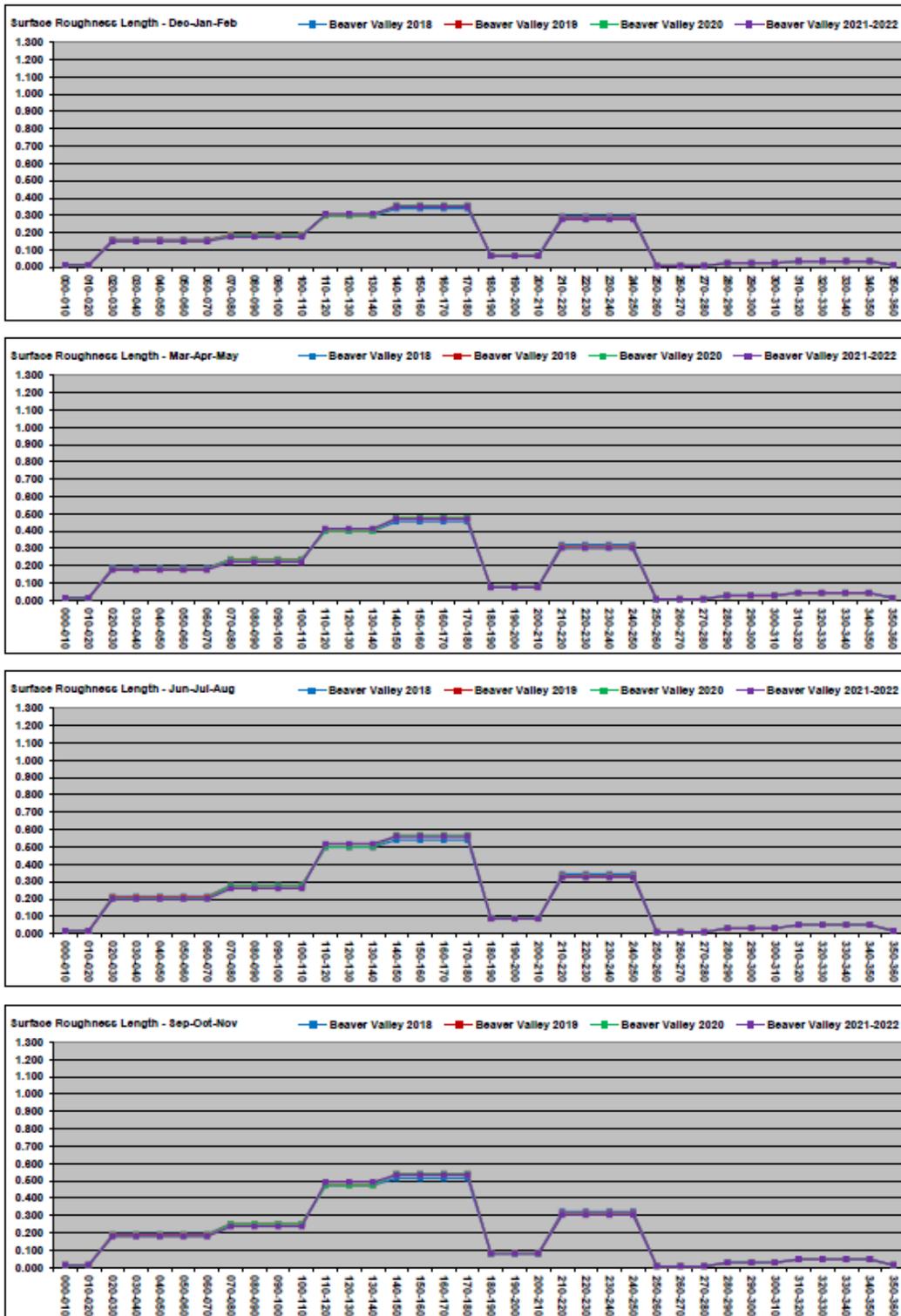


Figure 12. Surface Roughness Comparison Results

Data Processing

The meteorological data were provided to Landau Associates, Inc. (Landau) by DEP. DEP processed the Beaver Valley surface data, Pittsburgh International Airport (KPIT) surface data, and KPIT upper air data using the meteorological preprocessor AERMET (version 24142). In AERMET Stage 1, KPIT surface meteorological data in the Integrated Surface Data (ISD) format were extracted. KPIT upper air meteorological data in the Integrated Global Radiosond Archive (IGRA) format were also extracted.

Also, the MODIFY keyword was entered to fill missing temperatures in the upper air data with interpolated values. In AERMET Stage 2, values of the surface characteristics (noon-time albedo, Bowen ratio, and surface roughness length) representative of the Beaver Valley surface meteorological site were entered. These surface characteristics values were calculated by AERSURFACE (version 24142) using USGS National Land Cover Database (NLCD) land cover, impervious surface, tree canopy cover data for 2018, 2019, 2020, and 2021.¹⁴ The following options were selected in AERSURFACE: default 1-km radius and ten user-defined sectors defined as “High Z0” for developed areas and “Low Z0” for undeveloped areas for the surface roughness length study area, the default method for determining surface roughness length (ZORAD), monthly temporal resolution with default season assignment, and non-arid region.

AERSURFACE was executed for each surface moisture condition (average, dry, and wet), assuming both no continuous snow cover and continuous snow cover during the winter (i.e., AERSURFACE was executed six times). AERMET Stage 2 was then executed for each set of surface characteristics to produce six surface (.sfc) files. The final AERMET surface file was assembled by month based on actual estimates of surface moisture condition and snow cover during the meteorological data period. Estimates of surface moisture condition were based on precipitation data for Pennsylvania Climate Division 9. Snow cover was based on National Centers for Environmental Information (NCEI) Local Climatological Data from KPIT.

¹⁴ 2018 NLCD data was used for processing meteorological data from 2018, 2019 NLCD data was used for processing meteorological data from years 2019, 2020 NLCD data was used for processing meteorological data from years 2020, and 2021 NLCD data was used for processing meteorological data from years 2021 and 2022.

4.6 Output Options

Modeling was conducted using a unit emission rate of 1 pound per hour (lb/hr), with the exception of the cooling towers. The cooling towers were modeled with thirteen pairs of cells using 0.5 lb/hr per cell (equivalent to 1 lb/hr for each cooling tower) to match the output formats from the previous modeling analysis. The output options were specified to generate plot files of dispersion factors having the unit of microgram per cubic meter ($\mu\text{g}/\text{m}^3$) per lb/hr for each emission source for each averaging period. Acute impacts are based on the maximum 1-hour concentrations from the five years of meteorology. To assess the potential for acute impacts, the resulting 1-hour dispersion factor for each emission source at each receptor was then multiplied by the source's estimated hourly emission rate to obtain pollutant-specific concentrations for each source, for each COPC, at each receptor. The resulting pollutant-specific concentration for each source was then summed on a receptor-by-receptor basis to obtain the total facility-wide 1-hour concentration at each receptor for each COPC. This approach is conservative because it assumes that for each receptor, the maximum impact from each emission source occurs during the same hour, which it does not. Although this results in an overestimate of the acute health effects, this conservative assumption eliminates the need to do an individual AERMOD run for each of the individual COPCs that has an acute inhalation reference concentration.

The chronic impacts are based on the maximum annual average across the five year period. Dispersion factors having the unit of $\mu\text{g}/\text{m}^3$ per lb/hr for each receptor were determined by modeling a unit emission rate of 1 lb/hr from each emission source at SPM with the exception of the cooling towers. The cooling towers were modeled in thirteen pairs of cells using 0.5 lb/hr per cell (equivalent to 1 lb/hr for each cooling tower) to match the output formats from the previous modeling analysis. The resulting dispersion factors were then multiplied by the estimated annual average emissions rate in lb/hr for each COPC from each emission source to obtain pollutant-specific concentrations. In assessing chronic cancer and non-cancer risks, the 5-year average impacts and subsequent risk for each pollutant were summed for each receptor, and the

receptor with the maximum total (i.e., aggregate) excess lifetime cancer risk (ELCR) was determined .

5.0 RESULTS

5.1 Combustion Turbine Load Analysis Results

The results of the combustion turbine load analysis are presented in Table 4. As shown, the 100% load scenario for each turbine was found to generate the highest impacts. The 100% load case was therefore used in the final AERMOD runs for the risk assessment.

Table 4. Combustion Turbine Load Analysis Results

| Averaging Period | Source Name | Modeled Concentration ($\mu\text{g}/\text{m}^3$) | Source Description |
|------------------|-------------|--|----------------------|
| 1-hr | CT1_100 | 1.42 | Turbine 1, 100% load |
| | CT1_75 | 1.21 | Turbine 1, 75% load |
| | CT1_45 | 0.85 | Turbine 1, 45% load |
| | CT2_100 | 1.46 | Turbine 2, 100% load |
| | CT2_75 | 1.24 | Turbine 2, 75% load |
| | CT2_45 | 0.86 | Turbine 2, 45% load |
| | CT3_100 | 1.49 | Turbine 3, 100% load |
| | CT3_75 | 1.27 | Turbine 3, 75% load |
| | CT3_45 | 0.91 | Turbine 3, 45% load |
| Annual | CT1_100 | 0.015 | Turbine 1, 100% load |
| | CT1_75 | 0.013 | Turbine 1, 75% load |
| | CT1_45 | 0.009 | Turbine 1, 45% load |
| | CT2_100 | 0.014 | Turbine 2, 100% load |
| | CT2_75 | 0.012 | Turbine 2, 75% load |
| | CT2_45 | 0.009 | Turbine 2, 45% load |
| | CT3_100 | 0.013 | Turbine 3, 100% load |
| | CT3_75 | 0.012 | Turbine 3, 75% load |
| | CT3_45 | 0.009 | Turbine 3, 45% load |

5.2 Acute Pollutant Results

A Python script was used to combine the dispersion factors, emission rates, and health risk values. Spreadsheet files summarizing the calculated 1-hour concentrations, as well as all model input and output files will be provided electronically. The calculated 1-hour concentrations and resulting acute hazard quotients (HQ) for each COPC are summarized in Appendix D-3C. Supporting calculations will also be provided electronically.

5.3 Chronic Pollutant Results

To calculate the ambient concentrations used in the chronic cancer and non-cancer risks, a unit emission rate of 1 lb/hr was modeled for each source. An AERMOD plot file was generated containing the dispersion factors by source and by receptor. The AERMOD input and output files and supporting calculations for the chronic impacts will be provided electronically. The calculated ELCRs, HQs, and hazard index (HI) are presented in Appendix D-3C.

APPENDIX D-3C

INHALATION RISK ASSESSMENT FOR SHELL POLYMERS MONACA BEAVER COUNTY, PENNSYLVANIA



**Initial Submittal January 2015
First Submittal Update February 2020
Second Submittal Update September 2020
Third Submittal Update September 2024 (Revised May 2025)**

Inhalation Risk Assessment

1.0 GENERAL DISCUSSION

This inhalation risk assessment for the Shell Chemical Appalachia LLC (Shell) Polymers Monaca (SPM) facility evaluates the potential cancer and non-cancer inhalation risks from the compounds of potential concern (COPC) emitted from the facility. The approach used to conduct the assessment is based on guidance provided by the Pennsylvania Department of Environmental Protection (DEP) as outlined in the approved Inhalation Risk Assessment Protocol.¹

1.1 Chronic Cancer and Non-cancer Risks

Chronic cancer and non-cancer impacts were estimated for each COPC at approximately 10,000 habitable points on a receptor grid surrounding SPM. As detailed in Appendix D-3B, dispersion factors having the unit of microgram per cubic meter ($\mu\text{g}/\text{m}^3$) per pound per hour (lb/hr) were determined for each receptor by modeling a unit emission rate of 1 lb/hr from each emission source at SPM. The resulting dispersion factors were then multiplied by the estimated annual hourly average emissions rate for each COPC from each emission source to obtain pollutant-specific concentrations. Annual average emission rates used in this analysis are summarized in Table 2 of Appendix D-3A. For the chronic excess lifetime cancer risk (ELCR), the concentration of each pollutant at each receptor was multiplied by the compound-specific unit risk factor. The compound-specific unit risk factors used in the ELCR calculation are presented in Table 1 and have been updated from those used in the previous analysis based on data from the Risk Assessment Information System (RAIS) database and discussion with DEP.² Compound-specific unit risk factors for the chronic cancer risk analysis are based on a conservative basis of a continuous exposure over a 70-year lifetime (i.e., a person remained in that location for 24 hours per day, 365 days per year for 70 years). For COPCs that have a mutagenic mode of action (i.e., benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-cd]pyrene, hexavalent chromium, chrysene, dibenzo[a,h]anthracene, 7,12-dimethylbenz[a]anthracene, formaldehyde, 3-

¹ Email from A. Binder, DEP to P. May, RTP Environmental Assoc., January 12, 2015

² <http://rais.ornl.gov>

methylcholanthrene, methylene chloride, and vinyl chloride), an age-dependent adjustment factor (ADAF) of 1.63 was applied³. The ADAF-adjusted values account for increased susceptibility to cancer and tumor development in children from exposure to mutagens.

The aggregate ELCR was then determined for each receptor by summing the individual COPC ELCR. Table 2 presents the aggregate ELCR and Chronic HQ for the maximum receptor. All calculations and a Python script for combining the dispersion factors, emission rates, and health risk values are provided electronically along with the AERMOD input and output files. As shown in Figure 1, the receptor with the highest ELCR is located on the fence line of the SPM facility. The ELCR at the maximum receptor is 0.66 in 100,000 (*i.e.*, 6.58E-6) which is less than DEP's inhalation risk management facility-wide target level of cancer risk of 1 in 100,000 (*i.e.*, 1eE-5).

For the chronic non-cancer risk, the concentration of each pollutant at each receptor was divided by the compound-specific inhalation reference concentration (RfC) to determine the hazard quotient (HQ) for that COPC. Chronic non-cancer reference concentrations are designed to address continuous exposures from one year up to a lifetime. The inhalation reference concentrations used for this analysis are presented in Table 1. As with the unit risk factors, the RfCs were updated using the RAIS database and discussion with DEP. The aggregate health index (HI) was determined for each receptor by summing the individual COPC HQ values. The HQ for each COPC and the aggregate HI at each receptor, along with supporting calculations, are provided electronically. As shown in Figure 1, the receptor with the highest HI is located on the southwest corner of the facility's fence line in a wooded area. The facility HI at this receptor is 0.18, which is less than DEP's inhalation risk management facility-wide target level for non-cancer HI of 0.25.

The maximum aggregate ELCR and chronic HI both occur on the fence line of the Shell facility, in locations zoned as industrial, where individuals would not be expected to remain for extended periods. Based on the magnitude and location of the maximum impacts, SPM is not expected to result in adverse chronic health effects in the surrounding area.

³ EPA Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, March 2005

1.2 Acute Non-cancer Risks

To assess the potential for acute health impacts resulting from SPM, dispersion factors were obtained using AERMOD by modeling a unit emission rate of 1 lb/hr for each emission source for the 1-hour averaging period. The resulting dispersion factor ($\mu\text{g}/\text{m}^3$ per lb/hr) for each emission source at each receptor was then multiplied by the source's estimated hourly emission rate to obtain pollutant-specific concentrations for each source, for each COPC, at each receptor. Hourly emission rates used in this analysis are summarized in Table 3 of Appendix D-3A. The resulting pollutant-specific concentration for each source was then summed on a receptor-by-receptor basis to obtain the total facility-wide 1-hour concentration for each COPC. This approach is conservative because it assumes that for each receptor, the maximum impact from each emission source occurs during the same hour, which it does not. Although this results in an overestimate of the acute health effects, this conservative assumption eliminates the need to perform an individual AERMOD run for each of the individual COPCs that has an acute inhalation RfC.

The acute HQ was determined for a one-hour average exposure to each COPC at all points in the receptor grid. For each pollutant, the highest 1-hour concentration was divided by compound-specific inhalation RfC values derived from short-term exposure levels to determine the HQ for each pollutant. The compound-specific inhalation RfC values are presented in Table 1. As with the unit risk factors, the RfCs were updated using the RAIS database. Each HQ was then compared to the threshold of 1.0, the level at which no adverse effect would be expected from the exposure per DEP guidance. As presented in Table 3, the HQ for each COPC is less than 1. The pollutant with the highest HQ is hexavalent chromium, with an HQ of 0.16. This is well below the threshold of 1, even with the conservative approach utilized in this analysis. As shown in Figure 1, the receptor with the highest acute HQ is located along the railroad which transects the facility. It's unlikely that an individual would be located on or along the railroad tracks for an hour. Given the magnitude and location of the maximum acute impact, SPM is not expected to result in adverse acute health effects in the surrounding area.

1.3 Sensitive Receptors

The following sensitive receptor locations are in the vicinity of the Facility. Distances are measured from the center of the Facility:

- The nearest school is Todd Lane Elementary School, approximately 2 miles southeast of the Facility.
- The nearest daycare or pre-school is Tiny Sprouts Daycare Center, approximately 1.3 miles southeast of the Facility.
- The nearest church is located approximately 1 mile east of the Facility.
- The nearest hospital is Heritage Valley Beaver Hospital, approximately 2.9 miles north of the Facility.
- The nearest convalescent home is Brighton Rehabilitation and Wellness Center, approximately 2.4 miles north of the Facility.

Given the distance between these sites and the maximum receptors identified in Figure 1, and the low model-predicted concentrations at the sites, SPM is not expected to result in adverse health effects at these sensitive receptors. This health risk analysis assumes a lifetime exposure for the purpose of cancer risk and chronic non-cancer risk. The actual exposure duration at sensitive receptors would be significantly less than the assumption of 70 years of continuous exposure.

Table 1. Chronic and Acute Risk Factors for Inhalation Risk Assessment¹

| ANALYSIS | Chemical Abstracts Service (CAS) Number | Inhalation Unit Risk ($\mu\text{g}/\text{m}^3)^{-1}$ | Inhalation Unit Risk Reference | Chronic Inhalation Reference Concentration (mg/m^3) | Chronic Inhalation Reference Concentration Reference | Acute Inhalation Reference Concentration (mg/m^3) | Acute Inhalation Reference Concentration Reference |
|-------------------------|---|---|--------------------------------|---|--|---|--|
| Acenaphthene | 83-32-9 | | | | | | |
| Acenaphthylene | 208-96-8 | | | | | | |
| Acetaldehyde | 75-07-0 | 2.20E-06 | IRIS | 0.009 | IRIS | 0.47 | CALEPA |
| Acrolein | 107-02-8 | | | 2.00E-05 | IRIS | 0.0025 | Cal OEHHA |
| Ammonia | 7664-41-7 | | | 0.2 | Cal OEHHA | 1.18 | ATSDR Final |
| Anthracene | 120-12-7 | | | | | 0.03 | NIOSH |
| Arsenic, Inorganic | 7440-38-2 | 4.30E-03 | IRIS | 1.50E-05 | IRIS | 2.00E-04 | CALEPA |
| Barium | 7440-39-3 | 0.075 | DEP | | | 5.00E-04 | HEAST |
| Benzene | 71-43-2 | 7.80E-06 | IRIS | 0.003 | Cal OEHHA | 0.027 | Cal OEHHA |
| Benzo[a]anthracene | 56-55-3 | 6.00E-05 | EPA/RPF | | | 0.03 | DEP |
| Benzo[a]pyrene | 50-32-8 | 6.00E-04 | IRIS | 2.00E-06 | IRIS | 0.03 | DEP |
| Benzo[b]fluoranthene | 205-99-2 | 6.00E-05 | EPA/RPF | | | | |
| Benzo(e)pyrene | 192-97-2 | | | 2.00E-06 | PPRTV | | |
| Benzo[g,h,i]perylene | 191-24-2 | | | | | | |
| Benzo[k]fluoranthene | 207-08-9 | 6.00E-06 | EPA/RPF | | | | |
| Beryllium and compounds | 7440-41-7 | 0.0024 | IRIS | 7.00E-07 | Cal OEHHA | 7.50E-06 | ACGIH |
| Biphenyl | 92-52-4 | | | 4.00E-04 | SCREEN Current | 0.15 | NIOSH |
| Butadiene, 1,3- | 106-99-0 | 3.00E-05 | IRIS | 0.002 | IRIS | 0.66 | CALEPA |
| Butane, n- | 106-97-8 | | | | | 3.57E+02 | ACGIH |
| Butyr/Isobutyraldehyde | 123-72-8 | | | | | | |
| Cadmium | 7440-43-9 | 0.0018 | IRIS | 1.00E-05 | ATSDR Final | 3.00E-05 | ATSDR Final |
| Carbon Tetrachloride | 56-23-5 | 6.00E-06 | IRIS | 1.00E-01 | IRIS | 1.90E+00 | CalEPA |
| Chlorobenzene | 108-90-7 | | | 5.00E-02 | PPRTV | 6.91E+00 | ACGIH |
| Chloroform | 67-66-3 | 2.30E-05 | IRIS | 3.00E-01 | Cal OEHHA | 0.15 | Cal OEHHA |
| Chromium(III) | 16065-83-1 | | | 6.00E-05 | Cal OEHHA | 4.80E-04 | Cal OEHHA |

| ANALYSIS | Chemical Abstracts Service (CAS) Number | Inhalation Unit Risk ($\mu\text{g}/\text{m}^3$) ⁻¹ | Inhalation Unit Risk Reference | Chronic Inhalation Reference Concentration (mg/m^3) | Chronic Inhalation Reference Concentration Reference | Acute Inhalation Reference Concentration (mg/m^3) | Acute Inhalation Reference Concentration Reference |
|----------------------------------|---|---|--------------------------------|---|--|---|--|
| Chromium(VI) | 18540-29-9 | 1.10E-02 | IRIS | 3.00E-05 | IRIS | 1.25E-05 | ACGIH |
| Chrysene | 218-01-9 | 6.00E-07 | EPA/RPF | | | 0.03 | DEP |
| Cobalt | 7440-48-4 | 0.009 | PPRTV Current | 6.00E-06 | PPRTV Current | 0.003 | DEP |
| Copper | 7440-50-8 | | | | | 0.1 | CALEPA |
| Cyclopentane | 287-92-3 | | | | | 4.30E+02 | ACGIH |
| Dibenzo[a,h]anthracene | 53-70-3 | 6.00E-04 | EPA/RPF | | | | |
| Dibutylphthalate | 84-74-2 | | | | | 7.50E-01 | ACGIH |
| Dichlorobenzene | 106-46-7 | 1.10E-05 | Cal OEHHA | 0.8 | IRIS | 7.5 | CALEPA |
| Dichloroethane, 1,1- | 75-34-3 | 1.60E-06 | CalEPA | | | 6.07E+01 | ACGIH |
| Dichloroethane, 1,2- | 107-06-2 | 2.60E-05 | IRIS | 7.00E-03 | PPRTV | | |
| Dichloropropane, 1,2 | 78-87-5 | 3.70E-06 | PPRTV | 4.00E-03 | IRIS | | |
| Dichloropropene, 1,3- | 542-75 | 4.00E-06 | IRIS | 2.00E-02 | IRIS | 6.81E-01 | ACGIH |
| Dimethylbenz(a)anthracene, 7,12- | 57-97-6 | 0.071 | Cal OEHHA | | | | |
| Ethane | 74-84-0 | | | | | | |
| Ethylbenzene | 100-41-4 | 2.50E-06 | CALEPA | 1 | IRIS | 21.7 | ATSDR Final |
| Ethylene Dibromide | 106-93-4 | 6.00E-04 | IRIS | 9.00E-03 | IRIS | | |
| Fluoranthene | 206-44-0 | | | | | | |
| Fluorene | 86-73-7 | | | | | | |
| Formaldehyde | 50-00-0 | 1.10E-05 | IRIS | 7.00E-03 | IRIS | 0.049 | ATSDR Final |
| Heptane | 142-82-5 | | | 4.00E-01 | PPRTV | 5.12E+01 | ACGIH |
| Hexane, n- | 110-54-3 | | | 0.7 | IRIS | 2.64E+01 | ACGIH |
| Indeno[1,2,3-cd]pyrene | 193-39-5 | 6.00E-05 | EPA/RPF | | | | |
| Lead and Compounds | 7439-92-1 | 1.20E-05 | CALEPA | | | 0.0075 | DEP |
| Manganese | 7439-96-5 | | | 5.00E-05 | IRIS | 3.30E-03 | ACGIH |
| Mercury (elemental) | 7439-97-6 | | | 3.00E-05 | Cal OEHHA | 6.00E-04 | CALEPA |
| Methanol | 67-56-1 | | | 4 | Cal OEHHA | 28 | CALEPA |
| Methylcholanthrene, 3- | 56-49-5 | 0.0063 | Cal OEHHA | | | | |

| ANALYSIS | Chemical Abstracts Service (CAS) Number | Inhalation Unit Risk ($\mu\text{g}/\text{m}^3)^{-1}$ | Inhalation Unit Risk Reference | Chronic Inhalation Reference Concentration (mg/m^3) | Chronic Inhalation Reference Concentration Reference | Acute Inhalation Reference Concentration (mg/m^3) | Acute Inhalation Reference Concentration Reference |
|--|---|---|--------------------------------|---|--|---|--|
| Methylcyclohexane | 108-87-2 | | | 9.50E-02 | PPRTV | 6.02E+01 | ACGIH |
| Methylene Chloride | 75-09-2 | 1.00E-08 | IRIS | 6.00E-01 | IRIS | 1.40E+01 | CalEPA |
| Methylnaphthalene, 2- | 91-57-6 | | | | | 4.37E-01 | ACGIH |
| Molybdenum | 7439-98-7 | | | 0.002 | ATSDR | 0.45 | CALEPA |
| Naphthalene | 91-20-3 | 3.40E-05 | Cal OEHHA | 0.003 | IRIS | 2.0 | DEP |
| Nickel | 7440-02-0 | 2.60E-04 | Cal OEHHA | 1.40E-05 | CALEPA | 2.00E-04 | CALEPA |
| Nonane, n- | 111-84-2 | | | 2.00E-02 | PPRTV | 1.57E+02 | ACGIH |
| Octane, n- | 111-65-9 | | | | | 2.10E+02 | ACGIH |
| PAH (polycyclic aromatic hydrocarbons) | NA | 7.10E-02 | Cal OEEHA | | | 3.00E-02 | DEP/OSHA |
| Pentane | 109-66-0 | | | 1 | PPRTV Current | 2.66E+02 | CalEPA |
| Phenanthrene | 85-01-8 | | | | | 3.00E-02 | ACGIH |
| Phenol | 108-95-2 | | | 0.2 | CALEPA | 5.8 | CALEPA |
| Propane | 74-98-6 | | | | | 2.71E+02 | OSHA |
| Propylene | 115-07-1 | | | 3.00E+00 | CalEPA | 1.29E+02 | ACGIH |
| Propylene Oxide | 75-56-9 | 3.70E-06 | IRIS | 0.03 | IRIS | 3.1 | CALEPA |
| Pyrene | 129-00-0 | | | | | 0.03 | NIOSH |
| Selenium | 7782-49-2 | | | 0.02 | CALEPA | 0.03 | DEP |
| Styrene | 100-42-5 | | | 0.9 | Cal OEHHA | 21.0 | Cal OEHHA |
| Tetrachloroethane, 1,1,2,2- | 79-34-5 | 5.80E-05 | CalEPA | | | 1.03E+00 | ACGIH |
| Tetrachloroethylene | 127-18-4 | 2.60E-07 | IRIS | 4.00E-02 | PPRTV | 1.70E+01 | ACGIH |
| Trichloroethane, 1,1,2- | 79-00-5 | 1.60E-05 | IRIS | | | 8.18E+00 | ACGIH |
| Trimethylbenzene, 1,2,3- | 526-73-8 | | | 6.00E-02 | IRIS | | |
| Trimethylbenzene, 1,2,4- | 95-63-6 | | | 6.00E-02 | IRIS | | |
| Trimethylbenzene, 1,2,5- | 108-67-8 | | | 6.00E-02 | IRIS | | |
| Toluene | 108-88-3 | | | 0.42 | Cal OEHHA | 5.0 | Cal OEHHA |
| Vanadium | 7440-62-2 | | | 1.00E-04 | ATSDR | 8.00E-04 | ATSDR Final |

| ANALYSIS | Chemical Abstracts Service (CAS) Number | Inhalation Unit Risk ($\mu\text{g}/\text{m}^3)^{-1}$ | Inhalation Unit Risk Reference | Chronic Inhalation Reference Concentration (mg/m^3) | Chronic Inhalation Reference Concentration Reference | Acute Inhalation Reference Concentration (mg/m^3) | Acute Inhalation Reference Concentration Reference |
|----------------|---|---|--------------------------------|---|--|---|--|
| Vinyl Chloride | 75-01-4 | 4.40E-06 | IRIS | | | 1.80E+02 | CalEPA |
| Xylenes | 1330-20-7 | | | 0.1 | IRIS | 8.68 | ATSDR Final |
| Zinc | 7440-66-6 | | | | | | |

¹Source: The Risk Assessment Information located at <http://rais.ornl.gov>. Propane not a listed chemical in the RAIS database. Additional health risk values determined based on DEP feedback.



Figure 1. Location of Receptors with the Highest ELCR, Highest Chronic HI, and Highest Acute HQ

Table 2. Estimated Health Effects from COPCs at Receptors with the Highest Aggregate ELCR and Chronic HQ

| Compound of Potential Concern | Mutagenic? ¹ | Excess Lifetime Cancer Risk | Chronic Non-cancer HQ |
|----------------------------------|-------------------------|-----------------------------|-----------------------|
| Acenaphthene | | -- | -- |
| Acenaphthylene | | -- | -- |
| Acetaldehyde | | 2.81E-10 | 1.42E-05 |
| Acrolein | | -- | 2.60E-03 |
| Ammonia | | -- | 2.80E-04 |
| Anthracene | | -- | -- |
| Arsenic | | 1.02E-08 | 1.58E-04 |
| Barium | | -- | 1.04E-04 |
| Benzene | | 3.21E-06 | 1.37E-01 |
| Benzo(a)anthracene | Y | 3.26E-12 | -- |
| Benzo(a)pyrene | Y | 1.52E-11 | 7.77E-06 |
| Benzo(b)fluoranthene | Y | 2.15E-12 | -- |
| Benzo(e)pyrene | | -- | 1.22E-06 |
| Benzo(g,h,i)perylene | | -- | -- |
| Benzo(k)fluoranthene | Y | 2.19E-13 | -- |
| Beryllium | | 3.41E-10 | 2.03E-04 |
| Biphenyl | | -- | 3.17E-06 |
| Butadiene, 1,3- | | 1.70E-06 | 2.84E-02 |
| Butane | | -- | -- |
| Butyr/Isobutyraldehyde | | -- | -- |
| Cadmium | | 2.34E-08 | 1.30E-03 |
| Carbon Tetrachloride | | 1.75E-12 | 2.92E-09 |
| Chlorobenzene | | -- | 4.68E-09 |
| Chloroethane | | -- | -- |
| Chloroform | | 3.36E-08 | 4.87E-06 |
| Chromium III | | -- | 4.70E-04 |
| Chromium VI | Y | 2.24E-07 | 4.16E-04 |
| Chrysene | Y | 2.33E-14 | -- |
| Cobalt | | 8.94E-09 | 1.66E-04 |
| Copper | | -- | -- |
| Cyclopentane | | -- | -- |
| Dibenzo(a,h)anthracene | Y | 1.80E-11 | -- |
| Dibutylphthalate | | -- | -- |
| Dichlorobenzene | | 1.56E-10 | 1.77E-08 |
| Dichloroethane, 1,1- | | 3.00E-13 | -- |
| Dichloroethane, 1,2- | | 4.87E-12 | 2.68E-08 |
| Dichloropropane, 1,2- | | 7.92E-13 | 5.35E-08 |
| Dichloropropene, 1,3- | | 8.39E-13 | 1.05E-08 |
| Dimethylbenz(a)anthracene, 7,12- | | 2.19E-08 | -- |

| Compound of Potential Concern | Mutagenic? ¹ | Excess Lifetime Cancer Risk | Chronic Non-cancer HQ |
|-------------------------------|-------------------------|-----------------------------|-----------------------|
| Ethane | | -- | -- |
| Ethylbenzene | | 1.51E-07 | 6.04E-05 |
| Ethylene Dibromide | | 2.11E-10 | 3.91E-08 |
| Fluoranthene | | -- | -- |
| Fluorene | | -- | -- |
| Formaldehyde | Y | 3.22E-08 | 2.57E-04 |
| Heptane | | -- | 1.14E-06 |
| Hexane | | -- | 3.39E-05 |
| Indeno(1,2,3-cd)pyrene | Y | 2.34E-12 | -- |
| Lead | | 7.02E-11 | -- |
| Manganese | | -- | 8.99E-05 |
| Mercury | | -- | 1.02E-04 |
| Methanol | | -- | 3.55E-06 |
| Methylchloranthrene, 3- | Y | 2.19E-10 | -- |
| Methylcyclohexane | | -- | 7.64E-08 |
| Methylene Chloride | Y | 4.78E-15 | 4.89E-10 |
| Methylnaphthalene, 2- | | -- | -- |
| Molybdenum | | -- | 6.50E-06 |
| Naphthalene | | 5.37E-07 | 5.27E-03 |
| Nickel | | 6.46E-09 | 1.77E-03 |
| n-Nonane | | -- | 3.25E-08 |
| n-Octane | | -- | -- |
| PAH | Y | 6.16E-07 | -- |
| Pentane | | -- | 1.36E-04 |
| Perchloroethylene | | 3.80E-15 | 3.66E-10 |
| Phenanthrene | | -- | -- |
| Phenol | | -- | 4.12E-08 |
| Propane | | -- | -- |
| Propylene | | -- | 9.19E-06 |
| Propylene Oxide | | 1.64E-10 | 1.48E-06 |
| Pyrene | | -- | -- |
| Selenium | | -- | 1.42E-08 |
| Styrene | | -- | 1.24E-03 |
| Tetrachloroethane, 1,1,2,2- | | 1.99E-11 | -- |
| Toluene | | -- | 2.73E-03 |
| Trichloroethane, 1,1,2- | | 4.04E-12 | -- |
| Trimethylbenzene, 1,2,3- | | -- | 2.26E-09 |
| Trimethylbenzene, 1,2,4- | | -- | 1.41E-09 |
| Trimethylbenzene, 1,3,5- | | -- | 3.32E-09 |
| Trimethylpentane, 2,2,4- | | -- | -- |
| Vanadium | | -- | 2.72E-04 |

| Compound of Potential Concern | Mutagenic? ¹ | Excess Lifetime Cancer Risk | Chronic Non-cancer HQ |
|--|-------------------------|-----------------------------|-----------------------|
| Vinyl Chloride | Y | 8.49E-13 | -- |
| Xylenes | | -- | 1.64E-03 |
| Zinc | | -- | -- |
| Total at Receptor with Highest Impact | | 6.58E-06 | 0.18 |
| Approval Criteria | | 1.00E-05 | 0.25 |
| Percent of Approval Criteria | | 66% | 74% |

¹ COPCs with mutagenic mode of action are scaled by Age Dependent Adjustment Factor of 1.63, consistent with EPA guidance

² AP-42 factors for stationary combustion turbines are not available for individual PAH compounds. For this assessment, PAH emissions from CTs were conservatively assumed to be 7,12-dimethylbenz(a)anthracene. Mutagenic ADAF was applied to PAHs

--“ Denotes no available IUR and/or inhalation RfC

Table 3. Acute Non-Cancer Risk Assessment

| Compound of Potential Concern | Acute HQ |
|--------------------------------------|-----------------|
| Acenaphthene | -- |
| Acenaphthylene | -- |
| Acetaldehyde | 2.60E-05 |
| Acrolein | 1.72E-03 |
| Ammonia | 9.48E-03 |
| Anthracene | 7.46E-06 |
| Arsenic | 1.87E-03 |
| Barium | 1.10E-04 |
| Benzene | 9.31E-02 |
| Benzo(a)anthracene | 2.03E-07 |
| Benzo(a)pyrene | 8.48E-08 |
| Benzo(b)fluoranthene | -- |
| Benzo(g,h,i)perylene | -- |
| Benzo(e)pyrene | -- |
| Benzo(k)fluoranthene | -- |
| Beryllium | 2.99E-03 |
| Biphenyl | 5.58E-07 |
| Butadiene, 1,3- | 5.17E-03 |
| Butane | -- |
| Butyr/Isobutyraldehyde | -- |
| Cadmium | 6.84E-02 |
| Carbon Tetrachloride | 1.14E-08 |
| Chlorobenzene | 2.49E-09 |
| Chloroethane | -- |
| Chloroform | 2.99E-06 |
| Chromium III | 9.35E-03 |
| Chromium VI | 1.60E-01 |
| Chrysene | 1.31E-07 |
| Cobalt | 5.23E-05 |
| Copper | 1.59E-05 |
| Cyclopentane | 2.06E-10 |
| Dibenzo(a,h)anthracene | -- |
| Dibutylphthalate | 1.16E-07 |
| Dichlorobenzene | 2.99E-07 |
| Dichloroethane, 1,1- | 2.29E-10 |
| Dichloroethane, 1,2- | -- |
| Dichloropropane, 1,2- | -- |
| Dichloropropene, 1,3- | 2.28E-08 |
| Dimethylbenz(a)anthracene, 7,12- | -- |
| Ethane | -- |

| Compound of Potential Concern | Acute HQ |
|-------------------------------|----------|
| Ethylbenzene | 4.44E-06 |
| Ethylene Dibromide | -- |
| Fluoranthene | -- |
| Fluorene | -- |
| Formaldehyde | 4.58E-03 |
| Heptane | 2.33E-07 |
| Hexane | 1.14E-04 |
| Indeno(1,2,3-cd)pyrene | -- |
| Lead | 1.24E-04 |
| Manganese | 2.36E-04 |
| Mercury | 8.09E-04 |
| Methanol | 3.25E-05 |
| Methylchloranthrene, 3- | -- |
| Methylcyclohexane | 7.98E-09 |
| Methylene Chloride | 1.77E-09 |
| Methylnaphthalene, 2- | 1.32E-07 |
| Molybdenum | 4.56E-06 |
| Naphthalene | 2.56E-04 |
| Nickel | 1.96E-02 |
| n-Nonane | 2.74E-10 |
| n-Octane | 6.53E-10 |
| PAH | 2.33E-05 |
| Pentane | 5.24E-05 |
| Perchloroethylene | 5.70E-11 |
| Phenanthrene | 7.36E-06 |
| Phenol | 3.63E-08 |
| Propane | 3.25E-05 |
| Propylene | 1.51E-05 |
| Propylene Oxide | 1.53E-06 |
| Pyrene | 1.63E-06 |
| Selenium | 1.49E-06 |
| Styrene | 2.47E-05 |
| Tetrachloroethane, 1,1,2,2- | 2.53E-08 |
| Toluene | 2.81E-04 |
| Trichloroethane, 1,1,2- | 2.29E-09 |
| Trimethylbenzene, 1,2,3- | -- |
| Trimethylbenzene, 1,2,4- | -- |
| Trimethylbenzene, 1,3,5- | -- |
| Trimethylpentane, 2,2,4- | -- |
| Vanadium | 5.37E-03 |
| Vinyl Chloride | 4.88E-11 |

| Compound of Potential Concern | Acute HQ |
|--|----------|
| Xylenes | 1.57E-05 |
| Zinc | -- |
| Total HI at Receptor with Highest Impact | 3.84E-01 |
| Highest Contributor to HI | 1.60E-01 |
| Approval Criteria | 1 |
| Percent of Approval Criteria | 38% |

¹ AP-42 factors for stationary combustion turbines are not available for individual PAH compounds. For this assessment, PAH emissions from CTs were conservatively assumed to be benzo(a)pyrene.

-- Denotes no available inhalation RfC