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PERIMETER AIR MONITORING PLAN

SEATTLE DOT MERCER PARCELS SITE
800 MERCER STREET
SEATTLE, WASHINGTON

by
Haley & Aldrich, Inc.
Seattle, Washington

for
800 Mercer, LLC
Seattle, Washington

File No. 0202738-100 (19409-06)
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SEATTLE, WASHINGTON

PREPARED FOR
800 MERCER, LLC
SEATTLE, WASHINGTON

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List of Abbreviations

Abbreviation	Definition
$\mu g/m^3$	micrograms per cubic meter
AAC	acceptable ambient air concentration
bgs	below ground surface
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
CLARC	Cleanup Level and Risk Calculation
CMMP	Contaminated Media Management Plan
COC	constituent of concern
COPC	constituent of potential concern
CPAH	carcinogenic polycyclic aromatic hydrocarbon
CSO	Combined Sewer Overflow
CUL	cleanup level
CVOC	chlorinated volatile organic compound
DRO	diesel-range organics
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FS	Feasibility Study
GRO	gasoline-range organics
Haley & Aldrich	Haley & Aldrich, Inc.
HASP	Health and Safety Plan
mg/kg	milligrams per kilogram
NAAQS	National Ambient Air Quality Standard
PAH	polycyclic aromatic hydrocarbon
PAMP	Perimeter Air Monitoring Plan
PAMS	Perimeter Air Monitoring Station
PCE	tetrachloroethylene
PID	photoionization detector
PM_{10}	particulate matter of 10 micrometers or less in diameter
ppbPID	PID that measures to parts per billion levels
ppbv	parts per billion by volume
ppmv	parts per million by volume
Property	800 Mercer Street
PSCAA	Puget Sound Clear Air Agency
RI	Remedial Investigation
Site	Seattle DOT Mercer Parcels site
SL	screening level
TCE	trichlorethylene
TPH	total petroleum hydrocarbon
TVOC	total volatile organic compound
USEPA	United Stated Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound
WAC	Washington Administrative Code

1. Introduction

Haley & Aldrich, Inc. (Haley & Aldrich) has prepared this Perimeter Air Monitoring Plan (PAMP) on behalf of 800 Mercer, LLC for the Seattle DOT Mercer Parcels site (Site; Cleanup Site ID [CSID] No. 14784), which is primarily located at 800 Mercer Street in Seattle, Washington (Property). The Property is shown on Figure 1.

The PAMP describes the methods, procedures, and response actions for perimeter air monitoring at the Property to manage potential emissions to ambient air during excavation and removal of contaminated soil and groundwater as part of the planned redevelopment of the Property, in order to minimize impacts to the surrounding communities. The Contaminated Media Management Plan (CMMP; Haley & Aldrich, 2023a) identifies the type of contaminated media (i.e., soil, groundwater, and stormwater) that will be encountered during the redevelopment and construction on the Property, and how that media will be managed consistent with the applicable environmental regulations and requirements.

The Property is planned to be redeveloped with two 13-story towers – one on the western half and one on the eastern half of the Property – separated above grade by the vacated Eighth Avenue North right-of-way. The two separate towers will share a below-grade parking garage that will underlie the Property footprint, aside from the King County Combined Sewer Overflow (CSO) infrastructure in the north-central part of the Property and small areas in the northwest corner and along the southern Property boundary. Four levels of below-grade parking are planned, resulting in a uniform lowest finished floor elevation of approximately 10.75 feet[1] (approximately 23 to 48 feet below ground surface [bgs]). The foundation for the buildings and garage will consist of a 3- to 8-foot-thick concrete mat, resulting in a bottom of excavation ranging from elevation 1.75 to 7.75 feet. A vapor barrier shall be installed beneath the slab and along the below-grade walls of the new building structures at the Property per the Cleanup Action Plan (Washington State Department [Ecology], 2022) and the Engineering Design Report (EDR; Haley & Aldrich, 2023b). Redevelopment is expected to begin in approximately 2026.

During redevelopment, dust, vapor, and odor emissions will be managed to comply with applicable Puget Sound Clear Air Agency (PSCAA) Regulations for emissions of air contaminants (Regulation I, Article 9, Section 9.11) and fugitive dust (Regulation 1, Article 9, Section 9.13), Washington Administrative Code (WAC) Chapter 173-4700 Section 040 (General Standards for Maximum Emissions), as well as the National Ambient Air Quality Standard (NAAQS) for particulate matter of 10 micrometers or less in diameter (PM_{10}). The best management practices that will be used to manage airborne dust, vapor, and odors associated with Property redevelopment are outlined in the CMMP (Haley & Aldrich, 2023a).

The PAMP does not cover occupational exposures to on-site workers; the action levels and monitoring procedures for Haley & Aldrich on-site worker health and safety, including breathing zone monitoring and exposure to respirable crystalline silica during mixing concrete/cement, cutting, sawing, drilling, and crushing of concrete, brick, ceramic tiles, rock, and stone products are presented in the project Health and Safety Plan (HASP) included as Appendix D of the EDR (Haley & Aldrich, 2023b). The general contractor and each subcontractor are responsible for preparing and maintaining their own HASP to

[1] As described in the CMMP for the Property, all elevations are referenced to the North American Vertical Datum of 1988.

identify potential physical and chemical hazards associated with their own work practices, and for conducting their work in accordance with their HASP.

1.1 REGULATORY BASIS AND REQUIREMENTS

This PAMP incorporates requirements of the following applicable regulations:

- PSCAA Regulation I, Article 9, Section 9.11 (Emission of Air Contaminant: Detriment to Person or Property) and Section 9.15 (Fugitive Dust Control Measures);
- WAC General Standards for visible emissions (173-400-040(2)), Fallout (173-400-050(3), Odors (173-400-040(5)), Emissions detrimental to persons or property (173-400-040(6)), and Fugitive dust (173-400-040(9)); and
- United States Environmental Protection Agency (USEPA) NAAQS for PM_{10} established by the Clean Air Act 42 United States Code [USC] § 7401 et seq. and 40 Code of Federal Regulations [CFR] Part 50).

2. Project Overview

The Property is located in the South Lake Union neighborhood in Seattle, Washington. The Property is bounded by Roy Street to the north, Mercer Street to the south, Dexter Avenue North to the west, and Ninth Avenue North to the east (Figure 2).

As described in the Remedial Investigation (RI) Report (Hart Crowser, 2022) and the CMMP, soil and groundwater on the Property is impacted by historical site activity, including petroleum-related contamination from a historical gas/service station on the Property. Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and arsenic contamination is present in soil from fill material placed for realignment of roads. In addition, saturated soil and groundwater at the Property are impacted by dry-cleaning solvent contamination from an upgradient off-site source. Site constituents of concern (COCs) and non-Site related hazardous substances expected to be encountered during cleanup and redevelopment of the Property are described in detail below.

Site COCs (gasoline-range organics [GRO] and lead). GRO concentrations in soil that exceed the cleanup level (CUL) are located in a limited area within the northwest corner of the Property (Appendix A, Figure 2-1). These impacts are present at depths ranging from 5 to 25 feet bgs, corresponding to elevations between approximately 48.7 to 29.8 feet. Detections of lead in soil above the CUL are limited to two areas of the Property: an exceedance of lead in fill material in the north-central portion of the Property at a depth of 10 feet bgs corresponding to an elevation of approximately 40.5 feet; and an exceedance of lead in native material near the northeast corner of the Property at a depth of 22 feet bgs corresponding to an elevation of approximately 17.1 feet (Appendix A, Figure 2-2).

Non-Site related hazardous substances (cPAHs and arsenic). cPAH and arsenic concentrations in soil that exceed the RI (Hart Crowser, 2022) health-protective risk-based screening levels (SLs) are attributed to contaminated fill that was placed within the Broad Street alignment that was located on the Property between 1958 to 2012, and are generally located within that former roadway. This contamination is known as the Broad Street Alignment Contaminated Fill site (Broad Street Fill Site). cPAHs in soil at concentrations that exceed the RI SLs are in two areas of the Property: in the southwest corner of the Property, and in the east-central area of the Property (Appendix A, Figure 2-3). In the southwest corner of the Property, cPAH exceedances are present at depths ranging from 7.5 to 15 feet bgs (approximate elevations 51 to 44 feet). In the east-central area of the Property, two cPAH exceedances are present at 5 feet bgs and 10 feet bgs, both of which correspond to an approximate elevation of 37 feet. Arsenic concentrations in soil that exceed the RI SL are located in the central and southwest areas of the Property (Appendix A, Figure 2-4). These exceedances are present in the fill material at depths ranging from 5 to 25 feet bgs (approximate elevations 54 to 34 feet). One arsenic exceedance is also located on the eastern side of the Property, at 28 feet bgs (elevation 10 feet).

Non-Site related hazardous substances (chlorinated volatile organic compounds [CVOCs]). CVOC detections in deeper saturated soil on the Property are attributed to releases from historical laundry and dry-cleaning operations on the American Linen Supply Co Dexter Ave site (American Linen Site), originating at 700 Dexter Avenue North. CVOC detections in saturated soil from the American Linen Site include, but are not limited to, tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). These compounds have been detected in saturated soil at various locations on the Property at depths between approximately 25 and 50 feet bgs, corresponding to

elevations between approximately 23 and -12 feet (Appendix A, Figure 2-5). CVOCs were not detected in shallow soils above the water table on the Property.

The cleanup action involves excavating contaminated soil from the Property, including the GRO-contaminated soil in the northwest corner of the Property and the two areas of lead-contaminated soil in the north-central and northeast areas of the Property, and transporting the excavated material off Property for land disposal. The estimated quantity of GRO- and lead-contaminated soil (i.e., soil with concentrations greater than CULs) to be removed during the cleanup action is approximately 2,300 and 300 bank cubic yards, respectively. The cleanup action will occur concurrently with Property redevelopment. The vertical excavation extent is to approximately elevation 7.75 feet (approximately 26 to 51 feet bgs), except for the building cores, which will extend to approximately elevation 1.75 feet (approximately 32 to 57 feet bgs).

Soil excavation for Property redevelopment will also remove shallow contaminated soil on the Property from the Broad Street Fill Site (i.e., cPAHs and arsenic in the Broad Street 1958-2012 alignment) and CVOC-impacted saturated soil that has come to be located on the Property due to migration of contamination from the American Linen Site, primarily in the northern area of the Property. Based on the data collected to date, soil with CVOC detections (Class IV) will be encountered within soils below the water table at approximately 25 feet bgs in the northern portion of the Property, as well as other areas below the groundwater table.

Soils with known impacts will be direct-hauled to an appropriate soil disposal facility. Extensive pre-characterization of soil for disposal should minimize the need for stockpiling. However, it may be necessary to temporarily store soil with a potentially different classification from the surrounding area or from newly discovered unknown soil impacts. These stockpiles will be located within the limits of the excavation and be coordinated with the contractor based on construction logistics.

As described in the CMMP for the Property, temporary construction dewatering system shall be installed to remove water from the construction area throughout the excavation activities. Dewatering discharge shall be treated, as needed, to reduce concentrations of hazardous substances in groundwater, including CVOCs.

3. Acceptable Ambient Air Concentrations and Real-Time Action Levels

Per WAC 173-400-040(6) and PSCAA Regulation 1, Article 9 Section 9.11, air emissions of contaminants from any source that may be detrimental to human health must be restricted. Acceptable ambient air concentrations (AACs) for constituents of potential concern (COPCs) in fugitive air emissions during construction work in impacted soils were derived using human health risk screening exposure assumptions and methodologies consistent with Cleanup Level and Risk Calculation (CLARC) guidance from Ecology (Ecology, 2024). The principal use of the COPC-specific AACs is to determine the need for COPC-specific time-averaged perimeter air sampling data. Each AAC represents a conservative estimate of the long-term average concentration of the chemical in air to which off-Property populations could be safely exposed over the duration of construction work in impacted soils.

Real-time action levels were developed to evaluate semi-quantitative surrogate parameters, including PM_{10}. The real-time air monitoring action levels are intended to be conservative, providing guidance on timely initiation of additional emissions mitigation measures. The real-time monitoring results will be evaluated throughout the progress of work to document that the health of the surrounding community is protected throughout the project. The PAMP may be modified as the work progresses based on changes in Property-specific conditions. The development of the AACs and real-time action levels for the project are described in the following sections.

3.1 DEVELOPMENT OF ACCEPTABLE AMBIENT AIR CONCENTRATIONS

The COPC-specific AACs are intended to be conservative and consistent with a screening-level human health risk evaluation. Inhalation cancer potency factors (to evaluate potential carcinogenic risks) and reference doses (to evaluate potential noncarcinogenic hazards) were selected from the Ecology CLARC Tables (Ecology, 2024). The equations, toxicity values, and exposure factors used to develop the AACs are provided in Appendix B, Table B-1 and correspond with those provided in WAC 173-340-750.

3.1.1 COPCs

The COPCs evaluated for inclusion in the PAMP are non-Site related hazardous substances that may be encountered in soil that will be disturbed during Property redevelopment (i.e., cPAHs, arsenic, and CVOCs [i.e., PCE, TCE, cis-1,2-DCE, and VC]). Note that Site-related COCs lead and GRO are not evaluated as COPCs in the PAMP because potential emissions of these chemicals to ambient air would be limited in both magnitude and duration based on the very limited volume of soil[2] in the affected source area and few elevated concentrations of lead and GRO detected in soil at the Site[3].

In addition, as noted in Section 2 above, a dewatering system will be in place throughout the excavation activities, which will include groundwater treatment prior to discharge, limiting the potential for emissions from groundwater. Therefore, chemicals detected in groundwater are not evaluated for inclusion in the PAMP sampling program.

[2] Less than 2 percent of the total estimated volume of soil to be removed during excavation activities (Haley & Aldrich, 2023b).

[3] GRO detected at the Site exceeds the CUL of 30 milligrams per kilogram (mg/kg) in a total of eight individual, isolated sample locations in the limited area within the northwest corner of the Property (Appendix A, Figure 2-1), with concentrations ranging between 45 and 1,200 mg/kg. Lead concentrations exceed the CUL of 250 mg/kg in two isolated sample locations at Property (Appendix A, Figure 2-2), with concentrations of 279 and 591 mg/kg.

3.1.2 Receptors

The primary potential off-Property receptors (i.e., surrounding community) are nearby commercial workers located in adjacent commercial properties, whose potential exposures are expected to be up to 12 hours per day during remedial construction activities. The anticipated duration of impacted soil handling activities that will be performed is approximately 6 days per week, over the course of approximately 9 months. Thus, the minimum exposure duration of 1 year and an exposure frequency of 240 workdays per year (6 days per week for 40 weeks) were selected for developing the AACs. For the purpose of this PAMP and the development of the AACs, the off-Property commercial workers located nearest to the Property perimeter (i.e., adjacent commercial properties) are considered to be the most sensitive receptors. The assumed exposure duration of 12 hours per day is appropriate for comparison to the results of the perimeter air monitoring time-averaged sampling which will be conducted over the duration of the workday (i.e., between 8 and 12 hours).

3.1.3 Methodology

Appendix B, Table B-1 presents the human health risk screening methodology used to develop the AACs for commercial worker exposure to COPCs in air for the duration of remediation activities. The COPC-specific receptor AACs represent the anticipated COPC concentration in air that can continuously occur during 9 months of exposure at the receptor location without resulting in a significant risk to human health. Where applicable, the AAC is represented by the lower (i.e., more conservative) of the COPC-specific carcinogenic or non-carcinogenic risk-based threshold.

AACs for volatile COPCs (i.e., CVOCs including PCE, TCE, cis-1,2-DCE, and VC) detected in soil were used to assess whether perimeter air monitoring for VOCs at the Property is necessary to manage risk of chronic exposure to these chemicals for the duration of construction work in impacted soils. To estimate the potential for outdoor air concentrations of volatile COPCs to exceed AACs, the transport of volatile COPCs from soil into outdoor air was modeled by calculating a chemical-specific soil to outdoor air volatilization factor (VF) using the approach recommended in the USEPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002). The modeling approach conservatively assumes that the source of VOCs is infinite and the source area is the entire 2.35 acre Property. Chemical-specific physicochemical properties and soil properties for saturated soil were used in calculating the infinite source VFs. The chemical-specific physicochemical properties for the volatile COPCs in soil are presented in Appendix B, Table B-2. The soil properties for saturated soil are presented in Appendix B, Table B-3 as part of a sample VF calculation for vinyl chloride. The dispersion factor calculated for a 2.35-acre site is presented in Appendix B, Table B-4. Appendix B, Table B-2 presents the calculated VFs for the volatile COPCs, with corresponding maximum estimated outdoor air concentrations.

As shown in Table B-2, the maximum estimated outdoor air concentrations for volatile COPCs are below AACs indicating that VOC emissions for the project would not be expected to exceed health-risk based AACs. This indicates that perimeter air monitoring for VOCs at the Property is not necessary to manage the risk of chronic exposure to these chemicals for the duration of construction work in impacted soil. Time-averaged air samples will therefore not be collected for analysis of VOCs. The potential for short-term elevated emissions of VOCs will be monitored and controlled on-site, within the site work zone, using a real-time action level of 0.5 parts per million by volume (ppmv) is established in the HASP

using the health-based short-term (8-hour) occupational exposure limits for the COPCs at the site with the lowest exposure limits (i.e., vinyl chloride).

AACs for non-volatile COPCs in soil were used assess whether the 24-hour NAAQS for PM_{10} of 150 micrograms per cubic meter ($\mu g/m^3$) is protective for managing the risk of chronic exposure to particulate emissions of COPCs at the Property. Potential particulate concentrations in ambient air were estimated for each non-volatile COPC using the maximum soil concentration in areas of the Property that will be disturbed during the cleanup action and soil excavation for Property redevelopment and with the assumption that long-term concentrations of PM_{10} at the Property fence line are equal to the 24-hour NAAQS for PM_{10} of 150 $\mu g/m^3$. This assumption is conservative as long-term average concentrations of PM_{10} that may occur at the fence line would be expected to be significantly lower than 150 $\mu g/m^3$ for the duration of the excavation.

As presented in Appendix B, Table B-5, the PM_{10} action level of 150 $\mu g/m^3$ is protective for managing the risk of chronic exposure to particulate emissions of non-volatile COPCs at the Property (i.e., the upper-bound estimated potential concentrations of these COPCs in air at the PM_{10} action level of 150 $\mu g/m^3$ are well below the respective fence line AACs). This indicates that monitoring dust concentrations using an AAC of 150 ug/m^3 is protective for potential exposures to non-volatile COPCs (i.e., cPAHs and arsenic). Time-averaged air samples will therefore not be collected for analysis of cPAHs or arsenic.

3.2 DEVELOPMENT OF REAL-TIME ACTION LEVELS FOR DETERMINING THE NEED FOR ADDITIONAL MITIGATION MEASURES

The selection and rationale for the real-time action levels are described below. Section 5 presents the mitigation measures to be implemented if an action level is observed.

3.2.1 Particulate Matter Real-Time Action Level

The NAAQS for PM_{10} of 150 $\mu g/m^3$ is selected as the applicable action level for PM_{10} in ambient air at the perimeter of the Property during the cleanup action and soil excavation for Property redevelopment. This standard is based on a 24-hour averaging time and is supported by the USEPA as protective of human health from the effects of short-term exposures to coarse particles in ambient air and is thus protective of shorter, workday exposures (i.e., 8- to 12-hours). As detailed in Section 3.1.3 above, the PM_{10} action level also addresses AACs for individual non-volatile COPCs in fugitive particulate matter emissions from contaminated soil at the Property (Appendix B, Table B-5).

4. Perimeter Air Monitoring

Perimeter air monitoring will be performed to document that acceptable air quality conditions are maintained throughout the period of work; to verify the effectiveness of any additional emissions control measures taken to mitigate temporary exceedance of action levels; and to support the completion of the work in a manner that is protective of the health of the community. The monitoring program approach is summarized in Table 1 and discussed in Sections 4.1 and 4.2 below.

Action levels for monitoring during the period of work will be directly correlated to a system of real-time measurements. To meet the requirements for monitoring and managing ambient air quality in a manner that is protective of the surrounding community, action levels and systems to measure compliance with those action levels were developed for measurements of surrogate ambient air quality parameters monitored in real time during active working hours (i.e., PM_{10}).

Given the dispersion of COPCs in air with distance from the emission sources, the COPC concentrations that could be present in the air during remediation activities at any off-site receptor's point of exposure are not expected to be greater than the concentrations in air measured at the perimeter of the work area. In addition, COPCs present in ambient air originating from on-site work zones may be impeded by covered fences. A conservative measurement of COPCs potentially migrating off-site will be obtained by placing ambient air monitor intakes at the fence line or an appropriate work boundary location.

Background measurements will be taken over a 2-day period prior to the start of remediation work to evaluate the typical background concentrations present at the Property. Measurements will also be collected at locations representative of upwind conditions (e.g., at upwind perimeter air monitoring stations [PAMS]) during remediation activities.

The action levels established for perimeter air monitoring are:

Action levels for real-time surrogate measurements of air quality. Air quality conditions for PM_{10} will be measured in real time at perimeter stations throughout the workday as described in Section 4.1. Real-time monitoring will be evaluated against action levels for PM_{10} as described in Section 5.1.

A summary of the real-time sampling program is provided below and discussed in detail in the following sections:

Activity	Monitoring / Sampling	Frequency	Action Level
Background (2 week days, prior to start of work)	Real-Time PM_{10}	Continuous (normal work hours)	Not Applicable
Soil Disturbance	Real-Time PM_{10}	Continuous during normal work hours (Section 4.1.1)	150 $\mu g/m^3$ (Section 5.1.1)

4.1 REAL-TIME MONITORING METHODS, FREQUENCY, AND PROCEDURES

Real-time air monitoring for PM_{10} concentrations will be implemented at the start of soil-handling activities in the areas of impacted soil and continue throughout each workday at each PAMS during soil-handling activities.

Data will be transmitted in real-time using a remote telemetry system which will be programmed to send automated text or email alerts if an action level is exceeded. During active work periods on an as-needed basis, measurements from the automated monitoring systems may be supplemented with data collected by the field technician at the Property using hand-held measurement devices. A conservative measurement of dust potentially migrating to nearby commercial properties will be obtained by placing ambient air monitor intakes at the fence line or an appropriate work boundary location. The approximate locations of each of the PAMS are shown on Figure 2. In addition, a weather station will be placed adjacent to one of the PAMS to concurrently monitor windspeed and direction.

The dust monitoring instrumentation, approach, and method of documenting results are presented in Table 1 and summarized below.

4.1.1 Particulate Matter

The 24-hour PM_{10} standard of 150 µg/m^3 will be conservatively applied by comparing 15-minute average PM_{10} measurements to the PM_{10} action level. If the 15-minute average concentration of PM_{10} measured during remediation activities does not exceed the NAAQS of 150 µg/m^3, it is assumed that the PM_{10} concentration in ambient air attributable to the project would not exceed the standard over a 24-hour averaging period including non-work hours.

A TSI DustTrak II, or its equivalent, is recommended for PM_{10} monitoring. Data will be transmitted using a remote telemetry system which will send automated text or email alerts if a threshold is exceeded. Data will be logged continuously while the monitoring equipment is operating. Particulate monitors will data log measurements and display instantaneous, maximum, and appropriate time-averaged results selectively for PM_{10} continuously throughout the workday during excavation, stockpiling, and handling of contaminated soil. Data logged results will be routinely transferred to a computer for securing the data record of real-time PM_{10} air monitoring results. Upwind measurements will be collected at monitoring locations that are not directly downwind during remediation activities to evaluate real-time background conditions at the Property. The monitors will be maintained and calibrated daily in accordance with the manufacturer's specifications.

If there is an exceedance of the PM_{10} action level at a PAMS, the current wind direction will be noted and the exceedance evaluated in the context of dust-generating activities at the Property. If it is determined that the exceedance of the PM_{10} action level at the perimeter is due to Property activities, additional mitigation measures will be implemented as outlined in Section 5. Any exceedance of the PM_{10} action level or observation of visible dust crossing the project fence line will be noted and corrective actions taken in response, or extenuating factors will be documented.

It is noted that the instrument cannot distinguish construction dust from other particulate matter such as diesel equipment exhaust, off-Property vehicle emissions, fog/mist, and regional haze associated with wood burning and/or wildfires. The potential contribution of other sources to measured particulate matter concentrations will be considered. For example, if it is determined that a nominal exceedance of

the particulate matter action level was caused by an off-Property source, then additional dust control measures may not be warranted.

The dust monitoring instrumentation, approach, and method of documenting results are summarized in Table 1.

4.1.2 Visible Dust Emissions

Dust emissions will be managed if they occur at the source area in accordance with PSCAA Regulation I, Article 9, Section 9.15 (Fugitive Dust Control), WAC 173-400-040(3) (General Standards for Maximum Emissions, Fallout), and 173-400-040(9) (General Standards for Maximum Emissions, Fugitive Dust). If visible dust is generated within the work area, mitigation measures will be implemented to prevent visible dust from migrating outside the remediation work area. Requirements for mitigating visible dust are outlined in the CMMP (Haley & Aldrich, 2023a) and EDR (Haley & Aldrich, 2023b).

4.1.3 Odor Emissions

If nuisance odors are detected during impacted or contaminated soil excavation activities, the contractor shall take measures to manage odors in accordance with PSCAA Regulation I, Article 9, Section 9.11 (Emission of Air Contaminant: Detriment to Person or Property) and WAC General Standards for Maximum Emissions, Odor (WAC 173-400-040(5)). Applicable odor-control measures are described in the EDR (Haley & Aldrich, 2023b) and may include but are not limited to: covering exposed nuisance odor areas with plastic sheeting or odor suppressant spray foams at the end of each day and when excavation activities are not being performed; covering stockpiles with plastic sheeting when not in use; and using a neutralizing agent, if applicable.

4.1.4 Meteorological Monitoring

Meteorological monitoring will be performed using a LUFFT WS500-UMB Smart Weather Sensor, or equivalent, capable of real-time, continuous measurement of temperature, relative humidity, air pressure, wind direction, and wind speed. Wind speed and direction measurements will be logged continuously while the monitoring equipment is operating in association with PM_{10} measurements. Data will be transmitted in real-time to the central computer using a remote telemetry system.

4.2 PREPARATION FOR AIR MONITORING ACTIVITIES

All remediation support areas within the Property will have fences to delineate work area boundaries. As described below, at least three PAMS will be established for the Property during air monitoring activities. PAMS will be constructed using weatherproof enclosures to house real-time air monitoring equipment and placed along the perimeter of the fence.

4.2.1 Establishing PAMS Locations

At least three and up to six PAMS will be established on the perimeter at locations in closest proximity to off-Property populations, including at least one upwind location. The potential locations of the PAMS are shown at the maximum area of the anticipated work zone perimeter on Figure 2. The total number and location of the PAMS may be changed based on observed conditions, including changes to work areas being disturbed, changes in perimeter or work zone, air monitoring results, changes in wind direction, or other conditions that affect the achievement of air monitoring objectives during

construction. PAMS locations may be adjusted at the beginning of each workday to provide coverage of at least two downwind locations and one upwind location (i.e., at least three PAMS). The overall objective is to ensure that the emission control measures being implemented are effective and that the remedial activities occurring at the Property are not adversely impacting the health of the surrounding community.

Air monitoring stations will be located at an appropriate distance from any obstructions that may be present between the PAMS and on-Property activities, to the extent practicable. Given the dispersion of COPCs in air with distance from the emission sources, the COPC concentrations that could be present in the air during remediation activities at any off-Property receptor's point of exposure are not expected to be greater than the concentrations in air measured at the perimeter of the work area. In addition, COPCs present in ambient air originating from on-Property remediation work areas may be impeded by covered fences. A conservative measurement of COPCs potentially migrating off-Property will be obtained by placing ambient air monitor intakes at the fence line or an appropriate work boundary location.

The following general work activities will require establishing locations for PAMS:

- pre-construction background monitoring,
- excavation activities with the potential to disturb contaminated soil,
- stockpiling of contaminated soil, and
- soil loading and off-haul of contaminated soil.

5. Field Response Actions

Quantitative action levels have been established for particulate dust as PM_{10} concentrations in real time. The action levels are based on understandings of the project duration, the human populations in the vicinity of the Property, and the nature of the contamination present on the Property. If these assumptions change significantly, the risk-based threshold concentrations for the action levels will be re-evaluated. A summary of the response actions is provided in Table 1.

5.1 ACTION LEVELS

Additional engineering controls (e.g., wet suppression for dust control) or work modifications will be implemented if the real-time action levels for PM_{10} are exceeded, and such exceedances are deemed to be associated with construction activities. If engineering controls or work modifications do not bring the PM_{10} concentrations to levels below the applicable action level, work may be stopped until an acceptable solution can be reached. Because individual COPC concentrations cannot be measured in real time, corrective action would be primarily based on real-time PM_{10} results at the perimeter. The following provides the real-time action levels associated with PM_{10} for the Property.

Target Compounds	Alert Level	Action Level
PM_{10}	15-minute average concentration of 150 µg/m^3 above upwind background concentration[1]	1-hour average concentration of 150 µg/m^3 above upwind background concentration[1]
Visible Dust	Visible dust within the excavation work area	Visible dust at the fence line
Odor	Odor reported within the excavation work area	Odor reported at the fence line
Notes: *µg/m^3 = micrograms per cubic meter* *[1] Upwind background concentration recorded at the Property during the same time interval, upwind of the elevated reading.*		

Evaluation of PM_{10} monitoring results and response actions are provided in detail in the following sections.

5.1.1 Evaluation of PM_{10} Monitoring Results and Response Actions

Time-averaged concentrations of PM_{10} will be logged continuously while the monitoring equipment is operating at each PAMS throughout the workday. Alerts will be set up to notify field staff via email or text when 15-minute average concentrations exceed the action level for PM_{10} of 150 µg/m^3.

5.1.1.1 PM_{10} Alert Level

If the 15-minute average PM_{10} concentration exceeds 150 µg/m^3 at any one PAMS for more than 1 hour and is associated with on-Property remediation and/or construction activities, ***then*** the site Construction Manager will be notified to implement engineering controls (dust suppression by wetting) or other modifications to work activity to reduce PM_{10} levels.

5.1.1.2 PM_{10} Action Level

If subsequent 15-minute average PM_{10} results concentration exceeds 150 µg/m3 after the implementation of engineering controls and/or the modification of work activity, ***then*** the site Construction Manager and Project Manager will be notified, and more aggressive engineering controls will be implemented until PM_{10} levels are below 150 µg/m^3.

As noted in Section 1 above, the PM_{10} action level of 150 µg/m^3 is not applicable for monitoring occupational dust exposure due to on-Property dust generated during demolition or remediation activities, including on-site dust generated during concrete mixing, breaking, and/or coring activities.

References

1. Ecology 2022. Cleanup Action Plan, Seattle DOT Mercer Parcels Site, Seattle, WA. February 8.

2. Ecology 2024. Cleanup levels and risk calculation (CLARC) Data Tables and Other Technical Information. February revision, available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables

3. Haley & Aldrich, Inc. (Haley & Aldrich). 2023a. Contaminated Media Management Plan. Seattle DOT Mercer Parcels Site, 800 Mercer Street, Seattle, Washington. September.

4. Haley & Aldrich. 2023b. Engineering Design Report on Seattle DOT Mercer Parcels Site, 800 Mercer Street, Seattle, Washington. September.

5. Hart Crowser, a division of Haley & Aldrich. 2022. Remedial Investigation, Seattle DOT Mercer Parcels, 800 Mercer Street, Seattle, Washington. February 3.

6. United States Environmental Protection Agency. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. OSWER 9355.4-24. December.

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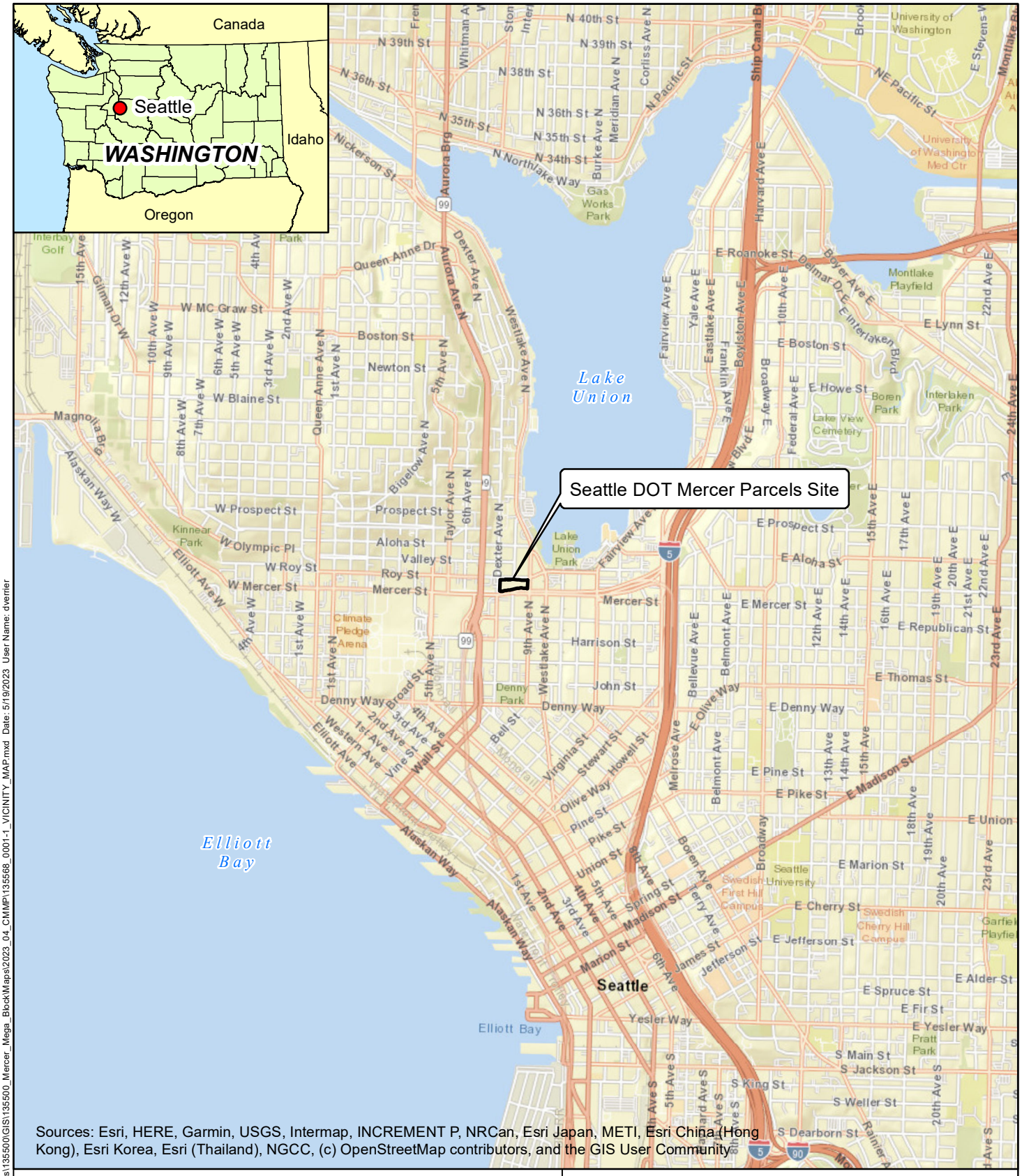
TABLE

TABLE 1
SUMMARY OF PERIMETER AIR MONITORING PLAN
SEATTLE DOT MERCER PARCELS SITE
SEATTLE, WASHINGTON

Activity	Parameter	Instrument/Analysis Method	Monitoring/Sampling Locations	Sampling Frequency	Action Level	Response Action	Documentation
Real-Time Fenceline Monitoring							
Disturbance of Impacted Soil at the Property: from soil surface to saturated soil between 25 and 50 feet bgs (Appendix A, Figures 2-1 through 2-5).	Dust (particulate matter less than 10 microns [PM_{10}]) Inhalable and Respirable	TSI DustTrak II or equivalent	Locations to be established on the perimeter of the Property in closest proximity to off-Property populations. At least two downwind locations and one upwind location (i.e., at least three PAMS) and up to a maximum of six PAMS (Figure 2 and Section 4.3.1)	Continuously throughout the workday during excavation, stockpiling, and handling of contaminated soil.	PM10 15-minute average >150 micrograms per cubic meter (µg/m3) at any one PAMS for more than one hour and is associated with any on-site remediation and/or construction activities.	Notify Construction Manager and Project Manager. Engineering controls and/or the modification of work activity will be implemented. Continue implementing engineering controls or work modifications until subsequent 15-minute average PM_{10} levels are <150 µg/m^3 above upwind concentrations.	Data will be logged continuously while monitoring equipment is operating. Field documentation must be recoverable and provide details on key emission variables: conditions of wind, engineering controls/ modification response and results.

FIGURES



0 0.25 0.5 1 Miles

N

Seattle DOT Mercer Parcels Site
Seattle, Washington

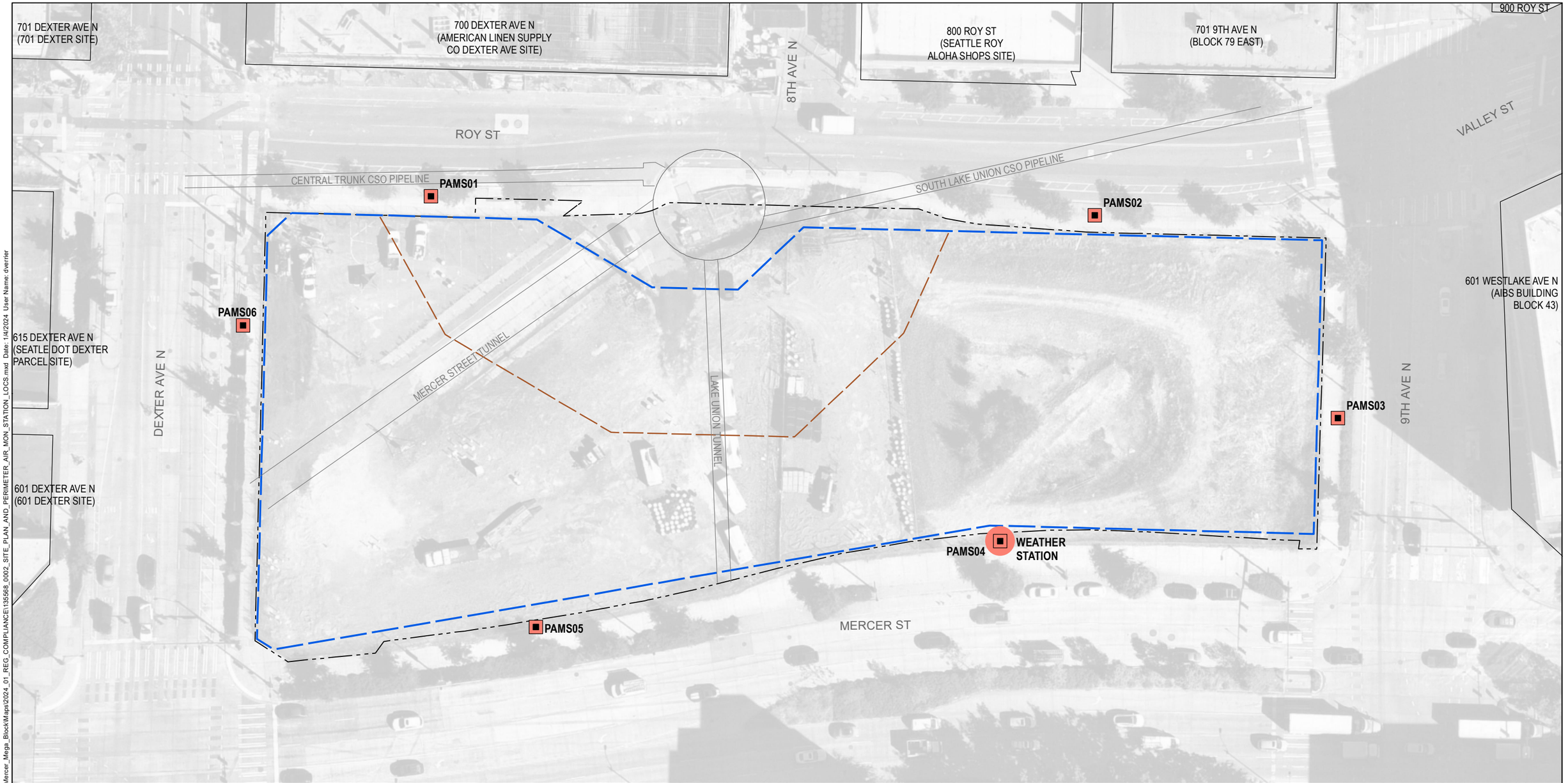
Vicinity Map

0202738-100 05/23

HALEY ALDRICH

Figure 1

Document Path: \\haleyaldrich.com\share\CF\Projects\135500\GIS\135500_Mercer_Mega_BlockMaps\2023_04_CMMP\135568_0001-1_VICINITY_MAP.mxd Date: 5/19/2023 User Name: dverrier



LEGEND

- PERIMETER AIR MONITORING STATION LOCATIONS. NUMBER AND LOCATION OF STATIONS MAY BE ADJUSTED BASED ON SITE CONDITIONS
- WEATHER STATION
- APPROXIMATE LIMTS OF 2H:1V SOIL BERM THAT WILL BE EXCAVATED LAST
- KING COUNTY MAIN FACILITY STRUCTURES
- OTHER PARCEL BOUNDARY
- EXCAVATION LIMITS; TO BE EXCAVATED TO ELEVATIONS RANGING FROM 7.75 TO 1.75 FT

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. EXCAVATION BOUNDARY DATA SOURCE: DIGITIZED FROM PLAN TITLED "ARE - MERCER BLOCKS." NBBJ, 11 NOVEMBER 2020.
3. AERIAL IMAGERY SOURCE: NEARMAP, 28 AUGUST 2020

0 25 50 100 Feet

N

Seattle DOT Mercer Parcels Site
Seattle, Washington

Site Plan and Perimeter Air Monitoring Station Locations

0202738-100 01/24

HALEY ALDRICH

Figure **2**

APPENDIX A
Distribution of COCs and Hazardous Substances in Soil at the Property

MBB-1	02/27/2020 5 ft el 50.02	02/27/2020 10 ft el 45.02	02/27/2020 15 ft el 40.02	02/27/2020 20 ft el 35.02	02/27/2020 25 ft el 30.02
GRO	5 U	5 U	7.7	570	5 U

MBGW-13	03/14/2019 5 ft el 49.47	03/14/2019 10 ft el 44.47	03/14/2019 15 ft el 39.47	03/14/2019 20 ft el 34.47
GRO	5 U	730 J	16	5 U

MBB-16	09/02/2020 5 ft el 48.7	09/02/2020 10 ft el 43.7	09/02/2020 15 ft el 38.7	09/02/2020 20 ft el 33.7
GRO	1200	200	20	5 U

HMW-18S	09/03/2020 5 ft el 52.61	09/03/2020 10 ft el 47.61	09/03/2020 15 ft el 42.61	09/03/2020 20 ft el 37.61	09/03/2020 25 ft el 32.61
GRO	5 U	45	5 U	5 U	5 U

MBB-3	02/27/2020 5 ft el 49.84	02/27/2020 10 ft el 44.84	02/27/2020 15 ft el 39.84	02/27/2020 20 ft el 34.84	02/27/2020 25 ft el 29.84
GRO	5 U	350	5 U	5 U	52

MBB-4	02/27/2020 5 ft el 49.61	02/27/2020 10 ft el 44.61	02/27/2020 15 ft el 39.61	02/27/2020 20 ft el 34.61	02/27/2020 25 ft el 29.61
GRO	5 U	5 U/7.3	5 U	210	5 U

BB-8 EL 43.7
BB-10 EL 57.4
21417-MB1 EL 55.4
MBGW-12 EL 54.0
HMW-17S EL 57.7
MBB-1 EL 55.0
MBB-16 EL 53.7
21417-MB2 EL 54.7
MBGW-13 EL 54.7
MBB-2 EL 55.5
MBB-4 EL 54.6
MBGW-6 EL 52.5
MBPP-7 EL 49.8
MBB-7 EL 49.4
MBGW-5 EL 49.9
MBB-5 EL 50.5
MBB-6 EL 50.3
HMW-3IA EL 55.0
MBB-3 EL 54.8
HMW-18S EL 57.5
MBB-8 EL 49.7
MBPP-5 EL 45.9
21417-MB6 EL 48.2
MBB-10 EL 49.7
MBGW-3 EL 47.8
MBB-20 EL 47.5
21417-MB8 EL 45.3
MBGW-4 EL 47.3
MBGW-1 EL 40.0
MBB-23 EL 47.2
MBGW-2 EL 46.1
21417-MB9 EL 39.0
HMW-1IB EL 38.3
21417-MB10 EL 38.1
MBB-9 EL 47.5
HMW-2IB EL 47.4
MBB-22 EL 42.0
MBPP-1 EL 45.3
MBGW-14 EL 46.1
21417-MB11 EL 39.0
HMW-11S EL 41.5
HMW-11IB EL 39.7
MBPP-2 EL 44.5
MBGW-8 EL 47.1
MBB-21 EL 47.6
HMW-10S EL 48.2
HMW-10D EL 48.2
MBPP-3 EL 45.9
21417-MB7 EL 47.4
BB-5 EL 49.5
MBPP-4 EL 48.3
MBB-18 EL 51.3
21417-MB5 EL 51.9
HMW-20S EL 53.6
MBB-24 EL 54.1
MBPP-6 EL 52.3
MBB-19 EL 51.7
HMW-9S EL 55.4
HMW-9IA EL 55.3
HMW-9D EL 55.3
HMW-9IB EL 55.4
MBB-17 EL 54.9
MBPP-8 EL 57.5
GP-9 EL 58.0
HMW-19S EL 58.4
HMW-5IB EL 58.4
GP-8 EL 58.3
GP-7 EL 58.5
HMW-6IA EL 58.6
HMW-6IB EL 58.7
HMW-6D EL 58.6
HMW-4IA EL 58.7
HMW-8IB EL 58.0
21417-MB3 EL 58.6
HMW-7IB EL 58.7
MBGW-9 EL 56.8
21417-MB4 EL 57.2
MBGW-10 EL 55.3
MBGW-11 EL 57.5
MBGW-16 EL 52.1
8TH AVE N
ROY ST
DEXTER AVE N
MERCER ST

0 20 40 80 Feet
N

SAMPLE DEPTH INTERVALS
- ≤ 5 FT BELOW GROUND SURFACE (BGS)
- 5 TO 10
- 10 TO 15
- 15 TO 20
- 20 TO 25
- > 25

- EXCAVATION LIMITS; TO BE EXCAVATED TO ELEVATIONS RANGING FROM 7.75 TO 1.75 FT
- PROPERTY BOUNDARY
- APPROXIMATE LIMTS OF 2H:1V SOIL BERM THAT WILL BE EXCAVATED LAST
- FORMER BROAD STREET 1958-2012

SOME SAMPLING LOCATIONS MAY HAVE BEEN SLIGHTLY OFFSET ON THIS MAP TO REDUCE SYMBOL OVERLAP

RED TEXT INDICATES EXCEEDANCE OF PROTECTIVE OF GROUNDWATER SCREENING LEVELS

SCREENING LEVELS PROVIDED BY ECOLOGY (NOVEMBER 17, 2020)

CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM (mg/kg)

DEPTH IN FEET BELOW GROUND SURFACE (BGS)

ELEVATION IN FEET (NAVD 88); EL. = GROUND SURFACE ELEVATION

U = NON-DETECT AT DETECTION LIMIT AS INDICATED
J = ESTIMATED VALUE
/ = MULTIPLE RESULTS INDICATE THAT A FIELD DUPLICATE WAS TAKEN

SAMPLE DEPTHS AND ELEVATIONS REFER TO THE TOP OF THE SAMPLE

AERIAL IMAGERY SOURCE: EAGLEVIEW

SCREENING LEVELS FOR GASOLINE RANGE ORGANICS (GRO) IN SOIL (mg/kg)	
ZONE	PROTECTIVE OF GW
Vadose (0 to 25 ft bgs) and Saturated (>25 ft bgs)	30

Seattle DOT Mercer Parcels Site
Seattle, Washington

GRO Distribution in Soil

0202738-100 05/23

HALEY ALDRICH

Figure **2-1**

GIS FILE PATH: \\haleyaldrich.com\share\CP\Projects\135500\GIS\135500_Mercer_Mega_Block\Maps\2023_04_CMMP\135568_00MB_BB_SOIL_SMARTIES_CMMP.mxd - USER: diverner - LAST SAVED: 5/19/2023 2:17:06 PM

MBB-5	03/02/2020 5 ft el 45.53	03/02/2020 10 ft el 40.53	03/02/2020 15 ft el 35.53	03/02/2020 20 ft el 30.53	03/02/2020 25 ft el 25.53
Lead	17.6	591	1.57	1.24	1.29

21417-MB9	05/11/2017 13 ft el 26.05	05/11/2017 22 ft el 17.05
Lead	19.3	279

ROY ST

8TH AVE N

DEXTER AVE N

MERCER ST

21417-MB1 EL 55.4
MBGW-12 EL 54.0
HMW-17S EL 57.7
MBB-1 EL 55.0
MBB-16 EL 53.7
MBGW-6 EL 52.5
MBB-2 EL 55.5
MBB-4 EL 54.6
HMW-3IA EL 55.0
MBB-3 EL 54.8
HMW-18S EL 57.5
HMW-19S EL 58.4
MBB-24 EL 54.1
HMW-20S EL 53.6
GP-9 EL 58.0
HMW-5IB EL 58.4
GP-8 EL 58.3
GP-7 EL 58.5
MBPP-8 EL 57.5
MBGW-7 EL 53.8
HMW-9S EL 55.4
HMW-9IA EL 55.3
HMW-9D EL 55.3
HMW-9IB EL 55.4
MBB-17 EL 54.9
MBPP-7 EL 49.8
MBGW-5 EL 49.9
MBB-5 EL 50.5
MBB-6 EL 50.3
MBB-18 EL 51.3
MBB-19 EL 51.7
MBB-7 EL 49.4
MBB-8 EL 49.7
MBPP-4 EL 48.3
MBB-9 EL 47.5
HMW-2IB EL 47.4
MBPP-5 EL 45.9
21417-MB6 EL 48.2
MBGW-3 EL 47.8
MBB-10 EL 49.7
MBB-20 EL 47.5
21417-MB8 EL 45.3
MBGW-4 EL 47.3
MBB-23 EL 47.2
MBGW-1 EL 40.0
MBB-12 EL 33.7
21417-MB9 EL 39.0
MBB-13 EL 36.0
MBGW-2 EL 46.1
MBB-11 EL 46.4
MBB-22 EL 42.0
MBPP-1 EL 45.3
21417-MB10 EL 38.1
MBPP-3 EL 45.9
MBGW-8 EL 47.1
HMW-10S EL 48.2
HMW-10D EL 48.2
MBB-21 EL 47.6
MBPP-2 EL 44.5
21417-MB11 EL 39.0
HMW-11S EL 41.5
MBGW-15 EL 40.9
HMW-11IB EL 39.7
HMW-6IA EL 58.6
HMW-6IB EL 58.7
HMW-6D EL 58.6
HMW-7IB EL 58.7
HMW-8IB EL 58.0
MBGW-9 EL 56.8
21417-MB4 EL 57.2
MBGW-11 EL 57.5
MBGW-10 EL 55.3

N

0 20 40 80 Feet

LEAD IN SOIL (mg/kg)
- ≥ 2,500
- ≥ 500 TO 2,500
- ≥ 250 TO 500
- ND/0 TO < 250
- NO DATA

SAMPLE DEPTH INTERVALS
- ≤ 5 FT BELOW GROUND SURFACE (BGS)
- 5 TO 10
- 10 TO 15
- 15 TO 20
- 20 TO 25
- > 25

- EXCAVATION LIMITS; TO BE EXCAVATED TO ELEVATIONS RANGING FROM 7.75 TO 1.75 FT
- PROPERTY BOUNDARY
- APPROXIMATE LIMTS OF 2H:1V SOIL BERM THAT WILL BE EXCAVATED LAST
- FORMER BROAD STREET 1958-2012

SOME SAMPLING LOCATIONS MAY HAVE BEEN SLIGHTLY OFFSET ON THIS MAP TO REDUCE SYMBOL OVERLAP

RED TEXT INDICATES EXCEEDANCE OF DIRECT CONTACT OR PROTECTIVE OF GROUNDWATER SCREENING LEVELS

SCREENING LEVELS PROVIDED BY ECOLOGY (NOVEMBER 17, 2020)

CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM (mg/kg)

DEPTH IN FEET BELOW GROUND SURFACE (BGS)

ELEVATION IN FEET (NAVD 88); EL. = GROUND SURFACE ELEVATION

U = NON-DETECT AT DETECTION LIMIT AS INDICATED
J = ESTIMATED VALUE
/ = MULTIPLE RESULTS INDICATE THAT A FIELD DUPLICATE WAS TAKEN

SAMPLE DEPTHS AND ELEVATIONS REFER TO THE TOP OF THE SAMPLE

AERIAL IMAGERY SOURCE: EAGLEVIEW

SCREENING LEVELS FOR LEAD (mg/kg) IN SOIL		
ZONE	DIRECT CONTACT	PROTECTIVE OF GW
Vadose (0 to 25 ft bgs)	250	3000
Saturated (>25 ft bgs)	250	150

Seattle DOT Mercer Parcels Site
Seattle, Washington

Lead Distribution in Soil

0202738-100 05/23

HALEY ALDRICH

Figure **2-2**

MBB-25	10/30/2020 5 ft el 53.63	10/30/2020 10 ft el 48.63	10/30/2020 15 ft el 43.63	10/30/2020 20 ft el 38.63	10/30/2020 25 ft el 33.63
cPAHs-TEQ	0.002 U	0.09	0.002 U	0.00041 U/0.00041 U	0.32

HMW-4IA	03/07/2019 7.5 ft el 51.2
cPAHs-TEQ	0.36

MBB-23	09/21/2020 5 ft el 42.18	09/21/2020 10 ft el 37.18	09/21/2020 15 ft el 32.18	09/21/2020 20 ft el 27.18	09/21/2020 25 ft el 22.18
cPAHs-TEQ	0.0097 U	2.4	0.0019 U	0.0019 U	0.0019 U

MBB-22	09/21/2020 5 ft el 37.05	09/21/2020 15 ft el 27.05	09/21/2020 20 ft el 22.05	09/21/2020 25 ft el 17.05
cPAHs-TEQ	0.42	0.0019 U	0.0019 U	0.0019 U

HMW-7IB	02/28/2020 5 ft el 53.69	02/28/2020 10 ft el 48.69	02/28/2020 15 ft el 43.69	02/28/2020 20 ft el 38.69	02/28/2020 25 ft el 33.69
cPAHs-TEQ	0.089	0.017	0.44	0.016	0.072

DEXTER AVE N

8TH AVE N

ROY ST

MERCER ST

HMW-17S EL 57.7
MBB-1 EL 55.0
MBB-16 EL 53.7
21417-MB2 EL 54.7
MBB-2 EL 55.5
MBB-4 EL 54.6
HMW-18S EL 57.5
MBB-3 EL 54.8
HMW-19S EL 58.4
MBB-24 EL 54.1
HMW-20S EL 53.6
MBB-18 EL 51.3
HMW-5IB EL 58.4
MBB-17 EL 54.9
MBB-19 EL 51.7
HMW-4IA EL 58.7
HMW-8IB EL 58.0
HMW-6IA EL 58.6
HMW-6IB EL 58.7
HMW-6D EL 58.6
21417-MB3 EL 58.6
MBB-25 EL 58.6
HMW-7IB EL 58.7
MBB-26 EL 58.8
MBGW-3 EL 47.8
MBB-20 EL 47.5
MBB-21 EL 47.6
MBGW-1 EL 40.0
MBB-23 EL 47.2
MBGW-2 EL 46.1
MBB-22 EL 42.0
MBB-14 EL 47.1
MBB-15 EL 37.7

N

0 20 40 80 Feet

cPAHs-TEQ IN SOIL (mg/kg)

- ≥ 1.90
- ≥ 0.38 TO 1.90
- ≥ 0.19 - 0.38
- ND/0 TO < 0.19
- NO DATA

SAMPLE DEPTH INTERVALS

- ≤ 5 FT BELOW GROUND SURFACE (BGS)
- 5 TO 10
- 10 TO 15
- 15 TO 20
- 20 TO 25
- > 25

- EXCAVATION LIMITS; TO BE EXCAVATED TO ELEVATIONS RANGING FROM 7.75 TO 1.75 FT
- PROPERTY BOUNDARY
- APPROXIMATE LIMTS OF 2H:1V SOIL BERM THAT WILL BE EXCAVATED LAST
- FORMER BROAD STREET 1958-2012

U = NON-DETECT AT DETECTION LIMIT AS INDICATED
J = ESTIMATED VALUE
/ = MULTIPLE RESULTS INDICATE THAT A FIELD DUPLICATE WAS TAKEN
cPAH = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON
cPAHs-TEQ = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON TOXIC EQUIVALENCY

SOME SAMPLING LOCATIONS MAY HAVE BEEN SLIGHTLY OFFSET ON THIS MAP TO REDUCE SYMBOL OVERLAP
RED TEXT INDICATES EXCEEDANCE OF DIRECT CONTACT OR PROTECTIVE OF GROUNDWATER SCREENING LEVELS
SCREENING LEVELS PROVIDED BY ECOLOGY (NOVEMBER 17, 2020)
CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM (mg/kg)
DEPTH IN FEET BELOW GROUND SURFACE (BGS)
ELEVATION IN FEET (NAVD 88)
EL. = GROUND SURFACE ELEVATION
SAMPLE DEPTHS AND ELEVATIONS REFER TO THE TOP OF THE SAMPLE
AERIAL IMAGERY SOURCE: EAGLEVIEW

SCREENING LEVELS FOR cPAHs-TEQ IN SOIL (mg/kg)		
ZONE	DIRECT CONTACT	PROTECTIVE OF GW
Vadose (0 to 25 ft bgs)	0.19	0.45
Saturated (>25 ft bgs)	0.19	0.022

Seattle DOT Mercer Parcels Site
Seattle, Washington

cPAH Distribution in Soil

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HALEY ALDRICH

Figure **2-3**

HMW-6D	03/02/2020 5 ft el 53.58	03/02/2020 10 ft el 48.58	03/02/2020 15 ft el 43.58	03/02/2020 25 ft el 33.58	03/02/2020 30 ft el 28.58
As	16.4	21.8	24.4	18	1.61/1.42

HMW-6IB	03/03/2020 5 ft el 53.67	03/03/2020 10 ft el 48.67	03/03/2020 15 ft el 43.67	03/03/2020 20 ft el 38.67	03/03/2020 25 ft el 33.67
As	13.4	15.9/14.9	22.2	25.6	2.23

MBPP-8	03/08/2019 15 ft el 42.52
As	16

MBB-5	03/02/2020 5 ft el 45.53	03/02/2020 10 ft el 40.53	03/02/2020 15 ft el 35.53	03/02/2020 20 ft el 30.53	03/02/2020 25 ft el 25.53
As	23.2	6.56	1.81	1.34	1.51

MBB-18	09/01/2020 5 ft el 46.33	09/01/2020 10 ft el 41.33	09/01/2020 15 ft el 36.33	09/01/2020 20 ft el 31.33
As	14.2	6.2	1.13	1.61

MBB-6	03/03/2020 5 ft el 45.33	03/03/2020 10 ft el 40.33	03/03/2020 15 ft el 35.33	03/03/2020 20 ft el 30.33	03/03/2020 25 ft el 25.33
As	21.2	9.18	1.84	2.08	1.6

MBB-8	02/26/2020 5 ft el 44.66	02/26/2020 10 ft el 39.66	02/26/2020 15 ft el 34.66	02/26/2020 20 ft el 29.66	02/26/2020 25 ft el 24.66
As	21.9	1.75	1.7/1.6	1.6	1.13

MBB-9	02/26/2020 5 ft el 42.55	02/26/2020 10 ft el 37.55	02/26/2020 15 ft el 32.55	02/26/2020 20 ft el 27.55	02/26/2020 25 ft el 22.55
As	9.58	1.94	1.72	1.7	1.27

21417-MB10	05/11/2017 28 ft el 10.08
As	7.75

HMW-9D	02/27/2020 5 ft el 50.32	02/27/2020 10 ft el 45.32	02/27/2020 15 ft el 40.32	02/27/2020 20 ft el 35.32	02/27/2020 25 ft el 30.32
As	1.78	1.38	15.3	2.55	1.46

HMW-9S	03/02/2020 5 ft el 50.39	03/02/2020 14 ft el 41.39	03/02/2020 17 ft el 38.39	03/02/2020 20 ft el 35.39	03/02/2020 25 ft el 30.39
As	2.64	14.5	17.7	1.3	1.36

HMW-9IB	02/28/2020 5 ft el 50.36	02/28/2020 13 ft el 42.36	02/28/2020 15 ft el 40.36	02/28/2020 20 ft el 35.36	02/28/2020 25 ft el 30.36
As	7.75	1.64	17.8	1.6	1.26

HMW-8IB	03/02/2020 5 ft el 52.97	03/02/2020 10 ft el 47.97	03/02/2020 15 ft el 42.97	03/02/2020 20 ft el 37.97	03/02/2020 25 ft el 32.97
As	21.4	19.5	17.1	4.86	1.12/1.06

HMW-7IB	02/28/2020 5 ft el 53.69	02/28/2020 10 ft el 48.69	02/28/2020 15 ft el 43.69	02/28/2020 20 ft el 38.69	02/28/2020 25 ft el 33.69
As	15.3	13.8	19.9	25.6	8.13/8.49

HMW-6IA	03/02/2020 5 ft el 53.65	03/02/2020 10 ft el 48.65	03/02/2020 15 ft el 43.65	03/02/2020 20 ft el 38.65	03/02/2020 30 ft el 28.65
As	15.6	13.6	18.6	18.3	3.1

DEXTER AVE N

8TH AVE N

ROY ST

MERCER ST

21417-MB1 EL 55.4
MBGW-12 EL 54.0
HMW-17S EL 57.7
MBB-1 EL 55.0
MBB-16 EL 53.7
MBGW-6 EL 52.5
MBB-2 EL 55.5
MBB-4 EL 54.6
HMW-3IA EL 55.0
MBB-3 EL 54.8
HMW-18S EL 57.5
HMW-19S EL 58.4
HMW-5IB EL 58.4
MBB-24 EL 54.1
HMW-20S EL 53.6
MBGW-7 EL 53.8
HMW-9S EL 55.4
HMW-9IA EL 55.3
HMW-9D EL 55.3
MBB-17 EL 54.9
MBPP-8 EL 57.5
HMW-9IB EL 55.4
MBB-19 EL 51.7
HMW-6IA EL 58.6
HMW-6IB EL 58.7
HMW-6D EL 58.6
HMW-8IB EL 58.0
MBGW-9 EL 56.8
21417-MB4 EL 57.2
HMW-7IB EL 58.7
MBGW-11 EL 57.5
MBGW-10 EL 55.3
MBPP-7 EL 49.8
MBB-7 EL 49.4
MBGW-5 EL 49.9
MBB-5 EL 50.5
MBB-6 EL 50.3
MBB-8 EL 49.7
MBB-18 EL 51.3
MBPP-5 EL 45.9
21417-MB6 EL 48.2
MBB-10 EL 49.7
MBB-20 EL 47.5
MBGW-3 EL 47.8
MBGW-4 EL 47.3
21417-MB8 EL 45.3
MBB-23 EL 47.2
MBGW-1 EL 40.0
MBGW-2 EL 46.1
21417-MB9 EL 39.0
MBB-9 EL 47.5
HMW-2IB EL 47.4
MBB-22 EL 42.0
MBPP-1 EL 45.3
MBPP-4 EL 48.3
21417-MB10 EL 38.1
MBPP-3 EL 45.9
21417-MB11 EL 39.0
MBGW-8 EL 47.1
MBB-21 EL 47.6
HMW-10D EL 48.2
HMW-10S EL 48.2
MBPP-2 EL 44.5
HMW-11S EL 41.5
MBGW-15 EL 40.9
HMW-11IB EL 39.7

0 20 40 80 Feet

N

ARSENIC IN SOIL (mg/kg)
- ≥ 14.6 TO 73
- ≥ 7.3 TO 14.6
- ND/0 TO < 7.3
- NO DATA

SAMPLE DEPTH INTERVALS
- ≤ 5 FT BELOW GROUND SURFACE (BGS)
- 5 TO 10
- 10 TO 15
- 15 TO 20
- 20 TO 25
- > 25

- EXCAVATION LIMITS; TO BE EXCAVATED TO ELEVATIONS RANGING FROM 7.75 TO 1.75 FT
- PROPERTY BOUNDARY
- APPROXIMATE LIMTS OF 2H:1V SOIL BERM THAT WILL BE EXCAVATED LAST
- FORMER BROAD STREET 1958-2012

SOME SAMPLING LOCATIONS MAY HAVE BEEN SLIGHTLY OFFSET ON THIS MAP TO REDUCE SYMBOL OVERLAP

RED TEXT INDICATES EXCEEDANCE OF PROTECTIVE OF GROUNDWATER SCREENING LEVELS ADJUSTED UP TO NATURAL BACKGROUND

SCREENING LEVELS PROVIDED BY ECOLOGY (NOVEMBER 17, 2020)

CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM (mg/kg)

DEPTH IN FEET BELOW GROUND SURFACE (BGS)

ELEVATION IN FEET (NAVD 88); EL. = GROUND SURFACE ELEVATION

U = NON-DETECT AT DETECTION LIMIT AS INDICATED
J = ESTIMATED VALUE
/ = MULTIPLE RESULTS INDICATE THAT A FIELD DUPLICATE WAS TAKEN

SAMPLE DEPTHS AND ELEVATIONS REFER TO THE TOP OF THE SAMPLE

AERIAL IMAGERY SOURCE: EAGLEVIEW

SCREENING LEVELS FOR ARSENIC IN SOIL (mg/kg) All levels adjusted up to natural background	
ZONE	PROTECTIVE OF GW
Vadose (0 to 25 ft bgs) and Saturated (>25 ft bgs)	7.3

Seattle DOT Mercer Parcels Site
Seattle, Washington

Arsenic Distribution in Soil

0202738-100 05/23

HALEY ALDRICH

Figure **2-4**

GIS FILE PATH: \\haleyaldrich.com\share\CF\Projects\135500\GIS\135500_Mercer_Mega_Block\Maps\2023_04_CMMP\135568_00MB_BB_SOIL_SMARTIES_CMMP.mxd - USER: dventer - LAST SAVED: 4/27/2023 12:25:35 PM

MBB-28	05/25/2022 45 ft el 8.88
PCE	0.56
TCE	0.04
cis-1,2-DCE	1.3
VC	0.19

MBB-29	05/25/2022 34 ft el 17.43	05/25/2022 39 ft el 12.43	05/25/2022 44 ft el 7.43
PCE	0.22	2	4.5
TCE	0.027	0.18	0.53
cis-1,2-DCE	0.072	0.86	0.66
VC	0.05 U	0.089	0.05 U

MW-346	05/19/2021 41.5 ft el 10.28	05/19/2021 47 ft el 4.78
PCE	4.43	1.98
TCE	0.415	0.228
cis-1,2-DCE	0.661	0.148
VC	0.124	0.0149

MBGW-5	03/11/2019 45 ft el 4.87
PCE	3.4
TCE	0.47
cis-1,2-DCE	0.26
VC	0.05 U

MBB-38	06/01/2022 34 ft el 15.75	06/01/2022 39 ft el 10.75	06/01/2022 44 ft el 5.75
PCE	0.55	0.43 J/0.085 J	1.2
TCE	0.056	0.08 J/0.02 UJ	0.2
cis-1,2-DCE	0.05 U	0.05 U/0.05 U	0.064
VC	0.05 U	0.05 U/0.05 U	0.05 U

MBB-41	05/24/2022 29 ft el 18.84
PCE	0.03
TCE	0.02 U
cis-1,2-DCE	0.05 U
VC	0.05 U

21417-MB8	05/11/2017 27 ft el 18.28
PCE	0.0238
TCE	0.0152 U
cis-1,2-DCE	0.0152 U
VC	0.00152 U

MBB-40	06/02/2022 39 ft el 8.96
PCE	0.19/0.18
TCE	0.029/0.03
cis-1,2-DCE	0.05 U/0.05 U
VC	0.05 U/0.05 U

MW-345	05/20/2021 41 ft el 11.85	05/20/2021 47 ft el 5.85
PCE	0.275	0.0228 J/0.00622 J
TCE	0.0273	0.00257/0.00105 J
cis-1,2-DCE	0.984	0.0973/0.122
VC	0.189	0.181/0.136

MBGW-3	03/07/2019 25 ft el 22.77
PCE	0.074
TCE	0.02 U
cis-1,2-DCE	0.05 U
VC	0.05 U

MBB-23	09/21/2020 30 ft el 17.18
PCE	0.025 U
TCE	0.03 U
cis-1,2-DCE	0.014
VC	0.005 U

MBB-30	05/25/2022 44 ft el 10.1	05/25/2022 46 ft el 8.1
PCE	0.17	0.043
TCE	0.09	0.033
cis-1,2-DCE	0.52	0.05 U
VC	0.53	0.054

MBB-44	05/23/2022 34 ft el 12.2
PCE	0.12
TCE	0.031
cis-1,2-DCE	0.1
VC	0.05 U

IWS-03	03/21/2022 39 ft el 13.3
PCE	0.511 J-
TCE	0.736
cis-1,2-DCE	2.99 J-
VC	0.479

MBB-35	05/31/2022 39 ft el 13.49
PCE	0.22
TCE	0.039
cis-1,2-DCE	0.14
VC	0.05 U

IWS-02	03/22/2022 41.5 ft el 11.79
PCE	0.453 J-
TCE	0.0164
cis-1,2-DCE	1.53
VC	0.887

IWS-05	03/16/2022 46 ft el 8.69
PCE	0.28
TCE	0.0215
cis-1,2-DCE	0.913
VC	0.0948

IWS-01	03/16/2022 48.5 ft el 7.15
PCE	0.294
TCE	0.155
cis-1,2-DCE	1.77
VC	0.408

IWS-06	03/15/2022 45.5 ft el 8.72
PCE	6.06
TCE	0.444
cis-1,2-DCE	12.6
VC	0.888

IWS-09	03/24/2022 47 ft el 7.97
PCE	1.54
TCE	0.911
cis-1,2-DCE	5.05
VC	0.542

MW-349	05/17/2021 49 ft el 6.84
PCE	1.05
TCE	0.209
cis-1,2-DCE	0.572
VC	0.0752

IWS-10	03/23/2022 46 ft el 8.28
PCE	8.75
TCE	0.648
cis-1,2-DCE	1.93
VC	0.351

MW-348	05/18/2021 41 ft el 12.96
PCE	0.749
TCE	0.249
cis-1,2-DCE	6.55
VC	0.569

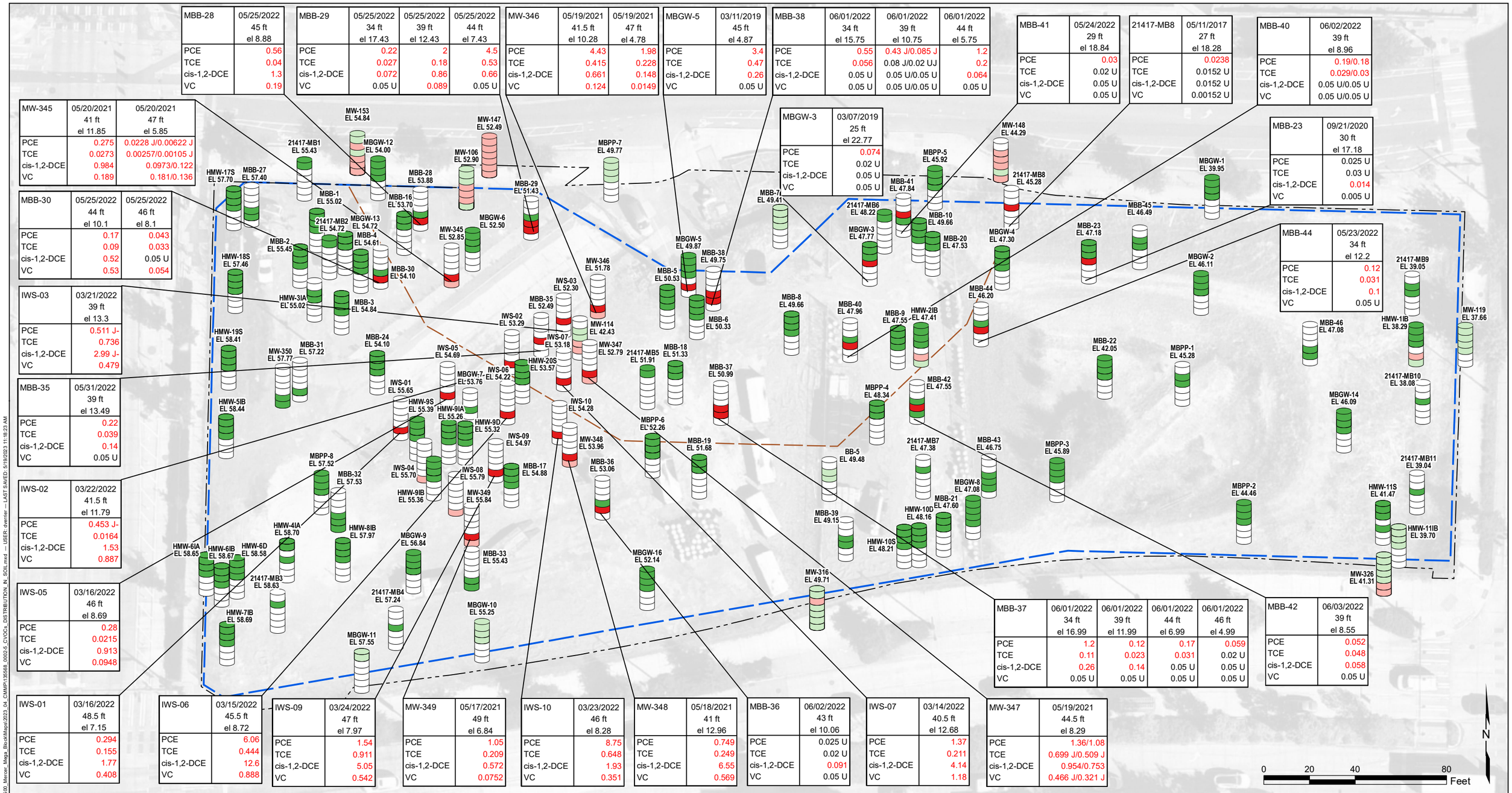
MBB-36	06/02/2022 43 ft el 10.06
PCE	0.025 U
TCE	0.02 U
cis-1,2-DCE	0.091
VC	0.05 U

IWS-07	03/14/2022 40.5 ft el 12.68
PCE	1.37
TCE	0.211
cis-1,2-DCE	4.14
VC	1.18

MW-347	05/19/2021 44.5 ft el 8.29
PCE	1.36/1.08
TCE	0.699 J/0.509 J
cis-1,2-DCE	0.954/0.753
VC	0.466 J/0.321 J

MBB-37	06/01/2022 34 ft el 16.99	06/01/2022 39 ft el 11.99	06/01/2022 44 ft el 6.99	06/01/2022 46 ft el 4.99
PCE	1.2	0.12	0.17	0.059
TCE	0.11	0.023	0.031	0.02 U
cis-1,2-DCE	0.26	0.14	0.05 U	0.05 U
VC	0.05 U	0.05 U	0.05 U	0.05 U

MBB-42	06/03/2022 39 ft el 8.55
PCE	0.052
TCE	0.048
cis-1,2-DCE	0.058
VC	0.05 U



CVOCs in SOIL

- CVOC DETECTION WITHIN EXCAVATION LIMITS
- CVOC NON-DETECT WITHIN EXCAVATION LIMITS
- CVOC DETECTION, PRE-2017 AND/OR OUTSIDE EXCAVATION LIMITS
- CVOC NON-DETECT, PRE-2017 AND/OR OUTSIDE EXCAVATION LIMITS
- NO DATA

SAMPLE DEPTH INTERVALS

- ≤ 10 FT BELOW GROUND SURFACE (BGS)
- 10 TO 20
- 20 TO 30
- 30 TO 40
- 40 TO 50
- > 50

- EXCAVATION LIMITS; TO BE EXCAVATED TO ELEVATIONS RANGING FROM 7.75 TO 1.75 FT
- PROPERTY BOUNDARY
- APPROXIMATE LIMTS OF 2H:1V SOIL BERM THAT WILL BE EXCAVATED LAST

CVOC = CHLORINATED VOLATILE ORGANIC COMPOUND
U = NON-DETECT AT DETECTION LIMIT AS INDICATED
J = ESTIMATED VALUE
J- = ESTIMATED VALUE, BUT THE RESULT MAY BE BIASED LOW
/ = MULTIPLE RESULTS INDICATE THAT A FIELD DUPLICATE WAS TAKEN

CVOCs CONSIST OF:
PCE = TETRACHLOROETHENE
TCE = TRICHLOROETHENE
cis-1,2-DCE = cis-1,2-DICHLOROETHENE
VC = VINYL CHLORIDE

SOME SAMPLING LOCATIONS HAVE BEEN SLIGHTLY OFFSET ON THIS MAP TO REDUCE SYMBOL OVERLAP

RED TEXT INDICATES DETECTION OF CONSTITUENT(S)

DATA BOXES ARE ONLY SHOWN FOR SOIL SAMPLES WITH DETECTIONS OF CVOCs WITHIN EXCAVATION LIMITS. REFER TO THE REMEDIAL INVESTIGATION REPORT FOR ADDITIONAL SAMPLE RESULTS

CONCENTRATIONS IN MILLIGRAMS PER KILOGRAM (mg/kg)

DEPTH IN FEET BELOW GROUND SURFACE (BGS)

ELEVATION IN FEET (NAVD 88); EL = GROUND SURFACE ELEVATION

SAMPLE DEPTHS AND ELEVATIONS REFER TO THE TOP OF THE SAMPLE

EXCAVATION BOUNDARY SOURCE: DIGITIZED FROM PLAN TITLED "ARE - MERCER BLOCKS," NBBJ, 11 NOVEMBER 2020

AERIAL IMAGERY SOURCE: EAGLEVIEW

Seattle DOT Mercer Parcels
Seattle, Washington

CVOCs Distribution in Soil

0202738-100 05/23

HALEY ALDRICH

Figure **2-5**

APPENDIX B
Acceptable Ambient Air Concentrations

TABLE B-1
DERIVATION OF ACCEPTABLE AMBIENT AIR CONCENTRATIONS
PERIMETER AIR MONITORING PLAN
SEATTLE DOT MERCER PARCELS SITE
SEATTLE, WASHINGTON

Property-Specific Remedial Action Parameters		Value	Basis
Exposure Frequency (dy/yr)	$EF_{commercial}$	240	property-specific assumption (6 days per week for approximately 40 weeks)
Exposure $Duration_{noncancer}$ (yrs)	$ED_{commercial}$	1	default assumption for noncancer hazard averaging time
Fraction of Day (unitless)	$FD_{commercial}$	0.50	property-specific assumption = (12 hrs / 24 hrs)
Target Hazard $Quotient_{noncancer}$	THQ	1	default assumption
Target $Risk_{carcinogenic}$	TR	1.0E-06	default assumption

COPC	Inhalation Cancer Potency Factor		Inhalation Reference Dose		Carcinogenic Risk-Based Concentration ($\mu g/m^3$)	Noncarcinogenic Risk-Based Concentration ($\mu g/m^3$)	Acceptable Ambient Air Concentration (AAC)	
	CPFi kg-day/mg	Basis	RfDi mg/kg-day	Basis			AAC ($\mu g/m^3$)	Basis
Polycyclic Aromatic Hydrocarbons								
cPAHs	2.10E+00	IRIS	5.71E-07	IRIS	0.76	0.0061	0.0061	nc
Volatile Organic Compounds								
cis-1,2-Dichloroethene (DCE)	NP	--	1.14E-02	PPRTV	--	121	121	nc
Tetrachloroethene (PCE)	9.10E-04	IRIS	1.14E-02	IRIS	877	121	121	nc
Trichloroethene (TCE)	1.44E-02	IRIS	5.71E-04	IRIS	9	6.1	6.1	nc
Vinyl Chloride	3.08E-02	IRIS	2.86E-02	IRIS	26	304	26	c
Metals								
Arsenic	1.51E+01	IRIS	4.29E-06	Cal EPA	0.053	0.046	0.046	nc

Calculation of Acceptable Ambient Concentrations (AACs)

Noncarcinogenic

$$RBC_{nc}\ (\mu g/m^3) = \frac{\text{RfDi (mg/Kg-day) * ABW (70 kg) * UCF (1000 µg/mg) * THQ * ATnc (365 dys/yr * 1 yr)}}{\text{BR (20 } m^3\text{/day) *ABSi (1) * EF (200 days/yr) * ED (1 yr) * FD (0.5)}}$$

Carcinogenic

$$RBC_{c}\ (\mu g/m^3) = \frac{\text{TR * ABW (70 kg) * ATc (365 dys/yr * 75 yr) * UCF (1000 µg/mg)}}{\text{CPFi (kg-day/mg) * BR (20 } m^3\text{/day) * ABSi (1)* EF (200 days/yr) * ED (1 yr) * FD (0.5)}}$$

Carcinogenic (TCE)

$$RBC_{c\text{-}TCE}\ (\mu g/m^3) = \frac{\text{TR * ATc (365 days/yr * 75 yr) * UCF (1000 µg/mg)}}{\text{EF (200 days/yr) * FD (0.5) * CPFi (kg-day/mg) * [(CAF (0.756) * ED (1 yr) * BR (20 } m^3\text{/day)/ABW (70 kg)) + (ADAF (1) * MAF (0.244) * ED (1yr) * BR (20 } m^3\text{/day)/ABW (70 kg))]}$$

ABBREVIATIONS:

$\mu g/m^3$ = Micrograms per cubic meter
ADAF = Age-dependent adjustment factor. In accordance with current Ecology Guidance (Ecology, 2024), cancer-based risk-based screening levels for these chemicals utilize ADAFs which account for early life susceptibility. As noted in the text, the nearest receptors to the Site are adult commercial workers. The ADAF value of 1, corresponding to an adult receptor 16 years of age or older, is applied in calculating cancer-based AAC for TCE.
AT = Averaging time
c = Carcinogenic
CAF = Carginogenic adjustment factor
CF = Conversion factor
COPC = Constituent of potential concern
CPFi = Inhalation cancer potency factor
EC = Equivalent carbon
ED = Exposure duration
hr(s) = Hour(s)
MAF = Mutagenic adjustment factor
mg/kg-day = Milligrams per kilograms per day
NA = Not applicable. The acceptable ambient air concentration for lead is based on the NAAQS.
nc = Noncarcinogenic
NP = Not published
RBC = Risk-based concentration
RfD_i = Inhalation reference dose

SOURCES:

Inhalation cancer potency factors (to evaluate potential carcinogenic risks) and reference doses (to evaluate potential noncarcinogenic hazards) were selected from following sources as presented in the table:
Cal EPA = California Environmental Protection Agency Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database. Available at: https://oehha.ca.gov/chemicals
Ecology = Washington State Department of Ecology. Per guidance for development of generic TPH screening levels, the reference dose for equivalent carbon (EC) 8-12 aliphatic fraction was used for GRO (Ecology, 2022)
IRIS = United States Environmental Protection Agency (USEPA). 2023. Integrated Risk Information System. Available at: https://www.epa.gov/iris.
PPRTV = Provisional Peer Reviewed Toxicity Values, as presented in: USEPA. 2023. Regional Screening Levels. May.
NP = Not published

REFERENCES:

Ecology. 2024. Cleanup levels and risk calculation (CLARC) Data Tables and Other Technical Information. February 2024 revision, available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables
USEPA. 2023. Regional Screeening Levels for Chemical Contaminants at Superfund Sites. May. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

TABLE B-2
SOIL TO OUTDOOR AIR VOLATILIZATION FACTORS FOR VOLATILE COPCS IN ON-SITE SOIL
PERIMETER AIR MONITORING PLAN
SEATTLE DOT MERCER PARCELS SITE
SEATTLE, WASHINGTON

Chemical	Diffusivity in Air (cm^2/s)	Diffusivity in water (cm^2/s)	Soil Organic Carbon Partition Coefficient (cm^3/g)	Henry's Law Constant (Unitless)	Maximum Soil Concentration (mg/kg)	Infinite Source Volatization Factor (m^3/kg)	Maximum Outdoor Air Concentration (mg/m^3)	Acceptable Ambient Air Concentration (mg/m^3)
Volatile Organic Compounds								
cis-1,2-Dichloroethene	8.8E-02	1.1E-05	4.0E+01	9.3E-02	12.6	9.5E+03	1.3E-03	1.2E-01
Tetrachloroethene (PCE)	5.0E-02	9.5E-06	9.5E+01	3.5E-01	8.75	1.4E+04	6.4E-04	1.2E-01
Trichloroethene	6.9E-02	1.0E-05	6.1E+01	2.1E-01	0.911	1.1E+04	8.0E-05	6.1E-03
Vinyl chloride	1.1E-01	1.2E-05	2.2E+01	7.9E-01	1.18	8.1E+03	1.5E-04	2.6E-02

Abbreviations:

cm^2/s = square centimetes per second.
cm^3/g = cubic centimeters per gram.
m^3/kg = cubic meters per kilogram.
mg/m^3 = milligrams per cubic meter.

TABLE B-3
SOIL TO OUTDOOR AIR VOLATILIZATION FACTOR EQUATIONS AND SAMPLE CALCULATION
PERIMETER AIR MONITORING PLAN
SEATTLE DOT MERCER PARCELS SITE
SEATTLE, WASHINGTON

Outdoor Air Volatilization Factor (VF) Calculated for Vinyl Chloride, (USEPA, 2002, Equation 4-8)
Offsite Receptor Scenario

$$VF = \frac{Q/C_{vol} \times (3.14 \times D_A \times T)^{1/2} \times 10^{-4}\ (m^2/cm^2)}{2 \times \rho_b \times D_A} = \mathbf{8.1E+03}\ m^3/kg$$

where:

$$D_A = \frac{[(\theta_a^{3.33} D_i H') + (\theta_w^{3.33} D_w)]/\eta^2}{\rho_b K_d + \theta_w + \theta_a H'_{TS}}$$

and:

Q/C_{vol}	62.62	$(g/m^2\text{-}s) / (kg/m^3)$	dispersion factor (calculated, see Table E-4)
D_A	5.3E-06	cm^2/s	apparent diffusivity (calculated using equation cited above)
T	3.2E+07	s	exposure interval (based on exposure duration of 1 year)
ρ_b	1.66	g/cm^3	dry soil bulk density (default, see Table E-1; USEPA 2017)
η	0.375	cm^3_{pore}/cm^3_{soil}	total soil porosity (default, see Table E-1; USEPA 2017)
θ_a	0.0038	cm^3_{air}/cm^3_{soil}	air-filled soil porosity (calculated, n-θ_w)
D_i	1.1E-01	cm^2/s	diffusivity in air (chemical-specific, see Table 7 of the HHRA)
θ_w	0.371	cm^3_{water}/cm^3_{soil}	water-filled soil porosity (Site-specific for saturated soil)
D_w	1.2E-05	cm^2/s	diffusivity in water (chemical-specific, see Table B-2)
$K_d = K_{oc} \times f_{oc}$	1.3E-01	cm^3/g	soil-water partition coefficient (calculated using equation provided)
K_{oc}	22	cm^3/g	soil organic carbon partition coefficient (chemical-specific, see Table B-2)
f_{oc}	0.0060	g/g	fraction organic carbon in soil (default; USEPA 2002)
H'_{TS}	7.9E-01	unitless	Henry's Law Constant (chemical-specific, see Table B-2)

Abbreviations:

cm^2/s = Square centimeters per second
cm^3_{air}/cm^3_{soil} = Cubic centimeters air per cubic centimeters soil
cm^3_{pore}/cm^3_{soil} = Cubic centimeters pore space per cubic centimeters soil
cm^3_{water}/cm^3_{soil} = Cubic centimeters water per cubic centimeters soil
cm^3/g = Cubic centimeters per gram
g/cm^3 = Grams per cubic centimeter
g/g = Grams per gram
$(g/m^2\text{-}s) / (kg/m^3)$ = Grams per square meter per second per kilograms per cubic meter
m^3/kg = Cubic meters per kilogram
s = Seconds

References:

United States Environmental Protection Agency (USEPA). 1996. *Soil Screening Guidance: User's Guide* . Office of Solid Waste and Emergency Response. EPA/540/R-96/018. July.

United States Environmental Protection Agency (USEPA). 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. Washington, D.C., December.

U.S. Environmental Protection Agency (USEPA). 2017. Documentation for EPA's Implementation of the Johnson and Ettinger Model to Evaluated Site Specific Vapor Intrusion into Buildings. Version 6.0. Washington, D.C. September.

TABLE B-4

DISPERSION FACTOR CALCULATION FOR VOLATILE COMPOUNDS

PERIMETER AIR MONITORING PLAN

SEATTLE DOT MERCER PARCELS SITE

SEATTLE, WASHINGTON

Site-specific Dispersion Factor for Volatiles (USEPA 2002, Equation D-1)

$Q/C_{vol} = A \exp[(\ln A_{site} - B)^2 (1/C)]$ = **62.62** $(g/m^2\text{-}s) / (kg/m^3)$

where:

A_{site}	2.35	acres	areal extent of the Source
Location	Seattle	--	General location (USEPA 2002)
A	14.2253	--	constant, default value presented in Exhibit D-3 (USEPA, 2002)
B	18.8366	--	constant, default value presented in Exhibit D-3 (USEPA, 2002)
C	218.1845	--	constant, default value presented in Exhibit D-3 (USEPA, 2002)

References:

USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. Washington, D.C., December.

TABLE B-5

COMPARISON OF PM_{10} ACTION LEVEL AND ACCEPTABLE AMBIENT AIR CONCENTRATIONS FOR NON-VOLATILE COPCS IN SOIL

PERIMETER AIR MONITORING PLAN
SEATTLE DOT MERCER PARCELS SITE
SEATTLE, WASHINGTON

COPC	Maximum Soil Concentration (mg/kg)	Exposure Point Concentration in Soil (mg/kg)	Exposure Point Concentration as PM_{10} [a] (mg/m^3)	Residential Health-Based AAC (mg/m^3)	Does the Potential Air Concentration Exceed the AAC?
Polycyclic Aromatic Hydrocarbons					
cPAHs	2.4	2.4	3.6E-07	6.1E-06	No
Metals					
Arsenic	26	26	3.8E-06	4.6E-05	No

Calculation of Maximum Predicted Concentration in Air

$C_{air} = (\text{Action Level}_{PM10} \times C_{soil}) \times (1x10^{-6}\ kg/mg)$

where:

C_{air} = High-end predicted concentration in air (mg/m^3)
$\text{Action Level}_{PM10}$ = Maximum particulate concentration action level (0.150 mg/m^3)
C_{soil} = Maximum chemical-specific concentration detected in soil (mg/kg)

ABBREVIATIONS:

AAC = Acceptable ambient air concentration
COPC = Chemical of potential concern
kg/mg = Kilograms per milligram
mg/kg = Milligrams per kilogram
mg/m^3 = Milligrams per cubic meter

NOTES:

[a] The maximum concentration detected in soil samples collected from within the excavation areas was selected as the exposure point concentration (EPC) in soil and used as a conservative estimate of the high-end concentration of COPCs as PM_{10}. Analytical results for soil samples collected from within the planned excavation areas of the Property are presented in the Engineering Design Report (Haley & Aldrich, 2023).

REFERENCES:

Haley & Aldrich, Inc. 2023. Engineering Design Report, Seattle DOT Mercer Parcels Site, 800 Mercer Street, Seattle, Washington. September.