# REMEDIAL INVESTIGATION WORK PLAN

## Barbee Mill Site

Prepared for: Barbee Mill Co., Inc.

Project No. 050004 • August 5, 2021 Final

Aspect CONSULTING

earth + water

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Aspect Consulting, LLC




8/5/2021

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# Acronyms

| | |
|---|---|
| AO | Agreed Order |
| Aspect | Aspect Consulting, LLC |
| Barbee | Barbee Mill Co., Inc. |
| COC | contaminant of concern |
| COPC | contaminant of potential concern |
| CSM | conceptual site model |
| DNAPL | dense non-aqueous phase liquids |
| EPA | U.S. Environmental Protection Agency |
| FS | Feasibility Study |
| FSP | Field Sampling Plan |
| HASP | Health and Safety Plans |
| IDP | Inadvertent Discovery Plan |
| mg/k | milligrams per kilogram |
| µg/L | micrograms per liter |
| MTCA | Model Toxics Control Act |
| PAH | polycyclic aromatic hydrocarbons |
| PAZ | passive attenuation zone |
| PCB | polychlorinated biphenyls |
| PQL | practical quantitation limits |
| QAPP | Quality Assurance Project Plan |
| PCB | RAOs Remedial Action Objectives |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| SAP | Sampling and Analysis Plan |
| SVOC | semivolatile organic compounds |
| TPH | total petroleum hydrocarbon |

# 1 Introduction

## 1.1 Purpose

This Remedial Investigation Work Plan (RI Work Plan) has been prepared by Aspect Consulting, LLC (Aspect) and Geosyntec Consultants (Geosyntec) on behalf of the Barbee Mill Co., Inc. (Barbee). Barbee is conducting a RI and Feasibility Study (FS) for the Barbee Mill Site (the Site) under an Agreed Order (AO; No. DE 5396), including the first and second amendments) with the Washington State Department of Ecology (Ecology). The Site includes property formerly owned by Barbee and adjacent properties that have been impacted by contaminants historically released during former Barbee operations.

A Draft RI Report (Aspect, 2019) was completed for the Site in May 2019. Ecology provided preliminary comments on the sediment portion of the report on June 14, 2019, and preliminary comments on the upland portion of the report on May 27, 2020. These comments, and responses to the comments, are provided in Appendix A.

In its comments for both upland and sediment, Ecology asked for updated screening levels and a revised list of the contaminants of potential concern (COPCs) based on the updated screening levels. Aspect, Geosyntec and Ecology met to discuss and finalize the updated screening levels and COPC screening process. This Work Plan summarizes the updated Site screening levels and COPC screening process, identifies data gaps based on these updates, and describes investigation activities proposed to address data gaps.

This Work Plan does not include Site information that has not changed significantly from the Draft RI Report (e.g., the environmental setting including topography, geology, and hydrogeology). Please refer to the Draft RI Report for additional background and supporting information as needed.

Information generated from implementation of this Work Plan will be presented in an RI Data Report and a Revised Draft RI Report for Ecology review.

## 1.2 Report Organization

The main body of this Work Plan includes the updated COPC screening process, data gaps identification, and planned field activities for the upland (i.e., soil and groundwater). The updated COPC screening, data gaps, and field activities for sediment are included as a Sediment Remedial Investigation Work Plan (SRI Work Plan) in Appendix B. This report is organized as follows:

- **Section 1** describes the purpose and organization of this Work Plan.
- **Section 2** contains background information about the Site.
- **Section 3** presents updated screening levels, the process for identifying COPCs, and resulting COPCs for the Site.

- **Section 4** identifies data gaps based on the updated screening levels and COPC screening process and describes the data collection activities needed to fill in these gaps.
- **Section 5** presents the schedule and reporting of data gaps activities.
- **Section 6** provides references used in the preparation of this report.

The text is followed by tables, figures, and appendices that support the text and illustrate the data gaps:

- Appendix A – Ecology's preliminary comments on the Draft RI Report, responses to those comments, and the Ecology-provided workbook for preliminary cleanup levels (PCULs).
- Appendix B – The SRI Work Plan, including a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) for sediment investigation activities.
- Appendix C – Quendall Terminals RI Groundwater Data.
- Appendix D – Terrestrial Ecological Evaluation.
- Appendix E – A SAP, including a Field Sampling Plan (FSP) and QAPP, for upland investigation activities.
- Appendix F – Health and Safety Plans (HASPs) for work conducted by Aspect and Geosyntec.
- Appendix G – An Inadvertent Discovery Plan (IDP) to be kept on-site during all field activities.

# 2 Background

## 2.1 Site Description

The Site is generally located at 4101 Lake Washington Blvd N in Renton, Washington (Figure 1). The Site includes portions of the following properties:

- The former Barbee property
- The southwestern portion of the Quendall Terminals property located to the north of the former Barbee property
- State-owned land located in Lake Washington to the west of the former Barbee property

Background information for the former Barbee and the Quendall Terminals properties is provided below.

### *2.1.1 Former Barbee Property*

May Creek runs west through the former Barbee property and discharges to Lake Washington. Barbee owned and operated a sawmill on the portion of the property north of May Creek until the early 2000s. At that time, there were 11 major buildings/features on the property. In 2006, the property was purchased by Conner Homes. Conner Homes subdivided and developed the property into 114 residential lots containing both duplex and single-family homes. The property is now owned by individual lot owners and the City of Renton (rights-of-way).

Chemicals released from the former Barbee operations impacted soil, groundwater, and sediments on the former Barbee property, a portion of the Quendall Terminals property adjacent to the north, and state-owned aquatic lands of Lake Washington adjacent to the west. Barbee completed the following remedial activities on the former Barbee property between 2000 and 2009 under Ecology's Voluntary Cleanup Program:

- Removal of 6,000 cubic yards of bark, wood debris, and associated sediment in an area adjacent to the former Barbee property (Hart Crowser, 2000) and dredging of 20,000 cubic yards of sediment from the Lake Washington shoreline adjacent to the former Barbee property (Anchor 2003). See Appendix B for removal footprints. Dredged materials were characterized and segregated into clean and contaminated material, with the contaminated material disposed of off-site at a permitted facility (Hart Crowser, 2000). Clean material was determined suitable for unrestricted use (Ecology, 2003) and was reused to amend topsoil as part of the Conner Homes development.
- Removal of 54,215 tons of arsenic-impacted soil (Aspect, 2006a) and removal of 623 tons of total petroleum hydrocarbon (TPH) and pentachlorophenol-contaminated soil (Aspect, 2006b). See Figure 3 for removal footprints. Contaminated soil was disposed of off-site at the Roosevelt Regional Landfill in Roosevelt, Washington.

- Installation of a passive attenuation zone (PAZ) consisting of a 690-foot-long, 10- to 35-foot-wide trench containing a mixture of granular iron filings and sand to intercept the impacted groundwater plume (Aspect, 2007). See Figure 3 for the PAZ footprint.
- Installation and operation of a pump-and-treat system with eight groundwater extraction wells. The system was started on June 3, 2009.
- Placement of an environmental covenant on the former Barbee property to prevent exposure to contaminated media and protect remedial action components.

Site development included placing approximately 4 to 6 feet of clean fill and installing roads, sidewalks, slab-on-grade residential structures, and a lined stormwater detention pond.

The AO was signed on December 1, 2009. Barbee completed the following remedial activities on the former Barbee property under the AO:

- Operation of the pump-and-treat system until August 5, 2011. The system removed 15,700,000 gallons of groundwater containing an estimated 37 pounds of arsenic (Aspect, 2010a).

### 2.1.2 Quendall Terminals Property

The Quendall Terminals property, located to the north of the former Barbee property, was historically used for creosote manufacturing. Contamination from these operations, including dense non-aqueous phase liquids (DNAPL) creosote and coal tar, resulted in the Quendall Terminals superfund site which is being remediated under the direction of the United States Environmental Protection Agency (EPA). The Quendall Terminals RI (Anchor and Aspect, 2012) was completed in 2012 and the Feasibility Study was completed in 2016 (Aspect and Arcadis, 2016). The Record of Decision (ROD) was issued in July 2020 and divided the site into two operable units: OU-1 (upland) and OU-2 (sediment). The Quendall ROD identified the following remedial elements for OU-1:

- *In situ* smoldering combustion to treat upland DNAPL source material causing groundwater contamination
- In situ solidification to stabilize soil containing remaining source material
- A soil cap
- Institutional controls and monitoring

The Quendall ROD identified the following remedial elements for OU-2:

- Dredging of sediments containing DNAPL source material
- Placing an engineered sand cap in sediments within the groundwater discharge area
- Implementing enhanced natural recovery in remaining contaminated sediment areas
- Institutional controls and monitoring

Pre-design activities for the Quendall ROD are underway.

At the time of the creosote manufacturing operations, the May Creek channel was located on the Quendall Terminals property, creating a separation between the northern two-thirds and southern third of the property (Anchor and Aspect, 2012). Creosote operations were located north of the former May Creek channel and as a result, contamination on the Quendall Terminals property is primarily in the central and northern areas. However, releases of creosote to the former May Creek channel have resulted in a groundwater plume of creosote-related contaminants that overlaps the northern portion of the Barbee Site. Figures from the Quendall Terminals RI Report showing groundwater conditions, including groundwater flow direction and occurrences of arsenic, naphthalene, and cPAHs, are provided in Appendix C. The relationship between contamination from the Quendall Terminals superfund site and the Barbee Site is discussed in Section 4.

# 3 Contaminants of Potential Concern and Screening Levels

This section presents the COPCs in soil and groundwater at the Site and explains how they were identified, including the development of appropriate Site screening levels. Sediment screening for COPCs is provided in Appendix B. This Section also summarizes the extent of COPCs based on historical and current data.

## 3.1 Site Screening Levels

Site screening levels consider the following pathways:

- Groundwater;
    - Human ingestion (drinking water);
    - Protection of surface water (via discharge to Lake Washington);
    - Protection of indoor air (via vapor intrusion); and
    - Protection of sediment (via sorption onto Lake Washington sediments).
- Soil;
    - Direct contact (ingestion);
    - Protection of groundwater (including surface water and sediment receptors).

For protection of terrestrial plants and/or animals, the Site qualifies for an exemption under WAC 173-340-7491(1) (see Appendix D). In addition, the Site was covered with clean fill as part of development and the soil erosion to sediment pathway is not complete. Therefore, screening levels for these pathways were not identified. A conceptual site model illustrating potentially complete pathways for the Site as it currently exists is provided on Figure 2. Potentially applicable Site screening levels were identified using Ecology's PCUL Workbook dated May 6, 2020 (provided in Appendix A). Screening levels are adjusted to natural background levels as appropriate.

## 3.2 Identification of COPCs

COPCs were identified as follows:

- Preliminary COPCs for soil and groundwater were identified based on previous Site use (see Section 2) and comparing all historical Site investigation data to the lowest potentially applicable screening level (initial screening level) for soil and groundwater. Based on this evaluation, the following contaminants were identified as either detected above initial screening levels in at least one medium or were not detected, but all reporting limits were above initial screening levels (see Table 1):
    - **Metals:** Antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, selenium, thallium, and zinc.

  - **Petroleum Hydrocarbons:** Diesel- and oil-range petroleum hydrocarbons (TPH-D and TPH-O).
  - **Volatile Organic Compounds (VOCs):** Benzene, ethylbenzene, 1,1,2-trichloroethane, 1,1,2,2-tetracholoroethane, 1,2,3-trichloropropane, 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 1,2-dibromoethane, 1,2-dichloropropane, acrolein, acrylonitrile, bromodichloromethane, carbon tetrachloride, cis-1,2-dichloroethane, dibromochloromethane, trans-1,2-dichloroethene, trans-1,3-dichloropropane, vinyl chloride
  - **SVOCs:** Carcinogenic PAHs (cPAHs), acenapthene, pyrene, fluorene, fluoranthene, 2,4,6-trichlorophenol, 2,4-dichlorophenol, phenol, hexachlorobutadiene, pentachlorophenol (PCP), dibenzofuran.
  - **PCBs.**

- Contaminants exceeding the lowest potentially applicable screening level were further evaluated based on:
  - Empirical data to determine whether a cross-media pathway is complete, or if an adjusted screening level is appropriate.[1]
  - Statistical evaluation of the data set relative to the screening level including the frequency of detection and compliance with the MTCA 3-part rule.[2]
  - For non-detected analytes, comparison of reporting limits to currently available practical quantitation limits (PQLs) and consideration of potential historical use.

Table 2 presents the results from this further evaluation. Specifically:

- Nine of the chemicals identified as preliminary COPCs in soil were not identified as preliminary COPCs in groundwater, because maximum detected concentrations in groundwater were below screening levels or they were never detected with reporting limits below screening levels. The soil screening levels for these chemicals were modified by eliminating the leaching pathway and focusing on direct contact. In each case, the maximum soil concentration was below the soil contact screening level, so these chemicals screened out as soil COPCs. These chemicals are ethylbenzene, chromium, lead, nickel,

[1] Much of the former Barbee property prior to development was covered with pavement or buildings, which can limit leaching from unsaturated soils. However, the water table at the Site is very shallow and the majority of soil samples exceeding potential screening levels based on the soil-to-groundwater leaching pathway were in the saturated zone. Therefore, the historical data set is considered adequate to empirically evaluate the leaching pathway.

[2] The 3-part rule requires: 1) the upper one sided ninety-five percent confidence limit on the true mean shall be less than the screening level; 2) no single sample concentration shall be greater than two times the screening level; and 3) less than ten percent of the sample concentrations shall exceed the screening level.

silver, dibenzofuran, 2,4,5-trichlorophenol, 2,4-dichlorophenol, and benzo(g,h,i)perylene.

- Although benzene was never detected in groundwater, it was identified as a preliminary groundwater COPC because all of the reporting limits exceeded the screening level. However, the reporting limits are consistent with the best practical quantitation limits (PQLs) achievable today, so benzene was screened out as a groundwater COPC. The maximum soil concentration was below the soil contact screening level, so benzene was also screened out as a soil COPC.
- The maximum total concentration of copper in groundwater exceeded the ground water screening level, but the maximum dissolved concentration did not. The dissolved concentrations are considered more representative of ground water conditions, so copper was screened out as a ground water COPC. The maximum soil concentration was below the soil contact screening level, so copper was also screened out as a soil COPC.
- PCP was identified as a preliminary groundwater COPC based on a single detection above the screening level. However, the single detection was below currently achievable PQLs, so PCP was eliminated as a ground water COPC. It remains a soil COPC because there are detected concentrations above the soil contact screening level.
- A total of 20 chemicals were never detected in groundwater with reporting limits above their screening levels. These chemicals are cadmium, thallium, hexachlorobutadiene, PCBs, and 16 volatile organic chemicals (VOCs). The reporting limits were also above currently achievable PQLs. However, cadmium was not detected above natural background, PCBs and thallium were not detected in soil, and hexachlorobutadiene and VOCs were not analyzed in soil and there is no record of their use at the site. They were analyzed as part of a standard suite of analyses. These chemicals were screened out as soil and groundwater COPCs.

A total of 14 chemicals were identified as having groundwater data gaps because they were detected in soil and either they were not analyzed in groundwater or the reporting limits were higher than groundwater screening levels and it is possible to get better reporting limits now. These chemicals are antimony, barium, iron, manganese, mercury, fluoranthene, pyrene, and the seven carcinogenic PAHs. Some or all of these chemicals may not qualify as groundwater COPCs. If this is the case, their soil screening levels will be modified in the Revised Draft RI Report by eliminating the leaching pathway and they will likely screen out as soil COPCs.

Iron and manganese were detected above groundwater screening levels, but these metals are not attributed to historical Site releases. These are redox-sensitive metals that are naturally elevated due to reducing conditions from peat and organic silt deposits. These chemicals were retained as COPCs as follows:

- **Iron.** Because the Passive Attenuation Zone includes iron, performance groundwater monitoring has included analysis of iron and comparison to a

preliminary background concentration (75 mg/L) to ensure that the interim action does not increase iron above background. Therefore, iron was retained as a COPC due to this performance monitoring element.

- **Manganese.** Manganese was identified as a preliminary groundwater COPC because all of the groundwater results exceeded the screening level. However, none of the saturated zone soil results exceeded the screening level. Manganese was not analyzed in vadose zone soil. Manganese was not used in site operations or a component of interim actions. It is likely that manganese is elevated in groundwater due to naturally occurring reducing conditions. Because there is limited Site data for this chemical, manganese was identified as a groundwater data gap for further evaluation as to whether it qualifies as a ground water COPC.

Background concentrations for manganese and iron will be further developed in the Revised Draft RI Report. The background dataset for each chemical will be reviewed to remove historical data points at which redox conditions were potentially affected by historical petroleum releases that were addressed during the interim actions described in Section 2.

The resulting COPCs for the Site, based on all historical data, include:

- **Metals:** Antimony, arsenic, barium, iron, manganese, mercury, selenium, and zinc
- **Petroleum Hydrocarbons:** TPH-D and TPH-O
- **SVOCs:** fluoranthene, pyrene, cPAHs, PCP

## 3.3 COPC Occurrences

Barbee completed a number of remedial actions (either under the VCP or under the AO) at the Site, as summarized in Section 2 and detailed in the Draft RI Report. For the purposes of identifying data gaps, figures from the Draft RI Report illustrating nature-and-extent of COPCs have been updated using the screening levels in Table 1, as follows:

- Figures 3 through 6 illustrate available soil and groundwater data for zinc, TPH-D[3], cPAHs, and PCP. On these figures, results are compared both to the initial screening level (i.e., lowest potential screening level) and, if applicable, the empirically adjusted screening level.
- Figures 7 through 9 illustrate available groundwater data for iron (before and after interim actions) and manganese (only data prior to interim actions is available). On these figures, results are compared to the initial screening level; data will be compared to a calculated site-specific background level in the Revised Draft RI Report.

The primary Site COPC is arsenic. The soil screening level for arsenic has not changed and no additional soil data for arsenic has been collected since the Draft RI Report, so a figure illustrating soil data for arsenic has not been included in this Work Plan. No data

[3] TPH-O exceedances were collocated with TPH-D at a subset of locations; therefore, a separate figure for TPH-O was not created.

gaps for arsenic in soil have been identified. Groundwater occurrences of arsenic and analysis of potential data gaps are discussed in Section 4.

The current data set is not adequate to evaluate whether the following COPCs exceed screening levels following the remedial actions taken to date:

- **Antimony** concentrations in groundwater. There is no known source of antimony at the Site. However, soil samples exceeded the final groundwater-protection screening level in initial investigations and Site groundwater samples, although non-detect, did not achieve best possible reporting limits.
- **Barium** concentrations in groundwater. There is no known source of barium at the Site. However, soil samples exceeded the final groundwater-protection screening level in initial investigations and Site groundwater has not been analyzed for barium.
- **Manganese** concentrations in groundwater. There is no known source of manganese at the Site, and background manganese concentrations are elevated due to naturally reducing conditions. However, no groundwater samples have been analyzed for manganese since initial investigations were conducted.
- **Mercury** concentrations in groundwater. There is no known source of mercury at the Site. However, soil samples exceeded the final groundwater-protection screening level in initial investigations and Site groundwater samples, although non-detect, did not achieve best possible reporting limits.
- **Selenium** concentrations in groundwater. There is no known source of selenium at the Site. However, groundwater exceeded the final screening level in initial investigations and no groundwater samples have been analyzed for selenium since initial investigations were conducted.
- **Zinc** concentrations in groundwater. Post- remedial action data indicated soil exceeds final screening levels based on protection of groundwater. Groundwater in shoreline wells did not exceed final screening levels but groundwater samples from wells adjacent to the highest soil exceedances were not analyzed for zinc.
- **PAH** concentrations in groundwater. There are no significant sources of cPAHs from historical operations at the Site, but a 1957 mill fire may have contributed to widespread low-level occurrences of cPAHs in soil. Historical data indicated soil exceeding screening levels based on protection of groundwater and based on direct contact. cPAHs have not been detected in Site groundwater, but historical detection limits are above current Ecology-accepted practical quantitation limits (PQLs) using SIM analysis. Therefore, additional sampling to determine if cPAHs are present in groundwater above current PQLs is needed to confirm the empirical pathway evaluation.

  Furthermore, two non-carcinogenic PAHs (fluoranthene and pyrene) were detected above initial screening levels in one historical sample, but the quality of that data (a grab sample from a test pit) is considered poor and unlikely to be representative of current groundwater conditions. Additional sampling to evaluate current concentrations of these PAHs is needed.

# 4 Extent of Arsenic Contamination in Groundwater

The Draft RI Report described the extent of arsenic in soil and groundwater. The Draft RI Report used a groundwater screening level for arsenic of 20 ug/L based on natural background concentrations. Ecology re-evaluated the background data set and has identified a Site-specific natural background concentration for arsenic of 16 ug/L. This section provides an updated description of arsenic occurrences in groundwater based on current groundwater data and the updated screening level and identifies data gaps.

Arsenic concentrations in groundwater (including historical data prior to interim remedial actions and current monitoring data) sitewide are delineated on Figures 10 and 11. For the purposes of this Work Plan, the shallow system is defined as groundwater less than 30 feet in depth. This approximately corresponds with the distinction between the shallow and deep alluvial units as characterized on the adjacent Quendall Terminals Site (see Section 4.2 below).

In general, arsenic exceedances of the groundwater screening level were historically located within the former source area (now represented by the 2006 Arsenic Remedial Excavation Footprint) and emanating in the downgradient direction (west to west-northwest) from the former source area toward Lake Washington. Prior to interim remedial actions, the highest concentrations in off-shore groundwater and porewater were detected on the southwestern corner of the Quendall Terminals property around well point WP-1. The alignment of the highest concentrations of the historical plume corresponded to a former alignment of the May Creek channel.

For the purposes of identifying potential data gaps to complete the RI/FS, arsenic concentrations were evaluated to determine 1) if the cumulative Site data are sufficient to define the lateral and vertical extent of arsenic along the former Barbee property boundary downgradient of the former source area; and 2) if the PAZ effectively mitigates arsenic impacts to porewater and surface water. Current conditions in three areas are discussed below, as follows:

- Around the PAZ;
- On the Quendall Terminals property; and
- Offshore.

## 4.1 Arsenic Concentrations around the PAZ

The PAZ was designed to capture the majority of arsenic contamination in groundwater along the downgradient side of the former Barbee property boundary and to prevent porewater exceedances of the groundwater screening level. The PAZ was not designed to capture limited areas exceeding the screening level located south of the PAZ or in the deeper groundwater system near the east end of the PAZ. Exceedances in these areas were localized, sporadic, possibly attributed to natural background conditions[4] and were

[4] Although the natural background concentration was calculated to be 16 ug/L, the natural background dataset includes values up to 28 ug/L.

determined to not impact surface water (Aspect 2006) but would have required substantial construction effort to address.

PAZ performance monitoring is conducted annually. The 2019 monitoring data was summarized in the annual Performance Monitoring Report (Aspect 2020); a map of arsenic concentrations from this report is provided on Figure 12. PAZ monitoring results and a data gap analysis are provided below.

### 4.1.1 Arsenic Concentrations at the PAZ Ends

The PAZ's effectiveness at capturing arsenic in groundwater above the screening level is evaluated based on the arsenic concentrations at two monitoring wells (CMW-1, at the south end of the PAZ, and CMW-6, at the east end of the PAZ), and on the groundwater flow patterns for the Site. Arsenic concentrations at CMW-1 and CMW-6 increased initially after construction of the PAZ due to radial flow from the backfilled excavation. Current conditions as of the 2019 annual monitoring event are as follows:

- At CMW-6, the arsenic concentration (140 ug/L) remains above the screening level but has shown an overall decreasing trend since 2011 (Aspect, 2020a). Groundwater concentrations downgradient of this area have steadily decreased since the PAZ was installed.
- At CMW-1, the arsenic concentration (63 ug/L) also remain above the screening level in 2019 and has shown a slight increasing trend since 2011. The concentration at this well is below levels previously determined to be protective of porewater based on shoreline groundwater/porewater pairs (see Section 4.3).

The southern boundary of the arsenic plume is estimated considering historical and current analytical data and groundwater flow direction. Based on the increase of arsenic concentrations at CMW-1 since PAZ construction (from 31 to 63 ug/L) and the estimated groundwater flow contours (see Figure 12) that indicate radial groundwater flow around the south end of the PAZ, additional data in this area is recommended to verify the lateral extent of the arsenic plume. Because upland access in this area is limited by the residential development, additional sampling of porewater is recommended to address this data gap, as described in Section 4.3.

### 4.1.2 Arsenic Concentrations Downgradient of the PAZ

As summarized in the annual Performance Monitoring Report, arsenic concentrations at most wells and well points downgradient of the PAZ are either below the screening level (wells CMW-2S, CMW-3, CMW-5, BH-29B, WP-1A) or steadily declining (CMW-4D, BH-29A, WP-8) as treated water flushes out residual arsenic. Arsenic concentrations at one deep well, CMW-2D, initially declined after PAZ installation but have rebounded to 200 ug/L, although concentrations remain below pre-remediation levels at this location. Based on historical groundwater/porewater evaluations, the arsenic concentrations at CMW-2D would not impact porewater above the arsenic screening level. Additional discussion of offshore groundwater/porewater conditions and data gaps is provided in Section 4.3.

## 4.2 Arsenic Concentrations on the Quendall Terminals Property

The arsenic plume extends north from the former Barbee Mill property onto the southwestern portion of the Quendall Terminals property. The Quendall Terminals hydrocarbon plume (including naphthalene and cPAHs) follows the historical May Creek channel to the area north of BH-29A and overlaps with the Barbee arsenic plume. Arsenic is also present in Quendall Terminals groundwater within the hydrocarbon plume footprint, due to mobilization of naturally-occurring arsenic under reducing conditions that arise from hydrocarbon biodegradation and natural organic (e.g., peat) deposits as described in the Quendall Terminals RI Report (Aspect and Anchor QEA 2012). Arsenic contamination[5] at Quendall is found in both the shallow and deep groundwater intervals. Figures from the Quendall RI Report showing arsenic occurrences and groundwater flow directions in shallow and deep groundwater are provided in Appendix C.

Arsenic occurrences associated with the former Barbee operations have been delineated for shallow and deep groundwater. For the purposes of this Work Plan, the shallow groundwater interval is defined by groundwater sampling data collected at depths less than 30 feet bgs. This generally corresponds to the Shallow Alluvium geologic unit. The deep interval is defined by groundwater samples collected at depths greater than 30 feet bgs, and corresponds to the lower portion of the Shallow Alluvium and the Deep Alluvium. A detailed delineation of arsenic occurrences on the southwest corner of the Quendall Terminals property was performed in a 2018 data gaps investigation (Aspect 2018). The majority of arsenic exceedances associated with the Barbee Mill plume are in shallow groundwater, with a localized area of deeper exceedances near the eastern end of the PAZ. Arsenic occurrences in the shallow interval are shown on Figure 13 and arsenic occurrences in the deeper interval are shown on Figure 14. Arsenic occurrences in cross-section are shown on Figure 15, which extends cross-section BB’ from the Draft RI Report northward (cross-section location is shown on Figures 13 and 14).

A summary of arsenic occurrences on the Quendall Terminals property and a data gaps analysis are provided below.

### *4.2.1 Arsenic in Shallow Groundwater*

In the shallow interval, groundwater flow is to the west-northwest. Quendall monitoring wells BH-21A and BH-26A define the northern and eastern extents of arsenic, respectively (Figure 13). An additional investigation was conducted in 2018 to more precisely define the Barbee arsenic plume to the north, which included collecting multiple discrete-depth, grab groundwater samples from direct-push borings in the southwestern area of the Quendall Terminals property (Aspect, 2018). The groundwater grab samples collected within the northern part of the Barbee arsenic plume showed variability from reducing conditions and hydrocarbon effects in individual discrete samples. When reducing conditions occur in groundwater as a result of organic

[5] The groundwater preliminary remediation goal (PRG) for arsenic at the Quendall Terminals site is based on the MCL of 10 ug/L, slightly less than the Site screening level (based on natural background) of 16 ug/L. A natural background value for arsenic was not calculated for the Quendall Terminals site.

enrichment (such as wood waste and/or hydrocarbon releases), the more mobile forms of arsenic predominate, and ferric iron, which limits the mobility of arsenic by sorption, reduces to the more soluble and mobile ferrous iron. Therefore, reducing geochemical conditions in groundwater on the Quendall property increase the mobility of arsenic, which results in increased concentrations of arsenic in groundwater. The former May Creek Channel alignment and extent of Quendall Terminals DNAPL and cPAHs in groundwater are shown on Figure 13 for comparison.

The estimated boundary of Barbee-related arsenic contamination in shallow groundwater is shown on Figure 13. This boundary is based on a combination of chemical data, groundwater flow direction, and field observations of elevated natural organics or hydrocarbon contamination corresponding to intervals with arsenic exceedances. Specifically:

- Arsenic exceedances at B-06 and B-17 correspond to field observations of hydrocarbon contamination (e.g. sheen), and the arsenic concentrations are higher than at locations upgradient of those borings (B-11 and B-12). Therefore, these exceedances are attributed to Quendall Terminals-related contamination.
- Arsenic exceedances at B-11 correspond to soil intervals with high levels of natural organics (wood), the concentrations are within the range of the background data set, and the average concentration within the shallow interval is less than the Site background level. Therefore, these exceedances are attributed to naturally reducing background conditions.

### *4.2.2 Arsenic in Deeper Groundwater*

In the deep interval, groundwater flow is west towards Lake Washington, as shown on Figure 14.

The extent of the deep arsenic plume to the west was investigated in the 2018 data gaps investigation. Direct-push groundwater grab samples from the 2018 study identified arsenic in the deep interval west of BH-26B, along the border of the former Barbee property line, up to a maximum concentration of 84 ug/L at B-15. This is similar to the maximum concentration detected in this area and depth during PAZ design (100 ug/L). The 2018 study, and data from well BH-29B, define the western extent of the arsenic plume in deeper groundwater.

The northern extent of contamination at BH-26B (Barbee plume boundary) is constrained by the groundwater flow direction. However, the exact location of the arsenic plume boundary to the north between BH-21B and BH-26B is unknown. An additional deep well northwest of BH-26B would be useful for defining the northern boundary of Barbee arsenic contamination.

## 4.3 Arsenic Concentrations Offshore

Arsenic concentrations in offshore groundwater and porewater were measured before and after installation of the PAZ between 2006 and 2009 at a number of locations, several of which were generally paired with shoreline monitoring wells to enable future monitoring to primarily be conducted at the shoreline (see Figure 16). These measurements demonstrated significant attenuation of arsenic concentrations along the groundwater-to-

surface water discharge pathway, as documented in the Barbee Sediment Data Gaps Evaluation Memo (Anchor QEA 2010: provided as Appendix G of the Draft RI Report).

Arsenic concentrations prior to PAZ installation ranged up to 21 µg/L west of the Barbee property and up to 1,400 µg/L on the Quendall Terminals property (Figure 16). After PAZ installation, concentrations in surface sediment porewater ranged from non-detect to a maximum of 17 µg/L, and concentrations in 2010 ranged from non-detect to a maximum of 2.6 µg/L (Aspect 2021). Concentrations of arsenic measured from 2006 and 2010 at closely located well point and porewater stations (e.g. WP-1A and PW-CMW-4) indicated substantial reductions in concentrations along the discharge flowpath. The Barbee Sediment Data Gaps Evaluation Memo included a fate-and-transport model that supported the empirical results.

Since 2010, as part of the annual performance monitoring, offshore arsenic concentrations have been monitored at well points WP-1A and WP-8, downgradient of the PAZ. Arsenic concentrations have decreased at both well points since the installation of the PAZ, but WP-8 remains above the screening level. WP-8 is located further away from the PAZ than WP-1A and was therefore expected to exhibit slower decreases due to treatment by the PAZ. The 2018 data gaps investigation included additional offshore groundwater samples from borings and temporary well points to further delineate arsenic offshore; this data is included in Figure 16.

Arsenic concentrations in nearshore porewater have historically been below both the site-specific groundwater screening level and the surface water quality standard. However, there are no historical porewater results near WP-8, which continues to exceed the groundwater screening level. Porewater data at this location would verify the assumption that porewater at the Site is not impacted above the screening level.

## 4.4 Data Gaps

The following data gaps relating to the extent of arsenic contamination in groundwater have been identified:

- The deep groundwater arsenic boundary between BH-26B and BH-21B. Installation of an additional monitoring well is needed to verify this boundary.
- Current arsenic concentrations in porewater south of the PAZ, to verify the assumed southern boundary of the arsenic plume and confirm that exceedances at CMW-1 do not unacceptably impact porewater.
- Current arsenic concentrations in porewater adjacent to WP-8, which is the well point with the highest offshore arsenic concentration remaining at the Site.

Planned work to fill the upland deep groundwater data gap is described in Section 5. Planned work to fill porewater data gaps is described the SRI Work Plan (Appendix B).

# 5 Identification of Upland Data Gaps and Data Collection Activities

This section describes the upland data needed to complete the RI. Offshore data – including porewater data needs identified in Section 4 – are covered in the SRI Work Plan (Appendix B).

The upland data gaps include the following:

- Evaluating the occurrence of certain COPCs, as identified in Section 3; and
- Delineating the northern extent of arsenic in deep groundwater.

## 5.1 COPC Evaluation

Additional data is needed to evaluate whether all of the COPCs identified in Section 3 currently exceed screening levels.

The primary data gaps are determining whether the soil-to-groundwater pathway is complete for the following COPCs: antimony, barium, manganese, mercury, selenium, zinc, and cPAHs. To fill these data gaps, additional groundwater monitoring was conducted at the existing Site monitoring wells. COPCs identified above screening levels will be identified as Site contaminants of concern (COCs).

Ecology approved the scope for this additional groundwater monitoring on March 12, 2021, in advance of finalizing this Work Plan to facilitate coordination with required annual groundwater performance monitoring. This additional groundwater monitoring is described below.

Existing groundwater monitoring well locations are shown on Figure 16. Because of the density of the existing well network, samples were collected at a subset of eight wells, including wells closest to historical soil samples exceeding initial screening levels. Sample locations included monitoring wells CMW-1, CMW-2S, CMW-4S,[6] and CMW-6 and extraction wells EW-2, EW-4, EW-6, and EW-8 (highlighted wells on Figure 16). Extraction wells have previously been sampled through the groundwater extraction system; however, for this investigation, they were sampled at the well head with a peristaltic pump to limit any interference from biofouling in the extraction system piping.[7]

The sampling was completed in conjunction with the annual groundwater monitoring event on March 18 and 19, 2021. These events were coordinated for efficiency and to

[6] The highest concentrations of contaminants detected in historical Site investigations have been in the shallow system. If exceedances are identified in shallow groundwater, deeper wells may need to be sampled to evaluate vertical extent. In this case, a sampling plan addendum would be prepared.

[7] Previous groundwater monitoring using the extraction system pumps and piping has resulted in entrained precipitates that have affected sample results. The location where sampling is conducted (well head vs. pump-and-treat manifold) will be documented in the RI Data Report.

provide concurrent data for comparison. At Ecology's request, total arsenic was also included as an analyte during the annual monitoring event, along with the planned analytes (dissolved arsenic and iron), as described in the Performance Monitoring Plan (Aspect, 2010b).

Therefore, analytes and analytical methods for groundwater samples at the eight locations were:

- Total antimony, arsenic, barium, mercury, and selenium[8] by EPA Method 6020
- Dissolved antimony, arsenic, barium, manganese, mercury, selenium, and zinc by EPA Method 6020 (field filtered)
- Dissolved iron by EPA Method 6010D (field filtered)
- PAHs by EPA Method 8270E-SIM

The SAP and QAPP, including techniques and QA/QC procedures, are provided in Appendix E. Health and Safety Plans (HASPs) for both the upland and sediment work are included in Appendix F. An Inadvertent Discovery Plan is included in Appendix G. Because the data gaps work and annual groundwater monitoring (which includes sampling of dissolved arsenic and iron at all Site wells) happened at the same time, field sampling information and QA/QC data are included in the SAP/QAPP for both scopes of work.

## 5.2 Arsenic Plume Boundary Delineation

To provide a northern boundary for arsenic occurrences in deeper groundwater and provide separation between elevated arsenic attributed to the former Barbee operations and elevated arsenic attributable to the Quendall Terminals site hydrocarbon contamination, a new well BH-31B is proposed to be located between BH-26B and BH-21B, as shown on Figure 17. This well screen will be installed at an approximate depth of 30 to 40 feet based on the depth range of arsenic exceedances at nearby borings.

The well will be installed using a hollow-stem auger drill rig, developed, and sampled for dissolved arsenic. Based on the anticipated implementation schedule, sampling is expected to occur during the dry season in August or September 2021. The new well will also be sampled during the annual monitoring event in December 2021 to provide data during the wet season. Well installation, development, and sampling procedures are provided in the SAP/QAPP (Appendix E). The well casing elevation will be surveyed into the site well network to assist in groundwater flow characterization. Investigation-derived waste (IDW) will be drummed, temporarily stored on site, and disposed of after groundwater results are received. It is assumed based on prior characterization work that IDW will be classified as non-hazardous waste.

[8] The screening level for zinc in groundwater is based on dissolved zinc; therefore, analysis of total zinc is not planned for this Work Plan.

# 6 Schedule and Reporting

After Ecology approves this Work Plan, field activities will proceed within 30 days, contingent upon contractor availability. Groundwater sampling at existing wells has already been conducted in conjunction with the annual groundwater monitoring event. Sediment sampling, as discussed in Appendix B, and installation and sampling of the new well will be conducted in parallel.

Data collected during the data gaps investigation will be summarized in a combined sediment and upland RI Data Report and submitted for agency review within 90 days of validation of the final laboratory report. The report may include recommendations for additional testing or analysis. If the report concludes that no additional data is needed and Ecology concurs, then the data report will be finalized, and a combined draft RI/FS Report will be prepared for Ecology review. The reporting schedule is dictated by an Ecology-approved Agreed Order Schedule Change Request (Aspect, 2020b).

# 7 References

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# 8 Limitations

Work for this project was performed for Barbee Mill Co., Inc. (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

# TABLES

## Table 1. Preliminary Chemicals of Potential Concern

Project No. 050004, Barbee Mill, Renton, WA

| | Number of Samples Analyzed | Number of Detected Samples | Preliminary Screening Level | Maximum Detected Concentration | Location of Maximum Detection | Number of Detections Exceeding Preliminary SL | Maximum Reporting Limit | Number of Non-Detections with Reporting Limits Exceeding Preliminary SL | Frequency of Exceedance of Preliminary SL[(a)] | Preliminary COPC[(b)] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Soil - Saturated (mg/kg)*** | | | | | | | | | | |
| **BTEX** | | | | | | | | | | |
| Benzene | 21 | 0 | 0.00015 | -- | -- | 0 | 0.081 | 21 | 100% | Yes |
| Toluene | 21 | 0 | 0.024 | -- | -- | 0 | 0.081 | 14 | 67% | No |
| Ethylbenzene | 21 | 1 | 0.014 | 0.049 | HC-39 | 1 | 0.081 | 20 | 100% | Yes |
| Total Xylenes | 15 | 1 | 0.83 | 0.053 | HC-39 | 0 | 0.064 | 0 | 0% | No |
| **Conventionals** | | | | | | | | | | |
| Chromium Reducible Sulfide | 8 | 7 | -- | 63 | AP-4 | 0 | 80 | 0 | 0% | No |
| Sulfide | 8 | 5 | -- | 0.5 | AP-1 | 0 | 1.4 | 0 | 0% | No |
| Total Organic Carbon | 8 | 8 | -- | 7.1 | AP-4 | 0 | -- | 0 | 0% | No |
| Total Solids | 8 | 8 | -- | 87 | AP-4 | 0 | -- | 0 | 0% | No |
| **Metals** | | | | | | | | | | |
| Aluminum | 8 | 4 | 33000 | 22500 | AP-4 | 0 | 14600 | 0 | 0% | No |
| Antimony | 6 | 2 | 5 | 10 | RSB-02 | 2 | 7 | 4 | 100% | Yes |
| Arsenic | 952 | 860 | 20 | 2600 | ZZ6 | 323 | 10 | 0 | 34% | Yes |
| Barium | 15 | 15 | 41 | 83 | HC-50 | 6 | -- | 0 | 40% | Yes |
| Beryllium | 6 | 6 | 3.2 | 0.3 | RSB-01 | 0 | -- | 0 | 0% | No |
| Cadmium | 39 | 7 | 0.77 | 0.5 | HC-43 | 0 | 1 | 2 | 5% | No |
| Chromium | 39 | 39 | 72 | 79 | HC-48 | 1 | -- | 0 | 3% | Yes |
| Copper | 37 | 37 | 36 | 450 | HC-53 | 12 | -- | 0 | 32% | Yes |
| Iron | 8 | 8 | 36000 | 23900 | AP-4 | 0 | -- | 0 | 0% | No |
| Lead | 39 | 35 | 21 | 48 | HC-48 | 1 | 2.1 | 0 | 3% | Yes |
| Manganese | 8 | 8 | 1100 | 411 | AP-4 | 0 | -- | 0 | 0% | No |
| Mercury | 37 | 7 | 0.07 | 1.6 | HC-42 | 7 | 0.14 | 26 | 89% | Yes |
| Nickel | 37 | 37 | 38 | 60 | HC-48 | 1 | -- | 0 | 3% | Yes |
| Selenium | 22 | 2 | 0.026 | 13 | RSB-02 | 2 | 7 | 20 | 100% | Yes |
| Silver | 39 | 0 | 0.028 | -- | -- | 0 | 1 | 39 | 100% | Yes |
| Thallium | 6 | 0 | 0.0044 | -- | -- | 0 | 10 | 6 | 100% | Yes |
| Zinc | 253 | 253 | 85 | 1600 | C5 | 45 | -- | 0 | 18% | Yes |
| **Other SVOCs** | | | | | | | | | | |
| 2,3,4,5-Tetrachlorophenol | 6 | 0 | -- | -- | -- | 0 | 0.096 | 0 | 0% | No |
| 2,3,4-Trichlorophenol | 6 | 0 | -- | -- | -- | 0 | 0.096 | 0 | 0% | No |
| 2,3,5,6-Tetrachlorophenol | 6 | 0 | -- | -- | -- | 0 | 0.096 | 0 | 0% | No |
| 2,3,6-Trichlorophenol | 6 | 0 | -- | -- | -- | 0 | 0.096 | 0 | 0% | No |
| 2,4,5-Trichlorophenol | 18 | 0 | 0.56 | -- | -- | 0 | 0.096 | 0 | 0% | No |
| 2,4,6-Trichlorophenol | 18 | 0 | 0.00017 | -- | -- | 0 | 0.096 | 18 | 100% | Yes |
| 2,4-Dichlorophenol | 12 | 0 | 0.00013 | -- | -- | 0 | 0.052 | 12 | 100% | Yes |
| Dibenzofuran | 6 | 0 | 0.2 | -- | -- | 0 | 0.11 | 0 | 0% | No |
| Pentachlorophenol | 45 | 14 | 0.0000018 | 220 | HSE-B-7 | 14 | 0.3 | 31 | 100% | Yes |
| Phenol | 3 | 0 | 0.088 | -- | -- | 0 | 0.3 | 3 | 100% | Yes |
| Total Tetrachlorophenols | 12 | 3 | -- | 0.15 | HC-42 | 0 | 0.013 | 0 | 0% | No |
| **PAHs** | | | | | | | | | | |
| 1-Methylnaphthalene | 22 | 5 | 22 | 0.10 | SH9 | 0 | 0.056 | 0 | 0% | No |
| 2-Methylnaphthalene | 28 | 4 | 320 | 0.13 | SH9 | 0 | 0.11 | 0 | 0% | No |
| Acenaphthene | 29 | 4 | 0.1 | 0.12 | SH5 | 1 | 0.11 | 1 | 7% | Yes |
| Acenaphthylene | 29 | 0 | -- | -- | -- | 0 | 0.11 | 0 | 0% | No |
| Anthracene | 29 | 4 | 2.4 | 0.035 | SH5 | 0 | 0.11 | 0 | 0% | No |
| Benzo(g,h,i)perylene | 29 | 17 | 0.005 | 0.12 | RSB-02 | 17 | 0.1 | 12 | 100% | Yes |
| Fluoranthene | 29 | 16 | 0.001 | 0.34 | SH5 | 16 | 0.1 | 13 | 100% | Yes |
| Fluorene | 29 | 7 | 0.08 | 0.084 | SH5 | 1 | 0.11 | 3 | 14% | Yes |
| Naphthalene | 29 | 6 | 0.24 | 0.2 | RSB-02 | 0 | 0.1 | 0 | 0% | No |
| Phenanthrene | 29 | 18 | -- | 0.35 | SH5 | 0 | 0.1 | 0 | 0% | No |

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Project No. 050004, Barbee Mill, Renton, WA

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|---|---|---|---|---|---|---|---|---|---|---|
| Pyrene | 29 | 21 | 0.001 | 0.3 | RSB-01 | 21 | 0.1 | 8 | 100% | Yes |
| Benz(a)anthracene | 29 | 13 | 0.000057 | 0.11 | SH5 | 13 | 0.11 | 16 | 100% | Yes |
| Benzo(a)pyrene | 29 | 25 | 0.000016 | 0.17 | RSB-02 | 25 | 0.1 | 4 | 100% | Yes |
| Benzo(b)fluoranthene | 29 | 20 | 0.0002 | 0.24 | RSB-02 | 20 | 0.1 | 9 | 100% | Yes |
| Benzo(k)fluoranthene | 29 | 10 | 0.0018 | 1.2 | RSB-01 | 10 | 0.11 | 19 | 100% | Yes |
| Chrysene | 29 | 21 | 0.0018 | 0.4 | SH9 | 21 | 0.1 | 8 | 100% | Yes |
| Dibenzo(a,h)anthracene | 29 | 5 | 0.000029 | 0.024 | SH9 | 5 | 0.11 | 24 | 100% | Yes |
| Indeno(1,2,3-cd)pyrene | 29 | 10 | 0.00056 | 0.084 | RSB-01 | 10 | 0.11 | 19 | 100% | Yes |
| Total PAHs | 31 | 29 | 17 | 2.5 | RSB-01 | 0 | 0.1 | 0 | 0% | No |
| Total cPAHs TEQ (ND = 1/2 RDL) | 31 | 27 | 0.0042 | 0.29 | RSB-01 | 27 | 0.076 | 4 | 100% | Yes |
| **PCBAro** | | | | | | | | | | |
| Aroclor 1016 | 12 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1221 | 6 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1232 | 6 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1242 | 12 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1248 | 12 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1254 | 12 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1260 | 12 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1262 | 4 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Total PCBs (Sum of Aroclors) | 12 | 0 | 0.0000022 | -- | -- | 0 | 0.1 | 12 | 100% | Yes |
| **TPHs** | | | | | | | | | | |
| Gasoline Range Organics | 36 | 0 | 100 | -- | -- | 0 | 8.2 | 0 | 0% | No |
| Diesel Range Organics | 59 | 25 | 340 | 4800 | TP-1 | 4 | 58 | 0 | 7% | Yes |
| Motor Oil Range Organics | 57 | 26 | 2000 | 4800 | TP-1 | 1 | 250 | 0 | 2% | Yes |
| **VOCs** | | | | | | | | | | |
| m,p-Xylenes | 18 | 1 | -- | 0.053 | HC-39 | 0 | 0.081 | 0 | 0% | No |
| o-Xylene | 9 | 0 | -- | -- | -- | 0 | 0.081 | 0 | 0% | No |
| ***Soil - Unsaturated (mg/kg)*** | | | | | | | | | | |
| **BTEX** | | | | | | | | | | |
| Benzene | 12 | 0 | 0.0024 | -- | -- | 0 | 0.067 | 12 | 100% | Yes |
| Toluene | 12 | 1 | 0.4 | 0.03 | TP-3 UST BF | 0 | 0.067 | 0 | 0% | No |
| Ethylbenzene | 12 | 3 | 0.24 | 0.1 | TP-3 UST BF | 0 | 0.067 | 0 | 0% | No |
| Total Xylenes | 1 | 1 | 14 | 0.11 | HC-49 | 0 | -- | 0 | 0% | No |
| **Metals** | | | | | | | | | | |
| Antimony | 10 | 3 | 5.1 | 9 | RSB-05 | 3 | 6 | 3 | 60% | Yes |
| Arsenic | 84 | 62 | 20 | 430 | VV6 | 19 | 6.6 | 0 | 23% | Yes |
| Barium | 1 | 1 | 820 | 41 | TP-7 | 0 | -- | 0 | 0% | No |
| Beryllium | 10 | 10 | 63 | 0.3 | RSB-05 | 0 | -- | 0 | 0% | No |
| Cadmium | 12 | 2 | 0.77 | 0.41 | HC-49 | 0 | 1 | 1 | 8% | No |
| Chromium | 12 | 12 | 72 | 50 | RSB-05 | 0 | -- | 0 | 0% | No |
| Copper | 11 | 11 | 36 | 26 | RSB-05 | 0 | -- | 0 | 0% | No |
| Lead | 12 | 12 | 21 | 25 | RSB-06 | 1 | -- | 0 | 8% | Yes |
| Mercury | 11 | 1 | 0.07 | 0.08 | RSB-07 | 1 | 0.12 | 1 | 18% | Yes |
| Nickel | 11 | 11 | 50 | 55 | RSB-05 | 1 | -- | 0 | 9% | Yes |
| Selenium | 11 | 2 | 0.78 | 6 | RSB-05 | 2 | 6 | 9 | 100% | Yes |
| Silver | 12 | 0 | 0.55 | -- | -- | 0 | 1 | 2 | 17% | No |
| Thallium | 10 | 0 | 0.088 | -- | -- | 0 | 6 | 10 | 100% | Yes |
| Zinc | 25 | 24 | 130 | 500 | ZZ5 | 5 | 40 | 0 | 20% | Yes |
| **Other SVOCs** | | | | | | | | | | |
| 2,3,4,5-Tetrachlorophenol | 10 | 1 | -- | 0.0032 | RSB-08 | 0 | 0.075 | 0 | 0% | No |
| 2,3,4-Trichlorophenol | 10 | 0 | -- | -- | -- | 0 | 0.075 | 0 | 0% | No |
| 2,3,5,6-Tetrachlorophenol | 10 | 0 | -- | -- | -- | 0 | 0.075 | 0 | 0% | No |

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|---|---|---|---|---|---|---|---|---|---|---|
| 2,3,6-Trichlorophenol | 10 | 0 | -- | -- | -- | 0 | 0.075 | 0 | 0% | No |
| 2,4,5-Trichlorophenol | 10 | 0 | 11 | -- | -- | 0 | 0.075 | 0 | 0% | No |
| 2,4,6-Trichlorophenol | 10 | 0 | 0.0029 | -- | -- | 0 | 0.075 | 10 | 100% | Yes |
| Dibenzofuran | 10 | 1 | 0.2 | 0.35 | RSB-02 | 1 | 0.085 | 0 | 10% | Yes |
| Pentachlorophenol | 20 | 6 | 0.000032 | 17 | TP-4-SL | 6 | 0.075 | 14 | 100% | Yes |
| Phenol | 2 | 0 | 0.12 | -- | -- | 0 | 15 | 2 | 100% | Yes |
| **PAHs** | | | | | | | | | | |
| 2-Methylnaphthalene | 10 | 1 | 320 | 0.18 | RSB-02 | 0 | 0.085 | 0 | 0% | No |
| Acenaphthene | 12 | 2 | 2 | 0.49 | RSB-02 | 0 | 0.085 | 0 | 0% | No |
| Acenaphthylene | 12 | 0 | -- | -- | -- | 0 | 0.086 | 0 | 0% | No |
| Anthracene | 12 | 1 | 47 | 0.34 | RSB-02 | 0 | 0.085 | 0 | 0% | No |
| Benzo(g,h,i)perylene | 12 | 0 | 0.005 | -- | -- | 0 | 0.086 | 11 | 92% | Yes |
| Fluoranthene | 12 | 3 | 0.005 | 1.2 | RSB-02 | 3 | 0.083 | 8 | 92% | Yes |
| Fluorene | 12 | 2 | 1.6 | 0.61 | RSB-02 | 0 | 0.085 | 0 | 0% | No |
| Naphthalene | 12 | 2 | 4.5 | 0.19 | RSB-02 | 0 | 0.085 | 0 | 0% | No |
| Phenanthrene | 12 | 3 | -- | 3 | RSB-02 | 0 | 0.083 | 0 | 0% | No |
| Pyrene | 12 | 5 | 0.005 | 0.57 | RSB-02 | 5 | 0.083 | 7 | 100% | Yes |
| Benz(a)anthracene | 12 | 2 | 0.0011 | 0.12 | RSB-02 | 2 | 0.085 | 10 | 100% | Yes |
| Benzo(a)pyrene | 12 | 3 | 0.00031 | 0.094 | TP-8S | 3 | 0.086 | 9 | 100% | Yes |
| Benzo(b)fluoranthene | 12 | 2 | 0.0039 | 0.1 | RSB-02 | 2 | 0.085 | 10 | 100% | Yes |
| Benzo(k)fluoranthene | 12 | 0 | 0.009 | -- | -- | 0 | 0.086 | 11 | 92% | Yes |
| Chrysene | 12 | 4 | 0.009 | 0.14 | RSB-02 | 4 | 0.083 | 8 | 100% | Yes |
| Dibenzo(a,h)anthracene | 12 | 0 | 0.00057 | -- | -- | 0 | 0.086 | 12 | 100% | Yes |
| Indeno(1,2,3-cd)pyrene | 12 | 0 | 0.009 | -- | -- | 0 | 0.086 | 11 | 92% | Yes |
| Total PAHs | 12 | 5 | 17 | 6.94 | RSB-02 | 0 | 0.083 | 0 | 0% | No |
| Total cPAHs TEQ (ND = 1/2 RDL) | 12 | 4 | 0.021 | 0.11 | TP-8S | 3 | 0.063 | 8 | 92% | Yes |
| **PCBAro** | | | | | | | | | | |
| Aroclor 1016 | 11 | 0 | -- | -- | -- | 0 | 0.36 | 0 | 0% | No |
| Aroclor 1221 | 1 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1232 | 1 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Aroclor 1242 | 11 | 0 | -- | -- | -- | 0 | 0.36 | 0 | 0% | No |
| Aroclor 1248 | 11 | 0 | -- | -- | -- | 0 | 0.36 | 0 | 0% | No |
| Aroclor 1254 | 11 | 0 | -- | -- | -- | 0 | 0.36 | 0 | 0% | No |
| Aroclor 1260 | 11 | 0 | -- | -- | -- | 0 | 0.36 | 0 | 0% | No |
| Aroclor 1262 | 1 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| Total PCBs (Sum of Aroclors) | 11 | 0 | 0.000043 | -- | -- | 0 | 0.36 | 11 | 100% | Yes |
| **TPHs** | | | | | | | | | | |
| Gasoline Range Organics | 13 | 2 | 100 | 51 | RSB-02 | 0 | 6.7 | 0 | 0% | No |
| Diesel Range Organics | 31 | 16 | 340 | 690 | RSB-02 | 3 | 100 | 0 | 10% | Yes |
| Motor Oil Range Organics | 28 | 17 | 2000 | 510 | TP-8S | 0 | 250 | 0 | 0% | Yes |
| **VOCs** | | | | | | | | | | |
| m,p-Xylenes | 12 | 2 | -- | 0.31 | TP-3 UST BF | 0 | 0.067 | 0 | 0% | No |
| o-Xylene | 11 | 1 | -- | 0.029 | HC-49 | 0 | 0.067 | 0 | 0% | No |
| ***Groundwater (ug/L)*** | | | | | | | | | | |
| **BTEX** | | | | | | | | | | |
| Benzene | 13 | 0 | 0.44 | -- | -- | 0 | 1 | 13 | 100% | Yes |
| Toluene | 13 | 1 | 57 | 1.1 | RMW-05 | 0 | 1.8 | 0 | 0% | No |
| Ethylbenzene | 13 | 0 | 29 | -- | -- | 0 | 1 | 0 | 0% | No |
| Total Xylenes | 8 | 1 | 330 | 1.2 | RMW-04 | 0 | 0.5 | 0 | 0% | No |
| **Conventionals** | | | | | | | | | | |
| Alkalinity, Total | 22 | 22 | -- | 865000 | RMW-01 | 0 | -- | 0 | 0% | No |
| Biochemical Oxygen Demand | 8 | 6 | -- | 13000 | HCMW-01S | 0 | 4000 | 0 | 0% | No |

## Table 1. Preliminary Chemicals of Potential Concern

Project No. 050004, Barbee Mill, Renton, WA

| | Number of Samples Analyzed | Number of Detected Samples | Preliminary Screening Level | Maximum Detected Concentration | Location of Maximum Detection | Number of Detections Exceeding Preliminary SL | Maximum Reporting Limit | Number of Non-Detections with Reporting Limits Exceeding Preliminary SL | Frequency of Exceedance of Preliminary SL[(a)] | Preliminary COPC[(b)] |
|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | 8 | 8 | -- | 14000 | WP-1B | 0 | -- | 0 | 0% | No |
| Nitrate as Nitrogen | 8 | 8 | 10000 | 700 | HCMW-02 | 0 | -- | 0 | 0% | No |
| Nitrite as Nitrogen | 8 | 3 | 1000 | 10 | RMW-04 | 0 | 10 | 0 | 0% | No |
| Orthophosphate | 8 | 8 | -- | 950 | HCMW-05S | 0 | -- | 0 | 0% | No |
| Sulfate | 8 | 2 | 250000 | 5400 | WP-1B | 0 | 200 | 0 | 0% | No |
| Sulfide | 8 | 7 | -- | 40 | RMW-04 | 0 | 50 | 0 | 0% | No |
| Total Organic Carbon | 8 | 8 | -- | 65900 | RMW-01 | 0 | -- | 0 | 0% | No |
| **Metals** | | | | | | | | | | |
| Antimony | 10 | 0 | 5.6 | -- | -- | 0 | 50 | 10 | 100% | Yes |
| Arsenic | 881 | 828 | 16 | 52000 | HCMW-02 | 625 | 80 | 13 | 80% | Yes |
| Beryllium | 10 | 0 | 4 | -- | -- | 0 | 1 | 0 | 0% | No |
| Cadmium | 21 | 0 | 0.72 | -- | -- | 0 | 5 | 21 | 100% | Yes |
| Calcium | 9 | 9 | -- | 155000 | RMW-01 | 0 | -- | 0 | 0% | No |
| Chromium | 21 | 3 | 100 | 13 | RMW-01 | 0 | 10 | 0 | 0% | No |
| Copper | 74 | 6 | 11 | 15 | RMW-03 | 2 | 20 | 1 | 4% | Yes |
| Iron | 631 | 613 | 300 | 140000 | EW-5 | 590 | 56 | 0 | 94% | Yes |
| Lead | 72 | 1 | 2.1 | 1.4 | CMW-5 | 0 | 20 | 9 | 13% | No |
| Magnesium | 9 | 9 | -- | 84800 | RMW-01 | 0 | -- | 0 | 0% | No |
| Manganese | 9 | 9 | 50 | 9780 | RMW-01 | 9 | -- | 0 | 100% | Yes |
| Mercury | 21 | 0 | 0.012 | -- | -- | 0 | 0.2 | 21 | 100% | Yes |
| Nickel | 21 | 7 | 52 | 30 | RMW-01 | 0 | 50 | 0 | 0% | No |
| Potassium | 9 | 8 | -- | 5910 | WP-1B | 0 | 1000 | 0 | 0% | No |
| Selenium | 10 | 3 | 5 | 90 | RMW-01 | 3 | 50 | 6 | 90% | Yes |
| Silicon | 9 | 9 | -- | 29800 | RMW-01 | 0 | -- | 0 | 0% | No |
| Silver | 21 | 0 | 3.2 | -- | -- | 0 | 50 | 12 | 75% | No |
| Sodium | 9 | 9 | -- | 48900 | RMW-01 | 0 | -- | 0 | 0% | No |
| Thallium | 10 | 0 | 0.062 | -- | -- | 0 | 50 | 10 | 100% | Yes |
| Zinc | 57 | 19 | 100 | 150 | HC-39 | 2 | 10 | 0 | 4% | Yes |
| Arsenic III | 8 | 8 | -- | 35100 | HCMW-02 | 0 | -- | 0 | 0% | No |
| Arsenic, Inorganic | 8 | 8 | -- | 37035 | HCMW-02 | 0 | -- | 0 | 0% | No |
| **Other SVOCs** | | | | | | | | | | |
| 2,3,4,5-Tetrachlorophenol | 5 | 0 | -- | -- | -- | 0 | 0.25 | 0 | 0% | No |
| 2,3,4-Trichlorophenol | 5 | 0 | -- | -- | -- | 0 | 0.25 | 0 | 0% | No |
| 2,3,5,6-Tetrachlorophenol | 5 | 0 | -- | -- | -- | 0 | 0.25 | 0 | 0% | No |
| 2,3,6-Trichlorophenol | 5 | 0 | -- | -- | -- | 0 | 0.25 | 0 | 0% | No |
| 2,4,5-Trichlorophenol | 11 | 0 | 300 | -- | -- | 0 | 0.25 | 0 | 0% | No |
| 2,4,6-Trichlorophenol | 11 | 0 | 0.25 | -- | -- | 0 | 0.25 | 0 | 0% | No |
| 2,4-Dichlorophenol | 6 | 0 | 0.3 | -- | -- | 0 | 0.25 | 0 | 0% | No |
| Dibenzofuran | 5 | 0 | 16 | -- | -- | 0 | 1 | 0 | 0% | No |
| Hexachlorobutadiene | 7 | 0 | 0.0011 | -- | -- | 0 | 5 | 7 | 100% | Yes |
| Pentachlorophenol | 12 | 1 | 0.002 | 0.06 | HC-42 | 1 | 0.25 | 11 | 100% | Yes |
| Total Tetrachlorophenols | 6 | 0 | -- | -- | -- | 0 | 0.1 | 0 | 0% | No |
| **PAHs** | | | | | | | | | | |
| 2-Methylnaphthalene | 5 | 0 | 32 | -- | -- | 0 | 1 | 0 | 0% | No |
| Acenaphthene | 6 | 1 | 20 | 0.2 | TP1-SEEP | 0 | 1 | 0 | 0% | No |
| Acenaphthylene | 6 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| Anthracene | 6 | 0 | 100 | -- | -- | 0 | 1 | 0 | 0% | No |
| Benzo(g,h,i)perylene | 6 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| Fluoranthene | 6 | 1 | 0.02 | 0.37 | TP1-SEEP | 1 | 1 | 5 | 100% | Yes |
| Fluorene | 6 | 0 | 10 | -- | -- | 0 | 1 | 0 | 0% | No |
| Naphthalene | 8 | 0 | 8.9 | -- | -- | 0 | 5 | 0 | 0% | No |
| Phenanthrene | 6 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |

## Table 1. Preliminary Chemicals of Potential Concern

Project No. 050004, Barbee Mill, Renton, WA

| | Number of Samples Analyzed | Number of Detected Samples | Preliminary Screening Level | Maximum Detected Concentration | Location of Maximum Detection | Number of Detections Exceeding Preliminary SL | Maximum Reporting Limit | Number of Non-Detections with Reporting Limits Exceeding Preliminary SL | Frequency of Exceedance of Preliminary SL[(a)] | Preliminary COPC[(b)] |
|---|---|---|---|---|---|---|---|---|---|---|
| Pyrene | 6 | 1 | 0.015 | 0.42 | TP1-SEEP | 1 | 1 | 5 | 100% | Yes |
| Benz(a)anthracene | 6 | 0 | 0.00016 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Benzo(a)pyrene | 6 | 0 | 0.000016 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Benzo(b)fluoranthene | 6 | 0 | 0.00016 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Benzo(k)fluoranthene | 6 | 0 | 0.0015 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Chrysene | 6 | 0 | 0.0045 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Dibenzo(a,h)anthracene | 6 | 0 | 0.000016 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Indeno(1,2,3-cd)pyrene | 6 | 0 | 0.00016 | -- | -- | 0 | 1 | 6 | 100% | Yes |
| Total cPAHs TEQ (ND = 1/2 RDL) | 6 | 0 | 0.0043 | -- | -- | 0 | 0.76 | 6 | 100% | Yes |
| **PCBAro** | | | | | | | | | | |
| Aroclor 1016 | 1 | 0 | -- | -- | -- | 0 | 0.02 | 0 | 0% | No |
| Aroclor 1221 | 1 | 0 | -- | -- | -- | 0 | 0.05 | 0 | 0% | No |
| Aroclor 1232 | 1 | 0 | -- | -- | -- | 0 | 0.05 | 0 | 0% | No |
| Aroclor 1242 | 1 | 0 | -- | -- | -- | 0 | 0.02 | 0 | 0% | No |
| Aroclor 1248 | 1 | 0 | -- | -- | -- | 0 | 0.02 | 0 | 0% | No |
| Aroclor 1254 | 1 | 0 | -- | -- | -- | 0 | 0.02 | 0 | 0% | No |
| Aroclor 1260 | 1 | 0 | -- | -- | -- | 0 | 0.02 | 0 | 0% | No |
| Total PCBs (Sum of Aroclors) | 1 | 0 | 0.000007 | -- | -- | 0 | 0.05 | 1 | 100% | Yes |
| **TPHs** | | | | | | | | | | |
| Gasoline Range Organics | 13 | 2 | 800 | 320 | RMW-04 | 0 | 250 | 0 | 0% | No |
| Diesel Range Organics | 32 | 4 | 500 | 1600 | RMW-04 | 2 | 260 | 0 | 6% | Yes |
| Motor Oil Range Organics | 30 | 0 | 500 | -- | -- | 0 | 750 | 8 | 27% | No |
| **VOCs** | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | 7 | 0 | 1.7 | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,1,1-Trichloroethane | 7 | 0 | 200 | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,1,2,2-Tetrachloroethane | 7 | 0 | 0.1 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| 1,1,2-Trichloroethane | 7 | 0 | 0.35 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| 1,1,2-Trichlorotrifluoroethane | 5 | 0 | 180 | -- | -- | 0 | 2 | 0 | 0% | No |
| 1,1-Dichloroethane | 7 | 0 | 7.7 | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,1-Dichloroethene | 7 | 0 | 7 | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,1-Dichloropropene | 5 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,2,3-Trichlorobenzene | 7 | 0 | -- | -- | -- | 0 | 5 | 0 | 0% | No |
| 1,2,3-Trichloropropane | 7 | 0 | 0.00038 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| 1,2,4-Trichlorobenzene | 7 | 0 | 0.036 | -- | -- | 0 | 5 | 7 | 100% | Yes |
| 1,2,4-Trimethylbenzene | 7 | 1 | 80 | 1.1 | RMW-04 | 0 | 1 | 0 | 0% | No |
| 1,2-Dibromo-3-chloropropane | 7 | 0 | 0.2 | -- | -- | 0 | 5 | 7 | 100% | Yes |
| 1,2-Dibromoethane (EDB) | 7 | 0 | 0.05 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| 1,2-Dichlorobenzene | 7 | 0 | 600 | -- | -- | 0 | 2 | 0 | 0% | No |
| 1,2-Dichloroethane (EDC) | 7 | 0 | 4.2 | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,2-Dichloropropane | 7 | 0 | 0.71 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| 1,3,5-Trimethylbenzene | 7 | 1 | 80 | 1.6 | RMW-04 | 0 | 1 | 0 | 0% | No |
| 1,3-Dichlorobenzene | 7 | 0 | 2 | -- | -- | 0 | 2 | 0 | 0% | No |
| 1,3-Dichloropropane | 7 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| 1,4-Dichloro-2-Butene | 5 | 0 | -- | -- | -- | 0 | 5 | 0 | 0% | No |
| 1,4-Dichlorobenzene | 7 | 0 | 4.9 | -- | -- | 0 | 2 | 0 | 0% | No |
| 2,2-Dichloropropane | 7 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| 2-Butanone | 7 | 3 | 4800 | 42 | RMW-04 | 0 | 10 | 0 | 0% | No |
| 2-Chloroethyl Vinyl Ether | 5 | 0 | -- | -- | -- | 0 | 5 | 0 | 0% | No |
| 2-Chlorotoluene | 7 | 0 | 160 | -- | -- | 0 | 1 | 0 | 0% | No |
| 2-Hexanone | 7 | 0 | 40 | -- | -- | 0 | 10 | 0 | 0% | No |
| 4-Chlorotoluene | 7 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| 4-Methyl-2-pentanone | 7 | 0 | 640 | -- | -- | 0 | 10 | 0 | 0% | No |

## Table 1. Preliminary Chemicals of Potential Concern

Project No. 050004, Barbee Mill, Renton, WA

| | Number of Samples Analyzed | Number of Detected Samples | Preliminary Screening Level | Maximum Detected Concentration | Location of Maximum Detection | Number of Detections Exceeding Preliminary SL | Maximum Reporting Limit | Number of Non-Detections with Reporting Limits Exceeding Preliminary SL | Frequency of Exceedance of Preliminary SL[(a)] | Preliminary COPC[(b)] |
|---|---|---|---|---|---|---|---|---|---|---|
| Acetone | 7 | 3 | 7200 | 15 | RMW-03 | 0 | 10 | 0 | 0% | No |
| Acrolein | 5 | 0 | 1 | -- | -- | 0 | 50 | 5 | 100% | Yes |
| Acrylonitrile | 5 | 0 | 0.019 | -- | -- | 0 | 5 | 5 | 100% | Yes |
| Bromobenzene | 7 | 0 | 64 | -- | -- | 0 | 1 | 0 | 0% | No |
| Bromochloromethane | 7 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| Bromodichloromethane | 7 | 0 | 0.73 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| Bromoethane | 5 | 0 | -- | -- | -- | 0 | 2 | 0 | 0% | No |
| Bromoform | 7 | 0 | 4.6 | -- | -- | 0 | 3 | 0 | 0% | No |
| Bromomethane | 7 | 0 | 11 | -- | -- | 0 | 2 | 0 | 0% | No |
| Carbon Disulfide | 7 | 0 | 400 | -- | -- | 0 | 10 | 0 | 0% | No |
| Carbon Tetrachloride | 7 | 0 | 0.2 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| Chlorobenzene | 7 | 0 | 20 | -- | -- | 0 | 1 | 0 | 0% | No |
| Chloroethane | 7 | 0 | 19000 | -- | -- | 0 | 2 | 0 | 0% | No |
| Chloroform | 7 | 0 | 1.2 | -- | -- | 0 | 1 | 0 | 0% | No |
| Chloromethane | 7 | 0 | 150 | -- | -- | 0 | 5 | 0 | 0% | No |
| cis-1,2-Dichloroethene (cDCE) | 7 | 0 | 16 | -- | -- | 0 | 1 | 0 | 0% | No |
| cis-1,3-Dichloropropene | 7 | 0 | 0.22 | -- | -- | 0 | 3 | 7 | 100% | Yes |
| Dibromochloromethane | 7 | 0 | 0.6 | -- | -- | 0 | 2 | 7 | 100% | Yes |
| Dibromomethane | 7 | 0 | 80 | -- | -- | 0 | 1 | 0 | 0% | No |
| Dichlorodifluoromethane | 2 | 0 | 5.6 | -- | -- | 0 | 1 | 0 | 0% | No |
| Isopropylbenzene | 7 | 1 | 800 | 3.8 | RMW-04 | 0 | 1 | 0 | 0% | No |
| m,p-Xylenes | 13 | 2 | -- | 1.8 | RMW-04 | 0 | 1 | 0 | 0% | No |
| Methylene Chloride | 7 | 0 | 5 | -- | -- | 0 | 5 | 0 | 0% | No |
| Methyliodide | 5 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| n-Butylbenzene | 7 | 0 | 400 | -- | -- | 0 | 1 | 0 | 0% | No |
| n-Propylbenzene | 7 | 1 | 800 | 5 | RMW-04 | 0 | 1 | 0 | 0% | No |
| o-Xylene | 13 | 0 | -- | -- | -- | 0 | 1 | 0 | 0% | No |
| p-Isopropyltoluene | 7 | 0 | -- | -- | -- | 0 | 2 | 0 | 0% | No |
| sec-Butylbenzene | 7 | 0 | 800 | -- | -- | 0 | 1 | 0 | 0% | No |
| Styrene | 7 | 0 | 100 | -- | -- | 0 | 1 | 0 | 0% | No |
| tert-Butylbenzene | 7 | 0 | 800 | -- | -- | 0 | 1 | 0 | 0% | No |
| Tetrachloroethene (PCE) | 7 | 0 | 2.4 | -- | -- | 0 | 1 | 0 | 0% | No |
| trans-1,2-Dichloroethene | 7 | 0 | 100 | -- | -- | 0 | 1 | 0 | 0% | No |
| trans-1,3-Dichloropropene | 7 | 0 | 0.22 | -- | -- | 0 | 3 | 7 | 100% | Yes |
| Trichloroethene (TCE) | 7 | 0 | 0.3 | -- | -- | 0 | 1 | 7 | 100% | Yes |
| Trichlorofluoromethane | 7 | 0 | 120 | -- | -- | 0 | 2 | 0 | 0% | No |
| Vinyl Acetate | 2 | 0 | 7800 | -- | -- | 0 | 10 | 0 | 0% | No |
| Vinyl Chloride | 7 | 0 | 0.02 | -- | -- | 0 | 2 | 7 | 100% | Yes |

**Notes:**

(a) Includes both detected concentrations and, for nondetected results, reporting limits.

(b) Entry is Yes if one or more detected results exceed SL or if chemical is never detected and all RLs exceed SL. Otherwise, entry is No.

COPC - chemical of potential concern

SL - screening level

**Table 2. Chemicals of Potential Concern**
Project No. 050004, Barbee Mill, Renton, WA

| | Preliminary COPC in Saturated Zone Soil | Preliminary COPC in Unsaturated Zone Soil | Preliminary COPC in Groundwater | COPCs in Soil Only | | | | Other Considerations | Soil COPC | Groundwater COPC | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Direct Contact SL (mg/kg) | Number of Samples Analyzed | Number of Detections Exceeding Direct Contact SL | Frequency of Exceedance of Direct Contact SL[(a)] | | | | |
| **BTEX** | | | | | | | | | | | |
| Benzene | Yes | Yes | Yes | 18 | 33 | 0 | 0% | Not detected in groundwater at current PQL. | No | No | -- |
| Ethylbenzene | Yes | No | No | 8000 | 33 | 0 | 0% | -- | No | No | -- |
| **Metals** | | | | | | | | | | | |
| Antimony | Yes | Yes | Yes | 32 | 16 | 0 | 0% | -- | Unknown | Unknown | Not detected in Site groundwater. Historical reporting limit above current PQL. Since this was detected in soil, need best available RLs. |
| Arsenic | Yes | Yes | Yes | 0.67 | 1036 | 920 | 100% | -- | Yes | Yes | -- |
| Barium | Yes | No | N/A | 16000 | 16 | 0 | 0% | No groundwater data available. | Unknown | Unknown | Need groundwater data.<br>If not a COPC in groundwater, it will screen out as a soil COPC. |
| Cadmium | No | No | Yes | -- | 51 | 0 | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Chromium | Yes | No | No | 120000 | 51 | 0 | 0% | -- | No | No | -- |
| Copper | Yes | No | Yes | 3200 | 48 | 0 | 0% | Groundwater exceedances are only for total concentrations, but the dissolved SL applies. No exceedances of dissolved SL. | No | No | -- |
| Iron | No | No | Yes | 56000 | 8 | 0 | 0% | Elevated in groundwater due to naturally reducing conditions in peat. Site-specific background not established. Component of PAZ. | No | Unknown | Need updated site-specific ground water background. Must be monitored in groundwater regardless of whether it qualifies as a COPC. |
| Lead | Yes | Yes | No | 250 | 51 | 0 | 0% | -- | No | No | -- |
| Manganese | No | No | Yes | 3736 | 8 | 0 | 0% | Elevated in groundwater due to naturally reducing conditions in peat. Site-specific background not established. | No | Unknown | Need site-specific groundwater background to determine if it qualifies as a COPC. |
| Mercury | Yes | Yes | Yes | 24 | 48 | 0 | 0% | -- | Unknown | Unknown | Not detected in Site groundwater. Historical reporting limit above current PQL. Since this was detected in soil, need best available RLs. |
| Nickel | Yes | Yes | No | 1600 | 48 | 0 | 0% | -- | No | No | -- |
| Selenium | Yes | Yes | Yes | 400 | 33 | 0 | 0% | -- | Yes | Yes | -- |
| Silver | Yes | No | No | 400 | 51 | 0 | 0% | -- | No | No | -- |
| Thallium | Yes | Yes | Yes | 0.8 | 16 | 0 | 100% | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Zinc | Yes | Yes | Yes | 24000 | 278 | 0 | 0% | -- | Yes | Yes | -- |
| **Other SVOCs** | | | | | | | | | | | |
| 2,4,6-Trichlorophenol | Yes | Yes | No | 80 | 28 | 0 | 0% | -- | No | No | -- |
| 2,4-Dichlorophenol | Yes | No | No | 240 | 12 | 0 | 0% | -- | No | No | -- |
| Dibenzofuran | No | Yes | No | 80 | 16 | 0 | 0% | -- | No | No | -- |
| Hexachlorobutadiene | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Pentachlorophenol | Yes | Yes | Yes | 2.5 | 65 | 4 | 7% | No groundwater detections above PQL. | Yes | No | -- |
| Phenol | Yes | Yes | No | 24000 | 5 | 0 | 0% | -- | No | No | -- |
| **PAHs** | | | | | | | | | | | |
| Acenaphthene | Yes | No | No | 4800 | 4 | 0 | 0% | -- | No | No | -- |
| Benzo(g,h,i)perylene | Yes | Yes | No | -- | 41 | 0 | 0% | -- | No | No | -- |
| Fluoranthene | Yes | Yes | Yes | 3200 | 41 | 0 | 0% | Only groundwater detect is from test pit grab sample, but all groundwater RLs exceed SL and are above current PQL. | Unknown | Unknown | Need best available RLs.<br>If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Fluorene | No | Yes | No | 3200 | 41 | 0 | 0% | -- | No | No | -- |
| Pyrene | Yes | Yes | Yes | 2400 | 41 | 0 | 0% | Only groundwater detect is from test pit grab sample, but all groundwater RLs exceed SL and are above current PQL. | Unknown | Unknown | Need best available RLs.<br>If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Benz(a)anthracene | Yes | Yes | Yes | -- | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs.<br>If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Benzo(a)pyrene | Yes | Yes | Yes | 0.19 | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs.<br>If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |

**Table 2. Chemicals of Potential Concern**
Project No. 050004, Barbee Mill, Renton, WA

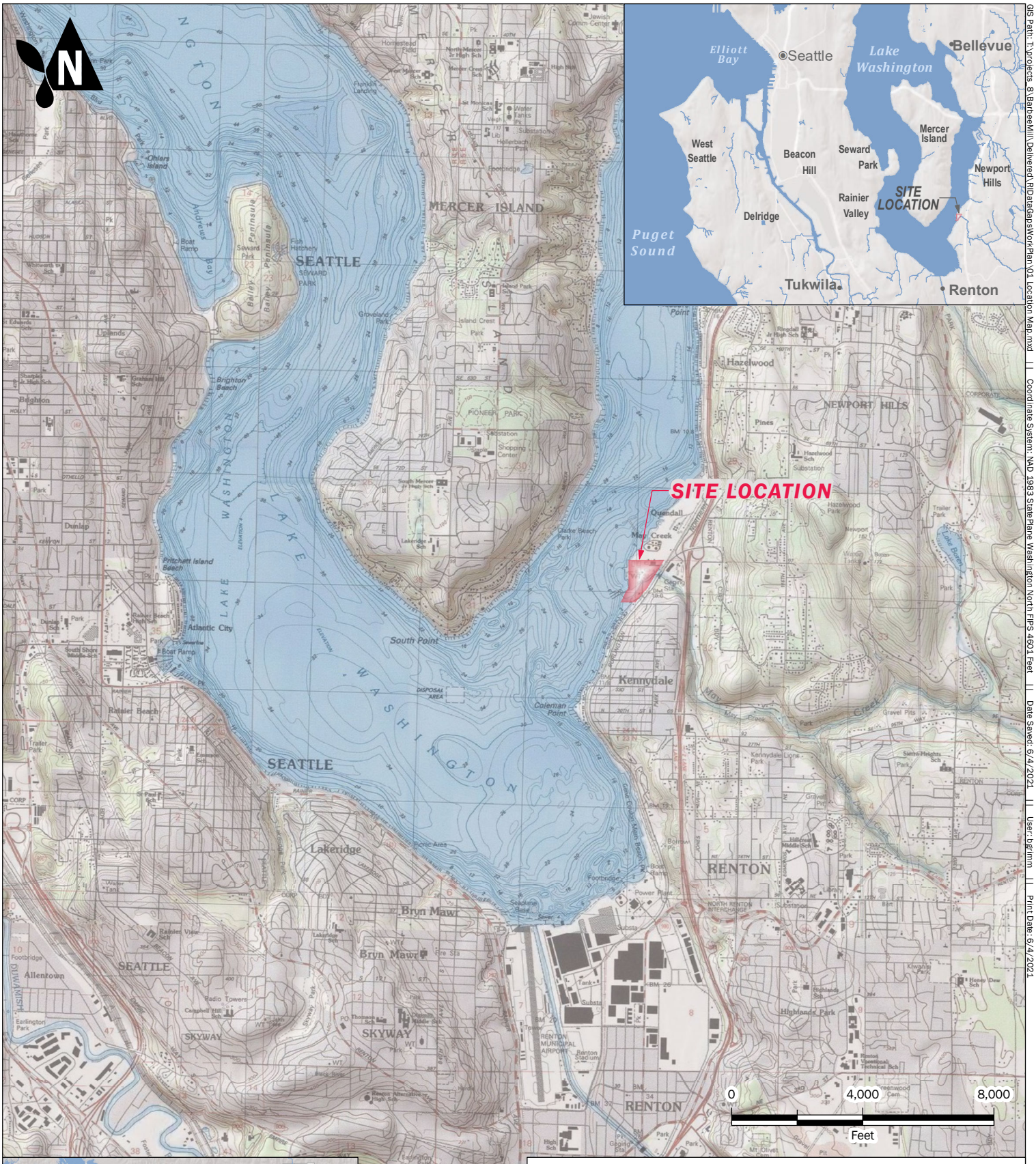
| | Preliminary COPC in Saturated Zone Soil | Preliminary COPC in Unsaturated Zone Soil | Preliminary COPC in Groundwater | COPCs in Soil Only | | | | Other Considerations | Soil COPC | Groundwater COPC | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Direct Contact SL (mg/kg) | Number of Samples Analyzed | Number of Detections Exceeding Direct Contact SL | Frequency of Exceedance of Direct Contact SL[(a)] | | | | |
| Benzo(b)fluoranthene | Yes | Yes | Yes | -- | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs. If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Benzo(k)fluoranthene | Yes | Yes | Yes | -- | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs. If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Chrysene | Yes | Yes | Yes | -- | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs. If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Dibenzo(a,h)anthracene | Yes | Yes | Yes | -- | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs. If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Indeno(1,2,3-cd)pyrene | Yes | Yes | Yes | -- | 41 | 0 | 0% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs. If not detected in groundwater with best available RLs, it would screen out as both soil & GW COPC. |
| Total cPAHs TEQ (ND = 1/2 RDL) | Yes | Yes | Yes | 0.19 | 43 | 2 | 6% | Not detected in groundwater, but groundwater RLs exceed screening levels and current PQL. | Unknown | Unknown | Need best available RLs. If not detected in groundwater with best available RLs, it would screen out as a GW COPC and Soil COPC using 3-part rule to compare to direct contact SL. |
| **PCBAro** | | | | | | | | | | | |
| Total PCBs (Sum of Aroclors) | Yes | Yes | Yes | 1 | 23 | 0 | 0% | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| **TPHs** | | | | | | | | | | | |
| Diesel Range Organics | Yes | Yes | Yes | -- | 96 | 0 | 0% | -- | Yes | Yes | -- |
| Motor Oil Range Organics | Yes | Yes | No | -- | 91 | 0 | 0% | -- | Yes | Yes | -- |
| **VOCs** | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| 1,1,2-Trichloroethane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| 1,2,3-Trichloropropane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| 1,2,4-Trichlorobenzene | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |

**Table 2. Chemicals of Potential Concern**
Project No. 050004, Barbee Mill, Renton, WA

| | Preliminary COPC in Saturated Zone Soil | Preliminary COPC in Unsaturated Zone Soil | Preliminary COPC in Groundwater | COPCs in Soil Only | | | | Other Considerations | Soil COPC | Groundwater COPC | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Direct Contact SL (mg/kg) | Number of Samples Analyzed | Number of Detections Exceeding Direct Contact SL | Frequency of Exceedance of Direct Contact SL[(a)] | | | | |
| 1,2-Dibromo-3-chloropropane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| 1,2-Dibromoethane (EDB) | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| 1,2-Dichloropropane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Acrolein | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Acrylonitrile | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Bromodichloromethane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Carbon Tetrachloride | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| cis-1,3-Dichloropropene | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Dibromochloromethane | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| trans-1,3-Dichloropropene | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Trichloroethene (TCE) | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |
| Vinyl Chloride | No | No | Yes | -- | -- | -- | -- | Not detected in Site groundwater. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities. Analyzed as part of full suite analytical list. | No | No | -- |

Note:
N/A - data not available
(a) Includes both detected concentrations and, for nondetected results, reporting limits. Includes both saturated and unsaturated zones.
COPC - chemical of potential concern
GW - groundwater
PAZ - passive attenuation zone
RL - reporting level
SL - screening level

# FIGURES




# Location Map

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect CONSULTING | JUN-2021 | BY: DFR / EAH | FIGURE NO. 1 |
| | PROJECT NO. 050004 | REV BY: DIM / WEG | |

GIS Path: T:\projects_8\BarbeeMill\Delivered\RIDataGapsWorkPlan\01_Location_Map.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021

**A** Northwest

Southeast **A'**

**House**
(Residents)

**House**
(Residents)

**House**
(Residents)

Direct Soil Contact

Direct Contact to Sediment

Lake Washington

Ingestion of Fish/Shellfish

Elevation Scale is in NAVD88

20 ft

10 ft

0 ft

-10 ft

-20 ft

30 ft

20 ft

10 ft

0 ft

-10 ft

-20 ft

Aquatic Organism Exposure

Benthic Organism Exposure

Groundwater Discharge to Surface Water and Sediment

*Fill for Development (Gravelly Sand with Silt and/or Topsoil)*

*Historical Fill*

*Well Graded Gravelly Sand*

*Silty Sand with Gravel*

*Groundwater Level*

*Clear Rock*

*3% Iron in Sand*

Soil Leaching to Groundwater

*29% Iron Mixture in Sand*

*Shallow Alluvium (Interbedded Sand, Sandy Silt, Organic Silt, and Peat)*

*Deeper Alluvium (Sand and Gravel)*

Recent Fill

Historical Fill

Shallow Alluvium

Deep Alluvium

Passive Attenuation Zone

Groundwater Flow

Soil Leaching to Groundwater

Nearshore Groundwater Mixing and Discharge

0 50 100 ft

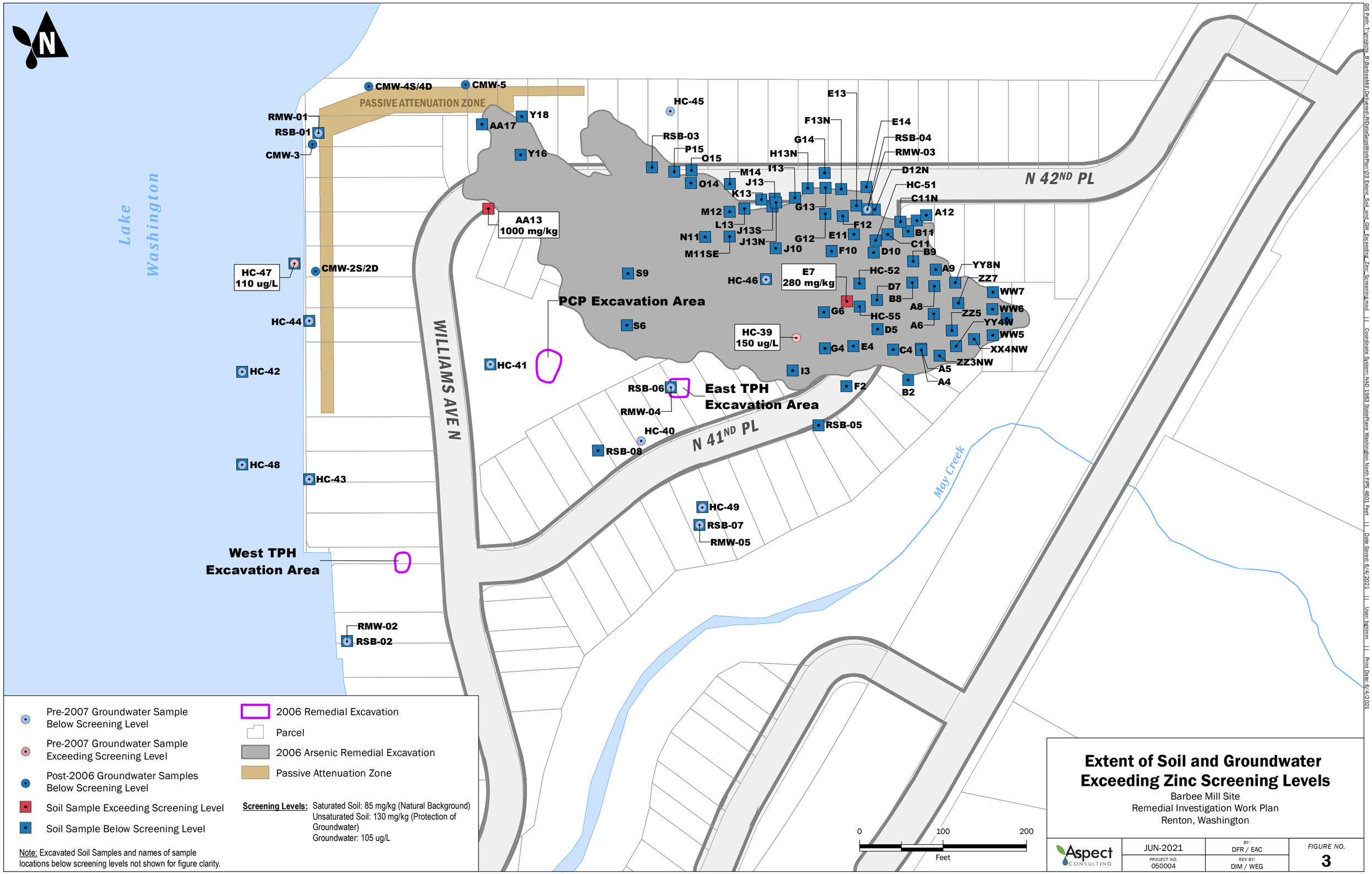
*SCALE IS APPROXIMATE*

# Preliminary Conceptual Site Model for Migration and Exposure Pathways

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect Consulting | JUN-2021 | BY: DM / TDR | FIGURE NO. 2 |
|---|---|---|---|
| | PROJECT NO. 05004 | REV BY: --- | |

T:\projects_8\BarbeeMill\Delivered\DraftFinalRReport\AI\X Preliminary Conceptual Site Model for Migration and Exposure Pathways.ai




Pre-2007 Groundwater Sample Below Screening Level

Pre-2007 Groundwater Sample Exceeding Screening Level

Post-2006 Groundwater Samples Below Screening Level

Soil Sample Exceeding Screening Level

Soil Sample Below Screening Level

2006 Remedial Excavation

Parcel

2006 Arsenic Remedial Excavation

Passive Attenuation Zone

**Screening Levels:** Saturated Soil: 85 mg/kg (Natural Background)
Unsaturated Soil: 130 mg/kg (Protection of Groundwater)
Groundwater: 105 ug/L

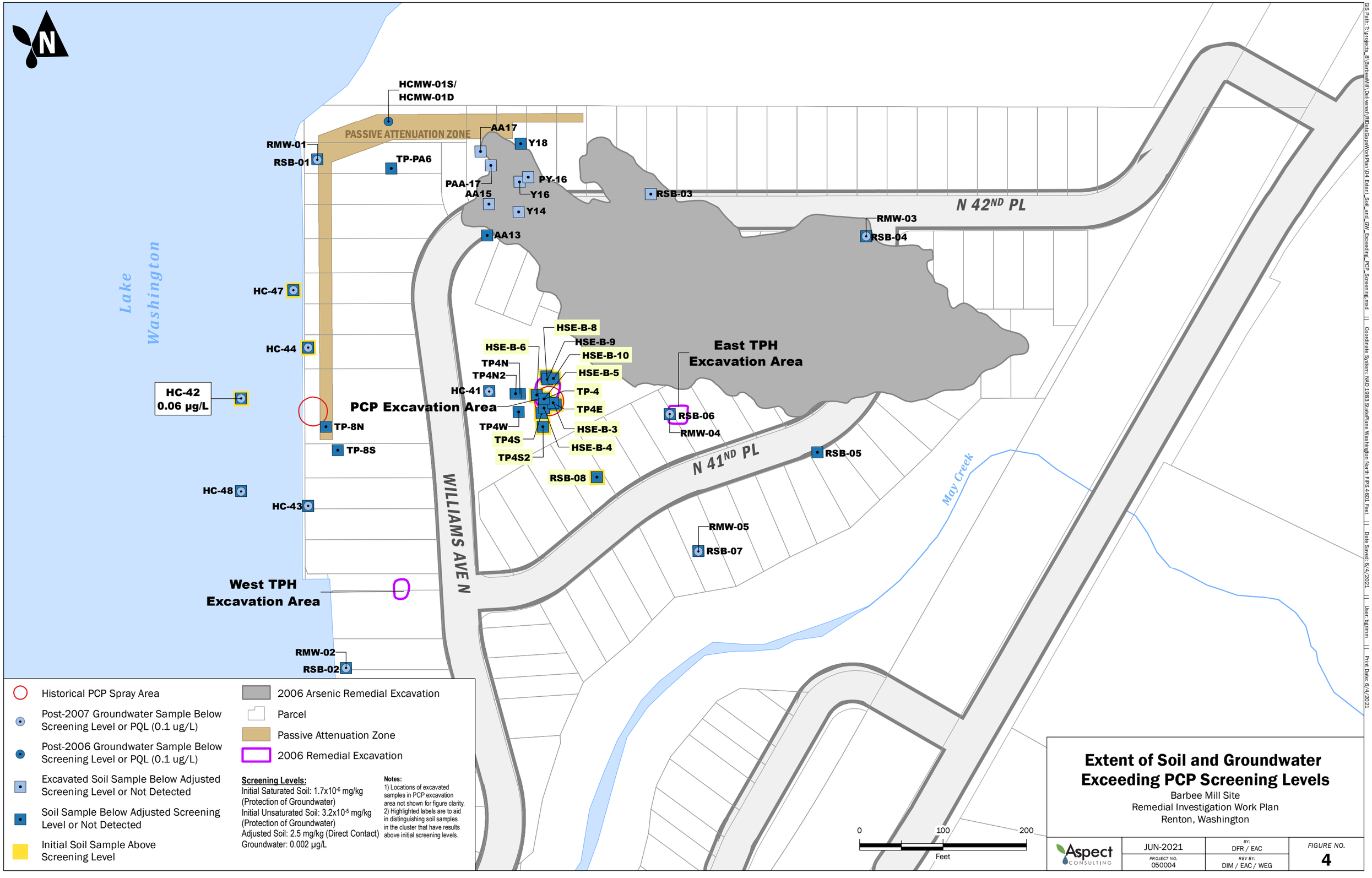
Note: Excavated Soil Samples and names of sample locations below screening levels not shown for figure clarity.

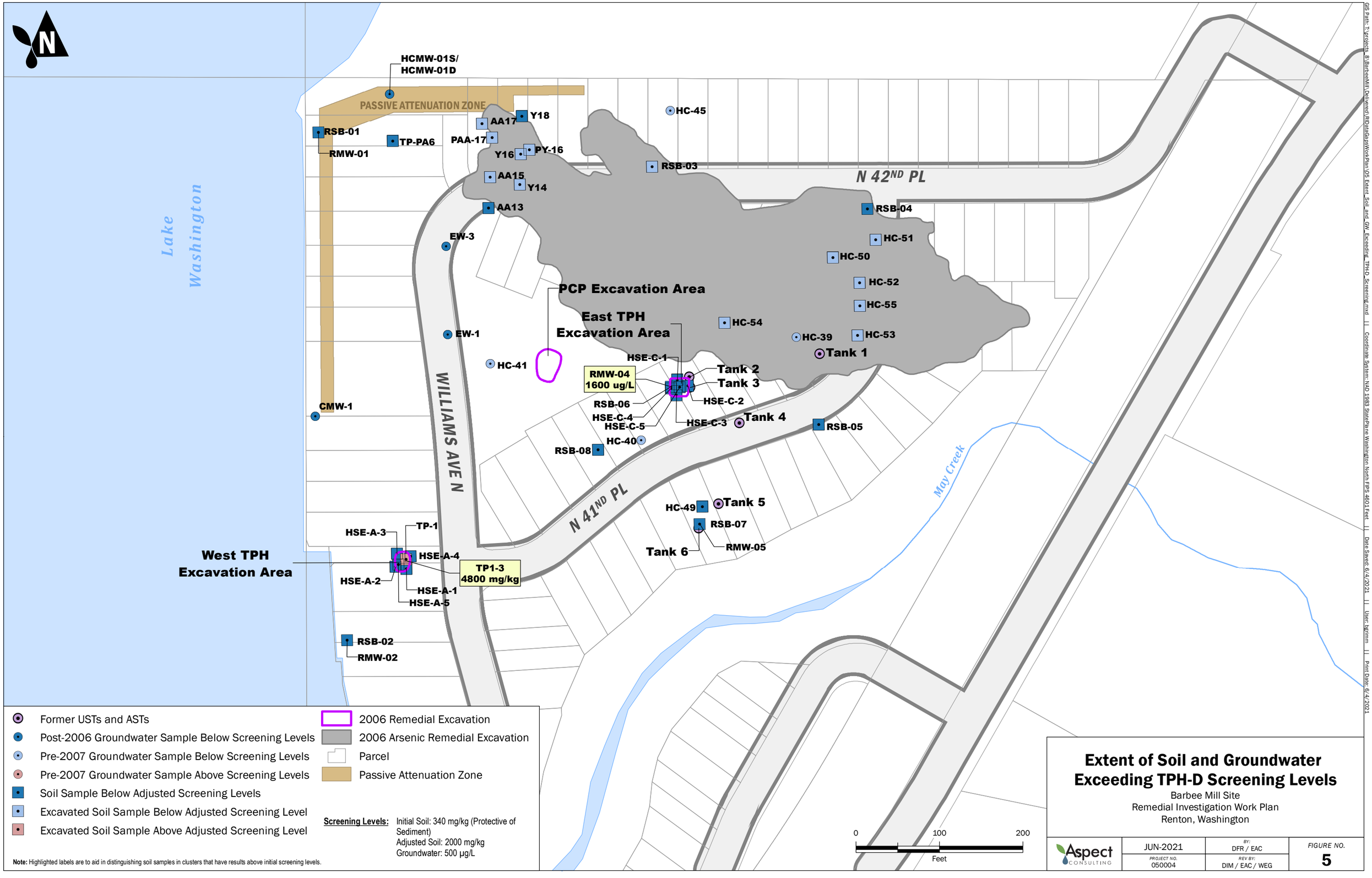
# Extent of Soil and Groundwater Exceeding Zinc Screening Levels

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect Consulting | JUN-2021 | BY: DFR / EAC | FIGURE NO. 3 |
|---|---|---|---|
| | PROJECT NO. 050004 | REV BY: DIM / WEG | |

GIS Path: T:\projects_8\Barbee\Mill Delivered\RI\data\gis\WorkPlan\03 Extent_Soil_and_GW_Exceeding_Zinc_Screening.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021


HCMW-01S/
HCMW-01D
PASSIVE ATTENUATION ZONE
RMW-01
RSB-01
TP-PA6
AA17
Y18
PAA-17
AA15
PY-16
Y16
Y14
AA13
RSB-03
N 42ND PL
RMW-03
RSB-04
Lake Washington
HC-47
HC-44
HC-42
0.06 µg/L
HSE-B-8
HSE-B-9
HSE-B-6
HSE-B-10
TP4N
TP4N2
HSE-B-5
HC-41
TP-4
TP4E
PCP Excavation Area
TP-8N
TP4W
HSE-B-3
TP4S
HSE-B-4
TP4S2
TP-8S
RSB-08
East TPH
Excavation Area
RSB-06
RMW-04
N 41ND PL
RSB-05
HC-48
HC-43
WILLIAMS AVE N
May Creek
RMW-05
RSB-07
West TPH
Excavation Area
RMW-02
RSB-02
Historical PCP Spray Area
Post-2007 Groundwater Sample Below Screening Level or PQL (0.1 ug/L)
Post-2006 Groundwater Sample Below Screening Level or PQL (0.1 ug/L)
Excavated Soil Sample Below Adjusted Screening Level or Not Detected
Soil Sample Below Adjusted Screening Level or Not Detected
Initial Soil Sample Above Screening Level
2006 Arsenic Remedial Excavation
Parcel
Passive Attenuation Zone
2006 Remedial Excavation
Screening Levels:
Initial Saturated Soil: 1.7x10-6 mg/kg (Protection of Groundwater)
Initial Unsaturated Soil: 3.2x10-5 mg/kg (Protection of Groundwater)
Adjusted Soil: 2.5 mg/kg (Direct Contact)
Groundwater: 0.002 µg/L
Notes:
1) Locations of excavated samples in PCP excavation area not shown for figure clarity.
2) Highlighted labels are to aid in distinguishing soil samples in the cluster that have results above initial screening levels.
0
100
200
Feet
Extent of Soil and Groundwater Exceeding PCP Screening Levels
Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington
Aspect CONSULTING
JUN-2021
PROJECT NO. 050004
BY: DFR / EAC
REV BY: DIM / EAC / WEG
FIGURE NO. 4
GIS Path: T:\projects_8\Barbee\Mill\Deliverable\RI\Data\gis\WorkPlan\Q4 Extent_Soil_and_GW_Exceeding_PCP_Screening.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021

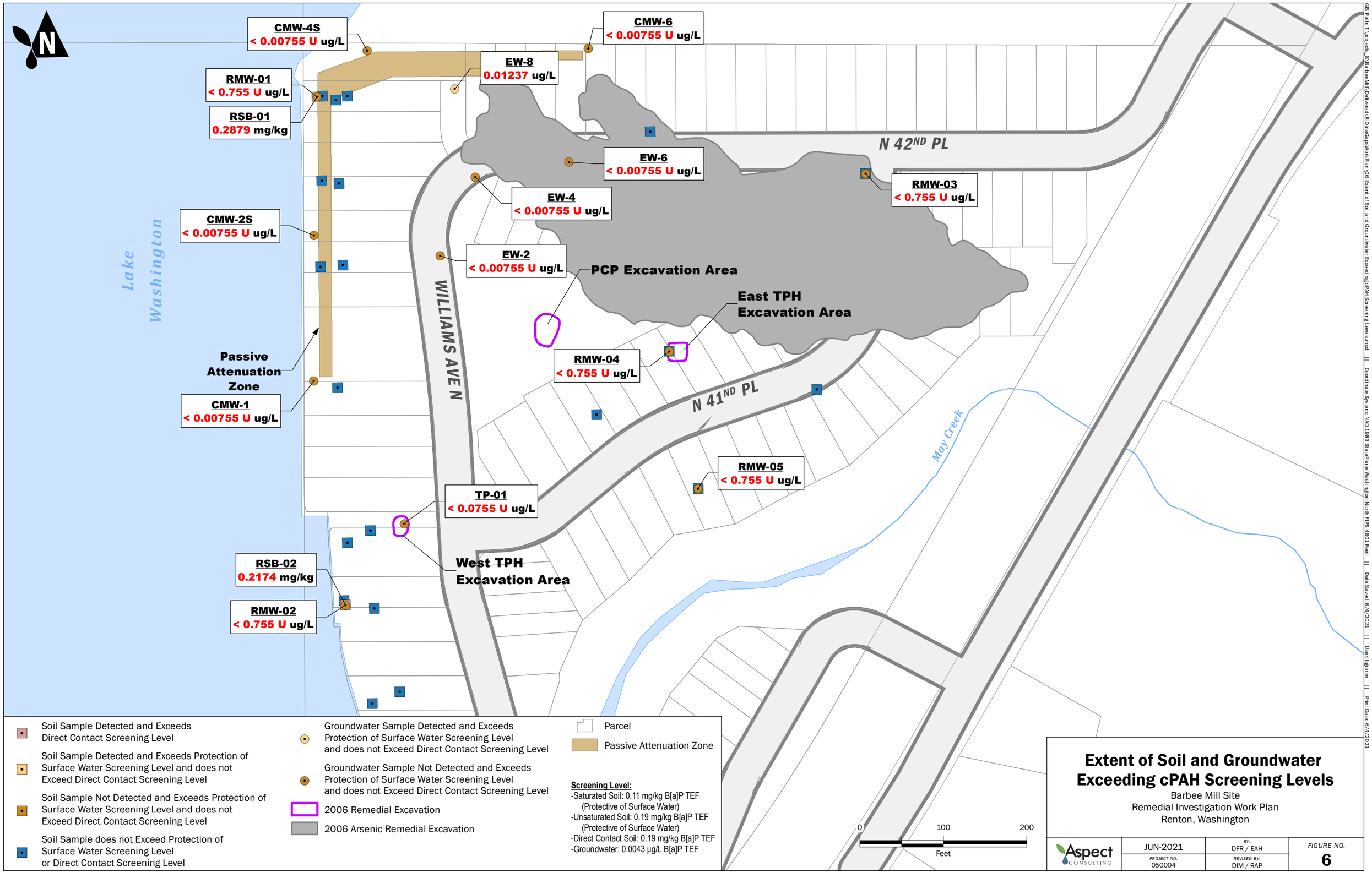


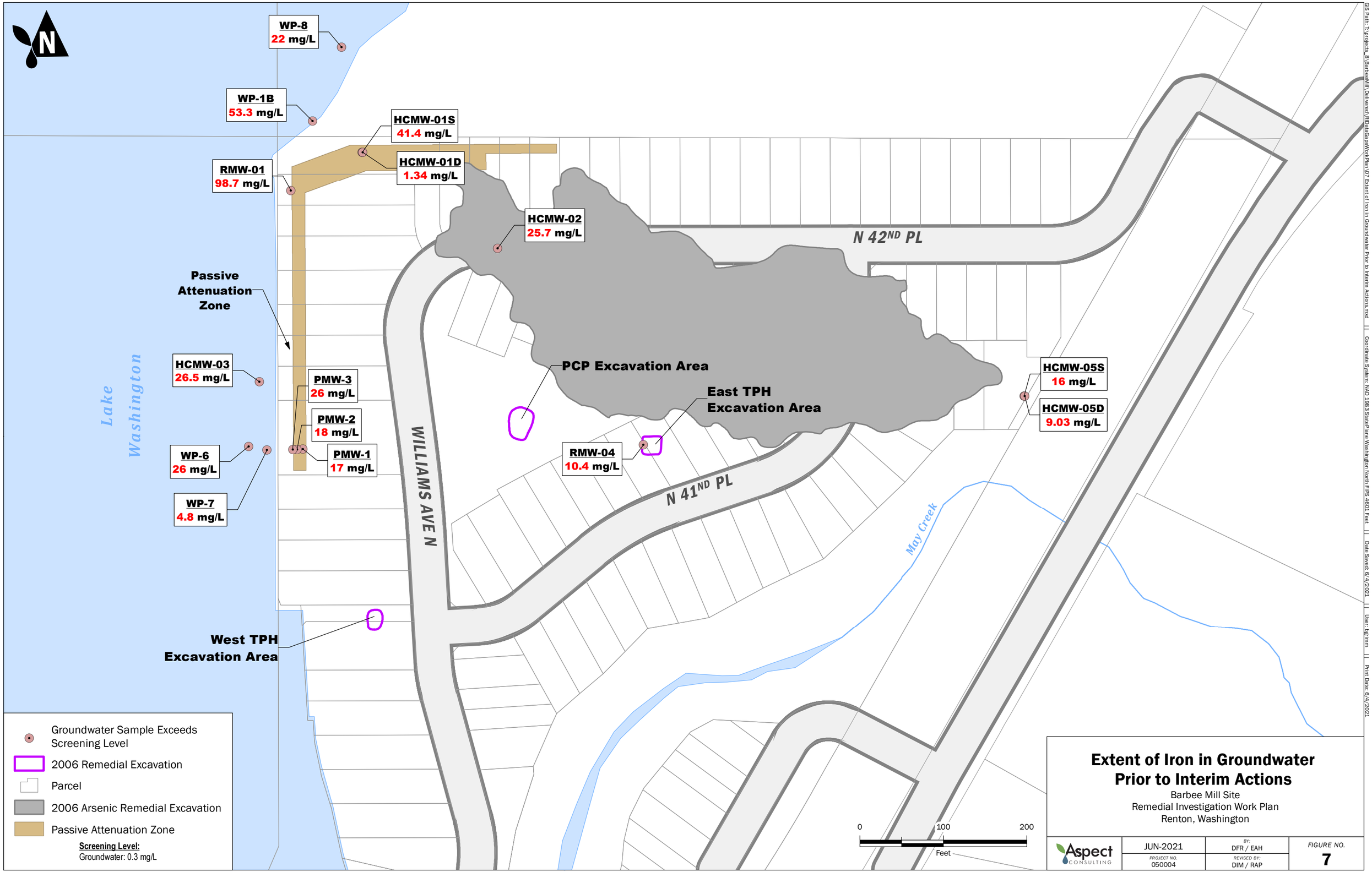

# Extent of Soil and Groundwater Exceeding TPH-D Screening Levels

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | JUN-2021 | BY: DFR / EAC | FIGURE NO. 5 |
| | PROJECT NO. 050004 | REV BY: DIM / EAC / WEG | |

GIS Path: T:\projects_8\Barbee Mill\Delivered\RI\Data Gaps Work Plan\05 Extent_Soil_and_GW_Exceeding_TPH-D_Screening.mxd | | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet | | Date Saved: 6/4/2021 | | User: bgrimm | | Print Date: 6/4/2021


CMW-4S
< 0.00755 U ug/L
CMW-6
< 0.00755 U ug/L
EW-8
0.01237 ug/L
RMW-01
< 0.755 U ug/L
RSB-01
0.2879 mg/kg
N 42ND PL
EW-6
< 0.00755 U ug/L
RMW-03
< 0.755 U ug/L
EW-4
< 0.00755 U ug/L
CMW-2S
< 0.00755 U ug/L
EW-2
< 0.00755 U ug/L
PCP Excavation Area
East TPH
Excavation Area
Lake
Washington
WILLIAMS AVE N
RMW-04
< 0.755 U ug/L
N 41ND PL
May Creek
Passive
Attenuation
Zone
CMW-1
< 0.00755 U ug/L
RMW-05
< 0.755 U ug/L
TP-01
< 0.0755 U ug/L
West TPH
Excavation Area
RSB-02
0.2174 mg/kg
RMW-02
< 0.755 U ug/L
Soil Sample Detected and Exceeds Direct Contact Screening Level
Soil Sample Detected and Exceeds Protection of Surface Water Screening Level and does not Exceed Direct Contact Screening Level
Soil Sample Not Detected and Exceeds Protection of Surface Water Screening Level and does not Exceed Direct Contact Screening Level
Soil Sample does not Exceed Protection of Surface Water Screening Level or Direct Contact Screening Level
Groundwater Sample Detected and Exceeds Protection of Surface Water Screening Level and does not Exceed Direct Contact Screening Level
Groundwater Sample Not Detected and Exceeds Protection of Surface Water Screening Level and does not Exceed Direct Contact Screening Level
2006 Remedial Excavation
2006 Arsenic Remedial Excavation
Parcel
Passive Attenuation Zone
Screening Level:
-Saturated Soil: 0.11 mg/kg B[a]P TEF (Protective of Surface Water)
-Unsaturated Soil: 0.19 mg/kg B[a]P TEF (Protective of Surface Water)
-Direct Contact Soil: 0.19 mg/kg B[a]P TEF
-Groundwater: 0.0043 µg/L B[a]P TEF
0
100
200
Feet
Extent of Soil and Groundwater Exceeding cPAH Screening Levels
Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington
Aspect CONSULTING
JUN-2021
PROJECT NO. 050004
BY: DFR / EAH
REVISED BY: DIM / RAP
FIGURE NO. 6
GIS Path: T:\projects_8\Barbee\Mxd\Delivered\RIData\GpsWorkPlan\Q6 Extent of Soil and Groundwater Exceeding cPAH Screening Levels.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021




# Extent of Iron in Groundwater Prior to Interim Actions

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | JUN-2021 | BY: DFR / EAH | FIGURE NO. 7 |
| | PROJECT NO. 050004 | REVISED BY: DIM / RAP | |

GIS Path: T:\projects_8\Barbee Mill\Delivered\RI\data\gis\WorkPlan\Q7 Extent of Iron in Groundwater Prior to Interim Actions.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021

NS01-C1
6.67 mg/L

WP-8
25 mg/L

BH-29A
23 mg/L

WP-1A
43 mg/L

CMW-4D
19 mg/L

CMW-4S
28 mg/L

CMW-5
43 mg/L

CMW-6
25 mg/L

CMW-3
27 mg/L

EW-8
22 mg/L

EW-6
36 mg/L

EW-4
88 mg/L

EW-7
18 mg/L

CMW-2D
9.2 mg/L

EW-5
140 mg/L

CMW-2S
66 mg/L

EW-3
26 mg/L

EW-2
25 mg/L

EW-1
22 mg/L

CMW-1
58 mg/L

Lake Washington

Passive Attenuation Zone

West TPH Excavation Area

PCP Excavation Area

East TPH Excavation Area

N 42ND PL

N 41ND PL

WILLIAMS AVE N

May Creek

0 100 200
Feet

Groundwater Sample Exceeds Screening Level
2006 Remedial Excavation
2006 Arsenic Remedial Excavation
Parcel
Passive Attenuation Zone

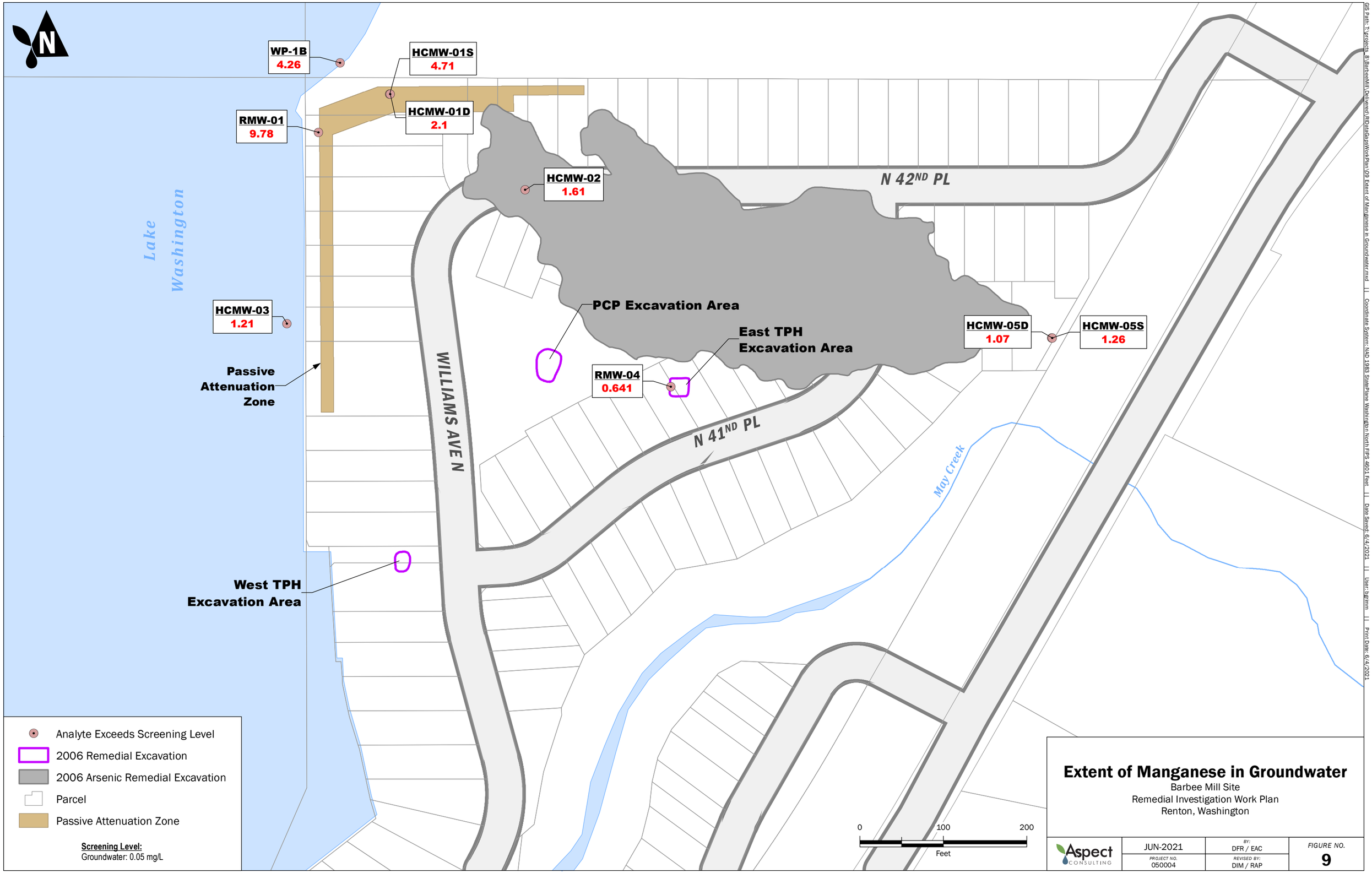
**Screening Level:**
Groundwater: 0.3 mg/L

# Extent of Iron in Groundwater After Interim Actions

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | JUN-2021 | BY: DFR / EAC | FIGURE NO. 8 |
| | PROJECT NO. 050004 | REVISED BY: DIM / RAP | |

GIS Path: T:\projects_8\Barbee\Mill\Delivered\RI\data\gis\WorkPlan\08 Extent of Iron in Groundwater After Interim Actions.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bglimm || Print Date: 6/4/2021

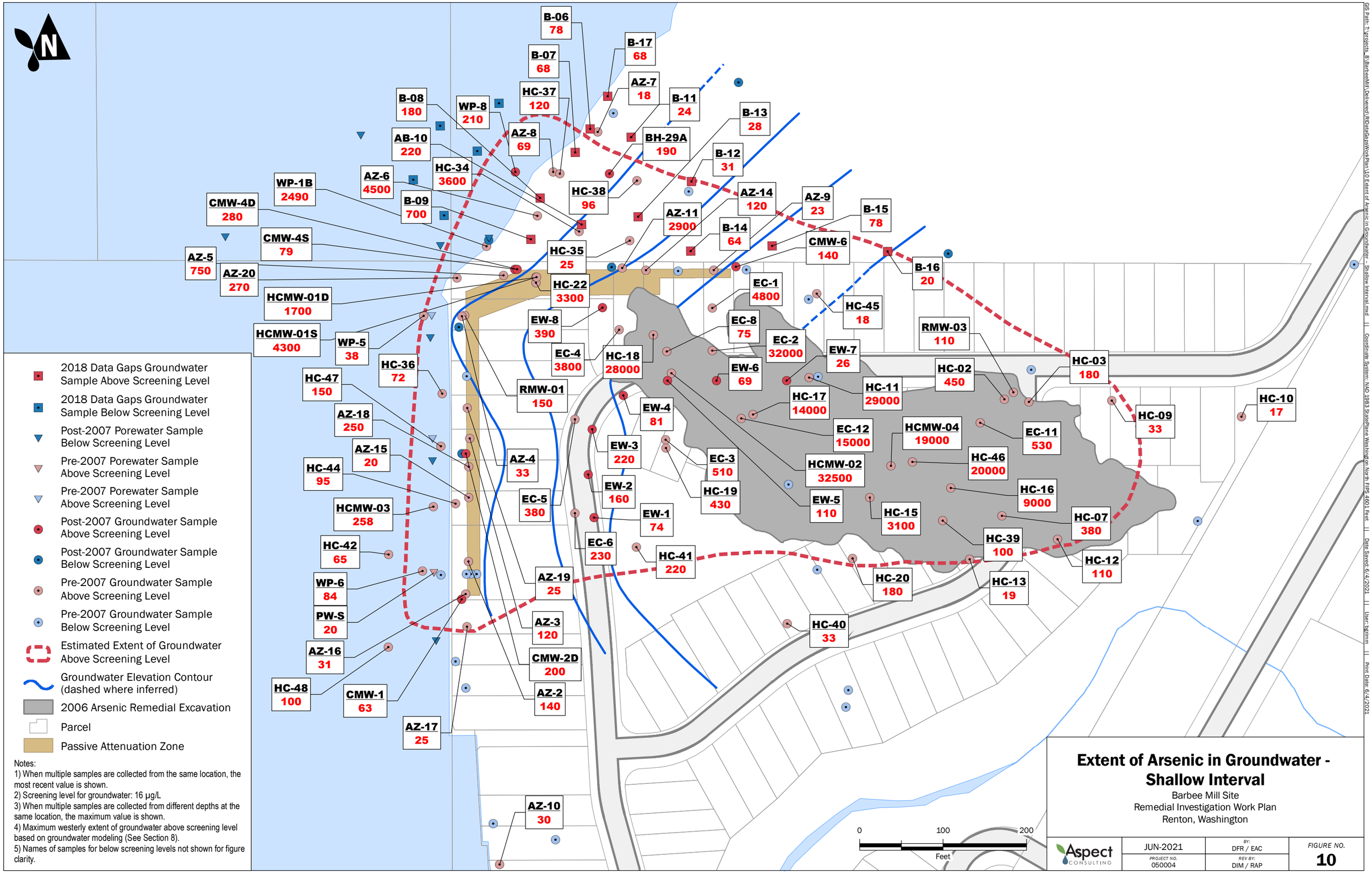



# Extent of Manganese in Groundwater

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | JUN-2021 | BY: DFR / EAC | FIGURE NO. 9 |
| | PROJECT NO. 050004 | REVISED BY: DIM / RAP | |

GIS Path: T:\projects_8\Barbee\Mill Delivered\RI\data\gis\WorkPlan\09 Extent of Manganese in Groundwater.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021



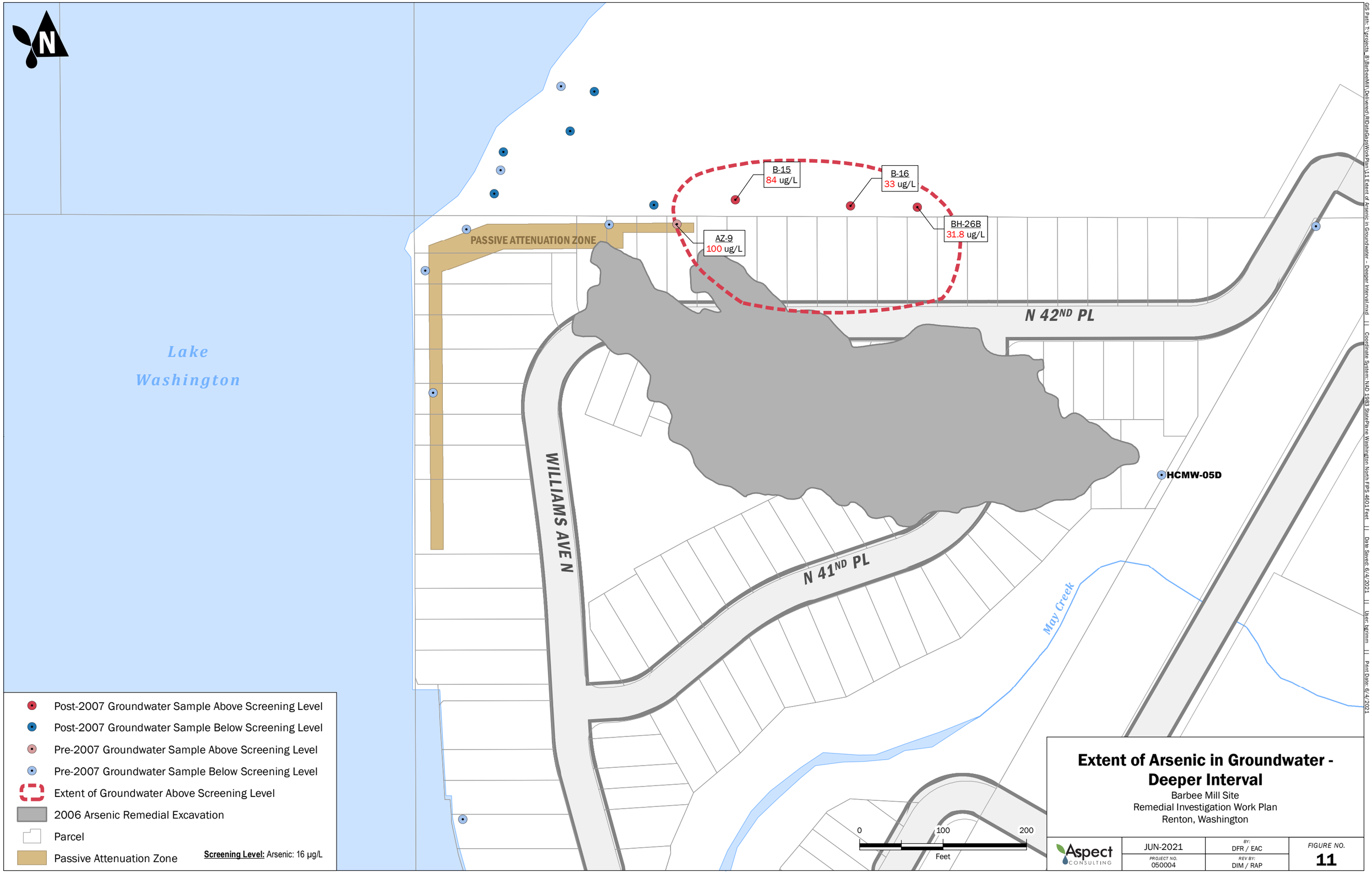

Notes:
1) When multiple samples are collected from the same location, the most recent value is shown.
2) Screening level for groundwater: 16 µg/L
3) When multiple samples are collected from different depths at the same location, the maximum value is shown.
4) Maximum westerly extent of groundwater above screening level based on groundwater modeling (See Section 8).
5) Names of samples for below screening levels not shown for figure clarity.

# Extent of Arsenic in Groundwater - Shallow Interval

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect Consulting | JUN-2021 | BY: DFR / EAC | FIGURE NO. 10 |
|---|---|---|---|
| | PROJECT NO. 050004 | REV BY: DIM / RAP | |

GIS Path: T:\projects_8\Barbee\Mill Delivered\RI\data\gis\WorkPlan\10 Extent of Arsenic in Groundwater - Shallow Interval.mxd | | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet | | Date Saved: 6/4/2021 | | User: tgrimm | | Print Date: 6/4/2021




# Extent of Arsenic in Groundwater - Deeper Interval

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | JUN-2021 | BY: DFR / EAC | FIGURE NO. 11 |
| | PROJECT NO. 050004 | REV BY: DIM / RAP | |

GIS Path: T:\projects_8\Barbee\Mill Delivered\RI\data\gis\WorkPlan\11 Extent of Arsenic in Groundwater - Deeper Interval.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bglimm || Print Date: 6/4/2021

**NOTES:**

1. VERTICAL DATUM: NAVD 88.
2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.
3. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.

LAKE WASHINGTON (17.0 Feet NAVD 88)

WP-8 210
WP-1A 10
BH-29A 17.91 190
BH-29B 19.19
BH-21B 19.39
BH-21A 18.15
BH-16
BH-26A 21.78
BH-26B 19.91
CMW-4S/4D 17.6/18.02 79/280
CMW-5 18.9 1.5
CMW-6* 18.08 140
CMW-3 18.8 1.6
CMW-2S/2D 17.14/17.43 1.3/200
CMW-1 17.72 63
EW-8 19.60 390
EW-5 21.06 110
EW-6 21.09 69
EW-7 21.07 26
EW-4 20.22 81
EW-3 19.09 220
EW-2 19.66 160
EW-1 19.91 74
PZ-2 21.31
PZ-1 20.27
AMW-2
HCMW-05S/ HCMW-05D

Property Boundary
N 42ND PL
N 41ST PL
MILL POND
MILL CREEK
Remediation System Vault Area
Excavation Footprint
BNSF RAILROAD
LAKE WASHINGTON BOULEVARD
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005

18 19 20 21

**Legend**

- Passive Attenuation Zone
- WP-6 — Well Point
- CMW-1 — Monitoring Well Location
- EW-7 — Extraction Well Location
- PZ-1 — Piezometer Location
- RS — Remediation System Utilities
- 21.36 — Groundwater Elevation (December 2019)
- 410 — Groundwater/Porewater Arsenic Concentration in µg/L (December 2019)
- U — Not Detected at Indicated Detection Limit
- 20 — Groundwater Elevation Contour (December 2019, Dashed Where Inferred)

* Water level not consistent with nearby wells, and was not used to draw groundwater elevation contours.

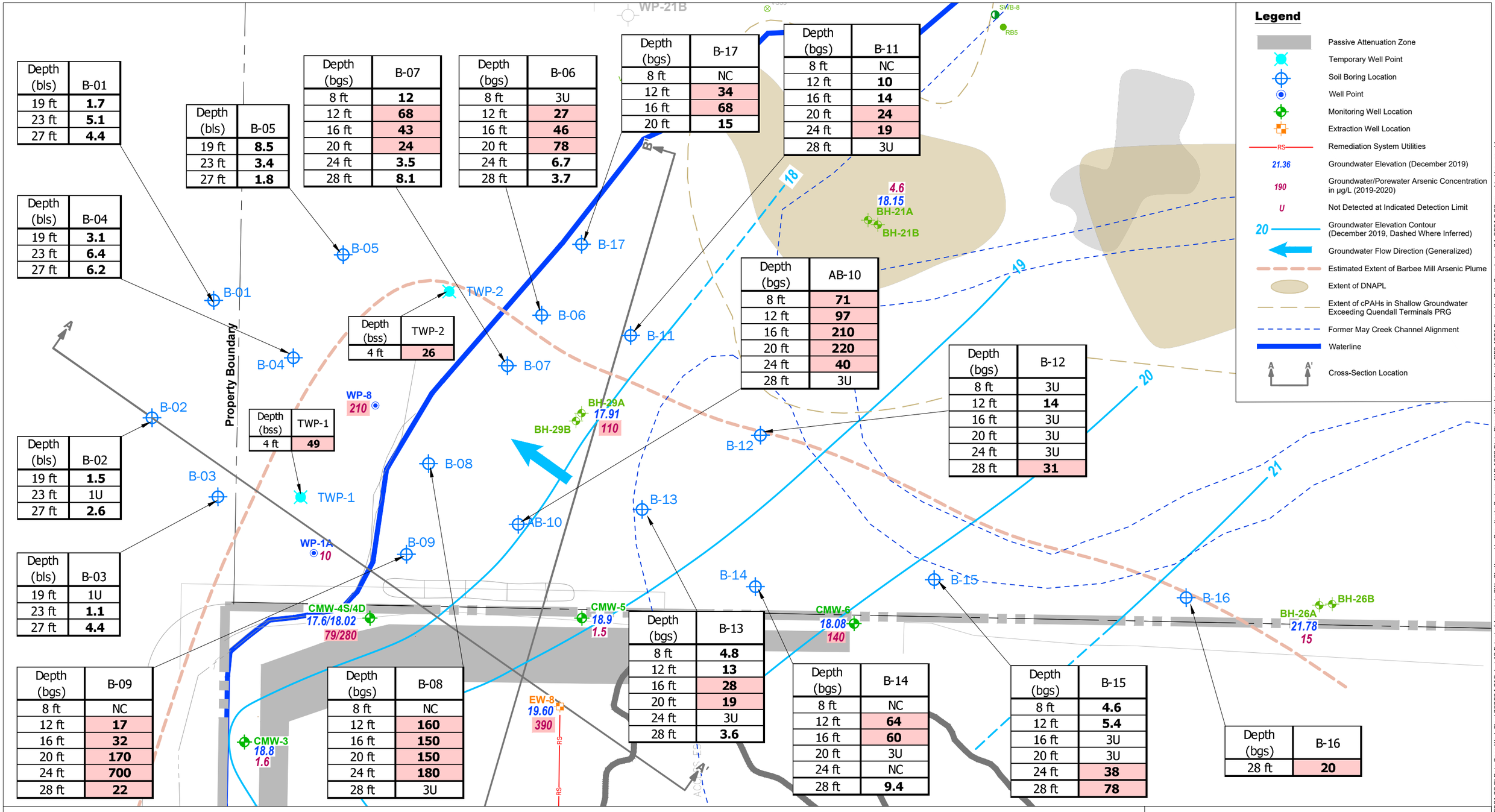
0 100 200 Feet

# Summary of Arsenic Monitoring Data December 2019

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect Consulting | Jun-2021 | BY: DIM/SCC | FIGURE NO. 12 |
|---|---|---|---|
| | PROJECT NO. 050004 | REV BY: SCC | |

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2021-03 RI Data Gaps Work Plan\050004-03.dwg GW Contours and Summary Data || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Jun 04, 2021 4:12pm || User: scudd




| Depth (bls) | B-01 |
|---|---|
| 19 ft | **1.7** |
| 23 ft | **5.1** |
| 27 ft | **4.4** |

| Depth (bls) | B-05 |
|---|---|
| 19 ft | **8.5** |
| 23 ft | **3.4** |
| 27 ft | **1.8** |

| Depth (bgs) | B-07 |
|---|---|
| 8 ft | **12** |
| 12 ft | **68** |
| 16 ft | **43** |
| 20 ft | **24** |
| 24 ft | **3.5** |
| 28 ft | **8.1** |

| Depth (bgs) | B-06 |
|---|---|
| 8 ft | 3U |
| 12 ft | **27** |
| 16 ft | **46** |
| 20 ft | **78** |
| 24 ft | **6.7** |
| 28 ft | **3.7** |

| Depth (bgs) | B-17 |
|---|---|
| 8 ft | NC |
| 12 ft | **34** |
| 16 ft | **68** |
| 20 ft | **15** |

| Depth (bgs) | B-11 |
|---|---|
| 8 ft | NC |
| 12 ft | **10** |
| 16 ft | **14** |
| 20 ft | **24** |
| 24 ft | **19** |
| 28 ft | 3U |

| Depth (bls) | B-04 |
|---|---|
| 19 ft | **3.1** |
| 23 ft | **6.4** |
| 27 ft | **6.2** |

| Depth (bss) | TWP-2 |
|---|---|
| 4 ft | **26** |

| Depth (bgs) | AB-10 |
|---|---|
| 8 ft | **71** |
| 12 ft | **97** |
| 16 ft | **210** |
| 20 ft | **220** |
| 24 ft | **40** |
| 28 ft | 3U |

| Depth (bgs) | B-12 |
|---|---|
| 8 ft | 3U |
| 12 ft | **14** |
| 16 ft | 3U |
| 20 ft | 3U |
| 24 ft | 3U |
| 28 ft | **31** |

| Depth (bss) | TWP-1 |
|---|---|
| 4 ft | **49** |

| Depth (bls) | B-02 |
|---|---|
| 19 ft | **1.5** |
| 23 ft | 1U |
| 27 ft | **2.6** |

| Depth (bls) | B-03 |
|---|---|
| 19 ft | 1U |
| 23 ft | **1.1** |
| 27 ft | **4.4** |

| Depth (bgs) | B-09 |
|---|---|
| 8 ft | NC |
| 12 ft | **17** |
| 16 ft | **32** |
| 20 ft | **170** |
| 24 ft | **700** |
| 28 ft | **22** |

| Depth (bgs) | B-08 |
|---|---|
| 8 ft | NC |
| 12 ft | **160** |
| 16 ft | **150** |
| 20 ft | **150** |
| 24 ft | **180** |
| 28 ft | 3U |

| Depth (bgs) | B-13 |
|---|---|
| 8 ft | **4.8** |
| 12 ft | **13** |
| 16 ft | **28** |
| 20 ft | **19** |
| 24 ft | 3U |
| 28 ft | **3.6** |

| Depth (bgs) | B-14 |
|---|---|
| 8 ft | NC |
| 12 ft | **64** |
| 16 ft | **60** |
| 20 ft | 3U |
| 24 ft | NC |
| 28 ft | **9.4** |

| Depth (bgs) | B-15 |
|---|---|
| 8 ft | **4.6** |
| 12 ft | **5.4** |
| 16 ft | 3U |
| 20 ft | 3U |
| 24 ft | **38** |
| 28 ft | **78** |

| Depth (bgs) | B-16 |
|---|---|
| 28 ft | **20** |

## Legend

- Passive Attenuation Zone
- Temporary Well Point
- Soil Boring Location
- Well Point
- Monitoring Well Location
- Extraction Well Location
- RS — Remediation System Utilities
- 21.36 — Groundwater Elevation (December 2019)
- 190 — Groundwater/Porewater Arsenic Concentration in µg/L (2019-2020)
- U — Not Detected at Indicated Detection Limit
- 20 — Groundwater Elevation Contour (December 2019, Dashed Where Inferred)
- Groundwater Flow Direction (Generalized)
- Estimated Extent of Barbee Mill Arsenic Plume
- Extent of DNAPL
- Extent of cPAHs in Shallow Groundwater Exceeding Quendall Terminals PRG
- Former May Creek Channel Alignment
- Waterline
- A — A' Cross-Section Location

NOTES:

1. All units are µg/L.
2. Bold values indicate arsenic detection.
3. Highlighted cells indicate exceedance of 16 µg/L CUL.
4. CUL = Cleanup Level
5. bgs = Below Ground Surface
6. bls = Below Lake Surface
7. bss = Below Sediment Surface
8. NC = Sample not collected because groundwater was not encountered or had insufficient yield to collect a sample.
9. Sample depth indicated is the bottom of a screen varying from 4-5 feet long.
10. Vertical Datum: NAVD 88.
11. Plat details based on site plan provided by OTAK on 9/25/06.
12. Topography is provided by Degross Aerial Mapping with aerial control by OTAK, INC. in 2003. Boundary lines shown are from A.L.T.A. A.C.S.M. Land Title Survey of south parcel for JAG Development by Bush, Roed and Hitchings, Inc dated 8/22/96 and a field survey by OTAK, Inc. in March 2002.
13. 2009 groundwater data reported in the Final Remedial Investigation Report, Quendall Terminals Site (Anchor QEA and Aspect 2012).
14. DNAPL and cPAH extent is from the Quendall Terminals RI Report (AnchorQEA and Aspect 2012) adjusted based on groundwater data collected in 2020.
15. Sample depth indicated is the midpoint of a screen varying from 3-5 feet long.

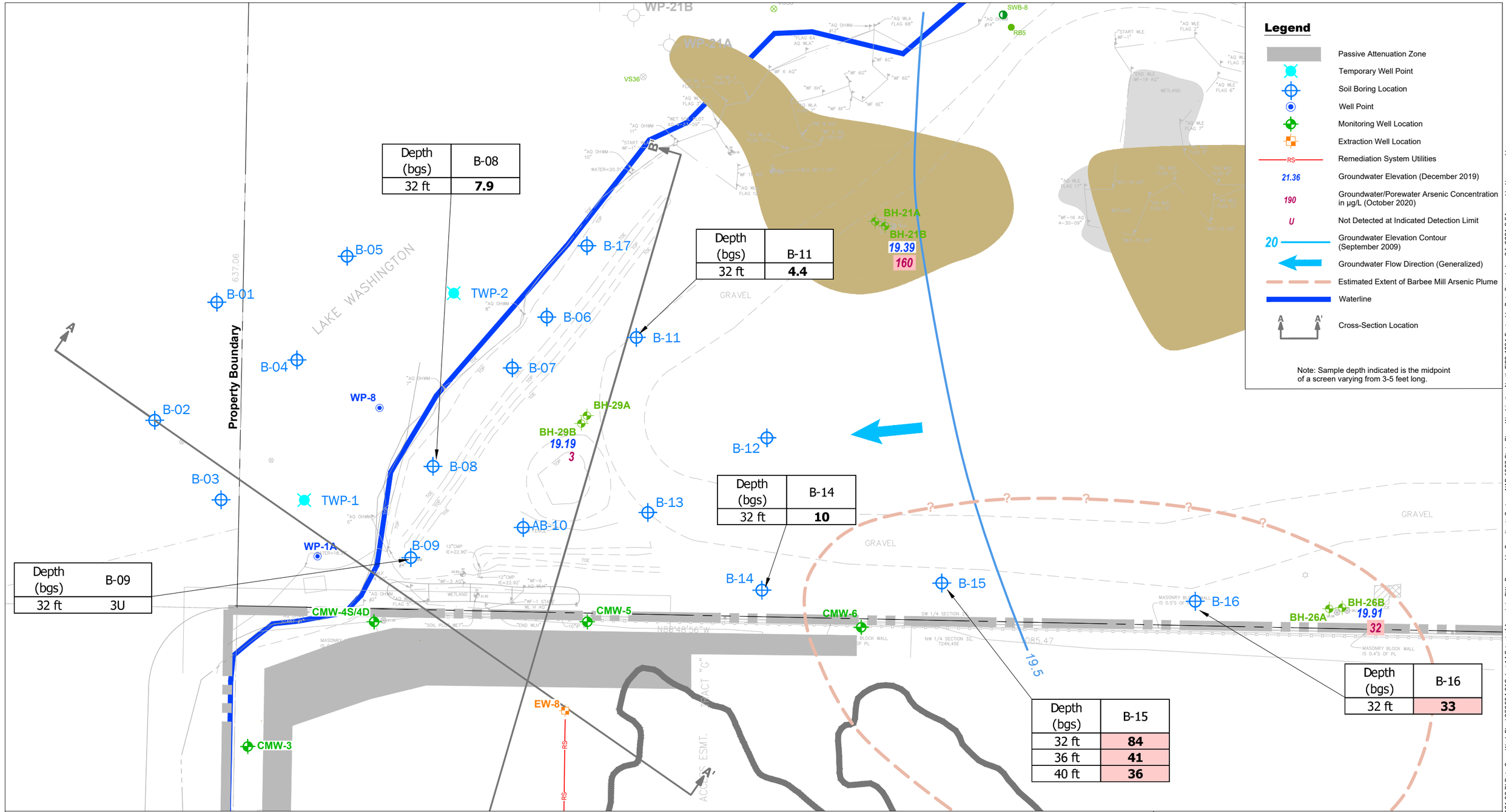
0 50 100 Feet

# Extent of Arsenic in Groundwater on Quendall Terminals - Shallow Interval

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect Consulting | Apr-2021 | BY: JJP/CMV | FIGURE NO. 13 |
|---|---|---|---|
| | PROJECT NO. 050004 | REV BY: SCC | |

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2021-03 RI Data Gaps Work Plan\050004-018.dwg 13 Extent of Arsenic in GW - Shallow || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Jun 04, 2021 3:56pm || User: scudd




## Legend

- Passive Attenuation Zone
- Temporary Well Point
- Soil Boring Location
- Well Point
- Monitoring Well Location
- Extraction Well Location
- RS — Remediation System Utilities
- 21.36 — Groundwater Elevation (December 2019)
- 190 — Groundwater/Porewater Arsenic Concentration in µg/L (October 2020)
- U — Not Detected at Indicated Detection Limit
- 20 — Groundwater Elevation Contour (September 2009)
- Groundwater Flow Direction (Generalized)
- Estimated Extent of Barbee Mill Arsenic Plume
- Waterline
- A — A' Cross-Section Location

Note: Sample depth indicated is the midpoint of a screen varying from 3-5 feet long.

NOTES:

1. All units are µg/L.
2. Bold values indicate arsenic detection.
3. Highlighted cells indicate exceedance of 16 µg/L CUL.
4. CUL = Cleanup Level
5. bgs = Below Ground Surface
6. bls = Below Lake Surface
7. bss = Below Sediment Surface
8. NC = Sample not collected because groundwater was not encountered or had insufficient yield to collect a sample.
9. Sample depth indicated is the bottom of a screen varying from 4-5 feet long.
10. Vertical Datum: NAVD 88.
11. Plat details based on site plan provided by OTAK on 9/25/06.
12. Topography is provided by Degross Aerial Mapping with aerial control by OTAK, INC. in 2003. Boundary lines shown are from A.L.T.A. A.C.S.M. Land Title Survey OF south parcel for JAG Development by Bush, Roed AND Hitchings, Inc dated 8/22/96 and a field survey by OTAK, Inc. in March 2002.
13. 2009 groundwater data reported in the Final Remedial Investigation Report, Quendall Terminals Site (Anchor QEA and Aspect 2012).

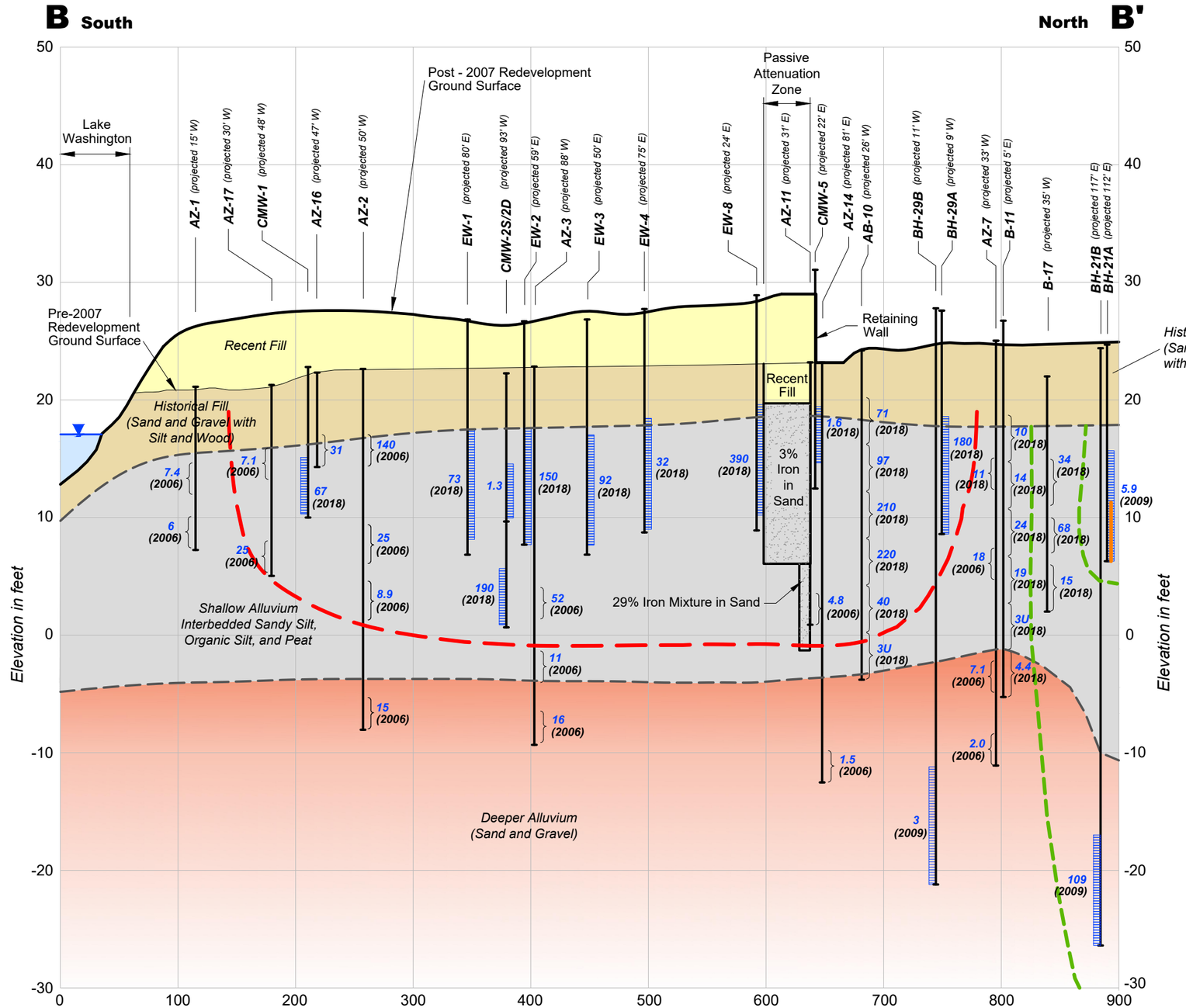
0 50 100 Feet

# Extent of Arsenic in Groundwater on Quendall Terminals - Deeper Interval

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect Consulting | Apr-2021 | BY: JJP/CMV | FIGURE NO. 14 |
|---|---|---|---|
| | PROJECT NO. 050004 | REV BY: SCC | |

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2021-03 RI Data Gaps Work Plan\050004-018.dwg 14 Extent of Arsenic in GW - Deep || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Jun 04, 2021 3:54pm || User: scudd




## LEGEND

- Ground Surface
- Geologic Unit Contact
- Dissolved Arsenic Concentration in µg/L — Sample Date — Hydrocarbon DNAPL (e.g. 450 (2018))
- Well Screen
- Soil Boring and Well Casing
- Estimated Extent of Groundwater Exceeding Arsenic Screening Level for Barbee Mill Plume
- Estimated Extent of Groundwater Exceeding Arsenic Screening Level Due to Hydrocarbon Influence
- Lake Level September 2018
- AZ-7 — Well Number

Note: Arsenic Screening Level in Groundwater 20µg/L

- Recent Fill
- Historical Fill
- Shallow Alluvium
- Deep Alluvium

Horizontal Scale
0 100 200
Feet

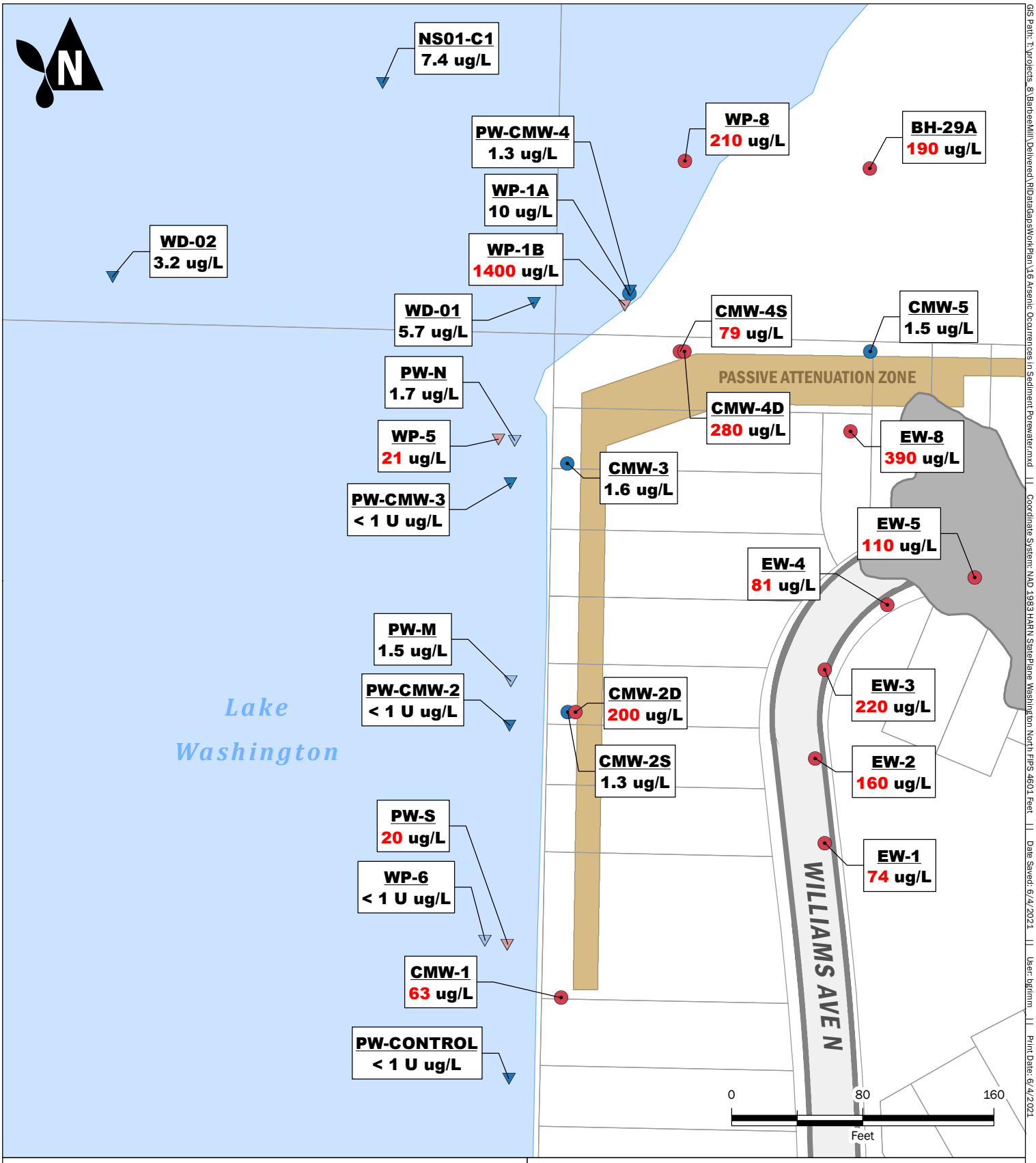
Vertical Exaggeration X 10
Scale: 1" = 100' Horizontal
1" = 10' Vertical

# Arsenic Occurrences along Cross Section B-B'

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| | | | |
|---|---|---|---|
| Aspect Consulting | Jun-2021 | BY: DFR/PMB/DIM | FIGURE NO. 15 |
| | PROJECT NO. 050004 | REV BY: SCC | |

CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2021-03 RI Data Gaps Work Plan\050004-BB with and without Arsenic Data.dwg Cross Section B-B' Arsenic Exceedance || Date Saved: Jun 04, 2021 3:58pm || User: scudd




GIS Path: T:\projects_8\BarbeeMill\Delivered\RIDataGapsWorkPlan\16 Arsenic Occurrences in Sediment Porewater.mxd || Coordinate System: NAD 1983 HARN StatePlane Washington North FIPS 4601 Feet || Date Saved: 6/4/2021 || User: bgrimm || Print Date: 6/4/2021

Post-2007 Porewater Sample Below Screening Level

Pre-2007 Porewater Sample Above Screening Level

Pre-2007 Porewater Sample Below Screening Level

2019 Groundwater Sample Above Screening Level

2019 Groundwater Sample Below Screening Level

2006 Arsenic Remedial Excavation

Parcel

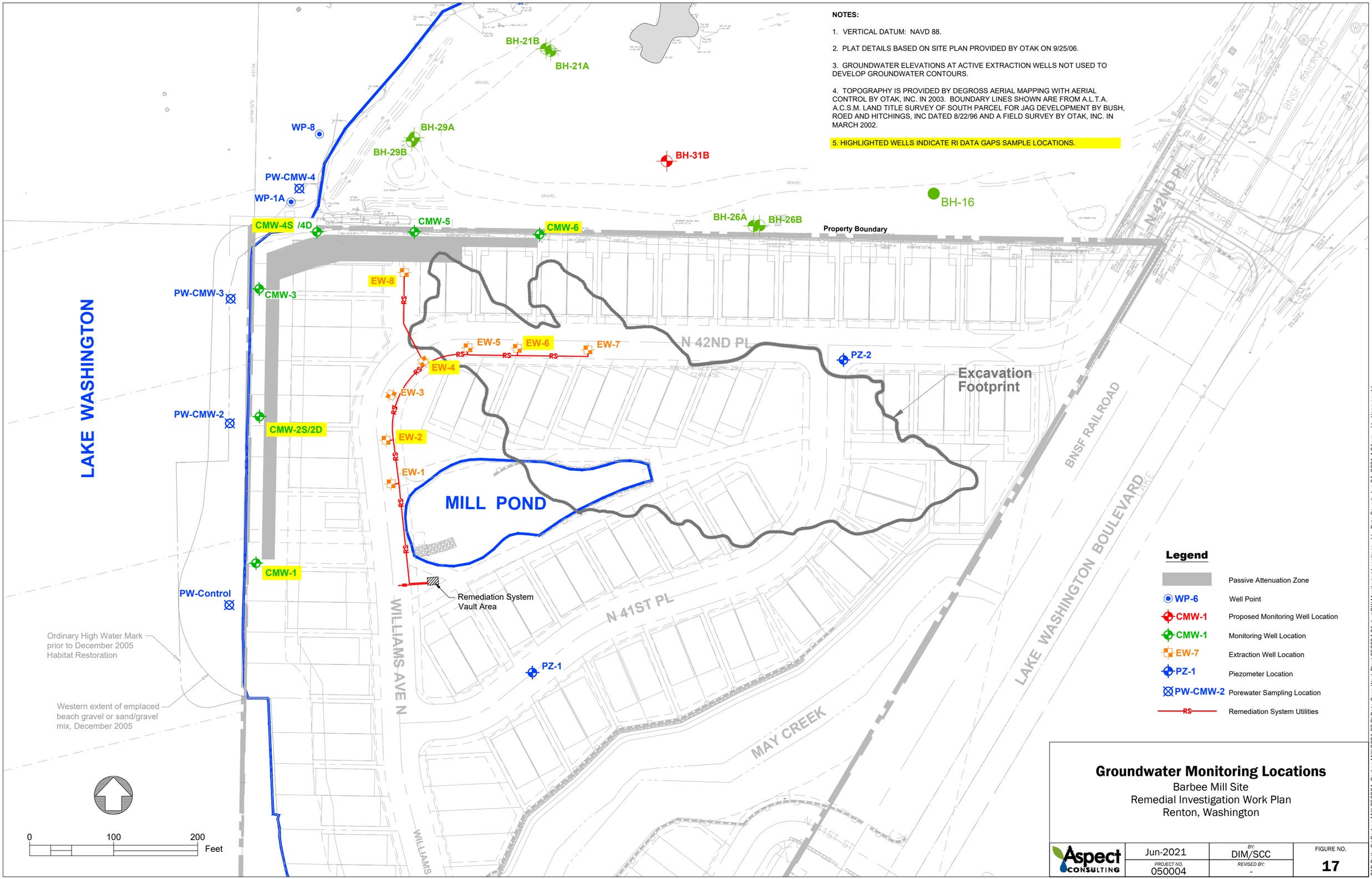
Passive Attenuation Zone

**Screening Level:** Arsenic: 16 µg/L

# Arsenic Occurrences in Sediment Porewater

Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington

| Aspect CONSULTING | JUN-2021 | BY: DFR / EAC | FIGURE NO. 16 |
|---|---|---|---|
| | PROJECT NO. 050004 | REV BY: DIM / RAP | |


NOTES:
1. VERTICAL DATUM: NAVD 88.
2. PLAT DETAILS BASED ON SITE PLAN PROVIDED BY OTAK ON 9/25/06.
3. GROUNDWATER ELEVATIONS AT ACTIVE EXTRACTION WELLS NOT USED TO DEVELOP GROUNDWATER CONTOURS.
4. TOPOGRAPHY IS PROVIDED BY DEGROSS AERIAL MAPPING WITH AERIAL CONTROL BY OTAK, INC. IN 2003. BOUNDARY LINES SHOWN ARE FROM A.L.T.A. A.C.S.M. LAND TITLE SURVEY OF SOUTH PARCEL FOR JAG DEVELOPMENT BY BUSH, ROED AND HITCHINGS, INC DATED 8/22/96 AND A FIELD SURVEY BY OTAK, INC. IN MARCH 2002.
5. HIGHLIGHTED WELLS INDICATE RI DATA GAPS SAMPLE LOCATIONS.
BH-21B
BH-21A
WP-8
BH-29A
BH-29B
BH-31B
PW-CMW-4
WP-1A
BH-16
BH-26A
BH-26B
Property Boundary
CMW-4S /4D
CMW-5
CMW-6
PW-CMW-3
CMW-3
EW-8
EW-5
EW-6
EW-7
EW-4
EW-3
PZ-2
Excavation Footprint
PW-CMW-2
CMW-2S/2D
EW-2
EW-1
MILL POND
CMW-1
PW-Control
Remediation System Vault Area
PZ-1
Ordinary High Water Mark prior to December 2005 Habitat Restoration
Western extent of emplaced beach gravel or sand/gravel mix, December 2005
0
100
200
Feet
LAKE WASHINGTON
N 42ND PL
N 43RD ST
N 41ST PL
WILLIAMS AVE N
MAY CREEK
BNSF RAILROAD
LAKE WASHINGTON BOULEVARD
GRAVEL
Legend
Passive Attenuation Zone
WP-6 Well Point
CMW-1 Proposed Monitoring Well Location
CMW-1 Monitoring Well Location
EW-7 Extraction Well Location
PZ-1 Piezometer Location
PW-CMW-2 Porewater Sampling Location
RS Remediation System Utilities
Groundwater Monitoring Locations
Barbee Mill Site
Remedial Investigation Work Plan
Renton, Washington
Aspect CONSULTING
Jun-2021
PROJECT NO. 050004
BY: DIM/SCC
REVISED BY: -
FIGURE NO. 17
CAD Path: Q:\Barbee Mill\050004 Barbee Mill\2021-03 RI Data Gaps Work Plan\050004-01.dwg GW Monitoring Locations || Date Saved: Jun 04, 2021 4:01pm || User: scudd

# APPENDIX A

# Response to Comments and Ecology's PCUL Workbook

# Responses to Ecology Comments on Barbee Mill RI Sediment Evaluations – June 14, 2019

Project No. 050004, Barbee Mill, Renton, Washington

| Comment Number | Ecology Comment | Comment Resolution |
|---|---|---|
| 1 | Human and ecological health must be considered in addition to benthic health | Agreed, sediment evaluation will include both ecological and human health receptors |
| 2 | If a risk assessment is performed, it must consider tribal fish consumption rates | Noted; since there are currently no tissue data for the site, we'll default to natural background to screen for human health risks via fish consumption. |
| 3 | For bioaccumlatives that have both carcinogenic and mutagenic modes of action, early life exposure must be considered in the risk assessment | Noted; we would default to natural background for evaluating bioaccumulatives |
| 4 | Ecology has established a regional background of 0.21 ug TEQ/kg DW for cPAHs for Lake Washington and Lake Union, and a natural background of 0.021 ug TEQ/kg DW for cPAHs for Puget Sound | These regional and natural background values will be included in the sediment evaluation. |
| 5 | Consider beach play as a potential exposure pathway | All human health exposure pathways as outlined in SCUM will be included, though note that the nature of the shoreline at the Site does not support beach play activities. |
| 6 | Soil erosion to sediment must be considered in the fate a transport analysis | This pathway will be considered. |
| 7 | Soil and GW screening levels must also protect sediment | Agreed, this will be evaluated. |

**Barbee Mill draft RI report dated May 3, 2019. Ecology Comments on that portion of the document pertaining to the upland area. May 27, 2020**

| Comment Number | Section and Paragraph | Page Number | Review Comment | Comment Resolution |
|---|---|---|---|---|
| 1 | 1.1, 1st paragraph | 1 | Remove statements indicating this report is an update to the 2012 RI. This is the only RI and is a stand-alone document. | Statements will be removed as requested. |
| 2 | 4.2.10 | 20 | Performance monitoring sampling (within the past 10+ years) has been only for dissolved arsenic. A statement should be included within this section to explain why. It is recommended that the next sampling event include analysis for total/dissolved to confirm relationships between the two have remained consistent since the initial investigations were performed. | Initial groundwater sampling at the site for total and dissolved metals did not identify higher concentrations of total versus dissolved arsenic for samples from the same well. During operation of the pump-and-treat system, iron fouling in the extraction system piping resulted in entrainment of iron precipitates in non-filtered samples, resulting in occasional anomalously high total iron and arsenic concentrations; based on discussions with Ecology the dissolved arsenic analysis was determined to be more representative of groundwater conditions from these wells.<br>Total and dissolved arsenic concentrations at site monitoring wells were measured in March 2021 to re-evaluate total and dissolved relationships. |
| 3 | 5.3, last paragraph | 25 | Revise screening levels in Tables 2 and 3 to reflect the preliminary cleanup levels (PCULs) table provided separately. | Screening level tables have been updated based on subsequent discussions with and are included in the Work Plan. |
| 4 | 5.3 | 25 | Conduct a terrestrial ecological evaluation. | The TEE provided to Ecology on July 7, 2020 is included in Appendix F of the Work Plan. |
| 5 | 5.3.1 | 26 | Ecology has calculated a localized natural background arsenic concentration of 13 ug/L. See separate Excel spreadsheet. Please use this value. | Per subsequent conversations with Ecology, an updated background data set and statistical evaluation yields a natural background arsenic concentration of 16 ug/L for groundwater. The updated calculation will be included in the revised RI. |
| 6 | 6 | 29 | COPCs identified in this section as above screening levels are COCs and should not be eliminated due to the interim actions. The RI needs to show how the interim actions addressed exposure to all COCs, revealing any remaining exposure pathways or potential exposure pathways that need to be addressed in the FS. In other words there is a pre-interim actions CSM and a post-interim actions CSM, but the COCs are constant. | The updated RI will include a pre-interim action and post-interim action CSM that identifies COCs and exposure pathways that need to be addressed in the FS. An updated COPC screening process is provided in the RI Work Plan that retains COPCs even if addressed during interim actions. |

| Comment Number | Section and Paragraph | Page Number | Review Comment | Comment Resolution |
|---|---|---|---|---|
| 7 | 7 | 38 | Are the Barbee Mill and Quendall arsenic plumes are comingling? Quendall's "deep groundwater As contamination" figure defines a plume extending back to the Barbee Mill property (it also is shown below shallow groundwater contamination on the Quendall property). This needs to be more fully discussed and, at a minimum, cross sections developed showing the extents of the shallow and deep arsenic groundwater plumes on both properties. | In general, the Barbee and Quendall plumes do not appear to be commingled. The Quendall deep As RI figure is somewhat misleading because it is based on interpolation of a more limited data set (just Quendall wells, prior to the Barbee data gaps investigation) and the deep 'plume' does not consider groundwater flow direction which is westerly, not northwesterly, in the deep system in this area. It also uses a groundwater screening level of 10 ug/L, based on the MCL, which does not consider natural background. Additional discussion regarding the delineation of the Barbee and Quendall arsenic plumes is provided in Section 4 of the Work Plan. |
| 8 | 9 | 43 | See comment above regarding CSMs for pre and post interim actions. | The RI will include pre- and post-interim action CSMs. |
| 9 | 9 | 43 | Were the outfalls a source of sediment COCs? All pathways need to be presented and discussed in the report. | Historical outfalls will be added to the pre-interim action CSM for the RI. These are discussed in the Sediment RI Work Plan. |
| 10 | 9, 2nd bullet | 43 | Sections 6.1.3 and 6.2.3 do not identify lead as a COC. Why is it identified here? | This was a relic of the 2012 RI Report, which identified a lower screening level for lead and a groundwater exceedance. The revised RI Report will be updated for consistency based on subsequent discussions regarding COPC identification. |
| 11 | General | | Per previous comments, a separate section should follow Section 9 discussing the post interim actions CSM | See response to Comment #8. |
| 12 | 10 | 45 | Please remove the discussion of restoration time frames. This is an FS topic. | Restoration time frame discussion will be removed from the RI Report. |
| 13 | Tables 2, 3 and 7 | | Revise per the PCULs table provided separately. | Screening levels have been revised as appropriate based on the PCUL workbook (see response to comment #3). |

| Comment Number | Section and Paragraph | Page Number | Review Comment | Comment Resolution |
|---|---|---|---|---|
| 14 | Appendix C, Figure 5.2-16 and 5.2-17 | | The arsenic plumes at Quendall (with a MCL of 10ug/L) are presented in these figures. The shallow impacts to groundwater appear to be separated, however contamination in the deeper aquifer appears to extend back to the Barbee Mill site. As mentioned in earlier comments, a cross section clearly illustrating the extents of each plume needs to be prepared. | See response to comment #7. |
| 15 | General | | The cleanup levels articulated in interim action documents are remediation levels. The RI identifies screening levels. The FS will identify preliminary cleanup levels, and Ecology will identify cleanup levels in a future cleanup action plan. Please revise any references to interim action cleanup levels in the RI text, table and figures to read remediation levels. | References to interim action cleanup levels will either be changed to remediation levels, or replaced with the RI screening level, as appropriate. |
| 16 | General | | The northern edge of the groundwater contamination plume has not yet been delineated. This is evident in the elevated levels of Arsenic found in locations B-11, B-12 and B-17. The logs do show wood debris in these areas. Additional sampling maybe necessary in this area. | See response to comment #7. |

**Preliminary Cleanup Levels for Soil at Freshwater Sites**

| Sort Order | Chemical (all concentrations are in mg/kg) | Most Stringent Soil PCUL Vadose Zone Potable GW SL #s 1-4, 8-10 | Most Stringent Soil PCUL Saturated Zone Potable GW SL #s 1, 5-10 | Most Stringent Soil PCUL Vadose Zone Nonpotable GW SL #s 1, 3, 4, 8-10 | Most Stringent Soil PCUL Saturated Zone Nonpotable GW SL #s 1, 6-10 | Protect Sediment Is "TBD" | User-Defined Soil PCUL Specify SL #s | SL-1 Direct Contact SL-Detail | SL-2 Protect Drinking Water Vadose Zone 747-1 | SL-3 Protect Surface Water via Ground Water Vadose Zone 747-1FW | SL-4 Protect Sediment via Ground Water Vadose Zone 747-1FW | SL-5 Protect Drinking Water Saturated Zone 747-1 | SL-6 Protect Surface Water via Ground Water Saturated Zone 747-1FW | SL-7 Protect Sediment via Ground Water Saturated Zone 747-1FW | SL-8 Protect Sediment via Erosion SMS Lower Tier Sed-FW | SL-9 Site-Specific TEE Unrest. Land Use SL-Detail | SL-10 Natural Background Ecology (1994) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ***PCBs*** | | | | | | | | | | | | | | | | |
| 2 | Total PCB Aroclors | 4.3E-05 | 2.2E-06 | 4.3E-05 | 2.2E-06 | -- | | 1.0E+00 | 2.7E+00 | 4.3E-05 | 4.8E-02 | 1.4E-01 | 2.2E-06 | 2.4E-03 | 1.2E-02 | 6.5E-01 | na |
| 3 | Total PCB congeners | 4.3E-05 | 2.2E-06 | 4.3E-05 | 2.2E-06 | -- | | 1.0E+00 | 2.7E+00 | 4.3E-05 | 1.4E-02 | 1.4E-01 | 2.2E-06 | 7.0E-04 | 3.5E-03 | 6.5E-01 | na |
| 4 | Total PCB TEQ | 2.7E-08 | 1.4E-09 | 2.7E-08 | 1.4E-09 | -- | | 7.7E-06 | 4.2E-05 | 2.7E-08 | 2.8E-06 | 2.1E-06 | 1.4E-09 | 1.4E-07 | 7.0E-07 | na | na |
| 5 | ***Dioxins/Furans*** | | | | | | | | | | | | | | | | |
| 6 | 2,3,7,8-TCDD | 1.3E-05 | 1.3E-05 | 1.3E-05 | 1.3E-05 | X | | 1.3E-05 | na | na | na | na | na | na | PQL | na | 5.2E-06 |
| 7 | Total dioxin/furan TEQ | 5.2E-06 | 5.2E-06 | 5.2E-06 | 5.2E-06 | -- | | 1.3E-05 | na | na | na | na | na | na | 5.0E-06 | na | 5.2E-06 |
| 8 | Total chlorinated dioxins | 2.0E-06 | 2.0E-06 | 2.0E-06 | 2.0E-06 | X | | na | na | na | na | na | na | na | PQL | 2.0E-06 | na |
| 9 | Total chlorinated furans | 2.0E-06 | 2.0E-06 | 2.0E-06 | 2.0E-06 | X | | na | na | na | na | na | na | na | PQL | 2.0E-06 | na |
| 10 | ***Inorganics*** | | | | | | | | | | | | | | | | |
| 11 | Cyanide, free | 5.0E+01 | 5.0E+01 | 5.0E+01 | 5.0E+01 | -- | | 5.0E+01 | na | na | na | na | na | na | 4.2E+02 | na | na |
| 12 | Nitrate | 1.3E+05 | 1.3E+05 | 1.3E+05 | 1.3E+05 | -- | | 1.3E+05 | na | na | na | na | na | na | 1.1E+06 | na | na |
| 13 | Nitrite | 8.0E+03 | 8.0E+03 | 8.0E+03 | 8.0E+03 | -- | | 8.0E+03 | na | na | na | na | na | na | 6.7E+04 | na | na |
| 14 | Sulfate | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 15 | ***Metals*** | | | | | | | | | | | | | | | | |
| 16 | Aluminum | 3.3E+04 | 3.3E+04 | 3.3E+04 | 3.3E+04 | -- | | 8.0E+04 | 4.8E+05 | 2.6E+03 | 1.3E+07 | 2.4E+04 | 1.3E+02 | 6.7E+05 | 6.7E+05 | 5.0E+01 | 3.3E+04 |
| 17 | Antimony | 5.0E+00 | 2.5E-01 | 5.0E+00 | 2.5E-01 | -- | | 3.2E+01 | 5.4E+00 | 5.1E+00 | 5.3E+03 | 2.7E-01 | 2.5E-01 | 2.7E+02 | 2.7E+02 | 5.0E+00 | na |
| 18 | Arsenic | 7.3E+00 | 7.3E+00 | 7.3E+00 | 7.3E+00 | -- | | 6.7E-01 | 3.4E-01 | 1.1E-02 | 2.2E+02 | 1.7E-02 | 5.3E-04 | 1.1E+01 | 1.1E+01 | 7.0E+00 | 7.3E+00 |
| 19 | Barium | 1.0E+02 | 4.1E+01 | 1.0E+02 | 4.1E+01 | -- | | 1.6E+04 | 1.6E+03 | 8.2E+02 | 2.7E+06 | 8.3E+01 | 4.1E+01 | 1.3E+05 | 1.3E+05 | 1.0E+02 | na |
| 20 | Beryllium | 1.0E+01 | 3.2E+00 | 1.0E+01 | 1.0E+01 | -- | | 1.6E+02 | 6.3E+01 | 1.2E+03 | 2.7E+04 | 3.2E+00 | 6.0E+01 | 1.3E+03 | 1.3E+03 | 1.0E+01 | 6.1E-01 |
| 21 | Cadmium | 7.7E-01 | 7.7E-01 | 7.7E-01 | 7.7E-01 | -- | | 8.0E+01 | 6.9E-01 | 9.9E-02 | 1.6E+01 | 3.5E-02 | 5.0E-03 | 8.0E-01 | 8.0E-01 | 4.0E+00 | 7.7E-01 |
| 22 | Chromium, total | 4.8E+01 | 4.8E+01 | 4.8E+01 | 4.8E+01 | -- | | na | na | na | na | na | na | na | 7.2E+01 | 4.2E+01 | 4.8E+01 |
| 23 | Chromium, trivalent | 1.5E+03 | 7.4E+01 | 1.5E+03 | 7.4E+01 | -- | | 1.2E+05 | 4.8E+05 | 1.5E+03 | 2.0E+07 | 2.4E+04 | 7.4E+01 | 1.0E+06 | 1.0E+06 | na | na |
| 24 | Chromium, hexavalent | 3.8E+00 | 1.9E-01 | 3.8E+00 | 1.9E-01 | X | | 2.4E+02 | 1.8E+01 | 3.8E+00 | TBD | 9.3E-01 | 1.9E-01 | TBD | PQL | na | na |
| 25 | Cobalt | 4.3E+00 | 2.2E-01 | 2.0E+01 | 2.0E+01 | -- | | 2.4E+01 | 4.3E+00 | na | 4.0E+03 | 2.2E-01 | na | 2.0E+02 | 2.0E+02 | 2.0E+01 | na |
| 26 | Copper | 3.6E+01 | 3.6E+01 | 3.6E+01 | 3.6E+01 | -- | | 3.2E+03 | 2.8E+02 | 5.0E+00 | 8.0E+03 | 1.4E+01 | 2.5E-01 | 4.0E+02 | 4.0E+02 | 5.0E+01 | 3.6E+01 |
| 27 | Iron | 3.6E+04 | 3.6E+04 | 3.6E+04 | 3.6E+04 | -- | | 5.6E+04 | 5.4E+03 | 5.4E+03 | 9.3E+06 | 2.7E+02 | 2.7E+02 | 4.7E+05 | 4.7E+05 | na | 3.6E+04 |
| 28 | Lead | 2.1E+01 | 2.1E+01 | 2.1E+01 | 2.1E+01 | -- | | 2.5E+02 | 3.0E+03 | 5.0E+02 | 4.2E+02 | 1.5E+02 | 2.5E+01 | 2.1E+01 | 2.1E+01 | 5.0E+01 | 1.7E+01 |
| 29 | Manganese | 1.1E+03 | 1.1E+03 | 1.1E+03 | 1.1E+03 | -- | | 3.7E+03 | 6.5E+01 | 6.5E+01 | 6.2E+05 | 3.3E+00 | 3.3E+00 | 3.1E+04 | 3.1E+04 | 1.1E+03 | 1.1E+03 |
| 30 | Mercury, inorganic | 7.0E-02 | 7.0E-02 | 7.0E-02 | 7.0E-02 | -- | | 2.4E+01 | 2.1E+00 | 1.3E-02 | 4.0E+00 | 1.0E-01 | 6.3E-04 | 2.0E-01 | 2.0E-01 | 1.0E-01 | 7.0E-02 |
| 31 | Methylmercury | 4.0E-01 | 4.0E-01 | 4.0E-01 | 4.0E-01 | X | | 8.0E+00 | na | na | na | na | na | na | PQL | 4.0E-01 | na |
| 32 | Molybdenum | 2.0E+00 | 1.6E+00 | 2.0E+00 | 2.0E+00 | -- | | 4.0E+02 | 3.2E+01 | na | 6.6E+04 | 1.6E+00 | na | 3.3E+03 | 3.3E+03 | 2.0E+00 | na |
| 33 | Nickel | 3.8E+01 | 3.8E+01 | 3.8E+01 | 3.8E+01 | -- | | 1.6E+03 | 1.3E+02 | 6.8E+01 | 1.0E+03 | 6.5E+00 | 3.4E+00 | 5.0E+01 | 5.0E+01 | 3.0E+01 | 3.8E+01 |
| 34 | Selenium | 1.0E-01 | 2.6E-02 | 1.0E-01 | 2.6E-02 | -- | | 4.0E+02 | 5.2E+00 | 5.2E-01 | 2.0E+00 | 2.6E-01 | 2.6E-02 | 1.0E-01 | 1.0E-01 | 3.0E-01 | na |
| 35 | Silver | 5.5E-01 | 2.8E-02 | 5.5E-01 | 2.8E-02 | -- | | 4.0E+02 | 1.4E+01 | 5.5E-01 | 1.1E+01 | 6.9E-01 | 2.8E-02 | 5.7E-01 | 5.7E-01 | 2.0E+00 | na |
| 36 | Thallium | 8.8E-02 | 4.4E-03 | 8.8E-02 | 4.4E-03 | -- | | 8.0E-01 | 2.3E-01 | 8.8E-02 | 1.3E+02 | 1.1E-02 | 4.4E-03 | 6.7E+00 | 6.7E+00 | 1.0E+00 | na |
| 37 | Tin | 5.0E+01 | 5.0E+01 | 5.0E+01 | 5.0E+01 | -- | | 4.8E+04 | 4.8E+04 | na | 8.0E+06 | 2.4E+03 | na | 4.0E+05 | 4.0E+05 | 5.0E+01 | na |
| 38 | Vanadium | 2.0E+00 | 2.0E+00 | 2.0E+00 | 2.0E+00 | -- | | 7.2E+02 | 2.9E+03 | na | 1.2E+05 | 1.4E+02 | na | 6.0E+03 | 6.0E+03 | 2.0E+00 | na |
| 39 | Zinc | 8.6E+01 | 8.5E+01 | 8.6E+01 | 8.5E+01 | -- | | 2.4E+04 | 6.0E+03 | 1.3E+02 | 6.4E+04 | 3.0E+02 | 6.5E+00 | 3.2E+03 | 3.2E+03 | 8.6E+01 | 8.5E+01 |
| 40 | ***Metals - Butyltins*** | | | | | | | | | | | | | | | | |
| 41 | Monobutyltin | 5.4E-01 | 5.4E-01 | 5.4E-01 | 5.4E-01 | -- | | na | na | na | na | na | na | na | 5.4E-01 | na | na |
| 42 | Dibutyltin | 9.1E-01 | 9.1E-01 | 9.1E-01 | 9.1E-01 | -- | | na | na | na | na | na | na | na | 9.1E-01 | na | na |
| 43 | Tributyltin oxide | 2.1E-03 | 2.1E-03 | 2.1E-03 | 2.1E-03 | -- | | 2.4E+01 | na | na | na | na | na | na | 2.1E-03 | na | na |
| 44 | Tetrabutyltin | 9.7E-02 | 9.7E-02 | 9.7E-02 | 9.7E-02 | -- | | na | na | na | na | na | na | na | 9.7E-02 | na | na |
| 45 | ***SVOCs - PAHs*** | | | | | | | | | | | | | | | | |
| 46 | Acenaphthene | 2.0E+00 | 1.0E-01 | 2.0E+00 | 1.0E-01 | -- | | 4.8E+03 | 9.8E+01 | 2.0E+00 | 1.3E+05 | 5.0E+00 | 1.0E-01 | 6.4E+03 | 3.1E+04 | 2.0E+01 | na |
| 47 | Acenaphthylene | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 48 | Anthracene | 4.7E+01 | 2.4E+00 | 4.7E+01 | 2.4E+00 | -- | | 2.4E+04 | 2.3E+03 | 4.7E+01 | 6.2E+05 | 1.1E+02 | 2.4E+00 | 3.1E+04 | 1.5E+05 | na | na |
| 49 | Benzo(a)anthracene | 1.1E-03 | 5.7E-05 | 1.1E-03 | 5.7E-05 | -- | | na | na | 1.1E-03 | 3.6E-02 | na | 5.7E-05 | 1.8E-03 | 9.0E-03 | na | na |
| 50 | Benzo(b)fluoranthene | 3.9E-03 | 2.0E-04 | 3.9E-03 | 2.0E-04 | -- | | na | na | 3.9E-03 | 3.6E-02 | na | 2.0E-04 | 1.8E-03 | 9.0E-03 | na | na |
| 51 | Benzo(k)fluoranthene | 9.0E-03 | 1.8E-03 | 9.0E-03 | 1.8E-03 | -- | | na | na | 3.9E-02 | 3.6E-02 | na | 2.0E-03 | 1.8E-03 | 9.0E-03 | na | na |
| 52 | Total benzofluoranthenes | 1.2E-02 | 1.2E-02 | 1.2E-02 | 1.2E-02 | -- | | na | na | na | na | na | na | na | 1.2E-02 | na | na |
| 53 | Benzo(g,h,i)perylene | 5.0E-03 | 5.0E-03 | 5.0E-03 | 5.0E-03 | -- | | na | na | na | na | na | na | na | 5.0E-03 | na | na |
| 54 | Benzo(a)pyrene | 3.1E-04 | 1.6E-05 | 3.1E-04 | 1.6E-05 | -- | | 1.9E-01 | 3.9E+00 | 3.1E-04 | 3.6E-02 | 1.9E-01 | 1.6E-05 | 1.8E-03 | 9.0E-03 | 1.2E+01 | na |
| 55 | Chrysene | 9.0E-03 | 1.8E-03 | 9.0E-03 | 1.8E-03 | -- | | na | na | 1.3E-01 | 3.6E-02 | na | 6.4E-03 | 1.8E-03 | 9.0E-03 | na | na |
| 56 | Dibenz(a,h)anthracene | 5.7E-04 | 2.9E-05 | 5.7E-04 | 2.9E-05 | -- | | na | na | 5.7E-04 | 3.6E-02 | na | 2.9E-05 | 1.8E-03 | 9.0E-03 | na | na |
| 57 | Dibenzofuran | 2.0E-01 | 2.0E-01 | 2.0E-01 | 2.0E-01 | -- | | 8.0E+01 | na | na | na | na | na | na | 2.0E-01 | na | na |
| 58 | Fluoranthene | 5.0E-03 | 1.0E-03 | 5.0E-03 | 1.0E-03 | -- | | 3.2E+03 | 6.3E+02 | 5.9E+00 | 2.0E-02 | 3.2E+01 | 3.0E-01 | 1.0E-03 | 5.0E-03 | na | na |
| 59 | Fluorene | 1.6E+00 | 8.0E-02 | 1.6E+00 | 8.0E-02 | -- | | 3.2E+03 | 1.0E+02 | 1.6E+00 | 8.3E+04 | 5.1E+00 | 8.0E-02 | 4.2E+03 | 2.0E+04 | 3.0E+01 | na |
| 60 | Indeno(1,2,3-cd)pyrene | 9.0E-03 | 5.6E-04 | 9.0E-03 | 5.6E-04 | -- | | na | na | 1.1E-02 | 3.6E-02 | na | 5.6E-04 | 1.8E-03 | 9.0E-03 | na | na |
| 61 | Methyl isopropyl phenanthrene | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 62 | 1-Methylnaphthalene | 2.2E+01 | 2.2E+01 | 2.2E+01 | 2.2E+01 | -- | | 3.4E+01 | na | na | na | na | na | na | 2.2E+01 | na | na |
| 63 | 2-Methylnaphthalene | 3.2E+02 | 3.2E+02 | 3.2E+02 | 3.2E+02 | -- | | 3.2E+02 | na | na | na | na | na | na | 2.0E+03 | na | na |
| 64 | Naphthalene | 4.5E+00 | 2.4E-01 | 3.8E+01 | 2.0E+00 | -- | | 1.6E+03 | 4.5E+00 | 3.8E+01 | 4.5E+04 | 2.4E-01 | 2.0E+00 | 2.4E+03 | 1.0E+04 | na | na |
| 65 | Phenanthrene | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 66 | Pyrene | 5.0E-03 | 1.0E-03 | 5.0E-03 | 1.0E-03 | -- | | 2.4E+03 | 6.5E+02 | 1.1E+01 | 2.0E-02 | 3.3E+01 | 5.5E-01 | 1.0E-03 | 5.0E-03 | na | na |
| 67 | Total LPAHs | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 68 | Total HPAHs | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 69 | Total PAHs | 1.7E+01 | 1.7E+01 | 1.7E+01 | 1.7E+01 | -- | | na | na | na | na | na | na | na | 1.7E+01 | na | na |
| 70 | Total cPAH TEQ | 2.1E-02 | 4.2E-03 | 2.1E-02 | 4.2E-03 | -- | | 1.9E-01 | 4.5E-01 | 1.9E-01 | 8.4E-02 | 2.2E-02 | 9.4E-03 | 4.2E-03 | 2.1E-02 | na | na |
| 71 | ***Other SVOCs*** | | | | | | | | | | | | | | | | |
| 72 | Aniline | 1.4E+02 | 1.4E+02 | 1.4E+02 | 1.4E+02 | -- | | 1.8E+02 | na | na | na | na | na | na | 1.4E+02 | na | na |
| 73 | Azobenzene | 7.1E+00 | 7.1E+00 | 7.1E+00 | 7.1E+00 | -- | | 9.1E+00 | na | na | na | na | na | na | 7.1E+00 | na | na |
| 74 | Benzidine | 3.4E-03 | 3.4E-03 | 3.4E-03 | 3.4E-03 | -- | | 4.3E-03 | na | na | na | na | na | na | 3.4E-03 | na | na |
| 75 | Benzoic acid | 2.9E+00 | 2.9E+00 | 2.9E+00 | 2.9E+00 | -- | | 3.2E+05 | 2.6E+02 | na | 4.0E+01 | 1.8E+01 | na | 2.9E+00 | 2.9E+00 | na | na |
| 76 | Benzyl alcohol | 8.0E+03 | 8.0E+03 | 8.0E+03 | 8.0E+03 | -- | | 8.0E+03 | na | na | na | na | na | na | 5.4E+04 | na | na |
| 78 | Bis(2-chloroethoxy)methane | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 79 | Bis(2-chloroethyl)ether | 1.1E-04 | 7.3E-06 | 1.1E-04 | 7.3E-06 | -- | | 9.1E-01 | 2.2E-04 | 1.1E-04 | 5.9E+00 | 1.4E-05 | 7.3E-06 | 3.9E-01 | 7.1E-01 | na | na |
| 80 | Bis(chloromethyl)ether | 3.5E-03 | 3.5E-03 | 3.5E-03 | 3.5E-03 | -- | | 4.5E-03 | na | na | na | na | na | na | 3.5E-03 | na | na |
| 81 | Bis(2-chloro-1-methylethyl)ether | 3.2E+03 | 3.2E+03 | 3.2E+03 | 3.2E+03 | -- | | 3.2E+03 | na | na | na | na | na | na | 2.2E+04 | na | na |
| 82 | 2,6-Bis(1,1-dimethylethyl) phenol | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 83 | Bis(2-ethylhexyl) phthalate | 1.0E-01 | 5.0E-03 | 1.0E-01 | 5.0E-03 | -- | | 7.1E+01 | 1.3E+01 | 1.0E-01 | 2.0E+00 | 6.7E-01 | 5.0E-03 | 1.0E-01 | 5.0E-01 | na | na |
| 84 | 4-Bromophenyl phenyl ether | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 85 | Butyl benzyl phthalate | 3.6E-03 | 1.8E-04 | 3.6E-03 | 1.8E-04 | -- | | 5.3E+02 | 1.3E+01 | 3.6E-03 | 1.7E+03 | 6.4E-01 | 1.8E-04 | 8.3E+01 | 4.1E+02 | na | na |
| 86 | Butyl diphenyl phosphate | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 87 | Carbazole | 9.0E-01 | 1.9E-01 | 9.0E-01 | 1.9E-01 | -- | | na | na | na | 3.7E+00 | na | na | 1.9E-01 | 9.0E-01 | na | na |
| 88 | 4-Chloroaniline | 1.2E-03 | 7.7E-05 | 3.9E+00 | 2.2E+00 | -- | | 5.0E+00 | 1.2E-03 | na | 3.4E+01 | 7.7E-05 | na | 2.2E+00 | 3.9E+00 | na | na |
| 89 | 4-Chloro-3-methylphenol | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 90 | 2-Chloronaphthalene | 6.4E+03 | 6.4E+03 | 6.4E+03 | 6.4E+03 | -- | | 6.4E+03 | na | na | na | na | na | na | 4.3E+04 | na | na |
| 91 | 2-Chlorophenol | 1.2E-03 | 6.7E-05 | 1.2E-03 | 6.7E-05 | -- | | 4.0E+02 | 4.7E-01 | 1.2E-03 | 1.4E+04 | 2.7E-02 | 6.7E-05 | 8.2E+02 | 2.7E+03 | na | na |
| 92 | 4-Chlorophenyl phenyl ether | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 93 | Dibutyl phthalate | 2.8E-01 | 1.5E-02 | 2.8E-01 | 1.5E-02 | -- | | 8.0E+03 | 5.7E+01 | 2.8E-01 | 1.7E+00 | 3.0E+00 | 1.5E-02 | 8.7E-02 | 3.8E-01 | 2.0E+02 | na |
| 94 | Dibutyl phenyl phosphate | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |
| 95 | 1,2-Dichlorobenzene | 7.0E+00 | 4.0E-01 | 8.1E+00 | 4.7E-01 | -- | | 7.2E+03 | 7.0E+00 | 8.1E+00 | 2.6E+05 | 4.0E-01 | 4.7E-01 | 1.5E+04 | 4.9E+04 | na | na |
| 96 | 1,3-Dichlorobenzene | na | na | na | na | -- | | na | na | na | na | na | na | na | na | na | na |

| Basis - Vadose, Potable GW | | | | | | | Basis - Saturated, Potable GW | | | | | | | Basis - Vadose, Nonpotable GW | | | | | | | Basis - Satur., Nonpotable GW | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Direct Contact | Drinking Water | Surface Water | Sediment | Bank Erosion | TEE | Nat. Background | Direct Contact | Drinking Water | Surface Water | Sediment | Bank Erosion | TEE | Nat. Background | Direct Contact | Drinking Water | Surface Water | Sediment | Bank Erosion | TEE | Nat. Background | Direct Contact | Surface Water | Sediment | Bank Erosion | TEE | Nat. Background | Select Use an 'X' to identify chemicals of interest for filtering |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | X | | | | | | | X | | | | | | | X | | | | | | X | | | | | X |
| | | X | | | | | | | X | | | | | | | X | | | | | | X | | | | | |
| | | X | | | | | | | X | | | | | | | X | | | | | | X | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | | | | | | | X | | | | | | | X | | | | | | | X | | | | | | |
| | | | | | X | | | | | | | X | | | | | | | X | | | | | | X | | |
| | | | | | X | | | | | | | X | | | | | | | X | | | | | | X | | |
| X | | | | | | | X | | | | | | | X | | | | | | | X | | | | | | |
| X | | | | | | | X | | | | | | | X | | | | | | | X | | | | | | |
| X | | | | | | | X | | | | | | | X | | | | | | | X | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | X | | | | | | | X | | | | | | | X | | | | | | X

| | | |

| | | |

## Preliminary Cleanup Levels for Groundwater at Freshwater Sites

| Sort Order | Chemical (all concentrations are in ug/L) | Most Stringent PCUL Potable Water GW #s 1-5 | Most Stringent PCUL Nonpotable Water GW #s 2-5 | Protect Sediment Is "TBD" | User-Defined PCUL Specify GW #s | GW-1 Protect Drinking Water GW-Detail-PW | GW-2 Protect Surface Water GW-Detail-SW-FW | GW-3 Protect Sediment Mod.747-1FW | GW-4 Screening Level Protect Indoor Air GW-Detail-PW | GW-5 Natural Background | Basis - Potable GW: Drinking Water | Basis - Potable GW: Surface Water | Basis - Potable GW: Sediment | Basis - Potable GW: Indoor Air | Basis - Potable GW: Nat. Background | Basis - Nonpotable GW: Surface Water | Basis - Nonpotable GW: Sediment | Basis - Nonpotable GW: Indoor Air | Basis - Nonpotable GW: Nat. Background | Select Use an 'X' to identify chemicals of interest for filtering |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ***PCBs*** | | | | | | | | | | | | | | | | | | | |
| 2 | Total PCB Aroclors | 7.0E-06 | 7.0E-06 | -- | | 4.4E-01 | 7.0E-06 | 7.8E-03 | na | na | | X | | | | X | | | | X |
| 3 | Total PCB congeners | 7.0E-06 | 7.0E-06 | -- | | 4.4E-01 | 7.0E-06 | 2.3E-03 | na | na | | X | | | | X | | | | |
| 4 | Total PCB TEQ | 4.4E-09 | 4.4E-09 | -- | | 6.7E-06 | 4.4E-09 | 4.5E-07 | na | na | | X | | | | X | | | | |
| 5 | ***Dioxins/Furans*** | | | | | | | | | | | | | | | | | | | |
| 6 | 2,3,7,8-TCDD | 5.0E-09 | 5.0E-09 | X | | 6.7E-06 | 5.0E-09 | na | na | na | | X | | | | X | | | | |
| 7 | Total dioxin/furan TEQ | 2.8E-09 | 2.8E-09 | -- | | 6.7E-06 | 2.8E-09 | na | na | na | | X | | | | X | | | | |
| 8 | Total chlorinated dioxins | na | na | X | | na | na | na | na | na | | | | | | | | | | |
| 9 | Total chlorinated furans | na | na | X | | na | na | na | na | na | | | | | | | | | | |
| 10 | ***Inorganics*** | | | | | | | | | | | | | | | | | | | |
| 11 | Cyanide, free | 1.0E+01 | 4.5E+02 | -- | | 1.0E+01 | 4.5E+02 | na | na | na | X | | | | | X | | | | |
| 12 | Nitrate | 1.0E+04 | na | -- | | 1.0E+04 | na | na | na | na | X | | | | | | | | | |
| 13 | Nitrite | 1.0E+03 | na | -- | | 1.0E+03 | na | na | na | na | X | | | | | | | | | |
| 14 | Sulfate | 2.5E+05 | na | -- | | 2.5E+05 | na | na | na | na | X | | | | | | | | | |
| 15 | ***Metals*** | | | | | | | | | | | | | | | | | | | |
| 16 | Aluminum | 8.7E+01 | 8.7E+01 | -- | | 1.6E+04 | 8.7E+01 | 4.5E+05 | na | na | | X | | | | X | | | | |
| 17 | Antimony | 5.6E+00 | 5.6E+00 | -- | | 6.0E+00 | 5.6E+00 | 5.9E+03 | na | na | | X | | | | X | | | | |
| 18 | Arsenic | 5.0E+00 | 5.0E+00 | -- | | 5.8E-01 | 1.8E-02 | 3.8E+02 | na | 5.0E+00 | | | | | X | | | | X | X |
| 19 | Barium | 1.0E+03 | 1.0E+03 | -- | | 2.0E+03 | 1.0E+03 | 3.2E+06 | na | na | | X | | | | X | | | | |
| 20 | Beryllium | 4.0E+00 | 7.6E+01 | -- | | 4.0E+00 | 7.6E+01 | 1.7E+03 | na | na | X | | | | | X | | | | |
| 21 | Cadmium | 7.2E-01 | 7.2E-01 | -- | | 5.0E+00 | 7.2E-01 | 1.1E+02 | na | na | | X | | | | X | | | | |
| 22 | Chromium, total | 1.0E+02 | na | -- | | 1.0E+02 | na | na | na | na | X | | | | | | | | | |
| 23 | Chromium, trivalent | 7.4E+01 | 7.4E+01 | -- | | 2.4E+04 | 7.4E+01 | 1.0E+06 | na | na | | X | | | | X | | | | |
| 24 | Chromium, hexavalent | 1.0E+01 | 1.0E+01 | X | | 4.8E+01 | 1.0E+01 | TBD | na | na | | X | | | | X | | | | |
| 25 | Cobalt | 4.8E+00 | 4.4E+03 | -- | | 4.8E+00 | na | 4.4E+03 | na | na | X | | | | | | X | | | |
| 26 | Copper | 1.1E+01 | 1.1E+01 | -- | | 6.4E+02 | 1.1E+01 | 1.8E+04 | na | na | | X | | | | X | | | | X |
| 27 | Iron | 3.0E+02 | 3.0E+02 | -- | | 3.0E+02 | 3.0E+02 | 5.2E+05 | na | na | X | X | | | | X | | | | X |
| 28 | Lead | 2.1E+00 | 2.1E+00 | -- | | 1.5E+01 | 2.5E+00 | 2.1E+00 | na | na | | | X | | | | X | | | X |
| 29 | Manganese | 5.0E+01 | 5.0E+01 | -- | | 5.0E+01 | 5.0E+01 | 4.8E+05 | na | na | X | X | | | | X | | | | |
| 30 | Mercury, inorganic | 1.2E-02 | 1.2E-02 | -- | | 2.0E+00 | 1.2E-02 | 3.8E+00 | 2.9E-01 | na | | X | | | | X | | | | |
| 31 | Methylmercury | 7.7E-01 | 7.7E-01 | X | | 1.6E+00 | 7.7E-01 | na | na | na | | X | | | | X | | | | |
| 32 | Molybdenum | 8.0E+01 | 1.6E+05 | -- | | 8.0E+01 | na | 1.6E+05 | na | na | X | | | | | | X | | | |
| 33 | Nickel | 5.2E+01 | 5.2E+01 | -- | | 1.0E+02 | 5.2E+01 | 7.7E+02 | na | na | | X | | | | X | | | | |
| 34 | Selenium | 5.0E+00 | 5.0E+00 | -- | | 5.0E+01 | 5.0E+00 | 1.9E+01 | na | na | | X | | | | X | | | | |
| 35 | Silver | 3.2E+00 | 3.2E+00 | -- | | 8.0E+01 | 3.2E+00 | 6.6E+01 | na | na | | X | | | | X | | | | |
| 36 | Thallium | 6.2E-02 | 6.2E-02 | -- | | 1.6E-01 | 6.2E-02 | 9.4E+01 | na | na | | X | | | | X | | | | |
| 37 | Tin | 9.6E+03 | 1.6E+06 | -- | | 9.6E+03 | na | 1.6E+06 | na | na | X | | | | | | X | | | |
| 38 | Vanadium | 1.4E+02 | 6.0E+03 | -- | | 1.4E+02 | na | 6.0E+03 | na | na | X | | | | | | X | | | |
| 39 | Zinc | 1.0E+02 | 1.0E+02 | -- | | 4.8E+03 | 1.0E+02 | 5.1E+04 | na | na | | X | | | | X | | | | X |
| 40 | ***Metals - Butyltins*** | | | | | | | | | | | | | | | | | | | |
| 41 | Monobutyltin | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 42 | Dibutyltin | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 43 | Tributyltin oxide | 7.2E-02 | 7.2E-02 | -- | | 4.8E+00 | 7.2E-02 | na | na | na | | X | | | | X | | | | |
| 44 | Tetrabutyltin | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 45 | ***SVOCs - PAHs*** | | | | | | | | | | | | | | | | | | | |
| 46 | Acenaphthene | 2.0E+01 | 2.0E+01 | -- | | 9.6E+02 | 2.0E+01 | 1.2E+06 | na | na | | X | | | | X | | | | |
| 47 | Acenaphthylene | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 48 | Anthracene | 1.0E+02 | 1.0E+02 | -- | | 4.8E+03 | 1.0E+02 | 1.3E+06 | na | na | | X | | | | X | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | Benzo(a)anthracene | 1.6E-04 | 1.6E-04 | -- | | na | 1.6E-04 | 5.0E-03 | na | na | | X | | X | | |
| 50 | Benzo(b)fluoranthene | 1.6E-04 | 1.6E-04 | -- | | na | 1.6E-04 | 1.5E-03 | na | na | | X | | X | | |
| 51 | Benzo(k)fluoranthene | 1.5E-03 | 1.5E-03 | -- | | na | 1.6E-03 | 1.5E-03 | na | na | | X | | X | | |
| 52 | Total benzofluoranthenes | na | na | -- | | na | na | na | na | na | | | | | | |
| 53 | Benzo(g,h,i)perylene | na | na | -- | | na | na | na | na | na | | | | | | |
| 54 | Benzo(a)pyrene | 1.6E-05 | 1.6E-05 | -- | | 2.0E-01 | 1.6E-05 | 1.9E-03 | na | na | | X | | X | | X |
| 55 | Chrysene | 4.5E-03 | 4.5E-03 | -- | | na | 1.6E-02 | 4.5E-03 | na | na | | X | | X | | |
| 56 | Dibenz(a,h)anthracene | 1.6E-05 | 1.6E-05 | -- | | na | 1.6E-05 | 1.0E-03 | na | na | | X | | X | | |
| 57 | Dibenzofuran | 1.6E+01 | na | -- | | 1.6E+01 | na | na | na | na | X | | | | | |
| 58 | Fluoranthene | 2.0E-02 | 2.0E-02 | -- | | 6.4E+02 | 6.0E+00 | 2.0E-02 | na | na | | X | | X | | |
| 59 | Fluorene | 1.0E+01 | 1.0E+01 | -- | | 6.4E+02 | 1.0E+01 | 5.3E+05 | na | na | | X | | X | | |
| 60 | Indeno(1,2,3-cd)pyrene | 1.6E-04 | 1.6E-04 | -- | | na | 1.6E-04 | 5.2E-04 | na | na | | X | | X | | |
| 61 | Methyl isopropyl phenanthrene | na | na | -- | | na | na | na | na | na | | | | | | |
| 62 | 1-Methylnaphthalene | 1.5E+00 | na | -- | | 1.5E+00 | na | na | na | na | X | | | | | |
| 63 | 2-Methylnaphthalene | 3.2E+01 | na | -- | | 3.2E+01 | na | na | na | na | X | | | | | |
| 64 | Naphthalene | 8.9E+00 | 8.9E+00 | -- | | 1.6E+02 | 1.4E+03 | 1.6E+06 | 8.9E+00 | na | | X | | X | | |
| 65 | Phenanthrene | na | na | -- | | na | na | na | na | na | | | | | | |
| 66 | Pyrene | 1.5E-02 | 1.5E-02 | -- | | 4.8E+02 | 8.0E+00 | 1.5E-02 | na | na | | X | | X | | |
| 67 | Total LPAHs | na | na | -- | | na | na | na | na | na | | | | | | |
| 68 | Total HPAHs | na | na | -- | | na | na | na | na | na | | | | | | |
| 69 | Total PAHs | na | na | -- | | na | na | na | na | na | | | | | | |
| 70 | Total cPAH TEQ | 4.3E-03 | 4.3E-03 | -- | | 2.3E-02 | 9.7E-03 | 4.3E-03 | na | na | | X | | X | | X |
| 71 | ***Other SVOCs*** | | | | | | | | | | ***Other SVOCs*** | | | | | |
| 72 | Aniline | 7.7E+00 | na | -- | | 7.7E+00 | na | na | na | na | X | | | | | |
| 73 | Azobenzene | 8.0E-01 | na | -- | | 8.0E-01 | na | na | na | na | X | | | | | |
| 74 | Benzidine | 2.0E-05 | 2.0E-05 | -- | | 3.8E-04 | 2.0E-05 | na | na | na | | X | | X | | |
| 75 | Benzoic acid | 1.0E+04 | 1.0E+04 | -- | | 6.4E+04 | na | 1.0E+04 | na | na | | X | | X | | |
| 76 | Benzyl alcohol | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | |
| 78 | Bis(2-chloroethoxy)methane | na | na | -- | | na | na | na | na | na | | | | | | |
| 79 | Bis(2-chloroethyl)ether | 2.0E-02 | 2.0E-02 | -- | | 4.0E-02 | 2.0E-02 | 1.1E+03 | 2.6E+01 | na | | X | | X | | |
| 80 | Bis(chloromethyl)ether | 2.0E-04 | 2.0E+02 | -- | | 2.0E-04 | 2.0E+02 | na | na | na | X | | | X | | |
| 81 | Bis(2-chloro-1-methylethyl)ether | 2.0E+02 | 2.0E+02 | -- | | 3.2E+02 | 2.0E+02 | na | na | na | | X | | X | | |
| 82 | 2,6-Bis(1,1-dimethylethyl) phenol | na | na | -- | | na | na | na | na | na | | | | | | |
| 83 | Bis(2-ethylhexyl) phthalate | 4.5E-02 | 4.5E-02 | -- | | 6.0E+00 | 4.5E-02 | 9.0E-01 | na | na | | X | | X | | |
| 84 | 4-Bromophenyl phenyl ether | na | na | -- | | na | na | na | na | na | | | | | | |
| 85 | Butyl benzyl phthalate | 1.3E-02 | 1.3E-02 | -- | | 4.6E+01 | 1.3E-02 | 6.0E+03 | na | na | | X | | X | | |
| 86 | Butyl diphenyl phosphate | na | na | -- | | na | na | na | na | na | | | | | | |
| 87 | Carbazole | 5.2E+01 | 5.2E+01 | -- | | na | na | 5.2E+01 | na | na | | X | | X | | |
| 88 | 4-Chloroaniline | 2.2E-01 | 6.3E+03 | -- | | 2.2E-01 | na | 6.3E+03 | na | na | X | | | X | | |
| 89 | 4-Chloro-3-methylphenol | 3.6E+01 | 3.6E+01 | -- | | na | 3.6E+01 | na | na | na | | X | | X | | |
| 90 | 2-Chloronaphthalene | 1.0E+02 | 1.0E+02 | -- | | 6.4E+02 | 1.0E+02 | na | na | na | | X | | X | | |
| 91 | 2-Chlorophenol | 1.0E-01 | 1.0E-01 | -- | | 4.0E+01 | 1.0E-01 | 1.2E+06 | na | na | | X | | X | | |
| 92 | 4-Chlorophenyl phenyl ether | na | na | -- | | na | na | na | na | na | | | | | | |
| 93 | Dibutyl phthalate | 8.0E+00 | 8.0E+00 | -- | | 1.6E+03 | 8.0E+00 | 4.7E+01 | na | na | | X | | X | | |
| 94 | Dibutyl phenyl phosphate | na | na | -- | | na | na | na | na | na | | | | | | |
| 95 | 1,2-Dichlorobenzene | 6.0E+02 | 7.0E+02 | -- | | 6.0E+02 | 7.0E+02 | 2.2E+07 | 2.6E+03 | na | X | | | X | | |
| 96 | 1,3-Dichlorobenzene | 2.0E+00 | 2.0E+00 | -- | | na | 2.0E+00 | na | na | na | | X | | X | | |
| 97 | 1,4-Dichlorobenzene | 4.9E+00 | 4.9E+00 | -- | | 7.5E+01 | 6.0E+01 | 4.3E+04 | 4.9E+00 | na | | X | | X | | |
| 98 | 3,3'-Dichlorobenzidine | 3.1E-03 | 3.1E-03 | -- | | 1.9E-01 | 3.1E-03 | 4.4E+02 | na | na | | X | | X | | |
| 99 | 2,4-Dichlorophenol | 3.0E-01 | 3.0E-01 | -- | | 2.4E+01 | 3.0E-01 | 1.6E+06 | na | na | | X | | X | | |
| 100 | Di(2-ethylhexyl)adipate | 4.0E+02 | na | -- | | 4.0E+02 | na | na | na | na | X | | | | | |
| 101 | Diethyl phthalate | 2.0E+02 | 2.0E+02 | -- | | 1.3E+04 | 2.0E+02 | 6.2E+08 | na | na | | X | | X | | |
| 102 | Dimethyl phthalate | 6.0E+02 | 6.0E+02 | -- | | na | 6.0E+02 | na | na | na | | X | | X | | |
| 103 | 2,4-Dimethylphenol | 8.5E+01 | 8.5E+01 | -- | | 1.6E+02 | 8.5E+01 | 8.1E+06 | na | na | | X | | X | | |
| 104 | 1,2-Dinitrobenzene | 1.6E+00 | na | -- | | 1.6E+00 | na | na | na | na | X | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | 1,3-Dinitrobenzene | 1.6E+00 | na | -- | | 1.6E+00 | na | na | na | na | X | | | | | |
| 106 | 1,4-Dinitrobenzene | 1.6E+00 | na | -- | | 1.6E+00 | na | na | na | na | X | | | | | |
| 107 | 4,6-Dinitro-2-methylphenol | 2.0E+00 | 2.0E+00 | -- | | na | 2.0E+00 | na | na | na | | X | | | X | |
| 108 | 2,4-Dinitrophenol | 1.0E+01 | 1.0E+01 | -- | | 3.2E+01 | 1.0E+01 | 3.8E+06 | na | na | | X | | | X | |
| 109 | 2,4-Dinitrotoluene | 3.9E-02 | 3.9E-02 | -- | | 2.8E-01 | 3.9E-02 | 3.3E+03 | na | na | | X | | | X | |
| 110 | 2,6-Dinitrotoluene | 5.8E-02 | 8.2E+02 | -- | | 5.8E-02 | na | 8.2E+02 | na | na | X | | | | | X |
| 111 | Di-n-octyl phthalate | 9.4E-05 | 9.4E-05 | -- | | 1.6E+02 | na | 9.4E-05 | na | na | | | X | | | X |
| 112 | 1,4-Dioxane | 4.4E-01 | na | -- | | 4.4E-01 | na | na | na | na | X | | | | | |
| 113 | 1,2-Diphenylhydrazine | 1.0E-02 | 1.0E-02 | -- | | 1.1E-01 | 1.0E-02 | na | na | na | | X | | | X | |
| 114 | Hexachlorobenzene | 5.0E-06 | 5.0E-06 | -- | | 5.5E-01 | 5.0E-06 | 2.5E-03 | na | na | | X | | | X | |
| 115 | Hexachlorobutadiene | 1.1E-03 | 1.1E-03 | -- | | 5.6E-01 | 1.0E-02 | 1.1E-03 | 8.1E-01 | na | | | X | | | X |
| 116 | Hexachlorocyclopentadiene | 1.0E+00 | 1.0E+00 | -- | | 4.8E+01 | 1.0E+00 | 3.2E+03 | na | na | | X | | | X | |
| 117 | Hexachloroethane | 2.0E-02 | 2.0E-02 | -- | | 1.1E+00 | 2.0E-02 | 2.1E+03 | 3.1E+00 | na | | X | | | X | |
| 118 | Isophorone | 2.7E+01 | 2.7E+01 | -- | | 4.6E+01 | 2.7E+01 | 1.6E+06 | na | na | | X | | | X | |
| 119 | 2-Methoxynaphthalene | na | na | -- | | na | na | na | na | na | | | | | | |
| 120 | 2-Methylphenol | 4.0E+02 | 3.6E+07 | -- | | 4.0E+02 | na | 3.6E+07 | na | na | X | | | | | X |
| 121 | 3-Methylphenol | 4.0E+02 | na | -- | | 4.0E+02 | na | na | na | na | X | | | | | |
| 122 | 4-Methylphenol | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | |
| 123 | 2-Nitroaniline | 1.6E+02 | na | -- | | 1.6E+02 | na | na | na | na | X | | | | | |
| 124 | 3-Nitroaniline | na | na | -- | | na | na | na | na | na | | | | | | |
| 125 | 4-Nitroaniline | 4.4E+00 | na | -- | | 4.4E+00 | na | na | na | na | X | | | | | |
| 126 | Nitrobenzene | 1.0E+01 | 1.0E+01 | -- | | 1.6E+01 | 1.0E+01 | 1.2E+06 | 1.6E+02 | na | | X | | | X | |
| 127 | 2-Nitrophenol | na | na | -- | | na | na | na | na | na | | | | | | |
| 128 | 4-Nitrophenol | na | na | -- | | na | na | na | na | na | | | | | | |
| 129 | n-Nitrosodimethylamine | 6.5E-04 | 6.5E-04 | -- | | 8.6E-04 | 6.5E-04 | na | na | na | | X | | | X | |
| 130 | n-Nitrosodiphenylamine | 6.2E-01 | 6.2E-01 | -- | | 1.8E+01 | 6.2E-01 | 2.4E+04 | na | na | | X | | | X | |
| 131 | n-Nitrosodi-n-propylamine | 4.4E-03 | 4.4E-03 | -- | | 1.3E-02 | 4.4E-03 | 2.7E+02 | na | na | | X | | | X | |
| 132 | Pentachlorophenol | 2.0E-03 | 2.0E-03 | -- | | 1.0E+00 | 2.0E-03 | 4.0E+02 | na | na | | X | | | X | |
| 133 | Phenol | 2.8E+02 | 2.8E+02 | -- | | 2.4E+03 | 3.0E+02 | 2.8E+02 | na | na | | | X | | | X |
| 134 | Pyridine | 8.0E+00 | na | -- | | 8.0E+00 | na | na | na | na | X | | | | | |
| 135 | 2,3,4,5-Tetrachlorophenol | na | na | -- | | na | na | na | na | na | | | | | | |
| 136 | 2,3,4,6-Tetrachlorophenol | 4.8E+02 | 9.6E+06 | -- | | 4.8E+02 | na | 9.6E+06 | na | na | X | | | | | X |
| 137 | 1,2,4-Trichlorobenzene | 3.6E-02 | 3.6E-02 | -- | | 1.5E+01 | 3.6E-02 | 3.1E+03 | 3.9E+01 | na | | X | | | X | |
| 138 | 2,4,5-Trichlorophenol | 3.0E+02 | 3.0E+02 | -- | | 8.0E+02 | 3.0E+02 | 6.6E+06 | na | na | | X | | | X | |
| 139 | 2,4,6-Trichlorophenol | 2.5E-01 | 2.5E-01 | -- | | 4.0E+00 | 2.5E-01 | 3.2E+04 | na | na | | X | | | X | |
| 140 | ***Volatile Organic Compounds*** | | | | | | | | | | ***Volatile Organic Compounds*** | | | | | |
| 141 | Acetone | 7.2E+03 | 2.1E+09 | -- | | 7.2E+03 | na | 2.1E+09 | na | na | X | | | | | X |
| 142 | Acrolein | 1.0E+00 | 1.0E+00 | -- | | 4.0E+00 | 1.0E+00 | na | 2.9E+00 | na | | X | | | X | |
| 143 | Acrylonitrile | 1.9E-02 | 1.9E-02 | -- | | 8.1E-02 | 1.9E-02 | na | 1.6E+01 | na | | X | | | X | |
| 144 | Benzaldehyde | 1.1E+01 | na | -- | | 1.1E+01 | na | na | na | na | X | | | | | |
| 145 | Benzene | 4.4E-01 | 4.4E-01 | -- | | 5.0E+00 | 4.4E-01 | 7.0E+04 | 2.4E+00 | na | | X | | | X | |
| 146 | Bromobenzene | 6.4E+01 | 3.7E+06 | -- | | 6.4E+01 | na | 3.7E+06 | na | na | X | | | | | X |
| 147 | Bromochloromethane | na | na | -- | | na | na | na | na | na | | | | | | |
| 148 | Bromoethane | na | na | -- | | na | na | na | na | na | | | | | | |
| 149 | Bromoform | 4.6E+00 | 4.6E+00 | -- | | 5.5E+01 | 4.6E+00 | 3.2E+05 | 2.0E+02 | na | | X | | | X | |
| 150 | Bromomethane | 1.1E+01 | 1.3E+01 | -- | | 1.1E+01 | 1.0E+02 | 2.8E+06 | 1.3E+01 | na | X | | | | | X |
| 151 | 2-Butoxyethanol | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | |
| 152 | n-Butylbenzene | 4.0E+02 | na | -- | | 4.0E+02 | na | na | na | na | X | | | | | |
| 153 | sec-Butylbenzene | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | |
| 154 | tert-Butylbenzene | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | |
| 155 | Carbon disulfide | 4.0E+02 | 4.0E+02 | -- | | 8.0E+02 | na | 1.3E+08 | 4.0E+02 | na | | | X | | | X |
| 156 | Carbon tetrachloride | 2.0E-01 | 2.0E-01 | -- | | 5.0E+00 | 2.0E-01 | 3.1E+04 | 5.6E-01 | na | | X | | | X | |
| 157 | Chlorobenzene | 2.0E+01 | 2.0E+01 | -- | | 1.0E+02 | 2.0E+01 | 9.5E+06 | 2.9E+02 | na | | X | | | X | |
| 158 | Chloroethane | 1.9E+04 | 1.9E+04 | -- | | na | na | na | 1.9E+04 | na | | | X | | | X |
| 159 | 2-Chloroethyl vinyl ether | na | na | -- | | na | na | na | na | na | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160 | Chloroform | 1.2E+00 | 1.2E+00 | -- | | 1.4E+01 | 6.0E+01 | 1.3E+05 | 1.2E+00 | na | | | X | | X | | |
| 161 | Chloromethane | 1.5E+02 | 1.5E+02 | -- | | na | na | na | 1.5E+02 | na | | | X | | X | | |
| 162 | 3-Chloro-1-propene | 2.1E+00 | na | -- | | 2.1E+00 | na | na | na | na | X | | | | | | |
| 163 | 2-Chlorotoluene | 1.6E+02 | na | -- | | 1.6E+02 | na | na | na | na | X | | | | | | |
| 164 | 4-Chlorotoluene | na | na | -- | | na | na | na | na | na | | | | | | | |
| 165 | Dibromochloromethane | 6.0E-01 | 6.0E-01 | -- | | 5.2E+00 | 6.0E-01 | 4.5E+04 | na | na | | X | | | X | | |
| 166 | 1,2-Dibromo-3-chloropropane | 2.0E-01 | na | -- | | 2.0E-01 | na | na | na | na | X | | | | | | |
| 167 | Dibromomethane | 8.0E+01 | na | -- | | 8.0E+01 | na | na | na | na | X | | | | | | |
| 168 | Dichlorobromomethane | 7.3E-01 | 7.3E-01 | -- | | 7.1E+00 | 7.3E-01 | 6.6E+04 | 1.8E+00 | na | | X | | | X | | |
| 169 | trans-1,4-Dichloro-2-butene | na | na | -- | | na | na | na | na | na | | | | | | | |
| 170 | Dichlorodifluoromethane | 5.6E+00 | 5.6E+00 | -- | | 1.6E+03 | na | na | 5.6E+00 | na | | | X | | X | | |
| 171 | 1,1-Dichloroethane | 7.7E+00 | 1.1E+01 | -- | | 7.7E+00 | na | 7.3E+05 | 1.1E+01 | na | X | | | | X | | |
| 172 | 1,2-Dichloroethane | 4.2E+00 | 4.2E+00 | -- | | 4.8E+00 | 8.9E+00 | 5.3E+04 | 4.2E+00 | na | | | X | | X | | |
| 173 | 1,1-Dichloroethylene | 7.0E+00 | 1.3E+02 | -- | | 7.0E+00 | 3.0E+02 | 6.1E+07 | 1.3E+02 | na | X | | | | X | | |
| 174 | cis-1,2-Dichloroethylene | 1.6E+01 | 2.9E+06 | -- | | 1.6E+01 | na | 2.9E+06 | na | na | X | | | | X | | |
| 175 | trans-1,2-Dichloroethylene | 1.0E+02 | 1.0E+02 | -- | | 1.0E+02 | 1.0E+02 | 2.8E+07 | na | na | X | X | | | X | | |
| 176 | 1,2-Dichloroethylene (mixed isomers) | 7.2E+01 | na | -- | | 7.2E+01 | na | na | na | na | X | | | | | | |
| 177 | 1,2-Dichloropropane | 7.1E-01 | 7.1E-01 | -- | | 5.0E+00 | 7.1E-01 | 1.2E+05 | 1.0E+01 | na | | X | | | X | | |
| 178 | 1,3-Dichloropropane | na | na | -- | | na | na | na | na | na | | | | | | | |
| 179 | 2,2-Dichloropropane | na | na | -- | | na | na | na | na | na | | | | | | | |
| 180 | 1,1-Dichloropropene | na | na | -- | | na | na | na | na | na | | | | | | | |
| 181 | cis-1,3-Dichloropropene | 2.2E-01 | 2.2E-01 | -- | | 4.4E-01 | 2.2E-01 | 5.4E+04 | na | na | | X | | | X | | |
| 182 | trans-1,3-Dichloropropene | 2.2E-01 | 2.2E-01 | -- | | 4.4E-01 | 2.2E-01 | 5.4E+04 | na | na | | X | | | X | | |
| 183 | Ethane | na | na | -- | | na | na | na | na | na | | | | | | | |
| 184 | Ethylbenzene | 2.9E+01 | 2.9E+01 | -- | | 7.0E+02 | 2.9E+01 | 5.1E+07 | 2.8E+03 | na | | X | | | X | | X |
| 185 | Ethylene oxide | 1.4E-01 | na | -- | | 1.4E-01 | na | na | na | na | X | | | | | | |
| 186 | Ethyl ether | 1.6E+03 | na | -- | | 1.6E+03 | na | na | na | na | X | | | | | | |
| 187 | Ethylene dibromide | 5.0E-02 | 2.7E-01 | -- | | 5.0E-02 | na | 1.8E+03 | 2.7E-01 | na | X | | | | X | | |
| 188 | Formaldehyde | 2.1E+00 | na | -- | | 2.1E+00 | na | na | na | na | X | | | | | | |
| 189 | 2-Hexanone | 4.0E+01 | na | -- | | 4.0E+01 | na | na | na | na | X | | | | | | |
| 190 | Isopropylbenzene | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | | |
| 191 | 4-Isopropyltoluene | na | na | -- | | na | na | na | na | na | | | | | | | |
| 192 | Methane | na | na | -- | | na | na | na | na | na | | | | | | | |
| 193 | Methyl ethyl ketone | 4.8E+03 | 1.7E+06 | -- | | 4.8E+03 | na | na | 1.7E+06 | na | X | | | | X | | |
| 194 | Methyl iodide | na | na | -- | | na | na | na | na | na | | | | | | | |
| 195 | Methyl isobutyl ketone | 6.4E+02 | 4.7E+05 | -- | | 6.4E+02 | na | na | 4.7E+05 | na | X | | | | X | | |
| 196 | Methyl tert-butyl ether | 2.4E+01 | 6.0E+02 | -- | | 2.4E+01 | na | 3.7E+06 | 6.0E+02 | na | X | | | | X | | |
| 197 | Methylene chloride | 5.0E+00 | 1.0E+01 | -- | | 5.0E+00 | 1.0E+01 | 3.4E+06 | 1.2E+03 | na | X | | | X | | | |
| 198 | 2-Pentanone | na | na | -- | | na | na | na | na | na | | | | | | | |
| 199 | n-Propylbenzene | 8.0E+02 | na | -- | | 8.0E+02 | na | na | na | na | X | | | | | | |
| 200 | Styrene | 1.0E+02 | 8.2E+03 | -- | | 1.0E+02 | na | 2.8E+07 | 8.2E+03 | na | X | | | | X | | |
| 201 | 1,1,1,2-Tetrachloroethane | 1.7E+00 | 7.4E+00 | -- | | 1.7E+00 | na | na | 7.4E+00 | na | X | | | | X | | |
| 202 | 1,1,2,2-Tetrachloroethane | 1.0E-01 | 1.0E-01 | -- | | 2.2E-01 | 1.0E-01 | 1.7E+04 | 6.2E+00 | na | | X | | X | | | |
| 203 | Tetrachloroethylene | 2.4E+00 | 2.4E+00 | -- | | 5.0E+00 | 2.4E+00 | 6.7E+05 | 2.4E+01 | na | | X | | X | | | |
| 204 | Toluene | 5.7E+01 | 5.7E+01 | -- | | 6.4E+02 | 5.7E+01 | 5.4E+07 | 1.5E+04 | na | | X | | X | | | X |
| 205 | 1,2,3-Trichlorobenzene | na | na | -- | | na | na | na | na | na | | | | | | | |
| 206 | 1,1,1-Trichloroethane | 2.0E+02 | 5.5E+03 | -- | | 2.0E+02 | 1.0E+04 | 1.4E+09 | 5.5E+03 | na | X | | | | X | | |
| 207 | 1,1,2-Trichloroethane | 3.5E-01 | 3.5E-01 | -- | | 3.0E+00 | 3.5E-01 | 6.0E+04 | 4.6E+00 | na | | X | | X | | | |
| 208 | Trichloroethylene | 3.0E-01 | 3.0E-01 | -- | | 4.0E+00 | 3.0E-01 | 6.5E+04 | 1.4E+00 | na | | X | | X | | | |
| 209 | Trichlorofluoroethane | na | na | -- | | na | na | na | na | na | | | | | | | |
| 210 | Trichlorofluoromethane | 1.2E+02 | 1.2E+02 | -- | | 2.4E+03 | na | na | 1.2E+02 | na | | | X | | X | | |
| 211 | 1,2,3-Trichloropropane | 3.8E-04 | na | -- | | 3.8E-04 | na | na | na | na | X | | | | | | |
| 212 | Trichlorotrifluoroethane | 1.8E+02 | 1.8E+02 | -- | | 2.4E+05 | na | na | 1.8E+02 | na | | | X | | X | | |
| 213 | 1,2,3-Trimethylbenzene | 8.0E+01 | na | -- | | 8.0E+01 | na | na | na | na | X | | | | | | |
| 214 | 1,2,4-Trimethylbenzene | 8.0E+01 | 2.4E+02 | -- | | 8.0E+01 | na | na | 2.4E+02 | na | X | | | | X | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 215 | 1,3,5-Trimethylbenzene | 8.0E+01 | na | -- | | 8.0E+01 | na | na | na | na | X | | | | | | | | | |
| 216 | Vinyl acetate | 7.8E+03 | 7.8E+03 | -- | | 8.0E+03 | na | 2.1E+09 | 7.8E+03 | na | | X | | | X | | | | | |
| 217 | Vinyl chloride | 2.0E-02 | 2.0E-02 | -- | | 2.9E-01 | 2.0E-02 | 4.0E+03 | 3.5E-01 | na | X | | | X | | | | | | |
| 218 | Total xylenes | 3.3E+02 | 3.3E+02 | -- | | 1.6E+03 | na | 9.2E+07 | 3.3E+02 | na | | X | | | X | | | | X | |
| 219 | ***Petroleum Hydrocarbons*** | | | | | | | | | | ***Petroleum Hydrocarbons*** | | | | | | | | | |
| 220 | Gasoline range hydrocarbons | 8.0E+02 | 1.0E+03 | -- | | 8.0E+02 | 1.0E+03 | na | na | na | X | | | X | | | | | X | |
| 221 | Diesel range hydrocarbons, fresh | 1.5E+02 | 1.5E+02 | -- | | 5.0E+02 | 1.5E+02 | na | na | na | | X | | X | | | | | | |
| 222 | Diesel range hydrocarbons, weathered | 5.0E+02 | 3.0E+03 | -- | | 5.0E+02 | 3.0E+03 | na | na | na | X | | | X | | | | | X | |
| 223 | Oil range hydrocarbons | 5.0E+02 | na | -- | | 5.0E+02 | na | na | na | na | X | | | | | | | | X | |
| 224 | Total diesel & oil range hydrocarbons | 5.0E+02 | 3.0E+03 | -- | | 5.0E+02 | 3.0E+03 | na | na | na | X | | | X | | | | | X | |
| 225 | ***Pesticides*** | | | | | | | | | | ***Pesticides*** | | | | | | | | | |
| 226 | Aldrin | 4.1E-08 | 4.1E-08 | -- | | 2.6E-03 | 4.1E-08 | 4.1E-04 | 3.2E-01 | na | | X | | | X | | | | | |
| 227 | alpha-BHC | 4.8E-05 | 4.8E-05 | -- | | 1.4E-02 | 4.8E-05 | 1.4E+01 | na | na | | X | | | X | | | | | |
| 228 | beta-BHC | 1.3E-03 | 1.3E-03 | -- | | 4.9E-02 | 1.3E-03 | 6.6E-01 | na | na | | X | | | X | | | | | |
| 229 | delta-BHC | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 230 | gamma-BHC | 8.0E-02 | 8.0E-02 | -- | | 2.0E-01 | 8.0E-02 | 1.0E+02 | na | na | | X | | | X | | | | | |
| 231 | cis-Chlordane | 3.6E-04 | 3.6E-04 | -- | | 2.5E-01 | 3.6E-04 | 3.9E-04 | na | na | | X | | | X | | | | | |
| 232 | trans-Chlordane | 3.6E-04 | 3.6E-04 | -- | | 2.5E-01 | 3.6E-04 | 3.9E-04 | na | na | | X | | | X | | | | | |
| 233 | Chlordane | 2.2E-05 | 2.2E-05 | X | | 2.0E+00 | 2.2E-05 | TBD | na | na | | X | | | X | | | | | |
| 234 | Chlorpyrifos | 4.1E-02 | 4.1E-02 | X | | 1.6E+01 | 4.1E-02 | na | na | na | | X | | | X | | | | | |
| 235 | 4,4'-DDD | 7.9E-06 | 7.9E-06 | -- | | 3.6E-01 | 7.9E-06 | 4.4E-04 | na | na | | X | | | X | | | | | |
| 236 | 4,4'-DDE | 8.8E-07 | 8.8E-07 | -- | | 2.6E-01 | 8.8E-07 | 2.3E-04 | na | na | | X | | | X | | | | | |
| 237 | 4,4'-DDT | 1.2E-06 | 1.2E-06 | -- | | 2.6E-01 | 1.2E-06 | 2.9E-05 | na | na | | X | | | X | | | | | |
| 238 | Total DDD | 3.6E-01 | 0.0E+00 | X | | 3.6E-01 | na | TBD | na | na | X | | | | | | | | | |
| 239 | Total DDE | 2.6E-01 | 0.0E+00 | X | | 2.6E-01 | na | TBD | na | na | X | | | | | | | | | |
| 240 | Total DDT | 2.6E-01 | 0.0E+00 | X | | 2.6E-01 | na | TBD | na | na | X | | | | | | | | | |
| 241 | Diazinon | 1.7E-01 | 1.7E-01 | X | | 1.1E+01 | 1.7E-01 | na | na | na | | X | | | X | | | | | |
| 242 | Dieldrin | 7.0E-08 | 7.0E-08 | -- | | 5.5E-03 | 7.0E-08 | 7.8E-04 | na | na | | X | | | X | | | | | |
| 243 | Endosulfan I | 5.6E-02 | 5.6E-02 | X | | 9.6E+01 | 5.6E-02 | TBD | na | na | | X | | | X | | | | | |
| 244 | Endosulfan II | 5.6E-02 | 5.6E-02 | X | | 9.6E+01 | 5.6E-02 | TBD | na | na | | X | | | X | | | | | |
| 245 | Endosulfan sulfate | 9.0E+00 | 9.0E+00 | -- | | 9.6E+01 | 9.0E+00 | na | na | na | | X | | | X | | | | | |
| 246 | Endrin | 2.0E-03 | 2.0E-03 | X | | 2.0E+00 | 2.0E-03 | TBD | na | na | | X | | | X | | | | | |
| 247 | Endrin aldehyde | 3.4E-02 | 3.4E-02 | -- | | na | 3.4E-02 | na | na | na | | X | | | X | | | | | |
| 248 | Endrin ketone | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 249 | Heptachlor | 3.4E-07 | 3.4E-07 | -- | | 1.9E-01 | 3.4E-07 | 2.1E-03 | na | na | | X | | | X | | | | | |
| 250 | Heptachlor epoxide | 2.4E-06 | 2.4E-06 | X | | 4.8E-02 | 2.4E-06 | TBD | na | na | | X | | | X | | | | | |
| 251 | Malathion | 1.0E-01 | 1.0E-01 | -- | | 3.2E+02 | 1.0E-01 | na | na | na | | X | | | X | | | | | |
| 252 | Methoxychlor | 2.0E-02 | 2.0E-02 | -- | | 4.0E+01 | 2.0E-02 | 6.7E+03 | na | na | | X | | | X | | | | | |
| 253 | Mirex | 1.0E-03 | 1.0E-03 | X | | 4.9E-03 | 1.0E-03 | na | na | na | | X | | | X | | | | | |
| 254 | Nonachlor | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 255 | Toxaphene | 3.2E-05 | 3.2E-05 | X | | 8.0E-01 | 3.2E-05 | TBD | na | na | | X | | | X | | | | | |
| 256 | ***Herbicides*** | | | | | | | | | | ***Herbicides*** | | | | | | | | | |
| 257 | 2,4-D | 7.0E+01 | 1.3E+03 | -- | | 7.0E+01 | 1.3E+03 | na | na | na | X | | | | X | | | | | |
| 258 | 2,4-DB | 4.8E+02 | na | -- | | 4.8E+02 | na | na | na | na | X | | | | | | | | | |
| 259 | 2,4,5-TP | 5.0E+01 | 1.0E+02 | -- | | 5.0E+01 | 1.0E+02 | na | na | na | X | | | | X | | | | | |
| 260 | 2,4,5-T | 1.6E+02 | na | -- | | 1.6E+02 | na | na | na | na | X | | | | | | | | | |
| 261 | Dalapon | 2.0E+02 | na | -- | | 2.0E+02 | na | na | na | na | X | | | | | | | | | |
| 262 | Dicamba | 4.8E+02 | na | -- | | 4.8E+02 | na | na | na | na | X | | | | | | | | | |
| 263 | Dichloroprop | na | na | -- | | na | na | na | na | na | | | | | | | | | | |
| 264 | Dinoseb | 7.0E+00 | na | -- | | 7.0E+00 | na | na | na | na | X | | | | | | | | | |
| 265 | MCPA | 8.0E+00 | na | -- | | 8.0E+00 | na | na | na | na | X | | | | | | | | | |
| 266 | MCPP | 1.6E+01 | na | -- | | 1.6E+01 | na | na | na | na | X | | | | | | | | | |
| | | | | | | | | | | | Number of Chemicals: | 85 | 105 | 11 | 12 | 1 | 115 | 22 | 23 | 1 | 17 |

# APPENDIX B

# Sediment Remedial Investigation Work Plan

*Prepared for*

**Barbee Mill Company, Inc.**
P.O. Box 359
Renton, Washington 98057-0359

# SEDIMENT REMEDIAL INVESTIGATION WORK PLAN

## BARBEE MILL SITE

*Prepared by*

Geosyntec consultants

engineers | scientists | innovators

520 Pike Street, Suite 2600
Seattle, Washington 98101

Project Number: PNG0869

*Submitted to*

Washington Department of Ecology, Northwest Regional Office, Shoreline, Washington

Final
August 5, 2021

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Anchor | Anchor Environmental, LLC |
| AO | Agreed Order |
| ARI | Analytical Resources, Incorporated |
| Aspect | Aspect Consulting |
| ASTM | American Society of Testing Materials |
| Barbee Mill | Barbee Mill Co., Inc. |
| BNSF | Burlington Northern Santa Fe |
| cm | centimeters |
| COPC | contaminant of potential concern |
| cPAHs | carcinogenic polycyclic aromatic hydrocarbons |
| CSL | Cleanup Screening Level |
| CSM | conceptual site model |
| DNAPL | dense aqueous non-phase liquid |
| DQOs | Data Quality Objectives |
| Draft RI Report | Agency Review Draft RI Report |
| Ecology | Washington State Department of Ecology |
| EIM | Environmental Information Management |
| EPA | Environmental Protection Agency |
| FS | feasibility study |
| Geosyntec | Geosyntec Consultants, Inc. |
| IDW | Inverse Distance Weighting |
| mg/kg | milligrams per kilogram |
| MTCA | Model Toxics Control Act |
| NOAA | National Oceanic and Atmospheric Administration |
| OHW | Ordinary High Water |
| OLW | Ordinary Low Water |
| OU | operable unit |
| PAHs | polycyclic aromatic hydrocarbons |
| PCBs | polychlorinated biphenyls |

| | |
|---|---|
| PQL | Practical Quantitation Limits |
| Property | the former Barbee Mill Property |
| PSEP | Puget Sound Estuary Protocols |
| QA/QC | Quality Assurance and Quality Control |
| QAPP | Quality Assurance Plan |
| RETEC | Remediation Technologies, Inc. |
| RI | remedial investigation |
| RL | Reporting Limit |
| SAP | Sampling and Analysis Plan |
| SCOs | Sediment Cleanup Objectives |
| SCUM | Sediment Cleanup User's Manual |
| Site | Barbee Mill Company Site |
| SMS | Sediment Management Standards |
| SRI Work Plan | Sediment Remedial Investigation Work Plan |
| SRI | Sediment Remedial Investigation |
| SWAC | spatially weighted average concentrations |
| TOC | total organic carbon |
| TPH | total petroleum hydrocarbons |
| TVS | total volatile solids |
| WAC | Washington Administrative Code |

# 1. INTRODUCTION

The Barbee Mill Co., Inc. (Barbee Mill) has completed a number of remedial actions to address soil, groundwater, and sediment contamination at the Barbee Mill Site (Site) located in Renton, Washington. Currently, Barbee Mill is working to complete a remedial investigation (RI) under an agreed order with the Washington State Department of Ecology (Ecology). Barbee Mill entered into Agreed Order No. DE 5396 with Ecology effective December 1, 2009, followed by a first amendment effective on December 16, 2010, and a second amendment effective on May 30, 2012 (collectively, AO). In May 2019, Aspect Consulting (Aspect) submitted a revised Agency Review Draft RI Report (Draft RI Report; Aspect, 2019) to Ecology. The Draft RI Report, which was an update to the 2012 Agency Review Draft RI Report, included the results of a data gap investigation to further delineate the extent of elevated arsenic in soil, sediment, and groundwater.

Ecology provided comments on the sediment portion of the Draft RI Report on June 14, 2019. In its comments, Ecology noted that while remedial actions had been completed on the sediment portion of the Site in 2002, additional analysis was needed to evaluate compliance with current sediment regulations. The applicable regulations include the Sediment Management Standards (SMS) for freshwater sediments under Chapter 173-204 Washington Administrative Code (WAC) and Ecology's Sediment Cleanup User's Manual (SCUM) guidance for managing contaminated sediment and implementing the SMS (Ecology, 2019). The SMS and SCUM are considered applicable cleanup standards under the Model Toxics Control Act (MTCA; Chapter 173-340 WAC).

Barbee Mill has engaged Geosyntec Consultants, Inc. (Geosyntec) to evaluate the existing sediment data in accordance with current sediment regulations and to determine the nature and extent of sediment contaminants, identify preliminary contaminants of potential concern (COPCs), and develop a preliminary sediment boundary.[1] These efforts are summarized in Section 3. Following discussions with Ecology on these historical data evaluations, Ecology identified post-remedial action surface sediment conditions as a data gap. This Sediment RI (SRI) Work Plan was prepared to address the identified data gap. This SRI Work Plan is being submitted as an appendix to the Remedial Investigation Work Plan (RI Work Plan) prepared by Aspect for the upland portion of the Site, and sampling events will be sequenced such that additional upland data will inform the SRI.

[1] The preliminary sediment boundary was developed to inform additional data collection and represents the current study area. It is not proposed as a final sediment boundary.

## 1.1 Purpose and Objective of SRI

Based on the updated COPC screening and boundary analysis discussed with Ecology in April 2020 (and documented in Section 3 of this SRI Work Plan), Ecology determined that additional data are needed to determine if sediment COPCs are in compliance with SMS.

The purpose of this SRI is to address data gaps (described in Section 3.4). The objectives of this SRI are to:

1. Characterize the current chemical conditions of the surface sediment through comparison with SMS Sediment Cleanup Objectives (SCOs) and Cleanup Screening Level [CSLs]);
2. Refine the preliminary sediment boundary; and
3. Determine if elevated arsenic in groundwater is resulting in exceedances of relevant surface water/sediment screening levels.

## 1.2 Site Description

The Site information is described in detail in the Draft RI Report. Briefly, the former Barbee Mill Property (Property) is located at 4101 Lake Washington Boulevard North in Renton, Washington (Figure 1). The Property is bounded by the Quendall Terminals Site (as defined by the Administrative Settlement Agreement and Order on Consent for the Quendall Terminals Site and including both the upland and sediment operable units) to the north, the former (currently owned by King County) Burlington Northern Santa Fe (BNSF) Railroad right-of-way to the east and south, and state-owned land in Lake Washington to the west. The Barbee Mill Site includes portions of: the Property; the adjacent Quendall Terminals property; and adjacent state-owned land in Lake Washington. May Creek runs west through the Property and discharges into Lake Washington. Ecology has not approved a final sediment boundary, but a preliminary sediment boundary, along with other features of interest, are shown in Figure 2. Also shown in Figure 2 are the extent of three sediment removal actions taken by Barbee Mill in 1996 and 2002 to remove wood waste-impacted sediments and in 2005 to restore the shoreline.

## 1.3 Project Team and Responsibilities

Jeremy Porter at Aspect is the Project Manager for Barbee Mill under the AO and is the lead consultant for the upland RI. In coordination with Aspect, Geosyntec is the lead consultant for the SRI. Ms. Anne Fitzpatrick (Geosyntec) is the senior technical lead for

the SRI and is responsible for providing technical oversight on SRI Work Plan development, all sediment project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the SRI. Ms. Fitzpatrick is supported by the project risk assessor, Ms. Jennifer Arblaster, and the project chemist, Ms. Julia Caprio. Ms. Arblaster will be the day-to-day lead on sediment investigation activities and data analysis. Ms. Caprio will be responsible for coordination with laboratories regarding sample volumes, logistics, schedule, detection limits and matrix interferences, and ensuring overall data quality. Data validation will be performed by Geosyntec's chemistry group located in Knoxville, Tennessee, led by Ms. Caprio. The field team will be led by the project geologist, Mr. Dustin Jensen.

Geosyntec is coordinating with Jeremy Porter at Aspect, who is responsible for development and delivery of the Data Report, which will describe the findings from both the upland RI and the SRI Work Plans. Aspect will manage the overall project database and will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following acceptance of the data validation.

Sediment sampling and vessel support will be provided by Research Support Services, under the direction of Geosyntec field staff. Eric Parker is the point of contact for Research Support Services. Analytical Resources, Incorporated (ARI) Laboratories will perform the analyses, and the point of contact at ARI Laboratories is Kelly Bottem. A complete list of project team members and respective contact information is provided in Table 1.

## 1.4 SRI Work Plan Organization

The remainder of the SRI Work Plan is organized as follows:

- Section 2: Site Information and Background, provides an overview of the Site, previous sediment investigations, and previous sediment cleanup and source control actions;
- Section 3: Preliminary Conceptual Site Model and Data Gaps, provide the Site Conceptual Site Model (CSM), a summary of the preliminary sediment boundary development process and COPC selection, and current data gaps;
- Section 4: Field Investigations and Data Collection, outlines the scope and methods for the collection of additional surface sediment data, including Data Quality Objectives (DQOs);
- Section 5: Data Management and Evaluation, outlines the data validation and management procedures and subsequent data uses;

- Section 6: Reporting, outlines the reporting deliverables associated with the SRI;
- Section 7: Schedule, provides an overall timeline for the SRI; and
- Section 8: References, provides references cited herein.

Tables and figures are located at the end of the text, followed by attachments.

# 2. SITE INFORMATION AND BACKGROUND

This section presents relevant information pertaining to the sediment portion of the Barbee Mill Site, including sediment conditions, a brief Site history, and a summary of previous investigations and sediment removal actions. Additional information and background are detailed in the Draft RI Report.

## 2.1 Physical Sediment Conditions

The geological features and CSM, along with past and present sources of contamination, are detailed in Aspect (2019). Lake Washington is a deep freshwater lake. Water levels range from Ordinary Low Water (OLW) elevation of 16.7 feet in winter to its Ordinary High Water (OHW) elevation of 18.7 feet in summer, with levels controlled by the United States Army Corps of Engineers at the Hiram M. Chittenden Locks (Aspect, 2019).

Water depths in the middle of the lake average 108 feet, with a maximum water depth of 214 feet. In the vicinity of the Site, the lake bottom slopes to the west to approximately -15 feet North American Vertical Datum of 1988 at the toe of the slope. Previous sediment investigations indicate that sediments in the vicinity of the Site are generally sandy silt at the surface with silty clay and sand lenses at depth. Pre-sediment removal bathymetry near the Site is shown in Figure 3a (1996; included in Remediation Technologies [RETEC], 1997). Post-sediment removal bathymetry is shown in Figure 3b (2005/2008; compiled from National Oceanic and Atmospheric Administration [NOAA] bathymetric surveys in 2005 [Survey H11377] and 2008 [Survey H11810] [NOAA, 2020]).

## 2.2 Site History

The Site is a former lumber mill facility located on the southeastern shoreline of Lake Washington, Renton, Washington. As a result of historical operations, chemical releases into soil, groundwater, and sediments have occurred at the Site. Historical operations are detailed in the Draft RI Report. Briefly, historical operations included log rafting, wood treatment, and sawmill operations. Specific historical operations and features relevant to the sediment portion of the Site include over-water portions of the sawmill building built in 1959 and historical stormwater outfalls draining to May Creek and Lake Washington (Figure 2). COPCs in sediment were identified in the Draft RI Report[2] as arsenic, zinc, total organic carbon (TOC), and wood waste, based on historical exceedances of screening levels, including the SMS and Site-specific cleanup levels developed for TOC

[2] An updated COPC screening is provided in Section 3 of this SRI Work Plan.

and wood waste based on toxicity testing at the adjacent Quendall Terminals site (Aspect, 2019).

In 2006, Barbee Mill excavated approximately 30,000 cubic yards of arsenic-contaminated soil, 230 cubic yards of petroleum-contaminated soil, and 160 cubic yards of pentachlorophenol-contaminated soil from the upland portions of the Site. Barbee Mill installed a passive attenuation zone to treat residual arsenic in the groundwater and installed a groundwater treatment system. The Property was then redeveloped to include residential use and recreational uses of Lake Washington, including boating, fishing, and swimming. The shoreline area at the Site has a minimal exposed area for beach play. Historical sediment remediation activities are described in more detail in Section 2.5.

## 2.3 Previous Sediment Investigations

Several investigations have been conducted at and adjacent to the Barbee Mill Site with the aim of delineating the nature and extent of contamination in sediments and inform previous remedial actions, as described below. The sampling conducted at the Barbee Mill Site over the years focused on sediment sampling in areas impacted by the historical operations, including log rafting, arsenic-based wood treatment, and sawmill operations. Investigations adjacent to the Barbee Mill Site include the RI performed at the adjacent Quendall Terminals Site. Additional details of previous investigations at the Barbee Mill Site and the Quendall Terminal Site are provided below, along with a description of the regulatory program that these investigations were conducted under.

### 2.3.1 Barbee Mill Site Investigations

Surface and subsurface sediment data were collected from 1997 through 2018 and reported in the following documents (additional details on investigations are provided in Aspect [2019] and Geosyntec [2019]):

- RETEC, 1997: collection of eight sediment cores with samples analyzed for wood waste, total petroleum hydrocarbons (TPH), priority pollutant metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). This investigation was performed as an independent action prior to the AO.
- Hart Crowser and Lloyd Associates, 1999 (as referenced in Anchor Environmental, LLC [Anchor], 2002): collection of nine surface (0- to 10-centimeter [cm]) sediment samples collected as part of sediment interim remedial action sampling prior to any sediment removal and analyzed for wood waste, metals, and PAHs. This investigation was performed as an independent action prior to the AO.

- Hart Crowser, 2000: Thirteen samples of stockpiled dredged material were collected and submitted for analysis of TPH, volatile organic compounds, semi-volatile organic compounds, and metals to determine potential reuse of the material. As these samples were collected for dredged material characterization, they are not considered appropriate for COPC screening, but were used to inform the preliminary sediment boundary. Data are presented for the analytes evaluated in Attachment A. This work was performed under a United States Army Corp of Engineers' dredging permit, and data were provided to Ecology in a letter dated January 17, 2000.
- Anchor Environmental, LLC, 2002: collection of surface sediment (0 to 10 cm) samples at 21 locations (pre- and post- sediment removal) in 2002 and analyzed for wood waste (visual estimate) and TOC. This work was performed under Ecology's Voluntary Cleanup Program.
- Aspect, 2018: collection of sediment cores at five locations with samples analyzed only for arsenic. This investigation was performed under the AO.

### 2.3.2 Quendall Terminals Site Investigations

The Quendall Terminals property (adjacent to Barbee Mill property to the north) is the location of a former creosote manufacturing facility and bulk fuel storage area. Contamination from these historical activities created the Quendall Terminals Site, which was added to the National Priority List in 2005. The Environmental Protection Agency (EPA) is currently directing cleanup activities pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act.

A remedial investigation report (Anchor and Aspect, 2012) was completed in 2012. It identified indicator chemicals in sediment such as coal tar products (benzene and select PAHs) along with arsenic, chromium, copper, PCBs, phenol, 4-methylphenol, pentachlorophenol, and TOC. Sediment sampling occurred from May to July, September, and November of 2009. Surface sediment was collected from a total of 82 locations in the Near Shore, background, T-Dock, and wood debris characterization areas; subsurface sediment was collected at a total of 55 locations. A total of 12 sediment and bioassay samples were collected in the area off-shore of the southern portion of the Quendall Terminals property in 2009 as part of the Quendall Terminals RI. Surface sediment samples were analyzed for resin acids, guaiacols, phenol, 4-methylphenol, TOC, total volatile solids (TVS), and grain size. Sediment porewater samples were also collected and analyzed for ammonia and sulfide. The majority of Quendall Terminals sampling locations are not evaluated here; however, select samples are in close proximity to Barbee Mill-impacted sediment and were included in the Barbee Mill sediment dataset (Attachment A): NS-01, NS-02, WD-01 and WD-02. The remedial investigation found

concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) up to 166 milligrams per kilogram (mg/kg) and observed dense aqueous non-phase liquid (DNAPL) creosote.

A feasibility study (FS) was completed in 2016 (Aspect and Arcadis, 2016), and a Record of Decision was issued by EPA in July 2020, describing the cleanup methods for the two Quendall Terminals Site operable units (OUs): the Uplands OU for soil and groundwater; and a Sediment OU. In the Sediment OU, the remedial action includes a combination of: dredging the source material, an engineered sand cap to control groundwater discharge, and enhanced natural recovery for the remaining areas. The southern extent of the Quendall Terminals Sediment OU is shown in Figure 2 and Figure 3a.

#### 2.3.2.1 2009 Bioassay Testing

The Quendall Terminals Site remedial investigation included bioassay testing of surface sediment samples to evaluate the potential for toxic effects on benthos from wood waste. These samples were located in the area immediately to the north of the Barbee Mill property line in areas of wood waste and TOC impacts. Sediment bioassay tests were performed on samples with less than 50% wood waste by volume (visual estimate) and on samples with elevated concentrations of wood waste (>50%). Samples were also analyzed for TOC to further determine the potential for toxic effects to benthos from wood waste and TOC in sediments.

The bioassay testing suite included 28-day amphipod (*Hyalella azteca*) and 20-day midge (*Chironomus dilutus*) survival and growth endpoints for 12 test samples and 3 reference samples.[3] All 12 test stations were located within the area to the north of the Barbee Mill sediment site (Area to the North, defined by NS-01, NS-02, NS-06, WD-09, SS-01, WD-07, WD-08, WD-03, WD-06, WD-01, SS-02, NS-07; Figure 4). Background samples were collected from two 1-mile-long transects along the shoreline beginning approximately 1 mile north and 1 mile south of the Site (BG-02, BG-03 and BG-13). Wood waste in test samples ranged from < 5% to 100% by volume and TOC ranged from 5% to 35% (Table 2). Control-adjusted survival and growth results for test samples were compared to reference locations with comparable grain size distributions. Only the bioassay from NS-07 resulted in significant differences in survival for the *Chironomus dilutus* (NS-07 is located approximately 545 feet to the north of the Barbee Mill property line); no significant differences were identified for other samples or endpoints when compared to reference samples. The test samples with the maximum wood waste and

[3] One of the three references samples for the *Chironomus dilutus* bioassay was not included in the statistical analyses due to poor survival. All three references samples were acceptable for the *Hyalella azteca* bioassay.

TOC did not result in significant impacts to either test species, indicating that elevated concentrations of wood waste and TOC at 100% and 35%, respectively, do not pose adverse risks to benthos.

### 2.3.3 Summary of Historical Datasets

A total of 40 samples have been collected within the area of interest. These data, along with data from the Quendall Terminal Site to the north and publicly available data from Ecology's Environmental Information Management (EIM) database, were used to determine the preliminary sediment boundary. The post-2002 surface sediment dataset (described in Section 3) was used to conduct a screening of COPCs against the revised SMS screening values (Ecology, 2019). Summary statistics for surface sediment data are provided in Attachment A-1.

## 2.4 Previous Sediment Cleanup and Source Control Actions at the Barbee Mill Site

Barbee Mill has completed three sediment removal actions at the Barbee Mill Site. In 1999 and then in 2002, Barbee Mill dredged a total of approximately 26,000 cubic yards of bark, wood debris, and associated sediment (Aspect, 2019). This work was performed under Ecology's Voluntary Cleanup Program. The objective of the removal actions was to remove sediments impacted with wood waste and elevated TOC. Cleanup requirements previously established for the adjacent Quendall Terminal Site based on results of historical toxicity testing were applied to actions at the Barbee Mill Site, as outlined in a letter from Ecology dated April 29, 2002 (Ecology, 2002). These Site-specific cleanup requirements include:

1. TOC must be less than 13.51% dry weight basis;
2. Wood debris must be less than 50% on a volumetric basis; and
3. Zinc must be less than 410 mg/kg dry weight basis.

The post-dredge acceptability criteria approved by Ecology for the remediation included:

- 50% wood waste based on visual assessment applied to the average of three adjacent samples or 75% based on visual assessment of any single sample; and
- 13.5% TOC applied to the average of three adjacent samples or 16.9% for any single sample.

The third removal action was completed by Barbee Mill in 2005. Barbee Mill removed a portion of the upland area that had been previously filled and restored the shoreline by placing clean gravel and sand along the shoreline (Aspect, 2019).

As a result of these sediment removal actions, some of the historical samples are no longer representative of current Site conditions. Historical surface sediment sample counts (pre- and post- dredging) vary depending on analyte. The complete historical database ranges from n = 6 for PAHs and some metals to n = 40 for wood waste. The current conditions dataset (only post-2002 samples and samples outside the 2002 dredging footprint) ranges from n = 3 for PAHs and most metals to n > 20 for TOC and wood waste.

Upland cleanup in 2005 and 2006 was performed under Ecology's Voluntary Cleanup Program and further addressed potential sources of sediment contamination as follows:

- Historical outfalls associated with the lumber mill were removed.
- Upland remedial actions were implemented to minimize migration of contaminants into Lake Washington. These actions included: contaminated soil removal; installation of a passive attenuation zone to treat arsenic in groundwater; and the installation and operation of a pump-and-treat system to remove and treat arsenic in groundwater.

# 3. PRELIMINARY CONCEPTUAL SITE MODEL AND DATA GAPS

This section describes the CSM for the sediment portions of the Barbee Mill Site related to sources and sediment fate and transport and potential exposure routes. It describes sources of chemicals to the sediment, exposure pathways, sediment screening procedures and COPC identification, and delineation of the preliminary sediment boundary and concludes with data gaps that require additional investigation (the subject of this document).

## 3.1 Sources and Exposure Pathways

The sources of chemicals to the sediment included the overwater log rafting and sawmill operations that resulted in wood waste deposits that have since been removed to achieve cleanup requirements. Additionally, the stormwater outfalls drained Site industrial runoff, resulting in chemical inputs to sediment.

Potentially complete exposure pathways to human and ecological receptors are described below and include the relevant receptors as outlined in SCUM (Ecology, 2019) and presented in the CSM (Figure 5):

### 3.1.1 Human Health

- Exposure of fish or shellfish consumers to bioaccumulative COPCs in sediment via fish and shellfish consumption;
- Exposure of clam diggers to bioaccumulative COPCs in sediment via shellfish consumption and direct exposure via incidental ingestion and dermal contact with sediment during these activities;
- Incidental ingestion and dermal contact with sediment during beach play (child receptor);
- Exposure of net fishers to bioaccumulative COPCs in sediment via fish and shellfish consumption and direct exposure via incidental ingestion and dermal contact with sediment during these activities; and
- Intentional and incidental ingestion of surface water (i.e., drinking water, ingestion during swimming); a complete exposure pathway (because it can occur), though unlikely to occur. While Lake Washington is designated for drinking water use, there are no known receptors using Lake Washington as a source of drinking water.

It is unclear if sediments (0 to 45 cm) in the nearshore represent a human health direct-contact exposure media pathway. As part of the shoreline restoration work on the Barbee

Mill Property, a layer of clean, imported gravel fill was placed in the shoreline area. This fill material is not the soft, penetrable sediment substrate typically needed for beach play or clam digging activities and exposure. No historical 0- to 45-cm sediment sample data have been collected from this area to evaluate risks or conduct a COPC screening for this exposure pathway. We expect this exposure pathway to be a low risk in the future because of the gravelly substrate, but the lack of data is considered a data gap that should be evaluated and concentrations in the sediment (0 to 45 cm) should be collected.[4]

The nature of the nearshore and shoreline areas will be evaluated during the sediment RI to better understand substrate conditions. If soft sediment, sand or fine gravel is present, up to three surface sediment samples will be collected from 0- to 45-cm depth to support the evaluation of the beach play and clam digging pathways. Riprap and large gravel will not be sampled.

### 3.1.2 Ecological

- Exposure of the benthic community directly to sediment-associated contaminants;
- Exposure of fish to surface water via dermal contact and incidental ingestion; and
- Exposure of wildlife to bioaccumulative COPCs in sediment via fish and shellfish consumption.

## 3.2 Screening and Identification of Sediment COPCs

The historical surface sediment data, as provided in Attachment A-2 (the post-2002 dataset), were evaluated to determine preliminary COPCs. Due to sediment removal actions, some of the historical samples are no longer representative of Site conditions; therefore, data located within the dredge footprint and collected before dredging were removed from the dataset. The representative dataset was developed by selecting data located outside the removal action areas from any time period and data from within the removal action areas collected after the 2002 removal actions. Only surface sediment data (i.e., top 10 cm) were included in the sediment screening evaluation because that is the only exposure pathway for recreators, fishers, and ecological receptors (i.e., benthic invertebrates). The dataset retained for COPC screening is provided in Attachment A-2, and all historical sediment data are provided in Attachment A-3. The selection of screening levels and process for identifying COPCs is described below.

[4] Upland PAH soil concentrations close to the shoreline area are below direct-contact screening levels for unrestricted use. Surface sediment samples (0 to 10 cm) from the nearshore area include three samples from soil that were subsequently excavated (BA-7, BA-13, and S. Outfall).

### 3.2.1 Selection of Relevant Screening Levels

Screening levels (Table 3) were selected based on SMS and SCUM guidance (Ecology, 2019) with the exception of wood waste and TOC, for which site-specific cleanup levels have been developed, as described below.

#### 3.2.1.1 SMS Screening Levels

Human health screening levels for direct contact are risk-based concentrations based on a target Hazard Quotient of 1 for non-carcinogenic chemicals and a Lifetime Cancer Risk of $10^{-6}$ for carcinogenic chemicals. Screening levels are based on Table 9-3 of SCUM or were calculated using the SCUM Appendix K Excel workbook.

Human health screening levels for bioaccumulative chemicals (for which exposure occurs via fish or shellfish consumption) reflect natural background for Puget Sound from Ecology (2019). Regional background values for Lake Washington are presented in Table 3, when available, from Ecology (2017). For arsenic, a finalized background value for Lake Washington was not included in Ecology (2017); however, at Ecology's recommendation, the arsenic dataset in Ecology (2017) and the arsenic background analysis done for Gas Works Park were reviewed and 24 mg/kg was applied as a preliminary regional background value. The natural background-based screening levels are also applicable to wildlife consumption of fish and shellfish, as site-specific tissue data to support the calculation of a risk-based threshold for wildlife is unavailable.

Benthic screening levels are based on the SCO for freshwater (Ecology, 2019). Sediment screening levels to be used for this study are provided in Table 3.

#### 3.2.1.2 Wood Waste and TOC

Wood waste and TOC have been identified as deleterious substances under SMS regulations and, prior to historical removal actions, exceeded the Site-specific cleanup requirements outlined in Section 2.4. Most remaining areas of wood waste and TOC exceeding cleanup requirements were subject to bioassay testing (and passed state criteria) as part of the Quendall Terminals RI. Ecology reviewed the Quendall bioassay data in September and October 2020 and concluded that it satisfactorily assessed benthic toxicity from remaining areas of elevated wood waste and TOC, and additional bioassay testing was unnecessary. Although bioassay testing was not performed in all remaining areas of elevated wood waste and TOC, based on the testing that was conducted, the untested areas would also be expected to pass state criteria (Ecology, 2020). As confirmed with Ecology on July 8, 2021, this expectation can therefore be applied to the entire area. As noted by Ecology, risks to benthos from wood waste are expected to be

lower in a freshwater environment than a marine environment. In a marine environment a higher level of sulfides and the higher buffered pH levels, as well as the general stability of pH, often cause toxicity compared to a freshwater environment.

Via email on April 17, 2020, Ecology confirmed that the 2002 Site-specific cleanup requirements outlined in Section 2.4 are still relevant in 2020, but that the lower averaged-based cleanup level should be used as the screening criteria on a single-point basis. For COPC screening, the 50% wood waste criteria and 13.5% TOC criteria were applied as screening levels on a point-by-point basis in this document. However, the more recent (2009) bioassay testing results, as described above, showed no toxic effect to benthos and override the numeric Site-specific cleanup requirements across the entire area. As a result, there are no remaining wood waste and TOC data gaps.

### 3.2.2 Identification of COPCs

COPCs were conservatively identified by comparing the maximum concentration in the post-2002 surface sediment dataset to the relevant screening level (area and point-based screening levels). Chemicals exceeding screening levels were identified as a COPC for the sediment portion of the Site. The data were then reviewed to evaluate if the chemical was considered a COPC in the upland area and if there were potential historical sources from the Site to sediment; this step provided additional context to help identify Site-related COPCs from all COPCs (note: only Site-related COPCs are used to define the preliminary sediment boundary).

The sediment screening indicated the following (Table 4 for Barbee Mill data):

- Arsenic is a human health and benthic Site-related COPC based on the maximum concentration of 16 mg/kg exceeding the benthic SCO (14 mg/kg) and the human health direct-contact screening levels. The maximum concentration also exceeds the Puget Sound marine natural background concentration of 11 mg/kg, but is below the Lake Washington preliminary regional background value of 24 mg/kg. Arsenic was retained as a Site-related COPC in sediment because it is an upland COPC in groundwater. Since arsenic is a groundwater COPC and has been detected in groundwater above the Site-specific natural background concentration, porewater sampling is included in this SRI Work Plan to evaluate the groundwater to surface water/sediment pathway.
- cPAHs calculated as benzo(a)pyrene equivalents are a human health bioaccumulative COPC based on the maximum concentration of 0.25 mg/kg exceeding the marine natural background value for cPAHs of 0.021 mg/kg. The

maximum concentration also slightly exceeds the Lake Washington regional background value of 0.21 mg/kg.

  - Additional individual cPAHs (benzo(g,h,i)perylene, fluoranthene, and pyrene) were identified as human health bioaccumulative COPCs based on exceedance of the Practical Quantitation Limit (PQL); however, these chemicals will be evaluated as total cPAHs.
  - No significant sources of cPAHs from historical operations have been identified for the Barbee Mill Site; however, a 1957 mill fire may have contributed to low-level occurrences of cPAHs in soil and sediment. As described in Section 3.2.2.1 below, additional evaluation of cPAHs in groundwater has been completed to determine if cPAHs are a Site-related COPC in sediment. Historic creosote operations are a known source of cPAHs at the Quendall Terminals Site, where DNAPL is present and cPAH maximum concentrations in surface sediment are as high as 166 mg/kg.

- Selenium is a COPC (both human health bioaccumulative and benthic), based on sediment samples with maximum reporting limits (RLs) (20 mg/kg) (non-detect results) that exceed the PQL of 0.1 mg/kg and the SCO of 11 mg/kg. Selenium was identified as an upland COPC based on detected concentrations in soil and groundwater above preliminary screening levels; however, there are no known site-related sources of selenium, so it not considered a Site-related COPC in sediment.
- Lead is a human health bioaccumulative COPC, based on a sediment sample maximum concentration of 46 mg/kg, which exceeds the natural background-based screening level of 21 mg/kg; however, lead was not previously identified as an upland COPC and there were no known Barbee Mill Site sources of lead to sediment (which is supported by the spatial distribution of lead in surface sediments); therefore, lead is not considered a Site-related COPC in sediment.
- Silver was a preliminary benthic COPC, based on maximum RLs (1 mg/kg) for non-detect results that exceed the SCO of 0.57 mg/kg. The historical RL is above the current PQL reported by laboratories, but silver is not suspected to be present at the Barbee Mill Site, based on historical industrial activities. It was only analyzed as part of a full suite analytical list, has not been detected in the uplands, and is not retained as an upland COPC. Based on these additional considerations, silver is not considered a COPC in sediment.
- Thallium is a preliminary human health direct-contact COPC, based on maximum RLs (20 mg/kg) for non-detect results exceeding the direct-contact screening level for beach play of 6.7 mg/kg. The historical RL is above the current PQL, but

thallium is not suspected to be present at the Barbee Mill Site, based on historical industrial activities. It was only analyzed as part of a full suite analytical list, has not been detected in the uplands, and is not retained as an upland COPC. Based on these additional considerations, thallium is not considered a COPC in sediment.

- Zinc was identified as an upland COPC and is elevated above natural background in Site sediments. However, zinc is not considered a COPC because it is not bioaccumulative and was below both the human health direct-contact screening levels and the SCO. As zinc was elevated above background and has a Site source, it is considered an appropriate indicator chemical to assist in determining the preliminary sediment boundary.
- Wood waste and TOC exceeded Site-specific cleanup requirements prior to the historical removal actions. As a result, both wood waste and TOC are Site-related COPCs. However, as discussed in Section 3.2.1.2, evaluation of historical bioassays performed for the Quendall Terminals Site show that remaining areas of wood waste and TOC that exceed Site-specific cleanup requirements do not pose a risk to benthic invertebrates. Ecology confirmed during a July 8, 2021 meeting that the bioassay override applies site wide. As a result, wood waste and TOC are not considered a data gap for the Site. The bioassay data are provided in Table 2.

#### 3.2.2.1 Recent Groundwater Monitoring to Identify COPCs and Data Gaps

As described in Section 5 of the main body of this RI Work Plan, additional groundwater data were collected on March 18 and 19, 2021 in advance of finalizing the work plan to facilitate coordination with the annual groundwater monitoring event. Groundwater samples were analyzed for additional chemicals (antimony, barium, manganese, mercury, selenium, zinc, and PAHs) to determine if they exceed relevant screening levels. Validated data were provided to Ecology in the Annual Performance Monitoring Report (Aspect, 2021) on June 1, 2021. The following phased approach was applied to determine whether these additional chemicals also need to be evaluated in sediment or porewater:

- If these data are below protection-of-sediment screening levels and surface water-based screening levels or non-detect at best available PQLs, no additional testing will be required to evaluate the groundwater-to-sediment/surface water pathways.
- If groundwater exceeds protection-of-sediment screening levels at the shoreline for antimony, barium, manganese, mercury or zinc, they will be added to the analyte list for sediment sampling stations currently planned for areas downgradient of the specific locations where an exceedance was observed, so long as a station is appropriately located. One additional jar of sediment will be

archived from each sediment sampling location, and this sediment will be used for the additional testing, if warranted. If groundwater exceeds protection-of-sediment screening levels at the shoreline for selenium and PAHs, no additional sediment testing is needed because they are already identified as sediment COPCs.

- If groundwater exceeds surface water-based screening levels at the shoreline, then additional porewater testing or offshore well points may be considered. The sampling methods would be consistent with porewater sampling methods for arsenic described in this SRI Work Plan.

The outcome of applying this phased approach to the validated data is discussed below:

- Barium, antimony, and mercury were not detected above protection-of-sediment nor surface water screening levels at the shoreline. Therefore, no additional testing is required to evaluate the groundwater-to-sediment/surface water pathways. These metals are not considered COPCs or Site-related COPCs.
- Manganese was not detected above protection-of-sediment screening levels at the shoreline. Therefore, no additional sediment testing is required.
- Manganese was detected above protection-of-surface water screening levels at the shoreline. Background concentrations of manganese at the Site are elevated due to naturally reducing conditions; a natural background concentration will be calculated in the RI. Porewater samples (and co-located sediment samples) will be analyzed for manganese.
- Selenium was not detected above protection-of-sediment nor surface water screening levels at the shoreline. Selenium remains a sediment COPC based on sediment samples with maximum RLs (20 mg/kg) (non-detect results) that exceed the PQL of 0.1 mg/kg and the SCO of 11 mg/kg; however, Selenium is not considered a Site-related COPC.
- Zinc was not detected above protection-of-sediment nor surface water screening levels at the shoreline. Zinc is not considered a sediment COPC, but remains an indicator chemical to assist in determining the preliminary sediment boundary.
- PAHs were detected in the upland areas (EW-8), but groundwater concentrations of PAHs along the shoreline were non-detect at the best available PQL. Therefore, PAHs remain a COPC in sediment based on screening level exceedances, but are not considered a Site-related COPC in sediment with respect to the groundwater-to-sediment or surface water pathway. These pathways are incomplete.

Table 5 provides a summary of all COPCs and identifies which are Site-related COPCs.

## 3.3 Preliminary Sediment Boundary Delineation

The above-identified Site-related COPCs and tracer chemical were used to determine a preliminary sediment boundary and inform the sediment data collection approach. The preliminary sediment boundary was developed using all historical data, including samples from locations removed during interim actions. The distribution of all COPCs and the tracer chemical were mapped using Inverse Distance Weighting (IDW) following the same methodology used by Ecology at the Quendall Terminals Site (Liedos Inc., 2020). For interpolation mapping, a larger dataset is needed to help define the IDW boundary conditions; therefore, all available data were used. Data were compiled from previous sediment investigations at Barbee Mill and the Quendall Terminals Site and from the EIM database (i.e., regional sediment data). Data treatment included the following:

- Within the 2002 removal action area, only the pre-dredging samples were used to reflect pre-removal action conditions. For TOC and wood waste only, a second IDW figure was developed using the post-2002 sediment removal data to provide a visual representation of current conditions.
- All samples from outside the removal action areas were included.
- Field duplicates were averaged prior to inclusion, and non-detected results were interpolated at both full and one-half the RL.

The IDW interpolation methodology and settings used for the IDW grids were referenced from Leidos, Inc. (2020) at Ecology's request.[5] The IDW figures for TOC, wood waste, arsenic, total cPAHs, zinc, and lead are presented in Figures 6 through 11, respectively. Figure 3a and Figure 3b show the bathymetry, as described in Section 2.1, which was also considered a supporting line of evidence in developing the preliminary sediment boundary.

The preliminary sediment boundary was developed by bounding all areas where screening level exceedances occurred for Site-related COPCs. The boundary may be refined based on results from this SRI. The preliminary sediment boundary (see blue outline in Figures 6 through 11) was developed based on the following:

- TOC and wood waste: The preliminary boundary includes the removal action areas for TOC and wood waste. Based on the bioassay results as discussed in Section 2.3.2.1 and 3.2.2, wood waste and TOC do not pose a toxicity concern

[5] IDW interpolation and data contouring were performed with the Spatial Analyst tool of ArcGIS Desktop (ESRI, version 10.5.1) using ESRI-defined procedures with an exponent of 3.5, maximum neighbors of 4, and variable search radius.

and were not used to further define the preliminary boundary. For completeness, the extents of TOC and wood waste are shown on Figures 6a and 6b and Figures 7a and 7b, respectively. Figures 6c and 7c include the historical bioassay data results from the Quendall Terminals Site RI along with the TOC and wood waste interpolations.

- Arsenic: The preliminary boundary was defined by the natural background contour for arsenic (11 mg/kg) to the north, and encompasses areas of historical samples with elevated RLs, the area of arsenic occurrences greater than preliminary regional background (24 mg/kg) in the near shore area and the offshore extent of the arsenic groundwater plume (Figures 8a and 8b).
- cPAHs: cPAHs were not used to define the preliminary boundary as recent groundwater monitoring showed that cPAHs are not a Site-related COPC in sediment. IDW interpolations of cPAHs are provided on Figure 9 for completeness.

  Additionally, PAH exceedances do not appear to be Barbee Mill related based on historical industrial uses and chemical distribution patterns; PAHs therefore, are not used to define the preliminary boundary. PAH exceedances appear to be related to both regional background and the Quendall Terminals Site.
- Zinc is not a COPC in sediment. Zinc was identified as an upland COPC and is elevated above natural background in sediment (Figure 10), but it is not bioaccumulative and was below both the human health direct-contact screening levels and the benthic SCO. As zinc was elevated above background and has a Site-related source, it is considered an appropriate tracer chemical to assist in determining the preliminary sediment boundary.
- Lead is not an upland COPC (i.e., there were no lead exceedances in soil or groundwater) and no sources of lead to sediments have been identified, so lead is not identified as a Site-related COPC for sediment, but is considered a COPC. Concentrations of lead were not used to develop the preliminary sediment boundary, but are provided in Figure 11 for completeness.
- Selenium is a COPC in sediment based on maximum RLs that exceed screening levels, but it is not considered a Site-related COPC. Concentrations of selenium were not used to develop the preliminary sediment boundary, but are provided in Figure 12 for completeness.

## 3.4 Identification of Data Gaps

Based on existing sediment data, IDW data interpolations, and the COPC screening, the following data gaps were identified:

- The 2002 sediment removal action focused on TOC and wood waste impacts, and only these analytes were evaluated in post-removal samples. As a result, there are limited data to characterize post-2002 surface sediment conditions for the chemical COPCs. The current nature and extent of chemicals in surface sediment are identified as data gaps, especially within the dredge footprint.
- Arsenic was not detected in multiple pre-dredging samples; however, RLs were elevated above the benthic SCO. In addition, one historical sample outside the dredge footprints slightly exceeded natural background and the benthic SCO. The nature and extent of arsenic in areas with elevated historical RLs and the location exceeding the benthic SCO are considered a data gap.
- Historical data in the 0- to 45-cm depth interval have not been collected in the nearshore area where potential beach play and clam digging exposures may occur. Depending on the substrate present, conditions in the nearshore area in the 0- to 45-cm depth are a data gap.
- Arsenic in groundwater at certain shoreline locations exceeds the Site-specific natural background screening level concentration of 16 µg/L, and it is unknown if groundwater at the point of compliance (groundwater-surface water interface) is resulting in exceedances of relevant surface water/sediment screening levels. Arsenic concentrations in porewater are a data gap. Historical concentrations of arsenic in porewater and groundwater are shown in Figure 13.
- Manganese in groundwater exceeded the surface water screening levels at the shoreline. Manganese is elevated in groundwater due to naturally reducing conditions. A natural background concentration will be calculated in the RI. It is unknown if porewater concentrations are above the natural background levels.
- The sediment boundary has not been confirmed and is considered a data gap. The preliminary sediment boundary has been developed, as described in Section 3.3.

# 4. FIELD INVESTIGATIONS AND DATA COLLECTION

## 4.1 Investigation Approach

This SRI will include the collection of 36 surface sediment grab samples via power grab sampler or collected by hand in nearshore areas, for chemical analysis of metals and PAHs; and two porewater samples analyzed for arsenic and manganese.

## 4.2 Data Quality Objectives

The specific DQOs for this SRI include:

- DQO #1: Refine the preliminary sediment boundary by:
  - Collecting sediment samples (0 to 10 cm) along the perimeter of the current boundary and comparing concentrations to relevant screening levels for Site-related COPCs.
- DQO #2: Evaluate current surface sediment conditions within the preliminary sediment boundary by:
  - Collecting sediment samples (0 to 10 cm) and comparing concentrations (either point-based or area-based) to relevant screening levels for all COPCs.
  - Replacing older data that had elevated detection limits above screening levels with newer surface sediment data.
- DQO #3: Determine if elevated arsenic and manganese in groundwater is impacting surface water/sediment by:
  - Collecting porewater samples and co-located sediment grab samples (0 to 10 cm) in nearshore areas where groundwater flux to porewater occurs and comparing porewater concentrations to relevant surface water screening levels.
- DQO #4: Evaluate nearshore sediments for human health direct contact exposures by:
  - Visually assessing sediment substrate conditions in the field, then sampling available soft sediment, sand, or fine gravel (0 to 45 cm depth, if possible), and comparing concentrations to human health screening levels for all COPCs.

## 4.3 Scope of the SRI

Surface sediment grab samples (0 to 10 cm) will be collected from the study area using a hydraulic power grab sampler; nearshore sediment samples will be collected by hand. Details on sampling methods, sample processing, and analyses are provided in the Sampling and Analysis Plan (SAP, Attachment B), which includes the Quality Assurance Project Plan (QAPP). Proposed sediment and porewater sampling locations are shown in Figure 13 and outlined in Table 6. The scope of sampling includes the following:

- Fifteen sediment grab samples (BM-SED-01 to BM-SED-15) within or adjacent to the footprint of the 2002 removal action to support the evaluation of current conditions. These samples locations have been placed in an approximately gridded pattern. Four of the proposed sampling locations are co-located with historical sampling stations (one porewater and three sediment samples), with elevated RLs for arsenic or where arsenic was previously detected above the natural background and the SCO.
- Sixteen surface sediment samples (PER-SED-01 to PER-SED-16) to the north/northwest, west and southwest to delineate the sediment boundary. Four of the proposed sampling locations are co-located with historical samples with elevated RLs for arsenic. The samples will be generally placed in two transects, with six samples in the more eastern transect and four samples in the further west transect. The most western samples (four locations) will be archived by the laboratory, pending the results of the first set of western boundary samples. If the first transect of boundary samples indicate exceedances of relevant screening levels for Site-related COPC's, then the further west archived samples will be analyzed.
- Three nearshore sediment samples (NS-SED-01 to NS-SED-03) from 0 to 45 cm to evaluate the human health beach play and clam digging direct contact pathways.
- Two porewater samples and co-located, 0- to 10-cm surface sediment samples (BM-SED-16/BM-PW-16 and BM-SED-17/BM-PW-17) to evaluate if dissolved arsenic in groundwater above the Site-specific natural background concentration and manganese in groundwater (no background level established yet) is impacting surface water/sediment. Porewater samples will be collected using porewater passive samples (peepers) that will be placed in the sediment from 0 to 10 cm and allowed to equilibrate for four weeks prior to retrieval. Upon retrieval, porewater will be analyzed for dissolved arsenic and manganese. Additional details are provided in Attachment B.

- Field duplicates at a 5% frequency (i.e., one field duplicate sample will be collected per 20 samples) and one equipment blank per week or one per sampling event (if less than one week) to be analyzed for the same target analyte list. Additional details on Quality Assurance and Quality Control (QA/QC) are provided in the QAPP (Attachment B).

Sediment grab samples (0- to 10-cm and 0- to 45-cm depth) will be visually evaluated for texture, color, and consistency per American Society of Testing Materials (ASTM) International Visual Classification of Soils methods during sampling (including a visual estimate for percent wood waste, if observed) and analyzed for all COPCs as follows:

- COPC metals (arsenic, lead, selenium) and indicator metals (zinc) by EPA Method 6020B;
- Sixteen priority-pollutant PAHs by EPA Method 8270 SIM; and
- Conventional analyses, including TOC by EPA Method 9060 and grain size by Puget Sound Estuary Program (PSEP, 1986) methods.

If arsenic is detected above the SCO (14 mg/kg), follow-up bioassay testing will be discussed with Ecology to evaluate the potential for risks to benthic invertebrates, and an SRI Work Plan Addendum describing the bioassay sampling and analysis would be developed and submitted to Ecology for approval.

# 5. DATA MANAGEMENT AND EVALUATION

## 5.1 Data Management

A record of all field procedures will be maintained, including sample locations, depths, analytical methods, handling, preservation, and storage procedures. Dates and times of collection, preservation, and storage will be recorded in daily field logs or sampling logs, along with any field circumstances potentially affecting sampling procedures. Field notes will also record the visual assessment of wood waste and other substrate conditions. Additional details are provided in the SAP (Attachment B).

All analyses will be performed by an accredited laboratory with QA/QC conducted as detailed by their respective laboratory QC procedures and manuals, including standard method and operating procedures, calibration, and internal QC. All analytical data will undergo Stage 2A validation by the project chemist with a review by the senior chemist. A data validation report detailing any data quality issues will be provided with the final report.

All finalized and validated data will be formatted and uploaded to Ecology's EIM database. Aspect will manage the overall project database and will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following acceptance of the data validation.

## 5.2 Data Evaluation

The data collected during this SRI will help define the nature and extent of hazardous substances and potential risks to human health and the environment as a part of the revised Draft RI. All data will be reported in the Sediment Sampling Data Report (to be completed following the completion of this scope of work and included as an appendix to the RI), and data evaluations will be included in the revised Draft RI Report (to be completed following the upland data gaps investigation to address Ecology's comments on the Draft RI Report).

### 5.2.1 Sediment Boundary Delineation

The preliminary sediment boundary presented in this SRI Work Plan will be revised as necessary based on the data generated. The extent of surface sediment concentrations will be mapped using the combined dataset of post-removal action historical data and new data (with reoccupied stations replacing historical data). Non-detect data will be included at one-half the method detection limit. The sediment boundary will be refined on a point-by-point basis as the area with Site-related COPCs above screening levels. IDW interpolation will be used to create contour concentration maps. Based on the data

analysis, Site-related COPCs and screening levels that will be used to refine the sediment boundary are expected to include:

- Detected concentrations of zinc exceeding the benthic SCO of 3,200 mg/kg; and
- Detected concentrations of arsenic exceeding Puget Sound natural background of 11 mg/kg if possible, or the freshwater benthic SCO of 14 mg/kg; or consider preliminary regional background value of 24 mg/kg in consultation with Ecology if natural background is exceeded in all samples.

Lead, selenium, and cPAHs are not Site-related COPCs and therefore will not be used to delineate the sediment boundary. However, they have been identified as COPCs because of screening level exceedances and will be considered for compliance with SMS where co-located with Site-related COPCs.

The expected outcome of this data evaluation is a proposed final sediment boundary. This data evaluation and the proposed final sediment boundary will be provided to Ecology in the revised Draft RI Report (which will be combined with the FS into a single RI/FS report).

### 5.2.2 Risk Screening

A human health and benthic invertebrate risk screening will be conducted in the revised Draft RI Report. For the human health screen, spatially weighted average concentrations (SWACs) of COPCs in nearshore and offshore/site-wide surface sediment will be compared to direct-contact screening levels. For bioaccumulative COPCs, site wide SWACs will be compared to natural background and regional background values. Risks will be evaluated point-by-point for benthic invertebrates via comparison to the SCO.

For the calculation of SWACs, the post-2002 removal action area historical data and the new data will be combined to represent current conditions, with new data replacing samples collected within 20 feet of a historical sample. Only data representing the most current conditions among available data will be used to identify risks. Non-detected results will be included at half the method detection level per Ecology (2019), and Kaplan-Meier methods will be considered for non-detect treatment as appropriate. IDW interpolation methods will be used to calculate the SWACs after the sediment boundary has been approved by Ecology.

# 6. REPORTING

The RI Data Report will be provided to Ecology following completion of all sampling and data validation. The RI Data Report will include a description of field activities, validated laboratory results, and any deviations from the SAP or RI Work Plan, including this SRI Work Plan. Field and analytical data will be presented in tabular and/or visual formats. The new data will be used to complete additional data analyses, as discussed in Section 5.2.2, in a combined Draft RI/FS Report for Ecology review.

## 7. SCHEDULE

After addressing Ecology's comments on this revised draft SRI Work Plan, a final SRI Work Plan with SAP, QAPP, and Health and Safety Plan, as an appendix to the RI Work Plan, will be submitted to Ecology for approval.

Field work is anticipated to begin within 30 days following Ecology's approval of the final SRI Work Plan and supporting documents. Pending any disruptions related to ongoing COVID-19 health and safety concerns, sediment sampling is tentatively expected to occur in the third quarter of 2021 (August, 2021). A draft RI Data Report will be provided to Ecology 90 days following receipt of final validated data. A final RI Data Report will be provided to Ecology 30 days after receiving comments on the draft report.

Following receipt of the final validated SRI data, it will be determined if bioassays are needed to further evaluate potential impacts from arsenic. If bioassays are required, Ecology will be notified within 10 days of receipt of final validated data, and an SRI Work Plan Addendum detailing additional sampling and analysis for bioassays will be submitted to Ecology within 60 days of receiving final validated sediment data.

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Ecology, 2020. Email correspondence from Lucy McInerney, Ecology Cleanup Project Manager, re: Barbee Mill Bioassay Maps for Ecology (to Ecology). 5 October.

# TABLES

## Table 1: Project Team and Contact Information

| Role | Name and Address |
|---|---|
| Client Representative | Lynn Manolopoulos<br>Davis Wright Tremaine, LLC<br>929 108th Avenue NE, #1500<br>Bellevue, WA 98004-4786<br>(425) 646-6146 |
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| Barbee Mill – Project Coordinator | Jeremy Porter, P.G.<br>Aspect Consulting<br>710 2nd Avenue, # 550<br>Seattle, WA 98104<br>(206) 838-5835 |
| Sediment Lead | Anne Fitzpatrick, LHG<br>Geosyntec Consultants, Inc.<br>520 Pike Street, #2600<br>Seattle, WA 98101<br>(206) 496-1461 |
| Project Risk Assessor | Jennifer Arblaster<br>Geosyntec Consultants, Inc.<br>Milton, VT 05468<br>(949) 295-5458 |
| Data Validation/Lead Chemist | Julia Klens Caprio<br>Geosyntec Consultants, Inc.<br>180A Market Place Blvd<br>Knoxville, TN 37922<br>(865) 330-0037 |
| Field Task Manager | Dustin Jensen, P.G.<br>520 Pike Street, #2600<br>520 Pike Street, #2600<br>Seattle, WA 98101<br>(206) 496-1450 |
| Lab Point of Contact | Kelly Frances Bottem<br>Analytical Resources, Inc. (ARI)<br>4611 S 134th Place, #100<br>Tukwila, Washington 98168<br>(206) 695-6211 |
| Vessel Support Lead | Eric Parker<br>Research Support Services, Inc.<br>321 Ne High School Road, #D3 563<br>Bainbridge Island, WA 98110<br>(206) 550-5202 |

## Table 2: Quendall Terminals Site Remedial Investigation 2009 Bioassay Data Summary

| 2009 Bioassay[a] Sample ID (for wood waste) | Sample Type | Amphipod (*Hyalella azteca*) 28-day Sediment Toxicity Test | | | | Midge (*Chironomus dilutus*) 20-day Sediment Toxicity Test[b] | | | | Station Pass Bioassay Sediment Cleanup Objective? | Wood Waste Volume[c] (%) | Total Organic Carbon[c] (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Survival as Percent of Control (%) | Statistically Different Survival from Reference (Y/N?) | Mean Individual Weight as Percent of Control (%) | Statistically Different Growth from Reference (Y/N?) | Survival as Percent of Control (%) | Statistically Different Survival from Reference (Y/N?) | Mean Individual Weight as Percent of Control (%) | Statistically Different Growth from Reference at Final (Y/N?) | | | |
| NS-01 | Test (Test Series 2) | 100 | No | 100.6 | No | 81.8 | No | 83.9 | No | Yes | 100 | 35.1 |
| NS-02 | Test (Test Series 2) | 101 | No | 68.2 | No | 94.8 | No | 76.3 | No | Yes | 80 | 23.0 |
| NS-06 | Test (Test Series 1) | 98.7 | No | 107 | No | 81.9 | No | 77.6 | No | Yes | 50-60 | 16.9 |
| WD-09 | Test (Test Series 1) | 92.3 | No | 100 | No | 75 | No | 68.8 | No | Yes | 50 | 11.6 |
| SS-01 | Test (Test Series 1) | 98.7 | No | 111 | No | 73.6 | No | 77.7 | No | Yes | 40-50 | 13.0 |
| WD-07 | Test (Test Series 1) | 101 | No | 116 | No | 75 | No | 61.1 | No | Yes | 30 | 4.9 |
| WD-08 | Test (Test Series 1) | 101 | No | 106 | No | 77.8 | No | 72.6 | No | Yes | 20-30 | 9.4 |
| WD-03 | Test (Test Series 1) | 101 | No | 91.6 | No | 83.3 | No | 70.9 | No | Yes | 20 | 9.9 |
| WD-06 | Test (Test Series 1) | 100 | No | 98.6 | No | 62.5 | No | 78.5 | No | Yes | 20 | 8.4 |
| WD-01 | Test (Test Series 2) | 101 | No | 87.7 | No | 93.6 | No | 94.6 | No | Yes | 10-20 | 11.1 |
| SS-02 | Test (Test Series 1) | 100 | No | 116 | No | 91.7 | No | 79 | No | Yes | 10 | 6.9 |
| NS-07 | Test (Test Series 1) | 103 | No | 100 | No | 55.6 | Yes | 61.1 | No | No | < 5 | 6.5 |
| BG-02 | Reference (Test Series 1) | 101 | NA | 105 | NA | 90.3 | NA | 76 | NA | NA | NA | NA |
| BG-03 | Reference (Test Series 1) | 76.9 | NA | 90.5 | NA | 55.6 [(a)] | NA | 109 | NA | NA | NA | NA |
| BG-13 | Reference (Test Series 1) | 97.4 | NA | 69.2 | NA | 83.3 | NA | 69.6 | NA | NA | NA | NA |
| BG-12 | Reference (Test Series 2) | 94.8 | NA | 74.1 | NA | 25 | NA | 87.1 | NA | NA | NA | NA |
| BG-13 | Reference (Test Series 2) | 93.6 | NA | 71.7 | NA | 23.8 | NA | 88.2 | NA | NA | NA | NA |

= bioassay fail, wood waste > 50% or TOC > 13.5%
= bioassay pass, wood waste < or = 50%, or TOC < or = 13.5%

**Footnotes:**
a. See Anchor (2012) Tables 7.2-25 and 7.2-26 for addition details.
b. One of the three references samples for the *Chironomus dilutus* bioassay was not included in statistically analyses.
c. Max of field duplicates are shown for wood waste and total organic carbon.

## Table 3. Sediment Screening Levels

| | | | | Human Health Direct Contact[c] | | | Benthic Criteria[d] | | | Bioaccumulation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyte | Bioaccum-ulative?[a] | Screening Level[b] | Units | Beach Play (Child) | Tribal Clamming | Net-fishing | SCO | CSL | Site-Specific | Natural Background[e] | Regional Background | PQL[f] |
| Wood waste | | 50 | % | -- | -- | -- | -- | -- | 50 | -- | -- | -- |
| Total organic carbon | | 13.5 | % | -- | -- | -- | -- | -- | 13.5 | -- | -- | 0.1 |
| Antimony | | 267 | mg/kg | 267 | 913 | 1,840 | -- | -- | -- | -- | -- | 0.5 |
| Arsenic | Yes | 11 | mg/kg | 4.8 | 0.96 | 3.0 | 14 | 120 | -- | 11 | 24[g] | 0.3 |
| Beryllium | | 1,340 | mg/kg | 1,340 | 4,560 | 9,200 | -- | -- | -- | -- | -- | -- |
| Cadmium | Yes | 0.8 | mg/kg | 610 | 1,300 | 4,400 | 2.1 | 5.4 | -- | 0.8 | -- | 0.07 |
| Chromium (III) | | 72 | mg/kg | 1,002,000 | 340,000 | 6,900,000 | 72 | 88 | -- | 62 | -- | 0.2 |
| Copper | | 400 | mg/kg | 27,000 | 91,000 | 180,000 | 400 | 1,200 | -- | 45 | -- | 0.1 |
| Lead | Yes | 21 | mg/kg | -- | -- | -- | 360 | > 1300 | -- | 21 | -- | 0.1 |
| Mercury | Yes | 0.2 | mg/kg | -- | -- | -- | 0.66 | 0.80 | -- | 0.2 | -- | 0.02 |
| Nickel | | 50 | mg/kg | 13,000 | 46,000 | 92,000 | 26 | 110 | -- | 50 | -- | 0.2 |
| Selenium | Yes | 0.1 | mg/kg | 3,300 | 11,000 | 23,000 | 11 | > 20 | -- | -- | -- | 0.1 |
| Silver | | 0.57 | mg/kg | 3,300 | 11,000 | 23,000 | 0.57 | 1.70 | -- | 0.24 | -- | 0.1 |
| Thallium | | 6.7 | mg/kg | 6.7 | 22.8 | 46.0 | -- | -- | -- | -- | -- | -- |
| Zinc | | 3200 | mg/kg | 200,000 | 680,000 | 1,400,000 | 3,200 | > 4200 | -- | 93 | -- | 1 |
| 2-Methylnaphthalene | | 2,040 | mg/kg | 2,040 | 2,600 | 15,800 | -- | -- | -- | -- | -- | 0.007 |
| Acenaphthene | | 30,600 | mg/kg | 30,600 | 39,000 | 240,000 | -- | -- | -- | -- | -- | 0.005 |
| Acenaphthylene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.005 |
| Anthracene | | 150,000 | mg/kg | 150,000 | 200,000 | 1,200,000 | -- | -- | -- | -- | -- | 0.005 |
| Benz(a)anthracene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Benzo(a)pyrene | | -- | mg/kg | 150 | 200 | 1,200 | -- | -- | -- | -- | -- | 0.009 |
| Benzo(b)fluoranthene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Benzo(g,h,i)perylene | Yes | 0.005 | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.005 |
| Benzo(k)fluoranthene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Chrysene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Dibenzo(a,h)anthracene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Fluoranthene | Yes | 0.005 | mg/kg | 20,400 | 26,000 | 160,000 | -- | -- | -- | -- | -- | 0.005 |
| Fluorene | | 20,400 | mg/kg | 20,400 | 26,000 | 160,000 | -- | -- | -- | -- | -- | 0.005 |
| Indeno(1,2,3-cd)pyrene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Naphthalene | | 10,200 | mg/kg | 10,200 | 13,000 | 79,000 | -- | -- | -- | -- | -- | 0.006 |
| Phenanthrene | | -- | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | 0.005 |
| Pyrene | Yes | 0.005 | mg/kg | 15,000 | 20,000 | 120,000 | -- | -- | -- | -- | -- | 0.005 |
| Total PAHs | | 17 | mg/kg | -- | -- | -- | 17 | 30 | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0 | Yes | 0.021 | mg/kg | 0.90 | 0.32 | 0.68 | -- | -- | -- | 0.021 | 0.210[h] | 0.009 |

**Footnotes:**
a. Information retrieved from DMMP (2018) List 1: Primary Bioaccumlative Chemicals of Concern.
b. For bioaccumulative chemicals, the SCO screening level is the maximum of natural background and the PQL. CSL screening level is the maximum of regional background or PQL. For nonbioaccumulative chemicals, the screening level is the minimum of human health direct contact and benthic SCO, adjusted up to natural background or PQL as appropriate.
c. Values either retrieved from Table 9-3 of SCUM (Ecology, 2019), or estimated using the Appendix K spreadsheet (Ecology, 2020).
d. Values from Table 8-1 SCUM (Ecology, 2019)
e. Natural background values from Table 10-1 of SCUM (Ecology, 2019)
f. Values retrieved from Table 11-1 or Appendix d of SCUM (Ecology, 2019).
g. Preliminary regional background value based on discussion with Ecology and analyses performed for the Gas Works Park site.
h. Regional background values from Table 10-2 of SCUM (Ecology, 2019)

**Acronyms:**
CSL - cleanup screening level
DMMP - Dredged Materials Management Program
ND = Non-detect
PQL - practical quantitation limit
SCO - sediment cleanup objective
SCUM - Sediment Cleanup Users Manual
TEQ = Toxicity equivalent quotients

## Table 4. Selection of Sediment Contaminants of Potential Concern

| Analyte | Units | Screening Level | Number Samples Analyzed | Number Samples Detected | Maximum Detected Concentration[a] | Number Detectected Results Exceeding SL | Maximum Reporting Limit[b] | Number Nondetected Results Exceeding SL | Frequency of Exceedance[c] |
|---|---|---|---|---|---|---|---|---|---|
| Wood waste | % | 50 | 21 | 7 | 60 | -- | 5 | -- | -- |
| Total organic carbon | % | 13.5 | 24 | -- | 16.8 | -- | -- | -- | -- |
| Antimony | mg/kg | 267 | 3 | -- | -- | -- | 20 | -- | -- |
| Arsenic | mg/kg | 11 | 9 | 3 | 16 | 1 | 20 | 4 | 0.56 |
| Beryllium | mg/kg | 1,340 | 3 | 1 | 0.2 | -- | 0.4 | -- | -- |
| Cadmium | mg/kg | 0.8 | 3 | -- | -- | -- | 0.8 | -- | -- |
| Chromium | mg/kg | 72 | 3 | 3 | 36 | -- | -- | -- | -- |
| Copper | mg/kg | 400 | 3 | 3 | 36.1 | -- | -- | -- | -- |
| Lead | mg/kg | 21 | 3 | 3 | 46 | 2 | -- | -- | 0.67 |
| Mercury | mg/kg | 0.2 | 3 | -- | -- | -- | 0.2 | -- | -- |
| Nickel | mg/kg | 50 | 3 | 3 | 31 | -- | -- | -- | -- |
| Selenium | mg/kg | 0.1 | 3 | -- | -- | -- | 20 | 3 | 1 |
| Silver | mg/kg | 0.57 | 3 | -- | -- | -- | 1 | 2 | 0.67 |
| Thallium | mg/kg | 6.7 | 3 | -- | -- | -- | 20 | 3 | 1 |
| Zinc | mg/kg | 3200 | 7 | 7 | 166 | -- | -- | -- | -- |
| 2-Methylnaphthalene | mg/kg | 2,040 | 3 | -- | -- | -- | 0.24 | -- | -- |
| Acenaphthene | mg/kg | 30,600 | 3 | -- | -- | -- | 0.24 | -- | -- |
| Acenaphthylene | mg/kg | -- | 3 | -- | -- | -- | 0.24 | -- | -- |
| Anthracene | mg/kg | 150,000 | 3 | -- | -- | -- | 0.24 | -- | -- |
| Benz(a)anthracene | mg/kg | -- | 3 | -- | -- | -- | 0.24 | -- | -- |
| Benzo(a)pyrene | mg/kg | -- | 3 | 1 | 0.21 | -- | 0.24 | -- | -- |
| Benzo(b)fluoranthene | mg/kg | -- | 3 | 1 | 0.16 | -- | 0.24 | -- | -- |
| Benzo(g,h,i)perylene | mg/kg | 0.005 | 3 | 1 | 0.19 | 1 | 0.24 | 2 | 1 |
| Benzo(k)fluoranthene | mg/kg | -- | 3 | 1 | 0.12 | -- | 0.24 | -- | -- |
| Chrysene | mg/kg | -- | 3 | 1 | 0.13 | -- | 0.24 | -- | -- |
| Dibenzo(a,h)anthracene | mg/kg | -- | 3 | -- | -- | -- | 0.24 | -- | -- |
| Fluoranthene | mg/kg | 0.005 | 3 | -- | -- | -- | 0.24 | 3 | 1 |
| Fluorene | mg/kg | 20,400 | 3 | -- | -- | -- | 0.24 | -- | -- |
| Indeno(1,2,3-cd)pyrene | mg/kg | -- | 3 | 1 | 0.14 | -- | 0.24 | -- | -- |
| Naphthalene | mg/kg | 10,200 | 3 | -- | -- | -- | 0.24 | -- | -- |
| Phenanthrene | mg/kg | -- | 3 | -- | -- | -- | 0.24 | -- | -- |
| Pyrene | mg/kg | 0.005 | 3 | -- | -- | -- | 0.24 | 3 | 1 |
| Total PAHs | mg/kg | 17 | 3 | 1 | 1.5 | -- | 2 | -- | -- |
| Total cPAH TEQ (ND=0.5DL) | mg/kg | 0.021 | 3 | 1 | 0.263 | 1 | 0.181 | 2 | 1 |

| Analyte | Used Historically at the Site | Upland COPC | Preliminary Benthic COPC | Preliminary Human Health COPC | Additional Notes | Benthic COPC | Human Health COPC | Data Gap Based on COPC Evaluation |
|---|---|---|---|---|---|---|---|---|
| Wood waste | Yes | No | **Yes** | No | -- | **Yes** | No | No - Quendall Terminals bioassay data override screening level exceedances. |
| Total organic carbon | Yes | No | **Yes** | No | -- | **Yes** | No | |
| Antimony | No | No | No | No | -- | No | No | -- |
| Arsenic | Yes | Yes | **Yes** | **Yes** | -- | **Yes** | **Yes** | Yes - current conditions vs SMS |
| Beryllium | No | No | No | No | -- | No | No | -- |
| Cadmium | No | No | No | No | -- | No | No | -- |
| Chromium | No | No | No | No | -- | No | No | -- |
| Copper | Yes | No | No | No | -- | No | No | -- |
| Lead | No | No | No | **Yes** | -- | No | **Yes** | Yes - current conditions vs SMS |
| Mercury | No | No | No | No | -- | No | No | -- |
| Nickel | No | No | No | No | -- | No | No | -- |
| Selenium | No | Yes | **Yes** | **Yes** | -- | **Yes** | **Yes** | Yes - current conditions vs SMS |
| Silver | No | No | **Yes** | No | d | No | No | -- |
| Thallium | No | No | No | **Yes** | d | No | No | -- |
| Zinc | Yes | Yes | No | No | -- | No | No | -- |
| 2-Methylnaphthalene | No | e | No | No | -- | No | No | -- |
| Acenaphthene | No | e | No | No | -- | No | No | -- |
| Acenaphthylene | No | e | No | No | -- | No | No | -- |
| Anthracene | No | e | No | No | -- | No | No | -- |
| Benz(a)anthracene | No | e | No | No | -- | No | No | -- |
| Benzo(a)pyrene | No | e | No | No | -- | No | No | -- |
| Benzo(b)fluoranthene | No | e | No | No | -- | No | No | -- |
| Benzo(g,h,i)perylene | No | e | No | **Yes** | -- | No | **Yes** | Yes - evaluate as cPAHs |
| Benzo(k)fluoranthene | No | e | No | No | -- | No | No | -- |
| Chrysene | No | e | No | No | -- | No | No | -- |
| Dibenzo(a,h)anthracene | No | e | No | No | -- | No | No | -- |
| Fluoranthene | No | e | No | **Yes** | -- | No | **Yes** | Yes - evaluate as cPAHs |
| Fluorene | No | e | No | No | -- | No | No | -- |
| Indeno(1,2,3-cd)pyrene | No | e | No | No | -- | No | No | -- |
| Naphthalene | No | e | No | No | -- | No | No | -- |
| Phenanthrene | No | e | No | No | -- | No | No | -- |
| Pyrene | No | e | No | **Yes** | -- | No | **Yes** | Yes - evaluate as cPAHs |
| Total PAHs | No | e | No | No | -- | No | No | -- |
| Total cPAH TEQ (ND=0.5DL) | No | e | No | **Yes** | -- | No | **Yes** | Yes - current conditions vs SMS |

**Footnotes:**
a. In surface sediment post-2002.
b. For non-detected results.
c. Includes both detected concentrations and, for nondetected results, reporting limits.
d. Historical reporting limit above current PQL, but not suspected to be present based on historical industrial activities and not an Upland COPC. Analyzed as part of a full suite analytical list.
e. Additional groundwater data are needed to evaluate if PAHs are site-related

**Acronyms:**
COPC = contaminant of potential concern
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
mg/kg = milligrams per kilogram
ND = Non-detect
PAHs = Polycyclic aromatic hydrocarbons
PQL - practical quantitation limit
SMS - Sediment management standards
TEQ = Toxicity equivalent quotient

**Table 5. Summary of Sediment Contaminants of Potential Concern**

| COPC | Basis[a] | Site-Related? |
|---|---|---|
| Wood waste | Benthic | Yes [c] |
| Total organic carbon | Benthic | Yes [c] |
| Arsenic [b] | Benthic & Human Health (DC & B) | Yes |
| Lead | Human Health (B) | No |
| Manganese [b] | Benthic | Yes |
| Selenium | Benthic & Human Health (B) | No |
| Benzo(g,h,i)perylene | Human Health (B) | No [d] |
| Fluoranthene | Human Health (B) | No [d] |
| Pyrene | Human Health (B) | No [d] |
| Total cPAH TEQ | Human Health (B) | No [d] |

**Footnotes:**
a. Human health COPCs are based on either direct contact (DC) or bioaccumulation (B) pathways.
b. Arsenic is a COPC in sediment and porewater; Manganese is a COPC in porewater only.
c. Wood waste and TOC have been shown not to pose a benthic risk based on bioassay data.
d. Based on results of recent groundwater data.

**Acronyms:**
COPC = contaminant of potential concern
cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
DC = Direct contact exposure pathways
B = Bioaccumulation
TEQ = Toxicity equivalent

## Table 6: Proposed Surface Sediment and Porewater Sample Counts

| Sample Type | Proposed Number of Samples | Sample ID | Historic Sample Re-occupied and Arsenic Result | Sampling Depth | Color Coding on Figure 13 | Supporting DQO |
|---|---|---|---|---|---|---|
| Surface Sediment Samples (0 to 10 cm) | 16 Perimeter Samples | PER-SED-01 | NS-02-SS; < 20 mg/kg | 0 to 10 cm | Orange | Samples located on the perimeter of the site footprint to confirm the Sediment Site boundary using results of this investigation (combined with the preliminary CSM) |
| | | PER-SED-02 | -- | 0 to 10 cm | | |
| | | PER-SED-03 | -- | 0 to 10 cm | | |
| | | PER-SED-04 | JB-7; < 20 mg/kg | 0 to 10 cm | | |
| | | PER-SED-05 | -- | 0 to 10 cm | | |
| | | PER-SED-06 | -- | 0 to 10 cm | | |
| | | PER-SED-07 | -- | 0 to 10 cm | | |
| | | PER-SED-08 | VB-2; < 20 mg/kg | 0 to 10 cm | | |
| | | PER-SED-09 | -- | 0 to 10 cm | | |
| | | PER-SED-10 | -- | 0 to 10 cm | | |
| | | PER-SED-11 | -- | 0 to 10 cm | | |
| | | PER-SED-12 | -- | 0 to 10 cm | | |
| | | PER-SED-13 | -- | 0 to 10 cm | | |
| | | PER-SED-14 | -- | 0 to 10 cm | | |
| | | PER-SED-15 | -- | 0 to 10 cm | | |
| | | PER-SED-16 | JB-1; < 20 mg/kg | 0 to 10 cm | | |
| | 15 Samples within Preliminary Site Boundary | BM-SED-01 | -- | 0 to 10 cm | Red | Within-site samples to determine current conditions after the interim action[a] |
| | | BM-SED-02 | -- | 0 to 10 cm | | |
| | | BM-SED-03 | -- | 0 to 10 cm | | |
| | | BM-SED-04 | -- | 0 to 10 cm | | |
| | | BM-SED-05 | -- | 0 to 10 cm | | |
| | | BM-SED-06 | -- | 0 to 10 cm | | |
| | | BM-SED-07 | -- | 0 to 10 cm | | |
| | | BM-SED-08 | -- | 0 to 10 cm | | |
| | | BM-SED-09 | -- | 0 to 10 cm | | |
| | | BM-SED-10 | BA-3; < 20 mg/kg | 0 to 10 cm | | |
| | | BM-SED-11 | -- | 0 to 10 cm | | |
| | | BM-SED-12 | VB-5; < 7 mg/kg | 0 to 10 cm | | |
| | | BM-SED-13 | WD-01; 16 mg/kg | 0 to 10 cm | | |
| | | BM-SED-14 | | 0 to 10 cm | | |
| | | BM-SED-15 | NS-01-SS; < 20 mg/kg | 0 to 10 cm | | |
| Porewater Samples | 2 Porewater and 2 Co-located Sediment | BM-SED-16 BM-PW-16 | WP-8; 240 ug/L | 0 to 10 cm | Red + Diamond | Evaluate if arsenic and manganese in groundwater presents a porewater hazard |
| | | BM-SED-17 BM-PW-17 | WP-6, < 1 ug/L and PW-S, 20 ug/L | 0 to 10 cm | | |
| Surface sediment with archived to 45 cm | 3 Nearshore Samples | NS-SED-01 | -- | 0 to 45 cm | Green | Nearshore 0-45 cm sample to evaluate beach play/clam digging |
| | | NS-SED-02 | -- | 0 to 45 cm | | |
| | | NS-SED-03 | -- | 0 to 45 cm | | |
| **Total Count** | **36 sediment, 2 porewater** | | | | | |

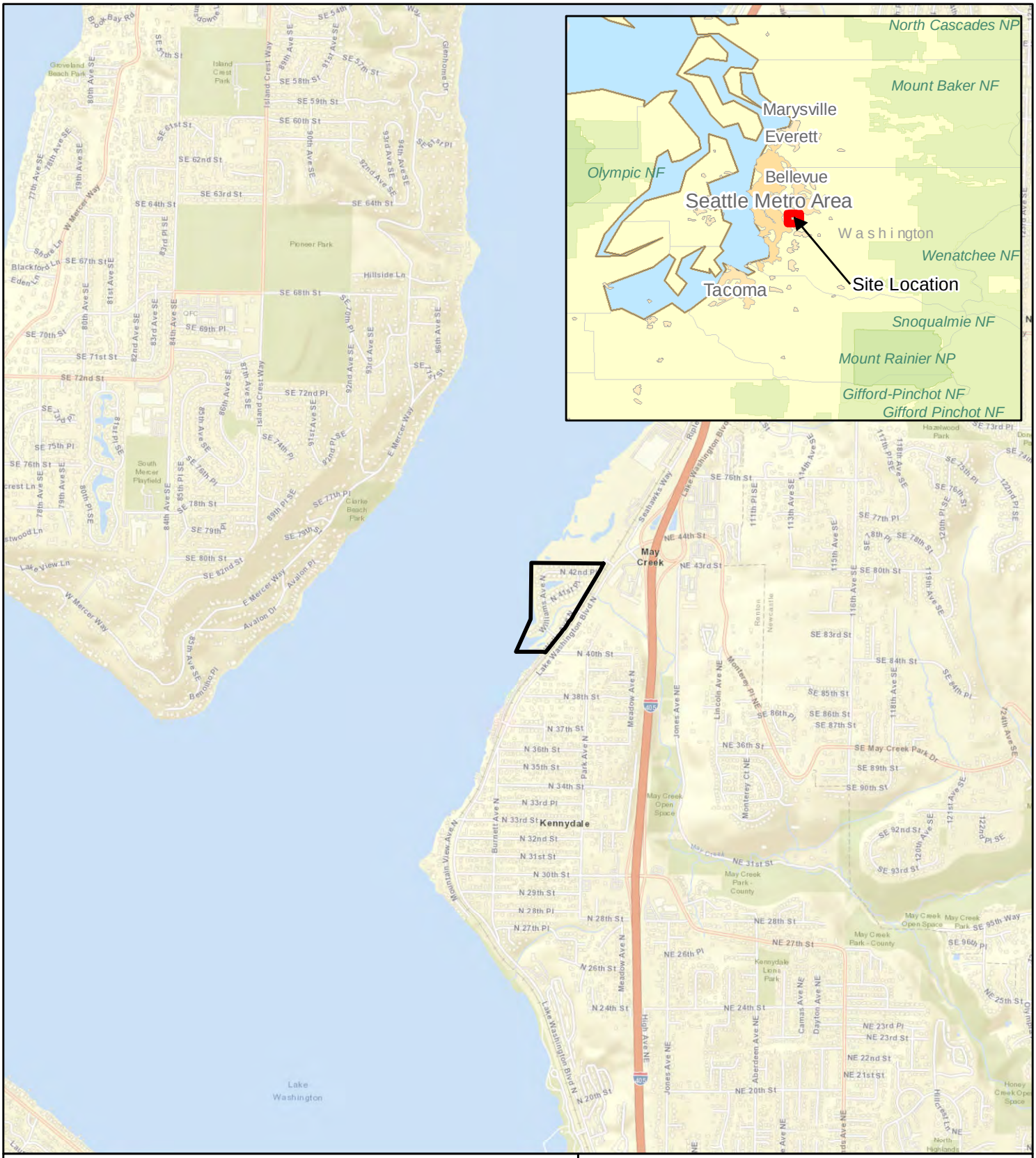
**Footnotes:**

a. Collectively, all of the data will be used to determine if the 2002 interim action removal was sufficient to meeting the SMS for site-related COPCs

**Acronyms:**

DQO = data quality objective
CSM = conceptual site model
SMS = Sediment Management Standards
COPCs = contaminants of potential concern

# FIGURES




**Legend**

Site Location

N

0 750 1,500 3,000 Feet

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

**Barbee Mill Upland Site Location**

Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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| PNG086 (SEA:MVI) | July 2021 |
|---|---|

**Figure 1**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 1 Site Location Map.mxd 6/1/2021 10:22:42 AM




**Legend**

- Historical Outfall Location
- Barbee Mill Site – Upland
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit
- Habitat Restoration Area (2002)
- Historical Building Footprint
- Sediment Removal Area (1999)

N

0 100 200 400 Feet

**Features of Interest**

Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 2**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 2 Site Features of Interest.mxd 6/7/2021 9:15:08 AM



Notes:
1. Bathymetric data was collected in 1996 by CRA Northwest in conjunction with Busch, Roed, and Hitchings (BRH).

**Legend**

- Historical Outfall Location
- Contour 1 ft (NAVD88)
- Barbee Mill Site – Upland
- Quendall Terminals Sediment Operable Unit
- Preliminary Sediment Boundary
- Historical Building Footprint

N

0 100 200 400 Feet

# 1996 Lake Washington Bathymetry (Pre-2002 Sediment Removal)

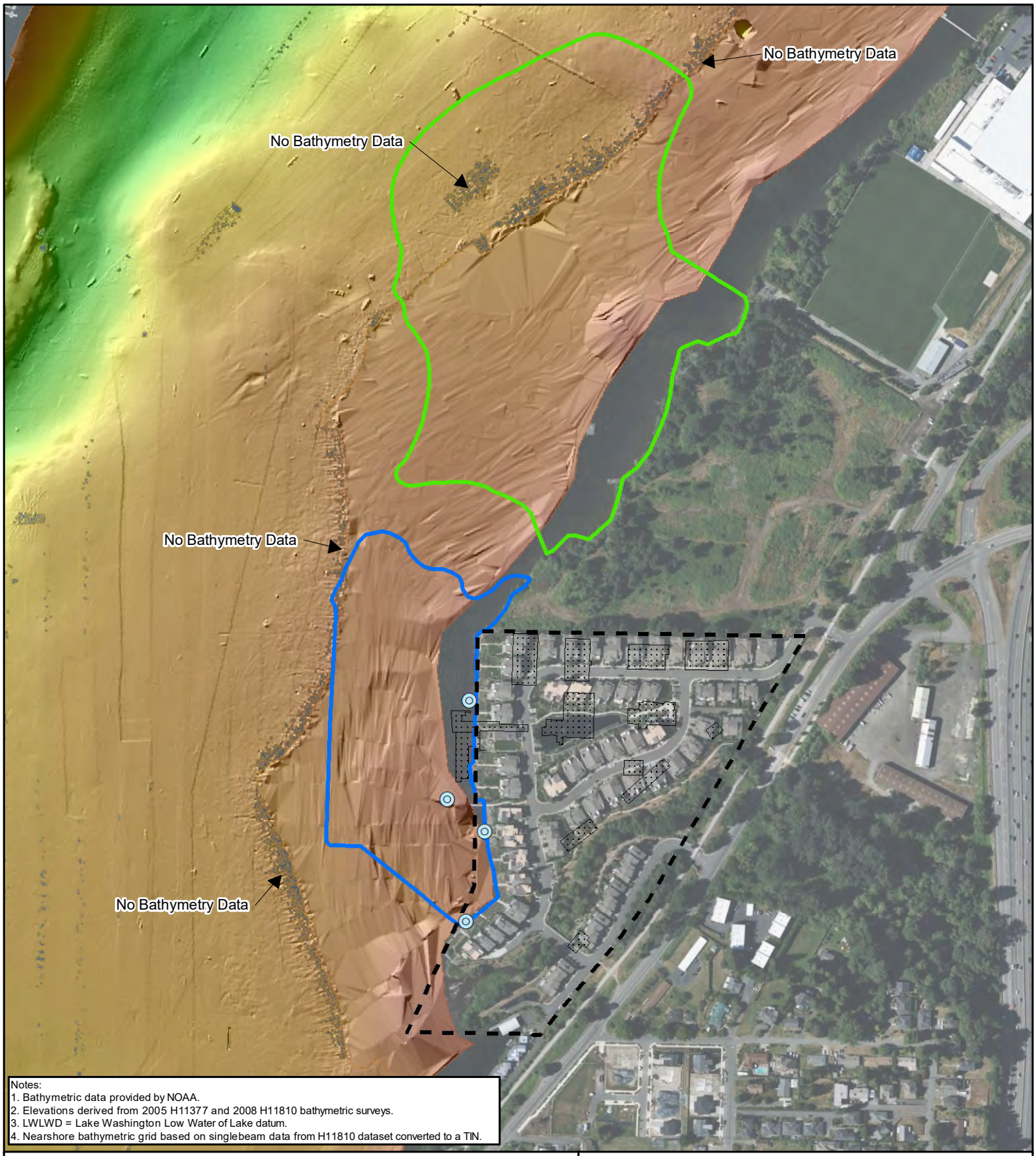
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|---|---|

**Figure 3a**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 3a 1996 Lake Washington Bathymetric SurveyV4.mxd 7/12/2021 7:32:34 AM




Notes:
1. Bathymetric data provided by NOAA.
2. Elevations derived from 2005 H11377 and 2008 H11810 bathymetric surveys.
3. LWLWD = Lake Washington Low Water of Lake datum.
4. Nearshore bathymetric grid based on singlebeam data from H11810 dataset converted to a TIN.

**Legend**

- Historical Outfall Location
- Barbee Mill Site – Upland
- Quendall Terminals Sediment Operable Unit
- Preliminary Sediment Boundary
- Historical Building Footprint

**Bathymetric Elevation**

**Feet LWLWD**

High : -0.375

Low : -41.42

N

0 100 200 400 Feet

# 2008/2005 Lake Washington Bathymetric Survey (Post-2002 Sediment Removal)

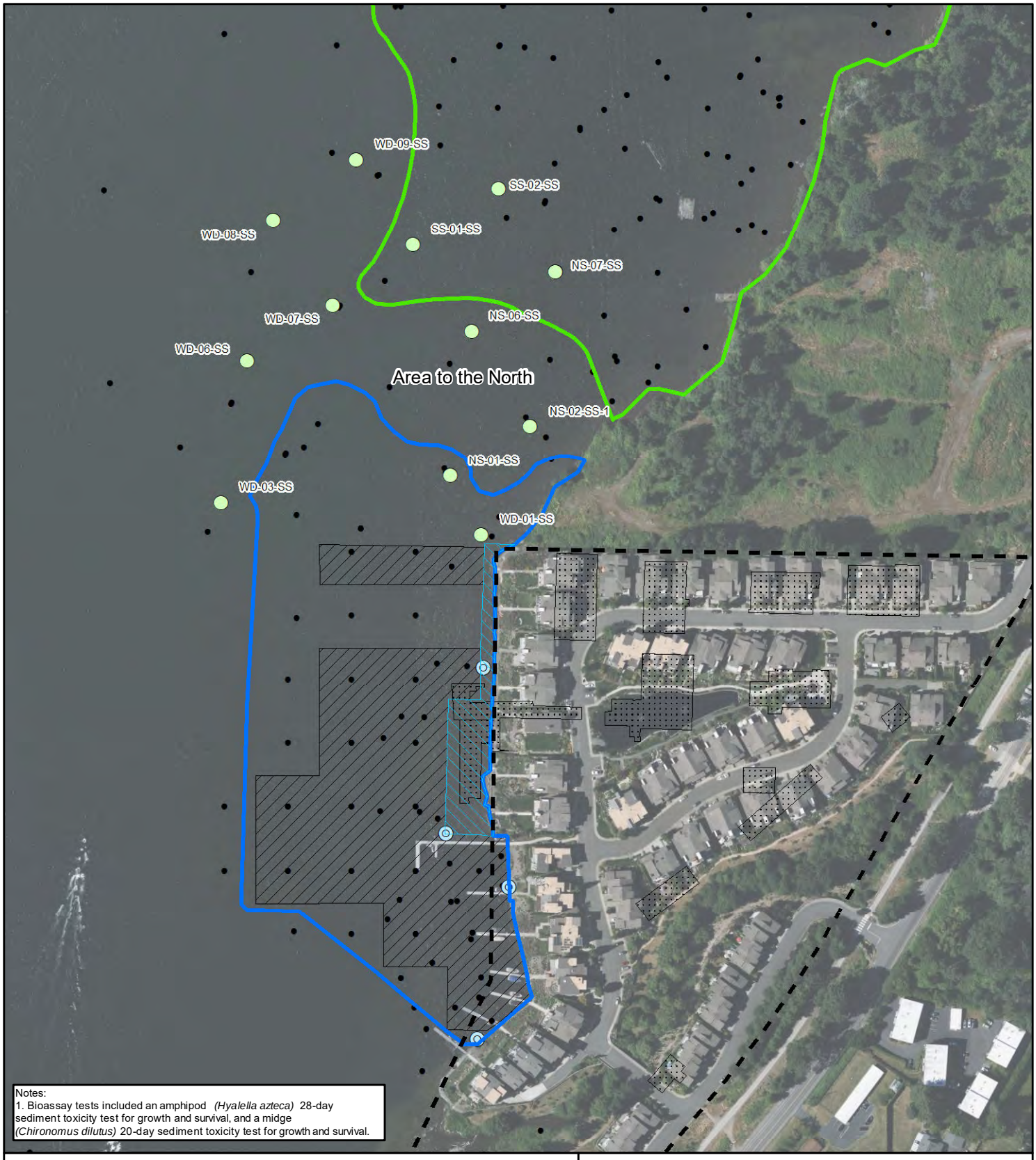
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 3b**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 3b 2005 Lake Washington Bathymetric SurveyV2.mxd 6/7/2021 9:17:48 AM




**Quendall Terminals Remedial Investigation**
**Bioassay Locations**

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| PNG0869 | July 2021 | **Figure 4** |
|---|---|---|

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 4 Quendall Terminals RI Bioassay Locations.mxd 6/17/2021 12:38:27 PM

| Exposure Medium | Exposure Route | Human Receptors: Beach Play | Human Receptors: Clam Digger | Human Receptors: Net Fisher | Human Receptors: Seafood Consumer | Human Receptors: Local Resident | Ecological Receptors: Benthic | Ecological Receptors: Fish | Ecological Receptors: Aquatic-Dependent Birds | Ecological Receptors: Aquatic-Dependent Mammals |
|---|---|---|---|---|---|---|---|---|---|---|
| Nearshore sediment | Dermal contact | a | a | | | | b | | | |
| | Incidental ingestion | a | a | | | | b | | | |
| Deep sediment | Dermal contact | | | a | | | b | | | |
| | Incidental ingestion | | | a | | | b | | | |
| Pore water | Dermal contact | | | | | | | | | |
| | Incidental ingestion | | | | | | | | | |
| Surface water | Dermal contact | | | | | | | c | | |
| | Incidental ingestion | | | | | | | | | |
| | Intentional ingestion | | | | | c | | c | | |
| Fish and shellfish | Ingestion | | | | d,e | | | c,d | d | d |

**Notes:**

| | |
|---|---|
| | Exposure pathway potentially complete and significant; addressed by sediment or surface water CULs |
| | Exposure pathway potentially complete but less significant and/or unlikely to occur; sediment and surface water CULs for other pathways are expected to be sufficiently protective |
| | Exposure pathway not complete |

**Footnotes:**

(a) SMS/SCUM sediment contact CULs
(b) SMS/SCUM benthic criteria
(c) Water quality standards for human health and aquatic life
(d) SMS/SCUM CULs for bioaccumulative compounds
(e) The seafood consumer could be, but is not necessarily, the same person as the clam digger or the net fisher.

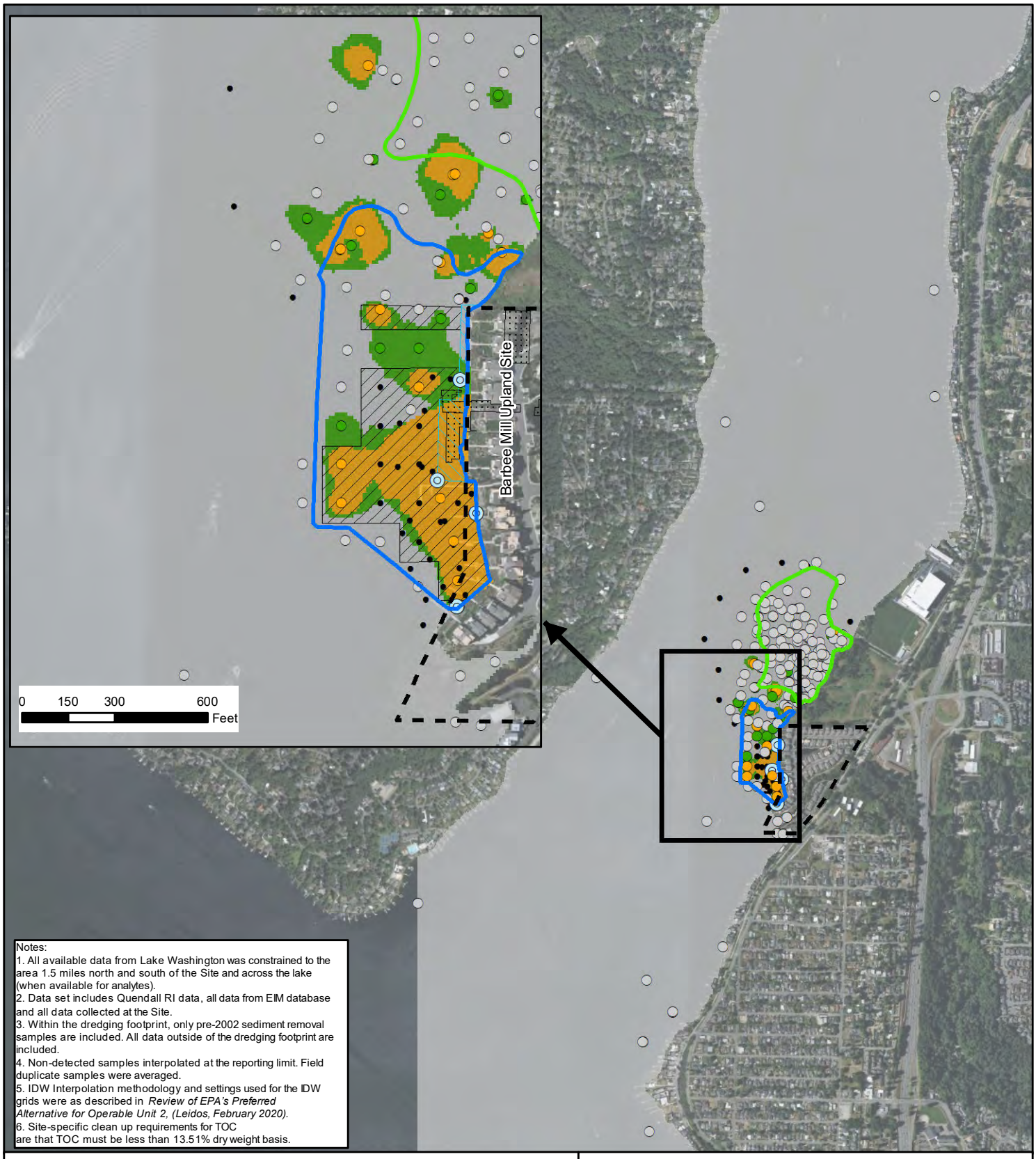
**Conceptual Site Model**

Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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Figure 5




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3. Within the dredging footprint, only pre-2002 sediment removal samples are included. All data outside of the dredging footprint are included.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged.
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*
6. Site-specific clean up requirements for TOC are that TOC must be less than 13.51% dry weight basis.

**Legend**

- Surface Sediment Sample Location
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Total Organic Carbon (%)**

- < 13.5%
- 13.5 – 16.9%
- > 16.9%

N

0 500 1,000 2,000
Feet

# IDW Interpolation of Total Organic Carbon Concentrations in Surface Sediment (Pre-2002 Sediment Removal Data)

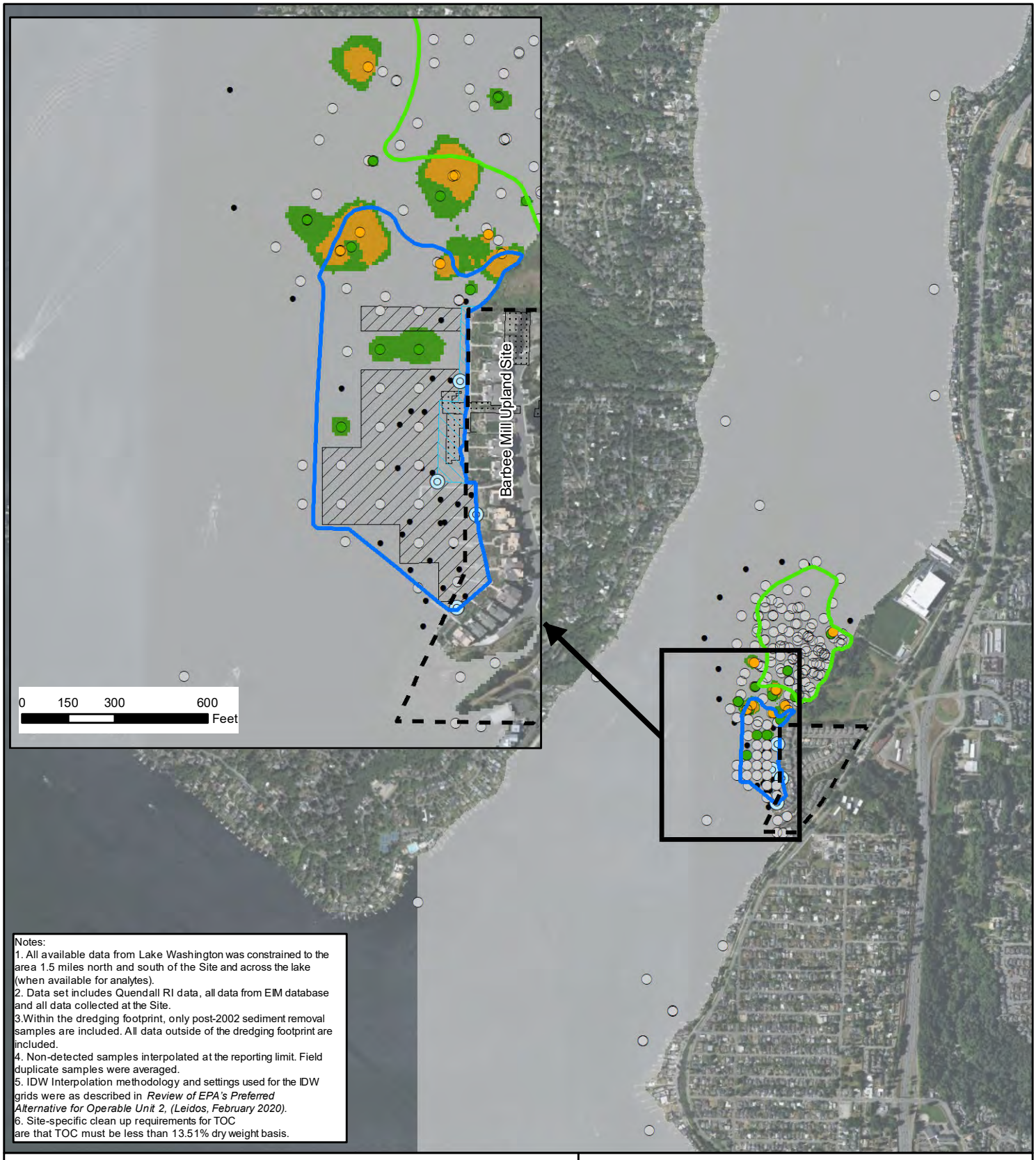
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**Figure 6a**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 6a Pre-dredge TOC Concentration.mxd 7/8/2021 8:52:03 AM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.Within the dredging footprint, only post-2002 sediment removal samples are included. All data outside of the dredging footprint are included.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged.
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*
6. Site-specific clean up requirements for TOC are that TOC must be less than 13.51% dry weight basis.

**Legend**

- Surface Sediment Sample Location
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Total Organic Carbon (%)**

- < 13.5%
- 13.5 – 16.9%
- > 16.9%

N

0 500 1,000 2,000 Feet

# IDW Interpolation of Total Organic Carbon Concentrations in Surface Sediment (Post-dredging Sediment Data)

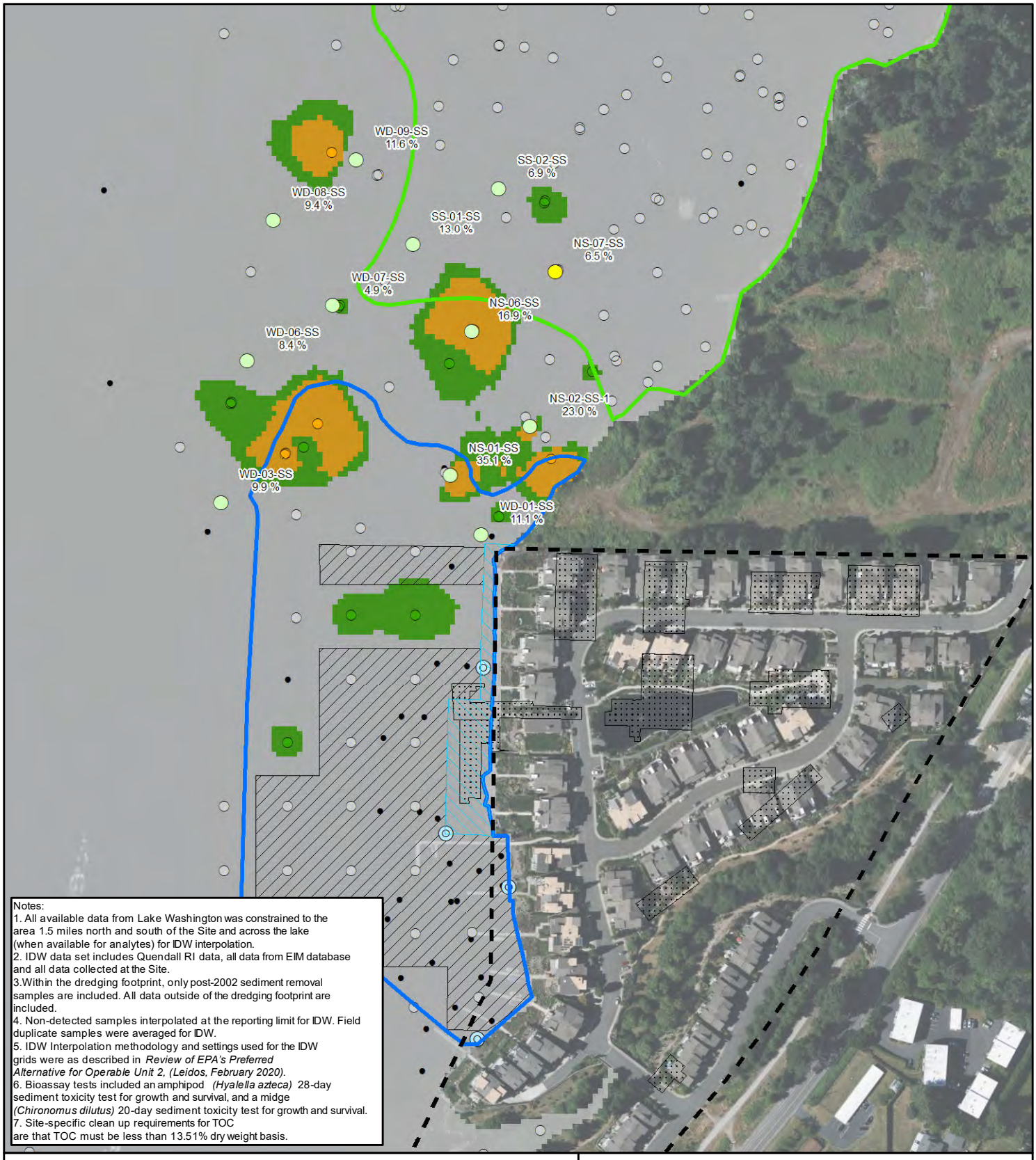
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 6b**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 6b TOC Concentration.mxd 7/8/2021 8:53:00 AM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes) for IDW interpolation.
2. IDW data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.Within the dredging footprint, only post-2002 sediment removal samples are included. All data outside of the dredging footprint are included.
4. Non-detected samples interpolated at the reporting limit for IDW. Field duplicate samples were averaged for IDW.
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*
6. Bioassay tests included an amphipod *(Hyalella azteca)* 28-day sediment toxicity test for growth and survival, and a midge *(Chironomus dilutus)* 20-day sediment toxicity test for growth and survival.
7. Site-specific clean up requirements for TOC are that TOC must be less than 13.51% dry weight basis.

**Legend**

- 2009 Historical Bioassay: Pass
- 2009 Historical Bioassay: Fail
- Surface Sediment Sample Location
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Total Organic Carbon (%)**

- < 13.5%
- 13.5 – 16.9%
- > 16.9%

Key:
NS-07-SS = Sample ID
6.5 % = Total Organic Carbon Percentage

N

0 125 250 500 Feet

# IDW Interpolation of Total Organic Carbon Concentrations in Surface Sediment (Post-dredging Sediment Data) with Historical Bioassay Results

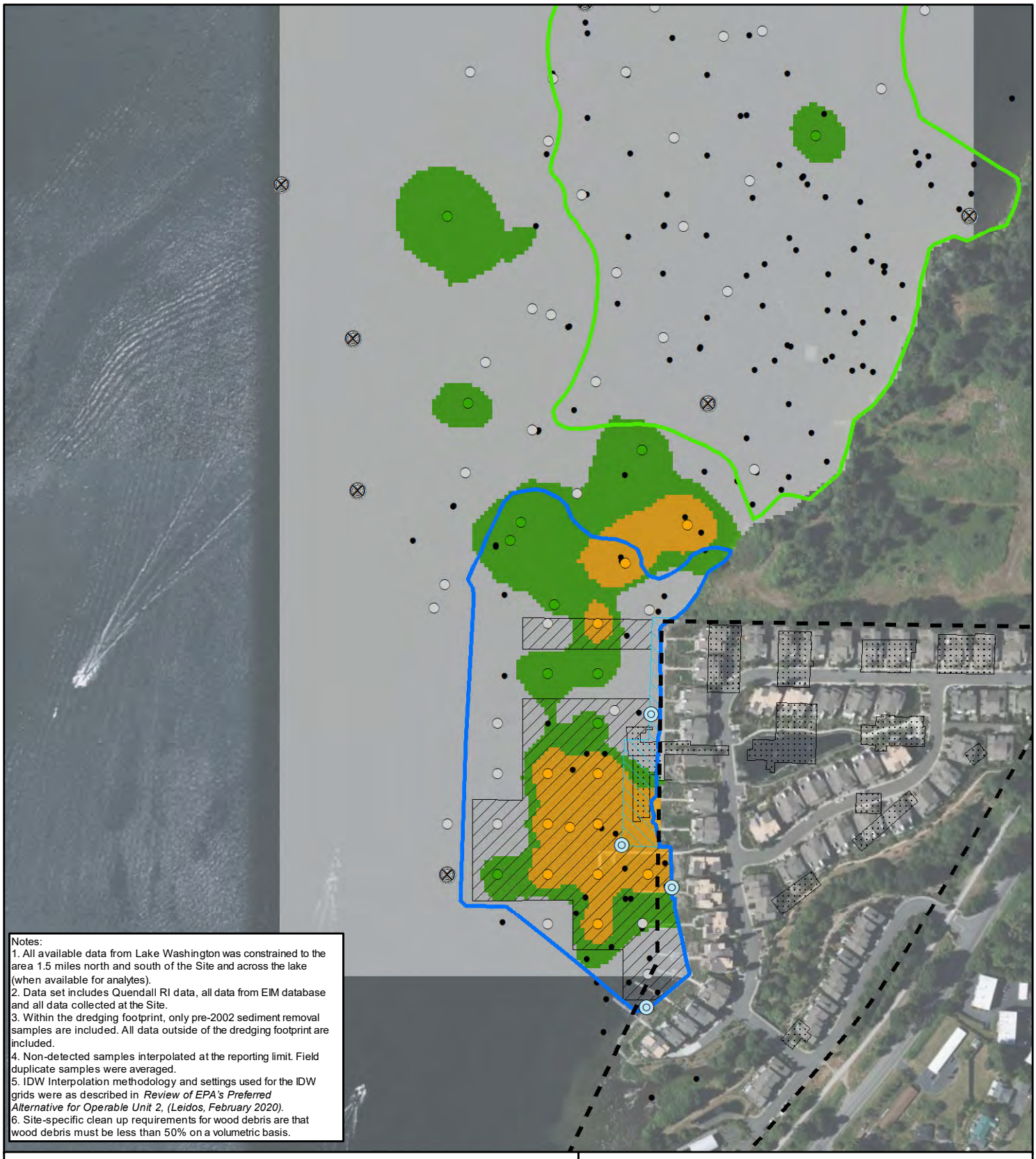
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 6c**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 6c TOC Concentration w Bioassay.mxd 7/8/2021 8:54:14 AM



Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3. Within the dredging footprint, only pre-2002 sediment removal samples are included. All data outside of the dredging footprint are included.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged.
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*
6. Site-specific clean up requirements for wood debris are that wood debris must be less than 50% on a volumetric basis.

**Legend**

- Surface Sediment Sample Location
- Non-Detect
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Wood Waste (%)**

- 0-50%
- 50-75%
- > 75%

N

0 100 200 400 Feet

# IDW Interpolation of Wood Waste Visual Estimates in Surface Sediment (Pre-2002 Sediment Removal Data)

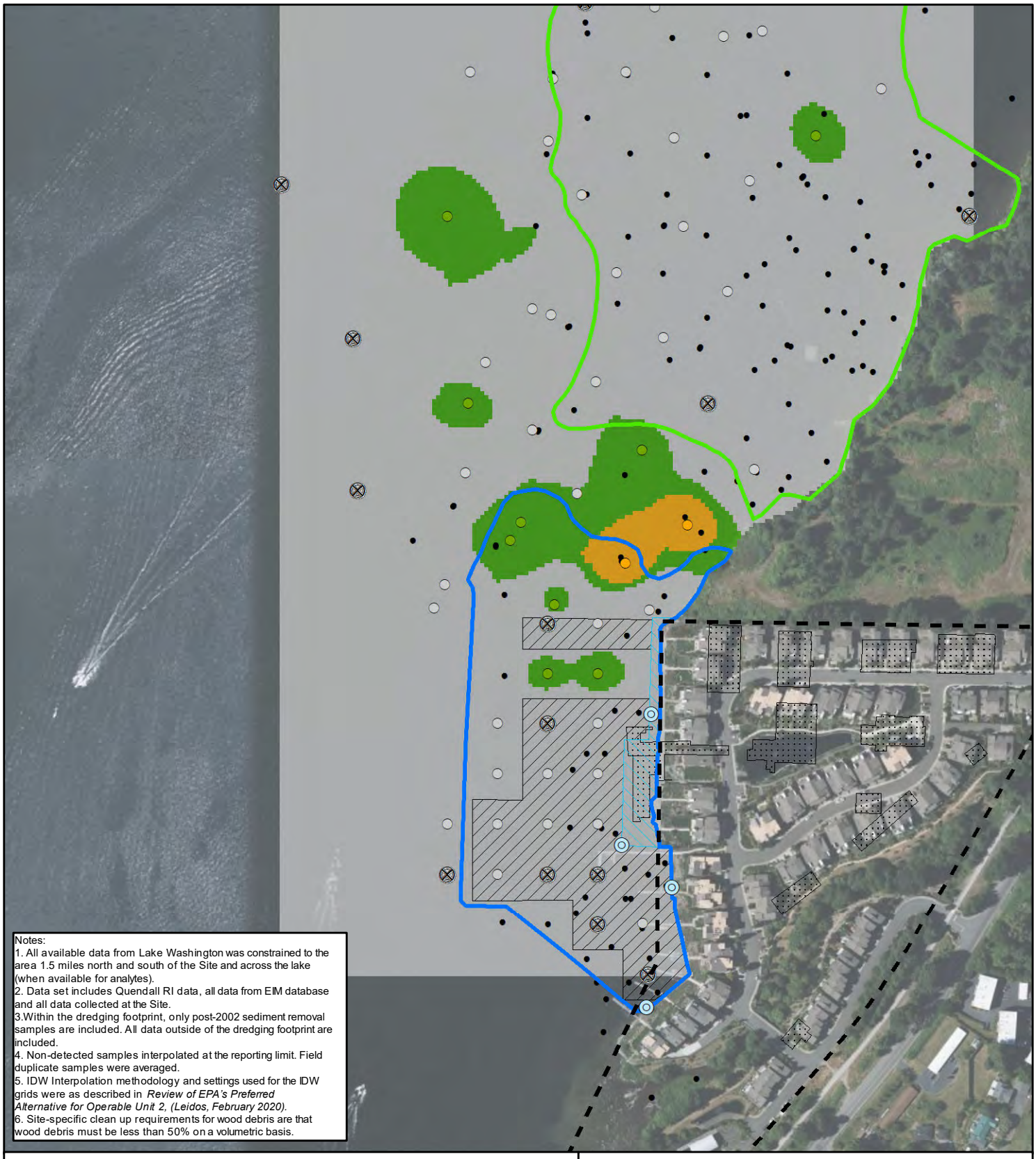
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 7a**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 7a Pre Dredge Wood Waste IDW Percentage.mxd 7/8/2021 8:56:11 AM



Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.Within the dredging footprint, only post-2002 sediment removal samples are included. All data outside of the dredging footprint are included.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged.
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*
6. Site-specific clean up requirements for wood debris are that wood debris must be less than 50% on a volumetric basis.

**Legend**

- Surface Sediment Sample Location
- Non-Detect
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Wood Waste (%)**

- 0-50%
- 50-75%
- > 75%

N

0 100 200 400 Feet

# IDW Interpolation of Wood Waste Visual Estimates in Surface Sediment (Post-dredging Sediment Data)

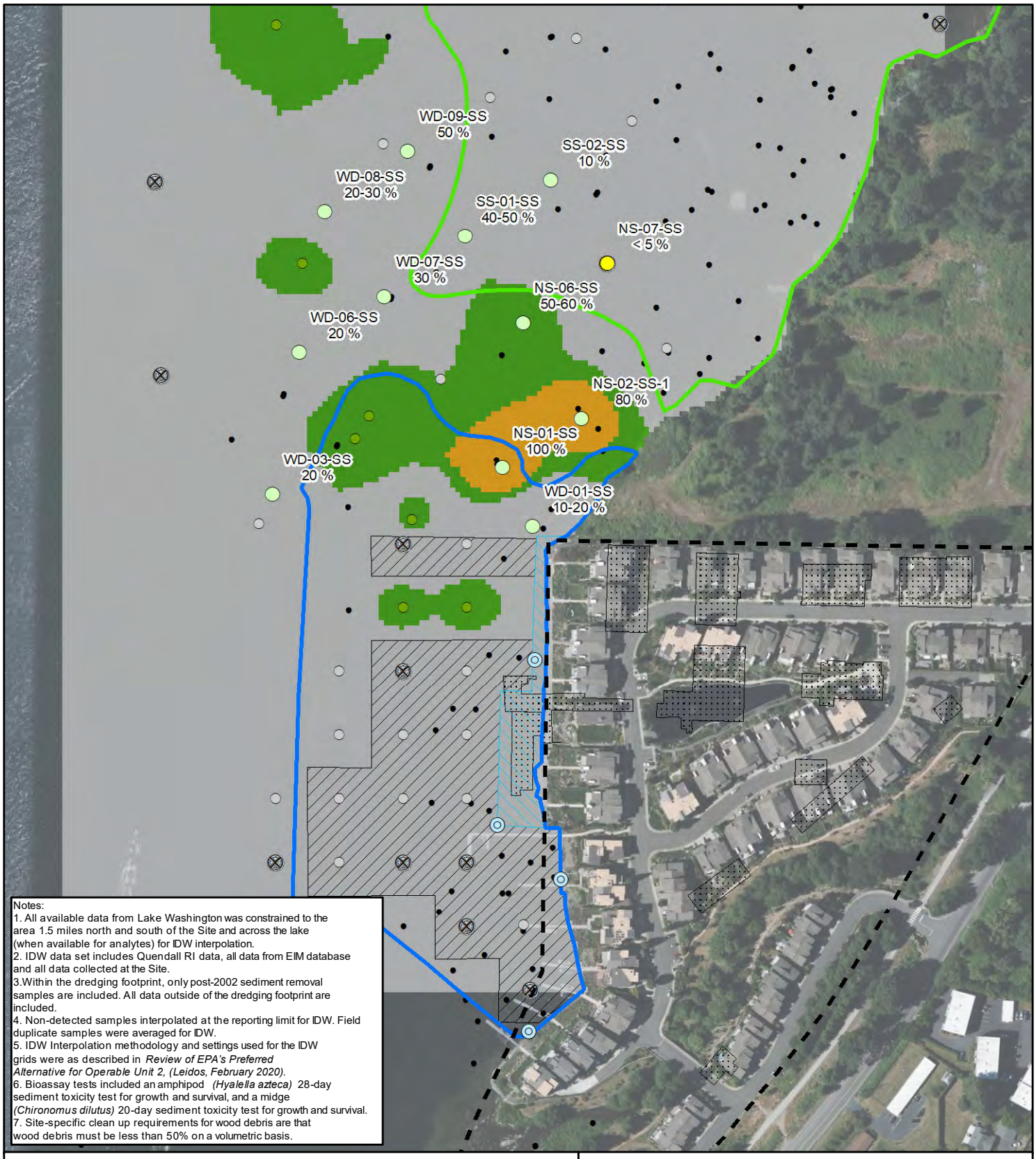
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**Figure 7b**

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P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 7b Wood Waste IDW Percentage.mxd 7/8/2021 8:56:58 AM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes) for IDW interpolation.
2. IDW data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.Within the dredging footprint, only post-2002 sediment removal samples are included. All data outside of the dredging footprint are included.
4. Non-detected samples interpolated at the reporting limit for IDW. Field duplicate samples were averaged for IDW.
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*
6. Bioassay tests included an amphipod *(Hyalella azteca)* 28-day sediment toxicity test for growth and survival, and a midge *(Chironomus dilutus)* 20-day sediment toxicity test for growth and survival.
7. Site-specific clean up requirements for wood debris are that wood debris must be less than 50% on a volumetric basis.

**Legend**
- 2009 Historical Bioassay: Pass
- 2009 Historical Bioassay: Fail
- Surface Sediment Sample Location
- Non-Detect
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Wood Waste (%)**
- 0-50%
- 50-75%
- > 75%

Key:
WD-06-SS = Sample ID
20 % = Wood Waste Percentage

N

0 100 200 400 Feet

# IDW Interpolation of Wood Waste Visual Estimates in Surface Sediment (Post-dredging Sediment Data) with Historical Bioassay Results

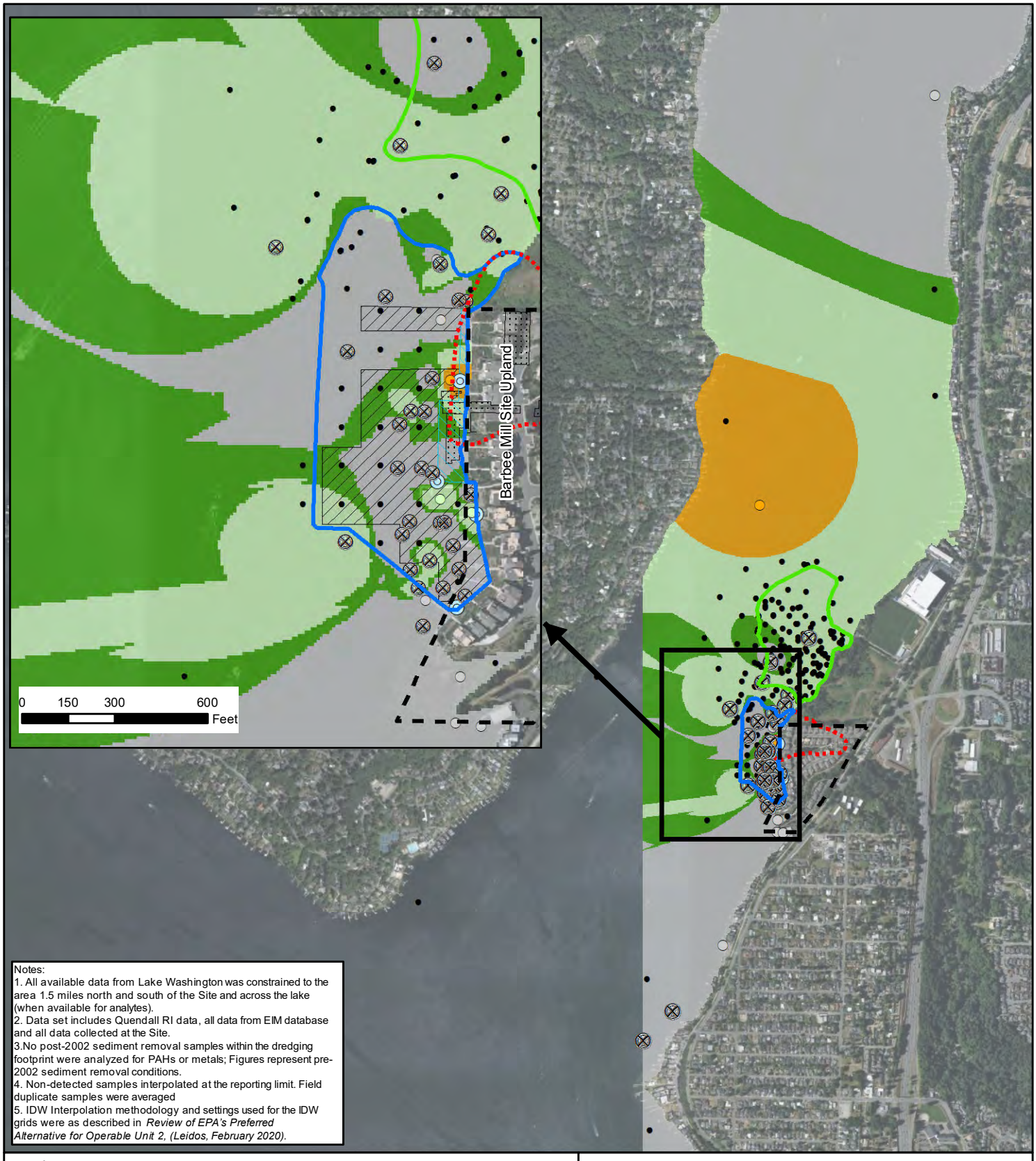
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**Figure 7c**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 7c Wood Waste IDW Percentage w Bioassay.mxd 7/8/2021 8:58:01 AM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.No post-2002 sediment removal samples within the dredging footprint were analyzed for PAHs or metals; Figures represent pre-2002 sediment removal conditions.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*

**Legend**

- Surface Sediment Sample Location
- Non-Detect
- Historical Outfall Location
- Barbee Mill Site – Upland
- Arsenic Groundwater Plume
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Arsenic Concentration (mg/kg)**

- <11 (Natural background)
- 11 - 14 (Natural background to SCO range)
- 14 - 24 (SCO to regional background range)
- 24 - 120 (regional background to CSL)
- > 120 (greater than CSL)

N

0 500 1,000 2,000 Feet

# IDW Interpolation of Arsenic Concentrations in Surface Sediment (Pre-dredging Sediment Data; Reporting Limits for ND)

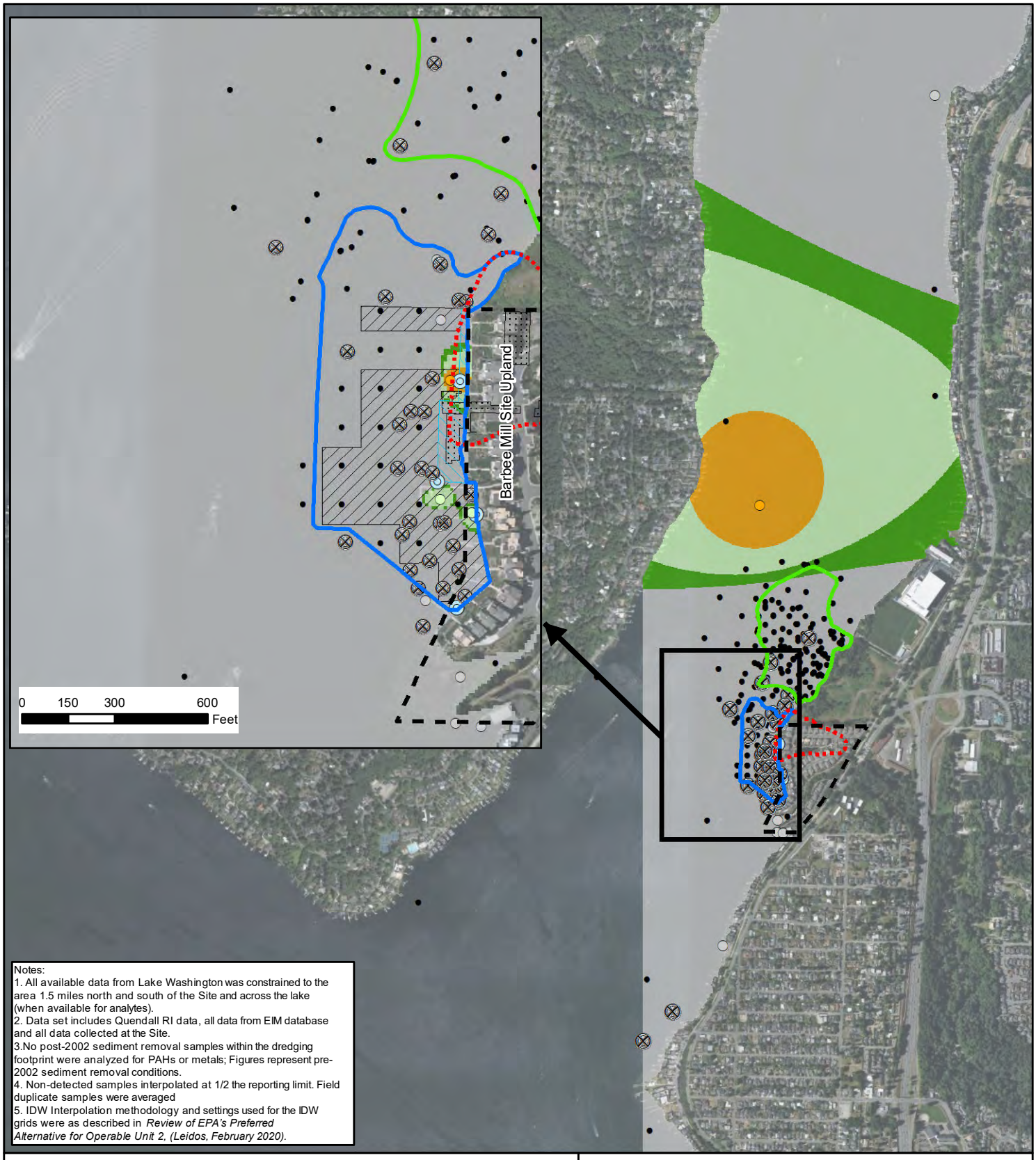
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 8a**

PNG0869 | July 2021

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 8a Arsenic Concentration.mxd 7/12/2021 7:48:29 AM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.No post-2002 sediment removal samples within the dredging footprint were analyzed for PAHs or metals; Figures represent pre-2002 sediment removal conditions.
4. Non-detected samples interpolated at 1/2 the reporting limit. Field duplicate samples were averaged
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*

**Legend**

- Surface Sediment Sample Location
- Non-Detect
- Historical Outfall Location
- Barbee Mill Site – Upland
- Arsenic Groundwater Plume
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Arsenic Concentration (mg/kg)**

- <11 (Natural background)
- 11 - 14 (Natural background to SCO range)
- 14 - 24 (SCO to regional background range)
- 24 - 120 (regional background to CSL)
- > 120 (greater than CSL)

N

0 500 1,000 2,000 Feet

# IDW Interpolation of Arsenic Concentrations in Surface Sediment (Pre-dredging Sediment Data; 1/2 Reporting Limits for ND)

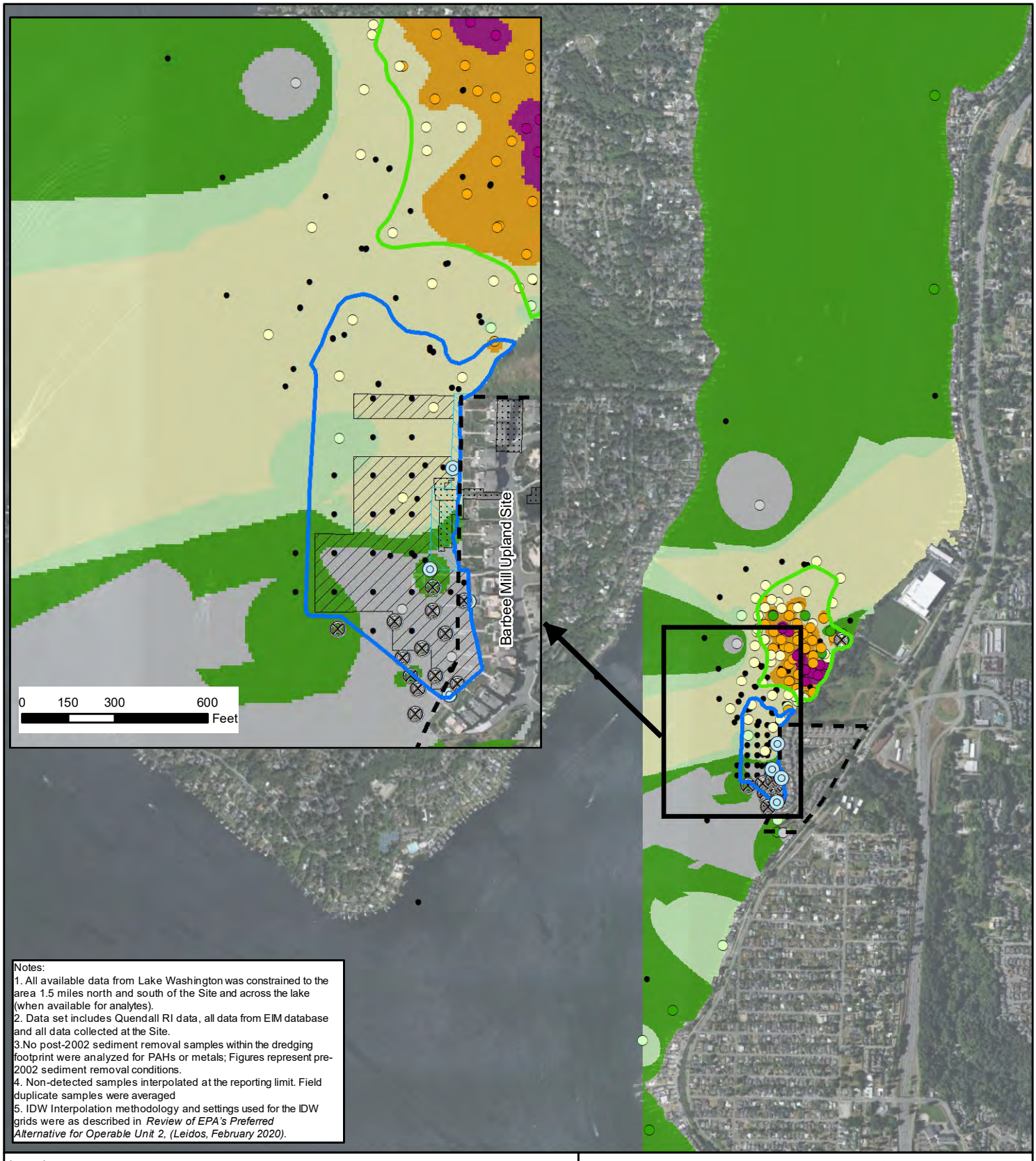
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**Figure 8b**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 8b Arsenic Concentration half.mxd 6/17/2021 12:45:47 PM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.No post-2002 sediment removal samples within the dredging footprint were analyzed for PAHs or metals; Figures represent pre-2002 sediment removal conditions.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*

**Legend**

- Surface Sediment Sample Location
- Non-Detect
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Total cPAH Concentration (µg/kg)**

- <21 (below natural background)
- 21 - 210 (Natural background to RB)
- 210 - 420 (RB to 2X RB)
- 420 - 2100 (2x RB to 10X RB)
- 2,100 - 21,000 (10x RB to 100x RB)
- > 21,000 (100x RB)

N

0 500 1,000 2,000
Feet

# IDW Interpolation of Total cPAH Concentrations in Surface Sediment (Pre-dredging Sediment Data)

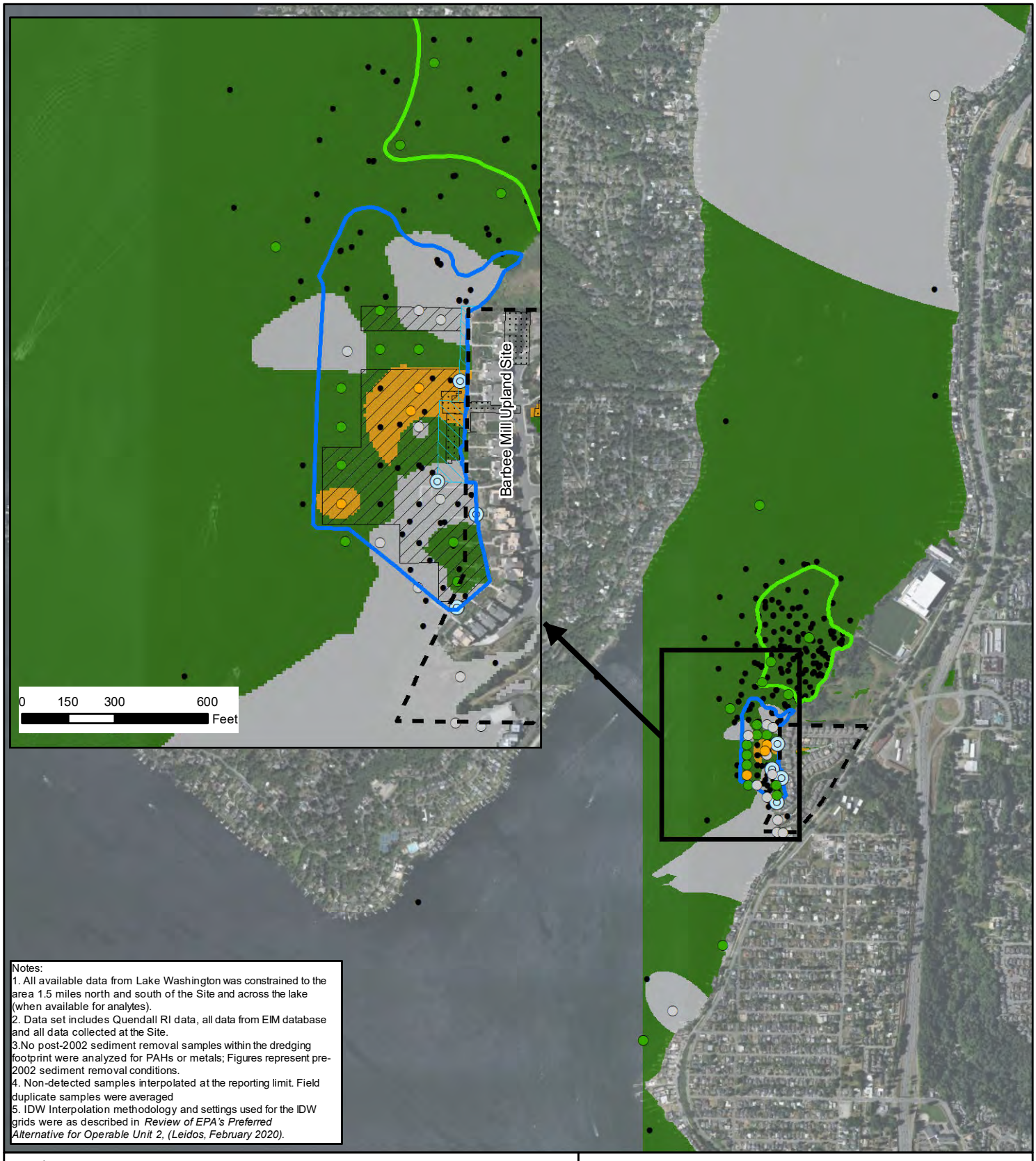
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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**Figure 9**

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P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 9 cPAH Concentration.mxd 6/17/2021 12:46:39 PM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.No post-2002 sediment removal samples within the dredging footprint were analyzed for PAHs or metals; Figures represent pre-2002 sediment removal conditions.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*

**Legend**

- Surface Sediment Sample Location
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Zinc Concentration (mg/kg)**

- < 93 (below Natural background)
- 93 - 186 (Natural background to 2x Natural background)
- >186 (> 2x Natural background)

N

0 500 1,000 2,000
Feet

# IDW Interpolation of Zinc Concentrations in Surface Sediment (Pre-dredging Sediment Data)

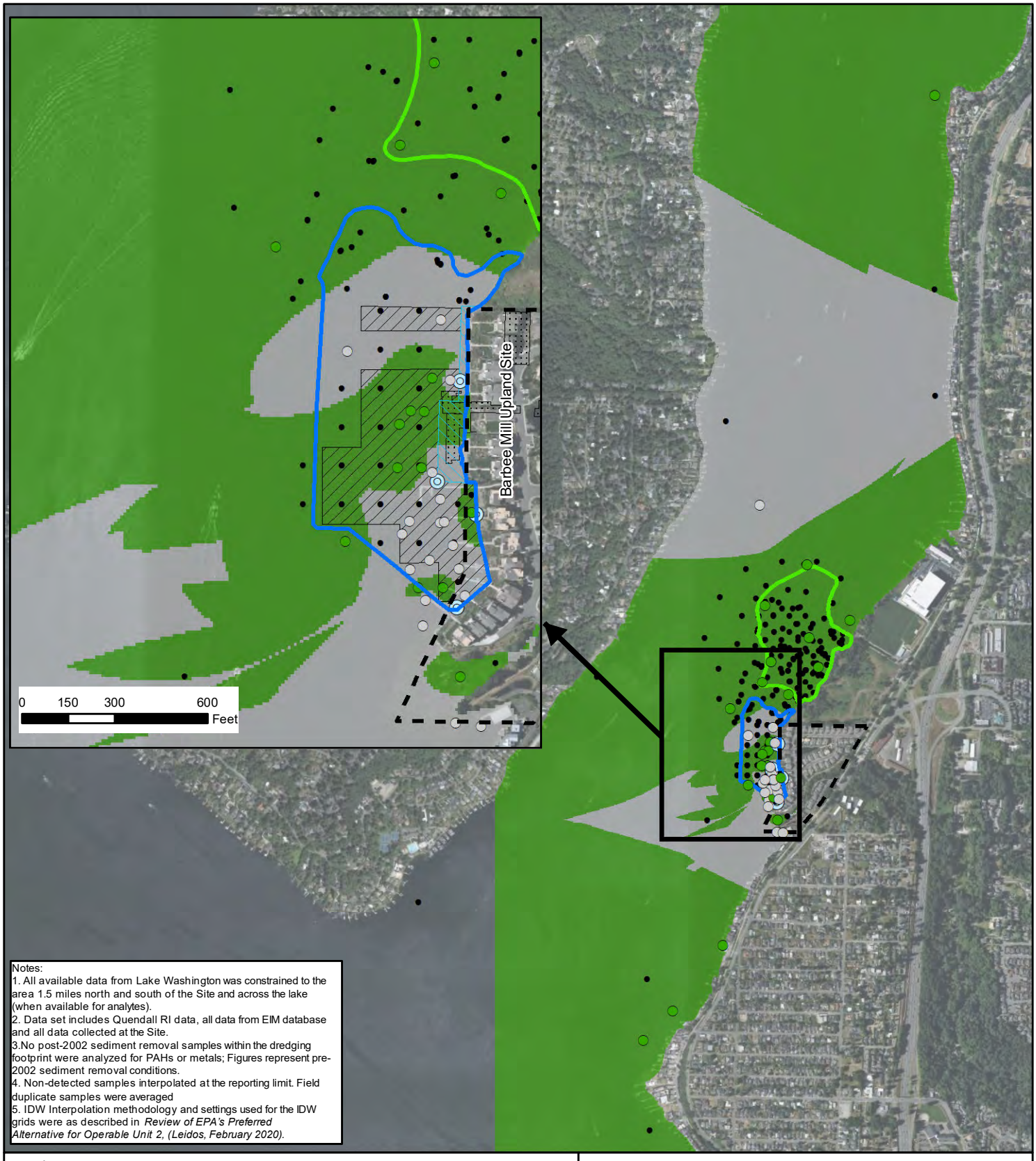
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**Figure 10**

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P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 10 Zinc Concentration.mxd 6/17/2021 12:35:00 PM




Notes:
1. All available data from Lake Washington was constrained to the area 1.5 miles north and south of the Site and across the lake (when available for analytes).
2. Data set includes Quendall RI data, all data from EIM database and all data collected at the Site.
3.No post-2002 sediment removal samples within the dredging footprint were analyzed for PAHs or metals; Figures represent pre-2002 sediment removal conditions.
4. Non-detected samples interpolated at the reporting limit. Field duplicate samples were averaged
5. IDW Interpolation methodology and settings used for the IDW grids were as described in *Review of EPA's Preferred Alternative for Operable Unit 2, (Leidos, February 2020).*

**Legend**
- Surface Sediment Sample Location
- Historical Outfall Location
- Barbee Mill Site – Upland
- Historical Building Footprint
- Sediment Removal Area
- Habitat Restoration Area
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit

**Lead (mg/kg)**
- < 21 (Below Natural Background)
- 21 - 360 (Natural Background to SCO)
- >360 (above SCO)

N

0 500 1,000 2,000
Feet

# IDW Interpolation of Lead Concentrations in Surface Sediment (Pre-dredging Sediment Data)

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**Figure 11**

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P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 11 Lead Concentration.mxd 6/17/2021 12:35:58 PM




# IDW Interpolation of Selenium Concentrations in Surface Sediment (Pre-dredging Sediment Data; Reporting Limits for ND)

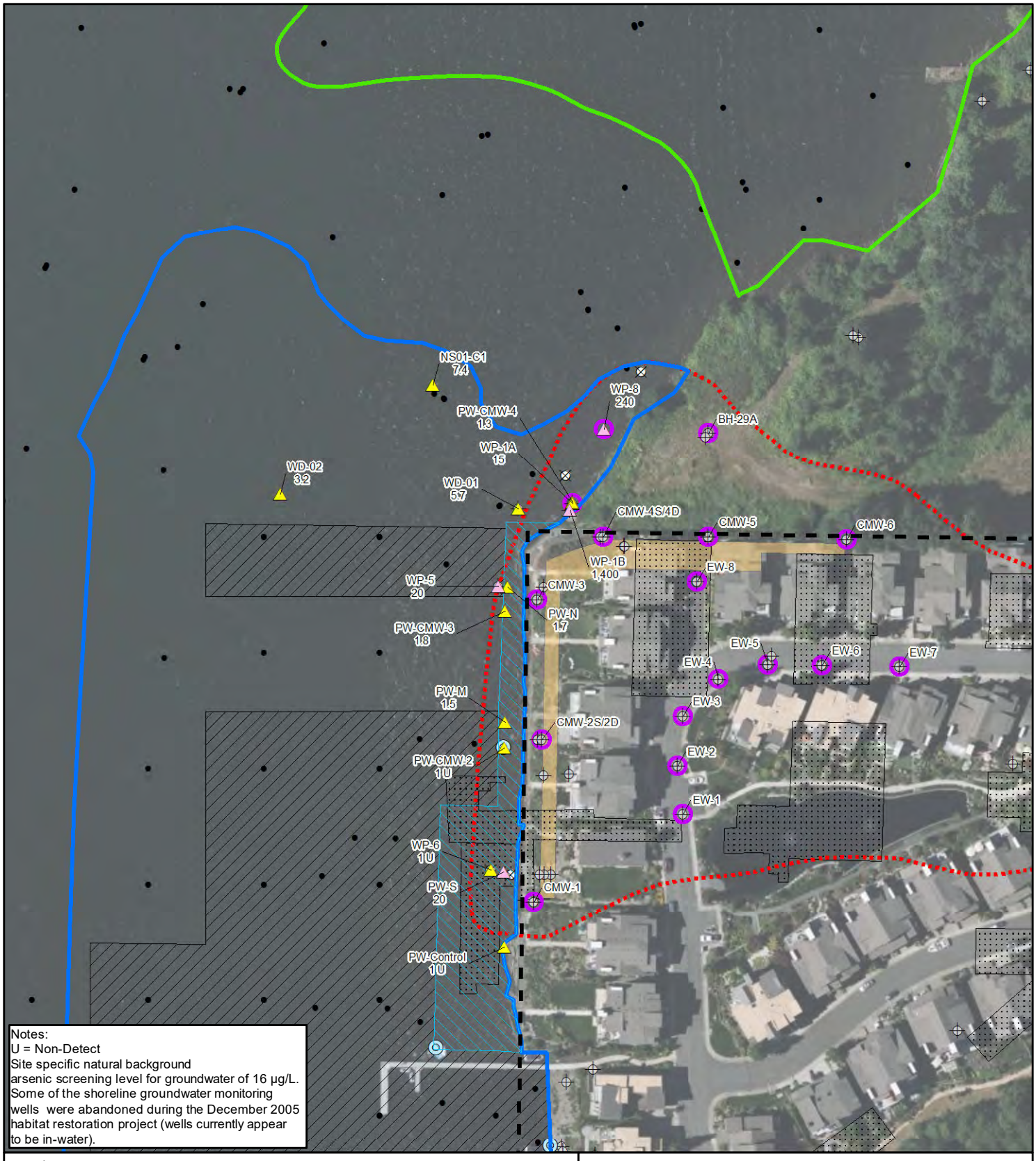
Barbee Mill Site Sediment Remedial Investigation Work Plan, Renton, WA

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Figure 12

PNG0869 | July 2021

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 12 Selenium IDW Concentration.mxd 7/8/2021 8:49:34 AM




# Porewater Arsenic Concentrations

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**Figure 13**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 13 Porewater Arsenic Concentration.mxd 7/6/2021 10:07:13 AM




Note:
Site specific natural background arsenic screening level for groundwater of 16 µg/L.

**Legend**

**Proposed Sample Locations**

- Onsite Surface Sediment Sample Location (0 to 10cm)
- Perimeter Surface Sediment Sample Location (0 to 10cm)
- Nearshore Sediment Sample (0 to 45cm)
- Porewater Sample Location (0 to 10cm)
- Historical Sample Location
- Historical Porewater Sample Location
- Outfall

- Barbee Mill Site – Upland
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit
- Habitat Restoration Area
- Historical Building Footprint
- 2002 Sediment Removal Area
- Passive Attenuation Zone
- Arsenic Groundwater Plume

N

0 100 200 400 Feet

# Proposed Surface Sediment and Porewater Sample Locations

Barbee Mill Site Sediment Remedial Investigation Work Plan
Renton, WA

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**Figure 14**

PNG0869 (SEA:MVI) | July 2021

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 14 Proposed Surface Sediment Porewater Sample Locations.mxd 7/12/2021 8:07:52 AM

# ATTACHMENT A

# All Historical Sediment Data

**Attachment A-1**
**Barbee Mill Surface and Subsurface Sediment Data Summary Statistics**

| Analyte | n | # Detects | # ND | FOD | % ND | Unit | Statistics for Data Set with NDs using Kaplan Meier Method | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Min MDL | Max MDL | KM Mean | KM SD | KM CV |
| **Conventionals** | | | | | | | | | | | |
| Wood Waste | 40 | 33 | 7 | 83% | 18% | % | 5 | 5 | 39.5 | 32.13 | 0.813 |
| Total Organic Carbon | 37 | 37 | 0 | 100% | 0% | % | N/A | N/A | 11.22 | 8.462 | 0.754 |
| **Metals** | | | | | | | | | | | |
| Antimony | 6 | 0 | 6 | 0% | 100% | mg/kg | 7 | 20 | N/A | N/A | N/A |
| Arsenic | 34 | 6 | 28 | 18% | 82% | mg/kg | 7 | 20 | 6.157 | 5.528 | 0.898 |
| Barium | 13 | 13 | 0 | 100% | 0.00% | mg/kg | N/A | N/A | 58.02 | 23.77 | 0.41 |
| Beryllium | 6 | 1 | 5 | 17% | 83% | mg/kg | 0.2 | 0.4 | 0.2 | 0 | N/A |
| Cadmium | 28 | 4 | 24 | 14% | 86% | mg/kg | 0.3 | 1 | 0.441 | 0.477 | 1.082 |
| Chromium | 28 | 28 | 0 | 100% | 0% | mg/kg | N/A | N/A | 32.67 | 14.47 | 0.443 |
| Copper | 6 | 6 | 0 | 100% | 0% | mg/kg | N/A | N/A | 23.5 | 10.48 | 0.446 |
| Lead | 28 | 28 | 0 | 100% | 0% | mg/kg | N/A | N/A | 22.61 | 13.6 | 0.601 |
| Mercury | 28 | 2 | 26 | 7% | 93% | mg/kg | 0.07 | 0.2 | 0.0644 | 0.0653 | 1.013 |
| Nickel | 6 | 6 | 0 | 100% | 0% | mg/kg | N/A | N/A | 22.67 | 8.937 | 0.394 |
| Selenium | 19 | 0 | 19 | 0% | 100% | mg/kg | 7 | 20 | N/A | N/A | N/A |
| Silver | 28 | 7 | 21 | 25% | 75% | mg/kg | 0.4 | 1 | 0.626 | 0.419 | 0.669 |
| Thallium | 6 | 0 | 6 | 0% | 100% | mg/kg | 7 | 20 | N/A | N/A | N/A |
| Zinc | 19 | 19 | 0 | 100% | 0% | mg/kg | N/A | N/A | 193.4 | 339.2 | 1.754 |
| **Polycyclic Aromatic Hydrocarbons** | | | | | | | | | | | |
| 2-Methylnaphthalene | 19 | 0 | 19 | 0% | 100% | µg/kg | 97 | 250 | N/A | N/A | N/A |
| Acenaphthene | 19 | 0 | 19 | 0% | 100% | µg/kg | 97 | 250 | N/A | N/A | N/A |
| Acenaphthylene | 19 | 0 | 19 | 0% | 100% | µg/kg | 97 | 250 | N/A | N/A | N/A |
| Anthracene | 19 | 2 | 17 | 11% | 89% | µg/kg | 97 | 250 | 65.94 | 104.3 | 1.582 |
| Benz(a)anthracene | 19 | 3 | 16 | 16% | 84% | µg/kg | 97 | 240 | 135.2 | 185.8 | 1.374 |
| Benzo(a)pyrene | 19 | 9 | 10 | 47% | 53% | µg/kg | 140 | 240 | 379.9 | 455.4 | 1.199 |
| Benzo(b)fluoranthene | 19 | 3 | 16 | 16% | 84% | µg/kg | 97 | 240 | 166 | 160.8 | 0.968 |
| Benzo(g,h,i)perylene | 19 | 4 | 15 | 21% | 79% | µg/kg | 140 | 240 | 149.7 | 179.5 | 1.199 |
| Benzo(k)fluoranthene | 19 | 7 | 12 | 37% | 63% | µg/kg | 97 | 240 | 259.5 | 336.9 | 1.298 |
| Chrysene | 19 | 9 | 10 | 47% | 53% | µg/kg | 97 | 240 | 229.5 | 205 | 0.893 |
| Dibenzo(a,h)anthracene | 19 | 3 | 16 | 16% | 84% | µg/kg | 97 | 250 | 94.55 | 39.72 | 0.42 |
| Fluoranthene | 19 | 3 | 16 | 16% | 84% | µg/kg | 97 | 250 | 145.2 | 158.9 | 1.094 |
| Fluorene | 19 | 3 | 16 | 16% | 84% | µg/kg | 97 | 250 | 136.5 | 88.18 | 0.646 |
| Indeno(1,2,3-cd)pyrene | 19 | 5 | 14 | 26% | 74% | µg/kg | 97 | 240 | 168.9 | 142.1 | 0.841 |
| Naphthalene | 19 | 4 | 15 | 21% | 79% | µg/kg | 97 | 250 | 108.6 | 65.75 | 0.606 |
| Phenanthrene | 19 | 1 | 18 | 5% | 95% | µg/kg | 97 | 250 | 171.3 | 298 | 1.74 |
| Pyrene | 19 | 2 | 17 | 11% | 89% | µg/kg | 99 | 240 | 252.3 | 530.7 | 2.104 |
| Total HPAHs | 25 | 17 | 8 | 68% | 32% | mg/kg | 1.1 | 1.2 | 1.814 | 2.154 | 1.188 |
| Total LPAHs | 25 | 7 | 18 | 28% | 72% | mg/kg | 0.1 | 0.75 | 0.488 | 1.041 | 2.134 |
| Total PAHs | 28 | 19 | 9 | 68% | 32% | mg/kg | 0.1 | 2 | 2.309 | 3.05 | 1.321 |
| Total cPAHs TEQ (dw,ND = 0) | 19 | 6 | 13 | 32% | 68% | mg/kg | 0.14 | 0.24 | 0.211 | 0.31 | 1.471 |
| Total cPAHs TEQ (OC, ND = 0) | 7 | 3 | 4 | 43% | 57% | mg/kg | 1 | 5 | 6.442 | 6.277 | 0.974 |
| Total cPAHs TEQ (dw, ND = 1/2 RDL) | 19 | 6 | 13 | 32% | 68% | mg/kg | 0.106 | 0.181 | 0.228 | 0.3 | 1.318 |
| Total cPAHs TEQ (OC, ND = 1/2) | 7 | 3 | 4 | 43% | 57% | mg/kg | 0.692 | 3.62 | 5.588 | 6.371 | 1.14 |

**Attachment A-1**
**Barbee Mill Surface and Subsurface Sediment Data Summary Statistics**

| Analyte | Statistics using Detected Data Only | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Minimum | Mean | Median | 90 %ile | Maximum | Variable | SD | CV |
| | **Conventionals** | | | | | | | |
| Wood Waste | 5 | 46.82 | 35 | 80 | 100 | 974.7 | 31.22 | 0.667 |
| Total Organic Carbon | 2.3 | 11.22 | 7.4 | 20.36 | 46 | 71.6 | 8.462 | 0.754 |
| | **Metals** | | | | | | | |
| Antimony | N/A | N/A | N/A | 20 | N/A | N/A | N/A | N/A |
| Arsenic | 3.2 | 13.5 | 11.7 | 20 | 30 | 109.4 | 10.46 | 0.775 |
| Barium | 30 | 58.02 | 54.4 | 77.06 | 124 | 564.9 | 23.77 | 0.41 |
| Beryllium | 0.2 | 0.2 | 0.2 | 0.35 | 0.2 | N/A | N/A | N/A |
| Cadmium | 0.3 | 1.175 | 0.85 | 1.06 | 2.7 | 1.183 | 1.087 | 0.925 |
| Chromium | 10 | 32.67 | 30.5 | 46.1 | 67 | 209.3 | 14.47 | 0.443 |
| Copper | 11.9 | 23.5 | 23.4 | 34.9 | 36.1 | 109.8 | 10.48 | 0.446 |
| Lead | 5 | 22.61 | 16.5 | 43.9 | 50 | 184.8 | 13.6 | 0.601 |
| Mercury | 0.1 | 0.25 | 0.25 | 0.13 | 0.4 | 0.045 | 0.212 | 0.849 |
| Nickel | 10 | 22.67 | 23 | 31.5 | 32 | 79.87 | 8.937 | 0.394 |
| Selenium | N/A | N/A | N/A | 20 | N/A | N/A | N/A | N/A |
| Silver | 1 | 1.271 | 1.1 | 1.29 | 2 | 0.132 | 0.364 | 0.286 |
| Thallium | N/A | N/A | N/A | 20 | N/A | N/A | N/A | N/A |
| Zinc | 34 | 193.4 | 123 | 195.4 | 1580 | 115069 | 339.2 | 1.754 |
| | **Polycyclic Aromatic Hydrocarbons** | | | | | | | |
| 2-Methylnaphthalene | N/A | N/A | N/A | 704 | N/A | N/A | N/A | N/A |
| Acenaphthene | N/A | N/A | N/A | 704 | N/A | N/A | N/A | N/A |
| Acenaphthylene | N/A | N/A | N/A | 704 | N/A | N/A | N/A | N/A |
| Anthracene | 39 | 254.5 | 254.5 | 704 | 470 | 92881 | 304.8 | 1.197 |
| Benz(a)anthracene | 76 | 402 | 280 | 960 | 850 | 160932 | 401.2 | 0.998 |
| Benzo(a)pyrene | 140 | 632.2 | 290 | 1380 | 1700 | 321094 | 566.7 | 0.896 |
| Benzo(b)fluoranthene | 160 | 443.3 | 470 | 840 | 700 | 73433 | 271 | 0.611 |
| Benzo(g,h,i)perylene | 69 | 377.3 | 375 | 832 | 690 | 87097 | 295.1 | 0.782 |
| Benzo(k)fluoranthene | 120 | 488.6 | 410 | 756 | 1500 | 239014 | 488.9 | 1.001 |
| Chrysene | 88 | 323.1 | 150 | 888 | 760 | 65042 | 255 | 0.789 |
| Dibenzo(a,h)anthracene | 80 | 128 | 84 | 704 | 220 | 6352 | 79.7 | 0.623 |
| Fluoranthene | 110 | 336.7 | 120 | 904 | 780 | 147433 | 384 | 1.141 |
| Fluorene | 130 | 273.3 | 250 | 704 | 440 | 24433 | 156.3 | 0.572 |
| Indeno(1,2,3-cd)pyrene | 93 | 320.6 | 390 | 704 | 500 | 36707 | 191.6 | 0.598 |
| Naphthalene | 75 | 181.3 | 190 | 704 | 270 | 9706 | 98.52 | 0.544 |
| Phenanthrene | 1400 | 1400 | 1400 | 1400 | 1400 | N/A | N/A | N/A |
| Pyrene | 530 | 1465 | 1465 | 1600 | 2400 | 1748450 | 1322 | 0.903 |
| Total HPAHs | 0.5 | 2.479 | 1.55 | 4.36 | 8 | 5.634 | 2.374 | 0.957 |
| Total LPAHs | 0.3 | 1.405 | 0.42 | 1.846 | 5 | 3.093 | 1.759 | 1.252 |
| Total PAHs | 0.5 | 3.179 | 1.97 | 4.534 | 13.7 | 11.77 | 3.43 | 1.079 |
| Total cPAHs TEQ (dw,ND = 0) | 0.0497 | 0.453 | 0.228 | 1.192 | 1.14 | 0.21 | 0.458 | 1.011 |
| Total cPAHs TEQ (OC, ND = 0) | 8.17 | 11.88 | 9.38 | 27.54 | 18.1 | 29.35 | 5.418 | 0.456 |
| Total cPAHs TEQ (dw, ND = 1/2 RDL) | 0.154 | 0.482 | 0.238 | 1.078 | 1.15 | 0.195 | 0.442 | 0.916 |
| Total cPAHs TEQ (OC, ND = 1/2) | 8.21 | 12.12 | 9.74 | 13.2 | 18.4 | 30.2 | 5.495 | 0.454 |

**Acronyms and Abbreviations:**
µg/kg = micrograms per kilogram
cPAHs TEQ = carcinogenic PAH Toxicity Equivalency Quotients
CV = coefficient of variation
dw = dry weight
FOD = frequency of detection
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
KM = Kaplan Meier
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
MDL = method detection limit
mg/kg = milligrams per kilogram
ND = non-detect result
OC = organic carbon
PAHs = polycyclic aromatic hydrocarbons
RDL = Reporting Limit
SD = standard deviation

**Attachment A-2**

**Barbee Mill Surface Sediment Data for COPC Screening – Metals, PAHs, Conventional Analytes**

| Analyte | Unit | AN-BM-3<br>10/29/2002<br>AN-BM-3_37558<br>0 - 10 cm | AN-BM-4<br>10/29/2002<br>AN-BM-4_37558<br>0 - 10 cm | AN-BM-5<br>10/29/2002<br>AN-BM-5_37558<br>0 - 10 cm | AN-BM-8<br>10/29/2002<br>AN-BM-8_37558<br>0 - 10 cm | BMPD-1<br>10/29/2002<br>BMPD-1_37558<br>0 - 10 cm | BMPD-2<br>10/29/2002<br>BMPD-2_37558<br>0 - 10 cm | BMPD-6<br>10/29/2002<br>BMPD-6_37558<br>0 - 10 cm | BMPD-7<br>10/29/2002<br>BMPD-7_37558<br>0 - 10 cm | BMPD-9<br>10/29/2002<br>BMPD-9_37558<br>0 - 10 cm |
|---|---|---|---|---|---|---|---|---|---|---|
| **Conventionals** | | | | | | | | | | |
| Wood Waste | % | 60 | 60 | 20 | 35 | < 5.0 U | 35 | < 5.0 U | 10 | 10 |
| Total Organic Carbon | % | 15.3 | 16.8 | 10.1 | 13.8 | 6.3 | 13 | 5.8 | 4.9 | 5.7 |
| **Metals** | | | | | | | | | | |
| Antimony | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Beryllium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chromium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nickel | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | mg/kg | 158 | 166 | 145 | 155 | -- | -- | -- | -- | -- |
| **PAHs** | | | | | | | | | | |
| 2-Methylnaphthalene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benz(a)anthracene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total HPAHs | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total LPAHs | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total PAHs | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | mg/kg-OC | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | mg/kg-OC | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Attachment A-2**

**Barbee Mill Surface Sediment Data for COPC Screening – Metals, PAHs, Conventional Analytes**

| Analyte | BMPD-10<br>10/29/2002<br>BMPD-10_37558<br>0 - 10 cm | BMPD-11<br>10/29/2002<br>BMPD-11_37558<br>0 - 10 cm | BMPD-12<br>10/29/2002<br>BMPD-12_37558<br>0 - 10 cm | BMPD-13<br>10/29/2002<br>BMPD-13_37558<br>0 - 10 cm | BMPD-14<br>10/29/2002<br>BMPD-14_37558<br>0 - 10 cm | BMPD-15<br>08/21/2002<br>BMPD-15_37489<br>0 - 10 cm | BMPD-16<br>08/21/2002<br>BMPD-16_37489<br>0 - 10 cm | BMPD-19<br>08/21/2002<br>BMPD-19_37489<br>0 - 10 cm | BMPD-20<br>08/21/2002<br>BMPD-20_37489<br>0 - 10 cm | BMPD-21<br>08/21/2002<br>BMPD-21_37489<br>0 - 10 cm | BMPD-22<br>10/29/2002<br>BMPD-22_37558<br>0 - 10 cm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Conventionals** | | | | | | | | | | | |
| Wood Waste | 10 | 5 | 25 | 25 | 10 | < 5.0 U | < 5.0 U | < 5.0 U | 15 | < 5.0 U | 25 |
| Total Organic Carbon | 6.4 | 3.5 | 5 | 7.3 | 6 | 5.5 | 2.3 | 6.2 | 7.7 | 4.1 | 7.3 |
| **Metals** | | | | | | | | | | | |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chromium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **PAHs** | | | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benz(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total HPAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total LPAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total PAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Attachment A-2**

**Barbee Mill Surface Sediment Data for COPC Screening – Metals, PAHs, Conventional Analytes**

| Analyte | BMPD-23 | NS01-C1 | NS-01-SS | NS-02-SS | VB-1 | VB-2 | VB-5 | WD-01 | WD-01-SS | WD-02 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 10/29/2002 | 09/01/2009 | 09/01/2009 | 09/01/2009 | 01/24/1997 | 01/24/1997 | 01/24/1997 | 09/01/2009 | 09/01/2009 | 09/01/2009 |
| | BMPD-23_37558 | NS01-C1-0-10 | NS-01-SS-0-10 | NS-02-SS-0-10 | VB-1_35454 | VB-2-0-10 | VB-5_35454 | WD-01-0-10 | WD-01-SS-0-10 | WD-02-0-10 |
| | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 35 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm |
| **Conventionals** | | | | | | | | | | |
| Wood Waste | < 5.0 U | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Organic Carbon | 5.6 | -- | -- | -- | 7.4 | 5 | 2.7 | -- | -- | -- |
| **Metals** | | | | | | | | | | |
| Antimony | -- | -- | -- | -- | < 20 UJ | < 20 UJ | < 7.0 UJ | -- | -- | -- |
| Arsenic | -- | 7.4 | < 20 U | < 20 U | < 20 U | < 20 U | < 7.0 U | 16 | < 8.0 U | 3.2 |
| Beryllium | -- | -- | -- | -- | < 0.30 U | < 0.40 U | 0.2 | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | < 0.70 U | < 0.80 U | < 0.30 U | -- | -- | -- |
| Chromium | -- | -- | -- | -- | 34 | 36 | 24.3 | -- | -- | -- |
| Copper | -- | -- | -- | -- | 27.3 | 36.1 | 12.5 | -- | -- | -- |
| Lead | -- | -- | -- | -- | 27 | 46 | 10 | -- | -- | -- |
| Mercury | -- | -- | -- | -- | < 0.10 U | < 0.20 U | < 0.070 U | -- | -- | -- |
| Nickel | -- | -- | -- | -- | 28 | 31 | 18 | -- | -- | -- |
| Selenium | -- | -- | -- | -- | < 20 U | < 20 U | < 7.0 U | -- | -- | -- |
| Silver | -- | -- | -- | -- | < 1.0 U | < 1.0 U | < 0.40 U | -- | -- | -- |
| Thallium | -- | -- | -- | -- | < 20 U | < 20 U | < 7.0 U | -- | -- | -- |
| Zinc | -- | -- | -- | -- | 75 | 142 | 34 | -- | -- | -- |
| **PAHs** | | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Acenaphthylene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Benz(a)anthracene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | < 220 U | < 240 U | 210 | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | < 220 U | < 240 U | 160 | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | < 220 U | < 240 U | 190 | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | < 220 U | < 240 U | 120 | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | < 220 U | < 240 U | 130 | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | < 220 U | < 240 U | 140 | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | < 220 U | < 240 U | < 99 U | -- | -- | -- |
| Total HPAHs | -- | -- | -- | -- | < 1.1 U | < 1.2 U | 1.148 | -- | -- | -- |
| Total LPAHs | -- | -- | -- | -- | < 0.66 U | < 0.72 U | < 0.297 U | -- | -- | -- |
| Total PAHs | -- | -- | -- | -- | < 1.9 U | < 2.0 U | 1.5 | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) | -- | -- | -- | -- | < 0.22 U | < 0.24 U | 0.253 | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | -- | -- | -- | -- | < 3.0 U | < 5.0 U | 9.38 | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | -- | -- | -- | -- | < 0.166 U | < 0.181 U | 0.263 | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | -- | -- | -- | -- | < 2.24 U | < 3.62 U | 9.74 | -- | -- | -- |

**General Notes:**

1. Includes all applicable data that represents the most current surface sediment conditions post-2002 interim actions.
2. Results not detected above Reporting Limits are shown as < RL and U flagged.

**Acronyms and Abbreviations:**

µg/kg = micrograms per kilogram
cPAHs TEQ = carcinogenic PAH Toxicity Equivalency Quotients
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
cm = centimeters
mg/kg = milligrams per kilogram
ND = non-detect results
PAHs = polycyclic aromatic hydrocarbons

**Attachment A-3**
**All Historical Sediment Data**

| Analyte | Unit | AN-BM-1 | AN-BM-2 | AN-BM-3 | AN-BM-4 | AN-BM-5 | AN-BM-6 | AN-BM-7 | AN-BM-8 | AN-BM-9 | AN-BM-10 | AN-BM-11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 | 10/29/2002 |
| | | AN-BM-1_37558 | AN-BM-2_37558 | AN-BM-3_37558 | AN-BM-4_37558 | AN-BM-5_37558 | AN-BM-6_37558 | AN-BM-7_37558 | AN-BM-8_37558 | AN-BM-9_37558 | AN-BM-10_37558 | AN-BM-11_37558 |
| | | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 cm | 0 - 10 cm | 0 - 10 cm | 0 cm | 0 - 5 cm | 0 - 10 cm |
| | Removed during 2002 dredging? | Yes | Yes | No | No | No | Yes | Yes | No | Yes | Yes | Yes |
| **Conventionals** | | | | | | | | | | | | |
| Wood Waste | % | 30 | 80 | 60 | 60 | 20 | 80 | 70 | 35 | 80 | 90 | 10 |
| Total Organic Carbon | % | 20.9 | 12.6 | 15.3 | 16.8 | 10.1 | -- | 18.1 | 13.8 | -- | 46 | 18.8 |
| **Metals** | | | | | | | | | | | | |
| Antimony | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Barium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Beryllium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chromium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nickel | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | mg/kg | 123 | 55.3 | 158 | 166 | 145 | -- | 194 | 155 | -- | 81.7 | 150 |
| **PAHs** | | | | | | | | | | | | |
| 2-Methylnaphthalene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benz(a)anthracene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | µg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total HPAHs | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total LPAHs | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total PAHs | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | mg/kg-OC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | mg/kg | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | mg/kg-OC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Attachment A-3**
**All Historical Sediment Data**

| Analyte | AN-BM-12 | AN-BM-13 | AN-BM-14 | AN-BM-15 | AN-BM-16 | AN-BM-17 | AN-BM-18 | AN-BM-19 | AN-BM-20 | AN-BM-21 | BA-1 | BA-2 | BA-3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10/29/2002 | 10/29/2002 | 10/29/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/25/1999 | 08/30/1999 | 08/31/1999 |
| | AN-BM-12_37558 | AN-BM-13_37558 | AN-BM-14_37558 | AN-BM-15_37489 | AN-BM-16_37489 | AN-BM-17_37489 | AN-BM-18_37489 | AN-BM-19_37489 | AN-BM-20_37489 | AN-BM-21_37489 | BA-1 | BA-2 | BA-3 |
| | 0 cm | 0 cm | 0 - 10 cm | 0 cm | 0 cm | 0 cm | 0 - 10 cm | 0 cm | 0 - 10 cm | 0 - 10 cm | - | - | - |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Conventionals** | | | | | | | | | | | | | |
| Wood Waste | 80 | 90 | 60 | 80 | 80 | 80 | 25 | 80 | 50 | 30 | -- | -- | -- |
| Total Organic Carbon | -- | -- | 18.7 | -- | -- | -- | 12.4 | -- | 21.3 | 20 | 9.6 | -- | -- |
| **Metals** | | | | | | | | | | | | | |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.4 | < 10 U | < 20 U |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 44 | 80.1 | 30 |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 1.0 U | < 0.50 U | < 1.0 U |
| Chromium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 18 | 43 | 15 |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 15 | 26 | 15 |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.1 | < 0.10 U | < 0.20 U |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 1.0 U | < 10 U | < 20 U |
| Silver | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 1.0 U | < 0.70 U | < 1.0 U |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | 201 | -- | -- | -- | 88.1 | -- | 104 | 93.4 | -- | -- | -- |
| **PAHs** | | | | | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Acenaphthylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Benz(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4000 U | < 530 U | < 410 U |
| Total HPAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4.0 U | < 0.53 U | < 0.41 U |
| Total LPAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4.0 U | < 0.53 U | < 0.41 U |
| Total PAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4.0 U | < 0.53 U | < 0.41 U |
| Total cPAHs TEQ (ND = 0) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 4.0 U | < 0.53 U | < 0.41 U |
| Total cPAHs TEQ (ND = 0) - OC Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 41.7 U | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 3.02 U | < 0.40 U | < 0.31 U |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | < 3.02 U | -- | -- |

**Attachment A-3**
**All Historical Sediment Data**

| Analyte | BA-4 | BA-5 | BA-6 | BA-7 | BA-8 | BA-9 | BA-10 | BA-11 | BA-12 | BA-13 | BA-SED-01 | BA-SED-02 | BA-SED-03 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 08/31/1999 | 09/01/1999 | 09/01/1999 | 09/03/1999 | 09/03/1999 | 09/08/1999 | 09/10/1999 | 10/24/1999 | 11/01/1999 | 11/02/1999 | 09/01/1999 | 09/01/1999 | 09/01/1999 |
| | BA-4 | BA-5 | BA-6 | BA-7 | BA-8 | BA-9 | BA-10 | BA-11 | BA-12 | BA-13 | BA-SED-01_36404 | BA-SED-02_36404 | BA-SED-03_36404 |
| | - | - | - | - | - | - | - | - | - | - | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Wood Waste | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5 | -- | -- |
| Total Organic Carbon | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | < 10 U | < 10 U | < 7.0 U | < 8.0 U | < 10 U | < 8.0 U | < 9.0 U | < 9.0 U | < 8.0 U | 20 | < 10 U | < 10 U | < 10 U |
| Barium | 44.7 | 56.7 | 56.9 | 64.9 | 63.5 | 35.2 | 54.1 | 54.4 | 45.8 | 124 | -- | -- | -- |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | < 0.40 U | < 0.50 U | 0.3 | < 3.0 U | 0.5 | < 0.30 U | < 0.40 U | < 0.30 U | < 0.30 U | 1.2 | < 1.0 U | < 1.0 U | < 1.0 U |
| Chromium | 21.3 | 27 | 26.5 | 65 | 21 | 17.6 | 26 | 25.2 | 25.8 | 67 | 44 | 51 | 40 |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | 8 | 15 | 11 | 17 | 21 | 5 | 10 | 13 | 9 | 47 | 40 | 37 | 50 |
| Mercury | < 0.090 U | < 0.10 U | < 0.050 U | < 0.060 U | < 0.10 U | < 0.060 U | < 0.070 U | < 0.070 U | < 0.080 U | < 0.10 U | < 0.10 U | < 0.10 U | < 0.10 U |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | < 10 U | < 10 U | < 7.0 U | < 8.0 U | < 10 U | < 8.0 U | < 9.0 U | < 9.0 U | < 8.0 U | < 10 U | -- | -- | -- |
| Silver | < 0.60 U | < 0.70 U | < 4.0 U | < 0.50 U | < 0.80 U | < 0.50 U | < 0.50 U | < 0.50 U | < 0.50 U | 1.5 | < 1.0 U | < 1.0 U | 2 |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | < 110 U | < 1400 U | -- | -- | -- |
| Acenaphthene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | < 110 U | < 1400 U | -- | -- | -- |
| Acenaphthylene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | < 110 U | < 1400 U | -- | -- | -- |
| Anthracene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | 39 J | < 1400 U | -- | -- | -- |
| Benz(a)anthracene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | 76 J | < 1400 U | -- | -- | -- |
| Benzo(a)pyrene | 290 | 1300 | < 100 U | < 120 U | < 130 U | < 260 U | 150 | 140 J | 270 | 1700 | -- | -- | -- |
| Benzo(b)fluoranthene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | < 110 U | < 1400 U | -- | -- | -- |
| Benzo(g,h,i)perylene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | 69 J | < 1400 U | -- | -- | -- |
| Benzo(k)fluoranthene | < 280 U | 570 | < 100 U | < 120 U | < 130 U | < 260 U | 120 J | < 230 U | 140 | 1500 | -- | -- | -- |
| Chrysene | < 280 U | 630 | < 100 U | 150 | 380 | < 260 U | 130 | 130 J | 88 J | < 1400 U | -- | -- | -- |
| Dibenzo(a,h)anthracene | < 280 U | 220 | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | 84 J | 80 J | < 1400 U | -- | -- | -- |
| Fluoranthene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | 120 J | 110 J | < 1400 U | -- | -- | -- |
| Fluorene | < 280 U | 250 | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | 130 J | 440 | < 1400 U | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | 93 J | 390 | < 1400 U | -- | -- | -- |
| Naphthalene | < 280 U | 270 | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | 120 J | 75 J | < 1400 U | -- | -- | -- |
| Phenanthrene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | < 110 U | < 1400 U | -- | -- | -- |
| Pyrene | < 280 U | < 160 U | < 100 U | < 120 U | < 130 U | < 260 U | < 120 U | < 230 U | < 110 U | < 1400 U | -- | -- | -- |
| Total HPAHs | 1.55 | 3.07 | < 0.10 U | 0.69 | 0.965 | < 0.26 U | 0.76 | 1.16 J | 1.64 J | 8 | 0.9 | 3.3 | 3.6 |
| Total LPAHs | < 0.28 U | 0.97 | < 0.10 U | < 0.12 U | < 0.13 U | < 0.26 U | 0.42 J | < 0.23 U | 0.413 J | 5 | 0.3 | 0.3 | < 0.10 U |
| Total PAHs | 2.53 | 4.12 | < 0.10 U | 1.11 | 1.42 | < 0.26 U | 1.24 J | 1.97 J | 2.11 J | 13.7 | 1.2 | 3.5 | 3.6 |
| Total cPAHs TEQ (ND = 0) | < 0.28 U | 0.0497 | < 0.10 U | < 0.12 U | < 0.13 U | < 0.26 U | < 0.12 U | 0.152 J | 0.202 J | < 1.4 U | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | < 0.211 U | 0.154 | < 0.0755 U | < 0.0906 U | < 0.0982 U | < 0.196 U | < 0.0906 U | 0.175 J | 0.213 J | < 1.06 U | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Attachment A-3**
**All Historical Sediment Data**

| Analyte | BA-SED-04<br>09/01/1999<br>BA-SED-04_36404<br>0 - 10 cm<br>Yes | BA-SED-05<br>09/01/1999<br>BA-SED-05_36404<br>0 - 10 cm<br>Yes | BA-SED-06<br>09/01/1999<br>BA-SED-06_36404<br>0 - 10 cm<br>Yes | BMPD-1<br>10/29/2002<br>BMPD-1_37558<br>0 - 10 cm<br>No | BMPD-2<br>10/29/2002<br>BMPD-2_37558<br>0 - 10 cm<br>No | BMPD-6<br>10/29/2002<br>BMPD-6_37558<br>0 - 10 cm<br>No | BMPD-7<br>10/29/2002<br>BMPD-7_37558<br>0 - 10 cm<br>No | BMPD-9<br>10/29/2002<br>BMPD-9_37558<br>0 - 10 cm<br>No | BMPD-10<br>10/29/2002<br>BMPD-10_37558<br>0 - 10 cm<br>No | BMPD-11<br>10/29/2002<br>BMPD-11_37558<br>0 - 10 cm<br>No | BMPD-12<br>10/29/2002<br>BMPD-12_37558<br>0 - 10 cm<br>No | BMPD-13<br>10/29/2002<br>BMPD-13_37558<br>0 - 10 cm<br>No | BMPD-14<br>10/29/2002<br>BMPD-14_37558<br>0 - 10 cm<br>No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Conventionals** | | | | | | | | | | | | | |
| Wood Waste | -- | 100 | -- | < 5.0 U | 35 | < 5.0 U | 10 | 10 | 10 | 5 | 25 | 25 | 10 |
| Total Organic Carbon | -- | -- | -- | 6.3 | 13 | 5.8 | 4.9 | 5.7 | 6.4 | 3.5 | 5 | 7.3 | 6 |
| **Metals** | | | | | | | | | | | | | |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | < 10 U | < 10 U | < 10 U | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | < 1.0 U | < 1.0 U | < 1.0 U | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chromium | 39 | 43 | 44 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | 24 | 34 | 37 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | < 0.10 U | 0.4 | < 0.10 U | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | 1 | 1.2 | 1.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **PAHs** | | | | | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benz(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total HPAHs | 1.8 | 0.6 | 0.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total LPAHs | < 0.10 U | < 0.10 U | < 0.10 U | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total PAHs | 1.8 | 0.6 | 0.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Attachment A-3**
**All Historical Sediment Data**

| Analyte | BMPD-15 | BMPD-16 | BMPD-19 | BMPD-20 | BMPD-21 | BMPD-22 | BMPD-23 | M. | N. | NS01-C1 | NS-01-SS | NS-02-SS | S. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 08/21/2002 | 10/29/2002 | 10/29/2002 | 09/01/1999 | 09/01/1999 | 09/01/2009 | 09/01/2009 | 09/01/2009 | 09/01/1999 |
| | BMPD-15_37489 | BMPD-16_37489 | BMPD-19_37489 | BMPD-20_37489 | BMPD-21_37489 | BMPD-22_37558 | BMPD-23_37558 | M. OUTFALL_36404 | N. OUTFALL_36404 | NS01-C1-0-10 | NS-01-SS-0-10 | NS-02-SS-0-10 | S. OUTFALL_36404 |
| | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm |
| | No | No | No | No | No | No | No | Yes | Yes | No | No | No | Yes |
| **Conventionals** | | | | | | | | | | | | | |
| Wood Waste | < 5.0 U | < 5.0 U | < 5.0 U | 15 | < 5.0 U | 25 | < 5.0 U | -- | -- | -- | -- | -- | -- |
| Total Organic Carbon | 5.5 | 2.3 | 6.2 | 7.7 | 4.1 | 7.3 | 5.6 | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | < 10 U | 30 | 7.4 | < 20 U | < 20 U | < 10 U |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | < 1.0 U | < 1.0 U | -- | -- | -- | < 1.0 U |
| Chromium | -- | -- | -- | -- | -- | -- | -- | 36 | 39 | -- | -- | -- | 14 |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | 13 | 18 | -- | -- | -- | 16 |
| Mercury | -- | -- | -- | -- | -- | -- | -- | < 0.10 U | < 0.10 U | -- | -- | -- | < 0.10 U |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Silver | -- | -- | -- | -- | -- | -- | -- | 1.1 | 1 | -- | -- | -- | < 1.0 U |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **PAHs** | | | | | | | | | | | | | |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benz(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total HPAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total LPAHs | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total PAHs | -- | -- | -- | -- | -- | -- | -- | 0.8 | 2.8 | -- | -- | -- | < 0.10 U |
| Total cPAHs TEQ (ND = 0) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**Attachment A-3**
**All Historical Sediment Data**

| Analyte | VB-1 | VB-2 | VB-3 | VB-4 | VB-5 | VB-8 | WD-01 | WD-01-SS | WD-02 |
|---|---|---|---|---|---|---|---|---|---|
| | 01/24/1997 | 01/24/1997 | 01/24/1997 | 01/24/1997 | 01/24/1997 | 01/24/1997 | 09/01/2009 | 09/01/2009 | 09/01/2009 |
| | VB-1_35454 | VB-2-0-10 | VB-3-0-9 | VB-4_35454 | VB-5_35454 | VB-8_35454 | WD-01-0-10 | WD-01-SS-0-10 | WD-02-0-10 |
| | 0 - 35 cm | 0 - 10 cm | 0 - 9 cm | 0 - 10 cm | 0 - 10 cm | 0 - 45 cm | 0 - 10 cm | 0 - 10 cm | 0 - 10 cm |
| | No | No | Yes | Yes | No | Yes | No | No | No |
| **Conventionals** | | | | | | | | | |
| Wood Waste | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total Organic Carbon | 7.4 | 5 | 24 | 5.1 | 2.7 | 14 | -- | -- | -- |
| **Metals** | | | | | | | | | |
| Antimony | < 20 UJ | < 20 UJ | < 20 UJ | < 20 UJ | < 7.0 UJ | < 10 UJ | -- | -- | -- |
| Arsenic | < 20 U | < 20 U | < 20 U | < 20 U | < 7.0 U | < 10 U | 16 | < 8.0 U | 3.2 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Beryllium | < 0.30 U | < 0.40 U | < 0.30 U | < 0.30 U | 0.2 | < 0.30 U | -- | -- | -- |
| Cadmium | < 0.70 U | < 0.80 U | < 0.60 U | 2.7 | < 0.30 U | < 0.60 U | -- | -- | -- |
| Chromium | 34 | 36 | 10 | 43 | 24.3 | 19 | -- | -- | -- |
| Copper | 27.3 | 36.1 | 11.9 | 33.7 | 12.5 | 19.5 | -- | -- | -- |
| Lead | 27 | 46 | 13 | 43 | 10 | 13 | -- | -- | -- |
| Mercury | < 0.10 U | < 0.20 U | < 0.10 U | < 0.10 U | < 0.070 U | < 0.10 U | -- | -- | -- |
| Nickel | 28 | 31 | 10 | 32 | 18 | 17 | -- | -- | -- |
| Selenium | < 20 U | < 20 U | < 20 U | < 20 U | < 7.0 U | < 10 U | -- | -- | -- |
| Silver | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 0.40 U | < 0.80 U | -- | -- | -- |
| Thallium | < 20 U | < 20 U | < 20 U | < 20 U | < 7.0 U | < 10 U | -- | -- | -- |
| Zinc | 75 | 142 | 55 | 1580 | 34 | 75 | -- | -- | -- |
| **PAHs** | | | | | | | | | |
| 2-Methylnaphthalene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | < 200 U | -- | -- | -- |
| Acenaphthene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | < 200 U | -- | -- | -- |
| Acenaphthylene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | < 200 U | -- | -- | -- |
| Anthracene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | 470 | -- | -- | -- |
| Benz(a)anthracene | < 220 U | < 240 U | < 220 U | 280 | < 99 U | 850 | -- | -- | -- |
| Benzo(a)pyrene | < 220 U | < 240 U | < 220 U | 730 | 210 | 900 | -- | -- | -- |
| Benzo(b)fluoranthene | < 220 U | < 240 U | < 220 U | 700 | 160 | 470 | -- | -- | -- |
| Benzo(g,h,i)perylene | < 220 U | < 240 U | < 220 U | 690 | 190 | 560 | -- | -- | -- |
| Benzo(k)fluoranthene | < 220 U | < 240 U | < 220 U | 410 | 120 | 560 | -- | -- | -- |
| Chrysene | < 220 U | < 240 U | < 220 U | 510 | 130 | 760 | -- | -- | -- |
| Dibenzo(a,h)anthracene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | < 200 U | -- | -- | -- |
| Fluoranthene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | 780 | -- | -- | -- |
| Fluorene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | < 200 U | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | < 220 U | < 240 U | < 220 U | 500 | 140 | 480 | -- | -- | -- |
| Naphthalene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | 260 | -- | -- | -- |
| Phenanthrene | < 220 U | < 240 U | < 220 U | < 250 U | < 99 U | 1400 | -- | -- | -- |
| Pyrene | < 220 U | < 240 U | < 220 U | 530 | < 99 U | 2400 | -- | -- | -- |
| Total HPAHs | < 1.1 U | < 1.2 U | < 1.1 U | 4.6 | 1.148 | 7.86 | -- | -- | -- |
| Total LPAHs | < 0.66 U | < 0.72 U | < 0.66 U | < 0.75 U | < 0.297 U | 2.43 | -- | -- | -- |
| Total PAHs | < 1.9 U | < 2.0 U | < 1.9 U | 5.5 | 1.5 | 10.4 | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) | < 0.22 U | < 0.24 U | < 0.22 U | 0.924 | 0.253 | 1.14 | -- | -- | -- |
| Total cPAHs TEQ (ND = 0) - OC Normalized | < 3.0 U | < 5.0 U | < 1.0 U | 18.1 | 9.38 | 8.17 | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2 RDL) | < 0.166 U | < 0.181 U | < 0.166 U | **0.937** | **0.263** | **1.15** | -- | -- | -- |
| Total cPAHs TEQ (ND = 1/2) - Organic Carbon Normalized | < 2.24 U | < 3.62 U | < 0.692 U | 18.4 | 9.74 | 8.21 | -- | -- | -- |

**Attachment A-3**
**All Historical Sediment Data**

**General Notes:**

Results not detected above Reporting Limits are shown as < RL and U flagged.
**Acronyms and Abbreviations:**
µg/kg = micrograms per kilogram
cm = centimeters
cPAHs TEQ = carcinogenic PAH Toxicity Equivalency Quotients
HPAHs = high molecular weight polycyclic aromatic hydrocarbons
LPAHs = low molecular weight polycyclic aromatic hydrocarbons
mg/kg = milligrams per kilogram
ND = non-detect results
PAHs = polycyclic aromatic hydrocarbons
-- = Not analyzed

# ATTACHMENT B

# Sampling and Analysis Plan and Quality Assurance Project Plan

Geosyntec consultants

engineers | scientists | innovators

# SEDIMENT REMEDIAL INVESTIGATION

# SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN

## BARBEE MILL SITE

*Prepared for*

**Barbee Mill Company, Inc.**
P.O. Box 359
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July 2021

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Figure 1: Barbee Mill Upland Site Location
Figure 2: Proposed Surface Sediment and Porewater Sample Locations
Figure 3: Porewater Sampling Device

## LIST OF ATTACHMENTS

Attachment B-1: Field Forms and Field Procedures

- Chain of Custody Form
- Sediment Sampling Field Form
- Jar Sheen Test Operating Procedure

Attachment B-2: Laboratory Standard Operating Procedures (provided upon request)

- EPA 6020B - Metals Analysis – NexIon ICP-MS
- EPA 8260E-SIM - Analysis of Polycyclic Aromatic Hydrocarbons – Gas Chromatography-Mass Spectrometry Selective Ion Monitoring (SIM)
- PSEP Method - Particle Size Distribution by Sieve
- EPA 9060 - Total Organic Carbon Analysis of Soil and Sediment

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| %R | percent recovery |
| °C | degrees Celsius |
| AO | Agreed Order |
| ARI | Analytical Resources, Incorporated |
| ASTM | American Society of Testing Materials |
| BNSF | Burlington Northern Santa Fe |
| cm | centimeters |
| COPCs | contaminants of potential concern |
| DGPS | differential global positioning system |
| DI | deionized |
| DO | dissolved oxygen |
| DQIs | data quality indicators |
| DQO | data quality objectives |
| Ecology | Washington Department of Ecology |
| EIM | Ecology Information Management |
| EPA | United States Environmental Protection Agency |
| Geosyntec | Geosyntec Consultants, Inc. |
| GPS | global positioning system |
| HASP | Health and Safety Plan |
| IDW | investigation-derived waste |
| LCS/LCSD | laboratory control sample/laboratory control sample duplicates |
| LDPE | low-density polyethylene |
| LPM | Laboratory Project Manager |
| MDL | method detection limit |
| MS/MSD | matrix spike/matrix spike duplicate |
| NAD83 | North American Datum 83 |
| PAHs | polycyclic aromatic hydrocarbons |
| PARCCS | precision, accuracy, representativeness, completeness, comparability, and sensitivity |
| PQL | project quantitation limit |

| | |
|---|---|
| Property | the Barbee Mill Property |
| PSEP | Puget Sound Estuary Program |
| QA/QC | quality assurance/quality control |
| QAPP | Quality Assurance Project Plan |
| RI | remedial investigation |
| RL | reporting limit |
| RPD | relative percentage difference |
| SAP | Sampling and Analysis Plan |
| SCO | Sediment Cleanup Objective |
| SCUM | Sediment Cleanup User's Manual |
| SIM | select ion monitoring |
| Site | Former Barbee Mill Company Site |
| SMS | Sediment Management Standards |
| SOP | standard operating procedures |
| SRI | Sediment Remedial Investigation |
| TOC | total organic carbon |
| SRI Work Plan | Sediment Remedial Investigation Work Plan |
| RI Work Plan | Remedial Investigation Work Plan |
| USEPA | United States Environmental Protection Agency |

# 1. INTRODUCTION

The Barbee Mill Co., Inc. (Barbee Mill) has completed a number of remedial actions to address soil, groundwater, and sediment contamination at the Barbee Mill Site (Site) located in Renton, Washington. Currently, Barbee Mill is working to complete a remedial investigation (RI) under an agreed order (AO) with the Washington State Department of Ecology (Ecology). Barbee Mill entered into Agreed Order No. DE 5396 with Ecology effective December 1, 2009, followed by a first amendment effective on December 16, 2010, and a second amendment effective on May 30, 2012 (collectively, AO). In May 2019, Aspect Consulting (Aspect) submitted a revised Agency Review Draft RI Report (Draft RI Report; Aspect, 2019) to Ecology. The Draft RI Report, which was an update to the 2012 Agency Review Draft RI Report, included the results of a data gap investigation to further delineate the extent of elevated arsenic in soil, sediment, and groundwater.

This Sampling and Analysis Plan (SAP), prepared on behalf of Barbee Mill Co., Inc., describes procedures for collecting and analyzing sediment samples in Lake Washington, as outlined in the Sediment Remedial Investigation Work Plan (SRI Work Plan), and presents the methodologies for surface sediment sampling, laboratory analyses, quality assurance (QA), reporting, and data management. This SAP, which includes a Quality Assurance Project Plan (QAPP), was prepared in accordance with the Sediment Management Standards (SMS) for freshwater sediments under Chapter 173-204 WAC and Ecology's Sediment Cleanup User's Manual (SCUM). The QAPP was also prepared in accordance with United States Environmental Protection Agency (EPA) guidance (EPA, 2002b). The SAP and QAPP together provide the necessary guidance to complete the proposed activities. A Health and Safety Plan (HASP) has been prepared and is included in Appendix D to the Remedial Investigation Work Plan prepared by Aspect for the upland portion of the Site (RI Work Plan). An Inadvertent Discovery Plan has also been prepared and is also included in the RI Work Plan as Appendix E.

## 1.1 Study Objectives

This SAP aims to address current data gaps, delineate the final sediment boundary, and further evaluate Site conditions. Specific study objectives of this SAP are as follows, and data quality objectives (DQOs) are presented in Section 4.2 of the SRI Work Plan:

1. Refine the preliminary sediment boundary;
2. Evaluate current surface sediment conditions within the preliminary sediment boundary;
3. Determine if elevated arsenic and manganese in groundwater are impacting surface water/sediment; and
4. Evaluate nearshore sediments for human health direct contact exposures.

## 1.2 Site Description and Background

The Site includes portions of the Barbee Mill Property, the adjacent Quendall Terminals property, and the adjacent Lake Washington sediments. The Barbee Mill Property (Property), located at

4101 Lake Washington Blvd N in Renton, Washington, is bounded by the Quendall Terminals to the north, the former Burlington Northern Santa Fe (BNSF) Railroad right-of-way to the east and south (now owned by King County), and state-owned land in Lake Washington to the west. May Creek runs east to west through the Property and discharges into Lake Washington. A general Site location map is provided in Figure 1.

The sawmill began operations in 1959 and operated on the portion of the Site north of May Creek until the early 2000s. Contaminants of potential concern (COPCs) in the adjacent sediments in Lake Washington were identified as arsenic, zinc, total organic carbon (TOC), and wood waste, based on historical exceedances of screening levels, including the SMS and Site-specific cleanup levels developed for TOC and wood waste, based on toxicity testing at the adjacent Quendall Terminals Site (Aspect Consulting, 2019). Potential contamination of sediments was first addressed in 1996 and 2002 when the Site underwent a series of removal actions, and wood debris and contaminated sediments were dredged. In 2005, a shoreline habitat restoration was performed. In 2006, Barbee Mill excavated approximately 30,000 cubic yards of arsenic-contaminated soil, 230 cubic yards of petroleum-contaminated soil, and 160 cubic yards of pentachlorophenol-contaminated soil. Barbee Mill also installed a Passive Attenuation Zone to treat residual arsenic in groundwater and a groundwater treatment system. The Property was then redeveloped to include residential use and recreational uses of Lake Washington, including boating, fishing, and swimming. The shoreline area at the Site has minimal exposed area for beach play. All remedial actions were conducted under Ecology's Voluntary Cleanup Program except for operation of the pump and treat system between 2009 and 2011. This was performed by Barbee Mill under an agreed order with Ecology.

## 1.3 Project Team

Jeremy Porter (Aspect Consulting) is the project coordinator for Barbee Mill under the AO and is the lead consultant for the upland RI. In coordination with Aspect, Geosyntec Consultants, Inc. (Geosyntec) is the lead consultant for the SRI. Ms. Anne Fitzpatrick (Geosyntec) is the senior technical lead for the SRI (Sediment Lead) and is responsible for providing technical oversight on SRI Work Plan development, all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. Ms. Fitzpatrick is supported by the project risk assessor, Ms. Jennifer Arblaster, and the project chemist, Ms. Julia Caprio. Ms. Arblaster will be the day-to-day lead on sediment investigation activities and data analysis. Ms. Caprio will be responsible for coordination with laboratories regarding sample volumes, logistics, schedule, detection limits and matrix interferences, and ensuring overall data quality. Data validation will be performed by Geosyntec's chemistry group located in Knoxville, Tennessee, led by Ms. Caprio. The field team will be led by the project geologist, Mr. Dustin Jensen. Sediment sampling and vessel support will be provided by Research Support Services, under the direction of Geosyntec field staff. Eric Parker is the point of contact for Research Support Services. Analytical Resources, Incorporated (ARI) Laboratories will perform the analyses for sediment samples; the chemistry laboratory point of contact is Kelly Bottem. Eurofins Test

America will perform the analysis for porewater samples; the point of contact is Carrie Gamber. Contact information for the Project Team is provided in Table 1.

## 1.4 Sediment Characterization Scope of Work

The scope of work includes collection of surface sediment samples for metals, polycyclic aromatic hydrocarbons (PAHs), grain size, and TOC. Additionally, two locations will be targeted for porewater sampling, with the purpose to evaluate arsenic and manganese concentrations in porewater. Co-located sediment grab samples will be collected at porewater sampling locations for physical and chemical analyses (grain size, TOC, and concentrations of arsenic and manganese). Sampling and analytical methods are described in Sections 2 and 3, respectively. Thirty-six surface sediment samples (0 to 10 or 0 to 45 centimeters [cm]) will be collected using a hydraulic power grab sampler or collected by hand in the nearshore area, and two porewater samples will be collected using a passive sampling approach, as described in Section 2.4. Sampling locations were determined based on investigation DQOs and include:

- Fifteen sediment grab samples within the area of the 2002 interim action distributed in an approximately gridded pattern. Data will be used to evaluate current Site conditions. Four of the proposed sampling locations are co-located with historical sampling stations with elevated reporting limits (RLs) for arsenic or where arsenic was previously detected above the Sediment Cleanup Objective (SCO).
- Sixteen sediment grab samples located on the western edge of the preliminary Sediment boundary to confirm the boundary. Four of the proposed sampling locations are co-located with historical samples with elevated RLs for arsenic.
- Two porewater samples and co-located surface sediment samples (0 to 10 cm) located on the northern and southern edges of the passive attenuation zone to evaluate concentrations of arsenic and manganese in porewater.
- Three deeper surface sediment samples in the nearshore (0 to 45 cm) to evaluate direct contact pathways, as needed. The shoreline substrate will be evaluated for soft sediment, sand, or fine gravel that are appropriate for beach play and clam digging activities, and these areas will be analyzed to evaluate this exposure pathway; large gravel or cobbles will not be sampled.

The sixteen boundary samples (PER-SED-01 to PER-SED-16, Table 2a) will be placed in two transects, with nine samples in the more eastern transect and seven samples in the further west transect. The seven samples on the further west and north transect (PER-SED-10 to PER-SED-16) will be initially archived pending results of the first set of the boundary samples. If the first transect of boundary samples exceed screening levels for Site-related COPC’s, then the archived samples will be analyzed.

# 2. SAMPLE COLLECTION METHODS

This section describes the equipment, nomenclature, locations, surface sediment and porewater sampling methods, field documentation to be implemented during sample collection, decontamination methods, and procedures for disposing of investigation-derived waste (IDW). This section has been prepared in accordance with the Ecology guidance for the development of SAPs (Ecology, 2008).

## 2.1 Sample Nomenclature

Each sediment sample will be assigned a unique alpha-numeric identifier. This identifier will facilitate the identification and tracking of each sample. Proposed sample location IDs, rationale, sample depths, coordinates, and analyses are provided in Table 2a and Table 2b and depicted in Figure 2.

The sample ID is divided into the following designations:

- The first field identifies the sample type and purpose:
  - BM – Samples to define current conditions of "Barbee Mill," including surface sediment (0 to 10 cm) sampling locations and two porewater sampling locations (0 to 10 cm);
  - PER – Samples to refine the preliminary sediment boundary (which are 0 to 10 cm); and
  - NS – Nearshore surface sediment sampling locations (which are 0 to 45 cm).
- The second field identifies the sample type:
  - SED – Surface sediment samples, (10 or 45 cm depths); and
  - PW – Porewater samples.
- The numeric field represents the unique location ID:
  - 01 to 17 for BM samples;
  - 01 to 16 for PER samples; and
  - 01 to 03 for NS samples.

For example, Sample BM-SED-04 is a surface sediment sample collected to define current conditions from Location 04. Field duplicates will be labeled in the same manner as the test sample, but with a "DUP" added after the location number. For example, a field sample with the designation BM-SED-04-DUP is a duplicate surface sediment sample collected within the current Site boundary from Location 04.

## 2.2 Location Control

Sample locations will be recorded using horizontal North American Datum (NAD) 83 (2011) State Plan Coordinate System, Washington North Zone, International Feet. Proposed sample location coordinates are listed in Table 2a. Field crew will attempt to get as close to the proposed locations as possible, while keeping safety a top priority. If it is not possible for the crew to get within 25 feet of the proposed location, then the Sediment Lead will be contacted to determine an alternate location.

A differential global positioning system (DGPS) unit will be used to confirm the horizontal sampling locations to an accuracy of 1 to 2 meters. The DGPS accuracy will be confirmed in the AM and PM of each day at a station with known global positioning system (GPS) coordinates. DGPS-confirmed station locations will be recorded to the nearest whole foot in NAD83 (2011). Sampling times will be recorded electronically.

Vertical control will be established using an onboard fathometer or lead line to measure depth to mudline at sampling locations. The fathometer accuracy will be checked regularly and calibrated when necessary, following American Society of Testing Materials (ASTM) International D6318 Standard Practice for Calibrating a Fathometer Using a Bar Check Method (ASTM, 2014) or other similar practice. Water levels will be recorded to the nearest one tenth of a foot.

## 2.3 Surface Sediment Collection and Processing

All samples will be collected using a hydraulic power grab sampler deployed from a vessel in accordance with Puget Sound Estuary Program (PSEP; 1997) and Ecology (2008) protocols except as noted below. The sampler utilizes a modified hydraulic hinged jaw assembly for sample collection. Upon contact with sediments, the jaws are drawn shut to collect the sample. Samples will be collected in the following manner:

- At the start of the day, the winch cable to the grab sampler will be drawn taut and vertical.
- Vessel will maneuver to proposed sample location. Location of the cable hoist will be measured and recorded by the location control personnel.
- Hydraulic power grab sampler will be decontaminated (see Section 2.7).
- The winch cable to the grab sampler will be inspected to determine if drawn taut and vertical.
- Grab sampler will be deployed at a controlled descent rate:
  - Upon contact with sediment, sampler will be closed to collect the sediment sample to the designed sampler penetration depth.
  - Vessel will record GPS coordinates and depth of water using weighted lead line tape and echo depth sounder in a field notebook upon collection of sediment.

- The sediment sample will be retrieved aboard the vessel and evaluated against the following PSEP acceptability criteria:
  - Grab sampler is not overfilled (i.e., sediment surface is not against the top of sampler);
  - Sediment surface is relatively flat, indicating minimal disturbance or winnowing;
  - Overlying water is present, indicating minimal leakage; and
  - Desired penetration depth is achieved. If the desired penetration depth is not reached after three attempts, then the best sample will be collected (most recovery, most intact).
- Overlying water will be siphoned off using low-density polyethylene (LDPE) tubing or turkey baster-type device.
- Penetration depth and surface conditions will be recorded.
- A stainless-steel spoon or similar device will be used to collect a 0- to 10-cm sediment layer from inside the sampler, taking care not to collect sediment in contact with the sides/surface of the sampler. Based on the quantity of sediment needed for analysis, field staff will determine if two grabs need to be collected and composited to provide enough sediment volume. Sediment samples from 0 to 45 cm will be hand collected from the shoreline area using a stainless-steel shovel or hand auger.
- The collected sediment will be placed in a stainless-steel mixing container. When sufficient sample volume has been collected, the sediment will be homogenized using a stainless-steel spoon until uniform in color and texture.
- Visual soil classification will be recorded on the field form or field notebook and photographs will be taken. Table 3 provides a physical description key for sediment samples following ASTM International D-2488 visual-manual classification methods (ASTM, 2017). Other field descriptors will also be included when possible, including, but not limited to:
  - Grain size;
  - Presence and visually estimated volume of wood waste;
  - Redox depth;
  - Odor and sheen;
  - Debris;
  - Stratification;
  - Methane bubbles/voids; and
  - Presence of biological organisms.

- If sheens are observed, they will be further inspected for type of sheen, presence of natural organic matters, and hydrocarbon content. A jar sheen test will be performed according to the Standard Operating Procedure (SOP, included in Attachment B-2) if required.
- Homogenized sediment will be placed immediately into appropriate pre-labeled sample containers and placed immediately on ice at 4 ± 2 degrees Celsius (°C) for transport to the appropriate laboratory.

## 2.4 Porewater Collection Approach

Porewater samplers will be deployed in duplicate at two locations to determine arsenic and manganese concentrations in porewater. Each peeper will include an array of four peeper vials (two for each side) secured in a peeper frame for deployment in sediment (Figure 3). The approach applied here for porewater sampling is the same general approach as used by Aspect for previous porewater sampling at the Site with slight modifications (Aspect 2007).

Passive porewater samplers (designed for collection of dissolved metals and referred to as peepers) consist of collection devices (vials) equipped with a dialysis membrane that allows the analyte concentrations to reach equilibrium with *in situ* conditions. Peepers will be deployed to a target depth of 10 cm below mudline. The custom-designed peepers for this project consist of four peeper vials in a 2x2 configuration and secured within a 3D-printed high-density polyethylene frame. The peeper design includes weights to secure the devices to the sediment bottom. This particular peeper, designed and built by SiREM laboratory in Guelph Ontario, has been successfully deployed and retrieved at several sediment sites in the last two years, although, as with any *in situ* analysis, there is some potential risk for sampler loss or disturbance over the deployment period. When placed in sediment, the peeper vials sample porewater over the targeted depth interval. Methods applied here are modified from AECOM & Geosyntec (2018).

### 2.4.1 Peeper Preparation

Peeper vials and frames will be prepared by SiREM in Guelph, Ontario, and shipped to Geosyntec's Seattle office for deployment at the Site. The peeper vials will be deoxygenated in nitrogen atmosphere by SiREM. Peeper vials will be placed in deionized (DI) water and bubbled with nitrogen until dissolved oxygen (DO) readings measure 0% or 0 mg/L. The peeper vials will then be filled with the deoxygenated DI water by SiREM. The peeper vials will be shipped in gas-impervious mylar bags to avoid oxygenation of the peeper vials.

Peepers will be prepared for deployment as follows:

- When stationed at the porewater sampling location, the peeper vials will then be removed from the mylar bags and secured in the 3D-printed frame.
- To prepare the 3D-printed frame for deployment, two Ziploc® bags will be filled with approximately 500 grams of clean sand and attached to each of the peeper frame wings with zip ties; these sand bags will act as weights to hold the peeper in the sediment.

Alternatively, a 10- to 15-pound marine-grade weight may be used, depending on flow conditions.

- A length of rope equal to the measured water depth at the location plus an additional few feet will be attached to the attachment point at the top of the peeper frame, with the other end secured to a weight (typically, a gallon-sized Ziploc® bag partially filled with rocks is sufficient, or a 10- to 15-pound marine-grade weight could be used, depending on flow conditions at the target station) as a grapple line. A floating marker buoy can be attached to the weight to assist with retrieval—the floating marker should not be attached to the peeper itself, as this may lift the peeper from the sediment, and the floating marker should not float high enough in the surface water to interfere with or become tangled in vessel traffic. This weight, floating marker, and rope will be used for retrieval.
- The peepers (i.e., peeper assembly, which includes the stack of peeper vials, frame, weights, and retrieval line) are ready for deployment.

### 2.4.2 Peeper Deployment

Peepers shall be deployed in the field from the *R/V Carolyn Dow* after the collection of the co-located sediment sample as follows:

- The push pole deployment system to be used for deployment consists of multiple 7-foot long pole sections that can be connected to create a single pole of appropriate length to reach the sediment-water interface (SWI) from the sampling vessel.
- At the end of the pole is an attached underwater camera and push pole tail with an approximately 4-inch slot that will hold the peeper. The peeper will be inserted into the slot, so that the hole at the top of the peeper frame is in line with the holes in the push pole frame. Each peeper will be tagged with the Sample ID prior to deployment by attaching a laminated sample ID card to the peeper with a zip tie.
- A spring-loaded pin will then be inserted through the push pole tail and peeper frame and secured with a hitch pin on the opposite side; this will secure the peeper frame to the push pole tail for deployment.
- The push pole tail and peeper frame are then slowly lowered into the water, while the end of the rope that is attached to the hitch pin and the weight are held above water.
- The underwater camera (mounted to the base of the push pole) should be observed to note when the SWI is reached and ensure good placement.
- Each peeper frame is fitted with two 6-inch-wide plastic “wings” that rest on the sediment surface to prevent over-penetration. The peeper frame is slowly inserted into the sediment until the frame wings are flush with the sediment surface. Weights are attached to each wing to help secure the peeper in place once deployed.

- The underwater camera will be used to confirm correct placement and vertical orientation of the peeper frame and capture a photograph of the peepers once placed. Correct deployment depth can also be inferred by the degree of resistance to additional pushing. There is a small degree of resistance upon insertion and then a strong degree of resistance once the peeper lander wings reach the SWI.
- Once the peeper frame is in the sediment, a grappling line attached at one end to the peeper frame and at the other end with a weight can be tossed approximately 20 feet downstream. This line will be used for retrieval using a grappling hook as described below. The line direction will be recorded on the field log.
- At this point, the rope secured to the hitch pin can be pulled, releasing the spring-loaded pin and releasing the peeper frame from the push pole tail.
- Repeat this process for any additional peepers at a sampling location, spacing peepers approximately 25 ft. apart.

If peepers are unable to be inserted to the full target depth due to resistance or refusal, the equipment will be moved to a new location within a 25-ft target radius of the proposed station and re-deployed. Alternative sampling methods, such as wading out to the locations, may be considered after several attempts.

The peeper vials are covered with a 0.45-micrometer polyether sulfone membrane and contain rows of chambers that are filled with DI water prior to deployment. During the deployment, dissolved metals (arsenic and manganese will be tested) present in ambient sediment porewater will diffuse through the membrane and equilibrate with the DI water within the peeper vial. This equilibration process will occur over 28 days (4 weeks), based on previous porewater studies performed by Aspect (2007) and past porewater sampling experience. At the end of 4 weeks, the peepers will be retrieved, and the content of the peeper vials will be collected and analyzed for dissolved arsenic and manganese as described below.

### 2.4.3 Retrieval and Processing of Porewater Samples

After the equilibration period, peeper retrieval and sample collection will follow the protocol as described below:

- Once the vessel is located at the mapped GPS sampling location, deploy the camera to observe the condition of the peeper, if possible.
- A grappling hook will be used to catch on the weighted rope. Once caught, slowly pull the peeper by hand from the sediment directly over the sampler for straight pull through the water column.
- Upon retrieval and after the frame is secured on the vessel deck, the peeper and frame will be inspected for damage. After acceptance, peeper wings can be removed, and the peeper can then be placed in a mylar bag until ready for processing on the shore (mylar bags reduce

oxygen exchange while the peepers are stored). Storage time should be reduced as much as practicable. Repeat this process until all peepers have been retrieved, replacing nitrile gloves between stations.

- Peeper vials have a total volume of 70 mL, and the sample should be processed/collected while preserving redox conditions to obtain an accurate measure that reflects the dissolved concentration of arsenic and manganese in porewater. The following procedure will be implemented on shore following retrieval of the peepers to collect the samples:
  - Using new nitrile gloves, peeper vials will be removed from the frame, and any sediment particles will be gently rinsed from the outside of the peeper using distilled water.
  - Draw 70 mL of high-purity nitrogen gas (from an air bag) into a clean syringe by pulling the syringe plunger to the 70-mL mark while it is connected to a bag that has been filled with nitrogen.
  - Using this syringe and needle, pierce the top of the peeper just below the cap. This top needle should remain in the peeper after piercing until all the water in the peeper has been removed.
  - Pierce the bottom of the peeper vial with another syringe and place a clean laboratory supplied vial under it to collect the sample.
  - Remove the syringe and needle from the bottom of the peeper such that the hole in the bottom is directly over the clean laboratory-supplied vial. Note, needle points when not in use will be stored in a sharp safe holder.
  - Transfer/drain the porewater aliquot from the peeper vial into the laboratory-supplied vial by plunging the first syringe at the top of the peeper to add a nitrogen gas headspace to the peeper, forcing the water out of the hole in the bottom of the peeper.
  - Repeat the above steps with the other three vials from the peeper into the sampling container.
  - Repeat the above steps for the next peeper at the station. The second sample will be treated as a field replicate sample.

## 2.5 Sample Handling, Custody, and Transport

Sediment samples will be placed in laboratory-supplied containers and porewater samples will be collected in laboratory-supplied vials. These will be labeled and stored on ice in insulated coolers while in the field. Following the completion of each day's sampling, a chain of custody form will be completed listing each sample. Samples delivered to ARI Laboratories or shipped to Eurofins Test America will be properly packed in coolers and maintained at 4±2 °C. Original chain of custody forms will accompany the samples to the laboratory.

All samples will be recorded chronologically on the chain of custody. Collection dates, times, requested methods, and preservatives (if applicable) will be recorded for each sample. All entries to chain of custody documents will be made in ink. Changes to the documents will be made with a single line through the error, and the correct entry written immediately beside the error, along with the sampler's initials and the date. The chain of custody document(s) will be placed in a Ziploc® plastic bag and enclosed in the sample cooler or shipping container. Chain of custody procedures are further described in Section 4.

## 2.6 Documentation

In addition to sample labels and chain of custody forms, a field logbook or daily field report will be maintained by the field task manager to provide a daily record of significant events. All entries will be signed and dated, made in non-erasable ink, and errors will be crossed out and initialed with a single line. The logbook will be kept as a permanent record. All field measurements will be recorded on the appropriate sampling log forms or in the logbook.

A field logbook or daily field report will be in use for all field sampling. The field logbook/report will be used to document a summary of the day's activities and non-repetitive tasks, including the following:

- Date;
- Time of arrival and departure from the Site, including breaks;
- Names of field team members, equipment, vessels;
- Daily scope of work;
- Site conditions;
- Time of arrival and departure of subcontractors;
- The nature of the daily health and safety tailgate meeting;
- Instrument calibration;
- Location control checks;
- Confirmed sampling locations and visual description of sample;
- QA/QC samples;
- Weather;
- Interaction with agency or client personnel;
- Name and affiliation of Site visitors;
- Incident occurrence and management; and
- Any other irregular or ad hoc activities.

As such, the logbook/report(s) will provide a comprehensive overview of all sampling activities. The level of detail of the documentation within each logbook entry will depend upon the duration of an individual visit and the applicability of field forms to the tasks performed.

## 2.7 Decontamination

Decontamination methods will be conducted as described by Ecology (2019). Stainless-steel sampling equipment in contact with the sediments will be cleaned prior to its use. Decontamination will be conducted between stations; it is not necessary to decontaminate sampling equipment between collection of grabs or composite sediment samples from a single station. Potential for cross-contamination may be minimized by sampling the lower concentration areas first, when information about level of contamination is available from earlier sampling.

Decontamination of spoons, bowls, and sampler will follow this protocol:

- Rinse equipment with fresh water to dislodge and remove residual sediment;
- Scrub the equipment with a brush and phosphate free detergent solution;
- Rinse with deionized water (for freshwater sediment);
- High levels of contamination are not expected; therefore, a solvent rinse will not be performed;
- Rinse with Site water or deionized water;
- Use immediately or cover (no contact) all decontaminated items with aluminum foil; and
- Store in clean, closed container for next use.

The analytical laboratory will provide certified, pre-cleaned, EPA-approved containers for all samples according to PSEP (1997) and Ecology (2008) protocols.

## 2.8 Investigation-Derived Waste Disposal

All IDW will be managed in accordance with the Requirements of the Ecology's SCUM (Ecology, 2019).

In most sediment investigations, acceptable practices to manage IDW are:

1. Return excess sediments collected and not needed for analysis to the water at the station where they were collected.
2. Retain sediments with visible evidence of contamination (e.g., oily droplets, sheen, paint chips, sandblast grit, other wastes) in a watertight drum onboard the vessel for later disposal onshore.

3. Dispose of contaminated sediment according to special handling as dangerous or hazardous wastes, when required. Any decision regarding the appropriate disposal for excess sediments may have to await receipt of the results of chemical analyses.
4. Disposable waste generated during sampling will be placed in heavyweight garbage bags or other appropriate containers and placed in normal refuse containers for disposal at a solid waste landfill. Disposable equipment is expected to be single-use and include, but not be limited to, Tyvek, gloves, paper towels, plastic sheeting, and other waste material generated during sampling.
5. Needles and syringes used for collecting porewater samples will be placed in a sharps container for disposal by a sharps retrieval program (e.g., Sharps Assure).

# 3. CHEMICAL ANALYSES

Chemical analytical procedures used in this sampling program will be performed in accordance with current EPA or state protocols. The samples will be analyzed by ARI Laboratories and Eurofins Test America, accredited in Washington State in compliance with provisions set forth in Chapter 173-50 WAC. The analytical laboratory will have and follow a separate internal quality assurance/quality control (QA/QC) plan. Analyses will be required to conform to this QAPP-specified standard methods and rigorous internal QA/QC checks prior to final approval.

Sediment samples will be analyzed for:

- Metals, analyzed using EPA Method 6020B;
- PAHs, analyzed using EPA Method 8270E-Select Ion Monitoring (SIM);
- Total organic carbon, quantified following the EPA Method 9060; and
- Grain size, tested using the PSEP procedures.

Porewater samples will be analyzed for:

- Dissolved arsenic and manganese, analyzed using EPA Method 6020B.

Table 4 lists the target analyte, appropriate analytical references, and holding times. These procedures have been designed to achieve the lowest practicable quantification limits (PQLs). Additional sample volume will be archived in separate jars for additional chemical testing, if required.

# 4. QUALITY ASSURANCE PROJECT PLAN

This QAPP addresses both field and laboratory activities and establishes protocols to ensure that the quality of the data generated supports the DQOs (Table 4 of the SRI Work Plan) and that valid conclusions are drawn for the project. To the extent practicable, standard protocols are referenced. The QAPP supports the sampling programs and provides QC elements to satisfy the DQOs for

each task. Specific QA/QC requirements will be addressed by both field personnel and the analytical laboratory.

All laboratory data will be validated, as described below, prior to their use in project reporting. This section addresses QC procedures associated with field sampling and analytical efforts; both general QC consideration and specific QC checks will provide ongoing control and assessment of data quality. A QC system is a set of internal procedures set to ensure the achievement of prescribed data quality criteria. A well-designed internal QC program controls and measures precision and accuracy; while the first one depends on the inherent variability of a given sampling method and matrix, the second represents the degree to which the measured value corresponds to the actual or "true" value.

This QAPP has been prepared in general accordance to the Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the USEPA Guidance (EPA, 2002a), the Sediment Management Standards (Ecology, 2008), and the Sediment Cleanup Users' Manual (Ecology, 2019).

## 4.1 PARCCS Overview

Quality assurance objects are formally estimated through computation of performance measures known as data quality indicators (DQIs). These are expressed in terms of the precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) parameters. The PARCCS parameters include:

1. Precision (reproducibility of data);
2. Accuracy (degree of difference and/or bias between measured values and the true value);
3. Representativeness (degree to which the data accurately and precisely describe the characteristics of the population);
4. Completeness (percent of the data that are valid);
5. Comparability (confidence of the dataset for comparisons to other data, use of established methods); and
6. Sensitivity (magnitude to which analytical methods can resolve quantitative differences among sample concentrations).

The field QA/QC program will be accomplished through the collection of a field duplicate and equipment (rinseate) blanks. The laboratory analytical QA/QC program will be assessed through the internal laboratory QC performance, including, but not limited to, method blanks, laboratory control sample (LCS) recoveries, surrogate recoveries, matrix spike/matrix spike duplicate (MS/MSD) recoveries, and evaluation of method detection limits (MDLs) compared to the PQL, if necessary. The PQL, sometimes referred to as the RL, is a quantifiable value and usually the lowest concentration standard used in the calibration curve. In practice, to allow for matrix interferences variability in instrument control, an RL three to eight times higher than the MDL is

typically reported. Table 6 presents the target objectives for each PARCCS parameter and each analyte with the exception of representativeness. Representativeness is not included in Table 6, but will be ensured by adhering to standard field sampling protocols, standard laboratory protocols, and an adequate number of samples per analysis, as outlined in the Work Plan and SAP (Ecology, 2019).

## 4.2 Field QA/QC Protocol and Record Keeping

Field QC samples are collected in the field and used to evaluate the validity of the field sampling effort. Field QC samples are collected to check precision, accuracy, and representativeness of the sampling procedures. The following section discusses the frequency and purpose of field QC samples, as summarized in Table 5.

### 4.2.1 Field Duplicates

Field duplicates or field split samples are additional samples collected at a sampling location from the bowl or container of field-composite material and then split into two unique samples to evaluate data precision. Two sets of samples are prepared from a composite bowl of homogenized sediments collected from a single source, labeled with unique sample numbers, and submitted to the laboratory. Field duplicates will be collected at a frequency of 5% (or 1 per 20 samples).

### 4.2.2 Equipment Blanks

Field equipment blanks will be used to assess potential contamination during sampling activities and effectiveness of decontamination procedures for non-dedicated sampling equipment. Field equipment blanks are collected by rinsing anywhere from 3 to 6 liters of deionized water over or through decontaminated sampling equipment and pouring it into the appropriate sample containers. Equipment blanks will also be collected from equipment surfaces exposed during actual sampling and analyzed along with the field samples. No equipment blanks will be collected from disposable or dedicated field equipment. One equipment blank per week or one per sampling event (if less than one week) will be analyzed for the same target analyte list.

### 4.2.3 Location Control

Location control is discussed in Section 2.2.

## 4.3 Sample Custody

Sample collection and sample custody procedures are designed so that custody of samples is maintained and documented. These procedures provide identification and documentation of the sampling event and the sample chain of custody from shipment of sample bottles and pre-cleaned sampling supplies, through sample collection, to receipt of the samples by the laboratory. When used in conjunction with the laboratory's custody procedures and documentation, these data establish full legal custody and allow complete tracking of a sample from preparation and receipt of sample bottles to sample collection, preservation, and shipping through laboratory receipt, sample analysis, and data validation. The chain of custody is defined as the sequence of persons

who have the item in custody. Field custody procedures, sample packing, and shipping are described below. The persons responsible for sample custody, and a brief description of their duties, are as follows:

- Laboratory Sample Custodian or Commercial Supplier: Verifies that the bottles are certified clean; arranges for shipment of bottles to field sampling personnel.
- Field Staff: Receives sample bottles from the laboratory and inspects bottles for physical integrity; retains shipping invoice or packing list from shipping courier as documentation of transfer of bottles; collects and preserves samples; retains bottles and samples under custody until sample shipment; and relinquishes samples to shipping courier or to the laboratory representative.
- Laboratory Sample Receipt: Receives samples from the field staff or shipping carrier, accepts custody of the samples for the laboratory.
- Laboratory Project Manager (LPM): Verifies reported laboratory analyses to the sample chain of custody; ensures that chain of custody documentation is incorporated into the project file.

A sample is in custody if it is or was:

- In the field investigator's, transferee's, or laboratory technician's actual possession;
- In the field investigator's, transferee's, or laboratory technician's view after being in his/her physical possession;
- In the field investigator's, transferee's, or laboratory technician's physical possession and then he/she secured it to prevent tampering; or
- Placed in a designated secure area.

### 4.3.1 Chain of Custody

The chain of custody form is used to record the custody of samples collected and maintain the record of custody during transport and analysis. The chain of custody also serves as a sample logging mechanism for the analytical laboratories' sample custodian.

The following information must be supplied in the indicated spaces in detail to complete the field chain of custody form:

- Project-specific information, including the project number and project name should be listed.
- The signature of the sampler and/or the sampling team leader should be included in the designated signature block.

- The sampling location identification number, date and time of sample collection, grab sample designation, and sample preservation type should be included on each line (each line should contain only those samples collected at a specific location).
- The total number of sample containers must be listed in the indicated space for each sample, and the total number of individual containers must be listed for each type of analysis.
- The field investigator and subsequent transferee(s) add signatures to document the transfer of the samples listed on the chain of custody form in the spaces provided at the bottom of the form. Both the person relinquishing the samples and the person receiving them must sign the form and provide the date and time that this occurred in the proper space on the form. Usually, the last person receiving the samples or evidence should be a laboratory sample custodian.
- The remarks column at the bottom of the form should be used to record air bill numbers or registered or certified mail serial numbers.

The chain of custody form is a serialized document (Attachment B-1). Once it is completed, it becomes an accountable document and must be maintained in the project file. The suitability of any other form for chain of custody should be evaluated based on its inclusion of the above information in a legible format.

### 4.3.2 Sample Packing and Shipping

Samples are packed for shipping in waterproof coolers. Depending upon container type, the sample containers may be individually sealed in Ziploc® or other similar plastic bags prior to packing them in the cooler with bubble wrap or Styrofoam packing. Wet ice will be double-bagged in plastic bags (to inhibit cross contamination of samples by melt water) and placed with the samples in the cooler to maintain the samples at a 4 ± 2 °C during shipping. Sediment samples will be delivered to ARI Laboratories, in Tukwila, Washington, and porewater samples will be shipped to Eurofins Test America in Pittsburg, Pennsylvania.

The chain of custody form that identifies the samples is signed as "relinquished" by the principal sampler or responsible party. This chain of custody form is sealed in a waterproof plastic bag and is placed inside the cooler, typically by taping the bag to the inside lid of the cooler.

Following packing, the cooler lid is sealed with packing tape. Two custody seals are signed, dated, and affixed from the cooler lid to the cooler body on two adjacent sides and are also covered with clear tape. This ensures that tampering with the cooler contents will be immediately evident.

The sample coolers will be shipped by courier (either commercial or provided by the laboratory) to the laboratory in accordance with laboratory schedule requirements. A copy of the shipping invoice is retained by the field task manager and becomes part of the sample custody documentation.

## 4.4 Laboratory QA/QC Requirements

The analytical laboratories' QC procedures will be consistent with the requirements of the analytical methods and the laboratories' SOPs (available upon request) and the laboratory Quality Management Plan. Analytical methods specify routine procedures that are required to evaluate whether data are within proper QC limits (Ecology, 2008). PARCCS Target Objectives are provided in Table 6, and the types and frequencies of analytical QC samples used to evaluate PARCCS parameters are shown in Table 7.

### 4.4.1 Hold Times

The first step in proper sample handling and custody is observance of analytical holding times, which can vary depending upon the media and analytical method(s) selected for the samples. Knowledge of required holding times will have a direct impact on the scheduling of sample collection, packing, and shipping activities. The sample containers, volumes, preservations, and holding times applicable to each analytical method and matrix are shown in Table 4.

### 4.4.2 Method Blanks

Method blanks are used to check for laboratory contamination and bias. A method (or preparation) blank is prepared at the frequency specified by the referenced method, typically one per preparation batch (a preparation batch is defined as a group of samples prepared together within a 24-hour time frame, not to exceed 20 samples). The purpose of the method blank is to ensure that there is no carryover of contaminants through the sample handling, preparation, and analysis, which could impact bias and the accuracy of the analysis.

### 4.4.3 Matrix Spikes and Matrix Spike Duplicates (MS/MSD)

MS/MSD pairs provide information to assess precision and accuracy. The MS is a second, extra aliquot of an environmental sample to which known concentrations of target analytes have been added. The MS is carried through the entire analytical procedure, and the recovery of the analytes is calculated. Results are expressed as percent recovery (%R). This QC sample aims to evaluate the effect of the sample matrix on the accuracy of the analysis. The MSD is a third, extra aliquot of an environmental sample that is also spiked with the same known concentrations of analytes used for the MS. The two spiked aliquots are processed separately, and the results are compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as relative percentage difference (RPD) and %R. PARCCS Target Objectives for RPD and %R are provided in Table 6.

One MS/MSD pair will be analyzed as applicable to the method (Table 7). The MS/MSD pair will be site specific, and field personnel will therefore be responsible for collecting additional sample volumes as needed (three times the normal volume) to account for the MS/MSD samples.

### 4.4.4 Laboratory Control Sample and Laboratory Control Sample Duplicate (LCS/LCSD)

Laboratory Control Samples are used to monitor the laboratory's day-to-day performance of routine analytical methods, independent of matrix effects, and are prepared at a frequency of one per preparation batch. LCSs are fortified with spike standard solutions containing target parameters of interest. The recovery of these standards is quantitatively measured during analysis, and historical records are maintained on the percent recovery for each sample. When enough parent sample volume is not included for an MS/MSD, LCS/LCSD pairs will be used to assess precision as RPD.

### 4.4.5 Surrogate Spikes

Surrogates are added to organic analyses pertinent to the specified method. Surrogate spikes are used as an indication of extraction efficiency on a sample-specific basis and indicate potential matrix interferences and the ability of the extraction to recover the class of compounds represented by the surrogate(s). The surrogate spike is carried through the entire analytical procedure, and the recoveries of the surrogate spikes are calculated. Results are expressed as %R for each sample.

## 4.5 Data Validation

This section describes the stages of data quality assessment after data have been received. It addresses data reduction, review, verification, and validation in accordance with EPA guidance (EPA, 2002b).

### 4.5.1 Data Reduction

Analysts will perform the first level review of the data as it is produced. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks as specified in the SOPs and applicable to the method. If any problems are noted during the analytical run, corrective action is taken and documented. A second review of the data is performed by the department manager prior to release to the LPM for reporting.

### 4.5.2 Data Review

Data review is an initial and relatively non-technical step of data assessment that primarily addresses issues of completeness and data handling integrity. In data review, the reviewer will ensure that the necessary reporting components have been included in laboratory reports, such as necessary fields (e.g., collection/analysis dates, units) as well as the presence of (but not implications of) QA/QC data components (e.g., LCS records, surrogate results).

### 4.5.3 Data Verification and Validation

Data verification is a more technical process than data review in that the core technical aspects of data quality (e.g., precision, accuracy) are evaluated through a review of the results of QA/QC measures, such as LCS and surrogates.

Following interpretation and data reduction by an analyst, data are transferred to the laboratory sample management system either by direct data upload from the analytical data system or manually. The data are reviewed by the group leader or another analyst and marked on the sample management system as being verified. The person performing the verification reviews the data, including QC information, prior to verifying the data. If data package deliverables have been requested, the laboratory will complete the appropriate forms summarizing the QC information and transfer copies of the raw data (e.g., instrument printouts, spectra, chromatograms) to the Data Packages Group as needed. This group will combine the information from the various analytical groups and the analytical reports from the laboratory sample management system into one package. This package is reviewed by the LPM for conformance and that project QC goals have been met. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

Following data verification by the laboratory, Stage 2a data validation will be conducted by a third-party validator independent from the laboratory producing the data. Validation will be conducted on PDF laboratory reports and electronic data deliverables and may use the assistance of an automated validation screening program performed electronically, if applicable and/or available. Data will be evaluated based on the method requirements, SAP requirements, and laboratory SOP criteria at the time samples were submitted to the laboratory. If there are QC results outside the criteria range or method requirements, the affected data may be qualified based on the potential effect of the out of compliance item on the data quality. Qualifiers will be assigned using professional and technical judgment of qualified validation personnel and guidance for assigning data qualifiers according to the method documentation.

### 4.5.4 Data Usability Determination

While data verification is a technical process in which the data's adherence to PARCCS parameters is evaluated (Table 7), it still does not answer the final question of the usability of the data and the implications of any departures from data expectations. The data validation process is designed to answer these questions through: i) the assignment of data qualifiers based on the data verification results; and ii) a case-by-case review of data quality issues with respect to QAPP objectives to render a final assessment of data usability.

The final step of data evaluation entails a comparison of data quality performance with the QAPP-specific DQOs. Validation of the analytical data is the process of determining that the data support the task-specific DQOs. Data validation will be performed by Geosyntec's independent, qualified validation team located in Knoxville, Tennessee, to fully evaluate whether or not the data are acceptable for their intended decision-making purpose.

### 4.5.5 Data Evaluation Roles and Responsibilities

The components of data evaluation will be performed by the entities noted in the following list:

- Data reduction will be performed by the analytical laboratory.
- Data review will be performed both by the laboratory and by the data validator.
- Data verification will be performed both by the laboratory and by the data validator.
- Data validation and usability determination will be performed by the data validator and the project team.

## 5. REPORTING

The Draft RI Data Report, which will be provided to Ecology following completion of all sampling and data validation, will consist of a description of all field activities, including sample collection, preparation, shipping, any field deviations or modifications, analysis, and results for both upland and sediment activities. Field and analytical data will be organized in tabular and/or visual formats. Aspect Consulting manages the overall project database and will be responsible for uploading information to the Ecology's Environmental Information Management database (EIM).

Comments received on the Draft RI Data Report will be addressed in the Final RI Data Report.

## 6. SCHEDULE

Sediment field work is anticipated to begin within 30 days following Ecology approval of the final RI Work Plan and supporting documents and after receipt of groundwater sampling results to evaluate additional chemicals as potential sediment analytes based on inclusion as groundwater COPCs, as discussed in the SRI Work Plan. Pending any disruptions related to ongoing COVID-19 health and safety concerns, sediment sampling is tentatively expected to occur in the second quarter of 2021. A draft RI Data Report will be provided to Ecology 90 days following receipt of final validated data. A final RI Data Report will be provided to Ecology 30 days after receiving comments on the draft report.

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# TABLES

## Table 1: Project Team and Contact Information

| Role | Name and Address |
|---|---|
| Client Representative | Lynn Manolopoulos<br>Davis Wright Tremaine, LLC<br>929 108th Avenue NE, #1500<br>Bellevue, WA 98004-4786<br>(425) 646-6146 |
| Ecology Project Manager | Lucy T. McInerney, P.E.<br>Washington Department of Ecology<br>3190 160th Ave SE<br>Bellevue, WA 98008-5452<br>(425) 649-7272 |
| Barbee Mill – Project Coordinator | Jeremy Porter, P.G.<br>Aspect Consulting<br>710 2nd Avenue, # 550<br>Seattle, WA 98104<br>(206) 838-5835 |
| Sediment Lead | Anne Fitzpatrick, LHG<br>Geosyntec Consultants, Inc.<br>520 Pike Street, #2600<br>Seattle, WA 98101<br>(206) 496-1461 |
| Project Risk Assessor | Jennifer Arblaster<br>Geosyntec Consultants, Inc.<br>Milton, VT 05468<br>(949) 295-5458 |
| Data Validation/Lead Chemist | Julia Klens Caprio<br>Geosyntec Consultants, Inc.<br>180A Market Place Blvd<br>Knoxville, TN 37922<br>(865) 330-0037 |
| Field Task Manager | Dustin Jensen, P.G.<br>Geosyntec Consultants, Inc.<br>520 Pike Street, #2600<br>Seattle, WA 98101<br>(206) 496-1450 |
| Lab Point of Contact (Sediment Analysis) | Kelly Frances Bottem<br>Analytical Resources, Inc. (ARI)<br>4611 S 134th Place, #100<br>Tukwila, Washington 98168<br>(206) 695-6211 |
| Lab Point of Contact (Porewater Analysis) | Carrie Gamber<br>Eurofin<br>301 Alpha Drive<br>Pittsburgh, PA 15238-2907<br>(412) 963-7058 |
| Vessel Support Lead | Eric Parker<br>Research Support Services, Inc.<br>321 Ne High School Road, #D3 563<br>Bainbridge Island, WA 98110<br>(206) 550-5202 |

## Table 2a: Proposed Sediment and Porewater Sampling Locations

| Sample Location | Rationale | Grouping | Depth Interval (cm) | Proposed Coordinates[a] (ft) | |
|---|---|---|---|---|---|
| | | | | Easting | Northing |
| BM-SED-01 | Evaluate current conditions | On Site | 0-10 | 1301366 | 196766 |
| BM-SED-02 | Evaluate current conditions | On Site | 0-10 | 1301440 | 196661 |
| BM-SED-03 | Evaluate current conditions | On Site | 0-10 | 1301321 | 196519 |
| BM-SED-04 | Evaluate current conditions | On Site | 0-10 | 1301221 | 196461 |
| BM-SED-05 | Evaluate current conditions | On Site | 0-10 | 1301343 | 196350 |
| BM-SED-06 | Evaluate current conditions | On Site | 0-10 | 1301215 | 196328 |
| BM-SED-07 | Evaluate current conditions | On Site | 0-10 | 1301321 | 196186 |
| BM-SED-08 | Evaluate current conditions | On Site | 0-10 | 1301153 | 196216 |
| BM-SED-09 | Evaluate current conditions | On Site | 0-10 | 1301430 | 196098 |
| BM-SED-10 | Evaluate current conditions; re-occupy historical Arsenic sample | On Site | 0-10 | 1301419 | 195976 |
| BM-SED-11 | Evaluate current conditions | On Site | 0-10 | 1301292 | 196654 |
| BM-SED-12 | Evaluate current conditions; re-occupy historical Arsenic sample | On Site | 0-10 | 1301153 | 196652 |
| BM-SED-13 | Evaluate current conditions; re-occupy historical Arsenic sample | On Site | 0-10 | 1301536 | 196812 |
| BM-SED-14 | Evaluate current conditions | On Site | 0-10 | 1301150 | 196936 |
| BM-SED-15 | Evaluate current conditions; re-occupy historical Arsenic sample | On Site | 0-10 | 1301455 | 196933 |
| BM-PW-16 | Evaluate groundwater to surface water pathway | On Site | 0-10 | 1301603 | 196900 |
| BM-SED-16 | Co-located with porewater samples | On Site | 0-10 | 1301603 | 196900 |
| BM-PW-17 | Evaluate groundwater to surface water pathway | On Site | 0-10 | 1301489 | 196420 |
| BM-SED-17 | Co-located with porewater samples | On Site | 0-10 | 1301491 | 196422 |
| NS-SED-01 | Evaluate direct contact pathway as needed for the 0-45cm | Nearshore | 0-45 | 1301540 | 196688 |
| NS-SED-02 | Evaluate direct contact pathway as needed for the 0-45cm | Nearshore | 0-45 | 1301532 | 196398 |
| NS-SED-03 | Evaluate direct contact pathway as needed for the 0-45cm | Nearshore | 0-45 | 1301592 | 196011 |
| PER-SED-01 | Confirm site boundary; re-occupy historical Arsenic sample | Perimeter | 0-10 | 1301610 | 197028 |
| PER-SED-02 | Confirm site boundary | Perimeter | 0-10 | 1301357 | 197042 |
| PER-SED-03 | Confirm site boundary | Perimeter | 0-10 | 1301099 | 197061 |
| PER-SED-04 | Confirm site boundary; re-occupy historical Arsenic sample | Perimeter | 0-10 | 1300924 | 196988 |
| PER-SED-05 | Confirm site boundary | Perimeter | 0-10 | 1301027 | 196656 |
| PER-SED-06 | Confirm site boundary | Perimeter | 0-10 | 1300972 | 196399 |
| PER-SED-07 | Confirm site boundary | Perimeter | 0-10 | 1300998 | 196105 |
| PER-SED-08 | Confirm site boundary; re-occupy historical Arsenic sample | Perimeter | 0-10 | 1301147 | 196037 |
| PER-SED-09 | Confirm site boundary | Perimeter | 0-10 | 1301353 | 195885 |
| PER-SED-10 | Confirm site boundary | Perimeter | 0-10 | 1301029 | 195852 |
| PER-SED-11 | Confirm site boundary | Perimeter | 0-10 | 1300794 | 196276 |
| PER-SED-12 | Confirm site boundary | Perimeter | 0-10 | 1300792 | 196541 |
| PER-SED-13 | Confirm site boundary | Perimeter | 0-10 | 1300788 | 196836 |
| PER-SED-14 | Confirm site boundary | Perimeter | 0-10 | 1301237 | 197199 |
| PER-SED-15 | Confirm site boundary | Perimeter | 0-10 | 1301484 | 197226 |
| PER-SED-16 | Confirm site boundary; re-occupy historical Arsenic sample | Perimeter | 0-10 | 1301652 | 197157 |

**Footnotes:**

a. State Plane Washington NAD 1983 coordinates.

**Acronyms:**

BM = Barbee Mill; cm = centimeters; ft = feet; NA = not applicable; PW = porewater; NS = nearshore; PER = perimeter; SED = sediment

## Table 2b: Proposed Sediment and Porewater Sampling Analyses

| Sample Location | Analysis | | | | |
|---|---|---|---|---|---|
| | Metals [(a)] (EPA 6020B) | PAHs (EPA 8270E-SIM) | Grain Size (PSEP) | Total Organic Carbon (EPA 9060) | Archive |
| BM-SED-01 | X | X | X | X | |
| BM-SED-02 | X | X | X | X | |
| BM-SED-03 | X | X | X | X | |
| BM-SED-04 | X | X | X | X | |
| BM-SED-05 | X | X | X | X | |
| BM-SED-06 | X | X | X | X | |
| BM-SED-07 | X | X | X | X | |
| BM-SED-08 | X | X | X | X | |
| BM-SED-09 | X | X | X | X | |
| BM-SED-10 | X | X | X | X | |
| BM-SED-11 | X | X | X | X | |
| BM-SED-12 | X | X | X | X | |
| BM-SED-13 | X | X | X | X | |
| BM-SED-14 | X | X | X | X | |
| BM-SED-15 | X | X | X | X | |
| BM-PW-16 | X | | | | |
| BM-SED-16 | X | | X | | |
| BM-PW-17 | X | | | | |
| BM-SED-17 | X | | X | | |
| NS-SED-01 | X | X | X | X | |
| NS-SED-02 | X | X | X | X | |
| NS-SED-03 | X | X | X | X | |
| PER-SED-01 | X | X | X | X | |
| PER-SED-02 | X | X | X | X | |
| PER-SED-03 | X | X | X | X | |
| PER-SED-04 | X | X | X | X | |
| PER-SED-05 | X | X | X | X | |
| PER-SED-06 | X | X | X | X | |
| PER-SED-07 | X | X | X | X | |
| PER-SED-08 | X | X | X | X | |
| PER-SED-09 | X | X | X | X | |
| PER-SED-10 | | | | | X |
| PER-SED-11 | | | | | X |
| PER-SED-12 | | | | | X |
| PER-SED-13 | | | | | X |
| PER-SED-14 | | | | | X |
| PER-SED-15 | | | | | X |
| PER-SED-16 | | | | | X |

**Footnotes:**

a: metals will include arsenic, lead, selenium and zinc for sediment samples; porewater samples will be analyzed for arsenic and manganese only.

**Acronyms:**

EPA = Environmental Protection Agency
PAHs = polycyclic aromatic hydrocarbons
PSEP = Puget Sound Estuary Program methods
SIM = Select Ion Monitoring

# Table 3: Key for Acceptance and Physical Description of Sediment Samples

***Sample Description***

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D-2488 were used as an identification guide.

***Density/Consistency***

Soil density/consistency is estimated based on visual observation and is presented parenthetically on the test pit logs.

| SAND or GRAVEL | Standard Penetration Resistance (N) in Blows/Foot | Visual Description | SILT or CLAY | Standard Penetration Resistance (N) in Blows/Foot | Approximate Shear Strength in TSF | Visual Description |
|---|---|---|---|---|---|---|
| ***Density*** | | | ***Consistency*** | | | |
| Very loose | 0–4 | freefall | Very soft | 0–2 | <0.125 | ooze, no shape |
| Loose | 4–10 | easy penetration | Soft | 2–4 | 0.125–0.25 | saggy shape |
| Medium dense | 10–30 | | Medium stiff | 4–8 | 0.25–0.5 | holds shape |
| Dense | 30–50 | low penetration | Stiff | 8–15 | 0.5–1.0 | holds shape |
| Very dense | >50 | refusal | Very stiff | 15–30 | 1.0–2.0 | low penetration |
| | | | Hard | >30 | >2.0 | refusal |

| ***Moisture*** | |
|---|---|
| Dry | Little perceptible moisture |
| Damp | Some perceptible moisture, probably below optimum |
| Moist | Probably near optimum moisture content |
| Wet | Much perceptible moisture, probably above optimum; subcategories include soupy and flocculant for increasing moisture content |

| ***Minor Constituents*** | ***Percentage (by weight)*** |
|---|---|
| Not identified in description | 0–5 |
| Slightly (clayey, silty, etc.) | 5–12 |
| Clayey, silty, sandy, gravelly | 12–30 |
| Very (clayey, silty, etc.) | 30–50 |
| MAJOR CONSTITUENTS | Majority or >50 |

***Surface Sediment Sample Acceptability Criteria (PSEP)***

1. Overlying water is present.
2. Water has low turbidity.
3. Sampler is not overfilled.
4. Surface is flat.
5. Penetration depth is acceptable.

***Color descriptions***

| | | |
|---|---|---|
| Light Brown | Greenish Gray | Light Gray |
| Yellowish Orange | Olive Gray | Dark Gray |

***Estimated Percentage of Other Minor Constituents***

(i.e., shells, wood, organics, plastic, metal brick, refuse)

| | ***Estimated Percentage (by volume)*** |
|---|---|
| Dusting | Trace on Surface |
| Trace | 0–5 |
| Occasional | 5–10 |
| Moderate | 10–30 |
| Substantial | 30–50 |

## Table 4: Analyte Categories, Analysis Methods, Matrix, Holding Times, and Container Requirements

| Analyte Category | Preparatory Method | Analytical Method | Matrix | Sample Container | Preservation | Holding Time | Archive Preservation[a] |
|---|---|---|---|---|---|---|---|
| Metals | EPA 3005 | EPA 6020B | Water | 100 mL HPDE vials | HNO3 pH < 2, 4 ± 2˚C | 180 days from collection to analysis | Not applicable |
| | SW 846 | | Sediment | 1x 8-ounce glass jar with Teflon®-lined lid | 4 ± 2˚C | 180 days from collection to analysis | Freeze to -18°C (2 years) |
| PAHs | SW 846 | EPA 8270E-SIM | Water | 1 liter amber glass | 4 ± 2˚C | 7 days to extraction; 40 days to analysis | Not applicable |
| | | | Sediment | 1x 8-ounce glass jar | 4 ± 2˚C | 14 days to extraction; 40 days to analysis | Freeze to -18°C (1 year) |
| Grain Size | PSEP Method | | Sediment | 100-150 grams; polyethylene, glass | 4 ± 2˚C | 6 months | Not applicable |
| Total Organic Carbon | EPA 9060 | | Sediment | 25 grams; glass | 4 ± 2˚C | 28 days | Freeze to -18°C (6 months) |

**Footnotes:**

a. Additional sediment will be collected and archived from each location and placed in 50-100 gram sample jars for possible future analysis.

**Acronyms:**

mL = millileters

C = Celsius

EPA = Environmental Protection Agency

HPDE = High density poly ethylene

PAHs = polycyclic aromatic hydrocarbons

PSEP = Puget Sound Estuary Program methods

SIM = Selected Ion Monitoring

## Table 5: Field Quality Control Criteria

| Control Item | Frequency | RPD | Corrective Action |
|---|---|---|---|
| ***Field Quality Assurance/Quality Control*** | | | |
| Field Duplicates | 5% (1 per 20 samples) | < 50% | Modify field sample homogenization procedures. |
| Equipment Blanks | Once per event or once per week | NA | Compare to equipment blank results to rule out laboratory contamination.<br>Modify sample collection and equipment decontamination procedures.<br>Qualify associated data. |

**Acronyms:**
RPD = Relative Percent Difference
NA = Not Applicable

## Table 6: PARCCS Target Objectives

| PARCCS: | Comparability | | | Completeness | Sensitivity | | | Accuracy and Precision[a] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | MS/MSD | | LCS/LCSD | |
| Parameter | CAS Number | Laboratory | Method | Usable Data | MDL | RL | Units | RPD (%) | Recovery (%) | RPD (%) | Recovery (%) |
| **Porewater** | | | | | | | | | | | |
| ***Metals*** | | | | | | | | | | | |
| Arsenic | 7440-38-2 | Eurofin | EPA 6020B | 90% | 0.313 | 1 | µg/L | 20 | 75-125 | 20 | 80-120 |
| Manganese | 7439-96-5 | Eurofin | EPA 6020B | 90% | 0.866 | 5 | µg/L | 20 | 75-125 | 20 | 80-120 |
| **Sediment** | | | | | | | | | | | |
| ***Metals*** | | | | | | | | | | | |
| Arsenic | 7440-38-2 | ARI | EPA 6020B | 90% | 0.038 | 0.2 | mg/kg | 20 | 75-125 | 20 | 80-120 |
| Lead | 7439-92-1 | ARI | EPA 6020B | 90% | 0.052 | 0.1 | mg/kg | 20 | 75-125 | 20 | 80-120 |
| Manganese | 7439-96-5 | ARI | EPA 6020B | 90% | 0.142 | 0.5 | mg/kg | 20 | 75-125 | 20 | 80-120 |
| Selenium | 7782-49-2 | ARI | EPA 6020B | 90% | 0.18 | 0.5 | mg/kg | 20 | 75-125 | 20 | 80-120 |
| Zinc | 7440-66-6 | ARI | EPA 6020B | 90% | 2.92 | 6 | mg/kg | 20 | 75-125 | 20 | 80-120 |
| ***PAHs*** | | | | | | | | | | | |
| Naphthalene | 91-20-3 | ARI | EPA 8270E-SIM | 90% | 1.28 | 5 | µg/kg | 30 | 36-120 | 30 | 36-120 |
| Acenaphthylene | 208-96-8 | ARI | EPA 8270E-SIM | 90% | 1.08 | 5 | µg/kg | 30 | 35-120 | 30 | 35-120 |
| Acenaphthene | 83-32-9 | ARI | EPA 8270E-SIM | 90% | 0.57 | 5 | µg/kg | 30 | 39-120 | 30 | 39-120 |
| Fluorene | 86-73-7 | ARI | EPA 8270E-SIM | 90% | 0.63 | 5 | µg/kg | 30 | 41-120 | 30 | 41-120 |
| Phenanthrene | 85-01-8 | ARI | EPA 8270E-SIM | 90% | 0.72 | 5 | µg/kg | 30 | 46-120 | 30 | 46-120 |
| Anthracene | 120-12-7 | ARI | EPA 8270E-SIM | 90% | 0.87 | 5 | µg/kg | 30 | 36-120 | 30 | 36-120 |
| Fluoranthene | 206-44-0 | ARI | EPA 8270E-SIM | 90% | 0.47 | 5 | µg/kg | 30 | 46-120 | 30 | 46-120 |
| Pyrene | 129-00-0 | ARI | EPA 8270E-SIM | 90% | 0.63 | 5 | µg/kg | 30 | 49-120 | 30 | 49-120 |
| Benzo(a)anthracene | 56-55-3 | ARI | EPA 8270E-SIM | 90% | 0.82 | 5 | µg/kg | 30 | 42-120 | 30 | 42-120 |
| Chrysene | 218-01-9 | ARI | EPA 8270E-SIM | 90% | 1.05 | 5 | µg/kg | 30 | 48-120 | 30 | 48-120 |
| Benzo(b)fluoranthene | 205-99-2 | ARI | EPA 8270E-SIM | 90% | 1.37 | 5 | µg/kg | 30 | 35-127 | 30 | 35-127 |
| Benzo(k)fluoranthene | 207-08-9 | ARI | EPA 8270E-SIM | 90% | 0.76 | 5 | µg/kg | 30 | 37-129 | 30 | 37-129 |
| Benzo(j)fluoranthene | 205-82-3 | ARI | EPA 8270E-SIM | 90% | 0.68 | 5 | µg/kg | 30 | 40-120 | 30 | 40-120 |
| Benzo(a)pyrene | 50-32-8 | ARI | EPA 8270E-SIM | 90% | 0.61 | 5 | µg/kg | 30 | 36-120 | 30 | 36-120 |
| Indeno(1,2,3-cd) pyrene | 193-39-5 | ARI | EPA 8270E-SIM | 90% | 1.05 | 5 | µg/kg | 30 | 40-120 | 30 | 40-120 |
| Dibenzo(a,h)anthracene | 53-70-3 | ARI | EPA 8270E-SIM | 90% | 0.89 | 5 | µg/kg | 30 | 38-120 | 30 | 38-120 |
| Benzo(g,h,i)perylene | 191-24-2 | ARI | EPA 8270E-SIM | 90% | 1.06 | 5 | µg/kg | 30 | 38-210 | 30 | 38-210 |
| ***Grain Size*** | | | | | | | | | | | |
| Clay | STL00587 | MTC | PSEP Method | 90% | 0.1 | 0.1 | % | NA | NA | NA | NA |
| Coarse Sand | STL00583 | MTC | PSEP Method | 90% | 0.1 | 0.1 | % | NA | NA | NA | NA |
| Fine Sand | STL00585 | MTC | PSEP Method | 90% | 0.1 | 0.1 | % | NA | NA | NA | NA |
| Gravel | STL00581 | MTC | PSEP Method | 90% | 0.1 | 0.1 | % | NA | NA | NA | NA |
| Medium Sand | STL00584 | MTC | PSEP Method | 90% | 0.1 | 0.1 | % | NA | NA | NA | NA |
| Silt | STL00586 | MTC | PSEP Method | 90% | 0.1 | 0.1 | % | NA | NA | NA | NA |
| ***Other*** | | | | | | | | | | | |
| Total Organic Carbon | 7440-44-0 | ARI | EPA 9060 | 90% | 0.02 | 0.02 | % | 20 | 75-125 | 20 | 80-120 |

**Footnotes:**

a. Accuracy and precision values, as well as MDLs, provided by the laboratories and presented for informational purposes only.

**Acronyms:**

CAS = Chemical Abstract Service
LCS = Laboratory Control Standard
LCSD = Laboratory Control Sample Duplicate
MDL = Method Detection Limit
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram
µg/L = micrograms per Liter
MS = Matrix Spike
MSD = Matrix Spike Duplicate
NA= Not Applicable
PAHs = polycyclic aromatic hydrocarbons
PARCCS = Precision, Acuracy, Representativeness, Completeness, Comparability, and Sensitivity
PSEP = Puget Sound Estuary Program methods
RL = Reporting Limits
RPD = Relative Percent Difference

## Table 7. Laboratory Quality Control Criteria

| Metals - EPA Method 6020B | | |
|---|---|---|
| **Control Item** | **Frequency** | **Corrective Action** |
| ***Method Quality Assurance/Quality Control*** | | |
| Holding Times | All samples | Laboratory to qualify results if holding times are exceeded. |
| Method Detection Limits (MDL) | Update method detection limit studies annually. | Revise detection limits. |
| Method Blanks | One per sample batch or every 20 samples. | Laboratory to re-digest and reanalyze samples. |
| Analytical Laboratory Duplicates and Matrix Spike Duplicates | Every sample batch. | Laboratory to re-digest and reanalyze samples. |
| Matrix Spikes | With every sample batch or every 20 samples, whichever is more frequent. | Laboratory may be able to correct or minimize problem, or qualify and accept data. |
| Laboratory Control Samples | With every sample batch or every 20 samples, whichever is more frequent. | Laboratory to correct problem and verify the analysis can be performed; then reanalyze affected |
| ***Instrument Quality Assurance/Quality Control*** | | |
| Initial Calibration | Daily | Stop analysis, investigate, reanalyze. |
| Initial Calibration Verification | Immediately after initial calibration with an ICV. | Same as above unless obvious matrix problems are evident. |
| Continuing Calibration Verification | After every 10 samples, and at the end of the analytical run with a mid- | Laboratory to recalibrate. |
| Initial and Continuing Calibration Blanks | Immediately after initial calibration, after the last sample every CCV. | Laboratory to recalibrate and reanalyze affected samples. |
| Low Check (CRI) Standard | Analyzed following calibration verification for each element. | Re-preparation of the blank, recalibration of the blank, or rinsing the instrument may be required. |
| Interference Check Solutions (ICSA/B) | Analyzed after the Low Check Standard. | |
| **PAHs - EPA Method 8270E-SIM** | | |
| **Control Item** | **Frequency** | **Corrective Action** |
| **Method Quality Assurance/Quality Control** | | |
| Holding Times | All samples | Laboratory to qualify results if holding times are exceeded. |
| Method Detection Limits (MDL) | At initial set-up and once per year; quarterly MDL verification checks. | Run MDL verification check at higher level and set MDL higher or reconduct MDL study |
| Method Blanks | One per preparatory batch. | Correct problem, if required, re- prep and reanalyze method blank and all affected samples. |
| Laboratory Control Sample (LCS) | Project specific | Perform Corrective Action[a] |
| LCS Duplicate (LCSD) | Project specific | Perform Corrective Action[a] |
| Matrix spike (MS) | One MS per preparatory batch per | Perform Corrective Action[a] |
| Matrix spike duplicate (MSD) | One per preparatory batch per matrix | Perform Corrective Action[a] |
| Surrogate spike | All field and QC samples | Correct problem then re-prep and reanalyze all |
| ***Instrument Quality Assurance/Quality Control*** | | |
| Retention time (RT) calculated for each analyte and surrogate | At method set-up and after major maintenance (e.g., column change) | NA |
| Evaluate relative retention time | With each sample | Correct problem, then rerun ICAL. |
| Tuning | Prior to the initial calibration | Retune, verify, and rerun affected samples. |
| Tune Check | Beginning of each analytical run | Retune, verify, and rerun affected samples. |
| Initial calibration (minimum 5 points, ICAL) | Initial calibration prior to sample analysis | Laboratory to recalibrate and reanalyze affect samples. |
| Continuing Calibration verification (ICV/CCV) | ICV: Daily, before sample analysis , and every 12 hours during analysis.<br>CCV: At the end of every batch run. | ICV FAILURE: Correct problem, then rerun ICV. If that fails, repeat initial calibration.<br>CCV FAILURE: Perform corrective action[a]. |

## Table 7. Laboratory Quality Control Criteria

| Conventional Analyses | | |
|---|---|---|
| **Control Item** | **Frequency** | **Corrective Action** |
| ***Grain Size - PSEP Method*** | | |
| QA range check | Every sample | If not within 95-105% ratio, reanalyze. If reanalysis is not possible, assign a data qualifier to the sample. |
| ***Total Organic Carbon - EPA 9060*** | | |
| Initial Calibration | Beginning of each batch | Stop analysis, investigate, reanalyze. |
| Initial Calibration Verification | Immediately after initial calibration with an ICV. | Same as above unless obvious matrix problems are evident. |
| Continuing Calibration | Every 10 samples | Same as above. |
| Calibration Blanks | Beginning of each batch | Stop analysis, investigate, recalibrate. |
| Laboratory Control Samples - SRM | Once each analytical run | If not within 25% RSD, investigate, reanalyze . |
| Matrix Spikes | Every 20 samples | If confirmed, the analyst should verify operating conditions |
| Laboratory Duplicates | Every 20 samples | If not within 20% RSD, investigate, reanalyze . |
| Method Blank | With each batch preparation | Stop analysis, investigate, reanalyze. |

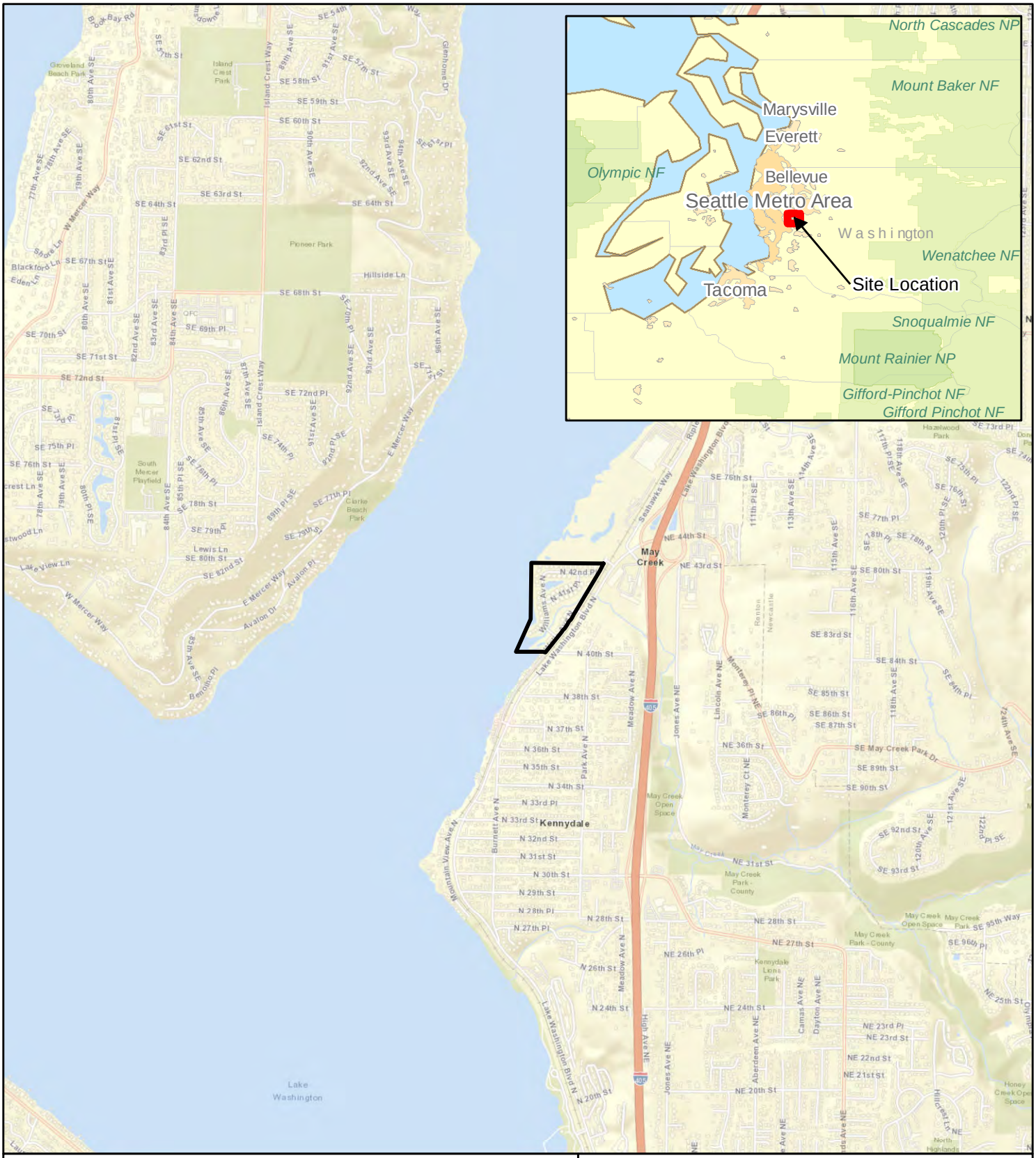
**Footnotes:**

a. Consider reevaluation, repreparation and reanalysis. If the issue is not resolved consider instrument maintenance, or recalibration. Revise data

**Acronyms:**

CCV = Continuing Calibration Verification Standard
CRI = Low Check Standard
EPA = Environmental Protection Agency
ICV = Initial Calibration Verification St ICSA/B = Interference Check Solution A or B
LCS = Laboratory Control Sample
LCSD = Laboratory Control Sample Duplicate
MDL = Method Detection Limit
MS = Matrix Spike
PAHs = polycyclic aromatic hydrocarbons
PSEP = Puget Sound Estuary Program methods
QA = Quality Assurance
RT = Retention Time
RRT = Relative Retention Time
RSD = Relative Standard Deviation
SIM = Select Ion Monitoring
SRM = Standard Reference Material

# FIGURES




**Legend**

Site Location

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

N

0 750 1,500 3,000 Feet

**Barbee Mill Upland Site Location**

Sediment RI Work Plan SAP/QAPP
Barbee Mill Site, Renton, WA

Geosyntec consultants

PNG086 (SEA:MVI) | July 2021

**Figure 1**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\Figure 1 Site Location Map.mxd 6/1/2021 10:22:20 AM




**Legend**

**Proposed Sample Locations**

- Onsite Surface Sediment Sample Location (0 to 10cm)
- Perimeter Surface Sediment Sample Location (0 to 10cm)
- Nearshore Sediment Sample (0 to 45cm)
- Porewater Sample Location (0 to 10cm)
- Historical Sample Location
- Historical Porewater Sample Location
- Outfall
- Barbee Mill Site – Upland
- Preliminary Sediment Boundary
- Quendall Terminals Sediment Operable Unit
- Habitat Restoration Area
- Historical Building Footprint
- 2002 Sediment Removal Area
- Passive Attenuation Zone
- Arsenic Groundwater Plume

N

0 100 200 400 Feet

# Proposed Surface Sediment and Porewater Sample Locations

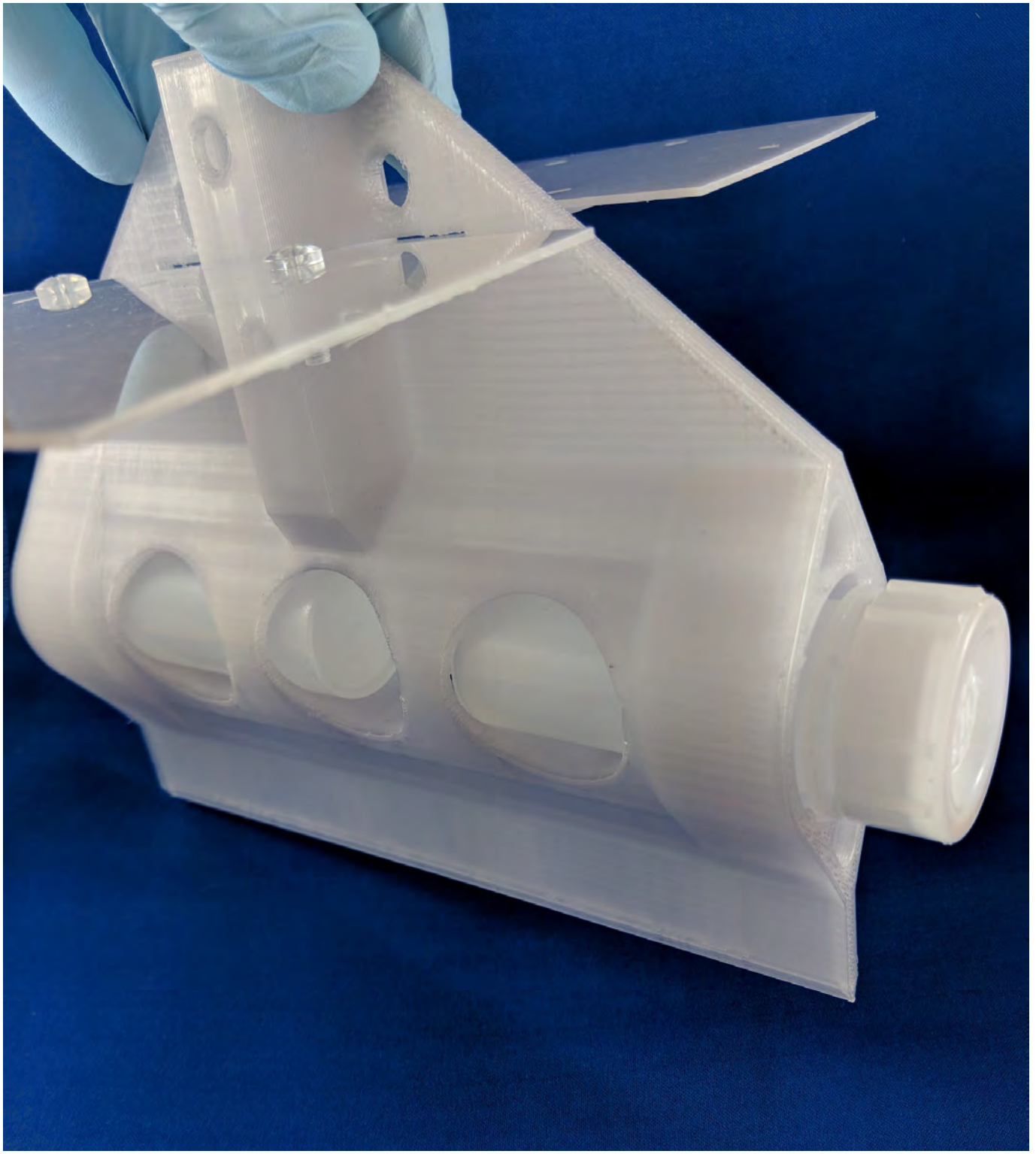
Sediment RI Work Plan SAP/QAPP
Barbee Mill Site, Renton, WA

Geosyntec consultants

PNG0869 (SEA:MVI) | July 2021

**Figure 2**

P:\Projects\Barbee Mill (DWT)\900 GIS and CAD\920 GIS\MXDs\RI Workplan\Figure 14 Proposed Surface Sediment Porewater Sample Locations.mxd 7/12/2021 8:07:52 AM



An example of a commercially available peeper design (SiREM Laboratories), showing the peeper vial inserted in a “winged”deployment device

Note:
For the purpose of porewater samplings related to this project, two rows of peeper vials will be used to collect samples representative of the 0-10 cm sediment depth interval.

**Porewater Sampling Device**

Sediment RI Work Plan SAP/QAPP
Barbee Mill Site, Renton, WA

Geosyntec consultants

| PNG0869 | June 2021 | **Figure 3** |
|---|---|---|

P :\Projects\Barbee Mill (GP)\P:\600 Deliverables - Geosyntec\d_SAP-QAPP (Appendix B)\Figure 3.pptx

# ATTACHMENT B-1
## Field Forms and Field Procedures

# Chain of Custody Record & Laboratory Analysis Request

| | | | |
|---|---|---|---|
| ARI Assigned Number: | Turn-around Requested: | Date: | |
| ARI Client Company: | Phone: | Page: | of |
| Client Contact: | | No. of Coolers: | Cooler Temps: |
| Client Project Name: | | | |
| Client Project #: | Samplers: | | |

**Analytical Resources, Incorporated**
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

| Sample ID | Date | Time | Matrix | No. Containers | PAHs (EPA8270E-SIM) | Metals (EPA6020A) | TOC (EPA9060) | Grain Size (PSEP) | | | | | Notes/Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | |

Analysis Requested

| Comments/Special Instructions | Relinquished by: (Signature) | Received by: (Signature) | Relinquished by: (Signature) | Received by: (Signature) |
|---|---|---|---|---|
| | Printed Name: | Printed Name: | Printed Name: | Printed Name: |
| | Company: | Company: | Company: | Company: |
| | Date & Time: | Date & Time: | Date & Time: | Date & Time: |

***Limits of Liability:*** *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

# Surface Sediment Field Log

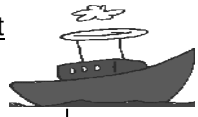
Job: _____ Core Location: _____

Job No: _____ Date: _____ Time: _____

Field Reps: _____ Sample Method: _____

Contractor: _____ Proposed Coordinates: _____

Water Height



DTS Boat: DTS Lead Line:

Mudline Elevation (datum): _____

Tide Measurements

Time/Height: _____

Time/Height: _____

Sample Acceptability Criteria:

1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: _____

| Grab # | Time | Confirmed Coordinates (datum) | | Sample Accept (Y/N) | Recovery Depth | Comments: (i.e.winnowing, jaws close, biota, overfill, good seal, sample depth) |
|---|---|---|---|---|---|---|
| | | Northing | Easting | | | |
| | | | | | | |
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| | | | | | | |

**Sediment Sample Description:** surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota)

Composite sample: _____

Sample Containers: _____

Analyses: _____

# Standard Operating Procedure
# Hydrocarbon Field Screening by Sheen Test

## 1.0 Purpose and Applicability

The Standard Operating Procedure (SOP) for sheen test describes a procedure to visually estimate areas of possible hydrocarbon impacts in soil or sediment. In addition, screening results can be used to aid in the selection of soil/sediment samples for chemical analysis. The field screening method includes a visual examination and water jar screening test.

Visual screening consists of inspecting the soil/sediment for stains, nonaqueous-phase liquids (NAPL), and/or sheens indicative of residual hydrocarbons. Visual screening is most effective at detecting heavy hydrocarbons, such as creosote, free-phase NAPL or high hydrocarbon concentrations. Water sheen screening from a representative soil/sediment sample is a more sensitive method at detecting the presence of hydrocarbons.

## 2.0 Responsibilities

The project manager is responsible for ensuring that a properly designed sampling program is prepared prior to any sample collection. The field sampling coordinator will have the responsibility to oversee and ensure that all sampling is performed in accordance with the project-specific sampling program and this SOP. In addition, the field sampling coordinator must ensure that all field workers are fully apprised of this SOP.

## 3.0 Health and Safety

This section presents the potential hazards associated with this technique. The site-specific Health & Safety Plan (HASP) will take precedence over this document. Note that sample collection usually requires Level D personal protection unless there is a potential for airborne or dermal exposures to site contaminants.

Health and safety hazards include but are not limited to the following:

- Dermal exposure to potentially contaminated media: proper personal protective equipment (PPE) is used to mitigate dermal contact including the impact of splashes of water or media to skin and/or eyes;
- Inhalation exposure when handling impacted media: respiratory protection should follow the procedures outlined in the project Site-Specific HASP; and
- Broken glass, in the event that a glass jar is used: use care when handling glassware.

## 4.0 Supporting Materials

The following materials must be on hand in sufficient quantity to ensure that proper screening procedures may be followed:

- Approximately one cubic-inch of media to be screened;
- 4 of 8 oz. wide-mouth, clear glass jar;
- Stirring devise (i.e. spoon);
- Squirt bottle; and
- Supply of distilled water.

# 5.0 Methods and Procedures

The strategy used to collect soil/sediment samples in the field for sheen testing will depend on the nature/grain size of the material and the type of hydrocarbon. Discrete samples may be collected from specific depths where NAPL is likely to occur. When lithology is course-grained material over fine-grained material, then a sample should be collected just above this interface where NAPL may be pooling above the "aquitard". Similarly, where fine-grained material overlies a coarse-grained layer with suspected impacts, the sample should be collected just below the contact. When lithology is fine-grained, then a sample should be collected near the contact with the coarse-grained layer. Alternatively, when lithology is finely bedded (< 1-inch thick), then homogenized samples may be collected over a larger depth interval to gain an "average" observation.

If the sample is being collected from inside a sediment core tube, the tube should be cut open longitudinally along the length of the core tube to prevent additional smearing. Make sure the interior of the sediment is exposed as a "fresh surface". Be sure to discard any material along the inside side-walls of the core tube; this is called the "smear zone". The smear zone may mask the true stratigraphy of a subsurface core sample. Then, use a spoon to scrap material across the "fresh" surface of the depth interval of interest, and place into sample jars for further observation. Once the sample volume is collected (approximately 1 oz or more depending upon grain size) the sample is examined and tested as described below.

## *Visual Examination*

In the field, observe sediment core tubes or soil samples for evidence of NAPL. Look at the material and note color and type/nature of occurrence. Observe the exterior and interio sidewalls of the sampling container for signs of staining. If wet, observe the nature of liquid. Among gravels, observe the surface of the gravel for signs of sheen and/or NAPL.

## *Water Sheen Test*

Water sheen screening involves placing soil/sediment in a clear glass jar or a black plastic pan partially filled with water, and observing the water surface for signs of a sheen. The volume of soil/sediment required for observation is approximately one cubic inch, or 10 mls, or about one tablespoon of media. For practical application in the field or lab, place about one cubic inch of soil/sediment (roughly 1 oz) in a 4 to 8 oz jar filled ¼-full with water. For larger volumes, use about 2 oz of material in an 8 oz wide-mouth glass jar filled ¼-full with water. Even larger volumes are needed for gravel. A plastic baggy may be substitute for a glass jar if field conditions require. Crush the material in the jar using a stirring devise (i.e., spoon), and shake the sealed jar vigorously for 30 seconds and allow the material to settle. Observe the water surface and sidewalls of the jar for signs of sheen, LNAPL, and DNAPL. Quantify the amount of sheen and blebs in the water surface using the following sheen classification:

| | |
|---|---|
| No Sheen | No visible sheen on water surface |
| Slight Sheen | Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly |
| Moderate Sheen | Light to heavy sheen, may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas without sheen on water surface |
| Heavy Sheen | Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen; visible droplets of immiscible liquids (i.e. NAPL) |

Quantify the spatial coverage of sheen and size/diameter NAPL blebs if observed. The color is often described as rainbow or metallic for sheens and dark brown to black for blebs, droplets, and staining. Observe the sidewalls of the jar and estimate the thickness of LNAPL on the water surface and the thickness of DNAPL accumulated at the bottom of the jar. Record visual signs of staining on jar sidewalls and stirring devise.

Field screening results will be recorded on the field logs forms or in a field notebook. Field screening results are site-specific and location-specific. Factors that may affect the performance of this method include: operator experience (experimentation may be required before routine screening is started) ambient air temperature, soil type, soil moisture, organic content, and type of hydrocarbon. Headspace screening may be collected to help correlate results and observations.

# 6.0 Quality Assurance/Quality Control

Not applicable.

# 7.0 Documentation

Documentation may consist of all or part of the following:

- Field sampling forms;
- Field log book; and
- Chain-of-custody forms.

Field records should contain sufficient detail to provide a clear understanding of how and where samples were collected. All documentation shall be placed in the project files and retained following completion of the project.

# Field Description Key for Potential NAPL in Sediment

The intent of this field description key is to provide field personnel with guidelines for logging and observing sediment conditions associated with potential presence of Non-Aqueous Phase Liquid (NAPL) in a consistent and factual manner.

## VISUAL DESCRIPTORS

The range of conditions that could exist in sediments include:

- **NAPL** (Non-Aqueous Phase Liquid) – a separate phase liquid that may be lighter than water (LNAPL) or denser than water (DNAPL). NAPL can have varying consistency (viscosity) and can range from non-viscous to highly viscous (taffy-like). NAPL observations should be accompanied by applicable olfactory with smell (see descriptors below) and other visual observations (e.g., color and viscosity). The visual appearance of NAPL should be noted using descriptors below as appropriate. If NAPL is identified, then a sheen or shake test should be completed as described in this SOP in the Hydrocarbon Field Screening by Sheen Test portion.
    - **Free Product –** the entirety of the pore space for a sample interval is saturated with NAPL. Care should be taken to ensure that the saturation described is not related to water in the sample. Depending on the viscosity, NAPL saturated materials may freely drain from a soil sample and should be documented accordingly.
    - **Present–** In some cases, NAPL may be present in the pore spaces, or some of the pore spaces, but not coating the soil grains. The NAPL occurrence may be greater than blebs but not freely draining (saturated) and not hydraulically continuous. In these cases, the appearance/abundance of the NAPL should be noted.
    - **Blebs or Globules–** discrete, multi-shaped NAPL in or on the soil matrix. Include additional descriptors to the extent practicable such as the approximate size (typically ranging in size from 0.01 to 0.05 inches in diameter) and quantity (number of blebs or qualitative estimate) to the extent practical.
    - **Coated –** soil grains are coated with NAPL – there is <u>not</u> sufficient NAPL present to saturate the pore spaces. Use modifiers such as light, moderate or heavy to indicate the degree of coating.
    - **Semi-solid NAPL–** NAPL that is present as a super viscous liquid and appears in a solid or semi-solid phase. The magnitude of the observed solid NAPL should be described (discrete granules, tarry balls, taffy-like, or a solid layer).
- **Sheen –** iridescent sheen. The sheen characteristics need to be described in the field log, including the color, and iridescent sheens need to be distinguished from bacterial sheens which tend to break up at angles on the water surface; whereas a non-bacterial sheen will be continuous and will not break up. Sheens can be described as:
    - Discontinuous sheen (i.e., spotty, streaks, florets) within a section of core and does not fill sediment pore spaces.

- Continuous sheen (i.e., covering an area greater than 1 square inch) within a section of core but does not fill pore spaces. Describe percent cover.

- **Stained** – visible, unnatural discoloration of the soil, with no visible NAPL.

**Other Visual Impacts and Descriptors**

In many cases, observed NAPL may be associated with a particular stratigraphic layer (e.g, sand lamination, woody debris layer, gravel lense), gas bubble, or void; NAPL distribution in relation to stratigraphy must be described. What does the material look like immediately above and below the area with suspected NAPL (e.g, clay). Impacts should be described using other visual descriptors as well, as applicable. Descriptors may include, but not be limited to, color, consistency, thickness, viscosity, water content, associated stratigraphy, presence shell or wood fragments or other debris, does NAPL flow out of the core tube, does it appear more or less viscous than water, results of jar sheen test, etc. Also note the staining of sampling equipment, and interior and exterior side-walls of the sampling tube, especially if entrainment of NAPL up the side-walls is suspected as an artifact of sample collection.

**OLFACTORY DESCRIPTORS**

Field personnel will not conduct olfactory testing as part of sample processing, because vapor inhalation is a potential health and safety risk. However, if incidental odors are noted by field personnel during regular sample processing activities, field personnel will record this observation in the field forms. General descriptors that could be used are the following:

- Note odors similar to mothballs, driveway sealer, highway paving oil, sewage or other odors that are acrid, burnt, or sulfur-like, etc.
- Other odors that are not believed to be natural should also be identified with descriptors such as organic, ammonia, sweet, chemical etc., as applicable.
- Use modifiers such as strong, moderate or slight to indicate intensity of the observed odor.
- In instances where multiple odors are present, a combination of descriptors should be used to clearly identify where these co-mingled impacts are present.

However, olfactory descriptions are more subjective than visual inspections. Visual inspection may be aided by a PID, ultraviolet (UV) fluorescence examination, shake test, or similar device, to monitor and record organic odors and suspected NAPL in the field. One may also consider collecting a sample of the suspected NAPL to assess physical characteristics and potential mobility.

# ATTACHMENT B-2

Laboratory Standard Operating Procedures
(provided upon request)

# APPENDIX C

# Quendall Terminals Groundwater Data

**Legend**

**Non-Detected Naphthalene Concentrations (µg/L)**

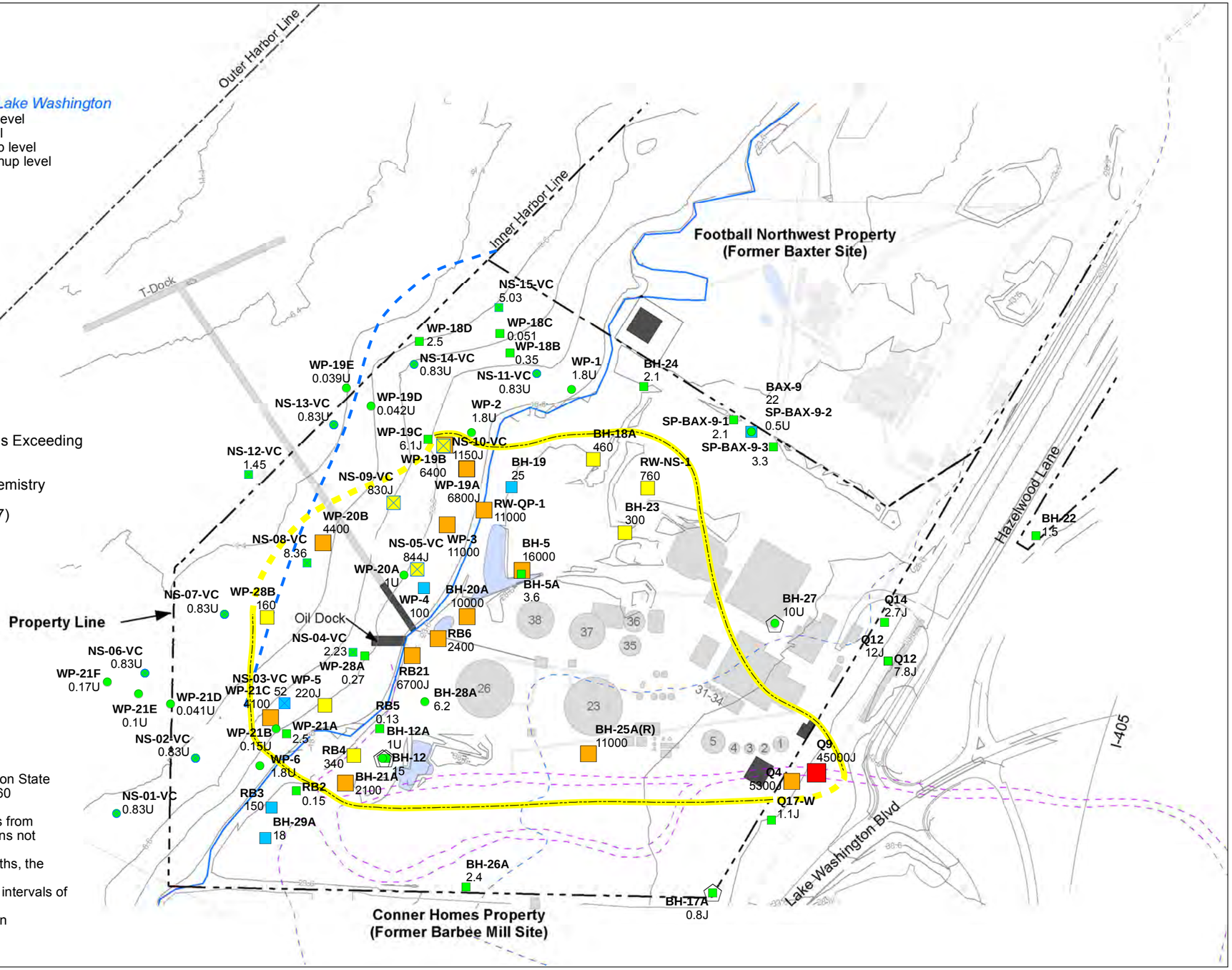
- <16
- ≥16 - 160
- ≥160 - 1,600
- ≥1,600 - 16,000
- >16,000

Basis of Screening Level Intervals
16 0.1x MTCA Method B groundwater cleanup level
160 MTCA Method B groundwater cleanup level
1600 10x MTCA Method B groundwater cleanup level
16000 100x MTCA Method B groundwater cleanup level

**Detected Naphthalene Concentrations (µg/L)**

- <16
- ≥16 – 160
- ≥160 – 1,600
- ≥1,600 – 16,000
- ≥16,000
- QA0 Level Data
- Indicates Porewater Sample from Sediment Vibracore
- Approximate Extent of Detected Naphthalene Concentrations Exceeding MTCA Method B Groundwater Cleanup Level (160 µg/L)
- Inferred from Lines of Evidence other than Groundwater Chemistry
- Predicted Western Extent of Groundwater Discharge (Note 7)
- Current Shoreline
- Historical Shoreline (1916)
- Former May Creek Channel
- Property Boundary
- Existing Structure
- Historical Structure
- Detention Pond

Notes:
1. Contour Intervals are 5 ft, NAVD 88.
2. U = Non-detect
3. J = Estimated value
4. The PRG screening level for naphthalene in groundwater is the Washington State Model Toxics Control Act (MTCA) Method B groundwater cleanup level of 160 micrograms per liter (µg/L).
5. Results shown in this figure represent either the maximum concentrations from sampling conducted in 2008 and 2009, or the most recent results for locations not sampled during that time.
6. At porewater sampling stations (e.g. NS-01-VC) with multiple sample depths, the maximum subsurface porewater concentration is shown.
7. Predicted western extent of groundwater discharging from contaminated intervals of the site (see Section 6.4). Does not include dispersion.
8. Southern and northern boundaries adjusted to include extent of DNAPL in subsurface (see Figure 4.4-1).




Q:\Jobs\020059_Quendall_Terminals\Maps\2012_0205\2-8 Shallow WG Naphthalene.mxd epipkin 9/17/2012 10:39:40 AM

ANCHOR QEA

Feet
0 100 200 300 400

**Figure 5.2-8**
Shallow Groundwater Naphthalene Concentrations
Final Remedial Investigation, Quendall Terminals

## Legend

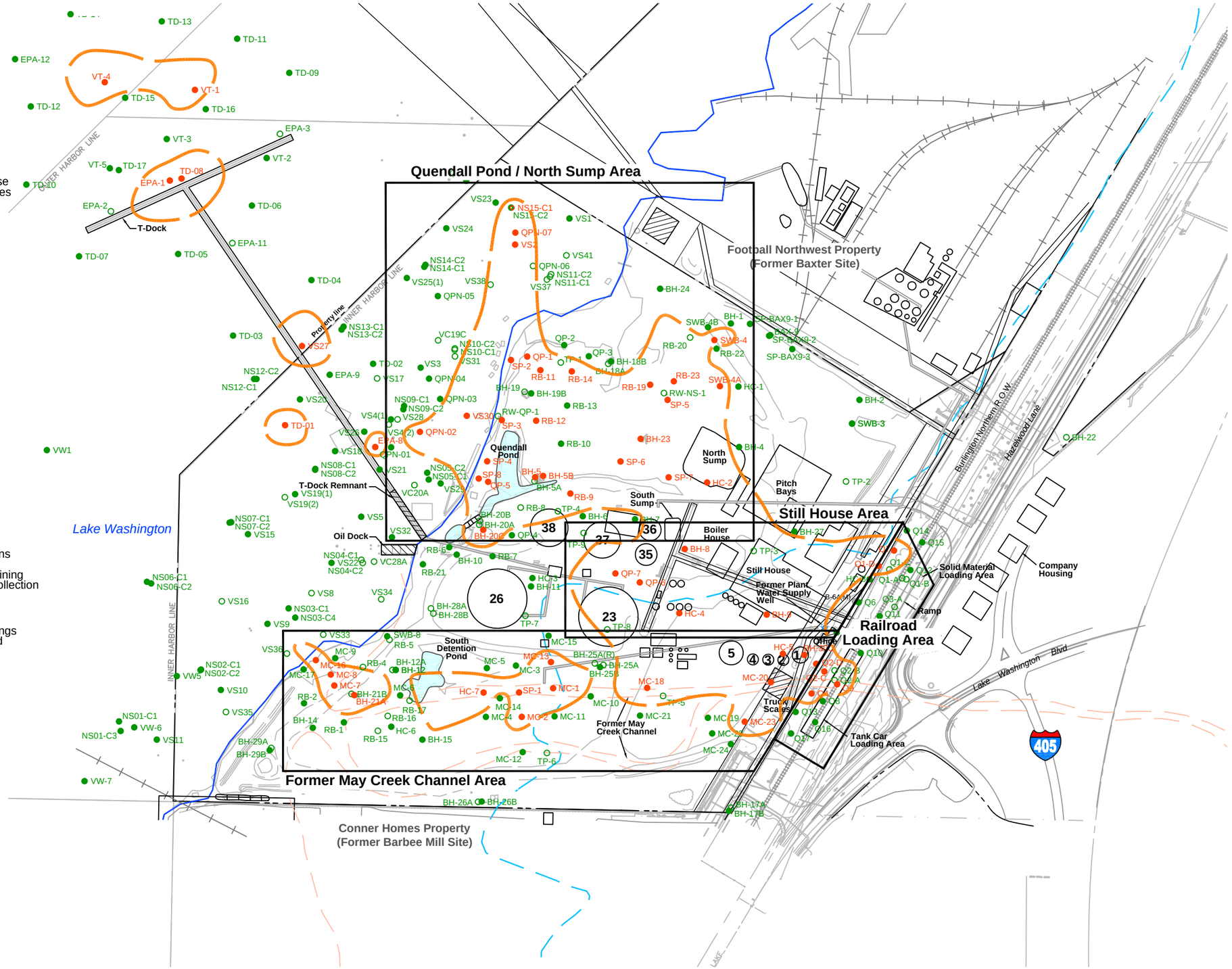
- TD-08 — Boring w/ DNAPL
- VT-3 — Boring w/ no DNAPL
- EPA-2 — Boring w/ no DNAPL but base is above adjacent occurrences or no samples collected
- Maximum Extent of DNAPL
- Detention Ponds
- Existing Structures
- Historical Structures
- Other Historical Features
- Current Shoreline
- 1916 Shoreline
- Former May Creek Channel

## Notes

1. DNAPL occurrences based on observations of oil-coated or oil-wetted soil. Soil exhibiting only sheen or staining not identified as containing DNAPL. See Attachment A-11 of the Data Collection Work Plan (Anchor QEA & Aspect 2009a).

2. Boundaries generally based on midpoint between borings containing DNAPL and borings with no DNAPL (if sufficiently deep), adjusted to fit Surfer-generated contour intervals of DNAPL thickness (see Figure 4.4-4).

3. DNAPL occurrences at each boring are summarized in Tables G-1 through G-4 in Appendix G.




N

0 200 400

Feet

Aspect CONSULTING

# Site Plan Showing DNAPL Occurrences

Final Remedial Investigation, Quendall Terminals
Renton, Washington

| | |
|---|---|
| DATE: SEP 2012 | PROJECT NO. 020027 |
| DESIGNED BY: RRR/JJP | |
| DRAWN BY: PMB/SCC | FIGURE NO. 4.4-1 |
| REVISED BY: SCC | |

CAD Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-441.dwg Figure 4.4-1 (11 x 17) || Date Saved: Sep 11, 2012 12:16pm || User: scudd || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet

**Legend**

**Non-Detected cPAH (B[a]P Equivalent) Concentrations (µg/L)**

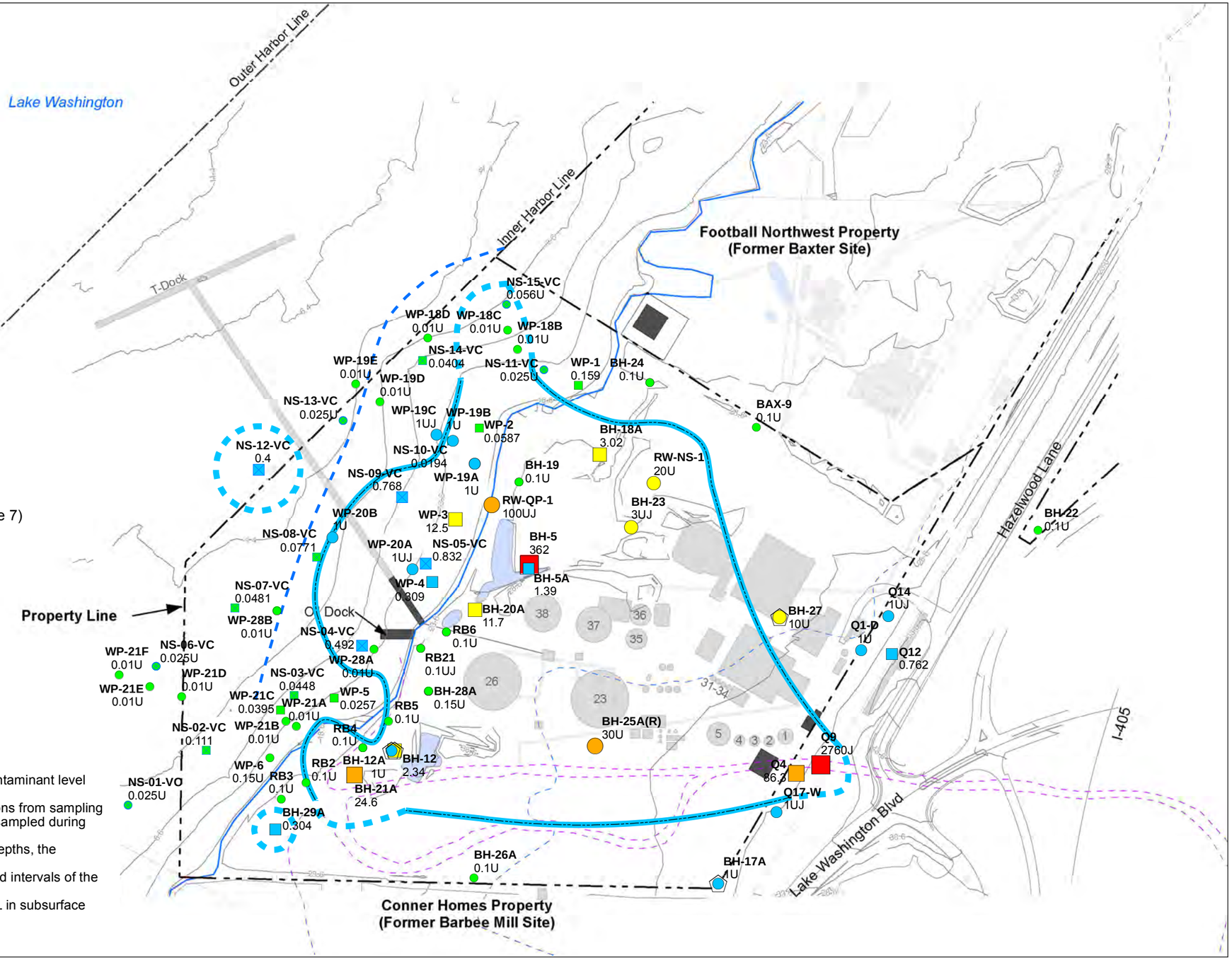
- <0.2
- ≥0.2 - 2
- ≥2 - 20
- ≥20 - 200
- ≥200

Basis of Screening Level Intervals
0.2 MCL
2 10x MCL
20 100x MCL
200 1000x MCL

**Detected cPAH (B[a]P Equivalent) Concentrations (µg/L)**

- <0.2
- ≥0.2 - 2
- ≥2 - 20
- ≥20 - 2,000
- ≥200
- QA0 Level Data
- Indicates Porewater Sample from Sediment Vibracore
- Approximate Extent of Detected cPAH (B[a]P Equivalent) Concentrations Exceeding MCL (0.2 µg/L)
- Inferred from Lines of Evidence other than Groundwater Chemistry
- Predicted Western Extent of Groundwater Discharge (Note 7)
- Current Shoreline
- Historical Shoreline (1916)
- Former May Creek Channel
- Property Boundary
- Existing Structure
- Historical Structure
- Detention Pond

Notes:
1. Contour Intervals are 5 ft, NAVD 88
2. U = Non-detect
3. J = Estimated value
4.The PRG screening level for cPAHs in groundwater is the maximum contaminant level (MCL) for benzo(a)pyrene of 0.2 microgram per liter (µg/L).
5. Results shown in this figure represent either the maximum concentrations from sampling conducted in 2008 and 2009, or the most recent results for locations not sampled during that time.
6. At porewater sampling stations (e.g. NS-01-VC) with multiple sample depths, the maximum subsurface porewater concentration is shown.
7. Predicted western extent of groundwater discharging from contaminated intervals of the Site (see Section 6.4). Does not include dispersion.
8. Southern and northern boundaries adjusted to include extent of DNAPL in subsurface (see Figure 4.4-1).




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ANCHOR QEA

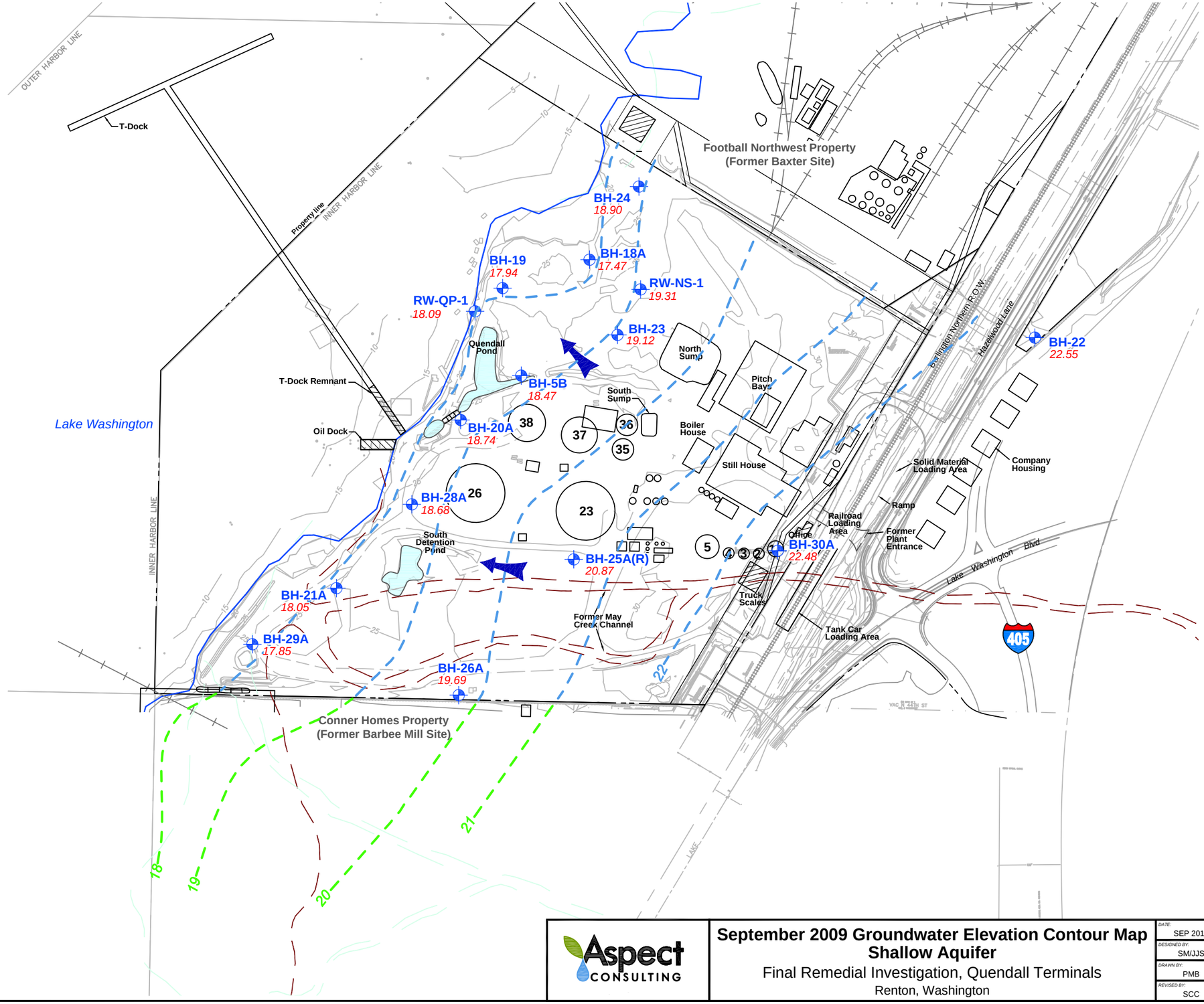
Feet
0 100 200 300 400

**Figure 5.2-14**
Shallow Groundwater cPAH (Benzo[a]Pyrene Equivalent) Concentrations
Final Remedial Investigation, Quendall Terminals

## Legend

- BH-22 / 22.55 — Monitoring Well with Data from September 2009 (Aspect)
- 20 — Groundwater Elevation Contour (September 2009)
- Inferred Direction of Groundwater Flow
- 20 — Groundwater Elevation Contour for adjacent Connor Homes Property (former Barbee Mill Site)
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88)




# September 2009 Groundwater Elevation Contour Map Shallow Aquifer

Final Remedial Investigation, Quendall Terminals

Renton, Washington

Aspect CONSULTING

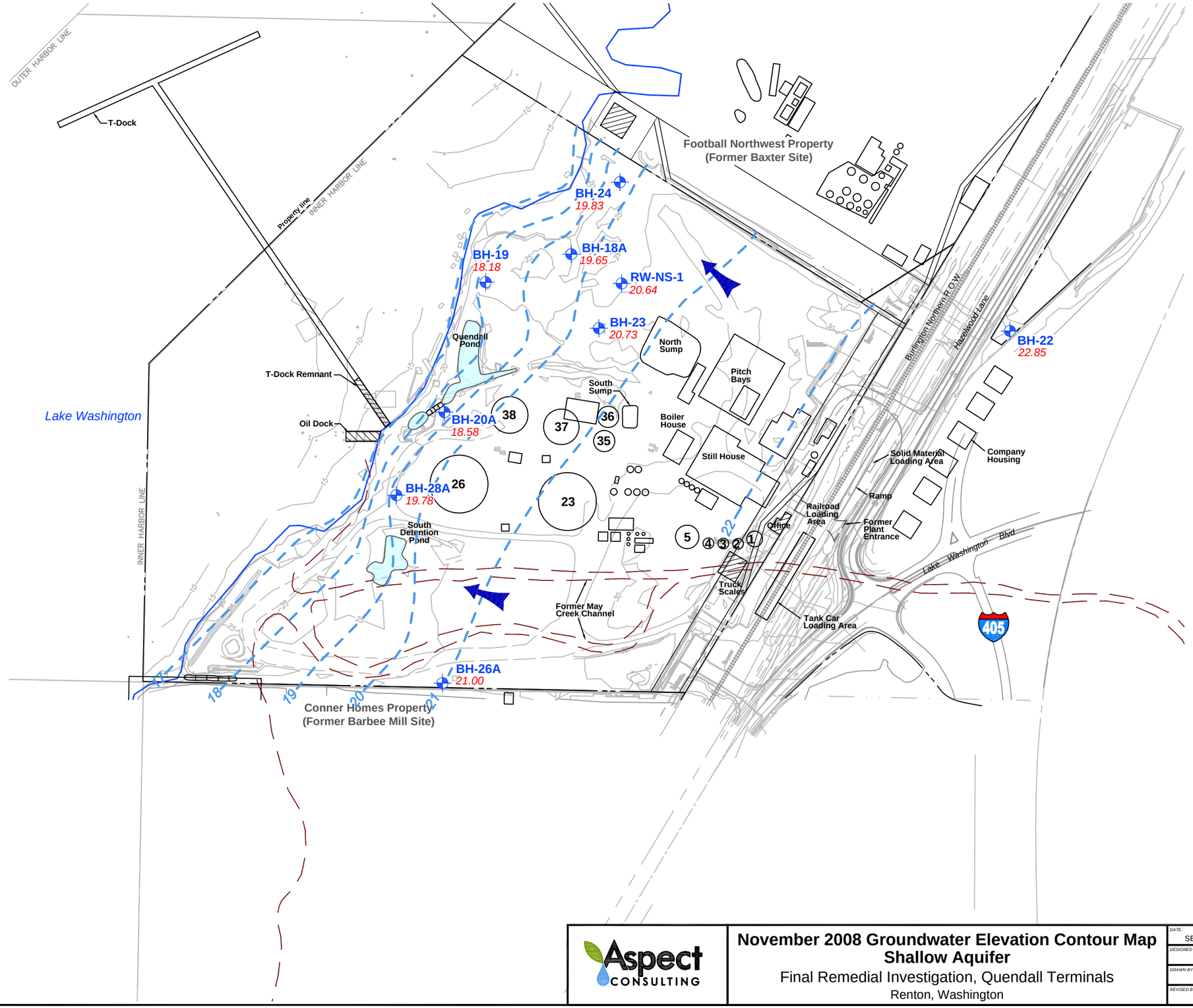
| DATE: | PROJECT NO. |
|---|---|
| SEP 2012 | 020027 |
| DESIGNED BY: SM/JJS | |
| DRAWN BY: PMB | FIGURE NO. 3.1-12 |
| REVISED BY: SCC | |

C:\GIS Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3112.dwg Figure 3.1-12 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:13pm || User: scudd

## Legend

- BH-24 / 19.83 — Monitoring Well with Data from November 2008 (Aspect)
- 19 — Groundwater Elevation Contour (November 2008)
- Inferred Direction of Groundwater Flow
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88)




**November 2008 Groundwater Elevation Contour Map**
**Shallow Aquifer**
Final Remedial Investigation, Quendall Terminals
Renton, Washington

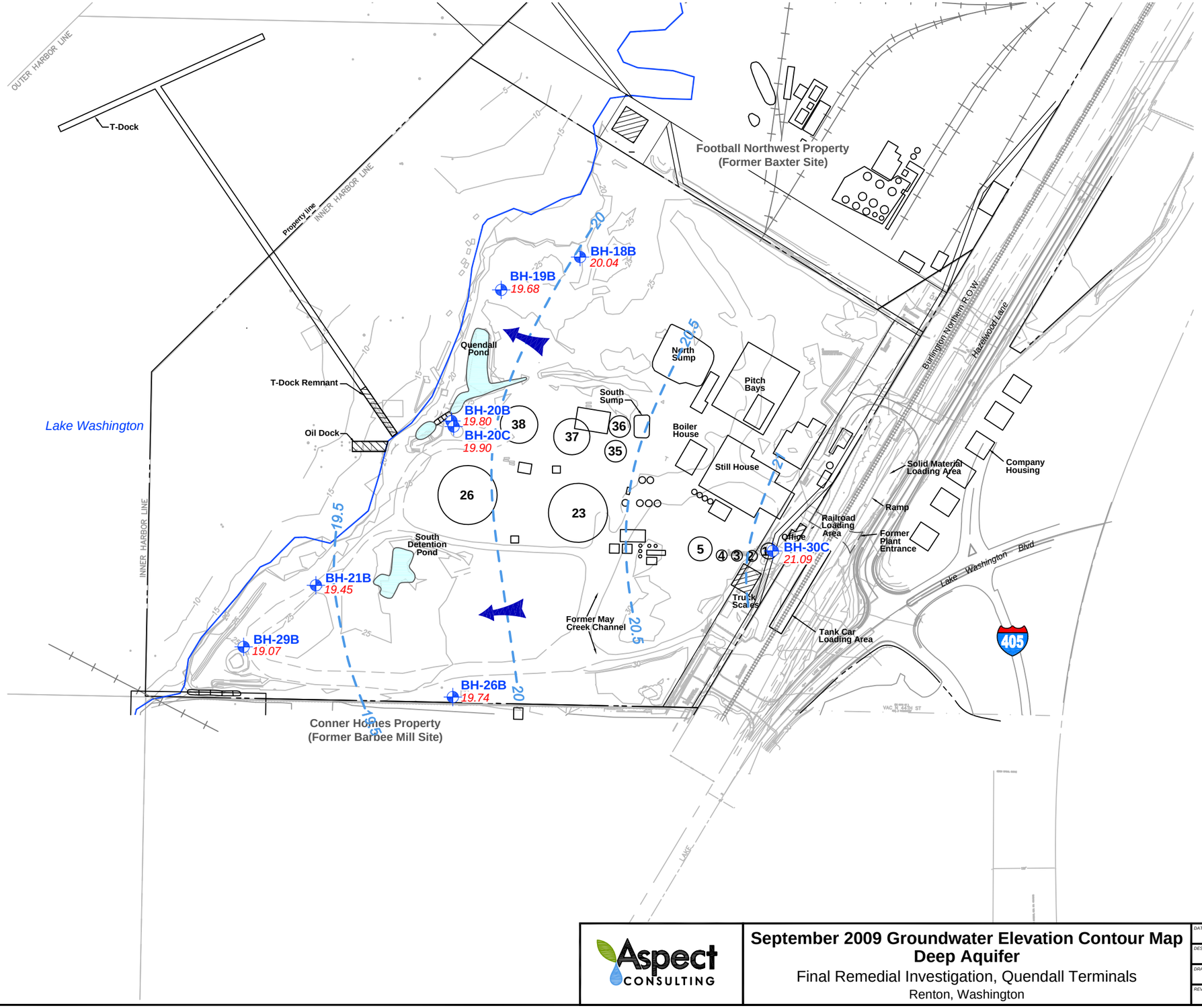
| | |
|---|---|
| DATE: SEP 2012 | PROJECT NO. 020027 |
| DESIGNED BY: SM | |
| DRAWN BY: PMB | FIGURE NO. 3.1-13 |
| REVISED BY: SCC | |

C4D Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3113.dwg Figure 3.1-13 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:18pm || User: scudd

## Legend

- **BH-19B** / *19.68* — Monitoring Well with Data from September 2009 (Aspect)
- *20* — Groundwater Elevation Contour (September 2009)
- Inferred Direction of Groundwater Flow
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88).



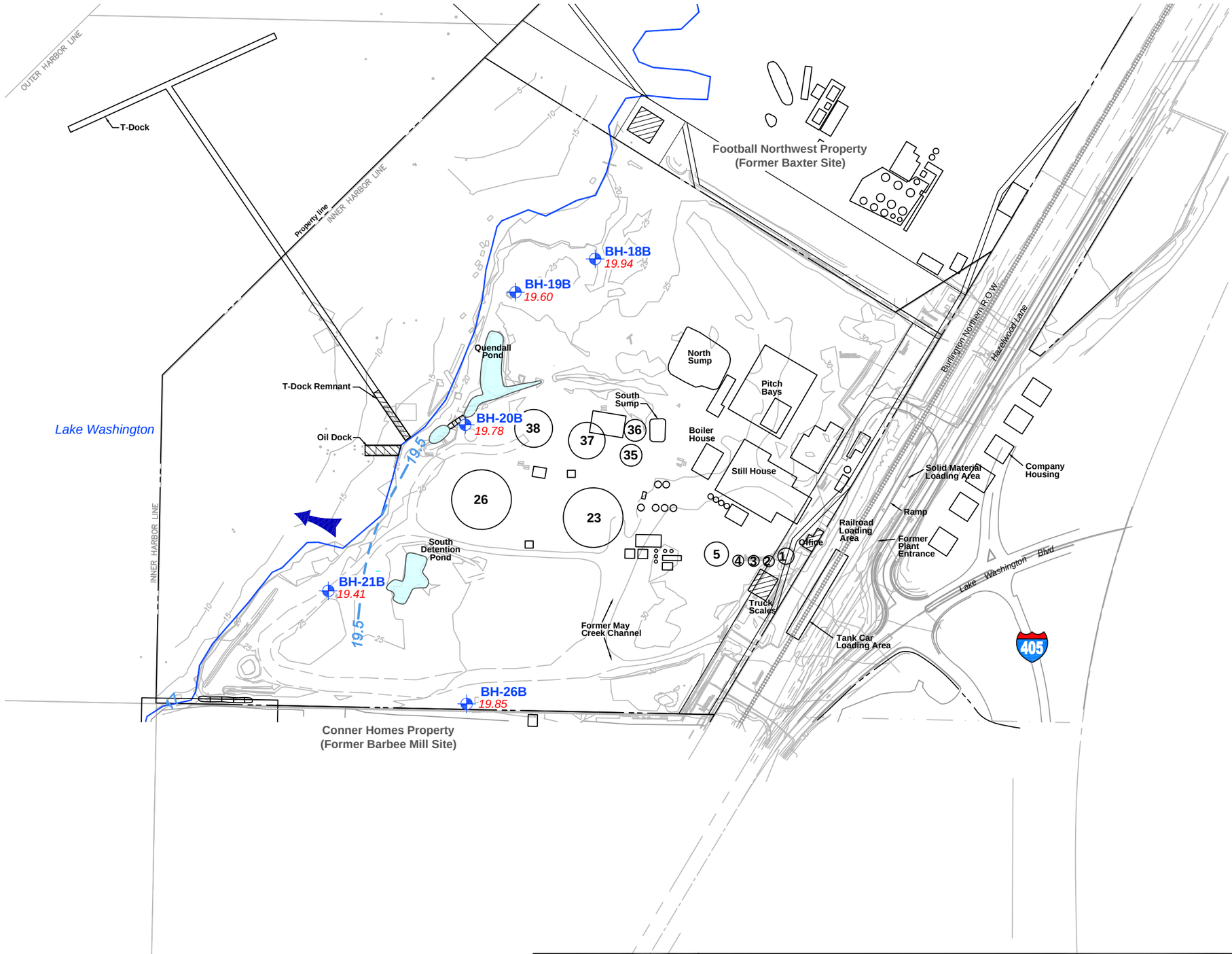

| | |
|---|---|
| Aspect Consulting | **September 2009 Groundwater Elevation Contour Map Deep Aquifer**<br>Final Remedial Investigation, Quendall Terminals<br>Renton, Washington |
| DATE: SEP 2012 | PROJECT NO. 020027 |
| DESIGNED BY: SM/JJS | |
| DRAWN BY: PMB | FIGURE NO. 3.1-14 |
| REVISED BY: SCC | |

CAD Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3114.dwg Figure 3.1-14 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:23pm || User: scudd

## Legend

- **BH-19B** *19.60* — Monitoring Well with Data from November 2008 (Aspect)
- *19.5* — Groundwater Elevation Contour (November 2008)
- Inferred Direction of Groundwater Flow
- Detention Ponds
- Existing Structures
- Historical Structures

Note: Elevations in feet (NAVD 88)




# November 2008 Groundwater Elevation Contour Map Deep Aquifer

Final Remedial Investigation, Quendall Terminals

Renton, Washington

Aspect CONSULTING

| | |
|---|---|
| DATE: SEP 2012 | PROJECT NO. 020027 |
| DESIGNED BY: SM/JJS | |
| DRAWN BY: PMB | FIGURE NO. 3.1-15 |
| REVISED BY: SCC | |

CAD Path: Q:\Quendall\020027 Quendall Terminals\2012-09 RI Final Report\020027-3115.dwg Figure 3.1-15 (11 x 17) || Coordinate System: NAD 1983 State Plane Washington North FIPS 4601 Feet || Date Saved: Sep 10, 2012 4:27pm || User: scudd

**Legend**

**Non-Detected Arsenic Concentrations (µg/L)**

- <10
- ≥10 - 100
- ≥100 - 1,000
- ≥1,000

**Detected Arsenic Concentrations (µg/L)**

- <10
- ≥10 - 100
- ≥100 - 1,000
- ≥1,000
- QA0 Level Data
- Approximate Extent of Detected Arsenic Concentrations Exceeding MCL (10 µg/L) Inferred from Lines of Evidence other than Groundwater Chemistry
- Current Shoreline
- Historical Shoreline (1916)
- Former May Creek Channel
- Property Boundary
- Existing Structure
- Historical Structure
- Detention Pond

Basis of Screening Level Intervals
10 MCL
100 10x MCL
1000 100x MCL

Notes:
1. Contour Intervals are 5 ft, NAVD 88
2. U = Non-detect.
3. J = Estimated value.
4. Results shown in this figure represent either the maximum concentrations from sampling conducted in 2008 and 2009, or the most recent results for locations not sampled during that time.
5. The PRG screening level for arsenic in groundwater is the maximum contaminant level (MCL) of 10 micrograms per liter (µg/L).
6. See Figure 3.3-1 for arsenic concentrations in shallow groundwater on Conner Homes property.

Lake Washington
Outer Harbor Line
Inner Harbor Line
T-Dock
Property Line
Oil Dock
Football Northwest Property (Former Baxter Site)
Conner Homes Property (Former Barbee Mill Site)
Hazelwood Lane
Lake Washington Blvd
I-405

WP-1 1U
BH-24 2.2
WP-2 1
BH-18A 7.3
BAX-9 2
BH-19 25.3
RW-NS-1 2.6
WP-3 1U
RW-QP-1 0.7
BH-23 5.7
BH-5 21.5
WP-4 2
BH-5A 53.8
BH-20A 6.9
BH-22 2.5
Q14 2.2
Q1-D 9.2
Q12 2.4
WP-5 6
BH-28A 1.6
BH-25A(R) 13.5
Q9 1690
WP-6 6
BH-12A 4
BH-12 8.1
BH-21A 5.9
Q4 2.9
Q17-W 2.8
BH-29A 389
BH-26A 3.8
BH-17A 1

Feet
0 100 200 300 400

ANCHOR QEA

**Figure 5.2-16**
Shallow Groundwater Arsenic Concentrations
Final Remedial Investigation, Quendall Terminals

Q:\Jobs\020059_Quendall_Terminals\Maps\2012_0215\2-16_Shallow_WG_Arsenic.mxd dhanson 9/12/2012 2:34:26 PM

**Legend**

**Non-Detected Arsenic Concentrations (µg/L)**

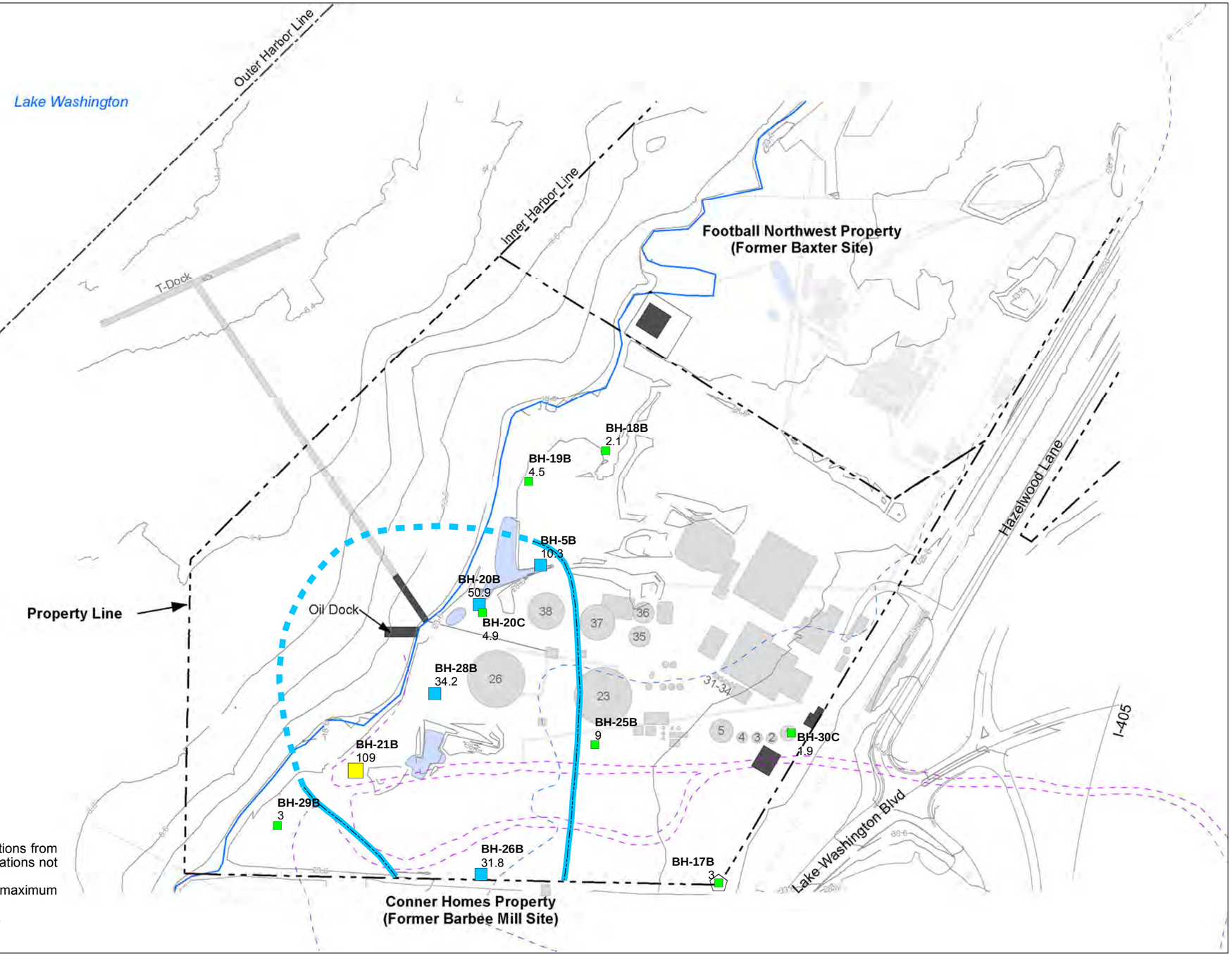
- <10
- ≥10 - 100
- ≥100 - 1,000
- ≥1,000

**Detected Arsenic Concentrations (µg/L)**

- <10
- ≥10 - 100
- ≥100 - 1,000
- ≥1,000
- QA0 Level Data
- Approximate Extent of Detected Arsenic Concentrations Exceeding MCL (10 µg/L) Inferred from Lines of Evidence other than Groundwater Chemistry
- Current Shoreline
- Historical Shoreline (1916)
- Former May Creek Channel
- Property Boundary
- Existing Structure
- Historical Structure
- Detention Pond

Basis of Screening Level Intervals
10 MCL
100 10x MCL
1000 100x MCL

Notes:
1. Contour Intervals are 5 ft, NAVD 88
2. U = Non-detect.
3. J = Estimated value.
4. Results shown in this figure represent either the maximum concentrations from sampling conducted in 2008 and 2009, or the most recent results for locations not sampled during that time.
5. The PRG screening level for arsenic in groundwater is the maximum contaminant level (MCL) of 10 micrograms per liter (µg/L).
6. There are no deep groundwater wells on the Conner Homes property.




Feet
0 100 200 300 400

**Figure 5.2-17**
Deep Groundwater Arsenic Concentrations
Final Remedial Investigation, Quendall Terminals

Q:\Jobs\020089_Quendall_Terminals\Maps\2012_0265.2-17_Deeper_WG_Arsenic.mxd dhanson 9/12/2012 2:37:15 PM

# APPENDIX D

# Terrestrial Ecological Evaluation

# Barbee Mill Terrestrial Ecological Evaluation

The purpose of a Terrestrial Ecological Evaluation (TEE) is to assess the potential risk to terrestrial plants and/or animals that live entirely or primarily on affected land. Sites may qualify for an exclusion from the TEE process under WAC 173-340-7491(1) if any of the following conditions are met:

1. All soil contaminated with hazardous substances is, or will be located below the standard point of compliance (15 feet bgs); or
2. All soil contaminated with hazardous substances is,or will be located below an approved conditional point of compliance (6 feet bgs, or alternative depth if approved by Ecology). Note: for this to be acceptable, an institutional control needs to be written in as a deed restriction on the property preventing excavation of soils below 6 feet (bgs). The purpose of this institutional control is to prevent contaminated soils from reaching the surface; or
3. All soil contaminated with hazardous substances is, or will be covered by buildings, paved roads, or other physical barriers that will prevent plants or wildlife from being exposed to the soil exposed to the soil contamination. Note: for this to be acceptable, an institutional control shall be required by the department under WACC 173-340-440. An exclusion based on planned future land use shall include a completion date for such future development that is acceptable to the department; or
4. For sites contaminated with any of the hazardous substances listed in WAC 173-340-7491(1)(c)(ii), there is less than ¼ acre of contiguous undeveloped area on or within 500 feet of the site; or
5. For sites with hazardous substances (other than those listed in WAC 173-340-7491(1)(c)(ii), there is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of the site.

The Barbee Mill site qualifies for a TEE exclusion because conditions for #2 and #3 are met, as described below:

- All contaminated soil associated with the Site is present on the Barbee Mill property.[1]
- Much of the Barbee Mill property, including the area in and around the soil interim action actions, was covered with approximately 4 to 8 feet of clean fill during redevelopment in 2007. All contaminated soil at the site is greater than 6 feet below the current grade.
- An environmental covenant was placed on the property. Because the interim action removed soil exceeding direct contact-based screening levels (adjusted for background) above 15 feet in depth, the covenant includes conditions preventing subsurface disturbances of: 1) the passive attenuation zone; 2) soil beneath the vertical extent of the 2005 arsenic excavation (approximately 18 feet or more below current grade); and 3) Site soil located below the historical high groundwater elevation of 19 to 23 feet NAVD88.
- In addition to the 4 to 8 feet of clean fill, the 2007 site redevelopment covered the area of contaminated soil with roads, sidewalks, utilities, buildings, and limited areas of landscaping and plantings that prevent wildlife or plants from being exposed to contaminated soil.

Therefore, no further evaluation of the terrestrial ecological pathway is required.

[1] Arsenic-contaminated groundwater is located on the adjacent Quendall Terminals Property; however, arsenic concentrations in soil within the footprint of the arsenic plume on Quendall Terminals do not exceed the MTCA Method A cleanup level for unrestricted use of 20 mg/kg.

# APPENDIX E

# Sampling and Analysis Plan

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# E1 Introduction

This Sampling and Analysis Plan (SAP) has been prepared by Aspect Consulting, LLC (Aspect) for the Barbee Mill Site (Site). This SAP is Appendix A to the Remedial Investigation Data Gaps Analysis and Work Plan (RI Work Plan) to meet the requirements of Agreed Order No. DE 5396 (Agreed Order) between the Washington State Department of Ecology (Ecology) and Barbee Mill Co., Inc.

The purpose of this SAP is to ensure that field sample collection, handling, and laboratory analysis conducted during the data gaps work will generate data to meet project-specific data quality objectives (DQOs) in accordance with the Model Toxics Control Act (MTCA) requirements (Washington Administrative Code [WAC] 173-340-350).

This SAP comprises two major components: a Field Sampling Plan (FSP) defining field protocols and a Quality Assurance Project Plan (QAPP) defining analytical protocols. It is the responsibility of Aspect personnel and subcontracted analytical laboratory personnel performing the data gaps sampling and analysis activities to adhere to the requirements of the FSP and QAPP.

The FSP and QAPP are presented below in Section C2 and Section C3, respectively.

# E2 Field Sampling Plan

Field investigation and sampling procedures to be followed during the annual groundwater monitoring and data gaps work are described in the following sections. Specific sample locations are shown on Figure 9 of the RI Work Plan.

## E2.1 Soil Sampling

Soil samples will be collected for soil logging purposes and to aid in determining well screen placement. Chemical analysis of soil samples is not planned.

### *E2.1.1 General Protocols*

Subsurface soil quality samples will be collected from direct push boring and hollow-stem auger explorations. A licensed geologist from Aspect Consulting will oversee the drilling activities and preparation of geologic logs for each of the explorations completed. The field representative will visually classify the soils in accordance with ASTM Method D2488 and record soil descriptions, field screening results, and other relevant details (e.g., staining, debris, odors, etc.) on the boring log form (see forms in Attachment C-1).

The Aspect field geologist will screen each soil sample using a PID to monitor the presence of VOCs. Soil samples will be removed from the sampler using a stainless steel spoon and placed in a stainless steel bowl for homogenization with the stainless steel spoon. Gravel-sized material greater than approximately 0.5 inch will be removed from the sample during mixing. A representative aliquot of the homogenized soil will be

placed into certified-clean jars supplied by the analytical laboratory. The following subsections detail the procedures for soil sample collection, handling, identification, and sample quality assurance/quality control (QA/QC).

### *E2.1.2 Hollow-Stem Auger Borings*

Aspect Consulting will subcontract with a Washington-licensed driller to complete the hollow-stem auger soil boring to be completed as a monitoring well. During drilling, soil samples will be collected at 2.5- to 5-foot-depth intervals using a split spoon sampler and the Standard Penetration Test (ASTM D1586-84). The hollow-stem auger soil boring will be completed as a monitoring well, as described below.

Soil produced during this work will be collected in drums and secured on the Quendall Terminals Property for profiling and disposal.

## E2.2 Monitoring Well Installation and Development

One monitoring well (BH-31B) will be installed between BH-21B and BH-26B on the Quendall Property to address existing data gaps related to the nature and extent of deep groundwater contamination at the Site. The rationale for the monitoring well location, depth, and chemical analyses are provided in Section 4 of the Work Plan. The proposed location of BH-31B is shown on Figure 9.

### *E2.2.1 Well Installation*

The monitoring well will be constructed in accordance with WAC 173-160 by licensed drillers. The well will be completed with an appropriate protective seal, typically a concrete surface seal with a monument flush-mounted at grade. An As-Built Well Completion Diagram will be completed by the field geologist for each installation (see Attachment C-1).

The proposed screen placement is from 30 to 40 feet below ground surface, within the deep groundwater interval. However, the screen placement elevation will be determined in the field based on hydrogeologic information obtained during drilling.

The monitoring well will have the following configuration: 2-inch-diameter, threaded Schedule 40 PVC slotted screen and blank casing. Well screens will be 0.020-inch slot (20-slot) and 10 feet in length. Screens will be filter-packed with 10/20 silica sand and an annular seal consisting of bentonite chips will be placed above the filter pack.

### *E2.2.2 Well Development*

The monitoring well will be developed to remove fine-grained material from inside the well casing and filter pack, and to improve hydraulic communication between the well screen and the surrounding water-bearing formation. The field geologist will document with well development activities using the form (see Attachment C-1). Well development will be performed using a submersible electric pump gently surged the entire length of the well screen. Each well will be developed until visual turbidity is reduced to minimal levels, or until 10 casing volumes of water plus a volume equal to any water added during drilling has been removed. Groundwater produced during well development will be collected in drums and secured on the Quendall Terminals Property for profiling and disposal.

### *E2.2.3 Surveying*

The monitoring well casing elevation will be surveyed into the existing network of monitoring wells. Survey elevations will be to the nearest 0.01 foot. Measurements will be taken at the "notched" or "marked" spot at the top edge of the open PVC casing. Where not yet marked, the highest point on the casing will be surveyed and marked. The approximate elevation of the groundwater level at each well will also be established in the survey. Coordinate locations will be established using a portable field global positioning system (GPS).

## E2.3 Groundwater Sampling

### *E2.3.1 Groundwater Level Monitoring and Well Inspection*

Depth-to-groundwater measurements will be conducted in the wells using an electric well sounder, graduated to 0.01 foot. Water level measurements will be completed before water quality sampling. All water levels will be recorded in the field notes.

### *E2.3.2 Groundwater Sample Collection*

For annual groundwater monitoring, groundwater samples will be collected from existing monitoring wells CMW-1 through CMW-6, EW-1 through EW-8, and BH-29A, and well points WP-1A and WP-8, and analyzed for dissolved arsenic and iron. To address the RI data gaps identified in this RI Work Plan, all wells will be analyzed for total arsenic, and a subset of these wells will be sampled for additional analytes, which are listed in Table C-1. The locations with additional analytes are highlighted on Figure 9. New monitoring well BH-31B will be sampled at minimum one week after being installed and developed and will be analyzed for total and dissolved arsenic.

Groundwater samples will be collected using low-flow techniques with peristaltic pumps and polyethylene tubing. Aspect field staff will document groundwater sampling activities using the form shown in Attachment C-1. The extraction wells (EW-1 through EW-8) will be sampled from the wellheads using a peristaltic pump, not the groundwater extraction vault, to limit any interference due to biofouling.

Prior to sample collection, the static water level in the well will be measured. The well will then be purged at flow rates less than 0.5 liter per minute. The following field parameters will be monitored using a YSI meter and flow-through cell:

- temperature
- pH
- electrical conductance
- dissolved oxygen (DO)
- oxidation-reduction potential (Eh).

These field parameters will be recorded on Groundwater Sampling Record form at 5-minute intervals throughout well purging until they stabilize. Stabilization is defined as three successive readings where the parameter values vary by less than 10 percent (or 0.5 mg/L dissolved oxygen if the readings are below 1 mg/L). However, no more than three well casing volumes will be purged prior to groundwater sample collection.

Once purging is complete, the groundwater samples will be collected using the same low flow rate. Samples will be collected by directly filling laboratory supplied pre-cleaned containers. Samples for dissolved metals analyses will be filtered in the field using a disposable in-line 0.45-micron filter (changed for each well).

### *E2.3.3 Groundwater Sample Identification*

Each groundwater sample will be assigned a unique sample identification number that includes the well number (no hyphen) and the 8-digit date on which the sample was collected. For example, a groundwater sample collected from monitoring well CMW-1 on December 31, 2020, would be identified as CMW-1-123120.

## E2.4 Sample Custody and Field Documentation

### *E2.4.1 Sample Custody*

Upon collection, samples will be placed upright in a cooler. Ice or blue ice will be placed in each cooler to meet sample preservation requirements. Inert cushioning material will be placed in the remaining space of the cooler as needed to limit movement of the sample containers. If the sample coolers are shipped (not hand carried) to the laboratory, the chain-of-custody (COC) form will be placed in a waterproof bag within the cooler for shipment.

After collection, samples will be maintained in Aspect's custody until formally transferred to the analytical laboratory courier or the shipper. For purposes of this work, custody of the samples is defined as follows:

- In plain view of the field representatives;
- Inside a cooler that is in plain view of the field representative; or
- Inside any locked space such as a cooler, locker, car, or truck to which the field representative has the only immediately available key(s).

A COC record provided by the laboratory will be initiated at the time of sampling for all samples collected. The record will be signed by the field representative and others who subsequently take custody of the sample. Couriers or other professional shipping representatives are not required to sign the COC form; however, shipping receipts will be collected and maintained in project files as a part of custody documentation. A copy of the COC form with appropriate signatures will be kept by Aspect's project manager.

Upon sample receipt, the laboratory will fill out a cooler receipt form to document sample delivery conditions. A designated sample custodian will accept custody of the shipped samples and will verify that the COC form matches the samples received. The laboratory will notify the Aspect project manager, as soon as possible, of any issues noted with the sample shipment or custody.

### *E2.4.2 Field Documentation*

While conducting field work, the field representative will document pertinent observations and events, specific to each activity, on field forms (e.g., groundwater sampling form, etc.) and/or in a field notebook, and, when warranted, provide photographic documentation of specific sampling efforts. Field notes will include a

description of the field activity, sample descriptions, and associated details such as the date, time, and field conditions.

## E2.5 Decontamination and Investigative-Derived Waste Management

All non-disposable sampling equipment (e.g., stainless steel spoons and bowls) will be decontaminated before collection of each sample. The decontamination sequence consists of a scrub with a non-phosphate (Alconox) solution, followed by a tap water (potable) rinse, and then a thorough spraying with deionized or distilled water.

Investigation-derived waste (IDW) soil and water generated during monitoring well installation and development will be placed in labeled Department of Transportation-approved drums pending analytical results to determine appropriate disposal. The drums will be temporarily consolidated on the Quendall Terminals property, profiled based on available analytical data, and disposed of at a permitted off-site disposal facility.

Investigation-derived waste (IDW) water generated during monitoring well sampling will be disposed of in the vault for the pump-and-treat-system.

# E3 Quality Assurance Project Plan

This QAPP identifies QC procedures and criteria required to ensure that data collected during the data gaps work are of known quality and acceptable to achieve project objectives. Specific protocols and criteria are also set forth in this QAPP for data quality evaluation, upon the completion of data collection, to determine the level of completeness and usability of the data. It is the responsibility of the project personnel performing or overseeing the sampling and analysis activities to adhere to the requirements of the FSP and this QAPP.

## E3.1 Purpose of the QAPP

As stated in Ecology's *Guidelines for Preparation of Quality Assurance Project Plans for Environmental Studies* (Ecology Publication No. 04-03-030, July 2004), specific goals of this QAPP are as follows:

- Focus project manager and project team to factors affecting data quality during the planning stage of the project
- Facilitate communication among field, laboratory, and management staff as the project progresses
- Document the planning, implementation, and assessment procedures for QA/QC activities for the investigation
- Ensure that the DQOs are achieved
- Provide a record of the project to facilitate final report preparation

The DQOs for the project include both qualitative and quantitative objectives, which define the appropriate type of data and specify the tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support the environmental assessment. To ensure that the DQOs are achieved, this QAPP details aspects of data collection including analytical methods, QA/QC procedures, and data quality reviews. This QAPP describes both quantitative and qualitative measures of data to ensure that the DQOs are achieved. DQOs dictate data collection rationale, sampling, and analysis designs that are presented in the main body of the Work Plan, along with the sample collection procedures presented in the FSP (Section A2) of this SAP.

## E3.2 Project Organization and Responsibilities

The project consultant team involved with data generation includes representatives from Aspect and OnSite Environmental Inc. (OnSite). Key individuals and their roles on this project are as follows:

**Project Manager – Jeremy Porter, PE, Aspect.** The project manager is responsible for the successful completion of all aspects of this project, including day-to-day management, production of reports, acting as liaison with Barbee Mill Inc., and coordination with the project team members. The project manager is also responsible for resolution of non-conformance issues, is the lead author on project plans and reports, and provides regular, up-to-date progress reports and other requested project information to Barbee Mill Inc. and Ecology.

**Field Manager – Delia Massey, PE, Aspect.** The field manager is responsible for overseeing the field sampling program outlined in this plan, including collecting representative samples and ensuring that they are handled properly prior to transfer of custody to the project laboratory. The field manager will manage procurement of necessary field supplies, assure that monitoring equipment is operational and calibrated in accordance with the specifications provided herein, and act as the Site Health and Safety Officer.

**Data Quality Manager – Lea Beard, Aspect.** The data quality manager is responsible for developing data quality objectives, selecting analytical methods, coordinating with the analytical laboratory, overseeing laboratory performance, and approving QA/QC procedures. The data quality manager is also responsible for conducting QA validation of the analytical data reports received from the project laboratory.

**Laboratory Project Manager – David Baumeister, OnSite.** The laboratory project manager is responsible for ensuring that all laboratory analytical work for water media complies with project requirements. The laboratory project manager also, while acting as liaison with the project manager, field manager, and data quality manager, fulfills project needs on the analytical laboratory work. This responsibility applies to work the laboratory project manager subcontracts to another laboratory.

## E3.3 Analytical Methods and Reporting Limits

Analytical methodologies applied to the analyses of samples collected during the data gaps work are in accordance with the following documents:

- USEPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983 and updates.
- Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 20th Edition, 1995.

Table C-2 lists the laboratory analytical methods for groundwater analyses to be performed during the data gaps work, along with samples containers, preservation, and analytical holding times for each analysis.

### *E3.3.1 Method Detection Limit and Method Reporting Limit*

The method detection limit (MDL) is the minimum concentration of a compound that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero. MDLs are established by the laboratory using prepared samples, not samples of environmental media.

The method reporting limit (MRL) is defined as the lowest concentration at which a chemical can be accurately and reproducibly quantified, within specified limits of precision and accuracy, for a given environmental sample. The MRL can vary from sample to sample depending on sample size, sample dilution, matrix interferences, moisture content, and other sample-specific conditions. As a minimum requirement for organic analyses, the MRL should be equivalent to or greater than the concentration of the lowest calibration standard in the initial calibration curve and equivalent to or, preferably less than, the project screening levels. The expected MRLs are summarized in Table C-4 for water samples.

## E3.4 Data Quality Objectives

DQOs, including the Measurement Quality Indicators (MQIs)—precision, accuracy, representativeness, comparability, completeness, and sensitivity (namely PARCCS parameters)—and sample-specific MRLs are dictated by the DQOs, project requirements, and intended uses of the data. For this project, the analytical data must be of sufficient technical quality to determine whether contaminants are present and, if present, whether their concentrations are greater than or less than applicable screening criteria based on protection of human health and the environment.

The quality of data generated through this data gaps work will be assessed against the MQIs set forth in this QAPP. Specific QC parameters associated with each of the MQIs are summarized in Table C-3. Specific MQI goals and evaluation criteria (i.e., MDLs, MRLs, percent recovery (%R) for accuracy measurements, relative percent difference (RPD) for precision measurements, are defined in Table C-4. Definitions of these parameters and the applicable QC procedures are presented below.

### E3.4.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared with their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples and laboratory control samples/laboratory control sample duplicate (LCS/LCSD) for organic analysis, and through laboratory duplicate samples for inorganic analyses.

Analytical precision is quantitatively expressed as the RPD between the LCS/LCSD, MS/MSD, or laboratory duplicate pairs and is calculated with the following formula:

$$RPD\,(\%) = 100 \times \frac{|S - D|}{(S + D)/2}$$

where:
S = analyte concentration in sample
D = analyte concentration in duplicate sample

Analytical precision measurements will be carried out at a minimum frequency of 1 per 20 samples for each matrix sampled, or 1 per laboratory analysis group. Laboratory precision will be evaluated against laboratory quantitative RPD performance criteria provided with the laboratory's analytical data report. If the control criteria are not met, the laboratory will supply a justification of why the limits were exceeded and implement the appropriate corrective actions. The RPD will be evaluated during data review and validation. The data reviewer will note deviations from the specified limits and will comment on the effect of the deviations on reported data.

### E3.4.2 Accuracy

Accuracy measures the closeness of the measured value to the true value. The accuracy of chemical test results is assessed by "spiking" samples with known standards (surrogates, blank spikes, or matrix spikes) and establishing the average recovery. Accuracy is quantified as the %R. The closer the %R is to 100 percent, the more accurate the data.

Surrogate recovery will be calculated as follows:

$$\text{Recovery}\,(\%) = \frac{MC}{SC} \times 100$$

where:
SC = spiked concentration
MC = measured concentration

Matrix spike (MS) percent recovery will be calculated as follows:

$$\text{Recovery}\,(\%) = \frac{MC - USC}{SC} \times 100$$

where:
SC = spiked concentration
MC = measured concentration
USC = unspiked sample concentration

Accuracy measurements on MS samples will be carried out at a minimum frequency of 1 in 20 samples per matrix analyzed. Blank spikes will also be analyzed at a minimum frequency of 1 in 20 samples per matrix analyzed. Surrogate recoveries for organic compounds will be determined for each sample analyzed for respective compounds. Laboratory accuracy will be evaluated against the laboratory's quantitative MS and surrogate spike recovery performance criteria as provided with the laboratory's analytical data report. If the control criteria are not met, the laboratory will supply a justification of why the limits were exceeded and implement the appropriate corrective actions. Percent recoveries will be evaluated during data review and validation, and the data reviewer will comment on the effect of the deviations on the reported data.

### *E3.4.3 Representativeness*

Representativeness measures how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the matrix sampled. The FSP sampling techniques and sample handling protocols (e.g., homogenizing, storage, preservation, and use of duplicates and blanks) have been developed to ensure representative samples. Sampling locations for data gaps work activities are described in Section 6 of the Work Plan. The field sampling procedures are described in the FSP (Section A2) of this SAP.

### *E3.4.4 Comparability*

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This goal will be achieved through the use of standard techniques to collect samples, USEPA-approved standard methods to analyze samples, and consistent units to report analytical results. Data comparability also depends on data quality. Data of unknown quality cannot be compared.

### *E3.4.5 Completeness*

Completeness is defined as the percentage of measurements made that are judged to be valid. Results will be considered valid if the precision, accuracy, and representativeness objectives are met and if MRLs are sufficient for the intended uses of the data. Completeness is calculated as follows:

$$Completeness\ (\%) = \frac{V}{P} \times 100$$

where:
V = number of valid measurements
P = number of measurements taken

Valid and invalid data (i.e., data qualified with the R flag [rejected]) will be identified during data validation. The target completeness goal for this project is 95 percent.

# E3.5 Quality Control Procedures

Field and laboratory QC procedures are outlined below.

## *E3.5.1 Field Quality Control*

Beyond the use of standard sampling and decontamination protocols defined in the FSP, field QC procedures include maintaining the field instruments used. Field instruments (e.g., YSI multiparameter instrument or equivalent meter for measuring field parameters during groundwater sampling) are maintained and calibrated regularly prior to use, in accordance with manufacturer recommendations.

## *E3.5.2 Laboratory Quality Control*

The laboratories' analytical procedures must meet requirements specified in the respective analytical methods or approved laboratory standard operating procedures (SOPs), e.g., instrument performance check, initial calibration, calibration check, blanks, surrogate spikes, internal standards, and/or labeled compound spikes. Specific laboratory QC analyses required for this project will, at a minimum, consist of the following:

- Instrument tuning, instrument initial calibration, and calibration verification analyses as required in the analytical methods and the laboratory SOPs;
- Laboratory and/or instrument method blank measurements at a minimum frequency of 5 percent (1 per 20 samples) or in accordance with method requirements, whichever is more frequent; and
- Accuracy and precision measurements as defined in Table C-4, at a minimum frequency of 5 percent (1 per 20 samples) or in accordance with method requirements, whichever is more frequent. In cases where a pair of MS/MSD or MS/laboratory duplicate analyses are not performed on a project sample, a set of LCS/LCSD analyses will be performed to provide sufficient measures for analytical precision and accuracy evaluation.

The laboratory's QA officers are responsible for ensuring that the laboratory implements the internal QC and QA procedures detailed in OnSite's Quality Assurance Manual.

# E3.6 Corrective Actions

If routine QC audits by the laboratory result in detection of unacceptable conditions or data, actions specified in the laboratory SOPs will be taken. Specific corrective actions are outlined in each SOP used and can include the following:

- Identifying the source of the violation
- Reanalyzing samples if holding time criteria permit
- Resampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting but qualifying data to indicate the level of uncertainty

If unacceptable conditions occur, the laboratory will contact Aspect's project manager to discuss the issues and determine the appropriate corrective action. Corrective actions

taken by the laboratory during analysis of samples for this project will be documented by the laboratory in the case narrative associated with the affected samples.

In addition, the project data quality manager will review the laboratory data generated for this investigation to ensure that project DQOs are met. If the review indicates that non-conformances in the data have resulted from field sampling or documentation procedures or laboratory analytical or documentation procedures, the impact of those non-conformances on the overall project data usability will be assessed. Appropriate actions, including re-sampling and/or re-analysis of samples, may be recommended to the project manager to achieve project objectives.

## E3.7 Data Reduction, Quality Review, and Reporting

All data will undergo a QA/QC evaluation at the laboratory, which will then be reviewed by the Aspect database manager and the project data quality manager. Initial data reduction, evaluation, and reporting at the laboratory will be carried out in full compliance with the method requirement and laboratory SOPs. The laboratory internal review will include verification (for correctness and completeness) of electronic data deliverable (EDD) accompanied with each laboratory report. The Aspect database manager will verify the completeness and correctness of all laboratory deliverables (i.e., laboratory report and EDDs) before data validation.

### *E3.7.1 Minimum Data Reporting Requirements*

The following sections identify general and specific requirements for analytical data reporting to provide sufficient deliverables for project documentation and data quality assessment.

#### General Requirements

The following requirements apply to laboratory reports for all types of analyses:

- A cover page signed by the laboratory director, the laboratory QA officer, or his/her designee to certify the eligibility of the reported contents and the conformance with applicable analytical methodology.
- Definitions of abbreviations, data flags, and data qualifiers used in the report.
- Cross reference of field sample names and laboratory sample identity for all samples in the sample delivery group (SDG).
- Completed COC document signed and dated by parties who acquired and received the samples.
- Completed sample receipt document with record of cooler temperature and sample conditions upon receipt at the laboratory. Anomalies such as inadequate sample preservation, inconsistent bottle counts, and sample container breakage, and communication record and corrective actions in response to the anomalies, will be documented and incorporated in the sample receipt document. The document will be initialed and dated by personnel that complete the document.
- Case narrative that addresses any anomalies or QC outliers in relation to sample receiving, sample preparation, and sample analysis on samples in the SDG. The

narrative will be presented separately for each analytical method and each sample matrix.

- All pages in the report are to be paginated. Any insertion of pages after the laboratory report is issued will be paginated with starting page number suffixed with letters (e.g., pages inserted between pages 134 and 135 should be paginated as 134A, 134B, etc.)
- Any resubmitted or revised report pages will be submitted to Aspect with a cover page stating the reason(s) and scope of the resubmission or revision, and signed by the laboratory director, QA officer, or the designee.

### Specific Requirements

The following presents specific requirements for laboratory reports:

- Sample results will be evaluated and reported down to the MRLs.
- Method blank results.
- LCS and LCSD (if MSD analysis is not performed) results with laboratory acceptance criteria for %R and RPD.
- Surrogate spike results with laboratory acceptance criteria for %R.
- MS and MSD results with laboratory acceptance criteria for %R and RPD. In cases where MS/MSD analyses were not performed on a project sample, LCS/LCSD analyses should be performed and reported instead.
- Internal standard (as applicable) results: Internal standard response areas in field samples, QC analyses, and associated calibration verification analyses.

## E3.8 Data Quality Verification and Validation

Reported analytical results will be qualified by the laboratory to identify QC concerns in accordance with the specifications of the analytical methods. Additional laboratory data qualifiers may be defined and reported by the laboratory to more completely explain QC concerns regarding a particular sample result. All data qualifiers will be defined in the laboratory's narrative reports associated with each case.

The project data quality manager, or other as directed by Aspect, will conduct an independent Level II (or Stage 2a as defined in USEPA, 2009) data verification and validation for all chemical data submitted by the analytical laboratories during the independent environmental assessment, following the guidance below:

- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, January 2010, USEPA 540/R-10/011.
- USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-08-01.

The data validation will examine and verify the following parameters against the method requirements and laboratory control limits specified in Table C-4:

- Sample management and holding times
- Laboratory and field blank results
- Detection and reporting limits
- Laboratory replicate results
- MS/MSD results
- LCS and/or standard reference material results
- Field duplicate results
- Surrogate spike recovery (organic analyses only)

Data qualifiers will be assigned based on the outcome of the data validation. Data qualifiers are limited to and defined as follows:

- J - The associated numerical value is an estimate of the approximate concentration of the analyte in the sample.
- UJ - The analyte was not detected above the reported quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified.
- DNR - Do not report from this analysis; the result for this analyte is to be reported from an alternative analysis.

In cases of multiple analyses (such as an undiluted and a diluted analysis) performed on one sample, the optimal result will be determined and only the determined result will be reported for the sample.

The scope and findings of the data validation will be documented and discussed in the Data Validation Report(s). The Data Validation Report(s) will be included in the Data Report.

## E3.9 Preventative Maintenance Procedures and Schedules

Preventative maintenance in the laboratory will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. Details of the maintenance procedures are addressed in the respective laboratory SOPs.

Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift

in calibration curves, decrease in sensitivity, or failure to meet one or another of the method-specific QC criteria.

Maintenance and calibration of instruments used in the field for sampling (e.g. YSI meter for measuring field parameters during groundwater sampling) will be conducted regularly in accordance with manufacturer recommendations prior to use.

## E3.10 Performance and System Audits

The Aspect project manager has responsibility for reviewing the performance of the laboratory QA program; this review will be achieved through regular contact with the analytical laboratory's project manager. To ensure comparable data, all samples of a given matrix to be analyzed by each specified analytical method will be processed consistently by the same analytical laboratory.

## E3.11 Data and Records Management

Records will be maintained documenting all activities and data related to field sampling and chemical analyses.

### *E3.11.1 Field Documentation*

The Aspect project manager will ensure that the field team receives and understands the final approved version of this QAPP, the Site Health and Safety Plan, and the SAP prior to the initiation of field activities and that all approved plans are followed at all times. Field documents will be maintained in the project file.

### *E3.11.2 Analytical Data Management*

Raw data received from the analytical laboratory will be reviewed, entered into a computerized database, and verified for consistency and correctness. The database will be updated based on data review and independent validation if necessary.

The following field data will be included in the database:

- Sample location coordinates
- Sample type (i.e., groundwater)
- Groundwater sampling depth interval

Information regarding whether concentrations represent total phase (unfiltered samples) or dissolved phase (filtered samples) will be compiled and stored in the database. Data will be submitted to Ecology's Environmental Information Management (EIM) database once data have been reviewed and validated.

# E4 References

US Environmental Protection Agency (USEPA), 2008, Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, June 2008, USEPA-540-R-08-01.

USEPA, 2009, Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use, January 13 2009. EPA 540-R-08-005.

USEPA, 2010, Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, Office of Superfund Remediation and Technical Innovation, U.S. Environmental Protection Agency, January 2010, USEPA 540/R-10/011.

# TABLES

# Table E-1. Groundwater Sampling Plan

Project No. 050004, Barbee Mill Groundwater Remediation
4101 Lake Washington Blvd N Renton, WA

| | | Groundwater Analytes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exploration Name** | **Sampling Method** | Total Antimony | Total Arsenic | Total Barium | Total Mercury | Total Selenium | Dissolved Antimony | Dissolved Arsenic | Dissolved Barium | Dissolved Iron | Dissolved Manganese | Dissolved Mercury | Dissolved Selenium | Dissolved Zinc | PAHs |
| ***Monitoring Well*** | | | | | | | | | | | | | | | |
| CMW-1 | Peristaltic | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| CMW-2S | Peristaltic | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| CMW-2D | Peristaltic | | X | | | | | X | | X | | | | | |
| CMW-3 | Peristaltic | | X | | | | | X | | X | | | | | |
| CMW-4S | Peristaltic | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| CMW-4D | Peristaltic | | X | | | | | X | | X | | | | | |
| CMW-5 | Peristaltic | | X | | | | | X | | X | | | | | |
| CMW-6 | Peristaltic | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| ***Extraction Well*** | | | | | | | | | | | | | | | |
| EW-1 | Peristaltic (at wellhead) | | X | | | | | X | | X | | | | | |
| EW-2 | Peristaltic (at wellhead) | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| EW-3 | Peristaltic (at wellhead) | | X | | | | | X | | X | | | | | |
| EW-4 | Peristaltic (at wellhead) | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| EW-5 | Peristaltic (at wellhead) | | X | | | | | X | | X | | | | | |
| EW-6 | Peristaltic (at wellhead) | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| EW-7 | Peristaltic (at wellhead) | | X | | | | | X | | X | | | | | |
| EW-8 | Peristaltic (at wellhead) | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| ***Well Points*** | | | | | | | | | | | | | | | |
| WP-1A | Peristaltic | | x | | | | | x | | x | | | | | |
| WP-8 | Peristaltic | | x | | | | | x | | x | | | | | |
| ***Quendall Wells*** | | | | | | | | | | | | | | | |
| BH-29A | Peristaltic | | x | | | | | x | | x | | | | | |
| BH-31B[1] | Peristaltic | | x | | | | | x | | | | | | | |

1. BH-31B will be installed as part of the data gaps work.

## Table E-2. Analytical Methods, Sample Containers, Preservation, and Holding Times

Project No. 050004, Barbee Mill Groundwater Remediation
4101 Lake Washington Blvd N Renton, WA

| Sample Matrix | Analytical Parameter | Analytical Method | Sample Container | No. Containers | Field Filtered? | Preservation Requirements | Holding Time |
|---|---|---|---|---|---|---|---|
| **Water** | Total Antimony | EPA 6020B | 500-mL polyethylene bottle | 1 | N | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Total Arsenic | EPA 6020B | 500-mL polyethylene bottle | 1 | N | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Total Barium | EPA 6020B | 500-mL polyethylene bottle | 1 | N | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Total Mercury | EPA 7470 | 500-mL polyethylene bottle | 1 | N | 4°C ±2°C, HNO3 pH < 2 | 28 days |
| **Water** | Total Selenium | EPA 6020B | 500-mL polyethylene bottle | 1 | N | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Antimony | EPA 6020B | 500-mL polyethylene bottle | 1 | N | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Arsenic | EPA 6020B | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Barium | EPA 6020B | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Iron | EPA 6010D | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Manganese | EPA 6020B | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Mercury | EPA 7470 | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 28 days |
| **Water** | Dissolved Selenium | EPA 6020B | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | Dissolved Zinc | EPA 6020B | 500-mL polyethylene bottle | 1 | Y | 4°C ±2°C, HNO3 pH < 2 | 6 months |
| **Water** | PAHs | EPA 8270D-SIM | 1-L amber glass bottle | 2 | N | 4°C ±2°C | 7 days |

# Table E-3. QC Parameters Associated with PARCCS

Project No. 050004, Barbee Mill Groundwater Remediation
4101 Lake Washington Blvd N Renton, WA

| Data Quality Indicators | QC Parameters |
|---|---|
| Precision | RPD values of: |
| | (1) LCS/LCS Duplicate |
| | (2) MS/MSD |
| | (3) Field Duplicates |
| Accuracy/Bias | Percent Recovery (%R): |
| | (1) LCS |
| | (2) MS |
| | (3) Surrogate Spikes |
| | Results of: |
| | (1) Method (Preparation) Blank |
| | (2) Equipment Rinsate Blank (if appropriate) |
| Representativeness | Results of All Blanks |
| | Sample Integrity (Chain-of-Custody and Sample Receipt Forms) |
| | Holding Times |
| Comparability | Sample-specific Reporting Limits |
| | Sample Collection Methods |
| | Laboratory Analytical Methods |
| Completeness | Data Qualifiers |
| | Laboratory Deliverables |
| | Requested/Reported Valid Results |
| Sensitivity | MDLs and MRLs |

Notes:
LCS – laboratory control sample
MDL – method detection limit
MRL – method reporting limit
MS/MSD – matrix spike/matrix spike duplicate

# Table E-4. Measurement Quality Objectives for Water Samples

Project No. 050004, Barbee Mill Groundwater Remediation
4101 Lake Washington Blvd N Renton, WA

| Analyte Name | MDL[(A)] | MRL | LCS/LCS %R[(A)] | RPD (%) | Surrogate %R[(A)] |
|---|---|---|---|---|---|
| **Groundwater - Metals by EPA 6020 (µg/L)** | | | | | |
| Total Antimony | 1.1 | 5.6 | 80-120 | ≤20 | NA |
| Total Arsenic | 0.34 | 3.3 | 80-120 | ≤20 | NA |
| Total Barium | 0.21 | 28 | 80-120 | ≤20 | NA |
| Total Selenium | 0.79 | 5.6 | 80-120 | ≤20 | NA |
| Dissolved Antimony | 1.1 | 5.0 | 80-120 | ≤20 | NA |
| Dissolved Arsenic | 0.31 | 3.0 | 80-120 | ≤20 | NA |
| Dissolved Barium | 0.11 | 25 | 80-120 | ≤20 | NA |
| Dissolved Manganese | 0.54 | 1.0 | 80-120 | ≤20 | NA |
| Dissolved Selenium | 0.37 | 5.0 | 80-120 | ≤20 | NA |
| Dissolved Zinc | 2.3 | 50 | 80-120 | ≤20 | NA |
| **Groundwater - Metals by EPA 6010 (µg/L)** | | | | | |
| Dissolved Iron | 32 | 56 | 80-120 | ≤20 | NA |
| **Groundwater - Metals by EPA 7470 (µg/L)** | | | | | |
| Total Mercury | 0.016 | 0.50 | 80-120 | ≤20 | NA |
| Dissolved Mercury | 0.016 | 0.50 | 80-120 | ≤20 | NA |
| **Groundwater - PAHs by EPA 8270E-SIM (µg/L)** | | | | | |
| Fluoranthene | 0.0047 | 0.10 | 53-115 | 20 | NA |
| Pyrene | 0.020 | 0.10 | 49-129 | 20 | NA |
| Benzo(a)anthracene | 0.0054 | 0.010 | 61-123 | 20 | NA |
| Chrysene | 0.0056 | 0.010 | 59-114 | 22 | NA |
| Benzo(b)fluoranthene | 0.0051 | 0.010 | 60-125 | 24 | NA |
| Benzo(j,k)fluoranthene | 0.0034 | 0.010 | 58-121 | 23 | NA |
| Benzo(a)pyrene | 0.0038 | 0.010 | 58-118 | 23 | NA |
| Indeno(1,2,3-c,d)pyrene | 0.0045 | 0.010 | 59-124 | 23 | NA |
| Dibenz(a,h)anthracene | 0.0043 | 0.010 | 59-123 | 23 | NA |
| Benzo(g,h,i)perylene | 0.0049 | 0.010 | 58-120 | 23 | NA |
| 2-Fluorobiphenyl (sur) | n/a | n/a | n/a | n/a | 20-106 |
| Pyrene-d10 (sur) | n/a | n/a | n/a | n/a | 26-104 |
| Terphenyl-d14 (sur) | n/a | n/a | n/a | n/a | 44-127 |

Notes:

[(A)] – Based on current laboratory control criteria. Some values may vary slightly between instruments and can be subject to change as the laboratory updates the charted values periodically.

%R – percent recovery

LCS/LCSD – laboratory control samples and laboratory control sample duplicate

MDL – method detection limit

MRL – method reporting limit

n/a – not applicable

RPD – relative percent difference

µg/L – microgram per liter

mg/kg - milligram per kilogram

sur - surrogate

# ATTACHMENT 1

# Field Forms

Aspect consulting
earth+water

# BORING LOG

SHEET _____OF _____

| LOCATION OF BORING | PROJECT NO. | BORING NO. |
|---|---|---|
| | PROJECT NAME | |

SKETCH OF LOCATION

DRILLING METHOD:

LOGGED BY:

DRILLER:

SAMPLING METHOD:

HAMMER WEIGHT/SAMPLER DIAMETER

| OBSERVATION WELL INSTALL YES _____ NO _____ | | | | | START | FINISH |
|---|---|---|---|---|---|---|
| WATER LEVEL | | | | | TIME | TIME |
| TIME | | | | | | |
| DATE | | | | | DATE | DATE |
| CASING DEPTH | | | | | | |

DATUM

GRADE ELEV.

SURFACE CONDITION

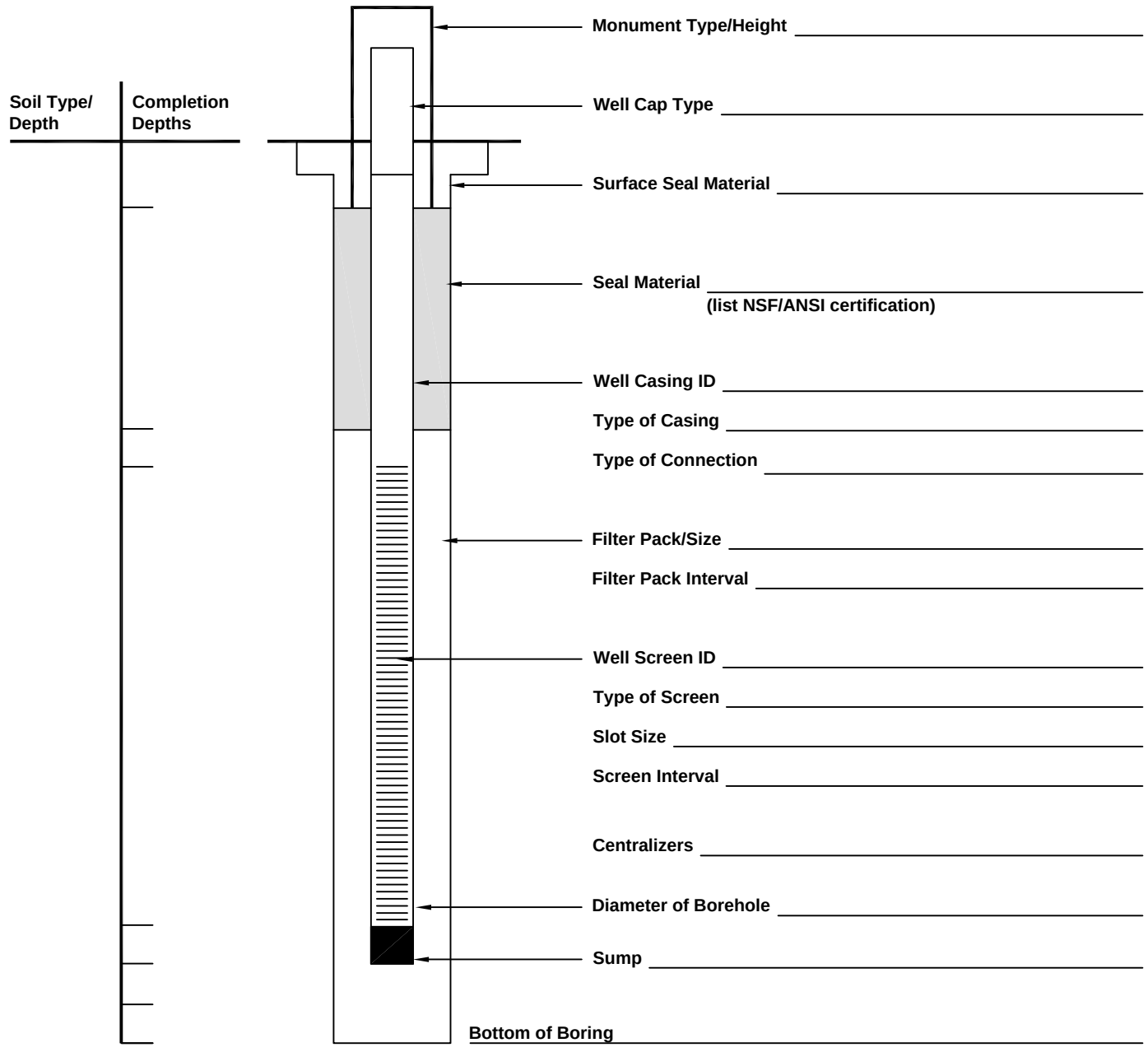
DESCRIPTION: Density, moisture, color, minor, MAJOR CONSTITUENT.
NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc. DRILL ACTION

| FIELDSCREENING | | | SAMPLE NO. / SAMPLE TYPE | SAMPLE DEPTH | INCHES DRIVEN / INCHES RECV'D | DEPTH IN FEET | PENETRATION RESISTANCE | USCS SUMMARY |
|---|---|---|---|---|---|---|---|---|
| ENV. SAMPLE TIME | PID (ppm) | SHEEN | | | | | | |
| | | | | | | 1 | | |
| | | | | | | 2 | | |
| | | | | | | 3 | | |
| | | | | | | 4 | | |
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| | | | | | | 2 | | |
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| | | | | | | 9 | | |
| | | | | | | 0 | | |

# As-Built Well Completion Diagram

| | |
|---|---|
| Project Number: | Boring/Monitoring Well Number: Sheet: of: |
| Project: | Location: |
| Elevation: | Drilling Contractor: |
| Drilling Method and Equipment Used: | Logged By: |
| Water Levels: | Completion Start: Finish: |

**Ecology Well ID** _____




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| | |
|---|---|
| Materials Used: | Screen: |
| Sand: | Bentonite: |
| Blank: | Monument: |
| Concrete: | Other: |

Q:_ACAD Standards\Standard Details\Well Diagram.dwg

## WELL DEVELOPMENT RECORD

**WELL NUMBER:**

Project Name:
Date:
Developed by:
Measuring Point of Well:
Screened Interval (ft. BGS):
Filter Pack Interval (ft. BGS):

Project Number:
Starting Water Level (ft TOC):
Casing Stickup (ft BGS):
Total Depth (ft TOC):
Casing Diameter (inches):

Casing Volume: ft Water x gpf =
Casing volumes: 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

## DEVELOPMENT MEASUREMENTS

| Elapsed Time (min) | Cumul. Vol. (gallons) | Purge Rate (gpm) | Temp. (C or F) | pH | Specific Conductance (µmhos/cm) | Turbidity (NTU) | Imhoff Cone (ml/L) | Comments |
|---|---|---|---|---|---|---|---|---|
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Total Discharge (gallons):
Total Casing Volumes Removed (gallons):

Ending Water Level (ft TOC):
Ending Total Depth (ft TOC):

## METHODS

Cleaning Equipment:
Development Equipment:
Disposal of Discharged Water:
Observations/Comments:

Aspect CONSULTING

**Sample name:** _____

## GROUNDWATER SAMPLING RECORD

**WELL NUMBER:** _____ **Page:**____ **of** ____

Project Name: _____ Project Number: _____

Date: _____ Starting Water Level (ft TOC): _____

Sampled by: _____ Casing Stickup (ft): _____

Measuring Point of Well: _____ Total Depth (ft TOC): _____

Screened Interval (ft. TOC) _____ Casing Diameter (inches): _____

Filter Pack Interval (ft. TOC) _____

Casing Volume _____ (ft Water) x _____ (Lpfv)(gpf) = _____ (L)(gal)

Casing volumes: 3/4"= 0.02 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf Sample Intake Depth (ft TOC): _____

3/4"= 0.09 Lpf 2" = 0.62 Lpf 4" = 2.46 Lpf 6" = 5.56 Lpf

### PURGING MEASUREMENTS

| **Criteria:** | | Typical 0.1-0.5 Lpm | Stable | na | ± 3% | ± 10% | ± 0.1 | ± 10 mV | ± 10% | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | Cumul. Volume (gal or L) | Purge Rate (gpm or Lpm) | Water Level (ft) | Temp. (°C) | Specific Conductance (µS/cm) | Dissolved Oxygen (mg/L) | pH | ORP (mv) | Turbidity (NTU) | Comments |
| | | | | | | | | | | |
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Total Gallons Purged: _____ Total Casing Volumes Removed: _____

Ending Water Level (ft TOC): _____ Ending Total Depth (ft TOC): _____

### SAMPLE INVENTORY

| Time | Volume [ml] | Bottle Type | Parameter | Quantity | Filtration | Preservation | Appearance | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Color | Turbidity & Sediment | |
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### METHODS

Sampling Equipment and IDs: _____

Purging Equipment: _____ Decon Equipment: _____

Disposal of Discharged Water: _____

Observations/Comments: _____

_____

# APPENDIX F

# Health and Safety Plans

# Uplands Health and Safety Plan

# PROJECT-SPECIFIC HEALTH AND SAFETY PLAN

| | | | |
|---|---|---|---|
| Property Name: | Barbee Mill | | |
| Project Number: | 050004 | | |
| Prepared By: | Delia Massey | Date: | 11/5/2020 |
| Reviewed By: | Jeremy Porter | Date: | 11/13/2020 |

## 1 INTRODUCTION

This project-specific health and safety plan establishes procedures and practices to protect employees of Aspect Consulting, LLC (Aspect) from potential hazards posed by field activities at the subject site. In this health and safety plan, measures are provided to minimize potential exposure, accidents, and physical injuries that may occur during daily activities and adverse conditions. Contingency arrangements are also provided for emergency situations.

## 2 EMERGENCY CONTACT INFORMATION

| | |
|---|---|
| **PROPERTY LOCATION** | 4101 Lake Washington Blvd N<br>Renton, WA 98056 |
| **NEAREST HOSPITAL** | Valley Medical Center<br>400 S 43rd St,<br>Renton, WA 98055<br>425-228-3450<br><br>**Attached figure shows route to hospital.** |
| **EMERGENCY RESPONDERS** | Police, Ambulance, Fire ……**911** |
| **OTHER CONTACTS** | Bob Hanford (mobile) ……..……...(206) 276-9256<br>Aspect, Seattle Office ……..……(206) 328-7443<br>Jeremy Porter ...……..(206) 838-5835 |
| **IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE** | Give the following information:<br>✓ **Where You Are:** address, cross streets, or landmarks<br>✓ **Phone Number** you are calling from<br>✓ **What Happened:** type of accident, injury<br>✓ **How Many Persons** need help<br>✓ **What is Being Done** for the victims<br>✓ **You Hang Up Last:** let whomever you called hang up first |

**In case of serious injuries or other emergency, immediately call Bob Hanford, Aspect Corporate Safety Officer, at (206) 780-7729 or (206)-276-9256.** If no response, call Doug Hillman at (206) 328-7443 or Tim Flynn at (206) 780-9370.

# 3 PERSONNEL ORGANIZATION AND CHAIN OF COMMAND

The Aspect Project Manager assigns the Site Safety Supervisor and other field personnel for this project and has ultimate responsibility for developing this project-specific health and safety plan and ensuring it is complied with during project execution. The Aspect Site Safety Supervisor has responsibility and authority for Aspect employees' safety during site activities. Other Aspect personnel on site have the responsibility to comply with this project-specific health and safety plan in coordination with the Site Safety Supervisor.

| **Aspect Personnel** | | | |
|---|---|---|---|
| **Role** | **Name** | **Office Phone** | **Mobile/Cell Phone** |
| Project Manager | Jeremy Porter | 206-838-5835 | 206-790-2129 |
| Project Environmental Engineer | Delia Massey | 206-812-4749 | 860-368-9745 |
| Site Safety Supervisor | Bob Hanford | 206-780-7729 | 206-276-9556 |
| Other Field Personnel | Baxter Call | 206-501-3735 | 206-369-7652 |

Aspect will inform its subcontractors working onsite of potential fire, explosion, health, safety or other hazards associated with planned site activities, and can make available to them this project-specific health and safety plan. **However, all subcontractors are solely responsible for preparation of their own health and safety plan, and for the safety of their employees.**

# 4 SITE CONTROL PLAN

## 4.1 Property Description

| | | |
|---|---|---|
| **Property Name:** | Barbee Mill | |
| **Property Location or Address:** | 4101 Lake Washington Blvd N, Renton, WA 98056 | |
| **Owner:** | Robert Cugini | |
| **Current Property Use:** | Private Residences | |
| **Past Use of Property (if different):** | Wood products processing | |
| **Designated Hazardous Waste Site?** | No | If yes, specify federal, state, or other: -- |
| **Industrial Site?** | No | |
| **Topography:** | Generally flat | |
| **Name of and distance to nearest surface water body:** | Lake Washington – adjacent to west | |
| **Surround Land Use/Nearest Population:** | Residential & industrial/nearest population to east | |
| **Drinking Water/Sanitary Facilities:** | None available on site | |
| **Site Map:** | See annual progress report | |

## 4.2 Site Access Control

Describe controls to be used to prevent entry by unauthorized persons:

- The property is closed to the public (fenced with secured gate).
- Traffic cones, barriers, chain-link fence, and caution tape, as needed.

Describe how exclusion zones and contamination reduction zones will be designated:

- Drilling and excavation activities will be performed in multiple areas of the property.
- The area immediately adjacent to each monitoring well/excavation location will be considered an exclusion zone.
- The contractor will mark the limits of the exclusion zone using cones, caution tape, etc.
- The contamination reduction zone will be located adjacent to the driller's/excavation contractor's mobile decontamination area and will include cleaning equipment for equipment decontamination.
- Aspect field personnel will remain vigilant about preventing unauthorized persons from approaching the exclusion zone.

## 4.3 Worker Hygiene Practices

Aspect personnel will use the following hygiene practices while working on site:

- No person will eat, drink, chew gum or tobacco in potentially contaminated areas. Drinking of replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Smoking is prohibited except in designated areas of the site.
- Long hair will be secured away from the face so that it does not interfere with any activities.
- All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as practical after leaving the property.

## 4.4 Worker Hygiene Practices (*Special COVID-19 Virus Prevention Actions*)

Along with normal hygiene practices commonly exercised by Aspect employees, workers must practice recommended infection prevention measures to avoid exposure and spreading of the COVID-19 virus. The Center for Disease Control (CDC) indicates that: *"COVID-19 is a respiratory illness that can spread from person to person."* Therefore, worker hygiene and distancing are critical elements to managing the virus' spread. The following is guidance that was used to develop this section of the HASP.

- Occupational Safety and Health Administration (OSHA) https://www.osha.gov/Publications/OSHA3990.pdf
- Centers for Disease Control (CDC) https://www.cdc.gov/coronavirus/2019-ncov/downloads/community-mitigation-strategy.pdf)
- World Health Organization (WHO) https://www.who.int/emergencies/diseases/novel-coronavirus-2019

Most COVID-19 guidance is geared toward protecting workers in office settings, whereas there is limited guidance for field work settings. Therefore, Aspect has adopted and enhanced the COVID-19 procedures outlined by OSHA under their guidelines for "Low Exposure Risk" work (https://www.osha.gov/Publications/OSHA3990.pdf). OSHA states that:

*"The Occupational Safety and Health Administration (OSHA) developed this COVID-19 planning guidance based on traditional infection prevention and industrial hygiene practices. It focuses on the need for employers to implement engineering, administrative, and work practice controls and personal protective equipment (PPE), as well as considerations for doing so.*"

## OSHA Guidance and Aspect Actions

OSHA outlines three categories of Exposure Risk: High/Very High, Medium and Low. The High/Very High and Medium Exposure Risk situations relate to health worker or large community settings. Aspect personnel will ONLY conduct projects in situations that meet the Low Exposure Risk Category. Guidance and Actions are outlined below.

***Low Exposure Risk.*** OSHA states that **"**Lower exposure risk (caution) jobs are those that do not require contact with people known to be, or suspected of being, infected with COVID-19 nor frequent close contact with (i.e., within 6 feet of) the general public. Workers in this category have minimal occupational contact with the public and other coworkers."

***ACTION.*** Aspect personnel will use the following hygiene practices while working on site to maintain Low Exposure Risk. Note that OSHA indicates for this category, that *"Additional PPE is not recommended for workers in the lower exposure risk group. Workers should continue to use the PPE, if any, that they would ordinarily use for other job tasks."* With this said, Aspect employees will use the following protocols to comply with established social distancing and sanitary hygiene directives.

### *Distancing Procedures*

1. Workers, if working in a team, will take separate vehicles to the job site.

2. Workers will not congregate in groups of more than four other individuals

3. Workers will not be permitted to enter the site if they feel sick or exhibit any symptoms common to cold, flu or COVID-19.

4. A minimum distance of six feet should be maintained from other individuals.

5. No person will eat, drink, chew gum or tobacco in potentially contaminated areas or around other people. Drinking replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations. Lunch should be eaten in a car or away from other individuals.

6. All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any new area; particularly eating areas.

### *Hygiene Procedures*

1. Nitrile gloves will always be worn and changed as often as needed.
2. Frequently touched objects (e.g. outhouse doors, gate lock) will be disinfected at least at the beginning and end of each day when workers are on site.
3. Workers will avoid sharing unsanitized equipment, including phones and laptop screens.
4. Hands should be washed with soap and water, or otherwise sanitized with hand-sanitizer after using the restroom, before and after lunch breaks and after co-handling objects.

5. Smoking is prohibited except in designated areas of the site.

Aspect will continue to monitor CDC guidance for businesses (https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html) and mitigation strategies (https://www.cdc.gov/coronavirus/2019-ncov/downloads/community-mitigation-strategy.pdf) as new information becomes available. This site-specific health and safety plan will be updated accordingly to reflect current information and recommendations.

## 4.5 Emergency Communications

Aspect workers on site will have a mobile (cell) phone on site, which will be used for communications should an emergency arise. Phone numbers for Aspect site personnel are listed in Section 3: Personnel Organization and Chain of Command.

## 4.6 Nearest Medical Assistance

**FIRST CALL 911.** The route from the site to the nearest hospital is shown in the attached figure.

# 5 SITE WORK PLAN

| | |
|---|---|
| **Proposed Work Activities On Site:** | • Drilling and development of monitoring wells.<br>• Soil handling, sampling, and loading.<br>• Excavation backfill and site grading.<br>• Groundwater sampling.<br>• Routine operation, maintenance, and monitoring. |
| **Objectives of Site Activities:** | Investigate groundwater and sediment data gaps based on updated site screening levels. Ongoing annual groundwater monitoring to assess effectiveness of passive reactive barrier containing zero-valent iron. |
| **Proposed Work Dates:** | Winter 2020-2021 (Groundwater Monitoring) |
| **Will On-site Personnel Potentially be Exposed to Hazardous Substances?** | Yes:<br><br>The property historically utilized arsenic in processes to treat wood products. Based on the 2012 Draft RI, potential chemical hazards include:<br>• Arsenic |
| **Do Personnel Conducting Site Activities have Training in Accordance with WAC 296-843-200?** | Yes |

# 6 DECONTAMINATION

| Goals | Procedures |
|---|---|
| To prevent the distribution of contaminants outside the exclusion zone or cross-contamination of samples, the following procedures will be used to decontaminate sample equipment. | • Decontamination process involving Alconox wash, tap water rinse, and deionized water rinse (with air dry).<br>• Dedicated tubing used for groundwater sampling will be disposed of or retained (bagged) for future use, but not decontaminated. |
| To prevent the distribution of contaminants outside the exclusion zone, unnecessary vehicles will not be allowed inside the exclusion zone. For vehicles required in the exclusion zone (e.g., drill rig, excavator), the following decontamination procedures will be used to prevent contamination from leaving the exclusion zone: | • Clean all equipment and excavator bucket that advances below ground surface, prior to leaving the contamination reduction zone. |
| To minimize or prevent worker exposure to hazardous substances, all personnel working in the exclusion zone and contamination reduction zones will comply with the following decontamination procedures: | • Wash boots and rain gear that have come into contact with soil or groundwater with Alconox/tap water and air dry.<br>• To prevent distribution of contaminants outside the exclusion zone, do not allow unnecessary vehicles inside the exclusion zone. |
| Soil cuttings, monitoring well purge water, and decontamination wastewater will be managed in the following manner: | • Place soil cuttings from each location on visqueen with bermed edges, and cover with visqueen weighted to minimize chance for removal by wind; appropriate disposition of the cuttings will be based on soil quality data collected for each location, per plan set.<br>• Combine decontamination wastewater and monitoring well purge water from locations with evidence of contamination in DOT-approved 55-gallon drums at the property for future disposal by the owner. |

# 7 HAZARD ANALYSIS

The potential hazards and corresponding control measures for planned site work activities are as follows:

| Work Activity | Primary Potential Hazards | Control Measures |
|---|---|---|
| Drilling monitoring wells, soil sampling | • Getting hit by drill rig equipment, especially from overhead. | • Stay back from rig whenever possible and stay alert.<br>• Modified Level D PPE (with hard hat, traffic vest, steel-toe boots). |
| | • Excessive noise. | • Wear hearing protection. |
| | • Chemical exposure (skin contact, ingestion, inhalation). | • Modified Level D PPE.<br>• Air monitoring. |
| Excavation, soil sampling | • Getting hit by excavator. | • Wear traffic vest. |

| | | |
|---|---|---|
| | | • Stay back from excavator and maintain eye contact with operator. |
| | • Falling into open excavation. | • Do not enter excavation >4 feet deep unless properly shored or sloped.<br>• Stay back from unstable slopes.<br>• Sample from excavator bucket where needed. |
| | • Chemical exposure (skin contact, ingestion, inhalation). | • Modified Level D PPE.<br>• Air monitoring. |
| Soil sampling by hand augers or surface grabs | • Chemical exposure (skin contact, ingestion, inhalation). | • Modified Level D PPE.<br>• Air monitoring. |
| Well development and groundwater sampling | • Chemical exposure (skin or eye contact, ingestion). | • Modified Level D PPE.<br>• Securely join pump tubing and other connectors. |
| All | • Getting hit by other trucks working on the property. | • Wear traffic vest.<br>• Stay back from roads and stay alert. |
| | • Hypothermia | • Take breaks, seek warm areas, drink hot fluids, use hand warmers and warm clothing |
| | • Heat stress | • Take breaks, seek shade, and increase fluid intake. |
| | • Exposure to/spreading of COVID-19 | • Drive individually to the job site, lab, or to obtain equipment<br>• Do not engage in groups<br>• Direct workers to stay home if they are sick<br>• Wear gloves, and change as needed<br>• Maintain a six-foot distance from other individuals or don a mask if distancing is unavoidable<br>• Disinfect frequently touched objects<br>• Wash hands after using the restroom, lunch breaks and after co-handling objects<br>• Eat lunch in the car or away from others |

| Potentially Hazardous Chemicals Known or Suspected at the Property and Permissible Exposure Limits (air) | | | | | |
|---|---|---|---|---|---|
| **Substance** | **Medium** | **OHSA PEL** | **OSHA STEL** | **IDLH** | **Carcinogen or Other Hazard** |
| Arsenic | Soil, GW | 0.5 mg/m$^3$ | | 5 | C |
| | | | | | |

Notes:
-- = none established
C = carcinogen
GW = groundwater
IDLH = immediately dangerous to life or health
N/A = not applicable/not available
OHSA = Occupational Safety and Health Administration
T = toxic
PEL = permissible exposure level (8-hour time-weighted average)
STEL = short-term exposure level

| **Chemicals Known or Suspected On-site** (check box) | | | |
|---|---|---|---|
| **Chemical Class** | **Known** | **Possible** | **Unlikely** |
| Corrosive (if expected, specify) | | | X |
| Ignitable (if expected, specify) | | | X |
| Reactive | | | X |
| Volatile | | | X |
| Radioactive | | | X |
| Explosive | | | X |
| Biological Agent | | | X |
| Particulate or Fibers | | | X |
| If known or likely, describe: | | | |

# 8 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above, the following personal protective equipment (PPE) will be required for the following field activities. This section specifies both an initial level of protection and a more protective (contingency) level or protection, in the event conditions should change. The contingency defines the PPE that will be available on site.

| **Work Activity** | **Level of Protection** | |
|---|---|---|
| | **Initial** | **Contingency** |
| Drilling/excavation/soil sampling | D | Mod. D or C |
| Well development/groundwater sampling | D | Mod. D or C |
| Sample handling | D | Mod. D or C |

Each level of protection will incorporate the following equipment (specify type of protective clothing, boots, gloves, respiratory cartridges or other protection, safety glasses, hardhat, and hearing protection):

| Level of Protection | Specific PPE |
|---|---|
| Level D | Work clothing, traffic vest, rubber (nitrile) gloves, steel toe and shank boots, safety glasses, hearing protection, and hardhat. |
| Modified D | Level D plus Tyvek coveralls or rain gear, and neoprene outer gloves. |
| Level C | Level D plus air-purifying respirator with combination organic vapor/HEPA dust cartridges. |

NOTE: Project personnel are not permitted to deviate from the specified levels of protection without the prior approval of the Site Safety Supervisor. A traffic vest is not needed if work clothes are suitably visible (e.g., orange/yellow rain gear or white/yellow chemical protective clothing).

# 9 AIR MONITORING

Air monitoring will be conducted for all subsurface explorations (soil borings, monitoring wells, and test pit excavations) to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring can be used to define exclusion zones. Air monitoring can also be conducted to evaluate relative concentrations of volatile organic chemicals in samples.

The following equipment will be used to monitor air quality in the breathing zone during work activities:

| Monitoring Instrument | Calibration Frequency | Parameters of Interest | Sampling Frequency |
|---|---|---|---|
| PID | Daily | Volatile organic compounds | • During collection of each soil sample during drilling.<br>• During trenching if workers smell petroleum odor. |

Use the following action levels to determine the appropriate level of personal protection to be used during field activities:

| Monitoring Instrument | Reading in Breathing Zone | Action | Comments |
|---|---|---|---|
| PID | 10 PID units above background for 5 minutes | Leave location pending further evaluation by Aspect Corporate Safety officer. | Alternatively, use engineering controls (ventilation) or leave location and return at a later time. |
| Olfactory | Noticeable odors | Leave location pending further evaluation by Aspect Corporate Safety officer. | |

| Monitoring Instrument | Reading in Breathing Zone | Action | Comments |
|---|---|---|---|
| PID | 100 PID units above background for 5 minutes | Leave location pending further evaluation by Aspect Corporate Safety Officer. | |

# 10 SAFETY EQUIPMENT

The following safety equipment will be on site during the proposed field activities:

| **Other Required Items** (check items required) | |
|---|---|
| First aid kit | X |
| Eyewash (e.g., bottled water) | |
| PID | X |
| Drinking water | X |
| Fire extinguisher | X |
| Brush fan | |
| Wind sox | |
| Other: | |

# 11 SPILL CONTAINMENT

| Will the proposed field work include the handling of bulk chemicals? | Yes | No X |
|---|---|---|
| If yes, describe spill containment provisions for the property: | | |

# 12 CONFINED SPACE ENTRY

| Will the proposed field work include confined space entry? | Yes | No X |
|---|---|---|
| If yes, attach to this plan the confined space entry checklist and permit. | | |

# 13 ASPECT TRAINING AND MEDICAL MONITORING

Aspect employees who perform site work are responsible for understanding potential health and safety hazards of the site. All Aspect site workers will have health and safety training for hazardous waste operations, in accordance with WAC 296-843-200. In addition, Aspect requires medical monitoring for all employees potentially exposed to chemical hazards in concentrations in excess of the permissible exposure limit (PEL) for more than 30 days per year, as required under WAC 296-843-210. Employees who use respirators for their work will have a respirator medical evaluation as required under Chapter 296-842-WAC.

# 14 DISCLAIMER

Aspect Consulting, LLC does not guarantee the health or safety of any person entering these properties. Because of the potentially hazardous nature of this property and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this property. The health and safety guidelines in this plan were prepared specifically for this site and should not be used on any other property without prior evaluation by trained health and safety personnel.

# FIELD SAFETY PLAN CONSENT AGREEMENT

### Aspect Consulting Employees

I have reviewed the project specific health and safety plan, dated October 2020, for the Jensen-Simard Residence fieldwork. I understand the purpose of the plan and I consent to adhere to its procedures and guidelines while conducting activities on site that are described in the plan.

| Employee Printed Name | Signature | Date |
|---|---|---|
| | | |
| | | |
| | | |
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| | | |

### Site Visitors

I have been briefed on the contents of the project-specific health and safety plan. I am responsible for my own health and safety.

| Visitor Printed Name and Organization/Company | Signature | Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

# FIELD SAFETY MEETING MINUTES

**Site Name _____Project No. _____**

**Meeting Location _____**

**Meeting Date _____ Time _____ Conducted by_____**

**Pre-field Work Orientation_____ Weekly Safety Meeting_____ Other_____**

**Subject Discussed _____**

_____

_____

_____

**Site Safety Supervisor Comments _____**

_____

_____

_____

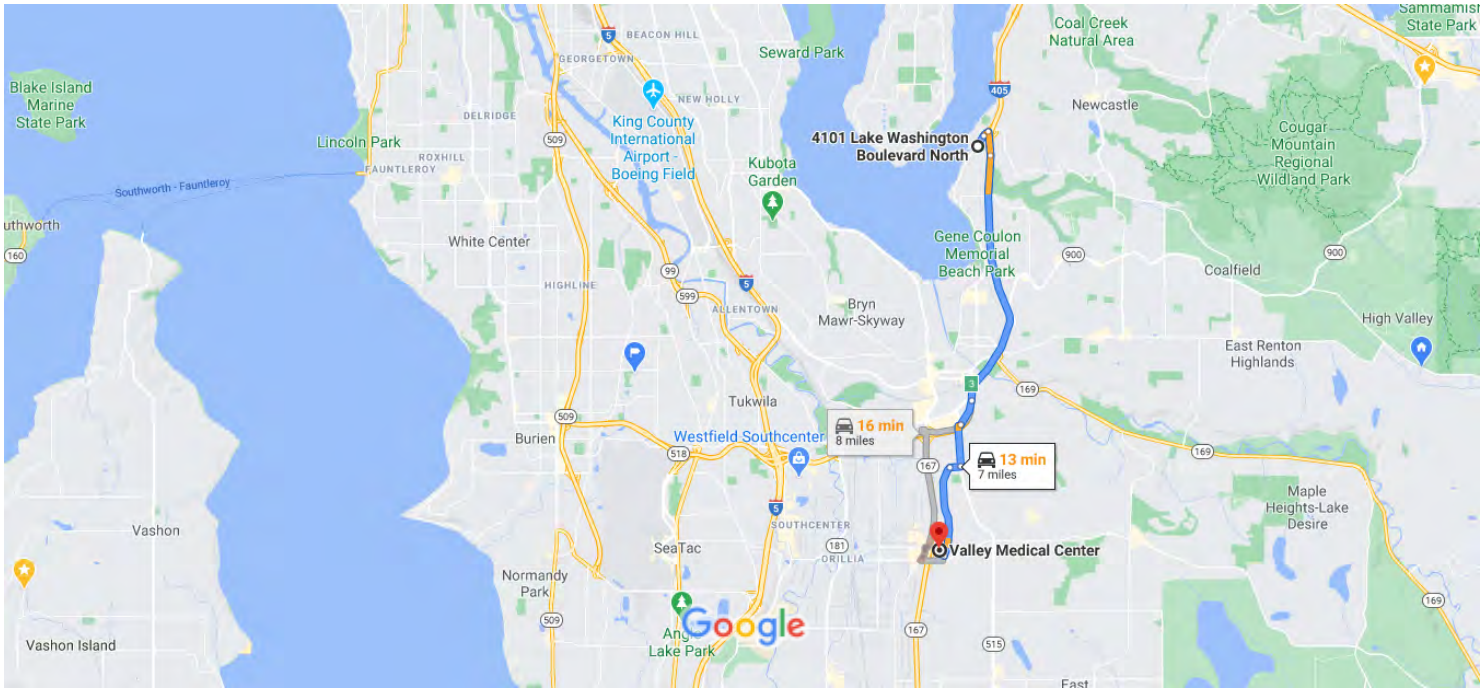
**Participants**

| Printed Name (and company if subcontractor) | Signature |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

Google Maps

# 4101 Lake Washington Blvd N to Valley Medical Center

Drive 7.0 miles, 13 min




Map data ©2020 Google 1 mi

## 4101 Lake Washington Blvd N

Renton, WA 98056

### Get on I-405 S

1 min (0.6 mi)

1. Head northeast on Lake Washington Blvd N toward N 41st St

0.2 mi

2. Continue onto N 44th St

495 ft

3. Turn right to merge onto I-405 S

0.4 mi

### Follow I-405 S to WA-515 S/Talbot Rd S. Take exit 3 from I-405 S

5 min (4.2 mi)

4. Merge onto I-405 S

3.8 mi

5. Take exit 3 for WA-515/Talbot Road S

0.4 mi

### Follow WA-515 S and Talbot Rd S to your destination

6 min (2.2 mi)

6. Use the left 2 lanes to turn slightly left onto WA-515 S/Talbot Rd S (signs for Talbot Road)

Continue to follow WA-515 S

0.6 mi

7. Turn right onto S 21st St

0.2 mi

8. Continue onto Talbot Rd S

1.3 mi

9. Turn right

154 ft

10. Continue straight

131 ft

## Valley Medical Center

400 S 43rd St, Renton, WA 98055

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

# Sediments Health and Safety Plan

# HEALTH AND SAFETY PLAN

## FORMER BARBEE MILL SITE

Sediment Remedial Investigation

*Prepared for:*

**Barbee Mill Company, Inc.**
PO Box 359
Renton, Washington 98057

*Prepared by:*

Geosyntec consultants

engineers | scientists | innovators

520 Pike Street, Suite 2600
Seattle, Washington 98101

March, 2021

Project Number: PNG0869

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Attachment B: Task Hazard Analyses

Attachment C: Summary of Chemical Hazards

Attachment D: Personal Protective Equipment

Attachment E: Safety Data Sheets

Attachment F: Fieldwork COVID-19 General Prevention Measures

Attachment G: Geosyntec Health and Safety Procedures

- HS-105 Driver and Vehicle Safety
- HS-113 Personal Protective Equipment
- HS-115 GHS Hazard Communication System
- HS-202 Safety Meetings
- HS-203 Stop Work Authority
- HS-306 Working on or Near the Water
- HS-502 Manual Hand Tools
- HS-503 Powered Hand Tools

## H&S INCIDENT RESPONSE PRODECURES

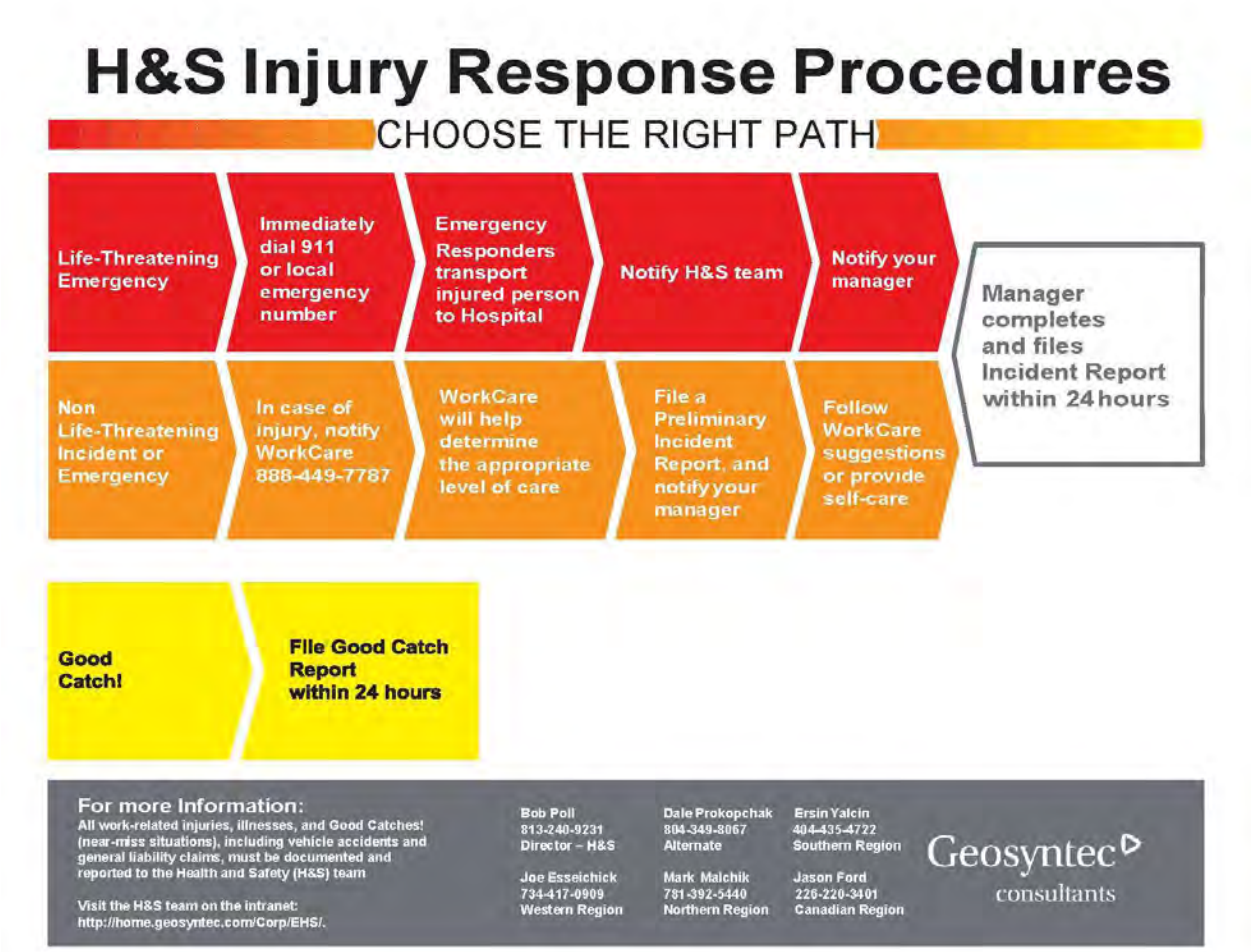



**Figure 1. Health and Safety Injury Response Procedure Flow Chart.**




**Figure 2. Route to the Hospital from the Site.**

## HOSPITAL INFORMATION:

**Emergency Room at Valley Medical Center**
425.690.1000
400 South 43rd Street
Renton, WA 98055-5010

## DIRECTIONS TO HOSPITAL FROM SITE

- Start: In Lake Washington off shore of the former Barbee Mills Site
  - Over Water
    - Head South 2 miles to Gene Coulon Public Boat Launch, located at 1203 Lake Washington Blvd N, Renton, WA 98056
  - By Vehicle
    - Head south toward Coulon Beach Acrd/Coulon Beach Park Dr (177 ft)
    - Turn right (75 ft)
    - Turn right (243 ft)
    - Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (164 ft)

- Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (285 ft)
- Continue onto Coulon Beach Acrd/Coulon BeachPark Dr (184 ft)
- Turn left to stay on Coulon Beach Acrd/CoulonBeach Park Dr (128)
- Turn right onto Lake Washington Blvd N (0.1 miles)
- Use the middle lane to turn left onto N SouthportDr (0.2 miles)
- Use the right lane to merge onto I-405 S via theramp to Tacoma (2.1 miles)
- Take exit 3 for WA-515/Talbot Road S (0.4 miles)
- Use the left 2 lanes to turn slightly left onto WA-515 S/Talbot Rd S (signs for Talbot Road) (0.6 miles)
- Turn right onto S 21st St (0.2 miles)
- Continue onto Talbot Rd S (1.3 miles)
- Turn right (154 ft)
- Turn left (240 ft)
- Turn right (167 ft)

o End: Valley Medical Center Emergency Room, 400 S 43rd St, Renton, WA 98055

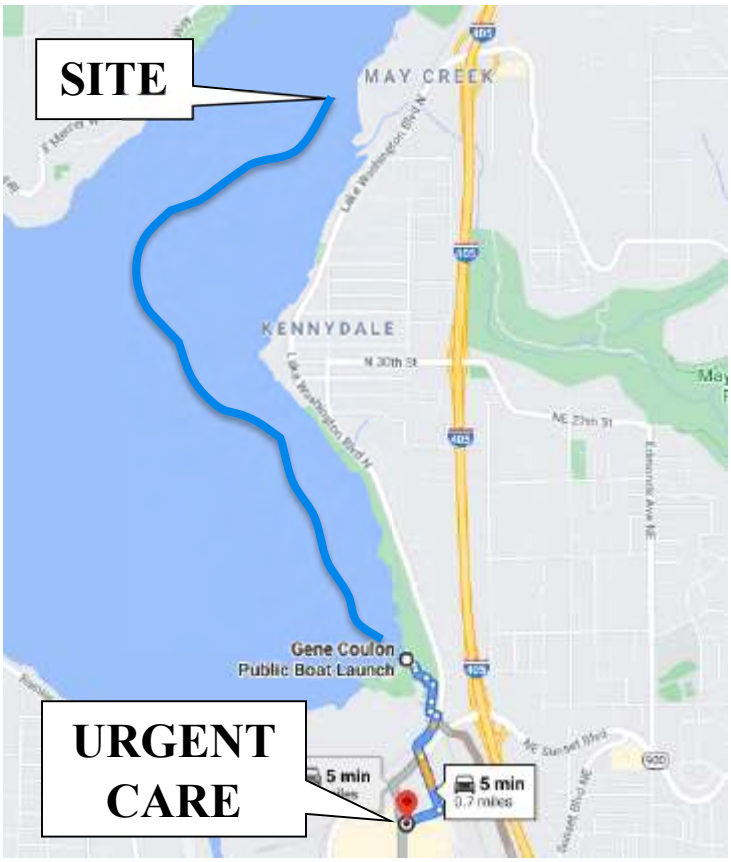



**Figure 3. Route to the Urgent Care from the Site.**

## URGENT CARE INFORMATION:

**Renton Landing Clinic | Urgent Care**
425.690.3475
1205 N 10th Street—Ste A
Renton, WA 98057

## DIRECTIONS TO URGENT CARE FROM SITE

- Start: In Lake Washington off shore of the former Barbee Mills Site
  - Over Water
    - Head South 2 miles to Gene Coulon Public Boat Launch, located at 1203 Lake Washington Blvd N, Renton, WA 98056
  - By Vehicle
    - Head south toward Coulon Beach Acrd/Coulon Beach Park Dr (177 ft)
    - Turn right (75 ft)
    - Turn right (243 ft)

- Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (164 ft)
- Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (285 ft)
- Continue onto Coulon Beach Acrd/Coulon BeachPark Dr (184 ft)
- Turn left to stay on Coulon Beach Acrd/CoulonBeach Park Dr (128)
- Turn right onto Lake Washington Blvd N (0.1 miles)
- Continue on Garden Ave N. Drive to N 10th St (0.3 Miles)
- Continue straight onto Garden Ave N (0.2 miles)
- Turn right onto N 10th St (0.1 miles)

o End: Renton Landing Clinic - Urgent Care - ValleyMedical Center, 1205 N 10th St Suite A, Renton, WA 98057

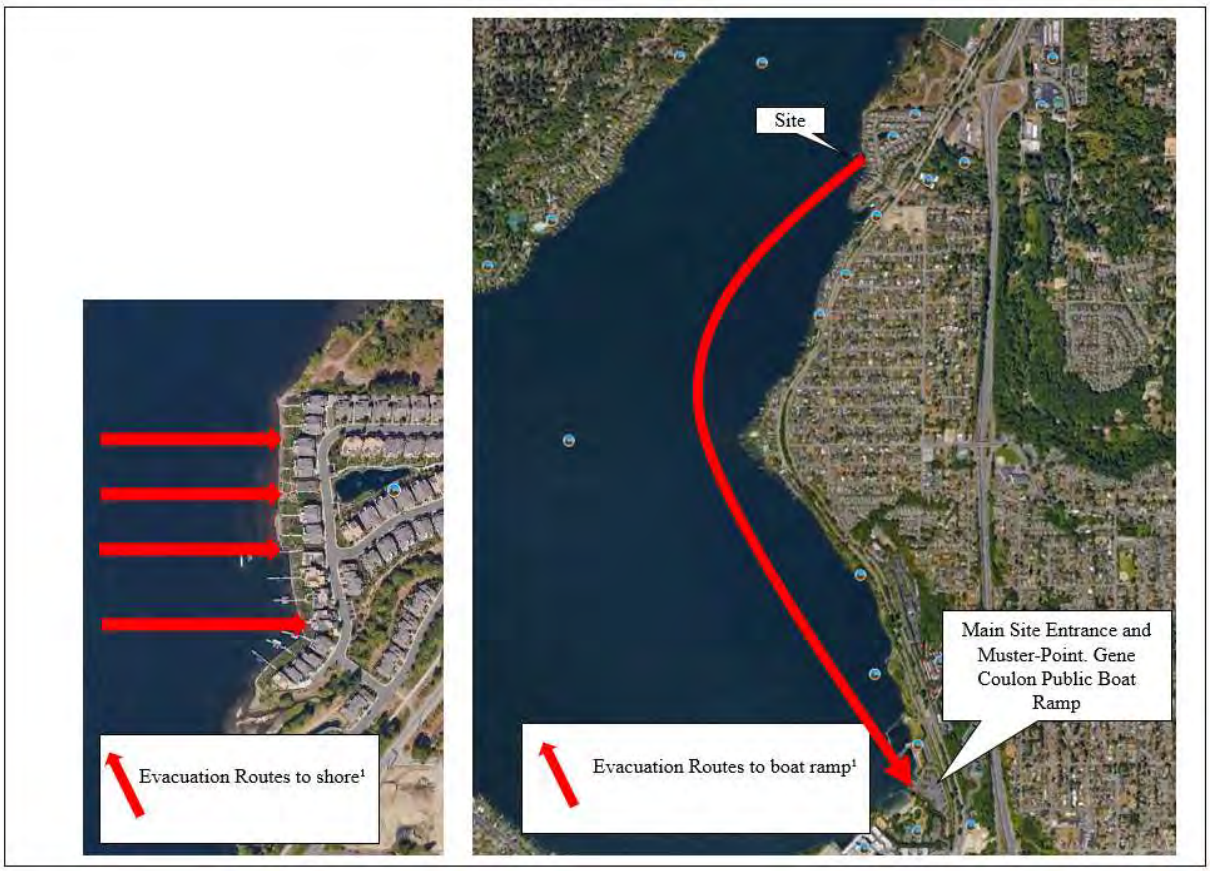



**Figure 4. Site Map and Evacuation Routes.**

[1]The muster point will be Gene Coulon Public Boat Ramp on the South Shore of Lake Washington. If it is safe, boats should dock at the boat ramp. If evacuation of the vessel is necessary while transiting to/from the Site or if immediate evacuation is necessary at the Site, the evacuation procedure will be to dock or beach the vessel at the closest dock or shore.

# 1. INTRODUCTION

This site-specific Health and Safety Plan (HASP) was prepared to address project-specific hazards known or suspected to be present associated with the existing conditions and work to be performed at the work site(s). This HASP was prepared to meet the requirements specified in Occupational Safety and Health (OSHA) Hazardous Waste Operations Emergency and Response (HAZWOPER) program, Geosyntec Consultants, Inc. (Geosyntec)'s Corporate Health and Safety (H&S or HS) Procedure HS 301, and the H&S requirements of the client (Written Hazard Communication Program, 29 C.F.R. § 1910.120(b)(1), Safety and Health Program, 29 C.F.R. § 1926.65(b)(1))

# 2. SIGNATURES

## 2.1 HASP Reviewers

This HASP must be maintained on-site when field work is being performed. The Site Health and Safety Officer (SHSO) can change or amend this document, in agreement with the Health and Safety Coordinator (HSC) or Project Manager (PM). Amendments (e.g., changes in personal protective equipment, addition of tasks, etc.) must be documented in in Attachment A. This HASP must be reviewed and amended on an annual basis for projects lasting more than one year.

| | | |
|---|---|---|
| **Reviewed by:** | Jennifer Arblaster, Coleman Hoyt | 10/20/2020 |
| | | Date |
| **Approved by:** |  | 11/20/2020 |
| | Project Manager | Date |

**This HASP has been given to the following H&S approved subcontractor(s).**

| Subcontractor | Representative | Date |
|---|---|---|
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |
| Subcontractor | Representative | Date |

## 2.2 Site Workers

This HASP must be reviewed by personnel prior to Site work. Workers not in attendance at the initial meeting must be trained by the SHSO on the information covered in the pre-entry briefing. After reading the HASP and attending a pre-entry briefing, Geosyntec employees and other parties covered under this HASP must sign the following acknowledgment statement.

*"I have read, understand, and will perform my work in accordance with the information set forth in this HASP."*

| Signature | Printed Name | Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## 3. EMERGENCY CONTACT INFORMATION

**Table 1. Emergency Contact Information.**

| Contact | Telephone Numbers | |
|---|---|---|
| | Office | Alternate (Type) |
| Fire Department | 911 | |
| Police Department | 911 | |
| Hospital – Valley Medical Center ER | (425) 690-1000 | |
| Urgent Care – Renton Landing Clinic | (425) 690-3475 | |
| Director of H&S – Bob Poll | (813) 379-4420 | (813) 240-9231 (Cell) |
| H&S Regional Manager – Joe Esseichick | (720) 509-8906 | (734) 417-0909 (Cell) |
| Project Manager – Jennifer Arblaster | | (949) 295-5458 (Cell) |
| Site Health & Safety Officer –Dustin Jensen | (206) 496-1451 | (712) 304-2128 |
| H&S Coordinator – Coleman Hoyt | (206) 496-1448 | (978) 394-1735 |
| Principal-in-Charge – Anne Fitzpatrick | (206) 496-1461 | (206) 963-8199 (Cell) |
| Utility Emergencies | 811 | |
| EthicsPoint | (844) 231-3371 | |
| WorkCare | (888) 449-7787 | (714) 978-7488 |
| Client Contact – Lynn Manolopoulos, Davis Wright Tremaine | (425) 646-6146 | (425) 503-1697 (Cell) |
| Subcontractor – Tim Thompson, Marine Sampling Sevices | (206)-418-6177 | |
| Subcontractor - | | |
| Subcontractor – | | |

## 4. APPLICABILITY OF THIS HASP

This HASP was prepared in accordance with Geosyntec's H&S Procedures for use by Geosyntec project staff and subcontractors. Subcontractors, at a minimum, shall ensure that their employees, and those of its lower tier subcontractors, comply with these procedures and other health, safety and security provisions in the Subcontract. Compliance with this HASP shall represent the minimum requirements to be met by subcontractors, who shall be responsible for examining the requirements and determining whether additional or more stringent health, safety and security provisions are appropriate for their portion of the work and implementing them accordingly. Therefore, for firms executing all or any portion of the work, this document and its contents should not be used without a thorough peer review by their H&S managers. Prior to commencing work, such firms are responsible for reviewing and supplementing the HASP to add appropriate procedures specific to their portion of the work.

## 5. TASK HAZARD ASSESSMENT

### 5.1 Site Background

The following is a brief description of the Site, including information as to the location, approximate size, previous usage, and current usage. A description of the tasks to be performed is also presented.

| | |
|---|---|
| **Site Location:** | Lake Washington<br>Latitude: 47.529872°<br>Longitude: -122.206139° |
| **Approximate Size of Site:** | Approximately 20 Acres, in-water area |
| **Previous Site Usage:** | Sawmilling and wood preservation |
| **Current Site Usage:** | Recreation area and residences |

**Description of Surrounding Property/Population:**

| | | | |
|---|---|---|---|
| **North:** | Quindall Terminal Sediment Cleanup Site | **East:** | Residences |
| **South:** | Lake Washington | **West:** | Lake Washington |

**Summary of Previous Site Investigations:**

The Site is a former lumber mill facility located on the southeastern shoreline of Lake Washington, Renton, Washington. As a result of historical operations, chemical releases to soil, groundwater, and sediments have occurred at the Site. Known historical operations include log rafting, wood treatment, and sawmill operations.

At least five sediment investigations and a dredging project have taken place at the Site since 1997. Analysis by Geosyntec of historical surface sediment data indicates that arsenic and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) are contaminants of potential concern (COPCs) in sediment. Maximum COPC concentrations measured at the Site during past investigations are 16 mg/kg for arsenic and 0.25 mg/kg for cPAHs.

## 5.2 Task Descriptions

Geosyntec will complete a sediment investigation at the Site which will include in-water work only. Individual tasks that will be completed during the Site investigation are summarized below.

### Task 1: Surface Sediment Sampling

Surface sediment will be collected from the Site with subcontractor operated equipment (such as van Veen grab samplers, or power grab samplers) deployed from a research vessel. Geosyntec will provide on-board staff to provide oversight and document the sampling process. Nearshore samples will be collected from foot with a shovel/hand auger as needed/appropriate.

General task-specific safety considerations include, contaminant exposure, slips, trips, and falls during vessel boarding and operations, overhead hazards (from sampling equipment), moving equipment and pinch points, heat and cold stress, adverse weather, working on or over water (e.g., person overboard, drowning), collision with submerged

objects, handtool use, and loud operating equipment. See the attached THA in Attachment B for details on the hazards involved and associated hazard controls.

**Task 2: Passive Sediment Sampling**

Porewater samples will be collected using porewater passive samples (peepers), which will be placed in the sediment from a research vessel deck using a pushpole. The passive samplers will be retrieved using a pushpole approximately 4 weeks after deployment. Geosyntec will complete the passive sampling task at the Site which will include in-water work only. Individual tasks that will be completed during the Site investigation are summarized below.

General task-specific safety considerations include, contaminant exposure, slips, trips, and falls during vessel boarding and operations, moving equipment and pinch points, heat and cold stress, adverse weather, working on or over water (e.g., person overboard, drowning), collision with submerged objects, and loud operating equipment. See the attached THA in Attachment B for details on the hazards involved and associated hazard controls.

## 5.3 Chemical Hazards

The classes of COPCs that are known or suspected to be present at the Site include the metals (arsenic) and cPAHs.

Controls for these hazards are presented in the THAs included in Attachment B. A summary of these chemical hazards is presented in Attachment C.

## 5.4 Physical Hazards

The following physical hazards have been identified associated with the work to be performed and the Site conditions.

- Working on and over water (e.g., falling overboard)
- Heat and cold stress
- Eye injury
- Hand/Foot injury
- Knives/Blades (e.g., contact with, cut by)
- Strain/Overexertion (e.g., Lifting heavy loads, repetition, bending, twisting)
- Loud noise/Vibration (hearing damage)

- Portable power/Hand tools (e.g., cuts from sharp parts, powered equipment injuries)
- Falls (slip/trip, fall to same level, fall from height)
- Thoroughfares/Traffic/Travel to/from Site
- Overhead hazards (e.g., heavy sampling equipment suspended by A-frame)

Controls for these hazards are presented in the THAs included in Attachment B.

## 5.5 Biological Hazards

The COVID-19 Pathogen has been identified as a biological hazard associated with the work to be performed and the Site conditions. Controls are presented in the THAs included in Attachment B.

## 5.6 Potential Exposure Pathways

Exposure to chemical hazards at the Site could occur by three pathways: inhalation, skin contact, and ingestion.

### Inhalation

Constituents that could potentially pose a concern to workers through the inhalation exposure pathway include volatile constituents included in the cPAH analyte category or cPAHs and metals contained in dust particles from dried sediment. Inhalation by workers could potentially happen during Task 1.

cPAH and metals exposure through inhalation is expected to be limited through the use of dust suppression techniques (as appropriate) and the proper use of PPE will adequately protect personnel.

### Skin Contact

Constituents that could potentially pose a concern to workers through the dermal contact exposure pathway include cPAHs and metals. Dermal contact with potentially contaminated sediment could occur during the Tasks associated with this project. However, dermal exposure is expected to be limited by the use of proper PPE designed to limit skin contact with sediment or soil.

### Ingestion

Constituents that could potentially pose a concern to workers through the inhalation exposure pathway include cPAHs and metals. Ingestion of potentially contaminated sediment could occur during the Tasks associated with this project. Exposure is expected to be minimal with the use of proper PPE and hygiene practices such as washing hands before eating.

## 5.7 COVID-19

COVID-19 related H&S measures will be taken during each task of this project. The COVID-19 pathogen can be transmitted from infected individuals, resulting in potentially life-threatening symptoms including difficulty breathing. As of October 2020, there is no vaccine available, and best-practices to minimize transmission are changing often. As updates are made to Geosyntec COVID-19 policies and Local, State, and Federal policies, this HASP and its associated THAs will be updated. Each task-specific THA will address COVID-19 by assessing potential COVID-19 related hazards and risks and will describe ways to minimize those risks. See the Field Work COVID-19 General Prevention Measures guideline in Attachment F for COVID-19 prevention measures.

## 5.8 Geosyntec Health and Safety Procedures

Geosyntec has developed HS procedures for many of the tasks being performed during this project. These procedures must be followed during all aspects of this project. Attachment G contains relevant Geosyntec HS procedures for this project and includes:

- HS-105 Driver and Vehicle Safety;
- HS-113 Personal Protective Equipment;
- HS-115 GHS Hazard Communication System;
- HS-202 Safety Meetings
- HS-203 Stop Work Authority;
- HS-306 Working on or Near the Water;
- HS-502 Manual Hand Tools; and
- HS-503 Powered Hand Tools.

## 6. GENERAL SAFE WORK PRACTICES

The following general safe work practices must be adhered to while performing Site work:

- Basic PPE (see Section 14) shall be worn, including hard hats, safety glasses, hard-toed boots, high-visibility vests, personal floatation device (PFD) (when on vessels), and hearing protection (when around loud equipment). If conditions allow, the requirement for hard hats may be reduced with approval of the SHSO and PM.
- Water specific PPE will be available on the vessel including extra PFDs, ring bouys, and a safety line.
- A float plan (HS-306 Working On or Near Water) must be completed prior to each trip.
- Minimize contact with impacted materials. Do not place equipment on the ground. Do not sit or kneel on potentially contaminated surfaces.
- Smoking, eating, or drinking after entering the work zone and before personal decontamination is not allowed. Employees who are suspected of being under the influence of illegal drugs or alcohol will be removed from the Site. Workers, including subcontractors, taking prescribed medication that may cause drowsiness shall not operate heavy equipment and are prohibited from performing tasks where Level C or B PPE is required.
- Practice good housekeeping.
- The following conditions must be observed when operating a motor vehicle:
    - Wearing of seat belts is mandatory.
    - The use of headlights is mandatory during periods of rain, fog, or other adverse weather or low-light conditions.
    - Posted traffic signs and directions from traffic controllers must be observed.
    - Equipment and/or samples transported in vehicles must be secured from movement.
    - Vehicles acquired by Geosyntec may not be operated by non-Geosyntec personnel.
- In an unknown situation, always assume the worst reasonable conditions.

- Be observant of your immediate surroundings and the surroundings of others. It is a team effort to notice and warn of dangerous situations. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.
- Conflicting situations may arise concerning safety requirements and working conditions. These must be addressed and resolved rapidly by the SHSO and PM to relieve motivations or pressures to circumvent established safety policies.
- Unauthorized breaches of specified safety protocol are not allowed. Workers unwilling or unable to comply with established procedures will be asked to leave the work Site.

## 7. EMERGENCY RESPONSE

This section discusses emergency response procedures and response equipment to be maintained on-site. A table presenting a list of contacts and telephone numbers for the applicable local and off-site emergency responders is provided inside the front cover of this HASP (Section 3).

### 7.1 Injury and Emergency Response Procedures

In the event of an injury to an employee, the instructions for injury response and reporting, located in the front of this HASP, must be implemented immediately. In the event that an emergency develops, the following procedures are to be implemented:

- The SHSO, or designated alternate, should be immediately notified via the on-site communication system. The SHSO assumes control of the emergency response.
- If applicable, the SHSO must immediately notify off-site emergency responders (e.g., fire department, hospital, police department, etc.) and must inform the response team of the nature and location of the emergency on-site.
- If applicable, the SHSO may call for evacuation of the Site. Site workers should move to their respective refuge stations using the evacuation routes provided on the Site Map.
- For small fires, flames should be extinguished using the appropriate type of fire extinguisher. Large fires should be handled by the local fire department.
- If a worker is injured, the procedures presented in "H&S Incident Response Procedures," located in the front of this HASP, must be implemented immediately.
- After an incident has stabilized, the procedures presented in "H&S Incident Response Procedures," located in the front of this HASP, must be followed.

## 7.2 Emergency Response Equipment

Emergency response equipment will be maintained in the work area as necessary for this project. Examples of emergency response equipment include first aid kits, fire extinguishers (Type ABC), PFDs, ring buoys, rescue line, and eyewash bottles.

# 8. KEY PERSONNEL AND HEALTH AND SAFETY RESPONSIBILITIES

Project personnel and their responsibilities in regard to H&S concerns on this project are as follows:

PM: Jennifer Arblaster

- Approve this HASP and amendments, if any;
- Monitor the field logbooks for H&S work practices employed;
- Coordinate with SHSO so that emergency response procedures are implemented;
- Check that corrective actions are implemented;
- Check and document that qualified personnel receive this HASP and are aware of its provisions and potential hazards associated with Site operations, and that they are instructed in safe work practices and familiar with emergency response procedures; and
- Provide for appropriate monitoring, PPE, and decontamination materials.

SHSO: Dustin Jensen

- Prepare and implement project HASP and amendments, if any, and report to the PM for action if deviations from the anticipated conditions exist and authorize the cessation of work if necessary;
- Check that Site personnel meet the training and medical requirements;
- Conduct pre-entry briefing and daily tailgate safety meetings;
- Check that monitoring equipment and PPE are operating correctly according to manufacturer's instructions and such equipment is utilized by on-site personnel. Calibrate or check calibration of monitoring equipment and record results;
- Check that decontamination procedures are being implemented;
- Implement Site emergency response and follow-up procedures;
- Notify the HSC in the event an emergency occurs; and
- Perform and document weekly inspections.

HSC: Coleman Hoyt

- Review and audit HASP and amendments;
- Notify Director of H&S when an emergency occurs;
- Assist with the implementation of the corporate H&S program; and
- Consult with staff on H&S issues.

Site Workers:

- Provide verification of required H&S training and medical surveillance prior to arriving at the Site;
- Notify supervisors of workplace accommodation requirements as the result of physical limitations or medical conditions;
- Attend pre-entry briefings and daily tailgate safety meetings;
- Immediately report accidents and/or unsafe conditions to the SHSO;
- Be familiar with and abide by the HASP; and
- Be ultimately responsible for his or her own safety.

## 9. WORKER TRAINING AND MEDICAL SURVEILLANCE

Personnel involved in field activities subject to OSHA HAZWOPER 29 Code of Federal Regulations (CFR) 1910.120 will be required to participate in both a H&S training program that complies with criteria primarily set forth by the OSHA HAZWOPER in 29 CFR 1910.120(e) and a medical surveillance program covered under 29 CFR 1910.120(f), or equivalent regulations based on the jurisdiction in which the project is performed.

### 9.1 Pre-Assignment and Annual Refresher Training

Prior to arrival on-site, the PM will be responsible for monitoring that their staff meet the requirements of pre-assignment training (40/24 hours per Procedure HS 301). In addition, personnel must be able to document dates of attendance at an annual 8-hour refresher and three days of fieldwork under a qualified supervisor. Failure to provide this documentation will prohibit entry to the active work area(s) (i.e., Exclusion Zone).

## 9.2 Site Supervisor Training

Consistent with OSHA 29 CFR 1910.120 (e)(4), prior to arrival on-site, individuals designated as Site supervisors require an additional eight hours of specialized training. The SHSO will be the Site supervisor for this project.

## 9.3 Initial Site Safety Orientation and HASP Review

In addition to complying with 29 CFR 1910(e), Site personnel will attend an initial safety orientation during which the HASP and applicable THAs will be reviewed prior to initiating field activities. This review will include the following:

- A briefing led by the Capatain of the vessel will detail man overboard, sinking vessel, and general water safety.
- Understanding the lines of authority regarding H&S and Site personnel roles and responsibilities;
- Information of specific hazard agents related to the Site and Site operations will be discussed, such as health hazards of Site chemicals and specific safety hazards of processes, tools, and equipment;
- Training in the proper use, maintenance, and decon protocol of PPE and Level(s) of Protection;
- Appropriate work practices and engineering controls to reduce/eliminate exposures to Site hazards will be reviewed;
- Personnel will be informed of means for normal Site and emergency communication(s);
- Unique/Site specific medical surveillance requirements that need to be considered based on Site contaminants;
- Understanding Site control measures, work zones, and proper decontamination procedures for personnel/tools/vehicles, etc. to reduce the potential for both on-/off-site contamination;
- Personnel will be trained to respond quickly and properly in the event of an emergency; and
- Personnel involved in specific hazardous activities, such as confined space entry, drum handling, sampling unknowns, etc. will receive specialized training in the appropriate techniques to employ prior to commencing these operations.

## 9.4 Baseline Medical Surveillance Exam

The baseline medical examination is used to identify physical capabilities and certain medical limitations that may have an impact on the candidate's ability to perform in the position and/or job activity for which he/she is being considered, as well as to establish certain baseline medical parameters. The initial test results can then be compared against future periodic or project-specific monitoring results.

## 9.5 Periodic/Annual/Biennial Medical Exam

The periodic medical examination is used to evaluate an employee's continued fitness for duty and to assess possible impact(s) occupational exposures may have had on their health status. The periodic examination includes an update to the medical and work history, results of previous occupational exposure assessments, and a detailed medical exam tailored to the job description.

The Medical Director from WorkCare determines the frequency of the periodic medical exams based on regulatory requirements, the position/work activities of the employee, and the level of exposure to physical, chemical, and biological agents.

## 9.6 Exposure/Activity/Project-Specific Medical Testing

Exposure-specific medical tests and/or evaluation of biological indices may be conducted to establish a baseline for certain project-specific parameters, to monitor the effectiveness of hazard controls, and/or to assess the impact of occupational exposures associated with a particular work activity or project. The Medical Director, in coordination with the H&S Department, will require or recommend an exposure-specific exam when deemed appropriate based on knowledge of project hazards, occurrence of employee health symptoms, or an unexpected exposure event. Requests for exposure-specific examinations will be forwarded to the H&S Department, who will process the requests in collaboration with the Medical Director. The Medical Director will determine the type and frequency of the exposure-specific medical exams for employees designated to participate based on sound medical practice, latest toxicology information, and current regulatory requirements.

Cardiopulmonary Resuscitation (CPR) and First Aid Trained Personnel that will be on-site will be identified in the HASP appendums or THAs for each study.

### 9.7 Exit Exam

An exit medical examination is offered when an employee leaves the medical surveillance program, either because of termination of employment with Geosyntec or because of reassignment to a position not designated or identified to participate in the medical surveillance program. This optional exit examination may be used to assess potential changes in medical status that have occurred during the course of employees' previous work activities, and to establish a medical baseline at the time of departure.

## 10. MAPS AND SITE CONTROL

### 10.1 Routes to Hospital and Urgent Care Facility

A hospital near the Site has been identified. Maps to the hospital and urgent care are included in Figure 2 and Figure 3. This figure also includes the facility name and phone number.

### 10.2 Site Map

A Site map (Figure 4) is located on Page ix of the pre-text of this HASP. The Site map is intended to provide on-site orientation, and to delineate evacuation routes and muster points. Changes may be made to the Site map by the SHSO based on changing Site conditions. The Site map should be accessible in the work area.

### 10.3 Buddy System

The buddy system is required when work is performed at the Site. The buddy system includes maintaining regular contact with one or more on-site Geosyntec personnel, clients, and/or contractors to periodically check on the condition of Site workers such that each employee in the work group is observed by (or in verbal contact with) at least one other employee in the work group. For field visits with only one employee on-site, the buddy system shall be implemented via periodic telephone contact with off-site Geosyntec personnel. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

### 10.4 Controlled Work Zones

APPLIES TO TASK: ☒① ☒②

Three controlled work zones, including an Exclusion Zone, a Contaminant Reduction Zone, and a Support Zone, are required for the task(s) indicated above in the check-boxes.

The Exclusion Zone is defined as the area on-site where contamination is suspected and tasks are to be performed. The Contaminant Reduction Zone is defined as the area where equipment and workers are to be decontaminated as they leave the Exclusion Zone. The Support Zone is defined as the command area and may serve as a staging and storage area for supplies. The location and extent of the work zones may be modified as necessary as Site investigation information becomes available. For sites that do not require the three controlled work zones, the area(s) where work is to be performed shall be called the Work Zone. Geosyntec employees must not be allowed into the Contaminant Reduction Zone or Exclusion Zone or the Work Zone until they have received the proper PPE and they have read, understand, and meet the requirements outlined in this HASP.

Visitors to the Site may need to be continually escorted for safety purposes. Visitors under Geosyntec's direction need to check in with the SHSO upon visiting the Site.

For the tasks identified above, the boundaries of the Exclusion Zone, Contaminant Reduction Zone, and Support Zone, or the Work Zone, shall be marked using appropriate methods, including but not limited to warning tape, signs, traffic cones, fencing, or other appropriate means.

When working on vessels, the Exclusion Zone, Contaminant Reduction Zone, and Support Zone is illustrated in Figure 5 (below).

To enter the Exclusion Zone, workers must check-in with support staff and don required PPE. Then workers must enter the Contaminant Reduction Zone before entering the Exclusion Zone.

To leave the Exclusion Zone, workers must directly enter the Contaminant Reduction Zone. In this zone, workers must remove contaminated PPE such as dirty nitrile gloves, and practice proper hygiene such as washing hands and cleaning residue off boots. Once decontaminated, the worker can enter the Support Zone where they can check-out with support staff if leaving the vessel is necessary.

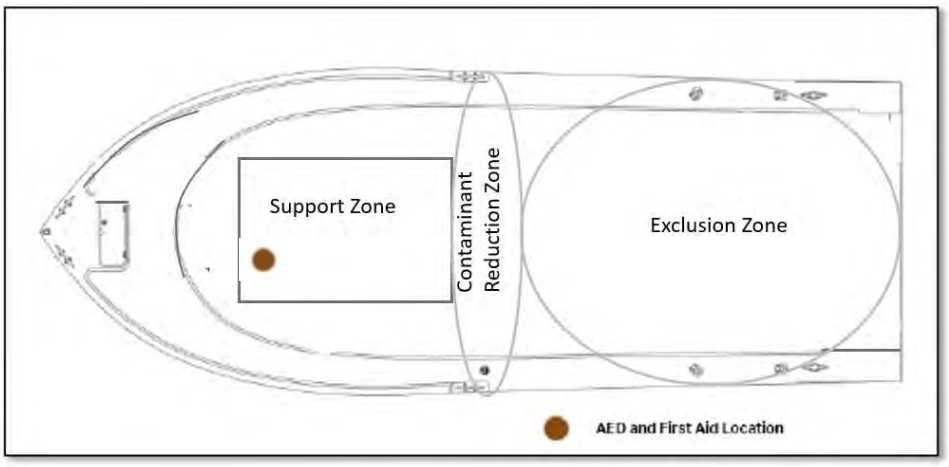



**Figure 5. Exclusion, Contaminant Reduction, and Support Zones when working on Vessel.**

## 10.5 Site Access and Muster Location

There are no Site-specific access requirements. Evacuation routes and muster locations are shown on Figure 4 (Page x).

## 10.6 Inspections

☒ APPLICABLE ☐ NOT APPLICABLE

Based on the hazards identified for the project, periodic H&S inspections may be performed. The H&S Inspection Checklist records should be kept on file at the project Site. The frequency for periodic inspections is:

☐ Weekly

☐ Monthly

☒ Other: On an as-needed basis, determined by the HSC or PM.

## 11. TAILGATE MEETINGS

In accordance with the Company's Procedure HS 202 – Safety Meetings, tailgate meetings must be held daily prior to starting work to discuss important H&S issues concerning tasks to be performed during that shift. Non-Geosyntec Site workers should also communicate H&S concerns associated with the tasks they will be performing. Topics discussed in the tailgate meetings must be documented.

## 12. STOP WORK AUTHORITY

In accordance with the Company's Procedure HS 203 – Stop Work Authority, Geosyntec personnel and subcontractor personnel have the authority and responsibility to issue a Stop Work Order if unsafe actions and/or conditions are identified. The Stop Work Authority process involves a stop, notify, correct, and resume approach for resolving observed unsafe work actions or conditions. The person issuing the work stoppage will first notify workers engaged in or affected by the unsafe activity or condition and require that associated work be stopped. After this Stop Work Order is issued, the Geosyntec project manager and the supervisors for affected or concerned contractors will also be notified. The Geosyntec project manager will document the issuance of the Stop Work Order on the form provided in Procedure HS 203. Work will not resume until the issues and concerns of the Stop Work Order have been adequately addressed.

## 13. AIR MONITORING

APPLIES TO TASK: ☐① ☐② ☐③ ☐④

Air monitoring will be not be performed. The COPCs, (cPAHs and metals) are not expected to cause an inhalation health hazard.

## 14. PERSONAL PROTECTIVE EQUIPMENT

The levels of PPE required for each task are presented in Attachment D. Required equipment and types of protective clothing materials, as well as an indication of the initial level of protection to be utilized, are listed. The level of protection may be upgraded or downgraded by the SHSO according to controls requirements in Attachment D.

In general, Geosyntec requires the following PPE during Site field efforts: hardhats, safety glasses, safety-toe shoes, sleeved work shirts, full-length trousers, and high visibility vests. A preliminary hazard assessment associated with the development of this HASP has identified additional Modified Level D PPE requirements for some of the planned tasks including hearing protection, outer work gloves, surgical or cloth masks for COVID-19, and PFDs (when working over water). More information on PPE is given in Attachment D, and Attachment G (HS-113).

## 15. DECONTAMINATION

The SHSO and PM will determine the type and level of decontamination procedures for both personnel and equipment based on evaluation of specific work activities in the

controlled work zones. Medical treatment will take precedence over decontamination in the event of a life threatening and/or serious injury/illness. Personnel will perform decontamination in designated and identified areas upon leaving "hot zones" where the potential exists for exposure to hazardous chemical, biological, or environmental conditions.

Decontamination of personnel in Level D (modified) will consist of proper containerization and disposal of coveralls, disposable boots, and gloves (if applicable) and washing of non-disposable PPE (such as rain gear) suspected of being contaminated using a soap solution followed by a water rinse.

Decontamination of personnel in Level C, if applicable, will consist, at a minimum, of:

- Removal and cleaning/disposal of boot covers, coveralls, and outer gloves;
- Removal, cleaning, and storage of respiratory protection;
- Washing of non-disposable PPE suspected of being contaminated using a soap solution followed by a water rinse; and
- Removal and disposal of inner gloves.

Hand tools and sampling equipment shall be decontaminated as needed by washing in decontamination basins with appropriate solutions, or, if possible, by dry decontamination. Wash solutions and PPE may require disposal at a licensed waste facility.

## 16. SPILL PREVENTION AND CONTAINMENT

The task(s) for this project may involve the handling of drums and/or containers that contain stored chemicals, hazardous materials, and/or investigation derived wastes. The drums and/or containers may have been spilled/dislodged during Site activities due to compromised construction of the drum/container, transportation accidents, improper packaging practices, and improper handling of hazardous materials during on/off loading. Containers shall be inspected, and their integrity assured prior to being moved and/or handled. If the integrity of the container is in question, the container shall be over packed, or its contents transferred. Operations shall be organized and coordinated to minimize movement of such containers. Where spills, leaks, or ruptures may potentially occur, a supply of sorbents shall be located in the immediate area.

Geosyntec will verify that subcontractors have either a spill plan or spill procedure prior to deploying equipment or launching vessels.

Additional preventative measures include:

- All hazardous materials will be stored in appropriate containers and labelled.
- Tops/lids will be placed over containers after use.

In the event of an unplanned release or spill of unknown or hazardous substances, the PM will designate personnel who will support the spill containment, control, and/or clean-up procedures. The team will request additional off-site emergency response assistance if necessary, based on the type of spill, volume, potential toxicity, etc.

The spill area will be isolated and restricted to only authorized personnel designated to assist with the containment, control, or clean-up activity. Authorized personnel will be trained to contain and clean spills from typical materials and quantities used at the project location. Physical barriers will be set up to warn unauthorized personnel to stay clear and evacuate the affected area. The spill, leak, or incident will be assessed by the team and characterized to determine the appropriate course(s) of action(s) to consider:

- Small spills may be remediated using absorbent materials by designated personnel;
- Large spills and/or spills of highly toxic materials may require assistance by off-site hazardous materials (HAZMAT) teams;
- Attempts shall be made to identify and stop the source(s) of spillage immediately while donning proper PPE (based on action levels and the air monitoring program) and performing air monitoring;
- If the spill has the potential to impact the water, the SHSO shall notify the PM and H&S Department, immediately;
- The SHSO will direct spill-response operations and stay at the spill area until it has been cleaned, inspected, and cleared for re-entry; and
- The SHSO will prepare a spill incident and clean-up report and will communicate findings to the PM, Principal-in-Charge and H&S Department.

## 17. CONFINED SPACE ENTRY

☐ APPLICABLE ☒ NOT APPLICABLE

The task(s) for this project do not involve confined-space entry.

## 18. GLOBALLY-HARMONIZED SYSTEM (GHS) FOR HAZARD COMMUNICATION

☒ APPLICABLE ☐ NOT APPLICABLE

The following procedures must be followed for chemicals brought onto the Site by Geosyntec personnel or by subcontractors (i.e., decontamination solution, sampling preservatives, etc.) while performing the tasks of this project:

- Labels on primary chemical containers must not be defaced;
- Chemicals must be stored in appropriate storage containers;
- Secondary containers and storage cabinets must be correctly and clearly labeled;
- Chemicals incompatible with each other must not be stored together;
- Workers must receive training on the chemical hazards; and
- Safety Data Sheets (SDSs) must be added to Attachment E.

When chemicals are used on-site, workers must abide by Geosyntec's GHS Hazard Communication Program (Procedure HS 115).

# Attachment A: HASP Amendments

Over the course of this project, it is possible that the project-specific hazards and working conditions will change. This HASP may be reviewed and amended as necessary to effectively describe the changing working conditions and measures to mitigate the potential H&S issues that may arise during the project. Amendments to the HASP should be briefly described in the following spaces provided. The full text of the amendments should be provided in Attachment A and/or additional THAs should be added to Attachment B.

**AMENDMENT 1:**

Date: _____ Project Manager: _____ HSC: _____

Brief Description of Amendment:

_____

_____

_____

_____

**AMENDMENT 2:**

Date: _____ Project Manager: _____ HSC: _____

Brief Description of Amendment:

_____

_____

_____

_____

**AMENDMENT 3:**

Date: _____ Project Manager: _____ HSC: _____

Brief Description of Amendment:

_____

_____

_____

_____

*Discuss details of amendments to this HASP here. Include amendment number, date, and details of amendments.*

# Attachment B: Task Hazard Analyses

| TASKS |
| --- |
| ① & ② Passive and Surface Sediment Sampling |

A THA for these tasks is presented in the following pages.

Geosyntec consultants

Geosyntec H&S Procedures referenced herein are available on Geosyntec's H&S SharePoint site and should be consulted, as appropriate, to ensure requirements are met. This THA has been prepared per "*HS-204-Work-Specific Hazard and Risk Assessment, Written Safety Plans*."

# TASK HAZARD ANALYSIS

(Ver. 3.1, 1-4-2021)

## *Part A – PROJECT/TASK INFORMATION*

| | | | |
|---|---|---|---|
| **Project/Site Name:** | FORMER BARBEE MILL SITE<br>Sediment Remedial Investigation | **Project Number/Org.:** | PNG0869/3010 |
| **Site Address:** | Lake Washington<br>Latitude: 47.529872°<br>Longitude: -122.206139° | | |
| **Task & Worksite Description:** | Sediment samples will be collected within 1,000 feet of shore. Sampling will be completed on foot, from a research vessel. Approximately 29 surface sediment samples will be collected using grab sample methods or collection by hand in the nearshore area. Approximately two passive sediment samples will be deployed, then retrieved four weeks later utilizing a pushpole.<br><br>This work will be completed by a subcontractor using subcontractor equipment. Geosyntec will provide on-board staff to provide oversight and document the sampling process. | | |

| **Geosyntec Personnel:** | **Name** | **Office Phone** | **Cell Phone** |
|---|---|---|---|
| Site Lead/H&S Officer | Dustin Jensen | 206-496-1451 | 712-304-2128 |
| Project Manager | Anne Fitzpatrick | 206-496-1461 | 206-963-8199 |
| Project Director | Sean Ragain | 503-222-9518 | 503-702-0205 |
| H&S Coordinator | Coleman Hoyt | 206-496-1448 | 978-394-1735 |
| Regional H&S Manager | Joe Esseichick | 720-509-8906 | 734-417-0909 |
| Corporate H&S Director | Bob Poll | 813-379-4420 | 813-240-9231 |
| **On-Site Subcontractor(s):** ☐ Not Applicable | ☒ Applicable; provide company name, work task and contact information for each Geosyntec subcontractor below: | | |
| | | | |
| **Client, Contact(s):** | Eric Parker, Research Support Services | (206) 550-5202 | |
| **ETHICS POINT HOTLINE** | US & Canada: 844-231-3371<br>UK: 800-89-0011 or 800-89-0011 | Australia: 800-551-155 or 800.811.011<br>Ireland: 800-222-55288 or 800-500-000 | |

## *Part B - EMERGENCY RESPONSE and FIRST AID*

**IMPORTANT: After initial emergency response actions and incident stabilization, contact appropriate project and H&S personnel listed in Part A**

Site-Specific Notes, Clarifications: **Consider relevant risk factors & response procedures** *(fire/explosion, medical, chemicals/spills, security, site factors, weather, communications)*, **as well as client/regulatory requirements and available of onsite/offsite emergency services (and the possible need for emergency contact numbers other than 911)**:

| | | |
|---|---|---|
| **Emergency Communication / Alerting** | ☐ Verbal ☒ Cell Phone ☐ Land Line ☐ 2-Way Radio ☐ Satellite Phone ☐ On-site alarm/signal system ☐ Other: | |
| **To Summon Police, Fire, Ambulance** | ☒ **DIAL 911**, for external responders ☐ **Other**: | |
| **WorkCare** *(for non-emergency injuries)* | **24/7: 888-449-7787** | |
| **Other Emergency Contacts** *(such as security, spill responder, utility-related):* | Spills-National Response Center: 800-424-8802<br>Report the spill immediately to BOTH:<br>1-800-258-5990 (Washington Emergency Management Division)<br>1-800-424-8802 (National Response Center) | |
| **Nearest EMERGENCY ROOM Medical Services** | Hospital Name: Emergency Room at Valley Medical Center<br>Address: 400 South 43rd Street<br>Renton, WA 98055-5010 | |
| | Phone #: 425-690-1000 | ☒ See Attached Directions |
| **Nearest URGENT CARE Medical Services** | Urgent Carel Name: Renton Landing Clinic \| Urgent Care<br>Address: 1205 N 10th Street—Ste A<br>Renton, WA 98057 | |
| | Phone #: 425-690-3475 | ☒ See Attached Directions |
| **Emergency Evacuation** - Route, Rally/Muster Point, Shelter Location(s) | Field work will be located on water adjacent to the southeast shore of Lake Washington. If there is an emergency on the water involving the vessel or a medical emergency, the field team will head to the Shoreline, or Gene Coulon Public Boat Launch, which is approximately 2 miles south of the Site. The research vessel used for the survey will launch at the boat launch and transit to the Site. | |

**EMERGENCY and FIRST AID EQUIPMENT** required for this work task is listed in **PART C.2. – SAFETY EQUIPMENT LIST**

# *PART C – TASK / HAZARD / CONTROL SUMMARY and EQUIPMENT LIST*

## C.1 SUMMARY OF TASKS, HAZARDS AND CONTROLS

| 1. TASKS / WORK ASPECTS | 2. HAZARDS / RISKS | 3. CONTROLS |
|---|---|---|
| *All steps* | *Catching or spreading COVID-19 through contact with surfaces or being in close proximity to other people.* | *Maintain a 6-foot distance from others, when possible, and take other social distancing measures when able. Take separate vehicles to/from the field site.*<br><br>*Ask those showing COVID-19 symptoms to dismiss yourself from work and self-isolate. Do not arrive to the work area with flu-like symptoms, including cough, fever, or respiratory illness.*<br><br>*Maintain personal hygiene (cough into elbow or tissue, and wash hands frequently).*<br><br>***Every worker has Stop Work Authority if they deem risks are unacceptable** (See COVID-19 Supplemental Attachment).* |
| *Driving to/from site* | *City Driving*<br><br>*Driving at and walking at boat ramp* | *Follow driving laws and familiarize yourself with unfamiliar vehicles before operating. Review prior to departure and utilize a map/GPS for directions to the site.*<br><br>*Follow on-site parking and driving rules. Yield to equipment, trucks, and other on-site operations. Use caution walking on roads and paths. Wear steel toe boots with good traction to avoid slipping on dock surfaces.* |
| *General Site Safety* | *Cold Exposure*<br><br>*Heat and Sun Exposure*<br><br>*Slips and Falls*<br><br>*Loading/Unloading Gear*<br><br>*On-Lake Traffic* | *Wear multiple layers underneath a water-resistant outer layer. Bring extra warming layers for replacement of wet clothes. Avoid fabrics that do not insulate when wet, such as cotton. Stay hydrated and be sure to eat frequent, but small snacks. Be prepared for cold, but above freezing temperatures with rain possible.*<br><br>*Wear multiple layers including long-sleeve garments. Bring a hat and sunscreen. Bring at least a days-worth of drinking water.*<br><br>*Wear steel-toe boots with good traction for slippery paths, docks, and boat surfaces. Try to maintain three points of contact when moving. Be careful when loading and unloading from a dock.*<br><br>*Use proper lifting techniques and use a lifting tool such as a dolly for heavy objects (try not to have multiple people lifting objects in order to maintain safe distances from others). Be cautious of potential pinch-points such as the area between stationary docks and moving vessels.*<br><br>*Follow marine navigation regulations and display proper navigation lights. Ensure vessel horn works and is used to inform others of location if necessary.* |
| *Sediment Sampling (Surface and Passive)* | *Working near water* | *Be aware of your surroundings and proximity to water bodies and know the location of extra personal flotation devices. Perform man overboard training with captain and crew and share the daily float plan and maintain communication with project management team. Check in/out at the beginning and end of each day. Perform daily safety checks to make sure vessel and equipment are in working order. Follow directions as given by the vessel captain.* |

| | | |
|---|---|---|
| | *Working outside of daylight hours* | *Make available a functioning flashlight for each team member. Vessel has working lights inside cabin and outside.* |
| | *Overhead/Sampling equipment* | *Maintain a safe distance from overhead equipment and wear a hard hat whenever outside vessel cabin.* |
| | *Eye injury* | *Wear safety-glasses at all times on the vessel.* |
| | *Hearing injury* | *Have ear protection available for each team member, such as foam ear plugs or safety earmuffs.* |
| | *Contaminant Exposure* | *Follow the controlled work zones procedures for working on vessels as outlined in the Health and Safety Plan (HASP) for this project. Only enter the Exclusion Zone via the Contaminant Reduction Zone. Follow proper procedures when leaving the Exclusion Zone and practice proper hygiene techniques before entering the Support Zone. Follow the Air Monitoring Plan as discussed in the HASP.* |
| *Working on water* | *Drowning, cold water, fire onboard* | *Wear personal floatation device at all times; practice man-over-board procedures, watch fellow employees and boat crew, keep eyes on, and point toward anyone overboard, follow emergency response procedures as directed by captain.* |

## C.2. SAFETY EQUIPMENT LIST (Gear to be brought to the worksite by Geosyntec personnel, or availability confirmed)

Site-Specific Notes, Clarifications: Wear high visibility clothing at all times. Wear safety glasses when operating any equipment to prevent eye injuries. Will bring portable first aid kit. Extra hand sanitizer and disinfecting chemicals will be on-Site for use in disinfecting frequently touched surfaces in order to minimize the risk of COVID-19 transmission (See COVID-19 Supplemental Attachment). Will bring supplies to construct field handwashing station. Workers are responsible for supplying their own drinking water and food.

Geosyntec employees are responsible for acquiring a PFD from the office. The marine contractor will supply the ring buoy.

| | | | | |
|---|---|---|---|---|
| ☐ | **WEATHER, CLIMATE, SEASONAL** | ☐ Project-provided drinking water<br>☐ Canopy for shade, weather protection | ☐ Sunscreen<br>☐ Ice creepers (boot attachments) | ☐ Rock salt, traction sand<br>☐ Portable heater (electric or kerosene) |
| | | ☐ Other: | | |
| ☒ | **HYGIENE PROVISIONS** | ☐ Hand washing equipment (soap & wash water) | ☒ Hand sanitizer, disinfectant supplies | ☐ Sanitary facility, porta-toilet |
| | | ☐ Other: | | |
| ☒ | **BASIC PPE** | ☒ Standard work clothes appropriate for task<br>☒ Hard-toed boots/shoes<br>☒ Hardhat | ☒ Safety glasses<br>☒ Work gloves appropriate for task<br>☒ Noise/hearing protection | ☒ High-visibility/reflective vest/apparel<br>☒ Nuisance dust mask (voluntary use) |
| ☒ | **BIOLOGICAL HAZARDS** | ☐ Insect control (DEET/picaridin repellant, wasp spray, other)<br>☐ Poison ivy protection (Ivy Block skin cream, Technu skin wash)<br>☐ Tick removal kit<br>☐ Pant-leg "blousing"/gaiters (tick safe)<br>☐ Snake chaps/gaiters | ☐ Animal warning device (for bears/cougars/wolves/large animals)<br>☐ Hand sanitizer (for general hygiene or COVID-19)<br>☐ Disinfectant supplies (for general hygiene or COVID-19)<br>☒ Face covers for COVID-19 prevention | |
| | | ☐ Other: | | |
| ☒ | **SPECIAL HAZARD CONTROLS** | ☐ Portable GFCI(s) for shock protection<br>☐ Electrical-hazard-rated boots, gloves<br>☐ Arc-resistant (AR) protection PPE for arc flash<br>☐ Flame-resistant (FR) clothing<br>☐ Work-area delineation supplies | ☐ Lockout/tagout equipment<br>☐ Portable lighting<br>☐ Tripod/winch<br>☐ Ventilation equipment (fan, blower)<br>☐ Traffic control devices | ☐ Personal fall protection apparatus<br>☒ Personal flotation device<br>☒ Ring buoy & rope<br>☐ Marine survival suit |
| | | ☐ Other: | | |
| ☐ | **CHEMICAL PPE and CHEMICAL SAFETY GEAR** | ☐ Goggles and/or face shield<br>☐ Chemical protective gloves<br>☐ Coveralls (Tyvek, or other)<br>☐ Outer boots, boot covers | ☐ Disposable N95 respirator<br>☐ Half-face respirator (APR), cartridges<br>☐ Full-face respirator (APR), cartridges<br>☐ Exclusion Zone delineation supplies | ☒ Decon solution, related supplies<br>☒ Receptacle for disposable PPE<br>☐ **Chemical hazard emergency gear – listed in "EMERGENCY EQUIPMENT" below** |
| | | ☐ Air monitoring equipment, worker exposure monitoring device(s): | | |
| | | ☐ Other: | | |

| | | | | |
|---|---|---|---|---|
| ☒ | **EMERGENCY EQUIPMENT** | ☐ Air horn, alarm, alerting equipment<br>☐ 2-Way radios; other communication device<br>☒ First aid kit(s) – onsite and/or in vehicles<br>☐ Fire extinguisher – onsite and/or in vehicles | ☐ Eyewash bottle(s)<br>☐ 15-min. eyewash station<br>☐ Emergency deluge shower<br>☐ Chemical spill kit/supplies | **Vehicle emergency preparedness:**<br>☐ Fire extinguisher, first aid kit<br>☐ Flares, lights, reflective device<br>☐ Roadside assistance service |
| | | Other: | | |

# *PART D – HAZARD ANALYSIS AND CONTROLS*

## D.1. ROUTINE HAZARD PREPAREDNESS (This section required for all Tasks)

Site-Specific Notes & Clarifications: Work will be scheduled for daylight hours, but gear loading/unloading may take place during twilight/dusk hours and lighting should be provided (e.g. headlamps/flashlights). Care will need to be taken regarding COVID-19 transmission. Maintain as much distance as is practical between people. Ask that people who develop the symptoms of COVID-19 leave the work site (See COVID-19 Supplemental Attachment). Take precautions when meeting at the boat ramp, don't leave your vehicle alone and use the buddy system. No work will be completed alone either on or near the water.

### Routine Driving Hazards

☒ **Routine work travel** – Use routine safe/defensive driving practices (seat belts, safe speeds, eyes ahead, no tailgating, limit distractions, safe cell phone use, no texting, clear windows, account for weather/road conditions, adequate sleep, other measures as appropriate).

☒ **Unfamiliar location** – Plan travel route before driving in roadway: view map, plot your route and/or enter destination and activate navigation device.

☒ **Fatigue** – Minimize fatigue during long drives: frequent rest breaks, eat light snacks-avoid heavy meals, stay hydrated, fresh air, no loud music, keep windshield clean; avoid/minimize long distance driving during your ordinary sleep hours; total *work time* and *drive time* should not exceed 14 hours per day.

☒ **Unfamiliar vehicle** – Become familiar with vehicle operational controls and handling characteristics before operating vehicle.

***Geosyntec Procedures:*** *HS-105-Driver and Vehicle Safety; HS-211-Fatigue Management Plan*

### General Safety

☒ **General site hazards** – Prevent slips/trips/falls (resulting from rough terrain, trip hazards, steep slope, slippery surfaces); maintain good housekeeping.

☒ **Musculoskeletal hazards** – Prevent strains/sprains from strenuous tasks, overexertion, repetitive motion/ergonomic/lifting (seek help/lift-aids over 49 lbs.)

☒ **Weather/climate-related hazards** – Prevent heat/cold-related illness, use sunscreen, monitor weather, i.d. shelter/refuge, use "30/30 rule" for lightning.

☒ **Plant/insect/animal hazards** – Use precautions: poison ivy blocker/wash; insect repellant; tick checks; wasp spray; animal precautions.

☒ **Common unsanitary/allergenic hazards** – Use routine hygienic measures/precautions; hand washing/sanitizer, food hygiene, PPE, disinfectant cleaning.

☒ **Infectious/Pathogenic** - For COVID-19, and other non-typical/potentially high-risk pathogenic hazards, see **D.13 "Infectious/Pathogenic Biohazards."**

☒ **Worksite traffic hazards** – Implement measures to protect personnel (high-visibility/reflective clothing, on-person lighting, traffic control measures).

☒ **Hazardous energy** – Use caution near electrical equipment/wet locations, machinery/physical hazards, stay out of hazard zone/line-of-fire, don't touch.

☒ **Illumination hazards/night work** – Illuminate work areas and/or access routes, use high-visibility and reflective clothing or on-person lighting, as appropriate.

☒ **Security, potential crime/violence, urban/industrial zones** – Complete the *Assessment for Specific Risk: Working in Urban and Industrial Zones*

☒ **Working alone** - Develop a project-specific plan/procedure on limitations for lone work, and specify a plan for periodic communication/contact.

***Geosyntec Procedures:*** *HS-124-Heat Stress, HS-125-Cold Stress, HS-127-Ticks, HS-207-Working Alone, HS-208-Housekeeping, HS-210-Walking and Working Surfaces, HS-401-Back Injury Prevention, HS-517-Traffic Safety, Assessment for Specific Risk: Working in Urban and Industrial Zones*

### Basic Personal Protection

☒ **Head protection from overhead hazards** – Wear hardhat or "bump cap" as appropriate for hazard.

☒ **Hand protection** – Wear protective work gloves appropriate for the hazard and work tasks.

☒ **Eye protection** – Wear safety glasses (with side shield or wrap around, either clear or shaded for sun protection), or other appropriate eye protection.

☒ **Foot protection, rough terrain** – Wear work boots/shoes with hard toes, ankle support, puncture resistance, traction, as appropriate for conditions.

☒ **Hearing protection** – use earplugs or earmuffs (or both) as appropriate for conditions; at a minimum where noise levels exceed 85 dBA.

☒ **Protective clothing/nuisance dust mask** – For general protection against dust, dirt, oily residues, unsanitary conditions, as needed.

☐ Other personal safety gear required for the task(s) covered in this THA is described above in Site-Specific Notes & Clarifications

***Geosyntec Procedures:*** *HS 109-Hearing Conservation, HS 112-Respiratory Protection, HS 113-Personal Protective Equipment*

## D.2. SPECIAL DRIVING / TRAFFIC / TRANSPORTATION HAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Sediment sampling work will take place over water. Flash flooding is not expected to be a concern on Lake Washington, there is a large volume of water that will dampen the effects of rain/stream input on water surface elevation. There is a small set of locks on the outlet of the lake. In the event of a lock emergency (e.g. earthquake or equipment failure), all over-water work will stop and the evacuation procedure will be enacted.

| | | |
|---|---|---|
| ☐ | **SPECIAL DRIVING HAZARDS**<br>Off-Road Driving or use of non-typical vehicle, heavy vehicle, van, UTV/ ATV<br>Hazards: Worker injury due to vehicle collision, rollover | ☐ For off-road driving, do not exceed capability of vehicle, beware of wet conditions, keep speed low, avoid unsafe orientation on slopes.<br>☐ UTV/ATV-specific procedures for training, use roll-bar or helmet, operate per manufacturer's instructions.<br>☐ Special Skills Required for Vehicle type – For vehicles requiring special skills (such as windowless van, heavy work vehicle, utility vehicle, similar) ensure operator is provided training and/or has appropriate operator skills through experience.<br>***Geosyntec Procedure(s):*** *HS-510-All Terrain Vehicles* |

| | | |
|---|---|---|
| ☐ | **ROADWAY TRAFFIC HAZARDS**<br>Where the worksite is located in/near vehicle thoroughfare (road, highway, parking lot, etc.).<br>Hazards: Worker injury from being struck by vehicle traveling in thoroughfare. | ☐ Prepare Management of Traffic (MOT) Plan (address location hazards / client and regulatory requirements).<br>☐ Wear DOT-approved reflective vests where exposed to traffic hazards.<br>☐ Where possible, park vehicles as protective shield from oncoming traffic.<br>☐ Configure work area and support vehicles to minimize worker exposure to traffic hazards.<br>☐ Use DOT signal devices and/or signage to re-route vehicles around work area, site entrances/exits.<br>☐ Use DOT-trained flaggers or police detail where appropriate or required.<br>***Geosyntec Procedure(s):*** *HS-517-Traffic Safety* |
| ☐ | **TOWING/HAULING LOADS**<br>Hazards: Vehicle accident, occupant injury from shifting load, unsafe equipment, un-roadworthiness of trailer. | ☐ Ensure load within vehicle is firmly secured (rope, straps, load configuration) to prevent shifting during travel.<br>☐ Slings, chains, strap, rope and related equipment used for towing, hauling, load-securing shall be appropriate for use, and used in a manner as to prevent an unsafe condition.<br>☐ For trailer use, verify tow-hitch components are compatible, hitch/safety chains secure, signal/braking lights operational, rear-view mirrors effective, tires inflated to proper pressure and tread acceptable. |
| ☐ | **RAILROAD HAZARD**<br>Hazard: Worker injury from being struck by train in R.R. right-of-way | ☐ Coordinate with rail company or on-site host facility and implement required safety and security measures.<br>☐ Site workers to receive safety training for railroad work.<br>**Geosyntec Procedure(s):** *HS-305-Rail Operations* |
| ☒ | **TRANSPORTATION BY WATER** | ☒ See **D.3., "Water Hazards."**<br>**Geosyntec Procedure(s):** *HS-312-Water Transportation Safety* |
| ☐ | **AIRPORT HAZARDS**<br>Worker injury when working on/near airport runway, or use of helicopter, light aircraft | ☐ Coordinate safety requirements with airport personnel and implement required safety measures.<br>☐ Site workers to receive safety training for airport work.<br>***Geosyntec Procedure(s):*** *HS-310-Helicopter Safety, HS 311-General Aviation (Small Aircraft) Safety* |
| ☐ | **TRAFFIC/VEHICLE HAZARDS RELATED TO HEAVY EQUIPMENT, CONSTRUCTION SITE ACTIVITIES** | ☐ See **D.8., "Construction, Heavy Equipment, Lift Equipment"** |

## D.3. WATER HAZARDS (Working Over/Near Water, Ash Ponds, Quicksand) ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Sediment sampling work will take place over water. Flash flooding is not expected to be a concern on Lake Washington, there is a large volume of water that will dampen the effects of rain/stream input on water surface elevation. There is a small set of locks on the outlet of the lake. In the event of a lock emergency (e.g. earthquake or equipment failure), all over-water work will stop and the evacuation procedure will be enacted.

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| ☐ | **WATER HAZARDS**<br>**Work/travel in watercraft or on equipment over water or over coal ash impoundment/pond:**<br>☒ Workboat, barge<br>☒ Water transportation<br>☐ Hazardous currents (river, tidal/riptide)<br>☐ Ash pond<br>☐ Towing, trailer, roadway<br>☐ Other – describe above<br>**Walking into water/wetland, on shoreline, riverbank, dock, bulkhead, abutment, coal ash:**<br>☒ Work on-foot near, or on ice over, waterbody<br>☐ Wading into water, wetland<br>☐ Hazardous tidal zone or surf<br>☐ Water release, flash flood<br>☐ Coal ash pond, quicksand<br>☐ Open culvert, arroyo, drainage/irrigation ditch<br>☐ Diving<br>Hazards (as applicable):<br>- Drowning, cold immersion<br>- Boating collision, navigation, fog, darkness<br>- Fire/fuel hazards<br>- Entrapment (mud/silt/coal ash/quicksand)<br>- Slip/fall hazards – ice, mud, silt, wet surfaces<br>- Weather, heat/cold stress | **General water-safety measures for all work near water:**<br>☒ Wear regulatory-approved personal flotation device (PFD) where drowning hazard is present.<br>☐ Bring emergency rescue and/or signaling equipment (ring buoy and rope, reaching device, flares)<br>☒ For fall protection over water, see **D.4. "Fall Hazards."**<br>☐ For electrical hazards associated with water/wet locations, see **D.10. "Electrical Work Tasks."**<br>**Boating-specific:**<br>☒ Use fuel safety practices, fire extinguisher present in boat.<br>☒ Develop/follow float plan, monitor weather, navigate/communicate as planned.<br>☒ Confirm navigation/communication equipment operable before heading onto water.<br>☐ For work over very cold water, have immersion survival suit available.<br>☐ For tidal, flash flood, dam release hazards, plan/locate work accordingly.<br>☐ For towing a boat trailer, see **D.2. "Special Driving/Traffic/Transportation Hazards."**<br>**Work-entering water or along shore/bank or on dock/pier/abutment:**<br>☐ For ice/slip hazards, wear ice creepers, sand work area, use tether, other appropriate measures.<br>☐ For work on ice over water, verify safe thickness, have ring buoy & rope available<br>☐ For unsure/slippery footing in water, use wading staff, high-traction soles on waders.<br>☐ Have lifesaving skiff/boat available in circumstances where other rescue means are inadequate.<br>☐ Monitor hazardous tides, weather for flash floods, know water release schedule.<br>**For ash ponds, quicksand:**<br>☐ Wear regulatory-approved personal flotation device (PFD).<br>☐ Bring emergency rescue equipment (ring buoy and rope, reaching device)<br>☐ If walking on ash/quicksand, provide stable walking/working surface (4'x8' plywood, or similar)<br>***Geosyntec Procedure(s):*** *HS-306-Working on/near Water and Ice, HS-312-Water Transportation Safety* |

## D.4. FALL HAZARDS (Falls to Lower Levels) ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Fall hazards from dock or vessels are possible.

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| ☒ | **WORKING AT HEIGHTS (GENERAL)**<br>Hazards: | ***Fall protection "trigger heights":***<br>***Built environment*** *– US & CAN: 4 ft. (1.2 m.);* ***Construction:*** *US: 6 ft., 10 ft. for scaffolds; CAN: 10 ft. (3 m)* |

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| | - Injury from falls onto lower surface or falls into hazardous equipment, chemicals, water<br>- Overhead utilities/obstructions<br>- Impalement hazard (such as from falling onto unprotected rebar and similar surface projections)<br>- Hazard posed to ground personnel from falling tools, equipment, materials | Protect from ***primary*** (fall) hazards:<br>☐ Restrict access to hazard (barriers, tape, sign)<br>☐ Ensure safe access to height (ladder, stair, lift)<br>☐ Ensure guardrails/stair-rails/handrails present<br>☐ Ensure covers in place over holes<br>☐ Use designated "watch person/monitor"<br>☐ Use tether or positioning device<br>☐ Use personal fall apparatus (PFA)<br>☐ Use fall protection net<br><br>Protect from ***secondary*** (collateral) hazards:<br>☐ Protect site ground personnel from falling objects (restrict access, toe-boards, tether tools)<br>☐ Install caps on protruding rebar and similar<br>☒ Working over water; see **D.3, "Water Hazards"**<br>☒ Working over hazardous machinery/equipment; see **D.5, "Power-Tools/Powered Equipment"**<br>☐ Overhead electrical; See **D.11. "Utility-Related Hazards"**<br>☐ Working over chemical hazards; See **D.14 and/or D.15 for chemical and/or contaminant hazards.**<br><br>***Geosyntec Procedure(s):*** *HS-120-Fall Protection, HS-210-Walking and Working Surfaces, HS-304-Overhead/Underground Utility Hazards* |
| ☒ | **LADDER / STAIRS**<br>☐ Extension/straight ladders<br>☐ Step ladders<br>☒ Fixed/installed ladders<br>☐ Portable/mobile stairs<br>☐ Job-made or scaffold stairs<br>Hazards:<br>- See general fall hazards, above. | ☒ Follow safe work practices:<br>• Use ladders according to safe practices and manufacturer's instructions.<br>• Maintain 3 points of contact at all times on ladder; keep center of gravity within side rails.<br>• Do not use metal (conductive) ladder near electrical hazard.<br>• Extension/straight ladders shall be properly footed, secured, angled, extend above upper work surface.<br>• Stepladders are set on level ground or properly shimmed, spreaders locked; do not climb/stand on top step, top cap, or rear non-climbing side; use step ladder of sufficient length for work.<br>• Equip stairs with stair handrails where more than 4 steps, and for stairway height of 4' or more.<br>• Ensure portable stairs are stable, plumb.<br><br>***Geosyntec Procedure(s):*** *HS-120-Fall Protection; HS-501-Ladders* |
| ☐ | **SCAFFOLD**<br>☐ Supported scaffold<br>☐ Suspended scaffold<br>☐ Free-standing/mobile scaffold<br><br>Hazards:<br>- See general fall hazards, above<br>- Equipment collapse | ☐ Follow safe work practices:<br>• Identify/coordinate operations with the scaffolding "Competent Person."<br>• Supported scaffold level, stable, proper attachments, tiebacks, planking,<br>• Suspended scaffolds anchored properly.<br>• Guardrails or personal fall apparatus required above 10 feet.<br>• Proper means of accessing scaffold (proper ladders, stair tower).<br>• Total height of free-standing scaffold not to exceed four times the minimum base dimension.<br>• Do not exceed load limits; store/stage materials in quantities sufficient for immediate use.<br><br>***Geosyntec Procedure(s):*** *HS-507-Scaffolds* |
| ☐ | **AERIAL BOOM/SCISSOR LIFT**<br>Hazards:<br>- See general fall hazards, above<br>- Struck-by, run-over, tip over<br>- Caught between (pinch points)<br>- Fluid leaks/fuel hazards or battery-related hazards | ☐ Follow safe work practices:<br>• Operators to be trained and certified.<br>• Equipment is inspected after mobilization and is in good condition.<br>• Harness & lanyard worn whenever operating the lift.<br>• Overhead hazards and surface obstructions to be reviewed with operators prior to use.<br><br>***Geosyntec Procedure(s):*** *HS-509-Aerial Lifts* |
| ☐ | **WARNING!** Confirmed or possible close proximity to **OVERHEAD ELECTRICAL UTILITY LINES.** | ☐ Follow safe work practices per **D.9., "Utility-Related Hazards"**<br><br>***Geosyntec Procedure(s):*** *HS-304-Overhead/Underground Utility Hazards* |

## D.5. HAND TOOLS (Manual, Hand-Powered) ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Preparing the grab sampler or passive sediment samplers may require the use of hand tools.

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| ☒ | **MANUAL HAND TOOL INJURIES**<br>☒ Struck by<br>☒ Pinch points/crushing injuries<br>☒ Puncture<br>☒ Cutting blade/laceration risk<br>☒ Flying objects, eye hazards<br>☐ Other, describe above | ☒ Proper tool for the job, maintain in good condition, use vise/clamp to hold work piece, proper follow through, stay clear of "line of fire," appropriate work gloves, keep blades sharp, use wrist strap when dropped tool poses a hazard.<br>☒ Utility/folding/collapsible knives and fixed open-bladed knives/cutting tools are *not* permitted, unless specifically authorized. Cutting tools with auto-retracting blades, or with enclosed/guarded blades are permitted. Use cut-resistant heavy work gloves, as applicable.<br>☐ Ground surface penetration – requires utility clearance; see **D.11. "Utility-Related Hazards"**<br>***Geosyntec Procedures:*** *HS-502-Manual Hand Tools* |
| ☒ | **MUSCULOSKELETAL (MSK) HAZARDS**<br>☒ Risk of acute physical MSK trauma (strains, sprains, soft tissue injuries)<br>☒ Risk of cumulative/chronic MSK trauma, repetitive motion injuries | ☒ For tools requiring high exertion (shovel, hand auger, sledgehammer, pickaxe, slide hammer, similar): do stretching exercises to prepare, clear hazard zone, use stable body position, take rest breaks, avoid overexertion. |

## D.6. POWERED TOOLS & EQUIPMENT (For Drilling & Heavy Equipment, see D.7 & D.8) ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Preparing the grab sampler or passive sediment samplers may require the use of handheld power tools.

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| ☒( | **Type of powered tools/equipment:**<br>☐ "Power tools"<br>☒ Powered portable equipment<br>☐ Powered fixed equipment<br>**Energy/power source:**<br>☒ Battery-operated<br>☐ Electric-powered<br>☐ 120V<br>☐ 240V<br>☐ 480V<br>☐ Extension/flexible cords<br><br>☐ Fuel-powered (gas or liquid)<br>☐ Pneumatic<br>☐ Hydraulic<br>☐ Gunpowder-actuated<br>**Hazards of Power Tools and Powered Equipment:**<br>☒ Eye/hand/body injury<br>☒ Point-of-operation hazards<br>☒ Pinch points, moving parts<br><br>☐ Line-of-fire hazards, struck by<br>☐ Fire/explosion, ignition sources<br>☐ Burns from hot surfaces, steam<br>☐ Noise<br>☐ Inhalation/atmospheric hazards<br>☐ Working at heights, falls<br>☐ Overhead obstruction(s)<br>☐ Musculoskeletal hazards<br>☐ Potential (stored) energy<br>☐ Illumination | ☒ <u>General safe work practices for operation of powered tools and equipment:</u><br>• Inspect before each use to ensure safe operating condition.<br>• Clear personnel from hazard zone; keep personnel out of the "line-of-fire;" heed warning labels/signage.<br>• Arrange worksite for safe access to equipment and safe use of tool; confirm no overhead obstructions.<br>• Secure long hair/loose clothing/hanging jewelry near moving/rotating parts.<br>• Ensure point-of-operation, mechanical power transmission, other moving parts are guarded with protective devices (as applicable); do not override interlocks, guards, protective devices.<br>• Do not make any equipment modifications that create a greater hazard or bypass safety design features.<br>• Use tool/equipment in accordance with manufacturer's use and safety instructions.<br>• Use PPE and/or other safety protections, as appropriate, for eye/hearing/hand/head/body protection.<br>• Provide training or verify operator competency for use of power tool/equipment.<br>• Use ventilation, wet methods, respirators, other applicable means to mitigate inhalation hazard.<br><br>• Move power cords/pressurized hoses to protect from damage during tool/equipment use.<br>• For spark/heat generating tool/equipment, have fire extinguisher available, remove combustible/flammable materials, or use other means to control fire hazard.<br>• Use safe lifting practices and/or lift aids for moving heavy portable equipment, and use safe operating procedures to protect from acute strains/sprains, overexertion, and cumulative trauma injuries.<br>• Implement safe work practices for compressed air, pressurized systems (pneumatic/hydraulic), stored energy.<br>☒ <u>Additional requirements for power tools:</u><br>• Use vise/clamp/work bench or other means to hold/secure a portable/moveable work piece.<br>• Don't carry electrical tools/equipment by the power cord; don't carry pneumatic tools by hoses.<br>• Disconnect tool/equipment from power source before changing bits, blades or making adjustments.<br>☐ <u>Additional requirements for fixed powered equipment:</u><br>• Implement lockout/tagout controls for repairs/adjustments/tooling changes.<br>• Equip pneumatic hoses with whip checks; ensure factory fittings are used for high-pressure hose connections.<br><br>☐ For climbing/fall hazards associated with large equipment, see **D.4. "Fall Hazards."**<br>☐ For electrical hazards, see **D.10. "Electrical Work Tasks."**<br>☐ For ground surface penetration, see **D.10. "Utility-Related Hazards."**<br>☐ For fuel-safety practices, see **D.14. "Commercial Chemical Products."**<br>☐ For air monitoring of atmospheric hazards, see **Part E, "Air Monitoring, Worker Exposure Monitoring."**<br>***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-119-Lockout/Tagout, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable* |
| ☐ | **WELDING, CUTTING, HOT WORK**<br>☐ Arc-welding (electrical arc)<br>☐ Gas-welding/cutting (fuel gases)<br>Hazards:<br>- UV/IR light-eye/skin burns<br>- hot-work hazards/fire<br>- toxic metal welding fumes<br>- compressed gases<br>- electrical shock | ☐ <u>General safe work practices for operators of welding equipment:</u><br>• Hot work permit system to be implemented.<br>• Operator properly protected (eye protection, clothing, apron, etc.).<br>• Fire hazard controls (watcher, fire extinguisher, water, remove combustibles from work area).<br>• Protect nearby personnel from hazardous UV, IR light (shielding, curtain); see **D.16. "Radiation Hazards."**<br>☐ For welding gas cylinders, secure them upright with caps on when stored or not in use; protect cylinders from damage; NEVER secure gas cylinders to metal welding bench used for electrical arc welding); see **D.14. "Commercial Chemical Products."**<br>☐ For arc welding, follow electrical safe work practices; see **D.10. "Electrical Work Tasks."**<br>☐ For inhalation hazards from welding fumes (toxic metals) and gases (asphyxiant, flammable), see **D.14. "Commercial Chemical Products."**<br>***Geosyntec Procedure(s):*** *HS-511-Welding, Cutting and Other Hot Work* |
| ☐ | **PORTABLE ELECTRIC GENERATOR**<br>Hazards:<br>- Electrical shock<br>- Carbon monoxide in exhaust<br>- Fuel-related fire hazard<br>- Injury from mechanical or lifting hazard<br>- Burns from hot surfaces | ☐ <u>Follow general safe work practices for Powered Tools & Equipment (above), and as follows:</u><br>• Use in accordance with manufacturer's instructions, including instructions for grounding the generator.<br>• Keep generator and work area dry.<br>• Never use indoors, or near building air intake vents due to carbon monoxide hazard.<br>• Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible.<br>• Use hearing protection in close proximity to operating generator, as needed.<br>• Use power cords/extension cords specified by instructions.<br>• Use ground-fault circuit interrupters (GFCIs) in accordance with manufacturer's instructions; see **D.10. "Electrical Work Tasks."**<br>• Shut down equipment before refueling; see safe practices for flammable/combustible liquids in **D.14. "Commercial Chemical Products."**<br>***Geosyntec Procedures:*** *HS-109-Hearing Conservation, HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel), HS-121-Electrical Safety, Others as applicable* |

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| ☐ | **PNEUMATIC / HYDRAULIC HAZARDS**<br>☐ Air compressor<br>☐ Compressed air system<br>☐ High-pressure liquid<br>☐ Pressurized steam<br>(For compressed gas cylinders, see **D.14. "Commercial Chemical Products")** | ☐ Never direct outlet nozzle toward body; use guards, restraints, engineering controls as appropriate.<br>☐ Never use compressed air for cleaning clothes you are wearing.<br>☐ If compressed air is used for cleaning, restrict pressure to 30 psi or below, equip nozzle with chip guard.<br>☐ Use PPE for eye (goggles or face shield)/hand/head/hearing/skin protection, as appropriate for the hazard.<br>☐ Ensure tank, hoses, fittings are in good repair using factory fittings, equipped with whip-checks.<br>☐ If pressure relief device poses a hazard to workers, reconfigure or shield device or restrict access by workers. |
| ☐ | **PORTABLE HEATER**<br>☐ electric<br>☐ fuel powered<br>Hazards:<br>- Shock (electrical)<br>- Carbon monoxide emissions and fuel-related fire hazards (fueled)<br>- Fires/burns from hot surfaces. | ☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows:<br>• Keep heater dry and locate heater on level surface away from high traffic areas to prevent tipping.<br>• Never use fuel-powered heaters indoors, or near air intake vents, due to carbon monoxide hazard.<br>• Provide ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible.<br>• Keep combustible materials at least 3 feet from hot surfaces.<br>• Do not use an extension cord or power strip to power an electric heater.<br>• For electric heaters, see **D.10., "Electrical Work Tasks."**<br>• Shut down fuel-powered equipment before refueling; see safe practices for flammable/combustible liquids and/or compressed gases in **D.14. "Commercial Chemical Products."**<br>***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel), HS-121-Electrical Safety, Others as applicable* |
| ☐ | **LOCKOUT/TAGOUT (LO/TO) OF HAZARDOUS ENERGY** To prevent unplanned equipment start-up or release of energy when under maintenance/repair. | ☐ Prepare site-specific written LO/TO *program*, and equipment-specific written LO/TO *procedures* (as applicable); implement control procedures for hazardous energy sources, provide locks/tags, train workers, designate "authorized" personnel, notify "affected" personnel.<br>***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout, HS-121-Electrical Safety* |

## D.7. DRILLING (Test Boring, Direct Push, Construction Drilling) ☐ Applicable ☒ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications:

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| ☐ | **DRILLING & DIRECT PUSH**<br>Includes hazards posed by drilling rig and associated equipment, heavy support vehicles, trailer/towing hazards, and similar mobile equipment.<br><br>Hazards:<br>- Struck-by equipment<br>- Run over, roll over<br>- Caught between (pinch points)<br>- Manual lifting, musculoskeletal<br>- Fuel/fluid leaks, fuel hazards<br>- Suspended equipment<br>- Roadway hazards. | ☐ Follow safe work practices, as applicable:<br>• Non-drilling personnel to stay clear of drilling work zone when drill rig in operation.<br>• Equipment maintained in good repair, inspected daily upon mobilization; backup alarms and emergency stop operational, machine guards in place, whip checks on high pressure lines.<br>• Leaks or defective safety equipment should be repaired before use.<br>• Establish eye contact with operator and use hand signals prior to approaching the rig.<br>• Use PPE near operating rig (eye/head/hearing/hand/foot protection, high visibility vests or equivalent).<br>• Arrange personal/support vehicles to protect drill team and not obstruct travel lanes or other operations.<br>• Operators/helpers maintain safe distance from moving parts; secure loose hair, loose clothing, equipment.<br>• Drill rigs will only be moved with masts lowered.<br>• Maximum safe slope for rig will be followed, drill rig leveled, appropriate blocking/cribbing as needed.<br>• Use safe practices for fuel handling/storage/transport; spill equipment available for fuel/fluid leaks.<br>• Ventilate exhaust and conduct air monitoring, as appropriate, when drilling indoors.<br>• Never climb drill mast without appropriate fall protection.<br>• Use precautions for overhead and underground utilities<br><br>***Geosyntec Procedure(s):*** *HS-403-Drilling, HS-304-Overhead/Underground Utility Hazards, Others as applicable* |
| ☐ | **MECHANICAL LIFTING, RIGGING**<br>Applies to lifting truck-mounted boom rig (e.g., drill rig), and all other drilling-related mechanical/electrical hoist equipment.<br>Hazards:<br>- Mechanical hazards<br>- Elevated loads | ☐ In addition to general drilling & direct push safety practices (above), as applicable:<br>• Slings, chains, rope, wire rope, as well as sheaves, boom, and attachments used for lifting/hoisting shall be maintained in good condition, inspected daily, and used/stored in a manner as to protect from damage.<br>• Do not exceed loading limits of lifting equipment; perform work in accordance with equipment load chart.<br>• Hooks will be equipped with safety latches.<br>• Ensure anchor points for winch or other lift device are engineered for intended use.<br>• Ensure personnel are not positioned beneath elevated loads.<br>***Geosyntec Procedure(s):*** *HS-506-Cranes* |
| ☐ | **WARNING!** Confirmed or possible close proximity to **OVERHEAD or UNDERGROUND UTILITIES.** | ☐ Follow safe work practices per **D.11. "Utility-Related Hazards."**<br>***Geosyntec Procedure(s):*** *HS-304-Overhead/Underground Utility Hazards* |

## D.8. CONSTRUCTION, HEAVY EQUIPMENT, LIFT EQUIPMENT ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Sampling equipment may be operated from a crane or A-frame. Other gear might be loaded with a crane or hoist.

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| ☒ | **WORKING NEAR MOBILE HEAVY EQUIPMENT, ON-SITE VEHICLES**<br>Hazards:<br>- Struck-by<br>- Caught between<br>- Run over, roll over<br>- Overhead hazards/obstructions<br>- Elevated loads | ☒ For personnel on-foot/on-the-ground near operating heavy equipment, follow safe work practices:<br>• High visibility vests for all personnel in construction vehicle work area, on-site roadways and travel lanes.<br>• Maintain unobstructed vision: wear shaded eyewear only in bright sun; don't wear hoods.<br>• Erect barriers and post signs to identify and isolate the equipment hazard zone, if possible.<br>• Stay out of swing radius of equipment, both in front and operating end, as well as at the back of equipment.<br>• Stay out of the travel path of operating heavy equipment.<br>• When crossing vehicle pathway behind moving equipment, cross at a distance not less than 30 feet.<br>• When approaching equipment, always be able to see operator so he/she can see you.<br>• Make eye contact with operator and use hand signals or make radio contact prior to approaching equipment.<br>• Operator to provide "all off" hand signal when it is safe to approach within swing radius of equipment. |
| ☐ | **OPERATION OF MOBILE HEAVY EQUIPMENT**<br>Hazards:<br>- Struck-by<br>- Run over, roll over<br>- Caught between (pinch points)<br>- Fluid leaks/fuel-/fire-hazards<br>- Overhead hazards/obstructions<br>- Potential for body entrapment/crushing<br>- Rotating equipment, moving parts. | ☐ Operators to follow safe work practices for operation of heavy equipment:<br>• Only trained/qualified persons allowed to operate heavy equipment.<br>• Wear seatbelts; roll-over protection system present/deployed; do not exceed maximum safe slope.<br>• No passengers on moving/operating equipment except where passenger seat/restraint is present.<br>• Equipment inspected daily upon mobilization; maintained in good repair, backup alarms.<br>• Leaks or defective safety equipment should be repaired before use; fire extinguisher present.<br>• Maintain eye contact with ground personnel and use hand signals to direct their approach near equipment.<br>• High visibility vests for all personnel in construction vehicle work area, on-site roadways and travel lanes.<br>• Cease operation if personnel enter swing radius, travel path or hazard zone of moving parts, elevated loads.<br>• Use safe practices for fuel handling/storage/transport; spill equipment available for fuel/fluid leaks.<br>• Equipment locked, secured, brakes set, buckets/forks lowered, when not in use.<br>• Shut down/lock out equipment to prevent crush situation beneath or between moving parts of equipment.<br>• Ensure personal/support vehicles are parked/located not to obstruct equipment travel lanes/operating zones.<br>• Mark temporary roadways clearly, provide berms/stops where needed.<br>***Geosyntec Procedure(s):*** *HS-504-Heavy Equipment, HS-132-Competent Persons* |
| ☐ | **TRENCHING/EXCAVATION**<br>Hazards:<br>- Cave-in, entrapment<br>- Hazardous atmosphere<br>- Water accumulation<br>- Falls into excavations<br>- Utility-related hazards<br>- Undermining structures & foundations | ☐ Safe work practices when personnel will enter trenches/excavations:<br>• Activities under supervision/oversight of Competent Person, conduct daily inspection of excavation.<br>• Excavated materials placed at least 2' from trench sidewall.<br>• Prevent water accumulation in trench.<br>• Sloping & shoring for trenches/excavations >20' deep must be approved by a Professional Engineer.<br>• Sloping/shoring/trench box for excavations >5' when persons enter trench/excavation.<br>• Sloping/shoring/trench box for shallow (<5') trench/excavation with cave-in hazard.<br>• Workers in trenches to be within 25 feet of ladder or sloped entryway.<br>• Excavations to be protected by perimeter fencing (not barricade tape), if potential for personnel to fall into.<br>• If potential for atmospheric hazard, see **D.12. "Confined/Enclosed Spaces"**<br>***Geosyntec Procedure(s):*** *HS-402-Excavation and Trenching, HS-132-Competent Persons* |
| ☐ | **FORKLIFT**<br>Hazards:<br>- Struck-by<br>- Run over/roll over/tip over<br>- Overhead utilities/obstructions<br>- Caught between (pinch points)<br>- Unstable/falling loads<br>- Elevated forks<br>- Fluid leaks | ☐ In addition to general safety practices for heavy equipment (above), as applicable:<br>• Qualified operator, per established forklift training (certificate is required); Geosyntec operator must be approved by Director of Health and Safety.<br>• Equipment inspected daily and documented on Forklift Preoperational Inspection Checklist.<br>• Do not exceed lifting load limits.<br>• Forklift shall not be moved/driven with empty forks in raised position.<br>• When not in use, forks lowered, brake set, controls in neutral, key removed.<br>***Geosyntec Procedure(s):*** *HS-505-Safe Operation of Forklifts, HS-132-Competent Persons* |
| ☐ | **AERIAL BOOM/SCISSOR LIFT**<br>Hazards:<br>- Falls from basket<br>- Overhead utilities/obstructions<br>- Struck-by, run over, tip over<br>- Caught between (pinch points)<br>- Tip over<br>- Fluid leaks. | ☐ Follow safe work practices:<br>• Operators to be appropriately trained and certified.<br>• Equipment is inspected after mobilization and is in good condition.<br>• Harness & lanyard worn whenever operating the lift.<br>• Overhead hazards and surface obstructions to be reviewed with operators/riders prior to use.<br>***Geosyntec Procedure(s):*** *HS-509-Aerial Lifts* |
| ☒ | **CRANES**<br>Hazards:<br>- electrocution by overhead utility<br>- injury in swing radius<br>- injury from falling load<br>- crane tipping over due to overbalancing, high winds, unstable ground, unsafe slope, bad placement of outriggers<br>- injury from mechanical hazards | ☒ In addition to general safety practices for Operation of Heavy Equipment (above), as applicable:<br>• Only qualified persons operate cranes (certificate required).<br>• Critical Lift Plan & Checklist prepared/executed (See HS 506-Cranes) prior to mobilization.<br>• Equipment to be inspected prior to mobilization and daily by crane operator.<br>• Crane operator will remain at the controls at all times during operation.<br>• Crane operation must be performed under the direction of an appointed signal person at all times using hand signals and/or voice/radio communication.<br>• Crane to be level and stable (solid ground or crane mats/timbers, outriggers if present, cribbing); over-reaching or exceeding load limits is prohibited.<br>• Keep area beneath suspended loads clear of personnel; tag lines used to maneuver load.<br>• Rigging procedures – see Mechanical Lifts with Rigging, below. |

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| | | ***Geosyntec Procedure(s):*** *HS-506-Cranes, HS-132-Competent Persons* |
| ☒ | **MECHANICAL LIFTS WITH RIGGING**<br>Applies to lifting by rigging attached to crane, truck-mounted boom rig (e.g. drill rig), heavy equipment, mechanical/electrical hoist, similar equipment.<br>Hazards:<br>- Mechanical hazards,<br>- Elevated loads | ☒ In addition to general safety practices for Operation of Heavy Equipment and Cranes (above), as applicable:<br>• Slings, chains, rope, wire rope, as well as sheaves, boom and attachments used for lifting/hoisting shall be maintained in good condition, inspected daily, and used/stored in a manner as to protect from damage.<br>• Coordinate lifting operations with competent person.<br>• Do not exceed loading limits of lifting equipment; perform work in accordance with equipment load chart.<br>• Hooks will be equipped with safety latches.<br>• Ensure anchor points for winch or other lift device (such as davit arm) are engineered for intended use.<br>• Ensure personnel are not positioned beneath elevated loads and that tag lines are used where appropriate.<br>***Geosyntec Procedure(s):*** *HS-506-Cranes* |
| ☐ | **WARNING!** Confirmed or possible close proximity to **OVERHEAD or UNDERGROUND UTILITIES.** | ☐ Follow safe work practices per **D.10. "Utility-Related Hazards"**<br>***Geosyntec Procedure(s):*** *HS-304-Overhead/Underground Utility Hazards* |
| ☐ | **DEMOLITION** | ☐ Develop/implement a demolition safety plan.<br>***Geosyntec Procedure(s):*** *HS-132-Competent Persons* |
| ☐ | **BLASTING, UNEXPLODED ORDNANCE** | ☐ Develop/implement safety plan for blasting, unexploded ordnance, as applicable.<br>***Geosyntec Procedure(s):*** *HS-307-Blasting and Use of Explosives, HS-132-Competent Persons* |
| ☐ | **PUBLIC AT RISK, SITE SECURITY** | ☐ During site operations protect public (overhead protection, fencing, barriers, warning signs).<br>☐ During off hours, protect public with fencing, barriers, warning signs/lights, other measures as appropriate.<br>☐ Lock/secure hazardous materials and/or equipment. |

## D.9. STORAGE/HANDLING OF BULK MATERIALS (for *Chemical* Storage, see D.14 & 15) ☐ Applicable ☒ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications:

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| ☐ | **BULK STORAGE HAZARDS:**<br>Collapse/movement of stacked/stored bags, blocks, containers, pipe, boxes, equipment, and similar.<br>☐ Stack/pallet/rack/shelf<br>☐ CONEX-box storage, or similar | ☐ Store materials in stable manner (stacked, racked, blocked, interlocked, tied, wrapped, or otherwise secured) to prevent tipping, sliding, rolling, falling or collapse.<br>☐ Do not exceed load limits and ensure storage structure is stable, robust, secure for intended load.<br>☐ Ensure stored materials do not block aisles, passageways, electrical panels, emergency equipment, emergency access/egress routes, vehicle routes. |
| ☐ | **LIFTING/MANUAL MATERIAL HANDLING HAZARDS** | ☐ During manual handling of materials and equipment, use safe lifting practices and/or lift aids; do stretches and use safe postures to protect from acute strains/sprains, overexertion, and cumulative trauma injuries. |

## D.10. ELECTRICAL WORK TASKS ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Sampling vessels operate using onboard electrical supply. Care will be taken to make sure electrical components, cords, etc. are not in standing water or near wet surfaces. Battery operated hand tools might be used.

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| ☒ | **USE OF BATTERIES, BATTERY-POWERED EQUIPMENT <50 V, OR OTHER DC EQUIPMENT < 50 V**<br>Potential fire hazard (if terminals are shorted), eye/skin hazards (when electrolyte is replenished), inhalation hazard in enclosed spaces. | ☒ Follow safe work practices to control hazards of voltage, shock, arcing, overheating, hazardous gases, irritant electrolytes, secondary hazards.<br>☒ Prevent short-circuiting of terminals when battery is in use (segregated from tools, metal objects) and during transport (use battery transport container or install guard/cover on positive terminal).<br>☒ For batteries requiring replenishment of electrolyte, use PPE for eye and skin protection, and have eyewash equipment at hand; see discussion of *acids/caustics/corrosives* in **D.14. "Commercial Chemical Products."**<br>***Geosyntec Procedure(s):*** *HS-121-Electrical Safety* |
| ☒ | **"NORMAL OPERATION" OF ELECTRICAL EQUIPMENT CONNECTED TO AC OR DC POWER SOURCE ≥ 50 V:**<br>Electrically powered tools, equipment, machinery, extension cords, portable generators, working near electrical equipment.<br><br>Hazards:<br>- Electrical shock<br>- Secondary hazards (falls, other injuries). | ☒ Follow "normal operation" requirements:<br>• All electrical enclosures/guards/covers must be in place/closed/secured.<br>• Electrical equipment maintained per codes/standards/manufacturer's recommendations.<br>• Ensure no indication of damage or impending failure (heat, smoke, buzzing, odors, arcing, melting).<br>• Operate equipment in accordance with manufacturer's standard operating procedures.<br>☒ Follow general electrical safety work practices to minimize shock hazard and secondary hazards:<br>• Control water-related/wet-location hazards in a manner appropriate for the job tasks/equipment/tool.<br>• Never touch electrical equipment if you are wet or standing/kneeling in water or on wet surfaces.<br>• Use extension cords/power cords properly, rated for use conditions and current draw, prevent damage.<br>• Inspect tool/equipment/extension cords/power cords before each use; remove from use if damaged.<br>• Use GFCI-protected outlet or portable GFCI in wet/moist locations, outdoors, basements, concrete floors.<br>• Do not enter any space delineated by an electrical approach boundary.<br>***Geosyntec Procedure(s):*** *HS-121-Electrical Safety* |
| ☐ | **HANDS-ON DIAGNOSTICS/REPAIR ON CIRCUIT(S) CONNECTED TO POWER SOURCE < 50 V:**<br>☐ AC ☐ DC<br>☐ Battery and/or solar power<br>☐ Capacitor(s)<br>☐ Stray voltage from soil electrodes | ☐ Implement electrical safe work practices pertaining to:<br>• Workers trained appropriately for the task.<br>• Shock prevention measures.<br>• Eye/skin protection for arcing hazards.<br>• Protection from secondary hazards.<br>***Geosyntec Procedure(s):*** *HS-121-Electrical Safety* |

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| ☐ | **WORK WITHIN *"APPROACH BOUNDARY"* OF EXPOSED, ENERGIZED (OR POTENTIALLY ENERGIZED) CONDUCTORS AND/OR CIRCUIT PARTS CONNECTED TO POWER SOURCE 50-600 V*:**<br>☐ AC ☐ DC ☐ 3-phase<br>☐ Battery and/or solar power<br>☐ Capacitor(s)<br>☐ Induced voltage<br>☐ Stray voltage ≥50V from soil electrodes<br>*** Working on >600 V not permitted for Geosyntec personnel** | ☐ Prepare project-specific written "Electrical Safety Program" addressing (at a minimum):<br>• Workers trained/designated as "Qualified Electrical Workers" per NFPA 70E (US)/CSA Z462 (CAN)<br>• Assess risks of electrical shock (voltage levels and sources), arc flash hazard and secondary hazards.<br>• Affix electrical hazard warning label to electrical enclosure(s) to be accessed.<br>• Physically delineate arc flash- or limited approach boundary, whichever is farthest from hazard source.<br>• Only "qualified" workers allowed within approach boundaries; prevent entry by non-qualified personnel.<br>• Establish electrically safe working condition; work on live circuits prohibited (except for diagnostic testing).<br>• Use PPE for shock/arc flash protection, as required.<br>• Use other safe procedures/equipment required for the task, such as lockout/tagout.<br>***Geosyntec Procedure(s):*** *HS-121-Electrical Safety, HS-129-High Voltage Electricity Safety* |
| ☐ | **LOCKOUT/TAGOUT (LO/TO) OF ELECTRICAL ENERGY** To prevent unplanned start-up or release of energy when equipment is under maintenance/repair. | ☐ Prepare site-specific written LO/TO *program*, and equipment-specific written LO/TO *procedures* (as applicable); implement control procedures for hazardous energy sources, provide locks/tags, train workers, designate "authorized" personnel, notify "affected" personnel.<br>***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout, HS-121-Electrical Safety* |
| ☐ | **WARNING!** Confirmed or possible close proximity to **OVERHEAD ELECTRICAL UTILITY LINES.** | ☐ Follow safe work practices per **D.10. "Utility-Related Hazards."**<br>***Geosyntec Procedure(s):*** *HS-304-Overhead/Underground Utility Hazards* |

## D.11. UTILITY-RELATED HAZARDS ☐ Applicable ☒ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications:

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| ☐ | **OVERHEAD, ABOVE-GROUND UTILITIES** | ☐ Arrange for power company/utility owner to de-energize power line.<br>☐ Do not cross approach boundaries with personnel or equipment; employ other appropriate precautions for the conditions (specify above).<br>☐ Use additional controls, as applicable: shielding, flagging, observer/monitor.<br>***Geosyntec Procedure(s):*** *HS 304-Overhead/Underground Utility Hazards* |
| ☐ | **UNDERGROUND UTILITIES** | ☐ Confirm appropriate underground utility clearance procedures have been completed prior to ground penetrations, and employ other utility clearance/locator practices, as appropriate for conditions.<br>☐ Hand digging/augering or vacuum post-holing within 3' of utility locations or other high-risk condition.<br>***Geosyntec Procedure(s):*** *HS 304-Overhead/Underground Utility Hazards* |

## D.12. CONFINED / ENCLOSED SPACES (Including Hazardous Indoor Spaces) ☐ Applicable ☒ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications:

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| ☐ | **Type of CONFINED/ENCLOSED/ HAZARDOUS INDOOR Workspace:**<br>☐ Indoors (occupied)<br>☐ Indoors (abandoned, vacant)<br>☐ Basement, crawl space, attic<br>☐ Tunnel, shaft, inspection gallery<br>☐ Storage bin, locker<br>☐ Culvert, catch basin, sewer<br>☐ Well vault, utility vault, manhole<br>☐ Tank, vessel, silo, vat, hopper<br>☐ Trench, excavation<br>☐ Machine/equipment pit<br>☐ Transportation container, railcar<br>☐ Other – describe above<br><br>**Confirmed or potential hazards:**<br>☐ Flammable/explosive<br>☐ Oxygen deficiency<br>☐ Hydrogen sulfide<br>☐ VOCs<br>☐ Carbon monoxide<br>☐ Combustible dust<br>☐ Combustion/exhaust emissions<br>☐ Welding/cutting fumes<br>☐ Electrical | **REQUIREMENTS:**<br>1. **Contact Corp. H&S Department** to determine applicability of confined space entry regulations, and to determine safe work practices for entry into any confined, enclosed or hazardous indoor spaces.<br><br>2. **Classify the work task** by checking **one** of the following:<br><br>☐ **CONFINED SPACE** classified **by U.S. OSHA as a "Permit-Required Confined Space;"** ensure OSHA requirements are met in OSHA jurisdictions.<br><br>☐ **CONFINED/ENCLOSED/INDOOR/CONFINED space NOT classified as an OSHA Permit-Required Confined Space**; develop site-specific entry procedure **per applicable regulations and Geosyntec requirements**.<br><br>3. **Delineate tasks, hazards and controls** associated with the work in **Section C.1. "Summary of Tasks, Hazards and Controls,"** and in applicable sections in **Parts C, D and E of this THA**; incorporate applicable safety provisions such as, but not limited to, the following:<br>• Risk assessment; entry plan, entry permit system/safety checklist.<br>• Air monitoring for atmospheric hazards.<br>• Entry roles (supervisor, entrant, attendant), buddy system, regulatory training requirement.<br>• Protect non-entry personnel from unauthorized entry (labels, signage, barriers)<br>• Ingress/egress (stairway, ramp, ladder, tripod/winch, harness/lifeline, etc.).<br>• Communication/alerting/rescue/emergency plan.<br>• Entry hazard controls:<br>- Isolation, cleaning, purging, lockout/tagout, fire protection.<br>- *Dilution* ventilation to introduce fresh air<br>- *Exhaust* ventilation to control point source of emissions.<br>- Duct/stack to direct hazardous emissions away from work area.<br>- Respiratory protection. |

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| | ☐ Mechanical equipment<br>☐ Entrapment, engulfment, drowning<br>☐ Building-related hazards<br>☐ Other – describe above | - PPE and safety gear to protect from chemical/physical/biological hazards.<br>- Fall protection.<br>- Traffic control.<br>***Geosyntec Procedure(s):*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-118-Confined Space Entry, Others as applicable to the specific work* |

## D.13. INFECTIOUS / PATHOGENIC BIOHAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications:

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| ☒ | **HAZARD TYPE:**<br>☒ COVID-19<br>☐ Wastewater, sewer<br>☐ Bird guano<br>☐ Mold, fungi, valley fever<br>☐ Bloodborne pathogens<br>☐ Discarded syringes<br>☐ Medical waste<br>☐ Other (describe above) | ☒ Follow ***Field Work COVID 19 General Prevention Measures*** (as applicable); **list project specific COVID interventions above, communicate/coordinate with project team prior to initiation of work.**<br>☐ Use "Universal Precautions" as applicable for potential exposures to infectious/pathogenic hazards.<br>☐ Low hazard – use basic hygiene practices, protective gloves, provide for hand washing.<br>☐ More severe hazard – add protective clothing, respirator/dust mask, decon, as appropriate.<br>☐ For bloodborne human pathogens follow Bloodborne Pathogen Program.<br>☐ Arrange with Human Resources for project-specific immunization.<br>☐ Implement remedial actions (remove syringes, clean up guano, decon/disinfect surfaces, etc.) as appropriate for the scope/scale of work.<br>***Geosyntec Procedure(s):*** *HS-133-Bloodborne Pathogens, COVID-19 Considerations and Mitigations for On-Going Business Operations, Field Work Covid-19 General Prevention Measures* |

## D.14. COMMERCIAL CHEMICAL PRODUCTS (per HAZCOM or WHMIS) ☒ Applicable ☐ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications: Alconox/Liquinox will be used for decontamination procedures. Hexane might be used for decontamination.

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| ☐ | **PRODUCTS REGULATED BY HAZCOM[1] (US) or WHMIS[2] (CAN)** | ☐ Safety Data Sheets (SDSs) available, either on site or readily available within same work shift, containers labelled properly, workers trained/oriented on hazards.<br>☐ For subcontractor/contractor use of chemical products, confirm SDS availability for affected onsite workers. |
| | *[1] OSHA Hazard Communication Standard (United States); [2] Workplace Hazardous Material Information System (Canada)* | |
| ☒ | **GENERAL SAFE WORK PRACTICES FOR FIELD USE OF CHEMICALS** | ☒ Consult SDS for H&S hazards, symptoms of exposure; ensure workers have been apprised of safe practices.<br>☒ Handle with care, maintain good housekeeping, provide adequate illumination in work area.<br>☒ Pour/dispense/transfer liquid chemicals on stable work surface.<br>☒ Use chemicals in well ventilated area; use fans/blowers/exhaust for active ventilation, as appropriate.<br>☒ Have eyewash bottles, eyewash station, deluge capabilities, commensurate for the hazard, readily available.<br>☐ Have spill/neutralization equipment, appropriate for the chemicals, readily available.<br>☐ Conduct air monitoring as appropriate; see **Part E, "Air Monitoring, Worker Exposure Monitoring."** |
| ☐ | **STORAGE/TRANSPORT OF CHEMICALS/HAZMAT**<br>☐ **Non-Emergency (Routine) Chemical Storage** Risk of personal contact and/or incidental release<br>☐ **HAZMAT Transport**<br>☐ **Risk of Emergency Spill/Release**<br>☐ **CFTAS (Chemical Facility Anti-Terrorism Standards) Applicability:** On-site overnight storage of non-waste chemical product at quantity ≥25 gal(115L) or ≥250 lbs. (115 kg) | ☐ Transport chemicals only in sealed containers, secured to prevent shifting/breakage during travel.<br>☐ Store chemicals only in sealed containers; overnight storage in squirt/spray bottles prohibited.<br>☐ Store flammable/combustible liquids in chemical storage cabinets, or other appropriate storage arrangement.<br>☐ For liquids, provide secondary containment during storage.<br>☐ Segregate incompatible chemicals during storage.<br>☐ For *incidental release/spill;* maintain spill kit suitable for low flammability/toxicity/quantity/volatility release.<br>☐ DOT/TDG/IATA-Regulated transport: see **D.17. "Hazmat/Dangerous Goods Shipping/ Transportation.**<br>☐ For *emergency spills*: describe spill/release hazard and response plan/procedure above, and indicate emergency response contact in Part B, "Emergency Response and First Aid."<br>☐ Locate emergency gear (eyewash, fire extinguisher, spill kit, safety signage) near storage area, as applicable.<br>☐ For CFTAS-applicable chemical storage, a safety and chemical management plan must be prepared and reviewed by a H&S Professional before bringing material to the site. (Does not apply to materials brought on to the site for daily work purposes and transported away at the end of each day) |
| ☒ | **COMPRESSED GAS CYLINDERS**<br>☐ Flammable<br>☒ Non-flammable<br>☐ Toxic<br>☐ Asphyxiant<br>☐ Oxygen | ☒ Secure cylinders upright, caps on when not in use.<br>☒ Handle with care; use and store cylinders in a manner and location to prevent damage.<br>☐ Propane cylinders not in use must be stored outdoors in a cage or similar secure ventilated enclosure.<br>☐ Ensure acetylene cylinders are NOT secured to steel arc welding bench.<br>☐ Segregate oxygen and fuel gases by distance (20') or fire-rated barrier.<br>☐ Control ignition sources.<br>☐ "No smoking" signage at cylinder storage area for flammable gases. |
| ☐ | **FLAMMABLE/COMBUSTIBLE LIQUIDS** | ☐ Use proper fuel safety can (metal fuel container with self-closing spout and flame arrestor preferred).<br>☐ Control/remove ignition sources near storage and use areas.<br>☐ Grounding and bonding where appropriate.<br>☐ Ensure a Type B or ABC fire extinguisher is readily available. |
| ☐ | **ACIDS, CAUSTICS, OTHER CORROSIVES** | ☐ Use appropriate protection for eyes/face (goggles/face shield) and skin (gloves, sleeves, apron).<br>☐ Use eyewash, deluge shower, drench hose, hand washing (with water), as appropriate. |

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| | | ☐ For severe eye hazards (due to high corrosivity, large quantity), 15-min. eyewash required. |
| ☐ | **TOXIC** | ☐ For toxic substances, use/store in a manner to control exposure hazards (inhalation, ingestion, skin contact, skin absorption); use active ventilation and/or PPE as appropriate. |
| ☐ | **EMISSIONS FROM FUEL COMBUSTION, HOT PROCESSES**<br>☐ Gasoline<br>☐ Diesel<br>☐ Propane/Natural Gas<br>☐ Welding/cutting/hot work<br>☐ Vehicle/equipment exhaust<br>☐ Other | ☐ Position outdoor personnel upwind of exhaust source.<br>☐ Avoid "idling" of equipment when not in use.<br>☐ Use *passive ventilation* (air infiltration/air currents) to disperse atmospheric hazards in breathing zone.<br>☐ Use *dilution ventilation* (blowers/fans) to provide fresh air to work area and dissipate atmospheric hazards.<br>☐ Use *exhaust ventilation* (hood/duct/exhaust stack/blower) to capture/divert exhaust from work area.<br>☐ Use respiratory protection for high levels of smoke, exhaust particulates, soot.<br>☐ Conduct air monitoring as appropriate; see **Part E," Air Monitoring, Worker Exposure Monitoring."** |
| ☐ | **OTHER HAZARDS** | ☐ Describe other hazardous substances and safety measures under "Site-Specific Notes & Clarifications," above. |
| | | ***Geosyntec Procedures:*** *HS-115-US-Hazard Communication, HS-115-CA-WHMIS, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, Others as applicable* |

## D.15. SITE CONTAMINANTS, CHEMICAL WASTES

☒ Applicable ☐ Not Applicable, Not Anticipated

**Site-Specific Notes & Clarifications:** The Site was historically the location of sawmilling and wood preserving operations. These operations resulted in soil and sediment contamination by metals and carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Five sampling and analysis investigations have taken place at the Site since the late 1990s. The results of sediment data along with historical information indicate that sediment contaminants of potential concern (COPCs) should include metals and PAHs.

**CHECK ALL THAT APPLY**. Provide site-specific notes/clarifications above.

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| ☒ Soil/groundwater contaminants (historical release) | ☐ Explosive dust | ☐ Potential for flammable gas (methane) |
| ☐ Recent release, known high concentrations | ☐ Oxygen deficiency | ☐ Corrosive, acids/caustics, strong irritants |
| ☐ Former chemical disposal site, landfill | ☐ Chlorinated volatile organic compounds (VOCs) | ☐ Asbestos abatement work |
| ☐ Urban fill, residual contaminants | ☐ BTEX, petroleum derived VOCs | ☐ Pesticides, herbicides, fungicides |
| ☐ Containerized waste (drums, process equipment) | ☐ Fuel oils, petroleum, waste oil, lubricants | ☐ Sensitizers |
| ☐ Buried drums (known or potential) | ☒ Metals, metal compounds, metal dusts | ☐ Radioactive contaminants |
| ☐ Large containers, potential for spills | ☐ Elemental mercury | ☐ Controlled substances, drugs |
| ☐ Contaminated building surfaces | ☒ Polyaromatic hydrocarbons (PAHs) | ☐ Other - describe above |
| ☐ Unexploded ordnance | ☐ Potential for flammable vapors | |

**NOTE:** For sites with one or more **"high-risk contaminants"** (below) designated/recognized as a *contaminant of concern*, or *exceeding an environmental reporting threshold*, or representing a *potential exceedance of an action level or exposure limit*, the THA must be reviewed by the H&S Dept. before initiating the work:

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| ☐ Asbestos | ☐ Cadmium | ☐ Lead |
| ☐ Arsenic/arsenic compounds | ☐ Chromium VI (Hexavalent chromium) | ☐ Methylene chloride |
| ☐ Benzene (except as trace constituent of petroleum fuel) | ☐ Dioxins | ☐ Polychlorinated biphenyls (PCBs) |
| ☐ Beryllium | ☐ Reactives – Cyanides/sulfides (HCN, $H_2S$) | ☐ Vinyl chloride |

☐ **FOR WORK CONSISTING OF CLEANUP OPERATIONS, CORRECTIVE ACTIONS, PRELIMINARY INVESTIGATIONS at an "UNCONTROLLED HAZ. WASTE SITE" (per HAZWOPER, 29 CFR 1910.120 or equivalent), delineate procedures in "Site-Specific Notes and Clarifications" (or attachments) addressing the following, as applicable to the work:**

- Workers attend **pre-work orientation** on hazards, risks, onsite safety measures, emergency contingencies.
- Implement **site control plan** - delineate Exclusion Zone(s), Contaminant Reduction Zone(s), Support Zone (aka EZ, CRZ, SZ).
- Include **site map/figure** depicting work locations and other relevant site-specific information.
- Site workers in EZ or CRZ to have 40-hour **HAZWOPER training**, current 8-hour refresher, 3 days supervised field experience.
- Site supervisor(s) required to have 8-hour **Supervisor training**.
- Site workers in EZ or CRZ to participate in **medical monitoring** program, as applicable.
- Implement **site-specific procedures** for worker protection via engineering controls, work practices, personal protective equipment (PPE), air monitoring, decontamination procedures, spill containment, emergency preparedness and response.
- Conduct **air monitoring**, as appropriate; see **Part E," Air Monitoring, Worker Exposure Monitoring."**
- **PPE program: S**pecify **Levels of Protectio**n and specific PPE to be used for applicable tasks;
  - **Level D**: No respirator, no chemical protective clothing, standard work clothes, basic PPE; (COVID-19 face covers allowed)
  - **Modified Level D**: No respirator, chemical protective clothing as appropriate; (COVID-19 face covers allowed)
  - **Level C**: Air-purifying respirator, chemical protective clothing as appropriate; **consult with Corp. H&S Dept. required**.
  - **Level B**: Air-supplied respirator, chemical protective clothing/suit as appropriate; **consult with Corp. H&S Dept. required**.
  - **Level A**: Fully encapsulating suit, self-contained breathing apparatus (SCBA); **Level A prohibited for Geosyntec personnel.**

***Geosyntec Procedures:*** *HS-301-HAZWOPER, HS-108-Medical Monitoring Surveillance, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, HS-405-Drum Sampling, Others as applicable*

☐ **FOR SITE WITH CHEMICAL CONTAMINANTS OR WASTE BUT NOT REGULATED BY HAZWOPER**

- Workers to be knowledgeable/aware of chemical hazards thru safety training/orientation and availability of hazard information.
- Implement controls to minimize worker exposure through engineering controls, work practices, PPE, decon, as appropriate.

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| | - Evaluate worker exposure via air monitoring/sampling, as applicable; see **Part E, "Air Monitoring, Worker Exposure Monitoring."**<br>***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, Others as applicable* | |
| ☐ | **STORAGE/TRANSPORT OF IDW***<br>**Spill/Release Risk:**<br>☐ Risk of *incidental spill/release*<br>☐ Risk of *emergency spill/release*<br><br>* *Investigation-Derived Waste* | ☐ Describe site-specific procedures above for spill containment, container handling, as applicable.<br>☐ For liquids, provide secondary containment during storage.<br>☐ Segregate incompatible chemicals during storage.<br>☐ Locate emergency gear (eyewash, fire extinguisher, spill kit, safety signage) near storage area, as applicable.<br>☐ For *incidental spills*; spill kit on-site for low-hazard releases (low-flammability/toxicity/quantity/volatility)<br>☐ For *emergency spills*: describe spill/release hazard and response plan/procedure above, and indicate Emergency response contact in Part B, "Emergency Response and First Aid."<br>☐ DOT/TDG/IATA-Regulated transport: see **D.17. "Hazmat/Dangerous Goods Shipping/Transportation."**<br>***Geosyntec Procedures****: HS-406-Unknown Hazardous Waste Drum Handling* |
| ☐ | **OFF-SITE MIGRATION OF AIRBORNE CONTAMINANTS** | ☐ Implement controls to minimize hazard migration (dust suppression, covers, foam, etc.).<br>☐ Community/perimeter air monitoring to be conducted per perimeter air monitoring plan; see **E.3 "Fence Line/Perimeter Air Monitoring."** |

## D.16. RADIATION HAZARDS (Other than Sunlight) ☐ Applicable ☒ Not Applicable, Not Anticipated

Site-Specific Notes & Clarifications:

| | | |
|---|---|---|
| ☐ | **IONIZING RADIATION** | Potential hazard sources may include nuclear density gauges, host-facility X-ray equipment, radioactive contaminants (α, β, γ), medical or laboratory waste. Describe hazards & safety measures above in Site-Specific Notes & Clarifications. Conduct exposure monitoring, as appropriate; see **Part E, "Air Monitoring, Worker Exposure Monitoring."**<br>***Geosyntec Procedures:*** *HS-126-Radiation Safety Program, HS-128-Ionizing and Non-Ionizing Radiation* |
| ☐ | **NON-IONIZING RADIATION** | Potential hazard sources may include lasers, UV/IR sources, microwaves & high-frequency radio waves from cell-phone transmitter, high-intensity visible light. Describe hazards & safety measures above in Site-Specific Notes & Clarifications. Conduct exposure monitoring, as appropriate; see **Part E, "Air Monitoring, Worker Exposure Monitoring."**<br>***Geosyntec Procedures:*** *HS-128-Ionizing and Non-Ionizing Radiation* |

## D.17. HAZMAT/DANGEROUS GOODS SHIPPING/TRANSPORTATION ☐ Applicable ☒ Not Applicable, Not Anticipated

| **MODE(S) OF TRANSPORT:** | ☐ Road | ☐ Rail | ☐ Air | ☐ Sea | ☐ Inland Waterway | ☐ International |
|---|---|---|---|---|---|---|

**IMPORTANT:** Ensure that each individual who will be involved in shipping/transportation of hazardous material is current with required training (awareness, function-specific, safety, security) in accordance with applicable regulatory authority (DOT, FAA, IATA, TDG), and ensure adherence to applicable regulations.
***Geosyntec Procedures:*** *HS-135-Hazardous Materials Procedures*

Site-Specific Notes & Clarifications:

# *PART E – AIR MONITORING, WORKER EXPOSURE MONITORING*

## E.1. AIR MONITORING ☐ Applicable ☒ Not Applicable, Not Anticipated

Site-Specific Notes, Clarifications:

AIR-TESTING PARAMETERS - Select site-specific testing parameters; list associated equipment in Part C.2, Safety Equipment List.

| | | |
|---|---|---|
| ☐ VOCs<br>☐ Photoionization detector (PID): **X** eV<br>☐ Flame ionization detector (FID)<br>☐ Colorimetric indicator tubes – describe above | ☐ Oxygen ($O_2$) – oxygen meter<br>☐ Lower Explosive Level (LEL) - LEL meter<br>☐ Hydrogen sulfide ($H_2S$) – $H_2S$ detector<br>☐ Carbon monoxide (CO) – CO detector | ☐ Particulates - total dust meter<br>☐ % Methane – methane meter<br>☐ Calibration kit for each parameter<br>☐ Other: |

SUBSTANCE-SPECIFIC (PRE-SET) ACTION LEVELS - Sustained breathing zone action levels (sustained general work-area levels for LEL).

| | | |
|---|---|---|
| ☐ **$O_2$** (Oxygen) | **19.5-23%** | Acceptable to continue work without $O_2$-focused respiratory protection. |
| | **<19.5%** | STOP WORK, ventilate to raise $O_2$ to >19.5% for re-entry. For persistent hazard, contact Corp. H&S Dept. |
| | **>23.0%** | STOP WORK, ventilate to lower $O_2$ to <23% for re-entry. For persistent hazard, contact Corp. H&S Dept. |
| ☐ **LEL** (Lower Explosive Limit) | IMPORTANT: | Confirm sufficient oxygen is present (min. 8-12%) to ensure accurate LEL readings. |
| | **<10% LEL** | Acceptable to continue working in work area; continue to monitor LEL. |
| | **≥10% LEL** | STOP WORK. Implement controls (reposition workers, ventilate, contain/eliminate source, etc.); resume work ONLY when LEL readings are <10%, sustained. |
| ☐ **$H_2S$** (Hydrogen Sulfide) | **< 1 ppm** | Acceptable to continue work without $H_2S$-focused respiratory protection. |
| | **1-10 ppm** | Implement controls (reposition workers, ventilate, contain/eliminate source, scheduling, etc.) to limit exposures to <1ppm, or use APR* with *VOC/acid-gas* cartridges (yellow); do not exceed MUC* for respirator type; confirm acceptability of respirator usage with Corp. H&S Dept. |
| | **> 10 ppm** | Implement controls (reposition workers, ventilate, contain/eliminate source, scheduling, etc.) to limit exposures to <10ppm (with respirator), or <1ppm (without respirator). For persistent levels >10 ppm, STOP WORK, contact Corp. H&S Dept. |

| | | |
|---|---|---|
| ☐ **CO** (Carbon Monoxide) | **< 25 ppm** | Acceptable to continue work without CO-focused respiratory protection. |
| | **≥ 25 ppm** | Implement controls (reposition workers, ventilate, contain/eliminate source, scheduling, etc.) to limit exposures to <25ppm. For persistent levels >25ppm, STOP WORK, contact Corp. H&S Dept. |
| ☐ **WILDFIRE SMOKE** (AQI for PM 2.5) | **≤150** | In this **Air Quality Index (AQI)** range, it's acceptable to continue work without respiratory protection. |
| | **151-500** | Voluntary use of N95 respirator is appropriate. |
| | **>500** | STOP WORK, or use APR* with approval of Corp. H&S Dept. |
| ☐ **<OTHER>** | | |
| SITE-DERIVED ACTION LEVELS – Sustained breathing zone action levels; derived based on site contaminants; REVIEW WITH CORP. H&S DEPT. REQUIRED. | | |
| ☐ **VOCs** (Volatile Organic Compounds) | **< X ppm** | Acceptable to continue work without VOC-focused respiratory protection. |
| | **> " ppm** | Implement controls (reposition workers, ventilation, containment, eliminate source, etc.) to lower VOC exposures to less than specified action level, or use APR* with approval of Corp. H&S Dept. |
| | **X to X ppm** | Use APR* with *VOC* cartridges (yellow or black); do not exceed MUC** for respirator type; confirm procedures for respirator usage with Corp. H&S Dept. |
| | **> X ppm** | STOP WORK. Implement controls, for persistent levels greater than action contact Corp H&S Dept. |
| ☐ **AIRBORNE DUST** (Total Particulates) | **< X mg/m³** | Acceptable to continue work without particulate-focused respiratory protection. |
| | **> " mg/m³** | Implement controls (water spray, reposition workers, ventilation, containment, etc.) to lower dust levels to less than specified action level, or use APR* with approval of Corp. H&S Dept. |
| | **X to X mg/m³** | Use APR* with particulate cartridges appropriate for the hazard; do not exceed MUC** for respirator type; confirm procedures for respirator usage with Corp. H&S Dept. |
| | **> mg/m³** | STOP WORK. Implement controls. For persistent levels greater than action level, contact Corp H&S Dept. |
| ☐ **<OTHER>** | | |
| * Air-purifying respirator ** Maximum use concentration | | |
| ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-602-Lead, HS-605-Hydrogen Sulfide, Wildfire Smoke THA Addendum* | | |

## E.2. OTHER WORKER EXPOSURE MONITORING ☐ Applicable ☒ Not Applicable, Not Anticipated

| | | |
|---|---|---|
| ☐ Heat/Cold Stress Testing/Monitoring | ☐ Wildfire Smoke – Tracking AQI (Air Quality Index) | ☐ <Other> |
| ☐ Air Sampling *(sample collection, passive dosimeter)* | ☐ Ionizing or Non-ionizing Radiation Testing | ☐ <Other> |
| ☐ Wipe/Bulk Sampling *(to evaluate worker exposure)* | ☐ Noise Testing | |

Site-Specific Notes, Clarifications:

***Geosyntec Procedures:*** *HS-109-Hearing Protection, HS-111-Air Monitoring, HS-124-Heat Stress Prevention, HS-125-Cold Stress Prevention, HS-126-Radiation Safety Program, HS-128-Ionizing and Non-ionizing Radiation, HS-601-Asbestos, HS-602-Lead, HS-604-Respirable Crystalline Silica, HS-605-Hydrogen Sulfide*

## E.3. FENCELINE / PERIMETER AIR MONITORING ☐ Applicable ☒ Not Applicable, Not Anticipated

Fence line/perimeter air monitoring to be conducted in accordance with a separate **"Perimeter Air Monitoring Plan"** for this work; results from *fence line/perimeter* air monitoring shall NOT be used as the sole basis for determining *work zone* atmospheric hazards.

Site-Specific Notes, Clarifications:

# *PART F – APPROVALS, ACKNOWLEDGEMENTS*

F.1. THA PREPARATION, REVIEW/APPROVAL SIGNATURES A THA is typically prepared by project staff, often with input from an HSC, with review/approval, at a minimum, by PM or PD. Corporate H&S staff must be consulted as required or otherwise deemed appropriate*.

| | *Printed Name* | *Signature* | *Date* |
|---|---|---|---|
| THA PREPARED BY: | Jon Laurance | | 03/04/2021 |
| | | | |
| | | | |
| THA REVIEWED/ APPROVED BY: (Project Manager or Project Director, at a minimum) | *Printed Name* | *Signature* | *Date* |
| | Jenn Arblaster | Jenn Arblaster | 03/25/21 |
| | | | |
| | | | |

* At a minimum, Corp. H&S must review/approve the THA review when Geosyntec staff will encounter "high hazards/high risks," or perform critical tasks, such as (but not limited to):

- Climb ladders to heights >10'
- Use a personal fall apparatus
- Self-perform tasks classified as construction labor
- Climb ladders to heights >10'
- Tow a trailer on roadway
- Oversee a hot-work permit system
- Enter a permit-required confined space
- Operate a UTV/ATV, aerial lift or fork-lift
- Implement lockout/tagout controls
- Enter a trench/excavation >5' deep
- Work near heavy equipment or crane
- Function as a construction "Competent Person"
- Operate a pneumatic or powder-actuated tool
- Electrical testing & maintenance (<50 V excluded)
- Work at height near overhead electrical utility lines
- Derive action levels for VOCs or toxic dusts
- Instrument monitoring for critical exposure risks
- Wear a respirator
- Presence of "high-risk" contaminant(s)
- Sustained exposure to wildfire smoke $AQI_{PM\ 2.5}$ >150
- Enter EZ/CRZ during HAZWOPER cleanup activities
- Exposure to radioactive isotopes ($\alpha$, $\beta$, $\gamma$)
- Onsite risk of emergency chemical spill
- Applicability of Chemical Anti-Terrorism Standards

Corporate H&S must also be consulted when Geosyntec subcontractors (*under Geosyntec's oversight*) perform high hazard/high risk work (such as demolition, blasting, crane lifts, confined space entry, testing/maintenance of electrical systems, lockout/tagout, HAZWOPER cleanup activities), OR when supplemental written H&S programs are required for a project (such as Electrical Safety Program, Lockout Program, Confined Space Entry Program, Emergency Response Plan), OR when a written safety plan must be submitted to a public agency. Consultation with Corp. H&S is encouraged for all questions/concerns regarding worker safety, regulatory compliance, risk/liability aspects, or project-specific safety requirements.

*Geosyntec H&S Procedure: For more information, see HS-204-Work-Specific Hazard and Risk Assessment, Written Safety Plans.*

## F.2. GEOSYNTEC FIELD CREW ACKNOWLEDGEMENTS

Please sign below to acknowledge you reviewed and understand this THA, participated in project safety briefing and had an opportunity to ask questions about the information herein.

| Printed Name | Signature | Employee No. | Date |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## F.3. SUBCONTRACTOR'S FIELD CREW ACKNOWLEDGEMENTS

☐ Applicable ☐ Not Applicable

Please sign below to acknowledge this THA was made available to you, and you had an opportunity to ask questions about the information herein.

| Printed Name | Signature | Company Name | Date |
|---|---|---|---|
| | | | |
| | | | |
| | | | |




**Figure 1. Route to the Hospital from the Site.**

**HOSPITAL INFORMATION:**

**Emergency Room at Valley Medical Center**
425.690.1000
400 South 43rd Street
Renton, WA 98055-5010

**DIRECTIONS TO HOSPITAL FROM SITE**

- Start: In Lake Washington off shore of the former Barbee Mills Site
  - Over Water
    - Head South 2 miles to Gene Coulon Public Boat Launch, located at 1203 Lake Washington Blvd N, Renton, WA 98056
  - By Vehicle
    - Head south toward Coulon Beach Acrd/Coulon Beach Park Dr (177 ft)
    - Turn right (75 ft)
    - Turn right (243 ft)
    - Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (164 ft)
    - Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (285 ft)
    - Continue onto Coulon Beach Acrd/Coulon BeachPark Dr (184 ft)
    - Turn left to stay on Coulon Beach Acrd/CoulonBeach Park Dr (128)
    - Turn right onto Lake Washington Blvd N (0.1 miles)
    - Use the middle lane to turn left onto N SouthportDr (0.2 miles)
    - Use the right lane to merge onto I-405 S via theramp to Tacoma (2.1 miles)

        - Take exit 3 for WA-515/Talbot Road S (0.4 miles)
        - Use the left 2 lanes to turn slightly left onto WA-515 S/Talbot Rd S (signs for Talbot Road) (0.6 miles)
        - Turn right onto S 21st St (0.2 miles)
        - Continue onto Talbot Rd S (1.3 miles)
        - Turn right (154 ft)
        - Turn left (240 ft)
        - Turn right (167 ft)
    - End: Valley Medical Center Emergency Room, 400 S 43rd St, Renton, WA 98055

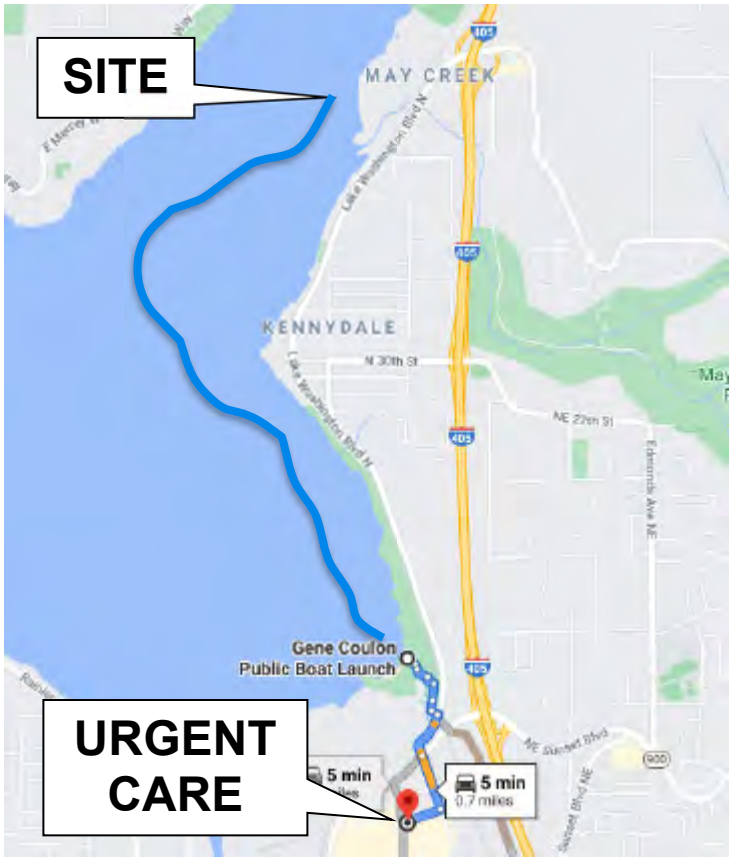



**Figure 2. Route to the Urgent Care from the Site.**

**URGENT CARE INFORMATION:**

**Renton Landing Clinic | Urgent Care**
425.690.3475
1205 N 10th Street—Ste A
Renton, WA 98057

**DIRECTIONS TO URGENT CARE FROM SITE**

- Start: In Lake Washington off shore of the former Barbee Mills Site
  - Over Water
    - Head South 2 miles to Gene Coulon Public Boat Launch, located at 1203 Lake Washington Blvd N, Renton, WA 98056
  - By Vehicle
    - Head south toward Coulon Beach Acrd/Coulon Beach Park Dr (177 ft)
    - Turn right (75 ft)
    - Turn right (243 ft)
    - Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (164 ft)
    - Turn right toward Coulon Beach Acrd/CoulonBeach Park Dr (285 ft)
    - Continue onto Coulon Beach Acrd/Coulon BeachPark Dr (184 ft)
    - Turn left to stay on Coulon Beach Acrd/CoulonBeach Park Dr (128)
    - Turn right onto Lake Washington Blvd N (0.1 miles)
    - Continue on Garden Ave N. Drive to N 10th St (0.3 Miles)
    - Continue straight onto Garden Ave N (0.2 miles)
    - Turn right onto N 10th St (0.1 miles)
  - End: Renton Landing Clinic - Urgent Care - ValleyMedical Center, 1205 N 10th St Suite A, Renton, WA 98057

# Attachment C: Summary of Chemical Hazards

## Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)

PAHs are produced during combustion events due to inadequate oxidation of fuel. PAHs in the pure state are yellowish crystalline solids. They are found in coal tar and in products of incomplete combustion. These chemicals have varying degrees of potency for causing cancer, with benzo(a)pyrene being among the most potent. The PAHs are evaluated collectively as COAL TAR PITCH VOLATILES. Coal tar pitch volatiles may cause photosensitization and a rash where sunlight strikes the skin. Exposure may also cause cancer of lungs, skin, bladder or kidneys. Benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3,c,d)pyrene have been identified as carcinogenic.

This information on PAH compounds is presented for Site contaminant awareness. While the potential for Site personnel sustaining significant inhalation exposures to volatilized PAH compounds during the Site activities of this project is minimal, there is the potential for inhalation of PAH-contaminated dust, and handling of contaminated soils presents skin exposure hazards. Use of dust suppression techniques (as appropriate) and the proper use of the PPE will adequately protect personnel. Some significant PAH compounds include:

- Anthracene
- Benzo(a)pyrene Benzo(a)anthracene
- Chrysene Benzo(b)fluoranthene
- Fluoranthene Benzo(k)fluoranthene
- Fluorene Benzo(g,h,i)perylene
- Indeno(1,2,3,c,d)pyrene Benzo(d,e,f)phenanthrene
- Phenanthrene

OSHA permissible exposure limit (PEL) for coal tar pitch volatiles is 0.2 $mg/m^3$ and National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) is 0.1 milligrams per cubic meter ($mg/m^3$), American Conference of Governmental Industrial Hygienists threshold limit value (ACGIH TLV) 0.2 $mg/m^3$ is for 8 hour time weighted average (TWA).

## Resource Conservation and Recovery Act (RCRA) Metals

These metals include arsenic, barium, cadmium, chrome, mercury, selenium, and silver. Heavy metals are known to cause neurologic effects (lead, mercury), kidney damage (cadmium), and respiratory damage (arsenic, cadmium). Oral and respiratory exposures should be minimized. The table below summarizes exposure limits.

| Chemical Name | PEL[1] | TLV[2] |
|---|---|---|
| Arsenic | 0.01 | 0.01 |

[1] OSHA PEL in parts per million
[2] ACGIH TLV in parts per million

# Attachment D: Personal Protective Equipment

| | Task ① |
|---|---|
| **Potential PPE Level per Task:** | ☒ D<br>☐ C |

| ***Modified Level D*** | | ***Level C*** | |
|---|---|---|---|
| ***Equipment*** | ***Material/Type*** | ***Equipment*** | ***Material/Type*** |
| ☒ Safety glasses | | ☐ Full-face air-purifying respirator | Cartridge Type: |
| ☒ Hard-toed boots | | ☐ Half-mask air-purifying respirator | Cartridge Type: |
| ☒ Protective clothing | | ☐ Safety glasses | |
| ☒ Hard hat* | | ☐ Hard-toed boots | |
| ☒ Hearing protection* | | ☐ Protective clothing | |
| ☒ High-visibility vest* | | ☐ Hard hat | |
| ☐ Outer boots* | | ☐ Hearing protection* | |
| ☒ Outer gloves* | | ☐ High-visibility vest* | |
| ☒ Rescue Line | | ☐ Outer boots* | |
| ☒ Surgical type masks or cloth face covers | Cloth | ☐ Outer gloves* | |
| ☒ Personal Floatation Device | | ☐ Inner gloves* | |
| ☒ Ring Bouy | | ☐ Other: | |
| | | | |

* PPE items may be downgraded (only with concurrence of SHSO and PM).

# Attachment E: Safety Data Sheets

| Included in this HASP | Chemical |
|---|---|
| ☒ | Alconox |
| ☐ | Other: _____ |
| ☐ | Other: _____ |
| ☐ | Other: _____ |
| ☐ | Other: _____ |

Note: SDSs are for chemicals that used to perform project work, not Site contaminants.

## 1 Identification of the substance/mixture and of the supplier

### 1.1 GHS Product identifier

**Trade Name:** Alconox®

**Product number:** 1101, 1103, 1104, 1104-1, 1112, 1112-1, 1125, 1150

### 1.2 Application of the substance / the mixture: Cleaning material/Detergent

**1.2.1 Recommended dilution ratio:** 1 – 2% in water

### 1.3 Details of the supplier of the Safety Data Sheet

**Manufacturer:**
Alconox Inc.
30 Glenn St
White Plains, NY 10603
(914) 948-4040

**Supplier:**

**Emergency telephone number:**
**ChemTel Inc**
North America: 1-888-255-3924
International: +1 813-248-0573

## 2 Hazards identification

### 2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

**Hazard-determining components of labeling:**
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

### 2.2 Label elements:

Eye damage, category 1.

Skin irritation, category 2.

**Product at recommended dilution:**
Eye irritation, category 2B

**Hazard pictograms:**



**Signal word**: Danger

**Hazard statements:**
H315 Causes skin irritation.
H318 Causes serious eye damage.

**Precautionary statements:**
P264 Wash skin thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

**Hazardous Elements at Use Dilution:**

Hazard Pictograms:



**Signal Word:** Warning

**Hazard Statements:**

H320 Causes eye irritation

**Precautionary statements:**

P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P501 Dispose of contents and container as instructed in Section 13

**Additional information:** None.

**Hazard description**

**Hazards Not Otherwise Classified (HNOC):** May cause surfaces to become slippery if wet. Use caution in areas of foot traffic if on floors.

**Information concerning particular hazards for humans and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

**Classification system:**

The classification is according to EC regulation No. 1272, 29CFR1910/1200 and GHS Requirements, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.

## 3 Composition/information on ingredients

**3.1 Chemical characterization**: Not determined or not available.

**3.2 Description**: None

**3.3 Hazardous components (percentages by weight)**

| Identification | Chemical Name | Classification | Wt. % |
|---|---|---|---|
| **CAS number:** 7758-29-4 | Sodium tripolyphosphate | Skin Irrit. 2; H315<br>Eye Irrit. 2; H319 | 12-28 |
| **CAS number:** 68081-81-2 or 68411-30-3 | Sodium Alkylbenzene Sulfonate | Acute Tox. 4; H303<br>Skin Irrit. 2; H315<br>Eye Dam. 1; H318 | 8-22 |
| **CAS number:** 7722-88-5 | Tetrasodium Pyrophosphate | Skin Irrit. 2; H315<br>Eye Irrit. 2; H319 | 2-16 |

Hazardous components at use dilution (percentages by weight):

| Identification | Chemical Name | Classification | Wt. % |
|---|---|---|---|
| **CAS number:** 7758-29-4 | Sodium tripolyphosphate | Eye Irrit. 2; H319 | 0.12 - 0.28 |
| **CAS number:** 68081-81-2 or 68411-30-3 | Sodium Alkylbenzene Sulfonate | Eye Irrit. 2; H319 | 0.08 – 0.22 |
| **CAS number:** 7722-88-5 | Tetrasodium Pyrophosphate | Eye Irrit. 2; H319 | 0.02 – 0.16 |

**3.4 Additional Information**: None.

## 4 First aid measures

### 4.1 Description of first aid measures

**General information:** None.

**After inhalation:**

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

**After skin contact:**

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

**After eye contact:**

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

**After swallowing:**

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

### 4.2 Most important symptoms and effects, both acute and delayed

None

### 4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

**First aid measure at recommended dilution:**

**General information:** None.

**After inhalation:**

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

**After skin contact:**

Wash affected area with soap and water.

**After eye contact:**

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.

**After swallowing:**

Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

## 5 Firefighting measures

**5.1 Extinguishing media**

**Suitable extinguishing agents:**

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

**For safety reasons unsuitable extinguishing agents**: None

**5.2 Special hazards arising from the substance or mixture**:

Thermal decomposition can lead to release of irritating gases and vapors.

**5.3 Advice for firefighters**

**Protective equipment:**

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

**5.4 Additional information**:

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

## 6 Accidental release measures

**6.1 Personal precautions, protective equipment and emergency procedures**:

Ensure adequate ventilation.
Ensure air handling systems are operational.

**6.2 Environmental precautions**:

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

**6.3 Methods and material for containment and cleaning up**:

Wear protective eye wear, gloves and clothing.

**6.4 Reference to other sections**: None

## 7 Handling and storage

**7.1 Precautions for safe handling**:

No expected hazards under normal use condition.

Avoid breathing mist or vapor if aerosolized.
Do not eat, drink, smoke or use personal products when handling chemical substances.

**7.2 Conditions for safe storage, including any incompatibilities**:

Store in a cool, well-ventilated area.

**7.3 Specific end use(s):**

No additional information.

## 8 Exposure controls/personal protection





**8.1 Control parameters**:

a) 7722-88-5, Tetrasodium Pyrophosphate, ACGIH TWA 10 mg/m3
b) 7758-29-4, Sodium Tripolyphosphate, ACGIH TWA 10 mg/m3
c) Dusts, non-specific OEL, Irish Code of Practice
   (i) Total inhalable 10 mg/m3 (8hr)
   (ii) Respirable 4 mg/m3 (8hr)
   (iii) Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3, (8hr)

**8.2 Exposure controls**

**Appropriate engineering controls:**

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

**Respiratory protection:**

Not needed under normal use conditions.

**Protection of skin:**

Select glove material impermeable and resistant to the substance.

**Eye protection:**

Safety goggles or glasses, or appropriate eye protection. Recommended to comply with ANSI Z87.1 and/or EN 166.

**General hygienic measures:**

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

**Exposure Control and Personal Protective Equipment at recommended dilution:**

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

## 9 Physical and chemical properties

| | | | |
|---|---|---|---|
| **Appearance (physical state, color):** | White and cream colored flakes - powder | **Explosion limit lower**:<br>**Explosion limit upper**: | Not determined or notavailable.<br>Not determined or notavailable. |
| **Odor**: | Not determined or not available. | **Vapor pressure at 20°C**: | Not determined or notavailable. |
| **Odor threshold**: | Not determined or not available. | **Vapor density**: | Not determined or notavailable. |
| **pH-value**: | 9.5 (1% aqueous solution) | **Relative density**: | Not determined or notavailable. |

| | | | |
|---|---|---|---|
| **Melting/Freezing point**: | Not determined or not available. | **Solubilities**: | Not determined or notavailable. |
| **Boiling point/Boiling range**: | Not determined or not available. | **Partition coefficient (n-octanol/water)**: | Not determined or notavailable. |
| **Flash point (closed cup)**: | Not determined or not available. | **Auto/Self-ignition temperature**: | Not determined or notavailable. |
| **Evaporation rate**: | Not determined or not available. | **Decomposition temperature**: | Not determined or notavailable. |

| | | | |
|---|---|---|---|
| **Flammability (solid, gaseous)**: | Not determined or not available. | **Viscosity**: | a. Kinematic: Not determined or not available.<br>b. Dynamic: Not determined or not available. |
| **Density at 20°C**: | Not determined or not available. | | |

## 10 Stability and reactivity

**10.1 Reactivity**: Not determined or not available.
**10.2 Chemical stability**: Not determined or not available.
**10.3 Possibility hazardous reactions:** Not determined or not available.
**10.4 Conditions to avoid**: Not determined or not available.
**10.5 Incompatible materials**: Not determined or not available.
**10.6 Hazardous decomposition products**: Not determined or not available.

## 11 Toxicological information

**11.1 Information on toxicological effects**:

**Acute Toxicity:**

**Oral**:

: LD50 > 5000 mg/kg oral rat - Product.

**Chronic Toxicity:** No additional information.

**Skin corrosion/irritation:**

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

**Serious eye damage/irritation:**

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Tetrasodium Pyrophosphate: Risk of serious damage to eyes.

**Product information at recommended dilution:**

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

**Respiratory or skin sensitization:** No additional information.

**Carcinogenicity:** No additional information.

**IARC (International Agency for Research on Cancer):** None of the ingredients are listed.

**NTP (National Toxicology Program):** None of the ingredients are listed.

**Germ cell mutagenicity:** No additional information.

**Reproductive toxicity:** No additional information.

**STOT-single and repeated exposure:** No additional information.

**Additional toxicological information:** No additional information.

## 12 Ecological information

**12.1 Toxicity:**

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

**12.2 Persistence and degradability:** No additional information.

**12.3 Bioaccumulative potential:** No additional information.

**12.4 Mobility in soil:** No additional information.

**General notes:** No additional information.

**12.5 Results of PBT and vPvB assessment:**

**PBT:** No additional information.

**vPvB:** No additional information.

**12.6 Other adverse effects:** No additional information.

## 13 Disposal considerations

**13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)**

**Relevant Information:**

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

## 14 Transport information

| | |
|---|---|
| **14.1 UN Number:**<br>ADR, ADN, DOT, IMDG, IATA | None |
| **14.2 UN Proper shipping name:**<br>ADR, ADN, DOT, IMDG, IATA | None |
| **14.3 Transport hazard classes:**<br>ADR, ADN, DOT, IMDG, IATA | **Class:** None<br>**Label:** None<br>**LTD. QTY:** None |

**US DOT**

**Limited Quantity Exception:** None

**Bulk:**
**RQ (if applicable):** None
**Proper shipping Name:** None
**Hazard Class:** None
**Packing Group:** None
**Marine Pollutant (if applicable):** No additional information.

**Non Bulk:**
**RQ (if applicable):** None
**Proper shipping Name:** None
**Hazard Class:** None
**Packing Group:** None
**Marine Pollutant (if applicable):** No additional information.

| | |
|---|---|
| **Comments:** None | **Comments:** None |
| **14.4 Packing group:**<br>ADR, ADN, DOT, IMDG, IATA | None |
| **14.5 Environmental hazards**: | None |
| **14.6 Special precautions for user:** | None |
| **Danger code (Kemler):** | None |
| **EMS number:** | None |
| **Segregation groups:** | None |
| **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable. | |
| **14.8 Transport/Additional information:** | |
| **Transport category:** | None |
| **Tunnel restriction code:** | None |
| **UN "Model Regulation":** | None |

**15 Regulatory information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.**

**North American**

**SARA**

**Section 313 (specific toxic chemical listings)**: None of the ingredients are listed.
**Section 302 (extremely hazardous substances)**: None of the ingredients are listed.

**CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable**

**Spill Quantity**: None of the ingredients are listed.

**TSCA (Toxic Substances Control Act):**

**Inventory**: All ingredients are listed as active.
**Rules and Orders**: Not applicable.

**Proposition 65 (California):**

**Chemicals known to cause cancer**: None of the ingredients are listed.

**Chemicals known to cause reproductive toxicity for females**: None of the ingredients are listed.

**Chemicals known to cause reproductive toxicity for males**: None of the ingredients are listed.

**Chemicals known to cause developmental toxicity**: None of the ingredients are listed.

**Canadian**

**Canadian Domestic Substances List (DSL)**:
All ingredients are listed.

**EU**

**REACH Article 57 (SVHC)**: None of the ingredients are listed.

**Germany MAK**: Not classified.
**EC 648/2004** – This is an industrial detergent. Contains >30% phosphate, 15-30% anionic surfactant, <5% EDTA salts
**EC 551/2009** – This is not a laundry or dishwasher detergent
**EC 907/2006** – Contains no enzymes, optical brighteners, perfumes, allergenic fragrances, or preservative agents

### Asia Pacific

**Australia**

**Australian Inventory of Chemical Substances (AICS)**: All ingredients are listed.

**China**

**Inventory of Existing Chemical Substances in China (IECSC)**: All ingredients are listed.

**Japan**

**Inventory of Existing and New Chemical Substances (ENCS)**: All ingredients are listed.

**Korea**

**Existing Chemicals List (ECL)**: All ingredients are listed.

**New Zealand**

**New Zealand Inventory of Chemicals (NZOIC)**: All ingredients are listed.

**Philippines**

**Philippine Inventory of Chemicals and Chemical Substances (PICCS)**: All ingredients are listed.

**Taiwan**

**Taiwan Chemical Substance Inventory (TSCI)**: All ingredients are listed.

## 16 Other information

**Abbreviations and Acronyms:** None

**Summary of Phrases**

**Hazard statements:**
H315 Causes skin irritation.
H318 Causes serious eye damage.

**NFPA:** 1-0-0
**HMIS:** 1-0-0

**At recommended dilution:**
**NFPA:** 1-0-0
**HMIS:** 1-0-0

**Precautionary statements:**
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

**Manufacturer Statement:**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

# Attachment F: Fieldwork COVID-19 General Prevention Measures

Geosyntec consultants | family of companies

**Date:** June 16, 2020
**Revision:** 4.1

# Health and Safety

## Fieldwork COVID-19 General Prevention Measures

Note: Major updates to the previous version (Rev. 3, April 3, 2020) are presented herein in green text.

### Scope of this Document

To facilitate the safety and well-being of our employees while executing field operations as various government agencies begin to lift COVID-19 workplace restrictions in many sectors, the Corporate H&S Department has prepared this guideline to help employees minimize the risk of spreading or contracting COVID-19 during ***fieldwork operations***. This information complements Geosyntec's "COVID-19 Considerations & Mitigations for Ongoing Business Operations," and other guidelines and communications distributed via Geosyntec's COVID-19 SharePoint Portal.

We invite all staff to share their questions and ideas with Managers and Supervisors, Health and Safety Coordinators and Corporate Health and Safety Department. All Corporate Health and Safety staff are available to assist you with COVID-19 safety solutions on your projects, and we will continue to update and improve these guidelines as we learn more and receive your feedback.

### Risk Analysis

The COVID-19 pathogen can be transmitted from infected individuals who *may* or *may not* be experiencing symptoms. So, all project/worksite locations and surrounding communities, and all coworkers and community members, represent a potential source of exposure for Geosyntec personnel. The virus is spread primarily by airborne respiratory droplets and aerosols containing the virus, which are emitted by infectious persons and can settle in the moth or nose of nearby people or be inhaled directly into the lungs. A secondary mode of infection is through *direct contact* between hands and contaminated surfaces (where droplets can also settle), and subsequent transfer to the mouth, nose, or eyes through touching. Our risk-reduction guidelines focus on avoidance or mitigation of elevated-risk situations through the core safety practices of ***physical distancing, use of face covers, personal hygiene, workspace sanitation***, and in certain situations, use of ***engineering controls*** and/or ***personal protective equipment***.

### Situation-Based Protection Strategies

For each fieldwork deployment by Geosyntec staff, a site-/project-specific "COVID-19 prevention strategy" shall be developed through evaluation of work tasks and associated COVID-19 exposure risks, and engagement with field team members, client representatives, and other onsite stakeholders (owners, clients, subcontractors, suppliers, contractors), as appropriate for the work. The core focus of such a strategy will always be on three fundamental objectives:

- **Minimize the Magnitude of Possible Virus Contact/Exposure** - Minimize the *intensity* and the *duration* of potential exposure to the virus.
- **Minimize the Number of Interpersonal Contacts** – Limit the number of *direct person-to-person contacts*, as well as *indirect contacts* via shared *work surfaces* and *air spaces.*[1]
- **Maximize Mitigation Measures** - Utilize COVID-19 protections applicable to work tasks, utilizing *redundant* protections to the extent feasible.

Geosyntec employees engaged in the management and execution of fieldwork must apply the prevention/mitigation strategies delineated herein as appropriate and feasible for their work, and as

[1] Limit both the number of contacts, and more important, limit the number of persons with whom contact is made.

needed to adhere to applicable government mandates and client requirements, to minimize the risks of transmitting or contracting COVID-19.

**1. Project Planning, Communication, Health and Safety Coordination**[2]

- Information updates – Employees engaged in the management and execution of fieldwork projects are encouraged to stay up to date with the latest information and updates to Company operating procedures and due diligence/best practice norms regarding COVID-19; include this information at all safety meetings and incorporate related safe work practices into written safety plans (HASPs/THAs).

- Client requirements - For job sites under the control of another organization, obtain a copy of any relevant COVID-19 exposure control requirements and ensure we can fully comply; H&S can assist in evaluating such plans as needed. Understand contract requirements for Geosyntec to staff projects, anticipate disruptions of our ability to serve the project that are out of our control, and develop contingency plans for such situations.

- Government rules/restrictions – All project teams shall adhere to government mandates and restrictions relevant in the jurisdiction of your fieldwork. Information on such requirements may be obtained from Corp. H&S, Geosyntec personnel familiar with your work location, client contacts, or on-line resources made available on municipal, state and federal COVID-19 websites.

- Project management, planning, budgets – We anticipate that the COVID-19 pandemic, and associated protections needed during execution of fieldwork, will result in changes in how we plan for and budget fieldwork projects. Many aspects of fieldwork may be impacted, including pre-mobilization planning, field equipment and supplies, travel costs, accommodations, coordination with clients and subcontractors. Review of the Project Manager Checklist for H&S Compliance with COVID-19 planning in mind, particularly *Sections A and B--"Proposal and Pre-Contract Activity*" and *"Project Planning"*-- may be helpful in this regard.

- Prework coordination, HSCs, HASP/THA – Prior to the start of fieldwork on each project, conduct a pre-work safety orientation or "kickoff meeting" that includes each member of the project/field team (as well as with clients, subcontractors, other contractors, as applicable) to determine the scope of prevention measures for COVID-19 and other site hazards. Delineate key COVID-19 safety elements in the Written Safety Plan (HASP/THA) and monitor/implement these measures daily throughout the performance of field activities. Health and Safety Coordinators (HSCs) and Regional Safety Managers can assist.

- Designate an on-site "COVID Lead" – Designate an individual to oversee (observe and enforce) the COVID 19 preventative measures to be implemented by personnel on site. On short-duration projects, this role is most typically assigned to the individual designated as the on-site safety lead or field supervisor; for long-duration large projects, the role may preferably be rotated among onsite personnel to fully engage the entire field team, as well as share the responsibility.

- Work task innovations – All employees are encouraged to consider innovative ways of conducting their work to reduce the risks of contracting or transmitting COVID-19. Learn new communication capabilities through available technologies (WebEx, Skype, MS Teams, Office 365) and develop safety innovations for on-site field work. Modify your work tasks and use non-typical field practices to maintain physical distancing, personal hygiene, and work area sanitation.

[2] *This section repositioned from Section 10 in the previous edition of this document to the current Section1*

## 2. Assess Risks, Avoid/Mitigate Elevated-Risk Work Situations, 'Stop Work' Authority[3]

- Risk assessment – Per criteria established by OSHA's COVID 19 risk classifications (https://www.osha.gov/SLTC/covid-19/hazardrecognition.html#risk_classification), Geosyntec fieldwork is generally classified as ranging from "Lower Exposure Risk" to "Medium Exposure Risk." Geosyntec fieldwork does not include "High Exposure Risk" or "Very High Exposure Risk" in this classification as our work does not require close proximity of employees to confirmed or presumed COVID-19 patients – potential exceptions to this must be coordinated directly with the Regional H&S Manager on a case-by-case basis.

- Medium exposure risks - Where Geosyntec fieldwork involves entry into "Medium Exposure Risk" workplace environments, such as occupied residences, active/occupied health care facilities, extended-care/rehab/elder-care facilities, schools, correctional facilities, crowded public transportation areas, high-volume retail settings and similar high population density work environments, such work shall either be 1) eliminated or significantly curtailed (preferred), or 2) a strategy of "maximum mitigation" through focused and redundant protections (to the extent feasible) shall be implemented to minimize the potential intensity of exposure to the virus, and minimize the number of interpersonal contacts, both direct and indirect.

- Low exposure risks - In all low-risk situations, vigilance shall be maintained with regard to physical distancing, sanitation/hygiene, use of face covers, and other applicable controls in order to minimize the risk of COVID-19 disease transmission among workers.

- Personnel convergence points[4], movement of personnel and materials – For each project site, consider process flows of both materials and personnel, and make specific arrangements to minimize interpersonal contact and maximize physical distancing. Eliminate convergence points by such measures as: separate entrances and exits; "circular" routing of personnel footpaths; designate pick up/drop of points for materials and equipment; stagger personnel approaches.

- Hierarchy of controls – Geosyntec employees shall consider the typical "hierarchy of controls" for eliminating/mitigating COVID-19 hazards, as summarized below, with examples:
    - *Hazard Elimination* – Modify the scope of work to eliminate an elevated risk element, such as entry into a hospital with known COVID-19 patients.
    - *Hazard Substitution* – Deploy an on-site portable toilet as a substitute for using a rest room in a high-population-density facility (site facility or nearby travel stop).
    - *Engineering controls* – Use of Plexiglas barriers, or fans for ventilation, at points of personnel convergence.
    - *Administrative controls, safe work practices* – Maintain physical distancing; assign specific tasks to each on-site staff member (minimize multi-tasking) to limit interpersonal encounters; frequent disinfection of high-touch surfaces.
    - *Face Covers, PPE* – Use of face covers as barriers to minimize airborne release of respiratory droplets; use of disposable gloves; use of N95 respirator for "high-" and "very high-" exposure risks (per OSHA classification).

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*[3] This section repositioned from Section 7 in the previous edition of this document to the current Section 2*

[4] Wherever persons come together and engage in *direct* person-to-person interactions, or when individuals contact each other *indirectly* via shared work surfaces and air spaces. Such points of convergence represent opportunities for transmission of the COVID-19 virus, should an infected person be encountered.

- Vigilance, redundant controls – Because the presence or absence of the COVID-19 virus in any workplace situation cannot be confirmed "real time" during fieldwork, vigilance in the application of controls, and a "default strategy" of using of redundant controls[5] where feasible, will afford the greatest levels of risk reduction and worker protection.

- Stop-work authority - Inform staff and coworkers that they have the authority to stop work if they suspect an unacceptable risk to the health or safety of participants. All employees are encouraged and expected to report elevated hazards to their supervisor/project manager, and seek assistance from the H&S Department in evaluating the risk and recommending safe work practices.

**3. Be On-the-Lookout for Symptoms**

- Symptoms – COVID-19 symptoms include:
    - Fever of 100.4 deg. F (38 deg. C) or higher
    - Fatigue (extreme, non-typical)
    - Persistent cough
    - Sore throat
    - Shortness of breath
    - Headache
    - Chills
    - Shaking/shivering with chills
    - Muscle aches/pains
    - Gastrointestinal distress (diarrhea, nausea, vomiting)
    - Loss of taste or smell (new, recent)
    - In severe cases, *emergency warning signs requiring immediate medical attention* may include trouble breathing, persistent pain or pressure in the chest, confusion, inability to arouse, and bluish lips or face.

- Self-monitor for symptoms – Geosyntec has implemented a Health Status Self-Check Process for our employees, detailed in Section 5.2.2 Geosyntec's "COVID-19 Considerations & Mitigations for Ongoing Business Operations." Using this process as our main tool, we will practice self-notification and self-quarantine as our primary method for excluding ill or potentially-ill workers who may be infectious from being present on our jobsites. Where local regulatory requirements or client requirements require more stringent on-site health check measures we will comply.
  Based on self-check/on-site check results, personnel with possible COVID-19 symptoms will respond as follows:
    - On site - If you are on site and begin to experience symptoms, wear a face covering, immediately isolate yourself from all other site personnel and notify your supervisor and the project manager (who will inform HR and the Branch Manager). Leave the site as soon as possible and follow Geosyntec guidance for self-quarantine. The company also recommends you seek medical care from your personal doctor or health care provider.
    - Off Site/Work – If you begin experiencing symptoms while away from work DO NOT GO TO THE JOB SITE. Contact your supervisor and the project manager and follow Geosyntec company guidance for self-quarantine. The company also recommends you seek medical care from your own personal doctor or health care provider.

[5] Use of two or more control measures simultaneously, such as wearing face covers, maintaining physical distancing, and using fans for fresh air ventilation, all at the same time in a given workplace setting.

For either of the above cases the Geosyntec HR & H&S Departments, in coordination with the project manager, will recommend appropriate follow-up measures (contact tracing, quarantine) regarding other project personnel. Project managers will need to arrange for replacement personnel if anyone is required to leave the site for an extended period of time.

- Coworker with symptoms – If a Geosyntec coworker, subcontractor, client or client contractor exhibits symptoms, or has presumptive or confirmed COVID-19, avoid close contact and implement safe work practices (delineated herein) as applicable. Contact the project manager, who will inform HR, H&S and the Branch Manager; the HR/H&S team, together with the project team, will evaluate risks and recommend appropriate response.

- Daily tailgate safety meetings – On a daily basis: communicate with on-site coworkers to reinforce COVID-19 prevention measures in general and those specific to the work, re-discuss symptoms to be on the lookout for, and confirm with each individual on the project team that they are not experiencing any possible COVID-19 symptoms.

- Field screening/documentation of worker symptoms – Formal procedures for onsite screening of symptoms may be required for certain projects (due to client requirements and/or government regulation), or as viable best practice (large workforce, multiple subcontractors, transient labor). Screening questions may focus on a range of specific symptoms, include questions about personal contacts and recent travel, and may include individual temperature checks. For additional information, or if Geosyntec is required to implement such a program, contact the Corp. H&S Department for assistance/guidance. As appropriate for the work, a requirement for formal COVID-19 screening of subcontractor personnel, or of other on-site stakeholder personnel, may be included in contractual subcontract agreements or site access agreements. Onsite project-specific forms can be readily developed as stand-alone forms, or as a component of related procedures/documents, such as worker/visitor entry/exit logs, safety dash cards, visitor orientation forms, etc. Contact Corp. H&S for assistance.

**4. Integrate Physical Distancing Strategies into all Fieldwork Activities and Meetings**

- Interpersonal physical distancing – Physical distancing is a fundamental strategy (in conjunction with use of face covers and other control measures) for controlling person-to-person transmission of the COVID-19 virus. For all work activities, maintain a *minimum* distance of 2 meters/6 feet from all other field staff, visitors and general public when possible. Where physical distancing objectives are not workable, face covers shall be worn, and other protective strategies delineated herein, as applicable to the situation, should be deployed (such as Plexiglas barriers, fans/ventilation, more frequent hand washing, more frequent work area sanitization,).

- Meetings - Eliminate in-person meetings where possible. Video meetings and conference calls are preferable. Practice physical distancing when conducting onsite daily tailgate safety meetings, pre-work assessments, progress meetings and oversight observations of the work. Where in-person meetings are necessary, limit the meeting to key individuals who absolutely need to attend--all attendees shall practice physical distancing with a minimum of 2 m/6 ft between individuals.

- Indoor/enclosed spaces - Minimize or eliminate time spent in a field trailer, and in similar indoor/enclosed work areas, particularly areas frequented by other individuals (coworkers, on-site personnel, general public). Where possible, conduct work tasks and in-person meetings out-of-doors to reduce transmission of airborne disease agents.

- Social greetings - Avoid hand shaking, fist bumps, and other social greetings with direct contact or proximity to individuals within the physical distancing limits. Greet coworkers at a distance and don't exchange business cards.

- Onsite paperwork, office supplies - Develop procedures to minimize person-to-person contact through exchange of logs, forms, field documentation, and other paperwork. Don't share miscellaneous office supplies (pens, pencils, etc.) and periodically wipe/disinfect commonly used items (staplers, printers, etc.).

- Schedules, staff assignments - Adjust staff schedules and work assignments to facilitate physical distancing and minimize contact with high-touch surfaces. Such measures may include (but are not limited to):
    - Stagger schedules/shifts;
    - Perform only critical tasks;
    - Cross-train individuals for greater flexibility in staff assignments;
    - Limiting field teams to only essential personnel can help minimize personal interactions;
    - Increasing the size of field teams may:
        - Enable assigning a specific onsite role to each team member, thereby minimizing close encounters with coworkers;
        - Shorten the workday and limit overnight hotel stays.

- Site visitors – For ***transient visitors*** (such as site deliveries) make arrangements to minimize interpersonal contact by maintaining physical distancing and completing visits outside of site trailers and site facilities. Prevent package handling by multiple individuals, wear disposable gloves when receiving packages, dispose of packaging/wrapping promptly, disinfect exterior of items, and wash hands thoroughly after receipt. For more extended visits by ***service providers*** or ***business visitors***, use appropriate controls as appropriate for the visit, including physical distancing, face covers, limit meetings to minimum essential personnel, limit the duration of the meetings, include visitor in a health status self-check process or document symptom screening.

**5. Maintain Personal Hygiene**

- Regular hand-washing – Conduct regular and thorough handwashing (at least 20 seconds) with soap and water throughout the day. Where a water supply for hand washing is not readily available, set up a 'field handwashing station' were feasible/appropriate, and label water container "for handwashing only."

- Hand sanitizer - Where water for handwashing is not available, utilize hand sanitizer (with at least 60% alcohol) frequently, then wash hands with soap and water as soon as possible. After applying alcohol-based hand sanitizer, allow it to dry completely before bringing hands into close proximity to potential ignition sources, such as arcing electrical equipment, surfaces that could cause static discharge, and most importantly – SMOKING!

- Skin moisturizers – Frequent handwashing, and use of alcohol-based hand cleaners, or contact with chemical irritants in disinfectant cleaners, can result in dry/cracked skin. Periodic use of moisturizing creams can counteract that effect.

- Facial tissues - Carry a supply of facial tissues and use as much as possible for coughs/sneezes and dispose of used tissue in regular trash. "Covering your cough" is acceptable; use and disposal of tissues is more sanitary and therefore preferred.

- "Cover your cough" – When facial tissue is not ready at hand, cover your cough or sneeze by coughing/sneezing into the crook of your elbow--not into your hands. If you need to cough/sneeze into your hands, wash hands immediately.
- Personal hygiene supplies – In Geosyntec-controlled site trailers and other regularly-visited worksites, personal hygiene supplies including hand sanitizer, wipes, soap, and paper goods shall be maintained in adequate supply, as available for purchase.
- Minimize hand-contact with work surfaces and your face – Develop changes in your typical work practices and personal habits to eliminate or minimize the frequency of hand contact with surfaces in your work environment (e.g., avoid unnecessary contact with work surfaces, open doors with minimal hand/finger contact, grip handrails with fingers or at intermittent junctures rather than sliding your hand the full length; etc.). Limit habitual hand contact with your face. Contact your face only after thorough hand washing. If it's necessary to contact your face, use the back of your hand or knuckles rather than your palm or fingertips.

**6. Work Area Cleaning, Sanitation, Protection, Modifications**

- On-site trailers and similar indoor workspaces – On-site trailers/facilities at Geosyntec-controlled sites should be cleaned by custodial services at least once per day. Disinfect "high-touch" surfaces regularly during each workday. Cleaning and sanitation supplies shall be maintained in adequate supply and used regularly to clean/sanitize work surfaces.
- Clean "high-touch" work surfaces – Wipe high-touch work surfaces with sanitizing cleaners (preferred), detergents or soap & water at the start and end of each work shift and periodically throughout the day. High-touch items include cell phones, personal water bottles, desktops, computer keyboards, touch screens, tools, field equipment, coolers, doorknobs, railings, refrigerators, microwaves, light switches, thermostats, faucet/toilet handles, latches on portable bathrooms, and similar items. Items being used/shared by more than 1 person should be cleaned before transferring.
- Cleaners/sanitizers - Cleaning/disinfecting supplies may include commercial cleaners containing common EPA-registered household disinfectants, alcohol solutions containing at least 60% alcohol, or diluted household bleach solution[6] applied with commercial wipes or paper towels. See COVID cleaning and disinfection guidelines for more detail and full disinfection steps. Discard all used wipes/paper towels in regular trash.
- Chemical hazards of cleaners/disinfectants – Commercial disinfectant products shall be used in accordance with product labels, safety data sheets and manufacturer specifications, and appropriate PPE--typically nitrile or vinyl gloves--used as recommended. Safety Data Sheets (SDSs) for commonly used cleaners and disinfectants are provided for use by workers on our COVID-19 SharePoint site HERE. Note that many alcohol-containing products are flammable and should be used well away from ignition sources. Many disinfectants contain chemical irritants that can cause skin dryness/cracking/irritation. Wearing chemical protective gloves when sanitizing surfaces and/or periodic use of skin moisturizers can counteract these effects.
- Housekeeping – Proper housekeeping shall be maintained in all work areas. Minimize/eliminate clutter and accumulations of trash and debris, particularly trash items that have received human

[6] Per the CDC, a solution can be prepared by mixing: 5 tablespoons (1/3rd cup) bleach per gallon of water, or for smaller amounts 4 teaspoons bleach per quart of water.

contact (food wrappers, disposable cups, paper towels/tissues, etc.). Minimizing clutter will facilitate regular cleaning of high-touch surfaces. Empty trash receptacles daily.

- Protect frequently-used workspaces – In workspaces frequently accessed by on-site personnel, such as supply storage areas, treatment system control stations, toilet facilities, and hand washing stations, require that all personnel who enter these workspaces wear face covers to minimize the presence of respiratory droplets in the air or settled on surfaces.
- Work area modifications – Physical modifications of the work area should be considered as a means of limiting the intensity and/or frequency of possible exposure to the virus (should infected personnel be present), such as:
    - Use of physical barriers or caution tape to delineate travel pathways as a means of limiting interpersonal contacts and maintaining physical distancing;
    - Opening doors and windows to enhance fresh air ventilation;
    - Erecting canopies for outdoor tailgate meetings during inclement weather;
    - Erecting Plexiglas barriers at specific points of personnel convergence

**7. Minimize Travel-Related Risks**

Geosyntec has developed specific business travel protocols in Section 6.0 of our "COVID-19 Considerations & Mitigations for Ongoing Business Operations" procedure (referred to as "the Procedure," below). In addition, personnel performing fieldwork-related travel should also consider the following:

- Vehicle travel – See Section 6.1 of the Procedure; in addition: Regularly clean/disinfect high-touch surfaces (steering wheel, shift lever, door handles, tailgate, etc.) in personal vehicles, company field vehicles and rental vehicles. Try to travel one person per vehicle, but no more than two. If traveling with others in the same vehicle, exercise physical distancing as possible within the vehicle and wear face masks/covers.
- Fatigue management – Limit total travel and work time to no more than 14 hours per day. Additional provisions are provided in *HS 211 Fatigue Management Plan*.
- Minimize stops - Make as few stops as possible during travels to limit exposure to public spaces. Adhere to Journey Management Plan requirements (where applicable).
- Fuel/food/supply stops - When traveling by vehicle, and when stopping for fuel or other supplies is necessary, either clean/sanitize your hands upon completion of food/fuel stop, or wear gloves during the stop, then discard gloves and wash hands. Utilize physical distancing (6 ft/2 m) and wear a face mask/cover during the stop.
- Public restrooms/washrooms – Minimize or eliminate the use of public restrooms/washrooms, particularly in high-population-density locations (such as travel stops, occupied site facilities), as elevated-risk factors may include: recent use by many individuals; poor ventilation; small enclosed air-space; repeated use of high-air-velocity hand driers (which increase levels of airborne particulates). On-site portable toilets, with doors propped open between use for ventilation, represent lower exposure risk, particularly if used by limited number of on-site personnel.
- Minimize/eliminate cash transactions – To minimize interpersonal contact, and to maintain appropriate physical distancing, use credit-card transactions where possible. Avoid passing credit cards to vendors is possible (prefer swipe/chip reader situations). If you must pass the credit card to someone, wipe it with sanitizer upon receiving it back.
- Air travel - See Section 6.2 of the Procedure; in addition: To the extent possible, minimize/curtail air travel. Branch Manager approval is required for air travel. Adhere to existing restrictions on

domestic and international travel. Maintain physical distancing and use a face cover while at any airport. Have disinfectant wipes with you and wipe high-touch surfaces (head rest, tray, arm rest, lavatory latch). Wear protective gloves and a face mask or cover at all times while on airplane.

- Public transportation – See Section 6.4 of the Procedure; in addition: Avoid travel on trains, subways, buses, and other public transportation (i.e., ride share) where possible, especially in metropolitan areas with elevated levels of community transmission. If such travel is necessary, practice physical distancing, disinfect high-touch surfaces (seat, headrest, arm rest, hand-hold, etc.). Wear protective gloves and a face mask or cloth face cover during travel, and wash hands thoroughly upon completion of travel.

- Safe accommodations - See Section 6.3 of the Procedure; in addition: Book accommodations only at reputable hotel chains and verify with the hotel that appropriate protocols are in place to limit the potential exposure and spread of the virus by thorough cleaning and disinfection. Motels/hotels with direct access to each room, or house/apartment rentals (such as through Airbnb) may be preferable to minimize the number of contacts, direct or indirect, with other people. Added safety measures include:
    - Sanitize high-touch surfaces in your room with your own sanitizing cleaner (doorknobs, light switches, TV controller, desktops, etc.);
    - Avoid public areas/common spaces to the greatest degree possible;
    - Use hotel entrances closest to your room; avoid lobby, elevators, and other public spaces as much as possible;
    - Eliminate daily housekeeping room service;
    - Select hotels/motels with direct outside access to your room.

- Critically assess the need for travel – Coordinate with clients and colleagues about the need for travel and the potential for alternatives to face-to-face meetings and travel away from home, such as schedule changes and virtual meetings.

**8. Utilize Safe Practices for Food & Beverage Provisions**

- "BYOFB" – Each individual should bring his/her own food and beverages to all work sites to avoid stopping at a store or restaurant. When shopping for food, obtain food for several days in advance to minimize the number of trips to the grocery store.

- Suspend providing food in common areas – Refrain from delivering commonly shared foods—bagels, muffins, buffet lunch, coffee service areas etc. If any food is to be provided for a group, it must be individually packed and served (e.g. box lunches), and physical distancing must be practiced by all while food is consumed.

- Personal cooler – Use your own personal lunch pack or cooler with ice packs refrozen daily for safe food storage during each workday and avoid use of "community" refrigerators.

- Physical distancing during meals - Food should be eaten alone or at a minimum physical distance of 2 m/6 ft between persons. Dine in your vehicle or outside alone and avoid using the project trailer or common spaces in site facilities.

- Drinking water/beverage dispensers – Restrict drinking water sources onsite to individual bottled water only. Refrain from using shared water dispensers and coffee service. Have workers take measures, such as labeling bottles, to avoid drinking out of someone else's bottle.

## 9. Face Covers, Personal Protective Equipment (PPE)

- Face masks/covers used as emission barriers – Use of a nose/mouth face covering—dust masks, surgical masks, cloth face covers—is considered a fundamental protective measure for COVID-19. Face masks and covers capture potentially infectious respiratory droplets/aerosols produced by the wearer (i.e., from coughs, sneezes, speaking, etc.), thereby limiting exposure risks to coworkers by limiting airborne levels of droplets and settling of droplets onto surfaces. Therefore, use of acceptable nose/mouth face coverings[7] is authorized for unrestricted use by Geosyntec personnel for cases where the coverings are strictly used *as an emission barrier only* for COVID-19 exposure risk reduction, particularly where preferred physical distancing measures and other controls are impractical. See COVID-19 Considerations & Mitigations for Ongoing Business Operations, Attachment 2, "Facial Coverings," for information on proper usage, video instructions, and additional resources.

- A few additional pointers about face covers – Light-weight loose fitting paper masks may tend to blow around a bit on a windy day—a heavier weight and/or form-fitting cloth cover may be preferable. Masks that do not fit tightly over the nose are more likely to cause fogging of eyewear, particularly in cool weather. Wash cloth masks frequently, and when not in use, place in a zip-loc bag or similar container to keep it clean. When wearing a face cover, individuals may be inclined drink less fluids due to apprehension to lift the mask—remember, it is still essential that you drink sufficient fluids to prevent heat related illness.

- Use of NIOSH-approved N95 respirators for wearer inhalation protection - In situations where workers require inhalation protection from a confirmed source of airborne COVID-19 hazard (e.g., entry into a high-exposure-risk locations such as a COVID-19 patient room in a hospital – see Section 2), respirator use MUST be coordinated directly with your H&S manager to ensure that a proper risk assessment and device selection is conducted and that all elements of a respiratory protection program are implemented.

- Disposable gloves – Where contact with potentially contaminated surfaces may occur the prevention of "hand-to-face" transfer of material is important to mitigate exposure risk, and requires frequent hand washing and disinfection. Surgical-type gloves made of nitrile or vinyl[8] provide a means of simplifying this decontamination and is especially preferable in elevated-risk circumstances where proper washing/disinfection could become excessive or where access to cleaning stations is not readily available. Gloves must be removed and disposed of after a specific task, and upon removal wearers must wash hands (for a minimum of 20 seconds) or apply hand sanitizer (>60% alcohol) immediately.

[7] Acceptable nose/mouth face coverings for use as emission barriers (only) include: Loose-fitting masks (commonly termed "surgical masks"), tight-fitting masks where the device body is the filtering material and the design does NOT incorporate an exhalation valve of any kind (irrespective of protection rating, such as N95, P99, KN95, etc.), or even home-made or make-shift face covers (e.g., home-made masks, bandanas, balaclavas, etc.). In accordance with the CDC, an acceptable cloth face cover should: fit snugly but comfortably against the side of the face; be secured with ties or ear loops; include multiple layers of fabric; allow for breathing without restriction; and be able to be laundered and machine-dried without damage or change to shape. Note: Any negative pressure elastomeric respirator devices utilizing filter cartridges (e.g., ½-face or full-face respirators) are strictly prohibited for use as emission barriers - use of such devices is for wearer inhalation protection only and requires prior concurrence from the H&S manager.

[8] Latex gloves are also effective and acceptable for protection against COVID-19 but come with a risk of severe allergic reaction to latex from sensitized individuals.

- Other PPE – Face shields used in conjunction with cloth masks, of use of Tyvek-suits, may have useful applicability in some situations to minimize exposure risk, or may be required by regulation or the client.

**10. Ventilation, Fresh Air, Air Circulation**

In some fieldwork environments both indoors (such as site trailers, treatment system facilities, host facilities) as well as outdoors (staff congregation points), a possible viable infection-risk-reduction measure—used in conjunction with physical distancing and face covers--may be to optimize the amount of air movement and/or fresh air ventilation in both the breathing zone and general work areas. The ultimate purpose is to mitigate localized areas of elevated inhalation risk, particularly at points of personnel convergence where site restrictions or the specific nature of the work may compromise physical distancing or use of face covers. Suggestions/examples are listed below:

- Facilitate passive cross ventilation – Where multiple personnel may temporarily congregate (sampling hand-off points, outdoor tailgate meetings, under canopies set up outdoors for rain/sun protection) consider strategies that facilitate "comfortable cross ventilation:"
  - Place canopies in an open location (not shielded by buildings, vegetation) to maximize passive air currents;
  - Set up indoor and outdoor workstations in locations with natural ventilation—avoid areas with limited air movement, "stagnant air."
  - Keep doors of portable toilets open at all times between use.
- Maximize fresh air – In site trailers, and inside on-site/client facilities, keep doors and windows open at all times (as practical), limit the use of air conditioners--eliminate "cocooned air-conditioned environments" with limited fresh air. Where work is conducted in an indoor environment, locate congregation points near open windows, open doors, or "high-bay" areas with open vents and natural air movement.
- Active cross ventilation – Under ambient conditions of little or no existing air movement, use fans or blowers to increase air movement across the breathing zone at elevated-risk congregation points, such as:
  - In site trailers with doors/windows open;
  - During outdoor tailgate meetings near site trailer under canopy during rain;
  - Working in "close quarters" on boats/barges;
  - Louvered exhaust fan in an enclosed/indoor treatment system facility;
  - For some work tasks, such as indoor drilling with fuel-powered equipment, use of blowers/fans is standard procedure for mitigating airborne combustion emissions, and will have the added benefit of reducing the airborne levels (local accumulations) of COVID 19.

IMPORTANT NOTE: Where Geosyntec personnel may see increased use of electrical fans and blowers, increased reliance on fresh air and the outdoors for hygienic purposes, and decrease reliance on "cocooned air-conditioned environments," we must be more cognizant of measures to mitigate electrical hazards (take precautions in wet locations, use GFCI-protected power sources), and heat stress hazards (drink fluids, more frequent breaks, shaded break locations, cooling personnel by air-movement, personal wellness).

**11. Maintain Healthy Lifestyle, Facilitate "Wellness"**

- Personal wellness – Spend extra effort to stay well (e.g., eat healthy, get enough rest) to maintain a strong immune system; develop strategies to maintain emotional wellness.

- Exercise, stretching – Make time for solitary physical exercise, stretching, yoga or similar activities; avoid group activities where possible; maintain physical distancing; use only your own personal exercise equipment and accessories.
- Ergonomics – As employees are adjusting to new work strategies, which may entail working from home in a non-office environment, all employees are encouraged to consider strategies for maintaining appropriate work-station ergonomics.

**Here are some additional resources to provide to employees and post in field office locations**

- COVID-19 Factsheet
- Geosyntec COVID Procedure: "COVID-19 Considerations & Mitigation for On-Going Business Operations"
- Keep Calm and Wash Your Hands
- Wash Your Hands!
- Make a Field Hand Washing Station
- Making Hand Washing Solution from Liquid Bleach
- Know the facts about Coronavirus Disease 2019 and help stop the spread of rumors

# Attachment G: Geosyntec Health and Safety Procedures

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# US Health & Safety Procedures

**Procedure:** HS 105 US
**Date:** June 2015
**Revised:** December 2019

## Driver and Vehicle Safety

### 1. PURPOSE

This procedure is designed to promote driver and vehicle safety and to establish the minimum requirements for the safe operation of motor vehicles while driving on company business by employees of our U.S. operations.

### 2. SCOPE

The procedure applies to the operation of motorized vehicles intended for ground transportation while on company business, including personally owned vehicles (POVs) when being used on company business and vehicles that are owned, rented, and or/leased by Geosyntec (the Company) or otherwise provided to an employee for business use.

### 3. COMMONLY USED TERMS

| Term | Description |
|---|---|
| **Accident** | Any incident in which the vehicle comes in contact with another vehicle, person, object, or animal which results in death, personal injury, or property damage, regardless of whom was injured, what was damaged or to what extent, where or when it occurred, or who was responsible. |
| **Accident, At-Fault** | An accident in which evidence has indicated that a driver's actions were the primary cause of the accident. |
| **Accident, No-Fault** | An accident in which there was not enough evidence to determine which, if any, driver's actions were the primary cause of an accident. |
| **Authorized Driver** | Any company employee or contracted hire: (i) who may operate a company-owned, leased, or rented vehicle, (i.e. a Company-Provided Vehicle) and/or a Personally Owned Vehicle (POV); and (ii) who has submitted the appropriate motor vehicle report consent forms and been approved by Human Resources (HR). |
| **Authorized Passenger** | Company employee, client, vendor, or other person(s) associated with company business traveling with an authorized driver for a business purpose. |
| **Company-Provided Vehicle (CPV)** | Any vehicle owned, leased, or rented by Geosyntec or its personnel for the purpose of conducting company business. Please refer to Vehicle |

| Term | Description |
|---|---|
| | Rental Policy for additional guidance on driver eligibility, insurance, and use restrictions. |
| **Health and Safety (H&S) Department** | The Geosyntec corporate department responsible for administering all H&S policies and procedures including this one. |
| **Personally Owned Vehicle (POV)** | Any type of motorized vehicle, other than a CPV, that is being used by an Authorized Driver on company business. |
| | |

## 4. PROCEDURE

### 4.1 Authorized Drivers

4.1.1 Only HR can approve an employee's Authorized Driver status after the required consent forms have been submitted, and a satisfactory motor vehicle record (MVR) has been confirmed.

4.1.2 Only Authorized Drivers are permitted to operate motor vehicles on company business.

4.1.3 Authorized Drivers are responsible for reporting any conviction (work-related and not work-related) resulting in license limitation, suspension, or revocation, or involving driving under the influence of drugs and/or alcohol to the Geosyntec HR Director immediately upon receipt of such a finding.

4.1.4 Authorized Drivers should notify HR promptly if there is a change to their driver's license number or state of issue.

### 4.2 Training

4.2.1 New employees who may drive for work purposes as an Authorized Driver must complete the Company's on-line Driver Safety (DD1) course, or an alternative course, approved by the Health and Safety (H&S) Director, prior to operating a CPV or a POV on company business.

4.2.2 Current employees who may drive for work purposes as Authorized Drivers must complete the company's on-line Driver Safety (DD1) course, or an alternative course, approved by the H&S Director, if they have not done so within the past two (2) years, in order to maintain their Authorized Driver status and thereby retain access to CPVs and POVs for company business.

4.2.3 At the discretion of the H&S Director, HR, and the Risk Management Committee (RMC), employees involved in accidents while driving for work purposes (At Fault or No-Fault) may be required to participate in supplemental training (i.e., Defensive Driving DD2) and/or an equivalent.

4.2.4 Retraining is required every two (2) years. Training records and refresher due dates are maintained by the Corporate Training Department or designee.

### 4.3 Motor Vehicle Records Review

4.3.1 Geosyntec will contract with an authorized background consumer reporting vendor to review employee motor vehicle records (MVR) as reported through our national system of State Department of Motor Vehicles. The intent of the procedure is to identify employees that may

pose an increased risk for the operation of vehicles for use on company business and provide an opportunity for enhanced driver safety education, as warranted.

4.3.2 Geosyntec will direct employees to sign electronic consent forms in accordance with state and federal laws and will obtain driving records for employees who may drive for work purposes - Authorized Drivers as defined in Section 3 above. An employee who does not submit the required consent forms is not considered an Authorized Driver and is not authorized to operate any vehicle for company business or to submit driving-related expenses. Review of employee MVRs will take place upon acceptance of an employment offer and prior to the start of employment for new employees, and every two (2) years for all Authorized Drivers. Employees cannot operate a vehicle for Company business until HR has approved the MVR record. The Company may also obtain and review MVRs for any employee who incurs an "at-fault" accident on company business or at the discretion of the supervisor and/or H&S Department as warranted for business-necessity reasons.

4.3.3 A new employee who may drive for work purposes will have his/her MVR reviewed and approved by HR as a condition of driving for company business and for authorization to submit driving-related expenses for reimbursements. Each state provides MVR records in line with specific state reporting requirements, which are not controlled by the Company or the authorized background consumer reporting vendor and may report MVR history beyond a two-year period. However, the Company will only consider the MVRs of hires and employees for the two-year period preceding the date of the records search for the purpose of this policy.

4.3.4 The Company contracts with an authorized background consumer reporting vendor to obtain state MVRs in compliance with state and federal laws. Representatives from the Company's HR department will review driver violations to determine if the record contains any Type A or Type B violations in the preceding two-year period, as further described below.

4.3.5 Type A violations include, but may not be limited to the following:

- Driving under the influence of alcohol or drugs or refusing to take a substance test.
- Driving with an open container of alcohol.
- Reckless/careless driving and/or hit and run.
- Fleeing, evading police or a roadblock, or racing/speeding incident.
- Driving on an expired, suspended, or revoked license.
- Vehicular assault.
- Restrictions to a driver's license which the Company is unable or unwilling to accommodate for safety or liability risk reasons, or because it creates an undue hardship for the Company to do so.

*4.3.6* Type B violations include, but may not be limited to the following:

- Moving violations such as, texting and driving, speeding, improper lane change, failure to yield, and failure to obey a traffic signal or sign; and
- At-fault accidents as confirmed by a police report/investigation.

4.3.7 Because the MVRs are a type of background/consumer report under the **Fair Credit and Reporting Act (FCRA)**, HR administers the FCRA aspect of the program. If the Company receives a non-compliant MVR, HR will inform the employee and will provide the employee with a statement of his/her rights, a copy of the MVR report, and the right to dispute potentially inaccurate information within state and federal guidelines. Employees will have at least five (5) business days or as otherwise noted in the applicable law of the employees' home state, to dispute the information. If the information is not disputed within the provided timeframe or, if

disputed, found by the authorized background consumer reporting vendor to be accurate, HR may share a summary of the report with representatives of our H&S Department and/or the employee's supervisor as deemed appropriate. In cases where consideration is being given to decline approval or provide a conditional approval, HR may also share the details of the MVR with the Company's H&S Director.

4.3.8 Employees with one (1) or more Type A driving violations within the prior two (2) years may be placed on probationary driving status or suspended from driving a CPV or POV on company business until such time as the Company has determined otherwise, depending on the violation(s). The employee affected will receive a copy of the MVR in question and will be given an opportunity to discuss the pertinent circumstances of the violation(s) with a member of the HR department. Depending on, but not limited to, the nature and frequency of the violation(s), at a minimum, the employee may be required to successfully complete a driver safety education program selected by the H&S Department within one (1) month of being placed on probation or being suspended. The H&S Department will develop a plan for the affected employee, which may include, but not be limited to, the length of probation or suspension, the driver safety education program(s) the employee may be required to take, the frequency of future MVR screenings, and the discipline that may be enforced should additional violations occur during or after the probationary or suspension period. In addition, other actions including rescinding an employment offer or termination of employment may be considered by the Company.

4.3.9 Employees with two (2) or more Type B moving violations or one (1) or more at-fault driving accident(s) during the applicable review period may be placed on probationary driving status. Employees placed on probation may be allowed to operate a vehicle for company business purposes provided he/she satisfactorily completes a driver safety program selected by the H&S Department within the timeframe established by the H&S Department. Based on the circumstances and severity of violations, the H&S Department may develop a plan for the affected employee, which may include the duration of probation, the frequency of future MVR record review, and the discipline that may be enforced should additional violations occur during the probationary period. Discipline for subsequent violations during or after the probationary period may include suspension from driving a personal, company or rental vehicle for business purposes, or termination of employment.

**4.4 General Requirements**

4.4.1 CPVs are for official company business only. Personal use is not permitted unless approved in advance by the employee's Department Manager or Branch Manager. Road travel will be limited to all extent possible and during daylight hours. The weather, environmental conditions, client expectations, etc. also need to be considered prior to driving. If bad weather conditions are forecasted, driving should be avoided/delayed when practical.

4.4.2 Authorized Drivers shall comply with all governmental traffic and other laws and regulations relating to vehicle operation, all client requirements, and project policies concerning vehicle operation.

4.4.3 Authorized Drivers who use a POV on company business are responsible for the POV's operating condition and for the personal safety of themselves and their passengers. They must also maintain appropriate insurance coverage on the POV, including coverage for liability, uninsured motorist, collision, and property loss.

**A note about insurance:**

It is your responsibility to maintain appropriate insurance coverage on your POV, including coverage for liability, uninsured motorist, collision, and property loss. If you use your POV for company business extensively, please consult your carrier's representative to ensure that your coverage extends to "business" uses. All Authorized Drivers should have in their possession a Geosyntec Accident Reporting Card.

4.4.4 Any vehicles used for company business must have the appropriate registration and insurance required by the jurisdiction in which the vehicle is registered.

4.4.5 All vehicles used on company business that have seat belts as original equipment must retain them. In vehicles with seat belts, all occupants must use them. In vehicles with seat belts, the number of occupants shall not exceed the number of seat belts.

4.4.6 No employee shall drive on company business when:

- They have a suspended, expired, or revoked license.
- They are under the influence of alcohol or drugs.
- They are specifically restricted by a medical provider (in writing) due to health issues, taking prescription medication(s) that have a stated adverse effect (i.e., drowsiness, blurred vision, dizziness, vertigo, etc.).
- They have injuries or illnesses that could prevent the safe operation.
- They are experiencing a temporary personal condition (e.g., excessive fatigue, extreme emotional distress) that could prevent safe operation.
- For extended driving periods, staff will take appropriate rest breaks to limit fatigue. Pursuant to HS201, employees are limited to no more than a 14 hour work day, which includes any driving for business that may be required.

4.4.7 Unless specifically approved by a client representative or a Geosyntec Department or Branch Manager, vehicle motors/engines shall not be left running when the vehicle is unattended.

4.4.8 Unless specifically required by the site health and safety plan or the client's site management regulations, the vehicle ignition key shall not be left in an unattended vehicle.

4.4.9 Geosyntec employees shall not use all-terrain vehicles (ATVs) and/or other motorized vehicles not specifically designed for over-the-road use unless specifically approved in the project/site health and safety plan.

4.4.10 Any samples or glass items shall be transported in vehicles in accordance with applicable governmental regulations.

4.4.11 Geosyntec employees are prohibited from riding in pickup truck cargo beds. Geosyntec employees are prohibited from transporting any passengers in pickup truck cargo beds.

4.4.12 Report missing or defective safety equipment to the appropriate manager and obtain replacement equipment before driving in or riding in a CPV. Confirm with both your direct supervisor and the office manager of your destination(s) and trip itinerary.

4.4.13 Maintain CPVs in a clean and orderly condition and obtain driving directions prior to traveling in unfamiliar locations and/or site facilities.

4.4.14 Ensure CPVs do not exceed weight or towing capacity.

4.4.15 Smoking is not permitted in CPVs.

4.4.16 While operating a CPV or POV on company business, employees are specifically prohibited from:

- Disabling any safety device including seat belts and air bags.
- Transporting anyone other than Authorized Passengers.
- Allowing unauthorized personnel to operate a CPV.
- Using portable computers or similar devices while the vehicle is in motion.
- Smoking or using a cell phone while refueling.
- Violating cell phone laws or restrictions (see 4.7 below).
- Violating applicable driving laws regarding alcohol levels and open containers of alcohol.

**4.5 Site Vehicles and Equipment**

4.5.1 Operation of materials-handling equipment such as, but not limited to, forklifts, winch trucks, front-end loaders, tractors, etc. by Authorized Drivers is not permitted without prior training, licensure, and written authorization from the Geosyntec's H&S Director.

4.5.2 Drivers and passengers shall ride with all portions of their bodies inside the vehicle body or frame.

4.5.3 Drivers and passengers shall be in the seated position, with the seat belts fastened before the vehicle is set in motion.

4.5.4 Riding on any vehicle's bumper or tailgate is prohibited.

4.5.5 Tailgates will be closed before the vehicle is set in motion unless carrying an extended load that is properly secured and flagged.

4.5.6 If a vehicle is not designed to transport passengers, it must not be used for that purpose.

4.5.7 When driving on private property or project sites, drivers shall comply with the posted or specified speed limits and traffic rules established for the project or site.

4.5.8 Drivers operating a vehicle with a gross vehicular weight of more than 20,000 pounds will use chocks when parking on steep slopes or grades.

**4.6 In Case of a Vehicle Accident**

In case of any accident involving a CPV at any time or a POV when being used on company business, whether there is any injury or damage whatsoever, or not, the Authorized Driver shall:

- Stop.
- Call for medical assistance in case of bodily injury and clear the road as required by local jurisdiction.
- Call for local police assistance to report the accident.
- Provide your name, address, driver's license number, and vehicle insurance information.
- Obtain the following:

- Name, address, telephone number, driver's license number, state of issue, and insurance information of the other drivers involved.
- Name and contact information from passengers in other vehicles if any.
- Year, make, and model of any vehicles involved.
- Name and contact information of any witnesses.
- Police report, when available.

- Promptly notify your supervisor.
- If you are in the United States or Canada, please notify the Legal Department to obtain help on insurance coverage with company owned vehicles. Please contact the Accounting Department if the incident involves rental vehicles. If you are outside of the United States or Canada, please contact the nearest Geosyntec office.
- Complete the form "What to do in case of a Vehicle Accident" (Attachment 1) and submit to your supervisor as soon as possible.
- Within 24 hours, or as soon as situationally possible, file an online Preliminary Incident Report and contact **WorkCare at 888-449-7787** to confirm injuries or lack thereof.

### 4.7 Cellular Phones/Wireless Communications

While operating a vehicle on company business, employees shall refrain from using wireless communications devices where specifically prohibited by law or regulation. Where no laws or regulations apply to the use of wireless communication devices, Authorized Drivers shall not use such devices while the vehicle is in motion unless the device is in a hands-free mode.

### 4.8 Safety Inspections

Authorized Drivers are responsible for verifying that vehicles they operate on company business are in safe operating condition. Authorized Drivers are not allowed to use vehicles that do not have current state and/or local inspections and registrations (new vehicles waiting for tags are exempt). Authorized Drivers should observe that the following safety items/systems are in good working order prior to vehicle operation:

- Seat belts.
- Doors and door locks.
- Headlights and tail lights.
- Rear view mirrors and side mirrors.
- Turn signals.
- Backup lights.
- Horn.
- Backup alarms, if applicable.
- Parking brake.
- Speedometer.
- Steering system.

- Windows (operate correctly, clean and, free of damage that might interfere with the driver's vision).
- Windshield wipers and washer fluid.
- Windshield defrosters and defoggers.
- Tire pressure and tread wear (at a minimum by visual inspection).

A vehicle inspection checklist is provided in Attachment 2 and, except for rented vehicles, should be completed prior to operation or at the direction of the CPV's owning Department Manager to identify problems related to safe operation. The completed checklists shall be submitted to the CPV's owning Department Manager and maintained on file. Any items identified on the checklist as deficient must be reported to the CPV's owning Department Manager. If any condition prevents an item from working properly, or if the Authorized Driver deems the vehicle unsafe, the vehicle must be repaired before it is used for company business. Where the condition is such that the Authorized Driver believes the vehicle may be operated safely, the vehicle may be driven to a service facility for repairs. With respect to POV's, drivers should observe that the safety/operational systems are in good working order on a weekly basis. Vehicles will be equipped with roadside emergency kits.

## 5. SECURITY

Vehicles must be secured in a safe place and locked whenever unattended and the keys removed except as noted in Section 4.3.8. Authorized Drivers should not leave sensitive materials or anything of value (company or personal) in the vehicle. When circumstances make it impractical to remove items, they should be placed in the trunk, kept out of site, or covered. In the advent of an emergency, the driver needs to confirm they have access to reliable communications (i.e., cell phone, CB radio, etc.)

## 6. ATTACHMENTS

- Attachment 1 – "What to do in case of a Vehicle Accident Form"
- Attachment 2 – Vehicle inspection checklist

## Attachment 1- What to do in case of a Vehicle Accident Form

### Driver's Report of Accident

Do not argue at the scene of the accident. Be courteous.

**Your Vehicle**

Name of Driver _____

Odometer Reading _____

Vehicle I.D. No. _____

License Plate No. _____ State _____

Place of Accident _____

_____

City/State/Province _____

Direction of Travel _____

Speed _____

**Other Vehicle**

Name of Driver _____

Address _____

_____

Phone No. _____

Vehicle I.D. No. _____

Year/Model _____

License Plate No. _____ State _____

Owner of Vehicle _____

Address of Owner _____

_____

_____

Insured by _____

Direction of Travel _____

Approximate Speed _____

### Diagram of Accident

Using the grid below, show exact relationship of roadways and vehicles at the time of the accident. (Indicate North) Show measurements if possible (Identify your vehicle as #1, other vehicles as #2, #3, etc.)

Geosyntec consultants

# What to do in case of a Vehicle Accident

## Here is what to do

1. Take precautions necessary to protect the scene of the accident from further accidents.
2. Call police immediately, if someone is injured, request medical assistance. In case of fire, request fire department.
3. If there are any injuries, follow the requirements of the injury, illness, near miss procedure
4. Be courteous. Answer police questions. Give identifying information to the other party involved, but do not admit fault. Check the glove box for insurance information on your rental car.
5. Complete this **FORM**. You will need this information later for state and insurance reports.
6. Report the accident to your immediate supervisor and H&S Manager as soon as possible. The supervisor will send the completed form to David George in the Oakland Office: phone (510) 836-3034. David will contact the insurance carrier. If a rental vehicle is involved in the accident, contact Robin Quinones in the Boca Raton office. Phone: (561) 922-1115. The supervisor will notify appropriate personnel within their department.
7. Take photographs of the damage if it is safe to do so.
8. Do not leave the scene of the accident, until police have arrived or you're being transported by rescue.

**H&S Contacts**:

Dale Prokopchak: 804-349-8067

Joe Esseichick 734-417-0909

Jason Ford 226-220-3401

Mark Malchik: 781-392-5440

Ersin Yalcin: 404-435-4722

## Description of Accident

Date_____ Time_____ ☐ am ☐ pm

Road Condition _____

**Illumination** ☐ Daylight ☐ Dawn/Dusk ☐ Dark

**Weather Condition** ☐ Foggy ☐ Cloudy ☐ Clear

**Road Surface** ☐ Wet ☐ Damp ☐ Dry

Description _____

Driver's Signature _____

Employer (check one)

☐ Geosyntec Consultants ☐ MMI

Branch Location _____

Branch Phone No. _____

## Witnesses

1. Name _____

Address _____

_____

Phone _____

2. Name _____

Address _____

_____

Phone _____

## Police Investigation

Name of Officer _____

Report Number _____

Name of Police Agency _____

Was Summons Issued? ☐ Yes ☐ No

## Injured Persons

**1. Name** _____ DOB: _____

Address _____

_____

Nature of Injury _____

**2. Name** _____ DOB: _____

Address _____

_____

Nature of Injury _____

## Damage to Property

**1. Owner** _____

Address _____

_____

Description _____

of Damage _____

_____

_____

**2. Owner** _____

Address _____

_____

Description _____

of Damage _____

_____

_____

## Attachment 2 - Vehicle Inspection Checklist

**Vehicle** _____ **Month** _____

| Description | Date | Mileage | Initials |
|---|---|---|---|
| **Windshield** (chips, cracks) | | | |
| **Fluids** (oil, fuel, windshield washer, brake, steering) | | | |
| **Brakes** | | | |
| **Tires** (tread, pressure) | | | |
| **Appearance** (scratches, dents) | | | |
| **Lights** (driving, parking) | | | |
| **Interior** (obstructions) | | | |
| **Exterior** (signage, bed, tie downs) | | | |
| **Weight of Cargo** (not exceeding maximum allowable) | | | |
| **Trailers** (connections, lights, weight) | | | |
| **Safety** (locks, door closure, seat belts, windows, chocks) | | | |
| **Documentation** (Registration, insurance, accident forms) | | | |
| **Emergency Kit** (triangle, jumper cables, first aid kit, fire extinguisher etc.) | | | |
| **Free Release** (oil or other fluid leaks) | | | |
| **Distraction avoidance** (Mobile phone hands free kit or headset, GPS or clear directions for unfamiliar areas, emails and texts muted or ignored) | | | |



| Discrepancies Noted | Date | Initials | Reported To |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

# US Health & Safety Procedures

## Personal Protective Equipment

This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company". Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

## 1.0 PURPOSE

Personal protective equipment (PPE) is specifically designed to protect select parts of the body from chemical, physical and biological hazards. Types of PPE include, but are not limited to, hard hats, safety glasses, safety shoes, and treated coveralls. This written program, along with site-specific hazard analyses, will provide the requirements for the selection, use and maintenance of personal protective equipment to comply with the provisions of the following to include but not be limited to: OSHA 29 CFR 1910, Subpart I., the American National Standards Institute (ANSI), the American Society of Testing and Materials (ASTM), and international agencies such as the Canadian Standards Association (CSA), British Standards (BS), and Malaysian Standards (MS).

## 2.0 SCOPE

A hazard assessment must be conducted for each task being performed for the purpose of identifying the potential hazards and selecting appropriate personal protective equipment based on the identified hazards. A written certification must be in place verifying that the hazard assessment has been performed**. Attachment 1** of this procedure contains a PPE Hazard Analysis template that can be used to document this requirement. Other formats, such as formal project-specific Health and Safety Plans (HASPs) and Task Hazard Analyses (THAs), can also be used when approved by the Corporate H&S Manager. All PPE Hazard Analysis must be reviewed annually (at a minimum) to ensure proper PPE has been identified, selected, and issued according to the identified hazards.

## 3.0 PROCEDURE

### 3.1 Hierarchy of Controls

Engineering controls are used to eliminate, stop, contain, or capture a hazard at the source or intercept it along its path to the worker. When feasible, these controls are preferred to administrative controls or the use of PPE. Administrative controls are measures to limit the duration of exposure to the hazard. With the exception of administrative controls to prevent heat-, cold-, or radiation- related exposures, the use of administrative controls requires the approval of the H&S Department.

### 3.2 General Requirements

1. Geosyntec will provide suitable PPE as required for the nature of the job being performed, such as, but not limited to, steel-toe (or tech-toe if approved by H&S Manager) boots, chemical protective clothing, respirators, eye and face protection, hardhats, and gloves.
2. Employees will use all required PPE as outlined in project-specific HASPs, THAs and/or PPE Hazard Assessments, or business unit PPE policy.
3. All PPE will meet all applicable current OSHA, MSHA, ANSI, NIOSH and regulatory agencies noted in Section 1.0 for the particular equipment.

### 3.3 Minimum PPE Requirements

The following minimum requirements are mandatory as a condition of working at Geosyntec-controlled field projects, construction projects, and operating facilities unless the activity is being conducted within a field trailer or facility control room and the project has established these locations as "office-like" areas. Minimum PPE requirements include:

1. Hardhats.
2. Safety glasses (ANSI Z-87 and other applicable agencies noted in Section 1.0) w/sideshields
3. Safety-toe boots or shoes.
4. A sleeved work shirt is required to cover the upper torso, if required by the client or hazard
5. Full-length trousers (shorts are prohibited).
6. High-visibility vests – when working around heavy/mobile equipment, moving vehicles, or as required by the client. See Section 3.12 for additional information.

### 3.4 Hazard Assessment

1. A PPE hazard assessment of the workplace will be conducted to identify the need and type(s) of PPE to be utilized. This hazard assessment will be performed as part of the initial development of project and site health and safety plans.
2. The workplace hazard assessment must be in written form and discussed with affected staff.

### 3.5 PPE Training

1. Employees will receive training on the proper use, inspection, and maintenance of PPE prior to being required to utilize any assigned equipment. The training will include:

    a. Discussion of when and what PPE is required.
    b. How to properly don, doff, adjust, and wear PPE.
    c. Limitations of the PPE.
    d. Decontamination procedures.
    e. Proper care, maintenance, useful life, and disposal of the PPE.

2. Employee training must be verified by a written certification. The certification must include the names of the employees trained, signature of instructor and participants, and the date of training. It must also be identified as a certification of training on the use of PPE.
3. Training documentation may include completion of Tailgate Safety Briefings with specific emphasis on PPE use and selection requirements.
4. Training will be repeated whenever the workplace hazards change, specified PPE changes, or when incorrect or incomplete use of PPE is observed, or as required by the re-training frequency.

### 3.6 Eye and Face Protection

#### 3.6.1 Basic Eye Protection

Eye and face protection prevents injuries due to particulates, splashing, flying objects and certain forms of ultraviolet radiation. Forms of eye protection include safety glasses, coverall goggles (both chipping and chemical splash), face shields, welding goggles and welding shields. Contact lenses do not meet the requirements of eye protection.
All non-prescription safety glasses, goggles, and face shields shall be provided at no cost to the employee. Prescription safety glasses are provided at no charge (up to a predetermined amount) through the Geosyntec prescription safety glasses program (See Intranet).

The following are the general use requirements for eye and face protection:

1. Employees who wear prescription lenses shall either obtain prescription safety glasses with side shields or goggles that completely cover the employees' prescription lenses without disturbing the spectacle adjustment.
2. Face and eye protection shall be comfortable and of the proper size to fit the employee.
3. All equipment shall be kept clean and in good repair by the employee. If the equipment cannot be cleaned (i.e. dried paint), or is damaged, it must be properly discarded and new equipment shall be obtained.
4. Equipment (except prescription glasses) can be used by different employees, as long as the equipment has been cleaned and disinfected between uses by each person.
5. Safety glasses shall be worn under welding shields.
6. Prescription safety glasses shall be replaced as necessary (i.e. damaged, change in prescription, lost). The employee will discuss replacement of safety glasses with his/her supervisor.

### 3.6.2 Contact Lenses

Wearing contact lenses is prohibited at worksites where the possibility of particles and chemicals getting behind the contact lens exist. Contact lenses do not provide eye protection; contact lens wearers must use the same additional eye protection as non-lens wearers.

### 3.6.3 Chemical (Splash-Proof) Goggles

Chemical goggles will be used as follows:

1. Approved chemical mono-goggles will be provided to ensure protection from the hazards associated with handling or dispensing liquid chemicals.
2. The appropriate Material Safety Data Sheets (MSDS) and/or Safety Data Sheets (SDS) will provide specific information for the use of chemical goggles. The MSDSs can be obtained in accordance with HS 115 Hazard Communications/Globally Harmonized System Program.
3. Basic eye protection and chemical goggles (with the exception of prescriptions glasses) will not be worn at the same time, but a face shield may be worn in conjunction with chemical goggles and may be required for certain operations.

### 3.6.4 Face Shield

1. An approved full-face shield will be worn to provide protection from flying particles, splashes, or mist, where required.
2. A face shield only provides protection to the face from direct impact objects, and does not provide acceptable eye protection. Additional standard eye protection or goggles must be worn in conjunction with a face shield.

### 3.6.5 Burning Goggles

Approved burning goggles will be worn to provide employee protection from optical radiation. Burning goggles will be worn whenever an oxy-gas torch is used for cutting or burning.

### 3.6.6 Welding Hood

A welding hood with either a filtered lens of number 10 shade or darker, or an auto-darkening lens providing the same shade number or darker (see applicable shading requirements), will be used to provide protection from the optical radiation produced during electric arc welding. Approved safety glasses with side shields will be worn in conjunction with the welding hood to ensure protection from popping hot slag when the hood is raised. Welding hoods will meet ANSI and/or standards noted in Section 1.0.

## 3.7 Head Protection

### 3. 7.1 Basic Head Protection

1. Approved hardhats will include only plastic or fiberglass hats that meet ANSI Z89.1 and Section 1.0 agencies.
2. Metal hardhats or bump caps are not considered approved head protection and will not be used on Geosyntec projects.
3. Approved hardhats will be worn by all employees exposed to hazards that could cause injury to the head (moving equipment, falling objects, protruding objects, etc.).
4. Compliance with state and/or local requirements is mandatory (e.g., chinstrap accessory, etc.).

### 3.7.2 Issuance of Head Protection

An approved hardhat will be issued to all employees exposed to overhead hazards. The decision to charge a fee for replacement hardhats will depend on the requirements of the individual project and will be determined by the Project Manager.

### 3.7.3 Color Coding

Color coding of hardhats will be at the discretion of the Site Project Manager for each individual project.

### 3.7.4 General Maintenance Requirements

It will be forbidden for employees to:

1. Drill holes in the shell of the hardhat.
2. Alter the shape of the hardhat or bill.
3. Remove the suspension straps or cut/alter them in any way.
4. Paint the hat or cover in non-approved decals.
5. Wear hardhats with the brim to the rear; or
6. Alter hardhat in any other manner that may compromise its integrity e.g. pasting stickers other than standard Geosyntec logo.

## 3.8 Hearing Protection

1. Employees will not be exposed to noise in excess of the Permissible Exposure Limits (PELs), occupational exposure levels, and/or other exposure levels established by applicable regulatory agency guidelines and industry best practices. Geosyntec has established an action level where hearing protection is mandatory at project sites where equipment, machinery, etc. generates noise levels in excess of applicable regulatory provisions and guidelines.

2. The two types of recognized hearing protection available for use in effectively reducing noise exposure are earplugs and earmuffs.
3. In most instances, universal-fit earplugs (expandable foam) will be acceptable hearing protection. Cotton plugs are not acceptable.
4. When using earmuffs for hearing protection, special care will be taken to ensure that the muffs are disinfected before being issued to another employee.
5. The H&S Department will indicate whether both earplugs and earmuffs must be worn to provide adequate hearing protection.

### 3.9 Hand Protection

Hand protection serves two purposes:

- Control of physical hazards
- Control of skin contact with hazardous materials

#### 3.9.1 General Purpose Gloves

Where workers are exposed to physical hazards, the use of standard leather or cloth work gloves will be employed. These selected gloves should:

- Be of sturdy construction.
- Be suitable to protect against the particular hazard(s) associated with the job (e.g., insulated gloves for hot work).
- Properly fit the worker's hands.

#### 3.9.2 Special Purpose Gloves

Gloves intended to provide chemical protection must be rated by the manufacturer as effective against the substance(s) expected to be encountered. Specific selection will be made on a task-by-task basis and approved by the H&S Department. Special purpose gloves may at times be required when employees are performing certain tasks as indicated below:

- Working with solvents or fuels (thinners, degreasers, gasoline, safety solvents, etc.).
- Handling pesticides, herbicides, or any poison.
- Working with insulating materials.
- Assisting welders or handling hot materials.

Special purpose gloves include:

- "Hot" gloves for electrical work.
- Cut-resistant gloves.
- Chemical-resistant gloves.
- Standard rubber gloves.
- Heat-resistant gloves.

Hydrocarbon-resistant rubber gloves will be worn to protect the hands when using petroleum-based cleaning agents.

Barrier creams/moisturizing lotions can provide additional protection from minor exposure to some irritants and will be used as specified:

- Barrier creams will be evaluated to ensure the proper protection is provided for the specific task to be performed. Barrier creams are NOT a substitute for gloves.
- Moisturizing lotion/creams will be utilized to restore the natural oils to the skin removed through frequent hand washing.

## 3.10 Foot Protection

### 3.10.1 Basic Foot Protection

Safety footwear will meet the following requirements:

1. Comply with applicable Standards noted in Section 1.0
2. Minimum height of 6 inches.
3. Safety-toed footwear will be worn at all job sites unless a variance is obtained from the H&S Department.
4. Sneakers, sandals, tennis shoes, high heels, and leather-soled street or dress shoes will not be considered approved industrial or construction footwear.
5. Safety shoes are provided at no charge (up to a predetermined amount) to the employee.

### 3.10.2 Special Purpose Footwear

Special footwear may be required to provide maximum protection to the employee.

1. Whenever employees may be exposed to corrosives or irritant chemicals (e.g., pouring concrete, applying form oils), they will wear the appropriate special purpose footwear.
2. Special purpose footwear may include PVC or neoprene boots, preferably with steel shanks.

### 3.10.3 Foot Protectors

Employees performing tasks that potentially expose them to extreme foot injury hazards (e.g., operating a ground tamper or chipping concrete with jackhammer) will wear metal foot protectors and/or metatarsal protection.

## 3.11 General Clothing Requirements

1. Clothing will be in good condition. Frayed or tattered clothing can be a hazard to the employee.
2. Pants will fit properly and not have large cuffs or belled or frayed bottoms.
3. Tank tops or sleeveless shirts (less than 4 inches below shoulder) will not be worn.
4. If dictated by the client or the hazards, long-sleeve shirts will be required.
5. Shirts will be worn tucked in at all times. Employees flame cutting or welding must have clothing suitable for that operation (i.e., prevent slag from being caught in cuffs, waist, or pocket openings).
6. Neckties, gauntlet-type gloves, and baggy, loose, or ragged clothing will not be worn when working near or with moving machinery.
7. Jewelry such as rings, watchbands, necklaces, earrings, or the like can cause or contribute to accidents. Loose, dangling jewelry will not be allowed.
8. In situations where an employee may be exposed to hazardous materials, such as corrosives, fire, toxins, irritants, heat, or sensitizers, the task will be evaluated and the employee will wear the appropriate clothing for the hazard identified.

9. All employees or contractors working on site controlled by Geosyntec with a potential to use respiratory protection (for normal as well as emergency escape purposes) must be shaved and shall not have facial hair (long mustache, long side burns, beard) that can affect sealing of respiratory protection equipment.

### 3.12 High-Visibility Vests – Communication

1. Fluorescent safety vests, or other approved high-visibility clothing made with reflecting orange, white, or yellow materials meeting ANSI and/or other regulatory agency specifications, are mandatory when working around heavy equipment and vehicular traffic. The reflecting material must be visible from all angles (360 degrees).

2. High-visibility vests are also required while working in and near traffic areas and in remote areas (e.g., working near and/or adjacent to hunting grounds).

Exception: Workers may be exempt from wearing high-visibility safety vests if a hazard assessment prepared for a specific task determines that wearing such gear may introduce additional hazards (e.g., loose clothing/polyester materials). Examples of these tasks may include, but are not limited to, work involving rotating tools/equipment and open flame or spark-producing activities such as welding, cutting, or grinding.

### 3.13 Safety Equipment for Respiratory Protection, Elevated Work, Confined Space Entry, Electrical Safety, Work Over Water, Etc.

Please refer to the respective H&S SOP(s) to review the PPE requirements.

## 4.0 STORAGE AND MAINTENANCE

### 4.1 Personal Items

The following PPE items will be obtained by the individual users, with costs reimbursed based on the condition and safe operating use of PPE. The employee's supervisor will approve new purchases of required PPE by the employee to include:

- Safety-toed boots.
- Prescription Safety Glasses.

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any equipment which becomes unserviceable shall be replaced by the employee, subject to reimbursement in accordance with Geosyntec's PPE Allowance criteria.

### 4.2 Individually Issued Items

The following PPE items will be issued individually to each worker, or will be obtained by each worker at Geosyntec expense for their personal use:

- Hard hat.
- Non-Prescription Safety Glasses.
- Safety-toed boots (rubber).
- Respiratory Protection.
- Ear Muffs/ear plugs.

- Cold weather gear (NOTE: All items must be approved for purchase through the employee's Branch or Department Manager prior to purchase).

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any problems should be identified to the site safety officer immediately so that replacements can be arranged.

Except for personal issue items, all other PPE will be stored onsite and issued to workers as required for use. This includes:

- Work coveralls.
- Chemically-protective outer coveralls.
- Leather and chemically-protective gloves.
- Face shields.
- Fall protection equipment.
- Specialized safety equipment.

All central issue equipment will be maintained in a clean, dry condition.

### 4.3 Inspection

Prior to use of any safety equipment (individual issue or centrally stored) personnel must inspect each piece to ensure that it is in good working order. Equipment exhibiting any signs of wear or damage will be immediately placed out of service and repaired/replaced.

## 5.0 REFERENCES

HS 109 US – Hearing Conservation Program
HS 112 US – Respiratory Protection Program
HS 115 US – Hazard Communication/Globally Harmonized System Program

## 6.0 ATTACHMENTS

Attachment 1 – PPE Hazard Hazard Analysis

## ATTACHMENT 1- PERSONAL PROTECTIVE EQUIPMENT HAZARD ANALYSIS

1. **Job Title(s):** This hazard analysis describes the tasks and required personal protective equipment for the following job titles:
   - ■
   - ■
   - ■
   - ■
   - ■

2. **Description of Tasks:** The tasks performed by personal in the above job titles include:
   - ■
   - ■
   - ■
   - ■
   - ■

3. **Potential Hazards and PPE Selection. (See List of Potential Hazards for assistance)**

| TASK | POTENTIAL HAZARDS (1) | PPE SELECTION |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

(1) Refer to attached list for a list of potential hazards to consider.

Signature of certifying Project Manager those tasks are accurately described.

_____

Signature Date

Print Name: _____

## LISTS OF POTENTIAL HAZARDS

| | *POTENTIAL HAZARDS* |
|---|---|
| **HEAD** | **Falling overhead objects** |
| | **Spark contact** |
| | **Chemical contamination** |
| | **Cold/heat** |
| | **Electrical (>600 volts)** |
| | |
| **HANDS** | **Cut, puncture, abrasions** |
| | **Burns** |
| | **Dermatitis** |
| | **Chemical absorption** |
| | **Cold** |
| | |
| **FEET** | **Falling or rolling objects** |
| | **Chemical absorption** |
| | **Dermatitis** |
| | **Burns** |
| | **Cold** |
| | **Slips, trips** |
| | |
| **FACE** | **Burns (chemical, spark, UV radiation)** |
| | **Chemical splashing** |
| | **Flying particulates** |
| | **Abrasions, cuts** |
| | |
| **EYES** | **Burns (gas, liquid, spark)** |
| | **Abrasions-flying particulates** |
| | **Absorption** |
| | **Retinal/corneal damage (UV/IR radiation)** |
| | |
| **EARS** | **Noise** |
| | **Cold/Heat/Liquids** |
| | |
| **FULL BODY** | **Chemical splashing** |
| | **Burns (chemical, UV radiation)** |
| | **Absorption** |
| | **Spark contact** |
| | **cuts/abrasions/punctures** |
| | **Heat/cold stress** |
| | |
| **MISCELLANEOUS** | **Insects (ticks, spiders, mosquitoes, bees/wasps)** |
| | **Animals (dogs, bears, wild boars, raccoons)** |
| | **Reptiles (snakes)** |
| | **Poisonous plants (poison ivy, sumac, poison oak)** |
| | **Biological (fungus, bacteria, fungus, viral)** |

# US Health & Safety Procedures

## The Globally Harmonized System for Hazard Communication

This procedure applies to all U.S-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved in writing, by the HS Director.

## 1.0 PURPOSE

The purpose of this program is to ensure that the potential hazards posed by all hazardous substances in the workplace are communicated to Geosyntec employees and subcontractors. Additionally, this program will aid in complying with the Hazard Communication Standard as it now exists. The Globally Harmonized System (GHS) for Hazard Communication was designed to replace all the diverse classification systems and present one universal standard which all countries should follow. The system provides the infrastructure for participating countries to implement a hazard classification and communication system.

## 2.0 SCOPE

The requirements defined in this program apply to all Geosyntec facilities, projects, employees, and subcontractors which receive, use, handle, store, transport, or distribute hazardous substances. This program does not apply to the following:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by RCRA, when subject to regulations issued by the USEPA.
- Tobacco or tobacco products.
- Wood or wood products.
- Articles.
- Food, drugs, cosmetics, or alcoholic beverages packaged for sale to customers.
- Food, drugs, or cosmetics intended for personal use.
- Any consumer product or hazardous substance as defined by the Consumer Product Safety Act and Federal Hazardous Substance Act when used in the workplace in the same manner as normal consumer use.
- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when sold in final form for patient use.

The labeling requirements defined in this program do not apply to the following when regulated by Federal requirements other than 29 CFR 1910.1200 (OSHA GHS for Hazard Communication Standard).

- Pesticides as defined by the Federal Insecticide, Fungicide, and Rodenticide Act.
- Food, drugs, cosmetics, or veterinary devices as defined by the Federal Food, Drug, and Cosmetic Act.
- Alcoholic beverages as defined by the Federal Alcohol Administration Act.
- Consumer products or hazardous substances defined by the Consumer Product Safety Act and Federal Hazardous Substance Act.

## 3.0 DEFINITIONS

"**Article**" means a manufactured item: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which does not release, or otherwise result in exposure to a hazardous substance under normal conditions of use.

**"Classification"** means to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous, and the degree of hazard where appropriate, by comparing the data with the criteria for health and physical hazards.

**"Consumer Product"** means any product intended for sale/use to the general public that is used in the same manner and frequency as a consumer. For example, motor oil purchased in quart containers used to service an Geosyntec vehicle will be considered a consumer product as long as it is used in the frequency (approx. once every 2-3 months) and manner (to change/add oil to a motor vehicle) as intended for consumer use. However, if the project/facility employee's a mechanic that uses the motor oil on a more frequent basis (i.e. as part of her/his normal job) then the motor oil will NOT be considered a consumer product.

"**Container**" means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous substance. For purposes of this procedure, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

"**Exposure**" or "exposed" means that an employee is subjected to a hazardous substance in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.) and includes potential (e.g., accidental or possible) exposure.

"**Foreseeable Emergency**" means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous substance into the workplace.

"**Hazardous Substance**" means any substance, not excluded by section 2.0 of this procedure, which is a physical hazard or a health hazard.

**"Hazard Category**" means the division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include 4 hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

**"Hazard Class"** means the nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.

**"Hazard Statement"** means a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.

**"Hazardous Chemical"** means any chemical which is classified as a physical hazard or a health hazard, or an unclassified hazard as defined in this section.

**"Health Hazard"** means a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in **Appendix A** to §1910.1200 -- Health Hazard Criteria.

"**Immediate Use**" means that the hazardous substance will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

“**Label**” means an appropriate group of written, printed or graphic information elements concerning a hazardous product, selected as relevant to the target sector(s) that is affixed to, printed on, or attached to the immediate container of a hazardous product, or to the outside packaging of a hazardous product.

**“Label Element”** means one type of information that has been harmonized for use in a label, e.g., pictogram, signal word.

**“Mixture”** means a mixture or a solution composed of two or more substances in which they do not react.

"**Physical Hazard**" means a substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water reactive.

**“Pictogram”** means a graphical composition that may include a symbol plus other graphic elements, such as a border, background pattern or color that is intended to convey specific information.

**“Precautionary Statement”** means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.

**“Product Identifier”** means the name or number used for a hazardous product on a label or in the SDS. It provides a unique means by which the product user can identify the substance or mixture within the particular use setting (e.g. transport, consumer or workplace).

"**Safety Data Sheets (SDS**)" means any technical data sheets which contain chemical identities, physical and chemical characteristics, physical hazards, health hazards, primary routes of entry, OSHA permissible exposure limits (whether chemical is listed as a carcinogen), precautions for safe handling and use, applicable control measures, emergency and first aid procedures, date of SDS preparation, and name, address, and telephone number of manufacturer or importer. If no relevant information is found for any given section on the SDS, that section shall not be left blank. It should be marked to indicate that it is not applicable or that no information was found.

**“Signal Words”** means the words “Danger" or "Warning" will be used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category. Some lower level hazard categories do not use signal words. Only one signal word corresponding to the class of the most severe hazard should be used on a label.

“**Symbols”** means (GHS hazard pictograms): that convey health, physical and environmental hazard information, assigned to a GHS hazard class and category. Pictograms include the harmonized hazard symbols plus other graphic elements, such as borders, background patterns or covers and substances which have target organ toxicity. Also, harmful chemicals and irritants are marked with an exclamation mark, replacing the European saltire. Pictograms will have a black symbol on a white background with a red diamond frame. For transport, pictograms will have the background, symbol and colors currently used in the UN Recommendations on the Transport of Dangerous Goods. Where a transport pictogram appears, the GHS pictogram for the same hazard should not appear.

"**Work Area**" means a room or defined space in a workplace where hazardous substances are produced or used, and where employees are present.

"**Workplace**" means an establishment, job site, or project, at one geographical location containing one or more work areas.

## 4.0 PROCEDURE

### 4.1 Designation of a Responsible Person

Each Geosyntec office and project will have an identified *Responsible Person* who will implement the requirements of the GHS for Hazard Communication Program.

- For each office, the Section Manager will appoint the Responsible Person, in writing.
- For each project, the Project Manager (or designated subordinate) will be assigned the duties for the Responsible Person.

### 4.2 Hazardous Substance Inventory (HSI)

All hazardous substances found in a particular workplace shall be listed on a Hazardous Substance Inventory (HSI). The HSI will be reviewed at least annually. New hazardous substances entering a workplace (e.g., project-specific materials) shall be added to the HSI upon receiving and reviewing the SDS. The HSI includes the following information:

- Product name.
- Chemical name (if different from product name).
- Manufacturer's name.
- Approximate typical quantity.
- Location of substance (i.e., work area).
- Description of use.

An example HSI format is provided as **Attachment 1**. A copy of the most current HSI, along with the corresponding SDS and a copy of this program (or site-specific program), will be available for review by all employees. The name of the material (product or chemical) on the HSI must be consistent with the SDS for that material.

### 4.3 Safety Data Sheets

The GHS for Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, OSHA will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

**Section 1, Identification** includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

**Section 2, Hazard(s) Identification** includes all hazards regarding the chemical; required label elements.

**Section 3, Composition/ Information on Ingredients** includes information on chemical ingredients; trade secret claims.

**Section 4, First Aid Measures** includes important symptoms/ effects, acute, delayed; required treatment.

**Section 5, Fire-Fighting Measures** lists suitable extinguishing techniques, equipment; chemical hazards from fire.

**Section 6, Accidental Release Measures** lists emergency procedures; protective equipment; proper methods of containment and cleanup.

**Section 7, Handling and Storage** lists precautions for safe handling and storage, including incompatibilities.

**Section 8, Exposure Controls/Personal Protection** lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

**Section 9, Physical and Chemical Properties** lists the chemical's characteristics.

**Section 10, Stability and Reactivity** lists chemical stability and possibility of hazardous reactions.

**Section 11, Toxicological Information** includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

**Section 12, Ecological Information***

**Section 13, Disposal Considerations***

**Section 14, Transport Information***

**Section 15, Regulatory Information***

**Section 16, Other Information,** includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15(29 CFR 1910.1200(g)(2)).

Geosyntec does not manufacture, package or distribute hazardous commodities. However, as an end user, Geosyntec must maintain hazard documentation for each hazardous substance used on each job site. This documentation will take the form of a listing of all onsite hazardous substances, and copies of manufacturer-developed Materials Safety Data Sheets (SDSs) for each listed item.

A SDS shall be available for every hazardous substance used or stored on each job site (this does not include SDSs for known or suspected environmental contaminants, the hazards of which are addressed on project-specific HS documentation). Copies of all SDSs will be maintained onsite in either a dedicated folder/binder, or as part of the project-specific HS documentation. All site personnel will be briefed as to the location of the SDSs, and will have immediate access to examine any SDS at any time during their work shift.

SDSs received for consumer products, articles and other materials not covered by this procedure will be maintained and made available to employees.

For on-going projects, each SDS associated with a material no longer in use will be marked as obsolete and the date it was obsolete. At the completion of any project the accumulated SDSs will be maintained as part of the project records. **NO SDS ASSOCIATED WITH ANY PROJECT WILL BE DESTROYED**.

Employees are required to report any hazardous substance found at the project site that is not on the list of hazardous substances. The report is to be made to the project/site manager.

If no SDS accompanies a hazardous substance, the manufacturer, distributor, or importer will be immediately notified and requested to provide one as soon as possible. The request will be documented in a letter or telephone log. If this request is not honored, the H&S Department will be notified.

**Employers must ensure that SDSs are readily accessible to employees.**

For more information: www.osha.gov when purchasing hazardous substances, the verbal or written purchase order will request an SDS be sent with the shipment. For each facility and/or project, the SDS will be kept in a location that is readily accessible to all employees at all times during their work periods. Additionally, the SDSs and HSI will be available to employees for review in such a way so that the assistance of a supervisor is not necessary.

### 4.3.1 New Information

Whenever a new or revised SDS is received, such information shall be provided to employees on a timely basis not to exceed 30 days after receipt.

## 4.4 Training

### 4.4.1 GHS-GHS for Hazard Communication Course Content – General Training

Due to the nature of our business, the information and training provided to Geosyntec employees with regard to GHS for Hazard Communication will take two forms: general and specific. General training and information will include the following:

- The elements and requirements of the OSHA GHS for Hazard Communication standard (29 CFR 1910.1200).
- Tasks and operations where hazardous substances are present.
- The location and availability of the written GHS for Hazard Communication Program, including the list(s) of hazardous substances and SDSs.
- The methods and observations that may be used to detect the presence or release of a hazardous substance, such as personal and area monitoring, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.
- The physical and health hazards of the substances in the work area, and the measures they can take to protect themselves from these hazards, including specific procedures implemented for the project or shop to protect employees from exposure to hazardous substances, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
- The project- or shop-specific details of the GHS for Hazard Communication Program, including an explanation of the labeling system and the SDSs, and how employees can obtain and use the appropriate hazard information.
- Information regarding hazardous substances to which employees may be exposed, according to the provisions of the OSHA GHS for Hazard Communication standard.
- Information for their physician to receive regarding hazardous substances to which the employee may be exposed according to provisions of this section.
- Freedom from discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act.

### 4.4.2 Facility-Specific GHS for Hazard Communication Training

Specific information regarding safe handling and use of hazardous materials found on the HSI will be presented during site specific training programs. This training may be for specific hazardous materials or for groups of hazardous substances, including flammable/combustible liquids, compressed gases, organic solvents, corrosives, and toxic metals. Additional specific training will be provided to the affected employees any time a new hazardous substance is introduced into the workplace (e.g., project specific substances) and/or when an employee is reassigned. All training conducted will be documented and copies of the documentation included in the permanent project files.

### 4.4.3 Training Records

The minimum required information required to be maintained at the job site or project is as follows:

- Training agenda.
- Name of attendees.
- Signature of attendees.
- Date and duration of training.
- List of any audio visual aids used.
- Name & Signature of instructor.
- Project or facility (specific training only).
- Copies of any tests and/or quizzes.

### 4.5 GHS Labels

#### 4.5.1 General

All hazardous substances received from outside suppliers will conform to legal requirements and display on each container, as a minimum, the following:

GHS safety labels have six standardized elements:

1. Product Identifier – Must match product identifier on safety data sheet.
2. Manufacturer Contact Information – Including name, phone number, and address.
3. Hazard Pictograms – New label elements that may require color printers.
4. Signal Word – Either DANGER or WARNING depending upon hazard severity.
5. Hazard Statements – Standardized sentences that describes the level of the hazards.
6. Precautionary Statements – Steps employees can take to protect themselves.

Stationary process containers may have signs, placards, process sheets, batch tickets, operating procedures, or other written material in lieu of fixed labels on the containers, as long as the alternative method conveys hazard information. The written materials will be readily accessible to the employees in the work area.

- Containers of hazardous substances transferred from labeled containers and not intended for the immediate use of the employee performing the transfer must be labeled in accordance with a hazardous materials identification system or an equivalent commercial system.
- Labels on incoming containers will not be removed or defaced.
- Labels or other forms of warning will be legible, in English, and prominently displayed on the containers, or readily available throughout each work shift.
- Container size is not the determining factor in deciding if a label is required; ALL containers of hazardous chemicals must be labeled.

#### 4.5.2 GHS Label Elements



One of the new symbols implemented by the GHS

The standardized label elements included in the GHS are:

**"Symbols"** means (GHS hazard pictograms): that convey health, physical and environmental hazard information, assigned to a GHS hazard class and category. Pictograms include the harmonized hazard symbols plus other graphic elements, such as borders, background patterns or covers and substances which have target organ toxicity. Also, harmful chemicals and irritants are marked with an exclamation mark, replacing the European saltire. Pictograms will have a black symbol on a white background with a red diamond frame. For transport, pictograms will have the background, symbol and colors currently used in the *UN Recommendations on the Transport of Dangerous Goods*. Where a transport pictogram appears, the GHS pictogram for the same hazard should not appear.

**"Signal Words"** means "Danger" or "Warning" will be used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category. Some lower level hazard categories do not use signal words. Only one signal word corresponding to the class of the most severe hazard should be used on a label.

**"Hazard Statements**" means standard phrases assigned to a hazard class and category that describe the nature of the hazard. An appropriate statement for each GHS hazard should be included on the label for products possessing more than one hazard.

Additional label elements in the GHS are:

**"Precautionary Statements**" means measures to minimize or prevent adverse effects. There are four types of precautionary statements covering: prevention, response in cases of accidental spillage or exposure, storage, and disposal. The precautionary statements are linked to each GHS hazard statement and type of hazard.

**"Product Identifier"** means (ingredient disclosure): Name or number used for a hazardous product on a label or in the SDS. The GHS label for a substance should include the chemical identity of the substance. For mixtures, the label should include the chemical identities of all ingredients that contribute to acute toxicity, skin corrosion or serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensitization, or Target Organ Systemic Toxicity (TOST), when these hazards appear on the label.

**Supplier identification**: The name, address and telephone number should be provided on the label.

**Supplemental information**: Non-harmonized information on the container of a hazardous product that is not required or specified under the GHS. Supplemental information may be used to provide further detail that does not contradict or cast doubt on the validity of the standardized hazard information.

### 4.5.3 GHS Label Format

The GHS includes directions for application of the GHS for Hazard Communication elements on the label. In particular, it specifies for each hazard, and for each class within the hazard, what signal word, pictogram, and hazard statement should be used. The GHS hazard pictograms signal words and hazard statements should be located together on the label.

### 4.5.4 Pipes / Vessel Labeling

All pipes or piping systems in a treatment system, and all process vessels containing hazardous substances, must be labeled or color coded using facility specific color coding for which all affected

employees have been trained. The Project Manager (PM) is responsible for ensuring that this is accomplished at each project site.

### 4.5.5 User

Each user shall ensure that each container of hazardous substances in the workplace is labeled, tagged, or marked with the following information:

- Identity of the hazardous substance(s) contained therein, and
- Appropriate hazard warnings.

### 4.5.6 Receiving

Employees receiving shipments of hazardous substances shall not accept the shipment, but return it to the shipper, if the containers are not properly labeled with the following information:

- Identity of the hazardous substance(s);
- Appropriate hazard warnings; and
- Name and address of the manufacturer, importer, or other responsible party.

## 4.6 Trade Secrets

### 4.6.1 Non-Emergency Access to Trade Secret Information

Each Responsible Person who obtains an SDS that claims trade secret information shall forward a copy of that SDS to the H&S Director. The HS Director will submit a written request to the supplier explaining that the information is needed for one or more of the following reasons, as applicable:

- To classify the hazards of the substances to which employees may be exposed.
- To guide appropriate sampling of the workplace atmosphere to determine employee exposure levels.
- To conduct pre-assignment or periodic medical surveillance of exposed employees;
- To provide medical treatment to exposed employees.
- To guide the selection of appropriate personal protective equipment for exposed employees;
- To guide the development of appropriate engineering controls or other protective measures for exposed employees; and
- To conduct studies to determine the health effects of exposure.

The request includes an agreement to protect the confidentiality of the disclosed information with assurance that the trade secret information will not be used for any purpose other than classifying health hazards.

The H&S Director will provide such information as necessary to coordinate an industrial hygiene evaluation of employee exposures. If this involves releasing trade secret information, the HS Director will sign a nondisclosure agreement before receiving such information.

Employees working with materials protected by a trade secret have access to the SDS, which does not have protected information.

### 4.6.2 Emergency Access to Trade Secret Information

Emergency access to trade secret information is provided through the H&S Director and Geosyntec's Occupational Physician. Where a physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous substance is necessary for emergency or first-aid treatment, the H&S Director shall request that the manufacturer, importer, or other supplier

immediately disclose the specific chemical identity of a trade secret substance, regardless of the existence of a written statement of need or a confidentiality agreement. The manufacturer, importer, or other supplier may require a written statement of need and confidentiality agreement, in accordance with the provisions of OSHA's GHS for Hazard Communication standard, as soon as circumstances permit.

### 4.7 Visitors

#### 4.7.1 Escorted Visitors

Visitors to the work area who have not received a GHS for Hazard Communication briefing on the substances present in the work area must be escorted the entire time they are in the work area to ensure that they do not contact and are not harmed by the hazardous substances.

#### 4.7.2 Unescorted Visitors

The supervisor must ensure all visitors who enter the work area unescorted receive a GHS for Hazard Communication briefing before encountering any of the hazardous substances in the work area.

#### 4.7.3 Subcontractors

All Geosyntec subcontractors will be required to provide a copy of their written GHS for Hazard Communication program and documentation of training to the Geosyntec project manager. This information will be maintained in the permanent project file. In the event that a subcontractor does not have a written program and/or the employees do not have the appropriate training, the situation must be rectified prior to allowing subcontractor employees to perform work activities in a work area containing a hazardous substance.

#### 4.7.4 Multi-Employer Worksites

In order to inform contractors of the hazardous substances that their employee's may be exposed to which are under the control of Geosyntec, a copy of the HSI and applicable SDSs will be made available to them. This may be accomplished by providing the contractor with direct access to the existing Geosyntec file or by providing them with copies of the necessary information. Additionally, the Geosyntec Project Manager will request a list of hazardous substances, with their location, and SDSs for those items which Geosyntec employees may be exposed. This request will be made from the client, any Geosyntec subcontractors, and any other client contractors which may impact Geosyntec operations. The response to this request shall be covered in the project specific training and maintained along with the Geosyntec HSI and SDSs.

### 4.8 Written Program

#### 4.8.1 GHS for Hazard Communication in Health and Safety Plans

All Health and Safety Plans or equivalent documents written for projects will contain all the elements of the GHS for Hazard Communication Program. SDSs for hazardous substances at the project site will also be included.

#### 4.8.2 Location-Specific GHS for Hazard Communication Programs

Each Geosyntec location where hazardous substances are present shall develop a GHS for Hazard Communication Program in accordance with OSHA's GHS for Hazard Communication regulation, this procedure, and location-specific work rules. The location-specific GHS for Hazard Communication Program must address all elements outlined in **Attachment 2** of this procedure and be in writing. In addition, certain state regulatory provisions require additional information to be included in a GHS for

Hazard Communication program. These state-specific requirements must be identified by the project/office manager and included in the final program.

**Attachment 2** is a template that can be used in developing facility specific GHS for Hazard Communication Programs. While the template is not mandatory, all elements addressed in Attachment 2 must be included in all final programs.

## 5.0 PROCUREMENT

No hazardous substance may be purchased for use on a Geosyntec-managed job site unless it:

- Is accompanied by a copy of the item's SDS (unless already on file on the job site)
- Is packaged with proper hazardous commodity hazard warning labels affixed to each container.

All hazardous substances, even those purchased at local stores, must be accompanied with a SDS. If a vendor cannot provide a SDS at the time of procurement, the material should not be purchased.

## ATTACHMENTS

Attachment 1 – Hazardous Material Inventory Template
Attachment 2 – GHS for Hazard Communication Program Template

# Attachment 1: Hazardous Material Inventory

| Product Name | Chemical Name | Manufacturer | Quantity | Location | Usage[1] |
|---|---|---|---|---|---|
| OVM/HNu Calibration Gas (Isobutylene in Air) | 100 ppm isobutylene in air | Varies (MSA, Scott Specialty Products, others) | ≤300 $ft^3$ | Varies (usually stored in site trailer or with other compressed gases) | D, B |
| LEL/$O_2$ Calibration Gas (Pentane and Oxygen in Nitrogen) | 0.75% pentane and 15% oxygen in balance nitrogen | Varies (MSA, Scott Specialty Products, others) | ≤300 $ft^3$ | Varies (usually stored in site trailer or with other compressed gases) | D, B |
| OVA Calibration Gas (Methane in Air) | 100 ppm methane in air | Varies (MSA, Scott Specialty Products, others) | ≤300 $ft^3$ | Varies (usually stored in site trailer or with other compressed gases) | D, B |
| Hydrogen Gas | 99.9999% hydrogen gas | Varies (check with Site Manager or HSSO) | ≤300 $ft^3$ | Varies (usually stored outside of site trailer with other compressed gas cylinders) | O, B |
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| | | | | | |

[1] Usage Legend

| | |
|---|---|
| D = Daily | F = Field; I = In-House; B= Both; S = Storage |
| O =Occasionally | |

# Attachment 2: GHS for Hazard Communication Program Template

Site Name: _____

Location: _____

1. The individual with overall responsibility for the implementation of this GHS for Hazard Communication Program at this site is: _____

   Responsibilities of key staff and employees with regards to GHS for Hazard Communication program at this will be as follows:

   a. Project Manager is responsible for:

   b. Operations Manager/Area Supervisors are responsible for:

   c. Individual employees are responsible for:

2. Inventory of hazardous substances is attached and also located:

   _____

3. Safety Data Sheets (SDSs) for all hazardous substances are located at:

   _____

4. Employees may review SDSs and the standard by following this procedure:

   _____

   _____

   SDSs not on hand that are requested by employees will be requested of suppliers within 7 days by letter.

5. The SDS file is updated with new information and new hazards identified by: _____, every _____weeks.

   Out of date or missing SDS are obtained and maintained in the files by: _____ within _____ days of the review.

6. Any new hazards will be reported immediately to: _____

   _____ and affected employees notified within 30 days.

7 Containers of hazardous materials entering the site will be checked by _____

   _____ to assure that they are properly labeled with the chemical name of the contents, the appropriate hazard warning, and the name and address of the supplier or manufacturer.

8. Onsite containers of hazardous materials will be labeled with the chemical name and hazard warning. Exceptions must be approved by _____

   _____

   The following exceptions have been approved

   - 
   - 

9. Non-routine tasks at this location involving hazardous materials may include the following:

## Attachment 2: GHS for Hazard Communication Program Template

Procedures for complying with the GHS for Hazard Communication Standard for these jobs are the following:

- 
- 
- 

10. Employee training is provided initially to all employees and for all new employees. This training covers the following areas:
    a. The basic requirements of the GHS for Hazard Communication Standard and their right to information on chemical hazards.
    b. Our company's program to comply with the standards and procedures to follow to see the standard, company program, and SDSs.
    c. How to interpret and use the labels on containers of hazardous materials.
    d. The potential physical hazards and health effects of the hazardous substances and how to use SDSs for more information.
    e. How to handle the hazardous substances safely and other protective measures in place.
    f. What to do in an emergency, release, or over-exposure to the chemicals.
    g. How the presence of hazardous chemicals can be detected in the work area.
11. This training is documented in the following manner: _____

    _____

    Records are maintained at the following location: _____

    _____
12. Training concerning new hazards (new chemicals or new information on SDSs) will be provided within 30 days and documented.
13. Periodic refresher training will be provided and documented as follows:

    - 
    - 

14. Outside employees (subcontractors and visitors) will be advised of chemical hazards at our site in the following manner: _____

    _____

    Contractors will be required to provide information on any chemicals used at this site as a condition of their contract.
15. An internal review or audit of GHS for Hazard Communication program is conducted by _____ every _____ months and results of audit are maintained at _____ for review.

Our company relies on the information contained in SDSs as permitted by the OSHA GHS for Hazard Communication Standard and does not perform independent hazard determinations.

Reviewed and approved:

_____ _____
H&S Department Date

_____ _____
Project Manager Date

| Geosyntec consultants<br>**Health, and Safety Procedure** | PROCEDURE NO. HS 202<br>DATE January 2020<br>PREVIOUS February 2014 |
|---|---|
| **Safety Meetings** | |

## 1.0 PURPOSE/SCOPE

This procedure will provide general guidelines on the type, content, and information to be communicated to employees during safety meetings and site safety training. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company" unless the use of an alternate procedure prepared specifically for/by a subsidiary has been endorsed by the Director of H&S.

## 2.0 PROJECT INITIATION/KICK-OFF

Where specified in the project-specific HS documentation, a kick-off safety meeting will be conducted prior to the start of field operations, and will involve representatives of all organizations working on the job site. Topics for this meeting will include:

- Communication of all on site H&S responsibilities and authority.
- Communication of organizational H&S performance expectations.
- Identification of significant project H&S issues/hazards and solutions.

## 3.0 ON-SITE MEETINGS

Safety meetings will be conducted at all job sites for the following operational milestones:

1. Project Start-up: On the first day of field operations for a new project or a new phase of work.
2. Periodic: On a regular, recurring frequency of not less than once per week (daily meetings are required for HAZWOPER activities per 29CFR1910.120 and H&S Procedure 301).
3. Significant Personnel Turn-over: The start of any workday where a new organization begins work on site or more than 25 percent of the day's work force is new to the site.
4. Accident Recovery: The start of the work day following any accident which results in more than $1000 dollars in property damage, an environmental release and/or issue, or where an injury to one or more personnel requires medical treatment (discuss the accident, its causes and preventive measures).

The meetings will be documented on the *Tailgate Safety Meeting Sign-In Log* (Attachment 1).

## 4.0 SUPPLEMENTAL SAFETY TRAINING

The Project Manager (PM), Site Supervisor (SS) or Site Safety Officer (SSO) will implement worker training on general safety topics as part of routine on-site training activities. Where such training is conducted it will be documented on the *Safety Training Log* (Attachment 2).

## 5.0 SITE ORIENTATIONS

1. All project employees will receive a safety orientation and training prior to the start of any project and/or task.
2. The PM, SS or SSO will perform the orientation and training. The level of training and method for providing orientation and training will consist of the mandatory items listed in Project HASP or the H&S Planning Document and a site-specific orientation that will be based on the project specifics, location of the project, and client requirements. The HS Department can provide examples of previous orientation material for reference.
3. The depth/level of training will be commensurate with the job function(s) to be performed. Site visitors will receive general orientation and task-specific training.
4. At a minimum, initial employee orientation and training will consist of the items listed below:

   * Identification of hazards associated with the individual's job function and responsibilities.

   * Specific safety procedural instruction needed to perform his or her required job function or task.

   *Content of the HASP, Job Safety Analysis (JSA), Task Hazard Analysis (THA), Journey Management Plan (JMP), etc.

   * Additional training for specific job functions will be conducted on an “as-needed” basis.

## 6.0 SAFETY MEETINGS

A safety/kick-off meeting will occur prior to the start of field activities. Safety meetings will be conducted by the PM or SS and supplemented by the supervisors of various crafts (labour, equipment operation, foreman, safety).

1. The purpose of these meetings is to allow the project employees an opportunity to maintain a high degree of safety awareness through timely safety education. This training will be used to discuss specific safety topics and obtain employee feedback.
2. The PM and SSO will monitor safety meetings to ensure that subject matter is properly presented.
3. Topics to be discussed will include safety hazards noted during the week and explanation of job safety procedures unique to the project.
4. Other items open for discussion may include, but are not limited to:
   - Use of employee personal protective equipment and decontamination protocol
   - Project safety rules, safe work practices, and control measures
   - Employee accidents and incident reviews
   - Review of applicable SOPs to job specific activities
5. Safety Briefings will be developed by the PM, SS, or SSO. Meetings will be conducted by the PM, SS, or foreman with support from the HS Department. Subjects may be obtained from the HS Dept.
6. Records of attendance at all employee safety orientation and training provided as part of this procedure will be documented on the Tailgate Safety Briefing Form (attached).

## 7.0 ATTACHMENTS

Attachment 1 – Tailgate Safety Meeting Sign-In Log

Attachment 2 – Safety Training Log

# Geosyntec Tailgate Safety Meeting Sign-In Log

| Briefing Lead By: | Signature: | Date: | Time: |
|---|---|---|---|
| | | | |

| Project name: | Project Number: | Project Contact: |
|---|---|---|
| | | |

| Muster Point: | Nearest Hospital: | First Aid Provider: |
|---|---|---|
| | | |

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the project:**

| | |
|---|---|
| **Scope of Work/Tasks:** | |
| **Hazards:** | |
| **Engineering/ Administrative Controls:** | |
| **PPE:** | |
| **Other:** | |

**Personnel Sign-in List (Geosyntec + Subcontractors)**

| Printed Name and Company | Signature | Printed Name and Company | Signature |
|---|---|---|---|
| 1. | | 5. | |
| 2. | | 6. | |
| 3. | | 7. | |
| 4. | | 8. | |

**End of Day - Tailgate Meeting:**

1. Any hazards found today that were not identified as part of the scope or morning tailgate?
2. Were any Incidents or Good Catches observed today and were they reported?
3. Any additional hazard controls, equipment, or PPE needed for tomorrow to complete the tasks?

Geosyntec
*family of companies*

# Geosyntec
# Safety Training Log

| **Training Conducted By:** | **Signature:** | **Date:** |
|---|---|---|
| **Project name:** | **Project Number:** | **Time:** |

This sign-in log documents the safety training conducted in accordance with Geosyntec requirements as well as other applicable regulatory requirements. Personnel who perform work activities in field/facility environments are required to attend each safety training session and acknowledge receipt of such training prior to a change in site/facility-specific operations or conditions. Additional training topics and/or regulations can be added to address ongoing site/facility operations. The assigned Manager (i.e., project, construction, response, facility, etc.) is instructed to maintain the completed documents at the facility for review for the duration of the project.

**Describe the elements of the training topic below. Use a separate for separate training. This form should be used for specific training (PPE training, Respiratory Protection training, HAZCOM/GHS, etc.)**

**Personnel Sign-in List**

| Printed Name | Signature | Printed Name | Signature |
|---|---|---|---|
| 1. | | 7. | |
| 2. | | 8. | |
| 3. | | 9. | |
| 4. | | 10. | |
| 5. | | 11. | |
| 6. | | 12. | |

## Stop Work Authority

## 1.0 PURPOSE

To recognize the right of all workers on Geosyntec project sites and in Geosyntec workplaces to stop work ("refusal to work"), without reprimand, if they believe, based on reasonable and practicable grounds, that an imminent H&S hazard or risk as defined herein, is likely to endanger them self, a co-worker, a subcontractor employee, a Client representative or visitor, or member of the general public. This Procedure also establishes administrative procedures associated with processing and closure of a formal Stop Work Order.

## 2.0 SCOPE/APPLICABILITY

This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director and Risk Management Committee (RMC).

This Procedure is not intended to require a formal work stoppage in place of normal and typical discourse among Geosyntec staff and subcontractors to discuss workplace hazards and develop appropriate safe work practices and hazard control measures, or to preclude other avenues for submitting a written request for corrective action; it is intended to ensure that workers are not exposed to "imminent" or "undue" hazards, and provide recourse to workers when normal/typical means of resolution through collaboration are not effective or available.

Circumstances for which a valid Stop Work Order may be submitted, include, but are not limited to the following:

- An individual is exposed to an imminent or undue work-related danger or risk, including an employee, subcontractor, client, visitor or member of the general public
- An imminent or undue threat to the environment, facilities, or property.
- Continuing work or equipment usage will result in exposure of other individuals to an imminent hazard, or significant damage, rework, or removal from the project.
- A project, or any segment of the project, is executed improperly or is substantively and critically out of compliance with contract specifications, or where a work area or work practices are not managed or maintained in a safe and healthy manner according to H&S submittals reviewed and accepted by Geosyntec.

Geosyntec's stop-work authority applies to all work locations, employees and subcontractors. All personnel are authorized to stop work if there is an identified unsafe condition with an imminent hazard to which a worker will be exposed.

The regulatory basis for workers' right to refuse work that represents an imminent hazard in North America includes, but may not be limited to:

- Alberta Occupational Health and Safety Act, Section 2, No. 35 "Existence of Imminent Danger", and No. 36 "Where Disciplinary Action Prohibited"

- British Columbia Occupational Health and Safety Regulation, Part 3 “Refusal of Unsafe Work,” Sections 3.12, 3.13, and 3.23 (2) (b)
- Ontario Occupational Health and Safety Act, Part V “Right to Refuse or to Stop Work Where Health or Safety in Danger,” Section 43
- U.S. OSHAct, Part 11(c), and regulation 29 CFR Part 1977.12 “Exercise of any Right Afforded by the [OSH]Act, Section (b)(2)

A Stop Work Order issued by a worker under this H&S Procedure will be without prejudice to any other legal or contractual rights of Geosyntec. Geosyntec reserves right to “stop work” where Geosyntec is responsible for enforcing terms of our contracts, negotiating with Client and/or Subcontractors, and other normal activities associated with execution of work.

Informal stop work interventions to correct minor conditions (e.g., to remind workers to put on their hard hats, safety glasses, parking of Company vehicles, etc.) do not require formal notification, and do not constitute grounds for a formal Stop Work Order, per this Procedure.

## 3.0 DEFINITIONS

**Imminent Danger:** Also termed an “imminent risk” or “imminent hazard;” or “undue risk or hazard;” a danger that is not “normal, or typical” for a work task. An impending or threatening hazard related to a condition, practice, piece of equipment, tool, which represents, if left uncorrected, a likelihood of worker exposure to an undue risk or hazard, with the potential for serious injury to any person, or critical/catastrophic environmental impact or property damage.

**Stop Work Order:** A formal action, documented in **Attachment 1 “Stop Work Order,”** initiated by a worker in which he/she refuses to perform work that represents an imminent or undue hazard or risk, and places the worker or others in danger of harm. A stop-work order may be issued for a specific task, practice, tool or piece of equipment, area within a work area or an entire work area or project site, to the extent necessary to protect affected workers from exposure to an imminent or undue hazard or risk.

## 4.0 PROCEDURES

This section delineates procedures for issuance and processing of a Stop Worker, including documentation of pertinent actions on the written **Stop Work Order**, provided in **Attachment 1**, including actions corresponding to the following Sections of the written Stop Work Order:

- Section 1 - Issuance of a Stop Work Order
- Section 2 - Review for Merit
- Section 3 – Abating the Hazard, Resumption of Work

## 4.1 Issuance of a Stop Work Order

To submit or issue a Stop Work Order, a worker shall first/immediately notifying the worker’s Supervisor/Project Manager of the work stoppage and the reason(s) for the action, followed as soon as possible by filling out **Section 1 “Submittal of a Stop Work Order”** of the written **“Stop Work Order.”** Submit the Stop Work Order, by hard copy or electronically, to the worker’s supervisor/manager, whose subsequent actions shall include:

- Immediately notify senior management directly associated with the organization/project team responsible for the work subject to the stop work order, including, at a minimum, the Project Manager and Branch Manager, and forward copies of the Stop Work Order.
- Immediately notify the Corporate HS, HR and Legal Departments, of the issuance of the Stop Work Order, and forward copies of the written Stop Work Order.
- As considered appropriate for the specific circumstance, investigate and take action, in coordination with operational Managers, HS, HR, and Legal Departments, to mitigate the hazard and/or prevent other workers from performing the work tasks that are the subject of the work stoppage and/or seeking additional information about the circumstance of the Stop Work Order.

- Follow procedures stated herein for documenting and resolving the work stoppage.

Where a subcontractor exercises his/her right to "Stop/Refuse to Work, he/she shall do so by notifying his/her manager/supervisor/employer, who will notify their primary Geosyntec contact(s) for the work. Subsequent activities will be generally in accordance with the principals outlined in this Procedure, with engagement/notification of Corp. HS, HR, Legal, or Contracts Departments, as appropriate for the circumstance.

## 4.2 Review of Stop Work Order for Merit/Justification

A formal "Stop Work Order" may be reviewed for merit by senior managers associated with the work. All decisions shall be in coordination/collaboration with the Corporate HS, HR and Legal Departments. It is the responsibility of the review team to ensure that:

- The employee's right to a safe workplace, and right to refuse work of undue or imminent hazard, are protected under the occupational health and safety regulations and laws applicable in the jurisdiction where with work is located;
- Make a determination as to the merit of the Stop Work Order, or lack thereof, based on current standards of care and due diligence, and in accordance with laws and regulations applicable in the jurisdiction where the work is located.

Findings of the review team shall be documented in Section 2 "Review for Merit," of the Stop Work Order, with information including substantive findings, corrective measures to eliminate/control the subject hazard(s) of the Stop Work Order, names of reviewers, relevant dates, and next steps.

Where the review team has determined that the Stop Work Order has merit and is validated, subsequent actions will be in accordance with the following Section 4.3 "Abating the Hazard and Resumption of Work." Where the review team contests/refutes the validity of the Stop Work Order, subsequent actions will either be resolved by impartial senior managers not directly associated with the project or work, to include Corp. HS HR and Legal Departments, or handled as a formal labor dispute, under direct supervision of Corp Legal and HR departments.

No action by the review team or Geosyntec will interfere with the employee's rights to any subsequent valid/legal course of action, taken in response to the findings of the reviewer team.

## 4.3 Abating the Hazard and Resumption of Work

Actions taken to abate the subject hazard(s) addressed in Sections 1 and 2 of the Stop Work Order, and for the resumption of work after hazard abatement, shall be documented in **Section 3** of the Stop Work Order, **"Resolution of Stop Work Order and Resumption of Work."**

In response to a valid Stop Work Order, in accordance with HS-202-Safety Meetings, work-site personnel affected by the stop work order will be instructed on the corrective actions and preventative measures to be taken in a timely manner. Additional requirements associated with corrective action(s) addressed in HS-104-Inspections, Audits, and Corrective Actions, will also be complied with and discussed with affected personnel.

The stop work order will remain in effect until the responsible organization resolves the problem(s), implements corrective measures, and brings the work area(s) to satisfactory conformance with established H&S requirements and eliminates worker exposures to imminent or undue hazards or risk.

Temporary stabilizing or halting of an imminent danger condition or practice is acceptable, as deemed acceptable to be left unattended/unresolved, and ensuring that no other person is exposed to the imminent or undue hazard. Work associated with the affected area or operation will not resume unless all corrective actions identified in the applicable Stop Work Order have been completed and closed.

If the responsible organization fails to provide resolution or if at any time their acts, or failure to act, cause substantial harm or imminent danger to the health and safety of project employees or the public or the environment, the organization and responsible individuals will be considered in violation of this Procedure.

## 5.0 DOCUMENTATION/RECORDS

Documentation of stop work actions, to include fully executed Stop Work Order, Attachment 1, and other relevant information/documentation generated during execution and closure of the Order, will be maintained by the Corporate HR and HS Departments, and by other Corporate Departments as deemed necessary or appropriate. Copies of the executed/closed written Stop Work Order will be provided to the individual(s) initiating the work stoppage as well as other members of the affected organization(s), including, as appropriate, the Project Manager, Department Manager, Branch Manager, Site Supervisor.

The HS Department will utilize general information associated with the Stop Work Order to communicate any resultant lessons learned or changes in Geosyntec's practices or procedures.

## 6.0 PROTECTION FROM REPRISALS, DISCIPLINARY ACTIONS

Geosyntec prohibits, and will not tolerate, any form of reprisal, reprimand, retribution, or intimidation, or other form of discipline directed at any individual, for exercising their right to refuse unsafe work, subject to the provisions delineated in this Procedure. Individuals failing to follow the directive of a "stop work order," or who reprimand a person, in any way, for exercising his/her right to refuse hazardous work, will be subject to disciplinary action.

## 7.0 TRAINING

Geosyntec employees will be provided training on the right to refuse unsafe work (work stoppage), and on the procedures for refusing unsafe work as part of New Employee Safety Orientation, and in accordance with HS 114 Safety Training Programs. Training on this topic will also be provided periodically during other appropriate worker training/learning/communication opportunities, such as:

- Periodic health and safety training programs
- "Safety Moments" and "Safety Alerts"
- Project specific safety orientations and daily tailgate meetings
- Shared/published "lessons learned" resulting from incident reports and investigations (per HS 101 Incident Reporting, and HS 102 Incident Investigation), or Stop Work Orders issued per this Procedure.

## 8.0 ATTACHMENTS

Attachment 1 – Stop Work Order

## 9.0 REFERENCES

HS 101 US CA- Incident Reporting
HS 102 US CA- Incident Investigation
HS 104 US– Inspections, Audits, and Corrective Actions
HS 114 US CA-Safety Training Programs
HS 202 US– Safety Meetings

# STOP WORK ORDER

| Section 1 – Issuance of a Stop Work Order | | |
|---|---|---|
| Project Name: | Project No: | Date: |
| Project Manager: | Time: | |
| Submitted/Reported By: | | |
| Summary of Hazardous Conditions, Relevant Factors: | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| **Section 2 – Review for Merit** | | |
| Findings; Next Steps: | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Signatures of Review Team: | | |
| | | |
| | | |
| **Section 3 – Resolution of Stop Work Order, Resumption of Work** | | |
| Actions Taken: | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Signatures Confirming Closure of Stop Work Order: | | |

| Title: | Print Name: | Signature: | Date: |
|---|---|---|---|
| **Project Manager** | | | |
| **Party Issuing Stop Work Order:** | | | |
| **Subcontractor Supervisor: (if applicable)** | | | |
| **Others:** | | | |
| | | | |

***HS 203 US: Stop Work Authority***

# US Health & Safety Procedures

## Working on or Near Water and Ice

## 1.0 PURPOSE

To establish the minimum safety requirements for personnel assigned to Geosyntec projects performing sampling, investigations, and support while working on or near water or ice. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

## 2.0 SCOPE

The following guidelines shall be implemented during all work activities that require personnel to work on, near or over water and/or ice (e.g., rivers, lakes, ponds, retention basins, unguarded clarifiers, containment systems, etc.). These guidelines must be communicated to all employees performing operations where the potential for drowning or exposure/immersion in water exists.

## 3.0 PROCEDURE

### 3.1 General Requirements

#### 3.1.1 Training

- Certification Requirements: All boat operators are required to complete a boating safety course and have experience operating a motorized vessel within the past two years.
- Boat safety training and education may be obtained through a recognized outside source such as the United States Coast Guard Auxiliary , Transport Canada---Office of Boating Safety, UK—Boat Safety Scheme (BSS), etc. and/or through local boating safety agencies in Geosyntec respective international location(s).
- Proof of course completion from one of these outside sources must be kept on record. Furthermore, the user may be required to demonstrate boat handling skills.
- Before departure, each passenger not holding certification must be briefed by the certified operator or captain as to the safety equipment and procedures on board the vessel.

#### 3.1.2 Personal Protective Equipment

Operations on/near water may require some or all of the following:

- Coast Guard (US),CE/ISO (UK), 4758(AS) Australia Standard, Safety of Life at Sea (SOLAS) in Malaysia, etc. approved Personal Flotation Device (PFD), sized and adjusted to the wearer, shall be worn by all when danger of drowning exists. To be immediately effective in an overboard situation, the straps must be buckled. Vests shall be reflectorized with a rescue light during night/low light/heavy weather conditions.
- Foul weather gear will be available for use during wet conditions as necessary.
- Gloves of appropriate material.

- Waders (only in shallow waters).
- Rescue line.
- Ring buoys.

### 3.1.3 Transfer Between Boats

Transferring between boats and barges can be dangerous, particularly in rough weather. Be extremely cautious each and every time you make a transfer. NEVER become complacent about this. Getting caught between vessels, even in calm seas, can be deadly.

### 3.1.4 Deck Hazards

Deck hazards are everywhere on vessels/barges. Rigging, wire, fittings, welding, lead, and stored materials are just some of the many trip and snagging hazards. Also watch for slippery decks particularly when muddy, wet, layered with ice or near fuel and lubricant spills. This is especially hazardous during rolling deck conditions.

### 3.1.5 Overhead Hazards

- Overhead hazards are always a threat. NEVER stand under a hanging load, empty bucket hook, or crane boom.
- Crane operators are not allowed to swing loads over other personnel.
- Stand clear of tag lines and other rigging suspended from above.

### 3.1.6 Hazardous Noise

High noise areas should be avoided. Ear plugs and/or muffs will be worn in high noise areas that must be entered or where engineering controls are unable to reduce exposure.

### 3.2 Diving

No Geosyntec employee shall be allowed to “wet dive” or “one atmosphere dive” in any vehicle, bell or suit without being authorized by the H&S Department. This includes self-contained underwater breathing apparatus (SCUBA) and hard hat diving.

### 3.2.1 Weather

- Full account will be given to existing weather conditions and forecast during planning for specific project operations.
- Boat handling will cease when winds reach sustained speed of 20 knots. Launching, recovering, or otherwise handling a boat is unsafe when wind speed reaches 20 knots.

## 4.0 WORKING NEAR WATER/ICE

If work must be performed on, near or over water, the following requirements must be followed:

- Work must be performed in accordance with the “Buddy System.”

- Employees working over or near water, where the danger of drowning exists, shall be provided with an approved PFD (See Section 3.1.2). Type of PFD should be selected by the water conditions present. Prior to and after each use, the PFDs shall be inspected for defects, which would alter their strength or buoyancy. Defective units shall not be used and must be replaced.
- Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- At least one lifesaving skiff/boat shall be immediately available at locations where employees are working over or adjacent to water.
- Whenever possible, minimize the risk to employees avoiding the use of watercraft and instead performing work from the shore/bank. For situations where ice exists, reschedule work to periods of warmer temperatures, when ice is not an issue.
- Avoid wearing waders or hip boots, in deeper waters. They are cumbersome and may encourage workers to go deeper into water than is safe. Only use this apparel in shallow waters (i.e., creek beds).
- If workers have the potential to get stuck in mud or sediment, air injection equipment designed to free workers feet/legs may need to be available onsite. If a worker does get stuck, do not struggle as this causes deeper sinking. Workers should not be permitted to access areas where this hazard exists, especially in locations containing tidal water flow.
- Use a pole to probe ahead to assess water depths and/or stability of shoreline terrain.
- Take special care on slippery rocks around lakeshores, riverbanks and creeks. Always look ahead at the ground when walking around the water's edge.
- If sampling near or in flowing water environments, be aware of slippery or steep banks and fast currents. If the current is fast or the water looks deeper than knee height, do not enter the water. If you must enter the water, a restraining system must be worn and secured to the bank for retrieval.

If work must be performed on ice, the following requirements must be followed:

- Work must be performed in accordance with the "Buddy System" with rescue communications available.
- Do not walk or work on ice unless there is no other way of performing work.
- Whenever possible, use alternate methods. Have personnel use a flat-bottomed boat with ropes (or equivalent) tied to each end and handled by workers on the berm, bank, or shore.
- Only walk on ice that is fully frozen, not cracked or brittle, that will support the necessary weight of workers and associated equipment.
- PFDs shall be inspected and worn in accordance with the requirements listed above.
- Workers must wear a restraining system (a lifeline attached to the front of a full-body harness) and stay close enough to the edge to make it possible for the attendant to pull the individual back on the ice.
- Workers must have available (on their person) equipment that can be used to partially penetrate the ice to help pull them out of the water and back up on the ice (equipment is available with capped ends that can be worn safely until needed).

Gauging the strength of ice is very difficult. There is no such thing as 100% safe ice.

- Never walk or drive on cloudy ice.

- Only go on clear, thick ice.
- Spring ice is **NEVER** safe.
- The thickness of ice is never consistent - it will be flat on top, but not on the bottom.
- Snow on ice acts as an insulator - it makes ice warmer and weaker.
- Extreme cold snaps will weaken the ice.
- Ice formed over running water (rivers & streams) is more dangerous. than ice formed over standing water (lakes & ponds).

General ice thickness guidelines from the various resources outline the following (new, clear ice only):

- Less than 2 inches - **STAY OFF!**
- 4" and thicker - probably safe for walking and ice fishing on foot
- 5" and thicker - probably safe for ATV or snowmobiling
- 8-12" and thicker - probably safe for small cars or light pickups
- 12-15" and thicker - probably safe for medium trucks

### 4.1 Water and Ice Safety Equipment

The safety equipment required to support work on, over or near water and/or ice includes:

- Cell phones (or equivalent) capable of contacting emergency services.
- Approved PFD.
- Ring buoys with at least 90 feet of line.
- Full-body harness with restraining line.
- Lifesaving skiff/boat (as needed) - contact the H&S Department for guidance.
- Air injection equipment designed to free workers feet/legs (if necessary).
- Poles to probe for assessment purposes.
- Capped ice picks, spikes, etc.

## 5.0 ATTACHMENTS

Attachment 1 – Boat Loading and Launching Checklist
Attachment 2 – Daily Float Plan

**ATTACHMENT 1**

# BOAT LAUNCHING & LOADING CHECKLIST

Page 1

**Purpose: The checklist covers loading and unloading boats.**
**The checklist includes vehicle to trailer hook-up and operating boats safely**

**Date:** | **Employee's Name:**

**Title: SAFE BOAT UNLOADING, OPERATING and LOADING**

| **Subject 1: PERSONAL PROTECTIVE EQUIPMENT REQUIRED** | **THA Followed (check)** YES | NO |
|---|---|---|
| **A. Safety Glasses** | | |
| **B. Safety Toe Boots** | | |
| **C. Hard Hats(Required for work, but not necessary while driving or riding boat(s) to and from work site.)** | | |
| **D. Personal Flotation Devices** | | |

| **Subject 2: VEHICLE TO TRAILER HOOK-UP** | | |
|---|---|---|
| **PRE-JOB TASKS:** | | |
| **A. Boat may be equipped with a transom drain plug. Make sure this plug is in place and tight.** | | |
| **B. Inspect the bottom of the boat and make note of all fittings below the waterline. Ensure none are loose or broken.** | | |
| **C. Check boat, motor and trailer for vegetation and remove before launching boat into water.** | | |
| **D. Check gas/oil tank(s) and lines for leaks, frays, cracks and breaks.** | | |
| **PROCEDURE:** | | |
| **A. Check behind the vehicle to make sure that no one or any obstacles are between vehicle and trailer.** | | |
| **B. Back vehicle toward trailer using approximate center of vehicle to align trailer hitch on vehicle with tongue of trailer. Put vehicle in park and set park brakes, and then check for vehicle ball and trailer hitch alignment. Adjust vehicle to desired distance. Put vehicle in park, set parking brake, and shut off engine. (Assistant can help align if available)** | | |
| **C. (1) Check vehicle tube receiver making sure pin and cotter pin are installed through receiver tube.** | | |
| **(2) Check ball on receiver for tightness.** | | |
| **(3) Check ball size (normally stamped on trailer hitch).** | | |
| **(4) Match ball size on vehicle receiver with trailer hitch.** | | |
| **Failure to use correct ball size can cause trailer to come unhitched from vehicle.** | | |
| **D. Remove safety pin from latch on trailer hitch. Latch must be in up position. Slowly lower trailer hitch toward ball, by turning jack handle to lower trailer tongue while aligning ball and hitch. When trailer hitch has bottomed on the ball, push latch down; install the safety pin through the latch.** | | |
| **NOTE: Jack can be used to raise and lower tongue to get the latch to lock.** | | |

**Subject 2: VEHICLE TO TRAILER HOOK-UP (Procedure Continued)**

E. Attach hooks on safety chains from trailer to vehicle hitch where holes are provided, or to vehicle frame. Chains should be crossed (XpedX) from trailer tongue to vehicle frame.

F. Plug trailer lights to vehicle. Ensure all lights are working properly.

G. Attach brake cable (if unit is equipped).

H. Pull pin on jack frame and pivot jack to tow position letting pin return into hole on frame to lock jack.

I. Check that trailer coupler is secure and latched.

J. Check that a safety pin or a lock is in place.

K. Check boat and trailer.

L. Complete Trailer inspection. Ensure that all equipment is present, in good condition and safe to operate.

M. Remove wheel chocks before moving boat trailer.

**Title: SAFE UNLOADING, OPERATING and BOAT LOADING**

**Subject 3: BOAT LAUNCHING**

A. Complete launch preparations while boat is in staging area.

1) Remove safety tie downs from boat to trailer.

2) Drop motor into vertical position. Remove support, if equipped.

3) Install transom drain plug.

4) Unhook trailer wires.

5) Be sure a bow line is fastened to boat.

B. Be sure all required equipment and safety devices are aboard.

1) If there are two people, launch boat with one person on boat (life jacket must be worn). Driver will slowly back the boat trailer down the ramp until the boat can easily float off the trailer. When backing onto the ramp; back to the left if possible. This gives the driver better launching visibility. Driver will place vehicle in park; put on parking brake; and keep one foot on brake pedal. When boat is floating in the water; remove vehicle/trailer from launch ramp and park in the parking area. Set parking brake before leaving vehicle.

2) If one person is launching, after boat is in water place vehicle in park, set parking brake and shut off engine. Place chocks under wheels of towing vehicle. Enter boat (life jacket must be worn) remove from trailer; dock at pier or on shoreline and tie off boat. Remove truck from launch ramp to parking area.

C. When boat is in the water, immediately inspect the motor for leakage. If an oil or gas leak is detected attempt to contain the release if possible, without risking bodily harm. Return the boat to the trailer and contact the area supervisor or the project sponsor. If there is immediate danger; evacuate the area.

**Title: SAFE BOAT UNLOADING, OPERATING and LOADING**

**Subject 3: BOAT LAUNCHING (Continued)**

| | | |
|---|---|---|
| **D. Check the boat for any through-the-hull fittings for sign of leakage into the boat. If any leaks are noted, the boat should be removed from the water immediately for repair.** | | |

**Subject 4: BOAT RULES and REGULATIONS**

| **BOATING and WATER SAFETY RULES** | **YES** | **NO** |
|---|---|---|
| **1. Each occupant (employees, contractors and visitors) aboard any water craft while on water, including boats and barges with standard handrails, must wear an approved personal flotation device.** | | |
| **A. Prior to and after each use, the Personal Floatation Device shall be inspected for defects that might alter their strength or buoyancy. Defective units shall not be used.** | | |
| **2. Each boat, including pontoon boats, shall have on board the following items:** | | |
| **A. A minimum of one Type IV life jacket (or equivalent)** | | |
| **B. One Life Ring Buoy with 90 feet of line (rope attached)** | | |
| **C. A sound device for alerting or alarm, whistle or horn .** | | |
| **D. A minimum of one paddle.** | | |
| **E. One site radio if applicable. (Tested to be sure radio is working properly.)** | | |
| **F. Minimum of one approved fire extinguisher.** | | |
| **Fire extinguisher(s) has current (monthly) inspection.** | | |
| **3. Approved hardhats, safety shoes and eye protection are required while working aboard any craft, not necessary when traveling aboard a boat.** | | |

**BOATING and WATER SAFETY RULES –MISC. Information**

**ATTACHMENT 2**

# DAILY FLOAT PLAN

| | | | | | |
|---|---|---|---|---|---|
| | | | | **Expected Weather Conditions:** | |
| **Name** | **Role** | **Phone No.** | **Signature** | **Description:** | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | **Air Temp:** | |
| | | | | **Water Temp:** | |
| | | | | **High Tide:** | |
| | | | | **Low Tide:** | |
| **Shore Support Personnel** | | | | **Sunrise:** | |
| **Name** | **Role** | **Phone No.** | **Signature** | **Sunset:** | |
| | | | | **Boat Information** | |
| | | | | **Model:** | |
| | | | | **Registration:** | |
| | | | | **Captain:** | |
| | | | | **Model:** | |
| | | | | **Registration:** | |
| | | | | **Captain:** | |

| | |
|---|---|
| **Trip Itinerary** | **Work Areas:** |

**Health and safety meeting prior to starting work.**
**Topics:**

| | | | |
|---|---|---|---|
| **General Timeline** | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| **Specialized Equipment Required** | | | |

**Safety Equipment**

_x_ As specified in HASP

## Manual Hand Tools

### 1.0 PURPOSE

All manually operated hand tools and equipment shall be used, handled, and stored in accordance with the following requirements. This procedure applies to all the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

### 2.0 GENERAL REQUIREMENTS

- Use each tool only for the job it was designed to do.
- Discard damaged or abused tools promptly.
- Buy several versions or sizes of the same tool.
- Inspect for distortion, cracks, chips, wear or mushrooming.
- Keep all tools clean and in working order.
- Be sure handles are fixed firmly to a tool's working end.
- Be sure tools and work mate properly to avoid slippage.
- Handles are made for the tool; never use extensions.
- Confine impact forces to striking and struck tools.
- Hold work in a clamp or vise, not in your hand.
- Start off slowly when engaging the tool and the work.
- Shut current off before using a tool near electricity.
- Make sure the handle sits securely in your hand.
- Keep moving parts lightly lubed; avoid lube leakage.
- Wear approved safety goggles when using hand tools.
- Keep hands away from sharp edges.
- Pull, don't push, a wrench handle for more leverage.
- Position your body securely while working with the tool.
- Keep jaw teeth, cutters and blades sharp for better results.
- Keep tool's moving parts properly cleaned and tightened
- Use steady pressure on jaws and cutters; don't rock the tool.
- Use pads in the jaws to protect soft or crushable work.
- Use a tool close to the vise or clamp.

- Hold work in a clamp or vise with sufficient pressure.
- Keep clamped assemblies away from vibration and bumping.
- Discard a tool instead of repairing it by welding or brazing.
- Keep tools from excessive heat.
- For continuous work, use comfort grips or gloves.
- Follow instructions on the tool and/or package.

## 3.0 TOOL-SPECIFIC REQUIREMENTS

### 3.1 Cutting Tools

- Wear safety glasses and protective gloves when using cutters.
- Choose the proper cutter for the job. Cutters are designed for a specific type, hardness, and size of material.
- Cut materials straight across - keep the material being cut at right angles to the cutting edges of jaws.
- Prevent injury from flying metal by wrapping a burlap bag, cloth or rag around the cutting jaws.
- Warn those in the area to take precautionary measures to avoid possible injury from flying metal pieces.
- Keep cutting tools in good repair.
- Adjust and lubricate cutter and moving parts daily if heavily used.
- Sharpen jaws according to manufacturers' instructions.
- Do not use a cutting tool until you are trained in its proper and safe use.
- Do not use cushion grip handles for jobs requiring electrically-insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- Do not use cutters which are cracked, broken or loose.
- Do not exceed the recommended capacity of a tool.
- Do not cut diagonally.
- Do not rock cutters from side to side when cutting wire.
- Do not pry or twist with tool when cutting.
- Do not hammer on cutting tools or extend the handle length to achieve greater cutting power.
- Do not expose cutters to excessive heat.

### 3.2 Hammers

- Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.
- Choose a hammer with a striking face diameter approximately ½ inch larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).

- Ensure that the head of the hammer is firmly attached to the handle.
- Replace loose, cracked or splintered handles.
- Discard any hammer with mushroomed or chipped face or with cracks in the claw or eye sections.
- Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).
- Look behind and above you before swinging the hammer.
- Watch and focus on the object you are hitting.
- Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.
- Do not use a hammer with a loose or damaged handle.
- Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head.
- Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.
- Do not use a hammer for any purpose for which it was not designed or intended.
- Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.
- Do not redress, grind, weld or reheat-treat a hammer head.
- Do not strike with the side or cheek of the hammer.

### 3.3 Saws

- Saws are made in various shapes and sizes and for many uses. Use the correct saw for the job.
- Wear safety glasses.
- Select a saw of proper shape and size for stock being used.
- Choose a saw handle that keeps your wrist in a natural position in the horizontal plane.
- Choose a saw with a handle opening of at least 5 inches long and 2.5 inches wide and slanted at a 15° angle.
- Check the stock being cut for nails, knots, and other objects that may damage or buckle the saw.
- Start the cut by placing your hand beside the cut mark with your thumb upright and pressing against blade. Start the cut carefully and slowly to prevent blade from jumping. Pull upward until blade bites. Start with a partial cut, and then set the saw at the proper angle.
- Apply pressure on downstroke only.
- Hold stock being cut firmly in place.
- Use a helper, a supporting bench or vise to support long stock if required.
- Keep teeth and blades properly set.
- Protect teeth of saw when not in use.

- Keep saw blades clean.
- Hacksaws:
    - Select correct blade for material being cut.
    - Secure blade with the teeth pointing forward.
    - Keep blade rigid, and frame properly aligned.
    - Cut using strong, steady strokes, directed away from you.
    - Use entire length of blade in each cutting stroke.
    - Use light machine oil on the blade to keep it from overheating and breaking.
    - Cut harder materials more slowly than soft materials.
    - Clamp thin, flat pieces requiring edge cutting.

### 3.4 Pipe Tools (Wrenches, Cutters, Reamers, and Threaders)

- Pipe tools are made in various shapes and sizes and for many uses. Always use the correct tool for the job.
- Select a pipe wrench with sufficient capacity and leverage to do the job.
- Use a pipe wrench to turn or hold a pipe. Never use a pipe wrench to bend, raise or lift a pipe.
- Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.
- Inspect pipe wrenches periodically for worn or unsafe parts and replace them (e.g., check for worn threads on the adjustment ring and movable jaw).
- Keep pipe wrench teeth clean and sharp.
- Face a pipe wrench forward. Turn wrench so pressure is against heel jaw.
- Pull, rather than push on the pipe wrench handle. Maintain a proper stance with feet firmly placed to hold your balance.
- Do not use a pipe wrench as a hammer, or strike a pipe wrench with a hammer.
- Do not use pipe wrenches on nuts and bolts.
- Do not use a pipe extender for extra leverage. Get a larger pipe wrench.
- Replace pipe cutter wheels which are nicked or otherwise damaged.
- Use a 3- or 4-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
- Choose a cutting wheel suitable for cutting the type of pipe material required:
    - Thin wheel for cutting ordinary steel pipe.
    - Stout wheel for cutting cast iron.
    - Other wheels for cutting stainless steel, plastic and other materials.
- Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75% as deep as the thread on the tap.
- Use a proper tap wrench (with a "T" handle) for turning a tap.
- Use lubricant or machine cutting fluid with metals other than cast iron.

- Do not permit chips to clog flutes (groves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning - this may result in the tap breaking if you continue to apply pressure.
- Do not use a conventional adjustable wrench for turning a tap - it will cause uneven pressure on the tap that may cause it to break.
- Do not attempt to thread hardened steel. This can chip or damage the die.
- Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
- Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

### 3.5 Pliers and Wire Cutters

- Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.
- Choose pliers or wire cutters that have a grip span of 2½ - 3½ inches to prevent your palm or fingers from being pinched when the tools are closed.
- Use adjustable pliers that allow you to grip the workpiece firmly while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).
- Use tools only if they are in good condition.
- Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.
- Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the workpiece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.
- Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.
- Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.
- Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.
- Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.
- Do not expose pliers or wire cutters to excessive heat.
- Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
- Do not use pliers as a hammer.
- Do not hammer on pliers or wire cutters to cut wires or bolts.
- Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.
- Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- Do not use pliers on nuts and bolts; use a wrench.

### 3.6 Screwdrivers

- Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.
- Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.
- Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.
- For cross-head screws, use the correct size and type of screwdriver: a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozidriv screwdriver.
- Use a vise or clamp to hold the stock if the piece is small or moves easily.
- Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.
- If work must be carried out on "live" electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.
- Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).
- Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.
- Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.
- Use a screwdriver that incorporates the following features when continuous work is needed:
    - A pistol grip to provide for a straighter wrist and better leverage.
    - A "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
    - A ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.
- File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.
- Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
- Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.
- Do not hold the stock in one hand while using the screwdriver with the other. If the screwdriver slips out of the slot, you may cut your hand.
- Do not hammer screws that cannot be turned.
- Do not grind the tip to fit another size screw head.

- Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).
- Do not use defective screwdrivers (e.g., ones with rounded or damaged edges or tips; split or broken handles; or bent shafts).
- Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.
- Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.
- Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.
- Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.
- Do not carry screwdrivers in your pockets.

### 3.7 Snips

- Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.
- Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like pliers handles. Models are available for cutting in straight lines and in curves to the left or right.
- Universal snips can cut in both straight and wide curves.
- Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.
- Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.
- Aviation snips have compound leverage that reduces the effort required for cutting.
- Offset snips have jaws that are set at an angle from the handle.
- Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).
- Use only snips that are sharp and in good condition.
- Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.
- Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.
- Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.
- Avoid springing the blades- this results from trying to cut metal that is too thick or heavy for the snips you are using.
- Keep the nut and the pivot bolt properly adjusted at all times.
- Oil the pivot bolt on the snips occasionally.
- Do not try to cut sharp curves with straight cut snips.

- Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.
- Do not hammer or use your foot to exert extra pressure on the cutting edges.
- Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.
- Do not attempt to resharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

### 3.8 Wood Chisels

- Wear safety glasses.
- Wood chisels are made in various shapes and sizes and for many uses. Use the correct chisel for the job.
- Use the right size of chisel for the job.
- Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel.
- Ensure that the cutting edge is sharp. Dull chisels can be difficult to control and require more effort to do the job.
- Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling.
- Clamp stock so it cannot move.
- Adjust your stance so that you do not lose your balance if the tool slips.
- Chip or cut away from yourself.
- Keep your hands and body behind the cutting edge.
- Use a wooden or plastic mallet with a large striking face on all chisels. Only heavy-duty or framing chisels are made of a solid or molded handle that can be struck with a steel hammer.
- Make finishing or paring cuts with hand pressure alone.
- Place chisels safely within the plastic protective caps to cover cutting edges when not in use.
- Replace any chisel that is bent or shows dents, cracks, chips, or excessive wear.
- Store chisels in a "storage roll," a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.
- Replace broken or splintered handles.
- Sharpen cutting edges as often as necessary.
- Do not use a wood chisel as a pry or a wedge.
- Do not use a wood chisel on metal.
- Do not use an all-steel chisel with a mushroomed face or a chipped edge. Redress with a file or whetstone.
- Do not use a grinder to redress heat-treated tools. Use a whetstone.
- Do not use a dull chisel.

### 3.9 Wrenches

- Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.
- Discard any damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).
- Select the correct jaw size to avoid slippage.
- Position your body in a way that will prevent you from losing balance and hurting yourself if the wrench slips or something (e.g., a bolt) suddenly breaks.
- Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.
- Ensure that the jaw of an open-ended wrench is in full contact (fully seated, "flat," not tilted) with the nut or bolt before applying pressure.
- Face an adjustable wrench "forward," adjust tightly, and turn the wrench so pressure is against the permanent or fixed jaw.
- Ensure that the teeth of a pipe wrench are sharp and free of oil and debris and that the pipe or fitting is clean to prevent unexpected slippage and possible injuries.
- Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.
- Support the head of the ratchet wrench when socket extensions are used.
- Pull on a wrench using a slow, steady pull; do not use fast, jerky movements.
- Stand aside when work is done with wrenches overhead.
- Make sure adjustable wrenches do not "slide" open during use.
- Keep tools well maintained (cleaned and oiled).
- Clean and place tools and wrenches in a tool box, rack or tool belt after use.
- Do not push on a wrench - losing your balance is more likely if the wrench slips.
- Do not use a wrench that is bent or damaged.
- Do not pull on an adjustable wrench that is loosely adjusted.
- Do not use pipe wrenches on nuts or bolts.
- Do not use pipe wrenches for lifting or bending pipes.
- Do not use a wrench on moving machinery.
- Do not use the wrong tools for the job. For example, never use pliers instead of a wrench or a wrench as a hammer.
- Do not use a makeshift wrench.
- Do not insert a shim in a wrench for better fit.
- Do not strike a wrench with a hammer or similar object to gain more force.
- Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length.

- Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

### 3.10 Chisels

- Personnel will not use a chisel that has a dull cutting edge or ones that have "mushroomed" striking heads.
- Hold a chisel by using a tool holder if possible.
- Clamp small workpieces in the vise and chip towards the stationary jaw when working with a chisel.

### 3.11 Vises

- When clamping a long workpiece in a vise, support the far end of the workpiece by using an adjustable pipe stand, saw horse or box.
- Position the workpiece in the vise so that the entire face of the jaw supports the workpiece.
- Personnel will not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
- Personnel will not slip a pipe over the handle of a vise to gain extra leverage.

### 3.12 Clamps

- Personnel will not use the C-clamp for hoisting materials.
- Personnel will not use the C-clamp as a permanent fastening device.

### 3.13 Jacks

- Personnel will not exceed the jack's rated lifting capacity as noted on the label of the jack.
- Clear all tools, equipment and any other obstructions from under the vehicle before lowering the jack.

### 3.14 Tool Boxes/Chests/Cabinets

- Use the handle when opening and closing a drawer or door of a tool box, chest, or cabinet.
- Tape over or file off sharp edges on toolboxes, chests or cabinets.
- Personnel will not stand on toolboxes, chests or cabinets to gain extra height.
- Lock the wheels on large toolboxes, chests or cabinets to prevent them from rolling.
- Push large chests, cabinets and toolboxes rather that pulling them.
- Personnel will not open more than one drawer of a toolbox at a time.
- Close and lock all drawers and doors before moving the tool chest to a new location.
- Personnel will not move a toolbox, chest or cabinet if it has loose tools or parts on the top.

# US Health & Safety Procedures

## Powered Hand Tools

## 1.0 PURPOSE

All power-operated hand tools and equipment shall be used, handled and stored in accordance with the following requirements. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health & Safety (H&S) Director.

## 2.0 GENERAL REQUIREMENTS

### 2.1 Selection and Use

- Select tools that can be used without bending the wrist. Hand tools should allow the operator to grasp, hold, and use the tool with the wrist held straight.
- Select the tool with the workplace layout and job design in mind. Sometimes a tool is correct for one operation and incorrect for another.
- Use the right tool for the job. Ensure it is the right size and has sufficient power to do the job safely. When there is a choice, select a tool of a low weight.
- Select low-vibrating tools, or choose tools with vibration-absorbing handles, like those covered with cork, rubber, plastic or plastic bonded to steel, to reduce hand-arm vibration.
- Choose hand tools that have the center of gravity within or close to the handle.
- Select tools with rounded and smooth handles that you can grip easily.
- If they are available, choose hand tools with double handles to permit easier holding and better manipulation of the tool.
- Select tools with a trigger strip, rather than a trigger button. This strip will allow you to exert more force over a greater area of the hand that, in turn, will reduce muscle fatigue.
- Ensure that the trigger works easily to reduce the effort needed to operate it.
- Ensure that your tool is well maintained and in good repair.
- Frequently used tools that weigh more than 1 pound should be counter-balanced.
- Hold the tool close to the body. Do not overreach.
- Keep good balance and proper footing at all times. This will help operators to control the tool better, especially in response to unexpected situations.
- Rest your hands by putting the tool down when you are not using it.
- Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
- Ensure that cutting tools, drill bits, etc., are kept sharp, clean, and well maintained.

- Do not wear gloves, loose clothing or jewelry while using revolving power tools. Tie back long hair or wear appropriate hair protection to prevent hair from getting caught in moving parts of equipment.
- Do not use a tool unless you have been trained to use it safely and know its limitations and hazards.

### 2.2 Storage and Handling

- All tools shall be stored in a manner to prevent damage and injury. Store tools in a dry, secure location when they are not being used.
- Tools shall be properly put away after use.
- Sharp or pointed tools shall be handled only if the sharp/pointed edge is covered, carried in a tool box or other device designed for that purpose, or the sharp/pointed edge is pointed downward, away from the body.

## 3.0 ELECTRIC TOOLS

### 3.1 Inspection

- Inspect tools for any damage prior to each use.
- Ensure that the power tool has the correct guard, shield or other attachment that the manufacturer recommends.
- Ensure that the tools are properly grounded using a three-prong plug, are double-insulated (and are labeled as such), or are powered by a low-voltage isolation transformer: this will protect users from an electrical shock.
- Check electric tools to ensure that a tool with a 3-prong plug has an approved 3-wire cord and is grounded. The three-prong plug should be plugged in a properly grounded 3-pole outlet. If an adapter must be used to accommodate a two-hole receptacle, the adapter wire must be attached to a known, functioning ground. Never remove the third, grounding prong from a plug.
- Check the handle and body casing of the tool for cracks or other damage.
- If the tool has auxiliary or double handles, check to see that they installed securely.
- Inspect cords for defects: check the power cord for cracking, fraying, and other signs of wear or faults in the cord insulation.
- Check for damaged switches and ones with faulty trigger locks.
- Inspect the plug for cracks and for missing, loose or faulty prongs.
- If a tool is defective, remove it from service, and tag it clearly "Out of service for repair". Replace damaged equipment immediately - do not use defective tools "temporarily". DO NOT ATTEMPT FIELD REPAIRS.

### 3.2 Battery Powered Tools

- Use the type of battery that the tool manufacturer specifies for the battery-powered tool that you are using.
- Recharge a battery-powered tool only with a charger that is specifically intended for the battery in that tool.

- Remove the battery from the tool or ensure that the tool is switched off or locked off before changing accessories, making adjustments, or storing the tool.
- Store a battery pack safely so that no metal parts, nails, screws, wrenches and so on can come in contact with the battery terminals; this could result in shorting the battery and possibly cause sparks, fires or burns.

### 3.3 Using Electric Tools

- Switch off the tools before connecting them to a power supply.
- If a power cord feels more than comfortably warm or if a tool is sparking excessively, have it checked by an electrician or other qualified person.
- Disconnect the power supply before making adjustments or changing accessories.
- Remove any wrenches and adjusting tools before turning on a tool.
- Inspect the cord for fraying or damage before each use. Tag defective tools clearly with an "Out of service" tag and replace immediately with a tool in good running order.
- During use, keep power cords clear of tools and the path that the tool will take.
- Use clamps, a vice or other devices to hold and support the piece being worked on, when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.
- Use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool that you are using. This will prevent the cord from overheating.
- For outdoor work, use outdoor extension cords marked "W-A" or "W."
- Suspend power cords over aisles or work areas to eliminate stumbling or tripping hazards.
- Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in overcurrent protection.
- Pull the plug, not the cord when unplugging a tool. Pulling the cord causes wear and may adversely affect the wiring to the plug and electrical shock to the operator may result.
- Keep power cords away from heat, water, oil, sharp edges and moving parts. They can damage the insulation and cause a shock.
- Avoid accidental starting by ensuring the tool is turned off before you plug it in. Also do not walk around with a plugged-in tool with your finger touching the switch.
- Do not bypass the ON/OFF switch and operate the tools by connecting and disconnecting the power cord.
- Do not disconnect the power supply of the tool by pulling or jerking the cord from the outlet.
- Do not leave a running tool unattended. Do not leave it until it has been turned off, has stopped running completely, and has been unplugged.
- Do not use electric tools in wet conditions or damp locations unless tool is connected to a ground fault circuit interrupter (GFCI).
- Do not expose electric power tools to rain or wet conditions; wet tools increase the likelihood for getting an electric shock.

- Avoid body contact with grounded surfaces like refrigerators, pipes and radiators when using electric powered tools; this will reduce the likelihood of shock if the operator's body is grounded.
- Do not plug several power cords into one outlet by using single-to-multiple outlet adapters or converters ("cube taps").
- Do not use light duty power cords.
- Do not connect or splice extension cords together to make a longer connection: the resulting extension cord may not be able to provide sufficient current or power safely.
- Do not carry electrical tools by the power cord.
- Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.
- Never break off the third prong on a plug: replace broken 3-prong plugs and make sure the third prong is properly grounded.
- Never use extension cords as permanent wiring- use extension cords only as a temporary power supply to an area that does not have a power outlet.
- Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.
- Do not brush away sawdust, shavings or turnings while the tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.
- Do not operate tools in an area containing explosive vapors or gases.
- Do not clean tools with flammable or toxic solvents.
- Do not surprise or touch anyone who is operating a tool. Startling a tool operator could end up causing an accident or injury.

### 3.3.1 Belt Sanders

- Wear safety glasses.
- Make sure the sander is switched "OFF" before connecting the power supply.
- Disconnect power supply before changing a sanding belt, making adjustments, or emptying dust collector.
- Inspect sanding belts before using them. Replace those belts that are worn or frayed.
- Install sanding belts that are the same widths as the pulley drum.
- Adjust sanding belt tension to keep the belt running true and at the same speed as pulley drum.
- Secure the sanding belt in the direction shown on the belt and the machine.
- Keep hands away from a sanding belt.
- Use two hands to operate sanders - one on a trigger switch and the other on a front handle knob.
- Keep all cords clear of sanding area during use.
- Clean dust from a motor and vents at regular intervals.

- Do not use a sander without an exhaust system or a dust collector present that is in good working order. Empty the collector when 1/4 full. The dust created when sanding can be a fire and explosion hazard. Proper ventilation is essential.
- Do not exert excessive pressure on a moving sander. The weight of the sander supplies adequate pressure for the job.
- Do not work on unsecured stock unless it is heavy enough to stay in place. Clamp the stock into place or use a "stop block" to prevent movement.
- Do not overreach. Always keep proper footing and balance.
- Do not cover the air vents of the sander.

### 3.3.2 Drills

- Wear safety glasses.
- Keep drill air vents clear to maintain adequate ventilation.
- Keep drill bits sharp always.
- Keep all cords clear of the cutting area during use. Inspect for frays or damage before each use.
- Disconnect power supply before changing or adjusting bit or attachments.
- Tighten the chuck securely. Remove chuck key before starting drill.
- Secure workpiece being drilled to prevent movement.
- Slow the rate of feed just before breaking through the surface.
- Drill a small "pilot" hole before drilling large holes.
- For small pieces, clamp stock so work will not twist or spin. Do not drill with one hand while holding the material with the other.
- Do not use a bent drill bit.
- Do not exceed the manufacturer's recommended maximum drilling capacities.
- Do not use a hole saw cutter without the pilot drill.
- Do not use high speed steel (HSS) bits without cooling or using lubrication.
- Do not attempt to free a jammed bit by starting and stopping the drill. Unplug the drill and then remove the bit from the workpiece.
- Do not reach under or around stock being drilled.
- Do not overreach. Always keep proper footing and balance.
- Do not raise or lower the drill by its power cord.

### 3.3.3 Planers

- Wear safety glasses.
- Disconnect the planer from the power supply before making any adjustments to the cutter head or blades.
- Use blades of the same weight and set at the same height.
- Ensure that the blade-locking screws are tight.
- Remove adjusting keys and wrenches before turning on power.

- Support the material (stock) in a comfortable position that will allow the job to be done safely and accurately.
- Check stock thoroughly for staples, nails, screws, or other foreign objects before using a planer.
- Start a cut with the infeed table (front shoe) resting firmly on the stock and with the cutter head slightly behind the edge of the stock.
- Use two hands to operate a planer - one hand on the trigger switch and the other on a front handle.
- Do not put your finger or any object in a deflector to clean out chips while a planer is running.
- Disconnect the power supply when stopping to dump out chips.
- Do not set a planer down until blades have stopped turning.
- Keep all cords clear of cutting area.

### 3.3.4 Routers

- Wear safety glasses.
- Disconnect the power supply before making any adjustments or changing bits.
- Ensure that the bit is securely mounted in the chuck and the base is tight.
- Put the base of the router on the work, template or guide. Make sure that the bit can rotate freely before switching on the motor.
- Secure stock. Never rely on yourself or a second person to support or hold the material. Sudden torque or kickback from the router can cause damage and injury.
- Before using a router, check stock thoroughly for staples, nails, screws or other foreign objects.
- Keep all cords clear of cutting area.
- Hold both hands on router handles always, until a motor has stopped. Do not set the router down until the exposed router bit has stopped turning.
- Do not overreach. Keep proper footing and balance.
- When inside routing, start the motor with the bit above the stock. When the router reaches full power, lower the bit to two times the required depth.
- When routing outside edges, guide the router counter clockwise around the work.
- When routing bevels, moldings and other edge work, make sure the router bit is in contact with the stock to the left of a starting point and is pointed in the correct cutting direction.
- Feed the router bit into the material at a firm, controlled speed.
- With softwood, you can sometimes move the router as fast as it can go. With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.
- The sound of the motor can indicate safe cutting speeds. When the router is fed into the material too slowly, the motor makes a high-pitched whine. When the router is pushed too hard, the motor makes a low growling noise.
- When the type of wood or size of the bit requires going slowly, make two or more passes to prevent the router from burning out or kicking back.

- To decide the depth of cut and how many passes to make, test the router on scrap lumber similar to the work.

### 3.3.5 Circular Saws

- Wear safety glasses and hearing protection.
- Check the retracting lower blade guard to make certain it works freely.
- Ensure that the blade that you have selected is sharp enough to do the job. Sharp blades work better and are safer.
- Check the saw for proper blade rotation.
- Set the depth of the blade, while the saw is unplugged, and lock it at a depth so that the lowest tooth does not extend more than about 1/8 inch beneath the wood.
- Keep all cords clear of cutting area.
- Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.
- Check the retracting lower blade guard frequently to make certain it works freely. It should enclose the teeth as completely as possible, and cover the unused portion of the blade when cutting.
- Check that the retracting lower blade guard has returned to its starting position before laying down the saw.
- Keep upper and retracting lower blade guard clean and free of sawdust.
- Disconnect power supply before adjusting or changing the blade.
- Allow the saw to reach full power before starting to cut.
- Use two hands to operate saws - one on a trigger switch and the other on a front knob handle.
- Keep the motor free from accumulation of dust and chips.
- Select the correct blade for stock being cut and allow it to cut steadily. Do not force it.
- Secure work being cut to avoid movement.
- Do not hold or force the retracting lower guard in the open position.
- Do not place your hand under the shoe or guard of the saw.
- Do not over-tighten the blade-locking nut.
- Do not twist the saw to change, cut or check alignment.
- Do not use a saw that vibrates or appears unsafe in any way.
- Do not force the saw during cutting.
- Do not cut materials without first checking for obstructions or other objects such as nails and screws.
- Do not carry the saw with a finger on the trigger switch.
- Do not overreach. Keep proper footing and balance.
- Do not rip stock without using a wedge or guide clamped or nailed to the stock.

### 3.3.6 Other Saws

- Wear safety glasses.

- Disconnect power supply before changing or adjusting blades.
- Use lubricants when cutting metals.
- Keep all cords clear of cutting area.
- Position the saw beside the material before cutting and avoid entering the cut with a moving blade.
- Make sure guards, if present, are installed and are working properly.
- Remember sabre saws cut on the upstroke.
- Secure and support stock as close as possible to the cutting line to avoid vibration.
- Keep the base or shoe of the saw in firm contact with the stock being cut.
- Select the correct blade for the material being cut and allow it to cut steadily. Do not force it. Clean and sharp blades operate best.
- Set the blade to go no further than 1/8 to 1/4 inch deeper than the material being cut.
- Do not start cutting until the saw reaches its full power.
- Do not force a saw along or around a curve. Allow the machine to turn with ease.
- Do not insert a blade into or withdraw a blade from a cut or lead hole while the blade is moving.
- Do not put down a saw until the motor has stopped.
- Do not reach under or around the stock being cut.
- Maintain control of the saw always. Avoid cutting above shoulder height.
- External Cuts:
  - Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.
  - Hold the saw firmly down against the material and switch the saw on.
  - Feed the blade slowly into the stock, maintaining an even forward pressure.
- Internal Cuts:
  - Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.
  - Do not let the blade touch the stock until the saw has been switched on.

## 4.0 PNEUMATIC TOOLS

### 4.1 General Requirements

- Wear safety glasses.
- Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool. An in-line regulator filter and lubricator increases tool life.
- Keep tools clean and lubricated, and maintain them according to the manufacturers' instructions.
- Use only the attachments that the manufacturer recommends for the tools you are using.

- Be careful to prevent hands, feet, or body from injury in case the machine slips or the tool breaks.
- Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.
- Use the proper hose and fittings of the correct diameter.
- Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.
- Choose air-supply hoses that have a minimum working pressure rating of 150 psig or 150% of the maximum pressure produced in the system, whichever is higher.
- Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.
- Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.
- Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection (e.g., chain, wire, or positive locking device).
- Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.
- Do not operate the tool at a pressure above the manufacturer's rating.
- Turn off the air pressure to the hose when not in use or when changing power tools.
- Do not carry a pneumatic tool by its hose.
- Avoid creating trip hazards caused by hoses laid across walkways or curled underfoot.
- Do not use compressed air to blow debris or to clean dirt from clothes.

### 4.2 Pneumatic Nailing and Stapling Tools

- Permit only experienced and trained persons to operate pneumatic nailing and stapling tools.
- Wear safety glasses or a face shield and, where necessary, use hearing protection.
- Inspect a tool before connecting it to air supply:
- Check tool safety mechanisms if applicable.
- Tighten securely all screws and cylinder caps.
- Check correct air supply and pressure before connecting a tool.
- Check that the tool is correctly and securely connected to the air supply hose and that it is in good working order, with the safety mechanism operative, before using.
- Always handle a tool as if it is loaded with fasteners (nails, staples, etc.).
- Equip tools with a work-contacting element that limits the contact area to one that is as small as practical.
- Make sure that the mechanical linkage between the work-contacting element and trigger is enclosed.
- Disconnect a tool from the air supply when the tool is unattended and during cleaning or adjustment. Before clearing a blockage, be sure that depressing the trigger exhausts all air from the tool.

- Use only fasteners recommended by the manufacturer.
- Permit only properly trained people to carry out tool maintenance.
- Do not operate at a pressure above the manufacturer’s rating.
- Do not depress the trigger unless the nosepiece of tool is directed onto a safe work surface.
- Do not carry a tool with the trigger depressed.
- Do not load a tool with fasteners while the trigger is depressed.
- Do not overreach. Keep proper footing and balance.
- Do not use compressed air to blow debris or to clean dirt from clothes.

# APPENDIX G

# Inadvertent Discovery Plan

# INADVERTENT DISCOVERY PLAN

## *PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS*

*To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.*

Site Name(s): Barbee Mill Site Location: 4101 Lake Washington Blvd N, Renton, WA

Project Lead/Organization: Aspect Consulting, LLC County: King

*If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.*

### 1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 05-05 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

### 2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

### 3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

#### STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

#### STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

#### STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

#### STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

**Project Lead Contacts**

| Primary Contact | | Alternate Contact | |
|---|---|---|---|
| Name: | Jeremy Porter | Name: | Delia Massey |
| Phone: | 206-790-2129 | Phone: | 860-368-9745 |
| Email: | jporter@aspectconsulting.com | Email: | dmassey@aspectconsulting.com |

**Ecology Contacts (completed by Ecology Project Manager)**

| Ecology Project Manager | | Alternate or Cultural Resource Contact | |
|---|---|---|---|
| Name: | Lucy McInerney | Name: | Sarah Wollwage |
| Program: | Toxics Cleanup | Program: | Cultural Resource Specialist |
| Phone: | 206-594-0123 | Phone: | 360-407-7141 |
| Email: | LPEB461@ECY.WA.GOV | Email: | sarah.wollwage@ecy.wa.gov |

**STEP E: Ecology will notify DAHP.**

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

**Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.**

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

**Human Remains/Bones**:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

**4. TRIBAL CONTACTS**

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

| | | | |
|---|---|---|---|
| Tribe: | Muckleshoot Indian Tribe | Tribe: | Snoqualmie Indian Tribe |
| Name: | Laura Murphy | Name: | Steven Mullen-Moses |
| Title: | Preservation Program, Cultural Resources | Title: | Director of Archaeology & Historic Preservation |
| Phone: | 253-876-3272 | Phone: | 425-292-0249 x2010 |
| Email: | Laura.murphy@muckleshoot.nsn.us | Email: | steve@snoqualmietribe.us |
| Tribe: | Stillaguamish Tribe of Indians | Tribe: | Suquamish Tribe |
| Name: | Kerry Lyste | Name: | Dennis E. Lewarch |
| Title: | Tribal Historic Preservation Officer | Title: | Tribal Historic Preservation Officer |
| Phone: | 360-572-7072 | Phone: | 360-394-8529 |
| Email: | klyste@stillaguamish.com | Email: | dlewarch@suquamish.nsn.us |

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

**5. FURTHER CONTACTS (if applicable)**

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

| Federal Agency: | | State Agency: | |
|---|---|---|---|
| Agency: | | Agency | |
| Name: | | Name: | |
| Title: | | Title: | |
| Phone: | | Phone: | |
| Email: | | Email: | |

## 6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

**Suggestion**: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: Richard Harruff, MD, PhD 206-731-3232, ext. 5
   - Local Law Enforcement main name and phone: Renton Police Department 425-430-7500
   - Local Non-Emergency phone number (911 if without a non-emergency number): (425) 430-7500
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

## 7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.56 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

## 8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

## 9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

## 10. ADDITIONAL RESOURCES

### Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

**Informational Resources**

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

**Potentially Interested Tribes**

Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

## 11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Tulalip Tribes
Richard Young
Cultural Resources
360-716-2652
ryoung@tulaliptribes-nsn.gov

**Implement the IDP if you see…**

**Chipped stone artifacts.**

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.



*Stone artifacts from Oregon.*



*Stone artifacts from Washington.*



*Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.*

**Implement the IDP if you see…**

**Ground stone artifacts.**

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.



*Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.*



*Artifacts from unknown locations (left and right images).*



**Implement the IDP if you see…**

**Bone or shell artifacts, tools, or beads.**

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.










Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*



**Implement the IDP if you see…**

**Culturally modified trees, fiber, or wood artifacts.**

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.






Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.







**Implement the IDP if you see…**

**Strange, different, or interesting looking dirt, rocks, or shells.**

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).



*Shell Midden pocket in modern fill discovered in sewer trench.*



*Underground oven. Courtesy of DAHP.*

*Shell midden with fire cracked rock.*





*Hearth excavated near Hamilton, WA.*

**Implement the IDP if you see…**

**Historic period artifacts (historic archaeology considered older than 50 years).**

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.





Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*





**Implement the IDP if you see…**

**Historic period artifacts (historic archaeology considered older than 50 years).**

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.



Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*





Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*





**Implement the IDP if you see…**

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.



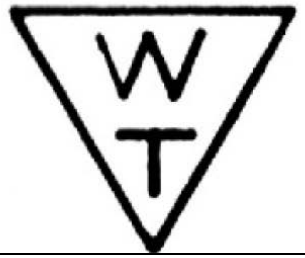


Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.




Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*






*Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).*




*Can opening dates, courtesy of W.M. Schroeder.*

**Implement the IDP if you see…**

**You see historic foundations or buried structures.**

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.










Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

**Implement the IDP if you see...**

**Potential human remains.**

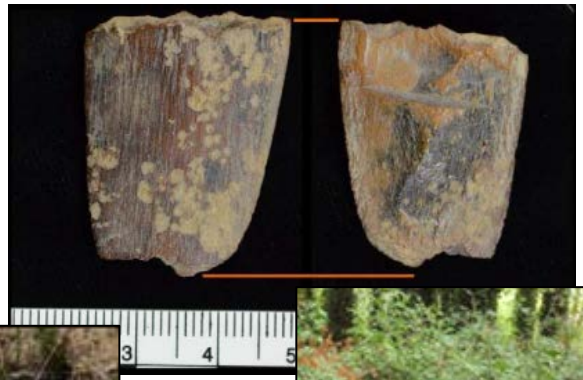
Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.



Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

*Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.*









Directly Above: This is a real discovery at an Ecology sewer project site.

*What would you do if you found these items at a site? Who would be the first person you would call?*

Hint: *Read the plan!*