100% Remedial Design

Volume II – Part V
Preliminary Waste Determination

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APPENDICES

ABBREVIATIONS

ARL	Analytical Resources, LLC
CFR	Code of Federal Regulations
cm	centimeter
D/F	dioxins/furans
EGL	Environmental Geochemistry Laboratory
EPA	U.S. Environmental Protection Agency
g	gram
January 2023 memo	January 26, 2023, waste characterization memorandum
LDW	Lower Duwamish Waterway
mm	millimeter
RAA	remedial action area
RD	remedial design
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
WAC	Washington Administrative Code

1 Introduction

Sediment and debris samples from the Lower Duwamish Waterway (LDW) upper reach were characterized for waste management as described in the January 26, 2023, waste characterization memorandum (January 2023 memo), prepared by Windward Environmental LLC and Anchor QEA, LLC, for the Lower Duwamish Waterway Group (Appendix A). This *Preliminary Waste Determination* summarizes the field activities, testing methods, and results of the preliminary waste determination for the sediment and debris in the upper reach. This preliminary waste determination and supporting information will be provided to bidders to assist them with selecting their approach for waste management. The selected Remedial Action Contractor will be required to perform a final waste determination in consultation with their selected transportation and disposal subcontractors.

Based on bulk chemistry data for sediment, remedial action areas (RAAs) 18 and 22 were identified as containing sediment that may be hazardous based on the federal toxicity characteristic defined in the Code of Federal Regulations (CFR), Title 40, Part 261.24. RAA 18 was subdivided into northern and southern areas based on separating out the northern portion of RAA 18 for deferral of remedial action until source control sufficiency is addressed, which was assumed in 60% remedial design (RD). RAA 18 South was proposed to be remediated as part of the 60% RD, but based on source control sufficiency recommendations developed by the Washington State Department of Ecology, the U.S. Environmental Protection Agency (EPA) has indicated that the remedy for all of RAA 18 will be deferred until sources are considered sufficiently controlled but within the overall time frame of LDW cleanup. Composite samples of sediment from each of the three areas (RAA 18 North, RAA 18 South, and RAA 22) were analyzed for the following characteristics:

- Material consistency and free liquids to assess the handling characteristics of the dredged material
- Toxicity characteristic leaching procedure (TCLP) chemistry to provide a preliminary waste determination relative to the federal toxicity characteristic
- Bulk chemistry to provide a preliminary waste determination relative to the Washington State criteria for toxic dangerous waste defined in Washington Administrative Code (WAC) 173-303-100.

Per the January 2023 memo, composite sediment samples were also amended with Portland cement and analyzed to provide material handling characteristics and federal waste determination for the material if amendment by dewatering is necessary. The sediment bulk chemistry constituents for analysis (arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc) were selected based on the existing sediment data, as described in the January 2023 memo (Appendix A). These metals were identified as the primary constituents contributing to the Equivalent Concentration, which is the basis for the Washington State toxicity determination.

Three debris piles (Debris Piles 1, 2, and 3), one in RAA 18 South and two in RAA 22 (Appendix A, Map 2), were originally identified to be removed as part of LDW upper reach remedy. As with sediment from RAA 18, remedial action for Debris Pile 1 will be deferred until a later stage of the LDW cleanup. Composite samples were collected from each of the debris piles to characterize the material for waste management. The debris samples were analyzed by TCLP for a preliminary determination of the federal toxicity characteristic and for bulk chemistry to provide a preliminary waste determination relative to the Washington State toxicity characteristic. The debris bulk chemistry constituents (metals, semivolatile organic compounds [SVOC], and dioxins/furans [D/F]) were identified in the January 2023 memo (Appendix A), based on the source of debris potentially being foundry brick and slag from demolished industrial facilities near the LDW.

2 Sediment Physical Characterization

2.1 Unamended Sediment Testing and Results

Testing on unamended sediment was performed to establish a baseline characterization of the physical properties and chemical content. Three composite sediment samples (approximately 500 grams [g] per sample) from RAAs 18 North, 18 South, and 22 were received at the Anchor QEA Environmental Geochemistry Laboratory (EGL) in Portland, Oregon, on February 7, 2023. The sample from RAA 22 was identified as LDW23-CMP22-01, the sample from the northern part of RAA 18 was identified as LDW23-CMP18N-01, and the sample from the southern part of RAA 18 was identified as LDW23-CMP18S-01. Samples were stored at 4°C before undergoing testing. Samples were homogenized in their original sample containers on February 13, 2023, and allowed to settle until analysis began. Prior to analysis, standing water in the sample container was decanted to simulate dewatering that would occur by gravity separation in field conditions. Shear strength, free liquids by paint filter, and moisture content were tested on the unamended samples on February 15, 2023.

2.1.1 Shear Strength Analysis

Shear strength analysis was performed according to ASTM International D8121/D8121M-19, Standard Test Methods for Approximating the Shear Strength of Cohesive Soils by Handheld Vane Shear Device (ASTM 2019). Approximately 100-g aliquots of homogenized sediment samples were placed into pre-cut plastic cylinders and gently tapped until the surface settled to a flat level. A metal Humboldt Manufacturing handheld miniature vane shear device with the large vane (4.8-centimeter [cm] diameter) was inserted into the top face of the sediment and manually rotated at a consistent pressure until failure occurred. The sediment surface was tapped gently to reform a flat surface, and the shear strength test was performed again. This procedure was performed in triplicate for each sample. Two replicate tests from RAA 18 North demonstrated a measurable shear strength. Shear strength analysis on all other samples yielded negligible results (Table 2-1).

2.1.2 Paint-Filter Test (EPA 9050B)

Due to limited sample mass, the same three subsamples from the shear strength test were used to perform free-liquid testing using the paint-filter test according to EPA Method 9095b. Testing for free liquids is a standard component of waste profiling because many landfills cannot accept waste with free liquids. The sediment samples were transferred into a Gerson Manufacturing 260-micron mesh paint filter set in a funnel over a graduated cylinder. The samples were gently tapped to promote settling and then allowed to sit for 5 minutes. After 5 minutes, the graduated cylinder and sides of the funnel stem were inspected for the presence of free liquids. The sample from RAA 22 produced no free liquids. The samples from RAA 18N and RAA 18S both produced more than one drop of free liquid after the 5-minute interval, indicating test failure (Table 2-2). An aliquot of the

remaining sample material was used in moisture content analysis (Section 2.1.3). All excess sample material was collected and archived at 4°C.

2.1.3 Moisture Content Analysis

Moisture content was analyzed according to the EGL standard operating procedure No. 201 as a supplemental analysis to evaluate the amount of water left in the sediment samples after the simulated dewatering procedure. Only 1 to 2 drops of liquid were lost from the 100-g subsample during the free-liquid testing; therefore, the difference in moisture content due to the free-liquid testing should be negligible. The subsample from RAA 18 South was run in duplicate for method quality control. The samples were weighed into aluminum dishes and dried in an oven at 110°C for approximately 18 hours. The final mass of dried samples was recorded, and moisture content was calculated as the mass of water per mass of wet sediment (Table 2-3).

2.2 Amended Sediment Testing and Results

2.2.1 Sediment Amendment

Portland Type IL cement (CalPortland) was used to amend the sediment samples at rates of 2% and 4% by weight (mass of dry cement/mass of wet sediment). A designation of either "-2" or "-4" was added to the identifications of the original sediment samples to identify the 2% and 4% dosages for the cement-amended samples. Sediment samples were homogenized with cement in clean plastic bowls with stainless steel spoons, and aliquots were designated for TCLP analysis by Analytical Resources, LLC (ARL), and shear strength and paint-filter testing by EGL staff. A total of 12 curing molds were prepared for the three sediment samples (Table 2-4). Table 2-4 provides final amendment rates for each sediment sample. Sediment samples were stored at ambient conditions for a 72-hour curing time.

After the amended sediment curing for 72 hours, the TCLP-designated samples were shipped via FedEx to ARL for TCLP analysis, and shear strength and paint-filter tests were performed by EGL staff.

2.2.2 Shear Strength Analysis

Shear strength of the amended sediment samples was analyzed by the same methods outlined in Section 2.1. The vane diameter was selected based on the strength of the amended sediment sample. The sample from RAA 22 with 2% cement was the only sample soft enough to require the 4.8-cm vane; all other samples were analyzed using the standard 2.54-cm vane. Replicate sample measurements were taken inside the hole created by the vane in the first replicate if a hole was created. If the sample was not strong enough to hold its shape or a hole was not created by the first replicate, the sample material was tamped down to create a flat surface, and the replicate

measurements were taken on that surface. Shear strength results and notes on replicate treatment are presented in Table 2-5.

2.2.3 Free Liquids by Paint-Filter Analysis (EPA 9050B)

The presence of free liquids in the amended sediment was evaluated according to the protocol described in Section 2.1.2. No samples produced free liquids (Table 2-6).

3 Sediment Chemical Characterization

Results of chemical testing are presented in the following subsections, and the preliminary waste determination is presented in Section 6. As described in Section 1, samples were analyzed for bulk chemistry to determine if the sediment from each of the RAAs should be characterized as a Washington State-only dangerous waste. Samples were analyzed by TCLP to determine if the unamended and amended sediment from each of the RAAs should be characterized as a federal hazardous waste.

3.1 Bulk Chemistry

Sediment bulk chemistry analysis was performed for the selected metals: arsenic, cadmium, chromium, copper, lead, mercury, silver, and zinc. The results of the sediment bulk chemistry are presented in Table 3-1, including the resulting equivalent concentrations calculated as defined in WAC 173-303-100.

3.2 Toxicity Characteristic Leaching Procedure

TCLP testing was performed by ARL in accordance with EPA Method 1311 for constituents of interest (arsenic, chromium, lead, and mercury) using unamended and amended sediment. The results of the TCLP testing are presented in Table 3-2. The regulatory level for each metal is provided for comparison.

4 Debris Pile Sample Size Reduction Methods

Three 1-gallon samples from debris piles were received at the EGL on March 1, 2023. Representative subsamples of each debris sample were reduced in size using a High Plains Prospectors handheld rock crusher. For each debris pile sample, one subsample was passed through a 9.5-millimeter (mm) sieve for TCLP analysis, and a second subsample was passed through a 2-mm sieve for bulk chemical characterization. After size reduction, the subsamples were stored at 4°C until shipment. The subsamples were shipped on ice to ARL via FedEx for analysis on March 7, 2023. Unpulverized debris at the EGL was archived at 4°C. An additional sample was crushed to pass a 9.5-mm sieve and homogenized for bioassay testing for each of the three debris piles in May 2023.

5 Debris Analytical Results

5.1 Bulk Chemistry

Debris bulk chemistry analysis was performed for metals, SVOCs, and D/F, which were selected as described in Section 1. The full analytical results are provided in Appendix B, and the laboratory reports are available in Appendix C. The constituents that were significant to the waste determination are summarized in Table 5-1, including the resulting equivalent concentrations calculated as defined in WAC 173-303-100.

5.2 Toxicity Characteristic Leaching Procedure

TCLP was performed by ARL in accordance with EPA Method 1311 for the three debris samples for all TCLP metals. The results of the TCLP and testing are presented in Table 5-2, and the laboratory reports are available in Appendix C. The regulatory level for each metal is provided for comparison.

5.3 Bioassay Testing

Bioassay testing was performed by Eurofins Environment Testing Northwest, LLC, in accordance with *Biological Testing Methods 80-12 for the Designation of Dangerous Waste, Static Acute Fish Toxicity Test* (Ecology 2021). The laboratory report is available in Appendix C. The samples of all three debris piles passed the bioassay test. For all three samples, all of the 30 test organisms survived.

6 Waste Determination

The preliminary waste determination considered both the federal toxicity characteristic (40 CFR 261.24), which is based on constituent-specific concentrations in simulated landfill leachate, and the Washington toxic dangerous waste criterion (WAC 173-303-100), which is based on whole sediment toxicity determined either by bulk chemistry (book designation) described in WAC 173-303-100 (5)(b) or a static acute toxicity test (designation from bioassay data) described in WAC 173-303-100 (5)(c).

6.1 Waste Determination for Sediment

The preliminary waste determination found that sediment from RAA 18 South and RAA 22 is nonhazardous considering both the federal toxicity characteristic (based on TCLP testing; Table 3-2) and the Washington toxicity characteristic (based on bulk chemical analysis; Table 3-1). The concentrations of all constituents in the TCLP leachate for these sediment samples were below the regulatory levels in the unamended sediment and the sediment samples amended with 2% and 4% (by weight) Portland cement. Sediment from RAA 18 North passed the TCLP test (Table 3-2) but was preliminarily characterized as a Washington State-only WT02 dangerous waste based on the book designation procedure with an Equivalent Concentration of 0.00181% (Table 3-1). Waste with an Equivalent Concentration of greater than or equal to 0.001% and less than 1.0% is defined as a toxic dangerous waste (dangerous waste number WT02). Given the low concentrations in the TCLP simulated leachate, metals in the RAA 18 North sediment may be mostly immobile.

6.2 Waste Determination for Debris Piles

The concentrations of all constituents in the TCLP leachate for the debris samples were below the regulatory levels (Table 5-2); therefore, none of the debris is federally regulated as hazardous waste. The debris samples also passed the bioassay testing; therefore, none of the debris is a Washington State-only dangerous waste. Based on the results of the bulk chemistry analyses, the debris had been preliminarily determined to be a WT02 dangerous waste based on the book designation (Table 5-1); however, per WAC 173-303-100(5)(d), "If the designation acquired from book designation and bioassay data do not agree, then bioassay data will be used to designate a waste."

7 References

ASTM (ASTM International), 2019. Standard Test Method for Approximating the Shear Strength of Cohesive Soils by the Handheld Vane Shear Device. ASTM D8121/D8121M-19. July 2019.

Ecology (Washington State Department of Ecology), 2021. *Biological Testing Methods 80-12 for the Designation of Dangerous Waste, Static Acute Fish Toxicity Test*. Revised May 2021.

Tables

Table 2-1

Vane Shear Consistency Testing on Unamended Sediment

Sample ID	Sample Description	Shear Value at Failure (kg/cm^2)				
		Replicate 1	Replicate 2	Replicate 3	Mean	Mean Corrected Value
LDW23-CMP22-01	RAA 22	0	0	0	0	0
LDW23-CMP18N-01	RAA 18 North	0	0.01	0.01	0.007	0.001
LDW23-CMP18S-01	RAA 18 South	0	0	0	0	0

Notes:

Testing was performed according to ASTM D8121/D8121M-19, Standard Test Method for Approximating the Shear Strength of Cohesive Soils by the Handheld Vane Shear Device.

The large vane was attached for all samples and a correction of factor of 0.2 was applied.

ASTM: ASTM International

kg/cm^2: kilograms per square centimeter

RAA: remedial action area

Table 2-2
Paint-Filter Testing for Free Liquids on Unamended Sediment

Sample ID	Sample Description	Pass/Fail
LDW23-CMP22-01	RAA 22	Pass
LDW23-CMP18N-01	RAA 18 North	Fail
LDW23-CMP18S-01	RAA 18 South	Fail

Notes:

Testing was performed according to EPA Method 9095B Paint Filter Liquids Test (Revision 2, November 2004).

Pass indicates that no free liquids were collected.

RAA: remedial action area

Table 2-3
Moisture Content Analysis

Sample ID	Sample Description	Weigh Boat (grams)	Weigh Boat + Wet Sample (grams)	Weigh Boat + Dry Sample (grams)	Moisture Content (%)
LDW23-CMP22-01	RAA 22	2.22	29.05	20.35	32.43
LDW23-CMP18N-01	RAA 18 North	2.25	32.68	23.86	28.98
LDW23-CMP18S-01	RAA 18 South	2.24	31.99	23.07	29.98
LDW23-CMP18S-01-LD	RAA 18 South (laboratory duplicate)	2.23	36.47	26.38	29.47

Note:

Duplicate sample relative percent difference = 1.73%

RAA: remedial action area

Table 2-4
Sediment Amendment Rates by Portland Type IL Cement

Sample ID	Testing to Be Performed After Curing	Cement (grams)	Sediment (grams)	Cement Amendment Rate (% by weight)
LDW23-CMP18N-01-2	Shear Strength and Free Liquids	2.14	103.43	2.07
	TCLP	2.09	103.51	2.02
LDW23-CMP18N-01-4	Shear Strength and Free Liquids	4.23	103.22	4.1
	TCLP	4.23	103.58	4.08
LDW23-CMP18S-01-2	Shear Strength and Free Liquids	2.1	102.76	2.04
	TCLP	2.14	102.24	2.09
LDW23-CMP18S-01-4	Shear Strength and Free Liquids	4.2	102.67	4.09
	TCLP	4.18	101.65	4.11
LDW23-CMP22-01-2	Shear Strength and Free Liquids	2.16	101.5	2.13
	TCLP	2.16	101.9	2.12
LDW23-CMP22-01-4	Shear Strength and Free Liquids	4.24	102.76	4.13
	TCLP	4.18	101.42	4.12

Note:

TCLP: toxicity characteristic leaching procedure

Table 2-5

Vane Shear Consistency Testing on Amended Sediment

Sample ID	Vane Correction Factor	Shear Value at Failure (kg/cm^2)						Replicate Measurement Notes
		Rep 1	Rep 2	Rep 3	Mean	Corrected Shear Value	Standard Deviation	
Amended Sediment with 2% Portland Cement by Weight								
LDW23-CMP22-01-2	0.2	0.14	0.13	0.09	0.12	0.02	0.01	Sediment was tamped down between replicate tests.
LDW23-CMP18N-01-2	1	0.225	0.15	0.3	0.23	0.23	0.07	Sample material was removed by vane device, and the next replicate was performed on the void space created by the prior replicate.
LDW23-CMP18S-01-2	1	0.14	0.16	0.2	0.17	0.17	0.03	Sample material was removed by vane device, and the next replicate was performed on the void space created by the prior replicate.
Amended Sediment with 4% Portland Cement by Weight								
LDW23-CMP22-01-4	1	0.2	0.175	0.16	0.18	0.18	0.02	Sediment was tamped down between replicate tests.
LDW23-CMP18N-01-4	1	0.14	0.24	0.3	0.23	0.23	0.08	Sample material was removed by vane device, and the next replicate was performed on the void space created by the prior replicate.
LDW23-CMP18S-01-4	1	0.2	0.2	0.21	0.2	0.2	0.01	Sample material was removed by vane device, and the next replicate was performed on the void space created by the prior replicate.

Notes:

Testing was performed according to ASTM D8121/D8121M-19, Standard Test Method for Approximating the Shear Strength of Cohesive Soils by the Handheld Vane Shear Device.

Vane correction value is given in table. LDW23-CMP22-01-2 was the only sample soft enough to require the large vane. All other samples were tested using the standard vane.

ASTM: ASTM International

kg/cm^2: kilograms per square centimeter

Table 2-6
Paint-Filter Testing for Free Liquids on Amended Sediment

Sample ID	Pass/Fail
Amended Sediment with 2% Portland Cement by Weight	
LDW23-CMP22-01-2	Pass
LDW23-CMP18N-01-2	Pass
LDW23-CMP18S-01-2	Pass
Amended Sediment with 4% Portland Cement by Weight	
LDW23-CMP22-01-4	Pass
LDW23-CMP18N-01-4	Pass
LDW23-CMP18S-01-4	Pass

Notes:

Testing was performed according to EPA Method 9095B, Paint Filter Liquids Test (Revision 2, November 2004).

Pass indicates that no free liquids were collected.

EPA: U.S. Environmental Protection Agency

Table 3-1
Sediment Bulk Chemistry Results

Sample ID	Sample Description	Concentration (mg/kg)								Equivalent Concentration (%)[1]	Waste Determination[2]
		Arsenic	Cadmium	Chromium	Lead	Mercury	Zinc	Copper	Silver		
LDW23-CMP22-01	RAA 22	11.8	10.3	88.3	463	0.193	213	58	0.38	0.000583	Non-Toxic
LDW23-CMP18N-01	RAA 18 North	178	0.59	21.4	26.4	0.155	118	33.1	0.29	0.00181	WT02
LDW23-CMP18S-01	RAA 18 South	38.8	0.73	26.7	45.1	0.149	192	34.6	0.32	0.000436	Non-Toxic

Notes:

1. Equivalent concentration percentages were calculated as defined in WAC 173-303-100.

2. Waste determination is based on the limits identified in WAC 173-303-100(5)(b)(iii), which for WT02 is a waste with an equivalent concentration equal to or greater than 0.001% and less than 1.0%. Waste with an equivalent concentration less than 0.001% is not a toxic dangerous waste.

mg/kg: milligram per kilogram

RAA: remedial action area

WAC: Washington Administrative Code

Table 3-2
Sediment TCLP Results

Sample ID	TCLP Leachate Concentration (mg/L)			
	Arsenic	Chromium	Lead	Mercury
Regulatory Level	5.0	5.0	5.0	0.2
Unamended Sediment				
LDW23-CMP22-01	0.250 U	0.0185 J	0.534	0.000013 J
LDW23-CMP18N-01	0.33	0.0250 U	0.025 J	0.000013 J
LDW23-CMP18S-01	0.117 J	0.0250 U	0.0175 J	0.000013 J
Amended Sediment with 2% Portland Cement by Weight				
LDW23-CMP22-01-2	0.0160 J	0.0250 U	0.0935 J	0.000020 J
LDW23-CMP18N-01-2	0.142 J	0.0250 U	0.100 U	0.000019 J
LDW23-CMP18S-01-2	0.0660 J	0.0040 J	0.100 U	0.000020 J
Amended Sediment with 4% Portland Cement by Weight				
LDW23-CMP22-01-4	0.250 U	0.0060 J	0.100 U	0.000018 J
LDW23-CMP18N-01-4	0.47	0.0030 J	0.100 U	0.000019 J
LDW23-CMP18S-01-4	0.160 J	0.0065 J	0.100 U	0.000021 J

Notes:

Testing was performed according to EPA Method 1311.

EPA: U.S. Environmental Protection Agency

mg/L: milligram per liter

TCLP: toxicity characteristic leaching procedure

Data Qualifiers:

J: estimated concentration value detected below the reporting limit

U: analyte was not detected. Concentration shown is the reporting limit.

Table 5-1
Debris Pile Bulk Chemistry Summary

Sample ID	Concentration (mg/kg)										Equivalent Concentration (%)[1]	Waste Determination[2]
	Arsenic	Cadmium	Chromium	Lead	Mercury	Zinc	Copper	Silver	Nickel	Antimony		
LDW23-DB01	65.4 J, D	5.19 U	876 D	540 D	0.0516	2,650 D	709 D	7.79 U	883 D	130 U	0.00132	WT02
LDW23-DB02	42.7 J, D	28.5 D	1,610 D	13,100 D	0.432	5,480 D	13,500 D	8.82 U	280 D	67.9 J, D	0.0138	WT02
LDW23-DB03	44.8 J, D	17.7 D	388 D	6,110 D	0.11	2,980 D	1,560 D	6.48 J, D	247 D	61.3 J, D	0.00663	WT02

Notes:

1. Equivalent concentrations were calculated as defined in WAC 173-303-100.

2. Waste determination is based on the limits identified in WAC 173-303-100(5)(b)(iii), which for WT02 are wastes with an equivalent concentration equal to or greater than 0.001% and less than 1.0%.

mg/kg: milligram per kilogram

WAC: Washington Administrative Code

Data Qualifiers:

D: The reported value is from a dilution.

J: estimated concentration value detected below the reporting limit

U: This analyte is not detected above the reporting limit or if noted, not detected above the limit of detection. Value was set to reporting limit.

Table 5-2
Debris Pile TCLP Results

Sample ID	TCLP Leachate Concentration (mg/L)							
	Arsenic	Barium	Cadmium	Chromium	Mercury	Lead	Selenium	Silver
Regulatory Level	5.0	100	1.0	5.0	0.2	5.0	1.0	5.0
Debris Piles								
LDW23-DB01	0.250 U	0.388	0.01 U	0.0045 J	0.000007 J	0.014 J	0.25 U	0.015 U
LDW23-DB02	0.250 U	0.283	0.018	0.0165 J	0.00010 U	4.04	0.25 U	0.015 U
LDW23-DB03	0.250 U	0.618	0.16	0.0075 J	0.00010 U	3.49	0.25 U	0.015 U

Notes:

Testing was performed according to EPA Method 1311.

EPA: U.S. Environmental Protection Agency

mg/kg: milligram per kilogram

Data Qualifiers:

J: estimated concentration value detected below the reporting limit

U: This analyte is not detected above the reporting limit or if noted, not detected above the limit of detection. Value was set to reporting limit.

Volume II, Part V – Preliminary Waste Determination

Appendix A
Waste Characterization Memorandum, January 26, 2023

200 First Avenue West • Suite 500 • Seattle, WA 98119

1201 Third Avenue • Suite 2600 • Seattle, WA 98101

MEMORANDUM

To: Lower Duwamish Waterway Group

From: Windward and Anchor QEA

Subject: Waste Characterization

Date: January 26, 2023

INTRODUCTION

As part of the Lower Duwamish Waterway (LDW) upper reach remedy, preliminary waste characterization will be performed to determine disposal requirements for sediment and debris to be removed from remedial action areas (RAAs) where dredging is proposed. Waste characterization determines if material can be managed as a nonhazardous waste, or if regulations for managing hazardous waste apply. Preliminary waste characterization results and results from other environmental sampling efforts will be provided to bidders to inform their plans for dredging and management of dredged material.

This memorandum describes the waste characterization process that will be conducted for material to be removed from proposed dredge areas. Toxicity characteristic leaching procedure (TCLP) testing and bulk chemistry analyses on composite samples for specific sediment management areas will be required for the disposal of material from areas with existing data that exceed screening levels. The TCLP testing will be performed on unamended composite samples as well as composite samples amended with Portland cement to simulate potential conditions of the dredged sediment as it will be received at the transload facility. In addition, waste characterization will be

conducted to characterize the debris piles within remedial areas, including bulk chemistry and TCLP testing.

DREDGED SEDIMENT CHARACTERIZATION

Evaluation of existing sediment data

Sediment data from RAAs were reviewed to identify RAAs with concentrations of any toxicity characteristic constituents exceeding conservative TCLP screening levels based on the Toxicity Characteristic Regulatory Levels. Table 1 presents these levels for arsenic, chromium, lead, and mercury, which are the only toxicity characteristic constituents that exceeded the conservative screening levels in any of the samples. The existing bulk chemistry data were also reviewed to screen for Washington State dangerous waste toxicity criteria (Washington Administrative Code, Section 173-303-100).

Table 1. Toxicity characteristic regulatory and screening levels

Constituent	Toxicity Characteristic Regulatory Level (mg/L)	TCLP Screening Level[a] (mg/kg)
Arsenic	5.0	100
Chromium	5.0	100
Lead	5.0	100
Mercury	0.2	4

[a] Screening levels are based on the "20 times rule" (i.e., they are the regulatory level divided by 20).

TCLP – toxicity characteristic leaching procedure

TCLP and bulk chemistry testing of composite samples created from archived sediment samples will be required to perform a waste determination for the disposal of dredged material from areas with any sediment concentrations exceeding screening levels. The testing for the federal hazardous waste screening and Washington State dangerous waste screening are performed following different procedures, as described below.

Federal toxicity characteristic screening

TCLP testing for the federal toxicity characteristic, as defined in the Code of Federal Regulations (CFR), Title 40, Part 261.24, is performed by preparing a simulated landfill leachate by extracting regulated constituents from the waste sample using a weak acid solution. The mass of extraction fluid is 20 times the mass of the waste sample. Given this dilution, materials with total constituent concentrations (in mg/kg) that are less than 20 times the toxicity characteristic regulatory level (in mg/L) are assumed to pass TCLP. Because the screening levels are conservative, materials with total constituent concentrations greater than 20 times screening levels may still pass TCLP and not be characterized as hazardous waste.

Concentrations of arsenic, chromium, lead, and mercury in at least one discrete sediment sample within RAAs 18 and 22 were greater than screening levels (Table 2).

No sediment samples from other RAAs exceeded the TCLP screening levels. RAA 18 is large and has been divided into two subareas: a northern area that corresponds approximately to RAAs 18A and 18B and a southern area that corresponds approximately to RAAs 18C, 18D, and 18E (Map 1).

Table 2. Samples with concentrations exceeding toxicity characteristic screening levels

RAA	Sample Location	Year	Interval	Chemical Exceeding Screening Level	Screening Level (mg/kg)	Concentration (mg/kg)
18 North (RAAs18A and 18B)	SD-504	2012	2–3 ft	arsenic	100	268
	LDW21-IT585	2021	2.5–3.5 ft	arsenic	100	844
			4.5–5.4 ft	arsenic	100	184
			5.4–7.0 ft	arsenic	100	307
	LDW-SC50a	2005	0–1 ft	arsenic	100	707
			1–2 ft	arsenic	100	281
			2–3 ft	arsenic	100	161
	LDW-SS114	2005	0–10 cm	arsenic	100	1,100
				lead	100	110
	SD-506	2012	2–3 ft	arsenic	100	270
	LDW21-IT588	2021	1.5–2.5 ft	arsenic	100	243
			2.5–3.5 ft	arsenic	100	651
			4.5–5.5 ft	arsenic	100	315
	RARE_2_B_1	2015	0–10 cm	lead	100	118
	RARE_2_B_2	2015	0–10 cm	lead	100	125
	RARE_2_B_3	2015	0–10 cm	lead	100	110
	RARE_2_B_6	2015	0–10 cm	lead	100	409
	PMU-3-2018	2018	0–10 cm	lead	100	206
18 South (RAAs 18C, 18D, and 18E)	R23	1997	0–10 cm	lead	100	221
	LDW-SS157	2005	0–10 cm	lead	100	148
	LDW-SS158	2005	0–10 cm	chromium	100	174
	SD-508	2012	2–3 ft	arsenic	100	248
	LDW21-IT592	2021	0–1.5 ft	arsenic	100	156
			1.5–2.0 ft	arsenic	100	186
	SD-510	2012	4–5 ft	arsenic	100	278

RAA	Sample Location	Year	Interval	Chemical Exceeding Screening Level	Screening Level (mg/kg)	Concentration (mg/kg)
22	AN-027	2006	0–10 cm	lead	100	191
	AN-029	2006	0–10 cm	lead	100	128
				mercury	4	6.8
	AN-045	2006	0–10 cm	lead	100	152
	LDW21-SC620	2021	0–2 ft	lead	100	113
	LDW20-SS243	2020	0–10 cm	lead	100	158
	AN-043	2006	1–2 ft	chromium	100	514
				lead	100	2,530
	AN-047	2006	0–10 cm	chromium	100	178
				lead	100	370
	LDW21-SS619	2021	0–10 cm	lead	100	141
	AN-044	2006	0–1 ft	Lead	100	161

Notes:

Shading indicates samples that are archived and could be included in composites for TCLP testing.

A total of 164 samples (63 in Area 18 North, 58 in Area 18 South, and 43 in Area 22) were screened for potential TCLP exceedances

RAA – remedial action area

TCLP – toxicity characteristic leaching procedure

In RAA 18, 17 locations had at least 1 interval with arsenic, lead, or chromium concentrations greater than screening levels (in that order of frequency). In RAA 22, 8 locations had at least 1 interval with lead, chromium, or mercury concentrations greater than screening levels (in that order or frequency). Note that the sediment data used in the screening process were biased toward areas believed to have the highest concentrations because these areas were targeted for design sampling. In addition, the data represented small vertical intervals (generally 4 in (10 cm) or 1 ft) from single sampling locations. Waste characterization, by contrast, is intended to represent the entire volume of waste; therefore, the waste characterization process will be performed on a composite of material from an entire dredge area.

Based on the evaluation of existing data, TCLP testing will be performed on composite samples representing the areas identified as RAA 18 North, RAA 18 South, and RAA 22. No samples from any other RAA had concentrations of toxicity characteristic constituents exceeding the TCLP screening levels. Therefore, no additional waste characterization will be performed on the sediment from the other RAAs.

Washington State dangerous waste screening

The Washington State dangerous waste toxicity criteria are defined in the Washington Administrative Code, Section 173-303-100. Unlike the federal toxicity characteristic, the waste toxicity determination for Washington State is performed by comparing bulk chemistry concentrations to certain published toxicity data.

The highest concentrations of each constituent found in any sample in each of the three areas identified in RAA 18 North, RAA 18 South, and RAA 22 were compared with the Washington State dangerous waste toxicity criteria. The results of the dangerous waste screening are summarized in Table 3. Based on this comparison, further characterization will be required using composite samples from each of these areas. The preliminary screening results also indicate that sediment from RAA 18 North may be a WT02 dangerous waste, and sediment from RAA 18 South and RAA 22 may be WT02 special wastes.

Table 3. Dangerous waste screening summary

Constituent	Toxic Category[1]	Maximum Concentration By Area (%)		
		Area 18 North	Area 18 South	Area 22
Arsenic	A	0.11	0.0278	0.00267
Cadmium	D	0.000221	0.00029	0.00169
Chromium	D	0.0076	0.0174	0.0514
Copper	D	0.00777	0.00997	0.0228
Lead	B	0.0409	0.0221	0.293
Mercury	B	0.000034	0.000031	0.00068
Silver	D	0.0002	0.00023	0.00032
Zinc	D	0.077	0.179	0.125
Equivalent Concentration[2]		0.0114	0.00302	0.00322
Dangerous Waste Designation[3]		WT02	WT02 Special Waste[4]	WT02 Special Waste[4]

Notes:

1 – Toxic categories determined from the Registry for Toxic Effects of Chemical Substances (RTECS) per WAC 173-303-100(5)(b)(1)

2 – Equivalent Concentration calculated using the formula given in WAC 173-303-100(5)(b)(2) based on the toxic categories (X, A, B, C, and D).

$$\text{Equivalent Concentration} = \sum X\%/1 + \sum A\%/10 + \sum B\%/100 + \sum C\%/1{,}000 + \sum D\%/10{,}000$$

3 – Dangerous Waste designation determined based on the Equivalent Concentration per WAC 173-303-100(5)(b)(iii).

4—Special wastes are identified in WAC 173-303-073 as posing a relatively low hazard to human health and the environment and are excluded from certain regulations applicable to dangerous waste.

COMPOSITING PLAN

This section presents the plan to develop sediment composite samples for waste characterization. This plan proposes use of existing, archived samples for development of the composites.

Preliminary dredge volume estimates have been developed for RAA 18 and RAA 22. These volumes are subject to change. The estimated dredge volume in RAA 18 is 14,000 CY (10,300 CY in RAA 18 North and RAA 3,700 CY in 18 South), and the estimated volume in RAA 22 is 2,500 CY. Preliminary waste characterization, pursuant to this

plan, will be performed to determine if the material to be removed from an RAA may be managed as a nonhazardous waste, or if regulations for managing hazardous or dangerous waste apply. The results of this preliminary waste characterization will be provided to bidders to develop their proposals for construction.

Sediment composite samples for RAA 18 North, RAA 18 South, and RAA 22 will be created at Analytical Resources, LLC laboratories (ARL) using samples identified in Figure 1 and Table 4. Archived samples from the Phase II Pre-Design Investigation (PDI) and samples collected during the Phase III PDI will be used to prepare one composite sample each to represent RAA 18 North, RAA 18 South, and RAA 22 (Map 1). Each composite sample will be created using an equal mass from each sediment sample. The target mass of each composite sample is approximately 800 g. Therefore, each of the 46 samples will contribute 20 g to the RAA 18 North composite, each of the 13 samples will contribute 60 g to the RAA 18 South composite, and each of the 7 samples will contribute 120 g to the RAA 22 composite.

Each composite sample will be homogenized and subsamples will be prepared for total metals and TCLP testing. Samples for total metals analysis and unamended samples for TCLP testing will be retained at ARL. The remaining material from each composite sample will be shipped to Anchor QEA in coolers on ice to be tested for free liquids (paint filter test) and consistency (miniature vane shear). Anchor QEA will also amend aliquots from each composite sample with Portland cement.

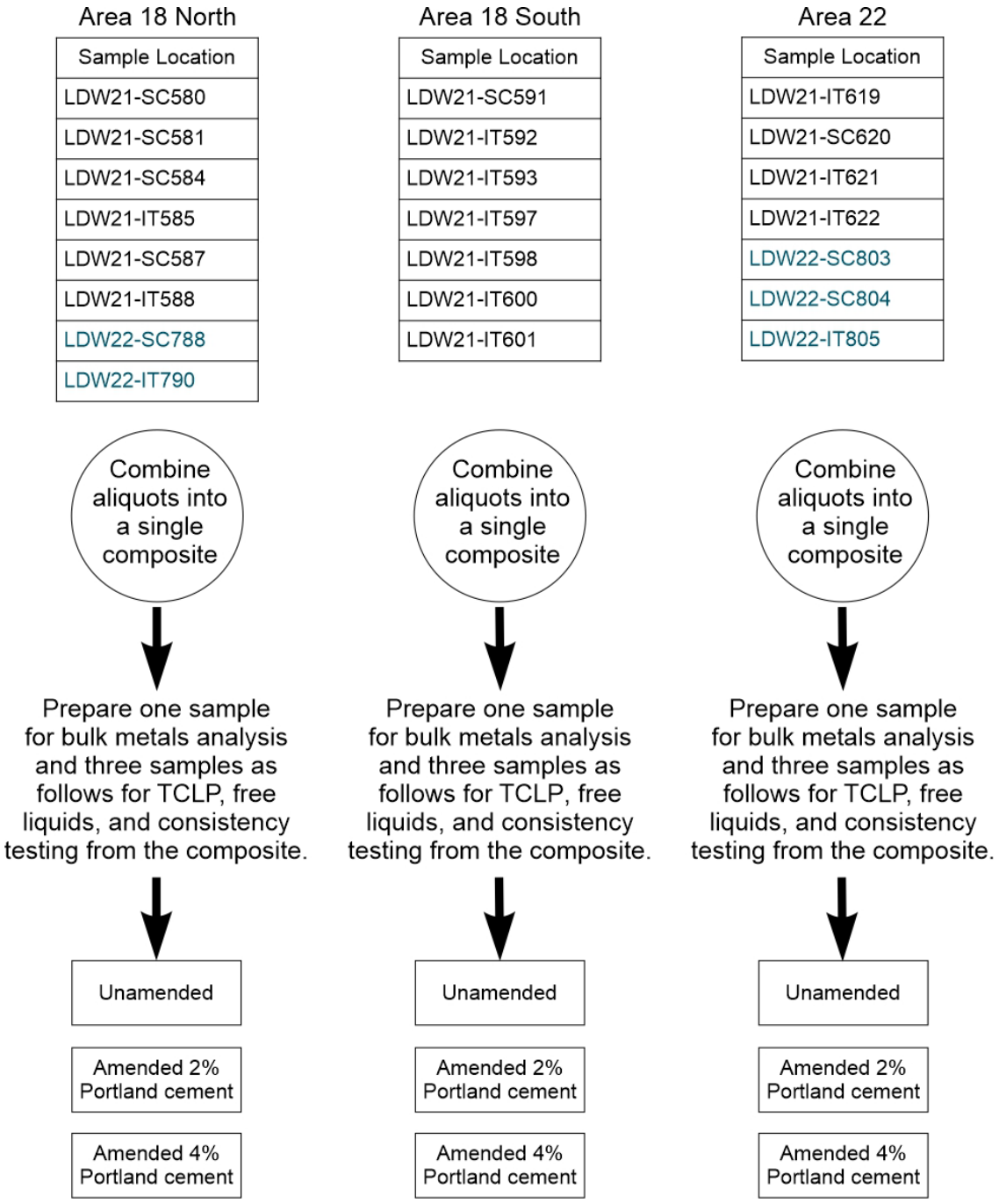


Figure 1. Waste characterization sampling and analysis

Table 4. Component samples for each sediment composite sample

Composite	Subarea	Dredge Depth	Location	Sample	Depth Interval
Area 18 North	18A	9.5 ft	580	SC580A	0–2 ft
			581	IT581A	0–1.5 ft
				IT581B	1.5–2.5 ft
				IT581C	2.5–3.5 ft
				IT581D	3.5–4.5 ft
				IT581E	4.5–5.5 ft
				IT581F	5.5–6.5 ft
			584	SC584A	0–2 ft
				SC584B	2–3 ft
				SC584C	3–4 ft
				SC584D	4–5 ft
				SC584E	5–6 ft
			585	IT585A	0–1.5 ft
				IT585B	1.5–2.5 ft
				IT585C	2.5–3.5 ft
				IT585D	3.5–4.5 ft
				IT585E	4.5–5.5 ft
				IT585F	5.5–6.5 ft
			788	SC788A	0–2 ft
				SC788B	2–3 ft
				SC788C	3–4 ft
				SC788D	4–5 ft
				SC788E	5–6 ft
				SC788F	6–7 ft
				SC788G	7–8 ft
				SC788H	8–9 ft
			790	IT790A	0–1.5 ft
				IT790B	1.5–2.5 ft
				IT790C	2.5–3.5 ft
				IT790D	3.5–4.5 ft
				IT790E	4.5–5.5 ft
				IT790F	5.5–6.5 ft
				IT790G	6.5–7.5 ft
				IT790H	7.5–8.5 ft
				IT790I	8.5–9.5 ft

Composite	Subarea	Dredge Depth	Location	Sample	Depth Interval
Area 18 North	18B	6 ft	587	SC587A	0–2 ft
				SC587B	2–3 ft
				SC587C	3–4 ft
				SC587D	4–5 ft
				SC587E	5–6 ft
			588	IT588A	0–1.5 ft
				IT588B	1.5–2.5 ft
				IT588C	2.5–3.5 ft
				IT588D	3.5–4.5 ft
				IT588E	4.5–5.5 ft
				IT588F	5.5–6.5 ft
Area 18 South	18C	3 ft	591	SC591A	0–2ft
				SC591B	2–3 ft
			592	IT592A	0–1.5 ft
				IT592B	1.5–2.5 ft
			593	IT593A	0–1.5 ft
				IT593B	1.5–2.5 ft
	18D	3.5 ft	597	IT597A	0–1.5 ft
				IT597B	1.5–2.5 ft
				IT597C	2.5–3.5 ft
	18E	2.5 ft	598	IT598A	0–1.5 ft
				IT598B	1.5–2.5 ft
			600	IT600	0–1.5 ft
			601	IT601	0–1.5 ft
Area 22	na	2 ft	619	IT619	0–1.5 ft
			620	IT620	0–1.5 ft
			621	IT621	0–1.5 ft
			622	IT622A	0–1.5 ft
			803	SC803	0–2 ft
			804	SC804A	0–2 ft
			805	IT805	0–1.5 ft

na – not applicable

SAMPLE PREPARATION

Amended samples will be prepared by determining the wet weight of the raw sediment samples and adding 2 and 4% Portland cement (dry weight of Portland cement per wet weight of sediment) and mixing thoroughly. The amended material from each treatment will be divided into three subsamples and allowed to cure in molds for three

days. After curing, one subsample from each amendment will be returned to ARL to be tested for toxicity characteristic metals using the TCLP, a second subsample will be tested for free liquids using the paint filter test (Method 9095B), and a third subsample will be tested for consistency using the miniature vane shear test (American Society for Testing and Materials [ASTM] Method D8121/D8121M-19). TCLP extracts will be prepared by US Environmental Protection Agency (EPA) Method 1311. At the proposed amendment percentages, the cured samples are expected to be friable; if the amended samples are monolithic solids and incapable of passing through a 9.5-mm (0.375-in.) sieve, they will be crushed as required by Section 7.1.3 of the TCLP (Method 1311).

ANALYTICAL METHODS

Leachate will be analyzed for arsenic, chromium, lead, and mercury, which are the only toxicity characteristic constituents that exceeded the conservative screening levels in any of the samples. Analytical methods for sediment characterization are presented in Table 5.

Table 5. Analytical methods and sample handling requirements for sediment samples and sediment TCLP leachates

Matrix	Analyte	Method	Reference	Container	Preservative	Sample Holding Time
Sediment	metals	ICP-AES	EPA 6010D	glass jar	4°C	6 months
Sediment	na	TCLP leach	EPA 1311	resealable bag	cool to ≤ 6°C	6 months (metals), 28 days (mercury)
Leachate	selected metals[1]	ICP-AES	EPA 6010D	glass jar	TCLP extract - 4°C with minimal headspace	6 months
Leachate	mercury	CV-AFS	EPA 7470A	glass jar	TCLP extract - 4°C with minimal headspace	28 days

Notes:

1 – arsenic, chromium, lead, and mercury

AES – atomic emission spectrometry

AFS – atomic fluorescence spectroscopy

CV – cold vapor

EPA – US Environmental Protection Agency

ICP – inductively coupled plasma

TCLP – toxicity characteristic leaching procedure

DEBRIS CHARACTERIZATION

Three piles of debris, including slag and foundry brick, were identified in RAA 18 and RAA 22 (Map 2). Debris materials within these RAAs will be removed prior to dredging. Therefore, the debris requires characterization to determine appropriate disposal options. Debris will be collected from each pile and composited to prepare samples representative of each pile.

The debris piles have been in place for many years with exposure to weather and surface water. Sediment has been deposited on the surface of the debris. Several factors limit safety when sampling the debris piles, including the presence of wet, fine-grained sediment, large and potentially sharp surfaces, and the growth of algae or other potentially slippery material. Random sample aliquots will be collected from as much of each pile as can be safely accessed. The number of aliquots will be determined based on the size of the pile and the aforementioned safety considerations in accordance with the *Standard Guide for Sampling Waste Piles* (ASTM D6009-19). Aliquots will be collected by removing or breaking pieces of the debris from the pile at the randomly selected locations.

Composites will be prepared by mixing equal-mass portions of each aliquot and then preparing the composites for the specific tests. Sample material will be crushed as required for the two types of testing. TCLP requires particle size reduction to 9.5 mm (Method 1311), and bulk chemistry testing requires particle size reduction to 2 mm.

The following analyses will be performed on the composite samples to characterize the material:

- Bulk chemistry to determine total concentrations of metals, semivolatile organic compounds (SVOCs), and dioxins and furans
- TCLP to determine total concentrations of constituents identified in Title 40, Part 261.24 of the CFR

Analytical methods for debris characterization are presented in Table 6. Debris samples will be stored in accordance with the conditions specified for the methods. After pulverization, samples will be shipped to ARL in coolers on ice. The laboratories will preserve and store samples as described in Table 6. Samples will be disposed of after hold times expire, following written authorization from the Windward Environmental LLC (Windward) project manager.

Table 6. Analytical methods and sample handling requirements for debris samples

Parameter	Method	Reference	Container	Preservative	Sample Holding Time
Metals	ICP-AES	EPA 6010D	glass jar	4°C	6 months
Mercury	CV-AFS	EPA 7470A	glass jar	4°C	28 days

Parameter	Method	Reference	Container	Preservative	Sample Holding Time
SVOCs	GC/MS	EPA 8270C	glass jar	4°C	14 days to extraction; 40 days to analysis 14 days to TCLP extraction; 7 days to prepare analytical extract; 40 days to analysis
Dioxins and furans	HRGC/HRMS	EPA 8290A	glass jar	6°C	30 days until extraction; 45 days to analysis

AES – atomic emission spectrometry
AFS – atomic fluorescence spectroscopy
CV – cold vapor
EPA – US Environmental Protection Agency
GC – gas chromatography
HRGC – high resolution gas chromatography
HRMS – high resolution mass spectrometry
ICP – inductively coupled plasma
MS – mass spectrometry
SVOC – semivolatile organic compound
TCLP – toxicity characteristic leaching procedure

SAMPLE HANDLING AND IDENTIFICATION

Unique alphanumeric identifications (IDs) will be assigned to each sample. The sample IDs for composite samples will include the following:

- Project area ID (i.e., LDW) and two-digit year (i.e., 23)
- Sample type:
  - Sediment composite – CMP
  - Debris – DB
- Area Number
  - Sediment composites – 18N, 18S, or 22
  - Debris samples – debris area 1, 2, or 3

For example, a composite sample from RAA 18 North would be labeled LDW23-CMP18N-01 and the first debris sample from debris area 1 would be labeled LDW23-DB01-1.

ANALYTICAL DATA MANAGEMENT

All field data will be recorded on field forms, which the field coordinator will check for missing information at the end of each field day and amend as necessary. A quality control check will be done to ensure that all data have been transferred accurately from the field forms to the database. Field forms will be archived in the Windward library.

Analytical laboratories are required to submit data in an electronic format, as described in the PDI quality assurance project plan (Windward and Anchor QEA 2020). The laboratory project manager will contact the project quality assurance/quality control coordinator prior to data delivery to discuss specific format requirements.

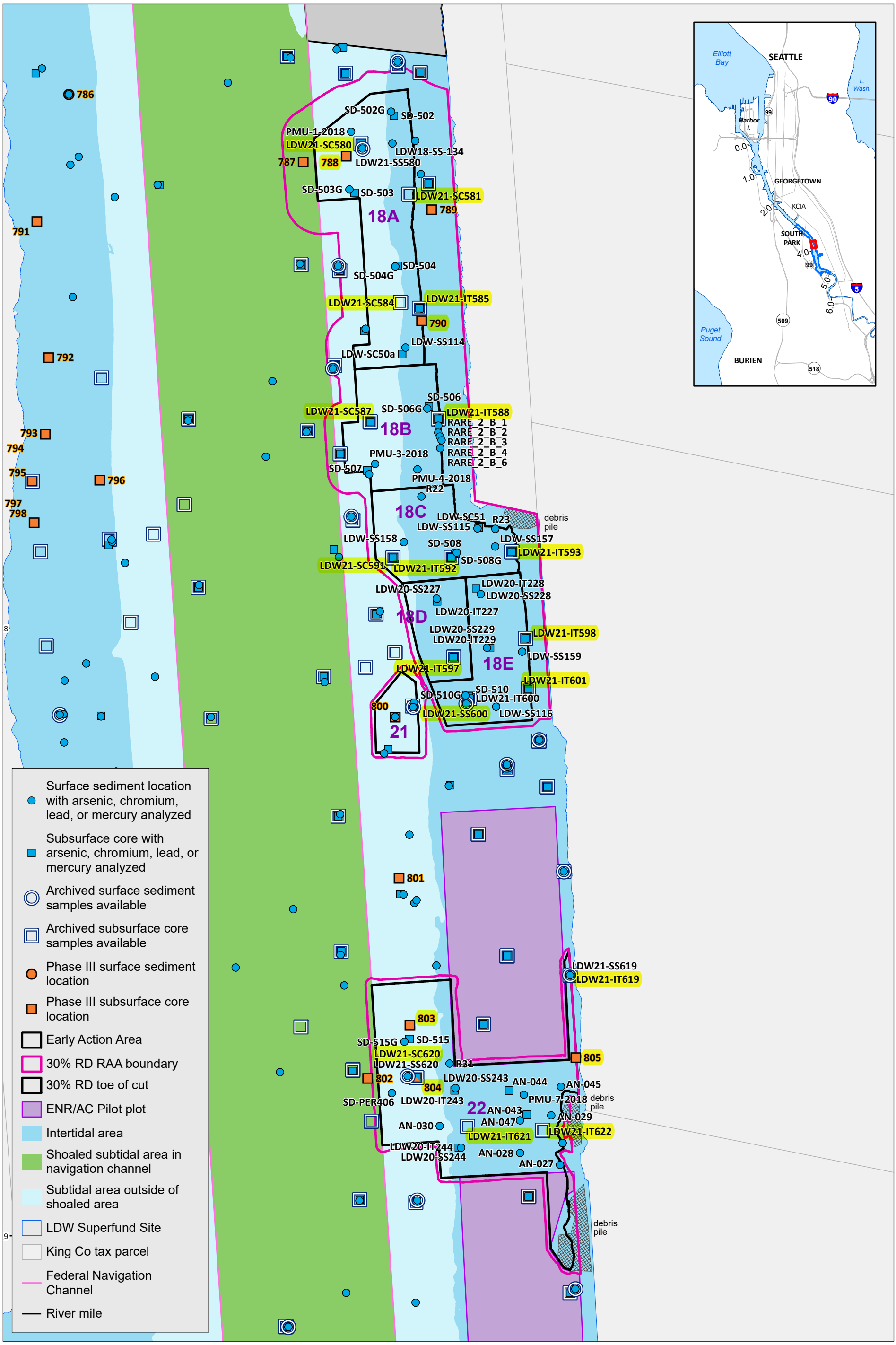
SCHEDULE

Preparation of composite sediment samples will begin as soon as possible. ARL will retain composites for testing unamended sediment and ship the remaining sample material to Anchor QEA's geochemical laboratory for preparation of amended samples and testing for free liquids and material consistency. The Anchor QEA laboratory will return amended samples to ARL for TCLP testing by the end of February 2023. All analytical data for sediment will be received from ARL by the end of March, and waste determinations will be made and incorporated into the draft final specifications during April 2023.

Daytime tides will not be sufficiently low for debris sampling until the end of February 2023. Sample collection is tentatively scheduled for February 27, and samples will be sent to the Anchor QEA lab for compositing and size reduction suitable for TCLP and bulk chemistry analyses. The prepared samples will be sent to ARL by the middle of March for analysis. Analytical results will be received in early April, and the waste determination for the debris will be completed and incorporated into the specifications by the end of April 2023.

REFERENCES

Windward, Anchor QEA. 2020. Lower Duwamish Waterway quality assurance project plan for remedial design of Upper Reach: pre-design investigation. Final. Submitted to EPA May 19, 2020. Windward Environmental LLC and Anchor QEA, Seattle, WA.



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Lower Duwamish Waterway Group

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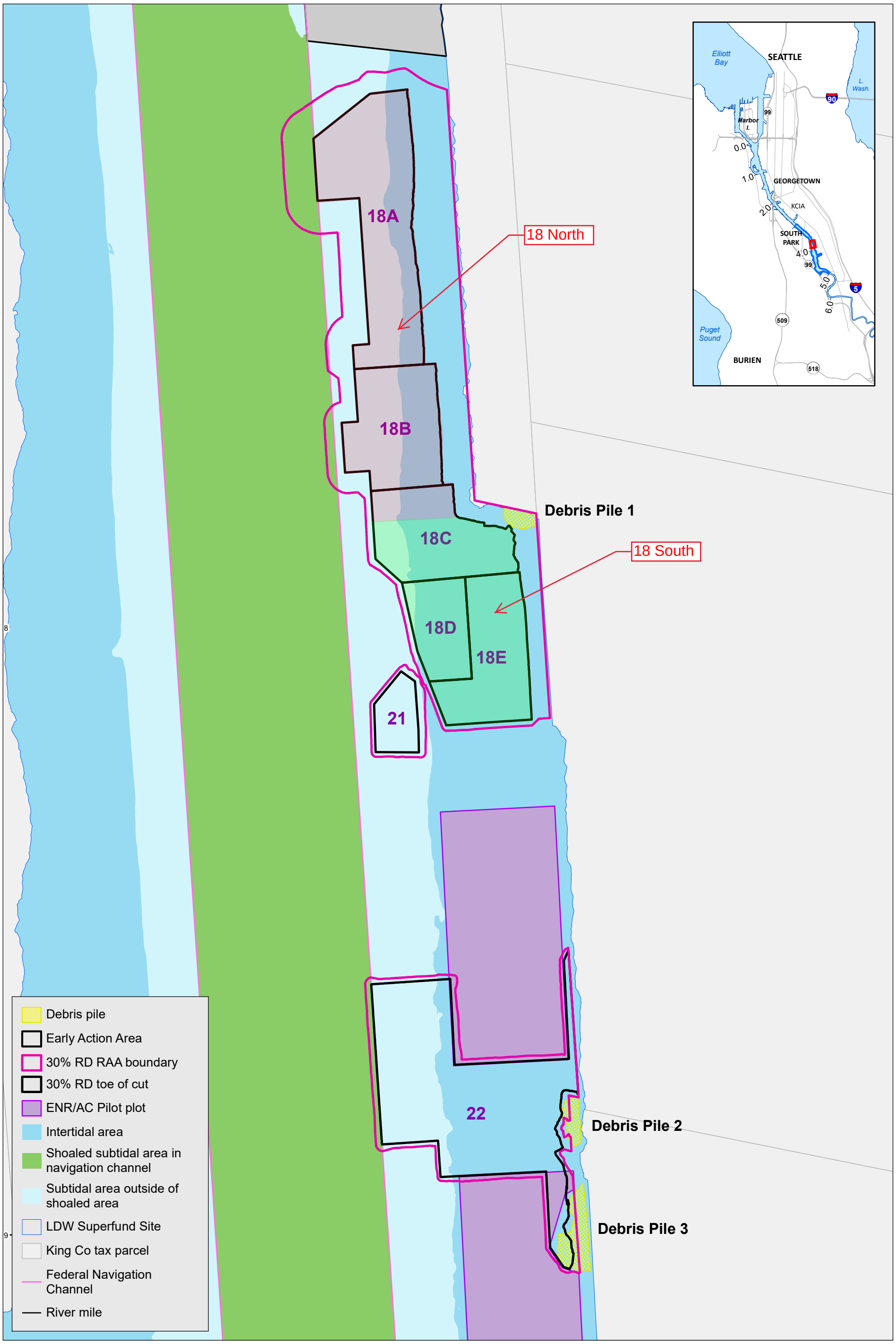
Map 1. Sample locations in RAAs 18 and 22

LDW Upper Reach Waste Characterization Memo

DRAFT

JANUARY 25, 2023

Prepared by craigh, 1/25/23; W:\Projects\Duwamish AOC4\GIS\Maps and Analyses\Phase II\30 Percent Design\TCLP\Map 1 7487 TCLP.mxd



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N

0 50 100 Feet

0 20 40 Meters

Map 2. Debris pile locations

LDW Upper Reach Waste Characterization Memo

DRAFT

JANUARY 26, 2023

Prepared by craigh, 1/26/23; W:\Projects\Duwamish AOC4\GIS\Maps and Analyses\Phase II\30 Percent Design\TCLP\Map 2 7487 TCLP - debris piles.mxd

Volume II, Part V – Preliminary Waste Determination

Appendix B
Debris Pile Bulk Chemistry Analytical Results

Appendix B
Debris Pile Bulk Chemistry Analytical Results

Analyte	Method	LDW23-DB01		LDW23-DB02		LDW23-DB03	
Total solids	D2216	92.31		83.3		81.77	
Metals (mg/kg)							
Antimony	SW6010	130	U	67.9	J, D	61.3	J, D
Arsenic	SW6010D	65.4	J, D	42.7	J, D	44.8	J, D
Cadmium	SW6010D	5.19	U	28.5	D	17.7	D
Chromium	SW6010	876	D	1,610	D	388	D
Copper	SW6010D	709	D	13,500	D	1,560	D
Lead	SW6010	540	D	13,100	D	6,110	D
Mercury	SW7471B	0.0516		0.432		0.11	
Nickel	SW6010	883	D	280	D	247	D
Silver	SW6010	7.79	U	8.82	U	6.48	J, D
Zinc	SW6010D	2,650	D	5,480	D	2,980	D
Semivolatile Organic Compounds (SVOCs; µg/kg)[1]							
1,2,4-Trichlorobenzene	SW8270E	79.7	U	400	U	19.2	J, D
1,2-Dichlorobenzene	SW8270E	79.7	U	400	U	30.0	J, D
1,4-Dichlorobenzene	SW8270E	79.7	U	400	U	12.8	J, D
2,4-Dimethylphenol	SW8270E	399	U	2,000	U	400	U
2-Methylnaphthalene	SW8270E	73.2	J, D	110	J, D	63.5	J, D
2-Methylphenol (o-Cresol)	SW8270E	79.7	U	400	U	79.9	U
4-Methylphenol (p-Cresol)	SW8270E	79.7	U	400	U	79.9	U
Acenaphthene	SW8270E	83.3	D	896	D	79.9	U
Acenaphthylene	SW8270E	79.7	U	400	U	79.9	U
Anthracene	SW8270E	31.5	J, D	1,040	D	34.8	J, D
Benzo(a)anthracene	SW8270E	98.2	D	2,860	D	66.4	J, D
Benzo(a)pyrene	SW8270E	76.7	J, D	1,570	D	49.0	J, D
Benzo(b,j,k)fluoranthenes	SW8270E	255	D	3,620	D	114	J, D
Benzo(g,h,i)perylene	SW8270E	98.3	D	1,050	D	64.1	J, D
Benzoic acid	SW8270E	797	U	4,000	U	799	U
Benzyl alcohol	SW8270E	79.7	U	400	U	79.9	U
bis(2-Ethylhexyl)phthalate	SW8270E	175	J, D	1,000	U	77.6	J, D
Butylbenzyl phthalate	SW8270E	79.7	U	400	U	64.1	J, D
Chrysene	SW8270E	201	D	3,310	D	108	D
Dibenzo(a,h)anthracene	SW8270E	79.7	U	408	D	79.9	U
Dibenzofuran	SW8270E	65.5	J, D	914	D	79.9	U
Diethyl phthalate	SW8270E	199	U	1,000	U	200	U
Dimethyl phthalate	SW8270E	79.7	U	400	U	79.9	U
Di-n-butyl phthalate	SW8270E	77.5	J, D	302	J, D	174	D
Di-n-octyl phthalate	SW8270E	79.7	U	400	U	79.9	U

Appendix B
Debris Pile Bulk Chemistry Analytical Results

Analyte	Method	LDW23-DB01		LDW23-DB02		LDW23-DB03	
Fluoranthene	SW8270E	394	D	11,800	D	168	D
Fluorene	SW8270E	62.6	J, D	1,650	D	79.9	U
Hexachlorobenzene	SW8270E	79.7	U	400	U	79.9	U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8270E	79.7	U	400	U	79.9	U
Indeno(1,2,3-c,d)pyrene	SW8270E	73.4	J, D	1,010	D	79.9	U
Naphthalene	SW8270E	83.1	D	165	J, D	102	D
n-Nitrosodiphenylamine	SW8270E	79.7	U	400	U	79.9	U
Pentachlorophenol	SW8270E	399	U	2,000	U	400	U
Phenanthrene	SW8270E	355	D	13,400	D	249	D
Phenol	SW8270E	27.2	J, D	400	U	79.9	U
Pyrene	SW8270E	281	D	8,850	D	156	D
Dioxins/Furans (ng/kg)							
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	SW8290	34.8		135		256	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	SW8290	1,230		798		1,280	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	SW8290	25		380		680	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	SW8290	243		248		502	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	SW8290	2.22		24.3		49.5	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290	4.74		80		207	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290	2.08	EMPC	13.2		35.4	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290	4.12		87.1		218	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290	15.8		23.2		59.3	
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	SW8290	1.22		19.5		44.9	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290	11.8		19.2		51.9	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290	5.93		73.3		245	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290	6.84		43.1		115	
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	SW8290	3.71		98.8		255	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	SW8290	6.47		126		360	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	SW8290	14.4	X	76.1	X	237	X
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290	1.42		4.68		15.2	
Total Heptachlorodibenzofuran (HpCDF)	SW8290	62.6		523		935	
Total Heptachlorodibenzo-p-dioxin (HpCDD)	SW8290	502		466		928	
Total Hexachlorodibenzofuran (HxCDF)	SW8290	57.8		888		2,010	
Total Hexachlorodibenzo-p-dioxin (HxCDD)	SW8290	125		254		856	
Total Pentachlorodibenzofuran (PeCDF)	SW8290	78		1,520		4,930	
Total Pentachlorodibenzo-p-dioxin (PeCDD)	SW8290	16.3		222		693	
Total Tetrachlorodibenzofuran (TCDF)	SW8290	89.7		1,820		6,030	
Total Tetrachlorodibenzo-p-dioxin (TCDD)	SW8290	7.32		160		554	

Appendix B
Debris Pile Bulk Chemistry Analytical Results

Notes:

1. SVOC results are from diluted samples.

µg/kg: microgram per kilogram

GC/MS: gas chromatography/mass spectrometry

mg/kg: milligram per kilogram

ng/kg: nanogram per kilogram

pct: percent

SVOC: semivolatile organic compound

Data Qualifiers:

D: The reported value is from a dilution.

EMPC: Estimated Maximum Possible Concentration qualifier for high resolution gas chromatography/mass spectrometry dioxin analysis.

J: Estimated concentration. Constituent was detected below the reporting limit.

M: Estimated value for a GC/MS analyte detected and confirmed by an analyst but with low spectral match parameters.

U: Not detected above the reporting limit or if noted, not detected above the limit of detection.

X: Indicates possible chlorinated diphenyl ether interference.

Volume II, Part V – Preliminary Waste Determination

Appendix C
Laboratory Reports

Analytical Resources, LLC
Analytical Chemists and Consultants

13 March 2023

Ali Judkins
Anchor QEA, LLC
1201 3rd Ave, Suite 2600
Seattle, WA 98101

RE: AOC4 UR Phase 3 (180067-02.04)

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
23B0051	N/A

Susan Dunnihoo

Digitally signed by Susan Dunnihoo
Date: 2023.03.13 07:50:57 -07'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Susan Dunnihoo, Director, Client Services

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Accredited in accordance with nelac
Cert# 100006-012

23B0051

1 of 1

CHAIN-OF-CUSTODY/TEST REQUEST FORM

№ 3407

18.3°C

Project/Client Name: LDW AOC4
Project Number: Task 802
Contact Name: Amara Vanderwort
Sampled By: AVICC

Ship to: ARL
Attn: Sue Dunnihoo
Shipper: Hand-Delivered
Form filled out by: AVICC

Shipping Date: 2/2/23
Airbill Number: —
Turnaround requested: Std.

Sample Collection Date (m/d/y)	Time	Sample Identification	Volume of Sample / # of Containers	Matrix	Test(s) Requested (check test(s) required) TCLP As,Cd,Pb,Hg	metals/Hg AOC4 list	Archive AN					Comments / Instructions [Jar tag number(s)]
2/2/23	1124	LDW23-CMP22-01	2 1 AN 1	Sediment	X	X						
"	1310	LDW23-CMP18N-01	1	"	X	X						
2/2/23	1344	LDW23-CMP18S-01	1	sediment	X	X						
		Total Number of Containers	3	Purchase Order / Statement of Work #								

2/2/23

1) Released by:	1) Rec'd by:	2) Released by:	2) Rec'd by:
Print name: Amara Vanderwort		Print name:	
Signature:		Signature:	
Company: Windward	Company: ARI INC	Company:	Company:
Date/Time: 2/2/23 1403.	Date/Time: 02102123 14:03	Date/Time:	Date/Time:

* Distribution: White copies accompany shipment; yellow retained by consignor.

Wind Ward environmental LLC
200 1st Ave W, Suite 500
Seattle, WA 98119
206.378.1364

To be completed by Laboratory upon sample receipt:

Date of receipt::	Laboratory W.O. #:
Condition upon receipt:	Time of receipt:
Cooler temperature:	Received by:

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
LDW23-CMP22-01	23B0051-01	Solid	02-Feb-2023 11:24	02-Feb-2023 14:03
LDW23-CMP18N-01	23B0051-02	Solid	02-Feb-2023 13:10	02-Feb-2023 14:03
LDW23-CMP18S-01	23B0051-03	Solid	02-Feb-2023 13:44	02-Feb-2023 14:03

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Work Order Case Narrative

Client: Anchor QEA, LLC
Project: AOC4 UR Phase 3
Work Order: 23B0051

Sample receipt

One sample as listed on the preceding page was received February 2, 2023 under ARI work order 23B0051. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Total Metals - EPA Method 6020B and 7471B

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The reference material (SRM) percent recoveries were within control limits.

The batch matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits, reported under work order 23B0032.

TCLP Metals

The sample(s) were leached, digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits, with a low level response noted. As results for the blank and sample were far below regulatory liimits, no corrective action was taken.

The batch matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits, run under a non-project work order.

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Windward / Anchor Project Name: AOC 4

COC No(s): 3107 NA Delivered by: Fed-Ex UPS Courier Hand Delivered Other: ____

Assigned ARI Job No: 23B0051 Tracking No: ____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 14:03 18.3 ____ ____ ____ ____ ____

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: T009208

Cooler Accepted by: [signature] Date: 02102123 Time: 111:03

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used? ...	Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: ____		
Was sufficient ice used (if appropriate)?	NA	YES	NO
How were bottles sealed in plastic bags?	Individually	Grouped	Not
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ...	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA		____

Were the sample(s) split by ARI? NA YES Date/Time: ____ Equipment: ____ Split by: ____

Samples Logged by: [signature] Date: 2-2-23 Time: 1629 Labels checked by: ____

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Temperature Compliance Form

ARI Work Order: 23B0051

Cooler#: _____ **Temperature(°C):** 18-3

Sample ID	Bottle Count	Bottle Type
		2VI bottles over 6°

Cooler#: _____ **Temperature(°C):** _____

Sample ID	Bottle Count	Bottle Type

Cooler#: _____ **Temperature(°C):** _____

Sample ID	Bottle Count	Bottle Type

Cooler#: _____ **Temperature(°C):** _____

Sample ID	Bottle Count	Bottle Type

Completed by: _____ Date: 02102123 Time: 1115

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP22-01

23B0051-01 (Solid)

Metals and Metallic Compounds

Method: EPA 6020B — Sampled: 02/02/2023 11:24
Instrument: ICPMS1 Analyst: MCB — Analyzed: 03/07/2023 04:35

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-01 A 03
Preparation Batch: BLB0518 — Sample Size: 1.071 g (wet) — Dry Weight:0.67 g
Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 62.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Silver	7440-22-4	20	0.03	0.30	0.38	mg/kg	

Instrument: ICPMS2 Analyst: MCB — Analyzed: 03/07/2023 23:13

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-01 A 03
Preparation Batch: BLB0518 — Sample Size: 1.071 g (wet) — Dry Weight:0.67 g
Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 62.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chromium	7440-47-3	100	1.95	3.75	88.3	mg/kg	D
Lead	7439-92-1	100	0.39	0.75	463	mg/kg	D

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP22-01

23B0051-01 (Solid)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED — Sampled: 02/02/2023 11:24

Instrument: ICPMS1 Analyst: MCB — Analyzed: 03/07/2023 04:35

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-01 A 03

Preparation Batch: BLB0518 — Sample Size: 1.071 g (wet) — Dry Weight:0.67 g

Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 62.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	20	0.06	0.30	11.8	mg/kg	
Cadmium	7440-43-9	20	0.05	0.15	10.3	mg/kg	
Copper	7440-50-8	20	0.26	0.75	58.0	mg/kg	
Zinc	7440-66-6	20	4.4	9.0	213	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP22-01

23B0051-01 (Solid)

Metals and Metallic Compounds

Method: EPA 7471B — Sampled: 02/02/2023 11:24

Instrument: HYDRA Analyst: ML — Analyzed: 02/27/2023 13:03

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SMM EPA 7471B — Extract ID: 23B0051-01 A

Preparation Batch: BLB0517 — Sample Size: 0.215 g (wet) — Dry Weight:0.13 g

Prepared: 02/23/2023 — Final Volume: 50 mL — % Solids: 62.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.00785	0.0374	0.193	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP22-01

23B0051-01 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/02/2023 11:24

Instrument: ICP3 Analyst: DOE — Analyzed: 02/16/2023 14:27

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0051-01 A 02

Preparation Batch: BLB0296 — Sample Size: 25 mL (wet) — Dry Weight:15.56 mL

Prepared: 02/13/2023 — Final Volume: 25 mL — % Solids: 62.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	ND	mg/L	U
Cadmium	7440-43-9	5	0.0006	0.0100	0.0045	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	0.534	mg/L	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP22-01

23B0051-01 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/02/2023 11:24

Instrument: HYDRA Analyst: ML — Analyzed: 02/13/2023 16:27

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0051-01 A 01

Preparation Batch: BLB0295 — Sample Size: 20 mL

Prepared: 02/13/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000013	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP22-01

23B0051-01 (Solid)

Wet Chemistry

Method: SM 2540 G-97 — Sampled: 02/02/2023 11:24

Instrument: BAL2 Analyst: UW — Analyzed: 02/28/2023 16:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23B0051-01

Preparation Batch: BLB0737 — Sample Size: 5 g (wet) — Dry Weight:3.11 g

Prepared: 02/28/2023 — Final Volume: 5 g — % Solids: 62.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	62.24	%	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18N-01

23B0051-02 (Solid)

Metals and Metallic Compounds

Method: EPA 6020B — Sampled: 02/02/2023 13:10

Instrument: ICPMS1 Analyst: MCB — Analyzed: 03/07/2023 04:39

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-02 A 03

Preparation Batch: BLB0518 — Sample Size: 1.084 g (wet) — Dry Weight:0.75 g

Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 68.76

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead	7439-92-1	20	0.07	0.13	26.4	mg/kg	
Silver	7440-22-4	20	0.03	0.27	0.29	mg/kg	

Instrument: ICPMS2 Analyst: MCB — Analyzed: 03/08/2023 00:53

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-02 A 03

Preparation Batch: BLB0518 — Sample Size: 1.084 g (wet) — Dry Weight:0.75 g

Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 68.76

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chromium	7440-47-3	50	0.87	1.68	21.4	mg/kg	D

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18N-01

23B0051-02 (Solid)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED — Sampled: 02/02/2023 13:10

Instrument: ICPMS1 Analyst: MCB — Analyzed: 03/07/2023 04:39

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-02 A 03

Preparation Batch: BLB0518 — Sample Size: 1.084 g (wet) — Dry Weight:0.75 g

Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 68.76

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	20	0.05	0.27	178	mg/kg	
Cadmium	7440-43-9	20	0.04	0.13	0.59	mg/kg	
Copper	7440-50-8	20	0.23	0.67	33.1	mg/kg	
Zinc	7440-66-6	20	1.3	8.0	118	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18N-01

23B0051-02 (Solid)

Metals and Metallic Compounds

Method: EPA 7471B — Sampled: 02/02/2023 13:10

Instrument: HYDRA Analyst: ML — Analyzed: 02/27/2023 13:05

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SMM EPA 7471B — Extract ID: 23B0051-02 A

Preparation Batch: BLB0517 — Sample Size: 0.246 g (wet) — Dry Weight:0.17 g

Prepared: 02/23/2023 — Final Volume: 50 mL — % Solids: 68.76

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.00621	0.0296	0.155	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18N-01

23B0051-02 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/02/2023 13:10

Instrument: ICP3 Analyst: DOE — Analyzed: 02/16/2023 14:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0051-02 A 02

Preparation Batch: BLB0296 — Sample Size: 25 mL (wet) — Dry Weight:17.19 mL

Prepared: 02/13/2023 — Final Volume: 25 mL — % Solids: 68.76

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.330	mg/L	
Cadmium	7440-43-9	5	0.0006	0.0100	ND	mg/L	U
Lead	7439-92-1	5	0.0065	0.100	0.0250	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18N-01

23B0051-02 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/02/2023 13:10

Instrument: HYDRA Analyst: ML — Analyzed: 02/13/2023 16:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0051-02 A 01

Preparation Batch: BLB0295 — Sample Size: 20 mL

Prepared: 02/13/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000013	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18N-01

23B0051-02 (Solid)

Wet Chemistry

Method: SM 2540 G-97 — Sampled: 02/02/2023 13:10

Instrument: BAL2 Analyst: UW — Analyzed: 02/28/2023 16:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23B0051-02

Preparation Batch: BLB0737 — Sample Size: 5 g (wet) — Dry Weight:3.44 g

Prepared: 02/28/2023 — Final Volume: 5 g — % Solids: 68.76

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	68.76	%	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18S-01

23B0051-03 (Solid)

Metals and Metallic Compounds

Method: EPA 6020B — Sampled: 02/02/2023 13:44

Instrument: ICPMS1 Analyst: MCB — Analyzed: 03/07/2023 04:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-03 A 03

Preparation Batch: BLB0518 — Sample Size: 1.041 g (wet) — Dry Weight:0.70 g

Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 67.68

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chromium	7440-47-3	20	0.37	0.71	26.7	mg/kg	
Lead	7439-92-1	20	0.07	0.14	45.1	mg/kg	
Silver	7440-22-4	20	0.03	0.28	0.32	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18S-01

23B0051-03 (Solid)

Metals and Metallic Compounds

Method: EPA 6020B UCT-KED — Sampled: 02/02/2023 13:44

Instrument: ICPMS1 Analyst: MCB — Analyzed: 03/07/2023 04:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWN EPA 3050B — Extract ID: 23B0051-03 A 03

Preparation Batch: BLB0518 — Sample Size: 1.041 g (wet) — Dry Weight:0.70 g

Prepared: 02/24/2023 — Final Volume: 50 mL — % Solids: 67.68

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	20	0.05	0.28	38.8	mg/kg	
Cadmium	7440-43-9	20	0.04	0.14	0.73	mg/kg	
Copper	7440-50-8	20	0.25	0.71	34.6	mg/kg	
Zinc	7440-66-6	20	1.3	8.5	192	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18S-01

23B0051-03 (Solid)

Metals and Metallic Compounds

Method: EPA 7471B — Sampled: 02/02/2023 13:44

Instrument: HYDRA Analyst: ML — Analyzed: 02/27/2023 13:07

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SMM EPA 7471B — Extract ID: 23B0051-03 A

Preparation Batch: BLB0517 — Sample Size: 0.252 g (wet) — Dry Weight:0.17 g

Prepared: 02/23/2023 — Final Volume: 50 mL — % Solids: 67.68

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.00616	0.0293	0.149	mg/kg	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18S-01

23B0051-03 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/02/2023 13:44

Instrument: ICP3 Analyst: DOE — Analyzed: 02/16/2023 14:33

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0051-03 A 02

Preparation Batch: BLB0296 — Sample Size: 25 mL (wet) — Dry Weight:16.92 mL

Prepared: 02/13/2023 — Final Volume: 25 mL — % Solids: 67.68

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.117	mg/L	J
Cadmium	7440-43-9	5	0.0006	0.0100	ND	mg/L	U
Lead	7439-92-1	5	0.0065	0.100	0.0175	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18S-01

23B0051-03 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/02/2023 13:44

Instrument: HYDRA Analyst: ML — Analyzed: 02/13/2023 16:32

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0051-03 A 01

Preparation Batch: BLB0295 — Sample Size: 20 mL

Prepared: 02/13/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000013	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

LDW23-CMP18S-01

23B0051-03 (Solid)

Wet Chemistry

Method: SM 2540 G-97 — Sampled: 02/02/2023 13:44

Instrument: BAL2 Analyst: UW — Analyzed: 02/28/2023 16:44

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 23B0051-03

Preparation Batch: BLB0737 — Sample Size: 5 g (wet) — Dry Weight:3.38 g

Prepared: 02/28/2023 — Final Volume: 5 g — % Solids: 67.68

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	67.68	%	

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BLB0517 - EPA 7471B

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLB0517-BLK1)				Prepared: 23-Feb-2023	Analyzed: 27-Feb-2023 12:30						
Mercury	ND	0.00525	0.0250	mg/kg							U
LCS (BLB0517-BS1)				Prepared: 23-Feb-2023	Analyzed: 27-Feb-2023 12:32						
Mercury	0.453	0.00525	0.0250	mg/kg	0.500		90.6	80-120			
Reference (BLB0517-SRM1)				Prepared: 23-Feb-2023	Analyzed: 27-Feb-2023 13:17						
Mercury	3.69	0.0507	0.242	mg/kg	3.31		112	86.1-139.9			D

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BLB0518 - EPA 6020B UCT-KED

Instrument: ICPMS1 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLB0518-BLK2)					Prepared: 24-Feb-2023 Analyzed: 06-Mar-2023 20:01							
Cadmium	111	ND	0.03	0.10	mg/kg							U
LCS (BLB0518-BS2)					Prepared: 24-Feb-2023 Analyzed: 06-Mar-2023 20:05							
Cadmium	111	24.8	0.03	0.10	mg/kg	25.0		99.0	80-120			

Instrument: ICPMS2 Analyst: SKD

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLB0518-BLK1)					Prepared: 24-Feb-2023 Analyzed: 01-Mar-2023 21:11							
Chromium	52	ND	0.26	0.50	mg/kg							U
Lead	208	ND	0.05	0.10	mg/kg							U
Silver	107	ND	0.02	0.20	mg/kg							U
Arsenic	75a	ND	0.04	0.20	mg/kg							U
Copper	63	ND	0.17	0.50	mg/kg							U
Zinc	66	ND	2.9	6.0	mg/kg							U
Zinc	67	ND	0.9	6.0	mg/kg							U
LCS (BLB0518-BS1)					Prepared: 24-Feb-2023 Analyzed: 01-Mar-2023 21:16							
Chromium	52	26.0	0.26	0.50	mg/kg	25.0		104	80-120			
Lead	208	26.0	0.05	0.10	mg/kg	25.0		104	80-120			
Silver	107	27.0	0.02	0.20	mg/kg	25.0		108	80-120			
Arsenic	75a	24.8	0.04	0.20	mg/kg	25.0		99.2	80-120			
Copper	63	25.5	0.17	0.50	mg/kg	25.0		102	80-120			
Zinc	66	80.0	2.9	6.0	mg/kg	80.0		100	80-120			
Zinc	67	76.1	0.9	6.0	mg/kg	80.0		95.1	80-120			

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Analysis by: Analytical Resources, LLC

TCLP Metals and Metallic Compounds - Quality Control

Batch BLB0295 - EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLB0295-BLK1)				Prepared: 13-Feb-2023 Analyzed: 13-Feb-2023 16:16							
Mercury	0.000016	0.000007	0.000100	mg/L							J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Analysis by: Analytical Resources, LLC

TCLP Metals and Metallic Compounds - Quality Control

Batch BLB0296 - EPA 6010D

Instrument: ICP3 Analyst: DOE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLB0296-BLK1)				Prepared: 13-Feb-2023 Analyzed: 13-Feb-2023 18:22							
Arsenic	ND	0.0140	0.250	mg/L							U
Cadmium	ND	0.0006	0.0100	mg/L							U
Lead	ND	0.0065	0.100	mg/L							U

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BLB0737 - SM 2540 G-97

Instrument: BAL2 Analyst: UW

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLB0737-BLK1)					Prepared: 28-Feb-2023 Analyzed: 28-Feb-2023 16:44						
Total Solids	0.05	0.04	0.04	%							

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Certified Analyses included in this Report

Analyte	Certifications
EPA 6010D in Solid	
Arsenic	NELAP,WADOE
Cadmium	NELAP,WADOE,DoD-ELAP
Lead	NELAP,WADOE,DoD-ELAP
EPA 6020B in Solid	
Silver-107	NELAP,DoD-ELAP,WADOE
Chromium-52	NELAP,DoD-ELAP,WADOE,ADEC
Chromium-53	NELAP,DoD-ELAP,WADOE,ADEC
Lead-208	NELAP,DoD-ELAP,WADOE,ADEC
EPA 6020B UCT-KED in Solid	
Arsenic-75a	NELAP,DoD-ELAP,WADOE,ADEC
Cadmium-111	NELAP,DoD-ELAP,WADOE,ADEC
Cadmium-114	NELAP,DoD-ELAP,WADOE,ADEC
Copper-63	NELAP,DoD-ELAP,WADOE
Copper-65	NELAP,DoD-ELAP,WADOE
Zinc-66	NELAP,DoD-ELAP,WADOE
Zinc-67	NELAP,DoD-ELAP,WADOE
EPA 7470A in Water	
Mercury	WADOE,NELAP,DoD-ELAP
EPA 7471B in Solid	
Mercury	WADOE,NELAP,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2023
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2023
WADOE	WA Dept of Ecology	C558	06/30/2023
WA-DW	Ecology - Drinking Water	C558	06/30/2023

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 07:47

Notes and Definitions

*	Flagged value is not within established control limits.
B	This analyte was detected in the method blank.
D	The reported value is from a dilution
HC	The natural concentration of the spiked analyte is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
J	Estimated concentration value detected below the reporting limit.
L	Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to +/- RL instead of 20% RPD
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, LLC
Analytical Chemists and Consultants

13 March 2023

Ali Judkins
Anchor QEA, LLC
1201 3rd Ave, Suite 2600
Seattle, WA 98101

RE: AOC4 UR Phase 3 (180067-02.04)

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
23B0434	N/A

Susan Dunnihoo

Digitally signed by Susan Dunnihoo
Date: 2023.03.13 11:02:13 -07'00'

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

Susan Dunnihoo, Director, Client Services

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006-012

23B0434

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number:	503-972-5019
Date:	2/20/2023
Project Name:	Lower Duwamish Waterways
Project Number:	180067-02.04 -Task 705.705AQ
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (backup number: 503-798-3456)
Shipment Method:	Fedex

Line	Field Sample ID	Collection		Matrix	No. of Containers	Parameters: TCLP (EPA 1311) As, Cr, Pb, Hg	Comments/Preservation
		Date	Time				
1	LDW23-CMP22-01-2	2/17/2023	10:00	Soil	1	X	Sediment amended with 2% T1L PC
2	LDW23-CMP22-01-4	2/17/2023	10:05	Soil	1	X	Sediment amended with 4% T1L PC
3	LDW23-CMP18N-01-2	2/17/2023	10:10	Soil	1	X	Sediment amended with 2% T1L PC
4	LDW23-CMP18N-01-4	2/17/2023	10:15	Soil	1	X	Sediment amended with 4% T1L PC
5	LDW23-CMP18S-01-2	2/17/2023	10:20	Soil	1	X	Sediment amended with 2% T1L PC
6	LDW23-CMP18S-01-4	2/17/2023	10:25	Soil	1	X	Sediment amended with 4% T1L PC
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

ANCHOR QEA

Lab Manager:
Masa Kanematsu
6720 SW Macadam Ave Suite 125
Portland OR 97219

Notes:

Relinquished by:	Company:	Received by:
Emma Nordlund	Anchor QEA	
Signature/Print Name:	Date/Time:	Signature/Print Name:
	9:20 02/20/2023	AR, LLC 02/21/23 1423

Relinquished by:	Company:	Received by:
Signature/Print Name:	Date/Time:	Signature/Print Name:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
LDW23-CMP22-01-2	23B0434-01	Solid	17-Feb-2023 10:00	21-Feb-2023 14:23
LDW23-CMP22-01-4	23B0434-02	Solid	17-Feb-2023 10:05	21-Feb-2023 14:23
LDW23-CMP18N-01-2	23B0434-03	Solid	17-Feb-2023 10:10	21-Feb-2023 14:23
LDW23-CMP18N-01-4	23B0434-04	Solid	17-Feb-2023 10:15	21-Feb-2023 14:23
LDW23-CMP18S-01-2	23B0434-05	Solid	17-Feb-2023 10:20	21-Feb-2023 14:23
LDW23-CMP18S-01-4	23B0434-06	Solid	17-Feb-2023 10:25	21-Feb-2023 14:23

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

Work Order Case Narrative

Client: Anchor QEA, LLC
Project: AOC4 UR Phase 3
Work Order: 23B0434

Sample receipt

Samples as listed on the preceding page were received February 21, 2023 under ARI work order 23B0434. For details regarding sample receipt, please refer to the Cooler Receipt Form.

TCLP Metals

The sample(s) were leached, digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits, with a low level response for mercury. As results were below regulatory limits, no corrective action was taken.

The matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits.

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Anchor QEA

Project Name: Lower Duwamish Waterway

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 23B0434

Tracking No: 7713 4326 6517 NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1423 2.2

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: TG-970S

Cooler Accepted by: JBr Date: 02/21/23 Time: 1423

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO
What kind of packing material was used?	Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____		
Was sufficient ice used (if appropriate)?	NA	YES	NO
How were bottles sealed in plastic bags?	Individually	Grouped	Not
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA	_____	

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JBr Date: 02/21/23 JBr Time: ~~1051~~ Labels checked by: JBr

***** Notify Project Manager of discrepancies or concerns *****

02/22/23 0927

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP22-01-2

23B0434-01 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/17/2023 10:00

Instrument: ICP3 Analyst: DOE — Analyzed: 03/06/2023 10:46

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0434-01 A 03

Preparation Batch: BLC0004 — Sample Size: 25 mL (wet)

Prepared: 03/01/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.0160	mg/L	J
Chromium	7440-47-3	5	0.0024	0.0250	ND	mg/L	U
Lead	7439-92-1	5	0.0065	0.100	0.0935	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP22-01-2

23B0434-01 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/17/2023 10:00

Instrument: HYDRA Analyst: ML — Analyzed: 03/01/2023 15:04

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0434-01 A 01

Preparation Batch: BLC0005 — Sample Size: 20 mL

Prepared: 03/01/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000020	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP22-01-4

23B0434-02 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/17/2023 10:05
Instrument: ICP3 Analyst: DOE — Analyzed: 03/06/2023 10:43

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0434-02 A 03
Preparation Batch: BLC0004 — Sample Size: 25 mL (wet)
Prepared: 03/01/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	ND	mg/L	U
Chromium	7440-47-3	5	0.0024	0.0250	0.0060	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	ND	mg/L	U

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP22-01-4

23B0434-02 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/17/2023 10:05

Instrument: HYDRA Analyst: ML — Analyzed: 03/01/2023 15:11

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0434-02 A 01

Preparation Batch: BLC0005 — Sample Size: 20 mL

Prepared: 03/01/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000018	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18N-01-2

23B0434-03 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/17/2023 10:10

Instrument: ICP3 Analyst: DOE — Analyzed: 03/06/2023 10:41

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0434-03 A 03

Preparation Batch: BLC0004 — Sample Size: 25 mL (wet)

Prepared: 03/01/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.142	mg/L	J
Chromium	7440-47-3	5	0.0024	0.0250	ND	mg/L	U
Lead	7439-92-1	5	0.0065	0.100	ND	mg/L	U

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18N-01-2

23B0434-03 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/17/2023 10:10

Instrument: HYDRA Analyst: ML — Analyzed: 03/01/2023 15:13

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0434-03 A 01

Preparation Batch: BLC0005 — Sample Size: 20 mL

Prepared: 03/01/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000019	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18N-01-4

23B0434-04 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/17/2023 10:15

Instrument: ICP3 Analyst: DOE — Analyzed: 03/06/2023 10:38

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0434-04 A 03

Preparation Batch: BLC0004 — Sample Size: 25 mL (wet)

Prepared: 03/01/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.470	mg/L	
Chromium	7440-47-3	5	0.0024	0.0250	0.0030	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	ND	mg/L	U

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18N-01-4

23B0434-04 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/17/2023 10:15

Instrument: HYDRA Analyst: ML — Analyzed: 03/01/2023 15:15

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0434-04 A 01

Preparation Batch: BLC0005 — Sample Size: 20 mL

Prepared: 03/01/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000019	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18S-01-2

23B0434-05 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/17/2023 10:20
Instrument: ICP3 Analyst: DOE — Analyzed: 03/06/2023 10:35

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0434-05 A 03
Preparation Batch: BLC0004 — Sample Size: 25 mL (wet)
Prepared: 03/01/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.0660	mg/L	J
Chromium	7440-47-3	5	0.0024	0.0250	0.0040	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	ND	mg/L	U

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18S-01-2

23B0434-05 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/17/2023 10:20
Instrument: HYDRA Analyst: ML — Analyzed: 03/01/2023 15:18

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0434-05 A 01
Preparation Batch: BLC0005 — Sample Size: 20 mL
Prepared: 03/01/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000020	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18S-01-4

23B0434-06 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 02/17/2023 10:25
Instrument: ICP3 Analyst: DOE — Analyzed: 03/06/2023 10:32

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23B0434-06 A 03
Preparation Batch: BLC0004 — Sample Size: 25 mL (wet)
Prepared: 03/01/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	0.160	mg/L	J
Chromium	7440-47-3	5	0.0024	0.0250	0.0065	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	ND	mg/L	U

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

LDW23-CMP18S-01-4

23B0434-06 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 02/17/2023 10:25
Instrument: HYDRA Analyst: ML — Analyzed: 03/01/2023 15:20

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23B0434-06 A 01
Preparation Batch: BLC0005 — Sample Size: 20 mL
Prepared: 03/01/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000021	mg/L	J

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

Analysis by: Analytical Resources, LLC

TCLP Metals and Metallic Compounds - Quality Control

Batch BLC0004 - EPA 6010D

Instrument: ICP3 Analyst: DOE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0004-BLK1)				Prepared: 01-Mar-2023 Analyzed: 03-Mar-2023 11:03							
Arsenic	ND	0.0140	0.250	mg/L							U
Chromium	ND	0.0024	0.0250	mg/L							U
Lead	ND	0.0065	0.100	mg/L							U
Duplicate (BLC0004-DUP1)		**Source: 23B0434-01**		Prepared: 01-Mar-2023 Analyzed: 06-Mar-2023 10:52							
Arsenic	ND	0.0140	0.250	mg/L		0.0160					U
Chromium	0.0045	0.0024	0.0250	mg/L		ND					J
Lead	0.100	0.0065	0.100	mg/L		0.0935			6.72	20	
Matrix Spike (BLC0004-MS1)		**Source: 23B0434-01**		Prepared: 01-Mar-2023 Analyzed: 06-Mar-2023 10:49							
Arsenic	4.10	0.0140	0.250	mg/L	4.00	0.0160	102	75-125			
Chromium	0.975	0.0024	0.0250	mg/L	1.00	ND	97.5	75-125			
Lead	4.04	0.0065	0.100	mg/L	4.00	0.0935	98.6	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

Analysis by: Analytical Resources, LLC

TCLP Metals and Metallic Compounds - Quality Control

Batch BLC0005 - EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0005-BLK1)				Prepared: 01-Mar-2023 Analyzed: 01-Mar-2023 15:01							
Mercury	0.000018	0.000007	0.000100	mg/L							J
Duplicate (BLC0005-DUP1)		**Source: 23B0434-01**		Prepared: 01-Mar-2023 Analyzed: 01-Mar-2023 15:06							
Mercury	0.000020	0.000007	0.000100	mg/L		0.000020			2.03	20	J
Matrix Spike (BLC0005-MS1)		**Source: 23B0434-01**		Prepared: 01-Mar-2023 Analyzed: 01-Mar-2023 15:08							
Mercury	0.000969	0.000007	0.000100	mg/L	0.00100	0.000020	95.0	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

Certified Analyses included in this Report

Analyte	Certifications
EPA 6010D in Solid	
Arsenic	NELAP,WADOE
Chromium	NELAP,WADOE,DoD-ELAP
Lead	NELAP,WADOE,DoD-ELAP
EPA 7470A in Water	
Mercury	WADOE,NELAP,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2023
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2023
WADOE	WA Dept of Ecology	C558	06/30/2023
WA-DW	Ecology - Drinking Water	C558	06/30/2023

Anchor QEA, LLC	Project: AOC4 UR Phase 3	
1201 3rd Ave, Suite 2600	Project Number: 180067-02.04	**Reported:**
Seattle WA, 98101	Project Manager: Ali Judkins	13-Mar-2023 10:55

Notes and Definitions

D	The reported value is from a dilution
J	Estimated concentration value detected below the reporting limit.
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, LLC
Analytical Chemists and Consultants
Tukwila, WA

29 April 2023

Masa Kanematsu
Anchor QEA, LLC
6720 South Macadam Ave, Suite 125
Portland, OR 97219

RE: Lower Duwamish Waterways (180067-02.04)

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
23C0174	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Shelly Fishel, Project Manager

Cert# 100006-012

23C0174

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number:	503-972-5019
Date:	3/6/2023
Project Name:	Lower Duwamish Waterways
Project Number:	180067-02.04 -Task 705.705AQ
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (backup number: 503-798-3456)
Shipment Method:	Fedex

Line	Field Sample ID	Collection		Matrix	No. of Containers	Parameters														Comments/Preservation
		Date	Time			TCLP (EPA 1311)	SMS List Metals (EPA 6010D)	Mercury (EPA 7470A)	SMS List SVOCs (EPA 8270C)	Dioxins/Furans (EPA 8290A)										
1	LDW23-DB01	3/3/2023	12:45	Soil	2	X	X	X	X	X										One jar < 9.5 mm; one jar < 2mm particle size.
2	LDW23-DB02	3/3/2023	13:45	Soil	2	X	X	X	X	X										One jar < 9.5 mm; one jar < 2mm particle size.
3	LDW23-DB03	3/3/2023	14:45	Soil	2	X	X	X	X	X										One jar < 9.5 mm; one jar < 2mm particle size.
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				

ANCHOR QEA

Lab Manager:
Masa Kanematsu
6720 SW Macadam Ave Suite 125
Portland OR 97219

Notes:

Relinquished by:	Company:	Received by:
Emma Nordlund	Anchor QEA	
Signature/Print Name:	Date/Time:	Signature/Print Name:
	3/6/23 15:42	3/8/23 14:33

Relinquished by:	Company:	Received by:
Signature/Print Name:	Date/Time:	Signature/Print Name:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

RE: Lower Duwamish Waterway Sample Receipt 23C0174

Gillian Williams <gwilliams@anchorqea.com>

Mon 3/13/2023 2:19 PM

To: Shelly Fishel <shelly.fishel@arilabs.com>
Cc: LabDataAttachments <labdataattach@anchorqea.com>;Masa Kanematsu <mkanematsu@anchorqea.com>;Emma Nordlund <enordlund@anchorqea.com>

Shelly,

TCLP Metals analysis on the 9.5mm passing sieve. SVOCs, bulk metals and dioxins/furans analyses on samples passing the 2 mm sieve. The analyses should be indicated on the sample bottles in the comments sections of the label. Sorry for all the confusion, and thank you for checking in with us about these!

Cheers,
Gillian

From: Shelly Fishel <shelly.fishel@arilabs.com>
Sent: Monday, March 13, 2023 2:15 PM
To: Gillian Williams <gwilliams@anchorqea.com>; LabDataAttachments <labdataattach@anchorqea.com>; Masa Kanematsu <mkanematsu@anchorqea.com>; Emma Nordlund <enordlund@anchorqea.com>
Subject: Re: Lower Duwamish Waterway Sample Receipt 23C0174

Hi Gillian,

I didn't complete my thoughts. The COC notes two different particle sizes for the samples. Which do you want analyzed or do you want each to be analyzed separately?

Please let me know if you need anything. Have a fantastic day!

****Please email your bottle requests to your project manager several days before needed to give staff time to assemble the kit - we may not be able to accommodate your request as a walk-in****

*** NOTE - TATs are running 3 to 6 weeks depending on analysis ***

Regards,

Shelly L Fishel, *Project Manager*

She/Her/Hers

Analytical Resources, LLC

Analytical Chemists and Consultants

4611 South 134th Place, Suite 100

Tukwila, WA 98168

(206) 695-6210 office

(210) 845-0183 cell

Email: [mailto:shelly.fishel@arilabs..com]shelly.fishel@arilabs.com

I will out of the lab on Wednesday, March 15, 2023

From: Gillian Williams <gwilliams@anchorqea.com>
Sent: Monday, March 13, 2023 2:11 PM
To: Shelly Fishel <shelly.fishel@arilabs.com>; LabDataAttachments <labdataattach@anchorqea.com>; Masa Kanematsu <mkanematsu@anchorqea.com>; Emma Nordlund <enordlund@anchorqea.com>
Subject: RE: Lower Duwamish Waterway Sample Receipt 23C0174

Hello –

We reviewed the sample receipts and confirm that TCLP Metals, SVOC, and metals analyses look correct on our end.

Thank you for confirming.

Cheers,

Gillian

From: Shelly Fishel <shelly.fishel@arilabs.com>
Sent: Monday, March 13, 2023 2:03 PM
To: LabDataAttachments <labdataattach@anchorqea.com>; Masa Kanematsu <mkanematsu@anchorqea.com>
Subject: Re: Lower Duwamish Waterway Sample Receipt 23C0174
Importance: High

Hello,

Hold times will expire later this week. I need clarification. Please advise.

Please let me know if you need anything. Have a fantastic day!

****Please email your bottle requests to your project manager several days before needed to give staff time to assemble the kit - we may not be able to accommodate your request as a walk-in****

*** NOTE - TATs are running 3 to 6 weeks depending on analysis ***

Regards,

Shelly L Fishel, *Project Manager*

She/Her/Hers

Analytical Resources, LLC

Analytical Chemists and Consultants

4611 South 134th Place, Suite 100

Tukwila, WA 98168

(206) 695-6210 office

(210) 845-0183 cell

Email: [mailto:shelly.fishel@arilabs..com]shelly.fishel@arilabs.com

I will out of the lab on Wednesday, March 15, 2023

From: Shelly Fishel
Sent: Thursday, March 9, 2023 9:06 AM
To: LabDataAttachments <labdataattach@anchorqea.com>; mkanematsu@anchorqea.com <mkanematsu@anchorqea.com>
Subject: Lower Duwamish Waterway Sample Receipt 23C0174

Hello Masa,

ARI received two soil samples for analysis which have been logged under work order 23C0174. Sample receiving paperwork is attached. Please review the attached carefully as this project only had TCLP metals. There was not a TCLP Metals list on the COC, so we have logged it based on the historical data. As it is the first time through please review the SVOC and metals lists.

Please let me know if you need anything. Have a fantastic day!

****Please email your bottle requests to your project manager several days before needed to give staff time to assemble the kit - we may not be able to accommodate your request as a walk-in**

*** NOTE - TATs are running 3 to 6 weeks depending on analysis ***

Regards,

Shelly L Fishel, *Project Manager*

She/Her/Hers

Analytical Resources, LLC

Analytical Chemists and Consultants

4611 South 134th Place, Suite 100

Tukwila, WA 98168

(206) 695-6210 office

(210) 845-0183 cell

Email: [mailto:shelly.fishel@arilabs..com]shelly.fishel@arilabs.com

I will out of the lab the morning of Wednesday, March 8, 2023.

How was your customer experience?
Please take our 5 minute Online Customer Survey

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
LDW23-DB01 - <2mm	23C0174-01	Solid	03-Mar-2023 12:45	08-Mar-2023 14:33
LDW23-DB02 - <2mm	23C0174-02	Solid	03-Mar-2023 13:45	08-Mar-2023 14:33
LDW23-DB03 - <2mm	23C0174-03	Solid	03-Mar-2023 14:45	08-Mar-2023 14:33
LDW23-DB01 - <9mm	23C0174-04	Solid	03-Mar-2023 12:45	08-Mar-2023 14:33
LDW23-DB02 - <9mm	23C0174-05	Solid	03-Mar-2023 13:45	08-Mar-2023 14:33
LDW23-DB03 - <9mm	23C0174-06	Solid	03-Mar-2023 14:45	08-Mar-2023 14:33

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Work Order Case Narrative

Client: Anchor QEA, LLC
Project: Lower Duwamish Waterways
Project Number: 180067-02.04
Work Order: 23C0174

Sample receipt

Sample(s) as listed on the preceding page were received 08-Mar-2023 14:33 under ARI work order 23C0174. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Semivolatiles - EPA Method SW8270E

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except Benzoic Acid which was out of control low and Benzo(g,h,i)perylene which was out of control high. All samples which contain analyte have been flagged with a "Q" qualifier.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) spike recoveries were within control limits. The blank spike duplicate (BSD/LCSD) spike recoveries were within control limits. The blank spike duplicate (BSD/LCSD) spike recoveries were within control limits except for N-Nitrosodiphenylamine which was out of control low. The BS/BSD relative percent difference (RPD) were within control limits except for N-Nitrosodiphenylamine. The deviations have been flagged.

Dioxin/Furans - EPA Method 8290

The sample(s) were extracted and analyzed within the recommended holding times. Analysis was performed using an application specific column recently developed by Restek. The RTX-DIoxin2 column has unique isomer separation for the 2378-TCDF, eliminating the need for confirmation analysis.

Initial and continuing calibrations were within method requirements.

Labeled internal standard areas were within limits.

The cleanup surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

The OPR (Ongoing Precision and Recovery) standard percent recoveries were within control limits.

Total Metals - EPA Method 6010D

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Total Mercury - EPA Method 7471

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The reference material (SRM) percent recoveries were within control limits.

TCLP Metals

The sample(s) were leached, digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits.

The matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits.

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Anchor QEA

Project Name: Lower Duwamish Waterway

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 23C0174

Tracking No: 7201 7114 8102 4057 NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler?	YES	NO
Were custody papers included with the cooler?	YES	NO
Were custody papers properly filled out (ink, signed, etc.)	YES	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.1

Time 14:33

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D09706

Cooler Accepted by: [signature] Date: 03/08/23 Time: 1433

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler?		YES	NO (T.S. 03/8/23)
What kind of packing material was used?	Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____		
Was sufficient ice used (if appropriate)?	NA	YES	NO
How were bottles sealed in plastic bags?	Individually	Grouped	Not
Did all bottles arrive in good condition (unbroken)?		YES	NO
Were all bottle labels complete and legible?		YES	NO
Did the number of containers listed on COC match with the number of containers received?		YES	NO
Did all bottle labels and tags agree with custody papers?		YES	NO
Were all bottles used correct for the requested analyses?		YES	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)	NA	YES	NO
Were all VOC vials free of air bubbles?	NA	YES	NO
Was sufficient amount of sample sent in each bottle?		YES	NO
Date VOC Trip Blank was made at ARI	NA		

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: PIB Date: 3/8/23 Time: 16:45 Labels checked by: PIB

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm
23C0174-01 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 12:45
Instrument: NT18 Analyst: VTS — Analyzed: 03/24/2023 08:26

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)		Extract ID: 23C0174-01 A 02
	Preparation Batch: BLC0423	Sample Size: 10.88 g (wet)	Dry Weight:10.03 g
	Prepared: 03/16/2023	Final Volume: 1 mL	% Solids: 92.23
Sample Cleanup:	Cleanup Method: GPC		Extract ID:23C0174-01 A 02
	Cleanup Batch: CLC0192	Initial Volume: 1 uL	
	Cleaned: 22-Mar-2023	Final Volume: 1 uL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	1	4.4	19.9	25.6	ug/kg	
1,4-Dichlorobenzene	106-46-7	1	3.1	19.9	3.8	ug/kg	J
1,2-Dichlorobenzene	95-50-1	1	2.4	19.9	2.4	ug/kg	J
Benzyl Alcohol	100-51-6	1	16.2	19.9	ND	ug/kg	U
2-Methylphenol	95-48-7	1	6.6	19.9	ND	ug/kg	U
4-Methylphenol	106-44-5	1	7.4	19.9	ND	ug/kg	U
2,4-Dimethylphenol	105-67-9	1	3.8	99.7	11.0	ug/kg	J
1,2,4-Trichlorobenzene	120-82-1	1	3.6	19.9	ND	ug/kg	U
Naphthalene	91-20-3	1	4.2	19.9	75.5	ug/kg	
Benzoic acid	65-85-0	1	38.9	199	ND	ug/kg	U
Hexachlorobutadiene	87-68-3	1	4.8	19.9	ND	ug/kg	U
2-Methylnaphthalene	91-57-6	1	4.5	19.9	69.5	ug/kg	
Acenaphthylene	208-96-8	1	6.2	19.9	6.4	ug/kg	J
Dimethylphthalate	131-11-3	1	4.4	19.9	7.8	ug/kg	J
Acenaphthene	83-32-9	1	5.2	19.9	79.2	ug/kg	
Dibenzofuran	132-64-9	1	14.1	19.9	61.8	ug/kg	
Fluorene	86-73-7	1	14.5	19.9	49.1	ug/kg	
Diethyl phthalate	84-66-2	1	19.6	49.8	ND	ug/kg	U
N-Nitrosodiphenylamine	86-30-6	1	5.3	19.9	ND	ug/kg	U
Hexachlorobenzene	118-74-1	1	13.4	19.9	ND	ug/kg	U
Pentachlorophenol	87-86-5	1	31.1	99.7	ND	ug/kg	U
Phenanthrene	85-01-8	1	8.7	19.9	327	ug/kg	
Anthracene	120-12-7	1	7.2	19.9	27.5	ug/kg	
Di-n-Butylphthalate	84-74-2	1	5.6	19.9	72.1	ug/kg	M
Fluoranthene	206-44-0	1	6.1	19.9	436	ug/kg	
Pyrene	129-00-0	1	5.7	19.9	302	ug/kg	
Butylbenzylphthalate	85-68-7	1	9.4	19.9	ND	ug/kg	U
Benzo(a)anthracene	56-55-3	1	5.9	19.9	91.5	ug/kg	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 12:45

Instrument: NT18 Analyst: VTS — Analyzed: 03/24/2023 08:26

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chrysene	218-01-9	1	6.0	19.9	174	ug/kg	
bis(2-Ethylhexyl)phthalate	117-81-7	1	5.4	49.8	227	ug/kg	
Di-n-Octylphthalate	117-84-0	1	4.4	19.9	ND	ug/kg	U
Benzofluoranthenes, Total		1	10.0	39.9	377	ug/kg	
Benzo(a)pyrene	50-32-8	1	4.2	19.9	87.2	ug/kg	
Indeno(1,2,3-cd)pyrene	193-39-5	1	14.6	19.9	20.3	ug/kg	
Dibenzo(a,h)anthracene	53-70-3	1	17.2	19.9	ND	ug/kg	U
Benzo(g,h,i)perylene	191-24-2	1	13.5	19.9	25.4	ug/kg	
Surrogate: 2-Fluorophenol				*27-120 %*	*96.7*	*%*	
Surrogate: Phenol-d5				*29-120 %*	*82.3*	*%*	
Surrogate: 2-Chlorophenol-d4				*31-120 %*	*80.6*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*32-120 %*	*75.3*	*%*	
Surrogate: Nitrobenzene-d5				*30-120 %*	*89.0*	*%*	
Surrogate: 2-Fluorobiphenyl				*35-120 %*	*85.6*	*%*	
Surrogate: 2,4,6-Tribromophenol				*24-134 %*	*93.3*	*%*	
Surrogate: p-Terphenyl-d14				*37-120 %*	*102*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 12:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 13:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 8290 — Extract ID: 23C0174-01 A 03

Preparation Batch: BLC0379 — Sample Size: 10.83 g (wet) — Dry Weight:10.00 g

Prepared: 03/15/2023 — Final Volume: 20 uL — % Solids: 92.31

Analyte	DF/Split	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	Notes
2,3,7,8-TCDF		0.757	0.655-0.886	0.26	1.00	**14.4**	ng/kg	X
2,3,7,8-TCDD		0.658	0.655-0.886	0.08	1.00	**1.42**	ng/kg	
1,2,3,7,8-PeCDF		1.345	1.318-1.783	0.19	1.00	**5.93**	ng/kg	
2,3,4,7,8-PeCDF		1.441	1.318-1.783	0.18	1.00	**6.47**	ng/kg	
1,2,3,7,8-PeCDD		1.618	1.318-1.783	0.25	1.00	**6.84**	ng/kg	
1,2,3,4,7,8-HxCDF		1.202	1.054-1.426	0.09	1.00	**4.74**	ng/kg	
1,2,3,6,7,8-HxCDF		1.352	1.054-1.426	0.09	1.00	**4.12**	ng/kg	
2,3,4,6,7,8-HxCDF		1.182	1.054-1.426	0.10	1.00	**3.71**	ng/kg	
1,2,3,7,8,9-HxCDF		1.246	1.054-1.426	0.12	1.00	**1.22**	ng/kg	
1,2,3,4,7,8-HxCDD		1.555	1.054-1.426	0.14	1.00	**2.08**	ng/kg	EMPC
1,2,3,6,7,8-HxCDD		1.188	1.054-1.426	0.15	1.00	**15.8**	ng/kg	
1,2,3,7,8,9-HxCDD		1.271	1.054-1.426	0.16	1.00	**11.8**	ng/kg	
1,2,3,4,6,7,8-HpCDF		1.008	0.893-1.208	0.17	1.00	**25.0**	ng/kg	
1,2,3,4,7,8,9-HpCDF		0.912	0.893-1.208	0.26	1.00	**2.22**	ng/kg	
1,2,3,4,6,7,8-HpCDD		1.044	0.893-1.208	0.30	2.50	**243**	ng/kg	
OCDF		0.895	0.757-1.024	0.30	2.50	**34.8**	ng/kg	
OCDD		0.860	0.757-1.024	0.47	10.0	**1230**	ng/kg	
Homologue groups								
Total TCDF					1.00	**89.7**	ng/kg	
Total TCDD					1.00	**7.32**	ng/kg	
Total PeCDF					1.00	**78.0**	ng/kg	
Total PeCDD					1.00	**16.3**	ng/kg	
Total HxCDF					1.00	**57.8**	ng/kg	
Total HxCDD					1.00	**125**	ng/kg	
Total HpCDF					1.00	**62.6**	ng/kg	
Total HpCDD					1.00	**502**	ng/kg	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC):	19.25
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC):	19.25
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, EMPC = ND):	19.14
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, EMPC = ND):	19.04

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 12:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 13:30

Analysis by: Analytical Resources, LLC

Analyte	DF/Split	Ion Ratio	Ratio Limits	Reporting Limit	Result	Units	Notes
Labeled compounds							
13C12-2,3,7,8-TCDF		*0.763*	*0.655-0.886*	*24-169 %*	*66.7*	*%*	
13C12-2,3,7,8-TCDD		*0.793*	*0.655-0.886*	*25-164 %*	*72.1*	*%*	
13C12-1,2,3,7,8-PeCDF		*1.556*	*1.318-1.783*	*24-185 %*	*80.1*	*%*	
13C12-2,3,4,7,8-PeCDF		*1.561*	*1.318-1.783*	*21-178 %*	*82.9*	*%*	
13C12-1,2,3,7,8-PeCDD		*1.702*	*1.318-1.783*	*25-181 %*	*56.1*	*%*	
13C12-1,2,3,4,7,8-HxCDF		*0.512*	*0.434-0.587*	*26-152 %*	*71.3*	*%*	
13C12-1,2,3,6,7,8-HxCDF		*0.512*	*0.434-0.587*	*26-123 %*	*61.9*	*%*	
13C12-2,3,4,6,7,8-HxCDF		*0.518*	*0.434-0.587*	*28-136 %*	*69.0*	*%*	
13C12-1,2,3,7,8,9-HxCDF		*0.510*	*0.434-0.587*	*29-147 %*	*68.8*	*%*	
13C12-1,2,3,4,7,8-HxCDD		*1.241*	*1.054-1.426*	*32-141 %*	*71.3*	*%*	
13C12-1,2,3,6,7,8-HxCDD		*1.263*	*1.054-1.426*	*28-130 %*	*61.6*	*%*	
13C12-1,2,3,4,6,7,8-HpCDF		*0.454*	*0.374-0.506*	*28-143 %*	*79.3*	*%*	
13C12-1,2,3,4,7,8,9-HpCDF		*0.465*	*0.374-0.506*	*26-138 %*	*77.3*	*%*	
13C12-1,2,3,4,6,7,8-HpCDD		*1.059*	*0.893-1.208*	*23-140 %*	*65.1*	*%*	
13C12-OCDD		*0.913*	*0.757-1.024*	*17-157 %*	*66.8*	*%*	
37Cl4-2,3,7,8-TCDD				*35-197 %*	*73.8*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 12:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 13:30

Analysis by: Analytical Resources, LLC

Analyte	DF/Split	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	Notes

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 03/03/2023 12:45

Instrument: ICP3 Analyst: DOE — Analyzed: 03/22/2023 13:19

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWC EPA 3050B — Extract ID: 23C0174-01 A 03

Preparation Batch: BLC0365 — Sample Size: 1.041 g (wet) — Dry Weight:0.96 g

Prepared: 03/14/2023 — Final Volume: 50 mL — % Solids: 92.53

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Antimony	7440-36-0	50	12.1	130	ND	mg/kg	U
Arsenic	7440-38-2	50	11.9	130	65.4	mg/kg	J, D
Cadmium	7440-43-9	50	1.82	5.19	ND	mg/kg	U
Chromium	7440-47-3	50	11.4	23.4	876	mg/kg	D
Copper	7440-50-8	50	3.63	7.79	709	mg/kg	D
Lead	7439-92-1	50	6.23	51.9	540	mg/kg	D
Nickel	7440-02-0	50	10.0	26.0	883	mg/kg	D
Silver	7440-22-4	50	2.02	7.79	ND	mg/kg	U
Zinc	7440-66-6	50	20.8	51.9	2650	mg/kg	D

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Metals and Metallic Compounds

Method: EPA 7471B — Sampled: 03/03/2023 12:45
Instrument: HYDRA Analyst: ML — Analyzed: 03/23/2023 15:12

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SMM EPA 7471B — Extract ID: 23C0174-01 A
Preparation Batch: BLC0413 — Sample Size: 0.276 g (wet) — Dry Weight:0.26 g
Prepared: 03/22/2023 — Final Volume: 50 mL — % Solids: 92.53

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.00411	0.0196	0.0516	mg/kg	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01 (Solid)

Extractions

Method: ASTM D2216 — Sampled: 03/03/2023 12:45

Instrument: N/A Analyst: NL — Analyzed: 03/15/2023 05:03

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep-Organics — Extract ID: 23C0174-01

Preparation Batch: BLC0248 — Sample Size: 1 g (wet)

Prepared: 03/14/2023 — Final Volume: 1 g

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids		1	0.01	92.31	%	

Labeled compounds

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01RE1 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 12:45

Instrument: NT10 Analyst: VTS — Analyzed: 04/07/2023 12:54

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)		Extract ID: 23C0174-01RE1 A 02
	Preparation Batch: BLC0423	Sample Size: 10.88 g (wet)	Dry Weight:10.03 g
	Prepared: 03/16/2023	Final Volume: 1 mL	% Solids: 92.23
Sample Cleanup:	Cleanup Method: GPC		Extract ID:23C0174-01RE1 A 02
	Cleanup Batch: CLC0192	Initial Volume: 1 uL	
	Cleaned: 22-Mar-2023	Final Volume: 1 uL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	4	17.5	79.7	27.2	ug/kg	J, D
1,4-Dichlorobenzene	106-46-7	4	12.5	79.7	ND	ug/kg	U
1,2-Dichlorobenzene	95-50-1	4	9.4	79.7	ND	ug/kg	U
Benzyl Alcohol	100-51-6	4	64.8	79.7	ND	ug/kg	U
2-Methylphenol	95-48-7	4	26.5	79.7	ND	ug/kg	U
4-Methylphenol	106-44-5	4	29.5	79.7	ND	ug/kg	U
2,4-Dimethylphenol	105-67-9	4	15.1	399	ND	ug/kg	U
1,2,4-Trichlorobenzene	120-82-1	4	14.2	79.7	ND	ug/kg	U
Naphthalene	91-20-3	4	16.9	79.7	83.1	ug/kg	D
Benzoic acid	65-85-0	4	156	797	ND	ug/kg	U
Hexachlorobutadiene	87-68-3	4	19.2	79.7	ND	ug/kg	U
2-Methylnaphthalene	91-57-6	4	18.0	79.7	73.2	ug/kg	J, D
Acenaphthylene	208-96-8	4	24.9	79.7	ND	ug/kg	U
Dimethylphthalate	131-11-3	4	17.5	79.7	ND	ug/kg	U
Acenaphthene	83-32-9	4	20.8	79.7	83.3	ug/kg	D
Dibenzofuran	132-64-9	4	56.3	79.7	65.5	ug/kg	J, D
Fluorene	86-73-7	4	58.1	79.7	62.6	ug/kg	J, D
Diethyl phthalate	84-66-2	4	78.6	199	ND	ug/kg	U
N-Nitrosodiphenylamine	86-30-6	4	21.2	79.7	ND	ug/kg	U
Hexachlorobenzene	118-74-1	4	53.7	79.7	ND	ug/kg	U
Pentachlorophenol	87-86-5	4	125	399	ND	ug/kg	U
Phenanthrene	85-01-8	4	34.8	79.7	355	ug/kg	D
Anthracene	120-12-7	4	28.7	79.7	31.5	ug/kg	J, D
Di-n-Butylphthalate	84-74-2	4	22.4	79.7	77.5	ug/kg	J, D
Fluoranthene	206-44-0	4	24.3	79.7	394	ug/kg	D
Pyrene	129-00-0	4	22.6	79.7	281	ug/kg	D
Butylbenzylphthalate	85-68-7	4	37.5	79.7	ND	ug/kg	U
Benzo(a)anthracene	56-55-3	4	23.8	79.7	98.2	ug/kg	D
Chrysene	218-01-9	4	24.2	79.7	201	ug/kg	D
bis(2-Ethylhexyl)phthalate	117-81-7	4	21.8	199	175	ug/kg	J, D
Di-n-Octylphthalate	117-84-0	4	17.5	79.7	ND	ug/kg	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <2mm

23C0174-01RE1 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 12:45

Instrument: NT10 Analyst: VTS — Analyzed: 04/07/2023 12:54

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzofluoranthenes, Total		4	39.9	159	255	ug/kg	D
Benzo(a)pyrene	50-32-8	4	16.9	79.7	76.7	ug/kg	J, D
Indeno(1,2,3-cd)pyrene	193-39-5	4	58.4	79.7	73.4	ug/kg	J, D
Dibenzo(a,h)anthracene	53-70-3	4	68.7	79.7	ND	ug/kg	U
Benzo(g,h,i)perylene	191-24-2	4	54.2	79.7	98.3	ug/kg	D
Surrogate: 2-Fluorophenol				*27-120 %*	*75.7*	*%*	
Surrogate: Phenol-d5				*29-120 %*	*78.5*	*%*	
Surrogate: 2-Chlorophenol-d4				*31-120 %*	*82.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*32-120 %*	*82.2*	*%*	
Surrogate: Nitrobenzene-d5				*30-120 %*	*85.4*	*%*	
Surrogate: 2-Fluorobiphenyl				*35-120 %*	*92.8*	*%*	
Surrogate: 2,4,6-Tribromophenol				*24-134 %*	*91.7*	*%*	
Surrogate: p-Terphenyl-d14				*37-120 %*	*91.7*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 13:45

Instrument: NT18 Analyst: VTS — Analyzed: 03/24/2023 09:07

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)		Extract ID: 23C0174-02 A 02
	Preparation Batch: BLC0423	Sample Size: 12.05 g (wet)	Dry Weight:10.00 g
	Prepared: 03/16/2023	Final Volume: 1 mL	% Solids: 83.00
Sample Cleanup:	Cleanup Method: GPC		Extract ID:23C0174-02 A 02
	Cleanup Batch: CLC0192	Initial Volume: 1 uL	
	Cleaned: 22-Mar-2023	Final Volume: 1 uL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	4	17.6	80.0	46.1	ug/kg	J, D
1,4-Dichlorobenzene	106-46-7	4	12.6	80.0	ND	ug/kg	U
1,2-Dichlorobenzene	95-50-1	4	9.5	80.0	ND	ug/kg	U
Benzyl Alcohol	100-51-6	4	65.0	80.0	ND	ug/kg	U
2-Methylphenol	95-48-7	4	26.6	80.0	ND	ug/kg	U
4-Methylphenol	106-44-5	4	29.6	80.0	ND	ug/kg	U
2,4-Dimethylphenol	105-67-9	4	15.1	400	ND	ug/kg	U
1,2,4-Trichlorobenzene	120-82-1	4	14.3	80.0	ND	ug/kg	U
Naphthalene	91-20-3	4	17.0	80.0	308	ug/kg	D
Benzoic acid	65-85-0	4	156	800	ND	ug/kg	U
Hexachlorobutadiene	87-68-3	4	19.2	80.0	ND	ug/kg	U
2-Methylnaphthalene	91-57-6	4	18.0	80.0	202	ug/kg	D
Acenaphthylene	208-96-8	4	25.0	80.0	ND	ug/kg	U
Dimethylphthalate	131-11-3	4	17.6	80.0	ND	ug/kg	U
Acenaphthene	83-32-9	4	20.9	80.0	1740	ug/kg	D
Dibenzofuran	132-64-9	4	56.5	80.0	1790	ug/kg	D
Fluorene	86-73-7	4	58.3	80.0	2650	ug/kg	D
Diethyl phthalate	84-66-2	4	78.8	200	ND	ug/kg	U
N-Nitrosodiphenylamine	86-30-6	4	21.3	80.0	ND	ug/kg	U
Hexachlorobenzene	118-74-1	4	53.9	80.0	ND	ug/kg	U
Pentachlorophenol	87-86-5	4	125	400	ND	ug/kg	U
Phenanthrene	85-01-8	4	34.9	80.0	19500	ug/kg	D, E
Anthracene	120-12-7	4	28.8	80.0	2040	ug/kg	D
Di-n-Butylphthalate	84-74-2	4	22.4	80.0	531	ug/kg	M, D
Fluoranthene	206-44-0	4	24.4	80.0	17800	ug/kg	D, E
Pyrene	129-00-0	4	22.7	80.0	12100	ug/kg	D, E
Butylbenzylphthalate	85-68-7	4	37.6	80.0	ND	ug/kg	U
Benzo(a)anthracene	56-55-3	4	23.8	80.0	5070	ug/kg	D
Chrysene	218-01-9	4	24.2	80.0	5470	ug/kg	D
bis(2-Ethylhexyl)phthalate	117-81-7	4	21.8	200	90.1	ug/kg	J, D
Di-n-Octylphthalate	117-84-0	4	17.6	80.0	ND	ug/kg	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 13:45
Instrument: NT18 Analyst: VTS — Analyzed: 03/24/2023 09:07

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzofluoranthenes, Total		4	40.0	160	11800	ug/kg	D
Benzo(a)pyrene	50-32-8	4	16.9	80.0	3110	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	4	58.6	80.0	413	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	4	68.9	80.0	169	ug/kg	D
Benzo(g,h,i)perylene	191-24-2	4	54.4	80.0	517	ug/kg	D
Surrogate: 2-Fluorophenol				*27-120 %*	*82.2*	*%*	
Surrogate: Phenol-d5				*29-120 %*	*86.0*	*%*	
Surrogate: 2-Chlorophenol-d4				*31-120 %*	*91.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*32-120 %*	*86.0*	*%*	
Surrogate: Nitrobenzene-d5				*30-120 %*	*102*	*%*	
Surrogate: 2-Fluorobiphenyl				*35-120 %*	*93.7*	*%*	
Surrogate: 2,4,6-Tribromophenol				*24-134 %*	*120*	*%*	
Surrogate: p-Terphenyl-d14				*37-120 %*	*110*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 13:45
Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 14:19

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 8290 — Extract ID: 23C0174-02 A 03
Preparation Batch: BLC0379 — Sample Size: 12.05 g (wet) — Dry Weight:10.04 g
Prepared: 03/15/2023 — Final Volume: 20 uL — % Solids: 83.30

Analyte	DF/Split	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	Notes
2,3,7,8-TCDF		0.763	0.655-0.886	0.27	1.00	**76.1**	ng/kg	X
2,3,7,8-TCDD		0.770	0.655-0.886	0.12	1.00	**4.68**	ng/kg	
1,2,3,7,8-PeCDF		1.592	1.318-1.783	0.37	1.00	**73.3**	ng/kg	
2,3,4,7,8-PeCDF		1.600	1.318-1.783	0.34	1.00	**126**	ng/kg	
1,2,3,7,8-PeCDD		1.582	1.318-1.783	0.23	1.00	**43.1**	ng/kg	
1,2,3,4,7,8-HxCDF		1.377	1.054-1.426	0.14	1.00	**80.0**	ng/kg	
1,2,3,6,7,8-HxCDF		1.321	1.054-1.426	0.22	1.00	**87.1**	ng/kg	
2,3,4,6,7,8-HxCDF		1.244	1.054-1.426	0.15	1.00	**98.8**	ng/kg	
1,2,3,7,8,9-HxCDF		1.303	1.054-1.426	0.20	1.00	**19.5**	ng/kg	
1,2,3,4,7,8-HxCDD		1.217	1.054-1.426	0.18	1.00	**13.2**	ng/kg	
1,2,3,6,7,8-HxCDD		1.172	1.054-1.426	0.20	1.00	**23.2**	ng/kg	
1,2,3,7,8,9-HxCDD		1.131	1.054-1.426	0.21	1.00	**19.2**	ng/kg	
1,2,3,4,6,7,8-HpCDF		1.027	0.893-1.208	0.16	1.00	**380**	ng/kg	
1,2,3,4,7,8,9-HpCDF		0.988	0.893-1.208	0.24	1.00	**24.3**	ng/kg	
1,2,3,4,6,7,8-HpCDD		1.030	0.893-1.208	0.30	2.49	**248**	ng/kg	
OCDF		0.923	0.757-1.024	0.35	2.49	**135**	ng/kg	
OCDD		0.874	0.757-1.024	0.38	9.96	**798**	ng/kg	
Homologue groups								
Total TCDF					1.00	**1820**	ng/kg	
Total TCDD					1.00	**160**	ng/kg	
Total PeCDF					1.00	**1520**	ng/kg	
Total PeCDD					1.00	**222**	ng/kg	
Total HxCDF					1.00	**888**	ng/kg	
Total HxCDD					1.00	**254**	ng/kg	
Total HpCDF					1.00	**523**	ng/kg	
Total HpCDD					1.00	**466**	ng/kg	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC):	136.29
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC):	136.29
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, EMPC = ND):	136.29
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, EMPC = ND):	136.29

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 13:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 14:19

Analysis by: Analytical Resources, LLC

Analyte	DF/Split	Ion Ratio	Ratio Limits	Reporting Limit	Result	Units	Notes
Labeled compounds							
13C12-2,3,7,8-TCDF		*0.774*	*0.655-0.886*	*24-169 %*	*44.3*	*%*	
13C12-2,3,7,8-TCDD		*0.779*	*0.655-0.886*	*25-164 %*	*59.9*	*%*	
13C12-1,2,3,7,8-PeCDF		*1.554*	*1.318-1.783*	*24-185 %*	*91.3*	*%*	
13C12-2,3,4,7,8-PeCDF		*1.597*	*1.318-1.783*	*21-178 %*	*94.9*	*%*	
13C12-1,2,3,7,8-PeCDD		*1.660*	*1.318-1.783*	*25-181 %*	*60.3*	*%*	
13C12-1,2,3,4,7,8-HxCDF		*0.506*	*0.434-0.587*	*26-152 %*	*84.4*	*%*	
13C12-1,2,3,6,7,8-HxCDF		*0.524*	*0.434-0.587*	*26-123 %*	*50.8*	*%*	
13C12-2,3,4,6,7,8-HxCDF		*0.515*	*0.434-0.587*	*28-136 %*	*80.8*	*%*	
13C12-1,2,3,7,8,9-HxCDF		*0.524*	*0.434-0.587*	*29-147 %*	*35.9*	*%*	
13C12-1,2,3,4,7,8-HxCDD		*1.312*	*1.054-1.426*	*32-141 %*	*84.3*	*%*	
13C12-1,2,3,6,7,8-HxCDD		*1.268*	*1.054-1.426*	*28-130 %*	*66.1*	*%*	
13C12-1,2,3,4,6,7,8-HpCDF		*0.460*	*0.374-0.506*	*28-143 %*	*94.9*	*%*	
13C12-1,2,3,4,7,8,9-HpCDF		*0.452*	*0.374-0.506*	*26-138 %*	*93.7*	*%*	
13C12-1,2,3,4,6,7,8-HpCDD		*1.103*	*0.893-1.208*	*23-140 %*	*76.4*	*%*	
13C12-OCDD		*0.896*	*0.757-1.024*	*17-157 %*	*76.3*	*%*	
37Cl4-2,3,7,8-TCDD				*35-197 %*	*60.5*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 13:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 14:19

Analysis by: Analytical Resources, LLC

Analyte	DF/Split	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	Notes

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 03/03/2023 13:45

Instrument: ICP3 Analyst: DOE — Analyzed: 03/22/2023 13:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWC EPA 3050B — Extract ID: 23C0174-02 A 03

Preparation Batch: BLC0365 — Sample Size: 1.018 g (wet) — Dry Weight:0.85 g

Prepared: 03/14/2023 — Final Volume: 50 mL — % Solids: 83.49

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Antimony	7440-36-0	50	13.7	147	67.9	mg/kg	J, D
Arsenic	7440-38-2	50	13.5	147	42.7	mg/kg	J, D
Cadmium	7440-43-9	50	2.06	5.88	28.5	mg/kg	D
Chromium	7440-47-3	50	13.0	26.5	1610	mg/kg	D
Copper	7440-50-8	50	4.12	8.82	13500	mg/kg	D
Lead	7439-92-1	50	7.06	58.8	13100	mg/kg	D
Nickel	7440-02-0	50	11.4	29.4	280	mg/kg	D
Silver	7440-22-4	50	2.29	8.82	ND	mg/kg	U
Zinc	7440-66-6	50	23.5	58.8	5480	mg/kg	D

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Metals and Metallic Compounds

Method: EPA 7471B — Sampled: 03/03/2023 13:45
Instrument: HYDRA Analyst: ML — Analyzed: 03/23/2023 15:14

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SMM EPA 7471B — Extract ID: 23C0174-02 A
Preparation Batch: BLC0413 — Sample Size: 0.25 g (wet) — Dry Weight:0.21 g
Prepared: 03/22/2023 — Final Volume: 50 mL — % Solids: 83.49

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.00503	0.0240	0.432	mg/kg	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02 (Solid)

Extractions

Method: ASTM D2216 — Sampled: 03/03/2023 13:45
Instrument: N/A Analyst: NL — Analyzed: 03/15/2023 05:03

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep-Organics — Extract ID: 23C0174-02
Preparation Batch: BLC0248 — Sample Size: 1 g (wet)
Prepared: 03/14/2023 — Final Volume: 1 g

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids		1	0.01	83.30	%	

Labeled compounds

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02RE1 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 13:45

Instrument: NT10 Analyst: VTS — Analyzed: 04/07/2023 14:50

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)		Extract ID: 23C0174-02RE1 A 02
	Preparation Batch: BLC0423	Sample Size: 12.05 g (wet)	Dry Weight:10.00 g
	Prepared: 03/16/2023	Final Volume: 1 mL	% Solids: 83.00
Sample Cleanup:	Cleanup Method: GPC		Extract ID:23C0174-02RE1 A 02
	Cleanup Batch: CLC0192	Initial Volume: 1 uL	
	Cleaned: 22-Mar-2023	Final Volume: 1 uL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	20	87.8	400	ND	ug/kg	U
1,4-Dichlorobenzene	106-46-7	20	62.8	400	ND	ug/kg	U
1,2-Dichlorobenzene	95-50-1	20	47.4	400	ND	ug/kg	U
Benzyl Alcohol	100-51-6	20	325	400	ND	ug/kg	U
2-Methylphenol	95-48-7	20	133	400	ND	ug/kg	U
4-Methylphenol	106-44-5	20	148	400	ND	ug/kg	U
2,4-Dimethylphenol	105-67-9	20	75.6	2000	ND	ug/kg	U
1,2,4-Trichlorobenzene	120-82-1	20	71.4	400	ND	ug/kg	U
Naphthalene	91-20-3	20	84.8	400	165	ug/kg	J, D
Benzoic acid	65-85-0	20	781	4000	ND	ug/kg	U
Hexachlorobutadiene	87-68-3	20	96.2	400	ND	ug/kg	U
2-Methylnaphthalene	91-57-6	20	90.2	400	110	ug/kg	J, D
Acenaphthylene	208-96-8	20	125	400	ND	ug/kg	U
Dimethylphthalate	131-11-3	20	87.8	400	ND	ug/kg	U
Acenaphthene	83-32-9	20	104	400	896	ug/kg	D
Dibenzofuran	132-64-9	20	282	400	914	ug/kg	D
Fluorene	86-73-7	20	291	400	1650	ug/kg	D
Diethyl phthalate	84-66-2	20	394	1000	ND	ug/kg	U
N-Nitrosodiphenylamine	86-30-6	20	106	400	ND	ug/kg	U
Hexachlorobenzene	118-74-1	20	270	400	ND	ug/kg	U
Pentachlorophenol	87-86-5	20	625	2000	ND	ug/kg	U
Phenanthrene	85-01-8	20	174	400	13400	ug/kg	D
Anthracene	120-12-7	20	144	400	1040	ug/kg	D
Di-n-Butylphthalate	84-74-2	20	112	400	302	ug/kg	J, D
Fluoranthene	206-44-0	20	122	400	11800	ug/kg	D
Pyrene	129-00-0	20	114	400	8850	ug/kg	D
Butylbenzylphthalate	85-68-7	20	188	400	ND	ug/kg	U
Benzo(a)anthracene	56-55-3	20	119	400	2860	ug/kg	D
Chrysene	218-01-9	20	121	400	3310	ug/kg	D
bis(2-Ethylhexyl)phthalate	117-81-7	20	109	1000	ND	ug/kg	U
Di-n-Octylphthalate	117-84-0	20	87.8	400	ND	ug/kg	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <2mm

23C0174-02RE1 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 13:45

Instrument: NT10 Analyst: VTS — Analyzed: 04/07/2023 14:50

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzofluoranthenes, Total		20	200	800	3620	ug/kg	D
Benzo(a)pyrene	50-32-8	20	84.6	400	1570	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	20	293	400	1010	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	20	345	400	408	ug/kg	D
Benzo(g,h,i)perylene	191-24-2	20	272	400	1050	ug/kg	D
Surrogate: 2-Fluorophenol				*27-120 %*	*39.4*	*%*	
Surrogate: Phenol-d5				*29-120 %*	*37.9*	*%*	
Surrogate: 2-Chlorophenol-d4				*31-120 %*	*47.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*32-120 %*	*50.4*	*%*	
Surrogate: Nitrobenzene-d5				*30-120 %*	*42.3*	*%*	
Surrogate: 2-Fluorobiphenyl				*35-120 %*	*50.1*	*%*	
Surrogate: 2,4,6-Tribromophenol				*24-134 %*	*48.8*	*%*	
Surrogate: p-Terphenyl-d14				*37-120 %*	*62.8*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 14:45

Instrument: NT18 Analyst: VTS — Analyzed: 03/24/2023 10:27

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)		Extract ID: 23C0174-03 A 02
	Preparation Batch: BLC0423	Sample Size: 12.26 g (wet)	Dry Weight:10.01 g
	Prepared: 03/16/2023	Final Volume: 1 mL	% Solids: 81.65
Sample Cleanup:	Cleanup Method: GPC		Extract ID:23C0174-03 A 02
	Cleanup Batch: CLC0192	Initial Volume: 1 uL	
	Cleaned: 22-Mar-2023	Final Volume: 1 uL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	1	4.4	20.0	11.4	ug/kg	J
1,4-Dichlorobenzene	106-46-7	1	3.1	20.0	10.0	ug/kg	J
1,2-Dichlorobenzene	95-50-1	1	2.4	20.0	27.8	ug/kg	
Benzyl Alcohol	100-51-6	1	16.2	20.0	ND	ug/kg	U
2-Methylphenol	95-48-7	1	6.7	20.0	ND	ug/kg	U
4-Methylphenol	106-44-5	1	7.4	20.0	9.4	ug/kg	J
2,4-Dimethylphenol	105-67-9	1	3.8	99.9	ND	ug/kg	U
1,2,4-Trichlorobenzene	120-82-1	1	3.6	20.0	16.0	ug/kg	J
Naphthalene	91-20-3	1	4.2	20.0	86.7	ug/kg	
Benzoic acid	65-85-0	1	39.0	200	ND	ug/kg	U
Hexachlorobutadiene	87-68-3	1	4.8	20.0	ND	ug/kg	U
2-Methylnaphthalene	91-57-6	1	4.5	20.0	52.9	ug/kg	
Acenaphthylene	208-96-8	1	6.2	20.0	ND	ug/kg	U
Dimethylphthalate	131-11-3	1	4.4	20.0	4.7	ug/kg	J
Acenaphthene	83-32-9	1	5.2	20.0	12.0	ug/kg	J
Dibenzofuran	132-64-9	1	14.1	20.0	34.6	ug/kg	
Fluorene	86-73-7	1	14.6	20.0	ND	ug/kg	U
Diethyl phthalate	84-66-2	1	19.7	49.9	ND	ug/kg	U
N-Nitrosodiphenylamine	86-30-6	1	5.3	20.0	ND	ug/kg	U
Hexachlorobenzene	118-74-1	1	13.5	20.0	ND	ug/kg	U
Pentachlorophenol	87-86-5	1	31.2	99.9	ND	ug/kg	U
Phenanthrene	85-01-8	1	8.7	20.0	215	ug/kg	
Anthracene	120-12-7	1	7.2	20.0	31.0	ug/kg	
Di-n-Butylphthalate	84-74-2	1	5.6	20.0	150	ug/kg	
Fluoranthene	206-44-0	1	6.1	20.0	137	ug/kg	
Pyrene	129-00-0	1	5.7	20.0	129	ug/kg	
Butylbenzylphthalate	85-68-7	1	9.4	20.0	44.8	ug/kg	
Benzo(a)anthracene	56-55-3	1	6.0	20.0	55.7	ug/kg	
Chrysene	218-01-9	1	6.1	20.0	91.8	ug/kg	
bis(2-Ethylhexyl)phthalate	117-81-7	1	5.5	49.9	21.6	ug/kg	J
Di-n-Octylphthalate	117-84-0	1	4.4	20.0	ND	ug/kg	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 14:45

Instrument: NT18 Analyst: VTS — Analyzed: 03/24/2023 10:27

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzofluoranthenes, Total		1	10.0	40.0	147	ug/kg	
Benzo(a)pyrene	50-32-8	1	4.2	20.0	42.9	ug/kg	
Indeno(1,2,3-cd)pyrene	193-39-5	1	14.6	20.0	ND	ug/kg	U
Dibenzo(a,h)anthracene	53-70-3	1	17.2	20.0	ND	ug/kg	U
Benzo(g,h,i)perylene	191-24-2	1	13.6	20.0	ND	ug/kg	U
Surrogate: 2-Fluorophenol				*27-120 %*	*81.8*	*%*	
Surrogate: Phenol-d5				*29-120 %*	*84.8*	*%*	
Surrogate: 2-Chlorophenol-d4				*31-120 %*	*86.3*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*32-120 %*	*75.8*	*%*	
Surrogate: Nitrobenzene-d5				*30-120 %*	*90.8*	*%*	
Surrogate: 2-Fluorobiphenyl				*35-120 %*	*85.9*	*%*	
Surrogate: 2,4,6-Tribromophenol				*24-134 %*	*95.1*	*%*	
Surrogate: p-Terphenyl-d14				*37-120 %*	*85.6*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 14:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 15:08

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: EPA 8290 — Extract ID: 23C0174-03 A 03

Preparation Batch: BLC0379 — Sample Size: 12.24 g (wet) — Dry Weight:10.01 g

Prepared: 03/15/2023 — Final Volume: 20 uL — % Solids: 81.77

Analyte	DF/Split	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	Notes
2,3,7,8-TCDF		0.757	0.655-0.886	0.27	1.00	**237**	ng/kg	X
2,3,7,8-TCDD		0.821	0.655-0.886	0.08	1.00	**15.2**	ng/kg	
1,2,3,7,8-PeCDF		1.573	1.318-1.783	0.30	1.00	**245**	ng/kg	
2,3,4,7,8-PeCDF		1.567	1.318-1.783	0.27	1.00	**360**	ng/kg	
1,2,3,7,8-PeCDD		1.603	1.318-1.783	0.16	1.00	**115**	ng/kg	
1,2,3,4,7,8-HxCDF		1.238	1.054-1.426	0.12	1.00	**207**	ng/kg	
1,2,3,6,7,8-HxCDF		1.238	1.054-1.426	0.13	1.00	**218**	ng/kg	
2,3,4,6,7,8-HxCDF		1.224	1.054-1.426	0.13	1.00	**255**	ng/kg	
1,2,3,7,8,9-HxCDF		1.245	1.054-1.426	0.15	1.00	**44.9**	ng/kg	
1,2,3,4,7,8-HxCDD		1.245	1.054-1.426	0.12	1.00	**35.4**	ng/kg	
1,2,3,6,7,8-HxCDD		1.323	1.054-1.426	0.12	1.00	**59.3**	ng/kg	
1,2,3,7,8,9-HxCDD		1.255	1.054-1.426	0.13	1.00	**51.9**	ng/kg	
1,2,3,4,6,7,8-HpCDF		1.061	0.893-1.208	0.13	1.00	**680**	ng/kg	
1,2,3,4,7,8,9-HpCDF		1.001	0.893-1.208	0.19	1.00	**49.5**	ng/kg	
1,2,3,4,6,7,8-HpCDD		1.029	0.893-1.208	0.21	2.50	**502**	ng/kg	
OCDF		0.923	0.757-1.024	0.25	2.50	**256**	ng/kg	
OCDD		0.861	0.757-1.024	0.34	9.99	**1280**	ng/kg	
Homologue groups								
Total TCDF					1.00	**6030**	ng/kg	
Total TCDD					1.00	**554**	ng/kg	
Total PeCDF					1.00	**4930**	ng/kg	
Total PeCDD					1.00	**693**	ng/kg	
Total HxCDF					1.00	**2010**	ng/kg	
Total HxCDD					1.00	**856**	ng/kg	
Total HpCDF					1.00	**935**	ng/kg	
Total HpCDD					1.00	**928**	ng/kg	

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC):	369.18
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC):	369.18
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, EMPC = ND):	369.18
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, EMPC = ND):	369.18

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 14:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 15:08

Analysis by: Analytical Resources, LLC

Analyte	DF/Split	Ion Ratio	Ratio Limits	Reporting Limit	Result	Units	Notes
Labeled compounds							
13C12-2,3,7,8-TCDF		*0.757*	*0.655-0.886*	*24-169 %*	*56.2*	*%*	
13C12-2,3,7,8-TCDD		*0.784*	*0.655-0.886*	*25-164 %*	*68.7*	*%*	
13C12-1,2,3,7,8-PeCDF		*1.539*	*1.318-1.783*	*24-185 %*	*85.0*	*%*	
13C12-2,3,4,7,8-PeCDF		*1.531*	*1.318-1.783*	*21-178 %*	*91.2*	*%*	
13C12-1,2,3,7,8-PeCDD		*1.782*	*1.318-1.783*	*25-181 %*	*59.6*	*%*	
13C12-1,2,3,4,7,8-HxCDF		*0.510*	*0.434-0.587*	*26-152 %*	*74.1*	*%*	
13C12-1,2,3,6,7,8-HxCDF		*0.518*	*0.434-0.587*	*26-123 %*	*63.1*	*%*	
13C12-2,3,4,6,7,8-HxCDF		*0.525*	*0.434-0.587*	*28-136 %*	*73.6*	*%*	
13C12-1,2,3,7,8,9-HxCDF		*0.515*	*0.434-0.587*	*29-147 %*	*72.0*	*%*	
13C12-1,2,3,4,7,8-HxCDD		*1.264*	*1.054-1.426*	*32-141 %*	*73.7*	*%*	
13C12-1,2,3,6,7,8-HxCDD		*1.276*	*1.054-1.426*	*28-130 %*	*62.4*	*%*	
13C12-1,2,3,4,6,7,8-HpCDF		*0.455*	*0.374-0.506*	*28-143 %*	*90.0*	*%*	
13C12-1,2,3,4,7,8,9-HpCDF		*0.457*	*0.374-0.506*	*26-138 %*	*86.2*	*%*	
13C12-1,2,3,4,6,7,8-HpCDD		*1.079*	*0.893-1.208*	*23-140 %*	*76.3*	*%*	
13C12-OCDD		*0.898*	*0.757-1.024*	*17-157 %*	*82.1*	*%*	
37Cl4-2,3,7,8-TCDD				*35-197 %*	*74.2*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Dioxins/Furans

Method: EPA 8290A — Sampled: 03/03/2023 14:45

Instrument: AUTOSPEC01 Analyst: pk — Analyzed: 04/25/2023 15:08

Analysis by: Analytical Resources, LLC

Analyte	DF/Split	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	Notes

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 03/03/2023 14:45

Instrument: ICP3 Analyst: DOE — Analyzed: 03/22/2023 13:33

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SWC EPA 3050B — Extract ID: 23C0174-03 A 03

Preparation Batch: BLC0365 — Sample Size: 1.033 g (wet) — Dry Weight:0.85 g

Prepared: 03/14/2023 — Final Volume: 50 mL — % Solids: 82.17

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Antimony	7440-36-0	50	13.7	147	61.3	mg/kg	J, D
Arsenic	7440-38-2	50	13.5	147	44.8	mg/kg	J, D
Cadmium	7440-43-9	50	2.06	5.89	17.7	mg/kg	D
Chromium	7440-47-3	50	13.0	26.5	388	mg/kg	D
Copper	7440-50-8	50	4.12	8.84	1560	mg/kg	D
Lead	7439-92-1	50	7.07	58.9	6110	mg/kg	D
Nickel	7440-02-0	50	11.4	29.5	247	mg/kg	D
Silver	7440-22-4	50	2.30	8.84	6.48	mg/kg	J, D
Zinc	7440-66-6	50	23.6	58.9	2980	mg/kg	D

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Metals and Metallic Compounds

Method: EPA 7471B — Sampled: 03/03/2023 14:45
Instrument: HYDRA Analyst: ML — Analyzed: 03/23/2023 15:16

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: SMM EPA 7471B — Extract ID: 23C0174-03 A
Preparation Batch: BLC0413 — Sample Size: 0.22 g (wet) — Dry Weight:0.18 g
Prepared: 03/22/2023 — Final Volume: 50 mL — % Solids: 82.17

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.00581	0.0277	0.110	mg/kg	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03 (Solid)

Extractions

Method: ASTM D2216 — Sampled: 03/03/2023 14:45

Instrument: N/A Analyst: NL — Analyzed: 03/15/2023 05:03

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: No Prep-Organics — Extract ID: 23C0174-03

Preparation Batch: BLC0248 — Sample Size: 1 g (wet)

Prepared: 03/14/2023 — Final Volume: 1 g

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids		1	0.01	81.77	%	

Labeled compounds

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03RE1 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 14:45

Instrument: NT10 Analyst: VTS — Analyzed: 04/07/2023 14:11

Analysis by: Analytical Resources, LLC

Sample Preparation:	Preparation Method: EPA 3546 (Microwave)		Extract ID: 23C0174-03RE1 A 02
	Preparation Batch: BLC0423	Sample Size: 12.26 g (wet)	Dry Weight:10.01 g
	Prepared: 03/16/2023	Final Volume: 1 mL	% Solids: 81.65
Sample Cleanup:	Cleanup Method: GPC		Extract ID:23C0174-03RE1 A 02
	Cleanup Batch: CLC0192	Initial Volume: 1 uL	
	Cleaned: 22-Mar-2023	Final Volume: 1 uL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Phenol	108-95-2	4	17.5	79.9	ND	ug/kg	U
1,4-Dichlorobenzene	106-46-7	4	12.5	79.9	12.8	ug/kg	J, D
1,2-Dichlorobenzene	95-50-1	4	9.5	79.9	30.0	ug/kg	J, D
Benzyl Alcohol	100-51-6	4	65.0	79.9	ND	ug/kg	U
2-Methylphenol	95-48-7	4	26.6	79.9	ND	ug/kg	U
4-Methylphenol	106-44-5	4	29.5	79.9	ND	ug/kg	U
2,4-Dimethylphenol	105-67-9	4	15.1	400	ND	ug/kg	U
1,2,4-Trichlorobenzene	120-82-1	4	14.3	79.9	19.2	ug/kg	J, D
Naphthalene	91-20-3	4	16.9	79.9	102	ug/kg	D
Benzoic acid	65-85-0	4	156	799	ND	ug/kg	U
Hexachlorobutadiene	87-68-3	4	19.2	79.9	ND	ug/kg	U
2-Methylnaphthalene	91-57-6	4	18.0	79.9	63.5	ug/kg	J, D
Acenaphthylene	208-96-8	4	24.9	79.9	ND	ug/kg	U
Dimethylphthalate	131-11-3	4	17.5	79.9	ND	ug/kg	U
Acenaphthene	83-32-9	4	20.9	79.9	ND	ug/kg	U
Dibenzofuran	132-64-9	4	56.4	79.9	ND	ug/kg	U
Fluorene	86-73-7	4	58.2	79.9	ND	ug/kg	U
Diethyl phthalate	84-66-2	4	78.8	200	ND	ug/kg	U
N-Nitrosodiphenylamine	86-30-6	4	21.3	79.9	ND	ug/kg	U
Hexachlorobenzene	118-74-1	4	53.9	79.9	ND	ug/kg	U
Pentachlorophenol	87-86-5	4	125	400	ND	ug/kg	U
Phenanthrene	85-01-8	4	34.8	79.9	249	ug/kg	D
Anthracene	120-12-7	4	28.7	79.9	34.8	ug/kg	J, D
Di-n-Butylphthalate	84-74-2	4	22.4	79.9	174	ug/kg	D
Fluoranthene	206-44-0	4	24.3	79.9	168	ug/kg	D
Pyrene	129-00-0	4	22.7	79.9	156	ug/kg	D
Butylbenzylphthalate	85-68-7	4	37.6	79.9	64.1	ug/kg	J, D
Benzo(a)anthracene	56-55-3	4	23.8	79.9	66.4	ug/kg	J, D
Chrysene	218-01-9	4	24.2	79.9	108	ug/kg	D
bis(2-Ethylhexyl)phthalate	117-81-7	4	21.8	200	77.6	ug/kg	J, D
Di-n-Octylphthalate	117-84-0	4	17.5	79.9	ND	ug/kg	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <2mm

23C0174-03RE1 (Solid)

Semivolatile Organic Compounds

Method: EPA 8270E — Sampled: 03/03/2023 14:45
Instrument: NT10 Analyst: VTS — Analyzed: 04/07/2023 14:11

Analysis by: Analytical Resources, LLC

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzofluoranthenes, Total		4	40.0	160	114	ug/kg	J, D
Benzo(a)pyrene	50-32-8	4	16.9	79.9	49.0	ug/kg	J, D
Indeno(1,2,3-cd)pyrene	193-39-5	4	58.5	79.9	ND	ug/kg	U
Dibenzo(a,h)anthracene	53-70-3	4	68.8	79.9	ND	ug/kg	U
Benzo(g,h,i)perylene	191-24-2	4	54.3	79.9	64.1	ug/kg	J, D
Surrogate: 2-Fluorophenol				*27-120 %*	*86.5*	*%*	
Surrogate: Phenol-d5				*29-120 %*	*84.4*	*%*	
Surrogate: 2-Chlorophenol-d4				*31-120 %*	*93.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*32-120 %*	*90.8*	*%*	
Surrogate: Nitrobenzene-d5				*30-120 %*	*90.1*	*%*	
Surrogate: 2-Fluorobiphenyl				*35-120 %*	*100*	*%*	
Surrogate: 2,4,6-Tribromophenol				*24-134 %*	*115*	*%*	
Surrogate: p-Terphenyl-d14				*37-120 %*	*107*	*%*	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <9mm

23C0174-04 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 03/03/2023 12:45
Instrument: ICP3 Analyst: DOE — Analyzed: 03/27/2023 12:05

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23C0174-04 A 01
Preparation Batch: BLC0616 — Sample Size: 25 mL (wet)
Prepared: 03/23/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	ND	mg/L	U
Barium	7440-39-3	5	0.0075	0.0150	0.388	mg/L	
Cadmium	7440-43-9	5	0.0006	0.0100	ND	mg/L	U
Chromium	7440-47-3	5	0.0024	0.0250	0.0045	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	0.0140	mg/L	J
Selenium	7782-49-2	5	0.0408	0.250	ND	mg/L	U
Silver	7440-22-4	5	0.0022	0.0150	ND	mg/L	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB01 - <9mm

23C0174-04 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 03/03/2023 12:45
Instrument: HYDRA Analyst: ML — Analyzed: 03/29/2023 13:51

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23C0174-04 A 01
Preparation Batch: BLC0617 — Sample Size: 20 mL
Prepared: 03/23/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	0.000007	mg/L	J

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <9mm

23C0174-05 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 03/03/2023 13:45

Instrument: ICP3 Analyst: DOE — Analyzed: 03/27/2023 12:30

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23C0174-05 A 01

Preparation Batch: BLC0616 — Sample Size: 25 mL (wet)

Prepared: 03/23/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	ND	mg/L	U
Barium	7440-39-3	5	0.0075	0.0150	0.283	mg/L	
Cadmium	7440-43-9	5	0.0006	0.0100	0.0180	mg/L	
Chromium	7440-47-3	5	0.0024	0.0250	0.0165	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	4.04	mg/L	
Selenium	7782-49-2	5	0.0408	0.250	ND	mg/L	U
Silver	7440-22-4	5	0.0022	0.0150	ND	mg/L	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB02 - <9mm

23C0174-05 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 03/03/2023 13:45
Instrument: HYDRA Analyst: ML — Analyzed: 03/29/2023 13:58

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23C0174-05 A 01
Preparation Batch: BLC0617 — Sample Size: 20 mL
Prepared: 03/23/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	ND	mg/L	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <9mm

23C0174-06 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 6010D — Sampled: 03/03/2023 14:45
Instrument: ICP3 Analyst: DOE — Analyzed: 03/27/2023 12:32

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEN Digestion of EPA 1311 Elutriate — Extract ID: 23C0174-06 A 01
Preparation Batch: BLC0616 — Sample Size: 25 mL (wet)
Prepared: 03/23/2023 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic	7440-38-2	5	0.0140	0.250	ND	mg/L	U
Barium	7440-39-3	5	0.0075	0.0150	0.618	mg/L	
Cadmium	7440-43-9	5	0.0006	0.0100	0.160	mg/L	
Chromium	7440-47-3	5	0.0024	0.0250	0.0075	mg/L	J
Lead	7439-92-1	5	0.0065	0.100	3.49	mg/L	
Selenium	7782-49-2	5	0.0408	0.250	ND	mg/L	U
Silver	7440-22-4	5	0.0022	0.0150	ND	mg/L	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

LDW23-DB03 - <9mm

23C0174-06 (Solid)

TCLP Metals and Metallic Compounds

Method: EPA 7470A — Sampled: 03/03/2023 14:45

Instrument: HYDRA Analyst: ML — Analyzed: 03/29/2023 14:00

Analysis by: Analytical Resources, LLC

Sample Preparation: Preparation Method: LEM 7470A Digestion of EPA 1311 Elutriate for Hg — Extract ID: 23C0174-06 A 01

Preparation Batch: BLC0617 — Sample Size: 20 mL

Prepared: 03/23/2023 — Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Mercury	7439-97-6	1	0.000007	0.000100	ND	mg/L	U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BLC0423 - EPA 8270E

Instrument: NT18 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0423-BLK1)				Prepared: 22-Mar-2023 Analyzed: 24-Mar-2023 06:25							
Phenol	ND	4.4	20.0	ug/kg							U
1,4-Dichlorobenzene	ND	3.1	20.0	ug/kg							U
1,2-Dichlorobenzene	ND	2.4	20.0	ug/kg							U
Benzyl Alcohol	ND	16.3	20.0	ug/kg							U
2-Methylphenol	ND	6.7	20.0	ug/kg							U
4-Methylphenol	ND	7.4	20.0	ug/kg							U
2,4-Dimethylphenol	ND	3.8	100	ug/kg							U
1,2,4-Trichlorobenzene	ND	3.6	20.0	ug/kg							U
Naphthalene	ND	4.2	20.0	ug/kg							U
Benzoic acid	ND	39.0	200	ug/kg							U
Hexachlorobutadiene	ND	4.8	20.0	ug/kg							U
2-Methylnaphthalene	ND	4.5	20.0	ug/kg							U
Acenaphthylene	ND	6.2	20.0	ug/kg							U
Dimethylphthalate	ND	4.4	20.0	ug/kg							U
Acenaphthene	ND	5.2	20.0	ug/kg							U
Dibenzofuran	ND	14.1	20.0	ug/kg							U
Fluorene	ND	14.6	20.0	ug/kg							U
Diethyl phthalate	ND	19.7	50.0	ug/kg							U
N-Nitrosodiphenylamine	ND	5.3	20.0	ug/kg							U
Hexachlorobenzene	ND	13.5	20.0	ug/kg							U
Pentachlorophenol	ND	31.3	100	ug/kg							U
Phenanthrene	ND	8.7	20.0	ug/kg							U
Anthracene	ND	7.2	20.0	ug/kg							U
Di-n-Butylphthalate	ND	5.6	20.0	ug/kg							U
Fluoranthene	ND	6.1	20.0	ug/kg							U
Pyrene	ND	5.7	20.0	ug/kg							U
Butylbenzylphthalate	ND	9.4	20.0	ug/kg							U
Benzo(a)anthracene	ND	6.0	20.0	ug/kg							U
Chrysene	ND	6.1	20.0	ug/kg							U
bis(2-Ethylhexyl)phthalate	ND	5.5	50.0	ug/kg							U
Di-n-Octylphthalate	ND	4.4	20.0	ug/kg							U
Benzofluoranthenes, Total	ND	10.0	40.0	ug/kg							U
Benzo(a)pyrene	ND	4.2	20.0	ug/kg							U
Indeno(1,2,3-cd)pyrene	ND	14.7	20.0	ug/kg							U
Dibenzo(a,h)anthracene	ND	17.2	20.0	ug/kg							U

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BLC0423 - EPA 8270E

Instrument: NT18 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0423-BLK1)				Prepared: 22-Mar-2023 Analyzed: 24-Mar-2023 06:25							
Benzo(g,h,i)perylene	ND	13.6	20.0	ug/kg							U
Surrogate: 2-Fluorophenol	486			ug/kg	*750*		*64.8*	*27-120*			
Surrogate: Phenol-d5	530			ug/kg	*750*		*70.7*	*29-120*			
Surrogate: 2-Chlorophenol-d4	536			ug/kg	*750*		*71.5*	*31-120*			
Surrogate: 1,2-Dichlorobenzene-d4	347			ug/kg	*500*		*69.3*	*32-120*			
Surrogate: Nitrobenzene-d5	394			ug/kg	*500*		*78.7*	*30-120*			
Surrogate: 2-Fluorobiphenyl	366			ug/kg	*500*		*73.2*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	456			ug/kg	*750*		*60.8*	*24-134*			
Surrogate: p-Terphenyl-d14	429			ug/kg	*500*		*85.8*	*37-120*			
LCS (BLC0423-BS1)				Prepared: 22-Mar-2023 Analyzed: 24-Mar-2023 07:05							
Phenol	372	4.4	20.0	ug/kg	500		74.5	34-120			
1,4-Dichlorobenzene	392	3.1	20.0	ug/kg	500		78.3	39-120			
1,2-Dichlorobenzene	386	2.4	20.0	ug/kg	500		77.2	40-120			
Benzyl Alcohol	413	16.3	20.0	ug/kg	500		82.6	19-120			
2-Methylphenol	296	6.7	20.0	ug/kg	500		59.3	28-120			
4-Methylphenol	347	7.4	20.0	ug/kg	500		69.3	29-120			
2,4-Dimethylphenol	184	3.8	100	ug/kg	1300		14.1	10-120			
1,2,4-Trichlorobenzene	390	3.6	20.0	ug/kg	500		78.1	35-120			
Naphthalene	397	4.2	20.0	ug/kg	500		79.5	43-120			
Benzoic acid	1890	39.0	200	ug/kg	2300		82.3	10-120			Q
Hexachlorobutadiene	401	4.8	20.0	ug/kg	500		80.3	37-120			
2-Methylnaphthalene	391	4.5	20.0	ug/kg	500		78.1	43-120			
Acenaphthylene	413	6.2	20.0	ug/kg	500		82.6	42-120			
Dimethylphthalate	456	4.4	20.0	ug/kg	500		91.3	43-120			
Acenaphthene	414	5.2	20.0	ug/kg	500		82.9	45-120			
Dibenzofuran	407	14.1	20.0	ug/kg	500		81.5	43-120			
Fluorene	422	14.6	20.0	ug/kg	500		84.4	45-120			
Diethyl phthalate	523	19.7	50.0	ug/kg	500		105	50-120			
N-Nitrosodiphenylamine	407	5.3	20.0	ug/kg	500		81.3	70-154			
Hexachlorobenzene	465	13.5	20.0	ug/kg	500		93.0	33-120			
Pentachlorophenol	1150	31.3	100	ug/kg	1300		88.7	16-120			
Phenanthrene	423	8.7	20.0	ug/kg	500		84.6	49-120			
Anthracene	377	7.2	20.0	ug/kg	500		75.4	45-120			
Di-n-Butylphthalate	469	5.6	20.0	ug/kg	500		93.9	48-126			

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BLC0423 - EPA 8270E

Instrument: NT18 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLC0423-BS1)					Prepared: 22-Mar-2023 Analyzed: 24-Mar-2023 07:05						
Fluoranthene	446	6.1	20.0	ug/kg	500		89.1	53-145			
Pyrene	428	5.7	20.0	ug/kg	500		85.7	52-134			
Butylbenzylphthalate	471	9.4	20.0	ug/kg	500		94.1	45-132			
Benzo(a)anthracene	432	6.0	20.0	ug/kg	500		86.4	49-120			
Chrysene	428	6.1	20.0	ug/kg	500		85.6	47-120			
bis(2-Ethylhexyl)phthalate	426	5.5	50.0	ug/kg	500		85.2	34-130			
Di-n-Octylphthalate	468	4.4	20.0	ug/kg	500		93.6	28-124			
Benzofluoranthenes, Total	926	10.0	40.0	ug/kg	1000		92.6	30-160			
Benzo(a)pyrene	416	4.2	20.0	ug/kg	500		83.2	42-120			
Indeno(1,2,3-cd)pyrene	447	14.7	20.0	ug/kg	500		89.5	42-163			
Dibenzo(a,h)anthracene	449	17.2	20.0	ug/kg	500		89.9	30-133			
Benzo(g,h,i)perylene	560	13.6	20.0	ug/kg	500		112	46-148			Q
Surrogate: 2-Fluorophenol	601			ug/kg	*750*		*80.1*	*27-120*			
Surrogate: Phenol-d5	639			ug/kg	*750*		*85.2*	*29-120*			
Surrogate: 2-Chlorophenol-d4	646			ug/kg	*750*		*86.1*	*31-120*			
Surrogate: 1,2-Dichlorobenzene-d4	391			ug/kg	*500*		*78.1*	*32-120*			
Surrogate: Nitrobenzene-d5	469			ug/kg	*500*		*93.7*	*30-120*			
Surrogate: 2-Fluorobiphenyl	429			ug/kg	*500*		*85.9*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	635			ug/kg	*750*		*84.6*	*24-134*			
Surrogate: p-Terphenyl-d14	458			ug/kg	*500*		*91.5*	*37-120*			
LCS Dup (BLC0423-BSD1)					Prepared: 22-Mar-2023 Analyzed: 24-Mar-2023 07:46						
Phenol	347	4.4	20.0	ug/kg	500		69.3	34-120	7.16	30	
1,4-Dichlorobenzene	357	3.1	20.0	ug/kg	500		71.4	39-120	9.22	30	
1,2-Dichlorobenzene	358	2.4	20.0	ug/kg	500		71.5	40-120	7.68	30	
Benzyl Alcohol	393	16.3	20.0	ug/kg	500		78.6	19-120	4.93	30	
2-Methylphenol	294	6.7	20.0	ug/kg	500		58.8	28-120	0.76	30	
4-Methylphenol	329	7.4	20.0	ug/kg	500		65.8	29-120	5.29	30	
2,4-Dimethylphenol	239	3.8	100	ug/kg	1300		18.4	10-120	26.40	30	
1,2,4-Trichlorobenzene	357	3.6	20.0	ug/kg	500		71.4	35-120	8.89	30	
Naphthalene	361	4.2	20.0	ug/kg	500		72.2	43-120	9.67	30	
Benzoic acid	2080	39.0	200	ug/kg	2300		90.3	10-120	9.24	30	Q
Hexachlorobutadiene	361	4.8	20.0	ug/kg	500		72.2	37-120	10.60	30	
2-Methylnaphthalene	358	4.5	20.0	ug/kg	500		71.7	43-120	8.62	30	
Acenaphthylene	390	6.2	20.0	ug/kg	500		78.0	42-120	5.76	30	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Semivolatile Organic Compounds - Quality Control

Batch BLC0423 - EPA 8270E

Instrument: NT18 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BLC0423-BSD1)					Prepared: 22-Mar-2023 Analyzed: 24-Mar-2023 07:46						
Dimethylphthalate	458	4.4	20.0	ug/kg	500		91.6	43-120	0.42	30	
Acenaphthene	396	5.2	20.0	ug/kg	500		79.2	45-120	4.54	30	
Dibenzofuran	391	14.1	20.0	ug/kg	500		78.3	43-120	4.02	30	
Fluorene	411	14.6	20.0	ug/kg	500		82.2	45-120	2.65	30	
Diethyl phthalate	474	19.7	50.0	ug/kg	500		94.8	50-120	9.93	30	
N-Nitrosodiphenylamine	176	5.3	20.0	ug/kg	500		35.2	70-154	79.30	30	*
Hexachlorobenzene	449	13.5	20.0	ug/kg	500		89.8	33-120	3.51	30	
Pentachlorophenol	1290	31.3	100	ug/kg	1300		99.1	16-120	11.00	30	
Phenanthrene	428	8.7	20.0	ug/kg	500		85.7	49-120	1.22	30	
Anthracene	371	7.2	20.0	ug/kg	500		74.1	45-120	1.73	30	
Di-n-Butylphthalate	488	5.6	20.0	ug/kg	500		97.7	48-126	3.95	30	
Fluoranthene	464	6.1	20.0	ug/kg	500		92.8	53-145	4.05	30	
Pyrene	446	5.7	20.0	ug/kg	500		89.2	52-134	4.01	30	
Butylbenzylphthalate	499	9.4	20.0	ug/kg	500		99.7	45-132	5.75	30	
Benzo(a)anthracene	461	6.0	20.0	ug/kg	500		92.2	49-120	6.52	30	
Chrysene	455	6.1	20.0	ug/kg	500		91.1	47-120	6.21	30	
bis(2-Ethylhexyl)phthalate	447	5.5	50.0	ug/kg	500		89.4	34-130	4.73	30	
Di-n-Octylphthalate	486	4.4	20.0	ug/kg	500		97.2	28-124	3.74	30	
Benzofluoranthenes, Total	940	10.0	40.0	ug/kg	1000		94.0	30-160	1.52	30	
Benzo(a)pyrene	385	4.2	20.0	ug/kg	500		77.0	42-120	7.76	30	
Indeno(1,2,3-cd)pyrene	452	14.7	20.0	ug/kg	500		90.3	42-163	0.96	30	
Dibenzo(a,h)anthracene	452	17.2	20.0	ug/kg	500		90.4	30-133	0.66	30	
Benzo(g,h,i)perylene	565	13.6	20.0	ug/kg	500		113	46-148	0.95	30	Q
Surrogate: 2-Fluorophenol	549			ug/kg	*750*		*73.2*	*27-120*			
Surrogate: Phenol-d5	569			ug/kg	*750*		*75.8*	*29-120*			
Surrogate: 2-Chlorophenol-d4	586			ug/kg	*750*		*78.1*	*31-120*			
Surrogate: 1,2-Dichlorobenzene-d4	346			ug/kg	*500*		*69.1*	*32-120*			
Surrogate: Nitrobenzene-d5	419			ug/kg	*500*		*83.8*	*30-120*			
Surrogate: 2-Fluorobiphenyl	391			ug/kg	*500*		*78.1*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	649			ug/kg	*750*		*86.5*	*24-134*			
Surrogate: p-Terphenyl-d14	464			ug/kg	*500*		*92.8*	*37-120*			

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Dioxins/Furans - Quality Control

Batch BLC0379 - EPA 8290A

Instrument: AUTOSPEC01 Analyst: pl

QC Sample/Analyte	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0379-BLK1)				Prepared: 15-Mar-2023 Analyzed: 25-Apr-2023 08:36							
2,3,7,8-TCDF		0.655-0.886	0.11	1.00	ND	ng/kg					U
2,3,7,8-TCDD		0.655-0.886	0.08	1.00	ND	ng/kg					U
1,2,3,7,8-PeCDF		1.318-1.783	0.10	1.00	ND	ng/kg					U
2,3,4,7,8-PeCDF		1.318-1.783	0.10	1.00	ND	ng/kg					U
1,2,3,7,8-PeCDD	1.944	1.318-1.783		1.00	0.18	ng/kg					EMPC, J
1,2,3,4,7,8-HxCDF		1.054-1.426	0.07	1.00	ND	ng/kg					U
1,2,3,6,7,8-HxCDF		1.054-1.426	0.07	1.00	ND	ng/kg					U
2,3,4,6,7,8-HxCDF		1.054-1.426	0.08	1.00	ND	ng/kg					U
1,2,3,7,8,9-HxCDF		1.054-1.426	0.10	1.00	ND	ng/kg					U
1,2,3,4,7,8-HxCDD		1.054-1.426	0.09	1.00	ND	ng/kg					U
1,2,3,6,7,8-HxCDD		1.054-1.426	0.09	1.00	ND	ng/kg					U
1,2,3,7,8,9-HxCDD		1.054-1.426	0.10	1.00	ND	ng/kg					U
1,2,3,4,6,7,8-HpCDF		0.893-1.208	0.07	1.00	ND	ng/kg					U
1,2,3,4,7,8,9-HpCDF		0.893-1.208	0.11	1.00	ND	ng/kg					U
1,2,3,4,6,7,8-HpCDD		0.893-1.208	0.12	2.50	ND	ng/kg					U
OCDF		0.757-1.024	0.24	2.50	ND	ng/kg					U
OCDD	1.217	0.757-1.024		9.99	1.00	ng/kg					EMPC, J
Homologue group											
Total TCDF				1.00	ND	ng/kg					U
Total TCDD				1.00	ND	ng/kg					U
Total PeCDF				1.00	ND	ng/kg					U
Total PeCDD				1.00	ND	ng/kg					U
Total HxCDF				1.00	ND	ng/kg					U
Total HxCDD				1.00	ND	ng/kg					U
Total HpCDF				1.00	ND	ng/kg					U
Total HpCDD				1.00	ND	ng/kg					U

Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, Including EMPC):	0.27
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0, Including EMPC):	0.18
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=1/2 EDL, EMPC=ND):	0.15
Total 2,3,7,8-TCDD Equivalence (WHO2005, ND=0 EDL, EMPC=ND):	0.00

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Dioxins/Furans - Quality Control

Batch BLC0379 - EPA 8290A

Instrument: AUTOSPEC01 Analyst: pl

QC Sample/Analyte	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0379-BLK1)				Prepared: 15-Mar-2023 Analyzed: 25-Apr-2023 08:36							
Labeled compounds											
13C12-2,3,7,8-TCDF	*0.780*	*0.655-0.886*			*56.9*			*24-169 %*			
13C12-2,3,7,8-TCDD	*0.792*	*0.655-0.886*			*67.6*			*25-164 %*			
13C12-1,2,3,7,8-PeCDF	*1.508*	*1.318-1.783*			*90.1*			*24-185 %*			
13C12-2,3,4,7,8-PeCDF	*1.521*	*1.318-1.783*			*88.8*			*21-178 %*			
13C12-1,2,3,7,8-PeCDD	*1.686*	*1.318-1.783*			*68.3*			*25-181 %*			
13C12-1,2,3,4,7,8-HxCDF	*0.511*	*0.434-0.587*			*88.9*			*26-152 %*			
13C12-1,2,3,6,7,8-HxCDF	*0.510*	*0.434-0.587*			*81.5*			*26-123 %*			
13C12-2,3,4,6,7,8-HxCDF	*0.526*	*0.434-0.587*			*88.4*			*28-136 %*			
13C12-1,2,3,7,8,9-HxCDF	*0.507*	*0.434-0.587*			*85.4*			*29-147 %*			
13C12-1,2,3,4,7,8-HxCDD	*1.270*	*1.054-1.426*			*89.2*			*32-141 %*			
13C12-1,2,3,6,7,8-HxCDD	*1.223*	*1.054-1.426*			*82.6*			*28-130 %*			
13C12-1,2,3,4,6,7,8-HpCDF	*0.470*	*0.374-0.506*			*103*			*28-143 %*			
13C12-1,2,3,4,7,8,9-HpCDF	*0.439*	*0.374-0.506*			*90.8*			*26-138 %*			
13C12-1,2,3,4,6,7,8-HpCDD	*1.100*	*0.893-1.208*			*81.6*			*23-140 %*			
13C12-OCDD	*0.903*	*0.757-1.024*			*85.1*			*17-157 %*			
37Cl4-2,3,7,8-TCDD					*62.7*			*35-197 %*			
LCS (BLC0379-BS1)				Prepared: 15-Mar-2023 Analyzed: 25-Apr-2023 09:25							
2,3,7,8-TCDF	0.698	0.655-0.886		1.00	21.3	ng/kg	107	75-158 %			
2,3,7,8-TCDD	0.759	0.655-0.886		1.00	20.8	ng/kg	104	67-158 %			
1,2,3,7,8-PeCDF	1.541	1.318-1.783		1.00	123	ng/kg	123	80-134 %			
2,3,4,7,8-PeCDF	1.537	1.318-1.783		1.00	118	ng/kg	118	68-160 %			
1,2,3,7,8-PeCDD	1.537	1.318-1.783		1.00	127	ng/kg	127	70-142 %			
1,2,3,4,7,8-HxCDF	1.265	1.054-1.426		1.00	105	ng/kg	105	72-134 %			
1,2,3,6,7,8-HxCDF	1.321	1.054-1.426		1.00	111	ng/kg	111	84-130 %			
2,3,4,6,7,8-HxCDF	1.242	1.054-1.426		1.00	105	ng/kg	105	70-156 %			
1,2,3,7,8,9-HxCDF	1.337	1.054-1.426		1.00	103	ng/kg	103	78-130 %			
1,2,3,4,7,8-HxCDD	1.219	1.054-1.426		1.00	103	ng/kg	103	70-164 %			
1,2,3,6,7,8-HxCDD	1.200	1.054-1.426		1.00	115	ng/kg	115	76-134 %			
1,2,3,7,8,9-HxCDD	1.194	1.054-1.426		1.00	120	ng/kg	120	64-162 %			
1,2,3,4,6,7,8-HpCDF	1.044	0.893-1.208		1.00	101	ng/kg	101	82-122 %			
1,2,3,4,7,8,9-HpCDF	1.041	0.893-1.208		1.00	104	ng/kg	104	78-138 %			
1,2,3,4,6,7,8-HpCDD	1.012	0.893-1.208		2.50	109	ng/kg	109	70-140 %			
OCDF	0.832	0.757-1.024		2.50	209	ng/kg	105	63-170 %			
OCDD	0.912	0.757-1.024		9.99	200	ng/kg	100	78-144 %			

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Dioxins/Furans - Quality Control

Batch BLC0379 - EPA 8290A

Instrument: AUTOSPEC01 Analyst: pl

QC Sample/Analyte	Ion Ratio	Ratio Limits	EDL	Reporting Limit	Result	Units	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BLC0379-BS1)				Prepared: 15-Mar-2023	Analyzed: 25-Apr-2023 09:25						
Labeled compounds											
13C12-2,3,7,8-TCDF	*0.759*	*0.655-0.886*			*33.8*			*24-169 %*			
13C12-2,3,7,8-TCDD	*0.781*	*0.655-0.886*			*42.5*			*25-164 %*			
13C12-1,2,3,7,8-PeCDF	*1.618*	*1.318-1.783*			*73.8*			*24-185 %*			
13C12-2,3,4,7,8-PeCDF	*1.553*	*1.318-1.783*			*73.0*			*21-178 %*			
13C12-1,2,3,7,8-PeCDD	*1.684*	*1.318-1.783*			*57.7*			*25-181 %*			
13C12-1,2,3,4,7,8-HxCDF	*0.508*	*0.434-0.587*			*75.1*			*26-152 %*			
13C12-1,2,3,6,7,8-HxCDF	*0.526*	*0.434-0.587*			*72.2*			*26-123 %*			
13C12-2,3,4,6,7,8-HxCDF	*0.495*	*0.434-0.587*			*83.7*			*28-136 %*			
13C12-1,2,3,7,8,9-HxCDF	*0.516*	*0.434-0.587*			*81.0*			*29-147 %*			
13C12-1,2,3,4,7,8-HxCDD	*1.271*	*1.054-1.426*			*78.0*			*32-141 %*			
13C12-1,2,3,6,7,8-HxCDD	*1.263*	*1.054-1.426*			*69.0*			*28-130 %*			
13C12-1,2,3,4,6,7,8-HpCDF	*0.434*	*0.374-0.506*			*99.8*			*28-143 %*			
13C12-1,2,3,4,7,8,9-HpCDF	*0.428*	*0.374-0.506*			*88.9*			*26-138 %*			
13C12-1,2,3,4,6,7,8-HpCDD	*1.123*	*0.893-1.208*			*80.6*			*23-140 %*			
13C12-OCDD	*0.905*	*0.757-1.024*			*84.6*			*17-157 %*			
37Cl4-2,3,7,8-TCDD					*40.7*			*35-197 %*			

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BLC0365 - EPA 6010D

Instrument: ICP3 Analyst: DOE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0365-BLK1)				Prepared: 14-Mar-2023 Analyzed: 22-Mar-2023 11:27							
Antimony	ND	0.466	5.00	mg/kg							U
Arsenic	ND	0.460	5.00	mg/kg							U
Cadmium	ND	0.0700	0.200	mg/kg							U
Chromium	ND	0.441	0.900	mg/kg							U
Copper	ND	0.140	0.300	mg/kg							U
Lead	ND	0.240	2.00	mg/kg							U
Nickel	ND	0.387	1.00	mg/kg							U
Silver	ND	0.0780	0.300	mg/kg							U
Zinc	ND	0.800	2.00	mg/kg							U
LCS (BLC0365-BS1)				Prepared: 14-Mar-2023 Analyzed: 22-Mar-2023 11:30							
Antimony	219	0.466	5.00	mg/kg	200		110	80-120			
Arsenic	222	0.460	5.00	mg/kg	200		111	80-120			
Cadmium	55.0	0.0700	0.200	mg/kg	50.0		110	80-120			
Chromium	54.1	0.441	0.900	mg/kg	50.0		108	80-120			
Copper	54.1	0.140	0.300	mg/kg	50.0		108	80-120			
Lead	220	0.240	2.00	mg/kg	200		110	80-120			
Nickel	55.9	0.387	1.00	mg/kg	50.0		112	80-120			
Silver	57.4	0.0780	0.300	mg/kg	50.0		115	80-120			
Zinc	54.7	0.800	2.00	mg/kg	50.0		109	80-120			

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

Metals and Metallic Compounds - Quality Control

Batch BLC0413 - EPA 7471B

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0413-BLK1)					Prepared: 22-Mar-2023 Analyzed: 23-Mar-2023 14:34						
Mercury	ND	0.00525	0.0250	mg/kg							U
LCS (BLC0413-BS1)					Prepared: 22-Mar-2023 Analyzed: 23-Mar-2023 14:37						
Mercury	0.456	0.00525	0.0250	mg/kg	0.500		91.2	80-120			
Reference (BLC0413-SRM1)					Prepared: 22-Mar-2023 Analyzed: 23-Mar-2023 15:40						
Mercury	3.77	0.0522	0.249	mg/kg	3.31		114	86.1-139.9			D

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

TCLP Metals and Metallic Compounds - Quality Control

Batch BLC0616 - EPA 6010D

Instrument: ICP3 Analyst: DOE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0616-BLK1)				Prepared: 23-Mar-2023 Analyzed: 27-Mar-2023 11:14							
Arsenic	ND	0.0140	0.250	mg/L							U
Barium	0.0085	0.0075	0.0150	mg/L							J
Cadmium	ND	0.0006	0.0100	mg/L							U
Chromium	ND	0.0024	0.0250	mg/L							U
Lead	ND	0.0065	0.100	mg/L							U
Selenium	ND	0.0408	0.250	mg/L							U
Blank (BLC0616-BLK2)				Prepared: 23-Mar-2023 Analyzed: 26-Apr-2023 14:24							
Silver	ND	0.0022	0.0150	mg/L							U
Duplicate (BLC0616-DUP1)				**Source: 23C0174-04** Prepared: 23-Mar-2023 Analyzed: 27-Mar-2023 12:08							
Arsenic	ND	0.0140	0.250	mg/L		ND					U
Barium	0.398	0.0075	0.0150	mg/L		0.388			2.42	20	
Cadmium	ND	0.0006	0.0100	mg/L		ND					U
Chromium	0.0040	0.0024	0.0250	mg/L		0.0045			11.80	20	J
Lead	ND	0.0065	0.100	mg/L		0.0140					U
Selenium	ND	0.0408	0.250	mg/L		ND					U
Duplicate (BLC0616-DUP2)				**Source: 23C0174-04** Prepared: 23-Mar-2023 Analyzed: 26-Apr-2023 14:09							
Silver	ND	0.0022	0.0150	mg/L		ND					U
Matrix Spike (BLC0616-MS1)				**Source: 23C0174-04** Prepared: 23-Mar-2023 Analyzed: 27-Mar-2023 12:11							
Arsenic	4.24	0.0140	0.250	mg/L	4.00	ND	106	75-125			
Barium	4.72	0.0075	0.0150	mg/L	4.00	0.388	108	75-125			
Cadmium	1.01	0.0006	0.0100	mg/L	1.00	ND	101	75-125			
Chromium	1.01	0.0024	0.0250	mg/L	1.00	0.0045	100	75-125			
Lead	4.02	0.0065	0.100	mg/L	4.00	0.0140	100	75-125			
Selenium	4.46	0.0408	0.250	mg/L	4.00	ND	112	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike (BLC0616-MS2)				**Source: 23C0174-04** Prepared: 23-Mar-2023 Analyzed: 26-Apr-2023 14:12							
Silver	1.12	0.0022	0.0150	mg/L	1.00	ND	112	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Analysis by: Analytical Resources, LLC

TCLP Metals and Metallic Compounds - Quality Control

Batch BLC0617 - EPA 7470A

Instrument: HYDRA Analyst: ML

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BLC0617-BLK1)				Prepared: 23-Mar-2023 Analyzed: 29-Mar-2023 13:49							
Mercury	ND	0.000007	0.000100	mg/L							U
Duplicate (BLC0617-DUP1)		**Source: 23C0174-04**		Prepared: 23-Mar-2023 Analyzed: 29-Mar-2023 13:53							
Mercury	0.000009	0.000007	0.000100	mg/L		0.000007			20.50	20	L, J
Matrix Spike (BLC0617-MS1)		**Source: 23C0174-04**		Prepared: 23-Mar-2023 Analyzed: 29-Mar-2023 13:56							
Mercury	0.000911	0.000007	0.000100	mg/L	0.00100	0.000007	90.4	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Certified Analyses included in this Report

Analyte	Certifications
EPA 6010D in Solid	
Silver	NELAP,WADOE,DoD-ELAP
Arsenic	NELAP,WADOE
Arsenic	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium	NELAP,WADOE,DoD-ELAP
Cadmium	NELAP,WADOE,DoD-ELAP,ADEC
Chromium	NELAP,WADOE,DoD-ELAP
Chromium	NELAP,WADOE,DoD-ELAP,ADEC
Copper	NELAP,WADOE,DoD-ELAP
Nickel	NELAP,WADOE,DoD-ELAP,ADEC
Lead	NELAP,WADOE,DoD-ELAP,ADEC
Lead	NELAP,WADOE,DoD-ELAP
Antimony	NELAP,WADOE,DoD-ELAP
Zinc	NELAP,WADOE,DoD-ELAP
Silver	NELAP,WADOE,DoD-ELAP
Arsenic	NELAP,WADOE,DoD-ELAP,ADEC
Arsenic	NELAP,WADOE
Barium	NELAP,WADOE
Cadmium	NELAP,WADOE,DoD-ELAP,ADEC
Cadmium	NELAP,WADOE,DoD-ELAP
Chromium	NELAP,WADOE,DoD-ELAP
Chromium	NELAP,WADOE,DoD-ELAP,ADEC
Lead	NELAP,WADOE,DoD-ELAP
Lead	NELAP,WADOE,DoD-ELAP,ADEC
Selenium	NELAP,WADOE,DoD-ELAP
EPA 7470A in Water	
Mercury	WADOE,NELAP,DoD-ELAP
EPA 7471B in Solid	
Mercury	WADOE,NELAP,DoD-ELAP
EPA 8270E in Solid	

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Phenol	DoD-ELAP,NELAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,NELAP,WADOE
Benzyl Alcohol	DoD-ELAP,NELAP,WADOE
2-Methylphenol	DoD-ELAP,NELAP,WADOE
4-Methylphenol	DoD-ELAP,NELAP,WADOE
2,4-Dimethylphenol	DoD-ELAP,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,NELAP,WADOE
Naphthalene	DoD-ELAP,NELAP,WADOE,ADEC
Benzoic acid	DoD-ELAP,NELAP,WADOE
Hexachlorobutadiene	DoD-ELAP,NELAP,WADOE
2-Methylnaphthalene	DoD-ELAP,NELAP,WADOE,ADEC
Acenaphthylene	DoD-ELAP,NELAP,WADOE,ADEC
Dimethylphthalate	DoD-ELAP,NELAP,WADOE
Acenaphthene	DoD-ELAP,NELAP,WADOE,ADEC
Dibenzofuran	DoD-ELAP,NELAP,WADOE,ADEC
Fluorene	DoD-ELAP,NELAP,WADOE,ADEC
Diethyl phthalate	DoD-ELAP,NELAP,WADOE
N-Nitrosodiphenylamine	DoD-ELAP,NELAP,WADOE
Hexachlorobenzene	DoD-ELAP,NELAP,WADOE
Pentachlorophenol	DoD-ELAP,NELAP,WADOE
Phenanthrene	DoD-ELAP,NELAP,WADOE,ADEC
Anthracene	DoD-ELAP,NELAP,WADOE,ADEC
Di-n-Butylphthalate	DoD-ELAP,NELAP,WADOE
Fluoranthene	DoD-ELAP,NELAP,WADOE,ADEC
Pyrene	DoD-ELAP,NELAP,WADOE,ADEC
Butylbenzylphthalate	DoD-ELAP,NELAP,WADOE
Benzo(a)anthracene	DoD-ELAP,NELAP,WADOE,ADEC
Chrysene	DoD-ELAP,NELAP,WADOE,ADEC
bis(2-Ethylhexyl)phthalate	DoD-ELAP,NELAP,WADOE
Di-n-Octylphthalate	DoD-ELAP,NELAP,WADOE
Benzofluoranthenes, Total	WADOE,ADEC
Benzo(a)pyrene	DoD-ELAP,NELAP,WADOE,ADEC

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
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Indeno(1,2,3-cd)pyrene	DoD-ELAP,NELAP,WADOE,ADEC
Dibenzo(a,h)anthracene	DoD-ELAP,NELAP,WADOE,ADEC
Benzo(g,h,i)perylene	DoD-ELAP,NELAP,WADOE,ADEC
EPA 8290A in Solid	
2,3,7,8-TCDF	DoD-ELAP,NELAP,WADOE
2,3,7,8-TCDD	NELAP,WADOE
1,2,3,7,8-PeCDF	DoD-ELAP,NELAP,WADOE
2,3,4,7,8-PeCDF	DoD-ELAP,NELAP,WADOE
1,2,3,7,8-PeCDD	DoD-ELAP,NELAP,WADOE
1,2,3,4,7,8-HxCDF	DoD-ELAP,NELAP,WADOE
1,2,3,6,7,8-HxCDF	DoD-ELAP,NELAP,WADOE
2,3,4,6,7,8-HxCDF	DoD-ELAP,NELAP,WADOE
1,2,3,7,8,9-HxCDF	DoD-ELAP,NELAP,WADOE
1,2,3,4,7,8-HxCDD	DoD-ELAP,NELAP,WADOE
1,2,3,6,7,8-HxCDD	DoD-ELAP,NELAP,WADOE
1,2,3,7,8,9-HxCDD	DoD-ELAP,NELAP,WADOE
1,2,3,4,6,7,8-HpCDF	DoD-ELAP,NELAP,WADOE
1,2,3,4,7,8,9-HpCDF	DoD-ELAP,NELAP,WADOE
1,2,3,4,6,7,8-HpCDD	DoD-ELAP,NELAP,WADOE
OCDF	DoD-ELAP,NELAP,WADOE
OCDD	DoD-ELAP,NELAP,WADOE
Total TCDF	DoD-ELAP,NELAP,WADOE
Total TCDD	DoD-ELAP,NELAP,WADOE
Total PeCDF	DoD-ELAP,NELAP,WADOE
Total PeCDD	DoD-ELAP,NELAP,WADOE
Total HxCDF	DoD-ELAP,NELAP,WADOE
Total HxCDD	DoD-ELAP,NELAP,WADOE
Total HpCDF	DoD-ELAP,NELAP,WADOE
Total HpCDD	DoD-ELAP,NELAP,WADOE
13C12-2,3,7,8-TCDF	DoD-ELAP,NELAP
13C12-2,3,7,8-TCDD	DoD-ELAP,NELAP
13C12-1,2,3,7,8-PeCDF	DoD-ELAP,NELAP
13C12-2,3,4,7,8-PeCDF	DoD-ELAP,NELAP

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

13C12-1,2,3,7,8-PeCDD	DoD-ELAP,NELAP
13C12-1,2,3,4,7,8-HxCDF	DoD-ELAP,NELAP
13C12-1,2,3,6,7,8-HxCDF	DoD-ELAP,NELAP
13C12-2,3,4,6,7,8-HxCDF	DoD-ELAP,NELAP
13C12-1,2,3,7,8,9-HxCDF	DoD-ELAP,NELAP
13C12-1,2,3,4,7,8-HxCDD	DoD-ELAP,NELAP
13C12-1,2,3,6,7,8-HxCDD	DoD-ELAP,NELAP
13C12-1,2,3,4,6,7,8-HpCDF	DoD-ELAP,NELAP
13C12-1,2,3,4,7,8,9-HpCDF	DoD-ELAP,NELAP
13C12-1,2,3,4,6,7,8-HpCDD	DoD-ELAP,NELAP
13C12-OCDD	DoD-ELAP,NELAP
37Cl4-2,3,7,8-TCDD	DoD-ELAP,NELAP
13C12-1,2,3,4-TCDD	DoD-ELAP,NELAP
13C12-1,2,3,7,8,9-HxCDD	DoD-ELAP,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2025
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	02/28/2025
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2023
WADOE	WA Dept of Ecology	C558	06/30/2023
WA-DW	Ecology - Drinking Water	C558	06/30/2023

Anchor QEA, LLC	Project: Lower Duwamish Waterways	
6720 South Macadam Ave, Suite 125	Project Number: 180067-02.04	**Reported:**
Portland OR, 97219	Project Manager: Masa Kanematsu	29-Apr-2023 09:17

Notes and Definitions

*	Flagged value is not within established control limits.
B	This analyte was detected in the method blank.
D	The reported value is from a dilution
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
EMPC	Estimated Maximum Possible Concentration qualifier for HRGCMS Dioxin
HC	The natural concentration of the spiked analyte is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
J	Estimated concentration value detected below the reporting limit.
L	Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to +/- RL instead of 20% RPD
M	Estimated value for a GC/MS analyte detected and confirmed by an analyst but with low spectral match parameters.
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
X	Indicates possible CDPE interference.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

WDOE 80-12 DESIGNATION REPORT

Project Name: ANCHOR QEA

Location: PORTLAND, OREGON

Prepared by: Eurofins Environment Testing Northwest, LLC

(aka TestAmerica – ASL)

1100 NE Circle Boulevard, Suite 310
Corvallis, Oregon 97330
541-243-6137

Accredited in accordance with NELAP

Oregon Environmental Laboratory Accreditation Program #OR100022 (NELAP)
State of Washington DOE Environmental Laboratory Accreditation Program, Lab ID C556
California State Environmental Laboratory Accreditation Program, Certificate No.: 1726

Report Date: June 23, 2023 Released by: Michelle Bennett

Lab I.D. No. B5646

Results relate only to the items tested and the sample(s) as received by the laboratory. The results included in this report have been reviewed for compliance and meet all requirements for accredited parameters. All data have been found to be compliant with laboratory protocol, with the exception of any items noted in this report. For questions, please contact the Project Manager (contact info on next page).

CONTENTS

LABORATORY CONTACT: Brett Muckey, Business Unit Manager (BUMa)
Brett.Muckey@et.eurofinsus.com (541) 243-0980

INTRODUCTION

Eurofins Environment Testing Northwest, LLC Applied Sciences Laboratory (EETNW - ASL) conducted 96-hour Washington State Hazardous Waste Regulation bioassay testing using rainbow trout (*Oncorhynchus mykiss*) on sample(s) provided by Anchor QEA, from Portland, Oregon.

The Project Name was: Lower Duwamish Waterways

The testing was initiated on April 4, 2020**,** on sample(s) labeled:

- 'LDW23-DB01'
- 'LDW23-DB02'
- 'LDW23-DB03'

Regulatory threshold tested:

- 'Dangerous Waste' or DW designation (a sample concentration of 100 mg/L)

OVERVIEW OF REGULATORY GUIDANCE

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following is taken from the WDOE guidance (Method 80-12, Part A, June 2009 revision):

- "The Washington State Department of Ecology (Ecology) developed the acute fish toxicity test (Method 80-12) to determine if a waste meets the definition of dangerous waste in the *Dangerous Waste Regulations*, Chapter 173-303 WAC."
- "If the toxicity of a waste is unknown, the waste must be tested for dangerous waste designation using Method 80-12. The waste concentrations of 100 mg/L and 10 mg/L were selected to correspond with the definitions of dangerous waste and extremely hazardous waste, respectively."
- "This method determines if the sample waste LC_{50} is significantly less than or equal to the regulatory threshold of 100 mg/L dangerous waste (DW), 10 mg/L extremely hazardous waste (EHW) …"
- "Waste designated by Method 80-12 [as DW or EHW] must be regulated and managed as specified in WAC 173-303 …"

The following is taken from *Dangerous Waste Regulations*, Chapter 173-303 WAC:

- 100 (5)(c)(ii): "The EHW … bioassay. To determine if a waste is EHW, a person must establish the toxicity of a waste by means of the fish bioassay at 10 mg/L …"
    - **"If the data from the test indicates that the waste is EHW, then the person will assign the dangerous waste number WT01."**

- **"Otherwise, the waste will be designated DW, and the person will assign the dangerous waste number WT02."** [unless DW testing proves otherwise]

- 100 (5)(c)(i): "The DW bioassay. To determine if a waste is DW, a person must establish the toxicity category range of a waste by means of the 100 mg/L acute static fish test …"
  - **"If the data from the test indicates that the waste is DW, then the person will assign the dangerous waste number WT02."**
  - **"Otherwise, the waste is not regulated as toxic dangerous waste."**
- 100 (5)(d): "If the designation acquired from book designation and bioassay data do not agree, then bioassay data will be used to designate a waste. If a waste is designated as DW or EHW following the book designation procedure, a person may test the waste by means of the … static acute fish … method, to demonstrate that the waste is not a dangerous waste or should be designated as DW and not EHW."

SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

EXHIBIT 1
Summary of Static Acute Test Results

Sample ID	Does the sample designate as an Extremely Hazardous Waste	Does the sample designate as a Dangerous Waste (DW)?
'LDW23-DB01'	-	No
'LDW23-DB02'	-	No
'LDW23-DB03'	-	No

METHODS AND MATERIALS

TEST METHODS

The test was performed according to: *Biological Testing Methods*, Washington State Department of Ecology, DOE 80-12, Revised June 2009.

DEVIATIONS FROM PROTOCOLS

Deviations from required procedures in the test methods:

- The sample was not within the holding time of 45 days from sample collection as required by the WDOE 80-12 protocol. See the Sample Collection and Storage section for further detail.

Deviations from recommended procedures in the test methods:

- None noted.

TEST DESIGN

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

- *O. mykiss* Acute test: 100 mg/L sample (dangerous waste designation) + dilution water for the control.

Test Organism Conditions:

- All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by WDOE (2009).
- The test organisms appeared vigorous and in good condition prior to testing.

O. mykiss acute test:

- Source: Thomas Fish Company, Anderson, California
- Age:
  - 30 to 90 days old (After Swim Up), within a 24 hour age range
  - Minimum 7 day acclimation period prior to test initiation
- Design: Three test vessels per concentration, Ten organisms per vessel
- Loading of Test Chambers: Less than 0.8 g of fish per Liter of water
- Test Solution Preparation:
  - Sample particles were reduced (as needed) to smaller than ~ 1 cm in its narrowest dimension.
  - Appropriate amount of sample was placed into borosilicate glass jar with 200 ml of dilution water and tumbled for ~ 18 hours at ambient lab temperatures (~ 23 ^{o}C).
  - Jar and all contents placed into aquaria containing additional volume of dilution water to create final sample concentration.
  - Test organisms introduced to test chambers within 30 minutes of jar addition.
- Test Solution Renewal: None
- Monitoring:
  - Test Initiation: DO and pH; all test chambers
  - Test Initiation: Temperature, Conductivity, Hardness, and Alkalinity; all concentrations
  - Daily: Survival, DO, and pH; all test chambers
  - Daily: Temperature and Survival, DO, pH, and temperature; all concentrations.
  - Test Termination: Survival, DO, and pH; all test chambers

    - Test Termination: Temperature, Conductivity, Hardness, and Alkalinity; all concentrations
- Termination: 96 hours.
- Endpoints: Survival (at termination)

DILUTION WATER

The dilution water used was the standard culture water used by EETNW - ASL:

- Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 75 to 105 mg/L as $CaCO_3$ and an alkalinity of 50 to 75 mg/L as $CaCO_3$.

SAMPLE COLLECTION AND STORAGE

The samples were accepted as scheduled by EETNW - ASL. Chain of Custody and Sample Receipt Records are provided in Appendix C.

- Following receipt, the samples were stored in the dark at 0 to 6 °C until test solutions were prepared and tested.
- The sample was out the required holding time of 45 days from sample collection. The protocol states, "Sample analysis must occur withing 45 days of sample collection." As no toxicity was observed, it is EETNW - ASL's professional opinion that the sample being out of the required holding time had no significant impact on test results.

DATA ANALYSIS

The statistical analyses performed for the acute tests were those outlined in *Biological Testing Methods*, Washington State Department of Ecology, DOE 80-12, Revised June 2009.

- The statistical outputs are included with each test's datasheets in Appendix A.

RESULTS AND DISCUSSION

The raw data sheets for all tests are presented in Appendix A.

WDOE Method 80-12 DEFINITION

Extremely Hazardous Waste (EHW): 96 hr LC_{50} concentration less than or equal to 10 mg/L.
Dangerous Waste (DW): 96 hr LC_{50} concentration less than or equal to 100 mg/L.

ACUTE BIOASSAY

Table 1 summarizes the survival data for the *O. mykiss* acute testing.

Table 1
Summary of Acute Results – 96 hour exposure
O. mykiss

Sample	Concentration (mg/L)	Number Dead/ Number Tested
Control	0	0/30
'LDW23-DB01'	100	0/30
'LDW23-DB02'	100	0/30
'LDW23-DB03'	100	0/30

According to the definitions listed above, these samples should not be classified as as a "Dangerous Waste".

The dissolved oxygen levels in the chronic tests remained above 6.0 mg/L. Test temperatures remained at 12±1°C. Test pH remained within the recommended 6.0 to 9.0 range.

The *O. mykiss* acute test meets Test Acceptability Criteria (TAC) of a minimum 90 percent control survival. The test proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

REFERENCE TOXICANT TEST

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox test indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *O. mykiss* reftox test was conducted using potassium chloride.

The data sheets for the reference toxicant test are provided in Appendix B.

Table 2 summarizes the reference toxicant test results and Cusum chart limits.

Table 2
Acute Reference Toxicant Test (g/L)

Species	LC_{50}	Cusum Chart Limits
Oncorhynchus mykiss	3.03	1.92 to 3.49

APPENDIX A

RAW DATA SHEETS

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FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA

Client: Anchor QEA | SDG #: B5646 | Test Initiation: Date 6/6/23

Contact: Masa Kanematsu 503-972-5001 | Test Termination: Date 6/10/23

Sample ID Number		Field ID	Collected Date (mm/dd/yy)	Collected Time (Pacific Zone)	Date Received	Temp (°C) as Rc'vd	Sample Concentration (mg/L)	Ammonia NH_3-N	Hardness (mg/l as $CaCO_3$) 0 hrs	Hardness (mg/l as $CaCO_3$) 96 hrs	Alkalinity (mg/l as $CaCO_3$) 0 hrs	Alkalinity (mg/l as $CaCO_3$) 96 hrs
B5646	-01	LDW23-DB01	2/24/23	13:30	6/1/23	3.5	100 mg/L	-	106	94	67	64
"	-02	LDW23-DB02	2/24/23	13:00	6/1/23	3.5	100 mg/L	-	106	89	61	61
"	-03	LDW23-DB03	2/24/23	12:30	6/1/23	3.5	100 mg/L	-	106	89	64	67
				Reporting Limits:		na	na	0.10 mg/L	4 mg/L		4 mg/L	

Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page.

Dilution Water	ID#	Hardness (mg/l as $CaCO_3$) 0 hrs	Hardness (mg/l as $CaCO_3$) 96 hrs	Alkalinity (mg/l as $CaCO_3$) 0 hrs	Alkalinity (mg/l as $CaCO_3$) 96 hrs
Recon MH (FHM)	5769	96	97	56	61

Comments: ☑ Indicates the action was taken, (☐= action not taken):

" - " = sample not dechlorinated, or analyte not collected/needed.

Water Quality Meters Used/ID#: Dissolved Oxygen # 7 pH # 23 Conductivity # 2

FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION

Client: Anchor QEA

Sample Designation (SDG): B B5646

Test Species Information	RBT # 472 *Oncorhynchus mykiss* Acute				
Organism Age at Initiation	57 Days				
Test Container Size	2.5 gallon				
Test Volume	~~5L~~ 6L	ROUT 6L			
Feeding: Type and Amount	*TetraMin* during acclimation				
Aeration: In Test Chambers via Slow Bubble :	☒ None ☐ Prior to use ☐ @ _____ hrs				
Acclimation Period	21 Days				
Organism Source	Thomas Fish				
Size	34.7 mm				
Loading Rate	0.68 g/L				

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): ☐ All ☐ _____

Date:

Comments:

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SAMPLE WEIGHT

Client: Anchor QEA

Tumbling Start Date: 6/5/23 Time: 1709 Initials: TC

Client ID#	Lab ID#	Concentration (mg/L)		Target Weight (g) ①	Actual Weight (g)
LDW23-DB01	B5646-01	100 mg/L	A	~~0.500~~ 0.600	0.606891
		100 mg/L	B	~~0.500~~ 0.600	0.606387
		100 mg/L	C	~~0.500~~ 0.600	0.62745
LDW23-DB02	B5646-02	100 mg/L	A	~~0.500~~ 0.600	0.73950
		100 mg/L	B	~~0.500~~ 0.600	0.658891
		100 mg/L	C	~~0.500~~ 0.600	0.656582
LDW23-DB03	B5646-03	100 mg/L	A	~~0.500~~ 0.600	0.611662
		100 mg/L	B	~~0.500~~ 0.600	0.76083
		100 mg/L	C	~~0.500~~ 0.600	0.606324

① Tank volume increased to 6L. TC 6/5/23

Tumbling stopped @ 0940 6/6/23 DT

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96 HOUR FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Waterbath/Incubator Used: # 12 | SDG's # B5646 | Sample Description see below | Test Initiation Date: 6/6/2023 Time: 10:48

Also collect: Hardness and Alkalinity in 100 mg/L @ 0 hrs. AND Hard & Alk in both Control & 100 mg/L @ 96 hrs (or when survival = 0%) | Termination Date: 6/10/2023 Time: 11:55

Client: Anchor QEA | Test Species: *Oncorhynchus mykiss* ID# RBT 472

		0 hr	24 hr	48 hr	72 hr	96 hr
Technician		DY	DY	TL	~~TL~~ DY	DY
Time		10:48	10:12	15:31	15:06	11:55
Therm. ID#		# 280	# 280	# 280	# 280	# 280

Collect Hardness and Alkalinity @ 96 hrs

Concentration	Test Container Number	Number of Live Organisms					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (µmohs/cm)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Anchor QEA WDOE 80-12 B5646.pdf Page 13 of 23	A	10	10	10	10	10	9.5	8.6	8.4	8.4	8.3	8.0	7.5	7.8	7.8	7.3	11.2	12.2	11.7	11.7	11.9	315				330
	B	10	10	10	10	10	9.5	8.6	8.5	8.5	8.5	8.0	7.5	7.8	~~7.8~~ 7.6	7.3										
	C	10	10	10	10	10	9.6	8.5	8.5	8.4	8.6	8.0	7.5	7.7	7.6	7.3										
100 mg/L LDW23-DB01	A	10	10	10	10	10	9.4	8.5	8.4	8.3	8.5	8.2	7.5	7.7	7.6	7.3	11.7	11.9	11.9	11.9	11.7	328				331
	B	10	10	10	10	10	9.6	8.6	8.4	8.6	8.5	8.2	7.5	7.7	7.7	7.4										
	C	10	10	10	10	10	9.5	8.5	8.4	7.8	8.6	8.2	7.5	7.6	7.7	7.4										
-02 100 mg/L LDW23-DB02	A	10	10	10	10	10	9.5	8.3	8.2	8.1	8.5	8.1	7.5	7.6	7.6	7.4	11.0	12.0	11.5	12.0	12.0	326				327
	B	10	10	10	10	10	9.6	8.4	8.2	8.0	8.5	8.1	7.5	7.6	7.6	7.4										
	C	10	10	10	10	10	9.6	8.2	8.1	7.9	8.3	8.1	7.5	7.6	7.5	7.3										
-03 100 mg/L LDW23-DB03	A	10	10	10	10	10	9.6	8.6	8.1	8.3	8.5	8.1	7.5	7.6	7.6	7.3	11.7	11.9	11.9	12.0	11.9	328				329
	B	10	10	10	10	10	9.6	8.4	8.3	8.3	8.6	8.1	7.5	7.6	7.6	7.4										
	C	10	10	10	10	10	9.6	8.4	8.4	8.4	8.6	8.1	7.5	7.6	7.6	7.4										

Summary of Test Results						
for		Anchor QEA				
LabID:	B5646-01		Start Date:	06/06/23		
	Control		10 mg/L		100 mg/L	
Replicate	Number Dead	Proport. Dead	Number Dead	Proport. Dead	Number Dead	Proport. Dead
A	0	0.0000	n/a	n/a	0	0.0000
B	0	0.0000	n/a	n/a	0	0.0000
C	0	0.0000	n/a	n/a	0	0.0000
Mean		0.0000		n/a		0.0000
Variance		0.0000		n/a		0.0000

	F statistic for variance test	
	10 mg/L	100 mg/L
Calculated F statistic	n/a	Equal Variance
Critical F degrees of freedom (Numerator, Denominator)	2 , 2	2 , 2
Cricital F (See Table 2 WDOE 80-12)	39	39
Equal Variance?	n/a	Yes

	t-Test	
	10 mg/L	100 mg/L
Calculated t staistic	n/a	n/a
Critical t degrees of freedom	n/a	4
Critical t value (See Table 3 WDOE 80-12)	n/a	-1.53
Does Waste Designate ...	**… as an Extremely Hazardous Waste ?**	**… as a Dangerous Waste ?**
	n/a	**No**

Summary of Test Results						
for		Anchor QEA				
LabID:	B5646-02		Start Date:	06/06/23		
	Control		10 mg/L		100 mg/L	
Replicate	Number Dead	Proport. Dead	Number Dead	Proport. Dead	Number Dead	Proport. Dead
A	0	0.0000	n/a	n/a	0	0.0000
B	0	0.0000	n/a	n/a	0	0.0000
C	0	0.0000	n/a	n/a	0	0.0000
Mean		0.0000		n/a		0.0000
Variance		0.0000		n/a		0.0000

	F statistic for variance test	
	10 mg/L	100 mg/L
Calculated F statistic	n/a	Equal Variance
Critical F degrees of freedom (Numerator, Denominator)	2 , 2	2 , 2
Cricital F (See Table 2 WDOE 80-12)	39	39
Equal Variance?	n/a	Yes

	t-Test	
	10 mg/L	100 mg/L
Calculated t staistic	n/a	n/a
Critical t degrees of freedom	n/a	4
Critical t value (See Table 3 WDOE 80-12)	n/a	-1.53
Does Waste Designate ...	**… as an Extremely Hazardous Waste ?**	**… as a Dangerous Waste ?**
	n/a	**No**

Summary of Test Results						
for		Anchor QEA				
LabID:	B5646-03		Start Date:	06/06/23		
	Control		10 mg/L		100 mg/L	
Replicate	Number Dead	Proport. Dead	Number Dead	Proport. Dead	Number Dead	Proport. Dead
A	0	0.0000	n/a	n/a	0	0.0000
B	0	0.0000	n/a	n/a	0	0.0000
C	0	0.0000	n/a	n/a	0	0.0000
Mean		0.0000		n/a		0.0000
Variance		0.0000		n/a		0.0000

	F statistic for variance test	
	10 mg/L	100 mg/L
Calculated F statistic	n/a	Equal Variance
Critical F degrees of freedom (Numerator, Denominator)	2 , 2	2 , 2
Cricital F (See Table 2 WDOE 80-12)	39	39
Equal Variance?	n/a	Yes

	t-Test	
	10 mg/L	100 mg/L
Calculated t staistic	n/a	n/a
Critical t degrees of freedom	n/a	4
Critical t value (See Table 3 WDOE 80-12)	n/a	-1.53
Does Waste Designate ...	**… as an Extremely Hazardous Waste ?**	**… as a Dangerous Waste ?**
	n/a	**No**

APPENDIX B

REFERENCE TOXICANT DATA SHEETS

REFERENCE TOXICANT DATA SHEET

Client: QA / QC | Test Chamber Size: 2.5 gal. | Reference Toxicant: KCl | Test Begin: Date 6/1/2023 Time 09:35

Organism: *Oncorhynchus mykiss* | Volume per Replicate: 5 L | Stock Solution: 50 g/L in DI (ASTM Type I) water | Test End: Date 6/5/2023 Time 09:34

Source: ☒ = Thomas Fish Co. ☐ = | Designed Temperature: 12 ± 1 °C | Reagent Log ID #: SBG10 - 04 | *Dilution Water (Recon MH) ID#: 5767

ID#: RBT # 472 | Dilution Water Total Alkalinity as $CaCO_3$: 62

Dilution Water Total Hardness as $CaCO_3$: 90

		0 hr	24 hr	48 hr	72 hr	96 hr
**Age: 52 days ASU	Technician	TC	BM	DH	TC	TC
Organism size: 34-7 mm	Time	0935	1440	1352	0645	0934
Loading rate: 0.81 g/L	Therm. ID #	270	280	280	280	279

Conc. (g/L)	Rep	Number of Live Organisms (use 10 per replicate)					Dissolved Oxygen (mg/l)					pH					Temperature (°C)					Conductivity (mS)				
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
Cont.	A	10	10	10	10	10	9.3	8.9	8.8	9.0	9.0	7.8	7.4	7.4	7.1	7.4	12.2	10.8	11.0	11.1	10.8	0.332				0.351
0.5	A	10	10	10	10	10	9.4	9.0	9.0	9.0	9.0	7.8	7.4	7.3	7.0	7.4	12.1	10.9	11.0	11.0	10.7	1.258				1.303
1.0	A	10	10	10	10	10	9.4	9.1	9.1	9.1	9.1	8.0	7.4	7.4	7.1	7.4	12.1	10.9	10.9	11.1	10.7	2.14				2.19
2.0	A	10	10	10	10	10	9.4	9.2	9.1	9.1	9.2	8.0	7.4	7.4	7.4	7.4	12.5	11.0	11.0	11.0	10.5	3.90				4.07
4.0	A	10	1	1	1	1	9.4	9.3	9.2	9.1	9.2	8.0	7.3	7.4	7.4	7.3	12.9	11.4	11.4	11.7	11.5	7.13				7.20
8.0	A	10	0	—	—	—	9.4	9.3	—	—	—	7.9	7.3	—	—	—	12.9	11.5	—	—	—	13.63	13490	—	—	—
		Survival in Controls: ≥ 90% (required Test Acceptability Criteria)					DO: (@ 12°C): > 4.0 and < 10.8 (recommended QA)					pH: > 6.0 and < 9.0 (recommended QA)					Temperature: ± 1 °C (recommended QA)					(QA) none				

*Dilution Water Code: Recon = reconstituted water MH = moderately hard

48 Hour LC_{50}: ~~2.98~~ 3.03 (pour TC 6/5) | 96 Hour LC_{50}: 3.03

**Age | Cusum Chart Limits: 2.25 to 3.32 | Cusum Chart Limits: 1.92 to 3.49

ASU = After Swim Up | Statistical Method: Spearman-Karber | Statistical Method: Spearman-Karber

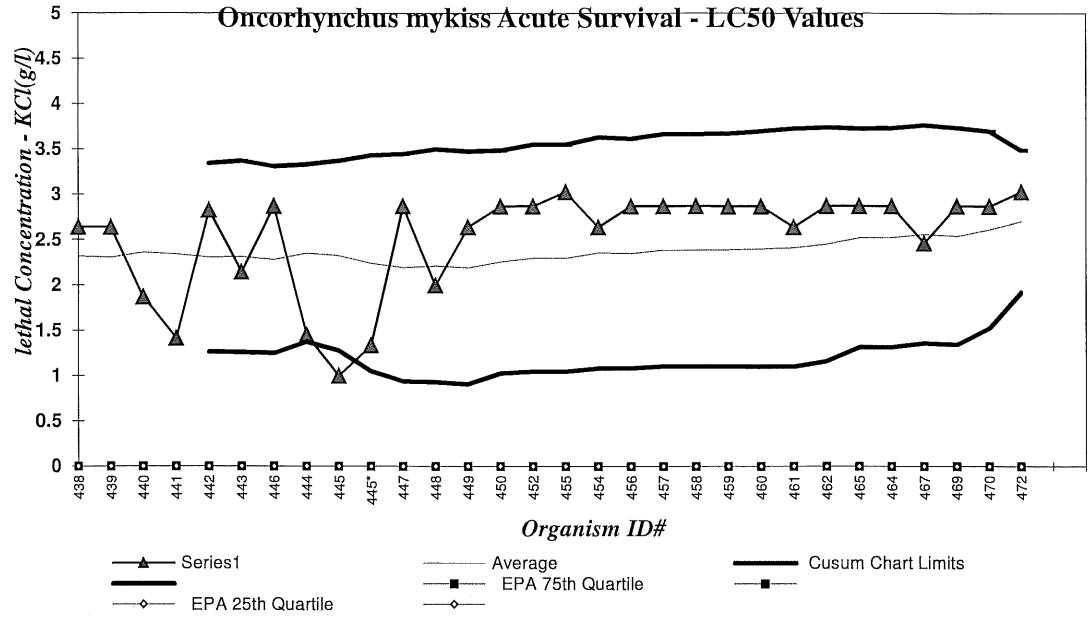
We verify this data is true and correct.

Task Manager: TC

Project Manager: TC

QA Officer:

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART



Oncorhynchus mykiss **- ACUTE (EPA Test Method 2019.0, Polisini & Miller CDFG 1988)**

POTASIUM CHLORIDE (g/L)

Organism age: 15 to 90 days

Endpoint: 96 hour Survival

Stats Method: Probit, Spearman-Karber, Linear Interpolation

Test Conditions: Recon MH, 12 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = na

25th Quartile CV (*warning limit*) = na

75th Quartile CV (*warning limit*) = na

90th Quartile CV (*control limit*) = na

As per EPA 833-R-00-003, section B.2.1, the quartiles listed above are from just a few labs (5) and therefore not to be considered typical or representative. Cusum limits are based on ASL data only.

	Event #	RBT ID #	Test Start Date	LC50	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
14	52	450	5/4/2022	2.87	2.26	0.61	**1.03**	**3.49**	0.27
15	53	452	6/16/2022	2.87	2.30	0.63	**1.05**	**3.55**	0.27
16	54	455	8/3/2022	3.03	2.30	0.63	**1.05**	**3.55**	0.27
17	55	454	8/11/2022	2.64	2.36	0.64	**1.08**	**3.63**	0.27
18	56	456	9/2/2022	2.87	2.35	0.63	**1.08**	**3.61**	0.27
19	57	457	9/9/2022	2.87	2.38	0.64	**1.10**	**3.67**	0.27
20	58	458	10/4/2022	2.87	2.38	0.64	**1.10**	**3.67**	0.27
21	59	459	10/16/2022	2.87	2.39	0.64	**1.10**	**3.67**	0.27
22	60	460	10/20/2022	2.87	2.40	0.65	**1.10**	**3.70**	0.27
23	61	461	11/14/2022	2.64	2.41	0.66	**1.10**	**3.72**	0.26
24	62	462	11/29/2022	2.87	2.45	0.64	**1.16**	**3.74**	0.24
25	63	465	2/9/2023	2.87	2.52	0.60	**1.32**	**3.73**	0.24
26	64	464	2/16/2023	2.87	2.52	0.60	**1.32**	**3.73**	0.24
27	65	467	4/7/2023	2.46	2.56	0.60	**1.36**	**3.76**	0.24
28	66	469	4/18/2022	2.87	2.54	0.60	**1.34**	**3.74**	0.21
29	67	470	5/15/2023	2.87	2.61	0.54	**1.52**	**3.70**	0.14
30	68	472	6/1/2023	3.03	2.70	0.39	**1.92**	**3.49**	0.08

APPENDIX C

CHAIN OF CUSTODY

eurofins | Environment Testing

Sample Receipt Record

Batch Number: B5646-01, -02, -03 Date Received: 10/1/23

Client/Project: Anchor QEA Received By: TR

Were custody seals intact? ☒ Yes ☐ No ☐ N/A

Packing Material: ROUTE 611 8.6 ☒ Ice ☐ Blue Ice ☐ Box

Temperature: Digital Therm ID: 1 Expires: / /20 Observed: 4.2 °C Is Temp OK? ☒ Yes ☐ No ☐ N/A

- OR - (for solid samples) IR Therm ID: 109 Expires: 7 /20 /203 Observed: 4.2 °C (≤ 6.0 °C)

IR Gun Daily Offset: -0.7 °C

Corrected Sample Temperature (IR Observed + IR Offset): 3.5 °C

If sample is noted @ ≤ 0.0 °C, is the sample frozen or partially frozen? ☐ Yes ☐ No ☒ N/A

Was a Chain of Custody (CoC) Provided? ☒ Yes ☐ No ☐ N/A

Was the CoC correctly filled out? (If No, document below) ☒ Yes ☐ No ☐ N/A

Were the sample containers in good condition (not broken or leaking)? ☒ Yes ☐ No ☐ N/A

Are all samples within 36 hours of collection? ☐ Yes ☐ No ☒ N/A

Method of Shipment: ☐ Hand Delivered, ☒ FedEx, ☐ UPS, ☐ Other: _____ ☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

Bioassay Receipt verification ASL993-0323
Doc Control ID: ASL993-0323

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number:	503-972-5019
Date:	5/31/2023
Project Name:	Lower Duwamish Waterways
Project Number:	180067-02.04 -Task 605.605AQ
Project Manager:	Masa Kanematsu
Phone Number:	503-972-5001 (backup number: 503-798-3456)
Shipment Method:	Fedex

ANCHOR QEA

Lab Manager:
Masa Kanematsu
6720 SW Macadam Ave Suite 125
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: Static Acute Fish Toxicity Test (Method 80-12)	Comments/Preservation
1	LDW23-DB01 B5646-01	2/24/2023	13:30	Soil	1	X	Debris material crushed to pass 9.5mm sieve.
2	LDW23-DB02 B5646-02	2/24/2023	13:00	Soil	1	X	Debris material crushed to pass 9.5mm sieve.
3	LDW23-DB03 B5646-03	2/24/2023	12:30	Soil	1	X	Debris material crushed to pass 9.5mm sieve.
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Notes:

Relinquished by:	Company:	Received by:
Emma Nordlund	Anchor QEA	Tori Crumvine 6/1/23 1400
Signature/Print Name:	Date/Time:	Signature/Print Name:
	05/31/23 15:15	

Relinquished by:	Company:	Received by:
Signature/Print Name:	Date/Time:	Signature/Print Name:

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

ORIGIN ID:BNOA (503) 798-3456
EMMA NORDLUND
ANCHOR QEA
6720 SOUTH MACADAM AVE.
SUITE 300
PORTLAND, OR 97219
UNITED STATES US

SHIP DATE: 31MAY23
ACTWGT: 30.00 LB
CAD: 109495568/INET4535

BILL SENDER

TO **BRETT MUCKEY BUSINESS UNIT MANAGER**
EUROFINS ENVIRONMENT TESTING NW LLC
1100 NORTHEAST CIRCLE BOULEVARD
STE 310
CORVALLIS OR 97330
(541) 243-0976

583J/2/29AB/FE2D

REF: 180067-02.04 TASK 605
INV:
PO: ANCHOR QEA
DEPT: SHIPPING ENVIRONMENTAL SAMPLES

FedEx Express

J232023046501uv

THU - 01 JUN 4:30P
STANDARD OVERNIGHT

TRK# 0201 **7722 9359 5726**

86 CVOA

97330
OR-US PDX

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