

TECHNICAL MEMORANDUM

Date: May 22, 2024
To: City of Seattle Finance and Administrative Services Department
From: Shannon McKernan, George Iftner: Herrera Environmental Consultants, Inc.
Subject: Waterway #20 Supplemental Phase II Environmental Site Assessment

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Introduction

This technical memorandum describes the field investigation methods and results of a supplemental Phase II Environmental Site Assessment (ESA) for soil and groundwater sampling conducted January 18, 2024, by Herrera Environmental Consultants (Herrera) at the Waterway Site #20 (Site). Samples were collected during this event to provide additional site characterization information, building upon the previous Phase II ESA sampling by Herrera documented in reports from March 9, 2023, and June 30, 2016. The Site is directly adjacent to Lake Union, and accessed from 1717 North Northlake Place, immediately west of Gas Works Park in Seattle, Washington (Figure 1).

The Site is owned by the State of Washington, managed by the Department of Natural Resources (DNR), and used by the Seattle Police Department Harbor Patrol (HP) in coordination with City of Seattle Finance and Administrative Services (FAS) Department. Use of the property by HP must be authorized by DNR pursuant to the terms and conditions of DNR's "Waterway Use Permit #20-89981" (Permit) in accordance with Chapter 79.120 of the Revised Code of Washington (RCW). One of the Permit conditions is for the City of Seattle to provide DNR with soil-sampling data for the filled (upland) portion of Waterway 20.

The Site is identified by the King County Tax Assessor as parcel 192504HYDR, and the adjacent property to the east operated by HP and owned by the City of Seattle Department of Parks and Recreation is identified as parcel 4088801930 (King County 2022). The upland portion of the Site that was investigated is approximately 0.24 acres in size (see Figure 2). The Site is also adjacent to the Gas Works Park Cleanup Site (GWPCS), which also includes the aquatic portion of the Site (see Figure 3). A Remedial Investigation/Feasibility Study (RI/FS) was submitted by GeoEngineers of Seattle, Washington in January 2023 for the aquatic portion of the GWPCS.

In April 2016, an initial limited Phase II ESA was completed that focused on sampling surface soils at three onsite locations approved by DNR. Low concentrations of lube oil-range total petroleum hydrocarbons were detected at concentrations below the Model Toxics Control Act (MTCA) Method A cleanup level (CUL), but slightly elevated concentrations of total carcinogenic polycyclic hydrocarbons (cPAHs) were detected above the MTCA Method A CUL. In September 2022, Herrera prepared a Sampling and Analysis Plan (SAP) at the request of FAS for additional field investigation activities at the Site as part of the lease renewal process with DNR. The SAP included a summary of the 2016 environmental investigation results and was used to guide the March 2023 field investigation activities (Herrera 2022). The results of the field work were presented in a May 2023 technical memorandum for FAS and DNR review (Herrera 2023).

The March 2023 work was completed to provide additional site characterization data on potential contaminants of concern (COCs) in surface and subsurface soils, and groundwater at the Site to support lease renewal with DNR, and to inform decisions regarding future Site redevelopment to allow public access to Waterway 20 and the adjacent upland area. The conceptual public access features planned for the Site will include an access pathway and beach access (see Figure 2).

Figure 1.
Vicinity Map, Waterway #20 Site, Seattle, Washington.





Groundwater Sampling Location

2023

2024

Existing Monitoring Well

Soil Boring Location

2016 (Surface samples only)

2023

2024

Other Structure - City of Seattle

Proposed Fence

DWW Mainline - City of Seattle

Waterway Use Permit Area

Approx. Location of Removed
UST and Fuel Pump/Pump
House

Project Site

Parcel (King County)

Proposed 6-ft Width ADA-
Accessible Pathway

Proposed Beach Cobble

Proposed Beach Sand

Proposed Bump Out/Vehicle
Drop-off Area

Figure 3.
Project Site Setting and Gas Works Park Cleanup Site Boundary.



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Date: 5/20/2024
Author: bba@herra.com

The January 2024 supplemental Phase II ESA was performed to:

- Further characterize soil and groundwater to delineate the lateral and vertical extent of contamination within the upland lease area boundary down to 10 feet below ground surface (bgs) in native soil.
- Evaluate applicable cleanup levels for the site, including whether potential COCs in soil are impacting groundwater.
- Review previous reports and new sampling results to provide general, up-to-date Best Management Practices (BMPs) to protect human health and prevent exposures to contaminated media for current HP use and potential future operations at the Site.

Summary of Previous Investigations

2016 Upland Soil Sampling

On May 7, 2016, three soil samples (WW20S1 through WW20S3) were collected with a shovel from three locations distributed across the active portion of the property (Figure 2). Each soil sample location had a discrete sample collected from 0 to 6 inches below ground surface (Table 1 through Table 4). Sample analysis and results indicated:

- Gasoline range organics (GRO) and diesel range organics (DRO); benzene, toluene, ethylbenzene, and xylenes (BTEX); polychlorinated biphenyls (PCBs); arsenic; cadmium; and mercury were not detected in WW20S1 through WW20S3.
- Detections of lube oil in WW20S1 through WW20S3 were below the MTCA Method A CUL of 2,000 milligrams per kilogram (mg/kg). Lube oil in the three soil samples ranged from 960 to 1,400 mg/kg.
- cPAHs were detected in WW20S1 through WW20S3. Total cPAHs in the three samples ranged from 0.12 to 1.7 mg/kg, which are above the MTCA CUL protective of surface water (0.000016 mg/kg). Benzo(a)pyrene, the cPAH reference chemical, was detected at concentrations from 0.091 to 1.3 mg/kg in each of the three samples.
- Chromium and lead were detected well below their respective MTCA Method A CULs (2,000 mg/kg and 250 mg/kg, respectively) in soil from WW20S1 through WW20S3. Chromium was detected in the three samples at concentrations ranging from 24 to 37 mg/kg. Lead was detected in the three samples at concentrations ranging from 29 to 49 mg/kg.

No groundwater samples were collected during the May 2016 investigation.

2023 Site Characterization and Recommendations

On March 9, 2023, Herrera conducted a field investigation to provide additional data on potential COCs in surface and subsurface soils at the Site as well as to evaluate potential impacts of potential COCs on groundwater. The investigation was performed to further characterize the upland portion of the property and to supplement the 2016 sampling results, areas of planned public use, and proximity to the aquatic portion of Waterway 20 (Figure 2).

Fourteen soil samples from six soil borings (WW20S4 through WW20S9) from surface soils to 5.5 feet bgs were collected and analyzed (Table 1 through Table 4). Sample analysis and results indicated the following:

- GRO and DRO, BTEX, PCBs, arsenic, cadmium, mercury, selenium, and silver were not detected in WW20S4 through WW20S9 from depths of up to 5.5 feet bgs.
- Lube oil was detected in 11 soil samples from depths of up to 5.5 feet bgs in soil samples from WW20S4 through WW20S9. Detections of lube oil in soil ranged from 120 to 5,000 mg/kg in the six soil borings. Lube oil was detected above the MTCA Method A CUL (2,000 mg/kg) in three soil samples: WW20S4 at 2 feet bgs at 5,000 mg/kg, WW20S5 at 2 feet bgs at 2,700 mg/kg, and WW20S6 from the surface interval at 2,400 mg/kg.
- cPAHs were detected and above the MTCA CUL in 13 soils samples collected from WW20S4 through WW20S9. The TEQ of cPAHs in these 13 samples ranged from 0.012 to 20.7 mg/kg, which are above the MTCA cleanup level protective of surface water (0.000016 mg/kg). Benzo(a)pyrene, the cPAH reference chemical, was detected at concentrations from 0.010 to 16 mg/kg in samples from WW20S4 through WW20S9. One sample, WW20S6 at 5 feet bgs, had no detections of cPAH compounds.
- Barium and chromium were detected well below their respective MTCA CULs (16,000 mg/kg for barium and 2,000 mg/kg for total chromium) in soil from WW20S4 through WW20S9. Barium was detected in each sample at concentrations ranging from 35 to 300 mg/kg. Total chromium was detected in each sample at concentrations ranging from 13 to 26 mg/kg. Laboratory analysis for hexavalent chromium was also performed on the two soil samples with the highest detections of total chromium (WW20S4-0 and WW20S7-0); concentrations of hexavalent chromium were non-detect in both samples. Lead was detected below the MTCA CUL in nine samples. Lead was detected above the MTCA CUL in WW20S4 at 2 feet bgs at 1,000 mg/kg and in WW20S8 at 5 feet bgs at 280 mg/kg.

Two groundwater samples were collected and analyzed during the March 2023 investigation (Table 5 through Table 7). One sample, WW20GW1 was collected from an existing monitoring well at the Site, TDW-1 (Figure 2). One sample, WW20GW2 was collected from a temporary well installed in soil boring WW20S6. Potential COCs were either non-detect or detected below CULs in these two groundwater samples.

Methods

The following sections describe the 2024 field investigation methods used to further characterize existing soil and groundwater conditions at the Site that may have been affected by historical site uses and placement of fill material. Observations of soils encountered during drilling and laboratory analytical results for soil and groundwater samples are presented in the Results section of this memorandum.

Soil Sampling

On January 18, 2024, under the direction of Herrera, Holocene Drilling of Puyallup, Washington completed five soil borings (WWS20S11 through WWS20S15) using a push-probe drill rig. The soil borings were completed to depths of 10 feet bgs to characterize surface and subsurface soils (Figure 2). The locations were selected to supplement the previous 2016 and 2023 sampling locations, to include areas of planned future public use, and to evaluate conditions in close proximity to the aquatic portion of Waterway 20.

Soil samples were collected for chemical analyses at each boring location. In general, sample recovery was poor due to the loose, wet nature of the soil. The depth of the samples collected varied depending on the field observations of contamination, the available material due to poor recovery, and the homogeneity of the subsurface material. In general, soil sample intervals included the following:

- A surface soil sample collected from the 0 to 1 foot bgs depth interval in the fill material.
- A subsurface soil sample near the bottom of the fill material.
- A subsurface soil sample within the top of the native material.
- A subsurface soil sample towards the bottom of the boring in the native material.

Soil collected from soil boring WW20S14 was collected to supplement soil data collected from WW20S8, a previous soil boring completed in 2023. Soil was only collected from WW20S14 within the native material.

Groundwater was collected from one existing monitoring well (TDW-1), and from two temporary wells set in push-probe borings (WW20S12 and WW20S14) (Figure 2). The approximate depths of groundwater encountered in the borings and monitoring well are documented in the soil boring logs in Appendix A. No well log was found for monitoring well TDW-1 that was previously installed at the Site by others.

The proposed location for soil boring WW20S10 was adjacent to the asphalt pavement near the dock along the waterway. The drill rig encountered a thick concrete pad beneath the proposed location, and also at a location three feet to the north of the proposed location. Therefore, boring WW20S10 was unable to be advanced or sampled due to refusal. The drill rig also encountered refusal in WW20S15 due to tree roots at 5 feet bgs. The drill rig was moved 2.5 feet to the northwest and the boring was successfully completed to the full 10-foot bgs depth.

The drilling and sample collection activities were completed according to the project SAP and scope of work. Soil boring logs are included in Appendix A. A photographic log is provided in Appendix B, and laboratory analytical results and a data quality assurance review memorandum are included in Appendix C.

A total of 18 soil samples were collected from the five borings plus one composite sample for waste characterization, and three groundwater samples were collected. Herrera hand delivered the samples in iced coolers to OnSite Environmental, Inc. (OnSite) of Redmond, Washington, for laboratory analysis. One sample was archived for potential analysis but was not analyzed.

Initial Analyses

A total of 17 samples were analyzed for:

1. GRO by Ecology Method NWTPH-Gx.
2. BTEX by EPA Method 8021B.
3. DRO and lube oil by Ecology Method NWTPH-Dx.
4. Total polycyclic aromatic hydrocarbons (PAHs) by U.S. EPA Method 8270D/SIM (Selected Ion Monitoring, low-level).
5. Total lead by EPA Method 6010D.

Follow-up Analyses

Per the SAP, follow-up PCB analysis was also performed on select soil samples with detected concentrations of lube oil above the laboratory reporting limit. This included PCB analysis by U.S. EPA Method 8082A performed on the 8 samples with the highest concentrations of lube oil.

Groundwater Sampling

During the field event on January 18, 2024, Herrera also collected three groundwater samples at the Site. Sample WW20GW3 was collected near the southeast corner of the Site from an existing monitoring well with well tag TDW-1, and samples WW20GW4 and WW20GW5 were collected from temporary well points installed in soil borings WW20S12 and WW20S14, respectively (Figure 2). Herrera hand delivered the samples in coolers with ice to OnSite for laboratory analysis of the following:

1. GRO by Ecology Method NWTPH-Gx.
2. BTEX by EPA Method 8021B.
3. DRO and lube oil TPH by Ecology Method NWTPH-Dx.
4. PAHs by U.S. EPA Method 8270D/SIM.
5. Total and dissolved lead by EPA Method 200.8.

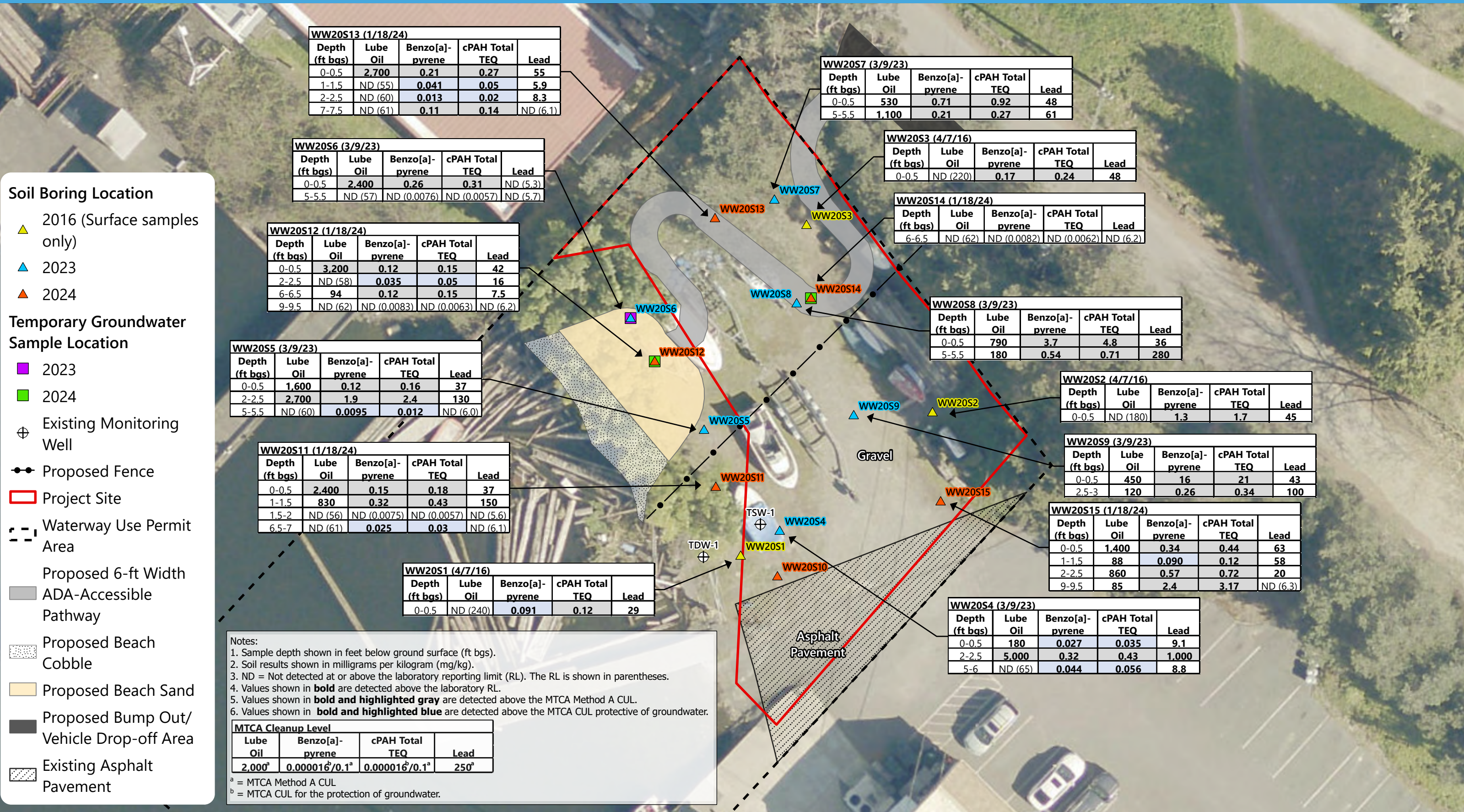
Each well was purged and sampled according to the SAP using a peristaltic pump with disposable polyethylene and silicone tubing (Herrera 2022). The wells were purged for approximately 30 minutes using low-flow techniques at a flow rate of approximately 0.2 liters per minute until turbidity diminished, the water appeared clear, and water quality parameters had stabilized.

Results

A data quality review (validation) was performed on the laboratory data following data quality objectives (DQOs) established in the SAP (Herrera 2022). The data validation memorandum is presented in Appendix C. All data were found to be acceptable as reported by the laboratory. Table 1 through Table 4 present a summary of soil sample results and Table 5 through Table 7 present a summary of groundwater results for the laboratory analyses. Figure 4 and Figure 5 depict soil and groundwater contaminants, respectively, detected above the applicable MTCA CULs.

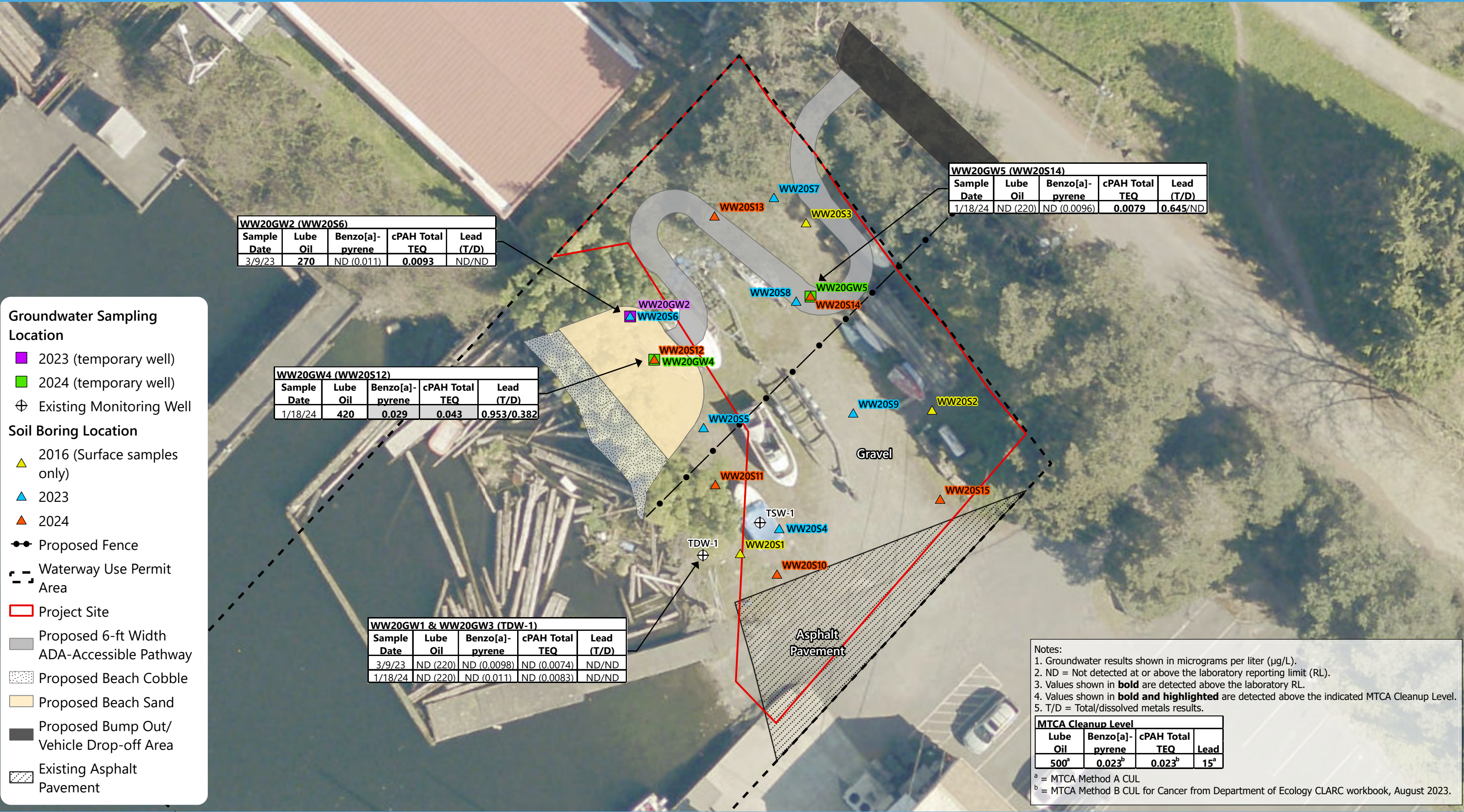
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Figure 4. Soil Sample Locations and Results, Waterway 20 Phase 2 Environmental Site Assessment, Seattle, Washington.



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Figure 5. Groundwater Sample Locations and Results, Waterway 20
Phase 2 Environmental Site Assessment, Seattle, Washington.



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Screening and Cleanup Levels

MTCA Method A CULs from Washington Administrative Code (WAC) 173-340-900, Table 720-1 for groundwater, or MTCA Method A CULs for unrestricted land use from Table 740-1 for soil were used to evaluate the concentrations of potential COCs in groundwater and soil.

In groundwater, when no Method A value was available for a potential COC, the most conservative Method B CUL (for non-cancer or cancer) from the Department of Ecology's (Ecology) Cleanup Levels and Risk Calculation (CLARC) workbook (Ecology 2024) was selected.

During the March 2023 and January 2024 investigations, there were no detections of GRO, BTEX, or metals (total or dissolved) in groundwater above the selected CUL. Because these constituents were not detected in groundwater above their applicable MTCA CULs, leaching from soil to groundwater is not considered to be a complete pathway for GRO, BTEX, or metals. One groundwater sample (WW20GW4) collected from a temporary well installed in soil boring WW20S12 had detections of diesel + lube oil range organics, benzo(a)pyrene, and total cPAHs above the selected groundwater CUL. Therefore, soil leaching to groundwater is considered a complete pathway for diesel + lube oil range organics, benzo(a)pyrene, and total cPAHs at the Site. Soil leaching to groundwater is not considered a complete pathway for other PAHs.

In soil, with the exceptions of benzo(a)pyrene, and total cPAHs, when no Method A value was available for a potential COC, the most conservative Method B CUL for direct contact (for non-cancer or cancer) from Ecology's CLARC workbook was selected. Because groundwater results indicated there is a complete leaching pathway from soil to groundwater for benzo(a)pyrene and total cPAHs, the MTCA CUL protective of surface water was selected for those compounds in soil. There is no established MTCA CUL for soil protective of surface water for diesel + lube oil range organics, so the most conservative soil CUL, the MTCA Method A CUL, was used for diesel + lube oil range organics.

Soil

Fill material was observed in the upper interval of each soil borings completed during the January 18, 2024 field investigation. The fill material was observed up to depths ranging from approximately 1.5 feet bgs in boring WW20S11 to 3.5 feet bgs in borings WW20S12 and WW20S15 (see Appendix B). As observed during the March 2023 investigation, the depth of fill material was shallowest near the south end of the Site by the shoreline and thickest to the north and northeast. The observed fill material composition was similar in composition to fill material encountered during the March 2023 investigation. In general, the fill material was brown to gray silty sand with gravel to silty gravel with sand. Trace brick fragments and tree roots were observed in some fill material.

As described in the May 2023 memorandum, a 2- to 6-inch-thick sandy charcoal layer was observed in WW20S4, WW20S5, and WW20S7 through WW20S9 in soils from approximately 1.5 to 3.5 feet bgs. The charcoal containing layer was interbedded with sand with silt in some locations. During the January 2024 sampling event, the same layer was observed during soil sampling. In boring WW20S12, at approximately 3 feet bgs, approximately 6 inches of an organic layer including charcoal and/or burnt material was

observed with fine sand, fine gravel, and trace roots. The same layer was observed in WW20S15 at approximately 1.5 feet bgs and 2.5 feet bgs and interbedded with approximately 6 inches of fill material of brown silty gravel with sand. This burnt layer was not observed in WW20S6 or WW20S13. Sample recovery, however, was poor within the interval of its expected occurrence in these two boring locations. Given the similar layer of charcoal-stained soils observed in nine of the 11 soil borings during the two investigations across relatively uniform depths, it is likely that there may have been an historic fire at the Site. A review of Sandborn maps and other historical site documents was not performed under this scope of work.

At the soil borings for WW20S11, WW20S12, WW20S13, and WW20S15, a sample was analyzed from the 0 to 1 foot bgs depth interval to further characterize surface soil contamination. In these four borings, a sample was also analyzed in the 1 to 2 feet bgs depth interval to analyze the bottom of the fill material. A sample was also collected from WW20S15 within the charcoal layer. In soil borings WW20S11 and WW20S13, a sample was collected at the top of the native material, around 2 feet bgs. Herrera was unable to collect a sample from the top of the native material from borings WW20S12, WW20S14, and WW20S15 due to poor sample recovery during drilling. In WW20S12, a sample was collected at 6 feet bgs, within the native material. In WW20S14, a sample was collected at 6 feet bgs, the only recovered portion of native material in that soil boring. In WW20S11, WW20S12, WW20S13, and WW20S15, a sample was collected from the bottom of the available recovered native material, from 6.5 to 9 feet bgs.

Consistent with previous investigations, no elevated photoionization detector (PID) field readings or petroleum odors were noted during the January 2024 investigation, and no GRO or BTEX were detected in any samples analyzed. DRO was detected well below the MTCA CUL (2,000 mg/kg) in three samples: WW20S11 at 1 foot bgs and WW20S15 at 2 feet and 9 feet bgs. Detections of DRO ranged from 43 to 370 mg/kg. Lube oil was detected in nine samples, from concentrations of 85 to 3,200 mg/kg. Lube oil exceeded the MTCA CUL of 2,000 mg/kg in only three surface samples (0 to 1 foot bgs) from WW20S11 (2,400 mg/kg), WW20S12 (3,200 mg/kg), and WW20S13 (2,700 mg/kg). As described in the May 2023 technical memorandum, lube oil detected above the applicable CUL could be associated with contaminated fill imported onsite or with leaks or drips from vehicles or equipment staged onsite over the years.

PCB analysis was performed on the eight samples with the highest detections of lube oil. PCBs were not detected above the laboratory practical quantitation limit (PQL)¹ in any of the soil samples analyzed, with the exception of PCB aroclor 1254 in WW20S15 at 1 foot bgs, which was detected just above the detection limit of 0.055 mg/kg at 0.055 mg/kg.

A total of 18 different PAHs were detected in the soil samples analyzed. However, only one particular cPAH, benzo(a)pyrene, the reference cPAH chemical, was detected above its MTCA Method A CUL (0.1 mg/kg) or its more conservative MTCA CUL protective of surface water (0.000016 mg/kg). Fourteen of the 17 soil samples collected had detections of benzo(a)pyrene greater than the MTCA soil CUL

¹ Practical quantitation limit (PQL) is the lowest concentration of a constituent or a chemical that can be reliably measured by a laboratory using a specific analytical method.

protective of surface water. Detections of benzo(a)pyrene above the MTCA CUL protective of surface water ranged from 0.013 to 2.4 mg/kg at sample depths ranging from the surface samples (0 to 1 foot bgs) to the bottom of the borings (9 feet bgs). Nine of those sample results exceed the MTCA Method A CUL within the same sampling depths. Total cPAHs exceeded the MTCA CUL protective of surface water (0.000016 mg/kg) in each of the 14 locations where benzo(a)pyrene exceeded the more conservative CUL. Total cPAHs exceeded the MTCA Method A CUL in 10 soil samples. Soil collected from WW20S11 at 1.5 feet bgs, WW20S12 at 9 feet bgs, and WW20S14 at 6 feet bgs did not have any detections of PAHs.

Lead, a metal of concern, was previously detected above the MTCA CUL in two subsurface soil samples within the fill. Lead was the only metal analyzed for during the January 2024 investigation. Lead was detected in 11 of the 17 soil samples, but well below the CUL of 250 mg/kg. Detections of lead ranged from 5.9 mg/kg in WW20S13 at 1 foot bgs to 150 mg/kg in WW20S11 at 1 foot bgs.

Groundwater Conditions

On January 18, 2024, groundwater was encountered from 4.3 to 7.2 feet bgs in the two temporary wells and monitoring well TDW-1.

Diesel + lube oil range organics were detected in one groundwater sample (WW20GW4) collected from a temporary well in soil boring WW20S12, at a concentration of 505 micrograms per Liter, which is slightly above the total MTCA Method A CUL of 500 µg/L. Consistent with the March 2023 sampling event, GRO, DRO, and lube oil were not detected in the groundwater sample collected from monitoring well TDW-1 (groundwater sample WW20GW3). GRO and BTEX have not been detected in any of the groundwater samples collected during the March 2023 or January 2024 sampling investigations. The installation of additional monitoring wells may be required to evaluate additional impacts of diesel + lube oil range organics to groundwater in the vicinity of boring WW20S12.

Four PAHs, including fluorene, fluoranthene, pyrene, and/or benzo(g,h,i)perylene were detected in groundwater from samples collected from the temporary wells set in WW20S12 and WW20S14 (groundwater samples WW20GW4 and WW20GW5, respectively). Detections of these compounds were low (less than 0.15 µg/L) and there are no applicable CULs for these compounds. Low levels of cPAHs were detected in groundwater samples WW20GW4 and WW20GW5. Benzo(a)pyrene was detected above the MTCA Method B CUL of 0.023 µg/L in one groundwater sample, WW20GW4 in soil boring WW20S12, at a concentration of 0.029 µg/L. Total cPAHs for groundwater sample WW20GW4 was 0.043 µg/L and above the MTCA Method B CUL of 0.023 µg/L.

Total and dissolved lead analysis was performed on all three groundwater samples, but consistent with the March 2023 sampling, lead was not detected in groundwater from TDW-1. Total or dissolved lead in groundwater collected from the January 2024 temporary wells was non-detect (less than 0.2 µg/L) or detected at low concentrations (0.382 to 0.953 µg/L), and well below the MTCA Method A CUL (15 µg/L).

Recommendations and Best Management Practices

Waste Management

Based on the soil and groundwater sampling results, it appears that lube oil and lead contamination at the Site are limited to soils within fill material. Lube oil and lead were detected above MTCA cleanup levels in fill soils within the gravel parking area and future footprint of the proposed park. Detections of total cPAHs, including benzo(a)pyrene, occur above both the MTCA Method A CUL and MTCA CUL protective of surface water throughout the site in both fill material and native material. No samples have been obtained of soils on the slope between the gravel parking area and North Northlake Place. However, it is likely that the same charcoal-stained soil layer and possible lube oil, lead, and or cPAH contamination could be present in fill materials beneath the slope. Soil potentially impacted by a suspected fire may require additional testing and analysis if the impacted soil is to be excavated from the Site.

It is assumed that at least some or all the fill material as well as some native soils may require offsite disposal at a Subtitle D landfill if excavated during construction or future site redevelopment. Alternatively, these soils could be capped in place with proper engineering controls. Any excavated soils should be stockpiled and tested or directly loaded into trucks for offsite disposal at a licensed facility (e.g., a RCRA Subtitle D landfill).

Standard best management practices (BMPs) should be implemented during construction to prevent the spread of contaminated soils beyond the immediate excavation or loading areas. Some examples of BMPs include silt fence and straw wattle perimeter protections, turbidity curtains for work along the water's edge, plastic sheeting on pavement to capture soils spilled while loading trucks or containers, street sweeping, and covering temporary stockpiles with plastic.

If dewatering is necessary during construction, all dewatering water should be temporarily contained within an onsite Baker tank and treated and tested for total settleable solids (TSS) and pH, as well as any other parameters if required under the permit issued for the project prior to discharge to the stormwater drainage system.

BMPs should be employed to prevent stormwater from contacting contaminated soils, and to avoid having to capture, treat, and dispose of contaminated stormwater.

Worker Health and Safety

This section provides general recommendations for protecting worker health and safety during day-to-day activities at the site as well as during potential future construction activities. Detailed BMPs including recommended controls for environmental hazards that can affect the health and well-being of workers at the site should be developed by a certified industrial hygienist. Preparation of a health and safety plan (HASP) and implementing the plan will be the responsibility of the future contractor selected to complete any park improvements. The Waterway Permit between DNR and FAS describes Protocols for Use of the

Property ("the Protocols") to minimize worker exposure to contaminants. FAS will ensure all workers comply with the Protocols.

COCs detected in soils at the Site that could pose hazards to workers include lube oil (maximum detected concentration of 5,000 mg/kg), lead (maximum detected concentration of 1,000 mg/kg), benzo(a)pyrene (maximum detected concentration of 16 mg/kg), and total cPAHs (maximum detected concentration of 21 mg/kg). Detections of COCs are distributed across surface soils of the upland portion of the site and into native material down to a known depth of at least 10 feet bgs.

Where practicable, asphalt pavement should be extended north to cover the existing exposed gravel parking lot surface of the Site. Asphalt pavement is an effective cap that can prevent human exposure to surface soil contamination. Asphalt pavement can be an effective control at the Site prior to any future construction activities.

During day-to-day activities at the site, the following BMPs are recommended for all Site personnel to prevent exposures to COCs:

- Do not perform ground disturbing activities in the gravel portion of the site. If ground disturbance is required, HP should notify FAS before proceeding to discuss the scope of the work, and to ensure that an appropriate plan and BMPs are in place.

During potential future construction activities, preventing potential worker exposures to COCs should not be difficult if appropriate BMPs are put in place. Based on the COCs and concentrations identified in soils and assuming that dust will be suppressed using water spray, the use of respirators during construction activities should not be necessary to prevent worker exposures to COCs. During construction activities, the following BMPs are recommended to prevent worker exposures to COCs during construction:

- Prepare a written Site-Specific HASP that meets the requirements of WAC 296 843 120.
- Inform workers who may be potentially exposed to lead of the potential hazards, direct them to review Appendices A and B of OSHA Regulation 1926.62, and provide Hazardous Waste Operations and Emergency Response (HAZWOPER) training prior to the time of initial job assignment and annually.
- Ensure that all workers have reviewed the HASP and don site and job specific protective personal protective equipment (PPE) during construction.
- Use dechlorinated water spray from a hydrant and hose or water truck to wet down soils as they are being excavated to prevent airborne dust emissions.
- Set temporary soil stockpiles on plastic sheeting and cover them with plastic sheeting, and ensure that the trucks hauling contaminated soils and/or containers have closed canopies or covers before they leave the site.
- Field screen soils periodically (e.g., one or two times per hour during each day of active construction) for volatile organic compounds (VOCs) using a PID as soils are being excavated. If

necessary, stop work and adjust BMPs as appropriate if permissible exposure limits (PELs) outlined for VOCs in the HASP are exceeded.

- Provide a decontamination station and supplies for workers during construction and properly dispose of all waste generated.

References

Ecology. 2024. Cleanup Levels and Risk Calculation (CLARC). Washington State Department of Ecology. February 2024.

Herrera. 2022. Sampling and Analysis Plan –Phase II Environmental Site Assessment, Waterway #20 Site, Seattle, Washington. Prepared for City of Seattle Finance and Administrative Services Department by Herrera Environmental Consultants, Inc., Seattle, Washington. September 23.

Herrera. 2023. Technical Memorandum- Waterway #20 Site Characterization and Recommendations. Prepared for City of Seattle Finance and Administrative Services Department by Herrera Environmental Consultants, Inc., Seattle, Washington. May 2023.

King County. 2022. Tax Parcel Data Reviewed April 20, 2022, on King County Tax Assessor's Parcel Viewer website: <<https://gismaps.kingcounty.gov/parcelviewer2/>>.

Tables

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Table 1. Petroleum Hydrocarbons and BTEX in Soil. Waterway #20, Seattle, Washington.

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Gasoline	Diesel Range Organics	Lube Oil Range Organics	Benzene	Toluene	Ethyl-benzene	m,p-Xylene	o-Xylene
MTCA Method A CUL				100	2,000^a		0.03	7	6	9^b	
WW20S1	WW20S1	04/07/16	0-0.5	ND (5.6)	ND (240)	1,400	ND (0.020)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)
WW20S2	WW20S2	04/07/16	0-0.5	ND (5.6)	ND (180)	960	ND (0.020)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)
WW20S3	WW20S3	04/07/16	0-0.5	ND (6.0)	ND (220)	1,200	ND (0.020)	ND (0.060)	ND (0.060)	ND (0.060)	ND (0.060)
WW20S4	WW20S4-0	03/09/23	0-0.5	ND (6.5)	ND (28)	180	–	–	–	–	–
	WW20S4-2	03/09/23	2-2.5	ND (15)	ND (270)	5,000	–	–	–	–	–
	WW20S4-5	03/09/23 ^c	5-5.5	–	ND (33)	ND (65)	–	–	–	–	–
WW20S5	WW20S5-0	03/09/23	0-0.5	ND (6.3)	ND (160)	1,600	–	–	–	–	–
	WW20S5-2	03/09/23	2-2.5	ND (7.1)	ND (150)	2,700	–	–	–	–	–
	WW20S5-5	03/09/23 ^c	5-5.5	–	ND (30)	ND (60)	–	–	–	–	–
WW20S6	WW20S6-0	03/09/23	0-0.5	ND (5.3)	ND (170)	2,400	–	–	–	–	–
	WW20S6-5	03/09/23	5-5.5	ND (5.8)	ND (28)	ND (57)	–	–	–	–	–
WW20S7	WW20S7-0	03/09/23	0-0.5	ND (7.3)	ND (53)	530	–	–	–	–	–
	WW20S7-5	03/09/23	5-5.5	ND (8.1)	ND (160)	1,100	–	–	–	–	–
WW20S8	WW20S8-0	03/09/23	0-0.5	ND (5.8)	ND (140)	790	–	–	–	–	–
	WW20S8-5	03/09/23	5-5.5	ND (6.8)	ND (28)	180	–	–	–	–	–
WW20S9	WW20S9-0	03/09/23	0-0.5	ND (6.4)	ND (34)	450	–	–	–	–	–
	WW20S9-2.5	03/09/23	2.5-3	ND (4.8)	ND (29)	120	–	–	–	–	–
WW20S11	WW20S11-0	01/18/24	0-0.5	ND (6.7)	ND (280)	2,400	ND (0.020)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)
	WW20S11-1	01/18/24	1-1.5	ND (10)	140	830	ND (0.020)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)
	WW20S11-1.5	01/18/24	1.5-2	ND (5.4)	ND (28)	ND (56)	ND (0.020)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)
	WW20S11-6.5	01/18/24	6.5-7	ND (7.0)	ND (30)	ND (61)	ND (0.020)	ND (0.070)	ND (0.070)	ND (0.070)	ND (0.070)
WW20S12	WW20S12-0	01/18/24	0-0.5	ND (6.8)	ND (290)	3,200	ND (0.020)	ND (0.068)	ND (0.068)	ND (0.068)	ND (0.068)
	WW20S12-2	01/18/24	2-2.5	ND (5.9)	ND (29)	ND (58)	ND (0.020)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)
	WW20S12-6	01/18/24	6-6.5	ND (6.7)	ND (33)	94	ND (0.020)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)
	WW20S12-9	01/18/24	9-9.5	ND (6.6)	ND (31)	ND (62)	ND (0.020)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)
WW20S13	WW20S13-0	01/18/24	0-0.5	ND (6.7)	ND (280)	2,700	ND (0.020)	ND (0.067)	ND (0.067)	ND (0.067)	ND (0.067)
	WW20S13-1	01/18/24	1-1.5	ND (5.9)	ND (28)	ND (55)	ND (0.020)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)
	WW20S13-2	01/18/24	2-2.5	ND (7)	ND (30)	ND (60)	ND (0.020)	ND (0.070)	ND (0.070)	ND (0.070)	ND (0.070)
	WW20S13-7	01/18/24	7-7.5	ND (6.9)	ND (31)	ND (61)	ND (0.020)	ND (0.069)	ND (0.069)	ND (0.069)	ND (0.069)
WW20S14	WW20S14-6	01/18/24	6-6.5	ND (6.3)	ND (31)	ND (62)	ND (0.020)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)
WW20S15	WW20S15-0	01/18/24	0-0.5	ND (7.2)	ND (270)	1,400	ND (0.020)	ND (0.072)	ND (0.072)	ND (0.072)	ND (0.072)
	WW20S15-1	01/18/24	1-1.5	ND (5.9)	ND (27)	88	ND (0.020)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)
	WW20S15-2	01/18/24	2-2.5	ND (8.4)	370	860	ND (0.020)	ND (0.084)	ND (0.084)	ND (0.084)	ND (0.084)
	WW20S15A-9	01/18/24	9-9.5	ND (8.8)	43	85	ND (0.020)	ND (0.088)	ND (0.088)	ND (0.088)	ND (0.088)

Notes:

Analytical results shown in milligrams per kilogram (mg/kg).

Sample depths shown in feet below ground surface (ft bgs).

Gasoline range organics analyzed by NWTPH-Gx.

Diesel range organics and lube oil range organics analyzed by NWTPH-Dx.

Benzene, Toluene, m,p-xylene, and o-xylene (BTEX) analyzed by EPA 8021B.

Model Toxics Control Act (MTCA) Method A Cleanup Levels (CULs) from WAC 173-340-900 Table 740-1. The Method A CULs shown are the most conservative applicable CULs for the indicated compounds.

a = Cleanup level is for combined diesel range and lube oil range organics results.

b = Cleanup level is for total xylenes.

c = Results for WW20S4-5 and WW20S5-5 were extracted and analyzed outside of hold time, per Herrera's request.

ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.

Results detected above the laboratory reporting limit are shown in **bold**.

Results detected above the MTCA cleanup level are shown in **bold and highlighted**.

Table 2. Polycyclic Aromatic Hydrocarbons (PAHs) in Soil. Waterway #20, Seattle, Washington.

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Naphthalene	2-Methylnaphthalene	1-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]anthracene	Chrysene	Benzo[b]fluoranthene	Benzo[j,k]fluoranthene	Benzo[a]pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	cPAH TEQ ^e
MTCA Method A/B CUL				5 ^a	320 ^b	34 ^c	-	4,800 ^b	3,200 ^b	-	24,000 ^b	3,200 ^b	2,400 ^b	-	-	-	-	0.1 ^a	-	-	-	0.1 ^a
MTCA CUL Protective of Surface Water				-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000016 ^d	-	-	-	0.000016 ^d
cPAH TEF ^d				-	-	-	-	-	-	-	-	-	-	0.1	0.01	0.1	0.1	1	0.1	0.1	-	-
WW20S1	WW20S1	04/07/16	0-0.5	0.031	0.016	ND (0.014)	0.029	ND (0.014)	ND (0.014)	0.087	0.024	0.11	0.15	0.048	0.077	0.10	0.028	0.091	0.10	0.024	0.23	0.12
WW20S2	WW20S2	04/07/16	0-0.5	0.088	ND (0.073)	0.076	0.15	0.29	0.31	2.7	0.78	3.0	3.5	1.1	1.3	1.5	0.50	1.3	1.0	0.19	1.2	1.7
WW20S3	WW20S3	04/07/16	0-0.5	0.060	0.032	0.023	0.068	ND (0.0073)	0.012	0.15	0.054	0.22	0.26	0.092	0.13	0.23	0.057	0.17	0.23	0.036	0.32	0.24
WW20S4	WW20S4-0	03/09/23	0-0.5	ND (0.0073)	ND (0.0073)	ND (0.0073)	0.0085	ND (0.0073)	ND (0.0073)	0.019	0.0079	0.031	0.034	0.017	0.022	0.028	0.0089	0.027	0.02	ND (0.0073)	0.026	0.035
	WW20S4-2	03/09/23	2-2.5	0.51	0.58	0.49	0.15	ND (0.057)	ND (0.057)	0.63	0.13	0.46	0.55	0.24	0.39	0.4	0.11	0.32	0.28	ND (0.057)	0.32	0.43
	WW20S4-5	03/09/23 ^f	5-5.5	0.012	ND (0.0087)	ND (0.0087)	0.01	ND (0.0087)	ND (0.0087)	0.020	0.016	0.05	0.077	0.039	0.034	0.034	0.016	0.044	0.021	ND (0.0087)	0.026	0.056
WW20S5	WW20S5-0	03/09/23	0-0.5	ND (0.036)	ND (0.036)	ND (0.036)	0.038	ND (0.036)	ND (0.036)	ND (0.036)	0.04	0.046	0.082	0.048	0.091	0.088	ND (0.036)	0.12	0.14	0.058	0.51	0.16
	WW20S5-2	03/09/23	2-2.5	0.26	0.077	0.056	0.1	0.067	0.059	1.2	0.24	2.3	2.9	1	1.8	2.1	0.47	1.9	1.2	0.23	1.7	2.4
		03/09/23 ^f	5-5.5	ND (0.0080)	ND (0.0080)	ND (0.0080)		ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	ND (0.0080)	0.0095	0.013	ND (0.0080)	0.018	0.012
WW20S6	WW20S6-0	03/09/23	0-0.5	ND (0.035)	ND (0.035)	ND (0.035)	ND (0.035)	ND (0.035)	ND (0.035)	ND (0.035)	0.044	ND (0.035)	0.34	0.097	0.23	0.12	ND (0.035)	0.26	0.16	0.085	0.56	0.31
	WW20S6-5	03/09/23	5-5.5	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	0.0078	ND (0.0076)	0.0089	0.011	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0076)	ND (0.0057)
WW20S7	WW20S7-0	03/09/23	0-0.5	0.24	0.11	0.071	0.22	ND (0.04)	ND (0.04)	0.33	0.15	0.77	0.94	0.41	0.57	0.78	0.2	0.71	0.53	0.11	0.63	0.92
	WW20S7-5	03/09/23	5-5.5	0.33	0.22	0.18	0.13	ND (0.042)	ND (0.042)	0.3	0.056	0.32	0.38	0.16	0.25	0.23	0.059	0.21	0.15	ND (0.042)	0.16	0.27
WW20S8	WW20S8-0	03/09/23	0-0.5	0.33	0.14	0.11	0.85	0.12	0.13	1.9	0.84	4.2	5.1	2.2	2.8	3.9	1	3.7	2.6	0.52	3	4.8
	WW20S8-5	03/09/23	5-5.5	0.14	0.11	0.091	0.077	0.024	0.035	0.66	0.14	0.71	1	0.33	0.62	0.63	0.17	0.54	0.41	0.085	0.46	0.71
WW20S9	WW20S9-0	03/09/23	0-0.5	0.58	0.2	0.089	2.2	0.18	0.6	9.3	4.1	26	27	13	14	16	6.5	16	8.1	2.4	7.6	21
	WW20S9-2.5	03/09/23	2.5-3	0.13	0.096	0.084	0.048	ND (0.0077)	0.0095	0.19	0.046	0.26	0.33	0.15	0.24	0.3	0.09	0.26	0.22	0.033	0.25	0.34
WW20S11	WW20S11-0	01/18/24	0-0.5	ND (0.038)	ND (0.038)	ND (0.038)	ND (0.038)	ND (0.038)	ND (0.038)	0.11	0.047	0.095	0.26	0.11	0.16	0.087	ND (0.038)	0.15	0.098	ND (0.038)	0.35	0.18
	WW20S11-1	01/18/24	1-1.5	0.16	0.14	0.097	0.1	ND (0.05)	ND (0.05)	0.29	0.073	0.44	0.52	0.23	0.33	0.43	0.091	0.32	0.27	ND (0.05)	0.29	0.43
	WW20S11-1.5	01/18/24	1.5-2	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0075)	ND (0.0057)
	WW20S11-6.5	01/18/24	6.5-7	0.013	ND (0.0081)	ND (0.0081)	ND (0.0081)	0.036	ND (0.0081)	0.011	ND (0.0081)	0.03	0.052	0.019	0.017	0.019	ND (0.0081)	0.025	0.014	ND (0.0081)	0.014	0.031
WW20S12	WW20S12-0	01/18/24	0-0.5	ND (0.038)	ND (0.038)	ND (0.038)	ND (0.038)	ND (0.038)	ND (0.038)	0.073	0.042	0.12	0.16	0.06	0.11	0.12	ND (0.038)	0.12	0.11	ND (0.038)	0.26	0.15
	WW20S12-2	01/18/24	2-2.5	ND (0.0077)	ND (0.0077)	ND (0.0077)	ND (0.0077)	0.011	ND (0.0077)	0.059	0.02	0.063	0.07	0.031	0.036	0.033	0.012	0.035	0.021	ND (0.0077)	0.023	0.045
	WW20S12-6	01/18/24	6-6.5	ND (0.0087)	ND (0.0087)	ND (0.0087)	0.032	ND (0.0087)	ND (0.0087)	ND (0.0087)	0.014	0.022	0.03	0.058	0.071	0.086	0.034	0.12	0.084	0.014	0.088	0.15
	WW20S12-9	01/18/24	9-9.5	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0083)	ND (0.0063)
WW20S13	WW20S13-0	01/18/24	0-0.5	ND (0.038)	ND (0.038)	ND (0.038)	0.053	ND (0.038)	ND (0.038)	0.14	0.072	0.2	0.25	0.1	0.18	0.2	0.052	0.21	0.24	ND (0.038)	0.52	0.27
	WW20S13-1	01/18/24	1-1.5	0.0084	ND (0.0074)	ND (0.0074)	0.012	ND (0.0074)	ND (0.0074)	0.023	0.0096	0.035	0.044	0.027	0.03	0.036	0.013	0.041	0.03	ND (0.0074)	0.029	0.052
	WW20S13-2	01/18/24	2-2.5	ND (0.008)	0.0082	ND (0.008)	ND (0.008)	ND (0.008)	ND (0.008)	0.017	ND (0.008)	0.017	0.024	0.011	0.012	0.013	ND (0.008)	0.013	0.0088	ND (0.008)	0.0096	0.017
	WW20S13-7	01/18/24	7-7.5	0.03	0.012	0.0085	0.031	0.03	0.046	0.12	0.09	0.18	0.22	0.11	0.091	0.09	0.026	0.11	0.063	ND (0.0082)	0.062	0.14
WW20S14	WW20S14-6	01/18/24	6-6.5	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0082)	ND (0.0062)
WW20S15	WW20S15-0	01/18/24	0-0.5	ND (0.036)	ND (0.036)	ND (0.036)	0.085	ND (0.036)	ND (0.036)	0.15	0.09	0.34	0.42	0.25	0.26	0.27	0.11	0.34	0.26	0.068	0.54	0.44
	WW20S15-1	01/18/24	1-1.5	0.026	0.014	0.0074	0.018	0.023	0.022	0.092	0.036	0.15	0.17	0.076	0.073	0.08	0.028	0.090	0.053	0.011	0.062	0.12
	WW20S15-2	01/18/24	2-2.5	0.098	0.03	0.017	0.094	0.25	0.25	0.22	0.29	0.87	0.98	0.48	0.47	0.48	0.16	0.57	0.31	0.049	0.32	0.72
	WW20S15A-9	01/18/24	9-9.5	0.33	0.37	0.22	1.7	0.049	0.15	0.88	0.69	2.2	3.2	2.2	2.3	2.6	0.64	2.4	1.7	0.29	1.7	3.2

Notes:

Analytical results shown in milligrams per kilogram (mg/kg).

Sample depths shown in feet below ground surface (ft bgs).

Polycyclic Aromatic Hydrocarbons (PAHs) analyzed by EPA Method 8270E (SIM).

MTCA CUL = Model Toxics Control Act Cleanup Level. The most conservative Method A or Method B CUL is shown for each compound.

a = MTCA Method A CUL from WAC 173-340-900 Table 740-1.

b = MTCA Method B CUL for Direct Contact, Non-Cancer from Department of Ecology Cleanup Levels and Risk Calculation (CLARC) workbook, February 2024.

c = MTCA Method B CUL for Direct Contact, Cancer from Department of Ecology CLARC workbook, February 2024.

d = MTCA CUL, Protective of Surface Water from Department of Ecology CLARC workbook, February 2024.

e = The total toxic equivalent concentration (Total TEQ) of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) is the sum of the quotient of each cPAH and its applicable toxicity equivalency factor (TEF). cPAHs include benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. One-half the reporting limit was used for results not detected above the reporting limit.

f = Results for WW20S4-5 and WW20S5-5 were extracted and analyzed outside of hold time, per Herrera's request.

ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.

Results detected above the laboratory reporting limit are shown in **bold**.

Results detected above the MTCA Method A/B cleanup level are shown in **bold and highlighted in gray**.

Results detected above the MTCA CUL Protective of Surface Water but below the MTCA Method A CUL are shown in **bold and highlighted in yellow**.

Table 3. Metals in Soil. Waterway #20, Seattle, Washington.													
Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	Arsenic	Barium	Cadmium	Chromium	Hexavalent Chromium	Lead	Mercury	Selenium	Silver	TCLP Lead (mg/L)
MTCA CUL				0.67 ^c	160 ^b	2 ^a	2,000 ^a	0.38 ^c	250 ^a	2 ^a	400 ^b	400 ^b	5 ^e
Natural Background Concentration				7.3	NE	0.77	48	NE	17	0.07	NE	NE	–
WW20S1	WW20S1	04/07/16	0-0.5	ND (11)		ND (0.53)	34	–	29	ND (0.26)			
WW20S2	WW20S2	04/07/16	0-0.5	ND (11)		ND (0.55)	24		45	ND (0.27)			
WW20S3	WW20S3	04/07/16	0-0.5	ND (11)		ND (0.55)	37		48	ND (0.27)			
WW20S4	WW20S4-0	03/09/23	0-0.5	ND (11)	38	ND (0.55)	24	ND (1.1)	9.1	ND (0.28)	ND (11)	ND (1.1)	–
	WW20S4-2	03/09/23	2-2.5	ND (17)	270	ND (0.85)	18	–	1,000	ND (0.43)	ND (17)	ND (1.7)	ND (0.20)
	WW20S4-5	03/09/23 ^d	5-5.5	ND (13)	42	ND (0.65)	16	–	8.8	ND (0.33)	ND (13)	ND (1.3)	–
WW20S5	WW20S5-0	03/09/23	0-0.5	ND (11)	37	ND (0.54)	14	–	37	ND (0.27)	ND (11)	ND (1.1)	–
	WW20S5-2	03/09/23	2-2.5	ND (12)	81	ND (0.62)	19	–	130	ND (0.31)	ND (12)	ND (1.2)	ND (0.20)
	WW20S5-5	03/09/23 ^d	5-5.5	ND (12)	41	ND (0.60)	21	–	ND (6.0)	ND (0.30)	ND (12)	ND (1.2)	–
WW20S6	WW20S6-0	03/09/23	0-0.5	ND (11)	38	ND (0.53)	15	–	ND (5.3)	ND (0.26)	ND (11)	ND (1.1)	–
	WW20S6-5	03/09/23	5-5.5	ND (11)	37	ND (0.57)	13	–	ND (5.7)	ND (0.28)	ND (11)	ND (1.1)	–
WW20S7	WW20S7-0	03/09/23	0-0.5	ND (12)	59	ND (0.6)	26	ND (1.2)	48	ND (0.30)	ND (12)	ND (1.2)	–
	WW20S7-5	03/09/23	5-5.5	ND (13)	300	ND (0.63)	17	–	61	ND (0.31)	ND (13)	ND (1.3)	–
WW20S8	WW20S8-0	03/09/23	0-0.5	ND (11)	37	ND (0.55)	19	–	36	ND (0.28)	ND (11)	ND (1.1)	–
	WW20S8-5	03/09/23	5-5.5	ND (11)	62	1.5	15	–	280	ND (0.28)	ND (11)	ND (1.1)	0.55
WW20S9	WW20S9-0	03/09/23	0-0.5	ND (11)	35	ND (0.55)	16	–	43	ND (0.27)	ND (11)	ND (1.1)	–
	WW20S9-2.5	03/09/23	2.5-3	ND (11)	110	ND (0.57)	18	–	100	ND (0.29)	ND (11)	ND (1.1)	–
WW20S11	WW20S11-0	01/18/24	0-0.5	–	–	–	–	–	37	–	–	–	–
	WW20S11-1	01/18/24	1-1.5	–	–	–	–	–	150	–	–	–	–
	WW20S11-1.5	01/18/24	1.5-2	–	–	–	–	–	ND (5.6)	–	–	–	–
	WW20S11-6.5	01/18/24	6.5-7	–	–	–	–	–	ND (6.1)	–	–	–	–
WW20S12	WW20S12-0	01/18/24	0-0.5	–	–	–	–	–	42	–	–	–	–
	WW20S12-2	01/18/24	2-2.5	–	–	–	–	–	16	–	–	–	–
	WW20S12-6	01/18/24	6-6.5	–	–	–	–	–	7.5	–	–	–	–
	WW20S12-9	01/18/24	9-9.5	–	–	–	–	–	ND (6.2)	–	–	–	–
WW20S13	WW20S13-0	01/18/24	0-0.5	–	–	–	–	–	55	–	–	–	–
	WW20S13-1	01/18/24	1-1.5	–	–	–	–	–	5.9	–	–	–	–
	WW20S13-2	01/18/24	2-2.5	–	–	–	–	–	8.3	–	–	–	–
	WW20S13-7	01/18/24	7-7.5	–	–	–	–	–	ND (6.1)	–	–	–	–
WW20S14	WW20S14-6	01/18/24	6-6.5	–	–	–	–	–	ND (6.2)	–	–	–	–
WW20S15	WW20S15-0	01/18/24	0-0.5	–	–	–	–	–	63	–	–	–	–
	WW20S15-1	01/18/24	1-1.5	–	–	–	–	–	58	–	–	–	–
	WW20S15-2	01/18/24	2-2.5	–	–	–	–	–	20	–	–	–	–
	WW20S15A-9	01/18/24	9-9.8	–	–	–	–	–	ND (6.3)	–	–	–	–
Composite	SOILCOMP-011824	01/18/24	–	ND (12)	47	ND (0.62)	18	–	8.7	ND (0.31)	ND (12)	ND (1.2)	–

Notes:
Analytical results shown in milligrams per kilogram (mg/kg). TCLP results shown in milligrams per liter (mg/L).
Sample depths shown in feet below ground surface (ft bgs).
Metals analyzed by EPA Methods 6010D/7471B. Hexavalent chromium analyzed by EPA Method 7196A (modified).
Toxic Characteristic Leaching Procedure (TCLP) of Lead analyzed by EPA Methods 1311/6010D.
MTCA CUL = Model Toxics Control Act Cleanup Level. The most conservative Method A or Method B CUL is shown for each compound.
a = MTCA Method A CUL from WAC 173-340-900 Table 740-1.
b = MTCA Method B CUL for Direct Contact, Non-Cancer from Department of Ecology Cleanup Levels and Risk Calculation (CLARC) workbook, February 2024.
c = MTCA Method B CUL for Direct Contact, Cancer from Department of Ecology CLARC workbook, February 2024.
d = Results for mercury for WW20S4-5 and WW20S5-5 were extracted and analyzed outside of hold time, per Herrera's request.
e = Maximum Concentration of Contaminants for the Toxicity Characteristic from WAC 173-303-090 Toxicity Characteristic List.
Natural background concentrations for Puget Sound from "Natural Background Soil Metals Concentrations in Washington State." Toxics Cleanup Program, Department of Ecology, October 1
NE = Not established.
ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.
Results detected above the laboratory reporting limit are shown in **bold**.
Results detected above the MTCA cleanup level are shown in **bold and highlighted**.
– = Results not available.

Table 4. PCBs in Soil. Waterway #20, Seattle, Washington.

Sample Location	Sample ID	Sample Date	Sample Depth (ft bgs)	PCB Aroclors									
				1016	1221	1232	1242	1248	1254	1260	1262	1268	Total
MTCA CUL				5.6 ^b	—	—	—	—	0.5 ^c	0.5 ^c	—	—	0.5 ^c
WW20S1	WW20S1	04/07/16	0-0.5	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)
WW20S2	WW20S2	04/07/16	0-0.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
WW20S3	WW20S3	04/07/16	0-0.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
WW20S4	WW20S4-0	03/09/23	0-0.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
	WW20S4-2	03/09/23	2-2.5	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)	ND (0.085)
WW20S5	WW20S5-0	03/09/23	0-0.5	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)	ND (0.054)
	WW20S5-2	03/09/23	2-2.5	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)	ND (0.062)
WW20S6	WW20S6-0	03/09/23	0-0.5	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)	ND (0.053)
WW20S7	WW20S7-0	03/09/23	0-0.5	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)	ND (0.06)
	WW20S7-5	03/09/23	5-5.5	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)	ND (0.063)
WW20S8	WW20S8-0	03/09/23	0-0.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
	WW20S8-5	03/09/23	5-5.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
WW20S9	WW20S9-0	03/09/23	0-0.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
	WW20S9-2.5	03/09/23	2.5-3	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)
WW20S11	WW20S11-0	01/18/24	0-0.5	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)
	WW20S11-1	01/18/24	1-1.5	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)	ND (0.075)
WW20S12	WW20S12-0	01/18/24	0-0.5	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)	ND (0.057)
	WW20S12-6	01/18/24	6-6.5	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)	ND (0.066)
WW20S13	WW20S13-0	01/18/24	0-0.5	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)	ND (0.056)
WW20S15	WW20S15-0	01/18/24	0-0.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
	WW20S15-1	01/18/24	1-1.5	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)	0.055	ND (0.055)	ND (0.055)	ND (0.055)	ND (0.055)
	WW20S15-2	01/18/24	2-2.5	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)	ND (0.059)

Notes:

Analytical results shown in milligrams per kilogram (mg/kg).

Sample depths shown in feet below ground surface (ft bgs).

Polychlorinated biphenyls (PCBs) analyzed by EPA Method 8082A.

MTCA CUL = Model Toxics Control Act Cleanup Level. The most conservative Method A or Method B CUL is shown for each compound.

b = MTCA Method B CUL for Direct Contact, Non-Cancer from Department of Ecology Cleanup Levels and Risk Calculation (CLARC) workbook, February 2024.

c = MTCA Method B CUL for Direct Contact, Cancer from Department of Ecology CLARC workbook, February 2024.

ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.

– = Not available.

Table 5. Petroleum Hydrocarbons and BTEX in Groundwater, Waterway #20, Seattle, Washington.

Sample Location	Sample ID	Sample Date	Gasoline Range Organics	Diesel Range Organics	Lube Oil Range Organics	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene
MTCA CUL			1,000 ^a	500 ^{a,d}		0.8 ^c	640 ^b	700 ^a	1,000 ^{a,e}	
Monitoring Wells										
TDW-1	WW20GW1	3/9/2023	ND (100)	ND (110)	ND (220)	–	–	–	–	–
	WW20GW3	1/18/2024	ND (100)	ND (220)	ND (220)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Temporary Wells										
WW20S6	WW20GW2	3/9/2023	ND (100)	ND (120)	270	–	–	–	–	–
WW20S12	WW20GW4	1/18/2024	ND (100)	85	420	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
WW20S14	WW20GW5	1/18/2024	ND (100)	ND (220)	ND (220)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)

Notes:

Analytical results shown in micrograms per liter (µg/L).

Gasoline analyzed for by NWTPH-Gx

Diesel range and lube oil range organics analyzed for by NWTPH-Dx.

Benzene, Toluene, m,p-xylene, and o-xylene (BTEX) analyzed by EPA 8021B.

MTCA CUL = Model Toxics Control Act Cleanup Level. The most conservative Method A or Method B CUL is shown for each compound.

a = MTCA Method A CUL from WAC 173-340-900 Table 720-1.

b = MTCA Method B CUL for Non-Cancer from Department of Ecology Cleanup Levels and Risk Calculation (CLARC) workbook, February 2024.

c = MTCA Method B CUL for Cancer from Department of Ecology CLARC workbook, February 2024.

d = Cleanup level is for combined diesel range and lube oil range organics results.

e = Cleanup level is for total xylenes.

ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.

Results detected above the laboratory reporting limit are shown in **bold**.

Results detected above the MTCA cleanup level are shown in **bold and highlighted**.

Table 6. Polycyclic Aromatic Hydrocarbons (PAHs) in Groundwater, Waterway #20, Seattle, Washington.

Sample Location	Sample ID	Sample Date	Naphthalene	2-Methylnaphthalene	1-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]anthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz[a,h]anthracene	Benzo[g,h,i]perylene	cPAH TEQ ^d
MTCA CUL			160 ^a	32 ^b	1.5 ^c	–	480 ^b	320 ^b	–	2,400 ^b	640 ^b	240 ^b	–	–	–	–	0.023 ^c	–	–	–	0.023 ^c
cPAH TEF ^d			–	–	–	–	–	–	–	–	–	–	0.1	0.01	0.1	0.1	1	0.1	0.1	–	–
Monitoring Wells																					
TDW-1	WW20GW1	03/09/23	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.098)	ND (0.0098)	ND (0.0098)	ND (0.0098)	ND (0.0098)	ND (0.0098)	ND (0.0098)	ND (0.0098)	ND (0.0098)	ND (0.0074)
	WW20GW3	01/18/24	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.0083)
Temporary Wells																					
WW20S6	WW20GW2	03/09/23	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	ND (0.11)	0.015	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	ND (0.011)	0.0093
WW20S12	WW20GW4	01/18/24	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	0.017	0.081	0.073	0.016	0.029	0.023	ND (0.010)	0.026	0.043
WW20S14	WW20GW5	01/18/24	ND (0.096)	ND (0.096)	ND (0.096)	ND (0.096)	ND (0.096)	0.10	ND (0.096)	ND (0.096)	0.11	0.15	0.011	ND (0.0096)	ND (0.0096)	ND (0.0096)	ND (0.0096)	ND (0.0096)	ND (0.0096)	ND (0.0096)	0.0079

Notes:

Analytical results shown in micrograms per liter (µg/L).

Polycyclic Aromatic Hydrocarbons (PAHs) analyzed by EPA Method 8270E (SIM).

MTCA CUL = Model Toxics Control Act Cleanup Level. The most conservative Method A or Method B CUL is shown for each compound.

a = MTCA Method A CUL from WAC 173-340-900 Table 720-1.

b = MTCA Method B CUL for Non-Cancer from Department of Ecology Cleanup Levels and Risk Calculation (CLARC) workbook, February 2024.

c = MTCA Method B CUL for Cancer from Department of Ecology CLARC workbook, February 2024.

d = The total toxic equivalent concentration (Total TEQ) of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) is the sum of the quotient of each cPAH and its applicable toxicity equivalency factor (TEF). cPAHs include benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. One-half the reporting limit was used for results not detected above the reporting limit.

ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.

Results detected above the laboratory reporting limit are shown in **bold**.

Results detected above the MTCA cleanup level are shown in **bold and highlighted**.

Table 7.																		
Sample Location	Sample ID	Sample Date	Arsenic		Barium		Cadmium		Chromium		Lead		Mercury		Selenium		Silver	
			Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
MTCA CUL			8 ^c		3,200 ^b		5 ^a		24,000 ^b		15 ^a		2 ^a		80 ^b		80 ^b	
Monitoring Wells																		
TDW-1	WW20GW1	03/09/23	ND (3.3)	ND (3.0)	ND (28)	ND (25)	ND (4.4)	ND (4.0)	ND (11)	ND (10)	ND (1.1)	ND (1.0)	ND (0.50)	ND (0.50)	ND (5.6)	ND (5.0)	ND (11)	ND (10)
	WW20GW3	01/18/24	–	–	–	–	–	–	–	–	ND (0.2)	ND (0.2)	–	–	–	–	–	–
Temporary Wells																		
WW20S6	WW20GW2	03/09/23	ND (3.3)	ND (3.0)	39	41	ND (4.4)	ND (4.0)	ND (11)	ND (10)	ND (1.1)	ND (1.0)	ND (0.50)	ND (0.50)	ND (5.6)	ND (5.0)	ND (11)	ND (10)
WW20S12	WW20GW4	01/18/24	–	–	–	–	–	–	–	–	0.953	0.382	–	–	–	–	–	–
WW20S14	WW20GW5	01/18/24	–	–	–	–	–	–	–	–	0.645	ND (0.2)	–	–	–	–	–	–

Notes:

Analytical results shown in micrograms per liter (µg/L).

Lead analyzed by EPA Method 200.8.

MTCA CUL = Model Toxics Control Act Cleanup Level. The most conservative Method A or Method B CUL is shown.

a = MTCA Method A CUL from WAC 173-340-900 Table 720-1.

b = MTCA Method B CUL for Non-Cancer from Department of Ecology Cleanup Levels and Risk Calculation (CLARC) workbook, February 2024.

c = Natural background concentration for arsenic from "Natural Background Groundwater Arsenic Concentrations in Washington State," Table 2, for the Puget Sound Basin, January 2022.

ND = Not detected at or above the laboratory reporting limit (RL), shown in parentheses.

Results detected above the laboratory reporting limit are shown in **bold**.

– = Not available.

Appendix A

Boring Logs

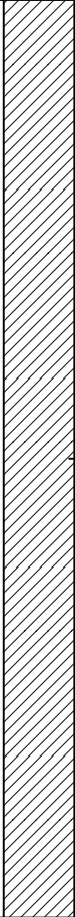
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Project Name: Waterway #20	Drilled By: Holocene Drilling	Sampler Type: Continuous (5 foot)
Project Number: 15-06211-000	Drill Method: Direct Push - track mounted	Sample Diameter: 2.25 inches
Client: City of Seattle	Total Drilled Depth: 0 feet	Logged By: SEM
Site Location: Seattle, WA	Drill Date: 1/18/2024	Location Description: Upland adjacent to waterway, north of asphalt pavement.
	Well Tag ID: NA	

COMMENTS Concrete pad encountered under surface gravel. Stepped rig over approximately 3.5 feet to the north of the proposed location and still encountered concrete pad.

Well Diagram	PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
					1			CRUSHED ROCK GRAVEL (1 inch)
					2			Concrete pad under gravel- unable to penetrate.
					3			
					4			
					5			
					6			
					7			
					8			
					9			
					10			
					11			
					12			
					13			
					14			

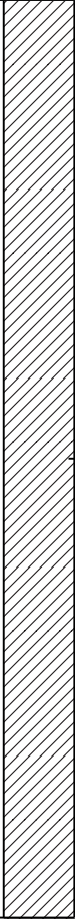
Project Name: Waterway #20	Drilled By: Holocene Drilling	Sampler Type: Continuous (5 foot)
Project Number: 15-06211-000	Drill Method: Direct Push - track mounted	Sample Diameter: 2.25 inches
Client: City of Seattle	Total Drilled Depth: 10 feet	Logged By: SEM
Site Location: Seattle, WA	Drill Date: 1/18/2024	Location Description: Upland adjacent to the waterway
	Well Tag ID: NA	

COMMENTS								
Well Diagram	PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
		WW20S11-0	5-foot core with liner	45%		FILL		CRUSHED ROCK GRAVEL (1 inch)
	0.0				1	GM		Brown silty GRAVEL with sand (GM), moist, fine to coarse subangular gravel, some fine to coarse sand, little fines. Trace brick fragments. FILL.
		WW20S11-1			2	SM		Gray silty SAND with gravel (SM), moist, fine to medium sand, some fines, little subangular to subrounded fine gravel. Trace roots, trace brick fragments. FILL.
	0.0					OL		Black sandy ORGANIC SOIL (OL) with charcoal, moist, some fine sand, trace fine gravel.
		WW20S11-2	5-foot core with liner	35%	3	SM		Gray silty SAND with gravel (SM), wet, fine to coarse sand, few fine to coarse gravel, few fines.
					4			
	0.0				5			at 5 ft bgs: wet
					6			
		WW20S11-6.5			7			
	0.0				8			
					9			
					10			Bottom of boring at 10 feet bgs.
					11			Boring backfilled with hydrated bentonite chips.
					12			
					13			
					14			

Boring Log: WW20S12

Project Name: Waterway #20	Drilled By: Holocene Drilling	Sampler Type: Continuous (5 foot)
Project Number: 15-06211-000	Drill Method: Direct Push - track mounted	Sample Diameter: 2.25 inches
Client: City of Seattle	Total Drilled Depth: 10 feet	Logged By: SEM
Site Location: Seattle, WA	Drill Date: 1/18/2024	Location Description: Upland adjacent to waterway
	Well Tag ID: NA	

COMMENTS

Well Diagram	PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
		WW20S12-0	5-foot core with liner	60%	0.0	FILL		CRUSHED ROCK GRAVEL (1 inch)
		WW20W12-1*			1	SM		Brown, silty SAND with gravel (SM), moist, medium sand, little fine subangular to subrounded gravel, little fines. FILL.
		WW20S12-2			2	SM		Gray silty SAND with gravel (SM), moist, fine to medium sand, some fines, little subangular to subrounded fine gravel. Trace roots. FILL.
					3	OL		Black sandy ORGANIC SOIL (OL) with charcoal, moist, some fine sand, trace fine gravel. Trace roots.
			5-foot core with liner	75%	4	SP-SM		Brown SAND with silt (SP-SM), moist, medium sand, few fines, trace fine to coarse subangular gravel.
					5			
		WW20S12-6			6			at 7 feet: wet
					7			
					8	CL		Gray sandy CLAY (CL), wet, some fine sand, low plasticity.
					8	SP-SM		Brown SAND with silt (SP-SM), moist, medium sand, few fines, trace fine to coarse subangular gravel.
					9	SM		Gray silty SAND (SM), wet, fine sand, few fines.
		WW20S12-9			9			
					10			Bottom of boring at 10 feet bgs.
					11			Temporary Well: 3/4 inch stainless steel screen from 5-10 feet bgs.
					12			Water sample: WW20GW4 *Sample not analyzed.
					13			Boring backfilled with hydrated bentonite chips.
					14			

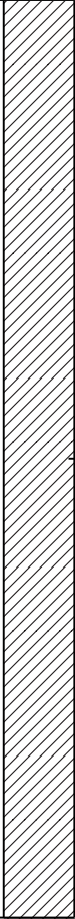
Boring Log: WW20S13

Project Name: Waterway #20
Project Number: 15-06211-000
Client: City of Seattle
Site Location: Seattle, WA

Drilled By: Holocene Drilling
Drill Method: Direct Push - track mounted
Total Drilled Depth: 10 feet
Drill Date: 1/18/2024
Well Tag ID: NA

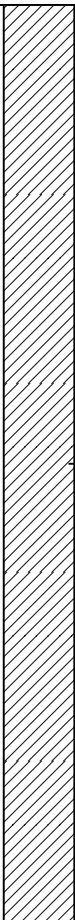
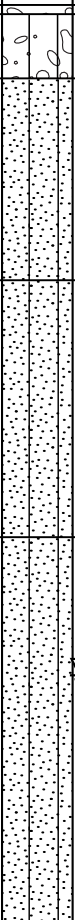
Sampler Type: Continuous (5 foot)
Sample Diameter: 2.25 inches
Logged By: SEM
Location Description: Midway down the proposed pathway

COMMENTS

Well Diagram	PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
		WW20S13-0	5-foot core with liner	60%		FILL		CRUSHED ROCK GRAVEL (1 inch)
	0.0				1	GM		Brown silty GRAVEL with sand (GM), moist, fine to coarse subangular gravel, some fine to coarse sand, little fines. Trace brick fragments. FILL.
		WW20S13-1			2	SM		Gray silty SAND with gravel (SM), moist, fine to medium sand, some fines, little subangular to subrounded fine gravel. Trace roots, trace brick fragments. FILL.
	0.0				3	CL		Gray sandy CLAY with gravel (CL), moist, some fine to coarse sand, few fine subangular to subrounded gravel, low plasticity.
		WW20S13-2	5-foot core with liner	50%	4	SM		Gray silty SAND (SM), wet, fine sand, few fines.
	0.0				5			at 5.2 feet: 3 inches of a crushed cobble at 5.4 feet: 1 inch wood fragments
					6			
					7	SM		Gray silty SAND with gravel (SM), wet, fine to coarse sand, few fine to coarse gravel, few fines.
	0.0				8			
		WW20S13-7			9			
					10			
					11			Bottom of boring at 10 feet bgs.
					12			Boring backfilled with hydrated bentonite chips.
					13			
					14			

Boring Log: WW20S14

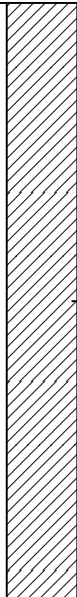
Project Name: Waterway #20	Drilled By: Holocene Drilling	Sampler Type: Continuous (5 foot)
Project Number: 15-06211-000	Drill Method: Direct Push - track mounted	Sample Diameter: 2.25 inches
Client: City of Seattle	Total Drilled Depth: 10 feet	Logged By: SEM
Site Location: Seattle, WA	Drill Date: 1/18/2024	Location Description: Northern portion of proposed pathway
	Well Tag ID: NA	

COMMENTS								
Well Diagram	PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
	0.0	WW20S14-6	5-foot core with liner	40%	0	FILL		CRUSHED ROCK GRAVEL (1 inch)
	0.0				1	GM		Brown silty GRAVEL with sand (GM), moist, fine to coarse subangular gravel, some fine to coarse sand, little fines. Trace brick fragments. FILL.
					2	SM		Gray silty SAND with gravel (SM), moist, fine to medium sand, some fines, little subangular to subrounded fine gravel. Trace roots, trace brick fragments. FILL.
					3	SM		Gray silty SAND (SM), wet, fine sand, few fines.
					4	SM		
	0.0		5-foot core with liner	25%	5	SM		Gray silty SAND (SM), wet, fine sand, few fines.
					6	SM		Gray silty SAND with gravel (SM), wet, fine to coarse sand, few fine to coarse gravel, few fines.
	0.0				7			
					8			
					9			
					10			Bottom of boring at 10 feet bgs.
					11			Temporary Well: 3/4 inch Sch. 40 PVC screen from 5-10 feet bgs.
					12			Water sample: WW20GW5
					13			Boring backfilled with hydrated bentonite chips.
					14			

Boring Log: WW20S15

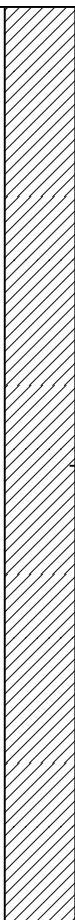
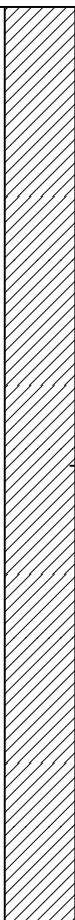
Project Name: Waterway #20	Drilled By: Holocene Drilling	Sampler Type: Continuous (5 foot)
Project Number: 15-06211-000	Drill Method: Direct Push - track mounted	Sample Diameter: 2.25 inches
Client: City of Seattle	Total Drilled Depth: 6.5 feet	Logged By: SEM
Site Location: Seattle, WA	Drill Date: 1/18/2024	Location Description: Southeast portion of Project Site, north of asphalt pavement
	Well Tag ID: NA	

COMMENTS Refusal due to tree root from 5 to 6.5 feet bgs. Stepped drill rig over 2 feet to the northwest to reach 10 feet. See log for WW20S15A for 5 to 10 feet.

Well Diagram		PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
		0.0	WW20S15-0	5-foot core with liner	55%	0.0	FILL		CRUSHED ROCK GRAVEL (1 inch)
			GM					Brown silty GRAVEL with sand (GM), moist, fine to coarse subangular gravel, some fine to coarse sand, little fines. Trace brick fragments. FILL.	
			SM					Gray silty SAND with gravel (SM), moist, fine to medium sand, some fines, little subangular to subrounded fine gravel. Trace roots, trace brick fragments. FILL.	
			GM					Brown silty GRAVEL with sand (GM), moist, fine to coarse subangular gravel, some fine to coarse sand, little fines. Trace brick fragments. FILL.	
			OL					Black sandy ORGANIC SOIL (OL) with charcoal, moist, some fine sand, trace fine gravel. Trace roots.	
			SM					Brown siltySAND (SM), moist, fine to coarse, little fines, few fine subangular to subrounded gravel, trace charcoal.	
			OL					Black sandy ORGANIC SOIL (OL) with charcoal, moist, some fine sand, trace fine gravel. Trace roots.	
			SM					Gray silty SAND with gravel (SM), wet, fine to coarse sand, few fine to coarse gravel, few fines.	
								at 5 feet: 1.5 feet of tree root- REFUSAL at 6.5 feet.	

Project Name: Waterway #20	Drilled By: Holocene Drilling	Sampler Type: Continuous (5 foot)
Project Number: 15-06211-000	Drill Method: Direct Push - track mounted	Sample Diameter: 2.25 inches
Client: City of Seattle	Total Drilled Depth: 10 feet	Logged By: SEM
Site Location: Seattle, WA	Drill Date: 1/18/2024	Location Description: Southeast portion of Project Site, north of asphalt pavement
	Well Tag ID: NA	

COMMENTS Stepped drill rig over 2 feet to the northwest of WW20S15 to avoid the tree root from 5 to 6.5 feet bgs. See log for WW20S15 for 0 to 5 feet bgs.

Well Diagram		PID (ppm)	Samples	Sample Interval	% Recovery	Depth (ft)	Soil Group	Graphic Log	Soil Description
 Bentonite		0.0		5-foot core with liner	50%	1			See log for WW20S15 for 0 to 5 feet.
				2					
				3					
				4					
				5					
		0.0	WW20S15A-9	5-foot core with liner	50%	5	SM		Brown silty SAND (SM), moist fine to medium sand, few fines.
						6	SM		Gray silty SAND (SM), wet, fine sand, few fines.
						7	SM		Gray silty SAND with gravel (SM), wet, fine to coarse sand, some fine to coarse gravel, few fines.
						8			
						9			
				10			Bottom of boring at 10 feet bgs.		
				11			Boring backfilled with hydrated bentonite chips.		
				12					
				13					
				14					

WATERWAY 20

01/18/23

SUPPLEMENTAL
DRILLING & GWS

0700 OFFICE/EQUIPMENT

0735 ONSITE (SEM)

0740 G. IFTNER ONSITE WITH EQUIPMENT

0830 HOLOCENE (TYLER & TERRENCE)
ONSITE.

H & S TAILGATE.

0840 G. IFTNER OFFSITE

(0800) K. JERAULD ONSITE

0900 BEGIN DRILLING WW20S12

SET TEMP WELL 5-10' BGS FOR
WW20GW4

0935. BEGIN DRILLING WW20S14

SET TEMP WELL 5-10' BGS
FOR WW20GW5.

1000 BEGIN DRILLING WW20S13

1030 BEGIN DRILLING WW20S11

1100 BEGIN DRILLING WW20S10

→ HIT CONCRETE UNDER GRAVEL

→ MOVE RIG NORTH ~ 3'

• STILL HITTING CONCRETE.

UNABLE TO ADVANCE

WW20S10.

1140 BEGIN DRILLING NW20S15
THICK TREE ROOT 5-6.5' BGS-
UNABLE TO ADVANCE.

1215 MOVE 28" TO NW OF
PROPOSED LOCATION FOR
NW50S15. ADVANCE NW20S15A
5-10'.

1230 DRILLING COMPLETE
HOLOCENE CLEANS UP &
MOBS EQUIPMENT.

1250 KSI DONE GWS.

1300 HOLOCENE OFFSITE
SEM & KSI PREPARE
SAMPLE COOLERS &
PACK EQUIPMENT.

1400 KSI & SEM OFFSITE.



SMO

SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring No.: WW20512
Total Depth: 10'
Sheet 1 of 1

Project Name: WW20
Project Number: 15-06570-000
Client: SEATTLE FAS
HEC Rep.: SEM

Drilling Contractor: HOLOCENE
Location: _____

Drilling Method: TRACK GEOPROBE
Sampling Method: CONTINUOUS - S
Ground Elevation: _____
Air Monitoring (Y/N): Y
Instrument(s): MINI RAE 300

Start Date: 1/18/24
 Compl. Date: 1/18/24

Instrument reading (ppm)	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Water level (feet)	Soil group	GRAVEL @ SURFACE Soil description	Well Details
0.0		36"		1	SS12-0:		0-15": DARK BR FILL. (20, 60, 20) MED SAND, F-C GR(SA-SR) UP TO 3/4" D. MOIST	
0.0				2	SS12-1: 1-1.5 @ 993		15"-24": GREY, MOIST.	
0.0				3	SS12-2: 2-2.5 @ 992		(20, 40, 20) - F-M SAND. SA-SR GR(F-C) UP TO 3/4" D. TRACE ROOTS.	
				4			3/4": BLACK CHARCOAL LAYER. TRACE ROOTS	
	5'			5				
				6	6.2		BR SAND(5, 85, 10) MCL 7. MED. GR: FC, SA.	
				7	SS12-6: 6-6.5 @ 993		7': WET. @ 7.5' - 3" LENS OF GREY (0, 40, 60), WET.	
	5'			8			@ 8' GREY WET, (0, 85, 15) FINE SAND).	
		45"		9	SS12-9: 9-9.5 @ 994			
				10				
							BOTTOM OF BORING @ 10'	
							Temp Well set & Screened @ 5'-10' w/ SS PIPE.	
							KST TO COLLECT GW (WW20GW4)	



Boring No.: WW20514
Total Depth: 10'
Sheet 1 of 1

Drilling Method: **TRACK GEOPROBE**

Sampling Method: CONTINUOUS-5'

Ground Elevation:

Air Monitoring (Y/N): Y

Instrument(s): MINI RAE 300

Page 1 of 1



Boring No.: WW20513
Total Depth: 10'
Sheet 1 of 1

Project Name: NW20 Drilling Contractor: Holocene Drilling Method: TRACK GEOPROBE
Project Number: 15-00520-000 Location: _____ Sampling Method: CONTINUOUS-5'
Client: SEATTLE FNS Ground Elevation: _____
HEC Rep.: SEM Start Date: 1/18/24 Air Monitoring (Y/N): Y
Compl. Date: _____ Instrument(s): MINI RAE 300

Instrument reading (ppm)	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Water level (feet)	Soil group	C1 GRAVEL @ SURFACE	Well Details
							Soil description	
				1		NNW0513-0	BROWN FILL / SAND & Silt 0-6" @ 101	
				2		NNW0513-2	"9": SAME AS Silt 0-10"	
				3		@1024	2-2.5' : GREY (15, 40, 55). LOW PLASTICITY. SAND: F-C.	
				4			GR: SA-SM UP TO 3/4" D. MOIST.	
				5				
				6			5.5' COBBLE (5.2")	
				7			WOOD DEBRIS (5.5')	
				8		NNW0513-1	GREY SAND (Silt 0-65") (5.6')	
				9		1-1.5' @ 1021	G. 5' : GREY, Silt 0-70"	
				10				
							BOTTOM OF BORING @ 10'	
						NNW0513-1		
						1-1.5' @ 1027		



Boring No.: WN20S11
Total Depth: 10
Sheet 1 of 1

Project Name: WW20 Drilling Contractor: MOLOCFNE Drilling Method: TRACK GEOPROBE
Project Number: 15-00520-000 Location: _____ Sampling Method: CONTINUOUS-5'
Client: SEATTLE FAS Ground Elevation: _____
HEC Rep.: SEM Start Date: 1/18/24 Air Monitoring (Y/N): Y
Compl. Date: "" Instrument(s): MINI RAE 309

kj SoilBoringMonWellRecord_2024.docx

SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring No.: WW20510
Total Depth: 0
Sheet 1 of 1

Drilling Method: TRACK MOUNT
Sampling Method: GEOPROBE
CONTINUOUS - 5'

Ground Elevation: _____

Air Monitoring (Y/N): _____

Instrument(s): MINI RAE 3000

Project Name: WW20

Project Number: 15-00211-

Client: CITY OF SEATTLE

HEC Rep.: SEM

Drilling Contractor: HOLOCENE

Location: WW20-SW, JUST

NEAR ASPHALT

Start Date: 1/18/24

Compl. Date: 11/11

[illegible]



Boring No.: WW20515
Total Depth: ~~10~~ 6.5'
Sheet 1 of 1

Instrument(s): MINI RAE 300

Page 1 of 1



HERRERA

SOIL BORING AND MONITORING WELL CONSTRUCTION RECORD

Boring No.: NW20S15A①
 Total Depth: 10
 Sheet 1 of 1

Project Name: 15-06520-000
 Project Number: NW20

Drilling Contractor: Holocene
 Location: 28" NW OF

Drilling Method: TRACK GEOPROBE
 Sampling Method: CONTINUOUS-5'

Client: SEATTLE FAS

NW20S15

Ground Elevation: _____

HEC Rep.: SEM

Start Date: 1/18/24

Air Monitoring (Y/N): Y

Compl. Date: " "

Instrument(s): MINI RAE 300

Instrument reading (ppm)	Sample type, interval	% recovery	Blow counts	Depth (feet, BGS)	Water level (feet)	Soil group	Soil description	Well Details
				1			SEE NW20S15 FOR 0-5'	
				2				
				3				
				4				
				5				
				6			5-6.5': BROWN (0, 85, 15) F-M. MOIST	
				7			5.5-6.5: GREY, WET, sandy 45 SIL 0.65"	
				8			6.5: (30, 50, 20) GREY, WET F-C, GR: SN-SR UP TO 1.5"	
				9				
				10			BOTTOM OF BORING @ 10'	

① 28" TO THE NW OF NW20S15



HERRERA

GROUNDWATER SAMPLING LOG

Project No.: 15-0621-00 Site: WW20 Well No.: WW20GW4 Date: 1/18/24
 Well Depth: 10 Screen Length: _____ Well Diameter: _____ Casing Type: _____
 Sampling Device: Peri Tubing Type: _____ Water Level: 6.2
 Measuring Point: FTBGS Other Info: _____

Sampling Personnel: Katie Jerauld

Time	pH	Temp.	Cond.	Dis.O ₂	Turb.	[] Conc.	WL	Notes
10:05	6.25	9.1°C	328.0	4.58	8.97	0.228	X	
10:08	6.07	9.1	327.8	2.72	8.14	0.229	X	
10:11	6.04	9.1	328.0	2.03	7.17	0.228	X	
10:15	6.02	9.3	328.0	1.49	6.64	0.230	6.3	→ at end of sampling
Sample ID: <u>WW20GW4</u>								
3 vials: 6x/BTEX								
2 500 mL (HCl): D _x								
2 1 liter: PAHS								
1 250 mL (HNO ₃): total lead								
1 250 mL (HNO ₃ , filtered): dissolved lead								
Time: <u>10:21</u>								

Type of Samples Collected for Laboratory Analysis:

Well Casing Volumes:

Gal/Ft 1¼" = 0.077 1½" = 0.10 2" = 0.16 2½" = 0.24 3" = 0.37 3½" = 0.50 4" = 0.65 6" = 1.46

GROUNDWATER SAMPLING LOG

Project No.: 15-0024 Site: WW20 Well No.: WW20GW5 Date: 1/18/24
 Well Depth: 10 Screen Length: _____ Well Diameter: 1" temp Casing Type: _____
 Sampling Device: Peri Tubing Type: _____ Water Level: _____
 Measuring Point: ground surface Other Info: soil boring WW20 S-14
 Sampling Personnel: Katie Jerauld

Time	pH	Temp.	Cond.	Dis.O ₂	Turb.	[] Conc.	WL	Notes
10:58	6.12	10.1	158.0	4.57	210	0.113	X	
11:03	5.84	10.3	151.8	1.81	38.1	0.109	X	
11:08	5.74	10.3	144.7	1.04	19.9	0.108	X	
11:13	5.78	10.3	148.6	0.76	18.4	0.107	X	
11:18	5.77	10.4	147.4	0.58	17.1	0.107	X	
11:20	5.77	10.4	147.4	0.54	15.4	0.107	7.3	→ at end of sampling
Sample ID: WW20GW5								
3 vial 6x/BTEX								
2 500 mL ambers (HCl): Dx								
2 1 liter ambers: PAHS								
1 250 mL: Total Lead								
1 250 mL (filtered): dissolved lead								
Time: 11:23								

Type of Samples Collected for Laboratory Analysis:

Well Casing Volumes:

Gal/Ft 1 1/4" = 0.077 1 1/2" = 0.10 2" = 0.16 2 1/2" = 0.24 3" = 0.37 3 1/2" = 0.50 4" = 0.65 6" = 1.46



HERRERA

GROUNDWATER SAMPLING LOG

Project No.: 15-06211-00 Site: WW20 Well No.: WW20GW3 Date: 1/18/24
 Well Depth: 10 Screen Length: _____ Well Diameter: _____ Casing Type: _____
 Sampling Device: Peri Tubing Type: _____ Water Level: 4.40
 Measuring Point: TOC Other Info: _____

Sampling Personnel: Kurtie Teranillo

Time	pH	Temp.	Cond.	Dis.O ₂	Turb.	[] Conc.	WL	Notes
12:07	6.11	11.6	211.7	8.40	3.57	0.158	4.42	
12:12	6.20	11.8	212.8	6.99	2.43	0.159	4.40	
12:17	6.24	11.9	213.0	6.71	1.81	0.160	4.35	
12:22	6.25	11.9	212.8	6.58	1.65	0.160	4.35	
12:25	6.26	12.0	212.8	6.55	1.72	0.160	4.35	
End water level: 4.20								
Sample ID: WW20GW3								
3 vials: Gx/BTEX								
2 500 mL ampers (HCl): Dx								
2 1 liter: PTH								
1 250 mL (HNO ₃) total lead								
1 250 mL (HNO ₃ , filtered) dissolved lead								
Time: 12:29								

Type of Samples Collected for Laboratory Analysis:

Well Casing Volumes:

Gal/Ft 1¼" = 0.077 1½" = 0.10 2" = 0.16 2½" = 0.24 3" = 0.37 3½" = 0.50 4" = 0.65 6" = 1.46

Chain of Custody

 Company: HERRERA ENVIRONMENTAL
 Project Number: 15-06211-000
 Project Name: WATERWAY 20 (WW20)
 Project Manager: G. ITNER
 Sampled by: SEM/KSJ

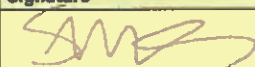
Turnaround Request (in working days)	
(Check One)	
☐ Same Day	☐ 1 Day
☐ 2 Days	☐ 3 Days
☒ Standard (7 Days)	
☐ _____ (other)	

Number of Containers

 Laboratory Number: **01-190**

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix
	WW20S12-0	1/18/24	11	S
	WW20S12-1		0925	
	WW20S12-2		0927	
	WW20S12-3		0936	
	WW20S12-6		0922	
	WW20S14-6		1000	
	WW20S13-0		1019	
	WW20S13-1		1027	
	WW20S13-7		1024	
	WW20S13-7		1021	

NWTPH-HCID	NWTPH-Gx/BTEX (8021) 8260 ☐	NWTPH-Gx	NWTPH-Dx (SG Clean-up) ☐	Volatiles 8260	Halogenated Volatiles 8260	EDB EPA 8011 (Waters Only)	Semivolatiles 8270/SIM (with low-level PAHs)	PAHs 8270/SIM (low-level)	PCBs 8082	Organochlorine Pesticides 8081	Organophosphorus Pesticides 8270/SIM	Chlorinated Acid Herbicides 8151	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664	HOLD	LEAD	% Moisture
	X	X						X									X	X	X
	S	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	X						X									X	X	X

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished		HERRERA	1/18/24	1542	WW20S12-1: HOLD.
Received		OSR	1/18/24	1542	
Relinquished					
Received					
Relinquished					
Received					Data Package: Standard ☐ Level III ☐ Level IV ☐
Reviewed/Date		Reviewed/Date			Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☒

Chain of Custody

Company: HEC

Project Number: 15-06211

Project Name: WW20

Project Manager: G. IFTNER

Sampled by: SCM/KT

**Turnaround Request
(in working days)**

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Days ☐ 3 Days

☒ Standard (7 Days)

☐ _____ (other)

Number of Containers

Laboratory Number: 01-190

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number	NWTPH	NWTPH	NWTPH	NWTPH	Volatiles	Halogen	EDB/E	Semivolatile (with low PAHs)	PAHs	PCBs	Organic	Organic	Chlorine	Total P	Total N	TCLP	HEM	1,1,1-T	DSS	LE	% Moisture
	WW7-11-0	1/18/24	1-42	S		X		X						X										X		X
	VIA 7-11-1	1	1-47	1		X		X						X										X		X
	VI 11-1.5	1	1-41	1		X		X						X										X		X
	VIA 10-11-1.5		1-51	1		X		X						X										X		X
	WW20-15-0		11-5	1		X		X						X										X		X
	V 17-15-1		1-55	1		X		X						X										X		X
	WW7-15E-2		12-2	1		X		X						X										X		X
	WW7-15A-9		12-1	1		X		X						X										X		X
	ILC MP-011824		12-7	1		X		X						X										X		X
	WW20GW4	1	1021	GW		X		X						X												



Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page 1 of 1

Company:	HFC
Project Number:	W 15 06211-00
Project Name:	WW?
Project Manager:	G IFTNER
Sampled by:	SFM/IST

**Turnaround Request
(in working days)**

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Days ☐ 3 Days

☐ Standard (7 Days)

☐ _____
(other)

[illegible]

Laboratory Number:	
NWTPH-HCID	
NWTPH-Gx/BTEX (802) (8260) ☐	☒ ☒
NWTPH-Gx	☒
NWTPH-Dx (SG Clean-up) ☐	☒ ☒
Volatiles 8260	☒
Halogenated Volatiles 8260	
EDB EPA 8011 (Waters Only)	
Semivolatiles 8270/SIM (with low-level PAHs)	
PAHs 8270/SIM (low-level)	☒ ☒
PCBs 8082	
Organochlorine Pesticides 8081	
Organophosphorus Pesticides 8270/SIM	
Chlorinated Acid Herbicides 8151	
Total RCRA Metals	
Total MTCA Metals	
TCLP Metals	
HEM (oil and grease) 1664	
TOTAL LEAD	☒ ☒
DISSOLVED LEAD	☒ ☒
% Moisture	

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished		HERRERA	1/18/24	1542	① FILT FILTERED
Received		OSE	1/18/24	1542	
Relinquished					
Received					
Relinquished					
Received					
Reviewed/Date		Reviewed/Date			Data Package: Standard ☐ Level III ☐ Level IV ☐
					Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Appendix B

Photographic Log

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Waterway #20 Supplemental Phase II

Environmental Site Assessment:

Photographic Log

Photo Number	Photo Description
1	Soil from soil boring WW20S11. Tape measure, 0 to 5 feet bgs, then 5 to 10 feet bgs. Charcoal layer observed at 13 to 18 inches bgs.
2	Soil from soil boring WW20S12. 0 to 5 feet bgs, tape measure, then 5 to 10 feet bgs. 1-inch of the charcoal layer observed in the tip of the 0 to 5 foot sleeve at approximately 34 inches bgs. Crushed rock at the top of the 5 to 10 foot interval.
3	Soil from soil boring WW20S13. 0 to 5 feet bgs, tape measure, then 5 to 10 feet bgs. Charcoal layer not observed/recovered.
4	Soil from soil boring WW20S15. 0 to 5 feet bgs, then 5 to 6.5 feet bgs. 5 to 6.5 feet bgs is all wood material. Charcoal layer observed from 19 to 21 inches bgs and 27 to 30 inches bgs.
5	Soil from soil boring WW20S15A. 5 to 10 feet bgs.

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Appendix C

Laboratory Data and QA Review Memorandum

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Data Quality Assurance Worksheet

By N. VandePutte

Project Name/No./Client: Waterway No. 20 Upland Sediment Sampling / 15-06211-000 / City of Seattle Date 2/14/24 Page 1 of 2

Laboratory/Parameters: Onsite / TPH, RCRA metals, total lead, PAHs, PCBs; AmTest / total and dissolved lead Checked: initials

Sample Date/Lab Report: 1/18/2024 / 2401-190 & 2401-190B date

Parameter	Completeness/ Methodology	Holding Times (days)		Blanks/ Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal ¹		
Soil												
TPH-Gasoline/BTEX	OK / NWTPH- Gx/8021B	5 hrs, 5 days	≤48 hrs ² / 14 days	<5 / 5.4-10 mg/kg	Surr 89- 109	65- 126	88-98	65- 126	NC, LCS 1-3, 8	<30	NA	No flag for elevated RLs.
Total Metals	OK / SM 6010C/7471B	7-13	≤180, 28 (mercury)	<0.25-10 / 0.31-12 mg/kg	87-101	75- 125	NA	75- 125	NC, 5, 14, MS<1-2	<20	NA	No flag for slightly elevated RLs.
Total Lead	OK / 1311 and 6010C/7470	7	≤180	<5.0 / 5.5-7.5 mg/kg	100, 102	75- 125	NA	75- 125	NC, MS 2	<20	NA	No flag for slightly elevated RLs.
TPH-Diesel and Oil	OK / NWTPH-Dx	5, <1	≤14 days/ 40 days	<25-50 / 28-62, 280-570 mg/kg	Surr 59-94	58- 132	NA	58- 132	NC	NA	NA	No flag for elevated RLs.
PAHs	OK / 8270D/SIM	1, <1	≤14 days/ 40 days	<0.0067 / 0.0074- 0.05 mg/kg	83-106 / Surr 75- 109	23- 143	NA	23- 143	MS <1-15	<34	NA	No flag for elevated RLs.
PCBs	OK / 8082A	18, 1	≤14 days/ 40 days	<0.05 / 0.06-0.08 mg/kg	Surr 74-99	26- 127	93, 98	26- 127	LCS 5	<22	NA	Flag J for extraction time exceedance. No flag for slightly elevated RLs.

¹ If the sample or duplicate value is less than five times the reporting limit, then the difference (D) is calculated rather than the RPD and the QA objective is that the difference shall not exceed 2 times the reporting limit instead of the number indicated in the objective column.

² Filtration holding time.



Data Quality Assurance Worksheet

By N. VandePutte

Project Name/No./Client: Waterway No. 20 Upland Sediment Sampling / 15-06211-000 / City of Seattle Date 2/14/24 Page 2 of 2

Laboratory/Parameters: Onsite / TPH, RCRA metals, total lead, PAHs, PCBs; AmTest / total and dissolved lead Checked: initials

Sample Date/Lab Report: 1/18/2024 / 2401-190 & 2401-190B date

Parameter	Completeness/ Methodology	Holding Times (days)		Blanks/ Reporting Limit	Matrix Spikes/ Surrogate Recovery (%)		Lab Control Samples Recovery (%)		Lab Duplicates RPD (%)		Instrument Calibration/ Performance	ACTION
		Reported	Goal		Reported	Goal	Reported	Goal	Reported	Goal ¹		
Groundwater												
TPH-Gasoline/BTEX	OK / NWTPH-Gx/8021	5	≤14	<100 / 100 ug/L	Surr 80-83	72- 128	101-108	72- 128	NC, LCS 4-5	<30	NA	None
Total and Dissolved Lead	OK / 6020/7470	4-7	≤180	<0.2 / 0.2 ug/L	92-96	75- 125	94-98	75- 125	MS <1-3	<20	NA	None
TPH-Diesel and Oil	OK / NWTPH-Dx	1, <1	≤14 days/ 40 days	<0.04-0.2 / 0.1-0.2 mg/L	Surr 78- 103	56- 120	NA	56- 120	NC	<30	NA	None
PAHs	OK / 8270D/SIM	5, <1	≤14 days/ 40 days	<0.01-0.1 / 0.01-0.1 ug/L	Surr 32-81	23- 143	66-90	23- 143	LCS 2-10	<50	NA	None

MB- method blank

NC – not calculable due to one or more values below the detection
limit

Surr - surrogate

hrs - hours

MS – matrix spike

RPD- relative percent difference

LCS- lab control sample

NA – not applicable or not available

¹ If the sample or duplicate value is less than five times the reporting limit, then the difference (D) is calculated rather than the RPD and the QA objective is that the difference shall not exceed 2 times the reporting limit instead of the number indicated in the objective column.

² Filtration holding time.

TECHNICAL MEMORANDUM

Date: May 22, 2024
To: Project File 15-06211-000
From: Nikki VandePutte
Subject: Data Quality Assurance Review of the Waterway 20 Supplemental Phase II ESA January 18, 2024 Data

Introduction

This memorandum presents a review of data quality for 18 soil samples, including one composite soil sample, and 3 groundwater samples collected for the Waterway No. 20 project on January 18, 2024. OnSite Environmental, Inc. in Redmond, Washington analyzed samples for:

- Total petroleum hydrocarbons (TPH)-Gasoline and benzene, toluene, ethylbenzene, and xylenes (BTEX)
- TPH-Diesel and Motor Oil
- Polycyclic aromatic hydrocarbons (PAHs)
- Total lead
- Polychlorinated biphenyls (PCBs)
- Total Resource Conservation and Recovery Act (RCRA) metals

In addition, AmTest, Inc. in Kirkland, Washington analyzed groundwater samples for:

Total and dissolved lead

Table 1. Analyses Performed on Samples Collected January 18, 2024.

Parameter	Method	Laboratory	Number and Type of Samples
TPH-Gasoline/BTEX	NWTPH-Gx/EPA 8021B	OnSite	All soil and water samples
TPH-Diesel and Motor Oil	NWTPH-Dx	OnSite	All soil and water samples
PAHs	EPA 8270/SIM	OnSite	All soil and water samples
Total Lead	EPA 6010D	OnSite	All soil samples
Total and Dissolved Lead	EPA 200.8	AmTest	All water samples
PCBs	EPA 8082A	OnSite	8 soil samples
Total RCRA Metals ^a	EPA 6010D/7471B	OnSite	1 composite soil sample

^a Total RCRA Metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

TPH = total petroleum hydrocarbons

Data Quality Review

Custody, Preservation, Holding Times, and Completeness—Acceptable

The samples were properly preserved and sample custody was maintained from sample collection to receipt at the laboratory. Samples were analyzed within the required method holding times, with the exception noted below. The laboratory reports were complete and contained results for all samples and tests requested on the chain-of-custody (COC) forms.

Samples analyzed for PCBs were extracted 18 days after collection, versus the recommended 14-day extraction holding time. All results were qualified as estimated (J flag). All sample results were non-detect (U flag), with one exception.

Table 2. Data Qualified Due to Holding Time Exceedance.

Sample ID	Parameter	Reason for Qualification	Flag
WW20S12-0	PCBs	Extraction holding time exceedance	UJ
WW20S12-6	PCBs	Extraction holding time exceedance	UJ
WW20S13-0	PCBs	Extraction holding time exceedance	UJ
WW20S11-0	PCBs	Extraction holding time exceedance	UJ
WW20S11-1	PCBs	Extraction holding time exceedance	UJ
WW20S15-0	PCBs	Extraction holding time exceedance	J (Aroclor 1254) / UJ
WW20S15-1	PCBs	Extraction holding time exceedance	UJ
WW20S15-2	PCBs	Extraction holding time exceedance	UJ

Laboratory Reporting Limits—Acceptable with Discussion

The laboratory reporting limits met those established in the 2022 Sampling and Analysis Plan (SAP) for the Site, with exceptions noted below:

- TPH-Gasoline reporting limits for soil samples ranged from 5.4 to 10 mg/kg, versus objective 5.0 mg/kg. Data quality was slightly affected for all soil samples because the samples were undetected at the elevated reporting limit. The data were not qualified.
- TPH-Deisel and Motor Oil reporting limits for 14 soil samples ranged from 28 to 75 mg/kg, and reporting limits for four soil samples ranged from 270 to 570 mg/kg, versus the objective 25 to 50 mg/kg. Data quality was slightly affected for all soil samples because one or both parameters were undetected in every sample at the elevated reporting limit. The data were not qualified.
- PAH reporting limits for 12 soil samples ranged from 0.0074 to 0.0087 mg/kg, and six soil samples ranged from 0.038 to 0.05 mg/kg, versus the objective 0.0067 mg/kg. Data quality was slightly

affected for 14 soil samples that had a number of undetected parameters at the elevated reporting limits. The data were not qualified.

- Total metals reporting limits ranged from 0.31 to 12 mg/kg, versus the objective 0.25 to 12 mg/kg. Data quality was slightly affected in one soil sample for arsenic, cadmium, mercury, selenium, and silver, which were undetected at the elevated reporting limits. The data were not qualified.
- Total lead reporting limits for soil samples ranged from 5.5 to 7.5 mg/kg, versus the objective 5.0 mg/kg. Data quality was slightly affected in 6 soil samples, which were undetected at the elevated reporting limits. No data were qualified.
- PCB reporting limits for 8 soil samples ranged from 0.055 to 0.075 mg/kg, versus the objective 0.05 mg/kg. Data quality was slightly affected in all 8 samples, which had undetected parameters at the elevated reporting limits. No data were qualified.

No data were qualified based on laboratory reporting limits.

Method Blank Analysis—Acceptable

Method blanks were analyzed at the required frequency. Method blanks did not contain levels of target analytes above the laboratory reporting limit.

Laboratory Control Sample Analysis—Acceptable

Laboratory control samples (LCS) were analyzed with project samples for TPH-Gasoline, PAHs, total and dissolved lead, and PCBs at the required frequency. The percent recovery for all parameters met the criteria established in the SAP.

Matrix Spike Analysis—Acceptable

Matrix spikes were analyzed for total metals, total and dissolved lead, and PAHs. The percent recovery values for all parameters met the control limits established in the SAP.

Surrogate Recovery Analysis—Acceptable

Surrogate recovery was analyzed alongside TPH-Gasoline, TPH-Deisel and Motor Oil, PAHs, and PCB samples. The percent recovery for all surrogates met the control limits established in the SAP.

Laboratory Duplicate Analysis—Acceptable

Laboratory duplicate samples were analyzed for all parameters. For project samples, the relative percent difference (RPD) was calculated for each analyte where both duplicate values were greater than five times the reporting limit (RL). The difference between duplicate values was calculated if the detected

compound concentration was less than five times the RL in either the sample or the duplicate. The RPD values or difference values met the control limits established by the laboratory or specified method.

Definition of Data Qualifiers

The following are data qualifier definitions applied for this project.

Table 4. Data Qualifier Definitions.	
Data Qualifier	Definition
J	Value is an estimate based on analytical results
U	Value is below the reporting limit
UJ	Value is below the reporting limit and is an estimate based on analytical results