AIR QUALITY DISPERSION MODELING REPORT

CPV Shore, LLC
Woodbridge Energy Center
Facility-Wide Risk Assessment

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1. EXECUTIVE SUMMARY

CPV Shore, LLC owns and operates the Woodbridge Energy Center (WEC), an electric generating facility located in Woodbridge Township, Middlesex County, New Jersey. WEC currently operates under Title V permit BOP190002 issued by New Jersey Department of Environmental Protection (NJDEP). As part of the renewal application currently under review (BOP210001), a facility-wide risk assessment modeling analysis has been requested for Hazardous Air Pollutants (HAPs), particularly the emissions of the following pollutants listed as reportable:

- Acetaldehyde
- Acrolein
- Ammonia
- Arsenic
- Benzene
- Beryllium
- 1,3-Butadiene
- Cadmium
- Ethylbenzene
- Formaldehyde
- Lead
- Manganese
- Mercury
- Naphthalene
- Nickel
- PAH
- Propylene Oxide
- Sulfuric Acid
- Toluene

Trinity is submitting this air quality modeling report on behalf of the WEC as a written description of the modeling procedures and data resources utilized in the risk modeling analysis. Trinity has conducted the modeling analyses in a manner that conforms to the applicable rules, guidance, and requirements for dispersion modeling, including the following guidance documents:

- U.S. EPA: *Guideline on Air Quality Models*, 40 CFR Part 51 - Appendix W
- U.S. EPA: *AERMOD Implementation Guide* (Updated June 1, 2022)
- NJDEP Technical Manuals 1002[1] and 1003[2]
- U.S. EPA: User's Guide for the AMS/EPA Regulatory Model – AERMOD (June 1, 2022)

The intent of submitting this dispersion modeling report is to provide the Department with documentation on modeling analysis procedures.

The modeling report is organized as follows:

- Section 2 provides the details of the emission sources,
- Section 3 describes the risk assessment methodology,
- Section 4 describes the selection of the appropriate dispersion model and describes the inputs required for the chosen model, and
- Section 5 presents the modeling results.

[1] NJDEP Technical Manual 1002 – Guidance on preparing an air quality modeling report dated May 2021.
[2] NJDEP Technical Manual 1003 – Guidance on preparing a risk assessment for air contaminant emissions dated December 2018.

2. FACILITY AND EMISSION SOURCE DESCRIPTION

2.1 Facility Description

The WEC is an electric generating facility located in Woodbridge Township, Middlesex County, New Jersey. The facility is located at the following address:

1070 Riverside Drive
Keasbey, New Jersey 08832

Figure 2-1 presents an aerial map of the facility.

Figure 2-1. Aerial Map of WEC

Table 2-1 below summarizes the land use types within 3 km of the facility. The majority of the area within 3 km of the site is comprised of open water, wetlands, and developed low intensity and open space areas. Approximately 42% of the land use is considered medium and high intensity developed areas, and as such, this land use is considered rural. In addition, topography within the facility is relatively uniform, with elevations increasing slightly to the northwest of the facility. The typical terrain elevations at the facility are approximately 3 meters above sea level.

Table 2-1. Land Use in 3 KM Surrounding WEC

Land Use Type	Grid Cell Count	% of Total Grid Cells
Open Water	3909	12.4%
Perennial Ice/Snow	0	0%
Developed, Open Space	2749	8.7%
Developed, Low Intensity	6001	19.1%
Developed, Medium Intensity	8113	25.8%
Developed, High Intensity	5236	16.7%
Barren Land (Rock/Sand/Clay)	143	0.5%
Unconsolidated Shore	0	0%
Deciduous Forest	429	1.4%
Evergreen Forest	1	0.003%
Mixed Forest	1	0.003%
Shrubland	109	0.3%
Orchards/Vineyard/Other	0	0%
Grasslands/Herbaceous	1026	3.3%
Pasture/Hay	0	0%
Cultivated Crops	0	0%
Lichens	0	0%
Moss	0	0%
Aquatic Beds	0	0%
Woody Wetlands	1295	4.1%
Emergent Herbaceous Wetlands	2412	7.7%
Other Wetlands	0	0%
Total	**31424**	
Total Urban	**13349**	**42.48%**

2.2 Emission Sources Description

The facility consists of two combined cycle combustion turbines that exclusively combust natural gas. Supporting ancillary equipment includes an auxiliary boiler, emergency diesel generator, fire pump, storage tanks and insignificant combustion sources. The site plan for the WEC is provided in **Appendix A**. The site plan provides the location of the sources, buildings, and the property line. A full size hardcopy of the site plan is submitted with this report.

Combustion Turbines

WEC includes two identical General Electric (GE) 207 FA.05 combustion turbines that exclusively utilize natural gas as a fuel. Each turbine has a maximum heat input capacity of 2,307 MMBtu/hr, based on the higher heating value (HHV) of the fuel without duct firing. The turbines utilize dry low-NO_X combustion and a selective catalytic reduction (SCR) system to control nitrogen oxide emissions and an oxidation catalyst to control carbon monoxide, volatile organic compounds and organic HAPs. Exhaust gases from each turbine are directed to a 145-foot above grade stack.

The stack coordinates for the combustion turbine units are presented in Table 2-2 below.

Table 2-2. Turbine Stack Locations

Source	UTM Coordinates		
	Zone	Easting (m)	Northing (m)
CT1 (E1)	18	557,683	4,485,153
CT2 (E2)	18	557,722	4,485,161

Table 2-3 provides detailed source parameters that were used in this modeling effort. The stack parameters are taken from the Title V permit (BOP190002). Minimum permitted stack parameters (temperature and flow rate) were used for short-term and average parameters for long-term (annual) modeling.

Table 2-3. Modeling Source Parameters – Turbines

Source	Stack Height (ft)	Stack Diameter (in)	Temperature (deg F)	Stack Velocity (m/s)
Short Term				
CT1 (E1)	145	240	162.3	12.2
CT2 (E2)	145	240	162.3	12.2
Long Term				
CT1 (E1)	145	240	177.5	16.1
CT2 (E2)	145	240	177.5	16.1

Worst case hourly emission rates (full load with duct firing) were modeled for each pollutant. Annualized hourly emission rates were calculated using permitted operating restrictions to determine compliance with the annual standards[3]. Modeled emission rates are included in Table 2-4.

Table 2-4. Source Emission Rates – Turbines at Full Load while Duct Firing

Pollutant	Per Unit Maximum Short Term Emission Rate (lb/hr)	Per Unit Maximum Long Term Emission Rate (lb/hr)
Acetaldehyde	9.23E-02	9.23E-02
Acrolein	1.48E-02	1.48E-02
Ammonia	1.91E+01	1.44E+01
Arsenic	5.50E-04	4.60E-04
Benzene	2.87E-02	2.78E-02
Beryllium	3.30E-05	2.76E-05
1,3-Butadiene	9.92E-04	9.92E-04
Cadmium	3.03E-03	2.53E-03
Ethylbenzene	7.38E-02	7.38E-02
Formaldehyde	3.37E-01	3.03E-01

[3] In general, HAP emissions from the combustion turbine are calculated using AP-42 emission factors from Section 3.1 while HAP emissions from the duct burner are calculated using the emission factors in AP-42 Section 1.4. As a result, annualized lb/hr emission rates for certain HAPS are not equivalent to short term emission rates.

Lead	1.38E-03	1.15E-03
Manganese	1.05E-03	8.74E-04
Mercury	7.15E-04	5.98E-04
Naphthalene	3.30E-03	3.02E-03
Nickel	5.78E-03	4.83E-03
PAH	5.12E-03	5.08E-03
Propylene Oxide	6.69E-02	6.69E-02
Sulfuric Acid	3.40E+00	8.79E-01
Toluene	3.02E-01	3.00E-01

1. Emission Rates are per turbine.

Ancillary Sources

The facility operates an emergency diesel generator (E7) which has not been included in this risk assessment due to the intermittent nature of the source's operation. The emergency generator runs for approximately 20 minutes per month when operated for routine testing and maintenance. Including this source as a contributor to potential HAP emissions would not reflect the reality of the activity occurring on site and is consistent with Department guidance regarding modeling of intermittent source.

The facility operates an auxiliary boiler (E5). Risk from reportable HAPs are demonstrated to be acceptable using either NJDEP's first level risk screening worksheet or the approved facility-wide risk assessment modeling for the Keasbey Energy Center.

Other ancillary sources (emergency fire pump, storage tanks, miscellaneous combustion equipment, etc.) were not included in the facility-wide risk assessment since potential HAP emissions from each unit are less than their respective NJDEP reporting threshold.

3. RISK ASSESSMENT

3.1 Overview

The first step of this air toxics modeling analysis was the completion of a risk screening worksheet for all applicable HAPs (i.e. potential HAP emissions that exceed the NJDEP reporting threshold). The risk screening worksheet calculations estimate the cancer and non-cancer health risks without specific dispersion modeling. No futher analysis was completed for all HAPs that demonstrated negligible risk on the worksheet. Furthermore, WEC computed the cumulative risk for each air toxic by adding the risk result in each workbook and comparing the sum to the facility-wide risk threshold of one in a million. For those HAPs for which the cumulative risk was determined to be in excess of the one in a million threshold, a refined risk assessment will be performed. This refined assessment consists of an atmospheric dispersion modeling analysis was completed using AERMOD (See Section 4). The individual source and facility-wide risk were assessed in this modeling analysis. The refined risk assessment evaluated the cancer risk and short- and long-term non-cancer health risks for each air toxic that triggered further risk evaluation. The following list of HAPs required a refined analysis:

- Acetaldehyde
- Acrolein
- Ammonia
- Arsenic
- Benzene
- Cadmium
- Ethylbenzene
- Formaldehyde
- Nickel
- PAH
- Propylene Oxide
- Sulfuric Acid

The air dispersion modeling analyses was conducted in accordance with 40 CFR Part 51, Appendix W, which contains the federal *Revision to Guideline on Air Quality Models* (*Guideline*) and is consistent with current and recommended U.S. EPA procedures for dispersion modeling analyses. The risk assessment was performed to meet the requirements of the NJDEP and thus, related procedures are only described in this report. As discussed during a September 9, 2021 conference call between Trinity Consultants, WEC and NJDEP, recent modeling approved for the proposed Keasbey Energy Center can be utilized to demonstrate acceptable risk for the Woodbridge Energy Center since the cumulative risk from both facilities was demonstrated to be below the risk thresholds and therefore negligible. A cumulative risk assessment was provided (and subsequently approved by NJDEP on August 6, 2021) for acrolein, arsenic, ammonia, cadmium, formaldehyde, sulfuric acid and PAH. Therefore, this risk analysis utilized AERMOD to evaluate the following applicable HAPs:

- Acetaldehyde
- Benzene
- Ethylbenzene
- Nickel
- Propylene Oxide

Ground level concentrations of these HAPS were compared against the NJDEP risk assessment guidelines of facility-wide cancer risk and Hazard Quotient values to ascertain compliance.

3.2 Cancer Risk Guidelines

The maximum modeled short-term and long-term concentrations were used to calculate the risk using the formula under Section 2.2.4.1 of Technical Manual 1003:

Cancer Risk = C x URF

Where,

C =maximum annual average ambient air concentration of a pollutant, $\mu g/m^3$

URF = pollutant-specific inhalation unit risk factor, $(\mu g/m^3)^{-1}$.

The URFs[4] to be used in the modeling analysis are summarized in Table 3-1 below:

Table 3-1. Inhalation Unit Risk Factors

Air Toxic	URF ($1/\mu g/m^3$)
Acetaldehyde	2.2E-06
Benzene	7.8E-06
Ethylbenzene	2.5E-06
Nickel	4.8E-04
Propylene Oxide	3.7E-06

The calculated risk value was compared to the NJDEP guidelines as provided in Table 3-2 below.

Table 3-2. NJDEP Cancer Risk Guidelines

Cancer Risk	Risk Guidelines
<=10 in a million (1 x 10-5)	Negligible Risk
10 in a million < Risk <= 100 in a million	Case-by-case review by Risk Management Committee.
Risk>= 1000 in a million	Unacceptable risk

3.3 Non-Cancer Risk Guidelines

The maximum modeled short-term and long-term concentrations were used to calculate the hazard quotient using the formula under Section 2.2.4.2 of Technical Manual 1003:

Hazard Quotient = C / RfC

Where,
C = maximum ambient air concentration, $\mu g/m^3$
RfC = pollutant-specific reference concentration, $\mu g/m^3$.

The RfCs[4] used in the modeling analysis are summarized in Table 3-3 below:

[4] https://dep.nj.gov/wp-content/uploads/boss/risk-screening/toxall-04- 2023.pdf

Table 3-3. Inhalation Reference Concentrations

Air Toxic	RfC Short-term (µg/m^3)	Short-term Averaging Period (Hr)	RfC Annual, (µg/m^3)
Acetaldehyde	470	1	9
Benzene	27	1	3
Ethylbenzene	1000	24	-
Nickel	0.2	1	0.014
Propylene Oxide	3100	1	30

The calculated hazard quotient values were compared to the NJDEP guidelines as provided in the below Table 3-4.

Table 3-4. NJDEP Non-Cancer Risk Guidelines

Hazard Quotient	Risk Guidelines
<=1	Negligible Risk
>1	Case-by-case review by Risk Management Committee

4. MODEL PARAMETERS

This section of the modeling report describes the modeling procedures and data resources utilized in the facility-wide risk assessment for the WEC.

4.1 Model Selection

Dispersion models predict downwind pollutant concentrations by simulating the evolution of the pollutant plume over time and space given data inputs. These data inputs include the quantity of emissions and the initial conditions of the stack exhaust to the atmosphere. According to the *Guideline*, the extent to which a specific air quality model is suitable for the evaluation of source impacts depends on the (1) the meteorological and topographical complexities of the area; (2) the level of detail and accuracy needed in the analysis; (3) the technical competence of those undertaking such simulation modeling; (4) the resources available; and (5) the accuracy of the database (i.e., emissions inventory, meteorological, and air quality data). Taking these factors under consideration, Trinity used AERMOD to represent all air emissions sources at the WEC. AERMOD is the default model for evaluating impacts attributable to industrial facilities in the near-field (i.e., source receptor distances of less than 50 km), and is the recommended model in the *Guideline*.

AERMOD (version 22112) was used to estimate maximum ground-level concentrations in all air pollutant analyses conducted for this application. Following procedures outlined in the *Guideline*, the AERMOD modeling was performed using all regulatory default options.

4.2 Meteorological Data

Site-specific dispersion models require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, the *Guideline* requires five years of reliable, quality assured, and representative meteorological data to be used in regulatory modeling analyses. The representativeness of a particular observation site should be evaluated with respect to four factors: (1) the proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected.

Regulatory air quality modeling using AERMOD requires five years of quality-assured National Weather Service (NWS) meteorological data or at least one year of site-specific meteorological data that includes hourly records of the following parameters:

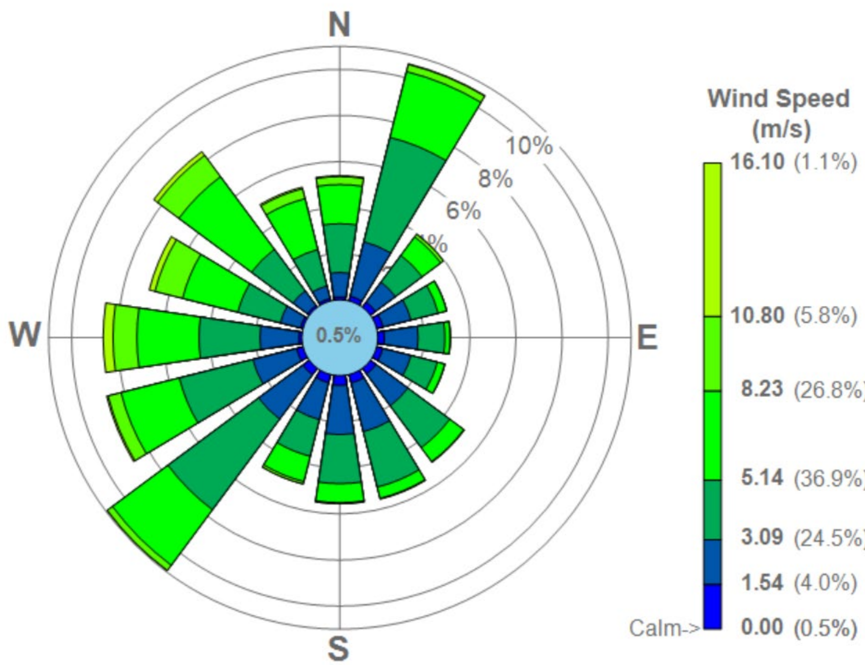
- Wind speed
- Wind direction
- Air temperature
- Micrometeorological parameters (e.g., friction velocity, Monin-Obukhov length)
- Mechanical mixing height
- Convective mixing height

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insolation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network are almost always found at airports and are typically operated by the NWS.

There are fewer upper air stations than surface observation points since the upper atmosphere is less vulnerable to local effects caused by terrain or other land influences and are therefore less variable. The NWS operates virtually all available upper air measurement stations in the United States.

NJDEP has pre-processed, model-ready meteorological data for the period 2016 through 2020 for the Newark International Airport in Newark, NJ. Figure 4-1 provides a wind rose for the Newark International Airport for the data period of 2016 to 2020.

Figure 4-1. Newark International Airport, Newark, NJ Wind Rose 2016-2020



4.3 Coordinate System

The location of emission sources, structures, and receptors are represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 kilometers [km]). The datum is based on North American Datum 1983 (NAD 83). UTM coordinates for this analysis all reside within UTM Zone 18.

4.4 Treatment of Terrain

The designation of terrain at a particular receptor is source-dependent. AERMOD is capable of estimating impacts in both simple and complex terrain.

Receptor elevations and base elevations required by AERMOD were determined using the AERMAP terrain preprocessor. AERMAP also calculates receptor hill height parameters required by AERMOD. As suggested in the *AERMOD Implementation Guide*, terrain elevations from the USGS 1/3RD-arc second NED data were used for the AERMAP processing of receptors. National elevation dataset (NED) data available from the USGS was utilized to interpolate surveyed elevations onto user-specified receptor grids, buildings, and sources in the absence of more accurate site-specific elevation data. NED data files were downloaded from Multi-Resolution Land characteristics Consortium (MRLC).[5]

4.5 Background Concentrations

Since no reliable background concentration data from ambient air monitoring networks is available for the hazardous pollutants in this evaluation, background concentrations of each of these HAPs were assumed to be zero in the modeling analysis. This is consistent with the NJDEP risk assessment policy guidance.

4.6 Basic Receptor Grid

The AERMOD model requires receptor data consisting of location coordinates and ground-level elevations. The receptor generating program, AERMAP (version 18081) was used to develop a complete receptor grid to a distance of 5 km from the facility. The following rectangular (i.e., Cartesian) receptors were used to assess the impact of the facility:

- 25 m along the facility property line
- 50 m extending from the property line to 0.5 km
- 100 m extending from 0.5 km to 1.5 km
- 250 m extending from 1.5 km to 3 km
- 500 m extending from 3 km to 5 km

Grid receptors within the fenced plant property were excluded from the grid as public access is precluded in this area.

4.7 Special Sensitive Receptors

An additional analysis was performed using selected sensitive receptors for the health risk assessment modeling. These locations include schools, hospitals, day care, and senior care facilities within one (1) kilometer (km) of the facility.

[5] https://www.mrlc.gov/

If the results show that the maximum long term or short-term impacts is close to the negligible threshold level, additional receptors spaced 50 m was placed over the areas of maximum concentration to ensure that the true maximum concentration is identified.

No sensitive receptors have been identified within 1 km of the Woodbridge Energy Center.

4.8 Building Downwash

The *Guideline* requires the evaluation of the potential for physical structures to affect the dispersion of emissions from stack sources. The exhaust from stacks that are located within specified distances of buildings may be subject to "aerodynamic building downwash" under certain meteorological conditions. This determination is made by comparing actual stack height to the Good Engineering Practice (GEP) stack height. The modeled emission units at the modified facility were evaluated in terms of their proximity to nearby buildings.

In accordance with recent AERMOD updates, an emission point is assumed to be subject to the effects of downwash at all release heights even if the stack height is above the U.S. EPA formula height, which is defined by the following formula:

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

where:

H_{GEP}	=	GEP stack height,
H	=	structure height, and
L	=	lesser dimension of the structure (height or maximum projected width).

This equation is limited to stacks located within 5L of a building. Stacks located at a distance greater than 5L are not subject to the wake effects of the building.

Direction-specific equivalent building dimensions used as input to the AERMOD model to simulate the impacts of downwash was calculated using the U.S. EPA-sanctioned Building Profile Input Program (BPIP-PRIME). BPIP-PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents and has been adapted to incorporate the PRIME downwash algorithms.[6] The PRIME version of BPIP features enhanced plume dispersion coefficients due to turbulent wake and reduced plume rise caused by a combination of the descending streamlines in the lee of the building and the increased entrainment in the wake using dominant building parameters (e.g. height, width, length). A GEP analysis of all modeled point sources at the WEC in relation to each building was performed to evaluate which buildings have the greatest influence on the dispersion of each stack's emissions. The GEP heights for each stack calculated using the dominant building's height and maximum projected width was also determined. The buildings having an effect on the stack were included in the modeling analysis.

[6] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised),* Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

Table 4-1. Building Downwash Analysis

Structure	Structure Height (ft)	Max Projected Width (ft)	5L (ft)	H_{GEP} (ft)	Distance to CT1 Stack (ft)	Distance to CT2 Stack (ft)
Combustion Turbine 01 Tier 01	30	60	150	75.0	143	183
HRSG 01 Tier 01	49	73	245	122.5	79	132
HRSG 01 Tier 02	95	87	435	225.5	18	99
Combustion Turbine 01 Tier 02	30	44	150	75.0	197	226
Air Inlet Filter 01	81.8	56	280	165.8	226	251
Combustion Turbine 02 Tier 01	30	60	150	75.0	183	143
HRSG 02 Tier 01	49	73	245	122.5	132	79
HRSG 02 Tier 02	95	87	435	225.5	99	18
Combustion Turbine 02 Tier 02	30	44	150	75.0	226	197
Air Inlet Filter 02	81.8	56	280	165.8	251	226
Steam Turbine Building	44	121	220	110.0	217	306
Warehouse Building	25	177	125	62.5	164	294
Demin Water Tank	24.2	40	121	60.5	114.8	240
Cooling Tower Building	41.9	336	209.5	104.8	140	140
Cooling Tower Cell 01	55	30	150	100.0	203.9	151.9
Cooling Tower Cell 02	55	30	150	100.0	237.6	193.6
Cooling Tower Cell 03	55	30	150	100.0	176.8	155.5
Cooling Tower Cell 04	55	30	150	100.0	214.5	196.7
Cooling Tower Cell 05	55	30	150	100.0	159.1	172.5
Cooling Tower Cell 06	55	30	150	100.0	200	210.6
Cooling Tower Cell 07	55	30	150	100.0	153.3	198.5
Cooling Tower Cell 08	55	30	150	100.0	195.3	232.7
Cooling Tower Cell 09	55	30	150	100.0	160.8	231.3
Cooling Tower Cell 10	55	30	150	100.0	201.2	261.3
Cooling Tower Cell 11	55	30	150	100.0	180.3	268.6
Cooling Tower Cell 12	55	30	150	100.0	217.6	295.4
Cooling Tower Cell 13	55	30	150	100.0	208.4	308.5
Cooling Tower Cell 14	55	30	150	100.0	241.4	331.8

5. REPORT

This section presents the results of the refined risk assessment dispersion modeling analysis. All resulting offsite modeled impacts of individual HAP emissions are negligible on a facility wide basis. Electronic input and output files, as well as all supporting data, are referenced in Appendix B of this report and will be provided to the NJDEP via secure electronic file transfer.

5.1 Air Toxics Analysis Results

Emissions from the stack were modeled and compared to the corresponding reference concentration, hazard quotient, and negligible risk threshold, as applicable. **Table 5-1** outlines which pollutants were evaluated.

Table 5-1. Pollutants Included in Risk Assessment

Pollutant	Averaging Period	Analysis
Acetaldehyde	1-Hour Annual	Short Term Hazard Quotient (Non-Cancer Risk) Long Term Hazard Quotient (Non-Cancer Risk) and Cancer Risk
Benzene	1-Hour Annual	Short Term Hazard Quotient (Non-Cancer Risk) Long Term Hazard Quotient (Non-Cancer Risk) and Cancer Risk
Ethylbenzene	24-Hour Annual	Short Term Hazard Quotient (Non-Cancer Risk) Long Term Hazard Quotient (Non-Cancer Risk) and Cancer Risk
Nickel	1-Hour Annual	Short Term Hazard Quotient (Non-Cancer Risk) Long Term Hazard Quotient (Non-Cancer Risk) and Cancer Risk
Propylene Oxide	1-Hour Annual	Short Term Hazard Quotient (Non-Cancer Risk) Long Term Hazard Quotient (Non-Cancer Risk) and Cancer Risk

The results of this modeling analysis are outlined in **Tables 5-2** through **5-4** below.

Long-Term Risk Assessment – Non-Cancer Risk

Table 5-2 presents the long-term (annual) modeled impacts and corresponding hazard quotient for each of the modeled air toxic pollutant.

Table 5-2. Long-Term (Annual) - Non-Cancer Risk

Pollutant	Modeled Annual 2016-2020 Maximum (μg/m^3)	RfC (μg/m^3)[a]	Calculated Hazard Quotient[b]	NJDEP Negligible Risk Threshold[c]	Exceed Threshold?
Acetaldehyde	7.69E-03	9	8.54E-04	1.0	No
Benzene	2.31E-03	3	7.70E-04	1.0	No
Ethylbenzene	6.15E-03	-	-	1.0	No
Nickel	4.00E-04	0.014	2.86E-02	1.0	No

Pollutant	Modeled Annual 2016-2020 Maximum (µg/m³)	RfC (µg/m³)[a]	Calculated Hazard Quotient[b]	NJDEP Negligible Risk Threshold[c]	Exceed Threshold?
Propylene Oxide	5.57E-03	30	1.86E-04	1.0	No

a. The reference concentration and Unit Risk Factor values obtained from NJDEP: https://dep.nj.gov/wp-content/uploads/boss/risk-screening/toxall-04- 2023.
b. The hazard quotient is calculated per the procedures provided in NJDEP Technical manual 1003, HQ = C/RfC.
c. NJDEP Negligible Risk Threshold (Technical Manual 1003) for Hazard Quotients is 1.0.

Modeled long-term non-cancer risk is negligible for each pollutant's emissions listed in the pending permit.

Long-Term Risk Assessment – Cancer Risk

Table 5-3 presents the long-term (annual) modeled impacts and corresponding cancer risk for each of the modeled air toxic pollutant.

Table 5-3. Long-Term (Annual) – Facility-Wide Cancer Risk

Pollutant	Modeled Annual 2016-2020 Maximum (µg/m³)	URF (µg/m³)[d]	Calculated Cancer Risk[e]	NJDEP Facility-Wide Negligible Risk Threshold[f]	Exceed Threshold?
Acetaldehyde	7.69E-03	2.20E-06	1.69E-08	1.0E-05	No
Benzene	2.31E-03	7.80E-06	1.80E-08	1.0E-05	No
Ethylbenzene	6.15E-03	2.50E-06	1.54E-08	1.0E-05	No
Nickel	4.00E-04	4.80E-04	1.92E-07	1.0E-05	No
Propylene Oxide	5.57E-03	3.70E-06	2.06E-08	1.0E-05	No

d. The Unit Risk Factor values obtained from NJDEP: https://dep.nj.gov/wp-content/uploads/boss/risk-screening/toxall-04- 2023.
e. The cancer risk is calculated per the procedures provided in NJDEP Technical manual 1003, Cancer Risk = C X URF.
f. NJDEP Negligible Risk Threshold (Technical Manual 1003) for cancer risks is 1.0E-5 (10 in a million) for facility wide evaluation.

Results of the modeling analysis indicate negligible cancer risk for each modeled pollutant's emissions.

Short-Term Risk Assessment – Non-Cancer Risk

Table 5-4 presents the short-term modeled impacts and corresponding hazard quotient for each of the modeled air toxic pollutant.

Table 5-4. Short-Term - Non-Cancer Risk

Pollutant	Modeled Annual 2016-2020 Maximum (µg/m³)	RfC (µg/m³)[g]	Calculated Hazard Quotient[h]	NJDEP Negligible Risk Threshold[i]	Exceed Threshold?
Acetaldehyde	2.42E-01	470	5.16E-04	1.0	No

Pollutant	Modeled Annual 2016-2020 Maximum (μg/m^3)	RfC (μg/m^3)[g]	Calculated Hazard Quotient[h]	NJDEP Negligible Risk Threshold[i]	Exceed Threshold?
Benzene	7.54E-02	27	2.79E-03	1.0	No
Ethylbenzene	1.51E-01	1000	1.51E-04	1.0	No
Nickel	1.52E-02	0.2	7.59E-02	1.0	No
Propylene Oxide	1.76E-01	3100	5.67E-05	1.0	No

g. The reference concentration and Unit Risk Factor values obtained from NJDEP: https://dep.nj.gov/wp-content/uploads/boss/risk-screening/toxall-04- 2023.
h. The hazard quotient is calculated per the procedures provided in NJDEP Technical manual 1003, HQ = C/RfC.
i. NJDEP Negligible Risk Threshold (Technical Manual 1003) for Hazard Quotients is 1.0.

Modeled short-term non-cancer risk is negligible for each pollutant's emissions listed in the pending permit.

APPENDIX A. MODELING PROTOCOL & NJDEP APPROVAL LETTER

APPENDIX B. ELECTRONIC MODELING FILES (VIA SECURE FILE TRANSFER)