REMEDIAL INVESTIGATION REPORT

Snopac Property

Facility Site ID #1523145
Cleanup Site ID # 12463

Prepared for: 5055 Properties LLC

Project No. 150054 • December 21, 2023 FINAL

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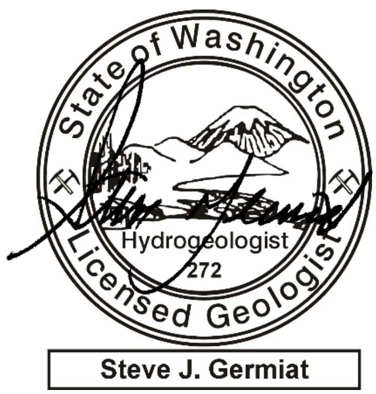

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The scope of this Remedial Investigation Report includes the uplands and in-water portions of the Snopac Property Site.

Aspect Consulting, LLC is responsible for the uplands portion of the remedial investigation. Remedial investigation work pertaining to the uplands portion of the Site was performed pursuant to the Agreed Order under the direct supervision of the above State of Washington-licensed professionals from Aspect Consulting.

Integral Consulting, Inc. is responsible for the in-water sediments portion of the remedial investigation. Remedial investigation work pertaining to the in-water portion of the Site was performed pursuant to the Agreed Order under the direct supervision of the above professional from Integral Consulting.

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Acronyms

Aspect	Aspect Consulting, LLC
ARAR	applicable or relevant and appropriate requirement
BTEX	benzene, ethylbenzene, toluene and xylenes
bml	below mudline
CAP	cleanup action plan
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
COC	constituent of concern
CSCSL	Confirmed and Suspected Contaminated Sites List
CUL	cleanup level
DBF	dibenzofuran
DRO	diesel-range organics
Ecology	Washington Department of Ecology
ENR	Enhanced Natural Recovery
EPA	U.S. Environmental Protection Agency
GRO	gasoline-range organics
LDW	Lower Duwamish Waterway
mg/kg	milligrams/kilograms
mg/L	milligrams per liter
µg/L	micrograms per liter
Manson	Manson Construction
MHHW	mean higher high water
MLLW	mean lower low water
MNR	monitored natural recovery
MP&E	Marine Power & Equipment
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark

ORO	oil-range organics
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PCP	pentachlorophenol
PCUL	preliminary cleanup level
PID	photoionization detector
QAPP	quality assurance project plan
RAL	remedial action level
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAP	Sampling Analysis Plan
SBG	spent sand blast grit
SC	specific conductivity
SCAP	source control action plan
SCS	source control strategy
SEPA	State Environmental Policy Act
SHA	Site Hazard Assessment
SQS	sediment quality standard
SVOC	semi-volatile organic compound
TBT	tributyltin
TCLP	toxicity characteristic leaching procedure
TEE	Terrestrial Ecological Evaluation
TOC	total organic carbon
TPH	total petroleum hydrocarbon
UST	underground storage tank
VOC	volatile organic compound
WAC	Washington State Administrative Code

Executive Summary

This Remedial Investigation (RI) Report was prepared by Aspect Consulting, LLC (Aspect) and Integral Consulting Inc. (Integral), on behalf of 5055 Properties LLC, for the Snopac Property (the Site). The Site is generally located at 5055 and 5053 East Marginal Way South in Seattle, Washington (Property; the Property is 1.33 acres in size, zoned for industrial use), and borders the eastern portion of Slip 1 of the Lower Duwamish Waterway (LDW).

The Site, as defined by Washington State's Model Toxics Control Act (MTCA), includes areas impacted by historical releases of hazardous substances from the Property. 5055 Properties LLC entered Agreed Order No. DE16300 (Agreed Order) with the Washington State Department of Ecology (Ecology) and this RI Report is an Agreed Order-required deliverable.

The Agreed Order requires that the scope of this RI Report include both the uplands and in-water sediments portions of the Site, which are divided at the mean higher high water (MHHW) elevation. The portion of the Site below MHHW includes intertidal and subtidal sediments that are part of LDW Superfund site regulated by the U.S. Environmental Protection Agency (EPA). EPA's Record of Decision (ROD) that defined the cleanup action for the LDW was finalized in November 2014.

5055 Properties LLC plans to perform cleanup activities as required by the Agreed Order and the ROD and redevelop the Property. Prior to redevelopment, an interim action will be performed on the uplands. The interim action will install a new shoring wall to stabilize the shoreface and facilitate removal of spent sandblast grit (SBG)-containing fill on the uplands side of the shoring wall. A subsequent remedial action for the Site will remove the full extent of SBG-containing fill on the LDW side of the shoring wall.

Site and Project Background

The Property is bordered by Slip 1 of the LDW to the west, East Marginal Way South and a rail spur to the east, Manson Construction (Manson) headquarters to the south (on property leased from King County), and Federal Center South to the north. The western Property boundary abuts King County property, which comprises the majority of Slip 1 and separates the Property from the main LDW channel. The area surrounding the Property is zoned primarily for light to heavy industrial use, with nearby property uses including marine and commercial fishing support, and manufacturing.

Current Property conditions include an approximately 23,600-square-foot warehouse constructed between 1919 and 1932. The warehouse is currently used by Manson Construction for storage and staging of construction equipment and will be demolished at the beginning of redevelopment.

The Property area has a long industrial history that began with the construction of the LDW Slip 1 at the beginning of the 1900s. Starting sometime in the 1970s, SBG was dumped directly on the bank adjacent to Slip 1, and then later behind the current retaining wall present at the Property. The SBG was reportedly derived from smelter slag. The smelter slag-derived grit and waste paints both contribute to contamination and spatially coexist in the SBG-containing fill—the primary identified source of contamination in uplands soil and groundwater, and in-water sediments, at the Site.

Significant environmental investigations have occurred at the uplands portion of the Site prior to the Agreed Order with Ecology, and additional characterization was performed in 2019 under the Agreed Order. Sediment investigations were initiated by EPA and their consultants in Slip 1, and then in 2018 by 5055 Properties LLC to supplement EPA results and support the sediment remedial action required by the ROD. All Site information from the environmental investigations is incorporated into this RI Report to meet the requirements of the Agreed Order.

Subsurface Conditions

Four soil units occur at the Site, from the surface down (1) fill materials (Fill Unit), older native units consisting of (2) estuarine deposits (Estuarine Unit) underlain by (3) native alluvium (Alluvium Unit). The native alluvium is underlain at a depth greater than 150 feet by (4) over-consolidated glacial deposits. Uplands soil contamination occurs in the Fill Unit and is associated principally with the SBG-containing fill.

Groundwater flow in the Fill Unit discharges to the LDW. The Fill Unit is a water table (unconfined) water-bearing unit, which is tidally influenced by the LDW. The Estuarine Unit functions as an aquitard, restricting groundwater flow between the Fill Unit and underlying Alluvium Unit. A confined aquifer is present in the Alluvium Unit; it is also tidally influenced and, because it is confined, has a greater tidal efficiency than the Fill Unit.

Constituents of Concern

Concentrations of contaminants from historically placed SBG-containing fill exceeding upland preliminary cleanup levels (PCULs) and in-water remedial action levels[1] (RALs) applied in this RI are observed in uplands soil and groundwater and in-water sediments. Based on the Site remedial investigation data, the following analytes are identified as Site constituents of concern (COCs):

- Metals (arsenic[2], copper, lead, mercury, and zinc); nickel (groundwater only)
- Polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Pentachlorophenol (PCP)
- Tributyltin Ion (TBT)
- Total petroleum hydrocarbons (TPHs; in a limited area of the uplands)

[1] These RALs vary by alternative and are set by EPA so that in each area the cleanup levels (CULs) will be met either immediately after construction, or in the long-term after natural recovery, to the extent practicable (described in Section 4).

[2] Possessing properties of both a metal and nonmetal, arsenic is chemically classified as a metalloid, but grouped with metals in this RI Report.

The extent of PCUL exceedances in uplands soil and groundwater coincides with the inferred extent of SBG-containing fill. Inland of the SBG extent, including outside and within the footprint of the existing warehouse, fill soils exhibit isolated low-level concentrations of PAHs, PCBs, and metals that exceed PCULs but are typical of concentrations in urban fill soils. There is no historical process on Site that explains the sporadic low-level exceedances outside of the SBG-containing fill.

The in-water sediment COCs in and adjacent to Slip 1 identified in the LDW RI/FS included PCBs, PAHs, and metals (Windward 2010). However, the area requiring active remediation at the head of Slip 1, shown as a region of proposed partial dredge and cap in Figure 18 of the EPA ROD (EPA 2014) for the LDW Superfund site, is primarily due to the presence of elevated metals concentrations.

Exceedances of LDW ROD RALs in Slip 1 in intertidal and subtidal sediments below MHHW are also associated with SBG-containing fill. The COCs for the adjacent shoreface and bank sediments are also PCBs, PAHs, and metals associated with the SBG that was historically disposed of on the bank adjacent to the slip.

Exposure Pathways and Potential Receptors

The following exposure pathways, evaluated in accordance with Ecology's PCUL Document and MTCA guidance, are currently considered complete at the Site for upland soil and groundwater and in-water surface water and sediments:

- Direct contact of ecological (aquatic) receptors to surface water contaminated by Site groundwater discharge
- Human exposure via consumption of aquatic organisms exposed to contaminated surface water
- Direct contact of ecological (benthic) receptors to contaminated sediment
- Direct contact of human receptors to contaminated sediment
- Human exposure via consumption of aquatic organisms exposed to contaminated sediment
- Direct human exposure for an employee or construction worker to soil via ingestion

Next Steps

This RI Report is prepared to satisfy the requirements of the Agreed Order. A Final Interim Action Work Plan describes an interim action that will install a new shoring wall to stabilize the shoreface, followed by removal of all SBG-containing fill from the landward side of the shoring wall (Aspect, 2020). Implementation of the Final Interim Action Work Plan is an enforceable part of the Agreed Order and will remove the primary source of contamination identified on the portion of the Property upland of the shoring wall.

Subsequent remedial actions will include removal of the remainder of SBG-containing fill on the water-side of the proposed shoring wall (some above and some below MHHW). The LDW ROD defines the remediation action required for in-water sediments within the Site.

1 Introduction

This Remedial Investigation (RI) Report was prepared by Aspect Consulting, LLC (Aspect) and Integral Consulting Inc. (Integral), on behalf of 5055 Properties LLC, for the Snopac Property (the Site). The Site is generally located at 5055 and 5053 East Marginal Way South in Seattle, Washington (Property), and borders the eastern portion of Slip 1 of the Lower Duwamish Waterway (LDW) (Figure 1). The Site, as defined by Washington State's Model Toxics Control Act (MTCA), includes all upland and in-water areas impacted by historical releases of hazardous substances from the Property. 5055 Properties LLC entered an Agreed Order No. DE16300 (Agreed Order) with the Washington State Department of Ecology (Ecology) and this RI Report is an Agreed Order-required deliverable.

The Agreed Order requires that the scope of this RI Report include both the uplands and in-water sediments portions of the Site, which are divided at the mean higher high water (MHHW) elevation. The portion of the Site below MHHW includes intertidal and subtidal sediments that are part of LDW Superfund site regulated by the U.S. Environmental Protection Agency (EPA).

1.1 Purpose and Scope of Work

Site groundwater, groundwater seeps, soil, and Slip 1 sediments have been impacted by historical releases of hazardous substances from the Property, as described in this RI Report. An Agreed Order between 5055 Properties LLC and Ecology was executed on July 15, 2019. The Agreed Order requires a scope of work to be performed as part of remedial actions for the Site.

5055 Properties LLC plans to redevelop the uplands portion of the Property. Prior to the redevelopment, an interim action (Interim Action) will be conducted in the uplands and as required by the Final Interim Action Work Plan (Aspect, 2020). The LDW ROD defines the remediation action required for in-water sediments within the Site, and, after the uplands interim action, a subsequent remedial action will remove the remaining SBG-containing fill on the water-side of the proposed shoring wall (some above and some below MHHW).

This RI Report has been prepared to satisfy requirements of the Agreed Order and Washington Administrative Code (WAC) Sections 173-340-350(7) and 173-204-550(6). The purpose of the RI is to document the nature and extent of contamination in the upland and intertidal/nearshore portions of the Site. The information will be used to select a cleanup action in accordance with 173-340-356 through 173-340-390.

2 Site Background and Setting

2.1 Site Description

The Property is 1.33 acres in size, zoned for industrial use, and occupies both the 5055 and 5053 East Marginal Way South addresses under King County Tax Parcel No. 3573201061. The Property is bordered by Slip 1 of the LDW to the west, East Marginal Way South and a rail spur to the east, Manson Construction (Manson) headquarters to the south (on property leased from King County), and Federal Center South to the north (Figure 2). The western Property boundary abuts King County Tax Parcel, No. 1924049067, which comprises the majority of Slip 1 and separates the Property from the main LDW channel. The area surrounding the Property is zoned primarily for light to heavy industrial use, with nearby property uses including marine and commercial fishing support, and manufacturing.

Current physical improvements on the Property include an approximately 23,600-square-foot building (hereafter referred to as the existing warehouse), constructed between 1919 and 1932 (Hart Crowser, 2011a). A small addition to the southern portion of the building was reportedly constructed in 1961. The building is currently used by Manson Construction for storage and staging of construction equipment.

A retaining wall is present on the west side of the Property bordering Slip 1. The retaining wall is approximately 7 feet high, 270 feet long, and extends the full length of the shoreface on the western Property boundary. During low tides, an intertidal shoreline is exposed west of the retaining wall base. The retaining wall, apparently constructed between the late 1970s and early 1980s, is comprised of vertical steel plates. The steel plates, at least in part, are salvaged from ship hulls, and are interwoven into pilings that supported an older dock structure. Recent photographs (taken during RI investigation activities) showing key features, including the retaining wall, are provided in Appendix A.

At various times after the late 1970s, fill materials including spent sandblast grit (SBG), were placed landward of the retaining wall to bring the area to current grade. The dock structure was reportedly deemed unsafe in 1980 (Hart Crowser, 2011), and only minor remnants of the dock structure now remain.

The portion of the Property between the existing warehouse and the retaining wall is used by Manson for parking and equipment storage. The uplands area is isolated by concrete blocks from the retaining wall and shoreface. The area between the concrete blocks and the retaining wall, partially vegetated with madrone and blackberry, is considered unstable and is not used.

2.2 Site History

The Property has supported various industrial uses since the 1920s. The Property is located in an area that was hydraulically filled between 1901 to 1917 as part of the LDW construction (Harper Owes, 1985). During this period, the Lower Duwamish River was dredged and straightened, and the historical shoreline and floodplain were hydraulically filled to facilitate shoreline development and control flooding. Although the source of the fill material was not documented, it is likely dredge material from the main channel (Harper-Owes 1985). This hydraulic fill is present above native estuarine and alluvium soil deposits on the majority of the Property. The early 1900s fill material does not appear to contain contaminants at concentrations of concern, except where that older fill material has been impacted by later releases. Explorations completed as part of this RI confirmed that this hydraulic fill is present above the native soil deposits on the majority of the Property.

Sanborn maps[3] indicate that the Property was developed with a building in 1919, and was occupied by Western Containers Inc, a corrugated paperboard manufacturing business, by 1929. At that time, Property improvements also included railroad spurs on the eastern and western sides of the Property, and a "coal screen" and two "coal burners" located between rail spurs in the northwest portion of the Property. The north adjacent property was listed as a coal yard in 1929.

Site history research by Hart Crowser (2011) and Farallon Consulting, LLC (Farallon, 2011) indicates that, following Western Containers Inc, the following businesses subsequently operated on the Property:

- Olympic Lighterage Company (1935 – 1940)
- Pioneer Towing Company (1935 – 1970)
- Interstate Transit Company (pre-1961)
- Emerson GM Diesel (1964 – Unknown)
- Stores Delivery Services (1970 – Unknown)
- Marine Leasing/Marine Logistics (1973 – 1988)
- United Marine Shipbuilding (1988 – 1992)
- Snopac Products, Inc. (1992 – 2012)

2.2.1 Property History 1935 -1970

Pioneer Towing Company used a shop and office building located on the northwest corner of the Property from 1935 through 1970. This building is thought to have been at least in part an overwater structure extending onto the dock.

Pioneer Towing Company had an 8,000-gallon diesel underground storage tank (UST) installed to the west of the existing warehouse building in 1959. At least two additional USTs were historically present on the Property, a 1,000-gallon tank located northeast of the existing warehouse, and a 2,500-gallon UST located northwest of the existing warehouse (SAIC, 2009; Hart Crowser, 2011a; Farallon, 2011a). Historical features, including the approximate locations of these former USTs, are shown on Figure 2. All three USTs were reportedly removed from the Property between 1989 and 1990. There was reported to be no contamination associated with the USTs, but the removals pre-dated requirements for sampling at closure, and it is unknown what field methods were used to assess conditions at UST closure (Ecology, 2009).

[3] Accessed from the Seattle Public Library in November 2016.

The City Directory lists Olympic Lighterage Company as a Property occupant from 1935 to 1940. Olympic Lighterage was reported to be a cargo ship unloading company. Available Sanborn Map, City Directory, and City tax records (Farallon, 2011, Hart Crowser, 2011) indicate the Property was also occupied between 1935 and 1970 by Interstate Transit, Emerson GM Diesel, and Stores Delivery Services. The available historical records did not provide details on the specific operational period or activities conducted by these Property occupants.

2.2.2 Marine Leasing/Marine Logistics Property History 1973-1988

The Property was acquired by Marine Leasing in 1973. Marine Leasing was subsequently renamed Marine Logistics (hereafter referred to as Marine Leasing/Marine Logistics). In 1988, Marine Logistics was then acquired through bankruptcy by United Marine Shipbuilding. During the period between 1973 and 1988, Marine Leasing/Marine Logistics reportedly used the existing warehouse at Property to store equipment in connection with Marine Power & Equipment's (MP&E) operations at MP&E's Northlake and Fox Avenue shipyards.

Starting sometime in the 1970s, Marine Leasing/Marine Logistics reportedly began disposing SBG on the Property. The source of the SBG is believed to have been the Northlake and Fox Avenue shipyards. The SBG was reportedly initially dumped directly on the side of the bank adjacent to Slip 1, and then later behind the steel plates placed between the older dock pilings by MP&E employees. These steel plates make up the current retaining wall present at the Property.

The Marine Leasing/Marine Logistics-disposed SBG was first reported in the subsurface on the Property during the 1989 removal of the 8,000-gallon diesel UST (Farallon, 2011a), which was located between the existing warehouse and the retaining wall (see Figure 2). Subsequent investigations failed to identify SBG in the subsurface (Farallon, 2011b). More recent data collection for this RI confirmed the presence of SBG at the base of the retaining wall, along much of the upper intertidal zone seaward of retaining wall, within the interior spaces between the retaining wall sheets, and in-fill soil extending eastward from the retaining wall to the western extent of the existing warehouse.

2.2.3 United Marine Shipbuilding Property History 1988-1992

WFI Industries, a holding company that held Marine Leasing/Marine Logistics filed for bankruptcy in 1988. WFI emerged from bankruptcy as United Marine Shipbuilding (Hart Crowser, 2011a), which operated on a limited basis at their 1441 Northlake Way shipyard.

2.2.4 Snopac Products Property History 1992 -2012

Snopac Products (Snopac) purchased the Property around 1992 and owned it until 2012. After Snopac acquired the Property, approximately 3 feet of fill material acquired from Pacific Topsoil was reportedly added to the entire exterior ground surface (Farallon, 2011a). Snopac used the Property for seafood processing until 2008, when they reportedly moved the business (SAIC 2009). 5055 Properties LLC purchased the Property from Snopac in June 2012 and have used it for storage and staging of construction equipment since that time.

2.3 Regulatory History

Site groundwater, intertidal groundwater seeps, soil, and Slip 1 sediments have been impacted by historical releases of hazardous substances at the Site. Seep sampling conducted on the Slip 1 shoreface (Seep 76) in 2004 confirmed the presence of metals in seep discharge at concentrations exceeding Washington State Marine Chronic Water Quality Standards (Windward, 2004). Surface sediment sampling conducted adjacent to the Property as part of the *Lower Duwamish Waterway Remedial Investigation* (LDWG, 2010) also confirmed the presence of multiple organic and inorganic contaminants in surface and subsurface sediments at concentrations exceeding Washington State Sediment Quality Standards (Ecology, 2009).

A 2004 updated Memorandum of Understanding between the U.S. Environmental Protection Agency (EPA) and Ecology divided agency responsibilities for the LDW Site (EPA, 2004). EPA was the lead agency for the LDW Remedial Investigation/ Feasibility Study (RI/FS), with Ecology (in association with the City of Seattle, King County, the Port of Seattle, and the City of Tukwila) to take the lead on source control for upland sites with ongoing discharge of contaminants to the LDW. In 2007, Ecology identified 16 discrete source control areas within the LDW drainage basin. Slip 1 was identified as one of these 16 source control areas. Three properties identified as being located directly adjacent to Slip 1 included the Property, the adjacent Federal Center South to the north, and the Manson-leased property to the south.

A Slip 1 Data Gaps Report (SAIC, 2008) commissioned by Ecology identified key information needed to further evaluate the potential for sediment recontamination from the Property. In 2009, Ecology issued a Source Control Action Plan (SCAP) for Slip 1 (River Mile 0.9-1) (Ecology, 2009). This SCAP summarized current and historical uses of the Property, summarized environmental investigations and cleanups completed at the Property, and discussed the potential for future releases to Slip 1 that could require source control remedial action. A summary of existing conditions on the Property was also prepared for Ecology in 2011 by Hart Crowser (Hart Crowser, 2011a).

After their evaluation of existing conditions, Hart Crowser prepared a Property-specific Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) for Ecology. The SAP/QAPP identified source control data gaps on the Property (Hart Crowser, 2011b), and proposed a scope of work for a "*reconnaissance-level investigation….to evaluate the site for the potential for sediment recontamination.*"

In June 2014, Ecology performed an Initial Investigation of the Site and completed a Site Hazard Assessment (SHA; Ecology, 2014a and 2014b). Ecology ranked the Site as a 2 on a scale of 1 to 5, where 1 indicates the highest relative risk and 5 the lowest. The exposure pathway that the SHA scored as the highest concern was the surface water to human and ecological receptors pathway. The data used to score this pathway were the Seep 76 arsenic results collected in 2004. Ecology subsequently notified 5055 Properties LLC via an Early Notice Letter that the Site was being added to Ecology's Confirmed and Suspected Contaminated Sites List (CSCSL) and was assigned Cleanup Site ID #12463.

An additional regulatory action relevant to this RI, and to future Slip 1 source control actions, is Ecology's Revised Policy Memorandum on groundwater cleanup levels (CULs) for upland sites bordering the LDW (Ecology, 2016a). Regarding the maximum beneficial use of groundwater for upland sites bordering the LDW, this memorandum states that *"Table 602 in WAC 173-201A does not list domestic water use as a beneficial use for the lower 11 miles of the Duwamish River. Therefore, for the purposes of this memo, it is presumed that groundwater cleanup levels protective of surface water for sites within the Lower Duwamish Waterway will not need to address drinking water use."* Consistent with Ecology's memorandum, groundwater discharge to surface water represents the highest beneficial use of groundwater at the Site.

In 2016, Ecology issued the updated *Lower Duwamish Waterway Source Control Strategy* (SCS) document (Ecology, 2016b). The SCS, prepared by the multiple agencies managing source control in the LDW, defines what constitutes both sources and pathways to the LDW, clarifies the agencies goals and priorities for the source control effort, what regulatory mechanisms are applicable, and how those mechanisms will be implemented. Ecology subsequently issued revised versions of the *Supplemental Information Paper* documenting instructions for use of their Preliminary Cleanup Level (PCUL) workbook in December 2018 (Ecology, 2018) and July 2019 (Ecology, 2019). The paper and accompanying workbook apply to the development of PCULs for upland sites where transport pathways to the LDW may impact surface water, sediments, or organisms in the LDW. PCULs for the Site, discussed later in this RI (see Section 4), were developed using the July 2019 LDW Preliminary Cleanup Level Workbook and Supplemental Information (Ecology, 2019).

Since 2015, 5055 Properties LLC has been conducting independent remedial investigations at the Site. Following negotiations between 5055 Properties LLC and Ecology, an Agreed Order was executed by 5055 Properties LLC and Ecology on July 15, 2019 that stipulates the scope of work for completing this RI. The Agreed Order also requires that 5055 Properties prepare and submit an Uplands Feasibility Study, a Sediment Feasibility Study, and an Uplands Draft Cleanup Action Plan.

2.4 Environmental Setting

2.4.1 Topography and Slip 1 Bathymetry

The Property topography is generally flat with a slight slope to the west, or toward the LDW. The floor elevation of the existing warehouse ranges from 16.66 to 17.16 feet North American Vertical Datum of 1988 (NAVD 88). The ground surface elevation, outside of the building, is approximately 17 feet (NAVD 88) near the eastern extent of the Property and ranges from approximately 15 to 17 feet (NAVD 88) near the existing retaining wall and top of bank to the west. Much of the bank is within the tidal range. The existing bank slope is steep, consisting of soil, SBG, and debris (metal, wood, and concrete).

The MHHW level at the Site is at 9.00 feet (NAVD88), or 11.38 feet (mean lower low water [MLLW] vertical datum; NOAA 2018). The MHHW elevation of 9.00 feet NAVD88 is the demarcation between the sediment and upland portions of the Site.

Below MHHW, the Slip 1 is relatively shallow, with surface elevations ranging from +0.96 feet (NAVD88) (or +3.34 feet MLLW) at the head of the slip to approximately -17 to -22 feet (NAVD88) (or -15 to -20 feet MLLW) at the in-water boundary of the Site. At low tide, bottom sediments are exposed at the head and along the adjacent eastern shoreface of Slip 1.

2.4.2 Upland Geology and Hydrogeology

The Duwamish River Valley is a subglacial valley created during the most recent glaciation by scour and erosion from meltwater channels beneath glacier ice. Dense/hard glacially consolidated deposits have been compacted beneath the weight of glacier ice and define the bottom of the valley. They are mantled by up to hundreds of feet of recent alluvium deposited by the Duwamish River, and by lahars/debris flows from Mt. Rainier. Locally, the recent alluvium is described as predominantly sandy with horizontal fine and coarse-grained lenses, including estuary peat and clay, deposited within the Duwamish River Valley. Between 1901 to 1917 as part of the LDW construction, the meandering Duwamish River was dredged, filled, and straightened to create a navigable waterway and associated developments (Harper Owes, 1985). In areas where filling occurred, including at the Site, the recent alluvium is overlain by fill materials.

Based on Site explorations, four discrete, mappable soil units were identified at the Property. These soil units, from the surface down, include an upper unit comprised of (1) fill material, older native units consisting of (2) estuarine deposits underlain by (3) native alluvium. The native alluvium is underlain by (4) over-consolidated glacial deposits. A description of these units is provided below.

The fill, estuarine, and native alluvium deposits are depicted in four geologic cross sections with layouts shown on Figure 2. Figure 3, Cross Section A-A’, is a north-south cross section oriented parallel to the shoreline along the north side of the existing warehouse. Three cross section oriented perpendicular to the shoreline are shown in Figures 4, 5, and 6, showing the top three soil units. The cross sections do not extend deep enough to show the deeper glacial deposits.

2.4.2.1 Fill Unit

The fill unit (Fill Unit) generally comprises the upper 10 to 11 feet of soil (bottom elevation of 5 to 6 feet NAVD88) at the Site, but in some areas extends to a depth of 16 feet (near 0 feet NAVD88). Three feet of fill material acquired from Pacific Topsoils was reportedly added to the entire exterior ground surface (Farallon, 2011a) by Snopac. This material comprises the upper portion of the Fill Unit on the Property. From the west side of the existing warehouse to the eastern Property boundary, the Fill Unit consists of a heterogeneous mix of gravelly sand, silt, and silty sand with little or no anthropogenic debris, or SBG observed. This fill is interpreted to be primarily hydraulic fill placed prior to 1919.

In the western portion of the Site, the Fill Unit consists of a heterogeneous mix of gravelly sand, silt, and silty sand, but also includes varying proportions of anthropogenic debris including SBG, railroad ties, coal fragments, glass shards, and brick or masonry fragments. Debris is most common in the upper portion of the Fill Unit, but generally appears to increase in both size and quantity towards the west, with debris noted at depths greater than 10 feet bgs in borings along the western portion of the Property near the retaining wall.

The fill present on the western portion of the Property is interpreted to be both hydraulic fill placed prior to 1919, and debris-containing fill placed post-1919. SBG-containing fill is thought to have been placed starting in 1970s as described in Section 2.2.2. The observed SBG consists of predominantly glassy, rounded to angular sand-sized grains, with admixtures of multi-colored paint chips. The observation of SBG was in the upper 3 to 5 feet of the Fill Unit, but was observed at depths up to 12 feet bgs at boring B-4 (Appendix B). The portions of the Fill Unit interpreted to contain SBG are depicted in cross section on Figures 3 through 6, and aerially on Figure 2.

2.4.2.2 Estuarine Unit

Estuarine deposits (the Estuarine Unit) were observed to extend from the bottom of the Fill Unit to a depth of about 16 feet bgs and are generally 4 to 6 feet thick. The estuarine deposits consist of very soft/loose organic silt and clay, with shells, abundant organic debris, and a sulfur like odor. The Estuarine Unit is depicted overlying the Native Alluvium Unit on the cross-section figures.

2.4.2.3 Alluvium Unit

Recent alluvial deposits (the Native Alluvium Unit) were observed in all borings advanced below the Estuarine Unit. The Alluvium Unit was observed to extend from the Estuarine Unit to a depth of about 158 feet bgs in boring B-21 (boring log in Appendix C). The recent alluvium deposits consist of very loose to medium dense sand, sandy to very sandy silt, and interbedded very soft to stiff low-plasticity clay and silt with variable organic content. The Alluvium Unit corresponds to the historical channel overbank/floodplain deposits from the Duwamish River and is interpreted to correlate with the Young Alluvium Unit (Qyal; Booth and Herman, 1998).

2.4.2.4 Glacial Unit

The Alluvium Unit was observed to be underlain by dense glacial soils (the Glacial Unit) at a depth of 158 feet bgs in soil boring B-21 completed for geotechnical purposes. The Glacial Unit consisted of hard, wet, low-plasticity clay with traces of gravel and thinly laminated silt. Shells were also noted in places. The Glacial Unit extended to a total depth of 186.5 feet bgs at soil boring B-21.

2.4.3 Hydrogeology

The Fill Unit is a water table (unconfined) water-bearing unit, which is tidally influenced by the LDW, as further detailed in the following section.

The Estuarine Unit functions as an aquitard, restricting groundwater flow between the Fill Unit and underlying Alluvium Unit. The aquitard's effective hydraulic separation of the two units is illustrated by the feet of head difference maintained between Fill Unit monitoring well MW-12 and Alluvium Unit monitoring well MW-8 on the east side of the Property. Based on the water level data from those two wells, there is a downward hydraulic gradient across the Estuarine Unit aquitard, from the Fill Unit to the underlying Alluvium Unit, in the eastern portion of the Property. The vertical hydraulic gradient likely progressively decreases with decreasing distance from the LDW because both units are in direct connection with the common head of the LDW.

A confined aquifer is present in the Alluvium Unit beneath the Estuarine Unit aquitard. The Alluvium unit is also tidally influenced and, because it is confined, has a greater tidal efficiency than the Fill Unit.

2.4.4 Fill Unit Groundwater Flow and Tidal Variability

Groundwater in the Fill Unit flows towards the LDW. The interpreted groundwater elevation contours for the 2017 and 2018 monitoring events are presented on Figure 7. The groundwater elevations were calculated using monitoring well water level measurements collected approximately 1 hour before low tide during the February 2017 event, and approximately 3 hours before low tide during the January 2018 event. Water levels were collected during a 0.5-hour window to best capture a “snapshot” of Site-wide water levels at the same tidal stage. During both events, groundwater was present in the Fill Unit at elevations ranging between 3 and 9 feet (NAVD88). Table B-1 in Appendix B presents top-of-casing elevations and screened interval depths for the Site monitoring wells, and groundwater level depths and elevations measured during the two events.

Surface water levels in the LDW are influenced by river flow and tidal effects from Puget Sound. The typical tidal range in Seattle’s Elliott Bay is approximately 11 feet, based on the difference between MHHW and MLLW (http://tidesandcurrents.noaa.gov). These tidal variations result in tidal influence and tidal mixing in nearshore portions of aquifers that discharge to the LDW.

To better understand the influence of tidal changes on groundwater levels and flow in the Fill Unit, three tidal studies were conducted in the winter of 2017 (comprising the “tidal study,” as referred to hereafter). During the tidal study, a total of nine wells completed in the Fill and Alluvium Units were monitored for groundwater level, specific conductivity (an empirical surrogate of salinity and total dissolved solids), and temperature for periods ranging from 24 to 72 hours, and for 20 days in Fill Unit well MW-2 and Alluvium Unit well MW-6. Summary data from the tidal study are presented in Appendix B. The tidal effects observed in groundwater at the Site were generally consistent with observations reported throughout the Duwamish River Basin (Booth and Herman, 1998). Some key findings from the tidal study are described below for the Fill Unit and deeper Alluvium Unit.

2.4.4.1 Fill Unit

Groundwater level responses in Fill Unit wells MW-2 and MW-3, located roughly 10 to 15 feet from the shoreline, showed a large magnitude of tidal response (tidal efficiencies[4] of 32 and 73 percent, respectively) and little if any tidal lag[5] (0.1 and 0.2 hours, respectively[6]), indicating these shoreline wells are in very close hydraulic connection to the LDW waters in adjacent Slip 1, as expected. Slightly farther inland from the shoreline, Fill Unit well MW-4 also had a high tidal efficiency (44 percent), but a tidal lag of approximately 1.2 hours. Approximately 55 feet inland from the shoreline, Fill Unit well MW-7 had a tidal efficiency of only 1 percent and a tidal lag of approximately

[4] Ratio of groundwater level change to corresponding tide level change.
[5] Time between a tidal peak and the corresponding peak in groundwater level.
[6] The tidal efficiencies and tidal lags presented are averages of multiple measurements from the tidal study at each well; refer to Appendix B for additional detail.

2.5 hours. Groundwater levels in Fill Unit monitoring wells MW-9 and MW-12, located roughly 80 and 160 feet inland, respectively, showed negligible tidal influence.

A notable observation from the nearshore Fill Unit wells is that the groundwater levels increase more rapidly throughout the rising tide cycle than they decrease throughout the falling tide cycle. This is attributed to the fact that, at lower low tidal stages, the tide is below the bottom of the Fill Unit (top of Estuarine Unit aquitard). When this occurs, the Fill Unit water table remains essentially perched on the aquitard several feet above the tidal stage. Because the water table is unable to follow the full tidal decline, the outbound hydraulic gradient, and thus the rate of groundwater discharge from the Fill Unit to the LDW, is effectively reduced. This is illustrated by the flattening of groundwater levels during lower low tidal stages measured at wells MW-2, MW-3, MW-4, and MW-7 (see Figures B-2, B-3, B-4, and B-5 respectively in Appendix B).

Widely variable specific conductivities (SC) of 1 to 20 millisiemens per centimeter (mS/cm) were measured in wells MW-2, MW-3, and MW-4, located nearest the shoreline. The SC values generally increase with higher groundwater elevations, documenting mixing of saline water in the nearshore transitional zone. Farther inland, lower SC readings of 13 to 15 mS/cm, with less apparent tidal correlation, were recorded in well MW-7. The SC was generally low and did not vary during tidal cycles in monitoring wells MW-8 and MW-12, located farthest inland. Groundwater temperature generally showed the coolest temperatures in the nearshore wells, with increasingly warmer temperatures recorded in more inland wells. At these shoreline wells, temperature decreases when groundwater levels increase, suggesting intrusion/mixing of seasonally cooler LDW surface water.

Precipitation also affects water levels and groundwater quality (SC and temperature) in the Fill Unit wells. This is most apparent in the data from the 20-day monitoring conducted in well MW-2 in February 2017. Figure B-2 in Appendix C illustrates the groundwater water level, SC, and temperature data along with LDW tidal data from that monitoring. While MW-2's groundwater elevations are fairly consistent at lower low tide over the 20 days, the higher-high-tide groundwater elevations vary considerably relative to corresponding tide levels, and those differences appear attributable to infiltration of precipitation. The upper plot on Figure B-11 in Appendix B illustrates MW-2 groundwater elevations with daily precipitation. Two large precipitation events (1.5 and 1.8 inches) occurred during the 20-day monitoring period. High-tide groundwater elevations gradually decline following the first (February 9 start of monitoring) event, increase again immediately after the second (February 15) event, and then gradually decline for several days thereafter.

Infiltration of (nonsaline) precipitation also appears to influence the MW-2 SC measurements, as illustrated on the upper plot of Figure B-11 in Appendix B. The daily small-scale increases and decreases of SC attributable to tidal mixing are visible in the data. However, the longer-term trend of declining and then rising groundwater SC over the 20 days appear attributable to the precipitation events prior to and during the monitoring period. In total, 6.74 inches of precipitation fell between February 2 and 16, 2017, as shown on Figure B-12. SC declined from the February 9 start of monitoring through February 22. The daily SC changes, attributed to tidal mixing, were small during this period suggesting infiltration caused the longer-term trend. That trend is more visible in the daily-average SC values plotted, which remove the diurnal tidal-based changes. After a week with little precipitation, from February 23 through the end of monitoring, SC increased overall and daily SC changes became more pronounced, as the effects of infiltration diminish. In addition, groundwater temperature at well MW-2 varies with the tide and the 20-day trend is generally the inverse of SC (upper plot on Figure B-12). This indicates groundwater cooling in response to the precipitation events.

These observations suggest that the groundwater level, SC, and temperature changes observed at shoreline well MW-2 over the 20 days are attributable to some combination of precipitation infiltrating on Site as well as intrusion/mixing of LDW surface water that was also temporarily changed in quality (greater freshwater component) by the large-scale precipitation events.

The water level, SC, and temperature data in monitoring wells, when compared to the LDW tidal data, confirm that tidal influences in the Fill Unit are greatest near the shoreface and decrease progressively inland as expected. The inferred limit of tidal influence in the unconfined Fill Unit groundwater is near the western edge of the existing warehouse.

During rising tide, increasing water levels in nearshore Fill Unit groundwater result in transient reversal of horizontal hydraulic gradient away from Slip 1. The horizontal hydraulic gradient steepens along the western portion of the Property, particularly during low tides. The net (tidally averaged) Fill Unit groundwater flow direction is westward with discharge to Slip 1.

2.4.4.2 Alluvium Unit

Water levels measured in wells screened in the Alluvium Unit beneath the Estuarine Unit aquitard (MW-1, MW-6, and MW-8) do not show the flattening at lower low tide stages observed in nearshore Fill Unit wells (see Figures B-1, B-6, and B-8 respectively in Appendix B). Tidal responses also extend much farther inland in the Alluvium Unit (confined aquifer) than in the Fill Unit (unconfined aquifer), with water level fluctuations of approximately 3.5 feet observed at well MW-8, located near the eastern property boundary, approximately 180 feet inland from the shoreline. Well MW-8 displayed tidally induced water level changes, short tidal lag, and no notable SC or temperature changes (Figure B-8). These observations are consistent with tidally induced pressure changes in a confined aquifer.

As observed in the Fill Unit, infiltration of precipitation affects groundwater in the Alluvium Unit. The lower plot on Figure B-11 shows groundwater levels measured at well MW-6 during the 20-day tidal study in February 2017. Given MW-6's lower tidal efficiency compared to well MW-2, the effects of infiltration are more pronounced on groundwater levels in well MW-6 than in MW-2 where tidal effects dominate. Likewise, the MW-6 data clearly show temporarily reduced groundwater temperature and SC shortly following the precipitation events (Figure B-12).

2.4.5 Fill Unit Hydraulic Conductivity Estimates

The hydraulic conductivity (K) of the Fill Unit was estimated from the tidal study data for purposes of this evaluation, using the stage-ratio and time-lag methods of Ferris

(1963) and is presented in detail in Appendix B. Table B-1 presents the tidal efficiency and tidal lag measurements used in the stage ratio and time lag K estimation methods.

Using the Ferris (1963) methods, the estimated K of the Fill Unit ranges from 3 x 10^{-2} centimeters per second (cm/sec) at MW-7 to 1 x10^{-1} cm/sec at MW-3, with a Property-wide geometric mean K of 6 x 10^{-2} cm/sec (Table B-2 in Appendix B). The high K values are indicative of permeable fill materials along the shoreface, which efficiently transmit tidal fluctuations into the nearshore Fill Unit.

2.5 Ecological Setting

2.5.1 Terrestrial Ecological Setting

The Site and the Property are surrounded by fully developed commercial and light to heavy industrial businesses. There are no appreciable undeveloped land areas proximal to the Site, and none exceeding 0.25 acres in size are located within 500 feet of the Site boundaries. Based on these conditions, the Site qualifies for an exclusion from the MTCA Terrestrial Ecological Evaluation (TEE) requirement, specifically per WAC 173-340-7491(1)(C)(ii). However, for purposes of the RI, the TEE soil screening levels are included in the development of the most stringent PCULs for soil.

2.5.2 Aquatic Ecological Setting

The in-water portion of the Site is located on the LDW, within an estuarine setting. The dominant natural habitat type in Slip 1 are intertidal (roughly between -4 and +14 feet MLLW) and subtidal areas (area deeper than -4 feet MLLW). The subtidal areas are typical of a degraded, industrial marine slip with high levels of marine traffic. Intertidal areas are highly modified, with oversteepened and armored banks, retaining walls, remnant piles, and overwater structures. Use of the Site by aquatic organisms is likely reduced due to industrial traffic and development.

2.6 Current and Future Land Use

The Property is currently zoned and utilized for commercial/industrial land use. 5055 Properties LLC plans to redevelop the upland portion of the Site with a new commercial office building, with building construction estimated to start in 2020. The planned footprint of the new building overlies part of the contaminated SBG-containing fill. The SBG-containing fill represents an ongoing source of contaminants to upland groundwater discharging to the sediments and surface waters of the LDW. An Interim Action is planned in 2020 that will install a new shoring wall to stabilize the shoreface and facilitate the removal of SBG containing fill prior to property redevelopment (Aspect, 2020). The proposed shoring alignment for the Interim Action is shown on Figure 2.

3 Environmental Investigations Summary

This section summarizes previous environmental investigations completed at or near the Site, and the investigations conducted for this RI.

3.1 Previous Investigations

Multiple historical environmental investigations have been conducted in the Slip 1 area or at the Site between 1998 and 2014 and are summarized below.

3.1.1 Lower Duwamish (LDW) Remedial Investigation – 1997 through 2006

As part of the LDW RI/FS, a limited sampling program was conducted from 1997 to 1998 and 2004 to 2006 to assess sediment quality in the vicinity of Slip 1 (Windward, 2010). At the head of the slip, sediments were evaluated at four locations (three surface sediment locations and one sediment core) as part of the RI/FS sampling. All four of these locations were within 50 feet of one another. From this limited data set (Table 1 and Figure 8a [left panel]), Figure 18 of the Record of Decision (ROD) suggested partial dredge and cap would be required for an area (58,987 square feet) that extended well beyond the area where samples were collected.

The LDW remedial investigation (Windward, 2010) also defined, generally, the ecological and human health risks posed by the contamination in the LDW. Pursuant to WAC 173-340-350(6), this information on receptors is incorporated by reference as follows:

- Based on the LDW remedial investigation ecological summary (AECOM, 2012), approximately 25 percent of the sediment within the LDW study area exceeded sediment quality standards, and in approximately 7 percent of this area, contaminant concentrations are above the ROD CULs, which are likely to have adverse effects on the benthic invertebrate community. Of the 44 contaminants elected as COCs for benthic invertebrates that were evaluated during the remedial investigation, 41 were selected as risk drivers with concentrations detected above the sediment quality standards (AECOM, 2012).
- The human health risk assessment estimates human health risk through exposure to contaminants in LDW seafood, sediment, and water. As summarized in the LDW remedial investigation (AECOM, 2012), total risk for exposure through seafood ranged from 7 in 10,000 to 4 in 1,000 (PCBs, arsenic, and carcinogenic PAHs). Direct contact with sediment during netfishing and clamming scenarios resulted with a 3 in 100,000 and 1 in 10,000, respectively (AECOM, 2012). Total excess cancer risk estimates for exposure during beach play ranged from 5 in 1,000,000 (5×10^{-6}) to 5 in 100,000 (5×10^{-5}) for the eight individual beach play areas evaluated (AECOM, 2012).

Based upon the arsenic and metals contamination observed in the LDW RI/FS data set, a remedy of partial dredge and cap was recommended for the subtidal area adjacent to the Snopac Property.

3.1.2 Slip 1/RM 0.9-1 Sediment Investigations – 1998-2006

The National Oceanic and Atmospheric Association (NOAA) conducted a Site Characterization in 1998, and the EPA conducted a Site Inspection in 1998. These investigations provided an initial assessment of Slip 1 conditions and the main LDW channel from river mile (RM) 0.9 to 1.0. The NOAA and EPA investigations included collection of surface and subsurface sediment samples within Slip 1 and in the main LDW channel. NOAA evaluated 10 samples for polychlorinated biphenyls (PCBs) and polychlorinated terphenyls (PCTs). The EPA analyzed samples for volatile organic compounds (VOCs), semi-volatile organic compound (SVOCs), metals, PCBs, total organic carbon (TOC), and dioxins and furans (NOAA, 1998; SAIC, 2008). Results for metals, PAHs, and PCBs in a number of samples exceeded the sediment quality standard (SQS) applicable at that time (NOAA, 1998; Weston, 1999; SAIC, 2008).

Additional sample collection in the LDW, including from the Slip 1 area, was conducted by Winward Environmental (Windward) between 2004 through 2006 (Windward 2004; 2005a and b; SAIC, 2008). Groundwater seep samples were also collected along the LDW, including at Seep 76 located along the western shoreline of Slip 1 adjacent to the Property. The Seep 76 sample contained dissolved arsenic, copper and zinc at concentrations exceeding the applicable chronic water quality criteria. Mercury was also detected in the Seep 76 sample (total analyzed from an unfiltered sample) at a concentration exceeding the applicable chronic water quality criteria. The dissolved arsenic concentration at Seep 76 was this highest detected of any of the LDW seeps sampled (Windward, 2005a and b).

3.1.3 Slip 1 Data Gaps Assessment – 2008

Science Applications International Corporation (SAIC) completed a review of available Slip 1 environmental data through 2008 to assess data gaps in the source control evaluation program for Slip 1, RM 0.9 to 1.0 (SAIC, 2008). Source control data gaps were summarized by potential sediment recontamination pathways, including stormwater discharge, surface runoff/spills, groundwater discharge, and bank erosion/leaching. For the Property, the following data gaps were noted:

Stormwater Data Gaps - A facility inspection, when property is occupied, to ensure compliance with applicable regulations and best management practices to prevent the release of contaminants to Slip 1 and the LDW.

Surface Runoff/Spills Data Gaps - A facility plan showing grading, catch basins, storm drains, stormwater runoff/water collection systems, to evaluate the potential for sediment recontamination via stormwater runoff. A materials and wastes inventory needed to assess the potential for sediment recontamination via runoff or spills (when property is re-occupied).

Groundwater Discharge Data Gaps – Inventory of historical materials used and wastes generated to facilitate assessment of the potential for release(s) to soil and groundwater at the Property.

Bank Erosion/Leaching Data Gaps - Additional information on the construction of the banks, and data on contaminant concentrations in bank soils, to evaluate the potential for sediment recontamination via this pathway. Additional information regarding dock materials to evaluate the potential for the failing dock to contribute to sediment recontamination.

3.1.4 Source Control Action Plan – 2009

In May 2009, Ecology and SAIC, with assistance from the City of Seattle, developed the SCAP for RM 0.9 to 1.0 East, Slip 1, of the LDW (Ecology, 2009). The SCAP identified COCs relevant to the Slip 1 source control area with regard to potential for sediment recontamination. COCs were identified based on the results of sediment sampling conducted near Slip 1. Chemicals that exceeded the Sediment Cleanup Objectives in at least one surface or subsurface sediment sample offshore of the Slip 1 source control area were considered COCs. The SCAP identified upland COCs by comparing upland soil and groundwater concentrations to conservative draft screening levels that were developed for Slip 4 as a tool to identify upland sites that do not need to be considered further as potential sediment recontamination sources.

3.1.5 LDW Surface Sediment Sampling at Outfalls – 2011

In May 2011, SAIC on behalf of Ecology conducted a study to characterize the quality of LDW surface sediment near stormwater outfalls and Combined Sewer Overflows (CSOs) in locations where data did not exist. A total of 162 locations were sampled near 84 outfalls in March and April 2011, including 11 locations in Slip 1 at RM 0.9 and 1.1 (SAIC, 2011).

3.1.6 Summary of Existing Information Report – 2011

Hart Crowser completed a review of the environmental conditions at the Property for Ecology in 2011 (Hart Crowser, 2011a). Information sources reviewed by Hart Crowser included Ecology files, online King County Tax Records, online Puget Sound Regional archives, and historical records through the database company EDR. No field investigations were conducted. Hart Crowser identified the potential for contamination at the Property, specifically related to its historical industrial use and development, and the USTs that existed on the Property.

3.1.7 Phase I ESA – 2011

Farallon conducted a Phase I ESA of the Property in 2011. As part of the Phase I Environmental Site Assessment ESA (ESA), Farallon identified the following recognized environmental conditions (REC) with the potential to impact soil and/or groundwater (Farallon, 2011a):

- "The potential migration of hazardous substances at facilities currently or historically located in the vicinity of the Site that have known or suspected releases to soil and/or groundwater that may have migrated in groundwater to the Site."
- "The potential soil and/or groundwater contamination associated with releases from an electrical transformer of unknown age observed within the warehouse."

- "The unknown nature and composition of the reported sandblast-like material on the western area of the Site."
- "The potential soil and/or groundwater contamination associated with releases from the USTs currently or formerly located on the Site."
- "The location of the Site adjacent to the LDW Superfund Site and identification as a potential source of contamination to sediments in the LDW."

3.1.8 Subsurface Investigation – 2011

To investigate the potential impacts identified in the Phase I ESA, Farallon completed subsurface investigations at the Property in 2011 documented in a Subsurface Investigation Results Letter (Farallon, 2011b). The investigation included soil and grab groundwater samples from borings installed on the Property. See Appendix D for reconnaissance groundwater sample results. The locations of the Farallon borings (boring location prefix of FB) are depicted on Figure 9. Farallon did not report observation of SBG on the Property in any soil borings. Coal fragments were identified in soils and were attributed to the former coal burners from the north adjoining property (Farallon, 2011b).

Farallon's soil sample analytical results are incorporated into this RI. The groundwater samples were collected as grab samples directly from soil borings. These results are not considered representative of groundwater quality because the groundwater samples were collected from open soil borings and were turbid, which can bias detected contaminant concentrations high, particularly for metals and hydrophobic organic compounds. If no exceedances are detected in such samples, there is a high level of confidence that contaminant concentrations in the groundwater are below PCULs at that location. Conversely, if there are exceedances detected, more reliable groundwater data (i.e., from permanent monitoring wells) should be collected—as implied by Farallon's use of the term "reconnaissance" for their grab groundwater samples. Further, they aren't comparable to samples collected from permanent monitoring wells installed during the RI and discussed in Section 3.2.2.

Gasoline-range TPH, benzene, ethylbenzene, toluene and xylenes (BTEX), and carcinogenic polycyclic hydrocarbons (cPAHs) were detected in soil at concentrations exceeding MTCA Method A CULs. Farallon concluded that the source of TPH and BTEX impacts to soil were the former USTs. The presence of cPAHs in soil were attributed to the potential presence of creosote treated timber pilings, or unknown sources.

The Subsurface Investigation Letter (Farallon, 2011b) noted that runoff from the existing warehouse roof was conveyed through stormwater piping directly to surface water of the LDW. Other stormwater runoff on the Property was noted to occur primarily via sheet-flow from the parking areas directly to the LDW (Farallon, 2011b).

3.2 Uplands Remedial Investigation

In 2015, Aspect was engaged by 5055 Properties LLC to conduct remedial investigations at the Site. The remedial investigation objectives included evaluating the nature and extent of SBG and other fill types on the Property; delineating impacts to soil and groundwater in the area landward of the existing retaining wall along Slip 1; and evaluating intertidal sediment, soil, and groundwater seep chemistry along the Slip 1 shoreface. To address these objectives, Aspect identified the following data collection objectives:

- Complete comprehensive shoreface soil and sediment, and seep sampling
- Evaluate the potential for shoreface soil erosion to recontaminate sediments
- Evaluate whether seep discharge is impacting surface water quality
- Evaluate the potential for seeps discharge to contaminate sediments
- Evaluate the nature and extent of SBG fill at the upland portion of the Site and conduct forensic chemical analyses of the SBG

These investigations were conducted in July 2015 and January 2017 through January 2018. Additional remedial investigations were performed in November 2018, April 2019, and August 2019 to further characterize soil for the planned Interim Action. Tables 2 – 5 summarize, respectively, the saturated zone soil data, shoreface data, vadose zone soil data, and groundwater and seeps data.

3.2.1 Shoreface Sediments and Seeps Characterization – July 2015

Aspect conducted sampling of shoreface sediments (below the MHHW) and soils (above the MHHW) and seeps to the west of the existing retaining wall during low tide conditions in July 2015. Sampling locations consisted of 6 sediment, 4 soil, and 6 seep samples (Figure 9).

During sampling, SBG was observed in the shoreface soil and sediments along most of the shoreface at the Property. Abundant, multi-colored waste paint chips were present in the SBG. The soil sample SSA-3, and sediment samples SSA-5 and SSA-8 contained SBG and were submitted for laboratory analysis. All samples were analyzed by Friedman and Bruya, Inc. Laboratory (F&B) for:

- Metals by EPA Methods 200.8 and 1631E
- PCBs by EPA Method 8082A
- Semi-volatile organic compounds, including cPAHs, by EPA Methods 8270D and 8270D SIM
- Organotin compounds by EPA Method 8270D SIM GC/MS
- TOC by EPA Method 9060

The analytical results for shoreface sediment samples collected from below the MHHW (SSA-5 through SSA-10) are presented in Table 3; results for upland shoreface soils collected from above MHHW (SSA-1 through SSA-4) are presented in Table 4. Laboratory reports for the shoreface and seep samples are included in Appendix E. A discussion of the analytical results is presented in Section 5.

Groundwater seep samples were collected using stainless-steel PushPoint mini-piezometers, which is comparable to the methods used to sample Seep 76 (Windward, 2004). The mini-piezometers were installed to penetration depths of 4 to 6 inches. Seep water was withdrawn from the mini-piezometers using a peristaltic pump and Teflon tubing. Once the pumped seep water was clear, laboratory containers were filled directly from the tubing. The samples were analyzed by F&B for the following analytes:

- Metals (total and dissolved) by EPA Method 200.8
- PCBs by EPA Method 8082A
- Semi-volatile organic compounds, including cPAHs, by EPA Method 8270D and EPA Method 8270D SIM
- BTEX and hexane by EPA Method 8260C.

The seep sampling analytical results (ASP- sample locations) are presented in Table 5 with the groundwater results. Laboratory reports for analytical results are included in Appendix E. A discussion of the seep analytical results is presented in Section 5.4.

3.2.2 Soil and Groundwater Characterization – 2017-2018

In January 2017, Aspect conducted further remedial investigation activities—completing 26 soil borings and installing 12 groundwater monitoring wells (MW-1 through MW-12) on the uplands at the Site. The soil borings and monitoring well installation was completed using a direct-push drilling equipment by Holt Services between January 23rd and January 27th, 2017.

Soil borings were advanced to up to 20 feet below ground surface (bgs) at all locations except MW-8 and MW-10, which were advanced to 25 feet bgs. Soil borings not completed as a monitoring well were backfilled with hydrated granular bentonite. The monitoring wells were constructed using two-inch diameter polyvinyl chloride (PVC) casing and 10-foot pre-packed screens. The monitoring wells were screened from approximately 4 to 14 feet bgs, except for monitoring wells MW-8 and MW-10, which were screened from 15 to 25 feet bgs. Boring logs including soil descriptions, photoionization detector (PID) readings, other observations (e.g., staining, debris, odors, etc.), and well construction information are included in Appendix B.

Selected soil samples from each boring were retained for laboratory analysis. The analytical suite selected for each sample was based on the sample location relative to known impacts, and Property history (potential impacts). Soil samples were analyzed by F&B for one or more the following:

- Metals by EPA Method 200.8
- PCBs by EPA Method 8082A
- Semi-volatile organic compounds, including cPAHs, by EPA Method 8270D and EPA Method 8270D SIM
- TBT by EPA Method 8270D SIM GC/MS
- BTEX and hexane by EPA Method 8260C
- Diesel- and oil-range TPH by NWTPH-Dx extended
- TOC by EPA Method 9060

The soil sample analytical results are summarized in Table 2 (saturated zone) and Table 4 (vadose zone) and. Laboratory reports for upland soils are included in Appendix F. A discussion of the soil analytical results is presented in Section 5.2.1.

After monitoring well development, groundwater samples were collected between February 5th and 8th, 2017. A second round of groundwater samples were collected between January 29th and 30th, 2018. Prior to each groundwater sampling event, water levels were measured within an approximate half-hour window from all monitoring wells.

Groundwater samples were collected using a peristaltic pump and low-flow methods. Field parameters (temperature, pH, specific conductivity (SC), dissolved oxygen, oxygen reduction potential, and turbidity) were monitored during purging and once stabilized, a sample was collected. Field parameters were recorded at the time of sample collection. SC ranged from 183.6 to 16,337 microsiemens per centimeter (µS/cm) in February 2017 and 572.3 to 10,284 µS/cm in January 2018. The highest SC occurred in the nearshore monitoring wells due to tidal influences. Dissolved oxygen concentrations ranged from 0.15 to 10.61 milligrams per liter (mg/L) in February 2017 and 0.17 to 9.10 mg/L in January 2018 across the Site.

Groundwater samples were submitted to F&B for one or more of the following analyses:

- Metals (total and dissolved) by EPA Method 200.8
- PCBs by EPA Method 8082A
- Semi-volatile organic compounds, including cPAHs, by EPA Method 8270D and EPA Method 8270D SIM
- BTEX and hexane by EPA Method 8260C
- Diesel- and Oil-range TPH by NWTPH-Dx extended

The analytical suite selected for each groundwater sample was based on the sample location relative to known impacts, and Property history (potential impacts).

The groundwater analytical results are included in Table 5. Laboratory reports are included in Appendix G. Discussion of the groundwater analytical results is presented in Section 5.4.

3.2.3 Supplemental Soil Characterization – November 2018

Supplemental soil characterization of SBG-containing fill soils was completed in November 2018 to support the design of the Interim Action, including collecting the necessary data for preliminary waste designation. Aspect performed additional characterization of soil within the planned excavation area in accordance with a waste designation sampling and analysis plan prepared by DH Environmental (Aspect, 2019b).

Test pits were installed for sample collection at 15 locations within the estimated extent of Interim Action excavation. The test pit locations are shown on Figure 9. One sample of the SBG-containing fill material was collected from each test pit and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) for Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) and select samples were analyzed for PCBs as required by the subtitle D landfill facilities. Leachable metals by the TCLP test were not detected in any sample.

Each sample was also analyzed for total metals (arsenic, copper, lead, nickel, and zinc). The analytical results from the November 2018 waste designation samples are included in Tables 2 and 4 (VSP sample locations).

- To evaluate the fill soil relative to Washington state dangerous waste criteria, a dangerous waste characterization fish bioassay was conducted by Rainier Environmental on the soil sample (VSP-12-3.3) exhibiting the highest total metals concentrations (bioassay report provided as Attachment 5 in Appendix E). There was no fish mortality during the test.

Based on results of the supplemental soil characterization results, DH Environmental concluded that fill soil in the Interim Action is designated as non-dangerous solid waste and can be disposed of in a non-hazardous waste (Subtitle D) landfill (Aspect, 2019b).

3.2.4 Additional Uplands Characterization – August 2019

After entering an Agreed Order for cleanup activities at the Site in July 2019, additional characterization was completed in August 2019 as required by the Agreed Order. The activities were completed in accordance with the Ecology-approved Sampling and Analysis Plan for Additional Characterization (SAP; Aspect, 2019a) to characterize soil underneath the existing warehouse, and assess groundwater quality within the uplands portion of the Site. The additional characterization activities included the following:

- Soil sampling was conducted where oil-stained concrete next to a former electrical transformer in the existing warehouse was previously observed. The oil-stained concrete was reportedly mitigated and cleaned around 2012-2013 and no staining was observed during this additional characterization. Based on the location of staining in a photograph taken prior to the mitigation and cleanup, and after a visual review of the area, the concrete was cored through the former oil-stained portion of the slab next to the former transformer.

  The extracted core was inspected to assess whether there is evidence of migration of oil through the concrete; no evidence of oil migration was observed. One soil boring (HA-1) was advanced through the cored hole using a hand auger to collect a soil sample from a depth of 0 to 6 inches beneath the slab, and a second sample from 12 to 18 inches beneath the slab. Each sample was analyzed for PCB aroclors.

- Eight soil borings were advanced from inside the existing warehouse using direct-push drilling equipment (SB-1 through SB-8). Each boring was advanced through the Fill Unit (fill soil) until encountering the Estuarine Unit (native soil) to total depths of approximately 15 feet below ground surface (bgs). Soil samples were collected continuously using direct-push sleeve samplers. No SBG was observed in these borings, consistent with the understanding that SBG-containing fill was placed with the existing warehouse present.

- Two samples of the fill soil and one sample of the underlying native soil were collected from each boring; all samples were submitted to the analytical laboratory to hold and select samples analyzed. Each fill soil sample was analyzed for metals (arsenic, copper, lead, mercury, and zinc). Based on field screening, five samples were also tested for organic constituents including low-level PAHs, PCB aroclors, gasoline-range TPH, and diesel- and oil-range TPH. A soil sample was collected from a depth of 6 to 7 feet bgs at the location of a former sump inside the existing warehouse, and analyzed for all constituents included in the SAP, in addition to VOCs by EPA Method 8260. The sample depth was selected based on field screening and the likelihood of being near the bottom of the former sump. Soil quality results are discussed further in Section 5.1.

- Groundwater sampling was conducted at Site monitoring wells MW-2, MW-4, MW-6 and MW-11, which were selected based on screening level exceedances of pentachlorophenol (PCP) in soil samples collected from nearby borings (Aspect, 2019a). Monitoring well MW-3 was also identified in the SAP but it was dry at the time of sampling. Groundwater samples were collected from the other wells and submitted to the analytical laboratory for analysis of PCP. Groundwater quality results are discussed further in Section 5.4.

The additional characterization locations are shown on Figure 9. The groundwater sampling results are included in Table 5, and the soil sample results are included in Tables 2 and 3.

3.3 Supplemental Slip 1 Sediment Investigations

In 2015 and 2018, 5055 Properties LLC conducted additional in-water sediment sampling within the Slip 1 area because of the limited data available at the head of Slip 1 from the LDW RI/FS. The additional sampling was intended to be at the density typically required for defining spatial extent for remedial design purposes.

The 2015 sampling included collection of surface sediment samples at five intertidal shoreface locations (described in Section 3.2.1) and at 18 subtidal locations. In February 2018, subsurface sediment samples were collected for chemistry and geotechnical analysis to support design of the remedial action required by the ROD. The latter sampling work was completed following completion of a pre-design sediment sampling work plan (Integral, 2018). A summary of field collection procedures and deviations from the work plan are provided below.

3.3.1.1 Sediment Sampling Locations and Design

The locations for the sampling stations were selected to provide additional subsurface data across the proposed remedial action area. Collocated cores were collected from three sampling stations (C01, C02, and C03), shown on Figure 8b. Three types of samples were collected at each station: sediment for chemical concentrations, porewater for chemical concentrations, and sediment for geotechnical properties. The geotechnical data will support partial dredge and cap design with the objective of characterizing shallow and deep-seated conditions.

All subsurface sediment and porewater samples were collected using barge mounted Sonic® drilling equipment operated by Holt Environmental Services. Borings were advanced to approximately 13 feet below mudline (bml), and subsurface sediment samples were collected from beneath the potential future cap footprint at each station to assess chemical concentrations and geotechnical properties. At each of the three stations, two cores were advanced to accommodate the required analyses. The first core was used to collect samples to assess sediment chemical concentrations and perform other geotechnical analysis not requiring undisturbed sample collection. The second core was used to collect undisturbed Shelby tubes for testing of porewater chemistry and geotechnical properties. See Appendix H for 2018 sediment core logs.

3.3.1.2 Sediment and Porewater Sampling

Collocated subsurface sediment and porewater samples were collected from 3 to 5 feet bml at stations C01, C02, and C03.

Samples for sediment chemistry analysis were collected by advancing a 4-inch core tube to the desired depth. Once on deck, sediment within the core tube was transferred to a clear polyethylene core liner bag. The core was then logged, with observation notes and samples collected as described in the work plan (Integral 2018).

Sediment for porewater chemistry analysis was collected using a Shelby tube to maximize the amount of porewater retained. A 3-feet Shelby tube was advanced to the desired 2-feet depth interval using the Sonic drill rig. Once the tube was on deck, the bottom of the Shelby tube was capped and taped to retain the sample. The depth of sediment in the Shelby tube was recorded, and the top was capped and taped. Samples for both sediment chemistry and porewater Shelby tubes were stored in coolers on ice.

Discrete samples were collected from the 0–3 feet bml interval at each core location, composited and analyzed for toxicity characteristic leaching procedure (TCLP) metals and semivolatile organic compounds by EPA Methods 1311 and 8270 for dredge waste characterization purposes.

3.3.1.3 Subsurface Geotechnical Sampling

Six collocated subsurface sediment samples were targeted for geotechnical analysis at 5–8 feet bml and 10–13 feet bml at each core location, C01, C02 and C03. Undisturbed geotechnical samples were collected using Shelby tubes or split spoon samplers. Once the tube was on deck, the bottom of each Shelby tube was capped and taped to retain the sample. The depth of sediment in the Shelby tube was recorded, then the top of the tube was capped and taped. Bulk sediment samples were collected from the same core advancement as the sediment chemistry cores described in Section 3.3. Geotechnical data results are not presented here but will be used during the remedial design process.

Because of abundant debris in the subsurface, an undisturbed sample was not collected from the 10–13 feet below sediment surface interval at core location C03 (Sample C03-GT-10-13), but sufficient bulk sediment was obtained from the collocated core at this location and depth interval.

4 Preliminary Cleanup Standards

This section identifies exposure pathways applicable to the Site uplands, and preliminary cleanup levels (PCULs) for uplands soil and groundwater. CULs for in-water sediment are the RALs identified in the ROD for the LDW (EPA, 2014) as described in Section 4.3. In addition, the points of compliance for each media are described in Section 4.5.

4.1 Highest Beneficial Use of Site Groundwater

The WAC 173-340-720(1)(a) states that, "Groundwater cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions." It is proposed that groundwater within the Site is classified as nonpotable in accordance with WAC 173-340-720(2), as follows:

(2)(a) The groundwater does not serve as a current source of drinking water. Groundwater at the Site is not used for any purpose. The Site is within City of Seattle municipal water service area and this potable water supply will continue in perpetuity.

(2)(b) The groundwater is not a potential future source of drinking water due to low yield or naturally poor water quality. Naturally brackish groundwater conditions occur throughout the Site water-bearing units due to proximity to the LDW (saltwater intrusion) and the fact that much of the fill was likely dredged from the marine environment. Specific conductivity measurements in Site groundwater samples exceeded the Washington State drinking water criterion (secondary maximum contaminant level of 0.7 mS/cm [WAC 246-290-310(3)(a)]).

(2)(c) It is unlikely that hazardous substances will be transported from the contaminated groundwater to groundwater that is a current or potential future source of drinking water, as defined in (a) and (b) of this subsection, at concentrations which exceed groundwater quality criteria published in chapter 173-200 WAC. There are no drinking water wells within the Site, and the LDW forms the downgradient limit of the water-bearing units on the Site.

(2)(d) There is an extremely low probability that the groundwater will be used for that purpose because of the site's proximity to surface water that is not suitable as a domestic water supply. At such sites, groundwater may be classified as non-potable if each of the following conditions can be demonstrated[7]:

(i) There are known or projected points of entry of the groundwater into the surface water. Hydrogeologic data from the Site document that groundwater on the Site discharges to the LDW.

[7] These determinations must be for reasons other than that the groundwater or surface water has been contaminated by a release of a hazardous substance at the site.

(ii) The surface water is not classified as a suitable domestic water supply source under chapter 173-205.1 WAC. The LDW is a marine surface water body and does not classify as a domestic water supply in Table 602 of Chapter 173-201A WAC.

(iii) The groundwater is sufficiently hydraulically connected to the surface water that the groundwater is not practicable to use as a drinking water source. Because of its substantial hydraulic connection with the LDW, it is not practicable to use groundwater on the Site as a drinking water source due to the potential for drawing saline water into the water-bearing zone (e.g., saltwater intrusion).

Because drinking water is not a practicable future use for groundwater at the Site, the highest beneficial use of the groundwater is considered discharge to the LDW.

4.2 Exposure Pathway Screening for Uplands Media

Ecology's 2019 revised *Lower Duwamish Waterway PCUL Workbook and Supplemental Information*, together referred to as the "PCUL Document" summarizes environmental transport and exposure pathways applicable to soil and groundwater in the upland portion of the Site (Ecology, 2019). The PCUL workbook exposure pathways, and PCUL workbook codes, applicable to the Site uplands are as follows:

1. GW-2 - Transport of contaminated groundwater to surface water
2. GW-3 - Partitioning of groundwater contamination to sediment
3. GW-4 - Groundwater vapor intrusion into a building
4. GW-5 - Natural background concentrations for groundwater
5. SL-1 - Direct contact with localized soil contamination assuming unrestricted (non-industrial) land use
6. SL-3 - Leaching of soil contaminants from the vadose zone to groundwater followed by transport to surface water
7. SL-4 - Leaching of soil contaminants from the vadose zone to groundwater followed by partitioning to sediment
8. SL-6 - Leaching of soil contaminants from the saturated zone to groundwater followed by transport to surface water
9. SL-7 - Leaching of soil contaminants from saturated zone to groundwater followed by partitioning to sediment
10. SL-8 - Erosion of contaminated bank soils directly to sediment
11. SL-9 – Site-Specific Terrestrial Ecological Evaluation, Unrestricted Land Use
12. SL-10 Natural background concentrations for soil

As demonstrated in Section 4.1, groundwater CULs will not need to address drinking water use.

These Site-specific exposure pathways were used for the development of PCULs as detailed in the following section. The Site exposure pathways are also discussed further as part of the conceptual site model (CSM) in Section 6.

4.3 Upland Soil and Groundwater PCULs

The PCULs for uplands soil and groundwater are the most stringent of the various exposure pathway screening levels established by Ecology and, as such, are protective of all applicable exposure pathways (Ecology, 2019).

The exposure pathway with the most stringent screening level for soil PCUL development is leaching to groundwater (for surface water or sediment protection; pathways SL-3 through SL-7). For one contaminant (TBT), soil erosion into LDW sediment (pathway SL-8) is the most stringent exposure pathway screening level, and, therefore, is the basis for its soil PCUL. These soil PCULs apply irrespective of future land use, but they are also protective of direct contact for unrestricted land use (pathway SL-1), and terrestrial ecological receptor exposure for unrestricted land use (pathway SL-9). The groundwater PCULs are based on the most stringent screening level for non-potable water[8] (i.e., groundwater exposure pathways GW-2 through GW-5).

In addition to PCULs provided in Ecology (2019), a generic soil cleanup level for TPH of 1,500 mg/kg is also applied as a PCUL for Site soils, based on discussion with Ecology. The 1,500 mg/kg TPH level is based on protection of human direct contact (for unrestricted use) and applies only for soil in which gasoline-range TPH is detected (Ecology, 2017).

Some of the PCULs are less than analytical reporting limits achieved for the Site sampling and analysis to date. However, for purposes of this RI, PCULs have not been adjusted for laboratory practical quantitation limits (PQL) as allowed by the Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] 173-340-700(6)(d)). PCULs for each analyte detected in Site upland media are included with the corresponding analytical data in Tables 2, 4, and 5.

4.4 In-Water Sediment Cleanup Levels

The selected CULs are described in Section 8 of the LDW ROD (EPA 2014), and are provided in Appendix I. Again, to be consistent with EPA's selected remedy for the LDW, these CULs were applied to this remedial investigation. CULs for Slip 1 sediments were developed to address applicable or relevant and appropriate requirements (ARARs, Table 6) state Sediment Management Standards, and EPA ROD requirements applicable to LDW site cleanup efforts. These goals and related regulatory requirements address river-wide conditions relative to potential impacts to human and ecological receptors, as well as land use, habitat, cultural resources, and other considerations.

[8] The groundwater PCULs for TPH from Ecology (2019) are based on potable use, which is not an applicable exposure pathway for the Site.

MTCA allows for the use of RALs, which are concentrations (or other method of identification) of a hazardous substance in soil, water, air, or sediment above which a particular cleanup action component will be required as part of a cleanup action at a site (WAC 173-340- 200). As part of the LDW ROD, EPA defined “Remedial Action Levels” under CERCLA for the entire LDW. These RALs are set forth in the ROD excerpts included as Appendix I. These RALs vary by Recovery Category and remedial alternative as defined in the ROD. These RALs are set by EPA so that in each area CULs will be met either immediately after construction, or in the long term after natural recovery, to the extent practicable. Recovery Category 1 refers to areas where recovery is presumed to be limited; Categories 2 and 3 refer to areas where recovery is less certain (Category 2) or areas that are presumed to recover (Category 3). Slip 1 falls under Recovery Category 2 and 3 (ROD Figure 12) and the ROD selected remedies include ENR, monitored natural recovery (MNR), cap, and partial dredge and cap (ROD Figure 18). For this remedial action, the RALs are defined in ROD Table 28, for Recovery Category 2 Intertidal Sediments (Top 10 cm) to be consistent with EPA’s chosen remedy for the LDW. Sediment analytical data are compared with the Human Health & Benthic COC RALs and the Enhanced Natural Recovery (ENR) Upper Limits (ROD Table 28) in Tables 1, 3, and 7.

Remedial action objectives will provide the framework for evaluating remedial alternatives and selecting a preferred alternative in the Agreed Order-required Feasibility Study for the in-water sediment portion of the Site.

4.5 Points of Compliance

Points of compliance for uplands soils, uplands groundwater, and in-water sediment are identified to inform this RI and used to evaluate remedial alternatives in the FS.

The soil point of compliance for protection of groundwater is throughout the Site, and for protection of direct contact exposure is through the Site to a depth of 15 feet bgs.

The standard point of compliance in groundwater is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth, which could potentially be affected by the Site (WAC 173-340-720(8)(b)).

The point of compliance for sediments within Slip 1 is the 10-cm depth (biologically active zone) as identified in the LDW RI (Windward, 2010) and LDW FS (AECOM, 2012).

5 Nature and Extent of Contamination

This section describes the nature and extent of contamination in uplands soil and groundwater, and sediments at the Site, and identification of Site COCs.

5.1 Soil Quality

During the RI data collection phase, soil samples were collected from depths to 25 feet bgs and were analyzed for metals, tributyltin ion, cPAHs, SVOCs, PCBs, TPH, VOCs, and TOC. Not all samples were analyzed for all constituents.

Because different PCULs are defined for soils in the vadose zone versus the saturated zone (above and below the water table, respectively), the MHHW elevation (9.0 feet NAVD88) was selected as the demarcation between vadose and saturated zone soils at the Site. This elevation is above the highest groundwater elevations observed in monitoring wells during the tidal study (Appendix B). The most stringent PCULs for soil are typically based on leaching and for saturated-zone soils are equal to or less than those for the vadose zone. Therefore, using the MHHW elevation as the definition of vadose versus saturated soils is a conservative approach to evaluating PCUL exceedances in soil.

Analytes that were detected above the PCULs for vadose and saturated soil include metals, arsenic,[9] TPH, TBT, total cPAHs,[10] SVOCs PCP, and dibenzofuran (DBF), and total PCBs.

The following sections describe soil quality for the SBG-containing fill and then for soils outside (east) of that fill. Soil quality is discussed on the basis of comparing analytical results to PCULs, and the PCUL exceedances to likely contaminant sources, including SBG-containing fill, and the former USTs and coal burners. Table 2 and 4 present the analytical results for saturated and vadose soil, respectively. Results that exceeded the PCUL are highlighted in those tables. These data were used to map the distribution of soil PCUL exceedances in vadose and saturated soils as shown on Figure 10.

5.1.1 SBG-Containing Fill

The SBG-containing fill is the primary source of contamination at the Site. The observed SBG consists of predominantly of glassy, rounded to angular sand-sized grains, with admixtures of multi-colored paint chips. The sandblasting grit was reportedly derived from smelter slag. The smelter slag-derived grit and waste bottom-paint components of the spent SBG both contribute to contamination and spatially coexist in the SBG-containing fill.

Metals, PAHs, TBT, and PCBs in SBG-Containing Fill

Samples of fill material containing visible SBG (samples SSA-3, VSP-12, and VSP-13) were collected from the uplands. Those sample analytical results, presented in Tables 2 and 4, were notable for the presence of elevated concentrations of arsenic (up to 4,980

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[9] Possessing properties of both a metal and nonmetal, arsenic is chemically classified as a metalloid, but grouped with metals in this RI Report.
[10] Total cPAHs as the total toxic equivalent concentration (TEQ) of benzo(a)pyrene calculated in accordance WAC 173-340-708 (e).

mg/kg), copper (up to 3,430 mg/kg), lead (up to 2,780 mg/kg), mercury (0.28 mg/kg[11]) and zinc (up to 12,900 mg/kg). The maximum concentrations of TBT (4.3 mg/kg) and total PCBs (0.6 mg/kg) were also detected where visible SBG was noted, at SSA-3. PAHs were also detected above their PCUL in the SSA-3 sample; however, maximum total cPAHs TEQ concentration of 5.859 mg/kg was observed in MW-3 soils. Elevated metals appear to be the most reliable indicator of SBG in soil, with TBT, PAHs and PCBs as secondary indicators.

Elevated metals concentrations, especially arsenic and copper, appear to be a reliable indicator of SBG presence. These two metals were detected at concentrations above the PCULs in all samples analyzed that contained visible SBG.

The extent of SBG-containing fill at the upland portion of the Site was inferred using soil analytical results displaying a SBG chemical signature combined with direct observations of visible SBG in surficial soils and soil borings. As shown on Figure 10, the SBG-containing fill occurs adjacent to the shoreface and extends laterally (north-south direction) along most of the upland portion and extends inland 40 to 60 feet. The eastern extent of SBG-containing fill generally occurs at the western edge of the existing warehouse. The lack of SBG-containing fill beneath the existing warehouse was confirmed during the additional characterization conducted in August 2019, as discussed in Section 5.1.2.

The inferred vertical and lateral extent of SBG-containing fill is shown on the cross sections in Figures 3 through 6. The SBG-containing fill occur at depths generally less than 6 feet along western side of the existing warehouse and thickens westward to greater than 11 feet thick in areas immediately behind the existing retaining wall, where in some locations it appears to directly overlie the Estuarine Unit. Observations made in 2015 along the top and shoreline side of the existing retaining wall revealed that pure SBG was present both on the shoreface and in the interstices between the retaining wall segments. Based on these observations, it is likely that fill behind much of the immediate landward side of the existing retaining wall consists primarily of SBG.

The following paragraphs describe other constituents exceeding PCULs in the SBG-containing fill.

Barium in SBG-Containing Fill

The metal barium has a very conservative PCUL of 8.3 mg/kg for saturated soil that is based on protection of surface water via groundwater pathway. Exceedances of the PCUL for barium occurred in every saturated soil sample analyzed, including samples collected from the Fill Unit, the Estuarine Unit, and the Alluvium Unit. The 1995 evaluation of background concentrations of metals in soil across Washington State, the United States Geological Survey (USGS) detected total barium in each of 37 samples, with a minimum concentration of 300 mg/kg and 90th percentile concentration of 760 mg/kg (USGS, 1995). All of the detected barium concentrations in Site soils are less than the USGS'

[11] A maximum mercury concentration of 1.4 mg/kg was detected at FB-5, but no SBG observations were reported (Farallon, 2001b). The FB-5 location was selected to be upgradient of Seep 76, and is approximately 20 feet from SSA-3, where SBG was observed and maximum concentrations of other metals occurred.

minimum detection (Tables 2 and 4), indicating detected concentrations in the SBG-containing fill are attributable to background conditions.

Total Petroleum Hydrocarbons in SBG-Containing Fill

Soil exceedances of PCULs for diesel- and motor oil-range TPH were confirmed in saturated soil samples from the MW-2 boring, located near the former 8,000-gallon diesel UST. In addition, exceedances for gasoline-range TPH with associated benzene, toluene, and ethylbenzene were detected in soil from borings FB-2, FB-2A, and FB-2B located adjacent to a former 2,500-gallon UST at the northwest corner of the property. The TPH PCUL exceedances at these locations are co-located with SBG-containing fill (Figure 10).

Non-PAH Semi-Volatile Organic Compounds in SBG-Containing Fill

PCUL exceedances for the SVOCs PCP, and DBF also occurred in Site uplands soil. PCP was detected at four locations in vadose zone soil (at borings B-4, B-6, and MW-6) and at one location (B-5) in saturated soil. PCP is a common contaminant associated with treated wood, such as railroad ties or wooden utility poles. One exceedance of the PCUL for DBF was also detected in vadose soil at boring MW-3. DBF is a common derivative of coal-tar and could be associated with the former coal burner in this area. The association with shallow fill soil suggests that the PCP and DBF may have also been contained in SBG-containing fill material.

5.1.2 Site Soils Outside of SBG-Containing Fill

Outside the footprint of the SBG-containing fill and beneath the warehouse structure, low-level exceedances were detected in soil samples collected at borings SB-2 (up to 0.006 mg/kg total cPAHs), SB-4 (0.12 mg/kg mercury), and SB-8 (0.018 mg/kg total cPAHs and 0.0066 mg/kg total PCBs) (Tables 2 and 4). The deeper soil samples from each of these three locations (and shallower at SB-4) were analyzed, and resulting concentrations were less than PCULs. The low-level exceedances in soils beneath the warehouse are horizontally and vertically bound based on these results. No PCBs were detected in the two soil samples collected beneath the location of formerly stained concrete next to a former electrical transformer (sample HA-1; Table 4). The low metals concentrations—without a single exceedance of arsenic, copper, lead, or zinc—confirm the visual observations from the borings that there is no SBG present beneath the warehouse, consistent with the understanding that SBG-containing fill was placed with the warehouse structure present.

In soils around the perimeter of the warehouse structure, low-level exceedances were detected for selected metals (arsenic up to 12.9 mg/kg, barium up to 50 mg/kg, cadmium at 1.69 mg/kg, and zinc at 393 mg/kg), total cPAHs (up to 0.074 mg/kg) and selected non-carcinogenic PAHs (up to 0.43 mg/kg) (Tables 2 and 4).

Although some total cPAH concentrations detected in Site soils outside of the SBG-containing fill exceed the 0.000016 mg/kg PCUL, all are less than the 0.084 mg/kg median concentration (and the 0.39 mg/kg 90^{th} percentile concentration) of total cPAHs detected in 120 soil samples collected throughout six Seattle neighborhoods by Ecology (2011a). Ecology (2011a) did not calculate statistics for non-carcinogenic PAHs, but review of the data tables in that document confirm that detected concentrations were commonly greater than those detected in Site soils outside of the SBG-containing fill.

Likewise, the metals exceedances detected in Site soils outside of the SBG-containing fill are likely attributable to area background soil conditions based on the following comparative information:

- The highest detected arsenic concentration (12.9 mg/kg) is within the range of natural background concentrations detected in Washington State soils (Ecology, 1994) and is less than the 20 mg/kg MTCA Method A unrestricted soil cleanup level that is based on natural background conditions (WAC 173-340-900 Table 740-1).
- The highest detected barium concentration (50 mg/kg) is less than background soil concentrations determined by USGS (1995), as described above.
- The highest detected cadmium concentration (1.69 mg/kg) is within the range of natural background concentrations detected in state soils, and only 0.69 mg/kg higher than the 1 mg/kg 90^{th} percentile natural background concentration determined by Ecology (1994).
- The highest detected mercury concentration (0.12 mg/kg) is within the range of natural background concentrations detected in state soils, and only 0.05 mg/kg higher than the 0.07 mg/kg 90^{th} percentile natural background concentration determined by Ecology (1994). Mercury is also emitted from vehicles and is ubiquitous at low concentrations throughout urbanized areas.
- Zinc is typically present at a concentration on the order of 1 percent (10,000 mg/kg) in vehicle tires and, as a result, soils and stormwater runoff in urbanized areas typically contain elevated zinc concentrations (Ecology, 2011b). Consistent with that, the maximum detected zinc concentration of 393 mg/kg in soils outside of the SBG-containing fill was observed at MW-10, where stormwater ponds during the rainy season. Only one other exceedance of the natural background concentration of 85 mg/kg determined by Ecology (1994) was observed outside the SBG-containing fill at FB-6 at 1.1 feet bgs, a location proximal to MW-10 and the stormwater ponding.

PCBs are also prevalent at low concentrations throughout urbanized areas. Consistent with that, the single low-level detection of PCBs in soils outside of the SBG-containing fill (0.066 mg/kg) is less than the 0.081 mg/kg arithmetic mean concentration detected in Western Washington urban stormwater solids (Table G-1 in Ecology, 2015).

The collective information indicates that contaminant concentrations in Site soils outside of the SBG-containing fill are attributable to area background conditions and not historical operations at the Site.

5.2 Groundwater Quality

Site-wide groundwater monitoring was conducted in February 2017 and January 2018. All 12 Site monitoring wells were sampled during each event. Additional groundwater sampling was conducted for selected wells in August 2019 as discussed in Section 3.2.4. Table 5 presents all groundwater analytical results and highlights PCUL exceedances.

PCUL exceedances were documented in groundwater for selected metals and PAHs, which have been established as chemical indicators of SBG-containing fill at the Site. In addition, PCP exceeded an exceedingly stringent PCUL of 0.002 µg/L at one location, MW-11 (0.44 µg/L).

The spatial distribution of PCUL exceedances in groundwater is limited to the inferred extent of SBG-containing fill as shown on Figure 11. No groundwater PCUL exceedances were detected in groundwater outside of the SBG-containing fill, consistent with the very low contaminant concentrations in fill soils there, as described in Section 5.1.2. Analytes with PCUL exceedances in groundwater were also documented at concentrations exceeding PCULs in the groundwater seeps discharging from SBG-containing fill to Slip 1 (see Section 5.3).

5.3 Intertidal Seep Quality

As noted in Section 3.1.1, Seep 76, located along the intertidal shoreface at the Property was sampled in 2004. This seep contained the highest arsenic concentration of any of the LDW seeps sampled in that investigation (Windward, 2005a and b). To further characterize Slip 1 shoreface seep discharge water quality, Aspect collected six seep samples in 2015. The intertidal seep locations, designated ASP-1 through ASP-6, are shown on Figure 9, and analytical results for the samples are included in Table 5.

Exceedances of the most stringent groundwater PCULs for arsenic and copper were reported in all seep samples, consistent with very high concentrations of those metals in the SBG-containing fill shoreface from which the seeps emanate. Exceedances of groundwater PCULs for lead, mercury, and zinc were also reported in seep sample ASP-4. Additionally, total cPAHs exceeded the PCUL in seep samples ASP-3 and ASP-6, and total PCBs exceeded the PCUL in the ASP-3 sample.

5.4 Potential for Vapor Intrusion

Soil vapor sampling was not conducted during the RI because soil and groundwater analytical results do not indicate the presence of VOCs at concentrations that could lead to exceedances of MTCA indoor air CULs under the current and anticipated future commercial /industrial land use scenario. Soil and groundwater impacts at the Site are located outside of the existing warehouse, and generally do not include VOCs.

Naphthalene, a semi-volatile contaminant, is present in Site soil and groundwater (see Tables 2, 4, and 5). Naphthalene was detected in the January 2018 Site groundwater sample from well MW-2 at a concentration of 10 µg/L, marginally above the 8.9 µg/L groundwater screening level based on vapor intrusion for unrestricted land use. The February 2017 sample from that well contained only 0.73 µg/L naphthalene, an order of magnitude below that screening level.

Naphthalene is a potential human carcinogen and is sufficiently volatile to create actionable levels in soil vapor and thus indoor air. Despite the presence of low-level naphthalene at the Site, it is not considered a risk-driver for current or future indoor air exposure due to the following factors:

- The naphthalene concentrations in Site groundwater are below the vapor-based screening level, except for the single marginal exceedance at well MW-2 that was not reproducible in consecutive sampling.
- Naphthalene is primarily co-located with the inferred area of SBG. This area is located west of, and does not extend beneath, the existing warehouse, which is not occupied.
- The planned Interim Action will remove the location where naphthalene occurs prior to the planned redevelopment, which represents the future use of the Site.

5.5 Constituents of Concern in the Site Uplands

A range of constituents associated with historically placed SBG-containing fill exceed PCULs are observed in uplands soil and groundwater (including groundwater discharging via intertidal seeps), as described above in Sections 5.1 through 5.4. This section identifies those constituents representing COCs in upland media.

5.5.1 Methods for Determining Constituents of Concern

COCs in the Site uplands were determined based on frequency and magnitude of PCUL exceedances in uplands soil and groundwater/intertidal seeps. Table 8 provides a statistical summary of Site upland soil and groundwater/seep data collected to date, including the following parameters for each detected constituent by media:

- Number of sampled locations and number of samples
- Number of detections
- Detection frequency (number of detects / number of samples)
- Maximum detected concentration
- Frequency of exceedance (number of exceedances / number of samples)
- Maximum magnitude of exceedance (maximum detected concentration / screening level)

The identification of upland COCs also considers whether exceedances of soil PCULs are actually creating PCUL exceedances in groundwater. The MTCA fixed-parameter, three-phase partitioning model (WAC 173-340-747(4)) for calculating the leaching-based soil PCULs is simplistic and intentionally highly conservative in terms of predicting contaminant leaching to groundwater. The empirical upland groundwater data are a more reliable determination of whether contaminant leaching from soil is occurring at concentrations of concern, and thus whether the existing soil concentrations are protective of groundwater in accordance with MTCA (WAC 173-340-747(9))—i.e., measurements outweigh modeling.

Under MTCA, contaminant concentrations in soil can be demonstrated empirically to be protective of groundwater via leaching if there are reliable groundwater data demonstrating no exceedances of groundwater PCULs (WAC 173-340-747(9)). The MTCA requirements for making that empirical demonstration are that a sufficient length of time has elapsed for contaminant migration to have occurred, and that the current site characteristics are representative of future site conditions (WAC 173-340-747(9)(b)). High concentrations of arsenic and other metals had migrated from the SBG-containing fill into upland groundwater and then to the intertidal Seep 76 as of 2004, which is 13 to 15 years prior to collection of the Site groundwater monitoring data used in this RI; this demonstrates that sufficient time has elapsed to observe contaminant migration from the uplands contaminated fill soils.

The current Site conditions represented by groundwater concentration data represent worst-case conditions relative to future Site conditions, given the planned Interim Action's full removal of the SBG-containing fill preceded by construction of a shoring wall (see Section 2.6) that will lengthen upland groundwater flow paths prior to discharge to the LDW. Therefore, MTCA requirements are met to allow use of the existing groundwater data to empirically evaluate whether contaminant concentrations in soil are protective of groundwater quality at the Site.

The empirical evaluation used to evaluate Site uplands COCs focuses on the 2015 seep data and groundwater data collected by Aspect between 2017 and 2019. The groundwater quality data were collected from properly installed and developed monitoring wells, which provide data as representative as possible of Site groundwater quality[12]. For the groundwater and seep samples, the total metals data, not dissolved metals data, are used in this analysis for conservatism. The empirical evaluation was only applied for leaching-based PCULs; other PCULs for direct contact, bank erosion, and TEE were also considered in identification of COCs.

Section 5.5.2 provides the rationale for defining upland COCs, organized by constituent group.

5.5.2 Identified Constituents of Concern in Upland Media

Based on analysis of the collective upland soil and groundwater/seeps data, the following analytes are proposed as Site COCs, and are highlighted in Table 8:

- Metals (arsenic, copper, lead, mercury, and zinc); nickel (groundwater only)
- PCBs
- PAHs
- PCP
- TBT
- TPH

Each of these constituents are present in the SBG-containing fill at concentrations exceeding soil PCULs and are present at concentrations exceeding groundwater PCULs in groundwater within and/or intertidal seeps discharging from that fill. The following sections discuss the rationale for the identified Site upland COCs.

[12] The Farallon collected "reconnaissance" grab groundwater samples from temporary soil borings as part of their 2011 Phase 2 environmental site assessment (Farallon, 2011; see Appendix D for results). Based on the sampling methods discussed in Section 3.1.8, the reconnaissance groundwater data are not included in the RI statistical data summary because they are deemed less representative of Site groundwater quality than the 2017–2019 groundwater data.

5.5.3 Metals: Arsenic, Copper, Lead, Mercury, and Zinc

Arsenic, copper, lead, and zinc had detected concentrations in soil exceeding the PCUL in greater than 10 percent of the soil samples and had a maximum magnitude of exceedance of at least 10 times. Each of these metals also exceeded the groundwater PCUL in one of more groundwater or seep samples, with arsenic and copper exceeding their PCUL in greater than 60 percent of those samples (Table 8). Concentrations of these metals also exceeded PCULs during the 2004 intertidal seep sampling at the Site (Seep 76; Lower Duwamish Waterway Group [LDWG], 2004). Therefore, these metals are identified as COCs.

In addition, detected concentrations of mercury exceeded its leaching-based soil screening level[13] in 7 percent of soil samples, with a maximum concentration of 1.4 milligram per kilogram (mg/kg). Mercury has not been detected in any Site groundwater sample, but the analytical reporting limit for the samples was an order of magnitude greater than the stringent 0.025 micrograms per Liter (ug/L) screening level. However, mercury exceeded the screening level in a Site intertidal seep sampled in 2004 (LDWG, 2004) and in 2015 (Table 8). Therefore, mercury is identified as a COC.

5.5.4 Nickel

The leaching-based screening levels for nickel in vadose and saturated soils default to a defined natural background concentration (48 mg/kg). Nickel concentrations detected in Site soil marginally exceeded the natural background level in only two of 44 samples (4 percent frequency of exceedance), with a maximum magnitude of exceedance of only 1.1, indicating there is not a nickel source in Site soils. Low-level nickel exceedances were detected sporadically in Site groundwater samples (Table 5). However, groundwater nickel exceedances were reproduced in consecutive samples only at well MW-4, and only well MW-5 had an average concentration from the 2017 and 2018 samples greater than two times the screening level, which is due to the anomalously high 100 ug/L detection in the January 2018 sample.

In addition, concentrations of total and dissolved nickel detected in Seep 76 during the 2004 sampling were less than the screening level (LDWG, 2004), indicating Site groundwater is not a source of elevated nickel to the LDW. Nevertheless, for conservatism in this RI, nickel is retained as a COC in groundwater at the Site.

5.5.5 PCBs

Detected concentrations of total PCBs in upland soil are relatively low (less than 0.6 mg/kg). PCBs were not detected in groundwater but were detected at a concentration exceeding the groundwater PCUL in a 2015 intertidal seep sample, ASP-3 (Table 5). Based on those data, and because PCBs are a primary constituent of concern for the LDW including Site sediments in Slip 1, PCBs are identified as a COC.

5.5.6 PAHs

PAHs represent a broad group of hydrocarbon compounds with widely varying mobility and toxicity. Several PAHs are present in upland soil at concentrations exceeding soil

[13] The soil PCULs for mercury default to the defined natural background concentration (see Tables 2 and 4-).

PCULs, and fluoranthene, pyrene, naphthalene, and total cPAHs[14] exceed groundwater samples in one or more samples of Site groundwater. While cPAHs have far less mobility in dissolved phase than does naphthalene, total cPAHs most frequently exceed because of its extremely stringent 0.000016 ug/L groundwater PCUL (two orders of magnitude below the 0.03 ug/L reporting limit achieved for the Site sampling; Table 5). Based on those data, and because PAHs are a primary constituent of concern for the LDW including Site sediments in Slip 1, PAHs as a group are identified as COCs. This does not imply that all individual PAH compounds pose a migration risk at the Site.

5.5.7 Petroleum Hydrocarbons Other than PAHs

The discussion of petroleum hydrocarbons apart from PAHs is divided into TPH as gasoline-range organics (GRO) with associated BTEX, and then the heavier-range TPH as diesel-range organics (DRO) and oil-range organics (ORO). There are no promulgated surface water or marine sediment standards for petroleum mixtures.[15]

Gasoline-Range Organics including BTEX

BTEX compounds are primary mobile and toxic constituents comprising a GRO mixture, with screening levels much more stringent than that of the complete GRO mixture (e.g., 1.6 ug/L benzene vs 800 ug/L GRO).

In their 2011 environmental site assessment (Farallon, 2011), Farallon detected GRO, benzene, ethylbenzene, and total xylenes at concentrations exceeding leaching-based soil PCULs in soil from a depth interval of approximately 5 feet at borings FB-2, FB-and 2A, and FB-2B completed adjacent to a former 2,500-gallon diesel UST at the northwest corner of the property (Figure 10). The presence of DRO and ORO in these samples at concentrations comparable to or greater than the GRO concentration, in combination with low BTEX concentrations and the presence of detectable high molecular weight PAHs (e.g. cPAHs), indicate that the petroleum product released in this area was a fuel oil, not gasoline. During Aspect's 2017–2018 investigation, BTEX compounds were not detected in any of the 15 Site soil samples, including at boring B-12 located adjacent to boring FB-2B. No soil exceedances for these compounds were detected in deeper samples from those borings, or in adjacent borings FB-2D, FB-2E, or FB-2F (Tables 2 and 4).

GRO was not detected in Farallon's reconnaissance groundwater sample collected from the FB-2 boring with the highest detected soil GRO concentration, or in any of the five other reconnaissance groundwater samples collected, with an analytical reporting limit well below the groundwater PCUL (Appendix D includes lab reports for Farallon's reconnaissance groundwater data). The lack of GRO detection in a turbid groundwater sample collected from the FB-2 boring, where the highest soil GRO concentration was detected on Site, indicates that the soil GRO is not leaching at concentrations of concern. This is consistent with results from Aspect's 2017-2018 investigation, in which no exceedances of the highly mobile BTEX compounds were detected in 24 samples of

[14] Total cPAHs are represented by the toxic equivalent concentration of benzo(a)pyrene calculated in accordance with WAC 173-340-708(8)(e).

[15] The groundwater PCULs for TPH from Ecology (2019) are based on potable use, which is not an applicable exposure pathway for the Site.

groundwater, including from well MW-4 located downgradient of the FB-2/FB-2A area (Figure 11; Table 5).

The lack of GRO or BTEX exceedances in Site groundwater indicates that GRO and BTEX concentrations in Site soil are protective of groundwater. As stated above, the soil data indicate that the detected GRO and BTEX are a light-molecular-weight fraction of a fuel oil that is also measured using the DRO/ORO analyses. Therefore, GRO and BTEX are not identified as COCs.

Diesel- and Oil-Range Organics

PAHs are primary toxic components of heavier-range petroleum mixtures (DRO/ORO) and they are identified COCs, as stated above.

For evaluation of diesel-range and oil-range TPH data (from NWTPH-Dx analytical method), Ecology policy requires summing the DRO and ORO results to represent a single petroleum product, unless it is clear that more than one product is present (Ecology, 2004). For purposes of this analysis, we term the summed value “DRO+ORO,” which is used for comparison against screening levels.

The detected DRO+ORO concentrations in Farallon’s (2011) 18 soil samples were all less than a 2,000 mg/kg screening level based on accumulation of free-phase petroleum product. During Aspect’s 2017-2018 investigation, one of 34 soil samples exceeded the screening level—8,700 mg/kg in the 10-foot sample from the MW-2 boring located at the location of a historical 8000-gallon diesel UST. No free-phase petroleum product has been observed during any of the drilling or in any of the completed monitoring wells on Site, including at the MW-2 location.

The summed DRO+ORO concentrations detected in seven of Farallon’s eight reconnaissance groundwater samples exceeded the 500 ug/L screening level, and the eighth sample (460 ug/L at FB-6) almost exceeded (Appendix D). Comparing the DRO+ORO reconnaissance groundwater results to DRO/ORO soil data from the same borings indicates no correlation. For example, at boring FB-8, there is no detectable DRO+ORO in soil, but the summed DRO+ORO groundwater concentration is 1,510 ug/L, versus boring FB-2 with 630 mg/kg DRO+ORO in soil and 700 ug/L DRO + ORO in groundwater. The fact that DRO+ORO concentrations in turbid grab groundwater samples appear unrelated to detected concentrations in Site soil, coupled with a lack of naphthalene and cPAH detections in the reconnaissance groundwater samples suggests that the DRO+ORO detections in the reconnaissance groundwater samples likely represent non-polar degradation compounds and/or naturally occurring organic compounds rather than petroleum hydrocarbons.

When more reliable groundwater data were collected from Site monitoring wells in 2017-2018, no DRO+ORO exceedances were detected in 24 groundwater samples (Table 5). This includes the two groundwater samples collected from well MW-2 which is screened at a depth interval (5 to 15 feet) directly across the soil interval containing the maximum-detected 8,700 mg/kg DRO+ORO. Notably, groundwater collected from MW-2 had detected naphthalene and cPAH exceedances (up to 10 ug/L and 0.17 ug/L, respectively) even though there were no detected DRO+ORO exceedances. The weight of evidence indicates that DRO and ORO hydrocarbons beyond PAHs in Site soils are not leaching to groundwater.

Note that the MW-2 location and the Sump sample location beneath the warehouse floor are the two locations where soil TPH was detected at concentrations greater than 1,500 mg/kg Tables 2 and 4), which is a generic soil cleanup level based on direct contact for unrestricted use applied in model remedy cleanup actions for petroleum-contaminated sites (Ecology, 2017). Ecology (2017) states that the 1,500 mg/kg soil cleanup level applies only if gasoline-range TPH is detected. Gasoline-range TPH was not detected in the Sump soil sample (Table 4), indicating the generic model remedy soil cleanup level does not apply, and the detected 1,610 mg/kg TPH concentration (sum of DRO and GRO) is less than the applicable 2,000 mg/kg PCUL. Gasoline-range TPH was not analyzed for in soil samples from MW-2, but the TPH concentration (sum of DRO and GRO) exceeds the 2,000 mg/kg PCUL.

For purposes of evaluating potential ecological risk, PCULs are established for gasoline-range and diesel-range TPH fractions (for exposure to plants and soil biota). Diesel-range TPH was detected in soil at four locations within the footprint of the SBG-containing fill (MW-2, MW-3, B-12, and FB-2) and in the sample from the sump bottom exceeding a 260 mg/kg PCUL based on terrestrial ecological risk.

Based on the collective data, TPH is identified as a COC, principally limited to the MW-2 area. However, TPH at the MW-3, FB-2, and B-12 locations also exceed PCULs based on protection of soil biota and plants.

5.6 In-Water Sediment Quality and COCs

Sediment quality was evaluated by comparing sediment COC concentrations with the RALs defined in the LDW ROD. Table 7 presents the in-water sediment analytical data collected in 2018. See Appendix J for laboratory analytical data reports for the RI sediment sampling.

An exceedance screening assessment was conducted to identify COCs that were greater than the Human Health & Benthic COC RALs and the ENR Upper Limits (ROD Table 28) (Tables 1, 7, and 8, and Figures 8a and 8b). Figures 19 and 20 from the LDW ROD (EPA, 2014) illustrate how RAL screening results are to be used to determine remedial technology assignments for intertidal (+11.3 feet MLLW to -4 feet MLLW) and subtidal (-4 feet MLLW and deeper) sediments, respectively.

Results from the LDW RI/FS sampling included RAL exceedances for metals and Total PCB Aroclors at three of the four sampling locations and RAL exceedances for select PAHs at Location B3b. Of the RAL exceedances that were identified in the LDW RI/FS data set, only the exceedance for arsenic at location B3b was sufficiently elevated to require active remediation beyond ENR (Figure 8a).

Because of the very sparse data that were available at the head of Slip 1 in the LDW RI/FS data set, in 2015, 5055 Properties LLC conducted additional shoreface and subtidal surface sediment sampling within the Slip 1 area. With the exception of a single RAL exceedance for Total PCB Aroclors at Location 46 and a single cPAH exceedance at Location 42, all other RAL exceedances identified from the 2015 subtidal surface sediment sampling were for metals only.

The 2015 supplemental sampling documented dramatic natural recovery throughout the slip, and it is clear that the area requiring active remediation is much smaller than what was proposed in the ROD. In particular, arsenic and metals contamination did not extend as far into Slip 1 as was predicted by Figure 18 of the ROD.

For the purposes of developing this RI, the RAL exceedances for arsenic and metals at the head of Slip 1 were used as chemical indicators of SBG at the Site and to help characterize the spatial extent of contamination. Elevated arsenic and metals concentrations above the RALs remain localized, and concentrations decrease rapidly as one moves away from the shoreface where SBG was deposited. In 2015, all RAL exceedances for metals at the head of Slip 1 were located within 50–100 feet of the shoreface (Figures 8a and 8b).

Intertidal sediment samples (shoreface samples below MHHW) collected in 2015 (Figure 8b [left panel]) were screened against the sediment RALs. Samples exceeded RALs total PCB Aroclors (SSA-5, SSA-6, SSA-7, SSA-8, and SSA-10), metals (SSA-5, SSA-6, SSA-7 and SSA-8) and PAHs (SSA-5, SSA-7 and SSA-8). Samples with TOC below 0.5 percent (SSA-5, SSA-7, SS-8, and SSA-10) were also screened against the dry weight normalized apparent effects thresholds (AETs) (Table 3. Samples exceeded AETs for total PCB Aroclors (SSA-5, SSA-7, and SSA-8), metals (SSA-5, SSA-7, and SSA-8), and PAHs (SSA-5 and SSA-8).

Sediment with COC concentrations exceeding AETs also exceeded RALs. Comparing sediment COC concentrations to the RALs provides a more conservative estimate of sediment quality.

In 2018, subsurface cores collected within the subtidal area of Slip 1 exceeded RALs for Total PCB Aroclors (C01, C02 and C03), metals (C02 and C03) and PAHs (C02 and C03) (Figure 8b [right panel]). It should be noted that most of the intertidal samples, and the core collected at C03 in 2018, had low organic carbon values (less than 0.76 percent [with the exception of SSA-2]). Because RALs for many analytes are defined on a carbon-normalized basis, this contributed to the larger number of RAL exceedances for these samples, as compared to what was observed in the data set collected as part of the LDW RI/FS and 5055 Properties LLC's 2015 subtidal sediment sampling effort.

All concentrations in TCLP leachate were below the TCLP limits for designation of the sediment as characteristic hazardous waste if dredged.

Identified COCs for in-water sediment are metals (arsenic, copper, lead, mercury, and zinc), PAHs, and total PCBs, consistent with COCs identified for upland media, and consistent with the SBG-containing fill on the shoreface as the source for the in-water COCs.

6 Conceptual Site Model

This section presents the conceptual site model (CSM) for the Site. It has been prepared consistent with the PCUL Document and Ecology's *Remedial Investigation Checklist* (Ecology, 2016c) and summarizes the physical CSM, contaminant sources, COC fate and transport, exposure pathways, and potential human and aquatic receptors.

6.1 Physical Conceptual Site Model

Prior to the early 1900s, the Property was a tidal estuary of the Lower Duwamish River. Between 1901 to 1917, the Lower Duwamish River was dredged and straightened (forming the LDW), and the historical shoreline and floodplain were hydraulically filled. Starting sometime in the 1970s, disposal of SBG was dumped directly on the side of the bank adjacent to Slip 1 (see Section 2.2.2), and then later behind the steel plates which make up the current retaining wall present at the Property. The hydraulic fill and SBG-containing fill comprise the shallow sediments at the Site, that are underlain by the native, confining Estuarine Unit, which is underlain by the native Alluvium Unit.

An existing warehouse currently occupies the majority of the Property. The existing retaining wall is located between the existing warehouse and Slip 1 that consists primarily of vertical steel plates interwoven into wood pilings from a former dock structure. The SBG was used as fill in the area west of the existing warehouse, on the shoreface and landward sides of the retaining wall.

Groundwater in the Fill and Alluvium Units is hydraulically separated by the Estuarine unit and flows to the west with discharge to the LDW. Tidal fluctuations in the LDW hydraulically influence both Fill and Alluvium Unit groundwater, with the Alluvium having a much greater tidal efficiency than the Fill Unit. During high tides, local and temporary groundwater flow direction reversals are observed in the Fill Unit. During low tides, groundwater discharges through seeps observed on the existing intertidal shoreface.

The topography of the Property is relatively flat and slopes steeply to the LDW at the shoreface.

6.2 Contaminant Sources

Based on soil groundwater quality (including seeps), and intertidal and subtidal sediment data collected for this RI, the SBG-containing fill at the Site is the primary source of COCs in both upland and in-water media. This SBG-containing fill is sourcing exceedances of PCULs in groundwater discharging to the LDW and, through erosion, in-water sediments. Other less-significant sources of COCs at the Site include the historical coal burners, USTs petroleum releases, and possibly treated wood pilings and dock materials. These subsidiary COC sources generally fall within the mapped area of SBG-containing fill.

The SBG contaminant source area forms a wedge of fill that is thinnest (approximately 5 feet bgs) at its eastern edge adjacent to the existing warehouse's western side. The wedge of SBG-containing fill thickens to the west to approximately 12 feet thick in areas along the east margin of the existing retaining wall, where it appears to directly overlie the

Estuarine Unit (see cross sections on Figures 3 through 6). West of the existing retaining wall, SBG was observed on the intertidal shoreface indicating that active bank erosion of SBG is occurring. Sediment quality data confirms that COCs associated with SBG are present in the intertidal and subtidal sediments of Slip 1.

As tidally influenced groundwater migrates through the SBG-containing fill, soluble metals and organic COCs are leached, and discharge to Slip 1, as confirmed by sampling of seeps discharging from the intertidal shoreface at low tides.

6.3 COC Fate and Transport

As noted in the above Section 6.2, soluble inorganic and organic COCs are present in SBG-containing fill located in the area between the existing warehouse and the shoreface. Release and transport mechanisms by which these COCs may reach Site receptors include the following:

- **Rainwater infiltration and leaching of COCs from the upland vadose soil to groundwater.** Contaminants are then subsequently transported through the tidal mixing zone to sediments, and to surface water discharge along the Slip 1 shoreface.
- **Groundwater leaching of COCs in upland saturated zone soil.** COCs are then transported through the tidal mixing zone and discharge to sediments and surface water along the Slip 1 shoreface.
- **Surface water leaching of COCs from SBG in shoreface sediments seaward of the retaining wall.** COCs may then be subsequently transported to sediments and surface water located further seaward in Slip 1.
- **Erosion of bank soil and sediment to intertidal and/or subtidal sediments in Slip 1.** With the existing retaining wall in place, this pathway is currently occurring via erosion of SBG from seams and penetrations in the exterior of the retaining wall.

6.4 Exposure Pathways and Potential Receptors

The following exposure pathways, evaluated in accordance with the PCUL Document and MTCA guidance, are currently considered complete at the Site for surface water, sediment, soil, and groundwater media:

6.4.1 Surface Water

- Direct contact of ecological (aquatic) receptors to surface water contaminated by Site groundwater discharge or soil erosion
- Human exposure via consumption of aquatic organisms exposed to contaminated surface water

6.4.2 Sediment

- Direct contact of ecological (benthic) receptors to contaminated sediment
- Direct contact of human receptors to contaminated sediment
- Human exposure via consumption of aquatic organisms exposed to contaminated sediment

6.4.3 Soil

- Direct human exposure for an employee or construction worker to soil via ingestion, inhalation, or dermal absorption

6.4.4 Groundwater

- Direct human exposure to groundwater via dermal absorption, for a construction worker working at or below the water table

7 Remedial Investigation Conclusions

The Site has a long industrial history that began with the construction of the LDW and Slip 1 at the beginning of the 1900s. Starting sometime in the 1970s, disposal of SBG was dumped directly on the west side of the bank adjacent to Slip 1, and then later behind the current retaining wall present at the Property. This SBG fill material represents the primary source of contamination in uplands soil and groundwater, and intertidal and subtidal sediments at the Site.

Significant environmental investigations have occurred at the uplands portion of the Site prior to the 2019 Agreed Order with Ecology, and additional characterization was performed in 2019 under the Agreed Order. Sediment investigations were performed by EPA and their consultants in Slip 1 up to 2006, and then in 2015 and 2018 by 5055 Properties LLC to supplement EPA results and support the sediment remedial action required by the ROD. All Site environmental investigations are incorporated into this RI Report to meet the requirements of the Agreed Order.

Based on these investigations, the proposed COCs for the Site are metals (arsenic, copper, lead, mercury, and zinc), nickel (groundwater only), PCBs, PAHs, PCP, TBT, and, in a limited area of the uplands, TPH. The extent of COC exceedances of PCULs for uplands soil and groundwater coincide with the inferred extent of SBG-containing fill at the Site. Inland of the SBG-containing fill extent, including outside and within the footprint of the existing warehouse, fill soils exhibit isolated low-level concentrations of PAHs, PCBs, and metals that exceed the exceedingly stringent soil PCULs, but are typical of concentrations in urban soils. There is no historical process on Site that explains the sporadic low-level exceedances outside of the SBG-containing fill.

COCs in intertidal sediments below MHHW are also associated with SBG-containing fill or pure SBG exposed on the shoreface. Exceedances of LDW ROD RALs in subtidal sediments in Slip 1 of the LDW are also associated with the SBG.

This RI Report is prepared to satisfy the requirements of the Agreed Order. A Final Interim Action Work Plan describes an interim action that will install a new shoring wall to stabilize the shoreface, followed by removal of all SBG-containing fill from the landward side of the shoring wall (Aspect, 2020). The Final Interim Action Work Plan is an enforceable part of the Agreed Order and will remove the primary source of contamination on the portion of the Property upland of the shoring wall.

Additional remedial action is planned that will include removal of the remainder of SBG on the water-side of the proposed shoring wall (some above and some below MHHW). The LDW ROD defines the remediation action required for in-water sediments within the Site.

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TABLES

Table 1. Historical Sediment Data
Project No. 150054, Snopac Property, Seattle, Washington

				Sample Location:	B3b	LDW-SS31	LDW-SC17	LDW-SC17	LDW-SC17	LDW-SC17	EST216	42	44
				Sample ID:	LDW-B3b-S	LDW-SS31_0-10	LDW-SC17_0-1	LDW-SC17_1-2	LDW-SC17_2-4	LDW-SC17_6-8.2	EST20-06	SD0044	SD0046
				Sample Date:	8/17/2004	1/21/2005	2/23/2006	2/23/2006	2/23/2006	2/23/2006	9/17/1997	6/1/2015	6/2/2015
				Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Sediment Interval (ft):	0 - 0.33	0 - 0.33	0 - 1	1- 2	2 - 4	6 - 8.2	0 - 0.33	0 - 0.33	0 - 0.33
Analyte	**Units**	**Human Health & Benthic COC RALs**	**Upper Limit for ENR**										
Polychlorinated Biphenyls (PCBs)													
Aroclor 1016	mg/kg dw	--	--		0.005 U	0.01 U	0.11 U	0.0425 U	0.45 U	0.09 U	--	0.0065 U	0.006 U
Aroclor 1221	mg/kg dw	--	--		0.01 U	0.01 U	0.11 U	0.0425 U	0.45 U	0.09 U	--	0.0125 U	0.0115 U
Aroclor 1232	mg/kg dw	--	--		0.005 U	0.01 U	0.11 U	0.0425 U	0.45 U	0.09 U	--	0.0065 U	0.006 U
Aroclor 1242	mg/kg dw	--	--		0.005 U	0.01 U	0.11 U	0.0425 U	0.45 U	0.48	--	0.028	0.074
Aroclor 1248	mg/kg dw	--	--		0.005 U	0.195 U	0.39	0.32	1.7	0.09 U	--	0.0065 U	0.006 U
Aroclor 1254	mg/kg dw	--	--		0.18	0.053	0.51	0.5	2.7	1	--	0.1	0.11
Aroclor 1260	mg/kg dw	--	--		0.17	0.043	0.32	0.22	5.4	0.45	--	0.062	0.11
Total PCB Aroclors	mg/kg dw				0.35	0.096	1.22	1.04	9.8	1.9	0.3	0.19	0.294
Total PCB Aroclors	mg/kg OC	12 (195 for top 2 ft)	36 (195 for top 2 ft)		19.2	4.42	39.9	32	154	58.6	13.6	3.95	8.33
Polynuclear Aromatic Hydrocarbons (PAHs)													
1-Methylnaphthalene	mg/kg dw	--	--		0.014		0.031 U	0.05 U	2.6	0.4		0.013	0.009
2-Methylnaphthalene	mg/kg dw	--	--		0.034	0.049 U	0.069	0.050 U	4.5	0.61		0.021	0.013
Acenaphthene	mg/kg dw	--	--		0.035	0.049 U	0.065	0.38	4.6	1.2		0.034 J	0.015
Anthracene	mg/kg dw	--	--		1.1	0.17	0.52	1.60	1.9	1.7		0.71 J	0.14
Benz(a)anthracene	mg/kg dw	--	--		2.8	0.28	1.1	1.5 J	1.5	2.1		1.0 J	0.44
Benzo(a)pyrene	mg/kg dw	--	--		1.4	0.42	1.3	1.4	0.94	1.6		1.2 J	0.41
Benzo(b)fluoranthene	mg/kg dw	--	--		1.7	0.58	2.2	1.8	1.7	2.5		2.0 J	0.68
Benzo(k)fluoranthene	mg/kg dw	--	--		1.2	0.57	1.3	1.4	0.99	1.3		0.55 J	0.24
Chrysene	mg/kg dw	--	--		5.4	0.63	1.8	2.4 J	1.8	2.6		2.3 J	0.66
Dibenz(a,h)anthracene	mg/kg dw	--	--		0.24	0.049 U	0.08	0.14	0.07 U	0.26		0.21 J	0.068
Dibenzofuran	mg/kg dw	--	--		0.036	0.049 U	0.077	0.21	1.7	0.71		0.033 J	0.018
Fluoranthene	mg/kg dw	--	--		3.6	0.67	2	5.6	7.4	7.1		1.6 J	0.8
Fluorene	mg/kg dw	--	--		0.15	0.049 U	0.11	0.34	4.3	1.4		0.068 J	0.03
Indeno(1,2,3-cd)pyrene	mg/kg dw	--	--		0.66	0.11	0.32	0.57 J	0.18	0.32		0.82 J	0.27
Naphthalene	mg/kg dw	--	--		0.036	0.049 U	0.12	0.15	3.4	1.2		0.043	0.022
Pyrene	mg/kg dw	--	--		2.3	0.7	2.4	3.7 J	5.7	7.6		1.1 J	0.76
2-Methylnaphthalene	mg/kg OC	76	228		1.87	2.24 U	2.25	1.52 U	70.9	18.8		0.437	0.368
Acenaphthene	mg/kg OC	32	96		1.92	2.24 U	2.12	11.7	72.4	37		0.707 J	0.425
Acenaphthylene	mg/kg OC	--	--		4.40	2.24 U	2.19	2.77 J	1.46 J	3.02		1.02	0.51
Anthracene	mg/kg OC	440	1,320		60.4	7.83	17	49.2	29.9	52.5		14.8 J	3.97
Benz(a)anthracene	mg/kg OC	220	660		154	12.9	35.9	46.2 J	23.6	64.8		20.8 J	12.5
Benzo(a)pyrene	mg/kg OC	198	594		76.9	19.4	42.5	43.1	14.8	49.4		24.9 J	11.6
Benzo(g,h,i)perylene	mg/kg OC	62	186		33	5.07	8.17	15.1	2.2 J	10.8		15.4	7.08
Total benzofluoranthenes	mg/kg OC	460	1,380		159	53	114	98.5	42.5	117		53 J	26.1
Chrysene	mg/kg OC	220	660		297	29	58.8	73.8 J	28.3	80.2		47.8 J	18.7
Dibenz(a,h)anthracene	mg/kg OC	24	72		13.2	2.24 U	2.61	4.31	1.1 U	8.02		4.37 J	1.93
Dibenzofuran	mg/kg OC	30	90		1.98	2.24 U	2.52	6.46	26.8	21.9		0.686 J	0.51

Table 1. Historical Sediment Data

Project No. 150054, Snopac Property, Seattle, Washington

				Sample Location:	B3b	LDW-SS31	LDW-SC17	LDW-SC17	LDW-SC17	LDW-SC17	EST216	42	44
				Sample ID:	LDW-B3b-S	LDW-SS31_0-10	LDW-SC17_0-1	LDW-SC17_1-2	LDW-SC17_2-4	LDW-SC17_6-8.2	EST20-06	SD0044	SD0046
				Sample Date:	8/17/2004	1/21/2005	2/23/2006	2/23/2006	2/23/2006	2/23/2006	9/17/1997	6/1/2015	6/2/2015
				Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Sediment Interval (ft):	0 - 0.33	0 - 0.33	0 - 1	1- 2	2 - 4	6 - 8.2	0 - 0.33	0 - 0.33	0 - 0.33
Analyte	Units	Human Health & Benthic COC RALs	Upper Limit for ENR										
Fluoranthene	mg/kg OC	320	960		198	30.9	65.4	172	117	219		33.3 J	22.7
Fluorene	mg/kg OC	46	138		8.24	2.24 U	3.59	10.5	67.7	43.2		1.41 J	0.85
Indeno(1,2,3-cd)pyrene	mg/kg OC	68	204		36.3	5.07	10.5	17.5 J	2.83	9.88		17 J	7.65
Naphthalene	mg/kg OC	198	594		1.98	2.24 U	3.92	4.62	53.5	37		0.894	0.623
Phenanthrene	mg/kg OC	200	600		41.8	11.1	18.3	36.9	205	130		6.86 J	5.38
Pyrene	mg/kg OC	2,000	6,000		126	32.3	78.4	114 J	89.8	235		22.9 J	21.5
Total HPAHs	mg/kg OC	1,920	5,760		1,090	188	418	585 J	321 J	793		240 J	130
Total LPAHs	mg/kg OC	740	2,220		121	18.9	47.1	117 J	425 J	302		25.7 J	11.8
cPAH	µg TEQ/kg dw	1000	3000		2,200	600	1,800	2,000 J	1,400	2,400		1,740 J	607
Metals													
Arsenic	mg/kg dw	57	171		725 J	122	110	170	60	76	--	24.9 J	23.4
Cadmium	mg/kg dw	10.2	30.6		1.67	3.2	4.5	7.6	15	20.4	--	0.6175 J	0.625
Chromium	mg/kg dw	520	1,560		42.5	55	47	47	386	50.3	--	25.8 J	32.5
Copper	mg/kg dw	780	2,340		495 J	245	187	224	219	235	--	87.3 J	91.1
Lead	mg/kg dw	900	2,700		437	172	173	286	1,740	470	--	39.85 J	41.2 J
Mercury	mg/kg dw	0.82	2.46		0.059	0.33	0.5	0.6	1.29	0.75	--	0.2405	0.274
Silver	mg/kg dw	12.2	36.6		0.891	1.2	1	1.4	2	2.2	--	0.274 J	0.362
Zinc	mg/kg dw	820	2,460		2,080	997	1,260	2,050	3,840	4,550	--	209 J	194
Organotin Compounds													
Tributyltin ion	µg/kg dw	--	--		320	81	--	--	--	--	--	--	--
Phthalates													
Bis(2-ethylhexyl)phthalate	mg/kg dw	--	--		0.26 J	0.16	0.570	0.44 J	2.3	1	--	--	--
Bis(2-ethylhexyl)phthalate	mg/kg OC	94	282		14.3 J	7.37	18.6	13.5 J	36.2	30.9	--	--	--
Chlorobenzenes													
1,2,4-Trichlorobenzene	mg/kg dw	--	--		0.025 U	0.049 U	0.009 J	0.017 J	0.11 J	0.003 U	--	--	--
1,2,4-Trichlorobenzene	mg/kg OC	1.62	4.86		1.37 U	2.24 U	0.304 J	0.523 J	1.73 J	0.102 U	--	--	--
Other SVOCs and COCs													
Benzoic acid	µg/kg dw	1,300	3,900		500 U	485 U	320	320	3,000 J	295 U	--	--	--
Organic Carbon													
Total Organic Carbon	%	--	--		1.82	2.17	3.06	3.25	6.35	3.24	2.21	4.81	3.53

Notes:

Results for core LDW-SC17 are shown for reference purposes only. With the exception of PCBs, RALs are not defined below 4 inches in Category 2/3 recovery areas.

Nondetects reported as 1/2 detection limit.

Lab duplicates have been averaged.

>Cat 2/3 RAL and ≤UL for ENR (ENR)

>UL for ENR (Active Remediation)

dw = dry weight

LDW = Lower Duwamish Waterway

RAL = remedial action level

ROD = record of decision

TEQ = toxicity equivalence

Data Qualifiers: J = result is estimated, U = result is not detected

COC = contaminant of concern

ENR = enhanced natural recovery

OC = organic carbon

SVOC = semivolatile organic compound

-- = no data available

Table data courtesy of Integral Consulting, Inc.

Table 1. Historical Sediment Data
Project No. 150054, Snopac Property, Seattle, Washington

		LDW ROD Remedial Action Levels		Sample Location:	45	46	47	48	49	50	51	52	53	54	55
				Sample ID:	SD0047	SD0048	SD0049	SD0050	SD0051	SD0052	SD0053	SD0054	SD0055	SD0056	SD0057
				Sample Date:	6/2/2015	6/4/2015	6/3/2015	6/3/2015	6/3/2015	6/1/2015	6/3/2015	6/3/2015	6/1/2015	6/1/2015	6/1/2015
				Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
				Sediment Interval (ft):	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
Analyte	**Units**	**Human Health & Benthic COC RALs**	**Upper Limit for ENR**												
Polychlorinated Biphenyls (PCBs)															
Aroclor 1016	mg/kg dw	--	--		0.0065 U	0.006 U	--	--	--	--	--	--	--	--	--
Aroclor 1221	mg/kg dw	--	--		0.0125 U	0.012 U	--	--	--	--	--	--	--	--	--
Aroclor 1232	mg/kg dw	--	--		0.0065 U	0.006 U	--	--	--	--	--	--	--	--	--
Aroclor 1242	mg/kg dw	--	--		0.054	0.03	--	--	--	--	--	--	--	--	--
Aroclor 1248	mg/kg dw	--	--		0.0065 U	0.006 U	--	--	--	--	--	--	--	--	--
Aroclor 1254	mg/kg dw	--	--		0.11	0.24	--	--	--	--	--	--	--	--	--
Aroclor 1260	mg/kg dw	--	--		0.13	0.18	--	--	--	--	--	--	--	--	--
Total PCB Aroclors	mg/kg dw				0.294	0.45	--	--	--	--	--	--	--	--	--
Total PCB Aroclors	mg/kg OC	12 (195 for top 2 ft)	36 (195 for top 2 ft)		7	12.6	--	--	--	--	--	--	--	--	--
Polynuclear Aromatic Hydrocarbons (PAHs)															
1-Methylnaphthalene	mg/kg dw	--	--		0.009	0.017 J	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg dw	--	--		0.015	0.024 J	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg dw	--	--		0.024	0.038 J	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg dw	--	--		0.22	0.25 J	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	mg/kg dw	--	--		0.53	0.5 J	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	mg/kg dw	--	--		0.51	0.56 J	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg dw	--	--		0.83	0.94 J	--	--	--	--	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg dw	--	--		0.28	0.3 J	--	--	--	--	--	--	--	--	--
Chrysene	mg/kg dw	--	--		0.91	0.85 J	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	mg/kg dw	--	--		0.087	0.096 J	--	--	--	--	--	--	--	--	--
Dibenzofuran	mg/kg dw	--	--		0.028	0.027 J	--	--	--	--	--	--	--	--	--
Fluoranthene	mg/kg dw	--	--		0.96	0.85 J	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg dw	--	--		0.049	0.045 J	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg dw	--	--		0.34	0.4 J	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg dw	--	--		0.021	0.042 J	--	--	--	--	--	--	--	--	--
Pyrene	mg/kg dw	--	--		0.86	0.85 J	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg OC	76	228		0.357	0.67 J	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg OC	32	96		0.571	1.06 J	--	--	--	--	--	--	--	--	--
Acenaphthylene	mg/kg OC	--	--		0.548	0.894 J	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg OC	440	1,320		5.24	6.98 J	--	--	--	--	--	--	--	--	--
Benz(a)anthracene	mg/kg OC	220	660		12.6	14 J	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	mg/kg OC	198	594		12.1	15.6 J	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg OC	62	186		7.62	10.6 J	--	--	--	--	--	--	--	--	--
Total benzofluoranthenes	mg/kg OC	460	1,380		26.4	34.6 J	--	--	--	--	--	--	--	--	--
Chrysene	mg/kg OC	220	660		21.7	23.7 J	--	--	--	--	--	--	--	--	--
Dibenz(a,h)anthracene	mg/kg OC	24	72		2.07	2.68 J	--	--	--	--	--	--	--	--	--
Dibenzofuran	mg/kg OC	30	90		0.667	0.754 J	--	--	--	--	--	--	--	--	--

Table 1. Historical Sediment Data

Project No. 150054, Snopac Property, Seattle, Washington

				Sample Location:	45	46	47	48	49	50	51	52	53	54	55
				Sample ID:	SD0047	SD0048	SD0049	SD0050	SD0051	SD0052	SD0053	SD0054	SD0055	SD0056	SD0057
				Sample Date:	6/2/2015	6/4/2015	6/3/2015	6/3/2015	6/3/2015	6/1/2015	6/3/2015	6/3/2015	6/1/2015	6/1/2015	6/1/2015
				Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Sediment Interval (ft):	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
Analyte	Units	Human Health & Benthic COC RALs	Upper Limit for ENR												
Fluoranthene	mg/kg OC	320	960		22.9	23.7 J	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg OC	46	138		1.17	1.26 J	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg OC	68	204		8.1	11.2 J	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg OC	198	594		0.5	1.17 J	--	--	--	--	--	--	--	--	--
Phenanthrene	mg/kg OC	200	600		7.14	8.66 J	--	--	--	--	--	--	--	--	--
Pyrene	mg/kg OC	2,000	6,000		20.5	23.7 J	--	--	--	--	--	--	--	--	--
Total HPAHs	mg/kg OC	1,920	5,760		134	160 J	--	--	--	--	--	--	--	--	--
Total LPAHs	mg/kg OC	740	2,220		15.2	20 J	--	--	--	--	--	--	--	--	--
cPAH	µg TEQ/kg dw	1000	3000		752	821 J	--	--	--	--	--	--	--	--	--
Metals															
Arsenic	mg/kg dw	57	171		36.4	102 J	66.2	121	733	52 J	173	474	29.3 J	44.9 J	60.9 J
Cadmium	mg/kg dw	10.2	30.6		0.61	0.841 J	1.54	1.68	1.28	1.25 J	1.38	1.86	0.63 J	0.453 J	1.05 J
Chromium	mg/kg dw	520	1,560		31.9	36.4 J	38.6	30.2	47.8	36.8 J	44.3	50	29.5 J	21.7 J	46 J
Copper	mg/kg dw	780	2,340		100	143 J	156	143	240	128 J	199	308	114 J	89.3 J	130 J
Lead	mg/kg dw	900	2,700		45.1 J	81.2 J	88.7 J	113 J	176 J	66 J	155 J	299 J	41.4 J	36.5 J	62.7 J
Mercury	mg/kg dw	0.82	2.46		0.238	0.239	0.284 J	0.261 J	0.601 J	0.288	0.437 J	0.32 J	0.194	0.185	0.224
Silver	mg/kg dw	12.2	36.6		0.344	0.439	0.423	0.459	0.473	0.376 J	0.546	0.761	0.317 J	0.233 J	0.357 J
Zinc	mg/kg dw	820	2,460		206	406 J	527 J	639 J	804 J	421 J	720 J	1,560 J	216 J	193 J	424 J
Organotin Compounds															
Tributyltin ion	µg/kg dw	--	--		--	--	--	--	--	--	--	--	--	--	--
Phthalates															
Bis(2-ethylhexyl)phthalate	mg/kg dw	--	--		--	--	--	--	--	--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	mg/kg OC	94	282		--	--	--	--	--	--	--	--	--	--	--
Chlorobenzenes															
1,2,4-Trichlorobenzene	mg/kg dw	--	--		--	--	--	--	--	--	--	--	--	--	--
1,2,4-Trichlorobenzene	mg/kg OC	1.62	4.86		--	--	--	--	--	--	--	--	--	--	--
Other SVOCs and COCs															
Benzoic acid	µg/kg dw	1,300	3,900		--	--	--	--	--	--	--	--	--	--	--
Organic Carbon															
Total Organic Carbon	%	--	--		4.2	3.58	3.95	4.07	6.52	3.59	4.08	3.83	3.78	4.27	3.53

Notes:

Results for core LDW-SC17 are shown for reference purposes only. With the exception of PCBs, RALs are not defined below 4 inches in Category 2/3 recovery areas.

Nondetects reported as 1/2 detection limit.

Lab duplicates have been averaged.

>Cat 2/3 RAL and ≤UL for ENR (ENR)

>UL for ENR (Active Remediation)

dw = dry weight

LDW = Lower Duwamish Waterway

RAL = remedial action level

ROD = record of decision

TEQ = toxicity equivalence

Data Qualifiers: J = result is estimated, U = result is not detected

COC = contaminant of concern

ENR = enhanced natural recovery

OC = organic carbon

SVOC = semivolatile organic compound

-- = no data available

Table data courtesy of Integral Consulting, Inc.

Table 1. Historical Sediment Data

Project No. 150054, Snopac Property, Seattle, Washington

				Sample Location:	56	57	58	59	60	60
				Sample ID:	SD0058	SD0059	SD0060	SD0061	SD0062	SD0063 (Field Rep)
				Sample Date:	6/3/2015	6/1/2015	6/3/2015	6/4/2015	6/5/2015	6/5/2015
				Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Sediment Interval (ft):	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
Analyte	Units	Human Health & Benthic COC RALs	Upper Limit for ENR							
Polychlorinated Biphenyls (PCBs)										
Aroclor 1016	mg/kg dw	--	--		--	--	--	--	--	--
Aroclor 1221	mg/kg dw	--	--		--	--	--	--	--	--
Aroclor 1232	mg/kg dw	--	--		--	--	--	--	--	--
Aroclor 1242	mg/kg dw	--	--		--	--	--	--	--	--
Aroclor 1248	mg/kg dw	--	--		--	--	--	--	--	--
Aroclor 1254	mg/kg dw	--	--		--	--	--	--	--	--
Aroclor 1260	mg/kg dw	--	--		--	--	--	--	--	--
Total PCB Aroclors	mg/kg dw				--	--	--	--	--	--
Total PCB Aroclors	mg/kg OC	12 (195 for top 2 ft)	36 (195 for top 2 ft)		--	--	--	--	--	--
Polynuclear Aromatic Hydrocarbons (PAHs)										
1-Methylnaphthalene	mg/kg dw	--	--		--	--	--	--	--	--
2-Methylnaphthalene	mg/kg dw	--	--		--	--	--	--	--	--
Acenaphthene	mg/kg dw	--	--		--	--	--	--	--	--
Anthracene	mg/kg dw	--	--		--	--	--	--	--	--
Benz(a)anthracene	mg/kg dw	--	--		--	--	--	--	--	--
Benzo(a)pyrene	mg/kg dw	--	--		--	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg dw	--	--		--	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg dw	--	--		--	--	--	--	--	--
Chrysene	mg/kg dw	--	--		--	--	--	--	--	--
Dibenz(a,h)anthracene	mg/kg dw	--	--		--	--	--	--	--	--
Dibenzofuran	mg/kg dw	--	--		--	--	--	--	--	--
Fluoranthene	mg/kg dw	--	--		--	--	--	--	--	--
Fluorene	mg/kg dw	--	--		--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg dw	--	--		--	--	--	--	--	--
Naphthalene	mg/kg dw	--	--		--	--	--	--	--	--
Pyrene	mg/kg dw	--	--		--	--	--	--	--	--
2-Methylnaphthalene	mg/kg OC	76	228		--	--	--	--	--	--
Acenaphthene	mg/kg OC	32	96		--	--	--	--	--	--
Acenaphthylene	mg/kg OC	--	--		--	--	--	--	--	--
Anthracene	mg/kg OC	440	1,320		--	--	--	--	--	--
Benz(a)anthracene	mg/kg OC	220	660		--	--	--	--	--	--
Benzo(a)pyrene	mg/kg OC	198	594		--	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg OC	62	186		--	--	--	--	--	--
Total benzofluoranthenes	mg/kg OC	460	1,380		--	--	--	--	--	--
Chrysene	mg/kg OC	220	660		--	--	--	--	--	--
Dibenz(a,h)anthracene	mg/kg OC	24	72		--	--	--	--	--	--
Dibenzofuran	mg/kg OC	30	90		--	--	--	--	--	--

Table 1. Historical Sediment Data

Project No. 150054, Snopac Property, Seattle, Washington

				Sample Location:	56	57	58	59	60	60
				Sample ID:	SD0058	SD0059	SD0060	SD0061	SD0062	SD0063 (Field Rep)
				Sample Date:	6/3/2015	6/1/2015	6/3/2015	6/4/2015	6/5/2015	6/5/2015
				Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Sediment Interval (ft):	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33	0 - 0.33
Analyte	**Units**	**Human Health & Benthic COC RALs**	**Upper Limit for ENR**							
Fluoranthene	mg/kg OC	320	960		--	--	--	--	--	--
Fluorene	mg/kg OC	46	138		--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg OC	68	204		--	--	--	--	--	--
Naphthalene	mg/kg OC	198	594		--	--	--	--	--	--
Phenanthrene	mg/kg OC	200	600		--	--	--	--	--	--
Pyrene	mg/kg OC	2,000	6,000		--	--	--	--	--	--
Total HPAHs	mg/kg OC	1,920	5,760		--	--	--	--	--	--
Total LPAHs	mg/kg OC	740	2,220		--	--	--	--	--	--
cPAH	µg TEQ/kg dw	1000	3000		--	--	--	--	--	--
Metals										
Arsenic	mg/kg dw	57	171		511	40.7 J	632	121.75 J	1,940	1,970
Cadmium	mg/kg dw	10.2	30.6		1.5	0.741 J	0.722	0.9635 J	2.44	2.45
Chromium	mg/kg dw	520	1,560		41.3	35.5 J	31.1	56.7 J	68.6 J	89.3 J
Copper	mg/kg dw	780	2,340		298	105 J	174	137 J	848	860
Lead	mg/kg dw	900	2,700		377 J	61.1 J	162 J	90.85 J	820	1,060
Mercury	mg/kg dw	0.82	2.46		0.136 J	0.255	0.118 J	0.213	0.129	0.069
Silver	mg/kg dw	12.2	36.6		0.669	0.385 J	0.389	0.4155	1.55	1.61
Zinc	mg/kg dw	820	2,460		1,580 J	278 J	799 J	448.5 J	3,960	5,590
Organotin Compounds										
Tributyltin ion	µg/kg dw	--	--		--	--	--	--	--	--
Phthalates										
Bis(2-ethylhexyl)phthalate	mg/kg dw	--	--		--	--	--	--	--	--
Bis(2-ethylhexyl)phthalate	mg/kg OC	94	282		--	--	--	--	--	--
Chlorobenzenes										
1,2,4-Trichlorobenzene	mg/kg dw	--	--		--	--	--	--	--	--
1,2,4-Trichlorobenzene	mg/kg OC	1.62	4.86		--	--	--	--	--	--
Other SVOCs and COCs										
Benzoic acid	µg/kg dw	1,300	3,900		--	--	--	--	--	--
Organic Carbon										
Total Organic Carbon	%	--	--		1.59	4.05	2.56	3.49	1.89	2.18

Notes:

Results for core LDW-SC17 are shown for reference purposes only. With the exception of PCBs, RALs are not defined below 4 inches in Category 2/3 recovery areas.

Nondetects reported as 1/2 detection limit.

Lab duplicates have been averaged.

>Cat 2/3 RAL and ≤UL for ENR (ENR)

>UL for ENR (Active Remediation)

dw = dry weight

LDW = Lower Duwamish Waterway

RAL = remedial action level

ROD = record of decision

TEQ = toxicity equivalence

Data Qualifiers: J = result is estimated, U = result is not detected

COC = contaminant of concern

ENR = enhanced natural recovery

OC = organic carbon

SVOC = semivolatile organic compound

-- = no data available

Table data courtesy of Integral Consulting, Inc.

Table 2. Saturated Zone Soil Data
Project No. 150054 - Snopac Property, Seattle, Washington

Analyte	Unit	Most Stringent PCUL (saturated)	B-5	B-5	B-5	B-8	B-9	B-12	B-12	B-13	B-13	B-13	B-15	B-15	B-19	FB-1	FB-1A	FB-2	FB-2	FB-2A	FB-2A	FB-2A	FB-2D
		Date	01/24/2017	01/24/2017	01/24/2017	01/24/2017	01/24/2017	01/25/2017	01/25/2017	01/25/2017	01/25/2017	01/25/2017	01/27/2017	01/27/2017	01/27/2017	08/25/2011	10/05/2011	08/25/2011	08/25/2011	10/06/2011	10/06/2011	10/06/2011	10/06/2011
		Sample	B5-10-10.2	B5-13-14	B5-16-17	B8-12-13	B9-16-17	B12-5-6	B12-6-7	B13-5.5-6.5	B13-10-11	B13-17.5-18.5	B15-11-12	B15-16-17	B19-12-13	082511-FB1-9.5	100511-FB1A-9.8	082511-FB2-5.2	082511-FB2-16.0	100611-FB2A-5.3	100611-FB2A-10.0	100611-FB2A-16.0	100611-FB2D-5.2
		Depth	10 - 10.2 ft	13 - 14 ft	16 - 17 ft	12 - 13 ft	16 - 17 ft	5 - 6 ft	10 - 11 ft	5.5 - 6.5 ft	10 - 11 ft	17.5 - 18.5 ft	11 - 12 ft	16 - 17 ft	12 - 13 ft	9.5 ft	9.8 ft	5.2 ft	16 ft	5.3 ft	10 ft	16 ft	5.2 ft
Metals																							
Arsenic	mg/kg	7	--	**6.39**	**3.4**	**5.34**	**6.33**	**21.8**	**12.4**	**1.38**	--	--	--	--	--	< 3.3 U	--	**6**	**8.9**	--	--	--	--
Barium	mg/kg	8.3	--	**17.4**	**16**	**14.9**	**12**	**67.5**	**76.2**	**19**	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	--	< 1 U	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U	< 1 U	--	--	--	--	--	< 0.56 U	--	< 0.47 U	< 0.93 U	--	--	--	--
Chromium	mg/kg	48	--	**12.5**	**11**	**12.6**	**12.1**	**17.5**	**8.57**	**11.3 J**	--	--	--	--	--	**7.3**	--	**9.3**	**13**	--	--	--	--
Copper	mg/kg	36	--	**23.3**	**14.8**	**21**	**15.5**	**35.3**	**334**	**102 J**	--	--	--	--	--	**8**	--	**270**	**29**	--	--	--	--
Lead	mg/kg	50	--	**4.88**	**1.72**	**3.15**	**2.6**	**30.2**	**400**	**3.37**	--	--	--	--	--	< 1.7 U	--	**50**	**3.7**	--	--	--	--
Mercury	mg/kg	0.07	--	< 1 U	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U	< 1 U	--	--	--	--	--	< 0.02 U	--	< 0.095 U	**0.03**	--	--	--	--
Nickel	mg/kg	48	--	**10.7**	**8.74**	**8.7**	**10.7**	**16.1**	**12.1**	**15 J**	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/kg	0.3	--	< 1 U	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U	< 1 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.016	--	< 1 U	< 1 U	< 2 U	< 1 U	< 1 U	< 1 U	< 1 U	--	--	--	--	--	< 1.1 U	--	< 0.93 U	< 1.9 U	--	--	--	--
Zinc	mg/kg	85	--	**24**	**20.7**	**24.3**	**26.9**	**153**	**183**	**55.1 J**	--	--	--	--	--	**23**	--	**120**	**38**	--	--	--	--
Organotin Compounds																							
Tributyltin Ion	mg/kg	0.12	**3.7**	--	--	--	--	--	< 0.0012 U	< 0.0012 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																							
1-Methylnaphthalene	mg/kg	29	< 0.5 U	--	--	--	--	--	--	--	< 0.05 U	< 0.05 U	--	--	--	< 0.0063 U	--	**0.94**	< 0.0098 U	--	--	--	--
2-Methylnaphthalene	mg/kg	0.67	< 0.5 U	--	--	--	--	--	--	--	< 0.05 U	< 0.05 U	--	--	--	< 0.0063 U	--	**1.1**	< 0.0098 U	--	--	--	--
Acenaphthene	mg/kg	0.028	**0.15**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.027**	< 0.0098 U	< 0.0324 U	< 0.0209 U	< 0.0193 U	--
Acenaphthylene	mg/kg	1.3	< 0.1 U	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.021**	< 0.0098 U	**0.0607**	< 0.0209 U	< 0.0193 U	--
Anthracene	mg/kg	0.051	**0.62**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.1**	< 0.0098 U	**0.199**	< 0.0209 U	< 0.0193 U	--
Benz(a)anthracene	mg/kg	0.000057	**2.4**	--	--	--	--	--	**0.84**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.14**	< 0.0098 U	**0.782**	< 0.0209 U	< 0.0193 U	--
Benzo(a)pyrene	mg/kg	0.000016	**3**	--	--	--	--	--	**0.59**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.12**	< 0.0098 U	**0.586**	< 0.0209 U	< 0.0193 U	--
Benzo(b)fluoranthene	mg/kg	0.0002	**3.5**	--	--	--	--	--	**0.73**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.3**	< 0.0098 U	**0.51**	**0.0337**	< 0.0193 U	--
Benzo(g,h,i)perylene	mg/kg	0.67	**1.6**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.1**	< 0.0098 U	**0.648**	< 0.0209 U	< 0.0193 U	--
Benzo(k)fluoranthene	mg/kg	0.002	**1.5**	--	--	--	--	--	**0.22**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.034**	< 0.0098 U	**0.386**	< 0.0209 U	< 0.0193 U	--
Chrysene	mg/kg	0.0064	**2.9**	--	--	--	--	--	**0.73**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**1.3**	< 0.0098 U	**0.73**	< 0.0209 U	< 0.0193 U	--
Dibenzo(a,h)anthracene	mg/kg	0.000029	**0.48**	--	--	--	--	--	< 0.1 U	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.026**	< 0.0098 U	**0.144**	< 0.0209 U	< 0.0193 U	--
Fluoranthene	mg/kg	0.09	**4.4**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.31**	< 0.0098 U	< 1.02 U	**0.035**	< 0.0193 U	--
Fluorene	mg/kg	0.029	**0.13**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.031**	< 0.0098 U	< 0.0647 U	< 0.0209 U	< 0.0193 U	--
Indeno(1,2,3-cd)pyrene	mg/kg	0.000056	**2**	--	--	--	--	--	**0.31**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.064**	< 0.0098 U	**0.383**	< 0.0209 U	< 0.0193 U	--
Naphthalene	mg/kg	0.0021	< 0.1 U	--	--	--	< 0.05 U	--	--	--	< 0.01 U	< 0.01 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.0063 U	< 0.0234 U	**0.85**	< 0.0098 U	**3.8**	< 0.0209 U	< 0.0193 U	--
Phenanthrene	mg/kg	1.5	**1.8**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.48**	< 0.0098 U	**0.847**	< 0.0209 U	< 0.0193 U	--
Pyrene	mg/kg	0.14	**4.1**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	< 0.0063 U	< 0.0234 U	**0.29**	< 0.0098 U	**1.14**	**0.06**	< 0.0193 U	--
Total Benzofluoranthenes	mg/kg	3.2	**5**	--	--	--	--	--	**0.95**	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	--	--	--	--	--	--	--	--
Total HPAHs	mg/kg	12	**25.88**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	--	--	--	--	--	--	--	--
Total LPAHs	mg/kg	5.2	**2.7**	--	--	--	--	--	--	--	< 0.01 U	< 0.01 U	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ	mg/kg	0.000016	**4.017**	--	--	--	--	--	**0.8123**	< 0.00755 U	< 0.00755 U	< 0.00755 U	--	--	--	< 0.005 U	< 0.018 U	**0.189**	< 0.007 U	**0.814**	**0.018**	< 0.015 U	--
Semi-Volatile Organic Compounds (SVOCs)																							
Carbazole	mg/kg		< 5 U	--	--	--	--	--	--	--	< 0.5 U	< 0.5 U	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	mg/kg	0.54	< 0.5 U	--	--	--	--	--	--	--	< 0.05 U	< 0.05 U	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	mg/kg	0.0000018	**2 J**	--	--	--	--	--	--	--	< 0.5 U	< 0.5 U	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																							
Aroclor 1254	mg/kg		**0.21**	--	--	--	--	--	< 0.2 U	< 0.2 U	--	--	--	--	--	< 0.012 U	< 0.0000577 U	< 0.011 U	< 0.019 U	< 0.0000399 U	--	< 0.000048 U	--
Aroclor 1260	mg/kg		**0.11**	--	--	--	--	--	< 0.2 U	< 0.2 U	--	--	--	--	--	< 0.012 U	< 0.0000577 U	< 0.011 U	< 0.019 U	< 0.0000399 U	--	< 0.000048 U	--
Total PCBs (Sum of Aroclors)	mg/kg	0.0000022	**0.32**	--	--	--	--	--	< 0.2 U	< 0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																							
Gasoline Range Organics	mg/kg	30	--	--	< 50 U	--	--	--	--	--	--	--	< 50 U	--	--	< 10 U	< 19.2 U	**420**	< 20 U	**143**	< 14.5 U	< 12.4 U	< 8.97 U
Diesel Range Organics	mg/kg	260	--	< 50 U	< 50 U	< 50 U	< 50 U	**310 X**	--	--	--	--	< 50 U	< 50 U	< 50 U	< 31 U	< 21.7 U	**200**	< 48 U	**320**	< 19.4 U	< 17.9 U	--
Motor Oil Range Organics	mg/kg	2000	--	< 250 U	< 250 U	< 250 U	< 250 U	**320**	--	--	--	--	< 250 U	< 250 U	< 250 U	< 63 U	**46.5**	**430**	< 96 U	**569**	< 38.8 U	< 35.7 U	--
Diesel + Oil Range Organics	mg/kg	2000	--	< 250 U	< 250 U	< 250 U	< 250 U	**630 X**	--	--	--	--	< 250 U	< 250 U	< 250 U	< 63 U	**46.5**	**630**	< 96 U	**889**	< 38.8 U	< 35.7 U	--
G+D+O Range Organics	mg/kg	1500*	--	--	--	--	--	--	--	--	--	--	--	--	--	< 63 U	**46.5**	**1050**	< 96 U	**1032**	< 38.8 U	< 35.7 U	--
Volatile Organic Compounds (VOCs)																							
Benzene	mg/kg	0.00056	< 0.03 U	--	--	--	< 0.03 U	--	--	--	--	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.051 U	< 0.0959 U	**4.7**	< 10 U	**1.56**	< 0.0725 U	< 0.0619 U	< 0.0448 U
Toluene	mg/kg	0.055	< 0.05 U	--	--	--	< 0.05 U	--	--	--	--	--	< 0.05 U	< 0.05 U	< 0.05 U	< 0.13 U	< 0.24 U	**2**	< 26 U	**0.918**	< 0.181 U	< 0.31 U	< 0.112 U
Ethylbenzene	mg/kg	0.015	< 0.05 U	--	--	--	< 0.05 U	--	--	--	--	--	< 0.05 U	< 0.05 U	< 0.05 U	< 0.13 U	< 0.24 U	**11**	< 26 U	**5.01**	< 0.181 U	< 0.31 U	< 0.112 U
Total Xylenes	mg/kg	16000	< 0.1 U	--	--	--	< 0.1 U	--	--	--	--	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.25 U	< 0.479 U	**16**	< 0.51 U	**8.65**	< 0.362 U	< 0.929 U	< 0.224 U

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL)

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 2. Saturated Zone Soil Data

Project No. 150054 - Snopac Property, Seattle, Washington

		Location	FB-2E	FB-3	FB-3A	FB-3A	FB-4	FB-4A	FB-5	FB-5	FB-5	FB-5A	FB-5A	FB-5B	FB-5C	FB-5C	FB-6	FB-6A	FB-7
		Date	10/06/2011	08/25/2011	10/06/2011	10/06/2011	08/25/2011	10/05/2011	08/25/2011	08/25/2011	08/25/2011	10/05/2011	10/05/2011	10/05/2011	10/05/2011	10/05/2011	08/26/2011	10/05/2011	08/26/2011
		Sample	100611-FB2E-5.2	082511-FB3-14.9	100611-FB3A-7.6	100611-FB3A-14.5	082511-FB4-8.7	100511-FB4A-9.7	082511-FB5-6.2	082511-FB5-10.2	082511-FB5-18.0	100511-FB5A-8.4	100511-FB5A-18.0	100511-FB5B-18.0	100511-FB5C-10.2	100511-FB5C-14.8	082611-FB6-11.6	100511-FB6A-11.5	082611-FB7-11.8
		Depth	5.2 ft	14.9 ft	7.6 ft	14.5 ft	8.7 ft	9.7 ft	6.2 ft	10.2 ft	18 ft	8.4 ft	18 ft	18 ft	10.2 ft	14.8 ft	11.6 ft	11.5 ft	11.8 ft
Analyte	**Unit**	**Most Stringent PCUL (saturated)**																	
Metals																			
Arsenic	mg/kg	7	--	**8.8**	--	--	< 3.5 U	--	**6.5**	**9.8**	**6.4**	--	--	--	--	--	**5.1**	--	**9.8**
Barium	mg/kg	8.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	--	< 0.82 U	--	--	< 0.59 U	--	**1.1**	**0.61**	< 0.68 U	--	--	--	--	--	< 0.66 U	--	< 0.71 U
Chromium	mg/kg	48	--	**15**	--	--	**7.7**	--	**21**	**20**	**13**	--	--	--	--	--	**15**	--	**19**
Copper	mg/kg	36	--	**32**	--	--	**11**	--	**180**	**75**	**21**	--	--	--	--	--	**21**	--	**26**
Lead	mg/kg	50	--	**3.8**	--	--	< 1.8 U	--	**73**	**19**	**4**	--	--	--	--	--	**50**	--	**3.7**
Mercury	mg/kg	0.07	--	**0.038**	--	--	< 0.018 U	--	**1.4**	**0.099**	**0.039**	--	--	--	--	--	**0.038**	--	< 0.046 U
Nickel	mg/kg	48	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/kg	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.016	--	< 1.6 U	--	--	< 1.2 U	--	< 1.3 U	< 0.99 U	< 1.4 U	--	--	--	--	--	< 1.3 U	--	< 1.4 U
Zinc	mg/kg	85	--	**37**	--	--	**21**	--	**200**	**120**	**39**	--	--	--	--	--	**30**	--	**39**
Organotin Compounds																			
Tributyltin Ion	mg/kg	0.12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																			
1-Methylnaphthalene	mg/kg	29	--	< 0.0089 U	--	--	< 0.006 U	--	--	--	< 0.008 U	--	--	--	--	--	< 0.0078 U	--	< 0.0075 U
2-Methylnaphthalene	mg/kg	0.67	--	< 0.0089 U	--	--	< 0.006 U	--	--	--	< 0.008 U	--	--	--	--	--	< 0.0078 U	--	< 0.0075 U
Acenaphthene	mg/kg	0.028	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	**0.0458**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Acenaphthylene	mg/kg	1.3	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	< 0.0188 U	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Anthracene	mg/kg	0.051	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	**0.105**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Benz(a)anthracene	mg/kg	0.000057	--	< 0.0089 U	**0.024**	< 0.0228 U	< 0.006 U	**0.0947**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Benzo(a)pyrene	mg/kg	0.000016	--	< 0.0089 U	**0.0196**	< 0.0228 U	< 0.006 U	**0.0473**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Benzo(b)fluoranthene	mg/kg	0.0002	--	< 0.0089 U	**0.0219**	< 0.0228 U	< 0.006 U	**0.0556**	--	--	< 0.008 U	--	**0.0194**	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Benzo(g,h,i)perylene	mg/kg	0.67	--	< 0.0089 U	**0.0174**	< 0.0228 U	< 0.006 U	**0.0234**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Benzo(k)fluoranthene	mg/kg	0.002	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	**0.0383**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Chrysene	mg/kg	0.0064	--	< 0.0089 U	**0.0336**	< 0.0228 U	< 0.006 U	**0.124**	--	--	< 0.008 U	--	**0.0352**	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Dibenzo(a,h)anthracene	mg/kg	0.000029	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	< 0.0188 U	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Fluoranthene	mg/kg	0.09	--	< 0.0089 U	**0.0641**	**0.0508**	< 0.006 U	**0.434**	--	--	< 0.008 U	--	**0.0271**	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Fluorene	mg/kg	0.029	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	< 0.0188 U	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.000056	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	**0.021**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Naphthalene	mg/kg	0.0021	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	< 0.0188 U	--	--	**9.11**	< 0.739 U	< 0.0164 U	< 0.743 U	**54.9**	**69.8**	< 0.0078 U	< 0.0231 U	< 0.0075 U
Phenanthrene	mg/kg	1.5	--	< 0.0089 U	< 0.0168 U	< 0.0228 U	< 0.006 U	**0.0499**	--	--	< 0.008 U	--	< 0.0164 U	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Pyrene	mg/kg	0.14	--	< 0.0089 U	**0.072**	**0.0478**	< 0.006 U	**0.411**	--	--	< 0.008 U	--	**0.0274**	--	--	--	< 0.0078 U	< 0.0231 U	< 0.0075 U
Total Benzofluoranthenes	mg/kg	3.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAHs	mg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total LPAHs	mg/kg	5.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ	mg/kg	0.000016	--	< 0.007 U	**0.027**	< 0.017 U	< 0.005 U	**0.07**	--	--	< 0.006 U	--	**0.014**	--	--	--	< 0.006 U	< 0.018 U	< 0.006 U
Semi-Volatile Organic Compounds (SVOCs)																			
Carbazole	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	mg/kg	0.54	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	mg/kg	0.0000018	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																			
Aroclor 1254	mg/kg		--	< 0.017 U	--	< 0.0000557 U	< 0.012 U	< 0.0000468 U	--	--	< 0.016 U	--	< 0.0000401 U	--	--	--	--	< 0.0000565 U	--
Aroclor 1260	mg/kg		--	< 0.017 U	--	< 0.0000557 U	< 0.012 U	< 0.0000468 U	--	--	< 0.016 U	--	< 0.0000401 U	--	--	--	--	< 0.0000565 U	--
Total PCBs (Sum of Aroclors)	mg/kg	0.0000022	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																			
Gasoline Range Organics	mg/kg	30	< 9.79 U	< 17 U	< 9.87 U	< 14.8 U	--	--	--	--	--	--	--	--	--	--	--	--	< 14 U
Diesel Range Organics	mg/kg	260	--	< 44 U	**15.7**	< 21.1 U	< 30 U	< 17.4 U	--	--	< 39 U	--	**55.5**	--	--	--	< 39 U	< 21.5 U	< 39 U
Motor Oil Range Organics	mg/kg	2000	--	**98**	**38.4**	**68.1**	< 60 U	< 34.9 U	--	--	< 77 U	--	**156**	--	--	--	< 79 U	**112**	< 78 U
Diesel + Oil Range Organics	mg/kg	2000	--	**98**	**54.1**	**68.1**	< 60 U	< 34.9 U	--	--	< 77 U	--	**211.5**	--	--	--	< 79 U	**112**	< 78 U
G+D+O Range Organics	mg/kg	1500*	--	**98**	**54.1**	**68.1**	--	--	--	--	--	--	--	--	--	--	--	--	< 78 U
Volatile Organic Compounds (VOCs)																			
Benzene	mg/kg	0.00056	< 0.0489 U	< 0.083 U	< 0.0493 U	< 0.0741 U	--	--	--	--	< 0.0306 U	< 0.0739 U	< 0.0457 U	< 0.0743 U	< 0.102 U	< 0.117 U	--	--	< 0.068 U
Toluene	mg/kg	0.055	< 0.122 U	< 0.21 U	< 0.123 U	< 0.185 U	--	--	--	--	< 0.153 U	< 0.369 U	< 0.229 U	< 0.371 U	< 0.509 U	< 0.584 U	--	--	< 0.17 U
Ethylbenzene	mg/kg	0.015	< 0.122 U	< 0.21 U	< 0.123 U	< 0.185 U	--	--	--	--	< 0.153 U	< 0.369 U	< 0.229 U	< 0.371 U	< 0.509 U	< 0.584 U	--	--	< 0.17 U
Total Xylenes	mg/kg	16000	< 0.245 U	< 0.42 U	< 0.247 U	< 0.371 U	--	--	--	--	< 0.59 U	< 1.11 U	< 0.686 U	< 1.11 U	< 1.529 U	< 1.754 U	--	--	< 0.34 U

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL)

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 2. Saturated Zone Soil Data

Project No. 150054 - Snopac Property, Seattle, Washington

Analyte	Unit	Location / Date / Sample / Depth / Most Stringent PCUL (saturated)	FB-7A 10/05/2011 100511-FB7A-11.8 11.8 ft	FB-8 08/26/2011 082611-FB8-11.6 11.6 ft	FB-8A 10/05/2011 100511-FB8A-11.7 11.7 ft	FB-9 08/26/2011 082611-FB9-12.0 12 ft	FB-9A 10/05/2011 100511-FB9A-11.8 11.8 ft	MW-1 01/23/2017 MW1-10-10.5 10 - 10.5 ft	MW-1 01/23/2017 MW1-15-16 15 - 16 ft	MW-2 01/23/2017 MW2-5-6 5 - 6 ft	MW-2 01/23/2017 MW2-10 10 ft	MW-2 01/23/2017 MW2-10-11 10 - 11 ft	MW-3 01/23/2017 MW3-5.5-6 5.5 - 6 ft	MW-3 01/23/2017 MW3-10-12 10 - 12 ft	MW-4 01/23/2017 MW4-7-8 7 - 8 ft	MW-4 01/23/2017 MW4-12.5-13.5 12.5 - 13.5 ft	MW-5 01/25/2017 MW5-10-10.5 10 - 10.5 ft	MW-5 01/25/2017 MW5-15.8-17 15.8 - 17 ft	MW-6 01/26/2017 MW6-7-8 7 - 8 ft	MW-6 01/26/2017 MW6-15-16 15 - 16 ft	MW-7 01/26/2017 MW7-10-11 10 - 11 ft	MW-7 01/26/2017 MW7-17-18 17 - 18 ft	MW-8 01/25/2017 MW8-15.5-16.5 15.5 - 16.5 ft	MW-9 01/25/2017 MW9-5-6 5 - 6 ft
Metals																									
Arsenic	mg/kg	7	--	**7.4**	--	**9**	--	**61.6**	**7.77**	**95.7**	**63.7**	**42.2**	**22.9**	**3.91**	**3.09**	**4.52**	**2.59**	**1.54**	< 5 U	**21.9**	< 5 U	< 5 U	**5.01**	**3.4**
Barium	mg/kg	8.3	--	--	--	--	--	**18.1**	**12.2**	**29.1**	**72.7**	**63**	**17.5**	**52.3**	**19.1**	**11.1**	**16.9**	**8.73**	**8.83**	**14.1**	**9.46**	**8.31**	**24.7**	**22.6**
Cadmium	mg/kg	0.8	--	< 0.84 U	--	< 0.7 U	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Chromium	mg/kg	48	--	**18**	--	**17**	--	**10.9**	**9.35**	**13.8**	**18.5**	**27.2**	**12.1**	**7.98**	**7.32**	**9.22**	**8.83**	**10.3**	**6.01**	**7.72**	**7.19**	**10**	**12.2**	**7.98**
Copper	mg/kg	36	--	**30**	--	**43**	--	**58.6**	**12**	**137**	**173**	**137**	**56.9**	**23.6**	**47.8**	**19.9**	**10.1**	**11.1**	**7.25**	**21.1**	**9.37**	**8.34**	**25.2**	**12.9**
Lead	mg/kg	50	--	**13**	--	**7.7**	--	**54.4**	**6.5**	**58.8**	**119**	**143**	**33.4**	**33.4**	**31.1**	**3.17**	**1.68**	**1.29**	< 1 U	**10.6**	**3.14**	< 1 U	**3.95**	**14.4**
Mercury	mg/kg	0.07	--	< 0.094 U	--	**0.06**	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Nickel	mg/kg	48	--	--	--	--	--	**11.4**	**6.43**	**13.9**	**52.1**	**49.8**	**16.7**	**6.48**	**7.69**	**7.8**	**8.74**	**6.04**	**4.63**	**5.55**	**4.88**	**5.13**	**9.86**	**5.89**
Selenium	mg/kg	0.3	--	--	--	--	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 5 U	< 5 U	< 5 U	< 5 U	< 1 U	< 1 U
Silver	mg/kg	0.016	--	< 1.7 U	--	< 1.4 U	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Zinc	mg/kg	85	--	**45**	--	**62**	--	**179**	**32.8**	**228**	**306**	**432**	**94.9**	**27.5**	**61.3**	**18.7**	**18.4**	**19.5**	**18**	**51.7**	**21.4**	**15.7**	**26.3**	**39.6**
Organotin Compounds																									
Tributyltin Ion	mg/kg	0.12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																									
1-Methylnaphthalene	mg/kg	29	--	< 0.0088 U	--	< 0.0078 U	--	--	--	--	< 0.5 U	--	**16**	--	--	--	--	--	--	--	--	--	--	< 0.05 U
2-Methylnaphthalene	mg/kg	0.67	--	< 0.0088 U	--	< 0.0078 U	--	--	--	--	< 0.5 U	--	**22**	--	--	--	--	--	--	--	--	--	--	**0.056**
Acenaphthene	mg/kg	0.028	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.11**	--	**89**	--	--	--	--	--	--	--	--	--	--	< 0.01 U
Acenaphthylene	mg/kg	1.3	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	< 0.1 U	--	**2.1**	--	--	--	--	--	--	--	--	--	--	< 0.01 U
Anthracene	mg/kg	0.051	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	< 0.1 U	--	**120**	--	--	--	--	--	--	--	--	--	--	< 0.01 U
Benz(a)anthracene	mg/kg	0.000057	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.79**	--	**73**	--	--	--	--	--	--	--	--	--	--	**0.013**
Benzo(a)pyrene	mg/kg	0.000016	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.55**	--	**40**	--	--	--	--	--	--	--	--	--	--	**0.013**
Benzo(b)fluoranthene	mg/kg	0.0002	< 0.0223 U	< 0.0088 U	**0.0318**	< 0.0078 U	< 0.022 U	--	--	--	**0.79**	--	**65**	--	--	--	--	--	--	--	--	--	--	**0.025**
Benzo(g,h,i)perylene	mg/kg	0.67	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.41**	--	**12**	--	--	--	--	--	--	--	--	--	--	**0.021**
Benzo(k)fluoranthene	mg/kg	0.002	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.22**	--	**19**	--	--	--	--	--	--	--	--	--	--	< 0.01 U
Chrysene	mg/kg	0.0064	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.38**	--	**110**	--	--	--	--	--	--	--	--	--	--	**0.02**
Dibenzo(a,h)anthracene	mg/kg	0.000029	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	< 0.1 U	--	**4.1**	--	--	--	--	--	--	--	--	--	--	< 0.01 U
Fluoranthene	mg/kg	0.09	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**3.6**	--	**290**	--	--	--	--	--	--	--	--	--	--	**0.026**
Fluorene	mg/kg	0.029	< 0.0223 U	< 0.0088 U	< 0.0293 U	**0.014**	< 0.022 U	--	--	--	**0.14**	--	**63**	--	--	--	--	--	--	--	--	--	--	< 0.01 U
Indeno(1,2,3-cd)pyrene	mg/kg	0.000056	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.28**	--	**13**	--	--	--	--	--	--	--	--	--	--	**0.016**
Naphthalene	mg/kg	0.0021	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.19**	--	**24**	--	--	< 0.05 U	--	--	--	--	--	--	--	**0.04**
Phenanthrene	mg/kg	1.5	< 0.0223 U	< 0.0088 U	< 0.0293 U	< 0.0078 U	< 0.022 U	--	--	--	**0.33**	--	**270**	--	--	--	--	--	--	--	--	--	--	**0.033**
Pyrene	mg/kg	0.14	< 0.0223 U	< 0.0088 U	< 0.0293 U	**0.011**	**0.0227**	--	--	--	**3.8**	--	**250**	--	--	--	--	--	--	--	--	--	--	**0.024**
Total Benzofluoranthenes	mg/kg	3.2	--	--	--	--	--	--	--	--	**1.01**	--	**84**	--	--	--	--	--	--	--	--	--	--	**0.025**
Total HPAHs	mg/kg	12	--	--	--	--	--	--	--	--	**10.82**	--	**876.1**	--	--	--	--	--	--	--	--	--	--	**0.158**
Total LPAHs	mg/kg	5.2	--	--	--	--	--	--	--	--	**0.77**	--	**568.1**	--	--	--	--	--	--	--	--	--	--	**0.073**
Total cPAHs TEQ	mg/kg	0.000016	< 0.017 U	< 0.007 U	**0.024**	< 0.006 U	< 0.017 U	--	--	--	**0.7668**	--	**58.51**	--	--	--	--	--	--	--	--	--	--	**0.0196**
Semi-Volatile Organic Compounds (SVOCs)																									
Carbazole	mg/kg		--	--	--	--	--	--	--	--	< 5 U	--	**15**	--	--	--	--	--	--	--	--	--	--	< 0.5 U
Dibenzofuran	mg/kg	0.54	--	--	--	--	--	--	--	--	< 0.5 U	--	**28**	--	--	--	--	--	--	--	--	--	--	< 0.05 U
Pentachlorophenol	mg/kg	0.0000018	--	--	--	--	--	--	--	--	< 5 U	--	< 5 U	--	--	--	--	--	--	--	--	--	--	< 0.5 U
Polychlorinated Biphenyls (PCBs)																									
Aroclor 1254	mg/kg		--	--	--	--	< 0.000054 U	--	--	--	< 0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	< 0.2 U
Aroclor 1260	mg/kg		--	--	--	--	< 0.000054 U	--	--	--	< 0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	< 0.2 U
Total PCBs (Sum of Aroclors)	mg/kg	0.0000022	--	--	--	--	--	--	--	--	< 0.2 U	--	--	--	--	--	--	--	--	--	--	--	--	< 0.2 U
Total Petroleum Hydrocarbons (TPH)																									
Gasoline Range Organics	mg/kg	30	< 18.1 U	< 9.9 U	< 25.4 U	< 14 U	< 15.6 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	mg/kg	260	< 20.8 U	< 43 U	< 27.3 U	< 40 U	**22.9**	< 50 U	< 50 U	< 50 U	**2100**	**500**	**750**	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U
Motor Oil Range Organics	mg/kg	2000	< 41.6 U	< 86 U	**116**	< 79 U	**124**	**510**	< 250 U	< 250 U	**6600**	**2000**	**700**	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U
Diesel + Oil Range Organics	mg/kg	2000	< 41.6 U	< 86 U	**116**	< 79 U	**146.9**	**510**	< 250 U	< 250 U	**8700**	**2500**	**1450**	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U
G+D+O Range Organics	mg/kg	1500*	< 41.6 U	< 86 U	**116**	< 79 U	**146.9**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																									
Benzene	mg/kg	0.00056	< 0.0907 U	< 0.05 U	< 0.127 U	--	< 0.0782 U	--	--	--	--	--	< 0.03 U	--	--	< 0.03 U	--	--	--	--	--	--	--	< 0.03 U
Toluene	mg/kg	0.055	< 0.227 U	< 0.12 U	< 0.318 U	--	< 0.391 U	--	--	--	--	--	< 0.05 U	--	--	< 0.05 U	--	--	--	--	--	--	--	< 0.05 U
Ethylbenzene	mg/kg	0.015	< 0.227 U	< 0.12 U	< 0.318 U	--	< 0.391 U	--	--	--	--	--	< 0.05 U	--	--	< 0.05 U	--	--	--	--	--	--	--	< 0.05 U
Total Xylenes	mg/kg	16000	< 0.454 U	< 0.25 U	< 0.636 U	--	< 1.173 U	--	--	--	--	--	< 0.1 U	--	--	< 0.1 U	--	--	--	--	--	--	--	< 0.1 U

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL)

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 2. Saturated Zone Soil Data

Project No. 150054 - Snopac Property, Seattle, Washington

		Location	MW-9	MW-10	MW-10	MW-11	MW-12	MW-12	SB-1	SB-2	SB-2	SB-3	SB-4	SB-4	SB-5	SB-6	SB-7	SB-8	SB-8	VSP-02	VSP-06	VSP-07	VSP-08	VSP-11
		Date	01/25/2017	01/25/2017	01/25/2017	01/26/2017	01/26/2017	01/26/2017	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	08/26/2019	11/12/2018	11/13/2018	11/12/2018	11/12/2018	11/12/2018
		Sample	MW9-15-16	MW10-5-6	MW10-15.5-16.5	MW11-10-11	MW12-11-12	MW12-17.5-18.5	SB1-10-11	SB2-10.5-11.5	SB2-13-14	SB3-10-11	SB4-8-9	SB4-13-14	SB5-9-10	SB6-10.5-11.5	SB7-10-11	SB8-10.5-11.5	SB8-13-14	VSP-2-5.1	VSP-6-6.2	VSP-7-8.2	VSP-8-5.6	VSP-11-5.6
		Depth	15 - 16 ft	5 - 6 ft	15.5 - 16.5 ft	10 - 11 ft	11 - 12 ft	17.5 - 18.5 ft	10 - 11 ft	10.5 - 11.5 ft	13 - 14 ft	10 - 11 ft	8 - 9 ft	13 - 14 ft	9 - 10 ft	10.5 - 11.5 ft	10 - 11 ft	10.5 - 11.5 ft	13 - 14 ft	5.1 ft	6.2 ft	8.2 ft	5.6 ft	5.6 ft
Analyte	Unit	Most Stringent PCUL (saturated)																						
Metals																								
Arsenic	mg/kg	7	**2.95**	**12.9**	**3.29**	**582 J**	**8**	< 5 U	**1.77**	**3.06**	--	**2.62**	**1.65**	--	**1.57**	**2.37**	**1.86**	**1.27**	--	**15.5**	**17.5**	**1.95**	**207**	**17.3**
Barium	mg/kg	8.3	**15.8**	**50.2**	**11.7**	**41.1 J**	**14.8**	**9.44**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	< 1 U	**1.69**	< 1 U	< 1 UJ	< 1 U	< 1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	48	**14.5**	**10**	**10.1**	**32.6**	**10.7**	**7.34**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	36	**18.6**	**28**	**14.6**	**457**	**24**	**5.08**	**5.89**	**10.2**	--	**8.95**	**5.64**	--	**5.7**	**8.14**	**7**	**5.71**	--	**51.8**	**52.2**	**124**	**154**	**33.1**
Lead	mg/kg	50	**2.71**	**49.4**	**2.4**	**524**	**2.84**	< 1 U	**1.01**	**1.68**	--	**1.4**	**1.11**	--	**1.07**	**1.24**	< 1 U	< 1 U	--	**221**	**69.7**	**4.88**	**179**	**52.5**
Mercury	mg/kg	0.07	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 0.01 U	**0.014**	--	**0.016**	**0.12**	**0.032**	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	--	--	--	--	--	--
Nickel	mg/kg	48	**8.57**	**8.35**	**6.1**	**16.3**	**8.39**	**5.73**	--	--	--	--	--	--	--	--	--	--	--	**17.1**	**7.46**	**15.7 J**	**10.9**	**5.98**
Selenium	mg/kg	0.3	< 1 U	< 1 U	< 1 U	< 5 UJ	< 5 U	< 5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.016	< 1 U	< 1 U	< 1 U	< 1 UJ	< 1 U	< 1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	85	**26.8**	**393**	**20.7**	**1680**	**17.5**	**12.7**	**13.4**	**17.4**	--	**16.3**	**15.2**	--	**16.9**	**16.5**	**13.3**	**13.4**	--	**221**	**77.6**	**49.6**	**626**	**97.6**
Organotin Compounds																								
Tributyltin Ion	mg/kg	0.12	--	--	--	**0.032**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																								
1-Methylnaphthalene	mg/kg	29	--	**0.07**	--	< 0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg	0.67	--	**0.076**	--	< 0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg	0.028	--	< 0.01 U	--	< 0.1 U	--	--	--	**0.0087 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.003 J**	< 0.002 UJ	--	--	--	--	--
Acenaphthylene	mg/kg	1.3	--	< 0.01 U	--	< 0.1 U	--	--	--	< 0.002 U	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Anthracene	mg/kg	0.051	--	**0.015**	--	< 0.1 U	--	--	--	**0.0033 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Benz(a)anthracene	mg/kg	0.000057	--	**0.042**	--	**0.18**	--	--	--	**0.0061 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Benzo(a)pyrene	mg/kg	0.000016	--	**0.053**	--	**0.25**	--	--	--	**0.0041 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg	0.0002	--	**0.087**	--	**0.35**	--	--	--	**0.0059 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg	0.67	--	**0.039**	--	**0.2**	--	--	--	**0.0025 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg	0.002	--	**0.032**	--	< 0.1 U	--	--	--	**0.0023 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Chrysene	mg/kg	0.0064	--	**0.069**	--	**0.29**	--	--	--	**0.009 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Dibenzo(a,h)anthracene	mg/kg	0.000029	--	< 0.01 U	--	< 0.1 U	--	--	--	< 0.002 U	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Fluoranthene	mg/kg	0.09	--	**0.13**	--	**0.34**	--	--	--	**0.034 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.0051 J**	< 0.002 UJ	--	--	--	--	--
Fluorene	mg/kg	0.029	--	**0.014**	--	< 0.1 U	--	--	--	< 0.002 UJ	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	0.000056	--	**0.039**	--	**0.18**	--	--	--	**0.0026 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Naphthalene	mg/kg	0.0021	--	**0.056**	--	< 0.1 U	--	--	--	< 0.002 U	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	--	--	--	--
Phenanthrene	mg/kg	1.5	--	**0.13**	--	**0.17**	--	--	--	< 0.002 UJ	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.0033 J**	< 0.002 UJ	--	--	--	--	--
Pyrene	mg/kg	0.14	--	**0.12**	--	**0.4**	--	--	--	**0.024 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.0038 J**	< 0.002 UJ	--	--	--	--	--
Total Benzofluoranthenes	mg/kg	3.2	--	**0.119**	--	**0.35**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HPAHs	mg/kg	12	--	**0.611**	--	**2.19**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total LPAHs	mg/kg	5.2	--	**0.215**	--	**0.17**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total cPAHs TEQ	mg/kg	0.000016	--	**0.07419**	--	**0.3339**	--	--	--	**0.00598 J**	< 0.00151 UJ	--	< 0.00151 U	--	--	--	--	< 0.00151 UJ	< 0.00151 UJ	--	--	--	--	--
Semi-Volatile Organic Compounds (SVOCs)																								
Carbazole	mg/kg		--	< 0.5 U	--	< 5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	mg/kg	0.54	--	< 0.05 U	--	< 0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	mg/kg	0.0000018	--	< 0.5 U	--	< 5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																								
Aroclor 1254	mg/kg		--	< 0.2 U	--	**0.16**	--	--	--	< 0.002 U	--	--	< 0.002 U	--	--	--	--	< 0.002 U	< 0.002 U	**0.044**	< 0.02 U	--	**0.24**	--
Aroclor 1260	mg/kg		--	< 0.2 U	--	**0.12**	--	--	--	< 0.002 U	--	--	< 0.002 U	--	--	--	--	< 0.002 U	< 0.002 U	**0.064**	< 0.02 U	--	< 0.02 U	--
Total PCBs (Sum of Aroclors)	mg/kg	0.0000022	--	< 0.2 U	--	**0.28**	--	--	--	< 0.002 U	--	--	< 0.002 U	--	--	--	--	< 0.002 U	< 0.002 U	**0.108**	< 0.02 U	--	**0.24**	--
Total Petroleum Hydrocarbons (TPH)																								
Gasoline Range Organics	mg/kg	30	--	--	--	--	--	--	--	< 5 U	--	--	< 5 U	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	mg/kg	260	< 50 U	< 50 U	< 50 U	**190 X**	< 50 U	< 50 U	--	< 50 U	--	--	< 50 U	--	--	--	--	--	--	--	--	--	--	--
Motor Oil Range Organics	mg/kg	2000	< 250 U	< 250 U	< 250 U	**1300**	< 250 U	< 250 U	--	< 250 U	--	--	< 250 U	--	--	--	--	--	--	--	--	--	--	--
Diesel + Oil Range Organics	mg/kg	2000	< 250 U	< 250 U	< 250 U	**1490 X**	< 250 U	< 250 U	--	< 250 U	--	--	< 250 U	--	--	--	--	--	--	--	--	--	--	--
G+D+O Range Organics	mg/kg	1500*	--	--	--	--	--	--	--	< 250 U	--	--	< 250 U	--	--	--	--	--	--	--	--	--	--	--
Volatile Organic Compounds (VOCs)																								
Benzene	mg/kg	0.00056	--	< 0.03 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	mg/kg	0.055	--	< 0.05 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	mg/kg	0.015	--	< 0.05 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Xylenes	mg/kg	16000	--	< 0.1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL)

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 3. Historical Shoreface Data

Project No. 150054. Snopac Property, Seattle, Washington

						Sample Location:	SL1-PIS-SD-01	SL1-PIS-SD-02	SL1-PIS-SD-03	SL1-PIS-SD-04	SL1-PIS-SD-05	SSA-5	SSA-6	SSA-7	SSA-8	SSA-9	SSA-10
						Sample ID:	SL1-PIS-SD-01	SL1-PIS-SD-02	SL1-PIS-SD-03	SL1-PIS-SD-04	SL1-PIS-SD-05	SSA-5	SSA-6	SSA-7	SSA-8	SSA-9	SSA-10
						Sample Date:	5/6/2015	5/6/2015	5/6/2015	5/6/2015	5/6/2015	7/2/2015	7/2/2015	7/2/2015	7/2/2015	7/2/2015	7/2/2015
						Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Soil/ Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Marine Sediment AETs[b]		Sediment Interval (ft):						0 - 0.25	0 - 0.25	0 - 0.25	0 - 0.25	0 - 0.25	0 - 0.25
Analyte	**Units**	**Human Health & Benthic COC RALs**	**Upper Limit for ENR**	**Lower AET**	**Upper AET**												
Polychlorinated Biphenyls (PCBs)																	
Aroclor 1016	mg/kg dw	--	--	--	--		--	--	--	--	--	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1221	mg/kg dw	--	--	--	--		--	--	--	--	--	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1232	mg/kg dw	--	--	--	--		--	--	--	--	--	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1242	mg/kg dw	--	--	--	--		--	--	--	--	--	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1248	mg/kg dw	--	--	--	--		--	--	--	--	--	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.01 U
Aroclor 1254	mg/kg dw	--	--	--	--		--	--	--	--	--	0.18	0.4	0.39	0.19	0.039	0.01 U
Aroclor 1260	mg/kg dw	--	--	--	--		--	--	--	--	--	0.093	0.02 U	0.01 U	0.1	0.027	0.071
Total PCB Aroclors	mg/kg dw	--	--	0.13[c]	1[c]		--	--	--	--	--	0.273	0.4	0.39	0.29	0.066	0.071
Total PCB Aroclors	mg/kg OC	12 (195 for top 2 ft)	36 (195 for top 2 ft)	--	--		--	--	--	--	--	53.6	69.2	167	110	11.5	21.6
Polynuclear Aromatic Hydrocarbons (PAHs)																	
1-Methylnaphthalene	mg/kg dw	--	--	--	--		--	--	--	--	--	0.11	0.1 U	0.02	0.15	0.005 U	0.005 U
2-Methylnaphthalene	mg/kg dw	--	--	0.67	0.67		--	--	--	--	--	0.087	0.1 U	0.02	0.13	0.005 U	0.005 U
Acenaphthene	mg/kg dw	--	--	0.5	0.5		--	--	--	--	--	0.24	0.1 U	0.027	0.36	0.005 U	0.005 U
Anthracene	mg/kg dw	--	--	0.96	0.96		--	--	--	--	--	0.58	0.1 U	0.077	0.89	0.016	0.015
Benz(a)anthracene	mg/kg dw	--	--	1.3	1.6		--	--	--	--	--	**1.7**	0.46	0.19	**2.1**	0.051	0.037
Benzo(a)pyrene	mg/kg dw	--	--	1.6	1.6		--	--	--	--	--	**1.95** J	0.31	0.27	**2.35** J	0.066	0.059
Benzo(b)fluoranthene	mg/kg dw	--	--	--	--		--	--	--	--	--	2.45 J	0.53	0.49	3 J	0.12	0.1
Benzo(k)fluoranthene	mg/kg dw	--	--	--	--		--	--	--	--	--	0.8 J	0.1 U	0.15	1.1 J	0.038	0.032
Chrysene	mg/kg dw	--	--	1.4	2.8		--	--	--	--	--	2.1	0.58	0.33	2.05	0.11	0.063
Dibenz(a,h)anthracene	mg/kg dw	--	--	0.23	0.23		--	--	--	--	--	**0.31** J	0.1 U	0.036	**0.25** J	0.012	0.005 U
Dibenzofuran	mg/kg dw	--	--	0.54[c]	0.54[c]		--	--	--	--	--	0.25 U	0.005 UJ	0.025 U	0.3	0.025 U	0.025 U
Fluoranthene	mg/kg dw	--	--	12	17		--	--	--	--	--	3.75	0.52	0.38	4.85	0.086	0.12
Fluorene	mg/kg dw	--	--	0.54	0.54		--	--	--	--	--	0.25	0.1 U	0.027	**0.54**	0.005 U	0.005 U
Indeno(1,2,3-cd)pyrene	mg/kg dw	--	--	0.6	0.69		--	--	--	--	--	**1.05** J	0.1 U	0.14	**1.55** J	0.048	0.044
Naphthalene	mg/kg dw	--	--	2.1	2.1		--	--	--	--	--	0.19	0.1 U	0.022	0.26	0.005 U	0.011
Pyrene	mg/kg dw	--	--	2.6	3.3		--	--	--	--	--	**3.75**	1.8	0.27	**4.2**	0.082	0.083
2-Methylnaphthalene	mg/kg OC	76	228	--	--		--	--	--	--	--	17.1	17.3 U	8.58	49.8	0.87 U	1.52 U
Acenaphthene	mg/kg OC	32	96	--	--		--	--	--	--	--	47.2	17.3 U	11.6	138	0.87 U	1.52 U
Acenaphthylene	mg/kg OC	--	--	--	--		--	--	--	--	--	9.82 U	17.3 U	9.01	61.3	0.87 U	1.52 U
Anthracene	mg/kg OC	440	1,320	--	--		--	--	--	--	--	114	17.3 U	33	341	2.78	4.57
Benz(a)anthracene	mg/kg OC	220	660	--	--		--	--	--	--	--	334	79.6	81.5	805	8.87	11.3
Benzo(a)pyrene	mg/kg OC	198	594	--	--		--	--	--	--	--	383 J	53.6	116	900 J	11.5	18
Benzo(g,h,i)perylene	mg/kg OC	62	186	--	--		--	--	--	--	--	206 J	36.3	64.4	536 J	9.39	14.9
Total benzofluoranthenes	mg/kg OC	460	1,380	--	--		--	--	--	--	--	697 J	91.7	275	1,570 J	27.5	40
Chrysene	mg/kg OC	220	660	--	--		--	--	--	--	--	413	100	142	785	19.1	19.2
Dibenz(a,h)anthracene	mg/kg OC	24	72	--	--		--	--	--	--	--	60.9 J	17.3 U	15.5	95.8 J	2.09	1.52 U
Dibenzofuran	mg/kg OC	30	90	--	--		--	--	--	--	--	49.1 U	0.865 UJ	10.7 U	115	4.35 U	7.62 U
Fluoranthene	mg/kg OC	320	960	--	--		--	--	--	--	--	737	90	163	1,860	15	36.6
Fluorene	mg/kg OC	46	138	--	--		--	--	--	--	--	49.1	17.3 U	11.6	207	0.87 U	1.52 U
Indeno(1,2,3-cd)pyrene	mg/kg OC	68	204	--	--		--	--	--	--	--	206 J	17.3 U	60.1	594 J	8.35	13.4
Naphthalene	mg/kg OC	198	594	--	--		--	--	--	--	--	37.3	17.3 U	9.44	99.6	0.87 U	3.35
Phenanthrene	mg/kg OC	200	600	--	--		--	--	--	--	--	521	17.3 U	85.8	1,670	8.35	19.2
Pyrene	mg/kg OC	2,000	6,000	--	--		--	--	--	--	--	737	311	116	1,610	14.3	25.3
Total HPAHs	mg/kg OC	1,920	5,760	--	--		--	--	--	--	--	3,770 J	763	1,030	8,750 J	116	180
Total LPAHs	mg/kg OC	740	2,220	--	--		--	--	--	--	--	768	17.3 U	161	2,510	11.1	27.1
cPAH	µg TEQ/kg dw	1,000	3,000	--	--		--	--	--	--	--	2,720 J	475	385	3,250 J	97.6	83

Table 3. Historical Shoreface Data

Project No. 150054. Snopac Property, Seattle, Washington

						Sample Location:	SL1-PIS-SD-01	SL1-PIS-SD-02	SL1-PIS-SD-03	SL1-PIS-SD-04	SL1-PIS-SD-05	SSA-5	SSA-6	SSA-7	SSA-8	SSA-9	SSA-10
						Sample ID:	SL1-PIS-SD-01	SL1-PIS-SD-02	SL1-PIS-SD-03	SL1-PIS-SD-04	SL1-PIS-SD-05	SSA-5	SSA-6	SSA-7	SSA-8	SSA-9	SSA-10
						Sample Date:	5/6/2015	5/6/2015	5/6/2015	5/6/2015	5/6/2015	7/2/2015	7/2/2015	7/2/2015	7/2/2015	7/2/2015	7/2/2015
						Matrix:	Sediment	Sediment	Sediment	Sediment	Sediment	Soil/ Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		LDW ROD Remedial Action Levels		Marine Sediment AETs[b]		Sediment Interval (ft):						0 - 0.25	0 - 0.25	0 - 0.25	0 - 0.25	0 - 0.25	0 - 0.25
Analyte	Units	Human Health & Benthic COC RALs	Upper Limit for ENR	Lower AET	Upper AET												
Metals																	
Arsenic	mg/kg dw	57	171	57	93		6,280	5,590	620	6,20	56	1,840 J	340	315	2,760 J	49.4	15.9
Cadmium	mg/kg dw	10.2	30.6	5.1	6.7		8	8	1.3	10	1.1	1.11 J	1.44	0.5 U	1.65 J	0.5	0.5 U
Chromium	mg/kg dw	520	1,560	260	270		176	221	43	190	39.1	69.7 J	20.4	24.9	104 J	6.93	6.61
Copper	mg/kg dw	780	2,340	390	390		3,790	2,200	361	2,760	112	1,330 J	164	165	1,330 J	53.1	21.1
Lead	mg/kg dw	900	2,700	450	530		3,650	2,870	433	3,640	95	1,890	237	305	2,400	35.5	34.7
Mercury	mg/kg dw	0.82	2.46	0.41	0.59		0.15	0.05	0.13	3.18	0.13	0.98	0.025 U	**0.66**	0.067	0.038	0.0125 U
Silver	mg/kg dw	12.2	36.6	6.1	6.1		6	4	0.9 U	5	0.5 U	--	--	--	--	--	--
Zinc	mg/kg dw	820	2,460	410	960		15600	14400	1580	16,800	309	5,860 J	1,110	738	8,300 J	162	168
Organotin Compounds																	
Tributyltin ion	µg/kg dw	--	--	--	--		--	--	--	--	--	--	--	--	280	--	--
Phthalates																	
Bis(2-ethylhexyl)phthalate	mg/kg dw	--	--	1.3	1.9		--	--	--	--	--	4 U	0.3 J	0.4 U	0.4 U	0.4 U	0.4 U
Bis(2-ethylhexyl)phthalate	mg/kg OC	94	282	--	--		--	--	--	--	--	786 U	51.9 J	172 U	153 U	69.6 U	122 U
Chlorobenzenes																	
1,2,4-Trichlorobenzene	mg/kg dw	--	--	0.031	0.051		--	--	--	--	--	**0.25** U	0.005 U	**0.25** U	**0.25** U	0.25 U	0.025 U
1,2,4-Trichlorobenzene	mg/kg OC	1.62	4.86	--	--		--	--	--	--	--	49 U	0.865 U	10.7 U	9.58 U	4.35 U	7.62 U
Other SVOCs and COCs																	
Benzoic acid	µg/kg dw	1,300	3,900	650	650		--	--	--	--	--	12,500 U	250 U	**1,250** U	**1,250** U	1,250 U	**1,250** U
Organic Carbon																	
Total Organic Carbon	%	--	--	--	--		--	--	--	--	--	0.509	0.578	0.233	0.261	0.575	0.328

Notes:

Nondetects reported as 1/2 detection limit.

Lab duplicates have been averaged.

[a]The lowest potential action levels are shown. These were established in accordance with the ARARs, cleanup and remedial action levels established in Tables 19, 20, and 26 of the LDW ROD.

[b]Note from DOE Sediment Cleanup Users Manual Table 8-1, December 2019: TOC normalized values and dry weight normalized AETs should be considered when TOC is outside the recommended range of 0.5-3.5% for organic carbon normalization.

[c]Total PCB Aroclors were not provided in SCUM Table 8-1. These values are from LDW PCUL workbook, July 2019.

>Cat 2/3 RAL and ≤UL for ENR (ENR)

>UL for ENR (Active Remediation)

>Lower AET

>Upper AET

COC = contaminant of concern
ENR = enhanced natural recovery
OC = organic carbon
SVOC = semivolatile organic compound
-- = no data available
Data Qualifiers: J = result is estimated, U = result is not detected
Table data courtesy of Integral Consulting, Inc.

dw = dry weight
LDW = Lower Duwamish Waterway
RAL = remedial action level
ROD = record of decision
TEQ = toxicity equivalence

Table 4. Vadose Zone Soil Data

Project No. 150054 - Snopac Property, Seattle, Washington

		Location	B-4	B-6	B-9	FB-2B	FB-2F	FB-6	HA-1	HA-1	MW-3	MW-6	MW-8	SB-1	SB-2	SB-3	SB-4
		Date	01/24/2017	01/24/2017	01/24/2017	10/06/2011	10/06/2011	08/26/2011	04/26/2019	04/26/2019	01/23/2017	01/26/2017	01/25/2017	08/26/2019	08/26/2019	08/26/2019	08/26/2019
		Sample	B4-SBG-0	B6-0.8-1.1	B9-0-1.5	100611-FB2B-4.7	100611-FB2F-2.2	082611-FB6-1.1	HA-1-0.5	HA-1-1.5	MW3-1-2	MW6-SBG-5.2-5.4	MW8-5-6	SB1-6-7	SB2-2-3	SB3-5-6	SB4-2-3
		Depth	0 ft	0.8 - 1.1 ft	0 - 1.5 ft	4.7 ft	2.2 ft	1.1 ft	0.5 ft	1.5 ft	1 - 2 ft	5.2 - 5.4 ft	5 - 6 ft	6 - 7 ft	2 - 3 ft	5 - 6 ft	2 - 3 ft
Analyte	**Unit**	**Most Stringent PCUL (vadose)**															
Metals																	
Arsenic	mg/kg	7	--	--	**309 J**	--	--	**7.5**	--	--	**73**	--	**1.54**	**1.42**	**1.21**	**1.38**	**2.49**
Barium	mg/kg	100	--	--	**52.4 J**	--	--	--	--	--	**25.2**	--	**11.4**	--	--	--	--
Cadmium	mg/kg	0.8	--	--	< 1 UJ	--	--	**1.9**	--	--	< 1 U	--	< 1 U	--	--	--	--
Chromium	mg/kg	48	--	--	**29**	--	--	**25**	--	--	**30.2**	--	**5.66**	--	--	--	--
Copper	mg/kg	36	--	--	**216**	--	--	**97**	--	--	**91.9**	--	**5.97**	**6.16**	**6.25**	< 5 U	**6.51**
Lead	mg/kg	50	--	--	**333**	--	--	**99**	--	--	**64.3**	--	< 1 U	**1.12**	< 1 U	< 1 U	**1.3**
Mercury	mg/kg	0.07	--	--	< 1 U	--	--	**0.15**	--	--	< 1 U	--	< 1 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U
Nickel	mg/kg	48	--	--	**27.2**	--	--	--	--	--	**23.4**	--	**3.1**	--	--	--	--
Selenium	mg/kg	0.3	--	--	< 1 UJ	--	--	--	--	--	< 1 U	--	< 1 U	--	--	--	--
Silver	mg/kg	0.32	--	--	< 1 UJ	--	--	< 1.3 U	--	--	< 1 U	--	< 1 U	--	--	--	--
Zinc	mg/kg	86	--	--	**842**	--	--	**320**	--	--	**189**	--	**11.4**	**14**	**12.7**	**12.3**	**13.4**
Organotin Compounds																	
Tributyltin Ion	mg/kg	0.12	**3.9**	**2.2**	**0.59**	--	--	--	--	--	--	**5.6**	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																	
1-Methylnaphthalene	mg/kg	29	< 0.5 U	< 0.5 U	--	--	--	--	--	--	< 0.5 U	< 2.5 U	< 0.05 U	--	--	--	--
2-Methylnaphthalene	mg/kg	0.67	< 0.5 U	< 0.5 U	--	--	--	--	--	--	< 0.5 U	< 2.5 U	< 0.05 U	--	--	--	--
Acenaphthene	mg/kg	0.5	**0.16**	**0.11**	--	--	--	--	--	--	**0.39**	< 0.5 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Acenaphthylene	mg/kg	1.3	< 0.1 U	< 0.1 U	--	--	--	--	--	--	**0.15**	< 0.5 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Anthracene	mg/kg	0.96	**0.53**	**0.21**	--	--	--	--	--	--	**1.2**	< 0.5 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Benz(a)anthracene	mg/kg	0.0011	**2**	**0.87**	**0.43**	--	--	--	--	--	**3**	**2.4**	< 0.01 U	< 0.002 U	**0.0023 J**	--	--
Benzo(a)pyrene	mg/kg	0.00031	**2.3**	**0.93**	**0.5**	--	--	--	--	--	**4.2**	**2.8**	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Benzo(b)fluoranthene	mg/kg	0.0039	**3**	**1.2**	**0.74**	--	--	--	--	--	**7.3**	**3.4**	< 0.01 U	< 0.002 U	**0.0044 J**	--	--
Benzo(g,h,i)perylene	mg/kg	0.67	**1.2**	**0.51**	--	--	--	--	--	--	**2.2**	**1.6**	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Benzo(k)fluoranthene	mg/kg	0.039	**1.2**	**0.42**	**0.21**	--	--	--	--	--	**2.5**	**1.4**	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Chrysene	mg/kg	0.13	**2.3**	**1.2**	**0.53**	--	--	--	--	--	**12**	**2.9**	< 0.01 U	< 0.002 U	**0.0053 J**	--	--
Dibenzo(a,h)anthracene	mg/kg	0.00057	**0.35**	**0.15**	< 0.2 U	--	--	--	--	--	**0.59**	< 0.5 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Fluoranthene	mg/kg	1.7	**4.2**	**1.7**	--	--	--	--	--	--	**4.5**	**4.2**	< 0.01 U	< 0.002 U	**0.003 J**	--	--
Fluorene	mg/kg	0.54	**0.17**	< 0.1 U	--	--	--	--	--	--	**0.35**	< 0.5 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	0.011	**1.4**	**0.57**	**0.3**	--	--	--	--	--	**2**	**2**	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Naphthalene	mg/kg	0.039	< 0.1 U	< 0.1 U	--	--	--	--	--	--	< 0.1 U	< 0.5 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Phenanthrene	mg/kg	1.5	**2.2**	**1.1**	--	--	--	--	--	--	**1.5**	**1.7**	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Pyrene	mg/kg	2.6	**3.8**	**2**	--	--	--	--	--	--	**6.2**	**4.5**	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--
Total Benzofluoranthenes	mg/kg	3.2	**4.2**	**1.62**	**0.95**	--	--	--	--	--	**9.8**	**4.8**	< 0.01 U	--	--	--	--
Total HPAHs	mg/kg	12	**21.75**	**9.55**	--	--	--	--	--	--	**44.49**	**25.2**	< 0.01 U	--	--	--	--
Total LPAHs	mg/kg	5.2	**3.06**	**1.42**	--	--	--	--	--	--	**3.59**	**1.7**	< 0.01 U	--	--	--	--
Total cPAHs TEQ	mg/kg	0.00031	**3.118**	**1.263**	**0.6833**	--	--	--	--	--	**5.859**	**3.774**	< 0.00755 U	< 0.00151 U	**0.002023 J**	--	--
Semi-Volatile Organic Compounds (SVOCs)																	
Carbazole	mg/kg		< 5 U	< 5 U	--	--	--	--	--	--	< 5 U	< 25 U	< 0.5 U	--	--	--	--
Dibenzofuran	mg/kg	0.54	< 0.5 U	< 0.5 U	--	--	--	--	--	--	< 0.5 U	< 2.5 U	< 0.05 U	--	--	--	--
Pentachlorophenol	mg/kg	0.000032	**2.1 J**	**2.6 J**	--	--	--	--	--	--	< 5 U	**7.6 J**	< 0.5 U	--	--	--	--
Polychlorinated Biphenyls (PCBs)																	
Aroclor 1254	mg/kg		**0.43**	**0.31**	**0.2**	--	--	--	< 0.02 U	< 0.02 U	--	**0.24**	< 0.2 U	< 0.002 U	--	--	--
Aroclor 1260	mg/kg		< 0.2 U	**0.15**	< 0.2 U	--	--	--	< 0.02 U	< 0.02 U	--	< 0.1 U	< 0.2 U	< 0.002 U	--	--	--
Total PCBs (Sum of Aroclors)	mg/kg	0.000043	**0.43**	**0.46**	**0.2**	--	--	--	< 0.02 U	< 0.02 U	--	**0.24**	< 0.2 U	< 0.002 U	--	--	--
Total Petroleum Hydrocarbons (TPH)																	
Gasoline Range Organics	mg/kg	30	--	--	--	**184**	< 11.7 U	--	--	--	--	--	--	< 5 U	--	--	--
Diesel Range Organics	mg/kg	260	--	--	**68 X**	--	--	--	--	--	**69 X**	--	< 50 U	< 50 U	--	--	--
Motor Oil Range Organics	mg/kg	2000	--	--	**760**	--	--	--	--	--	**410**	--	< 250 U	< 250 U	--	--	--
Diesel + Oil Range Organics	mg/kg	2000	--	--	**828 X**	--	--	--	--	--	**479 X**	--	< 250 U	< 250 U	--	--	--
G+D+O Range Organics	mg/kg	1500*	--	--	--	--	--	--	--	--	--	--	--	< 250 U	--	--	--
Volatile Organic Compounds (VOCs)																	
Benzene	mg/kg	0.0088	< 0.03 U	< 0.03 U	--	**0.768**	< 0.0585 U	--	--	--	< 0.03 U	< 0.03 U	< 0.03 U	--	--	--	--
Toluene	mg/kg	0.92	< 0.05 U	< 0.05 U	--	**1.32**	< 0.146 U	--	--	--	< 0.05 U	< 0.05 U	< 0.05 U	--	--	--	--
Ethylbenzene	mg/kg	0.26	< 0.05 U	< 0.05 U	--	**3.57**	< 0.146 U	--	--	--	< 0.05 U	< 0.05 U	< 0.05 U	--	--	--	--
Total Xylenes	mg/kg	16000	< 0.1 U	< 0.1 U	--	**9.36**	< 0.292 U	--	--	--	< 0.1 U	< 0.1 U	< 0.1 U	--	--	--	--

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL).

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation.

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 4. Vadose Zone Soil Data

Project No. 150054 - Snopac Property, Seattle, Washington

		Location	SB-5	SB-6	SB-7	SB-8	SSA-1	SSA-2	SSA-3	SSA-4	SUMP	VSP-01	VSP-03	VSP-04	VSP-05	VSP-09
		Date	08/26/2019	08/26/2019	08/26/2019	08/26/2019	07/02/2015	07/02/2015	07/02/2015	07/02/2015	08/26/2019	11/12/2018	11/12/2018	11/12/2018	11/12/2018	11/12/2018
		Sample	SB5-2-3	SB6-5-6	SB7-2-3	SB8-5.5-6.5	SSA-1	SSA-2	SSA-3	SSA-4	SUMP-6-7	VSP-1-2.2	VSP-3-3.6	VSP-4-4.5	VSP-5-2.6	VSP-9-3.2
		Depth	2 - 3 ft	5 - 6 ft	2 - 3 ft	5.5 - 6.5 ft	0 - 0.25 ft	0 - 0.25 ft	0 - 0.25 ft	0 - 0.25 ft	6 - 7 ft	2.2 ft	3.6 ft	4.5 ft	2.6 ft	3.2 ft
Analyte	**Unit**	**Most Stringent PCUL (vadose)**														
Metals																
Arsenic	mg/kg	7	**1.56**	**1.56**	**1.54**	**1.64**	**12.1**	**27.3**	**4890**	**70.1**	**1.3**	**816**	**2.54**	**337**	**15.4**	**57**
Barium	mg/kg	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	--	--	--	--	< 1 U	< 1 U	**1.15 J**	< 1 U	--	--	--	--	--	--
Chromium	mg/kg	48	--	--	--	--	**7.04**	**20.1**	**126**	**9.56**	--	--	--	--	--	--
Copper	mg/kg	36	**5.23**	**5.61**	**5.52**	**16.2**	**49.1**	**65.9**	**3430**	**55.3**	**6.02**	**603**	**85.3**	**214**	**51.1**	**72.2**
Lead	mg/kg	50	< 1 U	**1.03**	< 1 U	**2.29**	**66.6**	**54.7**	**1720**	**61.7**	< 1 U	**605**	**5.08**	**268**	**99.9**	**154**
Mercury	mg/kg	0.07	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	**0.052**	**0.082**	**0.28**	**0.25**	< 0.01 U	--	--	--	--	--
Nickel	mg/kg	48	--	--	--	--	--	--	--	--	--	< 50 U	**13 J**	< 25 U	**17.6**	**16.3**
Selenium	mg/kg	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.32	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	86	**13.5**	**12.8**	**12.7**	**20**	**76.4**	**150**	**12900**	**196**	**12.7**	**2250**	**38.2**	**923**	**151**	**284**
Organotin Compounds																
Tributyltin Ion	mg/kg	0.12	--	--	--	--	--	--	**4.3**	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)																
1-Methylnaphthalene	mg/kg	29	--	--	--	--	**0.075**	**0.043**	**0.028**	**0.03**	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg	0.67	--	--	--	--	**0.097**	**0.053**	**0.023**	**0.036**	--	--	--	--	--	--
Acenaphthene	mg/kg	0.5	--	< 0.002 U	--	< 0.002 U	**0.022**	**0.045**	**0.069**	**0.038**	< 0.002 U	--	--	--	--	--
Acenaphthylene	mg/kg	1.3	--	< 0.002 U	--	< 0.002 U	**0.027**	**0.042**	**0.019**	**0.018**	< 0.002 U	--	--	--	--	--
Anthracene	mg/kg	0.96	--	< 0.002 U	--	< 0.002 U	**0.16**	**0.2**	**0.14**	**0.078**	< 0.002 U	--	--	--	--	--
Benz(a)anthracene	mg/kg	0.0011	--	< 0.002 U	--	**0.013**	**0.78**	**0.6**	**0.59**	**0.27**	< 0.002 U	--	--	--	--	--
Benzo(a)pyrene	mg/kg	0.00031	--	< 0.002 U	--	**0.011**	**0.64**	**1.2**	**0.79 J**	**0.38**	< 0.002 UJ	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg	0.0039	--	< 0.002 U	--	**0.029**	**1.1**	**1.6**	**1.0 J**	**0.71**	< 0.002 UJ	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg	0.67	--	< 0.002 U	--	**0.0087**	**0.26**	**1.4**	**0.44 J**	**0.25**	< 0.002 UJ	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg	0.039	--	< 0.002 U	--	**0.0089**	**0.43**	**0.59**	**0.35 J**	**0.24**	< 0.002 UJ	--	--	--	--	--
Chrysene	mg/kg	0.13	--	< 0.002 U	--	**0.026**	**0.82**	**1.5**	**0.73**	**0.53**	**0.0059**	--	--	--	--	--
Dibenzo(a,h)anthracene	mg/kg	0.00057	--	< 0.002 U	--	**0.0024**	**0.085**	**0.26**	**0.12 J**	**0.067**	< 0.002 UJ	--	--	--	--	--
Fluoranthene	mg/kg	1.7	--	< 0.002 U	--	**0.05**	**0.65**	**0.83**	**0.99**	**0.53**	< 0.002 U	--	--	--	--	--
Fluorene	mg/kg	0.54	--	< 0.002 U	--	< 0.002 U	**0.046**	**0.058**	**0.054**	**0.034**	< 0.002 U	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	0.011	--	< 0.002 U	--	**0.011**	**0.3**	**1.1**	**0.50 J**	**0.25**	< 0.002 UJ	--	--	--	--	--
Naphthalene	mg/kg	0.039	--	< 0.002 U	--	< 0.002 U	**0.079**	**0.071**	**0.032**	**0.044**	< 0.002 U	--	--	--	--	--
Phenanthrene	mg/kg	1.5	--	< 0.002 U	--	**0.014**	**0.32**	**0.62**	**0.64**	**0.36**	< 0.002 U	--	--	--	--	--
Pyrene	mg/kg	2.6	--	< 0.002 U	--	**0.038**	**0.46**	**0.76**	**1.1**	**0.49**	< 0.002 U	--	--	--	--	--
Total Benzofluoranthenes	mg/kg	3.2	--	--	--	--	**1.53**	**2.19**	**1.35 J**	**0.95**	--	--	--	--	--	--
Total HPAHs	mg/kg	12	--	--	--	--	**5.525**	**9.84**	**6.61 J**	**3.717**	--	--	--	--	--	--
Total LPAHs	mg/kg	5.2	--	--	--	--	**0.654**	**1.036**	**0.954**	**0.572**	--	--	--	--	--	--
Total cPAHs TEQ	mg/kg	0.00031	--	< 0.00151 U	--	**0.01769**	**0.9177**	**1.63**	**1.0533 J**	**0.539**	**0.001559**	--	--	--	--	--
Semi-Volatile Organic Compounds (SVOCs)																
Carbazole	mg/kg		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzofuran	mg/kg	0.54	--	--	--	--	< 0.05 U	**0.051**	< 0.05 U	< 0.05 U	--	--	--	--	--	--
Pentachlorophenol	mg/kg	0.000032	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																
Aroclor 1254	mg/kg		--	< 0.002 U	--	**0.0033**	< 0.02 U	< 0.02 U	**0.6**	< 0.02 U	< 0.002 U	--	--	--	--	--
Aroclor 1260	mg/kg		--	< 0.002 U	--	**0.0033**	**0.041**	**0.051**	< 0.02 U	< 0.02 U	< 0.002 U	--	--	--	--	--
Total PCBs (Sum of Aroclors)	mg/kg	0.000043	--	< 0.002 U	--	**0.0066**	**0.041**	**0.051**	**0.6**	< 0.02 U	< 0.002 U	--	--	--	--	--
Total Petroleum Hydrocarbons (TPH)																
Gasoline Range Organics	mg/kg	30	--	< 5 U	--	< 5 U	--	--	--	--	< 5 U	--	--	--	--	--
Diesel Range Organics	mg/kg	260	--	< 50 U	--	< 50 U	--	--	--	--	**310 X**	--	--	--	--	--
Motor Oil Range Organics	mg/kg	2000	--	< 250 U	--	< 250 U	--	--	--	--	**1300**	--	--	--	--	--
Diesel + Oil Range Organics	mg/kg	2000	--	< 250 U	--	< 250 U	--	--	--	--	**1610 X**	--	--	--	--	--
G+D+O Range Organics	mg/kg	1500*	--	< 250 U	--	< 250 U	--	--	--	--	**1610**	--	--	--	--	--
Volatile Organic Compounds (VOCs)																
Benzene	mg/kg	0.0088	--	--	--	--	--	--	--	--	< 0.03 U	--	--	--	--	--
Toluene	mg/kg	0.92	--	--	--	--	--	--	--	--	< 0.05 U	--	--	--	--	--
Ethylbenzene	mg/kg	0.26	--	--	--	--	--	--	--	--	< 0.05 U	--	--	--	--	--
Total Xylenes	mg/kg	16000	--	--	--	--	--	--	--	--	< 0.1 U	--	--	--	--	--

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL).

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation.

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 4. Vadose Zone Soil Data

Project No. 150054 - Snopac Property, Seattle, Washington

		Location	VSP-10	VSP-12	VSP-13	VSP-14	VSP-15
		Date	11/13/2018	11/12/2018	11/13/2018	11/12/2018	11/12/2018
		Sample	VSP-10-4.6	VSP-12-3.3	VSP-13-2.2	VSP-14-4.1	VSP-15-4.8
		Depth	4.6 ft	3.3 ft	2.2 ft	4.1 ft	4.8 ft
Analyte	**Unit**	**Most Stringent PCUL (vadose)**					
Metals							
Arsenic	mg/kg	7	**135**	**3880**	**1340**	**95.4**	**3.3**
Barium	mg/kg	100	--	--	--	--	--
Cadmium	mg/kg	0.8	--	--	--	--	--
Chromium	mg/kg	48	--	--	--	--	--
Copper	mg/kg	36	**87.7**	**2540**	**803**	**107**	**21.7**
Lead	mg/kg	50	**124**	**2780**	**1130**	**157**	**22.9**
Mercury	mg/kg	0.07	--	--	--	--	--
Nickel	mg/kg	48	**21**	< 125 U	< 50 U	**19.7**	**5.44**
Selenium	mg/kg	0.3	--	--	--	--	--
Silver	mg/kg	0.32	--	--	--	--	--
Zinc	mg/kg	86	**401**	**9700**	**3630**	**393**	**21.7**
Organotin Compounds							
Tributyltin Ion	mg/kg	0.12	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (PAHs)							
1-Methylnaphthalene	mg/kg	29	--	--	--	--	--
2-Methylnaphthalene	mg/kg	0.67	--	--	--	--	--
Acenaphthene	mg/kg	0.5	--	--	--	--	--
Acenaphthylene	mg/kg	1.3	--	--	--	--	--
Anthracene	mg/kg	0.96	--	--	--	--	--
Benz(a)anthracene	mg/kg	0.0011	--	--	--	--	--
Benzo(a)pyrene	mg/kg	0.00031	--	--	--	--	--
Benzo(b)fluoranthene	mg/kg	0.0039	--	--	--	--	--
Benzo(g,h,i)perylene	mg/kg	0.67	--	--	--	--	--
Benzo(k)fluoranthene	mg/kg	0.039	--	--	--	--	--
Chrysene	mg/kg	0.13	--	--	--	--	--
Dibenzo(a,h)anthracene	mg/kg	0.00057	--	--	--	--	--
Fluoranthene	mg/kg	1.7	--	--	--	--	--
Fluorene	mg/kg	0.54	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	0.011	--	--	--	--	--
Naphthalene	mg/kg	0.039	--	--	--	--	--
Phenanthrene	mg/kg	1.5	--	--	--	--	--
Pyrene	mg/kg	2.6	--	--	--	--	--
Total Benzofluoranthenes	mg/kg	3.2	--	--	--	--	--
Total HPAHs	mg/kg	12	--	--	--	--	--
Total LPAHs	mg/kg	5.2	--	--	--	--	--
Total cPAHs TEQ	mg/kg	0.00031	--	--	--	--	--
Semi-Volatile Organic Compounds (SVOCs)							
Carbazole	mg/kg		--	--	--	--	--
Dibenzofuran	mg/kg	0.54	--	--	--	--	--
Pentachlorophenol	mg/kg	0.000032	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)							
Aroclor 1254	mg/kg		--	--	--	**0.37**	--
Aroclor 1260	mg/kg		--	--	--	< 0.02 U	--
Total PCBs (Sum of Aroclors)	mg/kg	0.000043	--	--	--	**0.37**	--
Total Petroleum Hydrocarbons (TPH)							
Gasoline Range Organics	mg/kg	30	--	--	--	--	--
Diesel Range Organics	mg/kg	260	--	--	--	--	--
Motor Oil Range Organics	mg/kg	2000	--	--	--	--	--
Diesel + Oil Range Organics	mg/kg	2000	--	--	--	--	--
G+D+O Range Organics	mg/kg	1500*	--	--	--	--	--
Volatile Organic Compounds (VOCs)							
Benzene	mg/kg	0.0088	--	--	--	--	--
Toluene	mg/kg	0.92	--	--	--	--	--
Ethylbenzene	mg/kg	0.26	--	--	--	--	--
Total Xylenes	mg/kg	16000	--	--	--	--	--

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL).

U - Analyte not detected at or above Reporting Limit (RL) shown

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation.

*: Ecology soil screening level for TPH model remedies (not LDW PCUL) that applies only if gasoline-range TPH is detected.

Most stringent PCUL for saturated soil (nonpotable groundwater) established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 5. Groundwater and Seeps Data
Project No. 150054. Snopac Property, Seattle, Washington

			Seeps						Groundwater										
		Location	ASP-1	ASP-2	ASP-3	ASP-4	ASP-5	ASP-6	MW-1	MW-1	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4
		Date	07/02/2015	07/02/2015	07/02/2015	07/02/2015	07/02/2015	07/02/2015	02/07/2017	01/29/2018	02/07/2017	01/30/2018	08/27/2019	02/06/2017	02/08/2017	01/30/2018	02/06/2017	01/28/2018	08/27/2019
		Sample	ASP-1	ASP-2	ASP-3	ASP-4	ASP-5	ASP-6	MW1-020717	MW01-20180129	MW2-020717	MW-02-20180130	MW-2-082719	MW3-020617	MW3-020817	MW-03-20180130	MW4-020617	MW04-20180128	MW-4-082719
Analyte	**Unit**	**Most Stringent PCUL Non-Potable Water GW #s 2-5**																	
Metals (Totals except as noted)																			
Arsenic	ug/L	8	**44.7**	**40.1**	**42.4**	**75.5**	**42.2**	**63.5**	**15.4 J**	**10.2 J**	**9.24 J**	**11.3 J**	--	**10.8 J**	**18.8 J**	**15.1 J**	**14.7 J**	**10.7 J**	--
Arsenic, dissolved	ug/L	8	--	--	--	--	--	--	**14.2 J**	**8.68 J**	**8.76 J**	**7.69 J**	--	--	**12.6 J**	**8.95 J**	**12.2 J**	**12.2 J**	--
Barium	ug/L	200	**31.2**	**28**	**61.4**	**95.5**	**89.3**	**92.2**	**54.2 J**	**16.3 J**	**17.7 J**	**11.1 J**	--	**10.3 J**	**12.4 J**	**9.9 J**	**96.4 J**	**18.5 J**	--
Barium, dissolved	ug/L	200	--	--	--	--	--	--	**60 J**	**13.8 J**	**20.7 J**	**8.49 J**	--	--	**11.6 J**	**5.25 J**	**90.6 J**	**28.7 J**	--
Cadmium	ug/L	1.2	< 10 U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	--	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	--
Cadmium, dissolved	ug/L	1.2	--	--	--	--	--	--	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	--	--	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	--
Chromium	ug/L	27	**2.58 J**	**2.21 J**	**2.81**	**3.36 J**	**1.47**	**2.59 J**	**6.23**	**35 J**	**3.17**	**23.7 J**	--	**3.43**	**1.89 J**	**129 J**	**2.28**	**1.52**	--
Chromium, dissolved	ug/L	27	--	--	--	--	--	--	**5.32 J**	**1.9 J**	**2.16 J**	**1.42 J**	--	--	< 1 UJ	**4.62 J**	**1.31 J**	**20.5 J**	--
Copper	ug/L	3.1	**86.5**	**97.5**	**35.2**	**226**	**103**	**31 J**	**5.49**	**14.8 J**	**5.44**	**11.3 J**	--	**7.92**	**10.9 J**	**21.3 J**	**8.5**	**7.98**	--
Copper, dissolved	ug/L	3.1	--	--	--	--	--	--	**7.59 J**	< 5 UJ	**5.31 J**	< 5 UJ	--	--	**8.88 J**	**5.1 J**	**6.13 J**	**17.8 J**	--
Lead	ug/L	8.1	< 10 U	< 10 U	**5.8**	**8.47 J**	< 1 U	< 1 U	< 1 UJ	**2.73 J**	< 1 U	< 1 UJ	--	**2.82**	< 1 U	**3.23 J**	**2.69 J**	< 1 U	--
Lead, dissolved	ug/L	8.1	--	--	--	--	--	--	< 1 UJ	< 1 UJ	< 1 U	< 1 UJ	--	--	< 1 UJ	< 1 UJ	< 1 U	**1.87 J**	--
Mercury	ug/L	0.025	< 0.1 U	< 0.1 U	< 0.1 U	**0.28 J**	< 0.1 U	< 0.1 U	< 1 UJ	< 1 UJ	< 1 U	< 1 UJ	--	< 1 U	< 1 U	< 1 UJ	< 1 UJ	< 1 U	--
Mercury, dissolved	ug/L	0.025	--	--	--	--	--	--	< 1 UJ	< 1 UJ	< 1 U	< 1 UJ	--	--	< 1 UJ	< 1 UJ	< 1 U	< 1 UJ	--
Nickel	ug/L	8.2	--	--	--	--	--	--	**16.8**	**3.39 J**	**18.4**	**4.87 J**	--	**20.5**	**11.4 J**	**7.24 J**	**11.7**	**16.3**	--
Nickel, dissolved	ug/L	8.2	--	--	--	--	--	--	**24.3 J**	**2.64 J**	**22.2 J**	**3.62 J**	--	--	**9.81 J**	**2.55 J**	**14.1 J**	**16.2 J**	--
Selenium	ug/L	71	--	--	--	--	--	--	**58.1**	< 65 UJ	**40**	< 110 UJ	--	**41.1**	--	< 65 UJ	--	< 10 UJ	--
Selenium, dissolved	ug/L	71	--	--	--	--	--	--	--	< 80 UJ	--	< 65 UJ	--	--	**62.3**	< 75 UJ	**35.7**	< 10 UJ	--
Silver	ug/L	1.9	--	--	--	--	--	--	**58.1**	< 65 UJ	**40**	< 110 UJ	--	**41.1**	--	< 65 UJ	--	< 10 UJ	--
Silver, dissolved	ug/L	1.9	--	--	--	--	--	--	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	--	--	< 1 UJ	< 1 UJ	< 1 UJ	< 1 UJ	--
Zinc	ug/L	81	**21.4 J**	**16.2 J**	**35.9**	**393**	**8.46**	< 50 U	**12.8**	**15.9 J**	**43.7**	**18.1 J**	--	**13.9**	**18 J**	**20.8 J**	**8.68**	**5.49**	--
Zinc, dissolved	ug/L	81	--	--	--	--	--	--	**12.3 J**	**12.4 J**	**50.7 J**	**12.3 J**	--	--	**15.3 J**	**7.49 J**	**8.32 J**	**10.4 J**	--
Polycyclic Aromatic Hydrocarbons (PAHs)																			
1-Methylnaphthalene	ug/L		< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	**0.033**	< 0.025 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--	--	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--
2-Methylnaphthalene	ug/L		< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	**0.026**	< 0.025 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--	--	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--
Acenaphthene	ug/L	5.3	< 0.025 U	**0.33**	**3.3**	< 0.025 U	**0.11**	< 0.025 U	< 0.03 U	< 0.03 U	**0.044**	**0.054**	--	--	**0.59**	< 0.03 U	< 0.03 U	< 0.03 U	--
Acenaphthylene	ug/L		< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--
Anthracene	ug/L	2.1	< 0.025 U	< 0.025 U	**0.047**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	**0.052**	< 0.03 U	< 0.03 U	< 0.03 U	--
Benz(a)anthracene	ug/L	0.00016	< 0.025 U	< 0.025 U	**0.14**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.032**	--	--	< 0.03 U	**0.068**	< 0.03 U	< 0.03 U	--
Benzo(a)pyrene	ug/L	0.000016	< 0.025 U	< 0.025 U	**0.089**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	**0.14**	< 0.03 U	< 0.03 U	--
Benzo(b)fluoranthene	ug/L	0.00016	< 0.025 U	< 0.025 U	**0.18**	< 0.025 U	< 0.025 U	**0.028**	< 0.03 U	< 0.03 U	< 0.03 U	**0.03**	--	--	**0.042**	**0.2**	< 0.03 U	< 0.03 U	--
Benzo(g,h,i)perylene	ug/L		< 0.025 U	< 0.025 U	**0.074**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	**0.13**	< 0.03 U	< 0.03 U	--
Benzo(k)fluoranthene	ug/L	0.0016	< 0.025 U	< 0.025 U	**0.051**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	**0.06**	< 0.03 U	< 0.03 U	--
Chrysene	ug/L	0.016	< 0.025 U	< 0.025 U	**0.084**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	**0.05**	**0.15**	< 0.03 U	< 0.03 U	--
Dibenzo(a,h)anthracene	ug/L	0.000016	< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--
Fluoranthene	ug/L	1.8	**0.03**	**0.035**	**2**	**0.028**	**0.19**	< 0.025 U	< 0.03 U	< 0.03 U	**0.24**	**0.37**	--	--	**0.27**	**0.08**	< 0.03 U	< 0.03 U	--
Fluorene	ug/L	3.7	**0.03**	**0.035**	**2**	**0.028**	**0.19**	< 0.025 U	< 0.03 U	< 0.03 U	**0.24**	**0.37**	--	--	**0.27**	**0.08**	< 0.03 U	< 0.03 U	--
Indeno(1,2,3-cd)pyrene	ug/L	0.00016	< 0.025 U	< 0.025 U	**0.073**	< 0.025 U	< 0.025 U	< 0.025 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	**0.1**	< 0.03 U	< 0.03 U	--
Naphthalene	ug/L	1.4	< 0.025 U	**0.033**	< 0.025 U	< 0.025 U	**0.47**	< 0.025 U	< 0.03 U	< 0.03 U	**0.73**	**10**	--	--	< 0.03 U	< 0.03 U	**0.081**	< 0.03 U	--
Phenanthrene	ug/L		**0.033**	**0.031**	**0.053**	**0.038**	**0.05**	**0.037**	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	--	< 0.03 U	< 0.03 U	**0.056**	< 0.03 U	--
Pyrene	ug/L	2	**0.03**	**0.035**	**1.2**	< 0.025 U	**0.28**	**2.2**	< 0.03 U	< 0.03 U	**0.18**	**0.25**	--	--	**0.062**	**0.14**	< 0.03 U	< 0.03 U	--
Total cPAHs TEQ	ug/L	0.000016	< 0.018875 U	< 0.018875 U	**0.13549**	< 0.018875 U	< 0.018875 U	**0.020425**	< 0.02265 U	< 0.02265 U	< 0.02265 U	**0.02585**	--	--	**0.0257**	**0.1858**	< 0.02265 U	< 0.02265 U	--
Other Semi-Volatile Organic Compounds (SVOCs)																			
Carbazole	ug/L		--	--	--	--	--	--	< 2 U	< 2 U	< 2 U	< 2 U	--	--	< 2 U	< 2 U	< 2 U	< 2 U	--
Dibenzofuran	ug/L		< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--	--	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--
Pentachlorophenol	ug/L	0.002	--	--	--	--	--	--	< 2 U	< 2 U	< 2 U	< 2 U	< 0.05 U	--	< 2 U	< 2 U	< 2 U	< 2 U	< 0.05 U
Polychlorinated Biphenyls (PCBs)																			
Aroclor 1254	ug/L		< 0.01 U	< 0.01 U	**0.054**	< 0.01 U	< 0.01 U	< 0.01 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--
Aroclor 1260	ug/L		< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--
Total PCBs (Sum of Aroclors)	ug/L	0.000007	< 0.01 U	< 0.01 U	**0.054**	< 0.01 U	< 0.01 U	< 0.01 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--
Total Petroleum Hydrocarbons (TPH)																			
Diesel-Range Organics	ug/L	500	--	--	--	--	--	--	< 50 U	< 50 U	**85 X**	< 50 U	--	--	< 70 U	< 50 U	**110 X**	< 50 U	--
Motor Oil-Range Organics	ug/L	500	--	--	--	--	--	--	< 250 U	< 250 U	< 250 U	< 250 U	--	--	< 350 U	< 250 U	< 280 U	< 250 U	--
Diesel + Oil-Range Organics	ug/L	500	--	--	--	--	--	--	< 250 U	< 250 U	**85 X**	< 250 U	--	--	< 350 U	< 250 U	**110 X**	< 250 U	--
Volatile Organic Compounds (VOCs)																			
Benzene	ug/L	1.6	--	--	--	--	--	--	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	--	--	< 0.35 U	< 0.35 U	**0.42**	< 0.35 U	--
Toluene	ug/L	130	--	--	--	--	--	--	< 1 U	< 1 U	< 1 U	< 1 U	--	--	< 1 U	< 1 U	< 1 U	< 1 U	--
Ethylbenzene	ug/L	31	--	--	--	--	--	--	< 1 U	< 1 U	< 1 U	< 1 U	--	--	< 1 U	< 1 U	< 1 U	< 1 U	--
Total Xylenes	ug/L	330	--	--	--	--	--	--	< 2 U	< 2 U	< 2 U	< 2 U	--	--	< 2 U	< 2 U	< 2 U	< 2 U	--
Field Parameters																			
Temperature	°C		16.4	16.3	16.4	16.5	17.1	15.1	7.4	8.3	7.2	9.2	15.7	--	4.8	7.4	6.7	9.7	16.5
Specific Conductivity	μS/cm		35530	34483	9970	27214	17390	16170	16337	8779	9959	9818	29913	--	12471	9220	10595	4305	22413
Dissolved Oxygen	mg/L		2.53	4.2	2.34	2.38	0.1	3.23	4.12	5.94	3.84	6.62	0.28	--	10.61	9.10	2.80	7.51	1.47
pH	s.u.		6.53	6.59	6.33	6.81	6.41	6.97	6.73	6.72	6.55	6.91	6.27	--	6.87	7.31	7.26	6.99	6.45
Oxygen Reduction Potential	mV		102.2	96.1	48.9	101.7	16.6	40.9	28.5	67.1	125.8	102.1	142.9	--	153.1	148.0	116.7	38.4	105
Turbidity	NTU		0.91	1.76	3.88	0.94	3.66	2.04	6.55	7.89	6.16	19.9	51	--	1.66	17.4	3.89	19.1	19

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL).

U - Analyte not detected at or above Reporting Limit (RL) shown.

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate.

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation.

Most stringent PCUL for nonpotable groundwater established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 5. Groundwater and Seeps Data

Project No. 150054. Snopac Property, Seattle, Washington

			Groundwater														
		Location	MW-5	MW-5	MW-6	MW-6	MW-6	MW-7	MW-7	MW-8	MW-8	MW-9	MW-9	MW-10	MW-10	MW-11	MW-11
		Date	02/05/2017	01/28/2018	02/06/2017	01/29/2018	08/27/2019	02/06/2017	01/30/2018	02/08/2017	01/29/2018	02/07/2017	01/30/2018	02/08/2017	01/30/2018	02/08/2017	01/29/2018
		Sample	MW5-020517	MW05-20180128	MW6-020617	MW06-20180129	MW-6-082719	MW7-020617	MW-07-20180130	MW8-020817	MW08-20180129	MW9-020717	MW-09-20180130	MW10-020817	MW-10-20180130	MW11-020817	MW11-20180129
Analyte	**Unit**	**Most Stringent PCUL Non-Potable Water GW #s 2-5**															
Metals (Totals except as noted)																	
Arsenic	ug/L	8	**1.34**	**8.94 J**	**1.96**	**25.1**	--	**3.76**	**6.38 J**	**2.41**	**1.25**	< 1 U	**1.92**	**1.15**	< 1 U	**20 J**	**8.19 J**
Arsenic, dissolved	ug/L	8	**1.28**	**8.21 J**	**1.09**	**21.8**	--	**3.29**	**6.68 J**	**2.42**	**1.35**	< 1 U	**2.01**	< 1 U	< 1 U	**12.8 J**	**7.84 J**
Barium	ug/L	200	**11.1**	**89.8 J**	**7.17**	**33.2**	--	**68.1**	**24.7**	**14.9**	**15**	**12.5**	**52.7**	**5.82**	**3.37**	**25.5 J**	**7.63 J**
Barium, dissolved	ug/L	200	**10.1**	**97.4 J**	**6**	**35.4**	--	**70.8**	**24.7 J**	**16.4**	**16.2**	**14.2**	**58.3**	**2.69**	**3.13**	**23.1 J**	**7.33 J**
Cadmium	ug/L	1.2	< 1 U	< 1 UJ	< 1 U	< 1 U	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 UJ	< 1 UJ
Cadmium, dissolved	ug/L	1.2	< 1 U	< 1 UJ	< 1 U	< 1 U	--	< 1 U	< 1 UJ	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 UJ	< 1 UJ
Chromium	ug/L	27	**1.42**	**21.3 J**	< 1 U	**1.01**	--	**1.31**	**2.38**	**1.23**	**1.08**	< 1 U	**1.09**	**4.71**	**2.16**	**2.61 J**	**9.86 J**
Chromium, dissolved	ug/L	27	**1.6**	**12 J**	< 1 U	< 1 U	--	< 1 U	**1.57**	**1.12**	< 1 U	< 1 U	**1.03**	**1.96**	**1.73**	< 1 UJ	**1.23 J**
Copper	ug/L	3.1	< 5 U	< 5 UJ	**7.4**	**11.6**	--	< 5 U	**5.05**	< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	--	**14.1 J**
Copper, dissolved	ug/L	3.1	< 5 U	**6.62 J**	< 5 U	< 5 U	--	< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	< 5 U	**11.8 J**	**9.7 J**
Lead	ug/L	8.1	< 1 U	< 1 UJ	**1.08**	< 1 U	--	**1.12**	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**6.61**	< 1 UJ
Lead, dissolved	ug/L	8.1	< 1 U	< 1 UJ	< 1 U	< 1 U	--	< 1 U	< 1 UJ	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 UJ	< 1 UJ
Mercury	ug/L	0.025	< 1 U	< 1 UJ	< 1 U	< 1 U	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 UJ
Mercury, dissolved	ug/L	0.025	< 1 U	< 1 UJ	< 1 U	< 1 U	--	< 1 U	< 1 UJ	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 UJ	< 1 UJ
Nickel	ug/L	8.2	**5.02**	**100 J**	**1.58**	**2.53**	--	**9.96**	**6.74**	**2.95**	**1.94**	**2.23**	**15.2**	**2.1**	**1.35**	**6.67 J**	**3.52 J**
Nickel, dissolved	ug/L	8.2	**3.52**	**110 J**	**1.46**	**2.76**	--	**9.8**	**5.71**	**3.53**	**2.17**	**2.6**	**16.3**	**1.06**	**1.19**	**5.34 J**	**3.12 J**
Selenium	ug/L	71	**2.4**	< 55 UJ	< 1 U	**1.73**	--	**5.68**	< 15 UJ	**7.43**	**2.98**	< 1 U	**6.53**	**1.06**	< 1 U	--	< 25 UJ
Selenium, dissolved	ug/L	71	**1.83**	< 125 UJ	< 1 U	**1.78**	--	**4.17**	< 10 UJ	**7.74**	**3.44**	< 1 U	**7.61**	< 1 U	< 1 U	**55.2**	< 95 UJ
Silver	ug/L	1.9	**2.4**	< 55 UJ	< 1 U	**1.73**	--	**5.68**	< 15 UJ	**7.43**	**2.98**	< 1 U	**6.53**	**1.06**	< 1 U	--	< 25 UJ
Silver, dissolved	ug/L	1.9	< 1 U	< 1 UJ	< 1 U	< 1 UJ	--	< 1 U	< 1 UJ	< 1 U	< 1 UJ	< 1 U	< 1 UJ	< 1 U	< 1 UJ	< 1 UJ	< 1 UJ
Zinc	ug/L	81	**8.14**	**75 J**	**12.2**	**34.1**	--	**9.22**	< 5 U	< 5 U	< 5 U	**5.91**	**8.75**	< 5 U	**6.7**	**34.6 J**	**12.7 J**
Zinc, dissolved	ug/L	81	**10.2**	**100 J**	**10.3**	**25.9**	--	**7.81**	< 5 U	< 5 U	< 5 U	**5.61**	**10**	< 5 U	< 5 U	**18.8 J**	**11.5 J**
Polycyclic Aromatic Hydrocarbons (PAHs)																	
1-Methylnaphthalene	ug/L		< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U
2-Methylnaphthalene	ug/L		< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U
Acenaphthene	ug/L	5.3	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U
Acenaphthylene	ug/L		< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U
Anthracene	ug/L	2.1	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U
Benz(a)anthracene	ug/L	0.00016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.046**	< 0.03 U
Benzo(a)pyrene	ug/L	0.000016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.072**	< 0.03 U
Benzo(b)fluoranthene	ug/L	0.00016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.11**	< 0.03 U
Benzo(g,h,i)perylene	ug/L		< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.062**	< 0.03 U
Benzo(k)fluoranthene	ug/L	0.0016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.035**	< 0.03 U
Chrysene	ug/L	0.016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.073**	< 0.03 U
Dibenzo(a,h)anthracene	ug/L	0.000016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U
Fluoranthene	ug/L	1.8	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.082**	< 0.03 U
Fluorene	ug/L	3.7	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.082**	< 0.03 U
Indeno(1,2,3-cd)pyrene	ug/L	0.00016	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.053**	< 0.03 U
Naphthalene	ug/L	1.4	< 0.03 U	< 0.03 U	**0.031**	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U
Phenanthrene	ug/L		< 0.03 U	< 0.03 U	**0.033**	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.044**	< 0.03 U
Pyrene	ug/L	2	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	--	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	< 0.03 U	**0.11**	< 0.03 U
Total cPAHs TEQ	ug/L	0.000016	< 0.02265 U	< 0.02265 U	< 0.02265 U	< 0.02265 U	--	< 0.02265 U	< 0.02265 U	< 0.02265 U	< 0.02265 U	< 0.02265 U	< 0.02265 U	< 0.02265 U	< 0.02265 U	**0.09863**	< 0.02265 U
Other Semi-Volatile Organic Compounds (SVOCs)																	
Carbazole	ug/L		< 2 U	< 2 U	< 2 U	< 2 U	--	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U
Dibenzofuran	ug/L		< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	--	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U
Pentachlorophenol	ug/L	0.002	< 2 U	< 2 U	< 2 U	< 2 U	< 0.05 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U
Polychlorinated Biphenyls (PCBs)																	
Aroclor 1254	ug/L		< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U
Aroclor 1260	ug/L		< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U
Total PCBs (Sum of Aroclors)	ug/L	0.000007	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	--	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U	< 0.1 U
Total Petroleum Hydrocarbons (TPH)																	
Diesel-Range Organics	ug/L	500	< 60 U	< 50 U	< 50 U	< 50 U	--	< 60 U	**88 X**	**110 X**	**100 X**	< 50 U	< 50 U	< 50 U	< 50 U	**100 X**	< 60 U
Motor Oil-Range Organics	ug/L	500	< 280 U	< 250 U	< 250 U	< 250 U	--	< 280 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	< 300 U
Diesel + Oil-Range Organics	ug/L	500	< 280 U	< 250 U	< 250 U	< 250 U	--	< 280 U	**88 X**	**110 X**	**100 X**	< 250 U	< 250 U	< 250 U	< 250 U	**100 X**	< 300 U
Volatile Organic Compounds (VOCs)																	
Benzene	ug/L	1.6	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	--	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U	< 0.35 U
Toluene	ug/L	130	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Ethylbenzene	ug/L	31	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Total Xylenes	ug/L	330	< 2 U	< 2 U	< 2 U	< 2 U	--	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U
Field Parameters																	
Temperature	°C		10.4	13.1	8.4	12.1	16.8	8.9	10.8	13.3	13.0	9.4	10.9	13.3	13.0	6.1	7.5
Specific Conductivity	µS/cm		742	10284	183.6	2389	18960	1647	5245	2287	2262	201.6	3342	402.4	702	13385	8494
Dissolved Oxygen	mg/L		1.39	1.69	0.51	0.78	0.19	3.10	1.62	0.22	0.26	4.07	3.86	0.15	0.17	10.10	7.96
pH	s.u.		6.57	6.09	6.46	6.55	6.64	6.84	7.12	6.63	6.78	6.79	6.27	6.25	6.22	6.65	6.92
Oxygen Reduction Potential	mV		44.5	9.6	67.4	14.4	42.3	110.7	80.2	-43.3	31.8	42.8	63.4	-33.0	72.4	37.8	54.2
Turbidity	NTU		8.72	19.1	7.02	4.61	16	15.9	8.42	9.41	10.9	3.57	1.85	49.3	4.18	5.88	2.35

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL).

U - Analyte not detected at or above Reporting Limit (RL) shown.

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate.

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation.

Most stringent PCUL for nonpotable groundwater established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 5. Groundwater and Seeps Data

Project No. 150054. Snopac Property, Seattle, Washington

			Groundwater		
		Location	MW-11	MW-12	MW-12
		Date	08/27/2019	02/07/2017	01/28/2018
		Sample	MW-11-082719	MW12-020717	MW12-20180128
Analyte	Unit	Most Stringent PCUL Non-Potable Water GW #s 2-5			
Metals (Totals except as noted)					
Arsenic	ug/L	8	--	**1.23**	**2.42**
Arsenic, dissolved	ug/L	8	--	**1.1**	**2.19**
Barium	ug/L	200	--	**7.29**	**6.74**
Barium, dissolved	ug/L	200	--	**8.13**	**5.5**
Cadmium	ug/L	1.2	--	< 1 U	< 1 U
Cadmium, dissolved	ug/L	1.2	--	< 1 U	< 1 U
Chromium	ug/L	27	--	< 1 U	< 1 U
Chromium, dissolved	ug/L	27	--	< 1 U	< 1 U
Copper	ug/L	3.1	--	< 5 U	< 5 U
Copper, dissolved	ug/L	3.1	--	< 5 U	< 5 U
Lead	ug/L	8.1	--	< 1 U	< 1 U
Lead, dissolved	ug/L	8.1	--	< 1 U	< 1 U
Mercury	ug/L	0.025	--	< 1 U	< 1 U
Mercury, dissolved	ug/L	0.025	--	< 1 U	< 1 U
Nickel	ug/L	8.2	--	**4.2**	**3.86**
Nickel, dissolved	ug/L	8.2	--	**5.08**	**3.27**
Selenium	ug/L	71	--	**1.56**	< 1 U
Selenium, dissolved	ug/L	71	--	**1.96**	< 1 U
Silver	ug/L	1.9	--	**1.56**	< 1 U
Silver, dissolved	ug/L	1.9	--	< 1 U	< 1 UJ
Zinc	ug/L	81	--	< 5 U	< 5 U
Zinc, dissolved	ug/L	81	--	< 5 U	< 5 U
Polycyclic Aromatic Hydrocarbons (PAHs)					
1-Methylnaphthalene	ug/L		--	< 0.2 U	< 0.2 U
2-Methylnaphthalene	ug/L		--	< 0.2 U	< 0.2 U
Acenaphthene	ug/L	5.3	--	< 0.03 U	< 0.03 U
Acenaphthylene	ug/L		--	< 0.03 U	< 0.03 U
Anthracene	ug/L	2.1	--	< 0.03 U	< 0.03 U
Benz(a)anthracene	ug/L	0.00016	--	< 0.03 U	< 0.03 U
Benzo(a)pyrene	ug/L	0.000016	--	< 0.03 U	< 0.03 U
Benzo(b)fluoranthene	ug/L	0.00016	--	< 0.03 U	< 0.03 U
Benzo(g,h,i)perylene	ug/L		--	< 0.03 U	< 0.03 U
Benzo(k)fluoranthene	ug/L	0.0016	--	< 0.03 U	< 0.03 U
Chrysene	ug/L	0.016	--	< 0.03 U	< 0.03 U
Dibenzo(a,h)anthracene	ug/L	0.000016	--	< 0.03 U	< 0.03 U
Fluoranthene	ug/L	1.8	--	< 0.03 U	< 0.03 U
Fluorene	ug/L	3.7	--	< 0.03 U	< 0.03 U
Indeno(1,2,3-cd)pyrene	ug/L	0.00016	--	< 0.03 U	< 0.03 U
Naphthalene	ug/L	1.4	--	< 0.03 U	< 0.03 U
Phenanthrene	ug/L		--	< 0.03 U	< 0.03 U
Pyrene	ug/L	2	--	< 0.03 U	< 0.03 U
Total cPAHs TEQ	ug/L	0.000016	--	< 0.02265 U	< 0.02265 U
Other Semi-Volatile Organic Compounds (SVOCs)					
Carbazole	ug/L		--	< 2 U	< 2 U
Dibenzofuran	ug/L		--	< 0.2 U	< 0.2 U
Pentachlorophenol	ug/L	0.002	**0.44**	< 2 U	< 2 U
Polychlorinated Biphenyls (PCBs)					
Aroclor 1254	ug/L		--	< 0.1 U	< 0.1 U
Aroclor 1260	ug/L		--	< 0.1 U	< 0.1 U
Total PCBs (Sum of Aroclors)	ug/L	0.000007	--	< 0.1 U	< 0.1 U
Total Petroleum Hydrocarbons (TPH)					
Diesel-Range Organics	ug/L	500	--	< 50 U	**110 X**
Motor Oil-Range Organics	ug/L	500	--	< 250 U	**290**
Diesel + Oil-Range Organics	ug/L	500	--	< 250 U	**400 X**
Volatile Organic Compounds (VOCs)					
Benzene	ug/L	1.6	--	< 0.35 U	< 0.35 U
Toluene	ug/L	130	--	< 1 U	< 1 U
Ethylbenzene	ug/L	31	--	< 1 U	< 1 U
Total Xylenes	ug/L	330	--	< 2 U	< 2 U
Field Parameters					
Temperature	°C		16.8	11.7	13.0
Specific Conductivity	µS/cm		33500	674	572.3
Dissolved Oxygen	mg/L		3.6	0.76	1.11
pH	s.u.		6.31	6.63	6.14
Oxygen Reduction Potential	mV		168	61.0	-23.8
Turbidity	NTU		40	5.19	15.4

Notes:

Bold - Analyte Detected

Highlighted cell indicates detected result exceeded most stringent preliminary cleanup level (PCUL).

U - Analyte not detected at or above Reporting Limit (RL) shown.

UJ - Analyte not detected and the Reporting Limit (RL) is an estimate.

J - Result value estimated

X - Chromatographic pattern does not match fuel standard used for quantitation.

Most stringent PCUL for nonpotable groundwater established by the July 2019 Lower Duwamish Waterway (LDW) Preliminary Cleanup Level Workbook (Ecology, 2019).

Table 6. Applicable or Relevant and Appropriate Requirements

Project No. 150054. Snopac Property, Seattle, Washington

Topic	Applicability: Uplands	Applicability: In-Water Sediments	Standard or Requirement	Regulatory Citation: Federal	Regulatory Citation: State	Comment
Cleanup Requirements	X	X	Evaluation and conduct of cleanup actions		MTCA Cleanup Regulation (WAC 173-340)	Cleanup at the Site is being conducted under formal oversight by Ecology under Agreed Order.
Sediment Quality		X	Sediment quality standards; cleanup screening levels	--	Sediment Management Standards (WAC 173-204)	The SMS are MTCA rules and an ARAR under CERCLA. Numerical standards for the protection of benthic marine invertebrates.
Fish Tissue Quality		X	Concentrations of contaminants in fish tissues	Food and Drug Administration Maximum Concentrations of Contaminants in Fish Tissue (49 CFR 10372-10442)	--	The Washington State Department of Health assesses the need for fish consumption advisories.
Surface Water Quality		X	Surface Water Quality Standards	Ambient Water Quality Criteria established under Section 304(a) of the Clean Water Act (33 USC 1251 et seq) http://www.epa.gov/ost/criteria/wqctable/	Surface Water Quality Standards (RCW 90-48; WAC 173-201A)	State surface water quality standards apply where the State has adopted, and EPA has approved, Water Quality Standards that are more stringent than Federal recommended Water Quality Criteria established under Section 304(a) of the Clean Water Act. Both chronic and acute standards, and marine and freshwater are used as appropriate.
Land Disposal of Waste	X	X	Disposal of materials containing PCBs	Toxic Substances Control Act (15 USC 2605; 40 CFR Part 761)	--	--
	X	X	Hazardous waste	Resource Conservation and Recovery Act Land Disposal Restrictions (42 USC 7401-7642; 40 CFR 268)	Dangerous Waste Regulations Land Disposal Restrictions (RCW 70.105; WAC 173-303, 140- 141)	--
Waste Treatment Storage and Disposal	X	X	Disposal limitations	Resource Conservation and Recovery Act (42 USC 7401-7642;40 CFR 264 and 265)	Washington State Dangerous Waste Regulations (RCW 70.105; WAC 173-303)	--
Noise		X	Maximum noise levels	--	Noise Control Act of 1974 (RCW 80.107; WAC 173-60)	
Groundwater		X	Groundwater quality	Safe Drinking Water Act MCLs and non-zero MCLGs (40 CFR 141)	RCW 43.20A.165 and WAC 173-290-310	For onsite potable water, if any.
Dredge/Fill and Other In-water Construction Work		X	Discharge of dredged/fill material into navigable waters or wetlands	Clean Water Act (33 USC 401 et seq.; 33 USC 141; 33 USC 1251-1316; 40 CFR 230, 231, 404; 33 CFR 320-330) Rivers and Harbors Act (33 USC 401 et seq.)	Hydraulic Code Rules (RCW 75.20; WAC 220-110)	For in-water dredging, filling, or other construction.
		X	Open-water disposal of dredged sediments	Marine Protection, Research and Sanctuaries Act (33 USC 1401-1445; 40 CFR 227)	DMMP (RCW 79.90; WAC 332-30-166)	--
Solid Waste Disposal	X	X	Requirements for solid waste handling management and disposal	Solid Waste Disposal Act (42 USC 215103259-6901-6991; 40 CFR 257-258)	Solid Waste Handling Standards (RCW 70.95; WAC 173-350)	--
Discharge to Surface Water	X	X	Point source standards for new discharges to surface water	National Pollutant Discharge Elimination System (40 CFR 122, 125)	Ecology Water Quality Construction Discharge Permit Program (RCW 90.48; WAC 173-216, 222)	--
Shoreline		X	Construction and development	--	Shoreline Management Act (RCW 90.58; WAC 173-16); King County and City of Seattle Shoreline Master Plans (KCC Title 25; SMC 23.60); City of Tukwila Shoreline Master Program (TMC 18.44)	For construction within 200 feet of the shoreline.
Floodplain Protection		X	Avoid adverse impacts, minimize potential harm	Executive Order 11988, Protection of Floodplains (40 CFR 6, Appendix A); FEMA National Flood Insurance Program Regulations (44 CFR 60.3Ld)(3)).	--	For in-water construction activities, including any dredge or fill operations. Includes local ordinances: KCC Title 9 and SMC 25.09.

Table 6. Applicable or Relevant and Appropriate Requirements

Project No. 150054. Snopac Property, Seattle, Washington

Topic	Applicability		Standard or Requirement	Regulatory Citation		Comment
	Uplands	In-Water Sediments		Federal	State	
Critical (or Sensitive) Area ARAR		X	Evaluate and mitigate impacts	--	Growth Management Act (RCW 36.70a); King County Critical Area Ordinance (KCC Title 21A.24); City of Seattle (SMC 25.09); City of Tukwila Sensitive Area Ordinance (TMC 18.45)	--
Habitat for Fish, Plants, or Birds ARAR		X	Evaluate and mitigate habitat impacts	Clean Water Act (Section 404 (b)(1)); U.S. Fish and Wildlife Mitigation Policy (44 CFR 7644); U.S. Fish and Wildlife Coordination Act (16 USC 661 et seq.); Migratory Bird Treaty Act (16 USC 703-712)	--	--
Construction Water Management	X	X	Discharges to public owned treatment works; National pretreatment Standards;	40 CFR Part 403	King County Industrial Wastewater Discharge Authorizations (Local);	--
Air	X	X	Air Quality		Washington Clean Air Act (RCW 70.94; WAC 173-400; WAC 173-460)	
Cultural Resources	X	X		Archeological and Historical Preservation Act (16 USCA 496a-1)	Department of Archaeology and Historic Preservation (DAHP)	
Construction Safety	X	X	Worker Safety and Health	Occupational Safety and Health Administration (OSHA)	Washington Industrial Safety and Health Act (WISHA) regulations (29 CFR 1910.120; Chapter 296-62 WAC)	
Environmental Impact Review	X	X	State Environmental Policy Act	--	State Environmental Policy Act RCW 43.21C; WAC 197-11-790)	Applicable to MTCA cleanups. Because the LDW is under a joint EPA/Ecology Order, Ecology has determined that CERCLA requirements are the functional equivalent of NEPA and SEPA.

Notes:

ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
Ecology = Washington State Department of Ecology
EPA = U.S. Environmental Protection Agency
LDW = Lower Duwamish Waterway
MCL = maximum contaminant level
MTCA = Model Toxics Control Act
NEPA = National Environmental Policy Act
PCB = polychlorinated biphenyl
SEPA = State Environmental Policy Act
SMS = sediment management standards
-- = not applicable

Table 7. RI Sediment Data
Project No. 150054, Snopac Property, Seattle, Washington

				Sample Location:	C01				C02		C03			
				Sample ID:	C01-SD-3-5		CO1-PW-3-5 (W)		C02-SD-3-5		C03-SD-3-5		CO3-PW-3-5 (W)	
				Sample Date:	2/6/2018				2/6/2018		2/7/2018			
				Matrix:	Sediment		Porewater		Sediment		Sediment		Porewater	
		LDW ROD Remedial Action Levels		Sediment Interval (ft):	3 - 5				3 - 5		3 - 5			
Analyte	Units	Human Health & Benthic COC RALs	Upper Limit for ENR				µg/L						µg/L	
Polychlorinated Biphenyls (PCBs)														
Aroclor 1016	mg/kg dw	--	--		0.0065	U	0.24	UJ	0.14	U	0.0055	U	0.20	UJ
Aroclor 1221	mg/kg dw	--	--		0.013	U	0.47	UJ	0.27	U	0.011	U	0.40	UJ
Aroclor 1232	mg/kg dw	--	--		0.0065	U	0.24	UJ	0.14	U	0.0055	U	0.20	UJ
Aroclor 1242	mg/kg dw	--	--		0.053	J	0.64	J	0.72		0.06	J	1.0	J
Aroclor 1248	mg/kg dw	--	--		0.0065	U	0.24	UJ	0.14	U	0.0055	U	0.2	UJ
Aroclor 1254	mg/kg dw	--	--		0.19		1.5	J	1.9		0.11		1.8	J
Aroclor 1260	mg/kg dw	--	--		0.2		0.45	J	0.56	J	0.025		0.51	J
Total PCB Aroclors	mg/kg dw				0.44	J	2.6		3.2	J	0.2	J	3.3	
Total PCB Aroclors	mg/kg OC	12 (195 for top 2 ft)	36 (195 for top 2 ft)		19	J	--		77	J	26	J	--	
Polynuclear Aromatic Hydrocarbons (PAHs)														
1-Methylnaphthalene	mg/kg dw	--	--											
2-Methylnaphthalene	mg/kg dw	--	--		0.099		0.011	U	0.033		0.012		12.00	
Acenaphthene	mg/kg dw	--	--		0.15		0.067	J	0.061		0.083		63.00	
Anthracene	mg/kg dw	--	--		0.24		0.14		0.39		5.4		6.50	
Benz(a)anthracene	mg/kg dw	--	--		0.47		0.15		1.7		14		6.40	
Benzo(a)pyrene	mg/kg dw	--	--		0.73		0.42		1.5		4		2.60	
Benzo(b)fluoranthene	mg/kg dw	--	--		1.1		0.69		2.3		7.6		4.50	
Benzo(k)fluoranthene	mg/kg dw	--	--		0.34		0.24		0.8		2.4		1.40	
Chrysene	mg/kg dw	--	--		0.78		0.09	J	2.0		16		3.40	
Dibenz(a,h)anthracene	mg/kg dw	--	--		0.096		0.05	J	0.18		0.43		0.22	
Dibenzofuran	mg/kg dw	--	--		0.13		0.024	U	0.053		0.034		26.00	
Fluoranthene	mg/kg dw	--	--		0.96		0.39		4.2		34		50.00	
Fluorene	mg/kg dw	--	--		0.15		0.047	J	0.086		0.26		29.00	
Indeno(1,2,3-cd)pyrene	mg/kg dw	--	--		0.35		0.16		0.67		1.3		0.81	
Naphthalene	mg/kg dw	--	--		0.28		0.03	U	0.094		0.028		0.41	
Pyrene	mg/kg dw	--	--		3.5		4.00		6.5		33		48.00	
2-Methylnaphthalene	mg/kg OC	76	228		4.2		--		0.8		1.6		--	
Acenaphthene	mg/kg OC	32	96		6.3		--		1.5		11		--	
Acenaphthylene	mg/kg OC	--	--		2.1		0.047	J	1.3		8.2		0.97	
Anthracene	mg/kg OC	440	1,320		10		--		9.4		710		--	
Benz(a)anthracene	mg/kg OC	220	660		20		--		41		1800		--	
Benzo(a)pyrene	mg/kg OC	198	594		31		--		36		530		--	
Benzo(g,h,i)perylene	mg/kg OC	62	186		14		0.19		13		120		0.75	
Total benzofluoranthenes	mg/kg OC	460	1,380		61		0.93		75		1300		5.90	
Chrysene	mg/kg OC	220	660		33		--		48		2100		--	
Dibenz(a,h)anthracene	mg/kg OC	24	72		4.1		--		4.3		57		--	
Dibenzofuran	mg/kg OC	30	90		5.5		--		1.3		4.5		--	

Table 7. RI Sediment Data

Project No. 150054, Snopac Property, Seattle, Washington

		LDW ROD Remedial Action Levels			C01		C02	C03	
				Sample ID:	C01-SD-3-5	CO1-PW-3-5 (W)	C02-SD-3-5	C03-SD-3-5	CO3-PW-3-5 (W)
				Sample Date:	2/6/2018		2/6/2018	2/7/2018	
				Matrix:	Sediment	Porewater	Sediment	Sediment	Porewater
				Sediment Interval (ft):	3 - 5		3 - 5	3 - 5	
Analyte	**Units**	**Human Health & Benthic COC RALs**	**Upper Limit for ENR**			µg/L			µg/L
Fluoranthene	mg/kg OC	320	960		41	--	100	4500	--
Fluorene	mg/kg OC	46	138		6.3	--	2.1	34	--
Indeno(1,2,3-cd)pyrene	mg/kg OC	68	204		15	--	16	170	--
Naphthalene	mg/kg OC	198	594		12	--	2.3	3.7	--
Phenanthrene	mg/kg OC	200	600		17	0.13	8.9	200	29.00
Pyrene	mg/kg OC	2,000	6,000		150	--	160	4300	--
Total HPAHs	mg/kg OC	1,920	5,760		370	5.07 J	490	15000	118.00
Total LPAHs	mg/kg OC	740	2,220		54	0.46 J	25	960	129.00
cPAH	µg TEQ/kg dw	1000	3000		1000	0.56 J	2100	6900	4.00
Metals									
Arsenic	mg/kg dw	57	171		11	91	33	7.3	343
Cadmium	mg/kg dw	10.2	30.6		0.77	0.18 J	16	10	0.16 J
Chromium	mg/kg dw	520	1,560		34	2.3 J	41	13	1.9 J
Copper	mg/kg dw	780	2,340		79	5.5	160	53	5.2
Lead	mg/kg dw	900	2,700		71	11	410	79	6.33
Mercury	mg/kg dw	0.82	2.46		0.42	0.2	0.6	0.13	<0.20
Silver	mg/kg dw	12.2	36.6		0.84	0.4 U	1.9	0.65	0.2 U
Zinc	mg/kg dw	820	2,460		150	14 U	3900	2200	12 U
Organotin Compounds									
Tributyltin ion	µg/kg dw	--	--		--	--	--	--	--
Phthalates									
Bis(2-ethylhexyl)phthalate	mg/kg dw	--	--		--	--	--	--	--
Bis(2-ethylhexyl)phthalate	mg/kg OC	94	282		--	--	--	--	--
Chlorobenzenes									
1,2,4-Trichlorobenzene	mg/kg dw	--	--		--	--	--	--	--
1,2,4-Trichlorobenzene	mg/kg OC	1.62	4.86		--	--	--	--	--
Other SVOCs and COCs									
Benzoic acid	µg/kg dw	1,300	3,900		--	--	--	--	--
Organic Carbon									
Total Organic Carbon	%	--	--		2.4	NA	4.2	0.76	NA

Notes:

Sampling results from 3-5 foot depth horizon were screened against surface RALs as they will be located immediately below the cap after dredging.

Nondetects reported as 1/2 detection limit.

Lab duplicates have been averaged.

>Cat 2/3 RAL and ≤UL for ENR (ENR)

>UL for ENR (Active Remediation)

dw = dry weight
LDW = Lower Duwamish Waterway
RAL = remedial action level
ROD = record of decision
TEQ = toxicity equivalence
Data Qualifiers: J = result is estimated, U = result is not detected

COC = contaminant of concern
ENR = enhanced natural recovery
OC = organic carbon
SVOC = semivolatile organic compound
-- = no data available

Table data courtesy of Integral Consulting, Inc.

Table 8. Data Summary of Statistics: Soil and Water

Project No. 150054, Snopac Property, Seattle, WA

Proposed constituents of concern for the Site are highlighted (refer to text).

Analyte	Combined Vadose and Saturated Zone Soils: Number of Sampled Locations	Number of Samples (excluding Field Dups)	Number of Samples with Detected Concentration	Frequency of Detection	Maximum Detected Concentration	Number of Detected Exceedances	Frequency of Exceedance	Max Magnitude of Exceedance	Groundwater and Seeps: Number of Sampled Locations	Number of Samples (excluding Field Dups)	Number of Samples with Detected Concentration	Frequency of Detection	Maximum Detected Concentration	Number of Exceedances of Preliminary Screening Level	Frequency of Exceedance	Max Magnitude of Exceedance
Metals																
Arsenic	54	82	76	93%	4890	37	45%	699	18	31	29	94%	75.5	19	61%	9.4
Barium	17	33	33	100%	76.2	30	91%	9.2	18	31	31	100%	96.4	0	0%	NE
Cadmium	30	50	5	10%	1.9	4	8%	2.4	18	31		0%		0	0%	NE
Chromium	30	50	50	100%	126	1	2%	2.63	18	31	27	87%	129	2	6%	4.8
Copper	54	82	81	99%	3430	33	40%	95	18	30	19	63%	226	19	63%	73
Lead	54	82	69	84%	2780	26	32%	56	18	31	9	29%	8.47	1	3%	1.0
Mercury	39	68	16	24%	1.4	7	10%	20	18	31	1	3%	0.28	1	3%	11
Nickel	32	48	44	92%	52.1	2	4%	1.1	12	25	25	100%	100	9	36%	12
Selenium	17	33		0%		0	0%	NE	12	22	11	50%	58.1	0	0%	NE
Silver	26	46		0%		0	0%	NE	12	21	11	52%	58.1	8	38%	30.6
Zinc	54	82	82	100%	12900	29	35%	129	18	31	24	77%	393	1	3%	4.9
Organotin Compounds																
Tributyltin Ion	9	9	7	78%	5.6	6	67%	47								
Polycyclic Aromatic Hydrocarbons (PAHs)																
1-Methylnaphthalene	24	27	7	26%	16	0	0%	NE	18	30	1	3%	0.033	0	0%	No SL
2-Methylnaphthalene	24	27	8	30%	22	2	7%	33	18	30	1	3%	0.026	0	0%	No SL
Acenaphthene	39	49	14	29%	89	4	8%	3179	18	30	6	20%	3.3	0	0%	NE
Acenaphthylene	39	49	8	16%	2.1	1	2%	1.6	18	30		0%		0	0%	No SL
Anthracene	39	49	14	29%	120	6	12%	2353	18	30	2	7%	0.052	0	0%	NE
Benz(a)anthracene	41	52	23	44%	73	23	44%	128070	18	30	4	13%	0.14	4	13%	875
Benzo(a)pyrene	41	52	22	42%	40	22	42%	2500000	18	30	3	10%	0.14	3	10%	8750
Benzo(b)fluoranthene	41	52	26	50%	65	26	50%	32500	18	30	6	20%	0.2	6	20%	1250
Benzo(g,h,i)perylene	39	49	20	41%	12	6	12%	18	18	30	3	10%	0.13	0	0%	No SL
Benzo(k)fluoranthene	41	52	19	37%	19	18	35%	9500	18	30	3	10%	0.06	3	10%	38
Chrysene	41	52	25	48%	110	21	40%	17187	18	30	4	13%	0.15	4	13%	9.4
Dibenzo(a,h)anthracene	41	52	12	23%	4.1	12	23%	141379	18	30	0	0%		0	0%	NE
Fluoranthene	39	49	24	49%	290	10	20%	3222	18	30	10	33%	2	1	3%	1.1
Fluorene	39	49	12	24%	63	4	8%	2172	18	30	10	33%		0	0%	NE
Indeno(1,2,3-cd)pyrene	41	52	21	40%	13	19	37%	1182	18	30	3	10%	0.1	3	10%	625
Naphthalene	45	58	13	22%	69.8	12	21%	33238	18	30	6	20%	10	1	3%	7.1
Phenanthrene	39	49	19	39%	270	4	8%	180	18	30	9	30%	0.056		0%	No SL
Pyrene	39	49	26	53%	250	10	20%	1786	18	30	10	33%	2.2	1	3%	1.1
Total Benzofluoranthenes	17	20	16	80%	84	5	25%	26								
Total HPAHs	15	17	14	82%	876.1	5	29%	73								
Total LPAHs	15	17	14	82%	568.1	1	6%	109								
Total cPAHs TEQ	41	52	27	52%	58.51	27	52%	3656875	18	30	6	20%	0.1858	6	20%	11613
Semi-Volatile Organic Compounds (SVOC)																
Carbazole	11	13	1	8%	15	0	0%	No SL	12	24	0	0%		0	0%	No SL
Dibenzofuran	15	17	2	12%	28	1	6%	52	18	30	0	0%		0	0%	No SL
Pentachlorophenol	11	13	4	31%	7.6	4	31%	1111111	12	28	1	4%	0.44	1	4%	220
Polychlorinated Biphenyls (PCBs)																
Aroclor 1254	39	44	11	25%	0.6	0	0%	No SL	18	30	1	3%	0.054	0	0%	No SL
Aroclor 1260	39	44	7	16%	0.15	0	0%	No SL	18	30	0	0%		0	0%	No SL
Total PCBs (Sum of Aroclors)	27	30	13	43%	0.6	13	43%	145455	18	30	1	3%	0.054	1	3%	7714
Total Petroleum Hydrocarbons (TPH)																
Gasoline Range Organics	22	26	3	12%	420	3	12%	14								
Diesel Range Organics	42	62	13	21%	2100	6	10%	8.1	12	24	7	29%	110	0	0%	NE
Motor Oil Range Organics	42	62	19	31%	6600	1	2%	3.3	12	24	1	4%	290	0	0%	NE
Diesel + Oil Range Organics	42	62	19	31%	8700	2	3%	4.4	12	24	7	29%	400	0	0%	NE
G+D+O Range Organics	18	22	9	41%	1610	1	5%	1.1								
Volatile Organic Compounds (VOC)																
Benzene	32	40	3	8%	4.7	3	8%	8393	12	24	1	4%	0.42	0	0%	NE
Toluene	32	40	3	8%	2	3	8%	36	12	24	0	0%		0	0%	NE
Ethylbenzene	32	40	3	8%	11	3	8%	733	12	24	0	0%		0	0%	NE
Total Xylenes	32	40	3	8%	16	0	0%	NE	12	24	0	0%		0	0%	NE

Notes

The respective screening levels for unsaturated and saturated soils are applied in the exceedance statistics (see Tables 1 and 3 for details by soil type).

Screening levels for each media are the most stringent preliminary cleanup levels (PCULs) established for the Lower Duwamish Waterway Site (Ecology, 2019); refer to text and Tables 1 through 6.

Orange shading = proposed contaminant of concern

The screening level for total cPAHs (TEQ) and Total PCBs are applied in lieu of screening levels for individual cPAHs and PCB Aroclors. Any exceedance for an individual compound will create an exceedance for the total value (summation).

No SL = No screening level is available from EPA (2018).

NE = No exceedance of screening level.

N/A: Not applicable.

Soil sample results are reported in mg/kg.

Groundwater and seep sample results are reported in ug/L.

FIGURES

FIGURES

Vicinity Map

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect Consulting	SEP-2019	BY: MLK / RAP	FIGURE NO.
	PROJECT NO. 150054	REVISED BY: SJG / RAP	1

Basemap Layer Credits || Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

In-Water Area

Shoreface Area

Proposed Shoring Alignment

Existing Ecology Block Wall

Inferred Extent of Uplands Sandblast Grit-Containing Fill

Cross Section Line

Historical Feature *Approximate Location*

Property Boundary

Mean Higher High Water (9 ft, NAVD88) (NOAA Lockheed Shipyard Station)

King County Tax Parcel

0 20 40
Feet

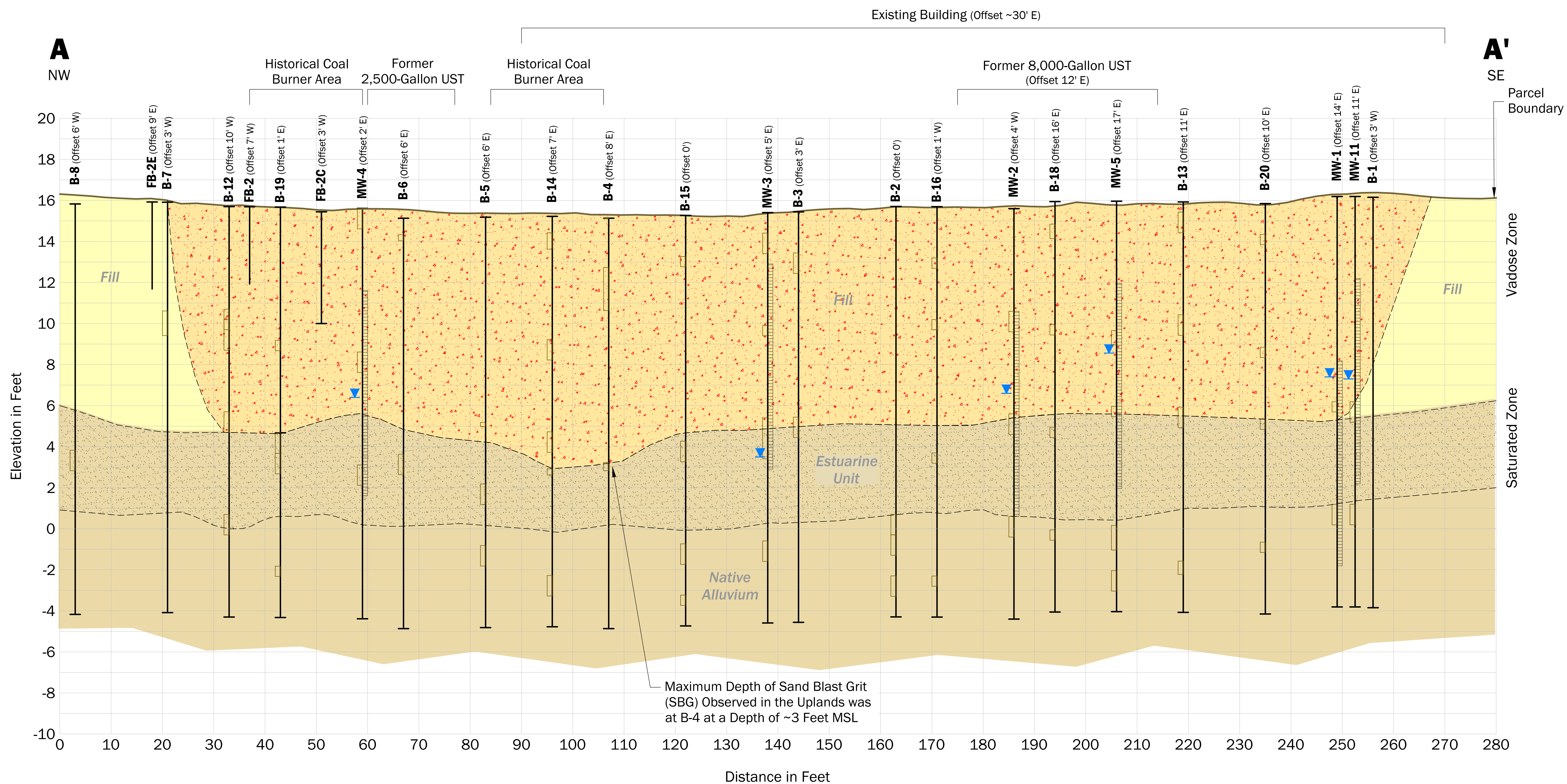
Site Map And Historical Features

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING

MAY-2020	BY: MLK / RAP	FIGURE NO.
PROJECT NO. 150054	REVISED BY: SJG / RAP	2

Basemap Layer Credits || Pictometry, King County



- - - Geologic Contact
— Existing Grade
▼ Groundwater Elevation (Feet NAVD88)

MW-4 (Offset 10' S)

Sample Interval

Screened Interval

Horizontal Scale: 1" = 20'
Vertical Scale: 1" = 5'
Vertical Exaggeration 4x

0 20 40 Feet

Fill Unit
Black to brown, gravelly, silty, sand with interspersed brick, wood chips, glass, and trace paint chips and coal

Fill containing sandblast grit

Estuarine Unit
Brown, silty sand with abundant woody debris and slight sulfur-like odor

Native Alluvium Unit
Brown to gray, poorly graded sand to silty sand with trace organics

NOTE: DEPICTIONS OF LITHOLOGY AND EXTENT OF FILL AND FILL CONTAINING SANDBLAST GRIT ARE BASED ON DATA FROM PREVIOUS SITE EVALUATIONS.

Cross Section A-A'

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING	May-2020	BY: MLK/SCC	FIGURE NO.
	PROJECT NO. 150054	REVISED BY: JCH/SCC	3

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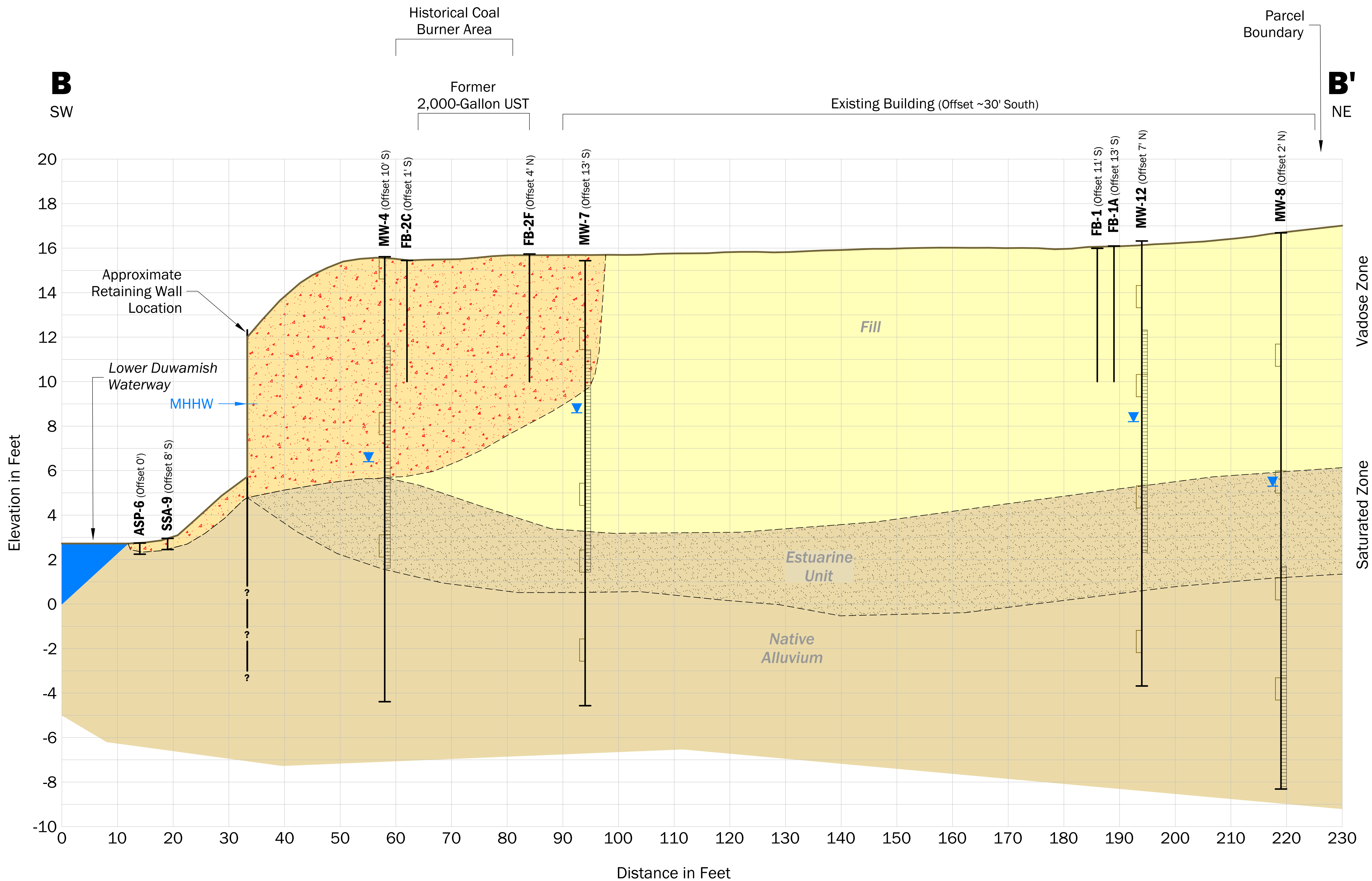


Geologic Contact

Existing Grade

MHHW — Mean Higher High Water (9 Feet NAVD88)

Groundwater Elevation (Feet NAVD88)

NOTE: DEPICTIONS OF LITHOLOGY AND EXTENT OF FILL AND FILL CONTAINING SANDBLAST GRIT ARE BASED ON DATA FROM PREVIOUS SITE EVALUATIONS.

MW-4 (Offset 10' S)

Sample Interval

Screened Interval

Horizontal Scale: 1" = 20'
Vertical Scale: 1" = 5'
Vertical Exaggeration 4x

0 20 40 Feet

Fill Unit
Black to brown, gravelly, silty, sand with interspersed brick, wood chips, glass, and trace paint chips and coal

Fill containing sandblast grit

Estuarine Unit
Brown, silty sand with abundant woody debris and slight sulfur-like odor

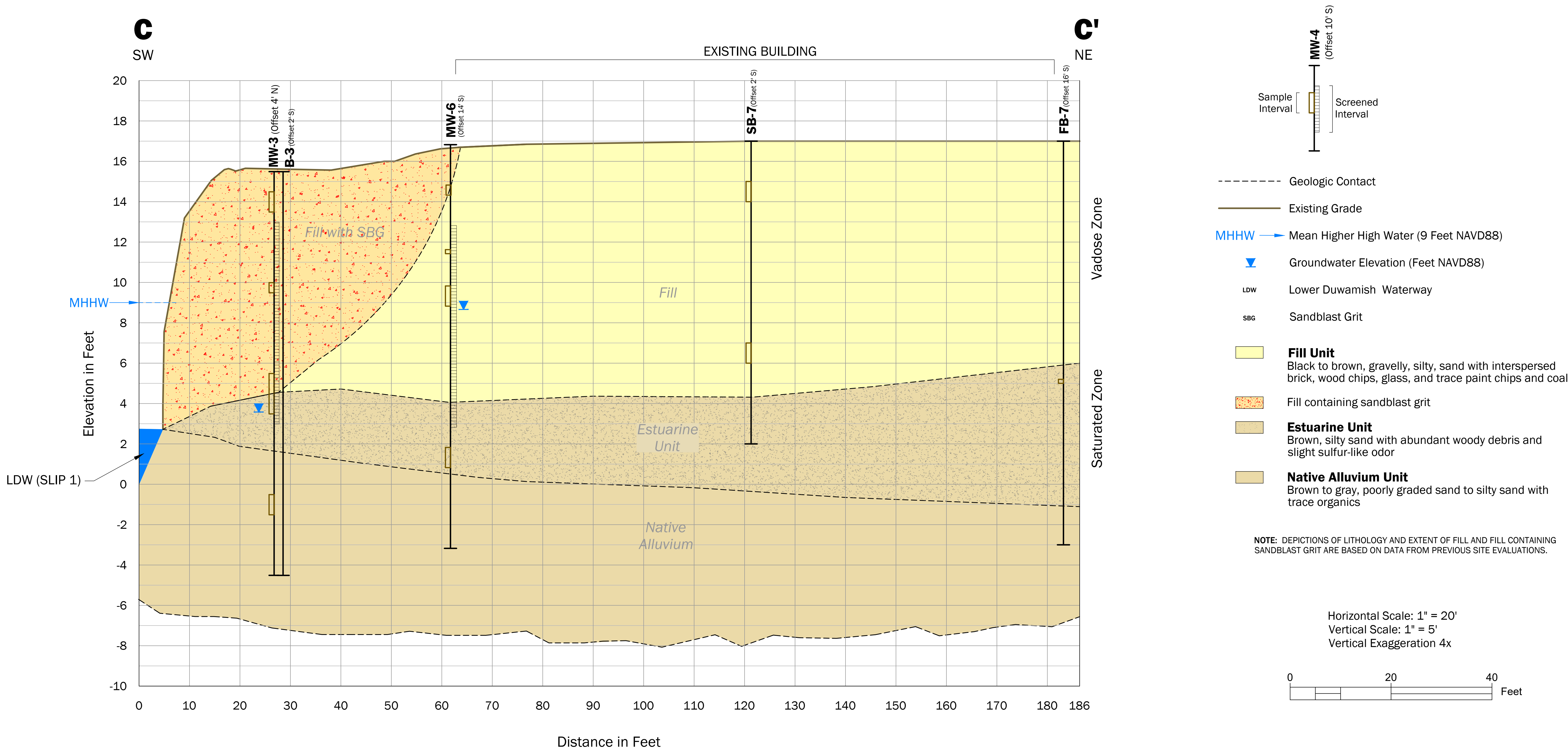
Native Alluvium Unit
Brown to gray, poorly graded sand to silty sand with trace organics

Cross Section B-B'

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING

May-2020	BY: MLK/SCC	FIGURE NO.
PROJECT NO. 150054	REVISED BY: JCH/SCC	4

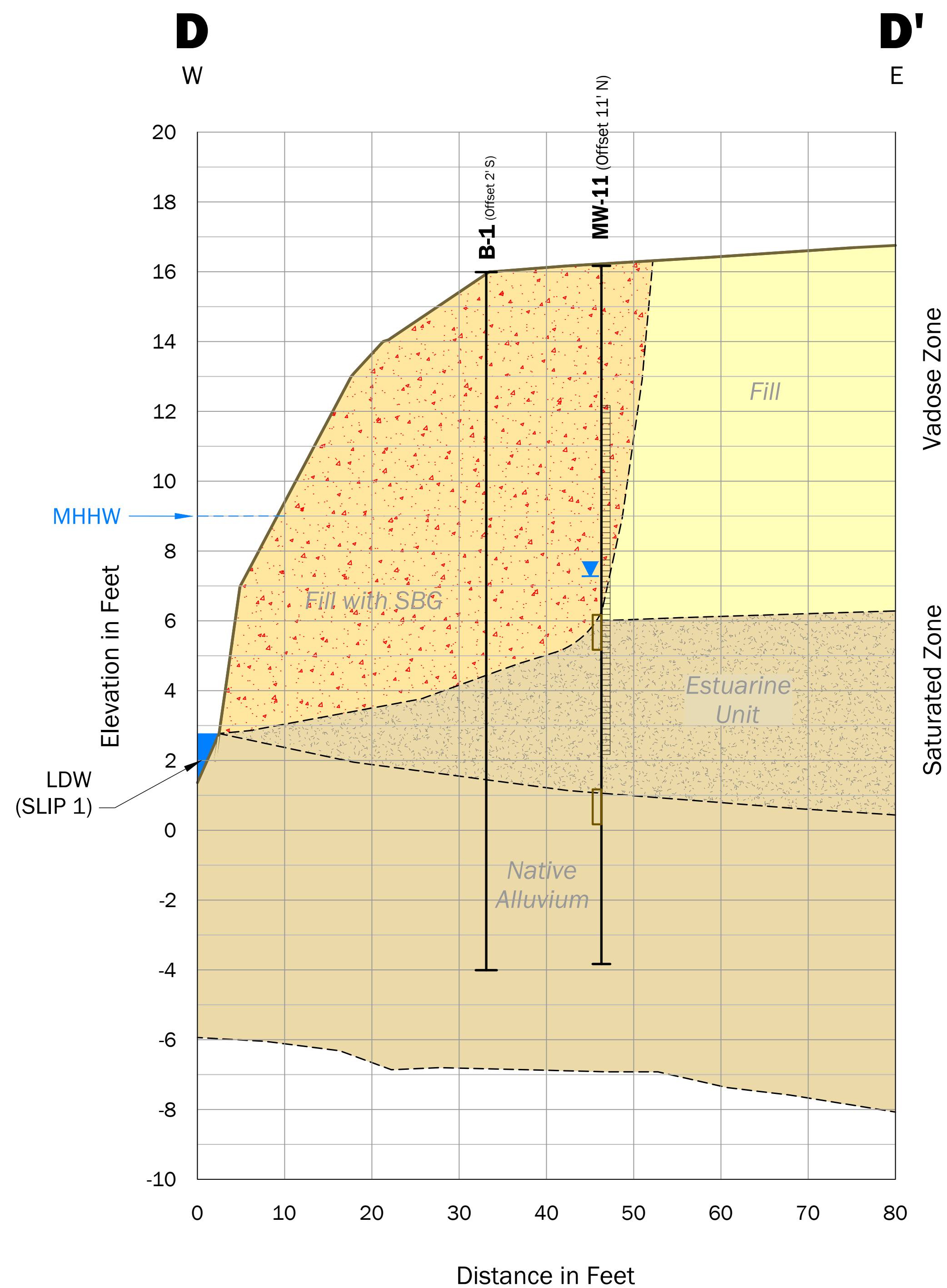


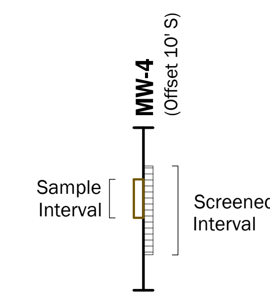
Cross Section C-C'

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING

May-2020	BY: DAH/CMV	FIGURE NO.	
PROJECT NO. 150054	REVISED BY: SCC	5	





- - - - Geologic Contact

—— Existing Grade

MHHW → Mean Higher High Water (9 Feet NAVD88)

Groundwater Elevation (Feet NAVD88)

LDW Lower Duwamish Waterway

SBG Sandblast Grit

Fill Unit
Black to brown, gravelly, silty, sand with interspersed brick, wood chips, glass, and trace paint chips and coal

Fill containing sandblast grit

Estuarine Unit
Brown, silty sand with abundant woody debris and slight sulfur-like odor

Native Alluvium Unit
Brown to gray, poorly graded sand to silty sand with trace organics

NOTE: DEPICTIONS OF LITHOLOGY AND EXTENT OF FILL AND FILL CONTAINING SANDBLAST GRIT ARE BASED ON DATA FROM PREVIOUS SITE EVALUATIONS.

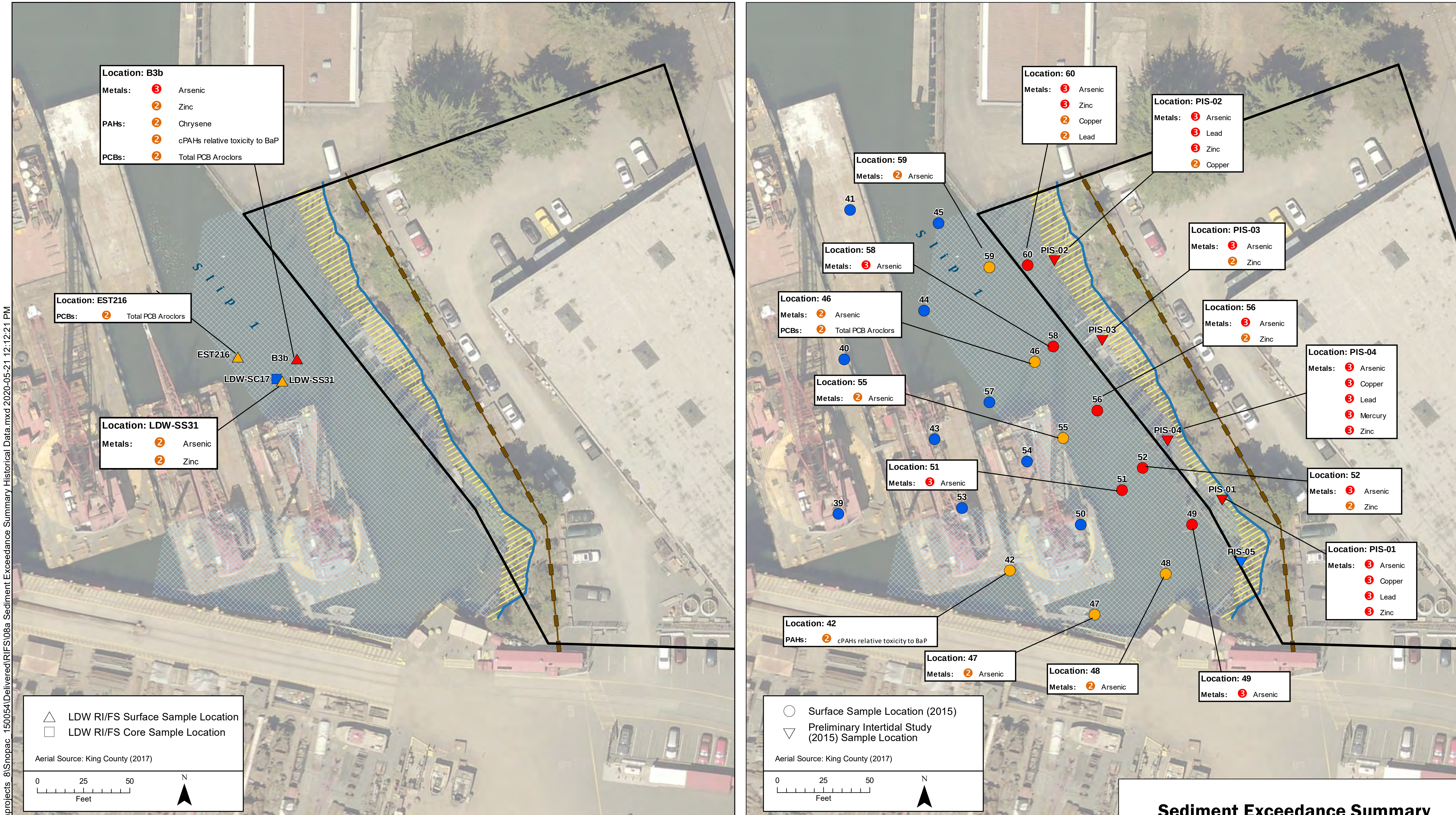
Horizontal Scale: 1" = 20'
Vertical Scale: 1" = 5'
Vertical Exaggeration 4x

0 20 40 Feet

Cross Section D-D'

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING	May-2020	BY: DAH/CMV	FIGURE NO.
	PROJECT NO. 150054	REVISED BY: SCC	6



integral consulting inc.

RAL = remedial action level
UL = upper limit
MNR = monitored natural recovery
ENR = enhanced natural recovery

Exceedance Category

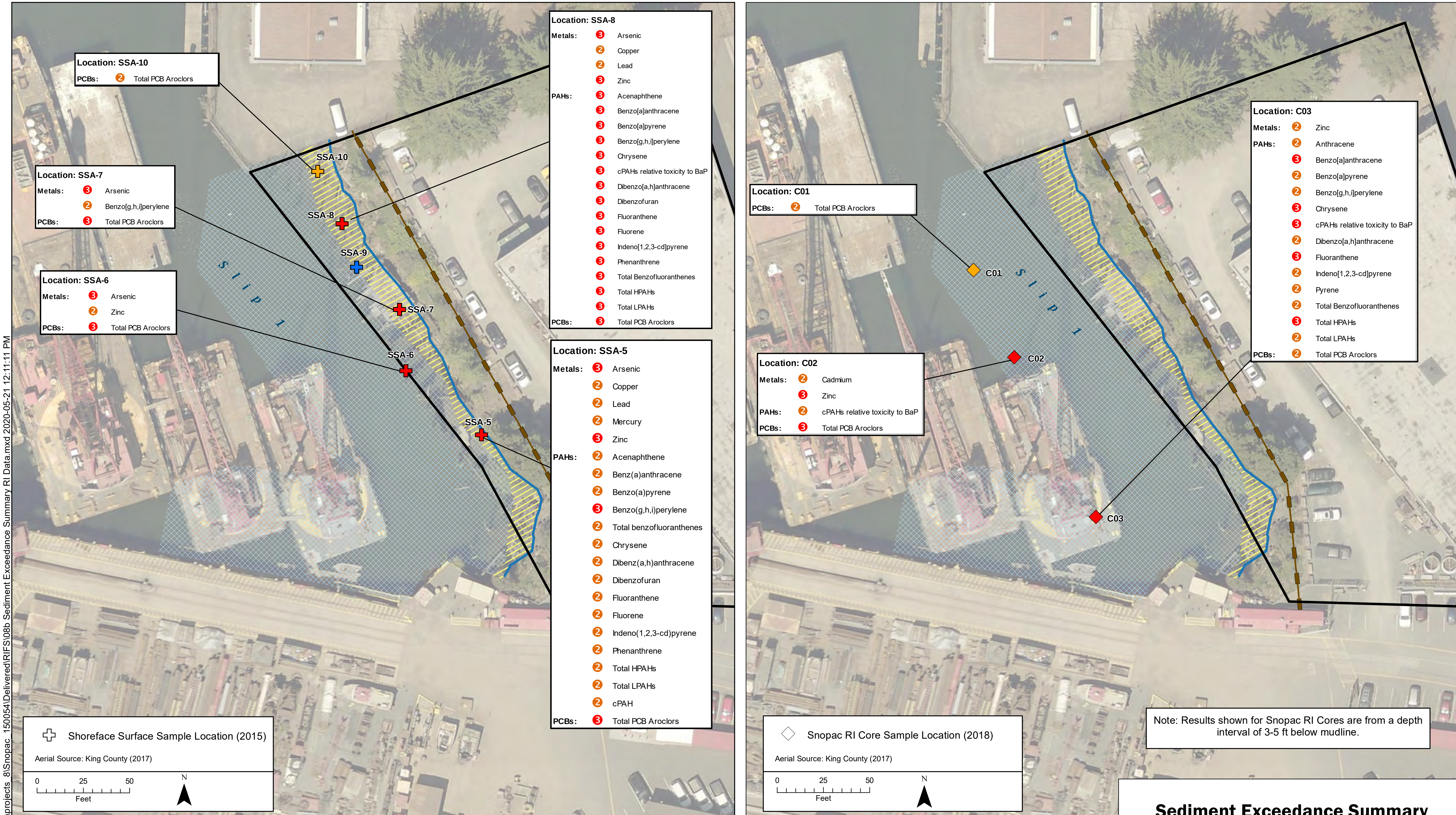
- ≤Cat 2/3 RAL (MNR)
- 2 >Cat 2/3 RAL and ≤UL for ENR (ENR)
- 3 >UL for ENR (Active Remediation)

- In-Water Area
- Shoreface Area
- Proposed Shoring Alignment
- Mean Higher High Water (9 ft, NAVD88) (NOAA Lockheed Shipyard Station)
- Property Boundary

Sediment Exceedance Summary Historical Data

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING | integral consulting inc. | BY: Integral MAY-2020 | FIGURE NO. **8a**



integral consulting inc.

RAL = remedial action level
UL = upper limit
MNR = monitored natural recovery
ENR = enhanced natural recovery

Exceedance Category

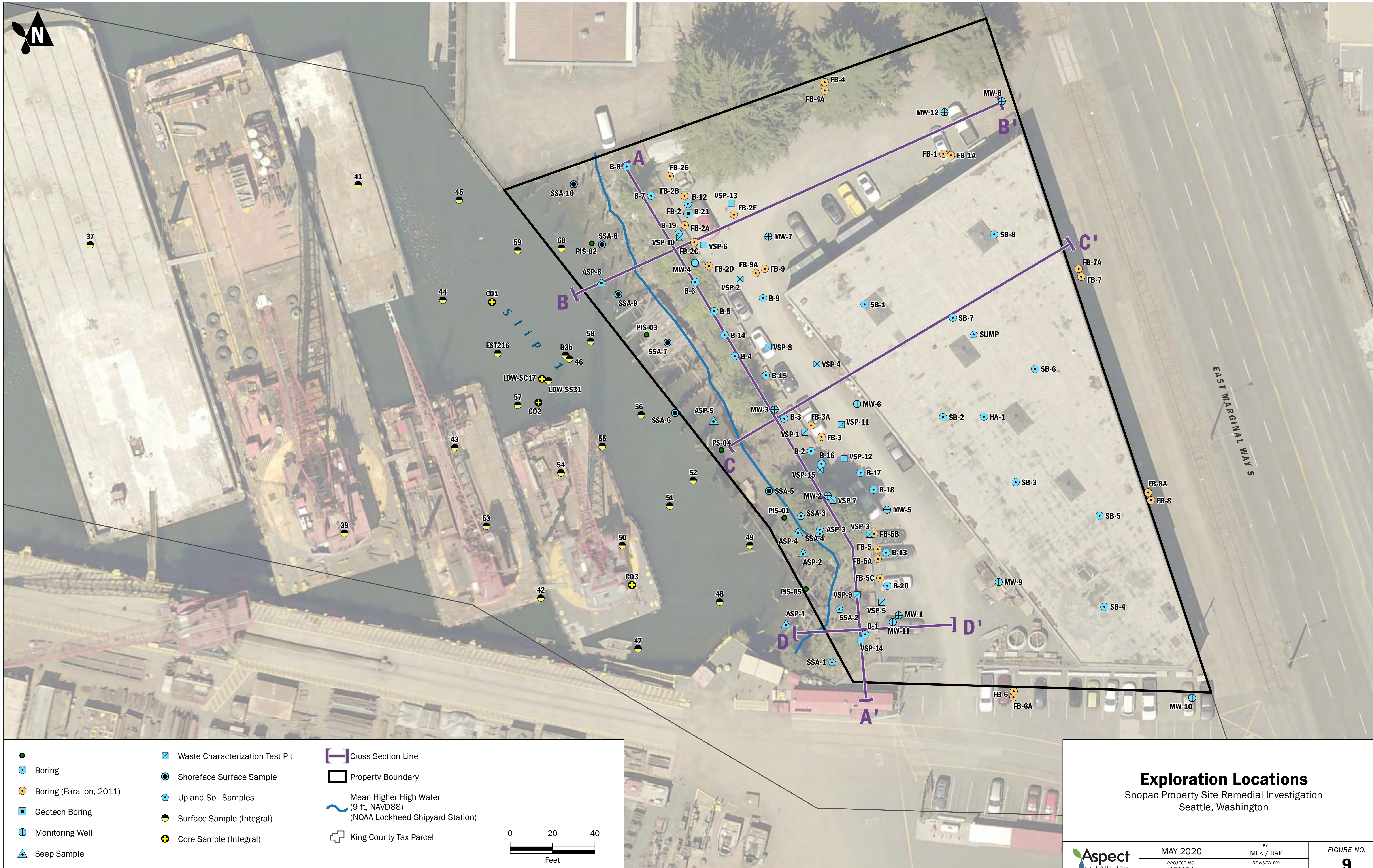
- 1 >Lowest ARAR CUL
- ≤Cat 2/3 RAL (MNR)
- 2 >Cat 2/3 RAL and ≤UL for ENR (ENR)
- 3 >UL for ENR (Active Remediation)

- In-Water Area
- Shoreface Area
- Proposed Shoring Alignment
- Mean Higher High Water (9 ft, NAVD88) (NOAA Lockheed Shipyard Station)
- Property Boundary

Sediment Exceedance Summary RI Data

Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING | integral consulting inc. | BY: Integral | MAY-2020 | FIGURE NO. 8b



Exploration Locations

Snopac Property Site Remedial Investigation
Seattle, Washington

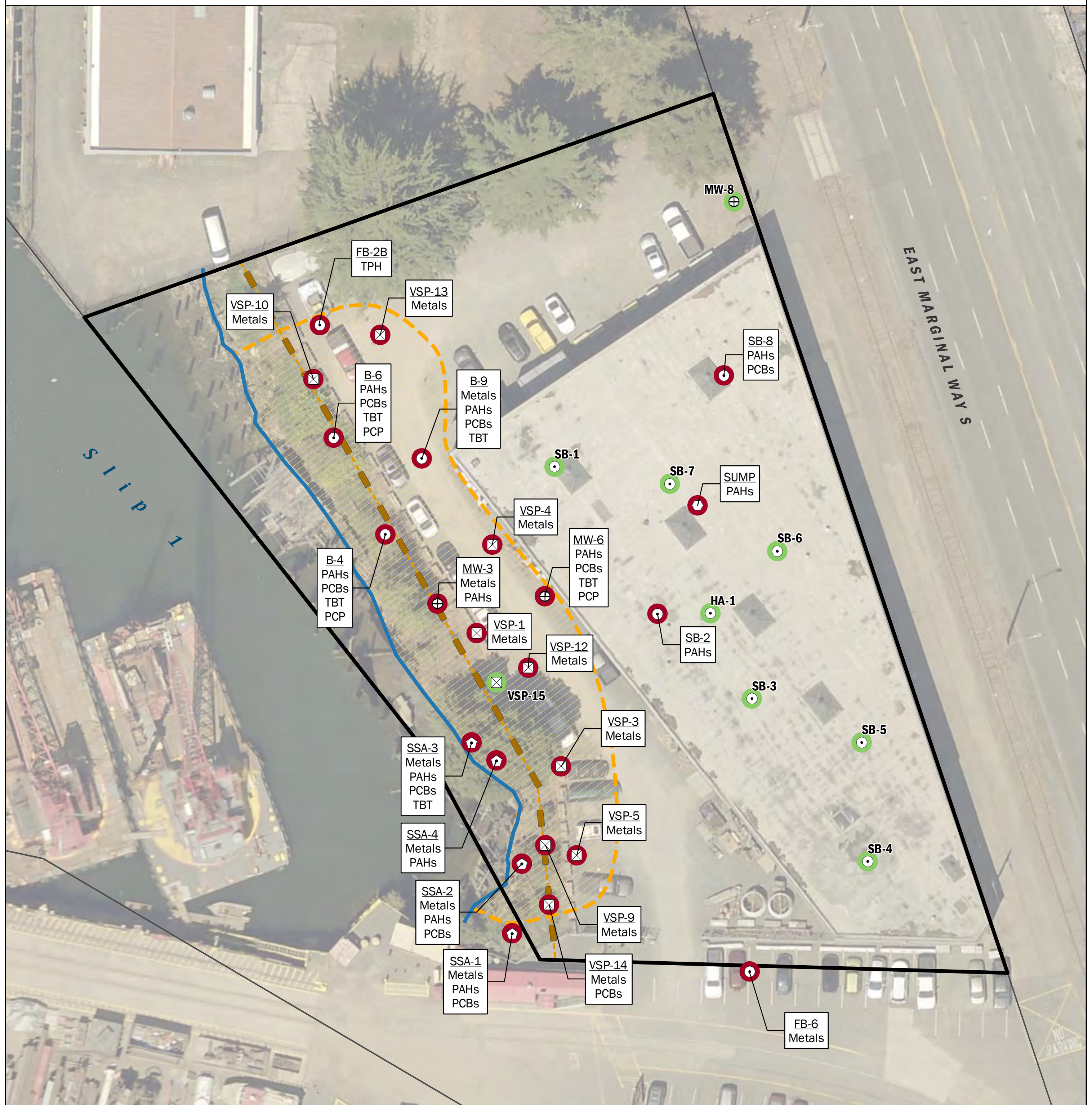
Aspect CONSULTING

MAY-2020	BY: MLK / RAP	FIGURE NO.
PROJECT NO. 150054	REVISED BY: CH/RAP/EAC	9

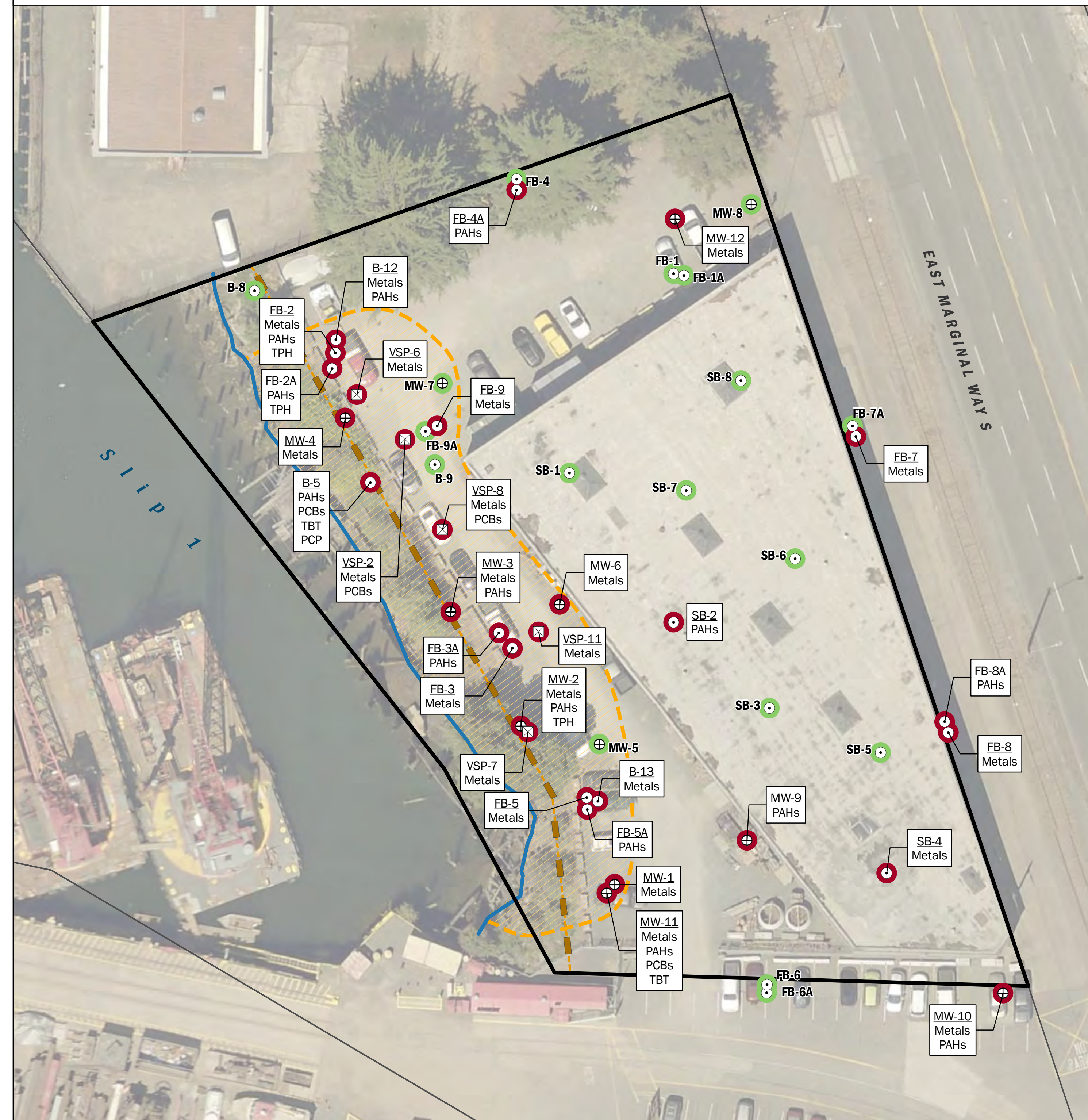
Basemap Layer Credits || Pictometry, King County

GIS Path: T:\projects_8\Snopac_150054\Delivered\RIFS\09 Exploration Locations.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 2020-05-21 || User: tsilen || Print Date: 2020-05-21

VADOSE SOIL EXCEEDANCE SUMMARY



SATURATED SOIL EXCEEDANCE SUMMARY



Analyte Groups with Exceedances include:
cPAHs
PCBs
TBT
Metals (including Arsenic, Copper, Lead, Mercury, Zinc)
PCP
TPH

Notes: *Exceedances represent detected concentration greater than the most stringent media-specific PCUL (Tables 5 and 6). Only analytes or analyte groups which have exceedances are labeled. Visible sandblast grit was found at locations B-4, B-5, B-6, MW-6, and VSP-12 to VSP-14.*

Exploration Type
- Upland Soil Samples
- Waste Characterization Test Pit
- Boring
- Monitoring Well
- Sump
- Property Boundary
- King County Tax Parcel

Analyte Group Exceedances
- One or More Analyte Groups Exceed
- No Exceedances
- Mean Higher High Water (9 ft, NAVD88) (NOAA Lockheed Shipyard Station)
- Proposed Shoring Alignment
- Inferred Extent of Uplands Sandblast Grit-Containing Fill

N

0 25 50
Feet

Vadose and Saturated Soil Exceedance Summary

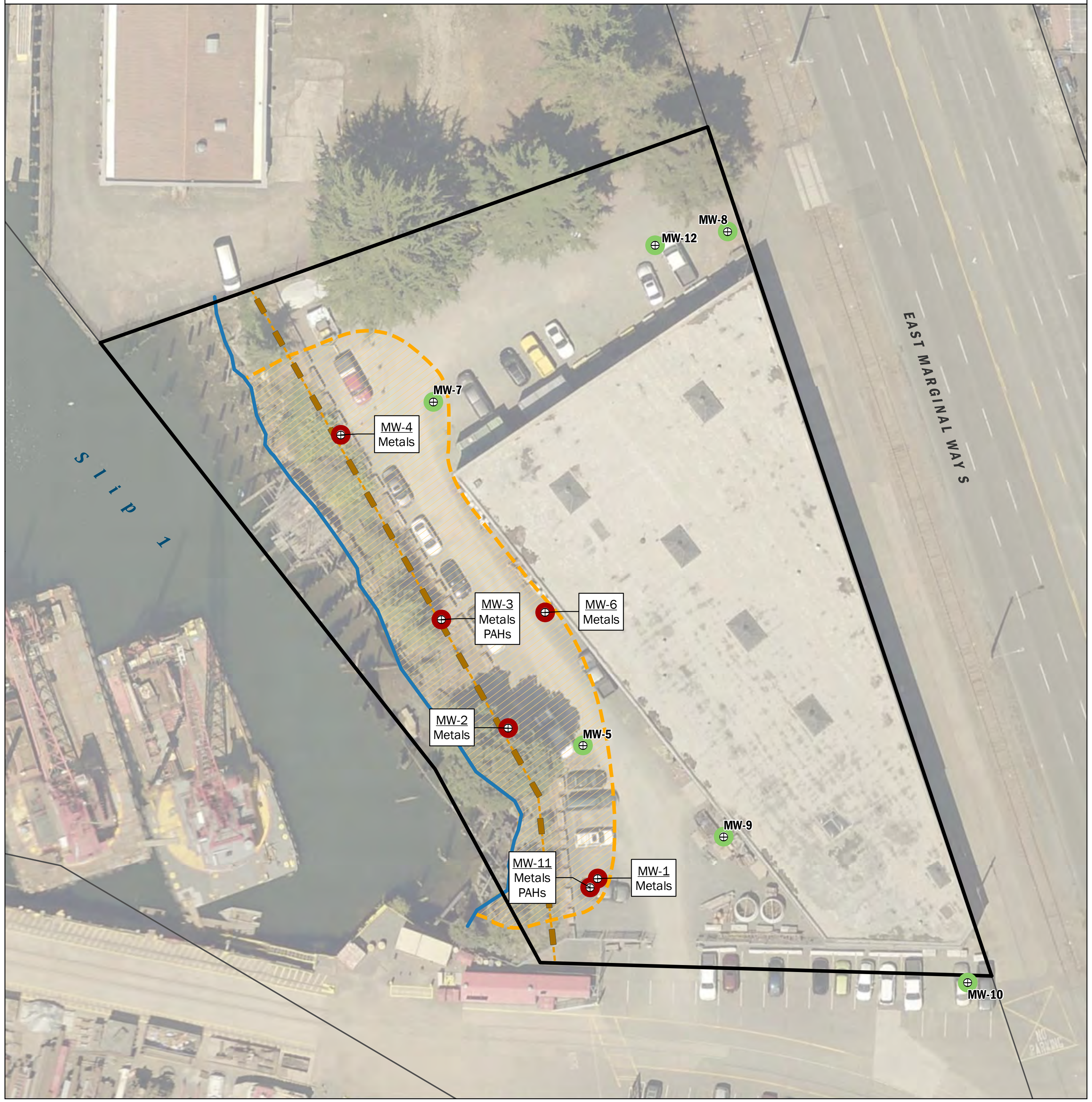
Snopac Property Site Remedial Investigation
Seattle, Washington

Aspect CONSULTING

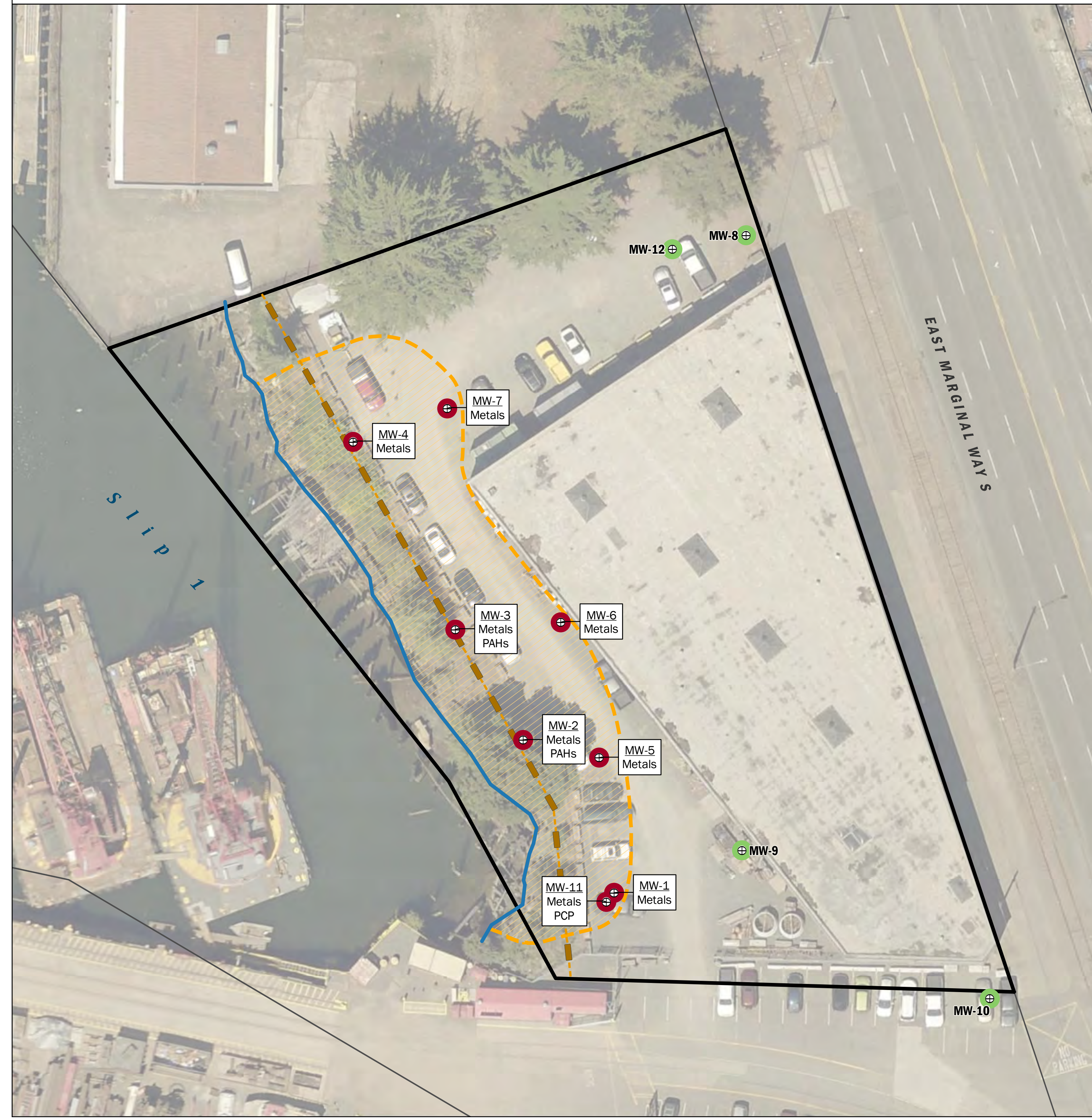
MAY-2020	BY: EAC / CH	FIGURE NO.
PROJECT NO. 150054	REVISED BY: - - -	10

T:\projects_8\Snopac_150054\Delivered\RIFS\10 Vadose and Saturated Soil Exceedances.mxd 2020-05-21 1:14:52 PM

2017



2018/2019



Analyte Groups with Exceedances include:

cPAHs

PCP

Metals (including Arsenic, Copper, Zinc)

Notes: *Exceedances represent detected concentration greater than the most stringent media-specific PCUL described in Table 4. Only analytes or analyte groups which have exceedances are labeled. See Table 4 for detailed analytical results.*

Exploration Type

- Monitoring Well

Analyte Group Exceedances

- One or More Analyte Groups Exceed
- No Exceedances

- Property Boundary
- King County Tax Parcel
- Mean Higher High Water (9 ft, NAVD88) (NOAA Lockheed Shipyard Station)
- Proposed Shoring Alignment
- Inferred Extent of Uplands Sandblast Grit-Containing Fill

N

0 25 50

Feet

Groundwater Exceedance Summary

Snopac Property Site Remedial Investigation

Seattle, Washington

Aspect CONSULTING

OCT-2019	BY: SJG / RAP	FIGURE NO.
PROJECT NO. 150054	REVISED BY: - - -	11

Basemap Layer Credits || Pictometry, King County

GIS Path: T:\projects_8\Snopac_150054\Delivered\RIFS\11 Groundwater Exceedance Summary.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 10/10/2019 || User: ecrumbaker || Print Date: 10/10/2019