Inhalation Risk Assessment Report
Homer City

Submitted to the Pennsylvania Department of Environmental Protection

Project number: 60734544

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Delivering a better world

Prepared for:

Homer City Generation, L.P.

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1. Introduction

1.1 Project Overview

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

The Project submitted an Air Plan Approval Application to Pennsylvania Department of Environmental Protection (PADEP) in April 2025. The application material included an assessment of air quality impacts associated with the Project to demonstrate applicable pollutants will not adversely impact the general public. Specifically, analyses were performed to demonstrate that the Project would not violate applicable primary and secondary National Ambient Air Quality Standards (NAAQS). NAAQS have been established by the United States Environmental Protection Agency (US EPA) to protect public health and welfare from air pollution. There are two types of NAAQS: primary and secondary. Primary standards focus on protecting public health, including the health of sensitive populations like asthmatics, children, and the elderly. Secondary standards aim to protect public welfare, such as preventing damage to vegetation, animals, and materials, as well as mitigating visibility impairment.

Subsequently, PADEP has requested that the Project evaluate the potential risk associated with Compounds of Potential Concern (COPC) that were generated from the operation of the new sources. COPCs can have a wide range of potential health effects. In accordance with guidance provided by PADEP, an inhalation risk assessment (IRA) was conducted to further evaluate potential air quality impacts from the Project.

This report presents the methodology and results for the IRA that was performed in support of the Project. As will be shown in the following analyses and report, the Project overall represents a very low level of risk,

1.2 Report Contents

The report consists of the following additional sections:

- Section 2 contains the Project description, including information regarding Project equipment, location, and the proposed emission sources.
- Section 3 describes the hazard identification step of the IRA. This includes the selection of the COPCs to be included in the assessment and the basis for COPC emission estimates.
- Section 4 describes the dose-response (toxicity) assessment which includes a review of the risk factors that regulatory agencies have developed to account for chronic, acute, and carcinogenic effects of COPC exposure.
- Section 5 describes the exposure assessment, which includes an overview of the dispersion modeling that was conducted to develop ground-level air concentrations used in the risk characterization step.
- Section 6 describes the risk characterization and results of the inhalation risk assessment.

- Section 7 describes some uncertainty in the results.
- Section 8 contained references.

1.3 Contacts

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2. Project Description

2.1 Project Location

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

2.2 Proposed Emission Sources

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

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

Figure 2-1. Project Location

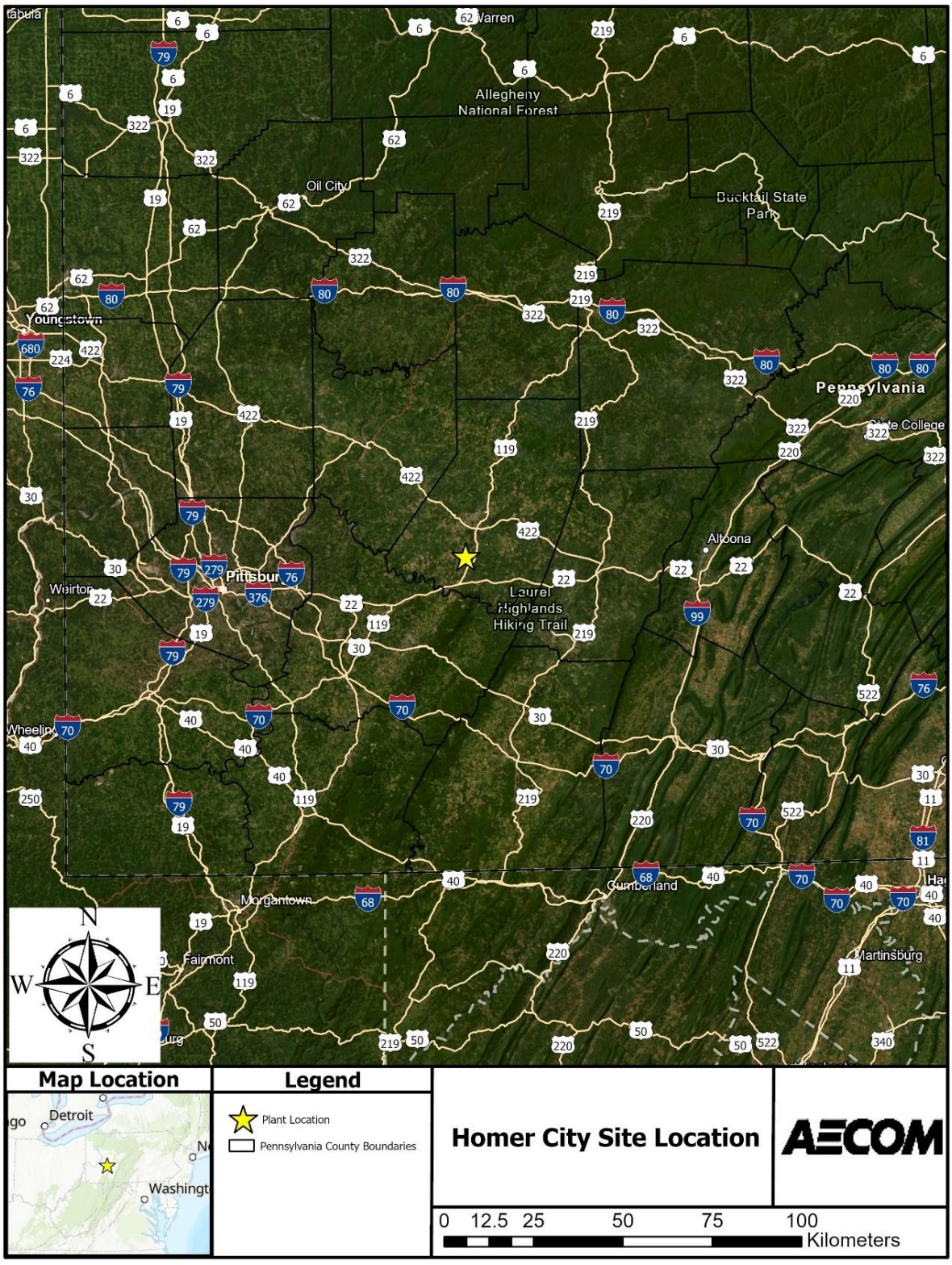
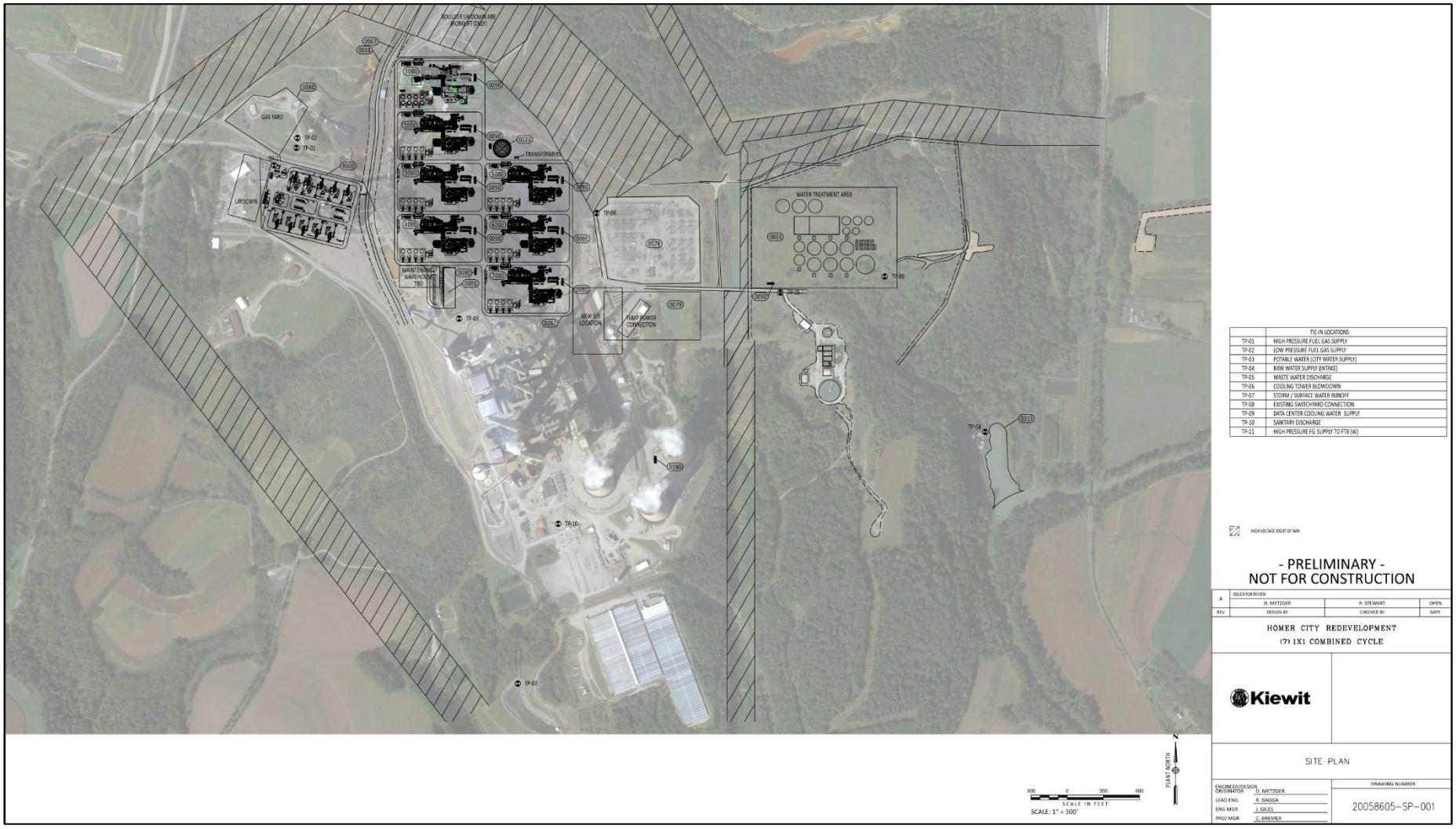


Figure 2-2. Aerial View of Project Site

Figure 2-3. Project Layout



3. Hazard Identification

The purpose of this step of the IRA is to identify COPCs for quantitative evaluation and to generate emissions estimates that are used to quantify exposures to the selected COPCs. With the exception of lead, criteria pollutants, substances for which health-protective ambient air quality standards have been established, are not included as COPCs.

Emission rates for the COPCs associated with the Project were quantified and included in the Air Plan Approval application submitted to PADEP in March 2025. No COPCs were screened out of the IRA regardless of their emission level and/or ground level concentration. Specifically, detailed emissions calculations for each emission source were presented in **Appendix C** of the Air Plan Approval application.

Table 3-1 and **Table 3-2** summarize the emission rates on a per-unit basis for each COPC which were used for the short-term and long-term IRA, respectively.

Table 3-1. Short Term Emission Rates (lb/hr) – Per Unit Rate

Compounds	Combustion Turbines[1]	FT8 MOBILEPACS[2]	Auxiliary Boilers[3]	Gas Heaters[4]	Cooling Towers	Fire Pump Engine[5]	2.5 MW Emergency Generators[6]	1.0 MW Emergency Generators[7]
Metal HAP Compounds:								
Arsenic	8.84E-04	5.90E-05	1.31E-05	2.11E-06	-	-	-	-
Beryllium	5.30E-05	3.54E-06	7.88E-07	1.27E-07	-	-	-	-
Cadmium	4.86E-03	3.25E-04	7.23E-05	1.16E-05	-	-	-	-
Chromium (Cr III)[8]	5.94E-03	3.97E-04	8.83E-05	1.42E-05	-	-	-	-
Chromium (Cr VI)[8]	2.48E-04	1.65E-05	3.68E-06	5.92E-07	-	-	-	-
Cobalt	3.71E-04	2.48E-05	5.52E-06	8.88E-07	-	-	-	-
Lead	2.21E-03	1.48E-04	3.28E-05	5.29E-06	-	-	-	-
Manganese	1.68E-03	1.12E-04	2.50E-05	4.02E-06	-	-	-	-
Mercury	1.15E-03	7.67E-05	1.71E-05	2.75E-06	-	-	-	-
Nickel	9.28E-03	6.20E-04	1.38E-04	2.22E-05	-	-	-	-
Selenium	1.06E-04	7.08E-06	1.58E-06	2.54E-07	-	-	-	-
Metal non-HAP Compounds:								
Barium	1.94E-02	1.30E-03	2.89E-04	4.65E-05	-	-	-	-
Copper	3.76E-03	2.51E-04	5.58E-05	8.98E-06	-	-	-	-
Molybdenum	4.86E-03	3.25E-04	7.23E-05	1.16E-05	-	-	-	-
Vanadium	1.02E-02	6.79E-04	1.51E-04	2.43E-05	-	-	-	-
Zinc	1.28E-01	8.56E-03	1.90E-03	3.07E-04	-	-	-	-
Organic HAP Compounds:								
1,3-Butadiene	9.69E-04	6.47E-05	-	-	-	1.09E-04	-	-
Acetaldehyde	9.02E-02	6.02E-03	-	-	-	2.14E-03	6.41E-04	2.62E-04
Acrolein	1.44E-02	9.63E-04	-	-	-	2.58E-04	2.00E-04	8.18E-05
Benzene	2.71E-02	1.81E-03	1.38E-04	2.22E-05	-	2.61E-03	1.97E-02	8.06E-03
Dichlorobenzene	-	-	7.88E-05	1.27E-05	-	-	-	-
Ethylbenzene	7.21E-02	4.82E-03	-	-	-	-	-	-
Formaldehyde	9.87E-01	6.59E-02	4.93E-03	7.93E-04	-	3.30E-03	2.01E-03	8.19E-04
Hexane	-	-	1.18E-01	1.90E-02	-	-	-	-
Propylene Oxide	6.54E-02	4.36E-03	-	-	-	-	-	-
Toluene	2.93E-01	1.96E-02	2.23E-04	3.59E-05	-	1.14E-03	7.15E-03	2.92E-03
Xylene	1.44E-01	9.63E-03	-	-	-	7.96E-04	4.91E-03	2.00E-03
Organic non-HAP Compounds:								
Butane	-	-	1.38E-01	2.22E-02	-	-	-	-
Ethane	-	-	2.04E-01	3.28E-02	-	-	-	-
Pentane	-	-	1.71E-01	2.75E-02	-	-	-	-
Propane	-	-	1.05E-01	1.69E-02	-	-	-	-
Propylene	-	-	-	-	-	7.21E-03	7.10E-02	2.90E-02
Polycyclic Organic Matter:								
Total POM	**4.96E-03**	**3.31E-04**	**4.59E-05**	**7.38E-06**	**0.00E+00**	**4.69E-04**	**5.38E-03**	**2.20E-03**
3-Methylchloranthrene	-	-	1.18E-07	1.90E-08	-	-	-	-
Total PAHs	*4.96E-03*	*3.31E-04*	*4.57E-05*	*7.36E-06*	*0.00E+00*	*4.69E-04*	*5.38E-03*	*2.20E-03*
2-Methylnaphthalene	-	-	*1.58E-06*	*2.54E-07*	-	-	-	-
7,12-Dimethylbenz(a)anthracene	-	-	*1.05E-06*	*1.69E-07*	-	-	-	-
Acenaphthene	-	-	*1.18E-07*	*1.90E-08*	-	*3.97E-06*	*1.19E-04*	*4.86E-05*
Acenaphthylene	-	-	*1.18E-07*	*1.90E-08*	-	*1.41E-05*	*2.35E-04*	*9.58E-05*
Anthracene	-	-	*1.58E-07*	*2.54E-08*	-	*5.22E-06*	*3.13E-05*	*1.28E-05*
Benz(a)anthracene	-	-	*1.18E-07*	*1.90E-08*	-	*4.69E-06*	*1.58E-05*	*6.46E-06*
Benzo(a)pyrene	-	-	*7.88E-08*	*1.27E-08*	-	*5.25E-07*	*6.54E-06*	*2.67E-06*
Benzo(b)fluoranthene	-	-	*1.18E-07*	*1.90E-08*	-	*2.77E-07*	*2.82E-05*	*1.15E-05*
Benzo(g,h,i)perylene	-	-	*7.88E-08*	*1.27E-08*	-	*1.37E-06*	*1.41E-05*	*5.77E-06*
Benzo(k)fluoranthene	-	-	*1.18E-07*	*1.90E-08*	-	*4.33E-07*	*5.54E-06*	*2.26E-06*
Chrysene	-	-	*1.18E-07*	*1.90E-08*	-	*9.86E-07*	*3.89E-05*	*1.59E-05*
Dibenzo(a,h)anthracene	-	-	*7.88E-08*	*1.27E-08*	-	*1.63E-06*	*8.80E-06*	*3.59E-06*
Fluoranthene	-	-	*1.97E-07*	*3.17E-08*	-	*2.13E-05*	*1.02E-04*	*4.18E-05*
Fluorene	-	-	*1.84E-07*	*2.96E-08*	-	*8.16E-05*	*3.26E-04*	*1.33E-04*
Indeno(1,2,3-cd)pyrene	-	-	*1.18E-07*	*1.90E-08*	-	*1.05E-06*	*1.05E-05*	*4.30E-06*
Naphthalene	*2.93E-03*	*1.96E-04*	*4.01E-05*	*6.45E-06*	-	*2.37E-04*	*3.31E-03*	*1.35E-03*
Phenanathrene	-	-	*1.12E-06*	*1.80E-07*	-	*8.21E-05*	*1.04E-03*	*4.24E-04*
Pyrene	-	-	*3.28E-07*	*5.29E-08*	-	*1.34E-05*	*9.43E-05*	*3.85E-05*
Ammonia	3.07E+01	2.05E+00	-	-	-	-	-	-

[1] Maximum hourly emission rates from Table C-6 of March 2025 Air Plan Approval Application.
[2] Maximum hourly emission rates from Table C-12 of March 2025 Air Plan Approval Application.
[3] Maximum hourly emission rates from Table C-14 of March 2025 Air Plan Approval Application.
[4] Maximum hourly emission rates from Table C-22 of March 2025 Air Plan Approval Application.
[5] Maximum hourly emission rates from Table C-20 of March 2025 Air Plan Approval Application.
[6] Maximum hourly emission rates from Table C-16 of March 2025 Air Plan Approval Application.
[7] Maximum hourly emission rates from Table C-18 of March 2025 Air Plan Approval Application.
[8] Total chromium emissions for natural gas fired emissions were speciated into chromium III and chromium VI for the purpose of the IRA (96% Chromium III and 4% Chromium VI). The speciation was based on data contained in Section 2.2.2 of US EPA's 2020 National Emissions Inventory Technical Support Document (US EPA, 2023) along with the chromium speciation tables available at: https://gaftp.epa.gov/air/nei/2020/doc/supporting_data/.

Table 3-2. Annual Emission Estimate (tons/yr) – Per Unit Rate

Compounds	Combustion Turbines[1]	FT8 MOBILEPACS[2]	Auxiliary Boilers[3]	Gas Heaters[4]	Cooling Towers	Fire Pump Engine[5]	2.5 MW Emergency Generators[6]	1.0 MW Emergency Generators[7]
Metal HAP Compounds:								
Arsenic	3.75E-03	2.55E-04	2.88E-06	9.26E-06	-	-	-	-
Beryllium	2.25E-04	1.53E-05	1.73E-07	5.56E-07	-	-	-	-
Cadmium	2.06E-02	1.40E-03	1.58E-05	5.09E-05	-	-	-	-
Chromium (Cr III)[8]	2.52E-02	1.71E-03	1.93E-05	6.22E-05	-	-	-	-
Chromium (Cr VI)[8]	1.05E-03	7.14E-05	8.06E-07	2.59E-06	-	-	-	-
Cobalt	1.58E-03	1.07E-04	1.21E-06	3.89E-06	-	-	-	-
Lead	9.38E-03	6.38E-04	7.19E-06	2.31E-05	-	-	-	-
Manganese	7.13E-03	4.85E-04	5.47E-06	1.76E-05	-	-	-	-
Mercury	4.88E-03	3.32E-04	3.74E-06	1.20E-05	-	-	-	-
Nickel	3.94E-02	2.68E-03	3.02E-05	9.72E-05	-	-	-	-
Selenium	4.50E-04	3.06E-05	3.45E-07	1.11E-06	-	-	-	-
Metal non-HAP Compounds:								
Barium	8.26E-02	5.61E-03	6.33E-05	2.04E-04	-	-	-	-
Copper	1.59E-02	1.08E-03	1.22E-05	3.94E-05	-	-	-	-
Molybdenum	2.06E-02	1.40E-03	1.58E-05	5.09E-05	-	-	-	-
Vanadium	4.32E-02	2.93E-03	3.31E-05	1.06E-04	-	-	-	-
Zinc	5.44E-01	3.70E-02	4.17E-04	1.34E-03	-	-	-	-
Organic HAP Compounds:								
1,3-Butadiene	4.12E-03	2.80E-04	-	-	-	2.73E-05	-	-
Acetaldehyde	3.83E-01	2.60E-02	-	-	-	5.36E-04	1.60E-04	6.54E-05
Acrolein	6.13E-02	4.16E-03	-	-	-	6.46E-05	5.01E-05	2.05E-05
Benzene	1.15E-01	7.81E-03	3.02E-05	9.72E-05	-	6.51E-04	4.93E-03	2.01E-03
Dichlorobenzene	-	-	1.73E-05	5.56E-05	-	-	-	-
Ethylbenzene	3.06E-01	2.08E-02	-	-	-	-	-	-
Formaldehyde	4.19E+00	2.85E-01	1.08E-03	3.47E-03	-	8.24E-04	5.02E-04	2.05E-04
Hexane	-	-	2.59E-02	8.33E-02	-	-	-	-
Propylene Oxide	2.78E-01	1.89E-02	-	-	-	-	-	-
Toluene	1.24E+00	8.46E-02	4.89E-05	1.57E-04	-	2.86E-04	1.79E-03	7.29E-04
Xylene	6.13E-01	4.16E-02	-	-	-	1.99E-04	1.23E-03	5.01E-04
Organic non-HAP Compounds:								
Butane	-	-	3.02E-02	9.72E-02	-	-	-	-
Ethane	-	-	4.46E-02	1.44E-01	-	-	-	-
Pentane	-	-	3.74E-02	1.20E-01	-	-	-	-
Propane	-	-	2.30E-02	7.41E-02	-	-	-	-
Propylene	-	-	-	-	-	1.80E-03	1.77E-02	7.24E-03
Polycyclic Organic Matter:								
Total POM	**2.11E-02**	**1.43E-03**	**1.00E-05**	**3.23E-05**	**0.00E+00**	**1.17E-04**	**1.34E-03**	**5.49E-04**
3-Methylchloranthrene	-	-	2.59E-08	8.33E-08	-	-	-	-
Total PAHs[9]	*2.11E-02*	*1.43E-03*	*1.00E-05*	*3.22E-05*	*0.00E+00*	*1.17E-04*	*1.34E-03*	*5.49E-04*
2-Methylnaphthalene	-	-	*3.45E-07*	*1.11E-06*	-	-	-	-
7,12-Dimethylbenz(a)anthracene			*2.30E-07*	*7.41E-07*	-	-	-	-
Acenaphthene	-	-	*2.59E-08*	*8.33E-08*	-	*9.92E-07*	*2.98E-05*	*1.21E-05*
Acenaphthylene	-	-	*2.59E-08*	*8.33E-08*	-	*3.53E-06*	*5.87E-05*	*2.40E-05*
Anthracene	-	-	*3.45E-08*	*1.11E-07*	-	*1.31E-06*	*7.82E-06*	*3.19E-06*
Benz(a)anthracene	-	-	*2.59E-08*	*8.33E-08*	-	*1.17E-06*	*3.95E-06*	*1.61E-06*
Benzo(a)pyrene	-	-	*1.73E-08*	*5.56E-08*	-	*1.31E-07*	*1.63E-06*	*6.67E-07*
Benzo(b)fluoranthene	-	-	*2.59E-08*	*8.33E-08*	-	*6.92E-08*	*7.06E-06*	*2.88E-06*
Benzo(g,h,i)perylene	-	-	*1.73E-08*	*5.56E-08*	-	*3.41E-07*	*3.53E-06*	*1.44E-06*
Benzo(k)fluoranthene	-	-	*2.59E-08*	*8.33E-08*	-	*1.08E-07*	*1.39E-06*	*5.66E-07*
Chrysene	-	-	*2.59E-08*	*8.33E-08*	-	*2.46E-07*	*9.73E-06*	*3.97E-06*
Dibenzo(a,h)anthracene	-	-	*1.73E-08*	*5.56E-08*	-	*4.07E-07*	*2.20E-06*	*8.98E-07*
Fluoranthene	-	-	*4.32E-08*	*1.39E-07*	-	*5.31E-06*	*2.56E-05*	*1.05E-05*
Fluorene	-	-	*4.03E-08*	*1.30E-07*	-	*2.04E-05*	*8.14E-05*	*3.32E-05*
Indeno(1,2,3-cd)pyrene	-	-	*2.59E-08*	*8.33E-08*	-	*2.62E-07*	*2.63E-06*	*1.07E-06*
Naphthalene	*1.24E-02*	*8.46E-04*	*8.78E-06*	*2.82E-05*	-	*5.92E-05*	*8.27E-04*	*3.37E-04*
Phenanathrene	-	-	*2.45E-07*	*7.87E-07*	-	*2.05E-05*	*2.59E-04*	*1.06E-04*
Pyrene	-	-	*7.19E-08*	*2.31E-07*	-	*3.34E-06*	*2.36E-05*	*9.63E-06*

[1] Annual emission rates from Table C-6 of March 2025 Air Plan Approval Application.
[2] Annual emission rates from Table C-12 of March 2025 Air Plan Approval Application.
[3] Annual emission rates for auxiliar boiler include a 5% capacity factor which will be reflected as a permit limit. This factor was inadvertently omitted from the emission calculations for the auxiliary boiler HAPs Table C-2 and Table C-14 in March 2025 Air Plan Approval Application.
[4] Annual emission rates from Table C-22 of March 2025 Air Plan Approval Application.
[5] Annual emission rates from Table C-20 of March 2025 Air Plan Approval Application.
[6] Annual emission rates from Table C-16 of March 2025 Air Plan Approval Application.
[7] Annual emission rates from Table C-18 of March 2025 Air Plan Approval Application.
[8] Total chromium emissions for natural gas fired emissions were speciated into chromium III and chromium VI for the purpose of the IRA (96% Chromium III and 4% Chromium VI). The speciation was based on data contained in Section 2.2.2 of US EPA's 2020 National Emissions Inventory Technical Support Document (US EPA, 2023) along with the chromium speciation tables available at: https://gaftp.epa.gov/air/nei/2020/doc/supporting_data/.
[9] Since emission factors for individual PAH species are not readily available for the combustion turbines and FT8 MOBILEPACs (except for naphthalene), total PAH emissions were evaluated in the cancer risk assessment and treated as emissions of benzo(a)pyrene, per discussions with PADEP. Chronic non-cancer risk did not evaluate these total PAH emissions. PAH emissions from the remainder of sources were evaluated for each of the individual species.

4. Dose-Response Assessment

The purpose of this step is to identify the types of inhalation health effects a compound may potentially cause, and to define the relationship between the dose of that compound and the likelihood and magnitude of a health effect (referred to as “response”). Chronic inhalation health effects are characterized by US EPA as potentially cancer-causing or non-cancer-causing. Combining the results of the dose-response assessment with information on the magnitude of potential human exposure provides an estimate, usually conservative, of potential health risk. In addition to chronic health effects, acute inhalation of maximum short-term (i.e., 1-hour) air concentrations were also evaluated.

Values proposed for the risk assessment were originally sourced from Table 1 in Appendix D-3C of the IRA for Shell Polymers Monaca (Shell Chemical Appalachia, 2024). Values were updated based on PADEP comments on the analysis (PADEP, 2024). A few additional updates were made based on newer values available or to provide more information on the reference source, as footnoted in **Table 4-1**. The reference databases used to develop the risk values are listed below. COPCs with “--" listed in **Table 4-1** do not have a specific dose-response factors.

Chronic Reference Concentrations (RfCs) and Chronic Cancer Inhalation Unit Risk Factors (IURs)

- US EPA's Integrated Risk Information System (IRIS, US EPA, 2025a),
- US EPA’s Provisional Peer-Reviewed Values (PPRTVs, US EPA, 2025b),
- State of California Office of Environmental Health Hazard Assessment (CalEPA, 2025),
- Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (CDC, 2025b),
- US EPA’s Relative Potency Factors (RPFs, US EPA, 2024b), and
- US EPA’s Health Effects Assessment Summary Tables (HEAST, US DOE, 2011).

Acute RfCs

- The Occupational Safety and Health (OSHA) Chemical Database, providing values from OSHA, National Institute for Occupational Safety and Health (NIOSH), and American Conference of Government Industrial Hygienists (ACGIH) (OSHA, 2025), and
- CalEPA, (2025).

Table 4-1 provides the chronic RfCs, IURs, and acute RfCs that were used to assess potential impacts associated with the project.

Table 4-1. Dose-Response Factors

CAS No.	Compound of Potential Concern	Chronic Inhalation Reference Conc.[1] (mg/m^3)	Reference[2]	Acute Inhalation Reference Conc.[1] (mg/m^3)	Reference[2]	Inhalation Unit Risk Factor[1] $(\mu g/m^3)^{-1}$	Reference[2]
83-32-9	Acenaphthene	--	--	--	--	--	--
208-96-8	Acenaphthylene	--	--	--	--	--	--
75-07-0	Acetaldehyde	9.00E-03	IRIS	4.70E-01	CalEPA	2.20E-06	IRIS
107-02-8	Acrolein	2.00E-05	IRIS	2.50E-03	CalEPA	--	--
7664-41-7	Ammonia	2.00E-01	CalEPA	6.75E-01	NIOSH STEL	--	--
120-12-7	Anthracene	--	--	3.00E-02	ACGIH TWA	--	--
7440-38-2	Arsenic, Inorganic	1.50E-05	CalEPA	2.00E-04	CalEPA	4.30E-03	IRIS
7440-39-3	Barium	5.00E-04	HEAST	7.50E-02	OSHA TWA	--	--
71-43-2	Benzene	3.00E-03	CalEPA	2.70E-02	CalEPA	7.80E-06	IRIS
56-55-3	**Benz[a]anthracene**	--	--	3.00E-02	NIOSH TWA	6.00E-05	EPA/RPF
50-32-8	**Benzo[a]pyrene**	2.00E-06	IRIS	3.00E-02	OSHA TWA	1.00E-03[7,9]	IRIS
205-99-2	**Benzo[b]fluoranthene**	--	--	--	--	6.00E-05	EPA/RPF
191-24-2	Benzo[g,h,i]perylene	--	--	--	--	--	--
207-08-9	**Benzo[k]fluoranthene**	--	--	--	--	6.00E-06	EPA/RPF
7440-41-7	Beryllium and compounds	7.00E-07	CalEPA	7.50E-06[3]	ACGIH TWA	2.40E-03	IRIS
106-99-0	Butadiene, 1,3-	2.00E-03	IRIS	6.60E-01	CalEPA	3.00E-05	IRIS
106-97-8	Butane	--	--	3.57E+02	ACGIH TWA	--	--
7440-43-9	Cadmium	1.00E-05	ATSDR	3.00E-05	ATSDR	1.80E-03	IRIS
7440-47-3	Chromium(III)[4]	6.00E-05	CalEPA	4.50E-04	ACGIH TWA	--	--
18540-29-9	**Chromium(VI)**	3.00E-05	IRIS	1.25E-05	ACGIH STEL	1.80E-02[9]	IRIS
218-01-9	**Chrysene**	--	--	3.00E-02[5]	ACGIH TWA	6.00E-07	EPA/RPF
7440-48-4	Cobalt	6.00E-06	PPRTV	3.00E-03	ACGIH TWA	9.00E-03	PPRTV
7440-50-8	Copper	--	--	1.00E-01	CalEPA	--	--
53-70-3	**Dibenzo[a,h]anthracene**	--	--	--	--	6.00E-04	EPA/RPF
106-46-7	Dichlorobenzene	8.00E-01	IRIS	7.50E+00	CalEPA	1.10E-05	CalEPA
57-97-6	**Dimethylbenz(a)anthracene, 7,12-**	--	--	3.00E-02[8]	NIOSH TWA	7.10E-02	CalEPA
74-84-0	Ethane	--	--	--	--	--	--
100-41-4	Ethylbenzene	1.00E+00	IRIS	1.30E+01	ACGIH TWA	2.50E-06	CalEPA
206-44-0	Fluoranthene	--	--	--	--	--	--
86-73-7	Fluorene	--	--	--	--	--	--
50-00-0	**Formaldehyde**	7.00E-03	IRIS	4.90E-02	ATSDR	1.10E-05[9]	IRIS
110-54-3	Hexane, n-	7.00E-01	IRIS	2.64E+01	ACGIH TWA	--	--
193-39-5	**Indeno[1,2,3-cd]pyrene**	--	--	--	--	6.00E-05	EPA/RPF
7439-92-1	Lead and Compounds	--	--	7.50E-03	ACGIH TWA	1.20E-05	CalEPA
7439-96-5	Manganese	5.00E-05	IRIS	3.00E-03	ACGIH TWA	--	--
7439-97-6	Mercury (elemental)	3.00E-05	CalEPA	6.00E-04	CalEPA	--	--
56-49-5	**Methylcholanthrene, 3-**	--	--	--	--	6.30E-03	CalEPA
91-57-6	Methylnaphthalene, 2-	--	--	4.37E-01	ACGIH TWA	--	--
7439-98-7	Molybdenum	2.00E-03	ATSDR	4.50E-01	CalEPA	--	--

CAS No.	Compound of Potential Concern	Chronic Inhalation Reference Conc.(1) (mg/m^3)	Reference(2)	Acute Inhalation Reference Conc.(1) (mg/m^3)	Reference(2)	Inhalation Unit Risk Factor(1) $(\mu g/m^3)^{-1}$	Reference(2)
91-20-3	Naphthalene	3.00E-03	IRIS	1.875 (6)	NIOSH STEL	3.40E-05	CalEPA
7440-02-0	Nickel	1.40E-05	CalEPA	2.00E-04	CalEPA	2.60E-04	CalEPA
109-66-0	Pentane	1.00E+00	PPRTV	1.80E+02	NIOSH REL-C	--	--
85-01-8	Phenanthrene	--	--	0.03	ACGIH TWA	--	--
74-98-6	Propane	--	--	2.71E+02	NIOSH TWA	--	--
115-07-1	Propylene	3.00E+00	CalEPA	1.29E+02	ACGIH TWA	--	--
75-56-9	Propylene Oxide	3.00E-02	IRIS	3.10E+00	CalEPA	3.70E-06	IRIS
129-00-0	Pyrene	--	--	3.00E-02(5)	ACGIH TWA	--	--
7782-49-2	Selenium	2.00E-02	CalEPA	3.00E-02	ACGIH TWA	--	--
108-88-3	Toluene	4.20E-01	CalEPA	5.00E+00	CalEPA	--	--
7440-62-2	Vanadium	1.00E-04	ATSDR	8.00E-04	ATSDR	--	--
1330-20-7	Xylenes	1.00E-01	IRIS	8.68E+00	ATSDR	--	--
7440-66-6	Zinc	--	--	--	--	--	--

BOLD TYPE indicates mutagenic carcinogens (US EPA 2024b)

(1) Values listed in the table were originally sourced from Appendix D-3C of Inhalation Risk Assessment for Shell Polymers Monaca (Shell Chemical Appalachia, 2024). Values were updated based on PADEP comments on the analysis (PADEP, 2024) and PADEP comments provided to AECOM (PADEP, 2025). A few additional updates were made as footnoted in the table.

(2) IRIS: US EPA Integrated Risk Information System (US EPA, 2025a)
PPRTV: US EPA Provisional Peer-Review Toxicity Values (US EPA, 2025b)
CalEPA: State of California Office of Environmental Health Hazard Assessment (US EPA, 2025c)
ATSDR: Agency for Toxic Substances and Disease Registry (ATSDR, 2025)
ACGIH/NIOSH/OSHA: Occupational Safety and Health Chemical Database (OSHA, 2025)
US EPA/RPF: US EPA Relative Potency Factors (US EPA, 2024)
HEAST: Health Effects Assessment Summary Tables (US DOE, 2011)
NA: Toxicity value has not been established for COPC.

(3) Value based on ACGIH TLV-TWA found on: https://www.acgih.org/beryllium-and-compounds/

(4) Pollutant was not included in the Shell 2024 analysis but is included here because total chromium emissions have been speciated into Chromium VI and Chromium III forms.

(5) Value based on ACGIH TWA value for anthracene, as OSHA chemical database cites that "Anthracene is a polynuclear aromatic hydrocarbon that OSHA has identified as one of a number of typical components of the benzene-soluble fraction of coal tar pitch volatiles. Other components include benzo[a]pyrene, phenanthrene, acridine, chrysene, and pyrene". It is assumed toxicity for chrysene and pyrene could be similar though they are not explicitly included in the OSHA database. https://www.osha.gov/chemicaldata/835

(6) Updated value in Shell table from 2 to 1.875 to account for more precision, and updated reference.

(7) Total PAH emissions will be evaluated in the cancer IRA using the dose response factors for benzo(a)pyrene, per discussions with PADEP.

(8) Using acute value for benz(a)anthracene as surrogate (PADEP, 2025).

(9) IUR for this mutagenic carcinogen includes age dependent adjustment factors (ADAFs), as discussed in Section 6.2.1.

5. Exposure Assessment

The goal of the exposure assessment step of IRA is to predict the magnitude of possible human exposure to COPCs emitted from a source once they enter potential exposure pathways. This assessment evaluated human health risk due to the inhalation exposure pathway. As such, air dispersion modeling was conducted to determine ground-level concentrations that were used in the risk characterization step. In order to provide conservative results, the IRA assumed continuous human exposure to the modeled air concentrations (i.e., 8,760 hours in a year).

The IRA evaluated the following exposure locations:

- A maximally exposed individual (MEI), based on the location of the overall maximum 1-hour and maximum long-term modeled concentration (within the modeled cartesian receptor grid, described below). This exposure scenario is meant to capture an individual that could be exposed to the maximum modeled concentration at any modeled receptor.
- Specific locations where nearby sensitive populations are assumed to be continuously exposed, including:
  - Residences
  - Daycare facilities
  - Schools
  - Nursing homes
  - Hospitals

The evaluated sensitive receptor locations are shown in **Figure 5-1**. The selection of these locations focused on a 5 km radius from the Project because this area included the highest potential risk associated with the project, based on the maximum modeled ground level concentrations. Selected residences were based on those closest to the Project in several different directions. Model output confirmed that these locations correspond to the maximum modeled concentrations at actual residences. Note that no hospitals or nursing homes were identified within 10 km of the Project.

5.1 Overview of Modeling Methodology

The modeling methodology used the approach presented in the air dispersion sections of the Plan Approval Application submitted to PADEP in March 2025 (AECOM, 2025). This section briefly summarizes the approach, which aligns with US EPA's GAQM, contained in 40 CFR Part 51, Appendix W (US EPA, 2024a). A single AERMOD run (using 5 years, 2020-2024, of meteorology) was conducted with the latest version of US EPA's and PADEPs preferred dispersion model, AERMOD (version 24142). Each emission source was modeled using a unitized emission rate (normalized at 1 gram per second (g/sec)).

AERMOD was with the following configuration:

- Use of BPIP-PRIME to develop direction-specific building dimensions to account for downwash of the plume due to structural influence.
- Characterization of the location dispersion environmental as rural, based on an analysis that classified land-use types within 3 km of the facility and found a majority fell into the rural classification. Therefore, the urban source option will not be used.
- Use of five years (2020-2024) of near-surface meteorological data from the John Murtha Johnstown-Cambria County Airport (Johnstown Airport) along with concurrent upper-level data from Pittsburgh International Airport.

- A cartesian receptor grid (see **Figure 5-2** and **Figure 5-3**) extending approximately 20 km from the centroid of the Project area, using the following spacing and processed with version 24142 of the AERMAP terrain preprocessor program:
  - 25-m spaced receptors along the ambient boundary;
  - 50-m spaced receptors extending from ambient boundary to 200 m;
  - 100-m spaced receptors between 200 m and 1 km from the proposed Project centroid;
  - 250-m spaced receptors between 1 km and 2.5 km from the proposed Project centroid;
  - 500-m spaced receptors between 2.5 m and 10 km from the proposed Project centroid; and
  - 1,000-m spaced receptors between 10 m and 20 km from the proposed Project centroid.

The model was set up to produce normalized concentrations for each source modeled. Both a 1-hour and period (i.e., 5-year) averaging period were selected to generate the short-term and long-term concentration output files.

5.2 Dispersion Model Output

Output from the AERMOD model was used in the risk characterization step described in Section 6. The model was set up to produce an output plot file for each source containing normalized concentrations in units of micrograms per cubic meter per g/sec ($\mu g/m^3$ per g/sec of emissions) at each modeled receptor.

Then, on a source-by-source basis, the normalized concentrations were multiplied by the COPC-specific emission rate. The total facility concentration at each receptor and for each COPC was found by summing each of the COPC-specific concentrations from all facility emission sources. This methodology was applied to both 1-hour and long-term averaging period produced by the model.

The resulting 1-hour concentrations using this approach are conservative because the summed concentrations are not paired in time. That is, at a particular receptor, the modeled concentration from one emission source may not necessarily occur during the same hour as the modeled concentration from another source, however the concentrations are summed regardless of the hour that they occur which maximizes the total concentration.

Figure 5-1. Sensitive Receptor Locations

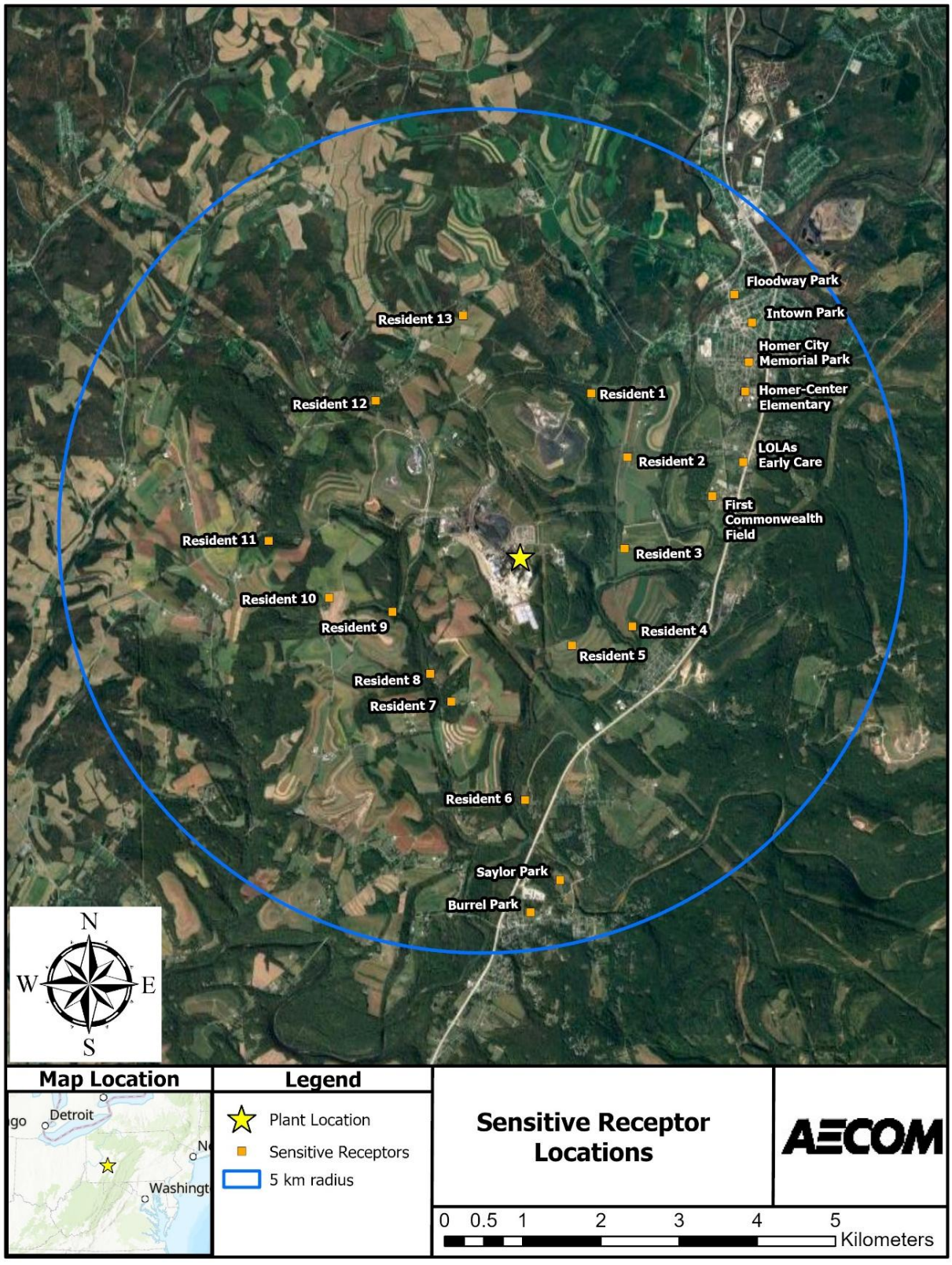


Figure 5-2. Far-field Receptor Grid

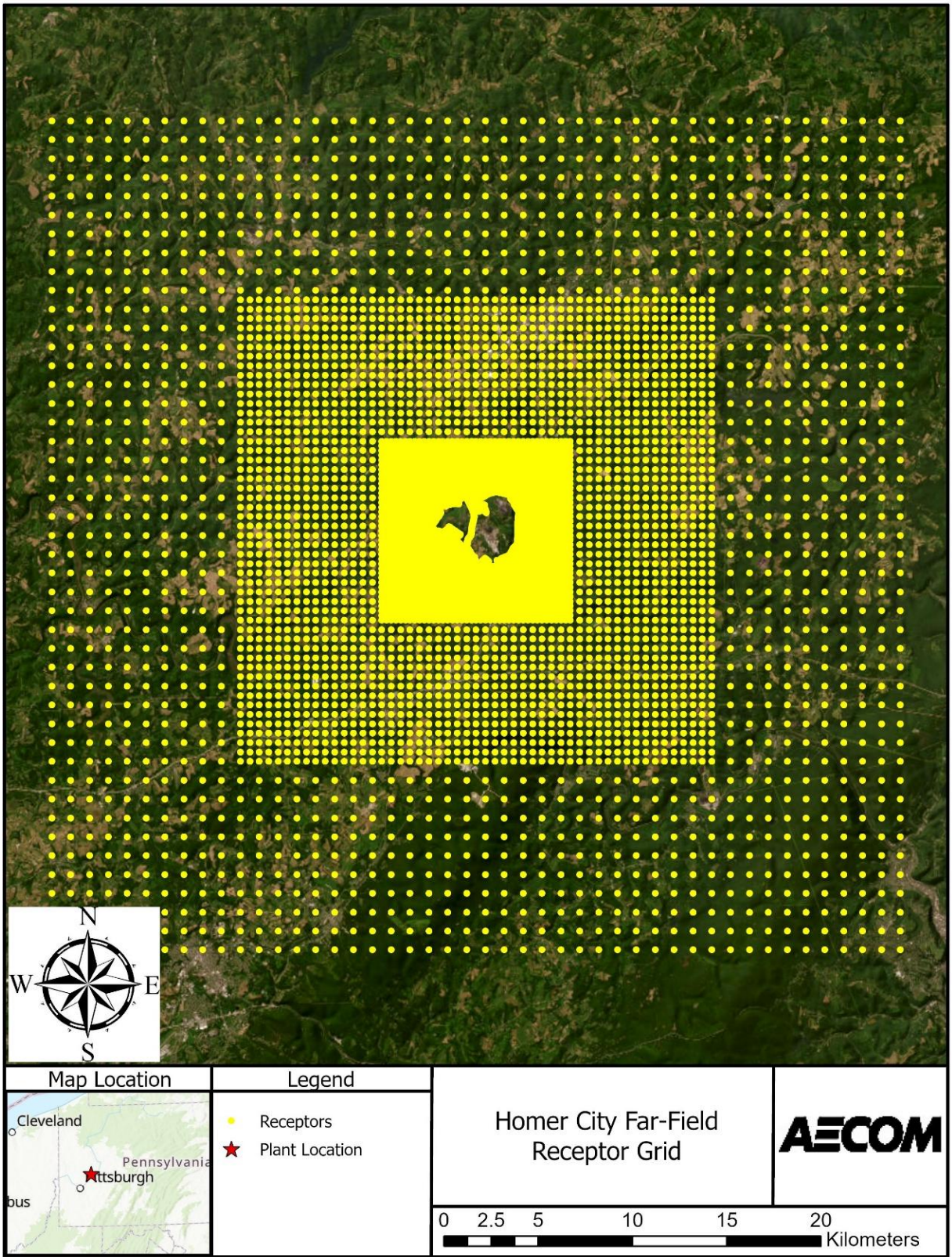
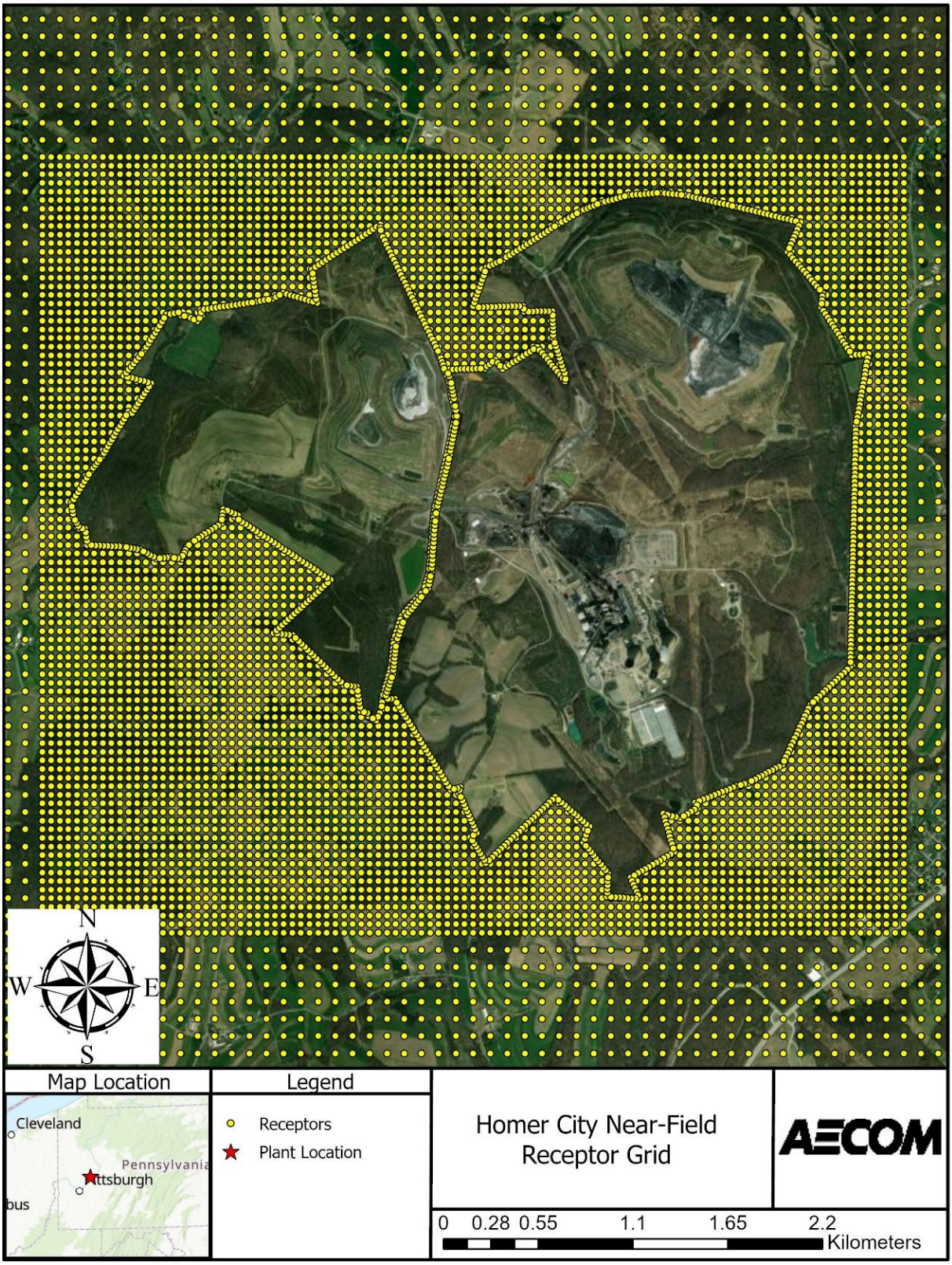


Figure 5-3. Near-field Receptor Grid



6. Risk Characterization

The risk characterization step of the IRA combines the results of the dose-response assessment with the exposure assessment to derive an estimate of potential risk to human health. As noted above, the normalized concentrations output from AERMOD were multiplied by the COPC-specific emission rate. The total facility concentration at each receptor and for each COPC was found by summing each of the COPC-specific concentrations from all facility emission sources. The total facility concentration was used as the air concentration variable in the risk equations presented below.

6.1 Chronic Non-Cancer Risk

Non-cancer risk estimates are based on a Hazard Quotient (HQ) which is the ratio of the potential exposure to a COPC and the level at which no adverse effects are expected. A HQ for each COPC was calculated based on the following equation:

$$\boldsymbol{HQ} = \frac{\boldsymbol{CC}\ (\mu\boldsymbol{g}/\boldsymbol{m^3})}{\boldsymbol{RfC}\ (\mu\boldsymbol{g}/\boldsymbol{m^3})}$$

Where:

HQ = hazard quotient
CC = chronic air concentration
RfC = COPC-specific, listed in **Table 4-1**.

The chronic air concentration was represented by the long-term air concentration from AERMOD and assumes that a person at a particular location would have continuous exposure through inhalation. The total Hazard Index (HI) for each evaluated exposure location was calculated by summing the HQs for each COPC. The HI is meant to represent the cumulative potential for adverse health effects from COPCs that affect the same organ or system in the body. This IRA conservatively assumed that all COPCs can affect the body in the same way even though that is not likely the case.

The Center for Disease Control (CDC, 2025a) indicates that an HQ for an individual constituent, or mixture of constituents where appropriate, should be measured against a value of 1.0. US EPA (2025d) similarly references a value of 1.0 but applies the threshold to the HI, or the sum of the individual HQs that affect the same organ/system in the body. Both references indicate that an HI below 1.0 means exposure to COPCs are unlikely to cause adverse non-cancer health effects over a lifetime of exposure.

PADEP has in special circumstances utilized a HI of 0.25 for assessing single-source impacts (not considering background concentrations of COPCs) which is based on US EPA Region 6's 1998 *"Risk Management Addendum - Draft Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities"* (US EPA 1998). This approach indicates a presumed background for COPCs equal to an HI of 0.75. Representing the HI for background COPCs as 0.75 for a rural application, as is the Project, is extremely conservative (see Pennsylvania Health Department Report[1] (PADEP 2018) which indicates chronic non-cancer HI averaging 0.30 based on actual measurement data). For longer term averaging periods and evaluations considering multiple compounds (as the chronic non-cancer risk does), consideration of background levels of COPCs may be appropriate in some cases.

Nonetheless, this IRA compared the estimated chronic non-cancer HI to a target of 1.0 and to 0.25, in accordance with the cited references. Notably, an HI that exceeds the applicable reference value does not necessarily mean adverse effects are likely but rather the need to be further evaluated on a case-by-case basis.

[1] https://www.atsdr.cdc.gov/HAC/pha/marcellusShale/Air_Marcellus_Shale_HC-508.pdf

The potential for chronic non-cancer risk was evaluated at all identified sensitive population locations, and the maximum for each sub-category (e.g., residence, schools, etc.) is presented in **Table 6-1**. The table also presents the chronic non-cancer risk for the MEI location, defined as the receptor location with the maximum risk regardless of whether an individual would be continually exposed in that location. **Table 6-2** presents the contributions of the individual COPCs to the total HI at the MEI. The highest contributors are acrolein, nickel, cadmium, ammonia, and formaldehyde. The maximum hazard index over all receptors (including sensitive receptors and the MEI) is 0.036, which is well below the target of 1.0 and also well below 0.25.

Figure 6-1 presents isopleths depicting the extent of the chronic non-cancer risk. Appendix A includes results for each sensitive receptor evaluated as well as for each individual COPC.

Table 6-1. Modeled Cumulative Chronic Non-Cancer Risk

Receptor (Sensitive Population Sub-Group)	Chronic Non-Cancer Hazard Index (unitless)
Target Level:	1 (0.25)[1]
School/Daycare	0.022
Park	0.024
Resident	0.032
MEI	0.036

[1]Target levels of 1 and 0.25 were used in accordance with the references cited above.

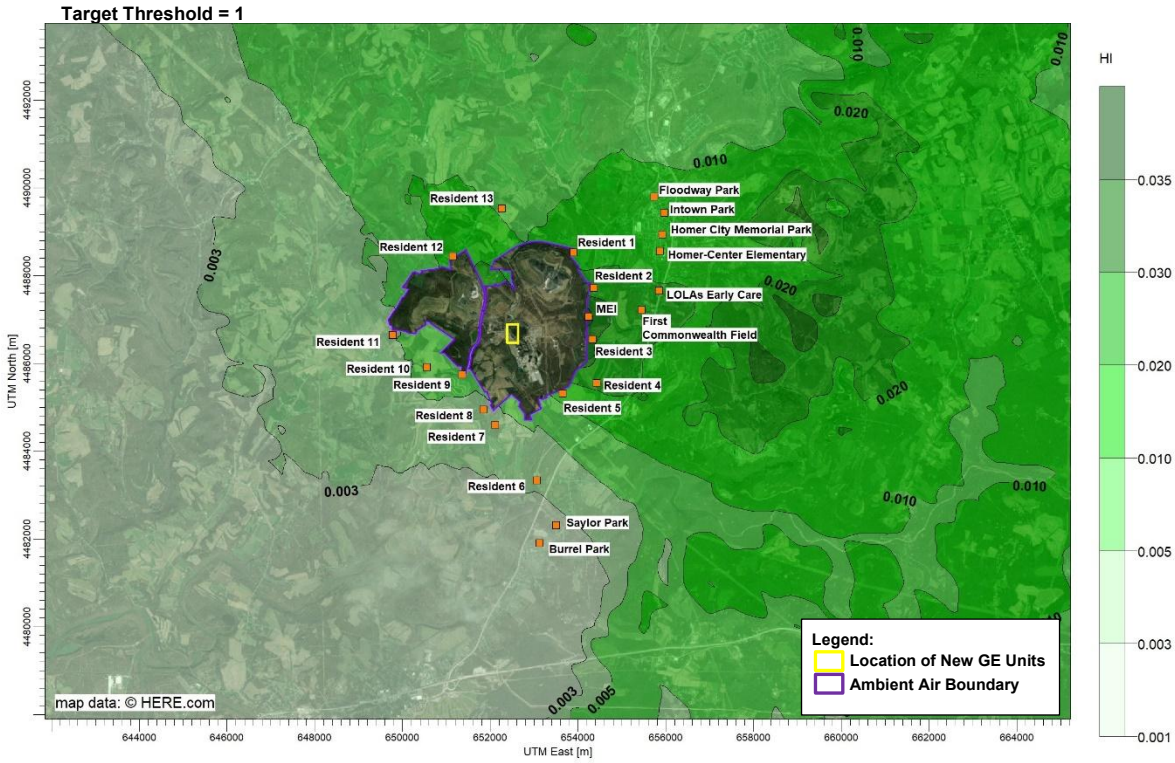
Table 6-2. Modeled Chronic Non-Cancer Risk for MEI Receptor
(Top 5 COPCs in bold)

COPC	Hazard Quotient (unitless)	COPC	Hazard Quotient (unitless)
MEI Cumulative HI: 3.63E-02			
Arsenic	7.92E-04	Xylene	1.97E-05
Beryllium	1.02E-03	Butane	--
Cadmium	**6.54E-03**	Ethane	--
Chromium (III)	1.33E-03	Pentane	1.04E-05
Chromium (VI)	1.11E-04	Propane	--
Cobalt	8.32E-04	Propylene	7.69E-07
Lead	--	2-Methylnaphthalene	--
Manganese	4.52E-04	3-Methylchloranthrene	--
Mercury	5.15E-04	7,12-Dimethylbenz(a)anthracene	--
Nickel	**8.91E-03**	Acenaphthene	--
Selenium	7.13E-08	Acenaphthylene	--
Barium	5.23E-04	Anthracene	--
Copper	--	Benz(a)anthracene	--
Molybdenum	3.27E-05	Benzo(a)pyrene	1.08E-04
Vanadium	1.37E-03	Benzo(b)fluoranthene	--
Zinc	--	Benzo(g,h,i)perylene	--
1,3-Butadiene	6.27E-06	Benzo(k)fluoranthene	--
Acetaldehyde	1.29E-04	Chrysene	--
Acrolein	**9.41E-03**	Dibenzo(a,h)anthracene	--

COPC	Hazard Quotient (unitless)	COPC	Hazard Quotient (unitless)
Benzene	3.30E-04	Fluoranthene	--
Dichlorobenzene	6.02E-09	Fluorene	--
Ethylbenzene	9.04E-07	Indeno(1,2,3-cd)pyrene	--
Formaldehyde	**1.82E-03**	Naphthalene	4.88E-05
Hexane	1.03E-05	Phenanathrene	--
Propylene Oxide	2.73E-05	Pyrene	--
Toluene	9.34E-06	**Ammonia**	**1.93E-03**

"—" = no established toxicity value
[1]Total PAH emissions from combustion turbines were evaluated as benzo(a)pyrene and included in this risk calculation.

Figure 6-1. Isopleths – Chronic Non-Cancer Risk



6.2 Cancer Risk

The cancer risk characterization is designed to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor would develop cancer in their lifetime as a result of exposure to a COPC in the air at a given location over a period of time. This likelihood is a function of the dose of a COPC (described in the exposure assessment) and the IUR (described in the dose-response assessment) for that COPC. The Excess Lifetime Cancer Risk (ELCR) is the likelihood over and above the background cancer rate that an individual would contract cancer in his or her lifetime. The ELCR was calculated separately for COPCs with a mutagenic mode of action and the non-mutagenic COPCs as described below. The total cancer risk was then found by adding the two together.

6.2.1 COPCs with a Mutagenic Mode of Action

US EPA recommends the cancer risk analysis for those carcinogens that operate by a mutagenic mode of action account for increased susceptibility for cancer and tumor development in children (US EPA, 2024). Those COPCs potentially emitted by the Project and included in US EPA's list of chemicals that are mutagens include the following:

- benzo[a[anthracene
- benzo[a]pyrene
- benzo[b]fluoranthene
- benzo[k]fluoranthene
- indeno[1,2,3-cd]pyrene
- methylcholanthrene, 3-
- chromium VI
- chrysene
- dibenzo[a,h]anthracene
- 7, 12-dimethylbenz[a]anthracene
- formaldehyde

The equation shown below was used to estimate the ELCR for mutagenic COPCs and includes age dependent adjustment factors (ADAFs). The ELCR was calculated for each individual COPC and summed to estimate the cumulative ELCR for mutagenic COPCs. Note that the IURs for hexavalent chromium [Cr(VI)], formaldehyde, and benzo(a)pyrene in US EPA's IRIS database already include ADAFs (US EPA 2024c), therefore the cancer risk associated with these COPCs was calculated as described for the non-mutagenic COPCs below in Section 6.2.2 since the total lifetime exposure risk is appropriately accounted for in that calculation.

It should be noted that the equation below is most applicable to residents, since it assumes exposure to a COPC 24 hours/day over a 70-year lifetime. However, the cumulative ELCR for mutagenic COPCs was conservatively evaluated at all identified sensitive population locations (even non-residents) and was summed with the cumulative ELCR for non-mutagenic COPCs.

Excess Lifetime Cancer Risk (ELCR) for Mutagenic COPCs:

$$\boldsymbol{ELCR} = \boldsymbol{Cancer\ Risk}\ (\boldsymbol{0-2\ years}) + \boldsymbol{Cancer\ Risk}\ (\boldsymbol{2-16\ years}) + \boldsymbol{Cancer\ Risk}\ (\boldsymbol{16-70\ years})$$

$$\boldsymbol{Cancer\ Risk}\ (\boldsymbol{0-2\ years}) = \boldsymbol{C}\ (\mu\boldsymbol{g/m^3})\boldsymbol{x}\ (\boldsymbol{IUR}\ (\mu\boldsymbol{g/m^3})^{\boldsymbol{-1}})\quad \boldsymbol{x\ 10\ x\ 2/70}$$

$$\boldsymbol{Cancer\ Risk}\ (\boldsymbol{2-16\ years}) = \boldsymbol{C}\ (\mu\boldsymbol{g/m^3})\boldsymbol{x}\ (\boldsymbol{IUR}\ (\mu\boldsymbol{g/m^3})^{\boldsymbol{-1}})\quad \boldsymbol{x\ 3\ x\ 14/70}$$

$$\boldsymbol{Cancer\ Risk}\ (\boldsymbol{16-70\ years}) = \boldsymbol{C}\ (\mu\boldsymbol{g/m^3})\boldsymbol{x}\ (\boldsymbol{IUR}\ (\mu\boldsymbol{g/m^3})^{\boldsymbol{-1}})\quad \boldsymbol{x\ 1\ x\ 54/70}$$

Where:

C =	average air concentration over a lifetime, represented by the long-term average concentration output from AERMOD.
IUR =	Inhalation Unit Risk Factor, COPC-specific (Table 4-1).
10 x 2/70 =	ADAF and Age weighting for 0–2 age group
3 x 14/70 =	ADAF and Age weighting for 2–16 age group
1 x 54/70 =	ADAF and Age weighting for 16–70 age group

6.2.2 Non-Mutagenic COPCs

The ELCR for the remainder of COPCs that were evaluated, which are non-mutagenic carcinogens, was calculated using the following equation:

Excess Lifetime Cancer Risk (ELCR) for Non-Mutagenic COPCs:

$$ELCR = C\ (\mu g/m^3)x\ (IUR\ (\mu g/m^3)^{-1})$$

Where:

ELCR = Excess Lifetime Cancer Risk
C = average air concentration over a lifetime, represented by the long-term average concentration output from AERMOD
IUR = Inhalation Unit Risk Factor, COPC-specific, listed in **Table 4-1**.

The average air concentration over a lifetime was represented by the long-term air concentration from AERMOD and assumes that a person at a particular location would have continuous exposure through inhalation. The ELCR was calculated for each individual COPC and summed to estimate the cumulative cancer risk for non-mutagenic COPCs.

The cumulative ELCR was evaluated at all identified sensitive population locations and was summed with the cumulative ELCR for mutagenic COPCs.

6.2.3 Total Cancer Risk

The total of the cumulative ELCR for mutagenic COPCs and the cumulative ELCR for non-mutagenic was found for all identified sensitive population locations, and the maximum for each sub-category (e.g., residence, schools, etc.) is shown in **Table 6-3**. The table also presents the total cancer risk for the MEI location, defined as the receptor location with the maximum risk regardless of whether an individual would be continually exposed at that location. The table shows that the maximum total cancer risk at the MEI is 0.54 in one million people, well below the target level of 10 in 1,000,000 identified by PADEP. **Table 6-4** presents the contributions of the individual COPCs to the total cancer risk at the MEI. The highest contributors are formaldehyde, cadmium, chromium (VI), arsenic, and benzo(a)pyrene.

Figure 6-2 presents isopleths depicting the extent of the total cancer risk.

Appendix A includes results for each sensitive receptor evaluated as well as for each individual COPC.

Table 6-3. Modeled Cumulative Cancer Risk

Receptor (Sensitive Population Sub-Group)	Cumulative[1] Cancer Risk – Mutagenic COPCs (per 1,000,000 people)	Cumulative[1] Cancer Risk – Non-Mutagenic COPCs (per 1,000,000 people)	Total Cancer Risk (per 1,000,000 people)
Target Level:	10	10	10
School/Daycare	0.163	0.160	0.324
Park	0.180	0.177	0.358
Resident	0.239	0.237	0.476
MEI	0.271	0.269	0.540

[1]Sum of ELCR for each individual COPC.

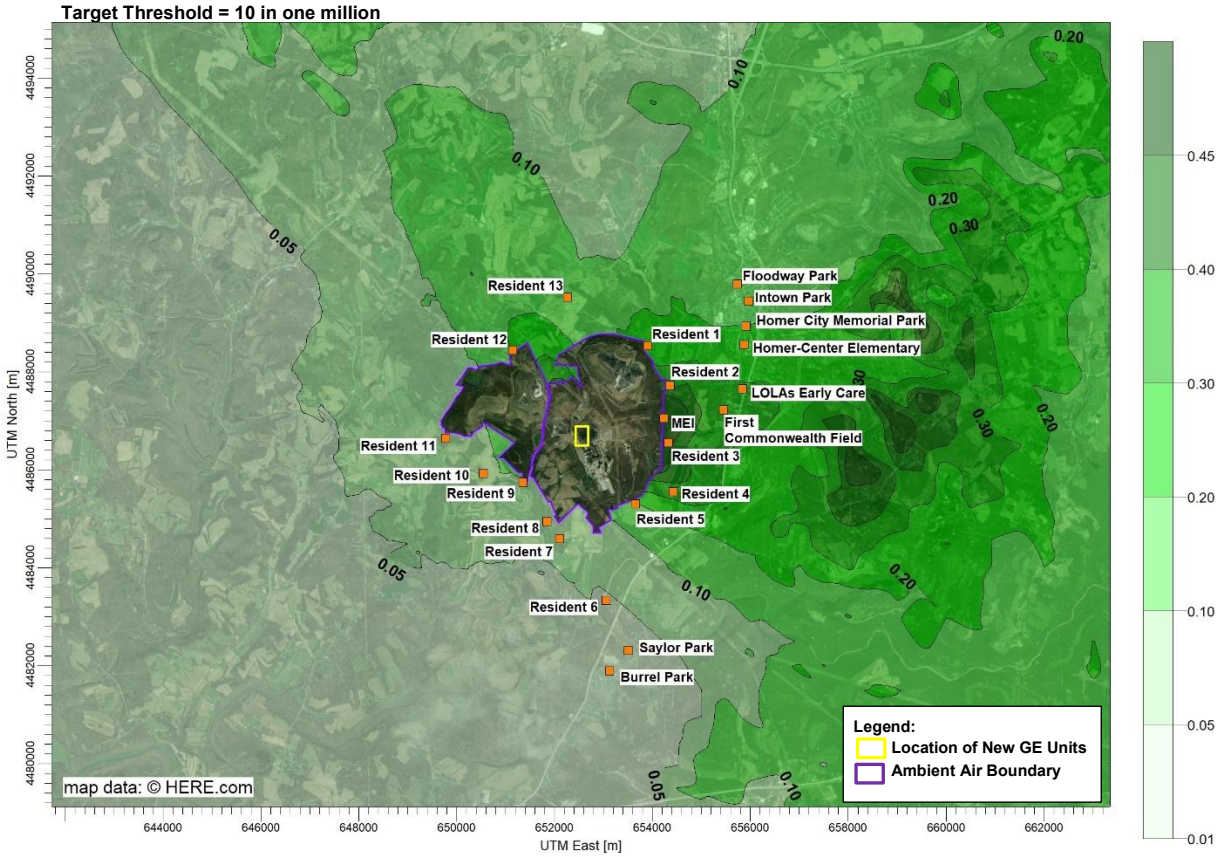
Table 6-4. Modeled Total Cancer Risk for MEI Receptor

(Top 5 COPCs in bold)

COPC	Total Cancer Risk (per 1,000,000 people)	COPC	Total Cancer Risk (per 1,000,000 people)
	MEI Total Cancer Risk: 5.40E-01		
Arsenic	**5.11E-02**	Xylene	--
Beryllium	1.71E-03	Butane	--
Cadmium	**1.18E-01**	Ethane	--
Chromium (III)	--	Pentane	--
Chromium (VI)	**5.99E-02**	Propane	--
Cobalt	4.49E-02	Propylene	--
Lead	3.57E-04	2-Methylnaphthalene	--
Manganese	--	3-Methylchloranthrene	7.55E-05
Mercury	--	7,12-Dimethylbenz(a)anthracene	7.56E-03
Nickel	3.24E-02	Acenaphthene	--
Selenium	--	Acenaphthylene	--
Barium	--	Anthracene	--
Copper	--	Benz(a)anthracene	5.29E-05
Molybdenum	--	**Benzo(a)pyrene**[1]	**6.24E-02**
Vanadium	--	Benzo(b)fluoranthene	9.10E-05
Zinc	--	Benzo(g,h,i)perylene	--
1,3-Butadiene	3.76E-04	Benzo(k)fluoranthene	1.86E-06
Acetaldehyde	2.55E-03	Chrysene	1.25E-06
Acrolein	--	Dibenzo(a,h)anthracene	2.92E-04
Benzene	7.73E-03	Fluoranthene	--
Dichlorobenzene	5.30E-05	Fluorene	--
Ethylbenzene	2.26E-03	Indeno(1,2,3-cd)pyrene	3.47E-05
Formaldehyde	**1.40E-01**	Naphthalene	4.97E-03
Hexane	--	Phenanathrene	--
Propylene Oxide	3.03E-03	Pyrene	--
Toluene	--	Ammonia	--

"—" = no established toxicity value
[1]Total PAH emissions from combustion turbines were evaluated as benzo(a)pyrene and included in this risk calculation.

Figure 6-2. Isopleths – Total Cancer Risk (per 1,000,000 people)



6.3 Acute Non-Cancer Risk

The potential for acute (maximum 1-hour) non-cancer health risk due to inhalation was evaluated for the MEI location, defined as the receptor location with the maximum modeled 1-hour total facility concentration. Acute HQs were calculated using the following equation:

$$HQ = \frac{AC\ (ug/m^3)}{acute\ benchmark\ (ug/m^3)}$$

Where:

HQ =	hazard quotient
AC =	acute concentration, represented by the 1-hour maximum modeled air concentration output from AERMOD
Acute benchmark =	COPC-specific benchmark or toxicity value, specified in Table 4-1.

The acute air concentration was represented by the maximum 1-hour air concentration from AERMOD and assumes that a person at the MEI location would be exposed via inhalation for 1-hour. The acute HQ for each COPC, shown in **Table 6-5**, was found to be less than the target value of 1 identified by PADEP and considered to be applicable for direct project impacts (unlike chronic non-cancer risk). For acute non-cancer risk the impact of background levels of COPCs are not considered due to the low likelihood of interaction of background sources for short-term averaging periods in highly rural areas. The COPCs with the highest HQs include cadmium, nickel, ammonia, benzene, and formaldehyde.

Figure 6-3 presents isopleths for cadmium, the COPC with the highest HQ overall.

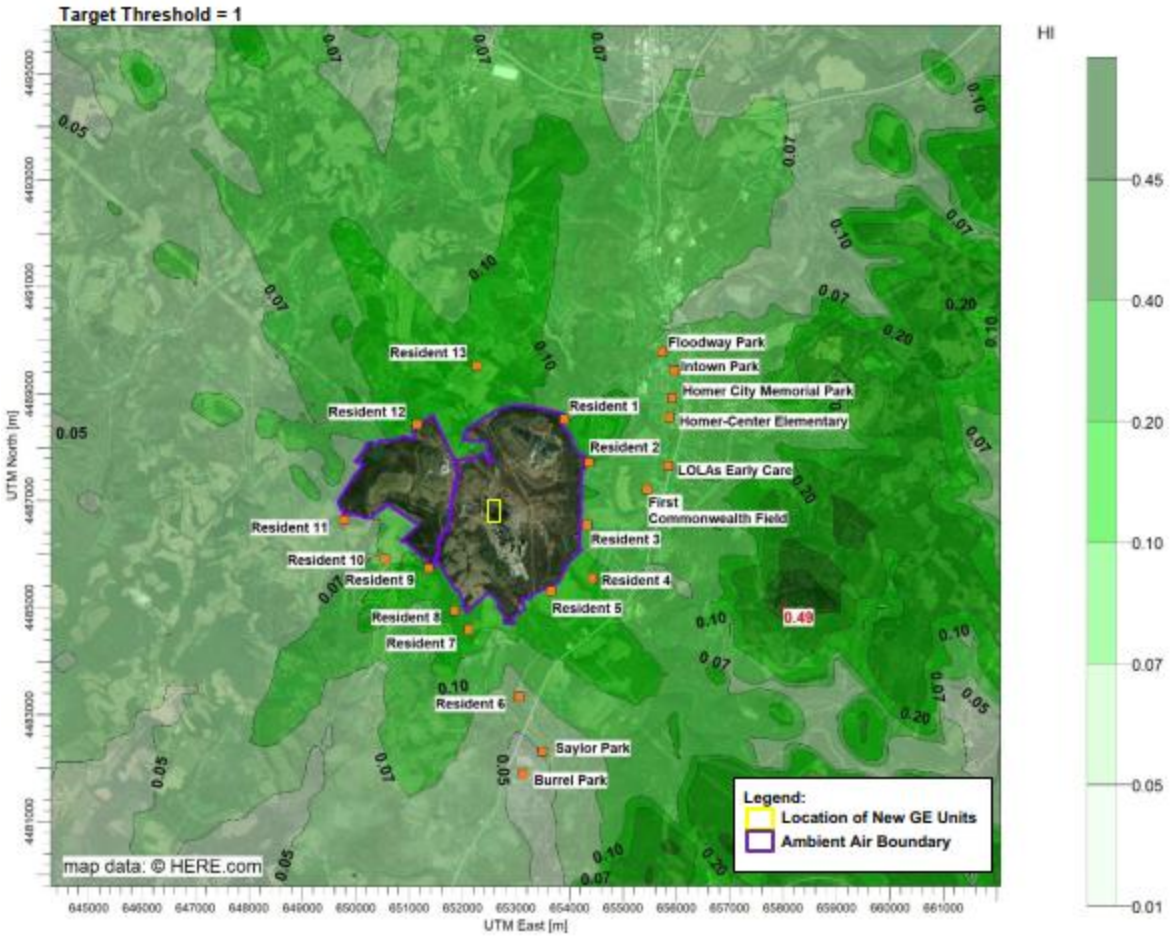
Table 6-5. Modeled Acute Risk for MEI Receptor
(Top 5 COPCs in bold)

COPC	Hazard Quotient (unitless)	COPC	Hazard Quotient
Target Level: 1			
Arsenic	1.35E-02	Xylene	9.18E-05
Beryllium	2.15E-02	Butane	1.94E-05
Cadmium	**4.93E-01**	Ethane	--
Chromium (III)	4.02E-02	Pentane	4.75E-05
Chromium (VI)	6.03E-02	Propane	1.95E-05
Cobalt	3.77E-04	Propylene	7.80E-05
Lead	8.97E-04	2-Methylnaphthalene	1.81E-07
Manganese	1.70E-03	3-Methylchloranthrene	--
Mercury	5.83E-03	7,12-Dimethylbenz(a)anthracene	1.76E-06
Nickel	**1.41E-01**	Acenaphthene	--
Selenium	1.08E-05	Acenaphthylene	--
Barium	7.89E-04	Anthracene	1.50E-04
Copper	1.14E-04	Benz(a)anthracene	7.75E-05
Molybdenum	3.29E-05	Benzo(a)pyrene	3.09E-05
Vanadium	3.87E-02	Benzo(b)fluoranthene	--
Zinc	--	Benzo(g,h,i)perylene	--
1,3-Butadiene	6.08E-06	Benzo(k)fluoranthene	--

COPC	Hazard Quotient (unitless)	COPC	Hazard Quotient
	Target Level: 1		
Acetaldehyde	5.87E-04	Chrysene	1.82E-04
Acrolein	1.78E-02	Dibenzo(a,h)anthracene	--
Benzene	**1.05E-01**	Fluoranthene	--
Dichlorobenzene	5.27E-07	Fluorene	--
Ethylbenzene	1.68E-05	Indeno(1,2,3-cd)pyrene	--
Formaldehyde	**6.13E-02**	Naphthalene	2.50E-04
Hexane	2.24E-04	Phenanathrene	4.89E-03
Propylene Oxide	6.39E-05	Pyrene	4.50E-04
Toluene	2.45E-04	**Ammonia**	**1.38E-01**

"—" = no established toxicity value

Figure 6-3. Isopleths – Acute Risk, Cadmium



7. Uncertainty Assessment

As with any modeling effort, the modeling applied to estimate exposure and risk are approximations of physical and chemical processes and some degree of uncertainty cannot be eliminated. Following US EPA's general guidance, this IRA applied conservative assumptions throughout the risk assessment to ensure that results are health-protective when all the sources of uncertainty are combined. The result of this approach is that it is likely that actual risks that were estimated and presented in the Final Report are overestimated rather than underestimated. However, the factors that introduce a potential degree of uncertainty into risk assessments that follow these guidelines are discussed in this section. Risk assessment uncertainties are necessarily addressed in general terms because they cannot be readily quantified.

7.1 Exposure Assessment Uncertainty

The exposure assessment involves the selection of receptor locations, estimation of exposure point concentrations, and calculation of exposure doses. Exposure point concentrations are the estimated concentrations of compounds to which humans may be exposed. Once the concentrations in air have been predicted, the calculation of human exposure and dose involves methods that include additional assumptions. Major sources of uncertainty associated with these assumptions are discussed below.

7.1.1 Air Quality Modeling

Air dispersion modeling was conducted using AERMOD, US EPA's preferred dispersion model. A general rule of thumb for well-characterized sources with known emission rates is that even the best air quality models are capable of estimating ground-level concentrations only within fifty percent of the actual concentrations for a given hour. Factors contributing to modeling uncertainty include meteorological data and surface characteristics. While these values have some degree of uncertainty, they are intended to be representative of the study area. Accordingly, following US EPA guidelines (US EPA 2024a), modeling parameters were assigned values to ensure that modeled values were not likely to be underestimated.

7.1.2 Chromium Speciation

In the absence of actual measurements, US EPA (2023) chromium speciation was used for the current analysis. Given that the modeled HI and cancer risk values are very low, the speciation of chromium emissions does not affect the finding of insignificant of non-cancer hazard and cancer risk.

7.2 Toxicity Assessment

Dose-response values are most often based on limited toxicological data. For this reason, a margin of safety is built into the methodology applied to estimates of both non-cancer hazard and cancer risk. The two major areas of uncertainty introduced in the dose-response assessment are: (1) animal to human extrapolation; and (2) high to low dose extrapolation.

7.2.1 Animal to Human Extrapolation

Human dose-response values are often extrapolated from or estimated using the results of animal studies. Extrapolation from animals to humans introduces a great deal of uncertainty in the risk assessment because, in most instances, it is not known how differently a human may react to the compound compared to the animal species used to test the compound. The procedures used to extrapolate from animals to humans involve conservative assumptions and incorporate several uncertainty factors that generally overestimate the adverse

effects associated with a specific dose. As a result, overestimation of the potential for adverse effects to humans is more likely than underestimation.

7.2.2 High to Low Dose Extrapolation

Predicting potential health effects from emissions requires the use of models to extrapolate the observed health effects from the high doses used in laboratory studies to the anticipated human health effects from low doses experienced in the environment. The models contain conservative assumptions to account for the large degree of uncertainty associated with this extrapolation (especially for potential carcinogens) and, therefore, tend to be more likely to overestimate than underestimate the risks.

7.3 Risk Characterization

The risk of adverse human health effects depends on estimated levels of exposure and dose-response relationships. Two important additional sources of uncertainty are introduced in this phase of the risk assessment: (1) the evaluation of potential exposure to more than one compound; and (2) the combination of upper-bound exposure assumptions.

7.3.1 Risk from Exposure to Multiple Compounds

Once exposure to and risk from each of the selected compounds is calculated, the total risk posed by cumulative modeled values in the study area is conservatively estimated by combining the health risk contributed by each compound. It is assumed that carcinogenic effects of different compounds may be added together. Non-carcinogenic effects are often summed, as in this report, although this likely overstates the effects, because different compounds may have different health endpoints (e.g., neurotoxicity, liver effects, respiratory irritation). A target endpoint-specific analysis would have been conducted if the combined HI was found to be greater than 1. It also is possible that a mixture of compounds could have antagonistic or synergistic effects. There are few scientific studies that study exposure and health risks due to chemical mixtures. The amount of uncertainty associated with summing the effects varies on a case-by-case basis.

7.3.2 Combination of Several Upper-Bound Assumptions

The goal of risk assessment is to estimate an upper-bound, but reasonable, estimate of potential risk to human health. Most of the assumptions about exposure and toxicity used in this assessment are representative of statistical upper-bounds or potential maxima for each of the parameters. The result of combining multiple upper-bound assumptions is that the estimate of potential risk is highly conservative.

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Appendix A :
Detailed Risk Results

Table A–1. Risk Results for Each Sensitive Receptor

Sensitive Receptor	Cancer Risk, Mutagenic COPCs (per 1,000,000 people)	Cancer Risk, Non - Mutagenic COPCs (per 1,000,000 people)	Total Cancer Risk (per 1,000,000 people)	Non-Cancer Chronic Risk (unitless)
Target Level:	10	10	10	1
LOLAs Early Care	0.163	0.160	0.324	0.041
Homer-Center Elementary	0.119	0.118	0.237	0.030
Max Risk School/Daycare	**0.163**	**0.160**	**0.324**	**0.041**
Floodway Park	0.082	0.081	0.163	0.020
Intown Park	0.093	0.092	0.185	0.023
Homer City Memorial Park	0.108	0.107	0.215	0.027
First Commonwealth Field	0.180	0.177	0.358	0.045
Saylor Park	0.021	0.021	0.042	0.005
Burrel Park	0.019	0.019	0.037	0.005
Max Risk Park	**0.180**	**0.177**	**0.358**	**0.045**
Resident 1	0.131	0.134	0.265	0.030
Resident 2	0.200	0.200	0.400	0.050
Resident 3	0.239	0.237	0.476	0.060
Resident 4	0.175	0.172	0.347	0.044
Resident 5	0.096	0.095	0.192	0.024
Resident 6	0.025	0.025	0.049	0.006
Resident 7	0.031	0.031	0.062	0.008
Resident 8	0.032	0.032	0.064	0.008
Resident 9	0.047	0.047	0.094	0.011
Resident 10	0.043	0.043	0.086	0.011
Resident 11	0.035	0.035	0.071	0.009
Resident 12	0.105	0.104	0.209	0.026
Resident 13	0.072	0.073	0.146	0.018
Max Risk Resident	**0.239**	**0.237**	**0.476**	**0.060**

Table A–2. Chronic Non-Cancer Risk Results for Individual COPCs (unitless)

Receptor	Arsenic	Beryllium	Cadmium	Chromium (III)	Chromium (VI)	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	1,3-Butadiene	Acetaldehyde	Acrolein	Benzene	Dichlorobenzene	Ethylbenzene
LOLAs Early Care	4.77E-04	6.14E-04	3.94E-03	8.02E-04	6.68E-05	5.01E-04	--	2.72E-04	3.10E-04	5.37E-03	4.30E-08	3.82E-06	7.86E-05	5.71E-03	1.53E-04	2.49E-09	5.57E-07
Homer-Center Elementary	3.49E-04	4.49E-04	2.88E-03	5.87E-04	4.89E-05	3.67E-04	--	1.99E-04	2.27E-04	3.93E-03	3.14E-08	2.78E-06	5.73E-05	4.17E-03	1.19E-04	2.04E-09	4.05E-07
Floodway Park	2.40E-04	3.08E-04	1.98E-03	4.02E-04	3.35E-05	2.51E-04	--	1.37E-04	1.56E-04	2.69E-03	2.16E-08	1.88E-06	3.86E-05	2.82E-03	1.01E-04	2.05E-09	2.71E-07
Intown Park	2.69E-04	3.46E-04	2.22E-03	4.52E-04	3.77E-05	2.82E-04	--	1.53E-04	1.75E-04	3.03E-03	2.42E-08	2.12E-06	4.36E-05	3.18E-03	1.09E-04	2.11E-09	3.06E-07
Homer City Memorial Park	3.15E-04	4.05E-04	2.60E-03	5.29E-04	4.41E-05	3.31E-04	--	1.80E-04	2.05E-04	3.54E-03	2.83E-08	2.50E-06	5.14E-05	3.75E-03	1.17E-04	2.06E-09	3.63E-07
First Commonwealth Field	5.27E-04	6.78E-04	4.35E-03	8.86E-04	7.38E-05	5.54E-04	--	3.01E-04	3.43E-04	5.93E-03	4.75E-08	4.21E-06	8.67E-05	6.31E-03	1.76E-04	2.86E-09	6.14E-07
Saylor Park	6.15E-05	7.91E-05	5.07E-04	1.03E-04	8.61E-06	6.46E-05	--	3.51E-05	4.00E-05	6.92E-04	5.54E-09	4.87E-07	1.00E-05	7.30E-04	2.19E-05	4.13E-10	7.08E-08
Burrel Park	5.50E-05	7.07E-05	4.54E-04	9.24E-05	7.70E-06	5.77E-05	--	3.13E-05	3.57E-05	6.19E-04	4.95E-09	4.36E-07	8.98E-06	6.53E-04	1.90E-05	3.52E-10	6.35E-08
Resident 1	3.66E-04	4.71E-04	3.02E-03	6.16E-04	5.13E-05	3.85E-04	--	2.09E-04	2.38E-04	4.12E-03	3.30E-08	2.78E-06	5.64E-05	4.17E-03	2.15E-04	5.56E-09	3.88E-07
Resident 2	5.86E-04	7.54E-04	4.84E-03	9.85E-04	8.21E-05	6.16E-04	--	3.34E-04	3.81E-04	6.60E-03	5.28E-08	4.62E-06	9.48E-05	6.93E-03	2.54E-04	4.90E-09	6.64E-07
Resident 3	6.98E-04	8.98E-04	5.76E-03	1.17E-03	9.78E-05	7.33E-04	--	3.98E-04	4.54E-04	7.86E-03	6.28E-08	5.54E-06	1.14E-04	8.35E-03	2.85E-04	4.63E-09	8.04E-07
Resident 4	5.11E-04	6.57E-04	4.21E-03	8.58E-04	7.15E-05	5.36E-04	--	2.91E-04	3.32E-04	5.75E-03	4.60E-08	4.09E-06	8.44E-05	6.14E-03	1.62E-04	2.43E-09	5.99E-07
Resident 5	2.81E-04	3.62E-04	2.32E-03	4.72E-04	3.94E-05	2.95E-04	--	1.60E-04	1.83E-04	3.16E-03	2.53E-08	2.23E-06	4.59E-05	3.35E-03	1.14E-04	2.00E-09	3.23E-07
Resident 6	7.41E-05	9.52E-05	6.11E-04	1.24E-04	1.04E-05	7.78E-05	--	4.22E-05	4.82E-05	8.33E-04	6.67E-09	5.83E-07	1.20E-05	8.74E-04	2.84E-05	5.77E-10	8.44E-08
Resident 7	9.15E-05	1.18E-04	7.55E-04	1.54E-04	1.28E-05	9.61E-05	--	5.21E-05	5.95E-05	1.03E-03	8.23E-09	7.13E-07	1.46E-05	1.07E-03	3.64E-05	8.59E-10	1.03E-07
Resident 8	9.44E-05	1.21E-04	7.79E-04	1.59E-04	1.32E-05	9.91E-05	--	5.38E-05	6.13E-05	1.06E-03	8.49E-09	7.26E-07	1.49E-05	1.09E-03	3.88E-05	9.93E-10	1.05E-07
Resident 9	1.38E-04	1.77E-04	1.14E-03	2.31E-04	1.93E-05	1.45E-04	--	7.85E-05	8.95E-05	1.55E-03	1.24E-08	1.06E-06	2.17E-05	1.59E-03	6.29E-05	1.55E-09	1.52E-07
Resident 10	1.27E-04	1.63E-04	1.05E-03	2.13E-04	1.78E-05	1.33E-04	--	7.23E-05	8.25E-05	1.43E-03	1.14E-08	9.76E-07	2.00E-05	1.47E-03	5.92E-05	1.46E-09	1.39E-07
Resident 11	1.04E-04	1.34E-04	8.57E-04	1.74E-04	1.45E-05	1.09E-04	--	5.92E-05	6.75E-05	1.17E-03	9.35E-09	8.03E-07	1.64E-05	1.20E-03	4.48E-05	1.12E-09	1.15E-07
Resident 12	3.08E-04	3.96E-04	2.54E-03	5.18E-04	4.31E-05	3.23E-04	--	1.76E-04	2.00E-04	3.47E-03	2.77E-08	2.38E-06	4.90E-05	3.57E-03	1.16E-04	2.94E-09	3.45E-07
Resident 13	2.13E-04	2.74E-04	1.76E-03	3.58E-04	2.99E-05	2.24E-04	--	1.22E-04	1.39E-04	2.40E-03	1.92E-08	1.63E-06	3.31E-05	2.43E-03	1.11E-04	2.94E-09	2.29E-07

Receptor	Formaldehyde	Hexane	Propylene Oxide	Toluene	Xylene	2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene
LOLAs Early Care	1.11E-03	4.27E-06	1.68E-05	5.62E-06	1.18E-05	--	--	--	--	--	--	--	4.17E-05	--	--	--	--
Homer-Center Elementary	8.10E-04	3.50E-06	1.22E-05	4.11E-06	8.61E-06	--	--	--	--	--	--	--	3.42E-05	--	--	--	--
Floodway Park	5.47E-04	3.52E-06	8.18E-06	2.80E-06	5.91E-06	--	--	--	--	--	--	--	3.33E-05	--	--	--	--
Intown Park	6.17E-04	3.61E-06	9.26E-06	3.16E-06	6.65E-06	--	--	--	--	--	--	--	3.54E-05	--	--	--	--
Homer City Memorial Park	7.28E-04	3.54E-06	1.10E-05	3.71E-06	7.79E-06	--	--	--	--	--	--	--	3.56E-05	--	--	--	--
First Commonwealth Field	1.23E-03	4.91E-06	1.86E-05	6.21E-06	1.30E-05	--	--	--	--	--	--	--	4.93E-05	--	--	--	--
Saylor Park	1.42E-04	7.09E-07	2.14E-06	7.20E-07	1.51E-06	--	--	--	--	--	--	--	6.51E-06	--	--	--	--
Burrel Park	1.27E-04	6.04E-07	1.92E-06	6.44E-07	1.35E-06	--	--	--	--	--	--	--	5.50E-06	--	--	--	--
Resident 1	8.07E-04	9.52E-06	1.17E-05	4.21E-06	8.99E-06	--	--	--	--	--	--	--	8.30E-05	--	--	--	--
Resident 2	1.34E-03	8.40E-06	2.01E-05	6.89E-06	1.45E-05	--	--	--	--	--	--	--	8.52E-05	--	--	--	--
Resident 3	1.61E-03	7.94E-06	2.43E-05	8.28E-06	1.74E-05	--	--	--	--	--	--	--	9.18E-05	--	--	--	--
Resident 4	1.19E-03	4.17E-06	1.81E-05	6.03E-06	1.26E-05	--	--	--	--	--	--	--	4.37E-05	--	--	--	--
Resident 5	6.48E-04	3.42E-06	9.74E-06	3.32E-06	6.99E-06	--	--	--	--	--	--	--	3.67E-05	--	--	--	--
Resident 6	1.70E-04	9.90E-07	2.55E-06	8.65E-07	1.82E-06	--	--	--	--	--	--	--	8.91E-06	--	--	--	--
Resident 7	2.08E-04	1.47E-06	3.10E-06	1.06E-06	2.23E-06	--	--	--	--	--	--	--	1.18E-05	--	--	--	--
Resident 8	2.13E-04	1.70E-06	3.16E-06	1.08E-06	2.28E-06	--	--	--	--	--	--	--	1.29E-05	--	--	--	--
Resident 9	3.10E-04	2.65E-06	4.59E-06	1.59E-06	3.36E-06	--	--	--	--	--	--	--	2.20E-05	--	--	--	--
Resident 10	2.85E-04	2.50E-06	4.21E-06	1.46E-06	3.10E-06	--	--	--	--	--	--	--	2.08E-05	--	--	--	--
Resident 11	2.34E-04	1.92E-06	3.47E-06	1.20E-06	2.52E-06	--	--	--	--	--	--	--	1.52E-05	--	--	--	--
Resident 12	6.99E-04	5.04E-06	1.04E-05	3.54E-06	7.44E-06	--	--	--	--	--	--	--	3.66E-05	--	--	--	--
Resident 13	4.73E-04	5.05E-06	6.92E-06	2.44E-06	5.19E-06	--	--	--	--	--	--	--	4.11E-05	--	--	--	--

Table A–2. Chronic Non-Cancer Risk Results for Individual COPC cont. (unitless)

Receptor	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanathrene	Pyrene	Ammonia	Barium	Copper	Molybdenum	Vanadium	Zinc	Butane	Ethane	Pentane	Propane	Propylene
LOLAs Early Care	--	--	--	--	2.16E-05	--	--	1.19E-03	3.15E-04	--	1.97E-05	8.23E-04	--	--	--	4.31E-06	--	2.96E-07
Homer-Center Elementary	--	--	--	--	1.70E-05	--	--	8.63E-04	2.30E-04	--	1.44E-05	6.02E-04	--	--	--	3.54E-06	--	2.42E-07
Floodway Park	--	--	--	--	1.49E-05	--	--	5.77E-04	1.58E-04	--	9.88E-06	4.13E-04	--	--	--	3.56E-06	--	2.36E-07
Intown Park	--	--	--	--	1.61E-05	--	--	6.53E-04	1.78E-04	--	1.11E-05	4.64E-04	--	--	--	3.65E-06	--	2.51E-07
Homer City Memorial Park	--	--	--	--	1.69E-05	--	--	7.74E-04	2.08E-04	--	1.30E-05	5.43E-04	--	--	--	3.58E-06	--	2.52E-07
First Commonwealth Field	--	--	--	--	2.49E-05	--	--	1.31E-03	3.48E-04	--	2.18E-05	9.10E-04	--	--	--	4.96E-06	--	3.50E-07
Saylor Park	--	--	--	--	3.15E-06	--	--	1.51E-04	4.06E-05	--	2.54E-06	1.06E-04	--	--	--	7.16E-07	--	4.60E-08
Burrel Park	--	--	--	--	2.71E-06	--	--	1.35E-04	3.63E-05	--	2.27E-06	9.49E-05	--	--	--	6.11E-07	--	3.89E-08
Resident 1	--	--	--	--	3.32E-05	--	--	8.27E-04	2.42E-04	--	1.51E-05	6.32E-04	--	--	--	9.63E-06	--	5.87E-07
Resident 2	--	--	--	--	3.77E-05	--	--	1.42E-03	3.87E-04	--	2.42E-05	1.01E-03	--	--	--	8.50E-06	--	6.04E-07
Resident 3	--	--	--	--	4.18E-05	--	--	1.71E-03	4.61E-04	--	2.88E-05	1.20E-03	--	--	--	8.02E-06	--	6.52E-07
Resident 4	--	--	--	--	2.28E-05	--	--	1.28E-03	3.37E-04	--	2.11E-05	8.81E-04	--	--	--	4.21E-06	--	3.10E-07
Resident 5	--	--	--	--	1.67E-05	--	--	6.87E-04	1.86E-04	--	1.16E-05	4.85E-04	--	--	--	3.46E-06	--	2.61E-07
Resident 6	--	--	--	--	4.15E-06	--	--	1.80E-04	4.89E-05	--	3.06E-06	1.28E-04	--	--	--	1.00E-06	--	6.30E-08
Resident 7	--	--	--	--	5.35E-06	--	--	2.19E-04	6.04E-05	--	3.77E-06	1.58E-04	--	--	--	1.49E-06	--	8.28E-08
Resident 8	--	--	--	--	5.75E-06	--	--	2.23E-04	6.23E-05	--	3.89E-06	1.63E-04	--	--	--	1.72E-06	--	9.05E-08
Resident 9	--	--	--	--	9.46E-06	--	--	3.24E-04	9.09E-05	--	5.68E-06	2.38E-04	--	--	--	2.68E-06	--	1.55E-07
Resident 10	--	--	--	--	8.91E-06	--	--	2.97E-04	8.38E-05	--	5.23E-06	2.19E-04	--	--	--	2.52E-06	--	1.47E-07
Resident 11	--	--	--	--	6.68E-06	--	--	2.45E-04	6.85E-05	--	4.28E-06	1.79E-04	--	--	--	1.94E-06	--	1.07E-07
Resident 12	--	--	--	--	1.70E-05	--	--	7.35E-04	2.03E-04	--	1.27E-05	5.31E-04	--	--	--	5.09E-06	--	2.57E-07
Resident 13	--	--	--	--	1.69E-05	--	--	4.88E-04	1.41E-04	--	8.80E-06	3.68E-04	--	--	--	5.10E-06	--	2.90E-07

Table A–3. Cancer Risk for Individual Non-Mutagenic COPCs (per 1,000,000 people)

Receptor	Arsenic	Beryllium	Cadmium	Chromium (III)	Chromium (VI)	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	1,3-Butadiene	Acetaldehyde	Acrolein	Benzene	Dichlorobenzene	Ethylbenzene
LOLAs Early Care	3.08E-02	1.03E-03	7.09E-02	-	-	2.71E-02	2.15E-04	-	-	1.95E-02	-	2.29E-04	1.56E-03	-	3.59E-03	2.19E-05	1.39E-03
Homer-Center Elementary	2.25E-02	7.54E-04	5.18E-02	-	-	1.98E-02	1.57E-04	-	-	1.43E-02	-	1.67E-04	1.13E-03	-	2.79E-03	1.80E-05	1.01E-03
Floodway Park	1.54E-02	5.17E-04	3.56E-02	-	-	1.36E-02	1.08E-04	-	-	9.81E-03	-	1.13E-04	7.64E-04	-	2.35E-03	1.81E-05	6.77E-04
Intown Park	1.74E-02	5.81E-04	3.99E-02	-	-	1.53E-02	1.21E-04	-	-	1.10E-02	-	1.27E-04	8.63E-04	-	2.56E-03	1.85E-05	7.66E-04
Homer City Memorial Park	2.03E-02	6.80E-04	4.68E-02	-	-	1.79E-02	1.42E-04	-	-	1.29E-02	-	1.50E-04	1.02E-03	-	2.73E-03	1.82E-05	9.08E-04
First Commonwealth Field	3.40E-02	1.14E-03	7.83E-02	-	-	2.99E-02	2.37E-04	-	-	2.16E-02	-	2.53E-04	1.72E-03	-	4.11E-03	2.52E-05	1.54E-03
Saylor Park	3.97E-03	1.33E-04	9.13E-03	-	-	3.49E-03	2.77E-05	-	-	2.52E-03	-	2.92E-05	1.98E-04	-	5.12E-04	3.64E-06	1.77E-04
Burrel Park	3.55E-03	1.19E-04	8.17E-03	-	-	3.12E-03	2.47E-05	-	-	2.25E-03	-	2.62E-05	1.78E-04	-	4.44E-04	3.10E-06	1.59E-04
Resident 1	2.36E-02	7.92E-04	5.44E-02	-	-	2.08E-02	1.65E-04	-	-	1.50E-02	-	1.67E-04	1.12E-03	-	5.03E-03	4.89E-05	9.70E-04
Resident 2	3.78E-02	1.27E-03	8.71E-02	-	-	3.32E-02	2.64E-04	-	-	2.40E-02	-	2.77E-04	1.88E-03	-	5.94E-03	4.31E-05	1.66E-03
Resident 3	4.50E-02	1.51E-03	1.04E-01	-	-	3.96E-02	3.14E-04	-	-	2.86E-02	-	3.33E-04	2.26E-03	-	6.66E-03	4.07E-05	2.01E-03
Resident 4	3.30E-02	1.10E-03	7.59E-02	-	-	2.90E-02	2.30E-04	-	-	2.09E-02	-	2.46E-04	1.67E-03	-	3.80E-03	2.14E-05	1.50E-03
Resident 5	1.81E-02	6.07E-04	4.18E-02	-	-	1.59E-02	1.27E-04	-	-	1.15E-02	-	1.34E-04	9.08E-04	-	2.67E-03	1.76E-05	8.06E-04
Resident 6	4.78E-03	1.60E-04	1.10E-02	-	-	4.20E-03	3.33E-05	-	-	3.03E-03	-	3.50E-05	2.37E-04	-	6.64E-04	5.08E-06	2.11E-04
Resident 7	5.90E-03	1.98E-04	1.36E-02	-	-	5.19E-03	4.12E-05	-	-	3.75E-03	-	4.28E-05	2.89E-04	-	8.51E-04	7.56E-06	2.57E-04
Resident 8	6.09E-03	2.04E-04	1.40E-02	-	-	5.35E-03	4.25E-05	-	-	3.86E-03	-	4.36E-05	2.95E-04	-	9.08E-04	8.74E-06	2.62E-04
Resident 9	8.89E-03	2.98E-04	2.05E-02	-	-	7.81E-03	6.20E-05	-	-	5.64E-03	-	6.36E-05	4.30E-04	-	1.47E-03	1.36E-05	3.80E-04
Resident 10	8.18E-03	2.74E-04	1.88E-02	-	-	7.20E-03	5.71E-05	-	-	5.20E-03	-	5.86E-05	3.96E-04	-	1.38E-03	1.28E-05	3.49E-04
Resident 11	6.70E-03	2.24E-04	1.54E-02	-	-	5.89E-03	4.67E-05	-	-	4.25E-03	-	4.82E-05	3.25E-04	-	1.05E-03	9.84E-06	2.87E-04
Resident 12	1.99E-02	6.65E-04	4.57E-02	-	-	1.75E-02	1.39E-04	-	-	1.26E-02	-	1.43E-04	9.70E-04	-	2.72E-03	2.59E-05	8.63E-04
Resident 13	1.38E-02	4.61E-04	3.17E-02	-	-	1.21E-02	9.60E-05	-	-	8.73E-03	-	9.77E-05	6.55E-04	-	2.60E-03	2.59E-05	5.73E-04

Table A–3. Cancer Risk for Individual Non-Mutagenic COPCs cont. (per 1,000,000 people)

Receptor	Formaldehyde	Hexane	Propylene Oxide	Toluene	Xylene	2-Methylnaphthalene	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene
LOLAs Early Care	-	-	1.87E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Homer-Center Elementary	-	-	1.36E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floodway Park	-	-	9.08E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Intown Park	-	-	1.03E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Homer City Memorial Park	-	-	1.22E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
First Commonwealth Field	-	-	2.06E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Saylor Park	-	-	2.37E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burrel Park	-	-	2.13E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 1	-	-	1.30E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 2	-	-	2.23E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 3	-	-	2.70E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 4	-	-	2.01E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 5	-	-	1.08E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 6	-	-	2.83E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 7	-	-	3.44E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 8	-	-	3.51E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 9	-	-	5.09E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 10	-	-	4.68E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 11	-	-	3.85E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 12	-	-	1.16E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 13	-	-	7.68E-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Receptor	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanathrene	Pyrene	Ammonia	Barium	Copper	Molybdenum	Vanadium	Zinc	Butane	Ethane	Pentane	Propane	Propylene
LOLAs Early Care	-	-	-	-	2.20E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Homer-Center Elementary	-	-	-	-	1.73E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Floodway Park	-	-	-	-	1.52E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Intown Park	-	-	-	-	1.64E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Homer City Memorial Park	-	-	-	-	1.72E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
First Commonwealth Field	-	-	-	-	2.54E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Saylor Park	-	-	-	-	3.22E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Burrel Park	-	-	-	-	2.77E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 1	-	-	-	-	3.39E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 2	-	-	-	-	3.85E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 3	-	-	-	-	4.27E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 4	-	-	-	-	2.33E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 5	-	-	-	-	1.71E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 6	-	-	-	-	4.23E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 7	-	-	-	-	5.46E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 8	-	-	-	-	5.87E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 9	-	-	-	-	9.65E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 10	-	-	-	-	9.09E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 11	-	-	-	-	6.81E-04	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 12	-	-	-	-	1.73E-03	-	-	-	-	-	-	-	-	-	-	-	-	-
Resident 13	-	-	-	-	1.73E-03	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A–4. Cancer Risk for Individual Mutagenic COPCs (per 1,000,000 people)

Receptor	Chromium (VI)	Formaldehyde	3-Methylchloranthrene	7,12-Dimethylbenz(a)anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene
LOLAs Early Care	3.61E-02	8.55E-02	3.12E-05	3.12E-03	2.04E-05	3.84E-02	3.50E-05	7.17E-07	4.83E-07	1.12E-04	1.34E-05
Homer-Center Elementary	2.64E-02	6.23E-02	2.56E-05	2.56E-03	1.67E-05	2.79E-02	2.87E-05	5.87E-07	3.95E-07	9.19E-05	1.10E-05
Floodway Park	1.81E-02	4.21E-02	2.57E-05	2.58E-03	1.62E-05	1.87E-02	2.79E-05	5.72E-07	3.85E-07	8.96E-05	1.07E-05
Intown Park	2.03E-02	4.75E-02	2.64E-05	2.64E-03	1.73E-05	2.11E-02	2.97E-05	6.09E-07	4.10E-07	9.53E-05	1.14E-05
Homer City Memorial Park	2.38E-02	5.60E-02	2.59E-05	2.59E-03	1.73E-05	2.50E-02	2.99E-05	6.11E-07	4.12E-07	9.57E-05	1.14E-05
First Commonwealth Field	3.99E-02	9.44E-02	3.59E-05	3.59E-03	2.41E-05	4.23E-02	4.14E-05	8.47E-07	5.71E-07	1.33E-04	1.58E-05
Saylor Park	4.65E-03	1.09E-02	5.18E-06	5.19E-04	3.17E-06	4.88E-03	5.46E-06	1.12E-07	7.52E-08	1.75E-05	2.09E-06
Burrel Park	4.16E-03	9.79E-03	4.41E-06	4.42E-04	2.68E-06	4.38E-03	4.61E-06	9.46E-08	6.35E-08	1.48E-05	1.76E-06
Resident 1	2.77E-02	6.21E-02	6.96E-05	6.97E-03	4.06E-05	2.69E-02	6.95E-05	1.43E-06	9.57E-07	2.24E-04	2.66E-05
Resident 2	4.43E-02	1.03E-01	6.14E-05	6.15E-03	4.16E-05	4.58E-02	7.15E-05	1.46E-06	9.85E-07	2.29E-04	2.73E-05
Resident 3	5.28E-02	1.24E-01	5.80E-05	5.81E-03	4.47E-05	5.55E-02	7.73E-05	1.57E-06	1.07E-06	2.47E-04	2.94E-05
Resident 4	3.86E-02	9.18E-02	3.04E-05	3.05E-03	2.13E-05	4.13E-02	3.67E-05	7.49E-07	5.06E-07	1.17E-04	1.40E-05
Resident 5	2.13E-02	4.99E-02	2.50E-05	2.51E-03	1.79E-05	2.22E-02	3.08E-05	6.29E-07	4.25E-07	9.89E-05	1.18E-05
Resident 6	5.60E-03	1.31E-02	7.23E-06	7.25E-04	4.35E-06	5.82E-03	7.47E-06	1.53E-07	1.03E-07	2.40E-05	2.86E-06
Resident 7	6.92E-03	1.60E-02	1.08E-05	1.08E-03	5.74E-06	7.08E-03	9.83E-06	2.03E-07	1.35E-07	3.16E-05	3.77E-06
Resident 8	7.14E-03	1.64E-02	1.24E-05	1.25E-03	6.26E-06	7.23E-03	1.07E-05	2.22E-07	1.48E-07	3.45E-05	4.12E-06
Resident 9	1.04E-02	2.39E-02	1.94E-05	1.94E-03	1.07E-05	1.05E-02	1.84E-05	3.79E-07	2.53E-07	5.91E-05	7.04E-06
Resident 10	9.59E-03	2.19E-02	1.82E-05	1.83E-03	1.02E-05	9.63E-03	1.74E-05	3.59E-07	2.40E-07	5.61E-05	6.68E-06
Resident 11	7.85E-03	1.80E-02	1.40E-05	1.40E-03	7.43E-06	7.93E-03	1.27E-05	2.62E-07	1.75E-07	4.09E-05	4.87E-06
Resident 12	2.33E-02	5.38E-02	3.68E-05	3.69E-03	1.78E-05	2.38E-02	3.05E-05	6.32E-07	4.20E-07	9.81E-05	1.17E-05
Resident 13	1.61E-02	3.64E-02	3.69E-05	3.69E-03	2.01E-05	1.58E-02	3.43E-05	7.08E-07	4.73E-07	1.11E-04	1.32E-05