UPLAND FEASIBILITY STUDY

Snopac Property
Facility Site ID No.: 1523145
Cleanup Site ID No.: 12463

Prepared for: 5055 Properties LLC

Project No. 150054 • December 20, 2023 FINAL

earth + water

Aspect
A Geosyntec Company

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Acronyms

Aspect	Aspect Consulting, LLC
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
bml	below mudline
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	cleanup action plan
CMMP	contaminated media management plan
COC	constituent of concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CPOC	conditional point of compliance
CUL	cleanup level
DCA	disproportionate cost analysis
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
GCMP	groundwater compliance monitoring plan
gpm	gallons per minute
GRA	General Response Actions
IA	Interim Action
IAWP	Interim Action Work Plan
IC	Institutional Controls
LDW	Lower Duwamish Waterway
mg/kg	milligrams/kilograms
mg/L	milligrams per liter
µg/L	micrograms per liter
MHHW	mean higher high water
MNA	monitored natural attenuation

MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PCP	pentachlorophenol
PCUL	preliminary cleanup level
PQL	practical quantification limits
RAL	remedial action level
RAO	remedial action objective
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling Analysis Plan
SBG	spent sandblast grit
SCAP	source control action plan
SEPA	State Environmental Policy Act
TBT	tributyltin
TEF	toxic equivalency factor
TEQ	toxic equivalent concentration
TPH	total petroleum hydrocarbon

Executive Summary

Aspect Consulting, LLC (Aspect) has prepared this Upland Feasibility Study Report (Upland FS) on behalf of 5055 Properties LLC, for the upland portion of the Snopac Property (the Site). The Site is 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 includes all upland and in-water areas impacted by historical releases of hazardous substances from the Property. Site groundwater, groundwater seeps, soil, and Slip 1 sediments have been 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) executed on July 15, 2019.

The Agreed Order requires separate FS Reports for the upland and in-water (sediment) portions of the Site, which are divided at the mean higher high water (MHHW) elevation. The scope of the Upland FS is for the upland portion of the Site above MHHW elevation. The intertidal and subtidal sediments (below MHHW elevation) are part of LDW Superfund site regulated by the United States Environmental Protection Agency (EPA).

All upland and sediment investigations are described in the Remedial Investigation (RI) Report, which determined the nature and extent of contamination in the upland and sediment portions of the Site (Aspect, 2023). Based on soil and groundwater quality (including intertidal seeps) and the intertidal and subtidal sediment data collected during the RI, the sandblast grit (SBG)-containing fill is the primary source of constituents of concern (COCs) at the Site in both upland and sediment media.

As required by the Agreed Order, an interim action (IA) was the completed in the uplands in accordance with an Interim Action Work Plan (IAWP; Aspect, 2020a). The IA scope included construction of a sheet pile shoring wall (shoring wall), which served as the IA western excavation limit inland of MHHW. The completed IA achieved the IAWP objectives of removing all SBG-containing fill and complying with soil remediation levels landward of the shoring wall, as reported in the Final Interim Action Report (Aspect, 2021d). Post-IA groundwater monitoring indicates Site COCs are naturally attenuating in Fill Unit groundwater. During the most recent event in April 2022, the COC exceedances in groundwater are limited to copper and nickel at two of five Fill Unit monitoring wells. The IA accomplished substantial contaminant source controls, contributing to the long-term protection of the adjacent LDW.

A compliance evaluation for the remaining uplands soil and groundwater post-IA conditions identified the media requiring cleanup evaluation in this Upland FS. The completed IA resulted in compliance of soils landward of the shoring wall. The remaining SBG-containing fill seaward of the shoring wall and above MHHW is the only contaminant source remaining on the uplands and is the primary media evaluated in this Upland FS.

This Upland FS evaluates three remedial alternatives and determines Alternative 1 to be the preferred remedial alternative. Remedial alternative 1 consists of SBG-containing fill removal (including completed IA), groundwater monitored natural attenuation (MNA), and institutional controls (ICs). The completed IA permanently removed all SBG-containing fill from the uplands landward of the shoring wall.

The removal of SBG-containing fill remaining above MHHW and seaward of the shoring wall can only be practicably removed during the in-water work. The in-water work will be conducted concurrently with the LDW sediment cleanup according to the LDW Record of Decision (ROD) (EPA, 2014), and the Explanation of Significant Differences (ESD) (EPA, 2021). The preferred remedial alternative for the upland portion of the Site will be selected by Ecology in the Upland Cleanup Action Plan (CAP).

1 Introduction

Aspect Consulting, LLC (Aspect) has prepared this Upland Feasibility Study Report (Upland FS) on behalf of 5055 Properties LLC, for the upland portion of 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. Site groundwater, groundwater seeps, soil, and Slip 1 sediments have been 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) executed on July 15, 2019.

The Agreed Order requires separate FS Reports be completed for the upland and in-water (sediment) portions of the Site, which are divided at the mean higher high water (MHHW) elevation. The scope of this FS is for the portion of the Site above MHHW elevation. This Upland FS is prepared in accordance with MTCA requirements for selection of cleanup actions. The intertidal and subtidal sediments (below MHHW elevation) are part of LDW Superfund site and regulated by the United States Environmental Protection Agency (EPA).

The Remedial Investigation (RI) Report (Aspect, 2023) was prepared to satisfy requirements of the Agreed Order and Washington Administrative Code (WAC) Sections 173-340-350(7) and 173-204-550(6). The completed RI Report determined the nature and extent of contamination in the upland and sediment portions of the Site.

As required by the Agreed Order, an interim action (IA) was the completed in the uplands in accordance with an Interim Action Work Plan (IAWP; Aspect, 2020a). The IA scope included construction of a sheet pile shoring wall (shoring wall) which served as the IA western excavation limit, inland of MHHW. The completed IA achieved the IAWP objectives of removing all sandblast grit (SBG)-containing fill and complying with soil remediation levels, as reported in the Final Interim Action Report (Aspect, 2021d).

This Upland FS has been prepared to satisfy requirements of the Agreed Order and WAC Sections 173-340-350(8) and 173-204-550(7). The purpose of this Upland FS is to develop and evaluate remedial alternatives for the upland portion of the Site using the criteria defined in 173-340-360 WAC, including a disproportionate cost analysis (DCA). This Upland FS develops a preferred remedial alternative for the upland portion of the Site which will ultimately be selected by Ecology in the Upland Cleanup Action Plan (CAP).

1.1 Site Description

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, SBG was disposed of directly on the bank at the head of Slip 1 on west side of Property, and then later behind the retaining wall present at the Property shoreface. Fill materials, composed of both soil and anthropogenic debris that includes spent SBG, railroad ties, coal fragments, glass shards, concrete, and brick or masonry fragments, were also dumped behind the retaining wall to bring the shoreface area of the Property to current grade.

Ground surface elevation within the uplands is approximately Elevation 15 feet[1]. A building formerly used as a warehouse existed on the Property during remedial investigations. This building was demolished in November 2020 to allow for the IA. The IA was completed in early 2021, and the Property is currently vacant, fenced, and stabilized for stormwater in accordance with the City of Seattle construction permit (Section 3.1).

Site groundwater, groundwater seeps, soil, and Slip 1 sediments have been impacted by historical releases of hazardous substances from the Property. Public and private Site investigations have been ongoing since 2004 and served as the findings of fact in the Agreed Order. For a detailed Site description, Site history, investigation summary, and environmental summary, see the RI and IAWP (Aspect, 2023 and 2020a, respectively).

Four soil units occur at the Site, which from the surface down are: (1) fill materials (Fill Unit); (2) older native units consisting of estuarine deposits (Estuarine Unit); (3) native alluvium (Alluvium Unit); and (4) over-consolidated glacial deposits that underly the Alluvium Unit at a depth greater than 150 feet. Upland contamination occurred in the Fill Unit and is associated with the SBG-containing fill.

The Fill Unit is a water table (unconfined), water-bearing unit that 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 beneath the Estuarine Unit aquitard.

The shoring wall installed during the IA fully penetrates the Fill Unit and the shallow portion[2] of the deeper Alluvium Unit. A tidal study was conducted to assess the hydraulic effect of the shoring wall on Site groundwater (Appendix A). The study determined tidal efficiency in the Fill Unit wells ranged from 0.9 to 1.5 percent at nearshore wells, an 85 to 98 percent reduction in tidal efficiency at these locations as a result of the shoring wall. Further, tidal response was not discernable in the two Fill Unit wells located farthest from the LDW (MW-12 and MW-17) further indicating the hydraulic cutoff effect of the shoring wall. After the shoring wall installation, the net (tidally averaged) groundwater flow direction in the Fill Unit is generally west towards the LDW and around the south end of the shoring wall where it then discharges to the LDW (Appendix A).

The confined Alluvium Unit is tidally influenced with groundwater level elevations ranging from 4 to 7.5 feet based on the 2017 and 2018 tidal study (Aspect, 2023). No substantial change was observed in the tidal responses in the Alluvium Unit as a result of the shoring wall, because the wall is not fully penetrating (Appendix A).

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[1] North American Vertical Datum (NAVD) of 1988. All elevations referenced in this Upland FS hereafter are relative NAVD88 vertical datum.

[2] The sheet pile shoring wall was installed to a depth of approximately 45 feet below grade.

The following sections summarize findings from the RI Report (Section 2) and the IA (Section 3) as a basis of this Upland FS.

2 Remedial Investigation Summary

Significant uplands environmental investigations occurred prior to the 2019 Agreed Order with Ecology, and additional uplands characterization was performed in 2019 under the Agreed Order. Sediment investigations were performed by the EPA and their consultants in Slip 1 from 1997 to 1998 and 2004 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 LDW Record of Decision (ROD; EPA, 2014). All upland and sediment environmental investigations are reported in the RI Report (Aspect, 2023) and satisfy the RI requirements of the Agreed Order.

The RI exploration locations in the uplands are shown on Figure 3. Groundwater seep samples collected seaward of MHHW are also shown, as the groundwater seeps are critical to evaluating groundwater exposure pathways in the Upland RI and FS.

The following sections summarize the RI Report conclusions as a basis of developing and selecting a remedial alternative for the final cleanup action in this Upland FS.

2.1 Contaminant Sources

Based on soil and groundwater quality (including intertidal seeps[3]), and intertidal and subtidal sediment data collected during the RI, the SBG-containing fill is the primary source of constituents of concern (COCs) at the Site in both upland and sediment media. The SBG contains metals typical of smelter slag and is the source of metals at the Site. This SBG-containing fill, which contains waste paint, is sourcing exceedances of preliminary cleanup levels (PCULs) in groundwater discharging to the LDW and, through erosion of the shoreface, in in-water sediments. COCs in intertidal sediments below MHHW are also associated with SBG-containing fill or pure SBG exposed on the shoreface.

The areal extent of SBG-containing fill in the uplands estimated in the RI is depicted on Figures 2 and 3 (Aspect, 2023). SBG-containing fill was also observed on the intertidal shoreface, indicating that active bank erosion of SBG is occurring.

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

Other potential sources of COCs at the Site include the historical coal burners, petroleum releases from underground storage tanks (USTs), and possibly treated wood pilings and dock materials. These subsidiary COC sources fall within the mapped area of SBG-containing fill shown on Figure 2, and are evaluated further in this Upland FS.

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[3] The seeps represent discharge of Site groundwater to Slip 1 of the LDW.

2.2 Preliminary Constituents of Concern

Concentrations of contaminants from SBG-containing fill exceeding upland PCULs established for LDW upland sites (Ecology, 2021) and in-water remedial action levels (RALs) established in the LDW ROD (EPA, 2014) are observed in uplands soil, groundwater, and sediments. Based on the RI data, the following analytes were identified as preliminary COCs for the Site (Aspect, 2023):

- Metals (arsenic[4], copper, lead, mercury, and zinc); nickel (groundwater only)
- Polycyclic aromatic hydrocarbons (PAHs)
- Pentachlorophenol (PCP)
- Polychlorinated biphenyls (PCBs)
- Tributyltin (TBT)
- Total petroleum hydrocarbons (TPHs; in a limited area of the uplands)

The extent of PCUL exceedances in uplands soil and groundwater coincides with the extent of SBG-containing fill. Inland of the SBG extent, including outside and within the footprint of the former building, fill soils exhibit isolated low-level concentrations of PAHs, PCBs, and metals that exceed PCULs but are typical of concentrations in urban fill soils[5]. There is no historical process on Site that explains the sporadic low-level exceedances outside of the SBG-containing fill.

Preliminary 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.

Additional soil and groundwater analytical results have been collected since the RI and are reported in this Upland FS. These results are used to establish the Upland COCs, described in Section 5.2.

2.3 Exposure Pathways and Potential Receptors

Ecology's *Lower Duwamish Waterway PCUL Workbook and Supplemental Information*, (PCUL Document; Ecology, 2021)[6], summarizes environmental transport and exposure pathways applicable to soil and groundwater.

The following exposure pathways, evaluated in accordance with Ecology's PCUL Document and MTCA guidance, are considered complete at the Site and applicable to the uplands:

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

[5] Only the SBG-containing fill was removed during the IA. The compliance of low-level exceedances outside of SBG-containing fill are discussed in Section 4.

[6] The RI used PCULs from a 2019 PCUL Document. The most recent PCUL Document in May 2021 does not change the RI conclusions (Ecology, 2021).

- Direct contact of ecological (aquatic) receptors to surface water contaminated by Site groundwater discharge.
- Direct human exposure for an employee or construction worker to soil via ingestion, inhalation, or dermal absorption.
- Direct human exposure to groundwater via dermal absorption, for a construction worker working at or below the water table.

This Upland FS evaluates remedial alternatives based on their ability to mitigate these exposure pathways. The RI also determined the following exposure pathways to be complete for in-water sediments and surface water, which serve as a basis of the in-water LDW Superfund site sediment cleanup:

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

3 Interim Action Summary

The SBG-containing fill is a significant source of contaminants to upland groundwater discharging to the sediments and surface waters of the LDW. The removal of upland SBG-containing fill was conducted as an Interim Action as defined in MTCA (WAC 173-340-430 (1)). The plan for the IA was approved by Ecology in a Final Interim Action Work Plan (IAWP; Aspect, 2020a).

The construction of a shoring wall was required to complete the IA remedial excavation in the uplands. The completed IA permanently removes sources of contamination to groundwater and the LDW and will not conflict with reasonable alternatives for the final cleanup action as required by MTCA (WAC 173-340-430[3][b]).

After completion of the Final IAWP activities, Ecology required groundwater monitoring to assess Site groundwater quality post-IA completion, and to verify the empirical demonstration of soil compliance with remediation levels for carcinogenic polycyclic aromatic hydrocarbons (cPAHs)[7] and naphthalene.

The IA Report summarizes the details of all completed IA activities and the post-IA groundwater monitoring, and satisfies the Agreed Order requirements for the IA (Aspect,

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[7] Total toxic equivalent concentration (TEQ) of benzo(a)pyrene calculated in accordance with WAC 173-340-708(8)(e). **Hereafter, all references to cPAH concentrations are total cPAH TEQ concentrations.**

2021d). This section summarizes the IA activities and findings as a basis of this Upland FS.

3.1 Interim Action Completion

The Final IAWP (Aspect, 2020a) required removal of SBG-containing fill landward of the shoring wall on the uplands at the Site. The completed IA achieved the IAWP objectives of removing SBG-containing fill and achieving soil remediation levels.

The IA was a component of construction permitted by the City of Seattle (City) Construction Permit 66942-CN (construction permit) issued on May 26, 2020. The construction permit included activities required to conduct the IA activities of building demolition, shoring wall installation, side-sewer connection, contaminated soil excavation, temporary dewatering, and backfill activities. Construction permit activities preceding remedial excavation began in August 2020. The IA soil removal activities started on December 26, 2020, and were completed on January 22, 2021. The IA Report (Aspect, 2021d) summarizes the details of all completed IA activities.

Removal of SBG-containing fill required temporary excavation dewatering and night work during low tides[8] the week of January 11, 2021. Removal of SBG-containing fill extended beyond the planned excavation limits[9] at shallow depths (less than 4 ft below ground surface [bgs]). In total, 5,983 tons of SBG-containing fill material were removed from the final IA excavation limits shown on Figure 4. The IA achieved permanent removal of nearly 6,000 tons of contaminated soil from the Site uplands immediately adjacent to the LDW. Nearly 80,000 gallons of groundwater were extracted during excavation in order to meet IA objectives, providing additional removal of contamination (in dissolved phase) from within the source area.

The IA excavation encountered a high density of wood pilings extending through the Estuarine Unit and into the Alluvium Unit. The wood pilings were cut at the Estuarine Unit at the bottom of the IA excavation, and removed from the Site and disposed with the contaminated soil.

The completed IA achieved the IAWP objectives of removing SBG-containing fill and achieving soil remediation levels. The completed IA has accomplished substantial contaminant source control along the LDW shoreline, thus contributing to the long-term protection of the adjacent LDW.

3.1.1 Soil Compliance with Remediation Levels

The Final IAWP (Aspect, 2020a) established performance monitoring analytes for all areas of IA excavation as:

- Metals (arsenic, copper, lead, mercury, and zinc)
- Polycyclic aromatic hydrocarbons (PAHs)

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[8] Excavation below elevation 7 feet NAVD88 only occurred at tides less than 1 feet NAVD88 in accordance with the IAWP.

[9] The planned excavation limits in the Final IAWP estimated 3,500 tons of SBG-containing fill to be removed based on the extent of SBG- containing Fill inferred in RI Report (Aspect, 2023).

- Polychlorinated biphenyls (PCBs)

The IA soil performance monitoring included the following analytes in selected areas of the IA excavation:

- Total petroleum hydrocarbons (TPH) as gasoline-, diesel-, and oil-range organics in the area around MW-2
- Pentachlorophenol (PCP) in the area around MW-11 (Figure 3)

During the IA, Ecology approved adjustment of soil remediation levels for two performance monitoring analytes: cPAHs and naphthalene. The soil remediation level was based on empirical demonstration of soil concentrations protective of groundwater discharging to sediment and surface water in accordance with MTCA (Aspect, 2021a; Aspect, 2021b). In addition, remediation levels used to evaluate IA soil compliance were updated based on Ecology's current PCUL Document (Ecology, 2021) and laboratory practical quantification limits (PQLs).

The residual soils within the excavation sidewalls and bottom comply with the IA remediation levels when applying the MTCA three-fold soil compliance criteria (WAC 173-340-740(7)(d) and (e)) (Aspect, 2021d). This compliance was limited to soils at the extent of the IA remedial excavation in order to verify the completion of the IA excavation. The soil compliance for the entire uplands is evaluated in Section 4.

3.2 Post-Interim Action Groundwater Monitoring

After completion of the Final IAWP activities, four quarters of post-IA groundwater monitoring was conducted to assess Site groundwater quality and verify the empirical demonstration of soil compliance with remediation levels for cPAHs and naphthalene.

Groundwater well locations and the analyte schedule were approved by Ecology in the "Sampling and Analysis Plan for Groundwater Confirmation Monitoring" (SAP; Aspect, 2021c). New monitoring wells MW-13 through MW-17 were installed on June 21 and 23, 2021 in accordance with the SAP. The locations of the five new monitoring wells (MW-13 through MW-17) and the two existing monitoring wells (MW-8 and MW-12) are shown on Figure 5. The existing groundwater monitoring network consist of five Fill Unit monitoring wells, and two Alluvium Unit monitoring wells (Figure 5).

Wells MW-13, MW-15, and MW-16 are located near the shoring wall to assess the quality of Fill Unit groundwater in the area as close as practicable to the LDW. The shoring wall redirects flow of groundwater; therefore, Fill Unit wells MW-13 and MW-16 are positioned near the wall's southern and northern ends, respectively. The tidal study determined that Fill Unit groundwater flows around the southern end of the shoring wall at MW-13 where it discharges to the LDW. MW-14 is also near the shoring wall and is screened in the Alluvium Unit. MW-17 is located east of the completed IA area to assess the quality of upgradient Fill Unit groundwater entering the Site.

Four quarterly post-IA groundwater monitoring events were conducted in 2021 and 2022 and results discussed in Section 4.3.

4 Post-Interim Action Uplands Compliance

The section evaluates compliance of remaining uplands soil and groundwater for current (post-IA) conditions in order to identify the media requiring cleanup evaluation in this Upland FS.

4.1 Soil Seaward of Shoring Wall

SBG-containing fill remains on the seaward side of the shoring wall (referred to as the "shoreface"). The soil analytical results from uplands soil seaward of the shoring wall (Tables 1A and 1B) do not comply with remediation levels. This remaining SBG-containing fill seaward of the shoring wall is the primary media requiring cleanup evaluation in this Upland FS.

4.2 Soil Landward of Shoring Wall

The competed IA removed all SBG-containing fill landward of the shoring wall and verified compliance with remediation levels at the IA lateral and vertical excavation extents. The completed IA confirmed the SBG-containing fill lateral extent was limited at the former building footprint and vertical extent limited by the Estuarine Unit aquitard. The following sections evaluate compliance of all remaining soils analytical results (Tables 2A and Tables 2B) landward of shoring wall to assess the need for cleanup evaluation for this portion of the uplands.

4.2.1 Pentachlorophenol

An analytical reporting limit of 0.05 milligrams per kilogram (mg/kg) is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level for PCP is established at this PQL.

In accordance with the IAWP (Aspect, 2020a), soil samples were collected in the one location where PCP was detected in groundwater at the Site. The remaining vadose and saturated soil landward of the shoring wall complies with the PCP soil remediation level[10] (Tables 2A and 2B).

4.2.2 TPH

The IAWP evaluated the soil and groundwater data in the RI Report to determine TPH analytes for soil performance monitoring during the IA. The lack of any gasoline-range total petroleum hydrocarbons or benzene, toluene, ethylbenzene, and xylenes (BTEX) exceedances in Site groundwater indicates that gasoline-range TPH and BTEX concentrations in Site soil are protective of groundwater. It was also demonstrated that PAHs are the appropriate analytes to address potential transport of diesel- and oil-range TPH at the Site, and PAHs were therefore selected as IA soil performance monitoring analytes (Aspect, 2023).

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[10] Two 2017 soil samples (MW8-5-6 and MW10-5-6) from outside the extent of SBG-containing fill have reporting limits greater than the soil remediation level of 0.5 mg/kg.

One RI soil sample exceeded a generic 1,500 mg/kg soil cleanup level based on direct contact[11] where an 8,000-gallon diesel UST was historically present (Figure 2). To address direct-contact risks associated with the petroleum mixture, IA verification soil samples collected adjacent to this location were analyzed for gasoline-, diesel-, and oil-range TPH. The remaining vadose and saturated soil landward of the shoring wall complies with the generic TPH soil remediation level for direct contact (Tables 2A and 2B).

4.2.3 Empirical Demonstration: Soils Protective of Leaching

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 cleanup levels (WAC 173-340-747(9)). The MTCA requirements for an 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)). As of 2004, high concentrations of contaminants (particularly arsenic) had migrated from the SBG-containing fill into upland groundwater and then the intertidal Seep 76. That is 13 to 15 years prior to collection of the Site groundwater monitoring data, demonstrating sufficient time has elapsed to observe contaminant migration into uplands groundwater.

Soil remediation levels for two upland Site COCs (cPAHs and naphthalene) were established based on empirical demonstration of soil concentrations protective of groundwater in accordance with MTCA (Aspect, 2021d). The Site sediment naphthalene data in the RI Report (Aspect, 2023) empirically demonstrate that the Site uplands soils were protective of LDW sediment before the IA started. The naphthalene data from Site seeps indicate that groundwater discharge, and thus uplands groundwater and associated soils, are also protective of discharge to LDW surface water for all receptors before the IA started.

The completed IA achieved compliance with the cPAH soil remediation level of 0.074 mg/kg. Compliance with the naphthalene soil remediation level of 0.056 mg/kg is demonstrated using the MTCA three-fold soil compliance criteria in the next section.

4.2.4 Three-Fold Evaluation for Soil Compliance

The vadose and saturated soils remaining landward of the shoring wall comply with the remediation levels when applying the MTCA three-fold soil compliance criteria (WAC 173-340-740(7)(d) and (e)). Table 3 summarizes this evaluation, which is described by COC below.

Concentrations of arsenic, mercury, zinc, PAHs (acenaphthene, anthracene, fluoranthene, naphthalene, and pyrene) and total PCBs exceed remediation levels in one or more samples of remaining soil. However, the residual concentrations for each of these

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[11] Generic soil screening level based on direct contact and applicable to model remedy cleanups for petroleum-contaminated soil where gasoline-range TPH is present. The screening level is compared against the summed concentration of gasoline-, diesel-, and oil-range petroleum fractions (Ecology, 2017).

analytes in the collective soil remaining landward of the shoring wall (sample data combined) achieves the MTCA three-fold compliance criteria, as follows:

- The 95 percent upper confidence limit (95 percent UCL) concentration is less than the remediation level.
- Residual soil concentrations are less than two times the remediation level, with two exceptions described below.
- The frequency of soil sample exceedance is less than 10 percent.

For this evaluation, the 95 percent UCL values were calculated using the EPA's ProUCL version 5.1 software.[12] The ProUCL calculation outputs for each constituent are included in Appendix B.

COCs in soil were detected in soil at concentrations greater than two times their remediation level at the following two sample locations:

- **Zinc at MW-10**. Zinc was detected at a concentration of 393 mg/kg, 4.6 times the 85 mg/kg remediation level in a sample of saturated soil within the Fill Unit (5- to 6-foot depth). As shown on Figure 3, MW-10 is located in a parking area off the south end of the Property, well outside (and hydraulically upgradient of) the former area of SBG-containing fill, which is the source of contamination on the Property. Zinc is commonly present in urban soils at concentrations much higher than the natural background conditions that the remediation level is based. This is due in large part to zinc's presence at high concentrations in vehicle brakes (e.g., ranging from 9,600 to 18,000 mg/kg; Ecology, 2013) and in tires (10,000 mg/kg; Ecology, 2006). The abrasion and runoff of zinc from vehicle brakes and tires is represented in zinc concentrations measured in stormwater solids sampled from in urban areas across western Washington: median and maximum zinc concentrations of 373 and 9,250 mg/kg, respectively, reported by Ecology (2015). Therefore, while an area background concentration of zinc has not been formally determined in accordance with MTCA, we conclude that the detected zinc concentration in MW-10 soil is due to area background conditions unrelated to the Site. In addition, the detected zinc concentration in groundwater at new Fill Unit monitoring well MW-17, located adjacent to MW-10[13], was less than the PCUL, indicating that zinc soil concentrations in that immediate area are not adversely impacting groundwater.
- **Non-Carcinogenic PAHs at FB-4A**. Three non-carcinogenic PAHs (anthracene, fluoranthene, and pyrene) were detected at concentrations greater than two times their respective remediation levels in a sample of saturated soil from boring FB-4A, located in a parking area near the northern Property boundary (Figure 3). PAHs are ubiquitous in urban settings due to a variety of sources, including vehicle emissions and tire dust. The low-level detections of these PAHs at FB-4A—0.11 mg/kg, 0.43 mg/kg, and 0.41 mg/kg, respectively—are in the range of

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[12] EPA's statistical software package for analysis of environmental data sets (https://www.epa.gov/land-research/proucl-software).

[13] MW-10 is screened in the deeper Alluvium Unit.

concentrations detected in residential neighborhood soils throughout Seattle (Ecology, 2011). Therefore, while area background concentrations of PAHs have not been formally determined in accordance with MTCA, we conclude that the detected PAHs concentration in FB-4A soil are due to area background conditions unrelated to the Site. In addition, no PAHs were detected above PCULs at new Fill Unit monitoring well MW-16, located downgradient of FB-4A, indicating that PAH soil concentrations in the FB-4A area are not adversely impacting groundwater.

- **Total PCBs at SB-8.** PCBs were detected at a concentration (0.0066 mg/kg) greater than three times the Total PCBs remediation level in vadose soil from boring SB-8, located in the northeastern footprint of the former building (Figure 3). No PCBs were detected (<0.002 mg/kg) in the two soil samples collected beneath the location of formerly stained concrete next to a former electrical transformer (Aspect, 2023). No PCBs were detected (<0.002 mg/kg) in any of the other seven soil samples collected in the former building footprint, including two deeper SB-8 samples (from 10.5-to-11.5, and 13-to-14 foot depths).

  The SBG-containing fill was placed with the former building present and is the only known source of PCBs at the Site. Low-level concentrations of PCBs are relatively widespread in urban soils (Ecology, 2015).

  In addition, during the post-IA groundwater monitoring to date, no PCBs were detected (with a very low reporting limit, <0.005 ug/L) in any Site monitoring wells including MW-15 and MW-16 located downgradient of SB-8 (Table 4). In addition, PCBs were never detected in upland groundwater during sampling conducted prior to the IA (Aspect, 2023). The groundwater results empirically demonstrate that PCB concentrations in Site soils, including the shallow soil at SB-8, are not adversely impacting Fill Unit groundwater.

Based on application of the MTCA three-fold soil compliance criteria, with consideration of area background concentrations and the empirical groundwater data, we conclude that the vadose and saturated soils remaining landward of the shoring wall (Tables 2A and Tables 2B, respectively) comply with the remediation levels. Soils landward of the shoring wall are therefore not considered for further cleanup action in this Upland FS.

4.3 Groundwater

Four post-IA groundwater monitoring events were conducted in June 2021, November 2021, January 2022, and April 2022. The groundwater monitoring results were screened against the most stringent groundwater PCUL for nonpotable groundwater (GWs #2-5) established in the PCUL Document (Ecology, 2021). For cPAHs, total PCBs, and PCP, the analytical method reporting limit, which is the PQL for purposes of this monitoring program, is greater than the PCUL. In accordance with WAC 173-340-700(6)(d), the groundwater PCUL for those analytes is established at their respective PQLs (Aspect, 2021c).

Table 4 presents the groundwater analytical results from the four rounds of monitoring, with exceedances of PCULs highlighted in blue. The first round of sampling indicates exceedances for selected constituents in four out of five Fill Unit wells. By the fourth event in April 2022, exceedances only occurred at two of the five Fill Unit monitoring wells. There are no PCUL exceedances in the two Alluvium Unit wells[14].

More specifically for the Fill Unit wells, no exceedances were detected for the organic COCs TPH, PCP, PCBs, and non-carcinogenic PAHs. These four events confirm compliance with groundwater PCULs for TPH, PCP, PCBs, and non-carcinogenic PAHs. Therefore, COCs in groundwater that exceeded PCULs in at least one result and require additional monitoring to demonstrate compliance are: arsenic, copper, nickel, zinc, naphthalene, and cPAHs.

As discussed in Section 3.1.1, soil remediation levels for cPAHs and naphthalene are dependent on an empirical demonstration of the protection of groundwater. Naphthalene was detected at MW-13 at a concentration of 1.5 µg/L, marginally exceeding the PCUL of 1.4 µg/L. This is one exceedance out of 20 total samples, and the two subsequent naphthalene results in MW-13 groundwater are less than the PCUL indicating that the adjusted soil remediation level is protective of groundwater.

Low-level exceedances of cPAHs were detected in new shoreline Fill Unit well MW-13 in three of four events and detected below the PCUL in the most recent event. At previously existing Fill Unit well MW-12 located east (upgradient) of the IA excavation area, low-level exceedances of cPAHs were detected in two of four events, and no cPAHs were detected in the two most recent events. The cPAHs are highly hydrophobic and the part-per-trillion (ppt) concentrations ranging from 7 to 20 ppt cPAHs detected in groundwater can be due to minor particulate matter present in a groundwater sample. The decreasing trend of cPAH groundwater exceedances at MW-12 and MW-13 and the current results complying with the stringent PCUL of 8 ppt indicate the adjusted soil remediation level is protective of groundwater.

The dissolved metals data indicate exceedances for arsenic, copper, nickel, and zinc in Fill Unit wells. Consistent with organics, the dissolved metals concentrations decreased over the four groundwater monitoring events. Only low-level copper and nickel exceeding their respective PCUL during the most recent event at only two of the five Fill Unit monitoring wells. The dissolved copper concentrations of 3.92 and 3.27 µg/L marginally exceed a stringent PCUL of 3.1 µg/L. Similarly, dissolved nickel occurred at a concentration of 9.51 µg/L marginally exceeding a stringent PCUL of 8.2 µg/L. These data suggest that dissolved metals concentrations are naturally attenuating as illustrated by a stable and shrinking plume.

4.4 Media Requiring Cleanup Evaluation

This section establishes three areas of contaminated upland media that, following successful completion of the IA, require evaluation in this Upland FS. The areas are based on exceedances of soil and groundwater CULs.

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[14] There is one outlier PCB PCUL exceedance at MW-14 that is a laboratory-estimated value. The estimate result was “J” flagged because the laboratory’s QC sample and its duplicate did not meet the laboratory’s relative percent difference (RPD) limits.

4.4.1 SBG-Containing Fill Soils Remaining on Shoreface

The compliance of soils landward of the shoring wall is established in Section 4.2. However, the SBG-containing fill remaining seaward of the shoring wall is a significant source of COCs in both upland and in-water media. This SBG-containing fill, which is 15 to 20 feet wide from shoring wall to MHHW, is sourcing exceedances of PCULs in groundwater discharging to the LDW and, through erosion, contributing to exceedances in in-water sediments.

The SBG-containing fill remaining seaward of the shoring wall and landward of MHHW on the shoreface is the only source of contamination remaining on the uplands and is estimated to be approximately 2,500 cubic yards (CY) in quantity.

4.4.2 Wood Pilings on Shoreface

The IA excavation encountered and removed a high density of wood pilings. Prior to IA excavation, several wood pilings extending to depths of approximately 30 feet were removed using vibratory equipment to allow for construction of the shoring wall. The other wood pilings encountered during IA excavation were cut at the top of the Estuarine Unit, leaving wood piling remaining in the Alluvium Unit landward of the shoring wall. The post-IA groundwater monitoring results from all Fill Unit and Alluvium Unit monitoring wells were less than naphthalene CUL, indicating the remaining pilings are not a substantive source of naphthalene to groundwater across the Site.

The same density of wood pilings are anticipated in the SBG-containing fill on the shoreface. Ecology has identified the wood pilings remaining seaward of the shoring wall as a potential source of contamination to soil and groundwater and they are therefore a media evaluated for cleanup in this Upland FS.

4.4.3 Fill Unit Groundwater

As described in Section 4.3, the post-IA groundwater monitoring event indicated exceedances for arsenic, copper, nickel, zinc, naphthalene and cPAHs in selected Fill Unit wells. The post-IA groundwater monitoring results indicate Site COCs in groundwater are naturally attenuating as illustrated by decreasing concentrations and a stable and shrinking plume. During the most recent event in April 2022, the COC exceedances are limited to copper and nickel at only two of the five Fill Unit monitoring wells. This Upland FS evaluates Fill Unit groundwater as a media requiring cleanup.

Because there have been no exceedances of groundwater CULs detected in the Alluvium Unit, Alluvium Unit groundwater is not included as a media requiring cleanup in this Upland FS.

5 Cleanup Requirements

This section establishes the cleanup requirements for evaluation of remedial alternatives in this Upland FS.

5.1 Applicable, Relevant, and Appropriate Requirements (ARARs)

The MTCA regulations (Chapter 70.105D Revised Code of Washington [RCW]) require that cleanup actions comply with applicable state and federal laws (WAC 173-340-360(2)a(iii)), which includes legally applicable requirements as well as requirements that determined to be relevant and appropriate. These requirements are collectively referred to as ARARs. The ARARs identified for the uplands Site are in Table 5.

5.2 Constituents of Concern

The RI Report (Aspect, 2020a) developed preliminary COCs based on initial screening against the most-stringent PCUL as summarized in Section 2.2. The IAWP developed soil performance analytes for IA performance monitoring; these results were evaluated for compliance in Section 4 and form a basis for updating the Site COC list for purposes of this Upland FS.

IA soil verification samples in the vicinity of the single groundwater exceedance complied with PCP soil remediation levels. Additionally, the post-IA groundwater did not detect PCP in MW-13, which was installed in the former location of MW-11. Therefore, PCP is not retained as a COC[15].

Similarly, IA soil verification samples analyzed for TPH in the vicinity of the soil sample collected at MW-2 complied with soil remediation levels. Additionally, the post-IA groundwater did not detect TPH in groundwater in MW-13. Based on the removal of TPH in soil exceeding the generic screening level, TPH is not retained as a COC.

Based on the post-interim action compliance results, the following are the Upland COCs retained for evaluation in the Upland FS:

- Metals (arsenic, copper, lead, mercury, and zinc); nickel (groundwater only)
- Polycyclic aromatic hydrocarbons (PAHs)
- Polychlorinated biphenyls (PCBs)
- Tributyltin (TBT)

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[15] Note there are two soil samples from the RI (MW8-5-6 and MW10-5-6) that have reporting limits of PCP greater than the soil remediation levels. These sample locations were collected from outside the extents of soil contamination and the elevated reporting limits do not indicate a CUL exceedance or soils out of compliance.

5.3 Cleanup Standards

This section proposes the soil and groundwater CULs for the Upland COCs and the points of compliance for those CULs. The final cleanup standards will be established in the Upland CAP.

5.3.1 Soil Cleanup Levels

Table 6 presents the most-stringent PCULs, the IA remediation levels, the PQLs, and, based on those, the CULs for soil. The exposure pathway with the most stringent soil PCUL is leaching to groundwater (for surface water or sediment protection; pathways SL-3 through SL-7). For TBT, soil erosion into LDW sediment (pathway SL-8) was the most stringent exposure pathway and soil PCUL basis. These soil PCULs apply irrespective of future land use, but they are also protective of direct contact for unrestricted land use (pathway SL-1).

Soil remediation levels for two Upland COCs (cPAHs and naphthalene) were established based on empirical demonstration of soil concentrations protective of groundwater in accordance with MTCA (Aspect, 2021d). The completed IA achieved compliance with the naphthalene soil remediation level of 0.056 mg/kg. The soil remediation level for naphthalene is less than the 1,600 mg/kg PCUL based on unrestricted direct contact with soil. Therefore, the soil remediation level for naphthalene of 0.056 mg/kg is anticipated to be protective of all exposure pathways and appropriate as the soil CUL. Of the 20 Fill Unit groundwater samples analyzed for naphthalene after the IA, only one groundwater sample (from MW-13) detected a naphthalene concentration of 1.5 ug/L greater than the PCUL of 1.4 ug/L. These groundwater results verify that the soil remediation level is an appropriate soil CUL.

The most stringent cPAH PCUL is 0.00031 mg/kg in vadose soils and 0.000016 mg/kg in saturated soils. These PCULs are based on leaching to groundwater for LDW surface water protection and are one to two orders of magnitude less than the 0.003 mg/kg analytical PQL for cPAH.[16] The IA achieved compliance with a cPAH soil remediation level of 0.074 mg/kg that was demonstrated to be protective of groundwater. The soil remediation level is less than the 0.19 mg/kg cPAH PCUL based on unrestricted direct contact and is therefore protective of all exposure pathways and appropriate as the soil CUL.

An analytical reporting limit of 0.002 mg/kg is achievable for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil CUL for total PCBs is established at this PQL.

5.3.2 Groundwater Cleanup Levels

The RI Report (Aspect, 2020a) established 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. The most stringent PCULs for non-potable water were established as screening levels in the RI Report and included in Table 7.

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[16] The analytical reporting limits for individual cPAHs is 0.002 mg/kg; the PQL for total cPAH TEQ includes application of toxicity equivalency factors (TEFs) and summation of the individual cPAH reporting limits.

For cPAHs and total PCBs, the analytical method reporting limit, which is the PQL, is greater than the PCUL. In accordance with WAC 173-340-700(6)(d), the groundwater CUL for those analytes is established at the respective PQL.

5.3.3 Points of Compliance

Under MTCA, the point of compliance is the location where the CULs must be attained in any specific media. The following points of compliance will be used to develop and evaluate remedial alternatives in this Upland FS:

Soil: Using CULs protective of the applicable exposure pathways, three soil points of compliance are identified:

- For protection of direct contact, the proposed soil point of compliance is in the upper 15 feet bgs throughout the upland Site, based on a reasonable maximum depth of excavation and assumed placement of excavated soils at the surface where contact occurs.
- For protection of leaching of contaminants from the vadose soil to groundwater, with subsequent discharge to surface water and/or sediments, the proposed point of compliance for vadose soil is the full vertical extent of the vadose zone throughout the upland Site.
- For protection of leaching of contaminants from the saturated soil to groundwater, with subsequent discharge to surface water and/or sediments, the point of compliance for saturated soil is throughout the saturated zone throughout the upland Site.

Groundwater: Discharge to surface water is the highest beneficial use of groundwater for the Site. MTCA allows for a conditional point of compliance (CPOC) for groundwater discharging to a surface water receiving body. Based on the Fill Unit groundwater flow discharge at the southern end of the sheet pile wall, MW-13 is positioned at the downgradient edge of the upland portion of the Site and as close as practicable to the groundwater discharge location. The final groundwater point of compliance will be determined by Ecology and is subject to completing the removal of SBG-containing fill seaward of the shoring wall to be conducted concurrently with the in-water sediment cleanup.

5.4 Remedial Action Objectives (RAOs)

Remedial action objectives (RAOs) are specific goals to be achieved by remedial alternatives that meet cleanup standards and provide protection of human health and the environment under a specified land use. Ecology has the following objectives for the LDW source control program (Ecology, 2016):

- The near-term goal of source control is to address existing, ongoing sources of contamination to the LDW, so that in-waterway sediment cleanup can begin without the risk of recontamination above remedial action levels (RALs), as defined in EPA’s ROD.
- The long-term goal is to minimize risk of re-contaminating sediments above the sediment cleanup standards established in the ROD.

These source control objectives were a basis of the completed IA and remain objectives for this Upland FS.

The RAOs established for the uplands are as follows:

- **RAO 1:** Prevent direct human contact with contaminated Site soil and/or groundwater containing contaminants at concentrations above CULs.
- **RAO 2:** Prevent discharge of Site groundwater contaminants to the LDW surface water and sediments at concentrations above CULs.
- **RAO 3:** Prevent erosion of soil on shoreface into the LDW sediments.

RAOs are generally achieved by elimination of the associated exposure pathway. Pathway-specific exposure elimination can be accomplished through contaminant removal or treatment to meet chemical- and media-specific cleanup standards at specified points of compliance. Exposure elimination can also be accomplished through institutional controls.

6 Remedial Technology Screening

This section identifies and screens remedial technologies that may be effective cleanup action components to satisfy the RAOs defined in Section 5.4. General Response Actions (GRAs) represent categories of remedial technologies that may involve elimination or destruction of hazardous substances via engineered or natural physical, biological, or chemical processes; reduction in risk of exposure to hazardous substances via engineering or institutional controls; or some combination of protection mechanisms.

All relevant and potentially applicable remediation technologies associated with these GRAs were screened based on their potential applicability for Site COCs and are summarized in Table 8. The following technologies were retained for purposes of developing and evaluating remedial alternatives:

- **Removal.** Removal of the source of contamination represents a permanent remediation of the uplands. The completed IA removed 5,893 tons of SBG-containing fill (including wood pilings in Fill Unit) from the uplands. Removal of the remaining SBG-containing fill on the shoreface will require construction from in-water. Removal and off-Site disposal is the most permanent remedial technology and is retained for alternative development. Removal with on-Site pre-treatment and off-Site disposal is not retained as there is no remedial or cost benefit to treat soils prior to disposing off-Site. Removal with on-Site treatment and reuse is not retained for alternative development as the remedial technology is not applicable to all Site COCs.

- ***In-situ* Containment.** *In-situ* containment technologies (e.g., capping and/or impermeable barriers) are designed only to inhibit exposure pathways and do not reduce concentrations or toxicity of contaminated media. Capping is not retained as it would not address media requiring cleanup evaluation. Any remedial benefit of an impermeable barrier for groundwater would be accomplished by the existing sheet pile shoring wall; therefore, an impermeable barrier is not retained for alternative development.

- ***In-situ* Treatment.** *In-situ* treatment technologies can potentially reduce the concentration, mobility, and/or toxicity of a contaminated media. These technologies may rely on physical, biological, and/or chemical mechanisms to transform or destroy the target contaminants.

  In-situ chemical treatment of groundwater is retained for alternative development. The immobilization of dissolved metals from groundwater systems is demonstrated by sorption, precipitation, and co-precipitation processes and the use of iron-based media (ferrous iron or zero-valent iron) has been demonstrated effective at immobilizing dissolved metals in groundwater systems. The *in-situ* treatment of cPAHs in groundwater is feasible with sorptive-based media (e.g., granular activated carbon). Placement of media can be through amended backfill, large-diameter augers, and/or injection equipment.

- **Monitored Natural Attenuation (MNA).** MNA is a cleanup technology that relies on natural attenuation processes to achieve RAOs within a reasonable time frame. Natural attenuation is the reduction of contaminant concentrations over time through natural processes such as precipitation, sorption, dilution, dispersion, and/or biodegradation. MNA requires compliance monitoring to ensure that the anticipated concentration reductions occur at an acceptable rate, and that protection of human health and the environment is achieved. MNA of groundwater is retained for alternative development.

- **Groundwater Extraction and Treatment.** Groundwater extraction and treatment, or “pump and treat”, is not retained for alternative development because the Fill Unit groundwater system is inadequate to support extraction, and the cost to construct and operate a system is infinitely disproportionate to any environmental benefit given the post-IA groundwater conditions.

- **Institutional Controls.** Institutional Controls (ICs) are administrative or engineering measures undertaken to limit or prohibit activities that may interfere with a cleanup action or result in exposure to contaminated media.

  The completed IA implemented ICs of interim fencing and signage to restrict human access and use of the shoreface and tidelands. Maintenance of these existing ICs and additional ICs are retained for alternative development.

7 Remedial Alternatives

Three remedial alternatives are developed for evaluation in this Upland FS, each of which incorporates the completed IA:

- Alternative 1 – SBG-Containing Fill Removal, Partial Wood Piling Removal, Groundwater MNA, ICs

- Alternative 2 – SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater MNA, and ICs

- Alternative 3 – SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater Treatment and MNA, and ICs

The following sections describe each remedial alternative component and assumptions necessary for estimating cost.

7.1 Alternative 1 – SBG-Containing Fill Removal, Partial Wood Piling Removal, MNA, ICs

Remedial Alternative 1 (conceptually depicted on Figure 6) consists of the following components:

- **SBG-Containing Fill Removal** – The remaining SBG-containing fill seaward of the shoring wall and landward of MHHW would be removed and disposed of off-Site at a Subtitle D disposal facility as non-dangerous special waste. The shoreface removal would be conducted as in-water work using barged equipment.

The removal limits would extend to the maximum extent practicable, assumed to be the northern and southern Property boundaries. Removal depth is assumed as the top of the Estuarine Unit consistent with the IA, and to an average depth of 11 feet bgs. Remaining soil analytical results from the saturated zone collected from the Estuarine Unit confirm that removal to the Estuarine Unit will achieve soil CULs (Table 2B)[17]. The removal would include cutting the wood pilings at the top of the Estuarine Unit, and removal of cuttings with the SBG-containing fill for off-Site disposal.

Backfill would re-establish stable slopes that both avoid a net fill below ordinary high-water mark (OHWM) and preserve upland land uses. Over-steepened and vertical sections would be replaced with stable slopes. The backfill surface would consist of the smallest substrate that would remain stable on the slopes. Above OHWM, the slope would be flattened to the extent possible up to the existing grade at the shoring wall. The restoration requires modifications to the shoring wall by restoring stormwater outfalls and cutting the top of the shoring wall to the restored grade. This restored shoreface area would be planted with a community of native trees, shrubs and herbaceous species to increase riparian habitat function.

- **Groundwater MNA –**The post-IA groundwater monitoring data suggest Site COCs in groundwater are naturally attenuating as illustrated by decreasing concentrations and stable and shrinking plume. During the most recent event in April 2022, the COC exceedances are limited to copper and nickel at two of the five Fill Unit wells. Additional groundwater monitoring will be conducted until four consecutive results comply with CULs to verify upland groundwater compliance landward of the shoring wall. Once compliance is demonstrated, no additional groundwater monitoring is planned until implementation of the in-water cleanup.

  A Groundwater Compliance Monitoring Plan (GCMP) will be developed during design of the SBG-containing fill removal and in-water sediment cleanup. The GCMP will report all completed groundwater monitoring results, evaluate MNA progress, and establish the final groundwater cleanup standards to be approved Ecology and establish the final groundwater points of compliance of groundwater monitoring wells and/or seeps seaward of the shoring wall.

  It is assumed that the restoration timeframe to reach CULs will be achieved 5 years after SBG-containing fill removal. For cost estimation, a total of 10 years of long-term monitoring and reporting is assumed.

- **ICs –** The interim ICs in place at the Site will be maintained until the SBG-containing fill is removed and the shoreface is restored. If uplands soil or

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[17] During the IA, all saturated bottom confirmation samples were collected from the top of the Estuarine Unit; two samples (B-J-1 and B-K-1) were collected from 0.5-feet below the top of the Estuarine Unit.

compliance is not achieved after the SBG-containing fill is removed, a deed restriction to notify construction workers of contaminated soil and groundwater would be used to prevent construction worker direct exposure. A contaminated media management plan (CMMP) would be prepared to provide the handling requirements for any soil and groundwater to be removed during subsequent upland redevelopment activities.

The estimated capital cost of Remedial Alternative 1 is $3,997,000, and the estimated total remedy cost is $4,360,000 (Table 9). The Remedial Alternative 1 cost estimate includes the sunk costs of the completed Interim Action of $2,755,383. The detailed cost estimate is included in Appendix C-1.

7.2 Alternative 2 – SBG-Containing Fill Removal, Complete Wood Piling Removal, MNA, ICs

Remedial Alternative 2 consists of the Remedial Alternative 1 components with the addition of full removal of wood pilings, as follows:

- **SBG-Containing Fill Removal** – Same as Remedial Alternative 1.
- **Groundwater MNA –** Same as Remedial Alternative 1. The addition of the wood piling removal is not anticipated to change the Fill Unit groundwater MNA scope and restoration timeframe.
- **ICs –** Same as Remedial Alternative 1.
- **Wood Piling Complete Removal –** The wood pilings seaward of the shoring wall will be removed in their entirety, including the portion in the Alluvium Unit. It is assumed that the removal will be conducted using a vibratory crane from the upland and not require in-water work.

The estimated capital cost of Remedial Alternative 2 is $4,452,000, and the estimated total remedy cost is $4,810,000 (Table 9). The Remedial Alternative 2 cost estimate includes the sunk costs of the completed Interim Action of $2,755,383. The detailed cost estimate is included in Appendix C-2.

7.3 Alternative 3 – SBG-Containing Fill Removal, Complete Wood Piling Removal with Groundwater Treatment, MNA, and ICs

Remedial Alternative 3 consists of the Remedial Alternative 2 components with the addition of Fill Unit active groundwater treatment. The description of each remedial alternative component includes assumptions necessary for estimating cost.

- **SBG-Containing Fill Removal** – Same as Remedial Alternative 1.
- **Wood Piling Complete Removal –** Same as Remedial Alternative 2.

- **ICs –** Same as Remedial Alternative 1.
- **Active Groundwater Treatment –** The post-IA groundwater conditions indicate that MNA alone will achieve groundwater compliance landward of the shorting wall. The active treatment would target any groundwater exceedances that remain in uplands after SBG-containing fill is removed. The assumed treatment is the use of iron-media to immobilize low-level dissolved metals remaining in groundwater. Iron will be emplaced in the subsurface through direct-push injections after the remaining SBG-containing fill is removed.

- **Groundwater MNA –** It is assumed that the restoration time frame to when CULs will be achieved is 2 years after SBG-containing fill removal. For cost estimation purposes, it is assumed that SBG-containing fill removal will occur 5 years after this Upland FS, for a total monitoring and reporting period of 7 years.

The estimated capital cost of Remedial Alternative 3 is $4,788,000, and the estimated total remedy cost is $5,020,000 (Table 9). The Remedial Alternative 3 cost estimate includes the sunk costs of the completed Interim Action of $2,755,383. The detailed cost estimate is included in Appendix C-3.

8 Evaluation of Remedial Alternatives

Each alternative was evaluated against MTCA criteria, and a DCA was completed to compare the incremental costs and incremental environmental benefits of the cleanup alternatives. This section describes the evaluation process and DCA results.

8.1 Evaluation with Respect to MTCA Threshold Requirements

The three remedial alternatives were evaluated for compliance with the MTCA threshold criteria described in the following section.

8.1.1 Protection of Human Health and the Environment

All three alternatives would be protective of human health and the environment by mitigating each potential exposure pathway through removal of the SBG-containing fill on the shoreface.

8.1.2 Compliance with Cleanup Standards

All three remedial alternatives are likely to achieve compliance with cleanup standards for continued industrial use. The removal of the SBG-containing fill from the shoreface will achieve cleanup standards for all soils on the uplands. The post-IA groundwater monitoring data indicate that MNA alone will achieve groundwater cleanup standards landward of the shoring wall. Therefore, any Fill Unit groundwater seaward of the shoring wall is also anticipated to comply with groundwater cleanup standards after removal of the remaining SBG-containing fill included in all alternatives.

Alternative 3 adds active groundwater treatment in order to enhance MNA, providing incrementally greater assurance that groundwater cleanup standards will be met within a shorter restoration timeline.

8.1.3 Compliance with Applicable State and Federal Laws

The remedial alternatives were developed to comply with MTCA and the potentially applicable state and federal laws and local requirements identified in Section 5.1 and Table 5. All alternatives are expected to comply with all applicable state and federal laws and local requirements, and the required engineering design and agency-review process would include steps to ensure compliance.

8.1.4 Provisions for Compliance Monitoring

All three alternatives provide for compliance monitoring. Health and safety protocols outlined in a Site-specific health and safety plan (required in all alternatives) would provide protection monitoring. Each alternative includes soil verification performance monitoring at the limits of the SBG-containing fill removal on the shoreface. The final groundwater point of compliance will be determined by Ecology and is subject to completing the removal of SBG-containing fill seaward of the shoring wall to be conducted concurrently with the in-water cleanup. Additional groundwater monitoring locations and/or seep monitoring may be determined necessary by Ecology for compliance.

8.1.5 *Conclusion Regarding Compliance with Threshold Requirements*

Based on the above evaluation, Remedial Alternatives 1 through 3 are considered to comply with the MTCA threshold criteria. Therefore, all three alternatives are carried forward to the next stage of evaluation.

8.2 Disproportionate Cost Analysis (DCA)

The purpose of a DCA is to determine whether a cleanup action uses permanent solutions to the maximum extent practicable by comparing the relative benefits and costs of remedial alternatives. A DCA quantifies the environmental benefits by first rating each cleanup alternative with respect to six criteria as specified in WAC 173-340-360(3)(f).

Environmental benefit was quantified by scoring each alternative with respect to each of the DCA criteria. Rating values (scores were assigned on a scale of 1 to 10, where 1 indicates the criteria is satisfied to a very low degree, and 10 indicates the factor is satisfied to a very high degree.

Because Ecology does not consider the six DCA criteria to be of equal importance, each criterion was assigned a “weighting factor” as follows:

- Overall protectiveness: 30 percent
- Permanence: 20 percent
- Long-term effectiveness: 20 percent
- Short-term effectiveness: 10 percent
- Implementability: 10 percent
- Consideration of public concerns: 10 percent

The basis for scoring for each category and the calculated benefit cost ratio are in Table 9 and shown on Figure 9.

8.2.1 *Overall Protectiveness*

MTCA defines the overall protectiveness criterion as:

> “Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk and attain cleanup standards, on-Site and off-Site risks resulting from implementation, and improvement of the overall environmental quality.” (WAC 173-340-360(3)(f))

The protectiveness of each alternative was ranked in Table 10 based on its effectiveness in reducing risks and achieving cleanup standards (i.e., cleanup levels at the point of compliance).

8.2.2 *Permanence*

MTCA defines the permanence criterion as:

> “The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in

> destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated." (WAC 173-340-360(3)(f)).

The basis for the permanence rating for each alternative considers degree of reduction in toxicity, mobility, or volume, and irreversibility of treatment or destruction.

8.2.3 Long-Term Effectiveness

MTCA defines the long-term effectiveness criterion as:

> "Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on Site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes." (WAC 173-340-360(3)(f)).

The basis for the long-term effectiveness rating for each alternative is presented in Table 10 relative to certainty and reliability in the long-term, and magnitude of residual risks.

8.2.4 Short-Term Risk Management

MTCA defines the short-term risk management criterion as:

> "Management of short-term risks, including the protection of human health and the environment associated with the alternative during construction and implementation." (WAC 173-340-360(3)(f)).

This criterion assesses potential risks associated with remedial alternative implementation, considering protection of workers, protection of the community, and potential impacts to the environment during remedy implementation. In general, the potential for adverse short-term impacts such as worker injuries, exposure to contamination, or contaminant releases to the environment increases with construction duration and the quantities of contaminated materials handled. An alternative with lesser short-term risks scores higher than one with greater risks.

8.2.5 Implementability

MTCA defines the implementability criterion as:

> "Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-Site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions." (WAC 173-340-360(3)(f)).

Implementability generally decreases with increased complexity of the alternatives. The basis for the implementability rating for each alternative is presented in Table 10 relative to technical feasibility/constructability and administrative feasibility.

8.2.6 *Consideration of Public Concerns*

The public will prefer permanent remedial actions, and the complete removal of the SBG-containing fill is permanent to the maximum extent. The selected remedial action in the CAP will be published for public comment. The implementation of the CAP will require State Environmental Policy Act (SEPA) review, which also requires a public comment period. Public comments will be responded to and incorporated into the remedial action implementation as warranted.

8.2.7 *Benefits Rankings, Estimated Costs, and Benefit/Cost Ratios*

Table 10 summarizes the alternative-specific ratings with respect to the six criteria discussed above. The MTCA benefits rankings, estimated costs, and benefit/cost ratios for the remedial alternatives are summarized in the table below and presented in Table 10 and on Figure 9.

	Benefit Ranking	Estimated Total Cost	Benefit/Cost Ratio
Alternative 1	7.1	$4,360,000	1.63
Alternative 2	7.5	$4,810,000	1.56
Alternative 3	7.8	$5,020,000	1.55

The MTCA benefits ranking is obtained for each alternative by multiplying the score assigned for the six evaluation criteria by their corresponding weighting factors, and summing the weighted values. The benefit rankings range from a low of 7.1 for Alternative 1 to a high of 7.8 for Alternative 3.

The estimated total costs for the alternatives range from $4,360,000 (Alternative 1) to $5,020,000 million (Alternative 3). The detailed cost estimates for each Alternative are included in Appendix C.

The benefit/cost ratio is equal to the MTCA benefits ranking divided by its total estimated cost as a relative measure of cost-effectiveness. Because all three alternatives include permanent removal of all contaminated media from the uplands, the range in total estimated cost is small—the highest cost Alternative 3 is only 15 percent greater than lowest cost Alternative 1. The incremental environmental benefit with Alternatives 2 and 3 is small; therefore, the range in benefit/cost ratio of alternatives is also small.

Based on the results of the DCA, Alternative 1 is permanent to the maximum extent practicable.

8.3 Evaluation of Reasonable Restoration Time Frame

The source of the contamination to groundwater and the LDW is the SBG-containing fill. The completed IA removed all SBG-containing fill landward of the shoring wall, and all three alternatives will remove the remaining SBG-containing fill from the Site.

Based on the post-IA groundwater monitoring results, MNA will achieve groundwater compliance in a reasonable restoration time frame estimated to be 5 years after SBG-containing fill removal.

8.4 Preferred Remedial Alternative

Alternative 1 is the preferred remedial alternative for the uplands and consists of SBG-containing fill removal, groundwater MNA, and ICs. The SBG-containing fill seaward of the shoring wall will be removed and disposed of off-Site at a Subtitle D disposal facility, completing the removal of all SBG-containing fill from the Site. The shoreface removal will be conducted as in-water work using barged equipment and will be conducted concurrently with the in-water sediment cleanup, in accordance with the LDW ROD.

The SBG-containing fill removal limits will extend from the shoring wall to MHHW and assumed to the northern and southern Property boundaries. All SBG-containing fill will be removed, requiring the excavation bottom be advanced to the top of the Estuarine Unit where soil compliance was verified during the IA. Removal will include cutting the wood pilings at the Estuarine Unit, and removal of the pile cuttings with the SBG-containing fill for proper off-Site disposal.

The restoration will include backfill to grade with a more-gentle slope, with habitat restoration elements designed and permitted as part of the in-water cleanup. The restoration will require modifications to the shoring wall by restoring stormwater outfalls and cutting the top of the shoring wall to the restored grade.

The preferred remedial alternative permanently removes all contamination from the Site which is resilient to climate changes and provides assurance of long-term remedy effectiveness. The backfill and shoreface restoration design will incorporate climate change information including predicted sea level rise.

Additional groundwater monitoring will be conducted until four consecutive results comply with CULs to verify upland groundwater compliance landward of the shoring wall. Once compliance is demonstrated, no additional groundwater monitoring is planned until implementation of the in-water cleanup. A GCMP will be developed during design of the SBG-containing fill removal and in-water sediment cleanup. The GCMP will report all completed groundwater monitoring results, evaluate MNA progress, and be submitted to Ecology for approval.

The interim ICs will be maintained at the Site until the SBG-containing fill removal and the shoreface restoration are completed. If uplands soil compliance is not achieved after the SBG-containing fill is removed, a deed restriction to notify construction workers of contaminated materials and require appropriate protection measures would be used to prevent construction worker direct exposure. A CMMP would be prepared to provide the handling requirements for any soil and groundwater.

9 Conclusions

This Upland FS has been prepared to develop and evaluate remedial alternatives for the upland portion of the Site to satisfy requirements of the Agreed Order and WAC Sections 173-340-350(8) and 173-204-550(7).

A compliance evaluation of post-IA conditions of the remaining uplands soil and groundwater identified the media requiring cleanup evaluation in this Upland FS. The completed IA resulted in compliance of soils landward of the shoring wall. The remaining SBG-containing fill seaward of the shoring wall and above MHHW is the remaining source on the uplands and is the primary media evaluated in this Upland FS.

Three remedial alternatives were evaluated in this Upland FS. The environmental benefit was determined through a DCA for additional remedial alternative components of wood piling removal (Alternatives 2 and 3) and Fill Unit groundwater treatment (Alternative 3) and determined to be disproportionate to the incremental cost.

Alternative 1 is the preferred remedial alternative for the uplands and consists of SBG-containing fill removal, groundwater MNA, and ICs. The SBG-containing fill seaward of the shoring wall will be removed and disposed of off-Site, completing the removal of all SBG-containing fill from the Site. The shoreface removal will be conducted as in-water work using barged equipment.

The scope of this Upland FS, and the preferred Remedial Alternative 1, is limited to landward MHHW. However, it is infeasible to only conduct the shoreface cleanup to MHHW, and the SBG-containing fill removal from shoreface will be conducted concurrently with the sediment cleanup according to the LDW ROD.

This Upland FS develops a preferred remedial alternative for the upland portion of the Site, which will be selected by Ecology in the Upland CAP.

10 References

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11 Limitations

Work for this project was performed for 5055 Properties LLC (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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

TABLES

Table 1A. Analytical Results for Soil Remaining Seaward of Shoring Wall (Vadose)

Project No. 150054, Snopac Property, Seattle, Washington

	Location	**B-4**	**B-6**	**SSA-1**	**SSA-2**	**SSA-3**	**SSA-4**
	Date	**01/24/2017**	**01/24/2017**	**07/02/2015**	**07/02/2015**	**07/02/2015**	**07/02/2015**
	Sample	**B4-SBG-0**	**B6-0.8-1.1**	**SSA-1**	**SSA-2**	**SSA-3**	**SSA-4**
	Depth (feet below ground surface)	**0 ft**	**0.8 - 1.1 ft**	**0 - 0.25 ft**	**0 - 0.25 ft**	**0 - 0.25 ft**	**0 - 0.25 ft**
Analyte	**Vadose Soil Remediation Level^{1}**						
Metals							
Arsenic	7.3	--	--	**12.1**	**27.3**	**4890**	**70.1**
Copper	36	--	--	**49.1**	**65.9**	**3430**	**55.3**
Lead	50	--	--	**66.6**	**54.7**	**1720**	**61.7**
Mercury	0.07	--	--	**0.052**	**0.082**	**0.28**	**0.25**
Zinc	86	--	--	**76.4**	**150**	**12900**	**196**
Polycyclic Aromatic Hydrocarbons (PAHs)							
1-Methylnaphthalene	34	< 0.5 U	< 0.5 U	**0.075**	**0.043**	**0.028**	**0.03**
2-Methylnaphthalene	0.67	< 0.5 U	< 0.5 U	**0.097**	**0.053**	**0.023**	**0.036**
Acenaphthene	0.5	**0.16**	**0.11**	**0.022**	**0.045**	**0.069**	**0.038**
Acenaphthylene	1.3	< 0.1 U	< 0.1 U	**0.027**	**0.042**	**0.019**	**0.018**
Anthracene	0.96	**0.53**	**0.21**	**0.16**	**0.2**	**0.14**	**0.078**
Fluoranthene	1.7	**4.2**	**1.7**	**0.65**	**0.83**	**0.99**	**0.53**
Fluorene	0.54	**0.17**	< 0.1 U	**0.046**	**0.058**	**0.054**	**0.034**
Naphthalene^{1}	0.056	< 0.1 U	< 0.1 U	**0.079**	**0.071**	**0.032**	**0.044**
Phenanthrene	1.5	**2.2**	**1.1**	**0.32**	**0.62**	**0.64**	**0.36**
Pyrene	2.6	**3.8**	**2**	**0.46**	**0.76**	**1.1**	**0.49**
Total cPAHs TEQ^{1,2}	0.074	**3.1**	**1.3**	**0.92**	**1.6**	**1.05 J**	**0.54**
Semivolatile Organic Compounds (SVOCs)							
Pentachlorophenol^{3}	0.05	**2.1 J**	**2.6 J**	--	--	--	--
Organotin Compounds							
Tributyltin Ion	0.12	**3.9**	**2.2**	**--**	**--**	**4.3**	**--**
Polychlorinated Biphenyls (PCBs)							
Total PCBs Aroclors^{4}	0.002	**0.43**	**0.46**	**0.041**	**0.051**	**0.6**	< 0.02 U
Total Petroleum Hydrocarbons (TPH)							
Gasoline Range Organics	--	--	--	--	--	--	--
Diesel Range Organics	--	--	--	--	--	--	--
Motor Oil Range Organics	--	--	--	--	--	--	--
G+D+O Range Organics^{5}	1500	--	--	--	--	--	--

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

IAWP - Interim Action Work Plan (Aspect, 2020b)

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

J - Result value estimated

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

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

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.

2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).

3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorphenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).

Table 1B. Analytical Results for Soil Remaining Seaward of Shoring Wall (Saturated)

Project No. 150054, Snopac Property, Seattle, Washington

	Location	**B-5**	**B-5**	**B-5**	**B-8**
	Date	**01/24/2017**	**01/24/2017**	**01/24/2017**	**01/24/2017**
	Sample	**B5-10-10.2**	**B5-13-14**	**B5-16-17**	**B8-12-13**
	Depth (feet below ground surface)	**10 - 10.2 ft**	**13 - 14 ft**	**16 - 17 ft**	**12 - 13 ft**
Analyte	**Saturated Soil Remediation Level**				
Metals					
Arsenic	7.3	--	**6.39**	**3.4**	**5.34**
Copper	36	--	**23.3**	**14.8**	**21**
Lead	50	--	**4.88**	**1.72**	**3.15**
Mercury	0.07	--	< 1 U	< 1 U	< 2 U
Zinc	85	--	**24**	**20.7**	**24.3**
Polycyclic Aromatic Hydrocarbons (PAHs)					
1-Methylnaphthalene	34	< 0.5 U	--	--	--
2-Methylnaphthalene	0.67	< 0.5 U	--	--	--
Acenaphthene	0.028	**0.15**	--	--	--
Acenaphthylene	1.3	< 0.1 U	--	--	--
Anthracene	0.051	**0.62**	--	--	--
Benz(a)anthracene	0.000057	**2.4**	--	--	--
Benzo(a)pyrene	0.000016	**3**	--	--	--
Benzo(b)fluoranthene	0.0002	**3.5**	--	--	--
Benzo(g,h,i)perylene	0.67	**1.6**	--	--	--
Benzo(k)fluoranthene	0.002	**1.5**	--	--	--
Chrysene	0.0064	**2.9**	--	--	--
Dibenzo(a,h)anthracene	0.000029	**0.48**	--	--	--
Fluoranthene	0.09	**4.4**	--	--	--
Fluorene	0.029	**0.13**	--	--	--
Indeno(1,2,3-cd)pyrene	0.00056	**2**	--	--	--
Naphthalene[1]	0.056	< 0.1 U	--	--	--
Phenanthrene	1.5	**1.8**	--	--	--
Pyrene	0.14	**4.1**	--	--	--
Total Benzofluoranthenes		**5**	--	--	--
Total HPAHs	12	**25.88**	--	--	--
Total LPAHs	5.2	**2.7**	--	--	--
Total cPAHs TEQ[1,2]	0.074	**4.017**	--	--	--
Semi-Volatile Organic Compounds (SVOCs)					
Pentachlorophenol[3]	0.05	**2 J**	--	--	--
Organotin Compounds					
Tributyltin Ion	0.12	**3.7**	--	--	--
Polychlorinated Biphenyls (PCB)					
Total PCBs Aroclors[4]	0.002	**0.32**	--	--	--
Total Petroleum Hydrocarbons (TPH)					
Gasoline-Range Organics	--	--	--	--	--
Diesel-Range Organics	--	--	< 50 U	< 50 U	< 50 U
Motor Oil-Range Organics	--	--	< 250 U	< 250 U	< 250 U
G+D+O Range Organics[5]	1500*	--	< 250 U	< 250 U	< 250 U

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

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

J - Result value estimated

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

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

HPAH = high-molecular weight PAH; LPAH = low-molecular weight PAH

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.
2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).
3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorphenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.
4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.
5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).

Table 2A. Analytical Results for Soil Remaining Landward of Shoring Wall (Vadose)

Project No. 150054, Snopac Property, Seattle, Washington

	Location	B-A-2	B-B-2	B-C-2	B-F-2	SW-AA-1	SW-AA-2	SW-A-3	SW-B-3	SW-C-5	SW-D-3	SW-E-2.5
	Date	01/04/2021	01/04/2021	01/04/2021	01/05/2021	01/21/2021	01/21/2021	12/31/2020	12/31/2020	01/15/2021	01/15/2021	01/15/2021
	Sample	B-A-2-11.5	B-B-2-11.5	B-C-2-11.5	B-F-2-11.5	SW-AA-1-12.5	SW-AA-2-12.5	SW-A-3-12	SW-B-3-12	SW-C-5-12	SW-D-3-12	SW-E-2.5-12
	Depth (feet below ground surface)	4.5	4.5	4.5	4.5	3.5	3.5	4	4	4	4	4
Analyte	**Vadose Soil Remediation Level[1]**											
Metals												
Arsenic	7.3	**1.34**	< 1 U	**1.63**	**3.49**	**1.08**	**1.14**	**1.6**	**8.55**	**1.86**	**2.02**	**4.88**
Copper	36	**6.79**	**5.98**	**5.92**	**9.67**	**5.88**	--	**4.1**	**11.2**	**7.81**	**6.96**	--
Lead	50	**1.45**	< 1 U	**1.26**	**3.29**	< 1	--	**1.02**	**10.1**	**5.41**	**2.14**	--
Mercury	0.07	**0.017**	**0.015**	**0.01**	**0.13**	< 0.01	--	**0.01**	**0.048**	**0.019**	**0.015**	--
Zinc	86	**16.8**	**12.6**	**13.5**	**87**	**12.2**	--	**11.4**	**34.8**	**20.2**	**16.8**	--
Polycyclic Aromatic Hydrocarbons (PAHs)												
1-Methylnaphthalene	34	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	**0.0022**	< 0.002 U	< 0.002 U	--
2-Methylnaphthalene	0.67	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	**0.0039 J**	< 0.002 U	< 0.002 U	--
Acenaphthene	0.5	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	--
Acenaphthylene	1.3	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	--
Anthracene	0.96	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	--
Fluoranthene	1.7	< 0.002 U	< 0.002 U	< 0.002 U	**0.0034**	< 0.002	--	**0.003**	**0.0048**	**0.0063**	**0.0029**	--
Fluorene	0.54	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	--
Naphthalene[1]	0.056	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	< 0.002 U	**0.0022**	< 0.002 U	< 0.002 U	--
Phenanthrene	1.5	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002	--	**0.0021**	**0.0041**	**0.0042**	< 0.002 U	--
Pyrene	2.6	< 0.002 U	< 0.002 U	< 0.002 U	**0.0027**	< 0.002	--	**0.0029**	**0.0053**	**0.0056**	**0.0026**	--
Total cPAHs TEQ[1,2]	0.074	< 0.00302 U	< 0.00302 U	< 0.00302 U	**0.0033**	< 0.00302 U	--	**0.0033**	**0.0061 J**	**0.0057**	**0.0030**	--
Semivolatile Organic Compounds (SVOCs)												
Pentachlorophenol[3]	0.05	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Total PCBs Aroclors[4]	0.002	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	--	< 0.002 U	< 0.002 U	**0.0023**	< 0.002 U	--
Total Petroleum Hydrocarbons (TPH)												
Gasoline Range Organics	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil Range Organics	--	--	--	--	--	--	--	--	--	--	--	--
G+D+O Range Organics[5]	1500		--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

IAWP - Interim Action Work Plan (Aspect, 2020b)

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

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

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.

2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).

3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorophenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).

Table 2A. Analytical Results for Soil Remaining Landward of Shoring Wall (Vadose)

Project No. 150054, Snopac Property, Seattle, Washington

	Location	SW-F-2	SW-G-2	SW-H-2	SW-I-3	SW-J-3	SW-K-2	SW-K-3	SW-L-2	SW-L-4	SW-M-1	SW-M-3
	Date	12/30/2020	12/30/2020	12/30/2020	12/31/2020	01/15/2021	12/31/2020	01/15/2021	12/31/2020	01/22/2021	12/31/2020	01/22/2021
	Sample	SW-F-2-12	SW-G-2-12	SW-H-2-12	SW-I-3-12	SW-J-3-13	SW-K-2-12	SW-K-3-13	SW-L-2-12	SW-L-4-13	SW-M-1-12	SW-M-3-14
	Depth (feet below ground surface)	4	4	4	4	3	4	3	4	3	4	2
Analyte	Vadose Soil Remediation Level[1]											
Metals												
Arsenic	7.3	**1.8**	**1.32**	**3.33**	**2.02**	**2.45**	**3.14**	**3.02**	**2.48**	**1.6**	**4.12**	**1.29**
Copper	36	**7.16**	**5.77**	**7.04**	**6.07**	**8.16**	**23.3**	**7.06**	**20.7**	**6.36**	**14.5**	**7.13**
Lead	50	**1.7**	**1.02**	**2.56**	**1.26**	**1.64**	**13.4**	**2.46**	**12.5**	**1.16**	**21.8**	**1.98**
Mercury	0.07	**0.012**	< 0.01 U	**0.01**	< 0.01 U	**0.088**	**0.061**	**0.017**	**0.033**	< 0.01 U	**0.025**	< 0.01 U
Zinc	86	**33.3**	**12.8**	**18**	**14.7**	**17**	**57.2**	**27.9**	**37.9**	**65**	**31.9**	**14**
Polycyclic Aromatic Hydrocarbons (PAHs)												
1-Methylnaphthalene	34	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.056**	**0.0021**	**0.073**	< 0.002 U	**0.011**	< 0.002 U
2-Methylnaphthalene	0.67	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.071 J**	**0.0024**	**0.095 J**	< 0.002 U	**0.015 J**	< 0.002 U
Acenaphthene	0.5	**0.003**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Acenaphthylene	1.3	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.01 U	< 0.002 U	**0.0053**	< 0.002 U	**0.0027**	< 0.002 U
Anthracene	0.96	**0.0068**	**0.0037**	< 0.002 U	< 0.002 U	< 0.002 U	**0.015**	< 0.002 U	**0.0096**	< 0.002 U	**0.0066**	< 0.002 U
Fluoranthene	1.7	**0.041**	**0.025**	**0.0054**	< 0.002 U	**0.0043**	**0.085**	**0.0029**	**0.041**	< 0.002 U	**0.036**	< 0.002 U
Fluorene	0.54	**0.0021**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Naphthalene[1]	0.056	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.093**	< 0.002 U	**0.076**	< 0.002 U	**0.013**	< 0.002 U
Phenanthrene	1.5	**0.029**	**0.017**	**0.0032**	< 0.002 U	**0.0029**	**0.06**	**0.0037**	**0.045**	< 0.002 U	**0.02**	< 0.002 U
Pyrene	2.6	**0.042**	**0.024**	**0.0049**	< 0.002 U	**0.0042**	**0.074**	**0.003**	**0.059**	< 0.002 U	**0.05**	< 0.002 U
Total cPAHs TEQ[1,2]	0.074	**0.035 J**	**0.017 J**	**0.0054 J**	< 0.00302 U	**0.0037**	**0.070 J**	**0.0041**	**0.046 J**	< 0.00302 U	**0.059 J**	< 0.00302 U
Semivolatile Organic Compounds (SVOCs)												
Pentachlorophenol[3]	0.05	--	--	--	--	--	--	--	< 0.05 U	--	< 0.05 U	--
Polychlorinated Biphenyls (PCBs)												
Total PCBs Aroclors[4]	0.002	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.0024**	< 0.002 U	**0.0025**	< 0.002 U
Total Petroleum Hydrocarbons (TPH)												
Gasoline Range Organics	--	--	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil Range Organics	--	--	--	--	--	--	--	--	--	--	--	--
G+D+O Range Organics[5]	1500	--	--	--	--	--	--	--	--	--	--	--

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

IAWP - Interim Action Work Plan (Aspect, 2020b)

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

J - Result value estimated

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

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

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.

2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).

3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorophenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).

Table 2A. Analytical Results for Soil Remaining Landward of Shoring Wall (Vadose)

Project No. 150054, Snopac Property, Seattle, Washington

	Location	**SW-N-5**	**MW-8**	**SB-1**	**SB-2**	**SB-3**	**SB-4**	**SB-5**	**SB-6**	**SB-7**	**SB-8**	**SUMP**
	Date	**01/22/2021**	**01/25/2017**	**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**
	Sample	**SW-N-5-13**	**MW8-5-6**	**SB1-6-7**	**SB2-2-3**	**SB3-5-6**	**SB4-2-3**	**SB5-2-3**	**SB6-5-6**	**SB7-2-3**	**SB8-5.5-6.5**	**SUMP-6-7**
	Depth (feet below ground surface)	**3**	**5 - 6 ft**	**6 - 7 ft**	**2 - 3 ft**	**5 - 6 ft**	**2 - 3 ft**	**2 - 3 ft**	**5 - 6 ft**	**2 - 3 ft**	**5.5 - 6.5 ft**	**6 - 7 ft**
Analyte	**Vadose Soil Remediation Level[1]**											
Metals												
Arsenic	7.3	**1.69**	**1.54**	**1.42**	**1.21**	**1.38**	**2.49**	**1.56**	**1.56**	**1.54**	**1.64**	**1.3**
Copper	36	**6.51**	**5.97**	**6.16**	**6.25**	< 5 U	**6.51**	**5.23**	**5.61**	**5.52**	**16.2**	**6.02**
Lead	50	**1.63**	< 1 U	**1.12**	< 1 U	< 1 U	**1.3**	< 1 U	**1.03**	< 1 U	**2.29**	< 1 U
Mercury	0.07	< 0.01 U	< 1 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U
Zinc	86	**15.7**	**11.4**	**14**	**12.7**	**12.3**	**13.4**	**13.5**	**12.8**	**12.7**	**20**	**12.7**
Polycyclic Aromatic Hydrocarbons (PAHs)												
1-Methylnaphthalene	34	< 0.002 U	< 0.05 U	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.67	< 0.002 U	< 0.05 U	--	--	--	--	--	--	--	--	--
Acenaphthene	0.5	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	< 0.002 U	< 0.002 U
Acenaphthylene	1.3	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	< 0.002 U	< 0.002 U
Anthracene	0.96	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	< 0.002 U	< 0.002 U
Fluoranthene	1.7	< 0.002 U	< 0.01 U	< 0.002 U	**0.003 J**	--	--	--	< 0.002 U	--	**0.05**	< 0.002 U
Fluorene	0.54	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	< 0.002 U	< 0.002 U
Naphthalene[1]	0.056	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	< 0.002 U	< 0.002 U
Phenanthrene	1.5	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	**0.014**	< 0.002 U
Pyrene	2.6	< 0.002 U	< 0.01 U	< 0.002 U	< 0.002 UJ	--	--	--	< 0.002 U	--	**0.038**	< 0.002 U
Total cPAHs TEQ[1,2]	0.074	< 0.00302 U	< 0.00755 U	< 0.00151 U	**0.0021 J**	--	--	--	< 0.00151 U	--	**0.018**	**0.0016**
Semivolatile Organic Compounds (SVOCs)												
Pentachlorophenol[3]	0.05	--	< 0.5 U	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)												
Total PCBs Aroclors[4]	0.002	< 0.002 U	< 0.2 U	< 0.002 U	--	--	--	--	< 0.002 U	--	**0.0066**	< 0.002 U
Total Petroleum Hydrocarbons (TPH)												
Gasoline Range Organics	--	--	--	< 5 U	--	--	--	--	< 5 U	--	< 5 U	< 5 U
Diesel Range Organics	--	--	< 50 U	< 50 U	--	--	--	--	< 50 U	--	< 50 U	**310 X**
Motor Oil Range Organics	--	--	< 250 U	< 250 U	--	--	--	--	< 250 U	--	< 250 U	**1300**
G+D+O Range Organics[5]	1500	--	< 250 U	< 250 U	--	--			<250 U	--	<250 U	**1610 X**

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

IAWP - Interim Action Work Plan (Aspect, 2020b)

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

J - Result value estimated

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

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

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.

2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).

3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorophenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.

5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).

Table 2B. Analytical Results for Soil Remaining Landward of Shoring Wall (Saturated)

Project No. 150054, Snopac, Seattle, Washington

	Location	B-A-1[6]	B-B-1[6]	B-C-1[6]	B-D-1[6]	B-E-1[6]	B-F-1[6]	B-G-1[6]	B-H-1[6]	B-I-1[6]	B-J-1[6]	B-K-1[6]	B-L-1[6]	SW-A-1	SW-B-1	SW-C-1	SW-D-1
	Date	01/13/2021	01/13/2021	01/13/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/11/2021	01/13/2021	01/15/2021	01/11/2021	01/13/2021	01/13/2021	01/13/2021	01/12/2021
	Sample	B-A-1-5	B-B-1-5	B-C-1-6	B-D-1-6	B-E-1-5.5	B-F-1-5	B-G-1-6	B-H-1-6	B-I-1-4.5	B-J-1-4	B-K-1-4.5	B-L-1-4	SW-A-1-8	SW-B-1-8	SW-C-1-9	SW-D-1-8
	Depth (feet below ground surface)	11	11	10	10	10.5	11	10	10	11.5	12	11.5	12	8	8	7	8
Analyte	**Saturated Soil Remediation Level**																
Metals																	
Arsenic	7.3	**7.57**	**5**	**5.23**	**7.05**	**4.58**	**3.33**	**3.66**	**4.69**	**4.92 J**	**3.24**	**10.1**	**5.13 J**	**1.11**	**1.45**	**1.4**	**1.29**
Copper	36	**17.4**	**17.5**	**31.2**	**19.9**	**26.1**	**24.7**	**18.2**	**27**	**16.9**	**22.8**	**19.7**	**23.7**	**6.45**	**7.26**	**5.17**	**6.07**
Lead	50	**2.69**	**2.65**	**4.62**	**3.42**	**3.98**	**3.57**	**3.76**	**3.93**	**3.07**	**3.22**	**3.85**	**3.27**	< 1 U	< 1 U	**1.73**	**1.11**
Mercury	0.07	**0.032**	**0.026**	**0.042**	**0.035**	**0.046**	**0.035**	**0.029**	**0.04**	**0.028**	**0.033**	**0.036**	**0.036**	**0.016**	**0.01**	< 0.01 U	< 0.01 U
Zinc	85	**15.9**	**20.1**	**23.9**	**27.9**	**20.4**	**19.9**	**21.8**	**22.5**	**20.9**	**20.3**	**23.9**	**26.1**	**48.3**	**29.3**	**21.3**	**14.6**
Polycyclic Aromatic Hydrocarbons (PAHs)																	
1-Methylnaphthalene	34	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.0038**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
2-Methylnaphthalene	0.67	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.004**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Acenaphthene	0.028	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.007**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Acenaphthylene	1.3	< 0.002 U	< 0.002 U	< 0.004 UJ	< 0.002 U	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Anthracene	0.051	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.0088**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Fluoranthene	0.09	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.056 J**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.0021 J**	< 0.002 U
Fluorene	0.029	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.006**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Naphthalene[1]	0.056	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.0057**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.0021**	**0.0071**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Phenanthrene	1.5	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.055**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.0029**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Pyrene	0.14	< 0.002 U	< 0.002 U	< 0.004 UJ	**0.052**	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Total cPAHs TEQ[1,2]	0.074	< 0.00302 U	< 0.00302 U	< 0.00604 U	**0.035**	< 0.00604 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	**0.005**	< 0.00302 U
Semi-Volatile Organic Compounds (SVOCs)																	
Pentachlorophenol[3]	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCB)																	
Total PCBs Aroclors[4]	0.002	< 0.002 U	< 0.002 U	< 0.004 UJ	< 0.002 U	< 0.004 UJ	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U
Total Petroleum Hydrocarbons (TPH)																	
Gasoline-Range Organics	--	--	--	--	--	--	--	--	--	< 5 U	--	--	--	--	--	--	--
Diesel-Range Organics	--	--	--	--	--	--	--	--	--	< 50 U	--	--	--	--	--	--	--
Motor Oil-Range Organics	--	--	--	--	--	--	--	--	--	< 250 U	--	--	--	--	--	--	--
G+D+O Range Organics[5]	1500*		--	--	--	--	--	--	--	< 250 U	--	--	--	--	--	--	--

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

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

J - Result value estimated

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

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

HPAH = high-molecular weight PAH; LPAH = low-molecular weight PAH

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.
2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).
3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorphenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.
4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.
5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).
6. Sample collected from the Estuarine Unit during the interim action. Samples B-J-1 and B-K-1 were collected 0.5-feet deeper than the upper estuarine unit surface.

Table 2B. Analytical Results for Soil Remaining Landward of Shoring Wall (Saturated)

Project No. 150054, Snopac, Seattle, Washington

	Location	SW-E-1	SW-F-1	SW-G-1	SW-H-1	SW-I-1	SW-J-1	SW-K-1	SW-L-1	FB-1	FB-1A	FB-4	FB-4A	FB-6	FB-6A	FB-7	FB-7A	FB-8
	Date	01/12/2021	01/12/2021	01/12/2021	01/12/2021	01/11/2021	01/11/2021	01/11/2021	01/11/2021	08/25/2011	10/05/2011	08/25/2011	10/05/2011	08/26/2011	10/05/2011	08/26/2011	10/05/2011	08/26/2011
	Sample	SW-E-1-8	SW-F-1-8	SW-G-1-7	SW-H-1-9	SW-I-1-8	SW-J-1-8	SW-K-1-5	SW-L-1-8	082511-FB1-9.5	100511-FB1A-9.8	082511-FB4-8.7	100511-FB4A-9.7	082611-FB6-11.6	100511-FB6A-11.5	082611-FB7-11.8	100511-FB7A-11.8	082611-FB8-11.6
	Depth (feet below ground surface)	8	8	9	7	8	8	8	8									
Analyte	Saturated Soil Remediation Level																	
Metals																		
Arsenic	7.3	**2.33**	**2.23**	**1.14**	**1.17**	**1.05 J**	**1.12 J**	**1.16 J**	**5.59 J**	< 3.3 U	--	< 3.5 U	--	**5.1**	--	**9.8**	--	**7.4**
Copper	36	**7.45**	**20.7**	**6.39**	**6.77**	**6.54**	**6.78**	**6.29**	**18.1**	**8**	--	**11**	--	**21**	--	**26**	--	**30**
Lead	50	**1.12**	**1.95**	**1.38**	**2.42**	< 1 U	< 1 U	< 1 U	**3.45**	< 1.7 U	--	< 1.8 U	--	**50**	--	**3.7**	--	**13**
Mercury	0.07	**0.015**	**0.028**	**0.01**	**0.018**	< 0.1 U	< 0.1 U	< 0.1 U	**0.041**	< 0.02 U	--	< 0.018 U	--	**0.038**	--	< 0.046 U	--	< 0.094 U
Zinc	85	**17.1**	**73**	**44**	**19**	**20.6**	**21.8**	**25.3**	**50.4**	**23**	--	**21**	--	**30**	--	**39**	--	**45**
Polycyclic Aromatic Hydrocarbons (PAHs)																		
1-Methylnaphthalene	34	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.011**	< 0.0063 U	--	< 0.006 U	--	< 0.0078 U	--	< 0.0075 U	--	< 0.0088 U
2-Methylnaphthalene	0.67	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.0075**	< 0.0063 U	--	< 0.006 U	--	< 0.0078 U	--	< 0.0075 U	--	< 0.0088 U
Acenaphthene	0.028	< 0.002 U	**0.0032**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.036**	< 0.0063 U	< 0.0234 U	< 0.006 U	**0.046**	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Acenaphthylene	1.3	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.0063 U	< 0.0234 U	< 0.006 U	< 0.0188 U	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Anthracene	0.051	< 0.002 U	**0.008**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.0063 U	< 0.0234 U	< 0.006 U	**0.11**	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Fluoranthene	0.09	< 0.002 U	**0.064 J**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.064**	< 0.0063 U	< 0.0234 U	< 0.006 U	**0.43**	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Fluorene	0.029	< 0.002 U	**0.0046**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.018**	< 0.0063 U	< 0.0234 U	< 0.006 U	< 0.0188 U	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Naphthalene[1]	0.056	< 0.002 U	**0.0023**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.01**	< 0.0063 U	< 0.0234 U	< 0.006 U	< 0.0188 U	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Phenanthrene	1.5	< 0.002 U	**0.0088**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.0063 U	< 0.0234 U	< 0.006 U	**0.0499**	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Pyrene	0.14	< 0.002 U	**0.046**	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	**0.11**	< 0.0063 U	< 0.0234 U	< 0.006 U	**0.41**	< 0.0078 U	< 0.0231 U	< 0.0075 U	< 0.0223 U	< 0.0088 U
Total cPAHs TEQ[1,2]	0.074	< 0.00302 U	**0.052**	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	< 0.00302 U	**0.008**	< 0.005 U	< 0.018 U	< 0.005 U	**0.07**	< 0.006 U	< 0.018 U	< 0.006 U	< 0.017 U	< 0.007 U
Semi-Volatile Organic Compounds (SVOCs)																		
Pentachlorophenol[3]	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCB)																		
Total PCBs Aroclors[4]	0.002	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.002 U	< 0.12 U	< 0.0000577 U	< 0.012 U	< 0.0000468 U	--	< 0.0000565 U	--	--	--
Total Petroleum Hydrocarbons (TPH)																		
Gasoline-Range Organics	--	--	--	--	--	< 5 U	--	--	--	< 10 U	< 19.2 U	--	--	--	--	< 14 U	< 18.1 U	< 9.9 U
Diesel-Range Organics	--	--	--	--	--	< 50 U	--	--	--	< 31 U	< 21.7 U	< 30 U	< 17.4 U	< 39 U	< 21.5 U	< 39 U	< 20.8 U	< 43 U
Motor Oil-Range Organics	--	--	--	--	--	< 250 U	--	--	--	< 63 U	**46.5**	< 60 U	< 34.9 U	< 79 U	**112**	< 78 U	< 41.6 U	< 86 U
G+D+O Range Organics[5]	1500*	--	--	--	--	< 250 U	--	--	--	< 63 U	**46.5**	--	--	--	--	< 78 U	< 41.6 U	< 86 U

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

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

J - Result value estimated

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

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

HPAH = high-molecular weight PAH; LPAH = low-molecular weight PAH

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.
2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).
3. Interim action verification soil samples analyzed for pentachlorophenol in the one location pentachlorphenol was detected in groundwater. An analytical reporting limit of 0.05 mg/kg is achievable for PCP in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.
4. An analytical reporting limit of 0.002 mg/kg is achievable by the laboratory for PCB Aroclors in soil. In accordance with WAC 173-340-700(6)(d), the soil remediation level is established at this practical quantitation limit.
5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).
6. Sample collected from the Estuarine Unit during the interim action. Samples B-J-1 and B-K-1 were collected 0.5-feet deeper than the upper estuarine unit surface.

Table 2B. Analytical Results for Soil Remaining Landward of Shoring Wall (Saturated)

Project No. 150054, Snopac, Seattle, Washington

Location		FB-8A	MW-8	MW-10	MW-10	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
Date		10/05/2011	01/25/2017	01/25/2017	01/25/2017	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
Sample		100511-FB8A-11.7	MW8-15.5-16.5	MW10-5-6	MW10-15.5-16.5	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
Depth (feet below ground surface)																		
Analyte	**Saturated Soil Remediation Level**																	
Metals																		
Arsenic	7.3	--	**5.01**	**12.9**	**3.29**	**8**	< 5 U	**1.77**	**3.06**	--	**2.62**	**1.65**	--	**1.57**	**2.37**	**1.86**	**1.27**	--
Copper	36	--	**25.2**	**28**	**14.6**	**24**	**5.08**	**5.89**	**10.2**	--	**8.95**	**5.64**	--	**5.7**	**8.14**	**7**	**5.71**	--
Lead	50	--	**3.95**	**49.4**	**2.4**	**2.84**	< 1 U	**1.01**	**1.68**	--	**1.4**	**1.11**	--	**1.07**	**1.24**	< 1 U	< 1 U	--
Mercury	0.07	--	< 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	--
Zinc	85	--	**26.3**	**393**	**20.7**	**17.5**	**12.7**	**13.4**	**17.4**	--	**16.3**	**15.2**	--	**16.9**	**16.5**	**13.3**	**13.4**	--
Polycyclic Aromatic Hydrocarbons (PAHs)																		
1-Methylnaphthalene	34	--	--	**0.07**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	0.67	--	--	**0.076**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.028	< 0.0293 U	--	< 0.01 U	--	--	--	--	**0.0087 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.003 J**	< 0.002 UJ
Acenaphthylene	1.3	< 0.0293 U	--	< 0.01 U	--	--	--	--	< 0.002 U	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ
Anthracene	0.051	< 0.0293 U	--	**0.015**	--	--	--	--	**0.0033 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ
Fluoranthene	0.09	< 0.0293 U	--	**0.13**	--	--	--	--	**0.034 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.0051 J**	< 0.002 UJ
Fluorene	0.029	< 0.0293 U	--	**0.014**	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ
Naphthalene[1]	0.056	< 0.0293 U	--	**0.056**	--	--	--	--	< 0.002 U	< 0.002 UJ	--	< 0.002 U	--	--	--	--	< 0.002 UJ	< 0.002 UJ
Phenanthrene	1.5	< 0.0293 U	--	**0.13**	--	--	--	--	< 0.002 UJ	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.0033 J**	< 0.002 UJ
Pyrene	0.14	< 0.0293 U	--	**0.12**	--	--	--	--	**0.024 J**	< 0.002 UJ	--	< 0.002 U	--	--	--	--	**0.0038 J**	< 0.002 UJ
Total cPAHs TEQ[1,2]	0.074	**0.024**	--	**0.074**	--	--	--	--	**0.00598 J**	< 0.00151 UJ	--	< 0.00151 U	--	--	--	--	< 0.00151 UJ	< 0.00151 UJ
Semi-Volatile Organic Compounds (SVOCs)																		
Pentachlorophenol[3]	0.05	--	--	< 0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCB)																		
Total PCBs Aroclors[4]	0.002	--	--	< 0.2 U	--	--	--	--	< 0.002 U	--	--	< 0.002 U	--	--	--	--	< 0.002 U	< 0.002 U
Total Petroleum Hydrocarbons (TPH)																		
Gasoline-Range Organics	--	< 25.4 U	--	--	--	--	--	--	< 5 U	--	--	< 5 U	--	--	--	--	--	--
Diesel-Range Organics	--	< 27.3 U	< 50 U	< 50 U	< 50 U	< 50 U	< 50 U	--	< 50 U	--	--	< 50 U	--	--	--	--	--	--
Motor Oil-Range Organics	--	**116**	< 250 U	< 250 U	< 250 U	< 250 U	< 250 U	--	< 250 U	--	--	< 250 U	--	--	--	--	--	--
G+D+O Range Organics[5]	1500*	**116**	--	--	--	--	--	--	< 250 U	--	--	< 250 U	--	--	--	--	--	--

Notes:

All concentrations are in milligrams per kilogram (mg/kg).

Bold - detected

Blue Shaded - Detected result exceeded remediation level

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

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

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

HPAH = high-molecular weight PAH; LPAH = low-molecular weight PAH

1. Remediation levels are the most-stringent Preliminary Cleanup Levels (PCULs) from the Preliminary Cleanup Levels Workbook for the Lower Duwamish Waterway (Ecology, 2020) or established empirically and approved by Ecology for the Interim Action. Empirically derived remediation levels for naphthalene and Total cPAHs TEQ are subject to post-interim action groundwater monitoring to be established as cleanup levels.
2. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).
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5. A combined TPH remediation level is based on the generic direct contact cleanup level of 1,500 mg/kg that applies only if gasoline-range TPH is detected. (Ecology, 2017).
6. Sample collected from the Estuarine Unit during the interim action. Samples B-J-1 and B-K-1 were collected 0.5-feet deeper than the upper estuarine unit surface.

Table 3. Statistical Compliance Summary for Upland Soil

Project No. 150054, Snopac Property, Seattle, Washington

	Remediation Levels (mg/kg)		Number of Samples	Exceedance Frequency (must be <10%)		Exceedance Factor (must be ≤2)		95% Upper Confidence Limit (UCL) Concentration (mg/kg)	
Indicator Hazardous Substance	Vadose Zone Soil	Saturated Zone Soil		Number of Samples Exceeding Remediation Level	Frequency of Exceedance	Maximum Remaining Concentration (mg/kg)	Exceedance Factor for Maximum Concentration	95% UCL Concentration (mg/kg)(1)	Notes
Metals									
Arsenic	7.3	7.3	75	7	9%	12.9	1.8	4.070	Data do not follow a discernable distribution; Maximum 95% UCL selected
Copper	36	36	73	0	0%	--	--	--	
Lead	50	50	73	0	0%	--	--	--	
Mercury	0.07	0.07	74	3	4%	0.13	1.9	0.0295	Detected results appear Approximate Gamma Distributed at 5% confidence Level
Zinc	86	85	73	2	3%	393	4.6	31.36	Data do not follow a discernable distribution; Maximum 95% UCL selected
Polycyclic Aromatic Hydrocarbons (PAHs)									
1-Methylnaphthalene	34	34	67	0	0%	--		--	
2-Methylnaphthalene	0.67	0.67	67	0	0%	--		--	
Acenaphthene	0.5	0.028	67	2	3%	0.046	1.6	0.00393	Detected results appear Approximate Gamma Distributed at 5% confidence Level
Acenaphthylene	1.3	1.3	67	0	0%	--	--	--	
Anthracene	0.96	0.051	67	1	1%	0.11	2.2	0.0036	Detected results appear Normal Distributed at 5% confidence Level
Fluoranthene	1.7	0.09	67	2	3%	0.43	4.8	0.0233	Data do not follow a discernable distribution; Maximum 95% UCL selected
Fluorene	0.54	0.029	67	0	0%	--	--	--	
Naphthalene	0.056	0.056	67	2	3%	0.093	1.7	0.0141	Detected results appear Lognormal at 5% confidence Level; max 95% lognormal UCL selecte
Phenanthrene	1.5	1.5	67	0	0%	--	--	--	
Pyrene	2.6	0.14	67	1	1%	0.41	2.9	0.0435	Data do not follow a discernable distribution; Maximum 95% UCL selected
Total cPAHs TEQ[3]	0.074	0.074	67	0	0%	--	--	--	
Semivolatile Organic Compounds									
Pentachlorophenol	0.05	0.05	4	0	0%	--	--	--	
Polychlorinated Biphenyls (PCBs)									
Total PCB Aroclors	0.002	0.002	60	4	7%	0.0066	3.3	0.00097	Data do not follow a discernable distribution; Maximum 95% UCL selected
Total Petroleum Hydrocarbons (TPH)									
Gasoline-Range Organics	1,500	1,500	2	0	0%	--	--	--	
Diesel-Range Organics									
Motor Oil-Range Organics									

Notes:

mg/kg - milligrams per kilogram

1. EPA software ProUCL v. 5.1 was used to calculate the 95% Upper Confidence Limit for analytes that exceed remediation levels. In accordance with PROUCL guidelines, outliers were removed from the UCL estimates.

2. -- : No exceedances so exceedance magnitude and 95% UCL not calculated.

3. Carcinogenic PAHs total toxic equivalent concentration of benzo(a)pyrene (total cPAH s TEQ) calculated in accordance with WAC 173-340-708(8)(e).

J - Result value estimated

Table 4. Groundwater Analytical Results

Project No. 150054. Snopac Property, Seattle, Washington

			FILL UNIT									
		Location Date	**MW-12 02/07/2017**	**MW-12 01/28/2018**	**MW-12 06/29/2021**	**MW-12 11/10/2021**	**MW-12 01/17/2022**	**MW-12 04/13/2022**	**MW-13 06/25/2021**	**MW-13 11/11/2021**	**MW-13 01/18/2022**	**MW-13 04/14/2022**
Analyte	Unit	PCUL										
Metals												
Arsenic	ug/L	8	**1.1**	**2.19**	**23.7**	**4.46**	**2.22**	**2.09**	**2.97**	**2.43**	< 1 U	< 1 U
Copper	ug/L	3.1	< 5 U	< 5 U	< 1 U	< 2 U	**3.2**	< 3 U	**4.03**	**2.58**	< 2.5 U	< 3 U
Lead	ug/L	5.6	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Mercury	ug/L	0.025	< 1 U	< 1 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U
Nickel	ug/L	8.2	**5.08**	**3.27**	**14.1**	**13.2**	**10.8**	**4.24**	**42.6**	**35.3**	**6.57**	**2.92**
Zinc	ug/L	81	< 5 U	< 5 U	**1.99 J**	< 5 U	**6.36**	< 5 U	**161 J**	**147**	**26**	**6.45**
Organometallic												
Tributyltin	ug/L		--	--	< 0.35 U	< 0.35 U	< 0.35 U	< 0.32 UJ	< 0.33 U	< 0.334 U	< 0.37 U	< 0.31 UJ
SVOCs												
Pentachlorophenol$^{(1)}$	ug/L	0.05	< 2 U	< 2 U	--	--	--		< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U
PAHs												
1-Methylnaphthalene	ug/L	800	< 0.2 U	< 0.2 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	**0.072**	**0.55**	**0.62**	**0.072**
2-Methylnaphthalene	ug/L	14	< 0.2 U	< 0.2 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	**0.19**	**0.088**	< 0.05 U
Acenaphthene	ug/L	5.3	< 0.03 U	< 0.03 U	**0.007**	**0.091**	< 0.005 U	**0.006**	**3.4**	**1.3**	**1.8**	**0.55**
Acenaphthylene	ug/L		< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	**0.08**	**0.028**	**0.035**	**0.012**
Anthracene	ug/L	2.1	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	**0.095**	**0.034**	**0.029**	**0.011**
Fluoranthene	ug/L	1.8	< 0.03 U	< 0.03 U	**0.029**	**0.024**	< 0.005 U	< 0.005 U	**0.86**	**0.058**	**0.035**	**0.013**
Fluorene	ug/L	3.7	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	**1.1**	**0.26**	**0.5**	**0.05**
Naphthalene	ug/L	1.4	< 0.03 U	< 0.03 U	**0.016**	< 0.05 U	< 0.05 U	< 0.05 U	**0.005**	**1.5**	**0.71**	**0.37**
Phenanthrene	ug/L		< 0.03 U	< 0.03 U	**0.022**	**0.016 J**	**0.0076**	**0.0077**	**0.014**	**0.038 J**	**0.2**	**0.027**
Pyrene	ug/L	2	< 0.03 U	< 0.03 U	**0.031**	**0.028**	< 0.005 U	< 0.005 U	**0.56**	**0.034**	**0.024**	**0.01**
Total cPAHs TEQ ^{1,2}	ug/L	0.008	< 0.02265 U	< 0.02265 U	**0.02018**	**0.01937**	< 0.00755 U	< 0.00755 U	**0.00909**	**0.00838**	**0.01178**	**0.00761**
Polychlorinated Biphenyls (PCBs)												
Total PCBs (Sum of Aroclors)$^{(1,3)}$	ug/L	0.005	< 0.1 U	< 0.1 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
TPHs												
Diesel Range Organics	ug/L	500	< 50 U	**110 X**	--	--	--	--	**230 X**	**230 X**	**220 X**	**210 X**
Motor Oil Range Organics	ug/L	500	< 250 U	**290**	--	--	--	--	< 250 U	< 250 U	< 250 U	< 250 U
Extended Range Organics	ug/L	500	< 250 U	**400 X**	--	--	--	--	**230 X**	**230 X**	**220 X**	**210 X**

Notes:

Bold - detected

Gray Shaded - Sampling events occurred prior to the interim action in 2020

Blue Shaded - Detected result or non-detected RL exceeded PCUL

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

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

TBT results UJ due to assorted low-bias QC issues. Non-detects may not be definitive.

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

FD - Field Duplicate QC sample

D - Dissolved Fraction (filtered) sample result

T - Total Fraction (unfiltered) sample result

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

"--" - indicates results not available

µg/L = microgram per liter

ND = 1/2 RDL - calculated using 1/2 the reporting limit for non-detected components

ND = 1 - calculated using the reporting limit value for non-detected components

PCUL = Preliminary Cleanup Level

1. Most stringent screening levels are the most stringent preliminary cleanup levels (PCULs) for groundwater (GWs #2-5) established by the May 2021 LDW Preliminary Cleanup Level Workbook (Ecology, 2021).
2. The Laboratory Method Reporting Limit (MRL) is the Practical Quantitation Limit (PQL), as per WAC 173-340-700(6)(d), for purposes of this monitoring program. In accordance with WAC 173-340-700(6)(d), the groundwater PCULs are established at the PQL.
3. TEQ: Total toxic equivalent concentration of benzo(a)pyrene, calculated in accordance with WAC 173-340-708(8)(e). The total cPAH TEQ PCUL incorporates TEF values for each individual cPAH and is set at the PQL.
4. Total PCBs is the sum of detected Aroclor concentrations.

Table 4. Groundwater Analytical Results

Project No. 150054. Snopac Property, Seattle, Washington

			FILL UNIT											
		Location Date	**MW-15** **06/25/2021**	**MW-15** **11/11/2021**	**MW-15** **01/18/2022**	**MW-15** **04/14/2022**	**MW-16** **06/25/2021**	**MW-16** **11/11/2021**	**MW-16** **01/18/2022**	**MW-16** **04/14/2022**	**MW-17** **06/25/2021**	**MW-17** **11/10/2021**	**MW-17** **01/17/2022**	**MW-17** **04/13/2022**
Analyte	Unit	PCUL												
Metals														
Arsenic	ug/L	8	**5.55**	**3.63**	**1.04**	**5.28**	**24.1**	**8.93**	**2.25**	**1.39**	< 1 U	**1.92**	< 1 U	**1.03**
Copper	ug/L	3.1	**3.76**	**4.78**	**5.55**	**3.92**	**4.54**	**4.63**	**6.49**	**3.27**	< 1 U	**2.19**	**7.2**	< 3 U
Lead	ug/L	5.6	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	**3.43**	< 1 U
Mercury	ug/L	0.025	< 0.01 U	< 0.01 U	**0.01**	< 0.01 U	< 0.01 U	< 0.01 U	**0.011**	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U
Nickel	ug/L	8.2	**12.9**	**14.8**	**7.05**	**9.51**	**10**	**20.6**	**7.65**	**4.9**	**2.19**	**2.03**	**1.36**	**1.98**
Zinc	ug/L	81	**4.57 J**	< 5 U	**4.64**	< 5 U	**5.07 J**	< 5 U	**4.56**	**18.3**	**5.85 J**	< 5 U	**23.1**	< 5 U
Organometallic														
Tributyltin	ug/L		< 0.35 U	< 0.32 U	< 0.37 U	< 0.32 UJ	< 0.35 U	< 0.32 U	< 0.36 U	< 0.31 UJ	< 0.35 U	< 0.35 U	< 0.36 U	< 0.33 UJ
SVOCs														
Pentachlorophenol(1)	ug/L	0.05	--	--	--	--	--	--	--	--	--	--	--	--
PAHs														
1-Methylnaphthalene	ug/L	800	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U
2-Methylnaphthalene	ug/L	14	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U
Acenaphthene	ug/L	5.3	**0.013**	< 0.005 U	**0.0051**	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	**0.0067**	< 0.005 U	< 0.005 U	< 0.005 U
Acenaphthylene	ug/L		< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Anthracene	ug/L	2.1	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Fluoranthene	ug/L	1.8	**0.012**	< 0.005 U	**0.012**	< 0.005 U	**0.0065**	< 0.005 U	**0.005**	< 0.005 U	**0.0065**	< 0.005 U	**0.0055**	< 0.005 U
Fluorene	ug/L	3.7	**0.005**	< 0.005 U	**0.0058**	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Naphthalene	ug/L	1.4	**0.011**	< 0.05 U	< 0.05 U	< 0.05 U	< 0.005 U	< 0.05 U	< 0.05 U	< 0.05 U	**0.015**	< 0.05 U	< 0.05 U	< 0.05 U
Phenanthrene	ug/L		**0.016**	**0.0069 J**	**0.025**	< 0.005 U	**0.014**	**0.0066 J**	**0.01**	< 0.005 U	**0.012**	**0.0072 J**	**0.0082**	< 0.005 U
Pyrene	ug/L	2	**0.012**	< 0.005 U	**0.011**	< 0.005 U	**0.008**	< 0.005 U	**0.005**	< 0.005 U	**0.006**	< 0.005 U	**0.0053**	< 0.005 U
Total cPAHs TEQ [1,2]	ug/L	0.008	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U
Polychlorinated Biphenyls (PCBs)														
Total PCBs (Sum of Aroclors)(1,3)	ug/L	0.005	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
TPHs														
Diesel Range Organics	ug/L	500	--	--	--	--	--	--	--	--	--	--	--	--
Motor Oil Range Organics	ug/L	500	--	--	--	--	--	--	--	--	--	--	--	--
Extended Range Organics	ug/L	500	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Bold - detected

Gray Shaded - Sampling events occurred prior to the interim action in 2020

Blue Shaded - Detected result or non-detected RL exceeded PCUL

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

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

TBT results UJ due to assorted low-bias QC issues. Non-detects may not be definitive.

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

FD - Field Duplicate QC sample

D - Dissolved Fraction (filtered) sample result

T - Total Fraction (unfiltered) sample result

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

"--" - indicates results not available

µg/L = microgram per liter

ND = 1/2 RDL - calculated using 1/2 the reporting limit for non-detected components

ND = 1 - calculated using the reporting limit value for non-detected components

PCUL = Preliminary Cleanup Level

1. Most stringent screening levels are the most stringent preliminary cleanup levels (PCULs) for groundwater (GWs #2-5) established by the May 2021 LDW Preliminary Cleanup Level Workbook (Ecology, 2021).
2. The Laboratory Method Reporting Limit (MRL) is the Practical Quantitation Limit (PQL), as per WAC 173-340-700(6)(d), for purposes of this monitoring program. In accordance with WAC 173-340-700(6)(d), the groundwater PCULs are established at the PQL.
3. TEQ: Total toxic equivalent concentration of benzo(a)pyrene, calculated in accordance with WAC 173-340-708(8)(e). The total cPAH TEQ PCUL incorporates TEF values for each individual cPAH and is set at the PQL.
4. Total PCBs is the sum of detected Aroclor concentrations.

Table 4. Groundwater Analytical Results

Project No. 150054. Snopac Property, Seattle, Washington

			ALLUVIUM UNIT									
		Location Date	**MW-14** **06/25/2021**	**MW-14** **11/10/2021**	**MW-14** **01/17/2022**	**MW-14** **04/13/2022**	**MW-8** **02/08/2017**	**MW-8** **01/29/2018**	**MW-8** **06/25/2021**	**MW-8** **11/10/2021**	**MW-8** **01/17/2022**	**MW-8** **4/13/2022**
Analyte	Unit	PCUL										
Metals												
Arsenic	ug/L	8	**1.03**	**1.15**	**1.08**	< 1 U	**2.42**	**1.35**	**1.17**	**1.19**	< 1 U	< 1 U
Copper	ug/L	3.1	< 1 U	**18.2**	< 2.5 U	< 3 U	< 5 U	< 5 U	< 1 U	< 2 U	< 2.5 U	< 3 U
Lead	ug/L	5.6	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U
Mercury	ug/L	0.025	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U	< 1 U	< 1 U	< 0.01 U	< 0.01 U	< 0.01 U	< 0.01 U
Nickel	ug/L	8.2	**2.79**	**7.07**	**4.96**	**3.43**	**3.53**	**2.17**	**1.74**	**2.49**	**2.77**	**1.63**
Zinc	ug/L	81	**1.62 J**	**12.9**	**6.09**	< 5 U	< 5 U	< 5 U	< 1 UJ	< 5 U	**6.49**	< 5 U
Organometallic												
Tributyltin	ug/L		< 0.34 U	< 0.70 U	< 0.36 U	< 0.33 UJ	--	--	< 0.34 U	< 0.36 U	< 0.36 U	< 0.32 UJ
SVOCs												
Pentachlorophenol$^{(1)}$	ug/L	0.05	--	--	--	--	< 2 U	< 2 U	--	--	--	--
PAHs												
1-Methylnaphthalene	ug/L	800	**0.12**	< 0.05 U	< 0.05 U	< 0.05 U	< 0.2 U	< 0.2 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U
2-Methylnaphthalene	ug/L	14	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.2 U	< 0.2 U	< 0.05 U	< 0.05 U	< 0.05 U	< 0.05 U
Acenaphthene	ug/L	5.3	**0.87**	**0.98**	**1.3**	**1.1**	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Acenaphthylene	ug/L		**0.0055**	< 0.005 U	**0.0081**	**0.0068**	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Anthracene	ug/L	2.1	**0.039**	**0.034**	**0.027**	**0.028**	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Fluoranthene	ug/L	1.8	**0.11**	**0.18**	**0.16**	**0.21**	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Fluorene	ug/L	3.7	**0.1**	< 0.005 U	< 0.005 U	< 0.005 U	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Naphthalene	ug/L	1.4	**0.62**	**0.11**	< 0.05 U	< 0.05 U	< 0.03 U	< 0.03 U	**0.0068**	< 0.05 U	< 0.05 U	< 0.05 U
Phenanthrene	ug/L		**0.092**	**0.04**	**0.056**	**0.053**	< 0.03 U	< 0.03 U	**0.0085**	< 0.005 U	**0.0065**	< 0.005 U
Pyrene	ug/L	2	**0.11**	**0.14**	**0.12**	**0.16**	< 0.03 U	< 0.03 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
Total cPAHs TEQ ^{1,2}	ug/L	0.008	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.02265 U	< 0.02265 U	< 0.00755 U	< 0.00755 U	< 0.00755 U	< 0.00755 U
Polychlorinated Biphenyls (PCBs)												
Total PCBs (Sum of Aroclors)$^{(1,3)}$	ug/L	0.005	< 0.005 U	**0.0168 J**	< 0.005 U	< 0.005 U	< 0.1 U	< 0.1 U	< 0.005 U	< 0.005 U	< 0.005 U	< 0.005 U
TPHs												
Diesel Range Organics	ug/L	500	--	--	--	--	**110 X**	**100 X**	--	--	--	--
Motor Oil Range Organics	ug/L	500	--	--	--	--	< 250 U	< 250 U	--	--	--	--
Extended Range Organics	ug/L	500	--	--	--	--	**110 X**	**100 X**	--	--	--	--

Notes:

Bold - detected

Gray Shaded - Sampling events occurred prior to the interim action in 2020

Blue Shaded - Detected result or non-detected RL exceeded PCUL

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

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

TBT results UJ due to assorted low-bias QC issues. Non-detects may not be definitive.

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

FD - Field Duplicate QC sample

D - Dissolved Fraction (filtered) sample result

T - Total Fraction (unfiltered) sample result

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

"--" - indicates results not available

µg/L = microgram per liter

ND = 1/2 RDL - calculated using 1/2 the reporting limit for non-detected components

ND = 1 - calculated using the reporting limit value for non-detected components

PCUL = Preliminary Cleanup Level

1. Most stringent screening levels are the most stringent preliminary cleanup levels (PCULs) for groundwater (GWs #2-5) established by the May 2021 LDW Preliminary Cleanup Level Workbook (Ecology, 2021).
2. The Laboratory Method Reporting Limit (MRL) is the Practical Quantitation Limit (PQL), as per WAC 173-340-700(6)(d), for purposes of this monitoring program. In accordance with WAC 173-340-700(6)(d), the groundwater PCULs are established at the PQL.
3. TEQ: Total toxic equivalent concentration of benzo(a)pyrene, calculated in accordance with WAC 173-340-708(8)(e). The total cPAH TEQ PCUL incorporates TEF values for each individual cPAH and is set at the PQL.
4. Total PCBs is the sum of detected Aroclor concentrations.

Table 5. Applicable or Relevant and Appropriate Requirements

Project No. 150054. Snopac Property, Seattle, Washington

Topic	Standard or Requirement	Regulatory Citation		Comment
		Federal	State	
Cleanup Requirements	Evaluation and conduct of cleanup actions		MTCA Cleanup Regulation (WAC 173-340)	Cleanup activities at the Site is being conducted under formal oversight by Ecology under Agreed Order. After completion of the Agreed Order requirements, the final uplands cleanup action will also be conducted under formal oversight by Ecology.
Land Disposal of Waste	Disposal of materials containing PCBs	Toxic Substances Control Act (15 USC 2605; 40 CFR Part 761)	--	--
	Hazardous or Dangerous 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	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)	--
Solid Waste Disposal	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	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)	For any uplands cleanup construction discharges to surface water, they will comply with Ecology Water Quality Program permit and discharge requirements.
Shoreline	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); Ecology Shoreline Variance Permit (Chapter 173-27-170)	The completed IA obtained a shoreline variance permit which included review for compliance with all local and state regulation criteria. Other cleanup construction on the shoreface will require the same permit and compliance review.
Construction Water Management	Discharges to public owned treatment works; National pretreatment Standards;	40 CFR Part 403	King County Industrial Wastewater Discharge Authorizations (Local)	The completed IA obtained and complied with King County Wastewater Discharge Authorization No. 1092-01 for permitted discharge of temporary dewatering to public treatment works.
Air	Air Quality		Washington Clean Air Act (RCW 70.94; WAC 173-400; WAC 173-460)	
Cultural Resources		Archeological and Historical Preservation Act (16 USCA 496a-1)	Department of Archaeology and Historic Preservation (DAHP)	Ground disturbing cleanup construction activities require an Inadvertent Discovery Plan to guide monitoring and notifications required for discovery of cultural artifacts.
Construction Safety	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	State Environmental Policy Act	--	State Environmental Policy Act RCW 43.21C; WAC 197-11-790)	Ecology will be lead SEPA agency and review planned environmental construction activities and determine if any environmental impact assessment is required, or issue a determination of non-significance.

Notes:

ARAR = applicable or relevant and appropriate requirement
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
-- = not applicable

Table 7. Groundwater Cleanup Levels

Project No. 150054, Snopac Property, Seattle, Washington

Constituent	Most Stringent PCUL[1]	Practical Quantification Limit (PQL)[2]	Groundwater Cleanup Level
Metals - Dissolved			
Arsenic	8	*1*	8
Copper	3.1	*1*	3.1
Lead	5.6	*1*	5.6
Mercury	0.025	*0.01*	0.025
Nickel	8.2	*1*	8.2
Zinc	81	*1*	81
Polycyclic Aromatic Hydrocarbons (PAHs)			
1-Methylnaphthalene	800	*0.05*	800
2-Methylnaphthalene	14	*0.05*	14
Acenaphthene	5.3	*0.005*	5.3
Acenaphthylene	--	*0.005*	--
Anthracene	2.1	*0.005*	2.1
Fluoranthene	1.8	*0.005*	1.8
Fluorene	3.7	*0.005*	3.7
Naphthalene	1.4	*0.005*	1.4
Phenanthrene	--	*0.005*	--
Pyrene	2	*0.005*	2
Total cPAHs TEQ[3]	0.0049	*0.008*[4]	0.008
Polychlorinated Biphenyls (PCBs)			
Total PCB Aroclors	0.000007	*0.005*	0.005

Notes:

All concentrations are in milligrams per liter (ug/L).

1. Most stringent screening levels are the most stringent preliminary cleanup levels (PCULs) for non-potable groundwater established by the Ecology PCUL Document (Ecology, 2021).

2. In accordance with WAC 173-340-700(6)(d), the groundwater CUL will be established at the PQL.

3. TEQ: Total toxic equivalent concentration of benzo(a)pyrene, calculated in accordance with WAC 173-340-708(8)(e).

4. The total cPAH TEQ RL incorporates TEF values for each individual cPAH.

Table 8. Remedial Technology Identification for Site COCs

Project No. 150054, Snopac Property, Seattle, Washington

	Metals		Polycyclic Aromatic Hydrocarbons (PAHs)		Polychlorinated Biphenyls (PCBs)
Remedial Technologies	**Soil**	**Groundwater**	**Soil**	**Groundwater**	**Soil**
Removal					
Off-Site Treatment/Disposal	X		X		X
On-Site (Ex Situ) Pre-Treatment/Off-site Disposal	X		X		X
On-Site Treatment and Reuse	X		X		
***In Situ* Containment Technologies**					
Capping	X		X		X
Impermeable Barriers for Groundwater Containment		X		X	
***In Situ* Treatment Technologies**		s			
Physical Treatment	X	X	X	X	
Chemical Treatment	X	X	X	X	
Biological Treatment		X	X	X	
Monitored Natural Attenuation		X		X	
Groundwater Extraction and Treatment		X		X	X
Institutional Controls	X	X	X	X	X

Notes:

X = Contaminant/media for which remedial technology is potentially applicable

Technology retained for remedial alternative development

Table 9. Remedial Alternative Cost Estimate Summary

Project No. 150054, Snopac Property, Seattle, Washington

Remedial Alternative		Estimated Capital Cost	Estimated O&M Period (years)	Estimated Total Cost
1)	SBG-Containing Fill Removal, Partial Wood Piling Removal, Groundwater MNA, Ics	$ 3,997,000	10	$ 4,360,000
2)	SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater MNA, and Ics	$ 4,452,000	10	$ 4,810,000
3)	SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater Treatment and MNA, and Ics	$ 4,788,000	7	$ 5,020,000

Notes:

1. Estimated cost are in 2021 dollars. All costs include the completed Interim Action sunk costs. The estimated future costs are preliminary, Feasibility Study-level estimates based on existing information and are estimated to be within +50/-30% of actual costs.

MNA = groundwater monitored natural attenuation

ICs = Institutional Controls

Table 10. Disproportionate Cost Analysis

Project No. 150054, Snopac Property, Seattle, Washington

	MTCA Description of DCA Criterion (WAC 173-340-360(3)(f))		Alternative 1	Alternative 2	Alternative 3
			SBG-Containing Fill Removal, Partial Wood Piling Removal, Groundwater MNA, Ics	SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater MNA, and Ics	SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater Treatment and MNA, and Ics
(1) OVERALL PROTECTIVENESS	*Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk and attain cleanup standards, on-site and offsite risks resulting from implementation, and improvement of the overall environmental quality.*		Alternative 1 provides a high degree of protectiveness by removal of the source of contamination at the Site, the SBG-containing fill remaining on the shoreface.	The wood pilings do no represent an exposure risk, and therefore the removal of wood pilings do not provide any additional protectiveness.	The active treatment of Fill Unit groundwater is capable of reducing the time to reach groundwater cleanup standards relative to MNA alone in Alternatives 1 and 2.
	Score[1]		8	8	9
	Weighted Score[2]	**30%**	**2.4**	**2.4**	**2.7**
(2) PERMANENCE	*The degree of permanent reduction in toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.*		Alternative 1 provides a high degree of permanence by removal of the source of contamination at the Site, the SBG-containing fill remaining on the shoreface. Removal is the permanent remedial solution.	Removal of the wood pilings does represent a slight increase in permanence, by removing a potential source of contamination.	Alternative 3 provides nominal incremental permanence relative to Alternatives 1 and 2.
	Score[1]		7	8	9
	Weighted Score[2]	**20%**	**1.4**	**1.6**	**1.8**
(3) LONG-TERM EFFECTIVENESS	*Long-term effectiveness includes the degree of certainty that the alternative will be successful, long-term reliability, the magnitude of residual risk, and the effectiveness of controls required to manage treatment residues or remaining wastes.*		Alternative 1 is effective in the long-term by permanently removing the source of contamination at the Site.	Removal of the wood pilings does represent a slight increase in long-term effectiveness, by removing a potential source of contamination.	MNA of Fill Unit groundwater is expected to be effective long-term at the Site once the SBG-containing fill is removed. The use of treatment to enhance MNA of Fill Unit groundwater does not provide any incremental long-term effectiveness.
	Score[1]		7	8	8
	Weighted Score[2]	**20%**	**1.4**	**1.6**	**1.6**

Table 10. Disproportionate Cost Analysis

Project No. 150054, Snopac Property, Seattle, Washington

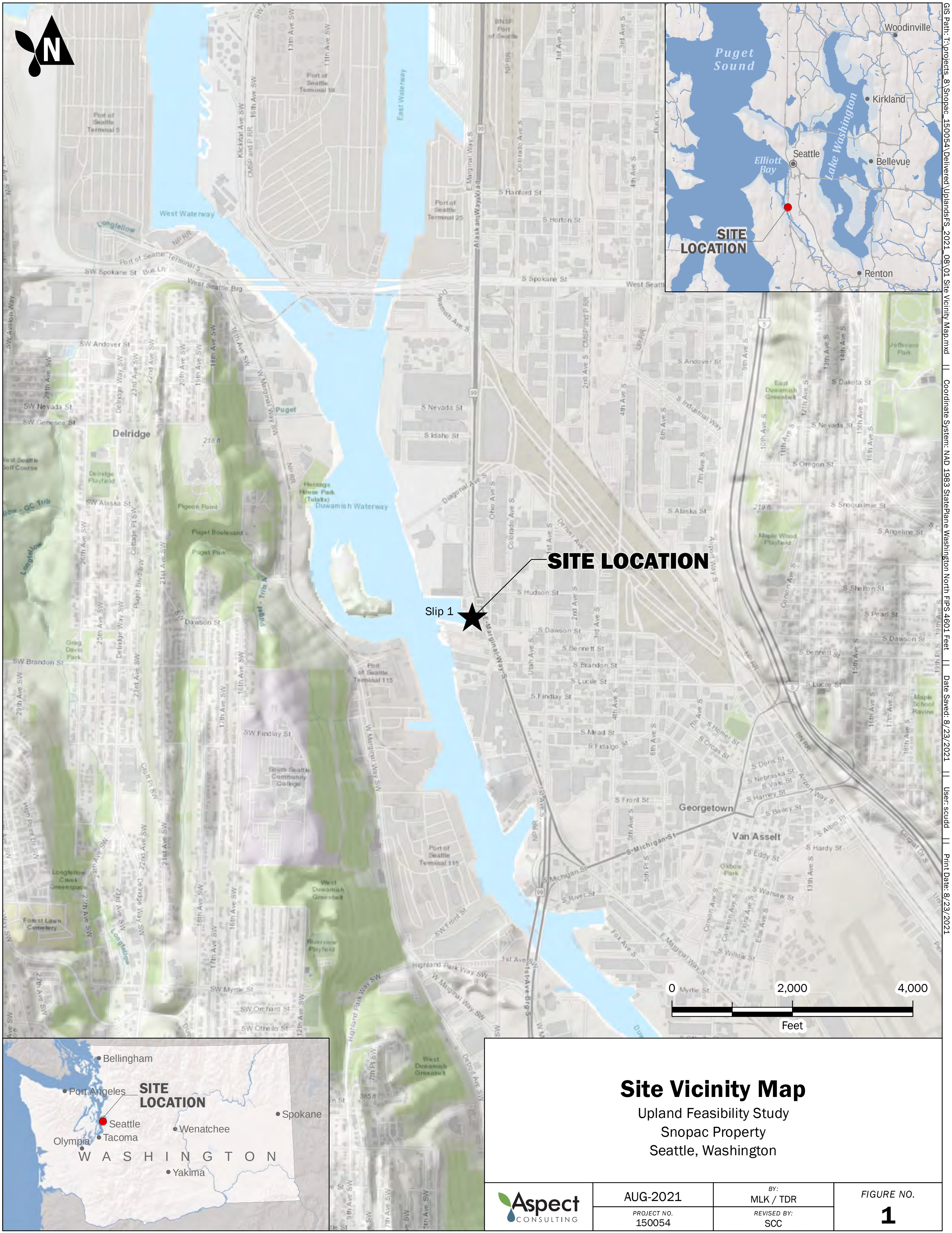
			Alternative 1	Alternative 2	Alternative 3
	MTCA Description of DCA Criterion (WAC 173-340-360(3)(f))		SBG-Containing Fill Removal, Partial Wood Piling Removal, Groundwater MNA, Ics	SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater MNA, and Ics	SBG-Containing Fill Removal, Complete Wood Piling Removal, Groundwater Treatment and MNA, and Ics
(4) SHORT-TERM RISKS	*Management of short-term risks, including the protection of human health and the environment associated with the alternative during construction and implementation.*		The removal of the SBG-containing fill requires in-water construction which represent short-term risks that can be mitigated through design and construction practices.	Removal of the wood pilings is an additional construction element, requiring a change and represents some additional short-term risks	The active treatment of Fill Unit groundwater consists of the direct push injection placement of reactive iron as slurry. The slurry injection will require pressurized equipment, representing an incremental short-term risk.
	Score[1]		6	5	3
	Weighted Score[2]	**10%**	**0.6**	**0.5**	**0.3**
(5) IMPLEMENTABILITY	*Implementability, including consideration of whether the alternative is technically possible, availability of necessary offsite facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*		The removal of the SBG-containing fill requires in-water construction and federal permitting, making the removal of the SBG-containing fill not readily implementable due to the permitting timeline. The means and methods for the in-water construction are readily implementable.	The wood piling removal is ready implementable from the landward side of the shoring wall.	The use of injections of slurry to treatment groundwater would need to be pilot-tested and demonstrated at the Site
	Score[1]		5	5	4
	Weighted Score[2]	**10%**	**0.5**	**0.5**	**0.4**
(6) PUBLIC CONCERNS	*Consideration of public concerns, including the extent to which the alternative addresses such concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*				
	Score[1]		8	9	10
	Weighted Score[2]	**10%**	**0.8**	**0.9**	**1.0**
	MTCA Benefits Ranking[3]		**7.1**	**7.5**	**7.8**
	Estimated Cost[4]		**$4,360,000**	**$4,810,000**	**$5,020,000**
	Benefit/Cost Ratio(5)		**1.63**	**1.56**	**1.55**

DCA = Disproportionate cost analysis	MTCA = Model Toxics Control Act	MNA = monitored natural attenuation
IC = institutional control	SBG = sandblast grit	ICs = Institutional Controls

Notes:

1. The Score for each criterion's subfactor is scored between 1 and 10, with 1 being the least favorable score and 10 the most favorable score based on the cleanup alternative's ability to meet the subfactor evaluated (e.g., not effective, not permanent, carries high short-term risks, difficult to implement).
2. The Weighted Score for each DCA criterion is obtained by multiplying the average of the subfactor scores for the criterion by the assigned weighting factor (% listed) for the criterion.
3. The MTCA benefits ranking for each alternative is obtained by summing the weighted scores for the six DCA criteria.
4. Costs are estimated in 2021 dollars. All costs include the completed Interim Action sunk costs. The costs shown are rounded to the nearest $10,000 dollar. Itemized cost estimates are provided in Appendix B.
5. The benefit/cost ratio is obtained by dividing the alternative's MTCA benefits ranking by its estimated cost. This ratio is multiplied by 1E6 for all alternatives such that the benefit/cost ratios are in the range of 1-10 for relative comparison (see Figure 9).

FIGURES



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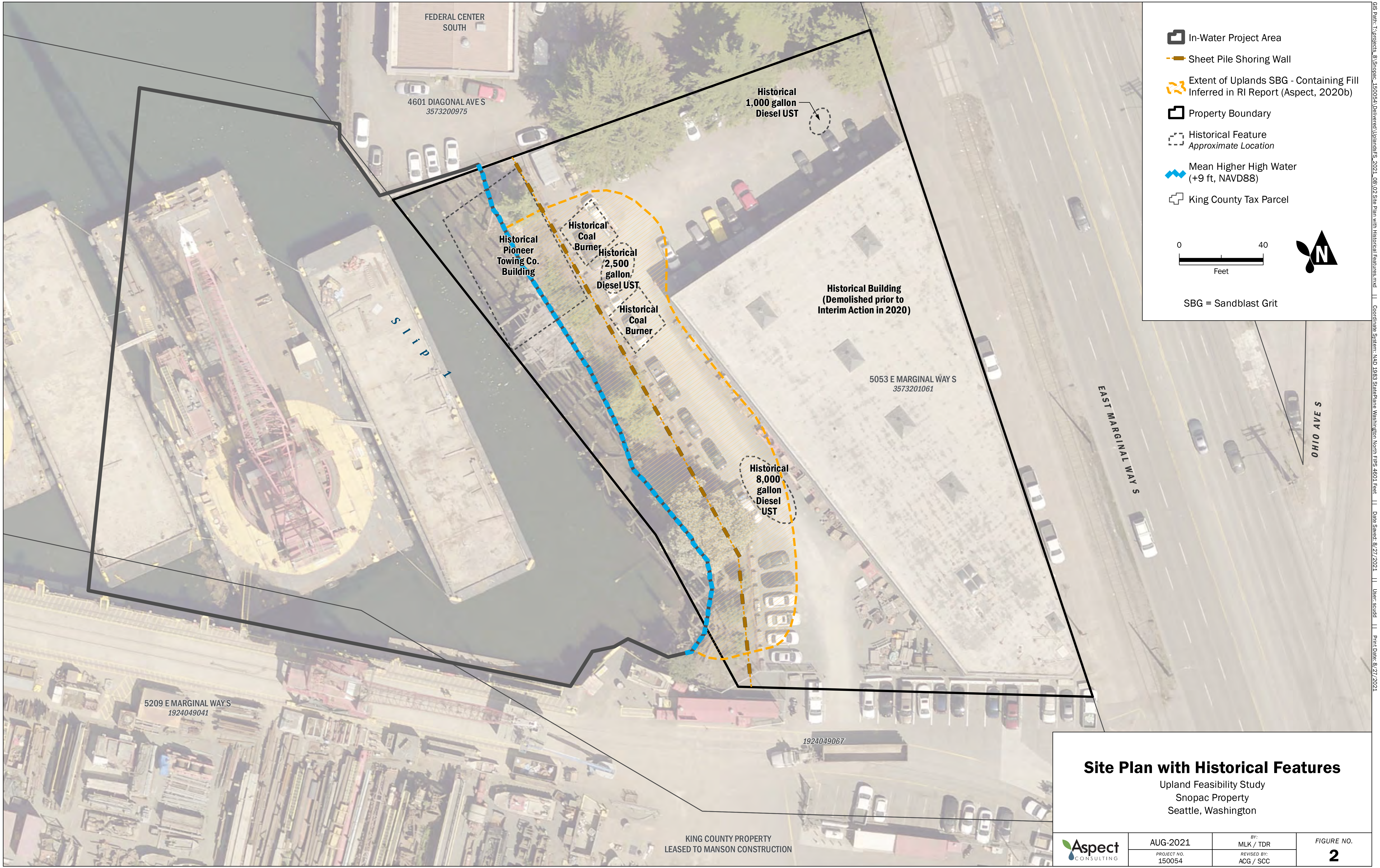
Site Vicinity Map

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING	AUG-2021	BY: MLK / TDR	FIGURE NO.
	PROJECT NO. 150054	REVISED BY: SCC	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



Site Plan with Historical Features

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING

AUG-2021

PROJECT NO. 150054

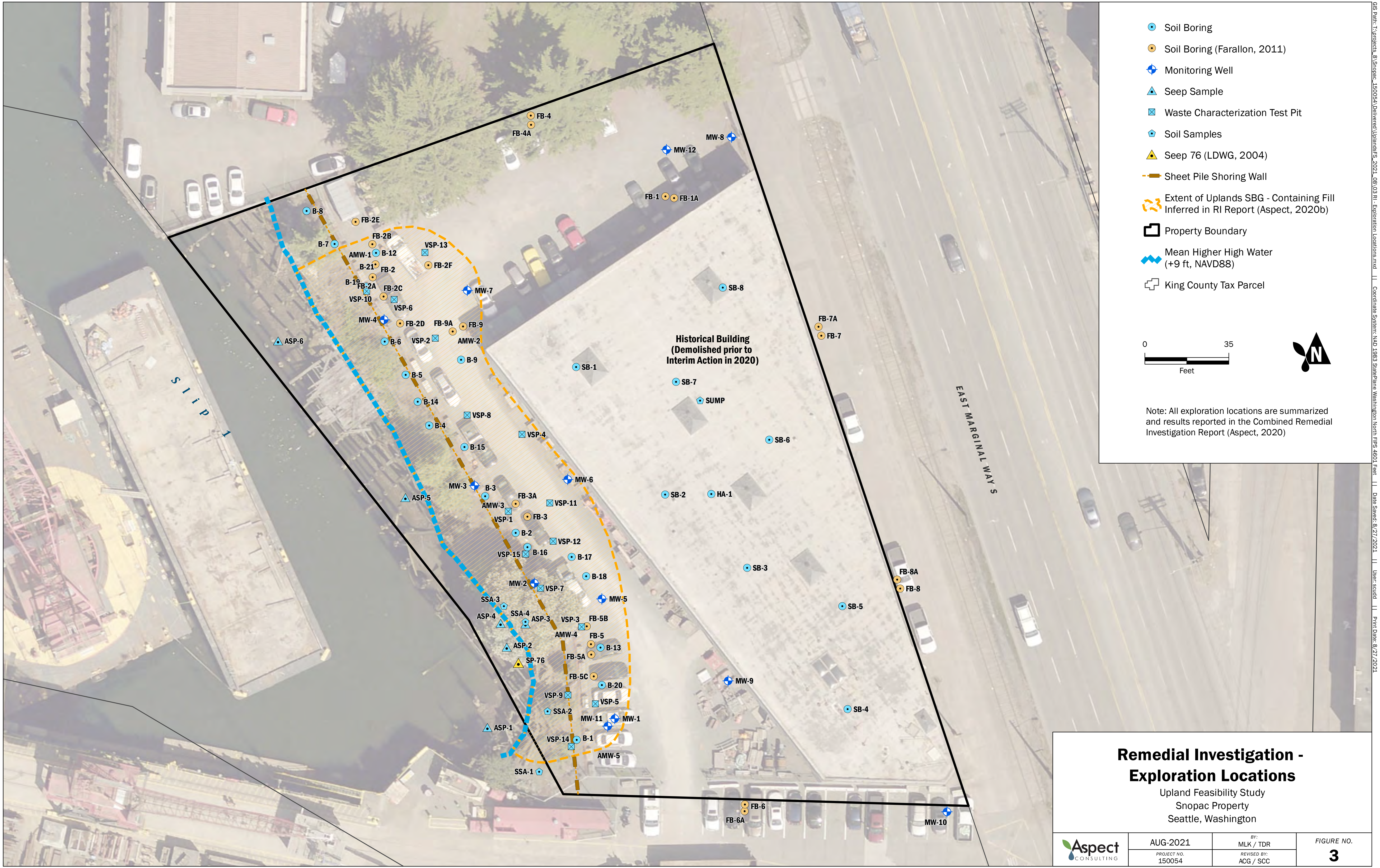
BY: MLK / TDR

REVISED BY: ACG / SCC

FIGURE NO. **2**

Basemap Layer Credits || EagleView Technologies, Inc.

GIS Path: T:\projects_8\Snopac_150054\Delivered\UplandsFS_2021_08\02 Site Plan with Historical Features.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 8/27/2021 || User: scudd || Print Date: 8/27/2021



Note: All exploration locations are summarized and results reported in the Combined Remedial Investigation Report (Aspect, 2020)

Basemap Layer Credits || EagleView Technologies, Inc.

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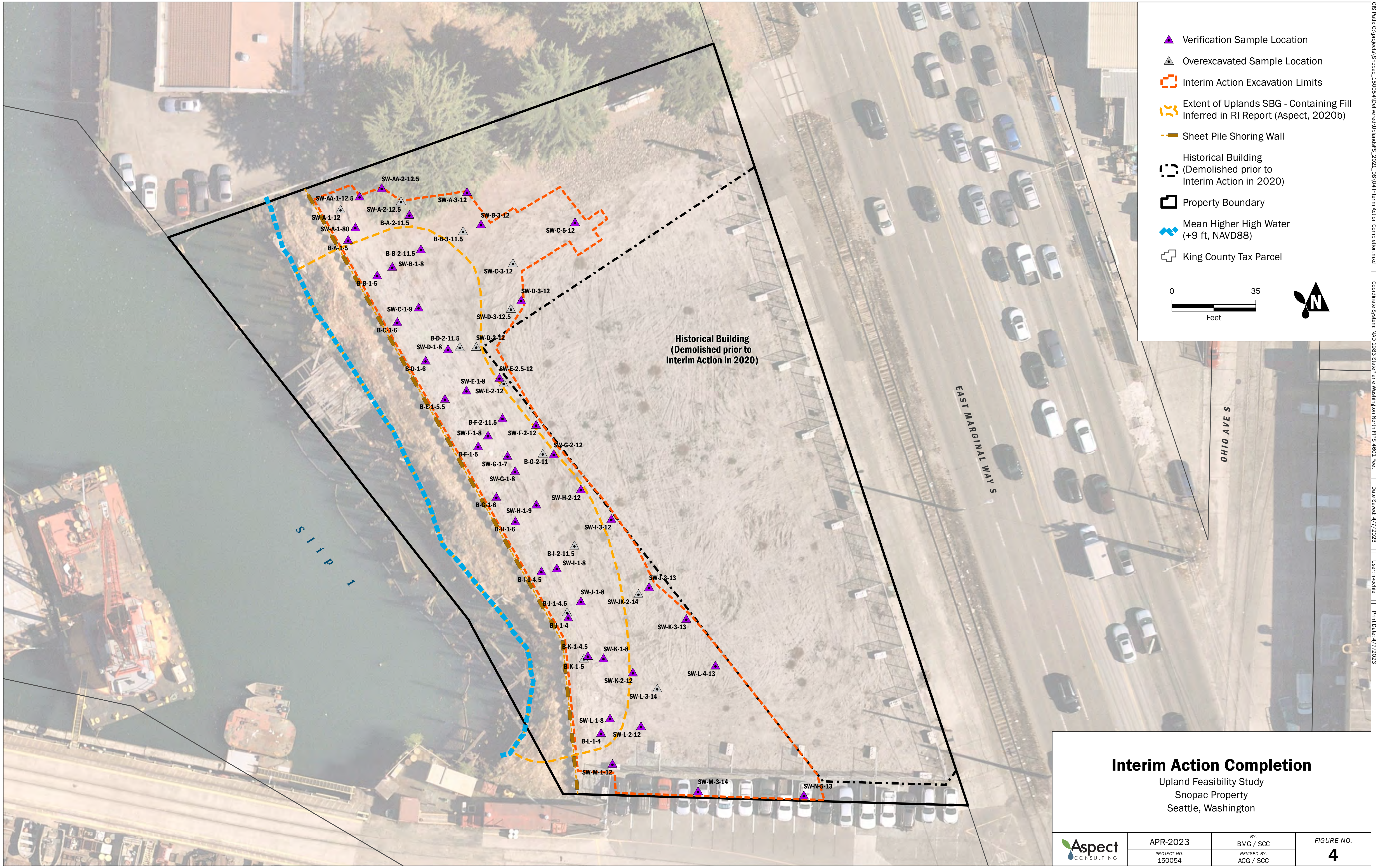
Remedial Investigation - Exploration Locations

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING

AUG-2021	BY: MLK / TDR	FIGURE NO. 3
PROJECT NO. 150054	REVISED BY: ACG / SCC	



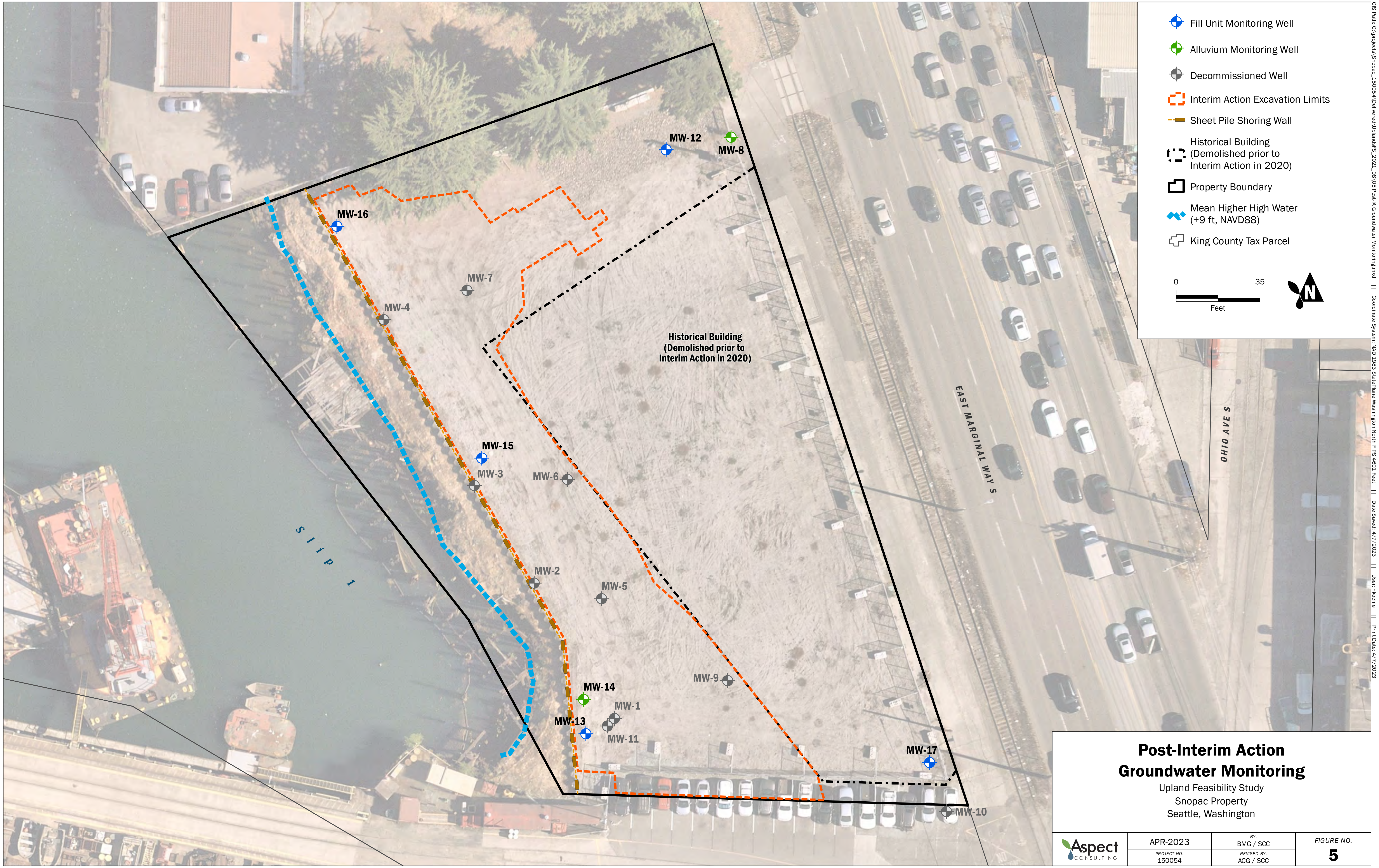
Interim Action Completion

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING

APR-2023	BY: BMG / SCC	FIGURE NO.
PROJECT NO. 150054	REVISED BY: ACG / SCC	4

GIS Path: G:\projects\Snopac_150054\Delivered\UplandsFS_2021_08\04 Interim Action Completion.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/7/2023 || User: nkochie || Print Date: 4/7/2023

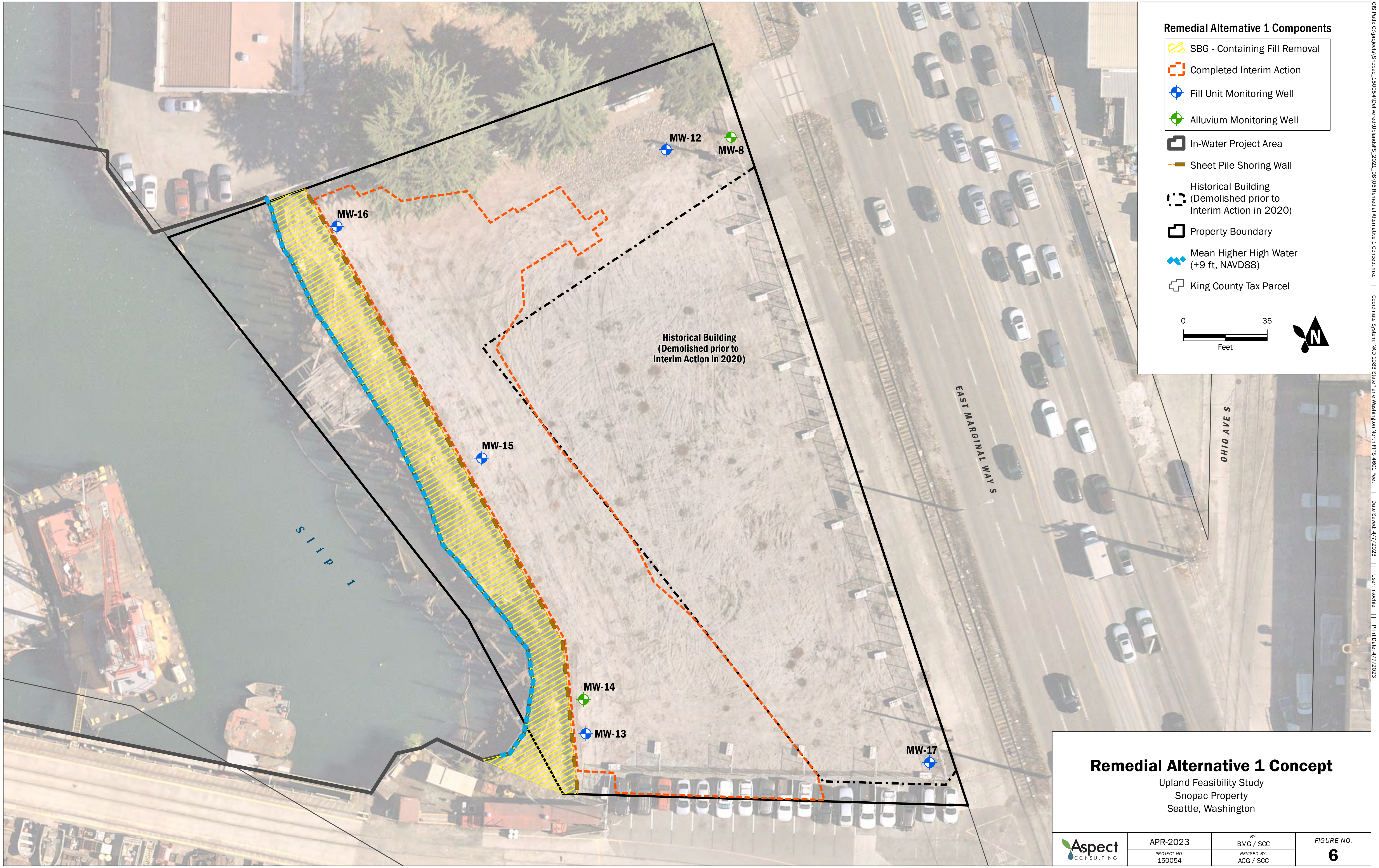


Post-Interim Action Groundwater Monitoring

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING	APR-2023	BY: BMG / SCC	FIGURE NO. 5
	PROJECT NO. 150054	REVISED BY: ACG / SCC	

GIS Path: G:\projects\Snopac_150054\Delivered\UplandsFS_2021_08\05 Post-IA Groundwater Monitoring.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/7/2023 || User: nkochie || Print Date: 4/7/2023

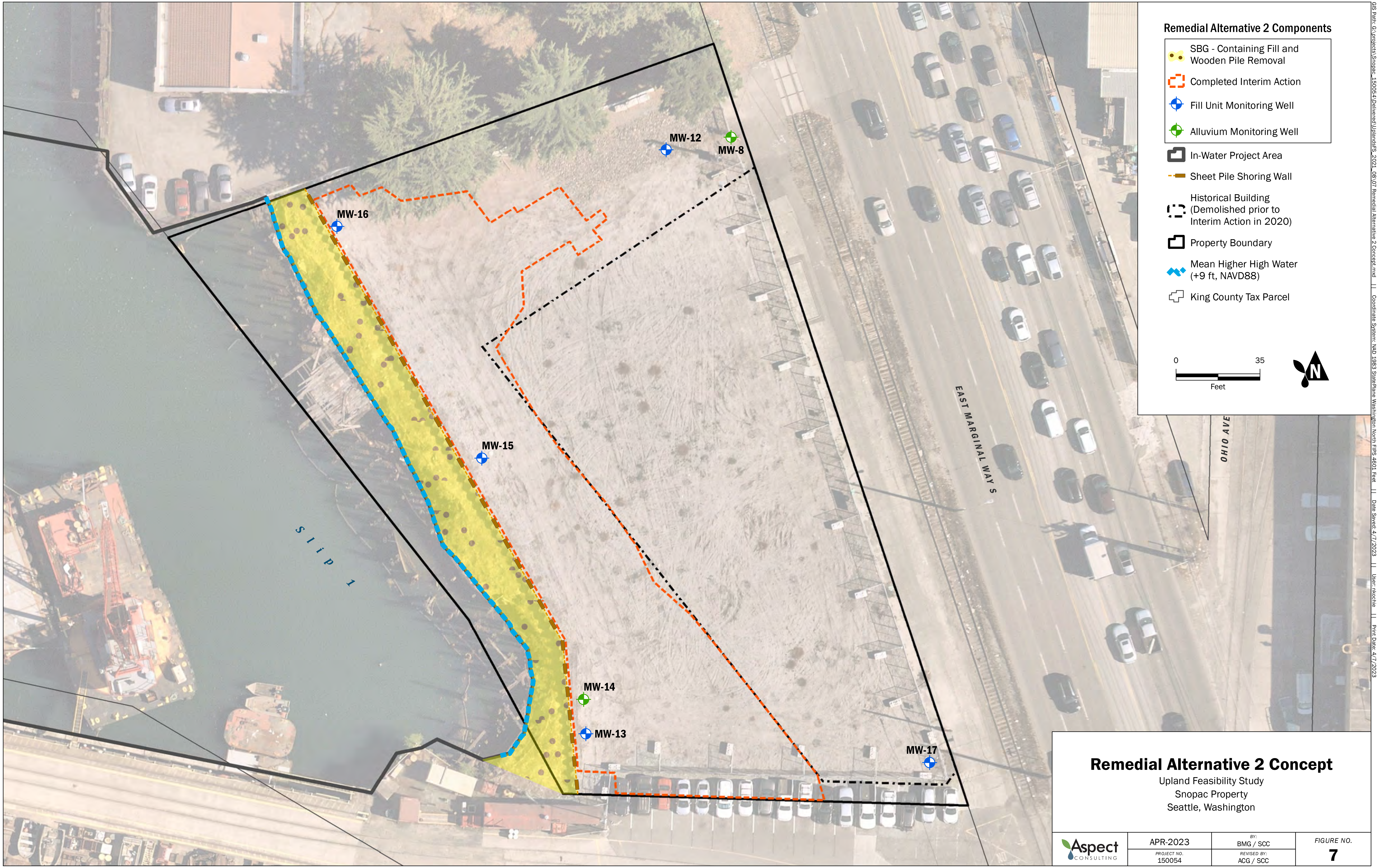


Remedial Alternative 1 Concept

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING	APR-2023	BY: BMG / SCC	FIGURE NO.
	PROJECT NO. 150054	REVISED BY: ACG / SCC	6

GIS Path: G:\projects\Snopac_150054\Delivered\UplandsFS_2021_08\06 Remedial Alternative 1 Concept.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/7/2023 || User: nkochie || Print Date: 4/7/2023

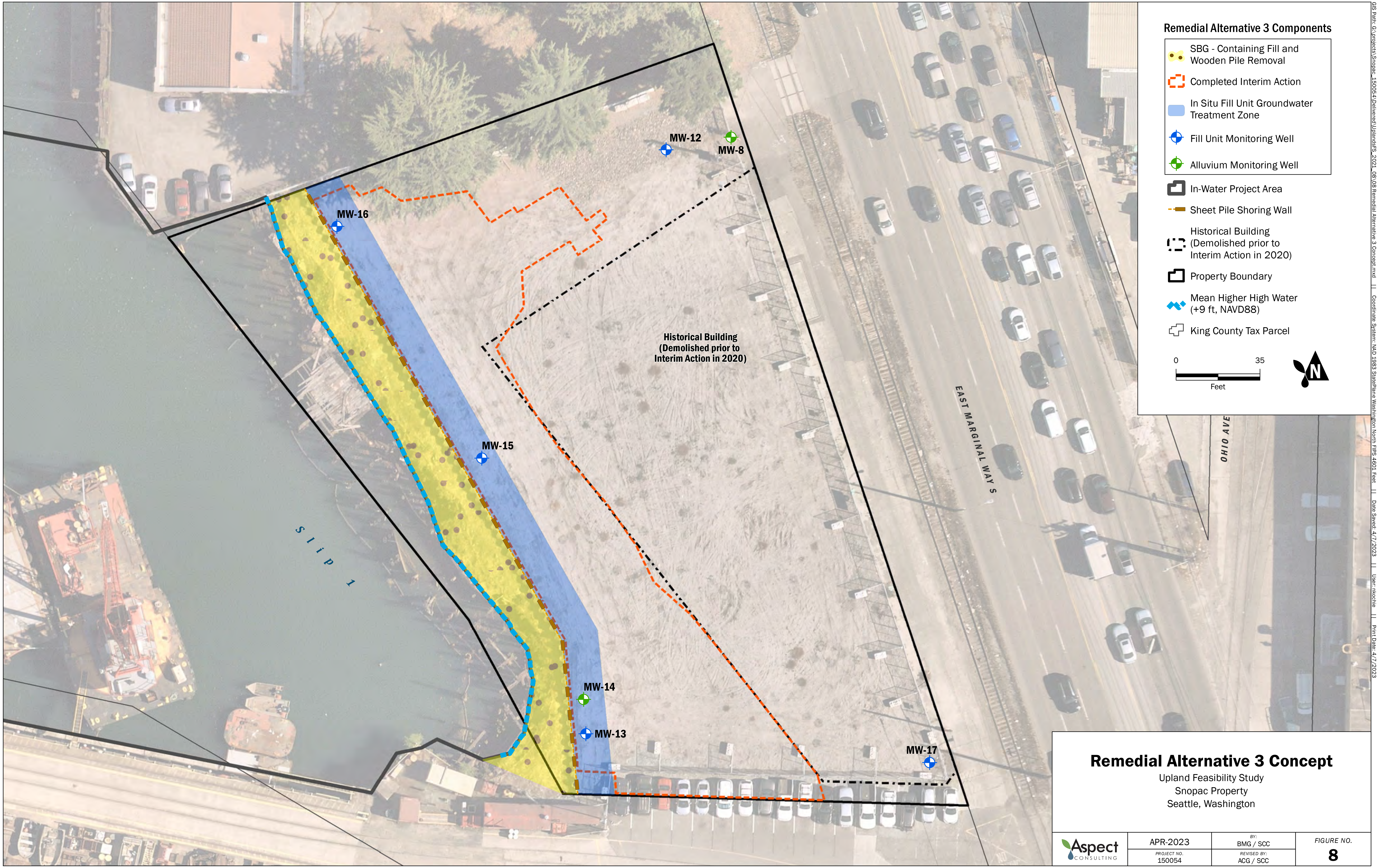


Remedial Alternative 2 Concept

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING	APR-2023 PROJECT NO. 150054	BY: BMG / SCC REVISED BY: ACG / SCC	FIGURE NO. 7

GIS Path: G:\projects\Snopac_150054\Delivered\UplandsFS_2021_08\07 Remedial Alternative 2 Concept.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/7/2023 || User: nkochie || Print Date: 4/7/2023

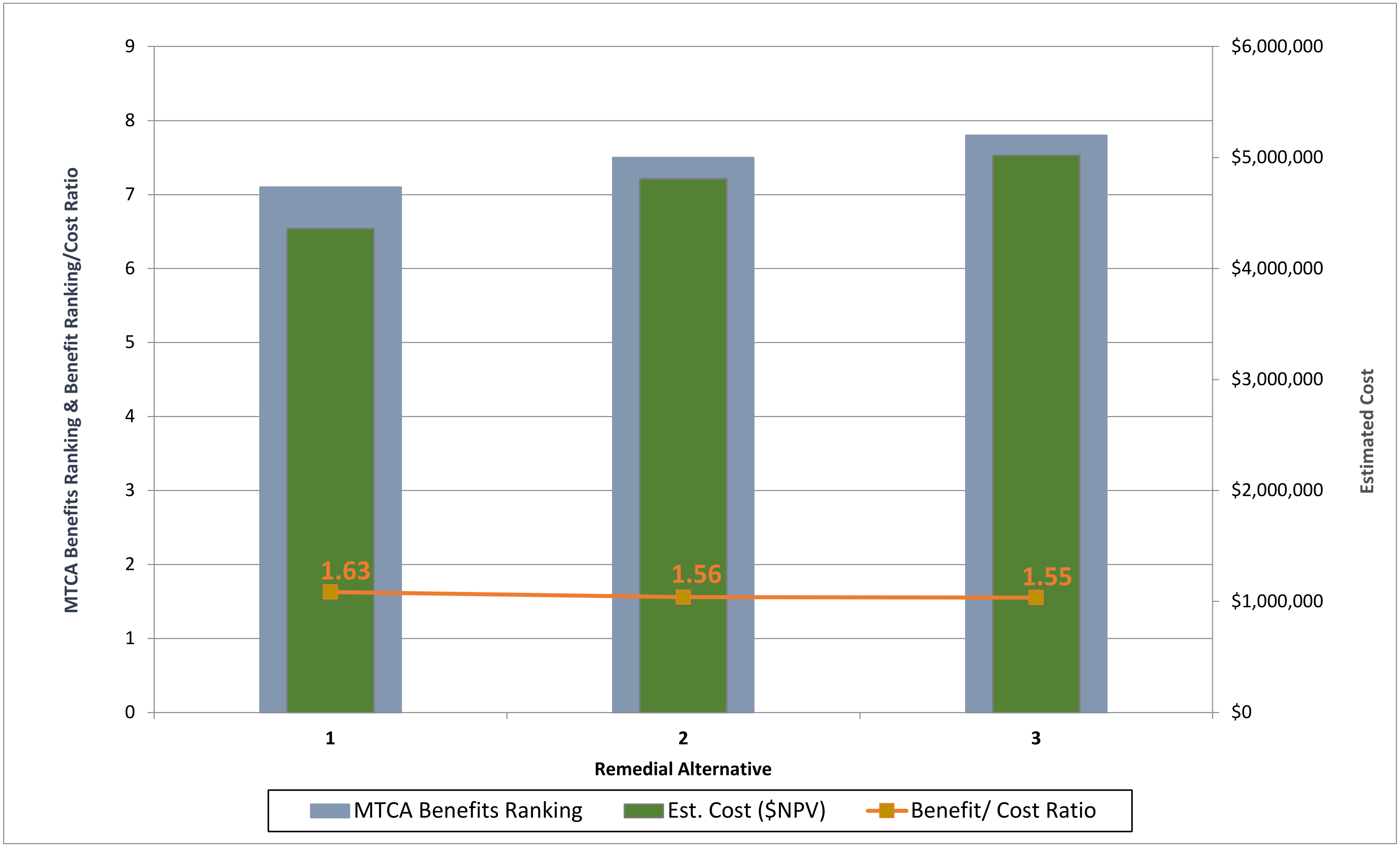


Remedial Alternative 3 Concept

Upland Feasibility Study
Snopac Property
Seattle, Washington

Aspect CONSULTING	APR-2023	BY: BMG / SCC	FIGURE NO. 8
	PROJECT NO. 150054	REVISED BY: ACG / SCC	

GIS Path: G:\projects\Snopac_150054\Delivered\UplandsFS_2021_08\08 Remedial Alternative 3 Concept.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 4/7/2023 || User: nkochie || Print Date: 4/7/2023



Notes:

1. Estimated cost are in 2021 dollars. All costs include the completed Interim Action sunk costs. The estimated future costs are preliminary, Feasibility Study-level estimates based on existing information and are estimated to be within +50/-30% of actual costs.

Aspect Consulting
12/18/2023

Figure 9
Disproportionate Cost Analysis Summary
Upland Feasibility Study
Project No. 150054

APPENDIX A

Post-Interim Action Tidal Study Memorandum

MEMORANDUM

Project No. 150054

April 3, 2023

To: Sandra Matthews, Washington State Department of Ecology

cc:
John Heckel, Manson Construction Co.
Doug Steding, Northwest Resource Law PLLC
Jane Sund, Integral Consulting

From:

State of Washington
Hydrogeologist
272
Licensed Geologist
Steve J. Germiat

4/3/2023

Matthew M. Lewis

Matthew M. Lewis, LHG
Project Hydrogeologist
mlewis@aspectconsulting.com

Steve J. Germiat, LHG
Principal Hydrogeologist
sgermiat@aspectconsulting.com

Re: **Post-Interim Action Tidal Study Methods and Results**
Snopac Property, Seattle, Washington

Introduction and Summary of Findings

This memo provides the methods and results of a tidal study Aspect Consulting, LLC (Aspect) completed as part of the Upland groundwater compliance activities at the Snopac Property (Site) located at 5055 East Marginal Way South in Seattle, Washington. The work was completed to assess the hydraulic effect of the recently installed sheet pile cutoff wall[1] on the Site groundwater levels and flow directions, as required by the Washington State Department of Ecology (Ecology) in a January 11, 2022, Completion of Interim Action Activities Letter. This cutoff wall extends along most of the shoreline at the Site and abuts the concrete bulkhead wall on the north-adjacent Federal Center property (Figure 1). The tidal study involved measurement of water levels for over 72 hours at five monitoring wells completed in the Fill Unit, and two wells completed in the Alluvium Unit, to evaluate the effects of tidal fluctuations on groundwater levels and gradients, and

---

[1] Installed to a depth of approximately 45 feet below grade as part of the 2021 upland interim action as described in the Interim Action Report (Aspect, 2021).

to define groundwater flow conditions, including tidally averaged groundwater elevations and flow direction.

The findings of the tidal study are:

- Tidal efficiency in the Fill Unit wells ranged from 0.9 to 1.5 percent, but the Alluvium Unit wells ranged from 16 to 19 percent. Lag times in the Fill Unit wells were between 1.4 and 3.8 hours in the Fill wells, but they were about 0.5 hours in the Alluvium Unit wells. Tidal signals were not discernable in the two Fill wells located farthest from the Lower Duwamish Waterway (LDW) shoreline (MW-12 and MW-17).
- Following installation of the sheet pile wall, the net (tidally averaged) groundwater flow direction in the Fill Unit is generally west towards the river, flowing around the south end of the cutoff wall. During higher-high tide, the gradient at the north end of the site shifts inland for less than 6 hours before returning to its typical western flow direction. Groundwater flow in the Alluvium Unit could not be directly calculated based on two wells but is assumed to flow towards the LDW.
- The results from the Fill wells were compared to the closest wells used in a previous tidal study, conducted by Aspect in February 2017, before the sheet pile wall was installed. Tidal magnitude and efficiency both showed a significant decrease (85 to 98 percent decrease) as a result of the sheet pile wall. However, no substantive change in tidal influence was observed in the Alluvium Unit because the wall does not fully penetrate the aquifer, allowing tidal pressures to propagate beneath the wall.

The following sections describe the tidal study field methods and results.

Field Methods

Aspect completed the tidal study using unvented pressure transducers (TD-Divers), manufactured by Van Essen Instruments. The TD-Divers were deployed for over 72 hours at 5-minute intervals (12:45 p.m. on March 21 through 12:45 p.m. on March 24, 2022) in the following seven wells:

- Fill Unit wells**:** MW-12, MW-13, MW-15, MW-16, MW-17
- Alluvium Unit wells: MW-8, MW-14

For the study duration, a barometric pressure transducer was installed above the water column in one of the study wells to record local fluctuations in atmospheric pressure that can affect the groundwater levels. Tidal stage data was acquired from the National Oceanic and Atmospheric Administration (NOAA) Tidal Station 9447130 located at the Seattle Ferry Terminal in Elliott Bay. Project well locations are presented on Figure 1.

Data Analysis and Results

Once the transducers were retrieved, the data were downloaded and corrected to account for changes in atmospheric pressure during the study using the data from the barometric pressure transducer. The data logger readings were converted to groundwater elevations using the depth-to-water measurements collected at the beginning and end of the tidal study and the surveyed top-of-well-casing elevations.

Tidal Study Data Analysis

Each well's water level data were processed by computing a series of running averages to filter out lunar and solar tidal signals (Serfes, 1991), resulting in a single average groundwater elevation for each well on March 23, 2022, at 1:45 a.m. Additionally, for each well, we calculated tidal efficiency (represented as a ratio of measured tidal amplitude in the well to tidal amplitude recorded in Elliott Bay) and tidal lag times (the average time for the tidal signal to be expressed in the well water level). For tidal efficiency and lag times, only the high tide data were used because at lower low tidal stages the tide is below the bottom of the Fill Unit (top of aquitard). When this occurs, the Fill Unit water table remains essentially perched on the aquitard several feet above the tidal stage, making the low tide data unreliable for analysis.

The tidally averaged groundwater elevations from the Fill Unit wells were used to create a groundwater elevation contour map from which the net groundwater flow directions (accounting for the full tidal cycle) can be estimated (Figure 1). A groundwater elevation contour map was not developed for the Alluvium wells because that would require at least three wells to be meaningful.

Tidal Study Results

Tidal study results indicate the tidal cycle is causing discernable water level elevation fluctuations in the Fill Unit wells along the shoreline (MW-13, MW-15, and MW-16), but not in the more distal wells (MW-12 and MW-17). Tidal efficiency in the shoreline Fill Unit wells ranged from 0.9 to 1.5 percent, and the tidal lag times were between 1.4 to 3.8 hours. However, the tidal signal was too weak in the distal Fill Unit wells to determine tidal efficiency or lag. The low tidal efficiencies reflect the fact that the sheet pile wall fully penetrates the Fill Unit across the property's entire shoreline. The differences in the remaining tidal effects among shoreline wells may be attributable to variation in the aquitard thickness or competence.

Tidal study results in the two Alluvium Unit wells (MW-8 and MW-14) indicate a higher hydraulic connectivity to tidal pressures in the LDW than the Fill Unit wells, with tidal efficiency of 16 percent and 19% and lag times of 0.45 hours and 0.48 hours, respectively. The higher tidal efficiency can be attributed to the sheet pile wall not fully penetrating the Alluvium Unit,[2] allowing tidal pressures to propagate into the unit beneath the bottom of the wall. See Table 1 below for results.

---

[2] Alluvium Unit is estimated to extend to a depth of roughly 160 feet below grade (Aspect, 2020).

Table 1. Tidal Study Results (Post-Installation of Sheet Pile Wall)

Well	Tidally Averaged Groundwater Elevation in Feet (NAVD88)	Maximum Tidal Swing in feet	Discernible Tidal Signal?	Average Tidal Efficiency	Average Tidal Lag in hours
Fill Unit Wells					
MW-12	7.82	0.09	No	-	-
MW-13	7.15	0.14	Yes	0.9%	3.3
MW-15	7.78	0.28	Yes	1.5%	2.8
MW-16	7.79	0.23	Yes	1.3%	1.4
MW-17	8.01	0.15	No	-	-
MW-7	n/a	n/a	Yes	1.3%	2.5
Alluvium Unit Wells					
MW-8	6.67	2.32	Yes	0.19	0.45
MW-14	6.34	1.90	Yes	0.16	0.48

Note: The tidal study at MW-7 was conducted in June 2021 after installation of the sheet pile wall.

Hydrographs of water level elevations in the Site wells and the tidal elevations measured in Elliott Bay during the tidal study duration are shown on Figure 2.

Groundwater Flow in Fill Unit After Sheet Pile Wall

The groundwater elevation contours on Figure 1 indicate that, with the sheet pile wall in place along the Site shoreline, the net (tidally averaged) gradient and flow direction within the Fill Unit is generally westward towards the LDW as expected. However, there appears to be a groundwater boundary dividing flow into the northwest direction and southwest around the cutoff wall. For the tidally averaged condition, the water table immediately inland from the cutoff wall is essentially flat in the northern half of the Site (0.01-foot head difference between MW-16 at the north end and MW-15 near the center of the wall), and with a steeper gradient (0.63-foot head difference) southward from MW-15 to MW-13 near the south end of the wall. We attribute these conditions to the fact that the sheet pile wall extends up to the concrete bulkhead along the shore of the north-adjacent property, largely eliminating hydraulic connection between the Fill Unit at the north end of the site and the LDW. This means that the hydraulic connection between the Fill Unit at the Site and the LDW is primarily constrained to the south end of the sheet pile wall near MW-13.

Groundwater in the southern half of the Site generally flows towards the southwest near MW-13. There is a western flow in the northern half of the site with a divide in between that likely varies throughout the tidal cycle. In addition, the net gradient from east to west is substantially higher in the southern portion of the Site (approximately 0.006 feet/foot between wells MW-17 and MW-13) than in the northern portion (approximately 0.0002 feet/foot between wells MW-12 and MW-16; see Figure 1). A driver for the southwestern flow component is the geometry of Slip 1 extending out from the LDW to the southwestern corner of the site. This can create a groundwater “sink” at the southern end of the cutoff wall where the gradient increases as the groundwater discharges into the LDW.

Comparison to Groundwater Conditions Prior to Sheet Pile Wall

As a component of the Site Remedial Investigation (RI), tidal studies were completed in early 2017, prior to installation of the sheet pile wall (Aspect, 2020). These data provide a basis of comparison and evaluation of the hydraulic effects created on the Site groundwater system by the sheet pile wall. Where possible, data from the wells in this tidal study were compared to the closest wells used in the 2017 study (see Figure 1 and Table 2 below).

Tidal effects in the Fill Unit are significantly lower in 2022 compared to those observed prior to the construction of the sheet pile wall. The tidal magnitude and efficiency in MW-3 in 2017 were 1.97 feet and 73 percent but were calculated at 0.28 feet and 1.5 percent in MW-15, located 12 feet to the south. These parameters were measured in MW-4 at 2.46 feet and 44 percent, but only 0.23 feet and 1.3 percent in MW-16, located 53 feet to the north along the shoreline. MW-2 and MW-13 are too distant to directly compare but show similar before-and-after trends. These results indicate the sheet pile wall has reduced hydraulic connection of the Fill Unit to the LDW, as reflected by greatly diminished tidal magnitudes and efficiencies. The connectivity of the Fill Unit to the LDW is now primarily at the south end of the sheet pile wall, near MW-13, versus along the entire shoreline as it was before. This suggests that MW-13 can be used to monitor the primary groundwater discharge point from the Fill Unit to the LDW.

Table 2. Tidal Study Comparisons

Well	Maximum Tidal Magnitude in feet	Average Tidal Efficiency
Fill Unit Wells		
MW-2	*3.86*	*32%*
MW-3	*1.97*	*73%*
MW-15	0.28	1.5%
MW-4	*2.46*	*44%*
MW-16	0.23	1.3%
MW-13	0.14	0.9%
Alluvium Unit Wells		
MW-6	*1.42*	*9.3%*
MW-8	2.32	19%
MW-14	1.90	16%

Note:
Italics indicate data from 2017 study.
Proximal well pairs are MW-3 with MW-15 and MW-4 with MW-16.

There is not sufficient data to directly compare tidal effects in the Alluvium Unit on a well-to-well basis; however, the 2022 tidal magnitude and efficiency data collected after the sheet pile installation are in the same order of magnitude as data collected in 2017. We attribute this to fact that the sheet pile wall only penetrates the upper portion of the very thick (> 100 feet) aquifer, allowing tidal pressures from the LDW to propagate beneath the wall.

References

Aspect Consulting (Aspect), 2020, Remedial Investigation Report, Snopac Property, July 7, 2020.

Aspect Consulting (Aspect), 2021, Interim Action Report, Snopac Property, Seattle, Washington, September 16, 2021.

Serfes, 1991, Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations, Ground Water, Vol. 29, No. 4, pp 549–555.

Limitations

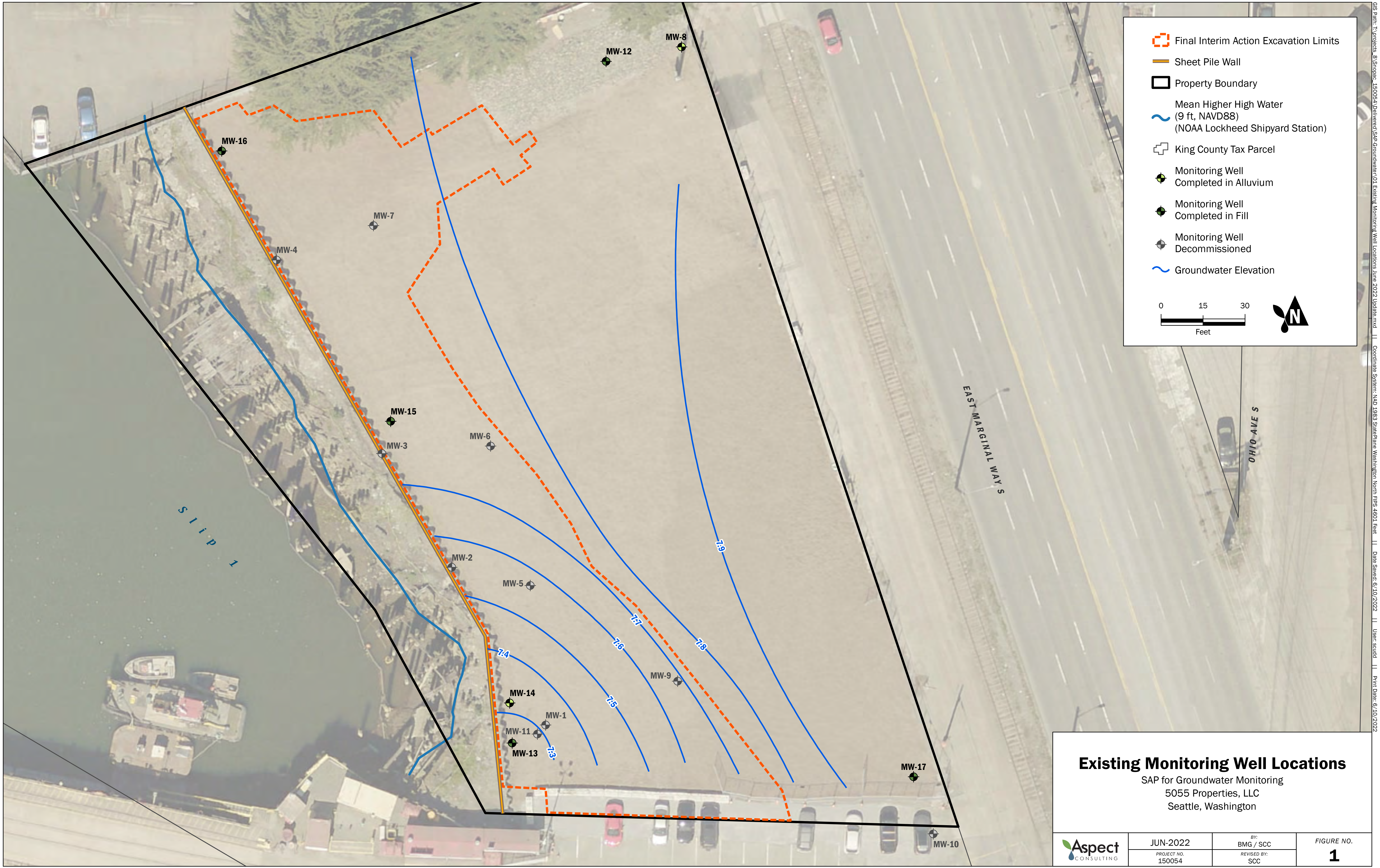
Work for this project was performed for the 5055 Properties, LLC (Client), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

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

Attachments: Figure 1 – Well Locations Map with Groundwater Contours
Figure 2 – Hydrographs of Project Wells and Elliott Bay Tidal Elevations

V:\150054 Snopac-Manson\Deliverables\2021 09_Uplands Feasibility Study\Public Review Draft\Appendices\Appendix A\Tidal Study Results Memo_FINAL_04032023.docx

FIGURES



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Existing Monitoring Well Locations

SAP for Groundwater Monitoring
5055 Properties, LLC
Seattle, Washington

Aspect CONSULTING

JUN-2022
PROJECT NO. 150054

BY: BMG / SCC
REVISED BY: SCC

FIGURE NO.
1

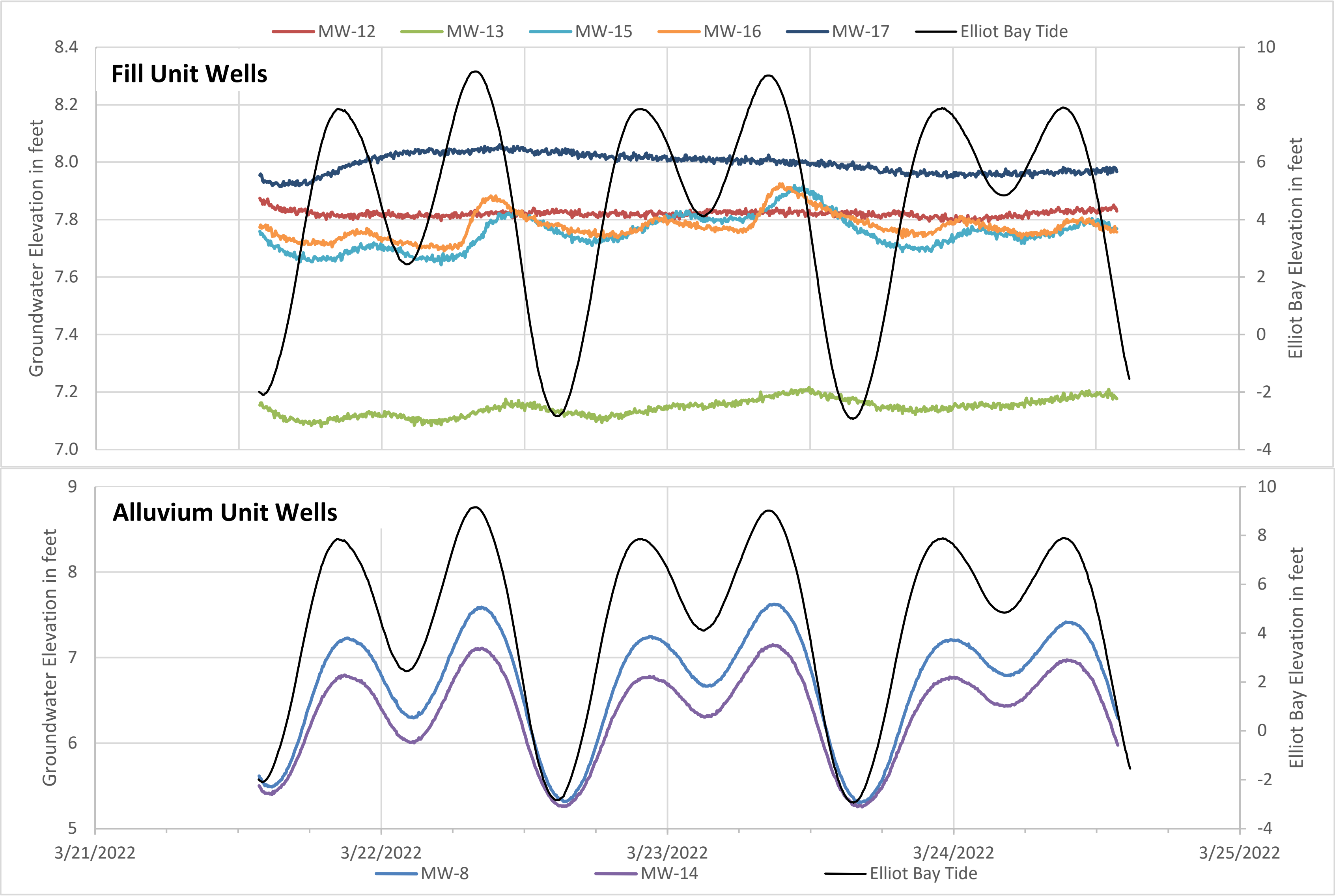


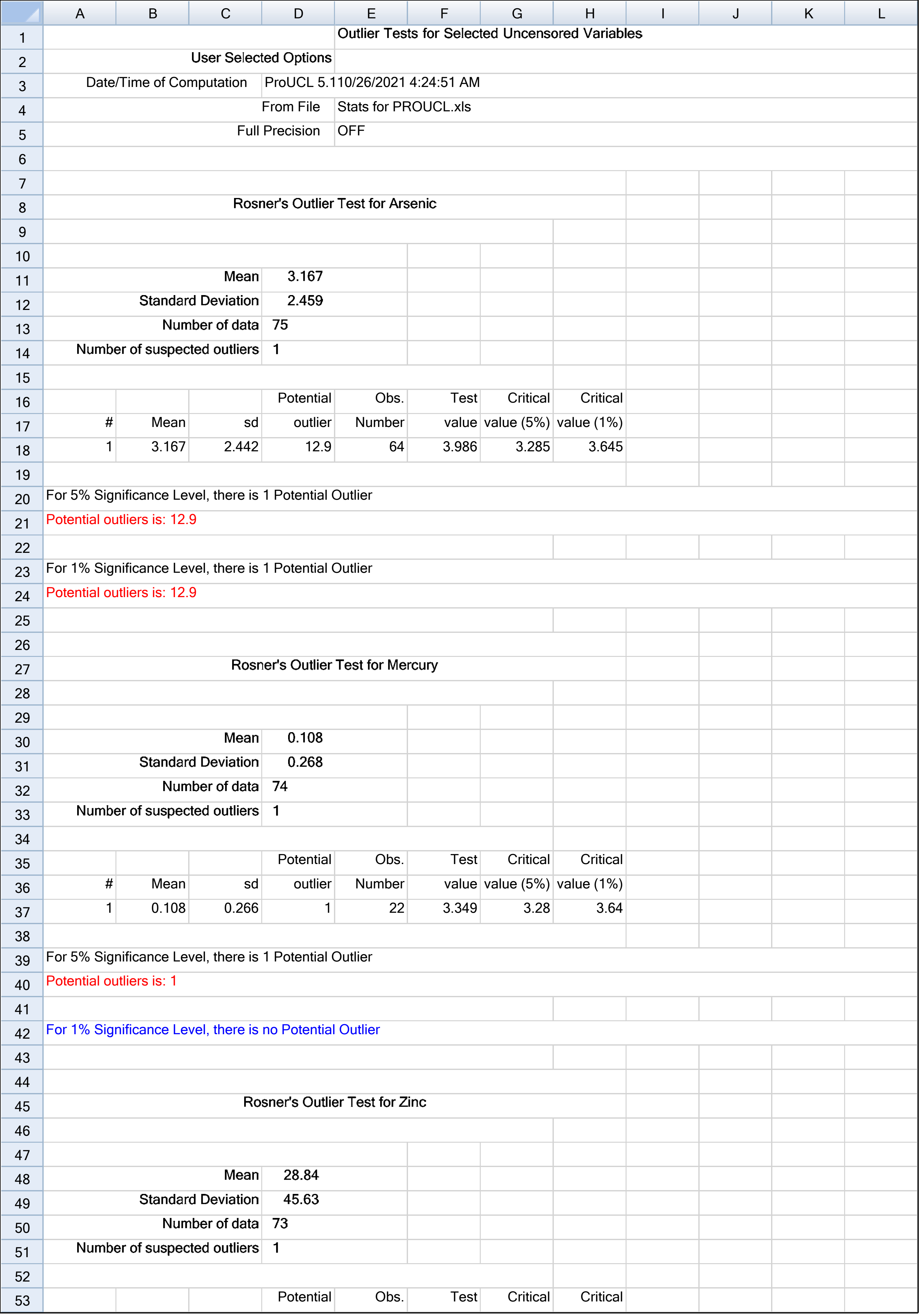
Figure 2
Hydrographs of Project Wells and Elliott Bay Tidal Elevations

Tidal Study Methods and Results
5055 Properties, LLC, Seattle, WA

Aspect Consulting
4/3/2023
\\biserver1.aspect.local\projects\Northwest Resource Law\5055 Properties LLC\Data\Analyses\Tidal Study_Tidal Study_v1.1

APPENDIX B

Soil Compliance Statistics – Pro UCL Backup



Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.110/26/2021 4:24:51 AM

From File Stats for PROUCL.xls

Full Precision OFF

Rosner's Outlier Test for Arsenic

Mean	3.167
Standard Deviation	2.459
Number of data	75
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	3.167	2.442	12.9	64	3.986	3.285	3.645

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 12.9

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 12.9

Rosner's Outlier Test for Mercury

Mean	0.108
Standard Deviation	0.268
Number of data	74
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	0.108	0.266	1	22	3.349	3.28	3.64

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 1

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for Zinc

Mean	28.84
Standard Deviation	45.63
Number of data	73
Number of suspected outliers	1

			Potential	Obs.	Test	Critical	Critical

#	Mean	sd	outlier	Number	value	value (5%)	value (1%)
1	28.84	45.32	393	62	8.035	3.275	3.635

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 393

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 393

Rosner's Outlier Test for Acenaphthene

Mean	0.00551
Standard Deviation	0.00846
Number of data	67
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	0.00551	0.0084	0.0458	55	4.799	3.242	3.602

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.0458

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.0458

Rosner's Outlier Test for Anthracene

Mean	0.0063
Standard Deviation	0.0136
Number of data	67
Number of suspected outliers	1

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	0.0063	0.0135	0.105	55	7.324	3.242	3.602

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.105

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.105

Rosner's Outlier Test for Fluoranthene

Mean	0.0197
Standard Deviation	0.0564

Number of data 67

Number of suspected outliers 1

			Potential	Obs.	Test	Critical	Critical
#	Mean	sd	outlier	Number	value	value (5%)	value (1%)
1	0.0197	0.056	0.434	55	7.401	3.242	3.602

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.434

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.434

Rosner's Outlier Test for Naphthalene1

Mean 0.00783

Standard Deviation 0.0161

Number of data 67

Number of suspected outliers 1

			Potential	Obs.	Test	Critical	Critical
#	Mean	sd	outlier	Number	value	value (5%)	value (1%)
1	0.00783	0.016	0.093	15	5.319	3.242	3.602

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.093

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.093

Rosner's Outlier Test for Pyrene

Mean 0.0195

Standard Deviation 0.0542

Number of data 67

Number of suspected outliers 1

			Potential	Obs.	Test	Critical	Critical
#	Mean	sd	outlier	Number	value	value (5%)	value (1%)
1	0.0195	0.0538	0.411	55	7.28	3.242	3.602

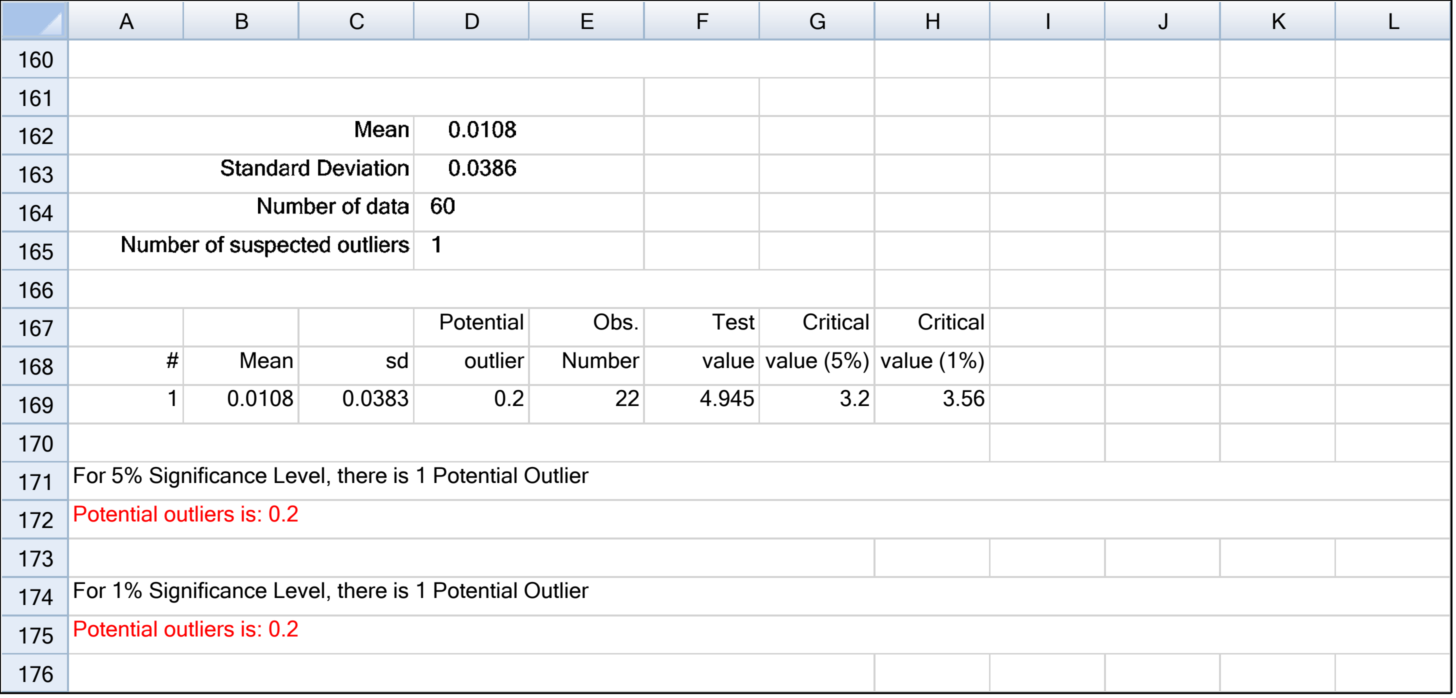
For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.411

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 0.411

Rosner's Outlier Test for Total PCBs Aroclors4



	A	B	C	D	E	F	G	H	I	J	K	L
160												
161												
162			Mean	0.0108								
163			Standard Deviation	0.0386								
164			Number of data	60								
165			Number of suspected outliers	1								
166												
167				Potential	Obs.	Test	Critical	Critical				
168	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
169	1	0.0108	0.0383	0.2	22	4.945	3.2	3.56				
170												
171	For 5% Significance Level, there is 1 Potential Outlier											
172	Potential outliers is: 0.2											
173												
174	For 1% Significance Level, there is 1 Potential Outlier											
175	Potential outliers is: 0.2											
176												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 4:49:42 AM
From File	Stats for PROUCL_Outliers removed_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic

General Statistics

Total Number of Observations	74	Number of Distinct Observations	65
Number of Detects	70	Number of Non-Detects	4
Number of Distinct Detects	62	Number of Distinct Non-Detects	4
Minimum Detect	1.05	Minimum Non-Detect	1
Maximum Detect	10.1	Maximum Non-Detect	5
Variance Detects	4.971	Percent Non-Detects	5.405%
Mean Detects	3.026	SD Detects	2.23
Median Detects	2.02	CV Detects	0.737
Skewness Detects	1.524	Kurtosis Detects	1.753
Mean of Logged Detects	0.889	SD of Logged Detects	0.639

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.791	Normal GOF Test on Detected Observations Only
5% Shapiro Wilk P Value	1.504E-13	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.195	Lilliefors GOF Test
5% Lilliefors Critical Value	0.106	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.953	KM Standard Error of Mean	0.256
KM SD	2.183	95% KM (BCA) UCL	3.367
95% KM (t) UCL	3.38	95% KM (Percentile Bootstrap) UCL	3.379
95% KM (z) UCL	3.375	95% KM Bootstrap t UCL	3.459
90% KM Chebyshev UCL	3.722	95% KM Chebyshev UCL	4.07
97.5% KM Chebyshev UCL	4.554	99% KM Chebyshev UCL	5.503

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.633	Anderson-Darling GOF Test
5% A-D Critical Value	0.761	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.171	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.107	Detected Data Not Gamma Distributed at 5% Significance Level

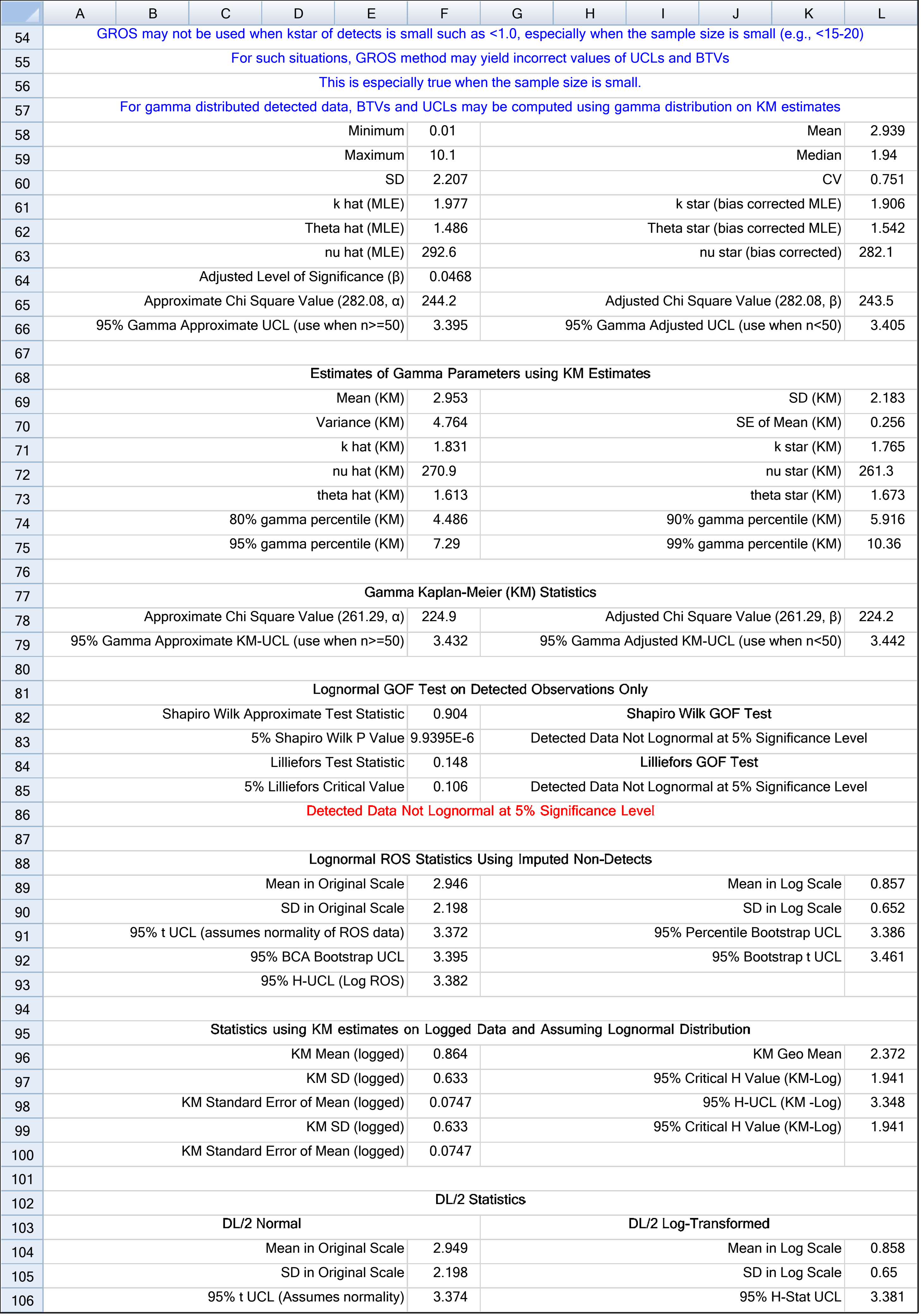
Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.445	k star (bias corrected MLE)	2.349
Theta hat (MLE)	1.238	Theta star (bias corrected MLE)	1.288
nu hat (MLE)	342.2	nu star (bias corrected)	328.9
Mean (detects)	3.026		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs



54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.01	Mean	2.939
59	Maximum	10.1	Median	1.94
60	SD	2.207	CV	0.751
61	k hat (MLE)	1.977	k star (bias corrected MLE)	1.906
62	Theta hat (MLE)	1.486	Theta star (bias corrected MLE)	1.542
63	nu hat (MLE)	292.6	nu star (bias corrected)	282.1
64	Adjusted Level of Significance (β)	0.0468		
65	Approximate Chi Square Value (282.08, α)	244.2	Adjusted Chi Square Value (282.08, β)	243.5
66	95% Gamma Approximate UCL (use when n>=50)	3.395	95% Gamma Adjusted UCL (use when n<50)	3.405
67				
68	Estimates of Gamma Parameters using KM Estimates			
69	Mean (KM)	2.953	SD (KM)	2.183
70	Variance (KM)	4.764	SE of Mean (KM)	0.256
71	k hat (KM)	1.831	k star (KM)	1.765
72	nu hat (KM)	270.9	nu star (KM)	261.3
73	theta hat (KM)	1.613	theta star (KM)	1.673
74	80% gamma percentile (KM)	4.486	90% gamma percentile (KM)	5.916
75	95% gamma percentile (KM)	7.29	99% gamma percentile (KM)	10.36
76				
77	Gamma Kaplan-Meier (KM) Statistics			
78	Approximate Chi Square Value (261.29, α)	224.9	Adjusted Chi Square Value (261.29, β)	224.2
79	95% Gamma Approximate KM-UCL (use when n>=50)	3.432	95% Gamma Adjusted KM-UCL (use when n<50)	3.442
80				
81	Lognormal GOF Test on Detected Observations Only			
82	Shapiro Wilk Approximate Test Statistic	0.904	Shapiro Wilk GOF Test	
83	5% Shapiro Wilk P Value	9.9395E-6	Detected Data Not Lognormal at 5% Significance Level	
84	Lilliefors Test Statistic	0.148	Lilliefors GOF Test	
85	5% Lilliefors Critical Value	0.106	Detected Data Not Lognormal at 5% Significance Level	
86	Detected Data Not Lognormal at 5% Significance Level			
87				
88	Lognormal ROS Statistics Using Imputed Non-Detects			
89	Mean in Original Scale	2.946	Mean in Log Scale	0.857
90	SD in Original Scale	2.198	SD in Log Scale	0.652
91	95% t UCL (assumes normality of ROS data)	3.372	95% Percentile Bootstrap UCL	3.386
92	95% BCA Bootstrap UCL	3.395	95% Bootstrap t UCL	3.461
93	95% H-UCL (Log ROS)	3.382		
94				
95	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
96	KM Mean (logged)	0.864	KM Geo Mean	2.372
97	KM SD (logged)	0.633	95% Critical H Value (KM-Log)	1.941
98	KM Standard Error of Mean (logged)	0.0747	95% H-UCL (KM -Log)	3.348
99	KM SD (logged)	0.633	95% Critical H Value (KM-Log)	1.941
100	KM Standard Error of Mean (logged)	0.0747		
101				
102	DL/2 Statistics			
103	DL/2 Normal		DL/2 Log-Transformed	
104	Mean in Original Scale	2.949	Mean in Log Scale	0.858
105	SD in Original Scale	2.198	SD in Log Scale	0.65
106	95% t UCL (Assumes normality)	3.374	95% H-Stat UCL	3.381

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	4.07

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 4:56:22 AM
From File	Stats for PROUCL_Outliers removed_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mercury

General Statistics

Total Number of Observations	69	Number of Distinct Observations	30
Number of Detects	39	Number of Non-Detects	30
Number of Distinct Detects	26	Number of Distinct Non-Detects	7
Minimum Detect	0.01	Minimum Non-Detect	0.01
Maximum Detect	0.13	Maximum Non-Detect	1
Variance Detects	7.2466E-4	Percent Non-Detects	43.48%
Mean Detects	0.033	SD Detects	0.0269
Median Detects	0.028	CV Detects	0.816
Skewness Detects	2.345	Kurtosis Detects	6.037
Mean of Logged Detects	-3.645	SD of Logged Detects	0.664

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.727	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.024	KM Standard Error of Mean	0.00289
KM SD	0.0231	95% KM (BCA) UCL	0.0286
95% KM (t) UCL	0.0288	95% KM (Percentile Bootstrap) UCL	0.0288
95% KM (z) UCL	0.0287	95% KM Bootstrap t UCL	0.0305
90% KM Chebyshev UCL	0.0326	95% KM Chebyshev UCL	0.0366
97.5% KM Chebyshev UCL	0.042	99% KM Chebyshev UCL	0.0527

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.008	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.758	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.121	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.143	Detected data appear Gamma Distributed at 5% Significance Level

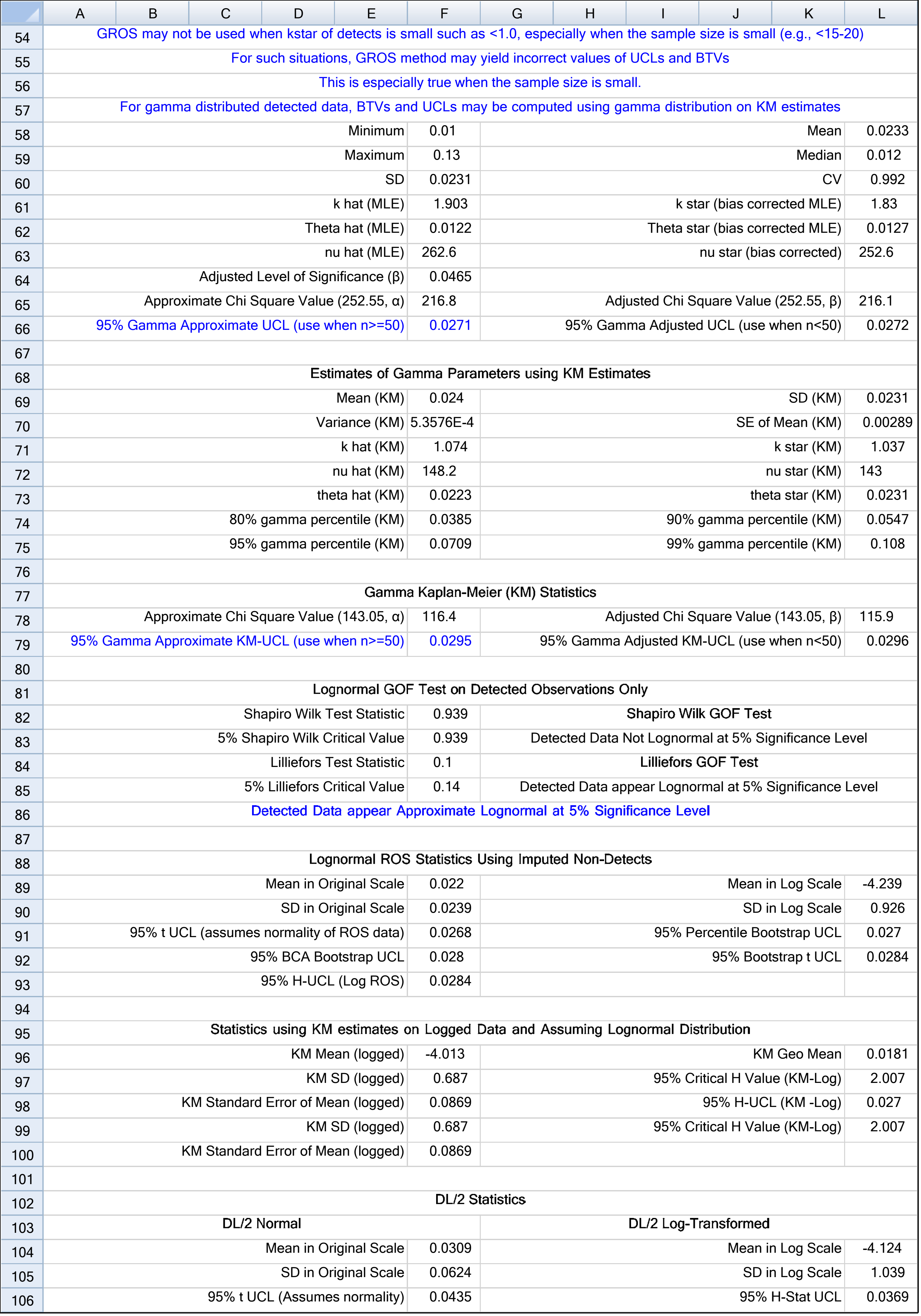
Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

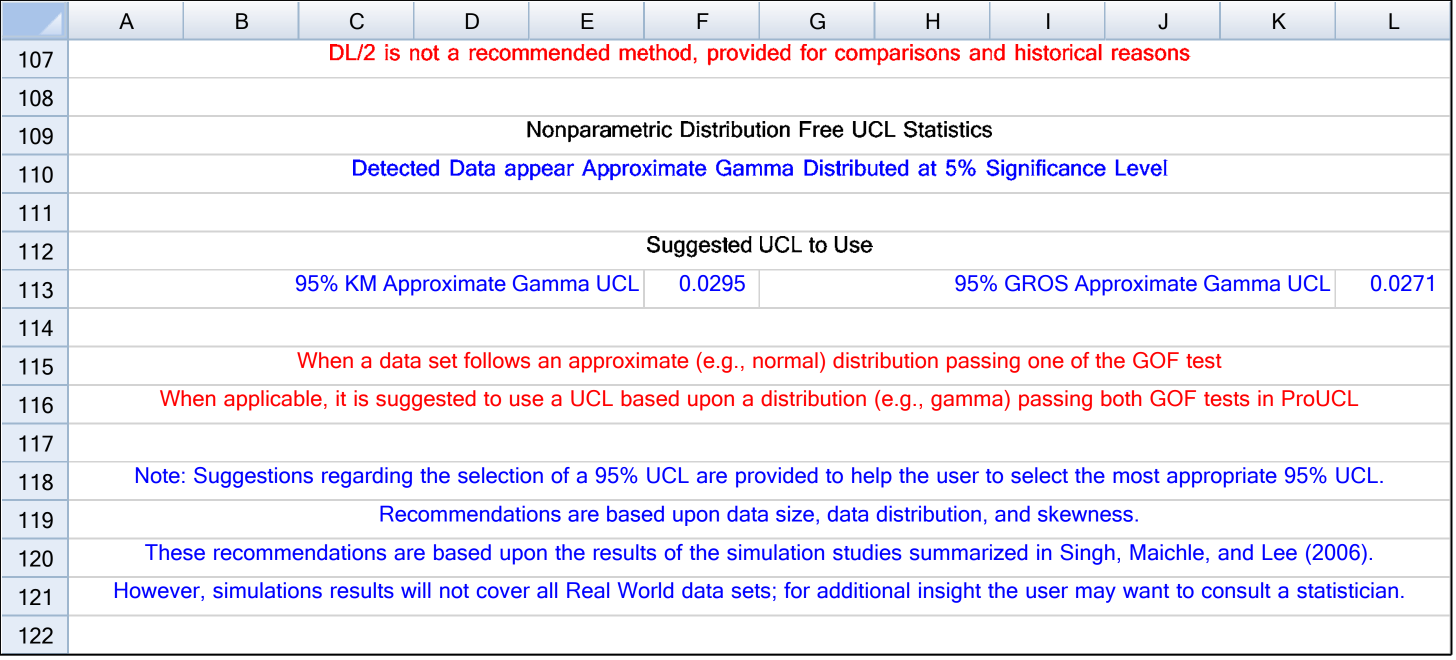
k hat (MLE)	2.297	k star (bias corrected MLE)	2.137
Theta hat (MLE)	0.0144	Theta star (bias corrected MLE)	0.0154
nu hat (MLE)	179.2	nu star (bias corrected)	166.7
Mean (detects)	0.033		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs



54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.01	Mean	0.0233
59	Maximum	0.13	Median	0.012
60	SD	0.0231	CV	0.992
61	k hat (MLE)	1.903	k star (bias corrected MLE)	1.83
62	Theta hat (MLE)	0.0122	Theta star (bias corrected MLE)	0.0127
63	nu hat (MLE)	262.6	nu star (bias corrected)	252.6
64	Adjusted Level of Significance (β)	0.0465		
65	Approximate Chi Square Value (252.55, α)	216.8	Adjusted Chi Square Value (252.55, β)	216.1
66	95% Gamma Approximate UCL (use when n>=50)	0.0271	95% Gamma Adjusted UCL (use when n<50)	0.0272
67				
68	Estimates of Gamma Parameters using KM Estimates			
69	Mean (KM)	0.024	SD (KM)	0.0231
70	Variance (KM)	5.3576E-4	SE of Mean (KM)	0.00289
71	k hat (KM)	1.074	k star (KM)	1.037
72	nu hat (KM)	148.2	nu star (KM)	143
73	theta hat (KM)	0.0223	theta star (KM)	0.0231
74	80% gamma percentile (KM)	0.0385	90% gamma percentile (KM)	0.0547
75	95% gamma percentile (KM)	0.0709	99% gamma percentile (KM)	0.108
76				
77	Gamma Kaplan-Meier (KM) Statistics			
78	Approximate Chi Square Value (143.05, α)	116.4	Adjusted Chi Square Value (143.05, β)	115.9
79	95% Gamma Approximate KM-UCL (use when n>=50)	0.0295	95% Gamma Adjusted KM-UCL (use when n<50)	0.0296
80				
81	Lognormal GOF Test on Detected Observations Only			
82	Shapiro Wilk Test Statistic	0.939	Shapiro Wilk GOF Test	
83	5% Shapiro Wilk Critical Value	0.939	Detected Data Not Lognormal at 5% Significance Level	
84	Lilliefors Test Statistic	0.1	Lilliefors GOF Test	
85	5% Lilliefors Critical Value	0.14	Detected Data appear Lognormal at 5% Significance Level	
86	Detected Data appear Approximate Lognormal at 5% Significance Level			
87				
88	Lognormal ROS Statistics Using Imputed Non-Detects			
89	Mean in Original Scale	0.022	Mean in Log Scale	-4.239
90	SD in Original Scale	0.0239	SD in Log Scale	0.926
91	95% t UCL (assumes normality of ROS data)	0.0268	95% Percentile Bootstrap UCL	0.027
92	95% BCA Bootstrap UCL	0.028	95% Bootstrap t UCL	0.0284
93	95% H-UCL (Log ROS)	0.0284		
94				
95	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
96	KM Mean (logged)	-4.013	KM Geo Mean	0.0181
97	KM SD (logged)	0.687	95% Critical H Value (KM-Log)	2.007
98	KM Standard Error of Mean (logged)	0.0869	95% H-UCL (KM -Log)	0.027
99	KM SD (logged)	0.687	95% Critical H Value (KM-Log)	2.007
100	KM Standard Error of Mean (logged)	0.0869		
101				
102	DL/2 Statistics			
103	DL/2 Normal		DL/2 Log-Transformed	
104	Mean in Original Scale	0.0309	Mean in Log Scale	-4.124
105	SD in Original Scale	0.0624	SD in Log Scale	1.039
106	95% t UCL (Assumes normality)	0.0435	95% H-Stat UCL	0.0369



	A	B	C	D	E	F	G	H	I	J	K	L
107	DL/2 is not a recommended method, provided for comparisons and historical reasons											
108												
109	Nonparametric Distribution Free UCL Statistics											
110	Detected Data appear Approximate Gamma Distributed at 5% Significance Level											
111												
112	Suggested UCL to Use											
113					95% KM Approximate Gamma UCL	0.0295					95% GROS Approximate Gamma UCL	0.0271
114												
115	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
116	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
117												
118	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
119	Recommendations are based upon data size, data distribution, and skewness.											
120	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
121	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
122												

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 4:59:42 AM
From File	Stats for PROUCL_Outliers removed_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Zinc

General Statistics

Total Number of Observations	72	Number of Distinct Observations	59
		Number of Missing Observations	0
Minimum	11.4	Mean	23.78
Maximum	87	Median	19.95
SD	14.76	Std. Error of Mean	1.74
Coefficient of Variation	0.621	Skewness	2.29

Normal GOF Test

Shapiro Wilk Test Statistic	0.735	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.104	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	26.68	95% Adjusted-CLT UCL (Chen-1995)	27.14
		95% Modified-t UCL (Johnson-1978)	26.76

Gamma GOF Test

A-D Test Statistic	3.116	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.756	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.106	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

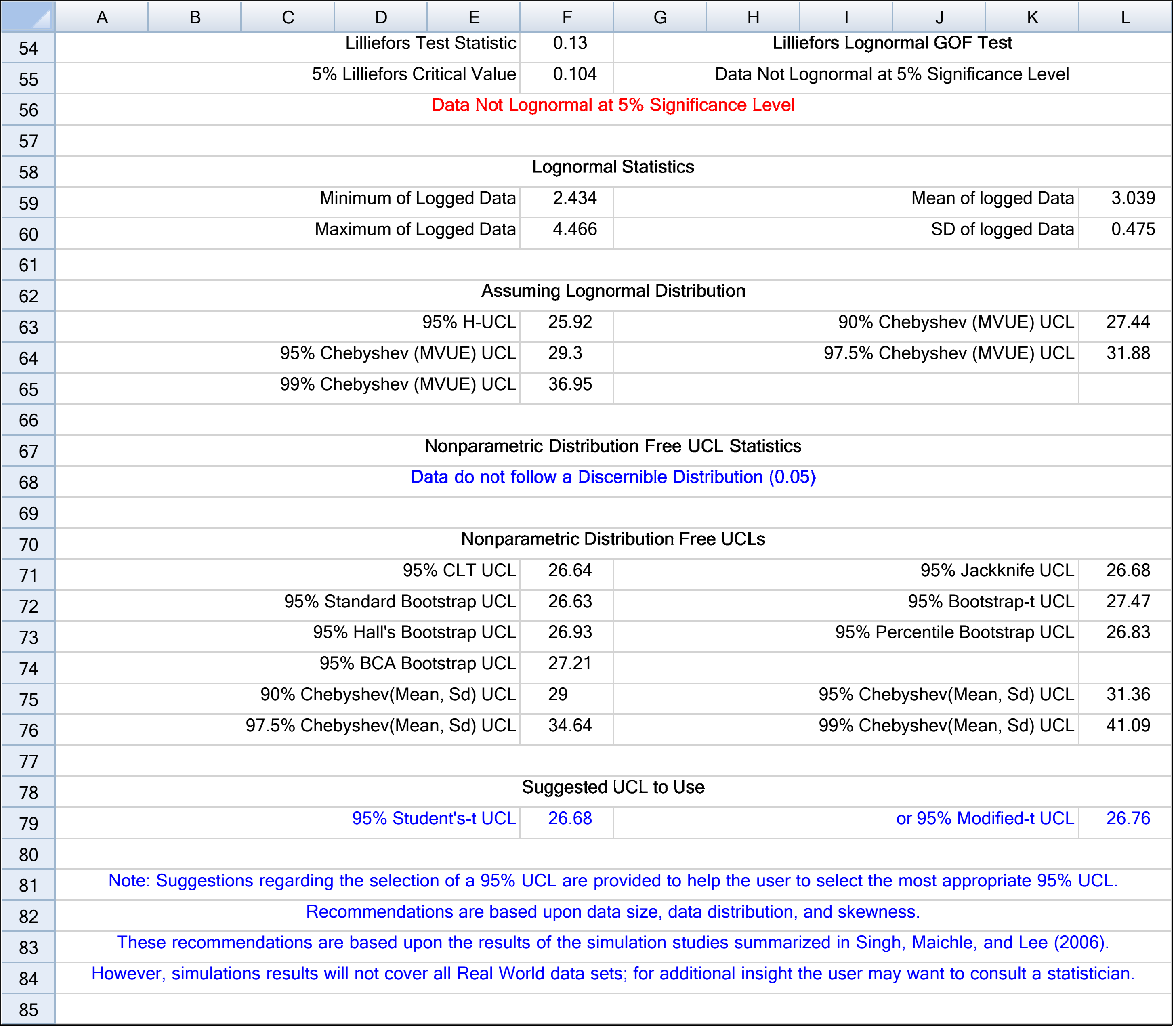
k hat (MLE)	4.005	k star (bias corrected MLE)	3.847
Theta hat (MLE)	5.938	Theta star (bias corrected MLE)	6.181
nu hat (MLE)	576.7	nu star (bias corrected)	554
MLE Mean (bias corrected)	23.78	MLE Sd (bias corrected)	12.12
		Approximate Chi Square Value (0.05)	500.4
Adjusted Level of Significance	0.0467	Adjusted Chi Square Value	499.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	26.33	95% Adjusted Gamma UCL (use when n<50)	26.38

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	2.0305E-6	Data Not Lognormal at 5% Significance Level



54	Lilliefors Test Statistic	0.13	Lilliefors Lognormal GOF Test	
55	5% Lilliefors Critical Value	0.104	Data Not Lognormal at 5% Significance Level	
56	Data Not Lognormal at 5% Significance Level			
57				
58	Lognormal Statistics			
59	Minimum of Logged Data	2.434	Mean of logged Data	3.039
60	Maximum of Logged Data	4.466	SD of logged Data	0.475
61				
62	Assuming Lognormal Distribution			
63	95% H-UCL	25.92	90% Chebyshev (MVUE) UCL	27.44
64	95% Chebyshev (MVUE) UCL	29.3	97.5% Chebyshev (MVUE) UCL	31.88
65	99% Chebyshev (MVUE) UCL	36.95		
66				
67	Nonparametric Distribution Free UCL Statistics			
68	Data do not follow a Discernible Distribution (0.05)			
69				
70	Nonparametric Distribution Free UCLs			
71	95% CLT UCL	26.64	95% Jackknife UCL	26.68
72	95% Standard Bootstrap UCL	26.63	95% Bootstrap-t UCL	27.47
73	95% Hall's Bootstrap UCL	26.93	95% Percentile Bootstrap UCL	26.83
74	95% BCA Bootstrap UCL	27.21		
75	90% Chebyshev(Mean, Sd) UCL	29	95% Chebyshev(Mean, Sd) UCL	31.36
76	97.5% Chebyshev(Mean, Sd) UCL	34.64	99% Chebyshev(Mean, Sd) UCL	41.09
77				
78	Suggested UCL to Use			
79	95% Student's-t UCL	26.68	or 95% Modified-t UCL	26.76
80				
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
82	Recommendations are based upon data size, data distribution, and skewness.			
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
85				

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 5:02:33 AM
From File	Stats for PROUCL_Outliers removed_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Acenaphthene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	17
Number of Detects	6	Number of Non-Detects	60
Number of Distinct Detects	5	Number of Distinct Non-Detects	12
Minimum Detect	0.003	Minimum Non-Detect	0.002
Maximum Detect	0.036	Maximum Non-Detect	0.0293
Variance Detects	1.6616E-4	Percent Non-Detects	90.91%
Mean Detects	0.0102	SD Detects	0.0129
Median Detects	0.0051	CV Detects	1.27
Skewness Detects	2.265	Kurtosis Detects	5.265
Mean of Logged Detects	-5.066	SD of Logged Detects	0.971

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.645	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.378	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00278	KM Standard Error of Mean	5.7823E-4
KM SD	0.00427	95% KM (BCA) UCL	0.00396
95% KM (t) UCL	0.00375	95% KM (Percentile Bootstrap) UCL	0.00377
95% KM (z) UCL	0.00373	95% KM Bootstrap t UCL	0.00584
90% KM Chebyshev UCL	0.00452	95% KM Chebyshev UCL	0.0053
97.5% KM Chebyshev UCL	0.00639	99% KM Chebyshev UCL	0.00853

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.726	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.712	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.274	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.34	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.191	k star (bias corrected MLE)	0.707
Theta hat (MLE)	0.00852	Theta star (bias corrected MLE)	0.0144
nu hat (MLE)	14.29	nu star (bias corrected)	8.48
Mean (detects)	0.0102		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.003	Mean	0.01
59	Maximum	0.036	Median	0.01
60	SD	0.00358	CV	0.357
61	k hat (MLE)	11.73	k star (bias corrected MLE)	11.21
62	Theta hat (MLE)	8.5341E-4	Theta star (bias corrected MLE)	8.9324E-4
63	nu hat (MLE)	1549	nu star (bias corrected)	1480
64	Adjusted Level of Significance (β)	0.0464		
65	Approximate Chi Square Value (N/A, α)	1391	Adjusted Chi Square Value (N/A, β)	1390
66	95% Gamma Approximate UCL (use when n>=50)	0.0106	95% Gamma Adjusted UCL (use when n<50)	0.0107
67				
68	Estimates of Gamma Parameters using KM Estimates			
69	Mean (KM)	0.00278	SD (KM)	0.00427
70	Variance (KM)	1.8194E-5	SE of Mean (KM)	5.7823E-4
71	k hat (KM)	0.425	k star (KM)	0.416
72	nu hat (KM)	56.12	nu star (KM)	54.91
73	theta hat (KM)	0.00654	theta star (KM)	0.00669
74	80% gamma percentile (KM)	0.00451	90% gamma percentile (KM)	0.0078
75	95% gamma percentile (KM)	0.0114	99% gamma percentile (KM)	0.0204
76				
77	Gamma Kaplan-Meier (KM) Statistics			
78	Approximate Chi Square Value (54.91, α)	38.88	Adjusted Chi Square Value (54.91, β)	38.58
79	95% Gamma Approximate KM-UCL (use when n>=50)	0.00393	95% Gamma Adjusted KM-UCL (use when n<50)	0.00396
80				
81	Lognormal GOF Test on Detected Observations Only			
82	Shapiro Wilk Test Statistic	0.82	Shapiro Wilk GOF Test	
83	5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
84	Lilliefors Test Statistic	0.258	Lilliefors GOF Test	
85	5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
86	Detected Data appear Lognormal at 5% Significance Level			
87				
88	Lognormal ROS Statistics Using Imputed Non-Detects			
89	Mean in Original Scale	0.00113	Mean in Log Scale	-9.014
90	SD in Original Scale	0.0046	SD in Log Scale	2.031
91	95% t UCL (assumes normality of ROS data)	0.00207	95% Percentile Bootstrap UCL	0.00219
92	95% BCA Bootstrap UCL	0.00313	95% Bootstrap t UCL	0.00459
93	95% H-UCL (Log ROS)	0.00205		
94				
95	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
96	KM Mean (logged)	-6.099	KM Geo Mean	0.00225
97	KM SD (logged)	0.435	95% Critical H Value (KM-Log)	1.826
98	KM Standard Error of Mean (logged)	0.0605	95% H-UCL (KM -Log)	0.00272
99	KM SD (logged)	0.435	95% Critical H Value (KM-Log)	1.826
100	KM Standard Error of Mean (logged)	0.0605		
101				
102	DL/2 Statistics			
103	DL/2 Normal		DL/2 Log-Transformed	
104	Mean in Original Scale	0.00291	Mean in Log Scale	-6.408
105	SD in Original Scale	0.0051	SD in Log Scale	0.879
106	95% t UCL (Assumes normality)	0.00396	95% H-Stat UCL	0.00307

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	0.00393

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 5:04:55 AM
From File	Stats for PROUCL_Outliers removed_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Anthracene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	19
Number of Detects	9	Number of Non-Detects	57
Number of Distinct Detects	8	Number of Distinct Non-Detects	12
Minimum Detect	0.0033	Minimum Non-Detect	0.002
Maximum Detect	0.015	Maximum Non-Detect	0.0293
Variance Detects	1.7828E-5	Percent Non-Detects	86.36%
Mean Detects	0.00853	SD Detects	0.00422
Median Detects	0.008	CV Detects	0.495
Skewness Detects	0.583	Kurtosis Detects	-0.511
Mean of Logged Detects	-4.881	SD of Logged Detects	0.53

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00297	KM Standard Error of Mean	3.7547E-4
KM SD	0.00277	95% KM (BCA) UCL	0.00362
95% KM (t) UCL	0.0036	95% KM (Percentile Bootstrap) UCL	0.00365
95% KM (z) UCL	0.00359	95% KM Bootstrap t UCL	0.00374
90% KM Chebyshev UCL	0.0041	95% KM Chebyshev UCL	0.00461
97.5% KM Chebyshev UCL	0.00532	99% KM Chebyshev UCL	0.00671

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.309	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.15	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.415	k star (bias corrected MLE)	3.017
Theta hat (MLE)	0.00193	Theta star (bias corrected MLE)	0.00283
nu hat (MLE)	79.47	nu star (bias corrected)	54.31
Mean (detects)	0.00853		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0033	Mean	0.0098
Maximum	0.015	Median	0.01
SD	0.00157	CV	0.16
k hat (MLE)	28.82	k star (bias corrected MLE)	27.52
Theta hat (MLE)	3.4002E-4	Theta star (bias corrected MLE)	3.5608E-4
nu hat (MLE)	3804	nu star (bias corrected)	3633
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (N/A, α)	3494	Adjusted Chi Square Value (N/A, β)	3491
95% Gamma Approximate UCL (use when n>=50)	0.0102	95% Gamma Adjusted UCL (use when n<50)	0.0102

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00297	SD (KM)	0.00277
Variance (KM)	7.6603E-6	SE of Mean (KM)	3.7547E-4
k hat (KM)	1.154	k star (KM)	1.112
nu hat (KM)	152.4	nu star (KM)	146.8
theta hat (KM)	0.00258	theta star (KM)	0.00267
80% gamma percentile (KM)	0.00474	90% gamma percentile (KM)	0.00667
95% gamma percentile (KM)	0.00858	99% gamma percentile (KM)	0.013

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (146.80, α)	119.8	Adjusted Chi Square Value (146.80, β)	119.3
95% Gamma Approximate KM-UCL (use when n>=50)	0.00364	95% Gamma Adjusted KM-UCL (use when n<50)	0.00366

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

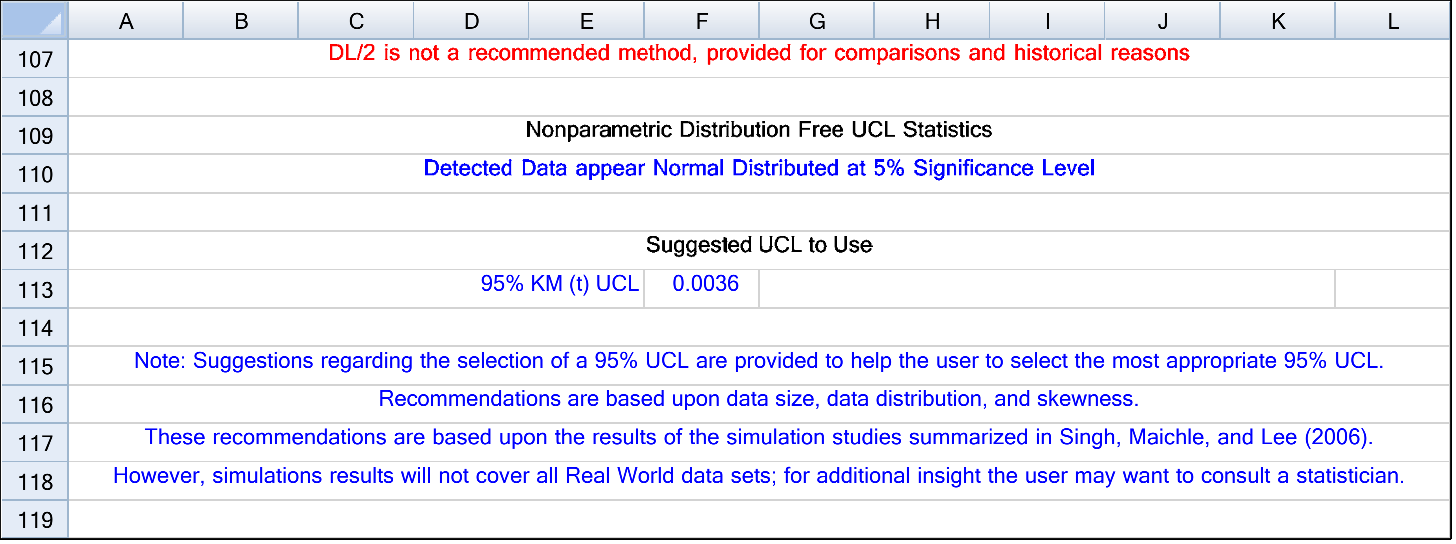
Mean in Original Scale	0.0022	Mean in Log Scale	-6.715
SD in Original Scale	0.00304	SD in Log Scale	1.076
95% t UCL (assumes normality of ROS data)	0.00283	95% Percentile Bootstrap UCL	0.00281
95% BCA Bootstrap UCL	0.00301	95% Bootstrap t UCL	0.0031
95% H-UCL (Log ROS)	0.00292		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-6.014	KM Geo Mean	0.00244
KM SD (logged)	0.511	95% Critical H Value (KM-Log)	1.873
KM Standard Error of Mean (logged)	0.0698	95% H-UCL (KM -Log)	0.00314
KM SD (logged)	0.511	95% Critical H Value (KM-Log)	1.873
KM Standard Error of Mean (logged)	0.0698		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00299	Mean in Log Scale	-6.348
SD in Original Scale	0.00385	SD in Log Scale	0.92
95% t UCL (Assumes normality)	0.00378	95% H-Stat UCL	0.00343



DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0036

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 5:06:46 AM
From File	Stats for PROUCL_Outliers removed_f.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Fluoranthene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	29
Number of Detects	21	Number of Non-Detects	45
Number of Distinct Detects	17	Number of Distinct Non-Detects	13
Minimum Detect	0.0021	Minimum Non-Detect	0.002
Maximum Detect	0.13	Maximum Non-Detect	0.056
Variance Detects	0.00118	Percent Non-Detects	68.18%
Mean Detects	0.0292	SD Detects	0.0343
Median Detects	0.0063	CV Detects	1.175
Skewness Detects	1.528	Kurtosis Detects	2.375
Mean of Logged Detects	-4.347	SD of Logged Detects	1.398

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.788	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.188	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0108	KM Standard Error of Mean	0.00287
KM SD	0.0227	95% KM (BCA) UCL	0.0161
95% KM (t) UCL	0.0156	95% KM (Percentile Bootstrap) UCL	0.0156
95% KM (z) UCL	0.0155	95% KM Bootstrap t UCL	0.0178
90% KM Chebyshev UCL	0.0194	95% KM Chebyshev UCL	0.0233
97.5% KM Chebyshev UCL	0.0287	99% KM Chebyshev UCL	0.0394

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.241	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.784	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.261	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.197	Detected Data Not Gamma Distributed at 5% Significance Level

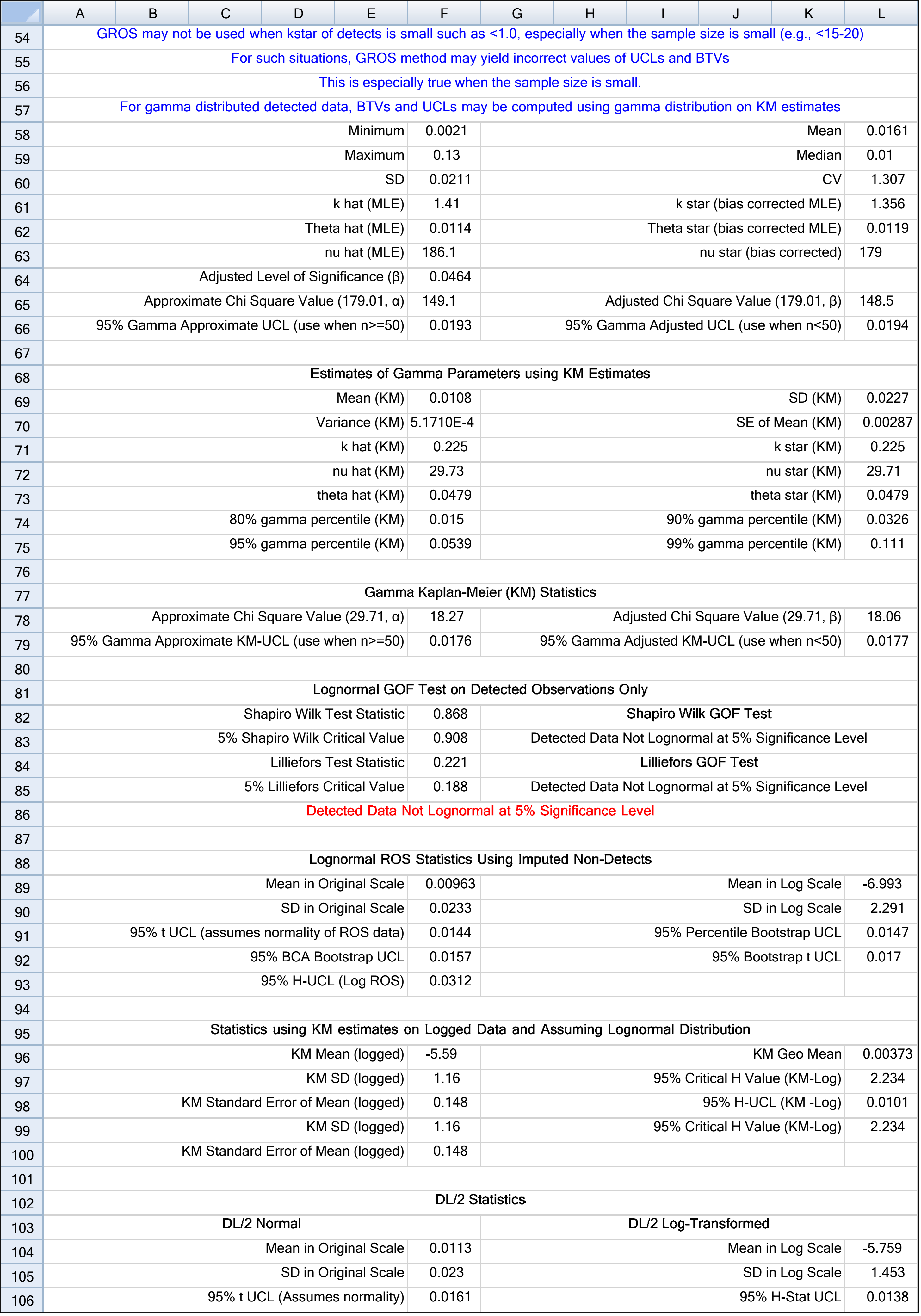
Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

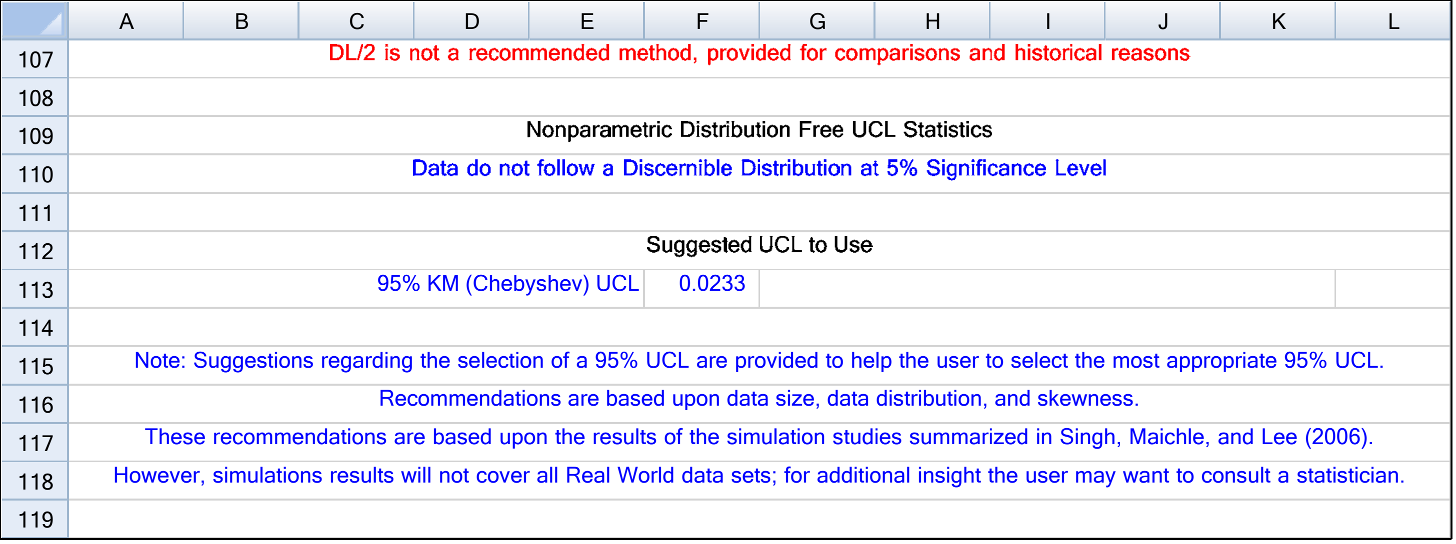
k hat (MLE)	0.737	k star (bias corrected MLE)	0.664
Theta hat (MLE)	0.0396	Theta star (bias corrected MLE)	0.044
nu hat (MLE)	30.97	nu star (bias corrected)	27.88
Mean (detects)	0.0292		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs



54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.0021	Mean	0.0161
59	Maximum	0.13	Median	0.01
60	SD	0.0211	CV	1.307
61	k hat (MLE)	1.41	k star (bias corrected MLE)	1.356
62	Theta hat (MLE)	0.0114	Theta star (bias corrected MLE)	0.0119
63	nu hat (MLE)	186.1	nu star (bias corrected)	179
64	Adjusted Level of Significance (β)	0.0464		
65	Approximate Chi Square Value (179.01, α)	149.1	Adjusted Chi Square Value (179.01, β)	148.5
66	95% Gamma Approximate UCL (use when n>=50)	0.0193	95% Gamma Adjusted UCL (use when n<50)	0.0194
67				
68	Estimates of Gamma Parameters using KM Estimates			
69	Mean (KM)	0.0108	SD (KM)	0.0227
70	Variance (KM)	5.1710E-4	SE of Mean (KM)	0.00287
71	k hat (KM)	0.225	k star (KM)	0.225
72	nu hat (KM)	29.73	nu star (KM)	29.71
73	theta hat (KM)	0.0479	theta star (KM)	0.0479
74	80% gamma percentile (KM)	0.015	90% gamma percentile (KM)	0.0326
75	95% gamma percentile (KM)	0.0539	99% gamma percentile (KM)	0.111
76				
77	Gamma Kaplan-Meier (KM) Statistics			
78	Approximate Chi Square Value (29.71, α)	18.27	Adjusted Chi Square Value (29.71, β)	18.06
79	95% Gamma Approximate KM-UCL (use when n>=50)	0.0176	95% Gamma Adjusted KM-UCL (use when n<50)	0.0177
80				
81	Lognormal GOF Test on Detected Observations Only			
82	Shapiro Wilk Test Statistic	0.868	Shapiro Wilk GOF Test	
83	5% Shapiro Wilk Critical Value	0.908	Detected Data Not Lognormal at 5% Significance Level	
84	Lilliefors Test Statistic	0.221	Lilliefors GOF Test	
85	5% Lilliefors Critical Value	0.188	Detected Data Not Lognormal at 5% Significance Level	
86	Detected Data Not Lognormal at 5% Significance Level			
87				
88	Lognormal ROS Statistics Using Imputed Non-Detects			
89	Mean in Original Scale	0.00963	Mean in Log Scale	-6.993
90	SD in Original Scale	0.0233	SD in Log Scale	2.291
91	95% t UCL (assumes normality of ROS data)	0.0144	95% Percentile Bootstrap UCL	0.0147
92	95% BCA Bootstrap UCL	0.0157	95% Bootstrap t UCL	0.017
93	95% H-UCL (Log ROS)	0.0312		
94				
95	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
96	KM Mean (logged)	-5.59	KM Geo Mean	0.00373
97	KM SD (logged)	1.16	95% Critical H Value (KM-Log)	2.234
98	KM Standard Error of Mean (logged)	0.148	95% H-UCL (KM -Log)	0.0101
99	KM SD (logged)	1.16	95% Critical H Value (KM-Log)	2.234
100	KM Standard Error of Mean (logged)	0.148		
101				
102	DL/2 Statistics			
103	DL/2 Normal		DL/2 Log-Transformed	
104	Mean in Original Scale	0.0113	Mean in Log Scale	-5.759
105	SD in Original Scale	0.023	SD in Log Scale	1.453
106	95% t UCL (Assumes normality)	0.0161	95% H-Stat UCL	0.0138



DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.0233

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 5:08:59 AM
From File	Stats for PROUCL_Outliers removed_g.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Naphthalene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	21
Number of Detects	9	Number of Non-Detects	57
Number of Distinct Detects	9	Number of Distinct Non-Detects	13
Minimum Detect	0.0021	Minimum Non-Detect	0.002
Maximum Detect	0.076	Maximum Non-Detect	0.0293
Variance Detects	7.3737E-4	Percent Non-Detects	86.36%
Mean Detects	0.0194	SD Detects	0.0272
Median Detects	0.0071	CV Detects	1.401
Skewness Detects	1.685	Kurtosis Detects	1.54
Mean of Logged Detects	-4.765	SD of Logged Detects	1.334

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.683	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00442	KM Standard Error of Mean	0.00146
KM SD	0.0112	95% KM (BCA) UCL	0.00697
95% KM (t) UCL	0.00686	95% KM (Percentile Bootstrap) UCL	0.00699
95% KM (z) UCL	0.00683	95% KM Bootstrap t UCL	0.0162
90% KM Chebyshev UCL	0.00881	95% KM Chebyshev UCL	0.0108
97.5% KM Chebyshev UCL	0.0136	99% KM Chebyshev UCL	0.019

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.699	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.244	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.29	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.732	k star (bias corrected MLE)	0.562
Theta hat (MLE)	0.0265	Theta star (bias corrected MLE)	0.0345
nu hat (MLE)	13.17	nu star (bias corrected)	10.11
Mean (detects)	0.0194		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

	A	B	C	D	E	F	G	H	I	J	K	L
54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
56	This is especially true when the sample size is small.											
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
58					Minimum	0.0021					Mean	0.0113
59					Maximum	0.076					Median	0.01
60					SD	0.0101					CV	0.892
61					k hat (MLE)	3.677					k star (bias corrected MLE)	3.52
62					Theta hat (MLE)	0.00307					Theta star (bias corrected MLE)	0.0032
63					nu hat (MLE)	485.4					nu star (bias corrected)	464.7
64					Adjusted Level of Significance (β)	0.0464						
65					Approximate Chi Square Value (464.66, α)	415.7					Adjusted Chi Square Value (464.66, β)	414.6
66					95% Gamma Approximate UCL (use when n>=50)	0.0126					95% Gamma Adjusted UCL (use when n<50)	0.0126
67												
68	Estimates of Gamma Parameters using KM Estimates											
69					Mean (KM)	0.00442					SD (KM)	0.0112
70					Variance (KM)	1.2504E-4					SE of Mean (KM)	0.00146
71					k hat (KM)	0.156					k star (KM)	0.159
72					nu hat (KM)	20.63					nu star (KM)	21.03
73					theta hat (KM)	0.0283					theta star (KM)	0.0278
74					80% gamma percentile (KM)	0.00505					90% gamma percentile (KM)	0.0132
75					95% gamma percentile (KM)	0.024					99% gamma percentile (KM)	0.0551
76												
77	Gamma Kaplan-Meier (KM) Statistics											
78					Approximate Chi Square Value (21.03, α)	11.61					Adjusted Chi Square Value (21.03, β)	11.46
79					95% Gamma Approximate KM-UCL (use when n>=50)	0.00801					95% Gamma Adjusted KM-UCL (use when n<50)	0.00812
80												
81	Lognormal GOF Test on Detected Observations Only											
82					Shapiro Wilk Test Statistic	0.889	Shapiro Wilk GOF Test					
83					5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level					
84					Lilliefors Test Statistic	0.17	Lilliefors GOF Test					
85					5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level					
86	Detected Data appear Lognormal at 5% Significance Level											
87												
88	Lognormal ROS Statistics Using Imputed Non-Detects											
89					Mean in Original Scale	0.00277					Mean in Log Scale	-9.521
90					SD in Original Scale	0.0116					SD in Log Scale	2.762
91					95% t UCL (assumes normality of ROS data)	0.00516					95% Percentile Bootstrap UCL	0.00531
92					95% BCA Bootstrap UCL	0.00661					95% Bootstrap t UCL	0.0141
93					95% H-UCL (Log ROS)	0.0108						
94												
95	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution											
96					KM Mean (logged)	-6.005					KM Geo Mean	0.00247
97					KM SD (logged)	0.688					95% Critical H Value (KM-Log)	2.004
98					KM Standard Error of Mean (logged)	0.0914					95% H-UCL (KM -Log)	0.00371
99					KM SD (logged)	0.688					95% Critical H Value (KM-Log)	2.004
100					KM Standard Error of Mean (logged)	0.0914						
101												
102	DL/2 Statistics											
103	DL/2 Normal						DL/2 Log-Transformed					
104					Mean in Original Scale	0.00459					Mean in Log Scale	-6.298
105					SD in Original Scale	0.0116					SD in Log Scale	1.056
106					95% t UCL (Assumes normality)	0.00697					95% H-Stat UCL	0.00432

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	0.00801

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 5:12:46 AM
From File	Stats for PROUCL_Outliers removed_h.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Pyrene

General Statistics

Total Number of Observations	66	Number of Distinct Observations	31
Number of Detects	20	Number of Non-Detects	46
Number of Distinct Detects	19	Number of Distinct Non-Detects	12
Minimum Detect	0.0026	Minimum Non-Detect	0.002
Maximum Detect	0.12	Maximum Non-Detect	0.0293
Variance Detects	0.00129	Percent Non-Detects	69.7%
Mean Detects	0.0337	SD Detects	0.036
Median Detects	0.024	CV Detects	1.067
Skewness Detects	1.182	Kurtosis Detects	0.772
Mean of Logged Detects	-4.15	SD of Logged Detects	1.403

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.824	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.905	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.233	Lilliefors GOF Test
5% Lilliefors Critical Value	0.192	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0117	KM Standard Error of Mean	0.00305
KM SD	0.0242	95% KM (BCA) UCL	0.0166
95% KM (t) UCL	0.0168	95% KM (Percentile Bootstrap) UCL	0.0169
95% KM (z) UCL	0.0167	95% KM Bootstrap t UCL	0.0181
90% KM Chebyshev UCL	0.0208	95% KM Chebyshev UCL	0.025
97.5% KM Chebyshev UCL	0.0307	99% KM Chebyshev UCL	0.042

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.992	Anderson-Darling GOF Test
5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.244	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.201	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.783	k star (bias corrected MLE)	0.699
Theta hat (MLE)	0.043	Theta star (bias corrected MLE)	0.0482
nu hat (MLE)	31.33	nu star (bias corrected)	27.97
Mean (detects)	0.0337		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.0026	Mean	0.0172
59	Maximum	0.12	Median	0.01
60	SD	0.0223	CV	1.299
61	k hat (MLE)	1.383	k star (bias corrected MLE)	1.33
62	Theta hat (MLE)	0.0124	Theta star (bias corrected MLE)	0.0129
63	nu hat (MLE)	182.5	nu star (bias corrected)	175.5
64	Adjusted Level of Significance (β)	0.0464		
65	Approximate Chi Square Value (175.54, α)	145.9	Adjusted Chi Square Value (175.54, β)	145.3
66	95% Gamma Approximate UCL (use when n>=50)	0.0207	95% Gamma Adjusted UCL (use when n<50)	0.0208
67				
68	Estimates of Gamma Parameters using KM Estimates			
69	Mean (KM)	0.0117	SD (KM)	0.0242
70	Variance (KM)	5.8355E-4	SE of Mean (KM)	0.00305
71	k hat (KM)	0.234	k star (KM)	0.233
72	nu hat (KM)	30.84	nu star (KM)	30.78
73	theta hat (KM)	0.05	theta star (KM)	0.0501
74	80% gamma percentile (KM)	0.0165	90% gamma percentile (KM)	0.0352
75	95% gamma percentile (KM)	0.0577	99% gamma percentile (KM)	0.118
76				
77	Gamma Kaplan-Meier (KM) Statistics			
78	Approximate Chi Square Value (30.78, α)	19.1	Adjusted Chi Square Value (30.78, β)	18.9
79	95% Gamma Approximate KM-UCL (use when n>=50)	0.0188	95% Gamma Adjusted KM-UCL (use when n<50)	0.019
80				
81	Lognormal GOF Test on Detected Observations Only			
82	Shapiro Wilk Test Statistic	0.864	Shapiro Wilk GOF Test	
83	5% Shapiro Wilk Critical Value	0.905	Detected Data Not Lognormal at 5% Significance Level	
84	Lilliefors Test Statistic	0.22	Lilliefors GOF Test	
85	5% Lilliefors Critical Value	0.192	Detected Data Not Lognormal at 5% Significance Level	
86	Detected Data Not Lognormal at 5% Significance Level			
87				
88	Lognormal ROS Statistics Using Imputed Non-Detects			
89	Mean in Original Scale	0.0106	Mean in Log Scale	-7.068
90	SD in Original Scale	0.0248	SD in Log Scale	2.439
91	95% t UCL (assumes normality of ROS data)	0.0157	95% Percentile Bootstrap UCL	0.0158
92	95% BCA Bootstrap UCL	0.0167	95% Bootstrap t UCL	0.018
93	95% H-UCL (Log ROS)	0.0435		
94				
95	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
96	KM Mean (logged)	-5.568	KM Geo Mean	0.00382
97	KM SD (logged)	1.207	95% Critical H Value (KM-Log)	2.2
98	KM Standard Error of Mean (logged)	0.153	95% H-UCL (KM -Log)	0.011
99	KM SD (logged)	1.207	95% Critical H Value (KM-Log)	2.2
100	KM Standard Error of Mean (logged)	0.153		
101				
102	DL/2 Statistics			
103	DL/2 Normal		DL/2 Log-Transformed	
104	Mean in Original Scale	0.0119	Mean in Log Scale	-5.789
105	SD in Original Scale	0.0244	SD in Log Scale	1.485
106	95% t UCL (Assumes normality)	0.0169	95% H-Stat UCL	0.0143

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	0.025

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/26/2021 5:15:33 AM
From File	Stats for PROUCL_Outliers removed_i.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Total PCBs Aroclors

General Statistics

Total Number of Observations	59	Number of Distinct Observations	12
Number of Detects	4	Number of Non-Detects	55
Number of Distinct Detects	4	Number of Distinct Non-Detects	8
Minimum Detect	0.0023	Minimum Non-Detect	4.6800E-5
Maximum Detect	0.0066	Maximum Non-Detect	0.2
Variance Detects	4.4167E-6	Percent Non-Detects	93.22%
Mean Detects	0.00345	SD Detects	0.0021
Median Detects	0.00245	CV Detects	0.609
Skewness Detects	1.991	Kurtosis Detects	3.97
Mean of Logged Detects	-5.78	SD of Logged Detects	0.507

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.667	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.424	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.9222E-4	KM Standard Error of Mean	1.5541E-4
KM SD	0.001	95% KM (BCA) UCL	N/A
95% KM (t) UCL	5.5200E-4	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	5.4785E-4	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	7.5846E-4	95% KM Chebyshev UCL	9.6965E-4
97.5% KM Chebyshev UCL	0.00126	99% KM Chebyshev UCL	0.00184

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.835	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.443	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.396	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.688	k star (bias corrected MLE)	1.339
Theta hat (MLE)	7.3598E-4	Theta star (bias corrected MLE)	0.00258
nu hat (MLE)	37.5	nu star (bias corrected)	10.71
Mean (detects)	0.00345		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

54	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
55	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
56	This is especially true when the sample size is small.			
57	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
58	Minimum	0.0023	Mean	0.00956
59	Maximum	0.01	Median	0.01
60	SD	0.00173	CV	0.181
61	k hat (MLE)	14.78	k star (bias corrected MLE)	14.04
62	Theta hat (MLE)	6.4661E-4	Theta star (bias corrected MLE)	6.8070E-4
63	nu hat (MLE)	1744	nu star (bias corrected)	1657
64	Adjusted Level of Significance (β)	0.0459		
65	Approximate Chi Square Value (N/A, α)	1563	Adjusted Chi Square Value (N/A, β)	1561
66	95% Gamma Approximate UCL (use when n>=50)	0.0101	95% Gamma Adjusted UCL (use when n<50)	N/A
67				
68	**Estimates of Gamma Parameters using KM Estimates**			
69	Mean (KM)	2.9222E-4	SD (KM)	0.001
70	Variance (KM)	1.0091E-6	SE of Mean (KM)	1.5541E-4
71	k hat (KM)	0.0846	k star (KM)	0.0916
72	nu hat (KM)	9.985	nu star (KM)	10.81
73	theta hat (KM)	0.00345	theta star (KM)	0.00319
74	80% gamma percentile (KM)	1.7720E-4	90% gamma percentile (KM)	7.4748E-4
75	95% gamma percentile (KM)	0.0017	99% gamma percentile (KM)	0.00485
76				
77	**Gamma Kaplan-Meier (KM) Statistics**			
78	Approximate Chi Square Value (10.81, α)	4.455	Adjusted Chi Square Value (10.81, β)	4.352
79	95% Gamma Approximate KM-UCL (use when n>=50)	7.0918E-4	95% Gamma Adjusted KM-UCL (use when n<50)	7.2584E-4
80				
81	**Lognormal GOF Test on Detected Observations Only**			
82	Shapiro Wilk Test Statistic	0.693	**Shapiro Wilk GOF Test**	
83	5% Shapiro Wilk Critical Value	0.748	Detected Data Not Lognormal at 5% Significance Level	
84	Lilliefors Test Statistic	0.412	**Lilliefors GOF Test**	
85	5% Lilliefors Critical Value	0.375	Detected Data Not Lognormal at 5% Significance Level	
86	Detected Data Not Lognormal at 5% Significance Level			
87				
88	**Lognormal ROS Statistics Using Imputed Non-Detects**			
89	Mean in Original Scale	5.3230E-4	Mean in Log Scale	-8.354
90	SD in Original Scale	9.7838E-4	SD in Log Scale	1.258
91	95% t UCL (assumes normality of ROS data)	7.4521E-4	95% Percentile Bootstrap UCL	7.6186E-4
92	95% BCA Bootstrap UCL	8.4373E-4	95% Bootstrap t UCL	9.6967E-4
93	95% H-UCL (Log ROS)	8.2962E-4		
94				
95	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**			
96	KM Mean (logged)	-9.666	KM Geo Mean	6.3374E-5
97	KM SD (logged)	1.091	95% Critical H Value (KM-Log)	2.494
98	KM Standard Error of Mean (logged)	0.169	95% H-UCL (KM -Log)	1.6436E-4
99	KM SD (logged)	1.091	95% Critical H Value (KM-Log)	2.494
100	KM Standard Error of Mean (logged)	0.169		
101				
102	**DL/2 Statistics**			
103	**DL/2 Normal**		**DL/2 Log-Transformed**	
104	Mean in Original Scale	0.0039	Mean in Log Scale	-6.826
105	SD in Original Scale	0.0149	SD in Log Scale	1.221
106	95% t UCL (Assumes normality)	0.00714	95% H-Stat UCL	0.00356

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 9.6965E-4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

APPENDIX C

Detailed Cost Estimates

Table C-1. Remedial Alternative 1 Cost Estimate

Project No. 150054, Snopac Property, Seattle, Washington

CAPITAL COSTS

Direct Costs

Completed Interim Action	Quantity	Units	Unit Cost	Cost ($)	Description
Interim Action Sunk Costs	1	LS	$2,755,383	$2,755,383	

SBG-Containing Fill Removal from Shoreface					Description
Pre-Construction, Mobilization, Site Preparation	1	LS	10%	$76,000	Percent of total construction costs. Includes mob/demob, bonds/insurance, health and safety, temporary facilities and controls.
Excavation of Shoreface	2,400	CY	$66	$158,400	Excavation of SBG-containing fill in uplands inland of MHHW. Conducted from barge.
Soil Transportation to Subtitle D Facility	3,960	tons	$28	$110,880	Assumes 10% swell, and unit weight of 1.5 tons/LCY.
Soil Disposal at Subtitle D Landfill	3,960	tons	$54	$213,840	
Import, place and compact backfill	3,740	tons	$44	$164,560	Assume shoreface backfill material density of 1.3 ton/cy. Factor of 1.2 applied to account for compaction.
Turbidity Controls	1	LS	$0	$0	Assumes conducted concurrently with in-water cleanup.
Shoreface – Topographic Survey	1	LS	$4,000	$4,000	Lump sum based on 66% of shoreface area above MHHW.
Shoreface – Habitat Restoration	1	LS	$56,000	$56,000	Lump sum based on 66% of shoreface area above MHHW.
Shoring Wall Finish	1	LS	$50,000	$50,000	Shoring wall to be cut to restoration grade and stormwater outfalls restored.
			Direct Cost (Subtotal):	$3,589,063	
			B&O Tax (1.5% Subtotal):	$13,000	B&O and Sales Tax included in lump sum Interim Action sunk costs and only applied to SBG-Containing Fill Removal from Shoreface (future costs).
			Sales Tax (10.25% Subtotal):	$85,000	
			Total Direct Cost:	***$3,687,063***	

Indirect Costs	Quantity	Units	Unit Cost	Extension	Description
Upland Cleanup Action Plan	1	LS	$15,000	$15,000	Aspect contract authorized for this item.
Quarterly Groundwater Monitoring	4	Event	$15,000	$60,000	
Groundwater Compliance Monitoring Plan	1	LS	$10,000	$10,000	
Contaminated Media Management Plan	1	LS	$10,000	$10,000	
Institutional Controls	1	LS	$7,500	$7,500	
			Total Indirect Cost:	***$102,500***	
			Total Capital Costs (Subtotal):	$3,790,000	
			Contingency (20% Subtotal):	$206,923	Contingency only applied to future costs (not Interim Action Sunk Costs).

TOTAL CAPITAL COSTS: $3,997,000

Long-term Monitoring and Reporting

Direct Annual Operating Costs	Quantity	Units	Unit Cost	Extension	Description
Groundwater Compliance Monitoring	1	Event	$15,000	$15,000	
Annual Reporting	1	Event	$10,000	$10,000	
			Project Management (15%):	$3,750	
			Annual Subtotals:	$28,750	Annual monitoring frequency before shoreface cleanup (years 1-5).
				$43,750	Semi-annual compliance monitoring frequency (years 6-10).

TOTAL LONG-TERM MONITORING AND REPORTING COST: $360,000

TOTAL REMEDY COST (Actual Dollars, 10 years): $4,360,000

Notes:

1. The costs presented are preliminary, Feasibility Study-level estimates based on existing information and are estimated to be within +50/-30% of actual costs.
2. The costs are in current dollars (2021). The estimate will need to be updated to account for inflation once the project is approved and the schedule is better defined.

Table C-2. Remedial Alternative 2 Cost Estimate

Project No. 150054, Snopac Property, Seattle, Washington

CAPITAL COSTS

Direct Costs

Completed Interim Action	Quantity	Units	Unit Cost	Cost ($)	Description
Interim Action Sunk Costs	1	LS	$2,755,383	$2,755,383	

SBG-Containing Fill and Piling Removal from Shoreface					Description
Pre-Construction, Mobilization, Site Preparation	1	LS	10%	$107,000	Percent of total construction costs. Includes mob/demob, bonds/insurance, health and safety, temporary facilities and controls.
Excavation of Shoreface	2,400	CY	$66	$158,400	Excavation of SBG-containing fill in uplands inland of MHHW. Conducted from barge.
Soil Transportation to Subtitle D Facility	3,960	tons	$28	$110,880	Assumes 10% swell, and unit weight of 1.5 tons/LCY
Soil Disposal at Subtitle D Landfill	3,960	tons	$54	$213,840	
Wood Piling Removal	1	LS	$200,000	$200,000	Based on project experience
Wood Piling Disposal	2,000	tons	$54	$108,000	
Import, place and compact backfill	3,740	tons	$44	$164,560	Assume shoreface backfill material density of 1.3 ton/cy. Factor of 1.2 applied to account for compaction.
Turbidity Controls	1	LS	$0	$0	Assumes conducted concurrently with in-water cleanup
Shoreface – Topographic Survey	1	LS	$4,000	$4,000	Lump sum based on 66% of shoreface area above MHHW.
Shoreface – Habitat Restoration	1	LS	$56,000	$56,000	Lump sum based on 66% of shoreface area above MHHW.
Shoring Wall Finish	1	LS	$50,000	$50,000	Shoring wall to be cut to restoration grade and stormwater outfalls restored
			Direct Cost (Subtotal):	$3,928,063	
			B&O Tax (1.5% Subtotal):	$18,000	B&O and Sales Tax included in lump sum Interim Action sunk costs and only applied to SBG-Containing Fill Removal from Shoreface (future costs).
			Sales Tax (10.25% Subtotal):	$120,000	
			Total Direct Cost:	***$4,066,063***	

Indirect Costs	Quantity	Units	Unit Cost	Extension	Description
Upland Cleanup Action Plan	1	LS	$15,000	$15,000	
Quarterly Groundwater Monitoring	4	Event	$15,000	$60,000	
Groundwater Compliance Monitoring Plan	1	LS	$10,000	$10,000	
Contaminated Media Management Plan	1	LS	$10,000	$10,000	
Institutional Controls	1	LS	$7,500	$7,500	
			Total Indirect Cost:	***$102,500***	
			Total Capital Costs (Subtotal):	$4,169,000	
			Contingency (20% Subtotal):	$282,723	Contingency only applied to future costs (not Interim Action Sunk Costs).
			TOTAL CAPITAL COSTS:	**$4,452,000**	

Long-term Monitoring and Reporting

Direct Annual Operating Costs	Quantity	Units	Unit Cost	Extension	Description
Groundwater Compliance Monitoring	1	Event	$15,000	$15,000	
Annual Reporting	1	Event	$10,000	$10,000	
			Project Management (15%):	$3,750	
			Annual Subtotals:	$28,750	Annual monitoring frequency before shoreface cleanup (years 1-5)
				$43,750	Semi-annual compliance monitoring frequency (years 6-10)

TOTAL LONG-TERM MONITORING AND REPORTING COST: $360,000

TOTAL REMEDY COST (Actual Dollars, 10 years): $4,810,000

Notes:

1. The costs presented are preliminary, Feasibility Study-level estimates based on existing information and are estimated to be within +50/-30% of actual costs.
2. The costs are in current dollars (2021). The estimate will need to be updated to account for inflation once the project is approved and the schedule is better defined.

Table C-3. Remedial Alternative 3 Cost Estimate

Project No. 150054, Snopac Property, Seattle, Washington

CAPITAL COSTS

Direct Costs

Completed Interim Action	**Quantity**	**Units**	**Unit Cost**	**Cost ($)**	**Description**
Interim Action Sunk Costs	1	LS	$2,755,383	$2,755,383	
SBG-Containing Fill and Piling Removal from Shoreface					**Description**
Pre-Construction, Mobilization, Site Preparation	1	LS	10%	$127,000	Percent of total construction costs. Includes mob/demob, bonds/insurance, health and safety, temporary facilities and controls.
Excavation of Shoreface	2,400	CY	$66	$158,400	Excavation of SBG-containing fill in uplands inland of MHHW. Conducted from barge.
Soil Transportation to Subtitle D Facility	3,960	tons	$28	$110,880	Assumes 10% swell, and unit weight of 1.5 tons/LCY
Soil Disposal at Subtitle D Landfill	3,960	tons	$54	$213,840	
Wood Piling Removal	1	LS	$200,000	$200,000	Based on project experience
Wood Piling Disposal	2,000	tons	$54	$108,000	
Import, place and compact backfill	3,740	tons	$44	$164,560	Assume shoreface backfill material density of 1.3 ton/cy. Factor of 1.2 applied to account for compaction.
Turbidity Controls	1	LS	$0	$0	Assumes conducted concurrently with in-water cleanup
Shoreface – Topographic Survey	1	LS	$4,000	$4,000	Lump sum based on 66% of shoreface area above MHHW.
Shoreface – Habitat Restoration	1	LS	$57,000	$57,000	Lump sum based on 66% of shoreface area above MHHW.
Shoring Wall Finish	1	LS	$50,000	$50,000	Shoring wall to be cut to restoration grade and stormwater outfalls restored
Fill Unit Groundwater Treatment					
Reagent Injection Subcontractors	15	days	$8,000	$120,000	Based on recent quotes from similar projects.
Zero Valent Iron (ZVI) Product	17,500	lbs	$5	$87,500	Based on Alternative 3 treatment area, saturated thickness of 6 ft, and reagent dosing of 0.5% by mass
			Direct Cost (Subtotal):	$4,156,563	
			B&O Tax (1.5% Subtotal):	$21,000	B&O and Sales Tax included in lump sum Interim Action sunk costs and only applied to SBG-Containing Fill Removal from Shoreface (future costs).
			Sales Tax (10.25% Subtotal):	$144,000	
			Total Direct Cost:	***$4,321,563***	

Indirect Costs	**Quantity**	**Units**	**Unit Cost**	**Extension**	**Description**
Upland Cleanup Action Plan	1	LS	$15,000	$15,000	
Quarterly Groundwater Monitoring	4	Event	$15,000	$60,000	
Groundwater Compliance Monitoring Plan	1	LS	$10,000	$10,000	
Contaminated Media Management Plan	1	LS	$10,000	$10,000	
Groundwater Treatment Design	1	LS	$25,000	$25,000	
Institutional Controls	1	LS	$7,500	$7,500	
			Total Indirect Cost:	***$127,500***	
			Total Capital Costs (Subtotal):	$4,449,000	
			Contingency (20% Subtotal):	$338,723	Contingency only applied to future costs (not Interim Action Sunk Costs).
			TOTAL CAPITAL COSTS:	**$4,788,000**	

Long-term Monitoring and Reporting

Direct Annual Operating Costs	**Quantity**	**Units**	**Unit Cost**	**Extension**	**Description**
Groundwater Compliance Monitoring	1	Event	$15,000	$15,000	
Annual Reporting	1	Event	$10,000	$10,000	
			Project Management (15%):	$3,750	
			Annual Subtotals:	$28,750	Annual monitoring frequency before shoreface cleanup (years 1-5)
				$43,750	Semi-annual compliance monitoring frequency (years 6-7)
			TOTAL LONG-TERM MONITORING AND REPORTING COST:	**$230,000**	
			TOTAL REMEDY COST (Actual Dollars, 7 years):	***$5,020,000***	

Notes:

1. The costs presented are preliminary, Feasibility Study-level estimates based on existing information and are estimated to be within +50/-30% of actual costs.
2. The costs are in current dollars (2021). The estimate will need to be updated to account for inflation once the project is approved and the schedule is better defined.

APPENDIX D

Post-Interim Action Groundwater Monitoring – Laboratory Reports

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins FGS, Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-104116-1
Client Project/Site: 106490

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
7/14/2021 3:04:25 PM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Job ID: 580-104116-1

Laboratory: Eurofins FGS, Seattle

Narrative

Job Narrative
580-104116-1

Comments
No additional comments.

Receipt
The samples were received on 6/29/2021 1:55 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.3º C.

GC/MS Semi VOA
Method Organotins: Surrogate recovery for the following sample was outside the upper control limit: MW16-062521 (580-104116-2). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Definitions/Glossary

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
S1+	Surrogate recovery exceeds control limits, high biased.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client Sample ID: MW15-062521

Lab Sample ID: 580-104116-1

Date Collected: 06/25/21 07:55

Matrix: Water

Date Received: 06/29/21 13:55

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/06/21 22:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*76*		*10 - 142*	*06/30/21 12:04*	*07/06/21 22:45*	*1*

Client Sample ID: MW16-062521

Date Collected: 06/25/21 08:00
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-2

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/06/21 23:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*151*	*S1+*	*10 - 142*	*06/30/21 12:04*	*07/06/21 23:11*	*1*

Client Sample Results

Client Sample ID: MW13-062521

Date Collected: 06/25/21 10:05
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-3

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.33		ug/L		06/30/21 12:04	07/06/21 23:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*84*		*10 - 142*	*06/30/21 12:04*	*07/06/21 23:37*	*1*

Client Sample ID: MW14-062521

Lab Sample ID: 580-104116-4

Date Collected: 06/25/21 10:09

Matrix: Water

Date Received: 06/29/21 13:55

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.34		ug/L		06/30/21 12:04	07/07/21 00:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*35*		*10 - 142*	*06/30/21 12:04*	*07/07/21 00:03*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Client Sample ID: MW17-062521
Date Collected: 06/25/21 11:47
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-5
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/07/21 00:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*38*		*10 - 142*	*06/30/21 12:04*	*07/07/21 00:30*	*1*

Client Sample Results

Client Sample ID: MW-8-062521
Date Collected: 06/25/21 12:00
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-6
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.34		ug/L		06/30/21 12:04	07/07/21 00:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*36*		*10 - 142*	*06/30/21 12:04*	*07/07/21 00:56*	*1*

Client Sample Results

Client Sample ID: MW-160-062521

Date Collected: 06/25/21 13:30

Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-7

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/07/21 01:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*95*		*10 - 142*	*06/30/21 12:04*	*07/07/21 01:22*	*1*

QC Sample Results

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-360666/1-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 360666

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		06/30/21 12:04	07/06/21 21:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*103*		*10 - 142*	*06/30/21 12:04*	*07/06/21 21:26*	*1*

Lab Sample ID: LCS 580-360666/2-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Tributyltin	1.79	0.295	J	ug/L		16	11 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*111*		*10 - 142*

Lab Sample ID: LCSD 580-360666/3-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin	1.79	0.348		ug/L		19	11 - 150	16	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*140*		*10 - 142*

Lab Chronicle

Client Sample ID: MW15-062521

Lab Sample ID: 580-104116-1
Date Collected: 06/25/21 07:55
Matrix: Water
Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/06/21 22:45	TL1	FGS SEA

Client Sample ID: MW16-062521

Lab Sample ID: 580-104116-2
Date Collected: 06/25/21 08:00
Matrix: Water
Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/06/21 23:11	TL1	FGS SEA

Client Sample ID: MW13-062521

Lab Sample ID: 580-104116-3
Date Collected: 06/25/21 10:05
Matrix: Water
Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/06/21 23:37	TL1	FGS SEA

Client Sample ID: MW14-062521

Lab Sample ID: 580-104116-4
Date Collected: 06/25/21 10:09
Matrix: Water
Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 00:03	TL1	FGS SEA

Client Sample ID: MW17-062521

Lab Sample ID: 580-104116-5
Date Collected: 06/25/21 11:47
Matrix: Water
Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 00:30	TL1	FGS SEA

Client Sample ID: MW-8-062521

Lab Sample ID: 580-104116-6
Date Collected: 06/25/21 12:00
Matrix: Water
Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 00:56	TL1	FGS SEA

Lab Chronicle

Client Sample ID: MW-160-062521
Date Collected: 06/25/21 13:30
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 01:22	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins FGS, Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Laboratory: Eurofins FGS, Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-22
ANAB	Dept. of Energy	L2236	01-19-22
ANAB	ISO/IEC 17025	L2236	01-19-22
California	State	2954	06-30-21 *
Florida	NELAP	E87575	06-30-22
Kentucky (WW)	State	KY98042	12-31-21
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-21
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-21
Wisconsin	State	399133460	08-31-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
580-104116-1	MW15-062521	Water	06/25/21 07:55	06/29/21 13:55	
580-104116-2	MW16-062521	Water	06/25/21 08:00	06/29/21 13:55	
580-104116-3	MW13-062521	Water	06/25/21 10:05	06/29/21 13:55	
580-104116-4	MW14-062521	Water	06/25/21 10:09	06/29/21 13:55	
580-104116-5	MW17-062521	Water	06/25/21 11:47	06/29/21 13:55	
580-104116-6	MW-8-062521	Water	06/25/21 12:00	06/29/21 13:55	
580-104116-7	MW-160-062521	Water	06/25/21 13:30	06/29/21 13:55	

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Eurofins

PROJECT NAME/NO.	PO #
106490	B-312

REMARKS

Please Email Results

Page # 1 of 1

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Tributyltin							Notes
MW15-062521		6/25/21	0755	Water	1				X							
MW16-062521			0800		1				X							
MW13-062521			~~0915~~ 1005		1				X							
MW14-062521			~~1005~~ 1009		1				X							
MW17-062521			~~1009~~ 1147		1				X							
MW-8-062521			~~1147~~ 1200		1				X							
MW-160-062521			1330		1				X							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	6/28/21	
Received by:	Kim Chasler	EFGS	6/29/21	1355
Relinquished by:				
Received by:				

Therm. ID: IR9 Cor: 4.3 ° Unc: 4.3 °
Cooler Dsc: Lg B
Packing: Bub
Cust. Seal: Yes___ No X
[✓ Blue Ice], Wet, Dry, None

FedEx:
UPS:
Lab Cour: X
Other:

Login Sample Receipt Checklist

Client: Friedman & Bruya
Job Number: 580-104116-1

Login Number: 104116
List Source: Eurofins FGS, Seattle
List Number: 1
Creator: Greene, Ashton R

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins FGS, Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-104115-1
Client Project/Site: 106507

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
7/14/2021 12:21:29 PM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Job ID: 580-104115-1

Laboratory: Eurofins FGS, Seattle

Narrative

Job Narrative
580-104115-1

Comments

No additional comments.

Receipt

The sample was received on 6/29/2021 1:55 PM. Unless otherwise noted below, the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.3º C.

GC/MS Semi VOA

Method Organotins: The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 580-360666 and analytical batch 580-361143 recovered outside control limits for the following analytes: Dibutyltin. This analyte was biased high in the LCS and was not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: MW-12-062921

Date Collected: 06/29/21 10:55

Date Received: 06/29/21 14:03

Lab Sample ID: 580-104115-1

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/07/21 01:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*48*		*10 - 142*	*06/30/21 12:04*	*07/07/21 01:48*	*1*

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-360666/1-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 360666

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		06/30/21 12:04	07/06/21 21:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*103*		*10 - 142*	*06/30/21 12:04*	*07/06/21 21:26*	*1*

Lab Sample ID: LCS 580-360666/2-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Tributyltin	1.79	0.295	J	ug/L		16	11 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*111*		*10 - 142*

Lab Sample ID: LCSD 580-360666/3-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin	1.79	0.348		ug/L		19	11 - 150	16	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*140*		*10 - 142*

Lab Chronicle

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Client Sample ID: MW-12-062921

Date Collected: 06/29/21 10:55
Date Received: 06/29/21 14:03

Lab Sample ID: 580-104115-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 01:48	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins FGS, Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Laboratory: Eurofins FGS, Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-22
ANAB	Dept. of Energy	L2236	01-19-22
ANAB	ISO/IEC 17025	L2236	01-19-22
California	State	2954	06-30-21 *
Florida	NELAP	E87575	06-30-22
Kentucky (WW)	State	KY98042	12-31-21
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-21
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-21
Wisconsin	State	399133460	08-31-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
580-104115-1	MW-12-062921	Water	06/29/21 10:55	06/29/21 14:03	

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Eurofins

PROJECT NAME/NO.	PO #
106507	B-312

REMARKS
Please Email Results

Page # 1 of 1

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Tributyltin							Notes
MW-12-062921		6/29/21	1055	water	1				X							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	6/29/21	1225
Received by:	Kim Presley	EFGS	6/29/21	1355
Relinquished by:				
Received by:				

Therm. ID: TR7 Cor: 4.3 ° Unc: 4.3 °
Cooler Dsc: by B
Packing: Bub
Cust. Seal: Yes___ No X
[✓ Blue Ice], Wet, Dry, None
FedEx:
UPS:
Lab Cour: P
Other:

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-104115-1

Login Number: 104115
List Number: 1
Creator: Greene, Ashton R

List Source: Eurofins FGS, Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

July 15, 2021

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the amended results from the testing of material submitted on June 25, 2021 from the SnoPac 150054, F&BI 106490 project. The naphthalene, mercury and metals reporting limits were lowered.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data, Adam Griffin
ASP0708R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
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Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
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fbi@isomedia.com
www.friedmanandbruya.com

July 8, 2021

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the results from the testing of material submitted on June 25, 2021 from the SnoPac 150054, F&BI 106490 project. There are 42 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data, Adam Griffin
ASP0708R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 25, 2021 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC SnoPac 150054, F&BI 106490 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
106490 -01	MW-15-062521
106490 -02	MW-16-062521
106490 -03	MW-12-062521
106490 -04	MW-13-062521
106490 -05	MW-14-062521
106490 -06	MW-17-062521
106490 -07	MW-8-062521
106490 -08	MW-160-062521

The samples were sent to Eurofins for tributyltin analysis. The report will be forwarded upon receipt.

Zinc in the 200.8 matrix spike and matrix spike duplicate failed the acceptance criteria. The laboratory control sample passed the acceptance criteria, therefore the results were due to matrix effect.

The 8082 laboratory control sample and laboratory control sample duplicate failed the relative percent difference for Aroclor 1260. PCBs were not detected, therefore the data were acceptable.

All other quality control requirements were acceptable.

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490
Date Extracted: 06/28/21
Date Analyzed: 06/28/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW-13-062521 106490-04	230 x	<250	83
Method Blank 01-1504 MB	<50	<250	130

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-15-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-01
Date Analyzed:	07/01/21	Data File:	106490-01.148
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	5.55
Copper	3.76
Lead	<1
Nickel	12.9
Zinc	4.57

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-16-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-02 x2
Date Analyzed:	07/01/21	Data File:	106490-02 x2.157
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Copper	4.54
Lead	<1
Nickel	10.0
Zinc	5.07

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-16-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-02 x10
Date Analyzed:	06/30/21	Data File:	106490-02 x10.158
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	24.1

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-12-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-03
Date Analyzed:	07/01/21	Data File:	106490-03.149
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	23.7
Copper	<1
Lead	<1
Nickel	14.1
Zinc	1.99

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-13-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-04
Date Analyzed:	07/01/21	Data File:	106490-04.150
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.97
Copper	4.03
Lead	<1
Nickel	42.6

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-13-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-04 x10
Date Analyzed:	06/30/21	Data File:	106490-04 x10.147
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Zinc	161

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-14-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-05
Date Analyzed:	07/01/21	Data File:	106490-05.151
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.03
Copper	<1
Lead	<1
Nickel	2.79
Zinc	1.62

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-17-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-06
Date Analyzed:	07/01/21	Data File:	106490-06.152
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<1
Lead	<1
Nickel	2.19
Zinc	5.85

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-8-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-07
Date Analyzed:	07/01/21	Data File:	106490-07.153
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.17
Copper	<1
Lead	<1
Nickel	1.74
Zinc	<1

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-160-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-08 x2
Date Analyzed:	07/01/21	Data File:	106490-08 x2.158
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Copper	6.26
Lead	<1
Nickel	11.0
Zinc	17.4

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-160-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-08 x10
Date Analyzed:	06/30/21	Data File:	106490-08 x10.159
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	23.6

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	I1-407 mb
Date Analyzed:	06/30/21	Data File:	I1-407 mb.095
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<1
Lead	<0.5
Nickel	<1
Zinc	<1

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490
Date Extracted: 06/28/21
Date Analyzed: 06/29/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Dissolved Mercury
MW-15-062521 106490-01	<0.01
MW-16-062521 106490-02	<0.01
MW-12-062521 106490-03	<0.01
MW-13-062521 106490-04	<0.01
MW-14-062521 106490-05	<0.01
MW-17-062521 106490-06	<0.01
MW-8-062521 106490-07	<0.01
MW-160-062521 106490-08	<0.01
Method Blank i1-403 MB	<0.01

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	MW-13-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	07/01/21	Lab ID:	106490-04 1/0.25
Date Analyzed:	07/02/21	Data File:	070227.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15 ip	50	150
Phenol-d6	10 ip	50	150
2,4,6-Tribromophenol	88	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	07/01/21	Lab ID:	01-1540 mb 1/0.25
Date Analyzed:	07/02/21	Data File:	070225.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	13 vo	50	150
Phenol-d6	8 vo	50	150
2,4,6-Tribromophenol	74	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-15-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-01 1/0.25
Date Analyzed:	07/01/21	Data File:	070110.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	12	11	65
Phenol-d6	9 ip	11	65
Nitrobenzene-d5	59	50	150
2-Fluorobiphenyl	54	50	150
2,4,6-Tribromophenol	57	30	131
Terphenyl-d14	57	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.011
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.013
Fluorene	0.0050
Phenanthrene	0.016
Anthracene	<0.005
Fluoranthene	0.012
Pyrene	0.012
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-16-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-02 1/0.25
Date Analyzed:	07/01/21	Data File:	070111.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	14	11	65
Phenol-d6	10 ip	11	65
Nitrobenzene-d5	64	50	150
2-Fluorobiphenyl	68	50	150
2,4,6-Tribromophenol	81	30	131
Terphenyl-d14	76	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.005
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.014
Anthracene	<0.005
Fluoranthene	0.0065
Pyrene	0.0080
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-13-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-04 1/0.25
Date Analyzed:	07/01/21	Data File:	070112.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	10 ip	11	65
Phenol-d6	9 ip	11	65
Nitrobenzene-d5	60	50	150
2-Fluorobiphenyl	64	50	150
2,4,6-Tribromophenol	78	30	131
Terphenyl-d14	76	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.005
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	0.072
Acenaphthylene	0.080
Acenaphthene	3.4
Fluorene	1.1
Phenanthrene	0.014
Anthracene	0.095
Fluoranthene	0.86
Pyrene	0.56
Benz(a)anthracene	0.019
Chrysene	0.019
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-14-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-05 1/0.25
Date Analyzed:	07/01/21	Data File:	070113.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	10 ip	11	65
Phenol-d6	9 ip	11	65
Nitrobenzene-d5	50	50	150
2-Fluorobiphenyl	50	50	150
2,4,6-Tribromophenol	66	30	131
Terphenyl-d14	65	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.62
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	0.12
Acenaphthylene	0.0055
Acenaphthene	0.87
Fluorene	0.10
Phenanthrene	0.092
Anthracene	0.039
Fluoranthene	0.11
Pyrene	0.11
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-17-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-06 1/0.25
Date Analyzed:	07/01/21	Data File:	070114.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	7 ip	11	65
Phenol-d6	6 ip	11	65
Nitrobenzene-d5	42 ip	50	150
2-Fluorobiphenyl	43 ip	50	150
2,4,6-Tribromophenol	68	30	131
Terphenyl-d14	55	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.015
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.0067
Fluorene	<0.005
Phenanthrene	0.012
Anthracene	<0.005
Fluoranthene	0.0065
Pyrene	0.0060
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-8-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-07 1/0.25
Date Analyzed:	07/01/21	Data File:	070115.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	13	11	65
Phenol-d6	10 ip	11	65
Nitrobenzene-d5	63	50	150
2-Fluorobiphenyl	64	50	150
2,4,6-Tribromophenol	93	30	131
Terphenyl-d14	83	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.0068
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0085
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-160-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-08 1/0.25
Date Analyzed:	07/01/21	Data File:	070116.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	3 ip	11	65
Phenol-d6	3 ip	11	65
Nitrobenzene-d5	24 ip	50	150
2-Fluorobiphenyl	28 ip	50	150
2,4,6-Tribromophenol	44	30	131
Terphenyl-d14	41 ip	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.005
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0075
Anthracene	<0.005
Fluoranthene	0.0070
Pyrene	0.0092
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	01-1531 mb 1/0.25
Date Analyzed:	07/01/21	Data File:	070109.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15	11	65
Phenol-d6	10 vo	11	65
Nitrobenzene-d5	75	50	150
2-Fluorobiphenyl	76	50	150
2,4,6-Tribromophenol	78	30	131
Terphenyl-d14	89	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.005
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-15-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/28/21	Lab ID:	106490-01 1/0.25
Date Analyzed:	06/29/21	Data File:	062907.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	37	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-16-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/28/21	Lab ID:	106490-02 1/0.25
Date Analyzed:	06/29/21	Data File:	062908.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	24	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-13-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/28/21	Lab ID:	106490-04 1/0.25
Date Analyzed:	06/29/21	Data File:	062910.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	28	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-14-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-05 1/0.25
Date Analyzed:	06/30/21	Data File:	063010.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	40	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-17-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	106490-06 1/0.25
Date Analyzed:	06/30/21	Data File:	063011.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	26	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-8-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/28/21	Lab ID:	106490-07 1/0.25
Date Analyzed:	06/29/21	Data File:	062913.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	29	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-160-062521	Client:	Aspect Consulting, LLC
Date Received:	06/25/21	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/28/21	Lab ID:	106490-08 1/0.25
Date Analyzed:	06/29/21	Data File:	062914.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	32	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/28/21	Lab ID:	01-1506 mb 1/0.25
Date Analyzed:	06/29/21	Data File:	062906.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	25	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 106490
Date Extracted:	06/30/21	Lab ID:	01-1532 mb 1/0.25
Date Analyzed:	06/30/21	Data File:	063007.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	47	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	132	140	63-142	6

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: 106488-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	11.5	97	94	70-130	3
Copper	ug/L (ppb)	20	<5	70	70	70-130	0
Lead	ug/L (ppb)	10	<1	76	76	70-130	0
Nickel	ug/L (ppb)	20	6.52	73	71	70-130	3
Zinc	ug/L (ppb)	50	<5	68 vo	67 vo	70-130	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	94	85-115
Copper	ug/L (ppb)	20	100	85-115
Lead	ug/L (ppb)	10	97	85-115
Nickel	ug/L (ppb)	20	100	85-115
Zinc	ug/L (ppb)	50	92	85-115

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Laboratory Code: 106490-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	<0.01	79	82	71-125	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	96	99	78-125	3

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	0.63	99	96	70-130	3

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	67	67	66-94	0
2-Methylnaphthalene	ug/L (ppb)	5	72	71	68-98	1
1-Methylnaphthalene	ug/L (ppb)	5	73	71	67-97	3
Acenaphthylene	ug/L (ppb)	5	77	76	70-130	1
Acenaphthene	ug/L (ppb)	5	73	72	70-130	1
Fluorene	ug/L (ppb)	5	79	77	70-130	3
Phenanthrene	ug/L (ppb)	5	79	80	70-130	1
Anthracene	ug/L (ppb)	5	80	81	70-130	1
Fluoranthene	ug/L (ppb)	5	88	87	70-130	1
Pyrene	ug/L (ppb)	5	86	84	70-130	2
Benz(a)anthracene	ug/L (ppb)	5	84	85	70-130	1
Chrysene	ug/L (ppb)	5	84	84	70-130	0
Benzo(a)pyrene	ug/L (ppb)	5	90	90	70-130	0
Benzo(b)fluoranthene	ug/L (ppb)	5	89	87	62-130	2
Benzo(k)fluoranthene	ug/L (ppb)	5	84	84	70-130	0
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	94	94	70-130	0
Dibenz(a,h)anthracene	ug/L (ppb)	5	89	91	70-130	2
Benzo(g,h,i)perylene	ug/L (ppb)	5	86	87	70-130	1

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.13	53	60	25-111	12
Aroclor 1260	ug/L (ppb)	0.13	65	81	23-123	22 vo

Date of Report: 07/08/21
Date Received: 06/25/21
Project: SnoPac 150054, F&BI 106490

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.13	66	64	25-111	3
Aroclor 1260	ug/L (ppb)	0.13	77	80	23-123	4

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

106490

SAMPLE CHAIN OF CUSTODY

ME 06/25/21

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Report To Breeyn Greer

Company Aspect

Address

City, State, ZIP

Phone 316.617.0499 Email bgreer@aspectconsulting.com

SAMPLERS (signature)

PROJECT NAME: SnoPac

PO #: 150054

REMARKS

INVOICE TO

Project specific RLs? - [✓ Yes] / No

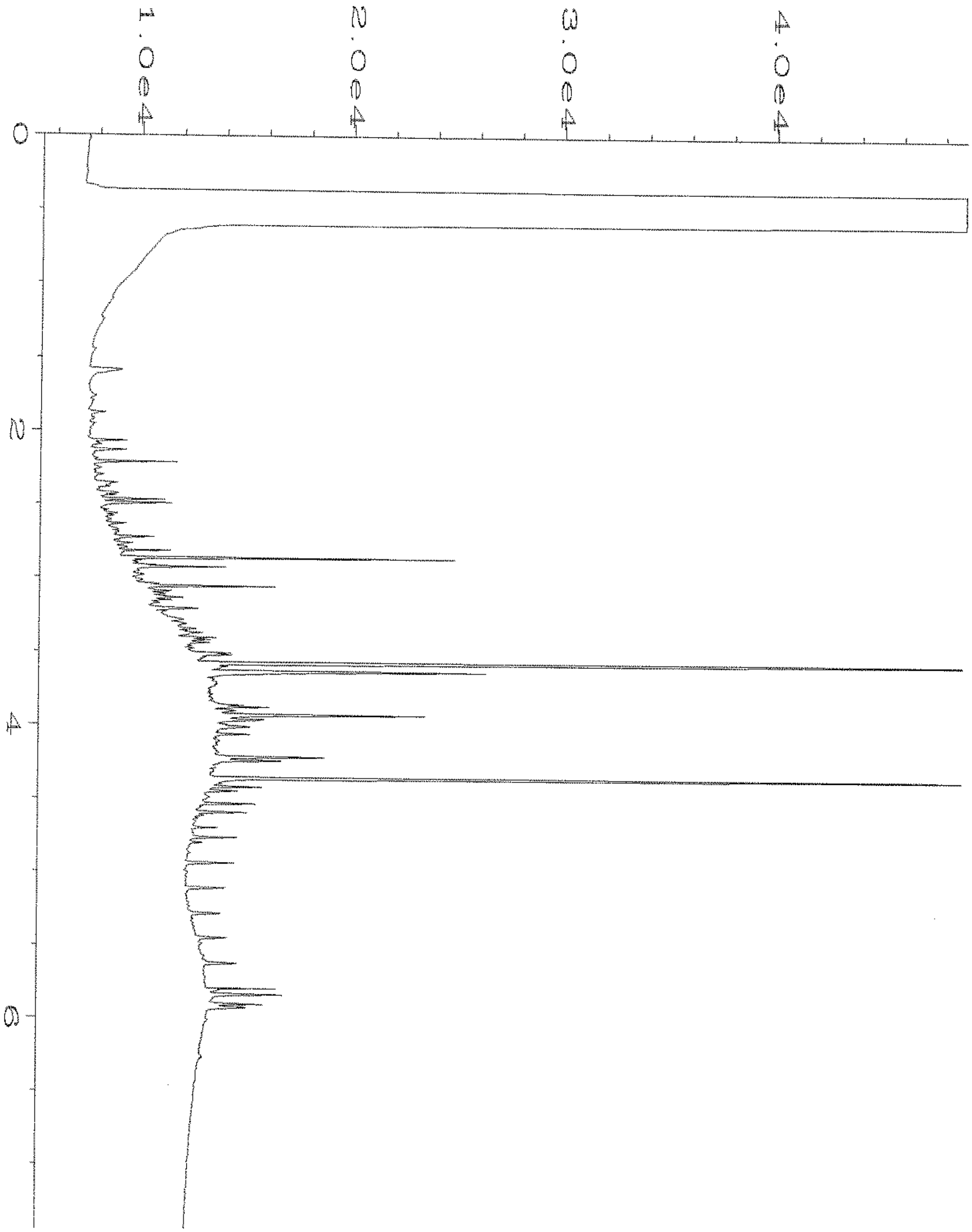
TURNAROUND TIME
☑ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	Low-level PAH-8270SIM ~~PAHs EPA 8270~~	PCB-aroclors-8082B ~~PCBs EPA 8082~~	Dissolved As, Cu, Pb Ni, Zn - 200.8	Dissolved Hg Method 1631E	Tributyltin-ion SM2540G	PCP - 8270-SIM	Turbidity & TDS Notes ● PAHs, PCBs, TBT issued in SDG 106507
MW-15-062521	01 A→J	6/25/21	0755	Water	10						X	X	X	X	X		6 / 6796
MW-16-062521	02 A→I		0800		9												5 / 17840
MW-12-062521	03 A→E		0915		5						●	●			●		12 / 1230
MW-13-062521	04 A→K		1005		11	X										X	2 / 5498
MW-14-062521	05 A→I		1009		9												8 / 1270
MW-17-062521	06 A→J		1147		10												<25 / 564
MW-8-062521	07 A→J		1200		10												10 / 1375
MW-160-062521	08 A→I	↓	1330	↓	9						↓	↓	↓	↓	↓		5 / 17840

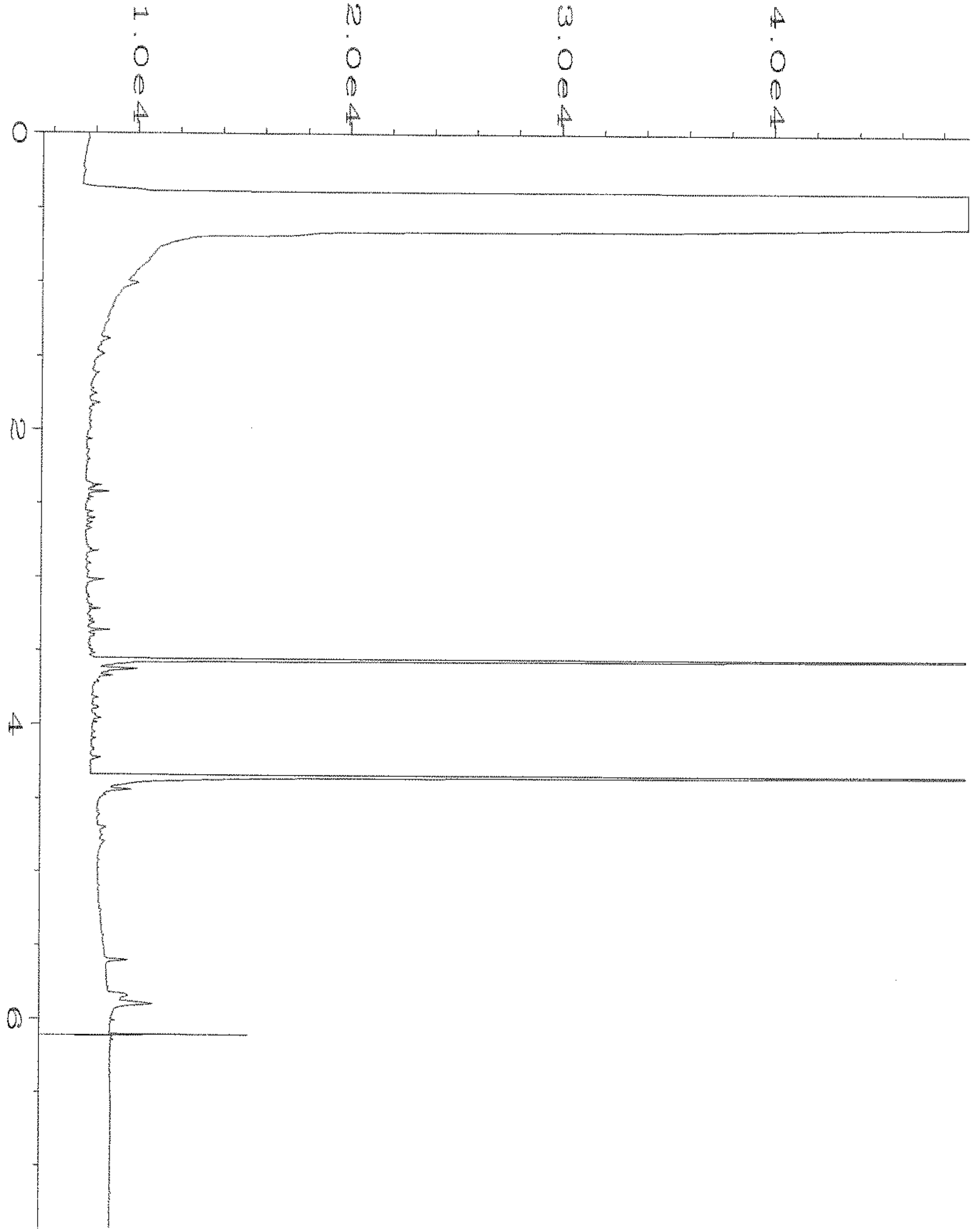
Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Daniel Blanchard	Aspect	6/25/21	1717
Received by:	JOE MOHAMMED	FBI	6/25/21	1717
Relinquished by:				
Received by:		Samples received at 3 °C		



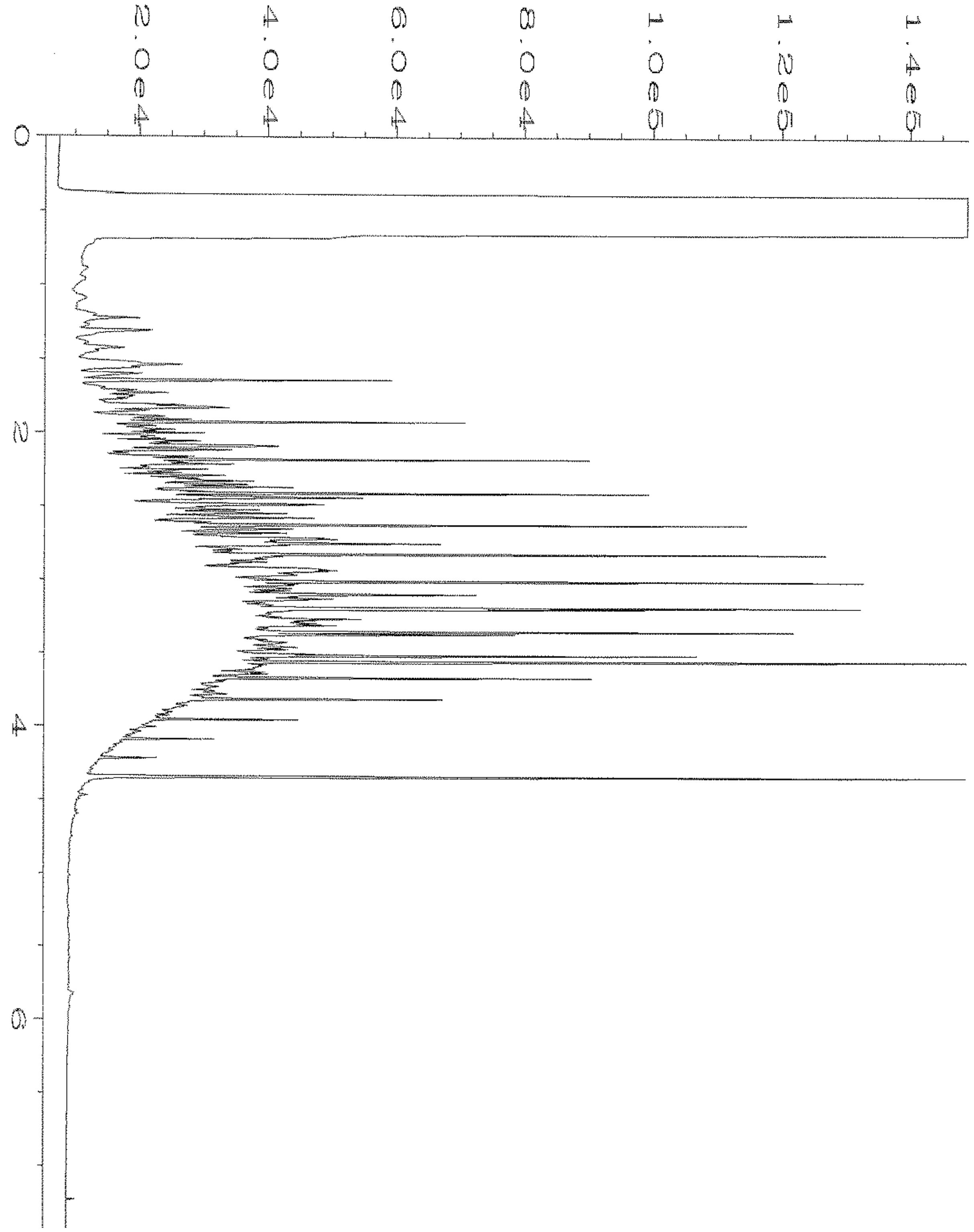
Data File Name : C:\HPCHEM\1\DATA\06-28-21\030F0901.D
Operator : TL
Instrument : GC1
Sample Name : 106490-04
Run Time Bar Code:
Acquired on : 28 Jun 21 04:58 PM
Report Created on: 29 Jun 21 10:19 AM

Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 9
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\06-28-21\024F0701.D
Operator : TL
Instrument : GC1
Sample Name : 01-1504 mb
Run Time Bar Code:
Acquired on : 28 Jun 21 03:19 PM
Report Created on: 29 Jun 21 10:26 AM

Page Number : 1
Vial Number : 24
Injection Number : 1
Sequence Line : 7
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name   : C:\HPCHEM\1\DATA\06-28-21\003F0801.D
Operator   : TL
Instrument   : GC1
Sample Name   : 500 Dx 63-79C
Run Time Bar Code:
Acquired on   : 28 Jun 21 04:20 PM
Report Created on: 29 Jun 21 10:19 AM

Page Number   : 1
Vial Number   : 3
Injection Number : 1
Sequence Line   : 8
Instrument Method: DX.MTH
Analysis Method   : DEFAULT.MTH

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins FGS, Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-104116-1
Client Project/Site: 106490

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
7/14/2021 3:04:25 PM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Job ID: 580-104116-1

Laboratory: Eurofins FGS, Seattle

Narrative

Job Narrative
580-104116-1

Comments
No additional comments.

Receipt
The samples were received on 6/29/2021 1:55 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.3º C.

GC/MS Semi VOA
Method Organotins: Surrogate recovery for the following sample was outside the upper control limit: MW16-062521 (580-104116-2). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Definitions/Glossary

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
S1+	Surrogate recovery exceeds control limits, high biased.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client Sample ID: MW15-062521
Lab Sample ID: 580-104116-1
Date Collected: 06/25/21 07:55
Matrix: Water
Date Received: 06/29/21 13:55

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/06/21 22:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*76*		*10 - 142*	*06/30/21 12:04*	*07/06/21 22:45*	*1*

Client Sample Results

Client Sample ID: MW16-062521
Lab Sample ID: 580-104116-2
Date Collected: 06/25/21 08:00
Matrix: Water
Date Received: 06/29/21 13:55

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/06/21 23:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*151*	*S1+*	*10 - 142*	*06/30/21 12:04*	*07/06/21 23:11*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Client Sample ID: MW13-062521

Date Collected: 06/25/21 10:05
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-3

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.33		ug/L		06/30/21 12:04	07/06/21 23:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*84*		*10 - 142*	*06/30/21 12:04*	*07/06/21 23:37*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 106490

Job ID: 580-104116-1

Client Sample ID: MW14-062521

Date Collected: 06/25/21 10:09
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-4

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.34		ug/L		06/30/21 12:04	07/07/21 00:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*35*		*10 - 142*	*06/30/21 12:04*	*07/07/21 00:03*	*1*

Client Sample ID: MW17-062521
Date Collected: 06/25/21 11:47
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-5
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/07/21 00:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*38*		*10 - 142*	*06/30/21 12:04*	*07/07/21 00:30*	*1*

Client Sample ID: MW-8-062521

Date Collected: 06/25/21 12:00
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-6

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.34		ug/L		06/30/21 12:04	07/07/21 00:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*36*		*10 - 142*	*06/30/21 12:04*	*07/07/21 00:56*	*1*

Client Sample ID: MW-160-062521

Date Collected: 06/25/21 13:30
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-7

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/07/21 01:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*95*		*10 - 142*	*06/30/21 12:04*	*07/07/21 01:22*	*1*

QC Sample Results

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-360666/1-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 360666

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		06/30/21 12:04	07/06/21 21:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*103*		*10 - 142*	*06/30/21 12:04*	*07/06/21 21:26*	*1*

Lab Sample ID: LCS 580-360666/2-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Tributyltin	1.79	0.295	J	ug/L		16	11 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*111*		*10 - 142*

Lab Sample ID: LCSD 580-360666/3-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin	1.79	0.348		ug/L		19	11 - 150	16	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*140*		*10 - 142*

Client Sample ID: MW15-062521

Lab Sample ID: 580-104116-1

Date Collected: 06/25/21 07:55

Matrix: Water

Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/06/21 22:45	TL1	FGS SEA

Client Sample ID: MW16-062521

Lab Sample ID: 580-104116-2

Date Collected: 06/25/21 08:00

Matrix: Water

Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/06/21 23:11	TL1	FGS SEA

Client Sample ID: MW13-062521

Lab Sample ID: 580-104116-3

Date Collected: 06/25/21 10:05

Matrix: Water

Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/06/21 23:37	TL1	FGS SEA

Client Sample ID: MW14-062521

Lab Sample ID: 580-104116-4

Date Collected: 06/25/21 10:09

Matrix: Water

Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 00:03	TL1	FGS SEA

Client Sample ID: MW17-062521

Lab Sample ID: 580-104116-5

Date Collected: 06/25/21 11:47

Matrix: Water

Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 00:30	TL1	FGS SEA

Client Sample ID: MW-8-062521

Lab Sample ID: 580-104116-6

Date Collected: 06/25/21 12:00

Matrix: Water

Date Received: 06/29/21 13:55

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 00:56	TL1	FGS SEA

Client Sample ID: MW-160-062521

Date Collected: 06/25/21 13:30
Date Received: 06/29/21 13:55

Lab Sample ID: 580-104116-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 01:22	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins FGS, Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Laboratory: Eurofins FGS, Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-22
ANAB	Dept. of Energy	L2236	01-19-22
ANAB	ISO/IEC 17025	L2236	01-19-22
California	State	2954	06-30-21 *
Florida	NELAP	E87575	06-30-22
Kentucky (WW)	State	KY98042	12-31-21
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-21
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-21
Wisconsin	State	399133460	08-31-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Friedman & Bruya
Project/Site: 106490

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
580-104116-1	MW15-062521	Water	06/25/21 07:55	06/29/21 13:55	
580-104116-2	MW16-062521	Water	06/25/21 08:00	06/29/21 13:55	
580-104116-3	MW13-062521	Water	06/25/21 10:05	06/29/21 13:55	
580-104116-4	MW14-062521	Water	06/25/21 10:09	06/29/21 13:55	
580-104116-5	MW17-062521	Water	06/25/21 11:47	06/29/21 13:55	
580-104116-6	MW-8-062521	Water	06/25/21 12:00	06/29/21 13:55	
580-104116-7	MW-160-062521	Water	06/25/21 13:30	06/29/21 13:55	

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Eurofins	
PROJECT NAME/NO. 106490	PO # B-312
REMARKS Please Email Results	

Page # 1 of 1

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Tributyltin							Notes
MW15-062521		6/25/21	0755	Water	1				X							
MW16-062521			0800		1				X							
MW13-062521			~~0915~~ 1005		1				X							
MW14-062521			~~1005~~ 1009		1				X							
MW17-062521			~~1009~~ 1147		1				X							
MW-8-062521			~~1147~~ 1200		1				X							
MW-160-062521			1330		1				X							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	6/28/21	
Received by:	Kim Chasler	EFGS	6/29/21	1355
Relinquished by:				
Received by:				

Therm. ID: IR9 Cor: 4.3 ° Unc: 4.3 °
Cooler Dsc: Lg B
Packing: Bub
Cust. Seal: Yes___ No X
Blue Ice, Wet, Dry, None
FedEx:
UPS:
Lab Cour: X
Other:

580-104116 Chain of Custody

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-104116-1

Login Number: 104116
List Number: 1
Creator: Greene, Ashton R

List Source: Eurofins FGS, Seattle

Question	**Answer**	**Comment**
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

July 15, 2021

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the amended results from the testing of material submitted on June 29, 2021 from the Snopac 150054, F&BI 106507 project. The naphthalene reporting limits were lowered.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data, Adam Griffin
ASP0708R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

July 8, 2021

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the results from the testing of material submitted on June 29, 2021 from the Snopac 150054, F&BI 106507 project. There are 8 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data, Adam Griffin
ASP0708R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 29, 2021 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Snopac 150054, F&BI 106507 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
106507 -01	MW-12-062921

Sample MW-12-062921 was sent to Eurofins for tributyltin analysis. The report generated by Eurofins will be forwarded to your office upon receipt.

All quality control requirements were acceptable.

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-12-062921	Client:	Aspect Consulting, LLC
Date Received:	06/29/21	Project:	Snopac 150054, F&BI 106507
Date Extracted:	06/30/21	Lab ID:	106507-01 1/0.25
Date Analyzed:	07/01/21	Data File:	070117.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	16	11	65
Phenol-d6	14	11	65
Nitrobenzene-d5	56	50	150
2-Fluorobiphenyl	54	50	150
2,4,6-Tribromophenol	81	30	131
Terphenyl-d14	62	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.016
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.0070
Fluorene	<0.005
Phenanthrene	0.022
Anthracene	<0.005
Fluoranthene	0.029
Pyrene	0.031
Benz(a)anthracene	0.012
Chrysene	0.013
Benzo(a)pyrene	0.015
Benzo(b)fluoranthene	0.020
Benzo(k)fluoranthene	0.0070
Indeno(1,2,3-cd)pyrene	0.0065
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Snopac 150054, F&BI 106507
Date Extracted:	06/30/21	Lab ID:	01-1531 mb 1/0.25
Date Analyzed:	07/01/21	Data File:	070109.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15	11	65
Phenol-d6	10 vo	11	65
Nitrobenzene-d5	75	50	150
2-Fluorobiphenyl	76	50	150
2,4,6-Tribromophenol	78	30	131
Terphenyl-d14	89	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.005
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-12-062921	Client:	Aspect Consulting, LLC
Date Received:	06/29/21	Project:	Snopac 150054, F&BI 106507
Date Extracted:	06/30/21	Lab ID:	106507-01 1/0.25
Date Analyzed:	06/30/21	Data File:	063012.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	44	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Snopac 150054, F&BI 106507
Date Extracted:	06/30/21	Lab ID:	01-1532 mb 1/0.25
Date Analyzed:	06/30/21	Data File:	063007.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	47	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Date of Report: 07/08/21
Date Received: 06/29/21
Project: Snopac 150054, F&BI 106507

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	67	67	66-94	0
2-Methylnaphthalene	ug/L (ppb)	5	72	71	68-98	1
1-Methylnaphthalene	ug/L (ppb)	5	73	71	67-97	3
Acenaphthylene	ug/L (ppb)	5	77	76	70-130	1
Acenaphthene	ug/L (ppb)	5	73	72	70-130	1
Fluorene	ug/L (ppb)	5	79	77	70-130	3
Phenanthrene	ug/L (ppb)	5	79	80	70-130	1
Anthracene	ug/L (ppb)	5	80	81	70-130	1
Fluoranthene	ug/L (ppb)	5	88	87	70-130	1
Pyrene	ug/L (ppb)	5	86	84	70-130	2
Benz(a)anthracene	ug/L (ppb)	5	84	85	70-130	1
Chrysene	ug/L (ppb)	5	84	84	70-130	0
Benzo(a)pyrene	ug/L (ppb)	5	90	90	70-130	0
Benzo(b)fluoranthene	ug/L (ppb)	5	89	87	62-130	2
Benzo(k)fluoranthene	ug/L (ppb)	5	84	84	70-130	0
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	94	94	70-130	0
Dibenz(a,h)anthracene	ug/L (ppb)	5	89	91	70-130	2
Benzo(g,h,i)perylene	ug/L (ppb)	5	86	87	70-130	1

Date of Report: 07/08/21
Date Received: 06/29/21
Project: Snopac 150054, F&BI 106507

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.13	66	64	25-111	3
Aroclor 1260	ug/L (ppb)	0.13	77	80	23-123	4

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY ME 06/29/21

106507

Report To Breeyn Greer
Company Aspect
Address 710 2nd Ave Ste 550
City, State, ZIP Seattle, WA 98104
Phone 316-617-0499 Email bgreer@aspectconsulting.com

SAMPLERS (signature) Rachel C

PROJECT NAME SnoPac	PO # 150054
REMARKS	INVOICE TO AP

Project specific RLs? - [✓ Yes] / No

Page # 1 of 1

TURNAROUND TIME D07
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

ANALYSES REQUESTED

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	low level PAH 8270	PCB - woclorg 8082B	Tributyltin		Notes
MW-12-062921	01A-C	6/29/21	1055	W	3								X	X	X		additional volume for MW-12-0629

Samples received at 4 °C

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Rachel C	Rachel Cornwell	Aspect	6/29/21	1210
Received by: James Bruya	James Bruya	F&B	6/29	1210
Relinquished by:				
Received by:				

eurofins | Environment Testing America

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11

ANALYTICAL REPORT

Eurofins FGS, Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-104115-1
Client Project/Site: 106507

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
7/14/2021 12:21:29 PM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Job ID: 580-104115-1

Laboratory: Eurofins FGS, Seattle

Narrative

Job Narrative
580-104115-1

Comments

No additional comments.

Receipt

The sample was received on 6/29/2021 1:55 PM. Unless otherwise noted below, the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 4.3º C.

GC/MS Semi VOA

Method Organotins: The laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 580-360666 and analytical batch 580-361143 recovered outside control limits for the following analytes: Dibutyltin. This analyte was biased high in the LCS and was not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Definitions/Glossary

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Client Sample ID: MW-12-062921

Date Collected: 06/29/21 10:55
Date Received: 06/29/21 14:03

Lab Sample ID: 580-104115-1

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.35		ug/L		06/30/21 12:04	07/07/21 01:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*48*		*10 - 142*	*06/30/21 12:04*	*07/07/21 01:48*	*1*

QC Sample Results

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-360666/1-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 360666

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		06/30/21 12:04	07/06/21 21:26	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*103*		*10 - 142*	*06/30/21 12:04*	*07/06/21 21:26*	*1*

Lab Sample ID: LCS 580-360666/2-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Tributyltin	1.79	0.295	J	ug/L		16	11 - 150

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*111*		*10 - 142*

Lab Sample ID: LCSD 580-360666/3-A
Matrix: Water
Analysis Batch: 361143

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 360666

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin	1.79	0.348		ug/L		19	11 - 150	16	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*140*		*10 - 142*

Client Sample ID: MW-12-062921

Lab Sample ID: 580-104115-1

Date Collected: 06/29/21 10:55
Date Received: 06/29/21 14:03

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			360666	06/30/21 12:04	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	361143	07/07/21 01:48	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins FGS, Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Laboratory: Eurofins FGS, Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-22
ANAB	Dept. of Energy	L2236	01-19-22
ANAB	ISO/IEC 17025	L2236	01-19-22
California	State	2954	06-30-21 *
Florida	NELAP	E87575	06-30-22
Kentucky (WW)	State	KY98042	12-31-21
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-21
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-21
Wisconsin	State	399133460	08-31-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Friedman & Bruya
Project/Site: 106507

Job ID: 580-104115-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
580-104115-1	MW-12-062921	Water	06/29/21 10:55	06/29/21 14:03	

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Eurofins

PROJECT NAME/NO. 106507

PO # B-312

REMARKS

Please Email Results

Page # 1 of 1

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Tributyltin							Notes
MW-12-062921		6/29/21	1055	water	1				X							

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	6/29/21	1225
Received by:	Kim Presley	EFGS	6/29/21	1355
Relinquished by:				
Received by:				

Therm. ID: IR7 Cor: 4.3 ° Unc: 4.3 °
Cooler Dsc: Lg B
Packing: Bub
Cust. Seal: Yes___ No X
Blue Ice [✓], Wet, Dry, None
FedEx:
UPS:
Lab Cour: ✓
Other:

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-104115-1

Login Number: 104115
List Number: 1
Creator: Greene, Ashton R

List Source: Eurofins FGS, Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

January 13, 2022

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included is the amended report from the testing of material submitted on November 11, 2021 from the Snopac 150054, F&BI 111222 project. Samples MW-16-111121 and MW-160-111121 were reextracted and reanalyzed for metals by 200.8. There was a discrepancy with between the original analysis of MW-160-111121 and the reanalysis, therefore the results for MW-160-111121 have been updated.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP1202R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 2, 2021

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the results from the testing of material submitted on November 11, 2021 from the Snopac 150054, F&BI 111222 project. There are 43 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP1202R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 11, 2021 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Snopac 150054, F&BI 111222 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
111222 -01	MW-8-111021
111222 -02	MW-14-111021
111222 -03	MW-12-111021
111222 -04	MW-17-111021
111222 -05	MW-16-111121
111222 -06	MW-160-111121
111222 -07	MW-15-111121
111222 -08	MW-13-111121

Phenanthrene was detected in the 8270E method blank. Detections in the field samples within ten times the concentration detected were qualified.

The 8082 laboratory control sample and laboratory control sample duplicate failed the relative percent difference for Aroclor 1016 and 1260. The data were flagged accordingly.

All other quality control requirements were acceptable.

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222
Date Extracted: 11/12/21
Date Analyzed: 11/12/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
MW-13-111121 111222-08	230 x	<250	114
Method Blank 01-2621 MB2	<50	<250	123

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-8-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	111222-01 x5
Date Analyzed:	11/16/21	Data File:	111222-01 x5.121
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.19
Copper	<2
Lead	<1
Nickel	2.49
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-14-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	111222-02 x5
Date Analyzed:	11/16/21	Data File:	111222-02 x5.122
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.15
Copper	18.2
Lead	<1
Nickel	7.07
Zinc	12.9

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-12-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	111222-03 x5
Date Analyzed:	11/16/21	Data File:	111222-03 x5.123
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	4.46
Copper	<2
Lead	<1
Nickel	13.2
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-17-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	111222-04 x5
Date Analyzed:	11/16/21	Data File:	111222-04 x5.124
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.92
Copper	2.19
Lead	<1
Nickel	2.03
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-16-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	111222-05 x5
Date Analyzed:	11/16/21	Data File:	111222-05 x5.125
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	8.93
Copper	4.63
Lead	<1
Nickel	20.6
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-160-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	01/04/22	Lab ID:	111222-06 rex x5
Date Analyzed:	01/04/22 17:30:34	Data File:	111222-06 rex x5.091
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	9.48
Copper	4.40
Lead	<1
Nickel	20.8
Zinc	7.89

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-15-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	111222-07 x5
Date Analyzed:	11/16/21	Data File:	111222-07 x5.133
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	3.63
Copper	4.78
Lead	<1
Nickel	14.8
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID: MW-13-111121
Date Received: 11/11/21
Date Extracted: 11/16/21
Date Analyzed: 11/16/21
Matrix: Water
Units: ug/L (ppb)

Client: Aspect Consulting, LLC
Project: Snopac 150054, F&BI 111222
Lab ID: 111222-08 x5
Data File: 111222-08 x5.134
Instrument: ICPMS2
Operator: SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.43
Copper	2.58
Lead	<1
Nickel	35.3
Zinc	147

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/16/21	Lab ID:	I1-752 mb
Date Analyzed:	11/16/21	Data File:	I1-752 mb.084
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<0.2
Copper	<0.4
Lead	<0.2
Nickel	<0.2
Zinc	<1

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Snopac 150054, F&BI 111222
Date Extracted:	01/04/22	Lab ID:	I2-03 mb
Date Analyzed:	01/04/22 12:42:14	Data File:	I2-03 mb.037
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<0.2
Copper	<0.5
Lead	<0.2
Nickel	<0.2
Zinc	<1

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222
Date Extracted: 11/12/21
Date Analyzed: 11/15/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Total Mercury
MW-8-111021 111222-01	<0.01
MW-14-111021 111222-02	<0.01
MW-12-111021 111222-03	<0.01
MW-17-111021 111222-04	<0.01
MW-16-111121 111222-05	<0.01
MW-160-111121 111222-06	<0.01
MW-15-111121 111222-07	<0.01
MW-13-111121 111222-08	<0.01
Method Blank i1-742 MB	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-8-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-01 1/0.25
Date Analyzed:	11/15/21	Data File:	111513.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	10 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	76	50	150
2-Fluorobiphenyl	80	44	108
2,4,6-Tribromophenol	97	10	140
Terphenyl-d14	91	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-14-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-02 1/0.25
Date Analyzed:	11/15/21	Data File:	111514.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	9 ip	11	65
Phenol-d6	5 ip	11	65
Nitrobenzene-d5	65	50	150
2-Fluorobiphenyl	69	44	108
2,4,6-Tribromophenol	80	10	140
Terphenyl-d14	72	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.11
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.98
Fluorene	<0.005
Phenanthrene	0.040
Anthracene	0.034
Fluoranthene	0.18
Pyrene	0.14
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID: MW-12-111021
Date Received: 11/11/21
Date Extracted: 11/15/21
Date Analyzed: 11/15/21
Matrix: Water
Units: ug/L (ppb)

Client: Aspect Consulting, LLC
Project: Snopac 150054, F&BI 111222
Lab ID: 111222-03 1/0.25
Data File: 111515.D
Instrument: GCMS12
Operator: VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	9 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	83	50	150
2-Fluorobiphenyl	85	44	108
2,4,6-Tribromophenol	89	10	140
Terphenyl-d14	90	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.091
Fluorene	<0.005
Phenanthrene	0.016 fb
Anthracene	<0.005
Fluoranthene	0.024
Pyrene	0.028
Benz(a)anthracene	0.012
Chrysene	0.014
Benzo(a)pyrene	0.014
Benzo(b)fluoranthene	0.018
Benzo(k)fluoranthene	0.0063
Indeno(1,2,3-cd)pyrene	0.011
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	0.010

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-17-111021 f	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/17/21	Lab ID:	111222-04 1/0.25
Date Analyzed:	11/18/21	Data File:	111807.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	21	11	65
Phenol-d6	15	11	65
Nitrobenzene-d5	71	50	150
2-Fluorobiphenyl	79	44	108
2,4,6-Tribromophenol	97	10	140
Terphenyl-d14	103	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0072 fb
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-16-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-05 1/0.25
Date Analyzed:	11/15/21	Data File:	111517.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	5 ip	11	65
Phenol-d6	6 ip	11	65
Nitrobenzene-d5	76	50	150
2-Fluorobiphenyl	77	44	108
2,4,6-Tribromophenol	41	10	140
Terphenyl-d14	91	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0066 fb
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-160-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-06 1/0.25
Date Analyzed:	11/15/21	Data File:	111518.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	10 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	78	50	150
2-Fluorobiphenyl	80	44	108
2,4,6-Tribromophenol	54	10	140
Terphenyl-d14	84	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-15-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-07 1/0.25
Date Analyzed:	11/15/21	Data File:	111519.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	3 ip	11	65
Phenol-d6	5 ip	11	65
Nitrobenzene-d5	77	50	150
2-Fluorobiphenyl	77	44	108
2,4,6-Tribromophenol	19	10	140
Terphenyl-d14	85	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0069 fb
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-13-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-08 1/0.25
Date Analyzed:	11/16/21	Data File:	111520.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	4 ip	11	65
Phenol-d6	6 ip	11	65
Nitrobenzene-d5	77	50	150
2-Fluorobiphenyl	77	44	108
2,4,6-Tribromophenol	24	10	140
Terphenyl-d14	87	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	1.5
2-Methylnaphthalene	0.19
1-Methylnaphthalene	0.55
Acenaphthylene	0.028
Acenaphthene	1.3
Fluorene	0.26
Phenanthrene	0.038
Anthracene	0.034
Fluoranthene	0.058
Pyrene	0.034
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	0.0056
Benzo(b)fluoranthene	0.0073
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/17/21	Lab ID:	01-2701 mb 1/0.25
Date Analyzed:	11/18/21	Data File:	111806.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	18	11	65
Phenol-d6	12	11	65
Nitrobenzene-d5	70	50	150
2-Fluorobiphenyl	71	44	108
2,4,6-Tribromophenol	76	10	140
Terphenyl-d14	93	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0065 lc
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	01-2685 mb 1/0.25
Date Analyzed:	11/15/21	Data File:	111512.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	11	11	65
Phenol-d6	8 vo	11	65
Nitrobenzene-d5	81	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	87	10	140
Terphenyl-d14	99	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	MW-13-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	111222-08 1/0.25
Date Analyzed:	11/15/21	Data File:	111509.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15 vo	50	150
Phenol-d6	8 vo	50	150
2,4,6-Tribromophenol	111	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/15/21	Lab ID:	01-2686 mb 1/0.25
Date Analyzed:	11/15/21	Data File:	111507.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15 vo	50	150
Phenol-d6	9 vo	50	150
2,4,6-Tribromophenol	86	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-8-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-01 1/0.25
Date Analyzed:	11/15/21	Data File:	111507.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	32	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-14-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-02 1/0.25
Date Analyzed:	11/15/21	Data File:	111508.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	12 ip	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	0.0088 jl
Aroclor 1260	0.0080 jl
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-12-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-03 1/0.25
Date Analyzed:	11/15/21	Data File:	111509.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	24	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-17-111021	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-04 1/0.25
Date Analyzed:	11/15/21	Data File:	111510.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	18 ip	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-16-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-05 1/0.25
Date Analyzed:	11/15/21	Data File:	111511.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	27	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-160-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-06 1/0.25
Date Analyzed:	11/15/21	Data File:	111512.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-15-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-07 1/0.25
Date Analyzed:	11/15/21	Data File:	111513.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	16 ip	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-13-111121	Client:	Aspect Consulting, LLC
Date Received:	11/11/21	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	111222-08 1/0.25
Date Analyzed:	11/15/21	Data File:	111514.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	25	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Snopac 150054, F&BI 111222
Date Extracted:	11/12/21	Lab ID:	01-2628 mb 1/0.25
Date Analyzed:	11/15/21	Data File:	111504.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	36	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	124	128	61-133	3

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: 111261-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<1	99	94	70-130	5
Copper	ug/L (ppb)	20	<5	98	94	70-130	4
Lead	ug/L (ppb)	10	<1	96	90	70-130	6
Nickel	ug/L (ppb)	20	<1	103	96	70-130	7
Zinc	ug/L (ppb)	50	<5	96	90	70-130	6

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	96	85-115
Copper	ug/L (ppb)	20	99	85-115
Lead	ug/L (ppb)	10	97	85-115
Nickel	ug/L (ppb)	20	100	85-115
Zinc	ug/L (ppb)	50	96	85-115

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: 201003-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	1.54	100	97	70-130	3
Copper	ug/L (ppb)	20	<5	89	88	70-130	1
Lead	ug/L (ppb)	10	<1	81	80	70-130	1
Nickel	ug/L (ppb)	20	2.65	93	94	70-130	1
Zinc	ug/L (ppb)	50	9.50	88	89	70-130	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	90	85-115
Copper	ug/L (ppb)	20	92	85-115
Lead	ug/L (ppb)	10	94	85-115
Nickel	ug/L (ppb)	20	95	85-115
Zinc	ug/L (ppb)	50	93	85-115

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 111225-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	<0.01	92	91	71-125	1

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	119	125	78-125	5

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	81	77	62-90	5
2-Methylnaphthalene	ug/L (ppb)	5	84	78	64-93	7
1-Methylnaphthalene	ug/L (ppb)	5	82	76	64-93	8
Acenaphthylene	ug/L (ppb)	5	92	91	70-130	1
Acenaphthene	ug/L (ppb)	5	87	86	70-130	1
Fluorene	ug/L (ppb)	5	93	93	70-130	0
Phenanthrene	ug/L (ppb)	5	89	91	70-130	2
Anthracene	ug/L (ppb)	5	90	93	70-130	3
Fluoranthene	ug/L (ppb)	5	92	92	70-130	0
Pyrene	ug/L (ppb)	5	100	98	70-130	2
Benz(a)anthracene	ug/L (ppb)	5	95	96	70-130	1
Chrysene	ug/L (ppb)	5	98	98	70-130	0
Benzo(a)pyrene	ug/L (ppb)	5	101	102	70-130	1
Benzo(b)fluoranthene	ug/L (ppb)	5	102	103	70-130	1
Benzo(k)fluoranthene	ug/L (ppb)	5	99	102	70-130	3
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	97	98	70-130	1
Dibenz(a,h)anthracene	ug/L (ppb)	5	96	95	70-130	1
Benzo(g,h,i)perylene	ug/L (ppb)	5	95	94	70-130	1

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	80	82	62-90	2
2-Methylnaphthalene	ug/L (ppb)	5	83	84	64-93	1
1-Methylnaphthalene	ug/L (ppb)	5	82	83	64-93	1
Acenaphthylene	ug/L (ppb)	5	94	94	70-130	0
Acenaphthene	ug/L (ppb)	5	88	89	70-130	1
Fluorene	ug/L (ppb)	5	89	90	70-130	1
Phenanthrene	ug/L (ppb)	5	91	90	70-130	1
Anthracene	ug/L (ppb)	5	89	93	70-130	4
Fluoranthene	ug/L (ppb)	5	92	92	70-130	0
Pyrene	ug/L (ppb)	5	105	102	70-130	3
Benz(a)anthracene	ug/L (ppb)	5	96	95	70-130	1
Chrysene	ug/L (ppb)	5	98	97	70-130	1
Benzo(a)pyrene	ug/L (ppb)	5	100	100	70-130	0
Benzo(b)fluoranthene	ug/L (ppb)	5	101	102	70-130	1
Benzo(k)fluoranthene	ug/L (ppb)	5	101	99	70-130	2
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	91	89	70-130	2
Dibenz(a,h)anthracene	ug/L (ppb)	5	90	87	70-130	3
Benzo(g,h,i)perylene	ug/L (ppb)	5	89	86	70-130	3

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	2.5	93	98	70-130	5

Date of Report: 12/02/21
Date Received: 11/11/21
Project: Snopac 150054, F&BI 111222

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.063	40	59	25-111	38 vo
Aroclor 1260	ug/L (ppb)	0.063	44	60	23-123	31 vo

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

111222

SAMPLE CHAIN OF CUSTODY ME 11/11/21 E04/AI3

Report To Breeyn Greer
Company Aspect Consulting
Address 710 2nd Ave Suite 550
City, State, ZIP Seattle, WA 98104
Phone 612.232.7343 Email bgreer@aspectconsulting.com

SAMPLERS (signature) Monique Rutte
PROJECT NAME SnoPac
PO # 150054
REMARKS
INVOICE TO
Project specific RLs? - Yes / No

Page # 1 of 1

TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

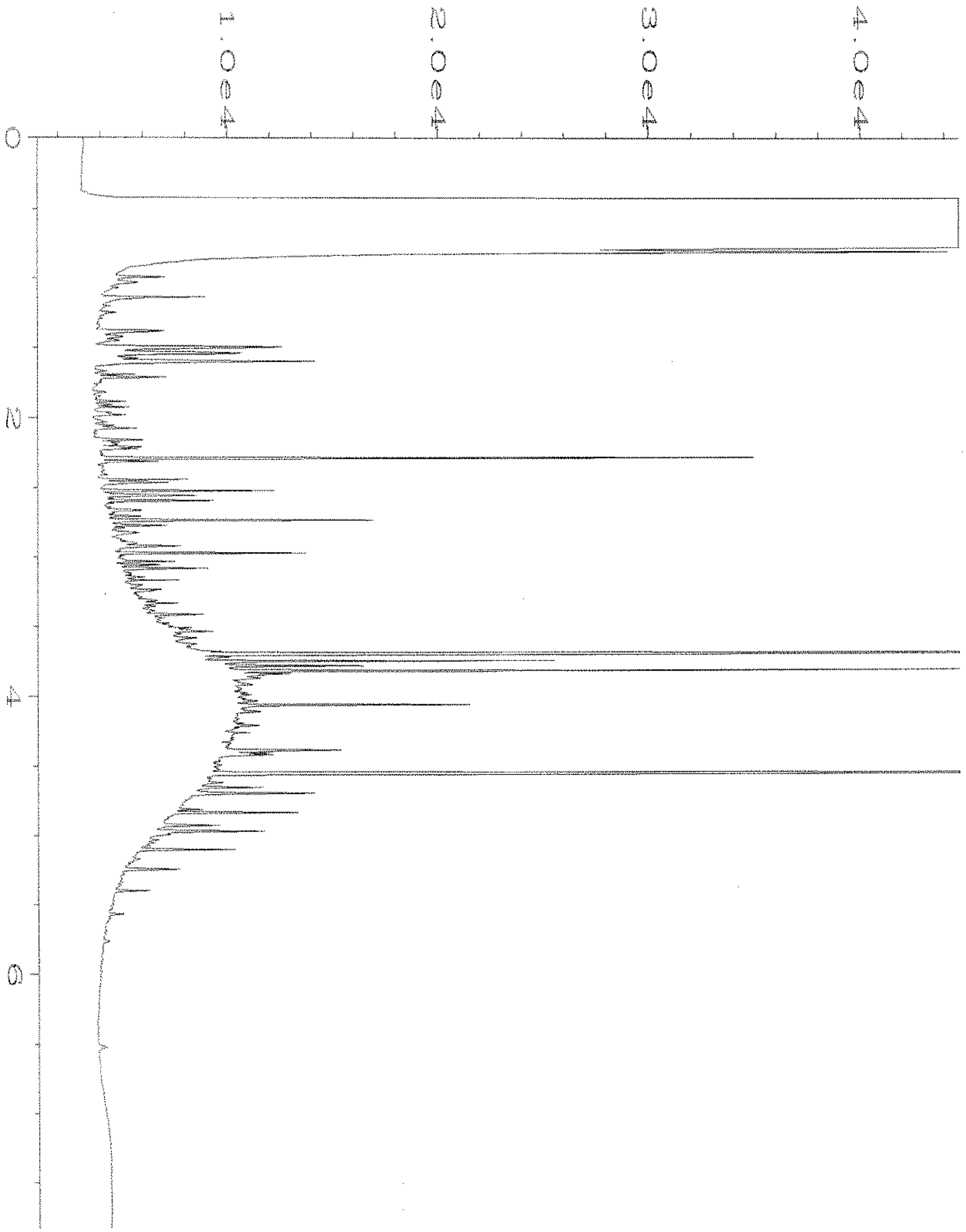
SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date, Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	Tributyltin Ion SM/406 ~~VOCs EPA 8260~~	Low level PAH 8270D-SIM ~~PAHs EPA 8270~~	PCB Aroclors 8082B ~~PCBs EPA 8082~~	Dissolved Metals As,Cu,Pb,Ni,Zn 200.8	Dissolved mercury method 1631E	Pentachlorophenol 8270-SIM		Notes Turbidity / TDS
MW-8-111021	01 A-H	11/10/21	0940	water	8					X	X	X	X	X			4 / 1997
MW-14-111021	02	↓	1115	↓	↓					↓	↓	↓	↓	↓			3 / 16053
MW-12-111021	03	↓	1240	↓	↓					↓	↓	↓	↓	↓			12 / 3505
MW-17-111021	04	↓	1355	↓	↓					↓	↓	↓	↓	↓			60 / 1606
MW-16-111121	05	11/11/21	0900	↓	↓					↓	↓	↓	↓	↓			58 / 7262
MW-160-111121	06	↓	0900	↓	↓					↓	↓	↓	↓	↓			58 / 7262
MW-15-111121	07	↓	1040	↓	↓					↓	↓	↓	↓	↓			28 / 1940
MW-13-111121	08 A-K	↓	1210	↓	11	X				↓	↓	↓	↓	↓	X		6 / 1371

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Monique Rutte	Monique Rutte	Aspect	11/11/21	1500
Received by:	HNguyen	HONG NGUYEN	FBI	11/11/21	15:05
Relinquished by:					
Received by:					

Samples received at 2 °C



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Data File Name    : C:\HPCHEM\4\DATA\11-12-21\018F1001.D
Operator          : TL                                 Page Number        : 1
Instrument        : GC#4                               Vial Number        : 18
Sample Name       : 111222-08                          Injection Number : 1
Run Time Bar Code:                                     Sequence Line      : 10
Acquired on       : 12 Nov 21   04:57 PM               Instrument Method: DX.MTH
Report Created on: 15 Nov 21   10:07 AM                Analysis Method    : DEFAULT.MTH
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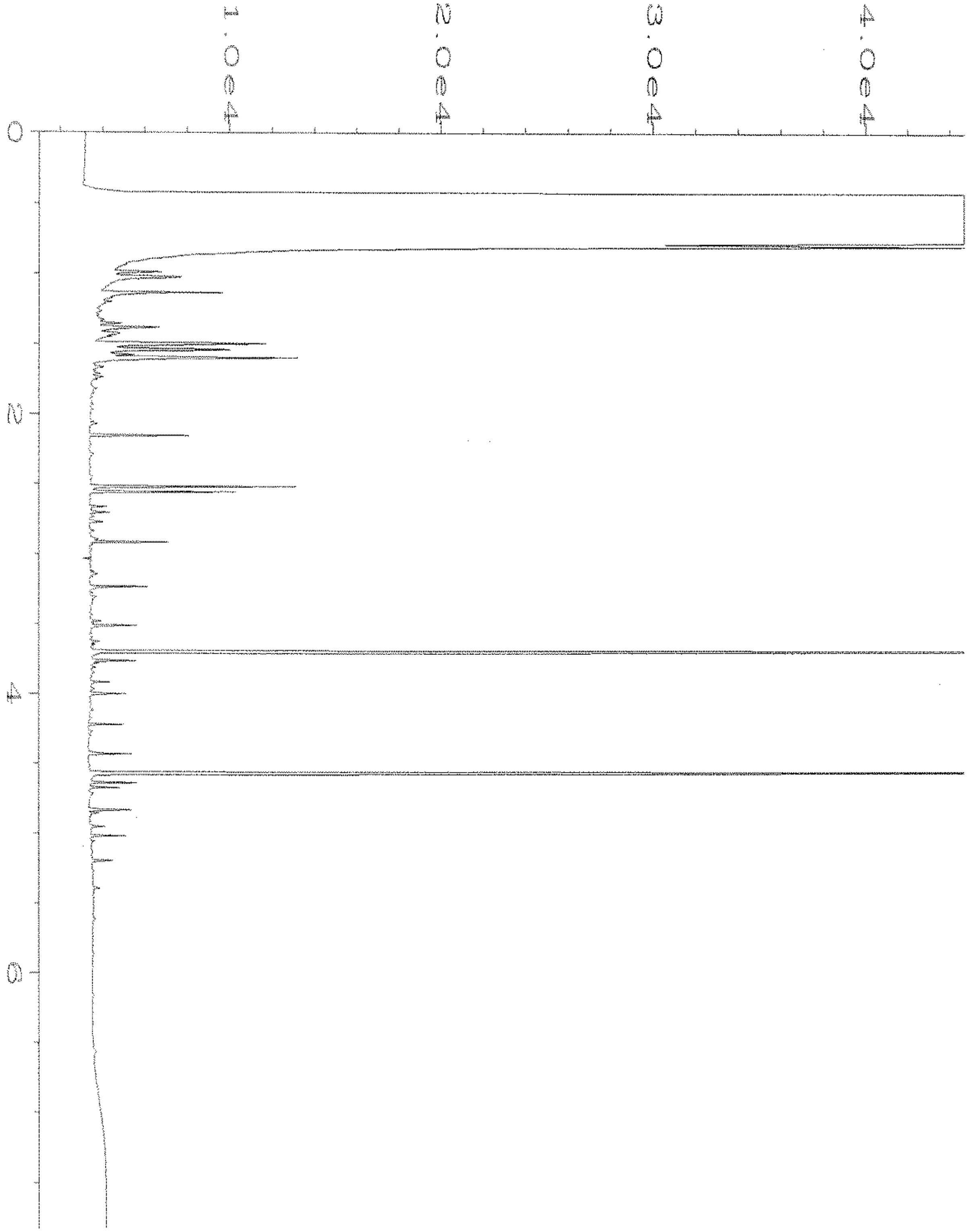
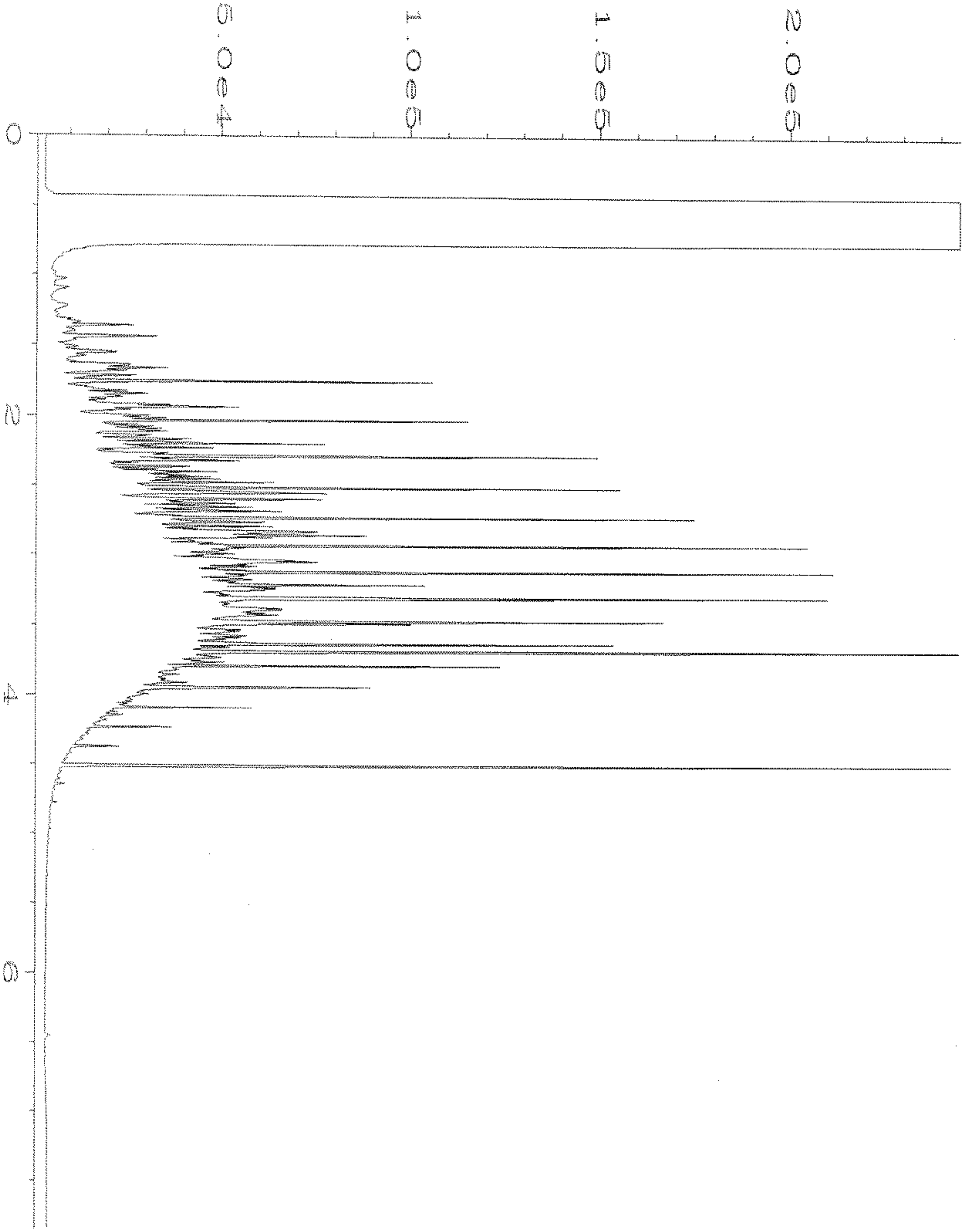


Data File Name : C:\HPCHEM\4\DATA\11-12-21\015F0501.D

Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 15
Sample Name	: 01-2621 mb2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 5
Acquired on	: 12 Nov 21 12:33 PM	Instrument Method:	DX.MTH
Report Created on:	15 Nov 21 10:07 AM	Analysis Method	: DEFAULT.MTH



Data File Name : C:\HPCHEM\4\DATA\11-12-21\003F0201.D

Operator	: TL	Page Number	: 1
Instrument	: GC#4	Vial Number	: 3
Sample Name	: 500 Dx 64-13H	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 2
Acquired on	: 12 Nov 21 05:56 AM	Instrument Method:	DX.MTH
Report Created on:	15 Nov 21 10:07 AM	Analysis Method	: DEFAULT.MTH

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eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins FGS, Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-107586-1
Client Project/Site: 111222

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
11/30/2021 2:43:32 PM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Job ID: 580-107586-1

Laboratory: Eurofins FGS, Seattle

Narrative

Job Narrative
580-107586-1

Comments

No additional comments.

Receipt

The samples were received on 11/17/2021 12:40 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 2.0º C.

Receipt Exceptions

The container label for the following sample did not match the information listed on the Chain-of-Custody (COC): MW-12-111021 (580-107586-3). The container labels list the sampling time 1430, while the COC lists 1240. The sample is logged in per COC.

GC/MS Semi VOA

Method Organotins: The following samples were received in Seattle outside of holding time or with insufficient hold time remaining: MW-8-111021 (580-107586-1), MW-14-111021 (580-107586-2), MW-12-111021 (580-107586-3) and MW-17-111021 (580-107586-4).

Method Organotins: Surrogate recovery for the following samples was outside the upper control limit: MW-160-111121 (580-107586-6) and MW-13-111121 (580-107586-8). This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

Method Organotin: A deviation from the Standard Operating Procedure (SOP) occurred. Details are as follows: Samples were received in wide mouth bottle instead of narrow mouth bottles. Since the Extraction process is not compatible with wide mouth bottles the samples were transferred to narrow mouth bottles.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: Friedman & Bruya
Project/Site: 111222

Job ID: 580-107586-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time
S1+	Surrogate recovery exceeds control limits, high biased.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client: Friedman & Bruya
Project/Site: 111222

Job ID: 580-107586-1

Client Sample ID: MW-8-111021
Date Collected: 11/10/21 09:40
Date Received: 11/17/21 12:40

Lab Sample ID: 580-107586-1
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H	0.36		ug/L		11/18/21 10:55	11/22/21 18:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*80*		*10 - 150*	*11/18/21 10:55*	*11/22/21 18:09*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 111222

Job ID: 580-107586-1

Client Sample ID: MW-14-111021
Date Collected: 11/10/21 11:15
Date Received: 11/17/21 12:40

Lab Sample ID: 580-107586-2
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H	0.70		ug/L		11/18/21 10:55	11/29/21 22:13	2

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*50*		*10 - 150*	*11/18/21 10:55*	*11/29/21 22:13*	*2*

Client Sample ID: MW-12-111021
Date Collected: 11/10/21 12:40
Date Received: 11/17/21 12:40

Lab Sample ID: 580-107586-3
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H	0.35		ug/L		11/18/21 10:55	11/22/21 18:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*139*		*10 - 150*	*11/18/21 10:55*	*11/22/21 18:59*	*1*

Client Sample ID: MW-17-111021
Date Collected: 11/10/21 13:55
Date Received: 11/17/21 12:40

Lab Sample ID: 580-107586-4
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H	0.35		ug/L		11/18/21 10:55	11/22/21 19:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*119*		*10 - 150*	*11/18/21 10:55*	*11/22/21 19:24*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 111222

Client Sample ID: MW-16-111021
Date Collected: 11/11/21 09:00
Date Received: 11/17/21 12:40

Lab Sample ID: 580-107586-5
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.32		ug/L		11/18/21 10:55	11/22/21 19:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*139*		*10 - 150*	*11/18/21 10:55*	*11/22/21 19:49*	*1*

Client Sample Results

Client Sample ID: MW-160-111121

Lab Sample ID: 580-107586-6

Date Collected: 11/11/21 09:00

Matrix: Water

Date Received: 11/17/21 12:40

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.36		ug/L		11/18/21 10:55	11/22/21 20:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*298*	*S1+*	*10 - 150*	*11/18/21 10:55*	*11/22/21 20:14*	*1*

Client Sample Results

Client Sample ID: MW-15-111121

Lab Sample ID: 580-107586-7

Date Collected: 11/11/21 10:40

Matrix: Water

Date Received: 11/17/21 12:40

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.32		ug/L		11/18/21 10:55	11/22/21 20:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*134*		*10 - 150*	*11/18/21 10:55*	*11/22/21 20:39*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 111222

Job ID: 580-107586-1

Client Sample ID: MW-13-111121
Date Collected: 11/11/21 12:10
Date Received: 11/17/21 12:40

Lab Sample ID: 580-107586-8
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.34		ug/L		11/18/21 10:55	11/22/21 21:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*152*	*S1+*	*10 - 150*	*11/18/21 10:55*	*11/22/21 21:03*	*1*

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-373712/1-A
Matrix: Water
Analysis Batch: 373997

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 373712

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		11/18/21 10:55	11/22/21 11:53	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*102*		*10 - 150*	*11/18/21 10:55*	*11/22/21 11:53*	*1*

Lab Sample ID: LCS 580-373712/2-A
Matrix: Water
Analysis Batch: 373997

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 373712

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Tributyltin			1.79	0.324		ug/L		18	11 - 150		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*78*		*10 - 150*

Lab Sample ID: LCSD 580-373712/3-A
Matrix: Water
Analysis Batch: 373997

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 373712

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin			1.79	0.437		ug/L		24	11 - 150	30	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*107*		*10 - 150*

Client Sample ID: MW-8-111021
Lab Sample ID: 580-107586-1
Date Collected: 11/10/21 09:40
Matrix: Water
Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 18:09	TL1	FGS SEA

Client Sample ID: MW-14-111021
Lab Sample ID: 580-107586-2
Date Collected: 11/10/21 11:15
Matrix: Water
Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		2	374513	11/29/21 22:13	TL1	FGS SEA

Client Sample ID: MW-12-111021
Lab Sample ID: 580-107586-3
Date Collected: 11/10/21 12:40
Matrix: Water
Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 18:59	TL1	FGS SEA

Client Sample ID: MW-17-111021
Lab Sample ID: 580-107586-4
Date Collected: 11/10/21 13:55
Matrix: Water
Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 19:24	TL1	FGS SEA

Client Sample ID: MW-16-111021
Lab Sample ID: 580-107586-5
Date Collected: 11/11/21 09:00
Matrix: Water
Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 19:49	TL1	FGS SEA

Client Sample ID: MW-160-111121
Lab Sample ID: 580-107586-6
Date Collected: 11/11/21 09:00
Matrix: Water
Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 20:14	TL1	FGS SEA

Lab Chronicle

Client Sample ID: MW-15-111121

Lab Sample ID: 580-107586-7

Date Collected: 11/11/21 10:40

Matrix: Water

Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 20:39	TL1	FGS SEA

Client Sample ID: MW-13-111121

Lab Sample ID: 580-107586-8

Date Collected: 11/11/21 12:10

Matrix: Water

Date Received: 11/17/21 12:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			373712	11/18/21 10:55	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	373997	11/22/21 21:03	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins FGS, Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Friedman & Bruya
Project/Site: 111222

Job ID: 580-107586-1

Laboratory: Eurofins FGS, Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-22
ANAB	Dept. of Energy	L2236	01-19-22
ANAB	ISO/IEC 17025	L2236	01-19-22
California	State	2954	06-30-21 *
Florida	NELAP	E87575	06-30-22
Kentucky (WW)	State	KY98042	12-31-21
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-22
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-22
Wisconsin	State	399133460	08-31-22

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Sample Summary

Client: Friedman & Bruya
Project/Site: 111222

Job ID: 580-107586-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-107586-1	MW-8-111021	Water	11/10/21 09:40	11/17/21 12:40
580-107586-2	MW-14-111021	Water	11/10/21 11:15	11/17/21 12:40
580-107586-3	MW-12-111021	Water	11/10/21 12:40	11/17/21 12:40
580-107586-4	MW-17-111021	Water	11/10/21 13:55	11/17/21 12:40
580-107586-5	MW-16-111021	Water	11/11/21 09:00	11/17/21 12:40
580-107586-6	MW-160-111121	Water	11/11/21 09:00	11/17/21 12:40
580-107586-7	MW-15-111121	Water	11/11/21 10:40	11/17/21 12:40
580-107586-8	MW-13-111121	Water	11/11/21 12:10	11/17/21 12:40

107586

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER Eurofins

PROJECT NAME/NO.	PO #
111222	B-500

REMARKS

Please Email Results EDD: Aspect EDD

Page # 1 of 1

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED										
Sample ID	Lab ID	Date Sampled	Time Sampled	Matrix	# of jars	Dioxins/Furans	EPH	VPH	Tributyltin							Notes
MW-8-111021		11/10/21	0940	Water					X							
MW-14-111021			1115						X							
MW-12-111021			1240						X							
MW-17-111021			1355						X							
MW-16-111021		11/11/21	0900						X							
MW-160-111121			0900						X							
MW-15-111121			1040						X							
MW-13-111121			1210						X							

580-107586 Chain of Custody

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	11/17/21	1019
Received by:	Ashton Greene	EFGS	11/17/21	1240
Relinquished by:				
Received by:				

Therm. ID: IR9 Cor: 2.0 ° Unc: 1.8 °
Cooler Dsc: 1gBl
Packing: BTB
Cust. Seal: Yes__ No X
Blue Ice, [✓ Wet] Dry, None
FedEx:
UPS:
Lab Cour:
Other: QDC

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-107586-1

Login Number: 107586

List Number: 1

Creator: Blankinship, Tom X

List Source: Eurofins FGS, Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time (excluding tests with immediate HTs)	False	Expiring on day of receipt.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 14, 2022

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included is the amended report from the testing of material submitted on January 18, 2022 from the SnoPac 150054, F&BI 201246 project. The total mercury results have been corrected to read dissolved mercury results.

We apologize for the inconvenience and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0201R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 1, 2022

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the results from the testing of material submitted on January 18, 2022 from the SnoPac 150054, F&BI 201246 project. There are 41 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0201R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on January 18, 2022 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC SnoPac 150054, F&BI 201246 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
201246 -01	MW-8-011722
201246 -02	MW-14-011722
201246 -03	MW-12-011722
201246 -04	MW-17-011722
201246 -05	MW-16-011822
201246 -06	MW-160-011822
201246 -07	MW-15-011822
201246 -08	MW-13-011822

The samples were sent to Eurofins for tribuyltin analysis. The report is enclosed.

The 8270E PAH and 8082A PCB containers for sample MW-17-011722 were centrifuged prior to extraction. The data were flagged accordingly.

Several 8270E surrogates failed in the method blank. The affected compounds were qualified accordingly.

All other quality control requirements were acceptable.

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246
Date Extracted: 01/19/21
Date Analyzed: 01/19/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW-13-011822 201246-08	220 x	<250	145
Method Blank 02-0188 MB	<50	<250	144

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-8-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-01 x5
Date Analyzed:	01/25/22	Data File:	201246-01 x5.163
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<2.5
Lead	<1
Nickel	2.77
Zinc	6.49

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-14-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-02 x5
Date Analyzed:	01/25/22	Data File:	201246-02 x5.164
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.08
Copper	<2.5
Lead	<1
Nickel	4.96
Zinc	6.09

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-12-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-03 x5
Date Analyzed:	01/25/22	Data File:	201246-03 x5.165
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.22
Copper	3.20
Lead	<1
Nickel	10.8
Zinc	6.36

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-17-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-04 x5
Date Analyzed:	01/25/22	Data File:	201246-04 x5.166
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	7.20
Lead	3.43
Nickel	1.36
Zinc	23.1

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-16-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-05 x5
Date Analyzed:	01/25/22	Data File:	201246-05 x5.167
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.25
Copper	6.49
Lead	<1
Nickel	7.65
Zinc	4.56

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-160-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-06 x5
Date Analyzed:	01/25/22	Data File:	201246-06 x5.168
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.90
Copper	4.75
Lead	<1
Nickel	5.65
Zinc	3.23

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-15-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-07 x5
Date Analyzed:	01/25/22	Data File:	201246-07 x5.169
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.04
Copper	5.55
Lead	<1
Nickel	7.05
Zinc	4.64

Analysis For Dissolved Metals By EPA Method 200.8

Client ID: MW-13-011822
Date Received: 01/18/22
Date Extracted: 01/25/22
Date Analyzed: 01/25/22
Matrix: Water
Units: ug/L (ppb)

Client: Aspect Consulting, LLC
Project: SnoPac 150054, F&BI 201246
Lab ID: 201246-08 x5
Data File: 201246-08 x5.170
Instrument: ICPMS2
Operator: SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<2.5
Lead	<1
Nickel	6.57
Zinc	26.0

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	I2-52 mb
Date Analyzed:	01/25/22	Data File:	I2-52 mb.040
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<0.2
Copper	<0.5
Lead	<0.2
Nickel	<0.2
Zinc	<0.5

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246
Date Extracted: 01/24/22
Date Analyzed: 01/25/22

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Dissolved Mercury
MW-8-011722 201246-01	<0.01
MW-14-011722 201246-02	<0.01
MW-12-011722 201246-03	<0.01
MW-17-011722 201246-04	<0.01
MW-16-011822 201246-05	0.011
MW-160-011822 201246-06	0.016
MW-15-011822 201246-07	0.010
MW-13-011822 201246-08	<0.01
Method Blank i2-55 MB	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-8-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-01 1/0.25
Date Analyzed:	01/20/22	Data File:	012011.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	0 ip	11	65
Phenol-d6	0 ip	11	65
Nitrobenzene-d5	69	50	150
2-Fluorobiphenyl	76	44	108
2,4,6-Tribromophenol	2 ip	10	140
Terphenyl-d14	92	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0065
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-14-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-02 1/0.25
Date Analyzed:	01/20/22	Data File:	012012.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	12	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	76	50	150
2-Fluorobiphenyl	77	44	108
2,4,6-Tribromophenol	92	10	140
Terphenyl-d14	86	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	0.0081
Acenaphthene	1.3
Fluorene	<0.005
Phenanthrene	0.056
Anthracene	0.027
Fluoranthene	0.16
Pyrene	0.12
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-12-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-03 1/0.25
Date Analyzed:	01/20/22	Data File:	012013.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	10 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	74	50	150
2-Fluorobiphenyl	75	44	108
2,4,6-Tribromophenol	68	10	140
Terphenyl-d14	86	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0076
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-17-011722 cf	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-04 1/0.25
Date Analyzed:	01/20/22	Data File:	012014.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	0 ip	11	65
Phenol-d6	0 ip	11	65
Nitrobenzene-d5	81	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	1 ip	10	140
Terphenyl-d14	83	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0082
Anthracene	<0.005
Fluoranthene	0.0055
Pyrene	0.0053
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-16-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-05 1/0.25
Date Analyzed:	01/20/22	Data File:	012015.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	7 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	80	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	43	10	140
Terphenyl-d14	87	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.010
Anthracene	<0.005
Fluoranthene	0.0050
Pyrene	0.0050
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-160-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-06 1/0.25
Date Analyzed:	01/21/22	Data File:	012016.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	0 ip	11	65
Phenol-d6	2 ip	11	65
Nitrobenzene-d5	83	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	5 ip	10	140
Terphenyl-d14	90	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.010
Anthracene	<0.005
Fluoranthene	0.0063
Pyrene	0.0063
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-15-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-07 1/0.25
Date Analyzed:	01/21/22	Data File:	012017.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	3 ip	11	65
Phenol-d6	4 ip	11	65
Nitrobenzene-d5	73	50	150
2-Fluorobiphenyl	76	44	108
2,4,6-Tribromophenol	20	10	140
Terphenyl-d14	76	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.0051
Fluorene	0.0058
Phenanthrene	0.025
Anthracene	<0.005
Fluoranthene	0.012
Pyrene	0.011
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-08 1/0.25
Date Analyzed:	01/21/22	Data File:	012018.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	8 vo	11	65
Phenol-d6	8 vo	11	65
Nitrobenzene-d5	87	50	150
2-Fluorobiphenyl	86	44	108
2,4,6-Tribromophenol	43	10	140
Terphenyl-d14	91	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.71
2-Methylnaphthalene	0.088
1-Methylnaphthalene	0.62
Acenaphthylene	0.035
Acenaphthene	1.8
Fluorene	0.50
Phenanthrene	0.20
Anthracene	0.029
Fluoranthene	0.035
Pyrene	0.024
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	0.0083
Benzo(b)fluoranthene	0.012
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	0.0073
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank cf	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-191 mb2 1/0.25
Date Analyzed:	01/20/22	Data File:	012009.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15	11	65
Phenol-d6	8 vo	11	65
Nitrobenzene-d5	82	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	87	10	140
Terphenyl-d14	96	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-191 mb 1/0.25
Date Analyzed:	01/20/22	Data File:	012010.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	9 vo	11	65
Phenol-d6	5 vo	11	65
Nitrobenzene-d5	49 vo	50	150
2-Fluorobiphenyl	49	44	108
2,4,6-Tribromophenol	47	10	140
Terphenyl-d14	54	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05 js
2-Methylnaphthalene	<0.05 js
1-Methylnaphthalene	<0.05 js
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/21/22	Lab ID:	201246-08 1/0.25
Date Analyzed:	01/25/22	Data File:	012512.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	12 vo	50	150
Phenol-d6	7 vo	50	150
2,4,6-Tribromophenol	105	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/21/22	Lab ID:	02-232 mb 1/0.25
Date Analyzed:	01/25/22	Data File:	012511.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15 vo	50	150
Phenol-d6	8 vo	50	150
2,4,6-Tribromophenol	76	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-8-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-01 1/0.25
Date Analyzed:	01/20/22	Data File:	012011.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-14-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-02 1/0.25
Date Analyzed:	01/20/22	Data File:	012012.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	35	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-12-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-03 1/0.25
Date Analyzed:	01/20/22	Data File:	012013.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	32	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-17-011722 cf	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-04 1/0.25
Date Analyzed:	01/20/22	Data File:	012015.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	30	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-16-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-05 1/0.25
Date Analyzed:	01/20/22	Data File:	012016.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	39	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-160-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-06 1/0.25
Date Analyzed:	01/20/22	Data File:	012017.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	37	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-15-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-07 1/0.25
Date Analyzed:	01/20/22	Data File:	012018.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	34	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-08 1/0.25
Date Analyzed:	01/20/22	Data File:	012019.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-0190 mb 1/0.25
Date Analyzed:	01/20/22	Data File:	012007.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	25	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank cf	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-0190 mb3 1/0.25
Date Analyzed:	01/20/22	Data File:	012008.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	47	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	112	128	63-142	13

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	96	98	85-115	2
Copper	ug/L (ppb)	20	95	98	85-115	3
Lead	ug/L (ppb)	10	94	96	85-115	2
Nickel	ug/L (ppb)	20	92	95	85-115	3
Zinc	ug/L (ppb)	50	93	96	85-115	3

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Laboratory Code: 201127-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	0.000	92	81	71-125	13

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	97	99	78-125	2

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	80	83	62-90	4
2-Methylnaphthalene	ug/L (ppb)	5	81	80	64-93	1
1-Methylnaphthalene	ug/L (ppb)	5	83	82	64-93	1
Acenaphthylene	ug/L (ppb)	5	84	89	70-130	6
Acenaphthene	ug/L (ppb)	5	86	92	70-130	7
Fluorene	ug/L (ppb)	5	89	92	70-130	3
Phenanthrene	ug/L (ppb)	5	89	94	70-130	5
Anthracene	ug/L (ppb)	5	89	91	70-130	2
Fluoranthene	ug/L (ppb)	5	88	92	70-130	4
Pyrene	ug/L (ppb)	5	93	94	70-130	1
Benz(a)anthracene	ug/L (ppb)	5	92	93	70-130	1
Chrysene	ug/L (ppb)	5	92	93	70-130	1
Benzo(a)pyrene	ug/L (ppb)	5	86	86	70-130	0
Benzo(b)fluoranthene	ug/L (ppb)	5	95	94	70-130	1
Benzo(k)fluoranthene	ug/L (ppb)	5	95	96	70-130	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	98	98	70-130	0
Dibenz(a,h)anthracene	ug/L (ppb)	5	103	100	70-130	3
Benzo(g,h,i)perylene	ug/L (ppb)	5	102	100	70-130	2

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	0.63	93	98	70-130	5

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.063	46	51	25-111	10
Aroclor 1260	ug/L (ppb)	0.063	56	68	23-123	19

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

201246

SAMPLE CHAIN OF CUSTODY

01-18-22

D04/A16

Page # 1 of 1

Report To Breeyn Greer

Company Aspect Consulting

Address 710 2nd Ave Suite 550

City, State, ZIP Seattle, WA 98104

Phone 612.232.7343 Email bgreer@aspectconsulting.com

SAMPLERS (*signature*) Monique Rutte

PROJECT NAME	PO #
SnoPac	150054
REMARKS All samples >1,000 uS/cm EXCEPT MW-17 & MW-13 Project specific RLs? [✓ Yes] / No	INVOICE TO

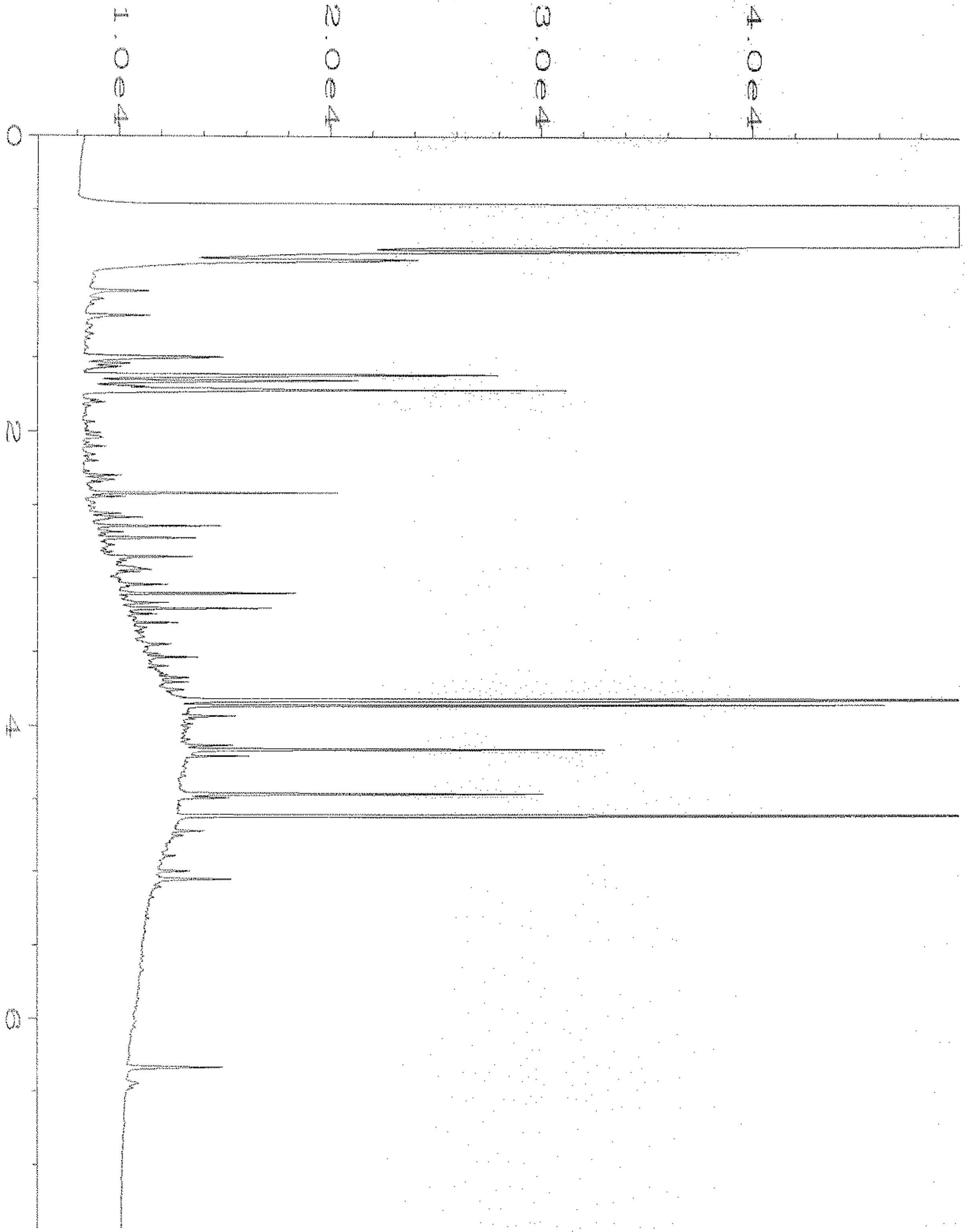
TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	*Dissolved Metals ~~PAHs EPA 8270~~	PCB Aroclors ~~PCBs EPA 8082~~B	Dissolved Hg 1631E	Low-level PAHs 8270D SIM	Tributyltin ion SM2540G	PCP 8270-SIM	Notes
MW-8-011722	01 A-K	1/17/22	0940	water	8						*						
MW-14-011722	02		1110														
MW-12-011722	03		1255														
MW-17-011722	04	↓	1510														centrifuge for PAH / PCBs
MW-16-011822	05	1/18/22	0915														
MW-160-011822	06		0915														
MW-15-011822	07		1100		↓												
MW-13-011822	08 A-K	↓		↓	11	X					↓	↓	↓	↓	↓	X	
																	* As, Cu, Pb, Ni, Zn

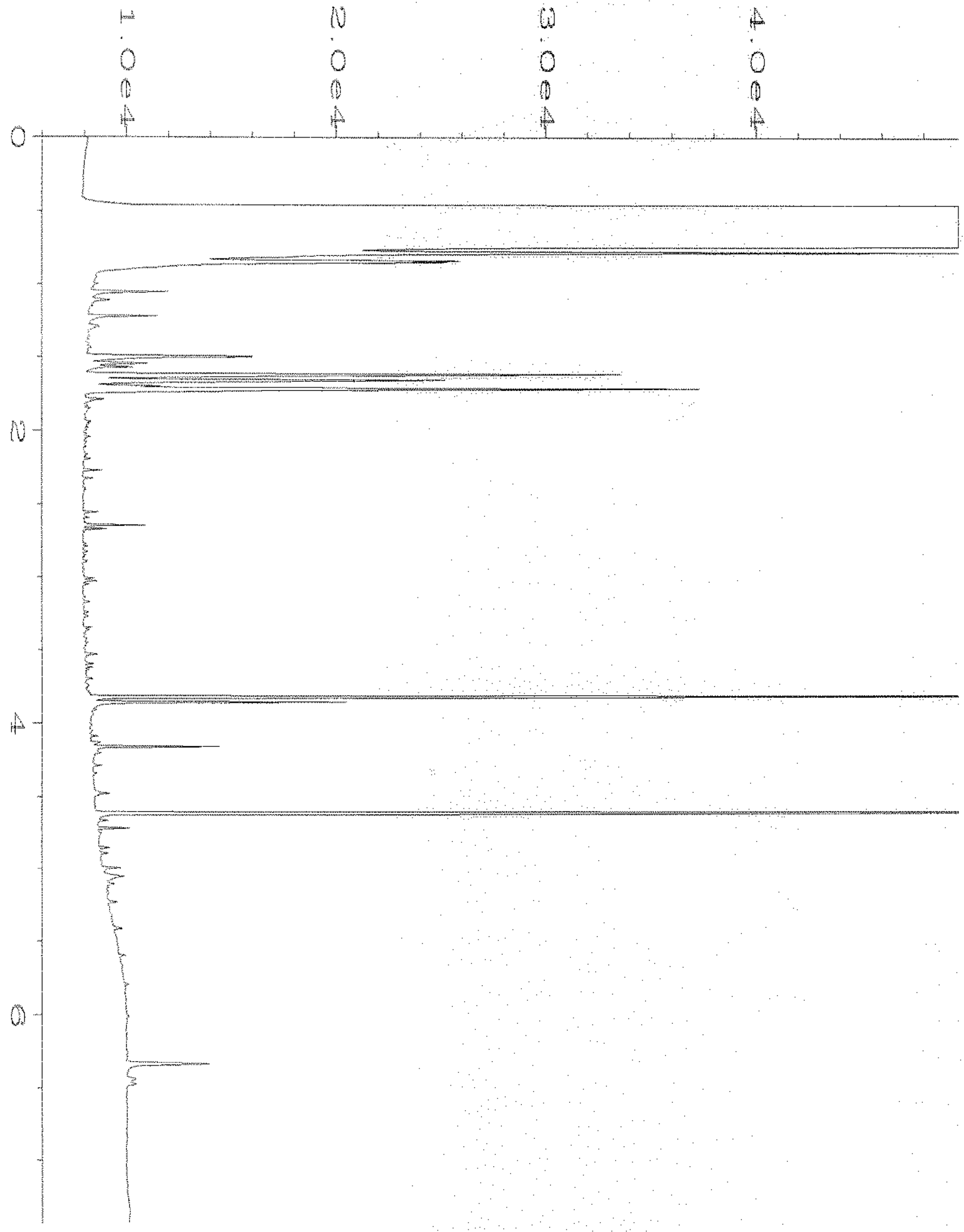
Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Monique Rutte	Monique Rutte	Aspect	1/18/22	1545
Received by:	Eric [illegible]	FB	1/18/22	1545
Relinquished by:				
Received by:		Samples received at 4 °C		

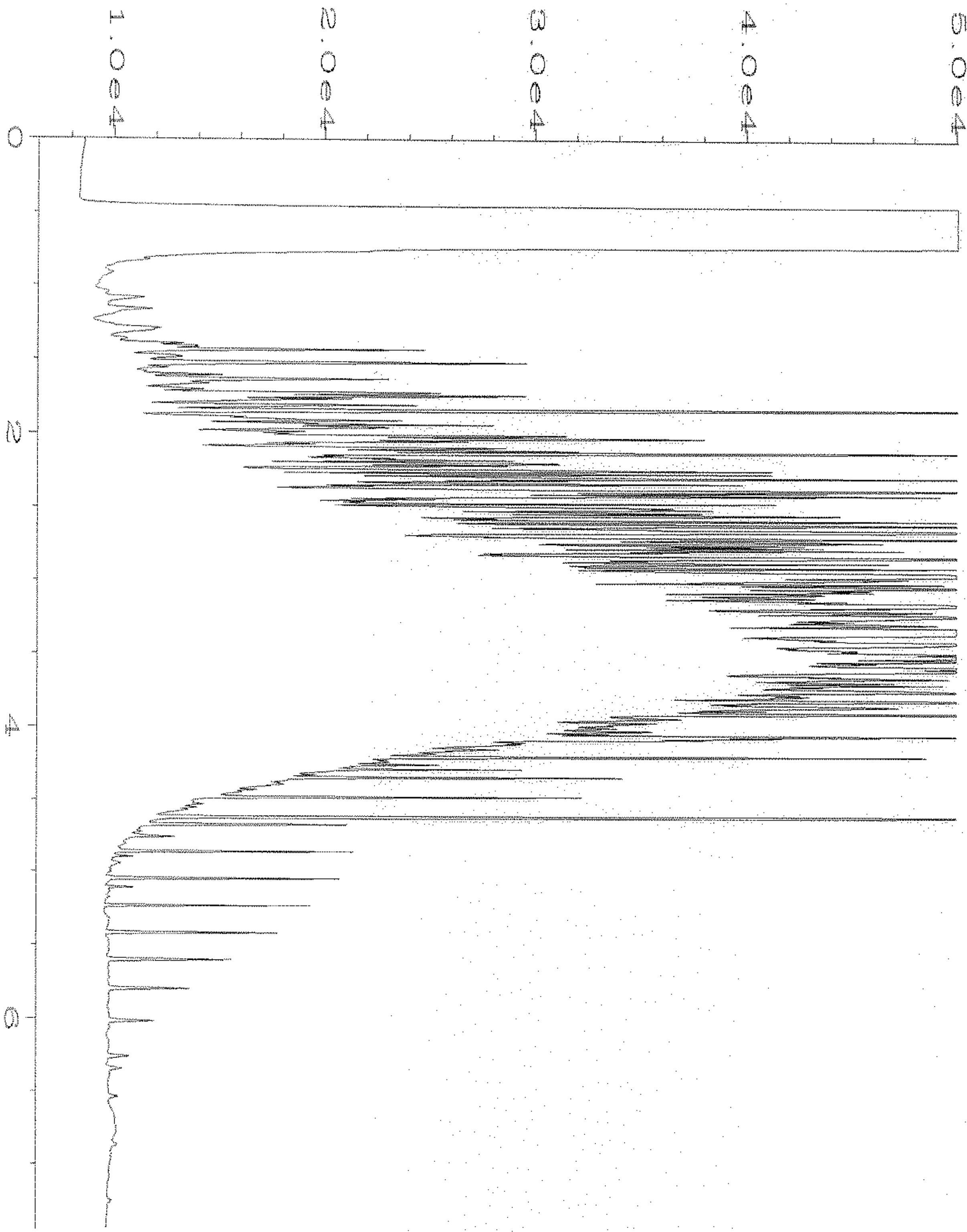


Data File Name   : C:\HPCHEM\1\DATA\01-19-22\054F1901.D
Operator   : TL
Instrument   : GC1
Sample Name   : 201246-08
Run Time Bar Code:
Acquired on   : 20 Jan 22   04:03 AM
Report Created on: 20 Jan 22   11:38 AM

Page Number   : 1
Vial Number   : 54
Injection Number : 1
Sequence Line   : 19
Instrument Method: DX.MTH
Analysis Method   : DEFAULT.MTH



Data File Name   : C:\HPCHEM\1\DATA\01-19-22\037F1501.D
Operator   : TL   Page Number   : 1
Instrument   : GC1   Vial Number   : 37
Sample Name   : 02-0188 mb   Injection Number : 1
Run Time Bar Code: Sequence Line   : 15
Acquired on   : 19 Jan 22 11:01 PM   Instrument Method: DX.MTH
Report Created on: 20 Jan 22 11:40 AM   Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\01-19-22\003F0201.D
Operator : TL
Instrument : GC1
Sample Name : 500 Dx 65-27F
Run Time Bar Code:
Acquired on : 19 Jan 22 06:09 AM
Report Created on: 20 Jan 22 11:41 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

Environment Testing
America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-109453-1
Client Project/Site: 201246

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
1/31/2022 11:55:35 AM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

LINKS

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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Job ID: 580-109453-1

Laboratory: Eurofins Seattle

Narrative

Job Narrative
580-109453-1

Comments
No additional comments.

Receipt
The samples were received on 1/19/2022 2:40 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 2.0º C.

GC/MS Semi VOA
Method Organotins: The RPD of the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 580-379029 and analytical batch 580-379353 recovered outside control limits for the following analytes: Tributyltin.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method Organotin: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate/sample duplicate (MS/MSD/DUP) associated with preparation batch 580-379029, so a LCS and LCSD were used instead.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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Definitions/Glossary

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
*1	LCS/LCSD RPD exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client Sample ID: MW-8-011722
Date Collected: 01/17/22 09:40
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-1
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 12:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*19*		*10 - 150*	*01/22/22 09:19*	*01/26/22 12:39*	*1*

Client Sample ID: MW-14-011722

Date Collected: 01/17/22 11:10
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-2

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 13:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*29*		*10 - 150*	*01/22/22 09:19*	*01/26/22 13:03*	*1*

Client Sample ID: MW-12-011722

Date Collected: 01/17/22 12:55
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-3

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.35		ug/L		01/22/22 09:19	01/26/22 13:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*33*		*10 - 150*	*01/22/22 09:19*	*01/26/22 13:28*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-17-011722
Date Collected: 01/17/22 15:10
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-4
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 13:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*38*		*10 - 150*	*01/22/22 09:19*	*01/26/22 13:53*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-16-011722
Date Collected: 01/17/22 09:15
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-5
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 14:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*43*		*10 - 150*	*01/22/22 09:19*	*01/26/22 14:18*	*1*

Client Sample Results

Client Sample ID: MW-160-011722

Lab Sample ID: 580-109453-6

Date Collected: 01/17/22 09:15

Matrix: Water

Date Received: 01/19/22 14:40

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.35		ug/L		01/22/22 09:19	01/26/22 14:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*31*		*10 - 150*	*01/22/22 09:19*	*01/26/22 14:43*	*1*

Client Sample ID: MW-15-011722
Date Collected: 01/17/22 11:00
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-7
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.37		ug/L		01/22/22 09:19	01/26/22 15:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*53*		*10 - 150*	*01/22/22 09:19*	*01/26/22 15:08*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-13-011722
Date Collected: 01/17/22 12:50
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-8
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.37		ug/L		01/22/22 09:19	01/26/22 15:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*46*		*10 - 150*	*01/22/22 09:19*	*01/26/22 15:33*	*1*

QC Sample Results

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-379029/1-A
Matrix: Water
Analysis Batch: 379353

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 379029

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		01/22/22 09:19	01/26/22 11:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*26*		*10 - 150*	*01/22/22 09:19*	*01/26/22 11:24*	*1*

Lab Sample ID: LCS 580-379029/2-A
Matrix: Water
Analysis Batch: 379353

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 379029

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Tributyltin			1.79	0.236	J	ug/L		13	11 - 150		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*18*		*10 - 150*

Lab Sample ID: LCSD 580-379029/3-A
Matrix: Water
Analysis Batch: 379353

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 379029

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin			1.79	0.350	*1	ug/L		20	11 - 150	39	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*42*		*10 - 150*

Lab Chronicle

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-8-011722

Lab Sample ID: 580-109453-1

Date Collected: 01/17/22 09:40
Date Received: 01/19/22 14:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 12:39	TL1	FGS SEA

Client Sample ID: MW-14-011722

Lab Sample ID: 580-109453-2

Date Collected: 01/17/22 11:10
Date Received: 01/19/22 14:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 13:03	TL1	FGS SEA

Client Sample ID: MW-12-011722

Lab Sample ID: 580-109453-3

Date Collected: 01/17/22 12:55
Date Received: 01/19/22 14:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 13:28	TL1	FGS SEA

Client Sample ID: MW-17-011722

Lab Sample ID: 580-109453-4

Date Collected: 01/17/22 15:10
Date Received: 01/19/22 14:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 13:53	TL1	FGS SEA

Client Sample ID: MW-16-011722

Lab Sample ID: 580-109453-5

Date Collected: 01/17/22 09:15
Date Received: 01/19/22 14:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 14:18	TL1	FGS SEA

Client Sample ID: MW-160-011722

Lab Sample ID: 580-109453-6

Date Collected: 01/17/22 09:15
Date Received: 01/19/22 14:40

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 14:43	TL1	FGS SEA

Lab Chronicle

Client Sample ID: MW-15-011722

Lab Sample ID: 580-109453-7

Date Collected: 01/17/22 11:00

Matrix: Water

Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 15:08	TL1	FGS SEA

Client Sample ID: MW-13-011722

Lab Sample ID: 580-109453-8

Date Collected: 01/17/22 12:50

Matrix: Water

Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 15:33	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Laboratory: Eurofins Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-25
ANAB	Dept. of Energy	L2236	01-19-25
ANAB	ISO/IEC 17025	L2236	01-19-25
California	State	2954	01-30-22
Florida	NELAP	E87575	06-30-22
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-22
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-22
Wisconsin	State	399133460	08-31-22

Sample Summary

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-109453-1	MW-8-011722	Water	01/17/22 09:40	01/19/22 14:40
580-109453-2	MW-14-011722	Water	01/17/22 11:10	01/19/22 14:40
580-109453-3	MW-12-011722	Water	01/17/22 12:55	01/19/22 14:40
580-109453-4	MW-17-011722	Water	01/17/22 15:10	01/19/22 14:40
580-109453-5	MW-16-011722	Water	01/17/22 09:15	01/19/22 14:40
580-109453-6	MW-160-011722	Water	01/17/22 09:15	01/19/22 14:40
580-109453-7	MW-15-011722	Water	01/17/22 11:00	01/19/22 14:40
580-109453-8	MW-13-011722	Water	01/17/22 12:50	01/19/22 14:40

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

109453

Page # 1 of 1

Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER
Eurofins

PROJECT NAME/NO. 201246

PO # C-30

REMARKS
Aspect EDD

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	Tributyltin											Notes
MW-8-011722		1/17/2022	940	Water	1	X											
MW-14-011722		1/17/2022	1110	Water	1	X											
MW-12-011722		1/17/2022	1255	Water	1	X											
MW-17-011722		1/17/2022	1510	Water	1	X											
MW-16-011722		1/17/2022	915	Water	1	X											
MW-160-011722		1/17/2022	915	Water	1	X											
MW-15-011722		1/17/2022	1100	Water	1	X											
MW-13-011722		1/17/2022	1250	Water	1	X											

580-109453 Chain of Custody

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	1/19/22	0945
Received by:	Ashton Greene	EFGS	1/19/22	1440
Relinquished by:				
Received by:				

Lg Bl/gel/tub IR8 2.0/1.8

cl Dr

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-109453-1

Login Number: 109453
List Number: 1
Creator: Blankinship, Tom X

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

February 1, 2022

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the results from the testing of material submitted on January 18, 2022 from the SnoPac 150054, F&BI 201246 project. There are 41 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0201R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on January 18, 2022 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC SnoPac 150054, F&BI 201246 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
201246 -01	MW-8-011722
201246 -02	MW-14-011722
201246 -03	MW-12-011722
201246 -04	MW-17-011722
201246 -05	MW-16-011822
201246 -06	MW-160-011822
201246 -07	MW-15-011822
201246 -08	MW-13-011822

The samples were sent to Eurofins for tribuyltin analysis. The report is enclosed.

The 8270E PAH and 8082A PCB containers for sample MW-17-011722 were centrifuged prior to extraction. The data were flagged accordingly.

Several 8270E surrogates failed in the method blank. The affected compounds were qualified accordingly.

All other quality control requirements were acceptable.

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246
Date Extracted: 01/19/21
Date Analyzed: 01/19/21

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW-13-011822 201246-08	220 x	<250	145
Method Blank 02-0188 MB	<50	<250	144

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-8-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-01 x5
Date Analyzed:	01/25/22	Data File:	201246-01 x5.163
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<2.5
Lead	<1
Nickel	2.77
Zinc	6.49

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-14-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-02 x5
Date Analyzed:	01/25/22	Data File:	201246-02 x5.164
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.08
Copper	<2.5
Lead	<1
Nickel	4.96
Zinc	6.09

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-12-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-03 x5
Date Analyzed:	01/25/22	Data File:	201246-03 x5.165
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.22
Copper	3.20
Lead	<1
Nickel	10.8
Zinc	6.36

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-17-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-04 x5
Date Analyzed:	01/25/22	Data File:	201246-04 x5.166
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	7.20
Lead	3.43
Nickel	1.36
Zinc	23.1

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-16-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-05 x5
Date Analyzed:	01/25/22	Data File:	201246-05 x5.167
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.25
Copper	6.49
Lead	<1
Nickel	7.65
Zinc	4.56

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-160-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-06 x5
Date Analyzed:	01/25/22	Data File:	201246-06 x5.168
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.90
Copper	4.75
Lead	<1
Nickel	5.65
Zinc	3.23

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-15-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-07 x5
Date Analyzed:	01/25/22	Data File:	201246-07 x5.169
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.04
Copper	5.55
Lead	<1
Nickel	7.05
Zinc	4.64

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	201246-08 x5
Date Analyzed:	01/25/22	Data File:	201246-08 x5.170
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<2.5
Lead	<1
Nickel	6.57
Zinc	26.0

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/25/22	Lab ID:	I2-52 mb
Date Analyzed:	01/25/22	Data File:	I2-52 mb.040
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<0.2
Copper	<0.5
Lead	<0.2
Nickel	<0.2
Zinc	<0.5

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246
Date Extracted: 01/24/22
Date Analyzed: 01/25/22

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Total Mercury
MW-8-011722 201246-01	<0.01
MW-14-011722 201246-02	<0.01
MW-12-011722 201246-03	<0.01
MW-17-011722 201246-04	<0.01
MW-16-011822 201246-05	0.011
MW-160-011822 201246-06	0.016
MW-15-011822 201246-07	0.010
MW-13-011822 201246-08	<0.01
Method Blank i2-55 MB	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-8-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-01 1/0.25
Date Analyzed:	01/20/22	Data File:	012011.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	0 ip	11	65
Phenol-d6	0 ip	11	65
Nitrobenzene-d5	69	50	150
2-Fluorobiphenyl	76	44	108
2,4,6-Tribromophenol	2 ip	10	140
Terphenyl-d14	92	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0065
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-14-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-02 1/0.25
Date Analyzed:	01/20/22	Data File:	012012.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	12	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	76	50	150
2-Fluorobiphenyl	77	44	108
2,4,6-Tribromophenol	92	10	140
Terphenyl-d14	86	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	0.0081
Acenaphthene	1.3
Fluorene	<0.005
Phenanthrene	0.056
Anthracene	0.027
Fluoranthene	0.16
Pyrene	0.12
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-12-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-03 1/0.25
Date Analyzed:	01/20/22	Data File:	012013.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	10 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	74	50	150
2-Fluorobiphenyl	75	44	108
2,4,6-Tribromophenol	68	10	140
Terphenyl-d14	86	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0076
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-17-011722 cf	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-04 1/0.25
Date Analyzed:	01/20/22	Data File:	012014.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	0 ip	11	65
Phenol-d6	0 ip	11	65
Nitrobenzene-d5	81	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	1 ip	10	140
Terphenyl-d14	83	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.0082
Anthracene	<0.005
Fluoranthene	0.0055
Pyrene	0.0053
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-16-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-05 1/0.25
Date Analyzed:	01/20/22	Data File:	012015.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	7 ip	11	65
Phenol-d6	7 ip	11	65
Nitrobenzene-d5	80	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	43	10	140
Terphenyl-d14	87	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.010
Anthracene	<0.005
Fluoranthene	0.0050
Pyrene	0.0050
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-160-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-06 1/0.25
Date Analyzed:	01/21/22	Data File:	012016.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	0 ip	11	65
Phenol-d6	2 ip	11	65
Nitrobenzene-d5	83	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	5 ip	10	140
Terphenyl-d14	90	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	0.010
Anthracene	<0.005
Fluoranthene	0.0063
Pyrene	0.0063
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-15-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-07 1/0.25
Date Analyzed:	01/21/22	Data File:	012017.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	3 ip	11	65
Phenol-d6	4 ip	11	65
Nitrobenzene-d5	73	50	150
2-Fluorobiphenyl	76	44	108
2,4,6-Tribromophenol	20	10	140
Terphenyl-d14	76	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.0051
Fluorene	0.0058
Phenanthrene	0.025
Anthracene	<0.005
Fluoranthene	0.012
Pyrene	0.011
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-08 1/0.25
Date Analyzed:	01/21/22	Data File:	012018.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	8 vo	11	65
Phenol-d6	8 vo	11	65
Nitrobenzene-d5	87	50	150
2-Fluorobiphenyl	86	44	108
2,4,6-Tribromophenol	43	10	140
Terphenyl-d14	91	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.71
2-Methylnaphthalene	0.088
1-Methylnaphthalene	0.62
Acenaphthylene	0.035
Acenaphthene	1.8
Fluorene	0.50
Phenanthrene	0.20
Anthracene	0.029
Fluoranthene	0.035
Pyrene	0.024
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	0.0083
Benzo(b)fluoranthene	0.012
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	0.0073
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank cf	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-191 mb2 1/0.25
Date Analyzed:	01/20/22	Data File:	012009.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15	11	65
Phenol-d6	8 vo	11	65
Nitrobenzene-d5	82	50	150
2-Fluorobiphenyl	84	44	108
2,4,6-Tribromophenol	87	10	140
Terphenyl-d14	96	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-191 mb 1/0.25
Date Analyzed:	01/20/22	Data File:	012010.D
Matrix:	Water	Instrument:	GCMS12
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	9 vo	11	65
Phenol-d6	5 vo	11	65
Nitrobenzene-d5	49 vo	50	150
2-Fluorobiphenyl	49	44	108
2,4,6-Tribromophenol	47	10	140
Terphenyl-d14	54	50	150

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05 js
2-Methylnaphthalene	<0.05 js
1-Methylnaphthalene	<0.05 js
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/21/22	Lab ID:	201246-08 1/0.25
Date Analyzed:	01/25/22	Data File:	012512.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	12 vo	50	150
Phenol-d6	7 vo	50	150
2,4,6-Tribromophenol	105	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/21/22	Lab ID:	02-232 mb 1/0.25
Date Analyzed:	01/25/22	Data File:	012511.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15 vo	50	150
Phenol-d6	8 vo	50	150
2,4,6-Tribromophenol	76	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-8-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-01 1/0.25
Date Analyzed:	01/20/22	Data File:	012011.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-14-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-02 1/0.25
Date Analyzed:	01/20/22	Data File:	012012.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	35	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-12-011722	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-03 1/0.25
Date Analyzed:	01/20/22	Data File:	012013.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	32	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-17-011722 cf	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-04 1/0.25
Date Analyzed:	01/20/22	Data File:	012015.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	30	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-16-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-05 1/0.25
Date Analyzed:	01/20/22	Data File:	012016.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	39	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-160-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-06 1/0.25
Date Analyzed:	01/20/22	Data File:	012017.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	37	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-15-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-07 1/0.25
Date Analyzed:	01/20/22	Data File:	012018.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	34	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-13-011822	Client:	Aspect Consulting, LLC
Date Received:	01/18/22	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	201246-08 1/0.25
Date Analyzed:	01/20/22	Data File:	012019.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-0190 mb 1/0.25
Date Analyzed:	01/20/22	Data File:	012007.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	25	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank cf	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 201246
Date Extracted:	01/20/22	Lab ID:	02-0190 mb3 1/0.25
Date Analyzed:	01/20/22	Data File:	012008.D
Matrix:	Water	Instrument:	GC7
Units:	ug/L (ppb)	Operator:	MG

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	47	24	127

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	112	128	63-142	13

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	96	98	85-115	2
Copper	ug/L (ppb)	20	95	98	85-115	3
Lead	ug/L (ppb)	10	94	96	85-115	2
Nickel	ug/L (ppb)	20	92	95	85-115	3
Zinc	ug/L (ppb)	50	93	96	85-115	3

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL MERCURY USING EPA METHOD 1631E

Laboratory Code: 201127-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	0.000	92	81	71-125	13

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	97	99	78-125	2

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	80	83	62-90	4
2-Methylnaphthalene	ug/L (ppb)	5	81	80	64-93	1
1-Methylnaphthalene	ug/L (ppb)	5	83	82	64-93	1
Acenaphthylene	ug/L (ppb)	5	84	89	70-130	6
Acenaphthene	ug/L (ppb)	5	86	92	70-130	7
Fluorene	ug/L (ppb)	5	89	92	70-130	3
Phenanthrene	ug/L (ppb)	5	89	94	70-130	5
Anthracene	ug/L (ppb)	5	89	91	70-130	2
Fluoranthene	ug/L (ppb)	5	88	92	70-130	4
Pyrene	ug/L (ppb)	5	93	94	70-130	1
Benz(a)anthracene	ug/L (ppb)	5	92	93	70-130	1
Chrysene	ug/L (ppb)	5	92	93	70-130	1
Benzo(a)pyrene	ug/L (ppb)	5	86	86	70-130	0
Benzo(b)fluoranthene	ug/L (ppb)	5	95	94	70-130	1
Benzo(k)fluoranthene	ug/L (ppb)	5	95	96	70-130	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	98	98	70-130	0
Dibenz(a,h)anthracene	ug/L (ppb)	5	103	100	70-130	3
Benzo(g,h,i)perylene	ug/L (ppb)	5	102	100	70-130	2

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	0.63	93	98	70-130	5

Date of Report: 02/01/22
Date Received: 01/18/22
Project: SnoPac 150054, F&BI 201246

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.063	46	51	25-111	10
Aroclor 1260	ug/L (ppb)	0.063	56	68	23-123	19

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

201246

SAMPLE CHAIN OF CUSTODY 01-18-22

D04/AI6

Page # 1 of 1

Report To Breeyn Greer
Company Aspect Consulting
Address 710 2nd Ave Suite 550
City, State, ZIP Seattle, WA 98104
Phone 612.232.7343 Email bgreer@aspectconsulting.com

SAMPLERS (*signature*) MoniqueRutte

PROJECT NAME	PO #
SnoPac	150054
REMARKS All samples >1,000 us/cm EXCEPT MW-17 & MW-13 Project specific RLs? [✓ Yes] / No	INVOICE TO

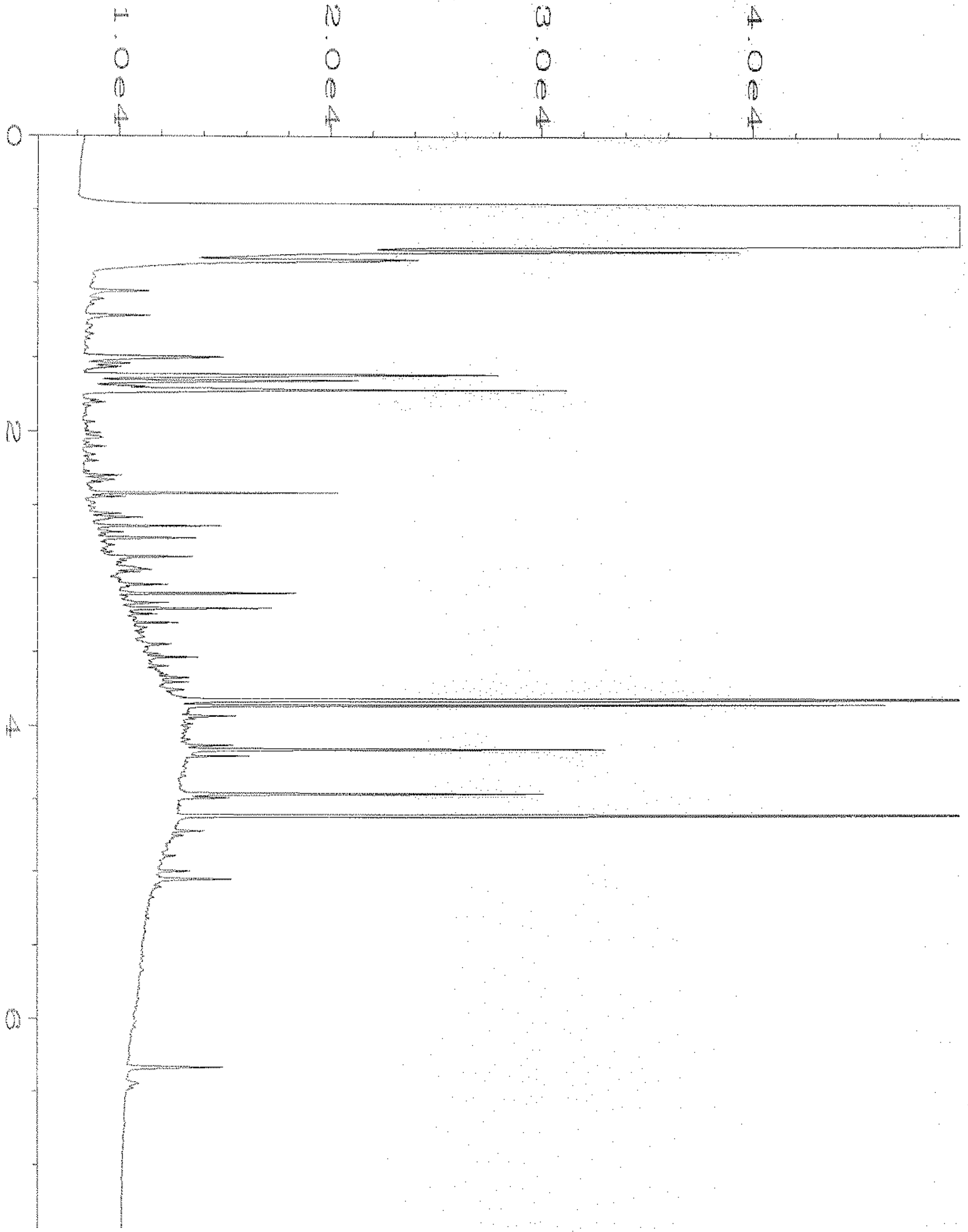
TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	Dissolved Metals ~~PAHs EPA 8270~~	PCB Aroclors ~~PCBs EPA~~ 8082B	Dissolved Hg 1631E	Low-level PAHs 8270D SIM	Tributyltin ion 8M2540G	PCP 8270-SIM	Notes
MW-8-011722	01 A-K	1/17/22	0940	water	8						*						
MW-14-011722	02		1110														
MW-12-011722	03		1255														
MW-17-011722	04	↓	1510															centrifuge for PAH / PCBs
MW-16-011822	05	1/18/22	0915														
MW-160-011822	06		0915														
MW-15-011822	07		1100		↓												
MW-13-011822	08 A-K	↓		↓	11	X					↓	↓	↓	↓	↓	X	
																	* As, Cu, Pb, Ni, Zn

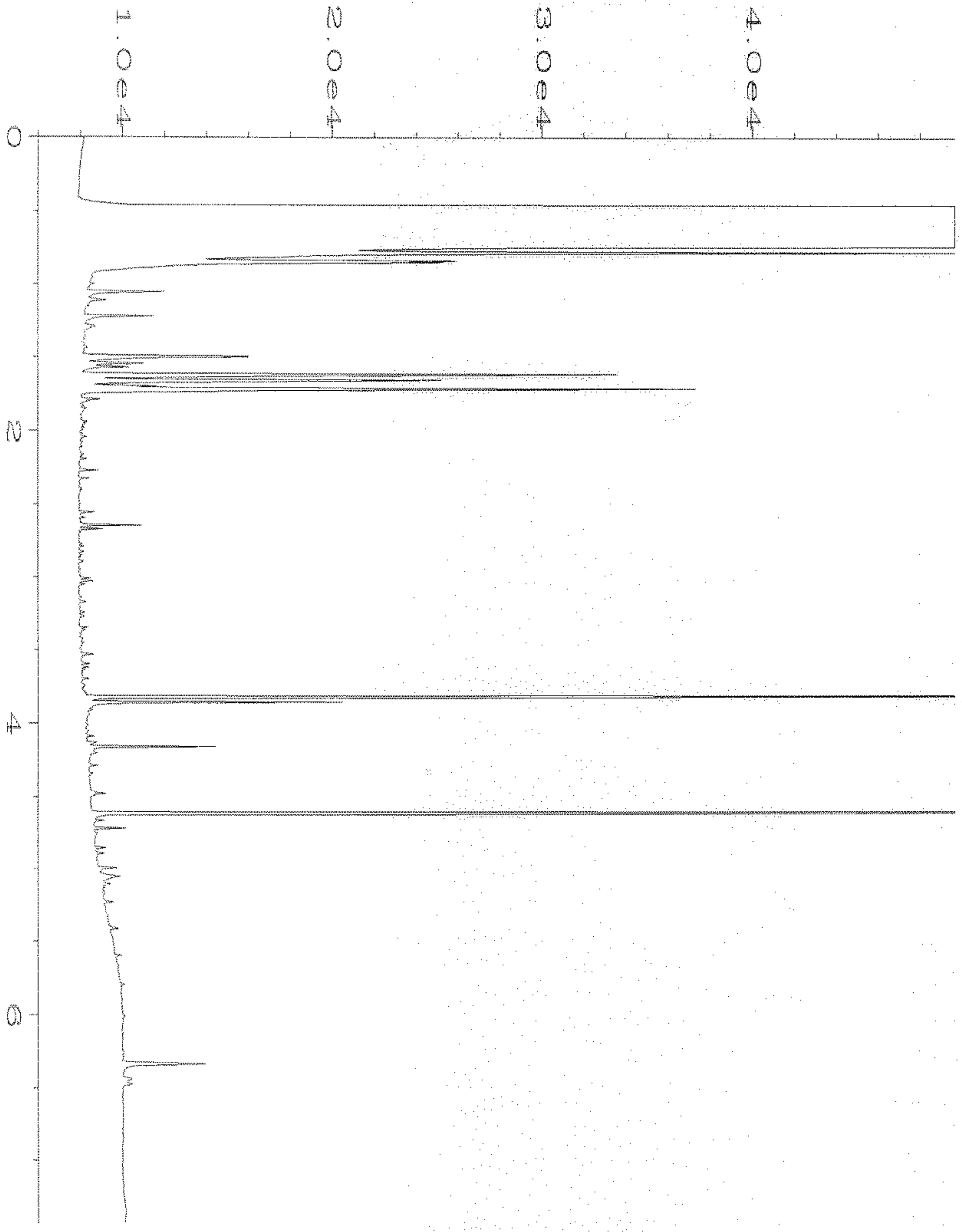
Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: MoniqueRutte	Monique Rutte	Aspect	1/18/22	1545
Received by:	Eric Clam	FB	1/18/22	1545
Relinquished by:				
Received by:		Samples received at 4 °C		



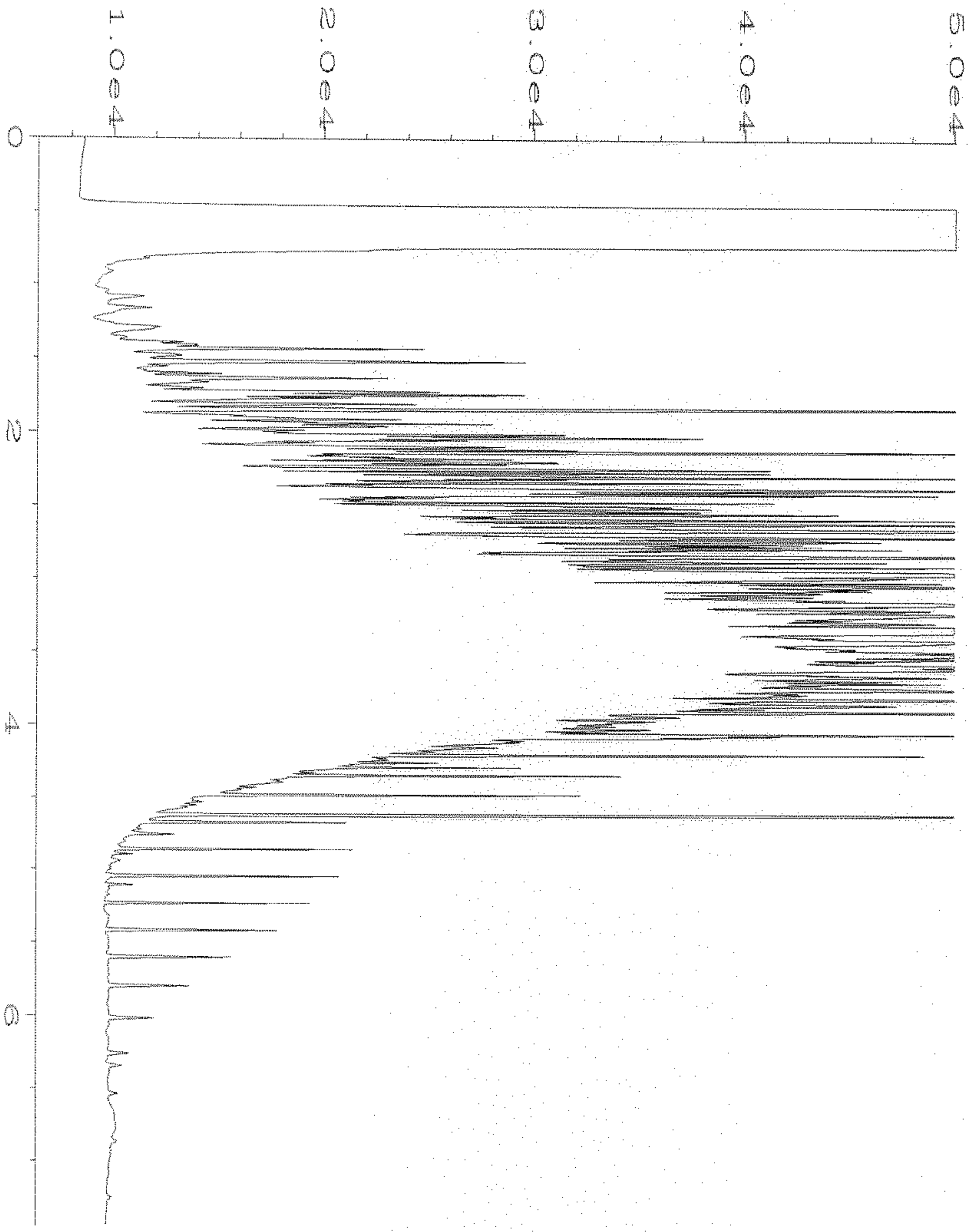
Data File Name : C:\HPCHEM\1\DATA\01-19-22\054F1901.D
Operator : TL
Instrument : GC1
Sample Name : 201246-08
Run Time Bar Code:
Acquired on : 20 Jan 22 04:03 AM
Report Created on: 20 Jan 22 11:38 AM

Page Number : 1
Vial Number : 54
Injection Number : 1
Sequence Line : 19
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\01-19-22\037F1501.D
Operator : TL
Instrument : GC1
Sample Name : 02-0188 mb
Run Time Bar Code:
Acquired on : 19 Jan 22 11:01 PM
Report Created on: 20 Jan 22 11:40 AM

Page Number : 1
Vial Number : 37
Injection Number : 1
Sequence Line : 15
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



Data File Name : C:\HPCHEM\1\DATA\01-19-22\003F0201.D
Operator : TL
Instrument : GC1
Sample Name : 500 Dx 65-27F
Run Time Bar Code:
Acquired on : 19 Jan 22 06:09 AM
Report Created on: 20 Jan 22 11:41 AM

Page Number : 1
Vial Number : 3
Injection Number : 1
Sequence Line : 2
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH

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eurofins
Environment Testing
America

ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-109453-1
Client Project/Site: 201246

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Authorized for release by:
1/31/2022 11:55:35 AM

Nathan Lewis, Project Manager I
(253)922-2310
Nathan.Lewis@Eurofinset.com

Table of Contents

Case Narrative

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Job ID: 580-109453-1

Laboratory: Eurofins Seattle

Narrative

Job Narrative
580-109453-1

Comments
No additional comments.

Receipt
The samples were received on 1/19/2022 2:40 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 2.0º C.

GC/MS Semi VOA
Method Organotins: The RPD of the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 580-379029 and analytical batch 580-379353 recovered outside control limits for the following analytes: Tributyltin.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method Organotin: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate/sample duplicate (MS/MSD/DUP) associated with preparation batch 580-379029, so a LCS and LCSD were used instead.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
*1	LCS/LCSD RPD exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample ID: MW-8-011722
Date Collected: 01/17/22 09:40
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-1
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 12:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*19*		*10 - 150*	*01/22/22 09:19*	*01/26/22 12:39*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Client Sample ID: MW-14-011722

Date Collected: 01/17/22 11:10

Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-2

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 13:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*29*		*10 - 150*	*01/22/22 09:19*	*01/26/22 13:03*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-12-011722
Date Collected: 01/17/22 12:55
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-3
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.35		ug/L		01/22/22 09:19	01/26/22 13:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*33*		*10 - 150*	*01/22/22 09:19*	*01/26/22 13:28*	*1*

Client Sample ID: MW-17-011722
Date Collected: 01/17/22 15:10
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-4
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 13:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*38*		*10 - 150*	*01/22/22 09:19*	*01/26/22 13:53*	*1*

Client Sample ID: MW-16-011722
Lab Sample ID: 580-109453-5
Date Collected: 01/17/22 09:15
Matrix: Water
Date Received: 01/19/22 14:40

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.36		ug/L		01/22/22 09:19	01/26/22 14:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*43*		*10 - 150*	*01/22/22 09:19*	*01/26/22 14:18*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-160-011722
Date Collected: 01/17/22 09:15
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-6
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.35		ug/L		01/22/22 09:19	01/26/22 14:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*31*		*10 - 150*	*01/22/22 09:19*	*01/26/22 14:43*	*1*

Client Sample Results

Client Sample ID: MW-15-011722
Date Collected: 01/17/22 11:00
Date Received: 01/19/22 14:40

Lab Sample ID: 580-109453-7
Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.37		ug/L		01/22/22 09:19	01/26/22 15:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*53*		*10 - 150*	*01/22/22 09:19*	*01/26/22 15:08*	*1*

Client Sample Results

Client Sample ID: MW-13-011722
Lab Sample ID: 580-109453-8
Date Collected: 01/17/22 12:50
Matrix: Water
Date Received: 01/19/22 14:40

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*1	0.37		ug/L		01/22/22 09:19	01/26/22 15:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*46*		*10 - 150*	*01/22/22 09:19*	*01/26/22 15:33*	*1*

QC Sample Results

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-379029/1-A
Matrix: Water
Analysis Batch: 379353

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 379029

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.30		ug/L		01/22/22 09:19	01/26/22 11:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*26*		*10 - 150*	*01/22/22 09:19*	*01/26/22 11:24*	*1*

Lab Sample ID: LCS 580-379029/2-A
Matrix: Water
Analysis Batch: 379353

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 379029

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Tributyltin			1.79	0.236	J	ug/L		13	11 - 150		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*18*		*10 - 150*

Lab Sample ID: LCSD 580-379029/3-A
Matrix: Water
Analysis Batch: 379353

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 379029

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Tributyltin			1.79	0.350	*1	ug/L		20	11 - 150	39	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*42*		*10 - 150*

Lab Chronicle

Client Sample ID: MW-8-011722

Lab Sample ID: 580-109453-1
Date Collected: 01/17/22 09:40
Matrix: Water
Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 12:39	TL1	FGS SEA

Client Sample ID: MW-14-011722

Lab Sample ID: 580-109453-2
Date Collected: 01/17/22 11:10
Matrix: Water
Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 13:03	TL1	FGS SEA

Client Sample ID: MW-12-011722

Lab Sample ID: 580-109453-3
Date Collected: 01/17/22 12:55
Matrix: Water
Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 13:28	TL1	FGS SEA

Client Sample ID: MW-17-011722

Lab Sample ID: 580-109453-4
Date Collected: 01/17/22 15:10
Matrix: Water
Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 13:53	TL1	FGS SEA

Client Sample ID: MW-16-011722

Lab Sample ID: 580-109453-5
Date Collected: 01/17/22 09:15
Matrix: Water
Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 14:18	TL1	FGS SEA

Client Sample ID: MW-160-011722

Lab Sample ID: 580-109453-6
Date Collected: 01/17/22 09:15
Matrix: Water
Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 14:43	TL1	FGS SEA

Lab Chronicle

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Client Sample ID: MW-15-011722

Lab Sample ID: 580-109453-7

Date Collected: 01/17/22 11:00

Matrix: Water

Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 15:08	TL1	FGS SEA

Client Sample ID: MW-13-011722

Lab Sample ID: 580-109453-8

Date Collected: 01/17/22 12:50

Matrix: Water

Date Received: 01/19/22 14:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			379029	01/22/22 09:19	RJL	FGS SEA
Total/NA	Analysis	Organotins		1	379353	01/26/22 15:33	TL1	FGS SEA

Laboratory References:

FGS SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Laboratory: Eurofins Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-22
ANAB	Dept. of Defense ELAP	L2236	01-19-25
ANAB	Dept. of Energy	L2236	01-19-25
ANAB	ISO/IEC 17025	L2236	01-19-25
California	State	2954	01-30-22
Florida	NELAP	E87575	06-30-22
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-22
Oregon	NELAP	4167	07-07-22
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-22
Wisconsin	State	399133460	08-31-22

Sample Summary

Client: Friedman & Bruya
Project/Site: 201246

Job ID: 580-109453-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-109453-1	MW-8-011722	Water	01/17/22 09:40	01/19/22 14:40
580-109453-2	MW-14-011722	Water	01/17/22 11:10	01/19/22 14:40
580-109453-3	MW-12-011722	Water	01/17/22 12:55	01/19/22 14:40
580-109453-4	MW-17-011722	Water	01/17/22 15:10	01/19/22 14:40
580-109453-5	MW-16-011722	Water	01/17/22 09:15	01/19/22 14:40
580-109453-6	MW-160-011722	Water	01/17/22 09:15	01/19/22 14:40
580-109453-7	MW-15-011722	Water	01/17/22 11:00	01/19/22 14:40
580-109453-8	MW-13-011722	Water	01/17/22 12:50	01/19/22 14:40

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

109453

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Send Report To Michael Erdahl

Company Friedman and Bruya, Inc.

Address 3012 16th Ave W

City, State, ZIP Seattle, WA 98119

Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER
Eurofins

PROJECT NAME/NO.	PO #
201246	C-30

REMARKS

Aspect EDD

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	Tributyltin											Notes
MW-8-011722		1/17/2022	940	Water	1	X											
MW-14-011722		1/17/2022	1110	Water	1	X											
MW-12-011722		1/17/2022	1255	Water	1	X											
MW-17-011722		1/17/2022	1510	Water	1	X											
MW-16-011722		1/17/2022	915	Water	1	X											
MW-160-011722		1/17/2022	915	Water	1	X											
MW-15-011722		1/17/2022	1100	Water	1	X											
MW-13-011722		1/17/2022	1250	Water	1	X											

580-109453 Chain of Custody

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	1/19/22	0945
Received by:	Ashton Greene	EFGS	1/19/22	1440
Relinquished by:				
Received by:				

Lg Bl/gel/tub IR8 2.0/1.8

cl Dr

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-109453-1

Login Number: 109453
List Number: 1
Creator: Blankinship, Tom X

List Source: Eurofins Seattle

Question	**Answer**	**Comment**
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Vineta Mills, M.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 16, 2022

Breeyn Greer, Project Manager
Aspect Consulting, LLC
710 2nd Ave S, Suite 550
Seattle, WA 98104

Dear Ms Greer:

Included are the results from the testing of material submitted on April 14, 2022 from the SnoPac 150054, F&BI 204225 project. There are 39 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Aspect Data
ASP0516R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on April 14, 2022 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC SnoPac 150054, F&BI 204225 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
204225 -01	MW-08-041322
204225 -02	MW-14-041322
204225 -03	MW-12-041322
204225 -04	MW-17-041322
204225 -05	MW-16-041422
204225 -06	MW-160-041422
204225 -07	MW-15-041422
204225 -08	MW-13-041422

The samples were sent to Eurofins for tributyltin analysis. The report is enclosed.

The 8082 laboratory control sample and laboratory control sample duplicate failed the relative percent difference for Aroclor 1260. PCBs were not detected, therefore the data were acceptable.

All other quality control requirements were acceptable.

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225
Date Extracted: 04/15/22
Date Analyzed: 04/15/22

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW-13-041422 204225-08	210 x	<250	119
Method Blank 02-916 MB2	<50	<250	123

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-08-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-01
Date Analyzed:	04/18/22	Data File:	204225-01 .087
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<3
Lead	<1
Nickel	1.63
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-14-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-02
Date Analyzed:	04/18/22	Data File:	204225-02 .088
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<3
Lead	<1
Nickel	3.43
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-12-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-03
Date Analyzed:	04/18/22	Data File:	204225-03 .089
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.09
Copper	<3
Lead	<1
Nickel	4.24
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-17-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-04
Date Analyzed:	04/18/22	Data File:	204225-04 .090
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.03
Copper	<3
Lead	<1
Nickel	1.98
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-16-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-05
Date Analyzed:	04/18/22	Data File:	204225-05 .091
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.39
Copper	3.27
Lead	<1
Nickel	4.90
Zinc	18.3

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-160-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-06
Date Analyzed:	04/18/22	Data File:	204225-06 .092
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	1.38
Copper	3.22
Lead	<1
Nickel	4.85
Zinc	14.3

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-15-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-07
Date Analyzed:	04/18/22	Data File:	204225-07 .095
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	5.28
Copper	3.92
Lead	<1
Nickel	9.51
Zinc	<5

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW-13-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	204225-08
Date Analyzed:	04/18/22	Data File:	204225-08 .096
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<3
Lead	<1
Nickel	2.92
Zinc	6.45

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/18/22	Lab ID:	I2-293 mb
Date Analyzed:	04/18/22	Data File:	I2-293 mb.049
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Copper	<3
Lead	<1
Nickel	<1
Zinc	<5

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225
Date Extracted: 04/21/22
Date Analyzed: 04/25/22

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Dissolved Mercury
MW-08-041322 204225-01	<0.01
MW-14-041322 204225-02	<0.01
MW-12-041322 204225-03	<0.01
MW-17-041322 204225-04	<0.01
MW-16-041422 204225-05	<0.01
MW-160-041422 204225-06	<0.01
MW-15-041422 204225-07	<0.01
MW-13-041422 204225-08	<0.01
Method Blank i2-303 MB	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-08-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-01 1/0.25
Date Analyzed:	04/19/22	Data File:	041915.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15	10	60
Phenol-d6	10	10	49
Nitrobenzene-d5	67	15	144
2-Fluorobiphenyl	72	25	128
2,4,6-Tribromophenol	91	10	142
Terphenyl-d14	99	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-14-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-02 1/0.25
Date Analyzed:	04/19/22	Data File:	041916.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	17	10	60
Phenol-d6	11	10	49
Nitrobenzene-d5	78	15	144
2-Fluorobiphenyl	80	25	128
2,4,6-Tribromophenol	97	10	142
Terphenyl-d14	100	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	0.0068
Acenaphthene	1.1
Fluorene	<0.005
Phenanthrene	0.053
Anthracene	0.028
Fluoranthene	0.21
Pyrene	0.16
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-12-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-03 1/0.25
Date Analyzed:	04/19/22	Data File:	041917.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	16	10	60
Phenol-d6	12	10	49
Nitrobenzene-d5	74	15	144
2-Fluorobiphenyl	70	25	128
2,4,6-Tribromophenol	55	10	142
Terphenyl-d14	88	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	0.0060
Fluorene	<0.005
Phenanthrene	0.0077
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-17-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-04 1/0.25
Date Analyzed:	04/19/22	Data File:	041918.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	13	10	60
Phenol-d6	10	10	49
Nitrobenzene-d5	63	15	144
2-Fluorobiphenyl	70	25	128
2,4,6-Tribromophenol	83	10	142
Terphenyl-d14	83	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-16-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-05 1/0.25
Date Analyzed:	04/20/22	Data File:	041919.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	14	10	60
Phenol-d6	10	10	49
Nitrobenzene-d5	71	15	144
2-Fluorobiphenyl	75	25	128
2,4,6-Tribromophenol	91	10	142
Terphenyl-d14	101	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-160-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-06 1/0.25
Date Analyzed:	04/20/22	Data File:	041920.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	15	10	60
Phenol-d6	11	10	49
Nitrobenzene-d5	71	15	144
2-Fluorobiphenyl	72	25	128
2,4,6-Tribromophenol	84	10	142
Terphenyl-d14	95	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-15-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-07 1/0.25
Date Analyzed:	04/20/22	Data File:	041921.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	17	10	60
Phenol-d6	14	10	49
Nitrobenzene-d5	81	15	144
2-Fluorobiphenyl	66	25	128
2,4,6-Tribromophenol	66	10	142
Terphenyl-d14	90	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	MW-13-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	204225-08 1/0.25
Date Analyzed:	04/20/22	Data File:	041922.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	11	10	60
Phenol-d6	10	10	49
Nitrobenzene-d5	50	15	144
2-Fluorobiphenyl	55	25	128
2,4,6-Tribromophenol	36	10	142
Terphenyl-d14	93	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.37
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	0.072
Acenaphthylene	0.012
Acenaphthene	0.55
Fluorene	0.050
Phenanthrene	0.027
Anthracene	0.011
Fluoranthene	0.013
Pyrene	0.010
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	0.0056
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/19/22	Lab ID:	02-961 mb 1/0.25
Date Analyzed:	04/19/22	Data File:	041914.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	13	10	60
Phenol-d6	11	10	49
Nitrobenzene-d5	65	15	144
2-Fluorobiphenyl	81	25	128
2,4,6-Tribromophenol	37	10	142
Terphenyl-d14	98	41	138

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.05
2-Methylnaphthalene	<0.05
1-Methylnaphthalene	<0.05
Acenaphthylene	<0.005
Acenaphthene	<0.005
Fluorene	<0.005
Phenanthrene	<0.005
Anthracene	<0.005
Fluoranthene	<0.005
Pyrene	<0.005
Benz(a)anthracene	<0.005
Chrysene	<0.005
Benzo(a)pyrene	<0.005
Benzo(b)fluoranthene	<0.005
Benzo(k)fluoranthene	<0.005
Indeno(1,2,3-cd)pyrene	<0.005
Dibenz(a,h)anthracene	<0.005
Benzo(g,h,i)perylene	<0.01

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	MW-13-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/20/22	Lab ID:	204225-08 1/0.25
Date Analyzed:	04/20/22	Data File:	042021.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	17 vo	50	150
Phenol-d6	11 vo	50	150
2,4,6-Tribromophenol	97	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis for Semivolatile Phenols By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/20/22	Lab ID:	02-970 mb 1/0.25
Date Analyzed:	04/20/22	Data File:	042018.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	20 vo	50	150
Phenol-d6	12 vo	50	150
2,4,6-Tribromophenol	77	50	150

Compounds:	Concentration ug/L (ppb)
Pentachlorophenol	<0.05

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-08-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-01 1/0.25
Date Analyzed:	04/19/22	Data File:	041839.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	22 ip	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-14-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-02 1/0.25
Date Analyzed:	04/19/22	Data File:	041840.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-12-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-03 1/0.25
Date Analyzed:	04/19/22	Data File:	041841.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	45	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-17-041322	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-04 1/0.25
Date Analyzed:	04/19/22	Data File:	041842.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	49	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-16-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-05 1/0.25
Date Analyzed:	04/19/22	Data File:	041843.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	50	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-160-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-06 1/0.25
Date Analyzed:	04/19/22	Data File:	041844.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	40	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-15-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-07 1/0.25
Date Analyzed:	04/19/22	Data File:	041845.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	26	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	MW-13-041422	Client:	Aspect Consulting, LLC
Date Received:	04/14/22	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	204225-08 1/0.25
Date Analyzed:	04/19/22	Data File:	041846.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	38	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Analysis For PCBs By EPA Method 8082A

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	SnoPac 150054, F&BI 204225
Date Extracted:	04/15/22	Lab ID:	02-953 mb 1/0.25
Date Analyzed:	04/19/22	Data File:	041838.D
Matrix:	Water	Instrument:	GC9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
TCMX	31	25	160

Compounds:	Concentration ug/L (ppb)
Aroclor 1221	<0.005
Aroclor 1232	<0.005
Aroclor 1016	<0.005
Aroclor 1242	<0.005
Aroclor 1248	<0.005
Aroclor 1254	<0.005
Aroclor 1260	<0.005
Aroclor 1262	<0.005
Aroclor 1268	<0.005

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	108	96	63-142	12

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: 204172-10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	96.1	71	79	70-130	11
Copper	ug/L (ppb)	20	<5	78	78	70-130	0
Lead	ug/L (ppb)	10	<1	89	89	70-130	0
Nickel	ug/L (ppb)	20	<1	79	79	70-130	0
Zinc	ug/L (ppb)	50	<5	78	78	70-130	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	93	85-115
Copper	ug/L (ppb)	20	101	85-115
Lead	ug/L (ppb)	10	99	85-115
Nickel	ug/L (ppb)	20	99	85-115
Zinc	ug/L (ppb)	50	100	85-115

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED MERCURY USING EPA METHOD 1631E

Laboratory Code: 204225-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	<0.0008	113	117	71-125	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Mercury	ug/L (ppb)	0.01	104	105	78-125	1

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	5	78	80	66-94	3
2-Methylnaphthalene	ug/L (ppb)	5	84	86	68-98	2
1-Methylnaphthalene	ug/L (ppb)	5	84	86	67-97	2
Acenaphthylene	ug/L (ppb)	5	88	91	70-130	3
Acenaphthene	ug/L (ppb)	5	87	89	70-130	2
Fluorene	ug/L (ppb)	5	91	93	70-130	2
Phenanthrene	ug/L (ppb)	5	90	95	70-130	5
Anthracene	ug/L (ppb)	5	92	95	70-130	3
Fluoranthene	ug/L (ppb)	5	97	101	70-130	4
Pyrene	ug/L (ppb)	5	93	97	70-130	4
Benz(a)anthracene	ug/L (ppb)	5	94	96	70-130	2
Chrysene	ug/L (ppb)	5	94	96	70-130	2
Benzo(a)pyrene	ug/L (ppb)	5	95	99	70-130	4
Benzo(b)fluoranthene	ug/L (ppb)	5	95	97	62-130	2
Benzo(k)fluoranthene	ug/L (ppb)	5	95	98	70-130	3
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	5	99	105	70-130	6
Dibenz(a,h)anthracene	ug/L (ppb)	5	104	107	70-130	3
Benzo(g,h,i)perylene	ug/L (ppb)	5	101	106	70-130	5

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR SEMIVOLATILE PHENOLS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 30)
Pentachlorophenol	ug/L (ppb)	0.63	74	92	70-130	22

Date of Report: 05/16/22
Date Received: 04/14/22
Project: SnoPac 150054, F&BI 204225

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR POLYCHLORINATED BIPHENYLS AS AROCLOR 1016/1260 BY EPA METHOD 8082A

Laboratory Code: Laboratory Control Sample 1/0.25

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Aroclor 1016	ug/L (ppb)	0.25	52	62	25-165	18
Aroclor 1260	ug/L (ppb)	0.25	52	74	25-163	35 vo

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

204225 [redacted]

SAMPLE CHAIN OF CUSTODY

04-14-22 [redacted]

C03 / E03 / AIS

Page # 1 of 1

Report To Breeyn Green
Company Aspect Consulting
Address 710 2nd Ave, Ste 550
City, State, ZIP Seattle, WA, 98107
Phone
Email bgreen@aspectconsulting.com

SAMPLERS (*signature*) BCM

PROJECT NAME Sno Pac

PO # 150054

REMARKS

INVOICE TO

Project specific RLs? [✓ Yes] No

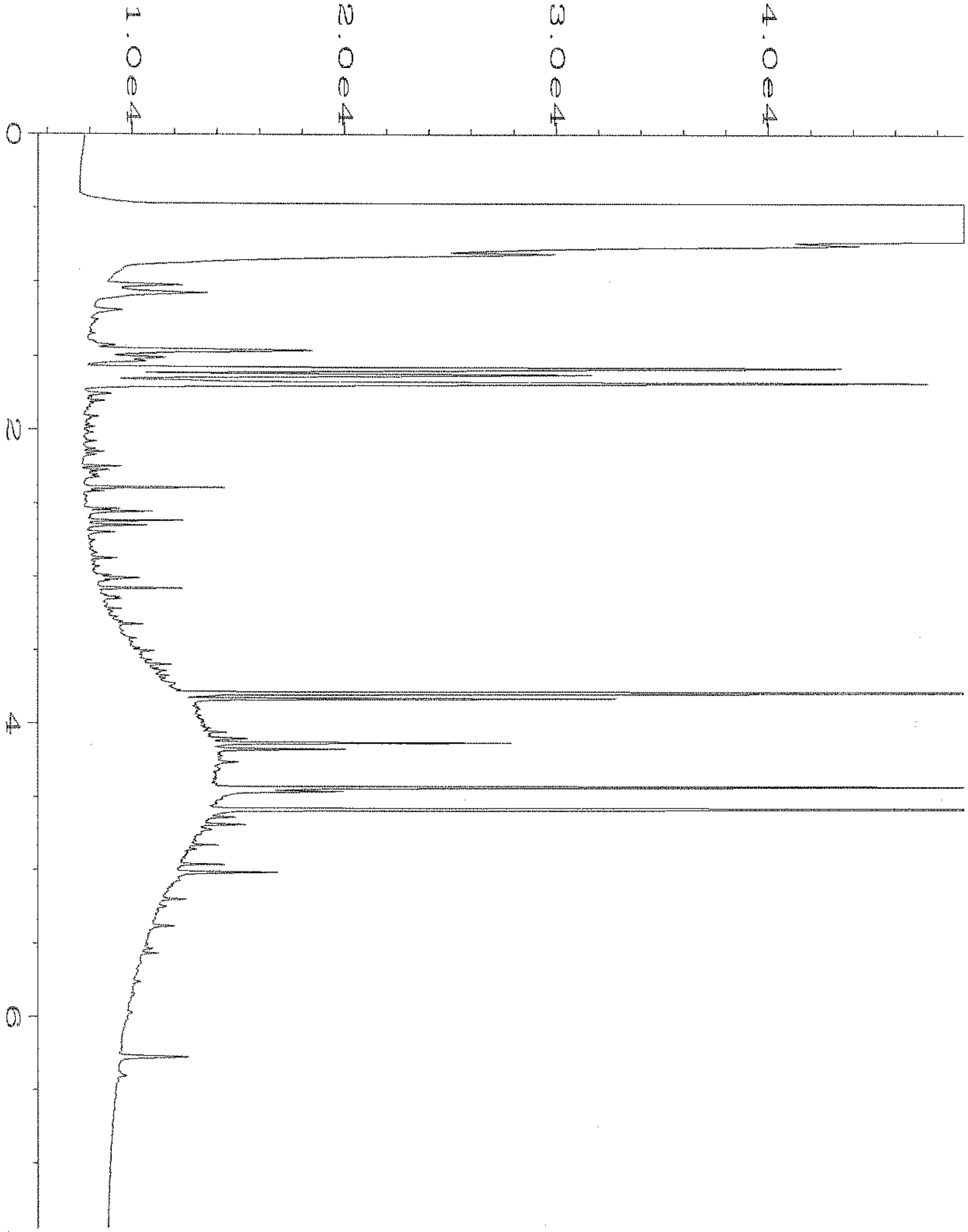
TURNAROUND TIME
☒ Standard turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive samples
☐ Other
Default: Dispose after 30 days

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	Dissolved metals ~~PAHs EPA 8270~~	PCB Aroclors ~~PCBs EPA 8082~~	Dissolved Hg	Low-level PAHs	Tributyltin	PCP	Notes
MW-08-041322	01 A-H	4/13/22	0910	GW	8						*X	X	X	X	X		SC > 1000 μS/cm
MW-14-041322	02	↓	1040	↓	↓						↓	↓	↓	↓	↓		↓
MW-12-041322	03		1220														
MW-17-041322	04		1430														
MW-16-041422	05	4/14/22	0920														
MW-160-041422	06	↓	0920														
MW-15-041422	07 ↓		1240		↓												SC > 1000 μS/cm
MW-13-~~041322~~ 041422 [illegible] 4/15/22	08 A-K	↓	1405	↓	11	X					↓	↓	↓	↓	↓	X	one bottle high turbidity, lab filter. * As, Cu, Pb, Ni, Zn

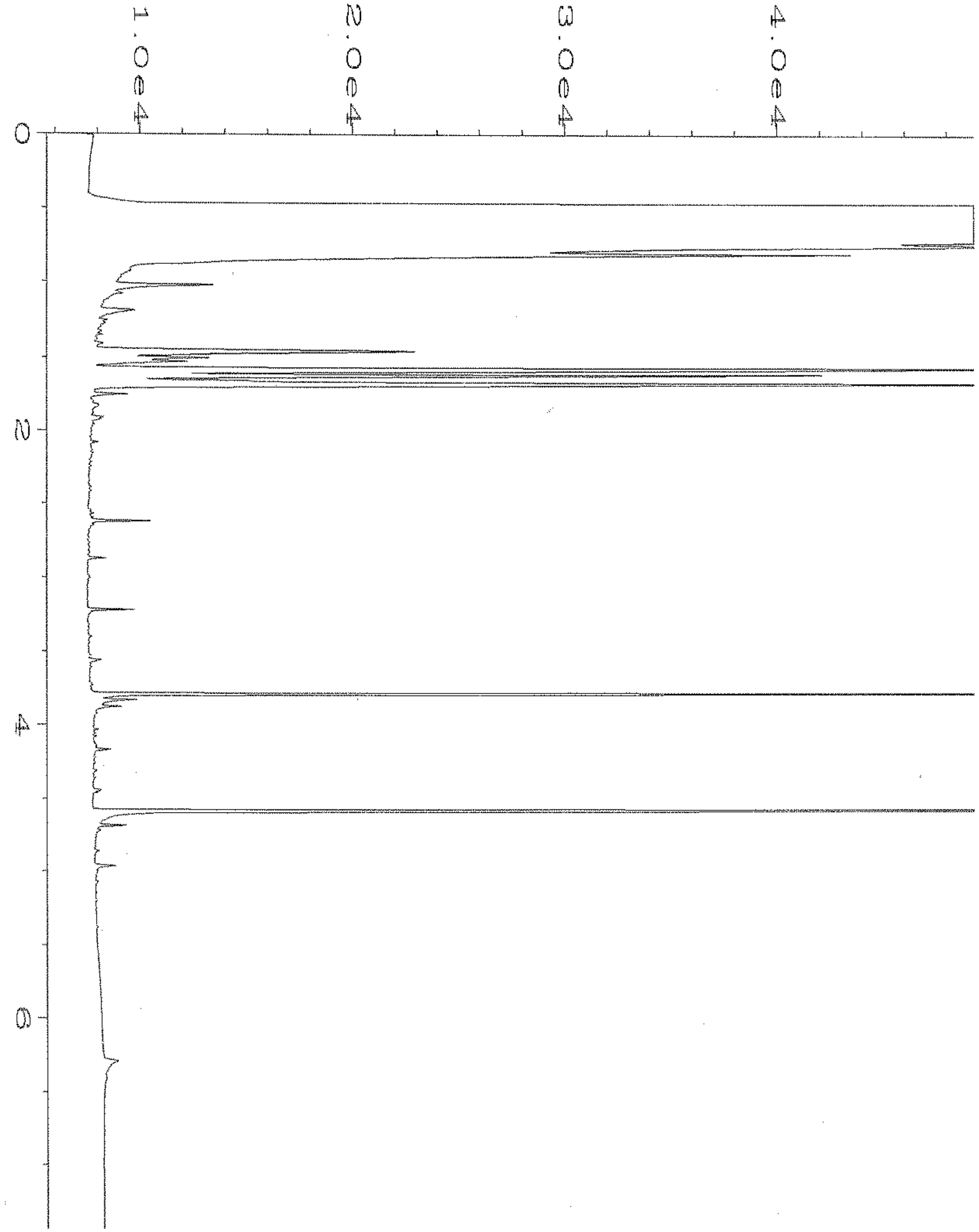
Friedman & Bruya, Inc.
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: BCM	Baxter Call	Aspect	4/14/22	1645
Received by: Hong	HONG NGUYEN	FBI	4/14/22	16:45
Relinquished by:				
Received by:		Samples received at 4 °C		



Data File Name : C:\HPCHEM\1\DATA\04-15-22\055F1301.D
Operator : TL
Instrument : GC1
Sample Name : 204225-08
Run Time Bar Code:
Acquired on : 15 Apr 22 11:39 PM
Report Created on: 18 Apr 22 09:22 AM

Page Number : 1
Vial Number : 55
Injection Number : 1
Sequence Line : 13
Instrument Method: DX.MTH
Analysis Method : DEFAULT.MTH



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Data File Name    : C:\HPCHEM\1\DATA\04-15-22\051F1301.D
Operator          : TL                          Page Number      : 1
Instrument        : GC1                         Vial Number      : 51
Sample Name       : 02-916 mb2                  Injection Number : 1
Run Time Bar Code:                              Sequence Line    : 13
Acquired on       : 15 Apr 22   10:40 PM        Instrument Method: DX.MTH
Report Created on: 18 Apr 22   09:23 AM         Analysis Method  : DEFAULT.MTH
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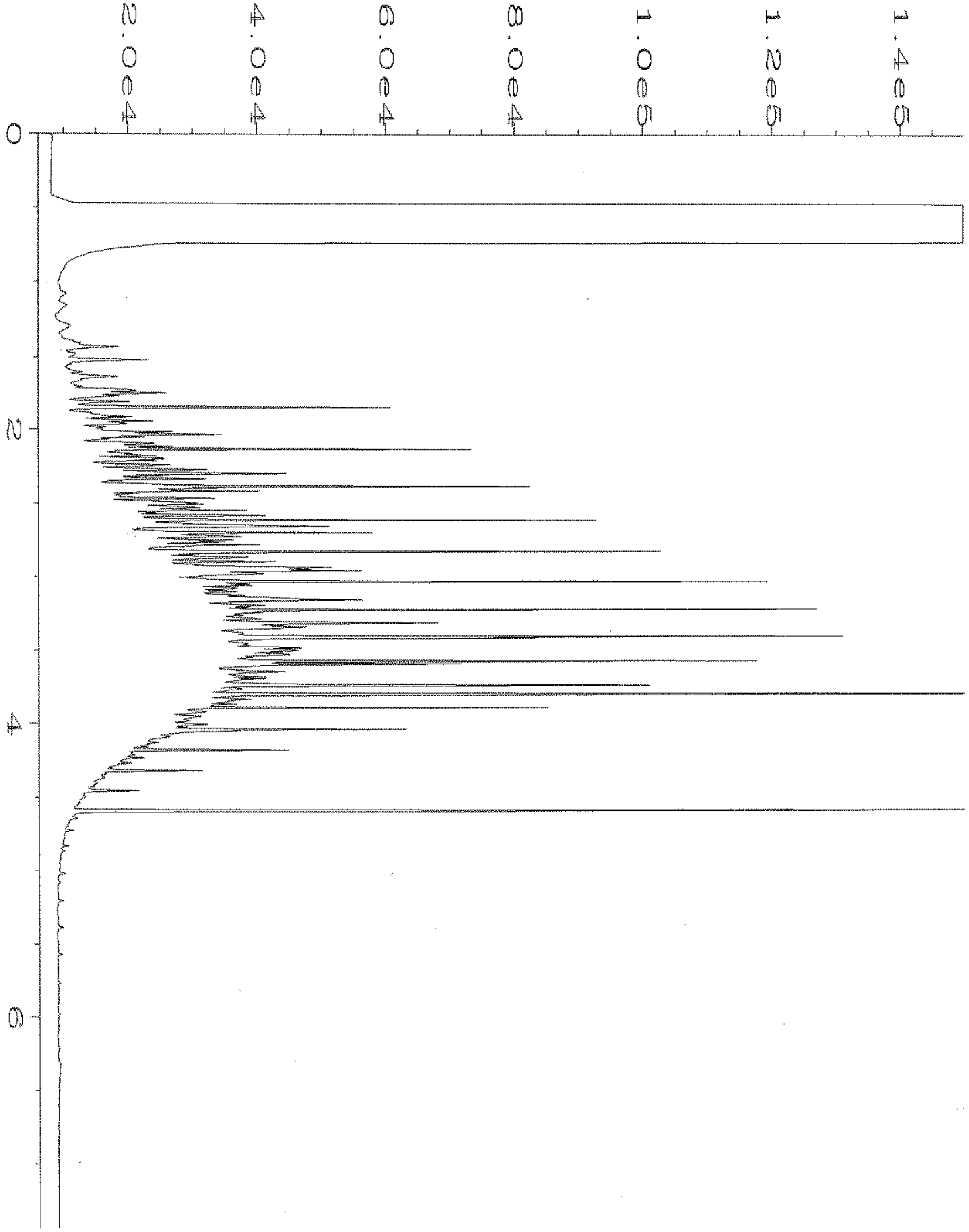

Data File Name : C:\HPCHEM\1\DATA\04-15-22\003F0201.D

Operator	: TL	Page Number	: 1
Instrument	: GC1	Vial Number	: 3
Sample Name	: 500 Dx 65-122D	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 2
Acquired on	: 15 Apr 22 06:10 AM	Instrument Method:	DX.MTH
Report Created on:	18 Apr 22 09:23 AM	Analysis Method	: DEFAULT.MTH

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ANALYTICAL REPORT

Eurofins Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

Laboratory Job ID: 580-112702-1
Client Project/Site: 204225

For:
Friedman & Bruya
3012 16TH AVENUE WEST
Seattle, Washington 98119-2029

Attn: Michael Erdahl

Kristine D. Allen

Authorized for release by:
5/13/2022 1:14:31 PM
Kristine Allen, Client Service Manager
(253)433-0390
Kristine.Allen@et.eurofinsus.com

Designee for

Tracy Dutton, Client Relations Manager
(253)380-6574
Tracy.Dutton@et.eurofinsus.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Friedman & Bruya
Project/Site: 204225

Job ID: 580-112702-1

Laboratory: Eurofins Seattle

Narrative

Job Narrative
580-112702-1

Comments

No additional comments.

Receipt

The samples were received on 4/15/2022 11:05 AM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 0.2º C.

GC/MS Semi VOA

Method Organotins: The laboratory control sample and duplicate (LCS/LCSD) for preparation batch 580-388157 and analytical batch 580-388951 recovered outside acceptance limits, low-biased, for Tributyltin (4%, >11% required) as well as Tripentyltin surrogate. There was insufficient sample to perform a re-extraction or re-analysis; therefore, the data have been reported.

Method Organotins: MW-08-041322 (580-112702-1), MW-14-041322 (580-112702-2), MW-12-041322 (580-112702-3) and MW-17-041322 (580-112702-4) were prepared outside of preparation holding time due to oversight.

Method Organotins: Surrogate recovery for the following sample was outside of acceptance limits: MW-14-041322 (580-112702-2). There was insufficient sample to perform a re-extraction; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Definitions/Glossary

Client: Friedman & Bruya
Project/Site: 204225

Job ID: 580-112702-1

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
*-	LCS and/or LCSD is outside acceptance limits, low biased.
H	Sample was prepped or analyzed beyond the specified holding time
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
S1-	Surrogate recovery exceeds control limits, low biased.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Client Sample Results

Client Sample ID: MW-08-041322

Lab Sample ID: 580-112702-1

Date Collected: 04/13/22 09:10

Matrix: Water

Date Received: 04/15/22 11:05

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H *-	0.32		ug/L		04/21/22 13:39	04/29/22 19:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*21*		*10 - 150*	*04/21/22 13:39*	*04/29/22 19:39*	*1*

Client Sample Results

Client Sample ID: MW-14-041322

Lab Sample ID: 580-112702-2

Date Collected: 04/13/22 10:40

Matrix: Water

Date Received: 04/15/22 11:05

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H *-	0.33		ug/L		04/21/22 13:39	04/29/22 20:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*7*	*S1-*	*10 - 150*	*04/21/22 13:39*	*04/29/22 20:04*	*1*

Client Sample Results

Client: Friedman & Bruya
Job ID: 580-112702-1
Project/Site: 204225

Client Sample ID: MW-12-041322

Lab Sample ID: 580-112702-3

Date Collected: 04/13/22 12:20
Matrix: Water
Date Received: 04/15/22 11:05

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H *-	0.32		ug/L		04/21/22 13:39	04/29/22 20:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*44*		*10 - 150*	*04/21/22 13:39*	*04/29/22 20:30*	*1*

Client Sample Results

Client: Friedman & Bruya
Job ID: 580-112702-1
Project/Site: 204225

Client Sample ID: MW-17-041322

Lab Sample ID: 580-112702-4

Date Collected: 04/13/22 14:30

Matrix: Water

Date Received: 04/15/22 11:05

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	H *-	0.33		ug/L		04/21/22 13:39	04/29/22 20:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*41*		*10 - 150*	*04/21/22 13:39*	*04/29/22 20:56*	*1*

Client Sample Results

Client: Friedman & Bruya
Project/Site: 204225

Job ID: 580-112702-1

Client Sample ID: MW-16-041422

Date Collected: 04/14/22 09:20
Date Received: 04/15/22 11:05

Lab Sample ID: 580-112702-5

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*-	0.31		ug/L		04/21/22 13:39	04/29/22 21:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*21*		*10 - 150*	*04/21/22 13:39*	*04/29/22 21:21*	*1*

Client Sample ID: MW-16O-041422

Date Collected: 04/14/22 09:20
Date Received: 04/15/22 11:05

Lab Sample ID: 580-112702-6

Matrix: Water

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*-	0.32		ug/L		04/21/22 13:39	04/29/22 21:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*53*		*10 - 150*	*04/21/22 13:39*	*04/29/22 21:47*	*1*

Client Sample Results

Client Sample ID: MW-15-041422
Lab Sample ID: 580-112702-7
Date Collected: 04/14/22 12:40
Matrix: Water
Date Received: 04/15/22 11:05

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*-	0.32		ug/L		04/21/22 13:39	04/29/22 22:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*38*		*10 - 150*	*04/21/22 13:39*	*04/29/22 22:13*	*1*

Client Sample Results

Client Sample ID: MW-13-041422
Lab Sample ID: 580-112702-8
Date Collected: 04/14/22 14:05
Matrix: Water
Date Received: 04/15/22 11:05

Method: Organotins - Organotins, PSEP (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND	*-	0.31		ug/L		04/21/22 13:39	04/29/22 22:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*10*		*10 - 150*	*04/21/22 13:39*	*04/29/22 22:38*	*1*

QC Sample Results

Client: Friedman & Bruya
Project/Site: 204225

Job ID: 580-112702-1

Method: Organotins - Organotins, PSEP (GC/MS)

Lab Sample ID: MB 580-388157/1-A
Matrix: Water
Analysis Batch: 388842

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 388157

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyltin	ND		0.32		ug/L		04/21/22 13:39	04/28/22 20:12	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tripentyltin	*16*		*10 - 150*	*04/21/22 13:39*	*04/28/22 20:12*	*1*

Lab Sample ID: LCS 580-388157/2-A
Matrix: Water
Analysis Batch: 388951

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 388157

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
Tributyltin			1.94	0.0829	J *-	ug/L		4	11 - 150		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tripentyltin	*8*	*S1-*	*10 - 150*

Lab Sample ID: LCSD 580-388157/3-A
Matrix: Water
Analysis Batch: 388951

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 388157

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Tributyltin			2.03	0.0840	J *-	ug/L		4	11 - 150	1	35

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Tripentyltin	*36*		*10 - 150*

Lab Chronicle

Client: Friedman & Bruya
Project/Site: 204225

Job ID: 580-112702-1

Client Sample ID: MW-08-041322

Lab Sample ID: 580-112702-1

Date Collected: 04/13/22 09:10
Date Received: 04/15/22 11:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 19:39	JCM	FGS SEA

Client Sample ID: MW-14-041322

Lab Sample ID: 580-112702-2

Date Collected: 04/13/22 10:40
Date Received: 04/15/22 11:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 20:04	JCM	FGS SEA

Client Sample ID: MW-12-041322

Lab Sample ID: 580-112702-3

Date Collected: 04/13/22 12:20
Date Received: 04/15/22 11:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 20:30	JCM	FGS SEA

Client Sample ID: MW-17-041322

Lab Sample ID: 580-112702-4

Date Collected: 04/13/22 14:30
Date Received: 04/15/22 11:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 20:56	JCM	FGS SEA

Client Sample ID: MW-16-041422

Lab Sample ID: 580-112702-5

Date Collected: 04/14/22 09:20
Date Received: 04/15/22 11:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 21:21	JCM	FGS SEA

Client Sample ID: MW-16O-041422

Lab Sample ID: 580-112702-6

Date Collected: 04/14/22 09:20
Date Received: 04/15/22 11:05

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 21:47	JCM	FGS SEA

Lab Chronicle

Client: Friedman & Bruya
Project/Site: 204225
Job ID: 580-112702-1

Client Sample ID: MW-15-041422

Lab Sample ID: 580-112702-7

Date Collected: 04/14/22 12:40
Matrix: Water
Date Received: 04/15/22 11:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 22:13	JCM	FGS SEA

Client Sample ID: MW-13-041422

Lab Sample ID: 580-112702-8

Date Collected: 04/14/22 14:05
Matrix: Water
Date Received: 04/15/22 11:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Organotin			388157	04/21/22 13:39	D1N	FGS SEA
Total/NA	Analysis	Organotins		1	388951	04/29/22 22:38	JCM	FGS SEA

Laboratory References:

FGS SEA = Eurofins Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Accreditation/Certification Summary

Laboratory: Eurofins Seattle

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	20-004	02-19-25
ANAB	Dept. of Defense ELAP	L2236	01-19-25
ANAB	Dept. of Energy	L2236	01-19-25
ANAB	ISO/IEC 17025	L2236	01-19-25
California	State	2954	07-07-22
Florida	NELAP	E87575	06-30-22
Louisiana	NELAP	03073	06-30-22
Maine	State	2020012	05-02-22
Montana (UST)	State	NA	04-14-27
New Jersey	NELAP	WA014	06-30-22
New York	NELAP	11662	04-01-23
Oregon	NELAP	4167	07-07-22
US Fish & Wildlife	US Federal Programs	058448	05-31-22
USDA	US Federal Programs	P330-20-00031	02-10-23
Washington	State	C788	07-13-22
Wisconsin	State	399133460	08-31-22

Sample Summary

Client: Friedman & Bruya
Project/Site: 204225

Job ID: 580-112702-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-112702-1	MW-08-041322	Water	04/13/22 09:10	04/15/22 11:05
580-112702-2	MW-14-041322	Water	04/13/22 10:40	04/15/22 11:05
580-112702-3	MW-12-041322	Water	04/13/22 12:20	04/15/22 11:05
580-112702-4	MW-17-041322	Water	04/13/22 14:30	04/15/22 11:05
580-112702-5	MW-16-041422	Water	04/14/22 09:20	04/15/22 11:05
580-112702-6	MW-16O-041422	Water	04/14/22 09:20	04/15/22 11:05
580-112702-7	MW-15-041422	Water	04/14/22 12:40	04/15/22 11:05
580-112702-8	MW-13-041422	Water	04/14/22 14:05	04/15/22 11:05

SUBCONTRACT SAMPLE CHAIN OF CUSTODY

Send Report To Michael Erdahl
Company Friedman and Bruya, Inc.
Address 3012 16th Ave W
City, State, ZIP Seattle, WA 98119
Phone # (206) 285-8282 merdahl@friedmanandbruya.com

SUBCONTRACTER
Eurofins

PROJECT NAME/NO. 204225
PO # C-148

REMARKS
Aspect EDD

Page # 1 of 1

TURNAROUND TIME
☒ Standard TAT
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

						ANALYSES REQUESTED											
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	Tributyltin											Notes
MW-08-041322		4/13/22	0910	Water	1	X											
MW-14-041322		↓	1040		1	X											
MW-12-041322			1220		1	X											
MW-17-041322			1430		1	X											
MW-16-041422		4/14/22	0920		1	X											
MW-160-041422		↓	0920		1	X											
MW-15-041422			1240		1	X											
MW-13-~~041322~~			1405		1	X											
041422 ME																	

580-112702 Chain of Custody

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Michael Erdahl	Friedman & Bruya	4/15/22	0800
Received by: Tom Blankinship	Blankinship	EETN	4/15/22	1105
Relinquished by:				

Fed[illegible] wet/bub IR8 0.2/0.4 w/o

Login Sample Receipt Checklist

Client: Friedman & Bruya

Job Number: 580-112702-1

Login Number: 112702

List Number: 1

Creator: Vallelunga, Diana L

List Source: Eurofins Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	