MAUL FOSTER ALONGI
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January 3, 2023
Project No. M1945.01.002

Laura Gloria
Executive Services Director, City of Wenatchee
1350 McKittrick Street
Wenatchee, Washington 98801

Re: Phase II Environmental Site Assessment for Riverfront Park
North Worthen Street, Wenatchee, Washington

Dear Laura Gloria:

On behalf of Chelan Douglas Regional Port Authority (the Port), Maul Foster & Alongi, Inc. (MFA), conducted a Phase II environmental site assessment (ESA) at Riverfront Park, located along North Worthen Street in Wenatchee, Washington (the Property; see Figure 1). The Phase II ESA was conducted to evaluate the nature and extent of contaminants of potential concern in soil and soil gas at the Property to inform mitigation activities in preparation for the City's planned park improvements projects. The Port initiated characterization under a U.S. Environmental Protection Agency (EPA) community-wide assessment grant. The assessment was conducted consistent with the site-specific work plan and the quality assurance project plan that MFA prepared for the Port (MFA 2021, 2022b).

PROPERTY BACKGROUND

The approximately 23.7-acre Property is located along North Worthen Street in Wenatchee, Washington. The Property is comprised of seven Chelan County tax parcels; the northernmost parcel (parcel no. 222003861023) is owned by the Chelan County Public Utility District, and the remaining six parcels (parcel nos. 222003861024, 222003861001, 222003821012, 222003821007, 222003821020, and 222003821009) are owned by the City of Wenatchee (the City). The Property is primarily used as a public park. The City operates a wastewater treatment plant on the central portion of the Property. The public park and wastewater treatment plant have existed on the Property since the mid-1980s. Prior to its use as a park, from approximately 1930 to 1972, the central portion of the Property was used as a landfill (the approximate former landfill area is shown on Figure 2).

RECOGNIZED ENVIRONMENTAL CONDITION

MFA completed a Phase I ESA for the Property in May 2022, that identified the following recognized environmental condition (MFA 2022a):

- **Former landfill operations**. The Property was historically used as a municipal landfill, and buried solid waste remains at the Property. Buried refuse may break

down over time and generate methane gas, which is harmful to human health. Methane is lighter than air, colorless, odorless, non-carcinogenic, and flammable. Potential human health risks associated with methane include potential fire or explosion hazards where ignition sources may be present and inhalation resulting in acute exposure risks. Additionally, refuse-burning activities were conducted at the Property, which may introduce polycyclic aromatic hydrocarbons into the environment. Buried incinerated refuse is known to be present beneath the Property.

The purpose of this Phase II ESA investigation was to evaluate soil and soil gas impacts associated with the former landfill operations described above. The investigation included collecting surface soil samples via direct-push drilling, soil gas monitoring with a landfill gas meter, and soil gas sampling.

FIELD METHODS

Federal funding requires the consideration of cultural resources during ground-disturbing activities, consistent with Section 106 of the National Historic Preservation Act. Due to the potential for encountering cultural resources during the Phase II ESA, MFA retained Environmental Science Associates of Seattle, Washington to perform cultural resources monitoring, as requested by the Washington State Department of Archaeology and Historic Preservation and the Confederated Tribes of the Colville Reservation. To assess settlement concerns associated with the construction of planned park improvements on landfill material, MFA retained RH2 Engineering, Inc. (RH2), to conduct a geotechnical evaluation. The geotechnical evaluation was conducted concurrent with the Phase II ESA.

MFA coordinated public and private utility locates prior to investigation activities on the Property. MFA conducted fieldwork on October 18 and 19, 2022, as described below. Field photographs from the investigation are provided in Attachment A.

Cultural Resources Assessment

Environmental Science Associates performed cultural resources monitoring during the Phase II ESA. Environmental Science Associates observed no historic or precontact cultural materials during drilling and sample collection. The cultural resources report by Environmental Science Associates documents applicable regulatory background and oversight activities and is included as Attachment B.

Geotechnical Evaluation

RH2 conducted a geotechnical evaluation concurrent with the environmental investigation. A geotechnical engineer observed soil cores from four boring locations (B02, B03, B04, and B05; locations shown on Figure 2). The driller conducted split spoon sampling at 5-foot intervals in

geotechnical borings to assess soil density, except at location B05, where methane concentrations were elevated at 20 feet below ground surface (bgs). RH2's geotechnical report, which describes the material properties underlying planned park improvements and recommendations for settlement-resilient construction practices, is included as Attachment C.

Environmental Assessment

Surface Soil Assessment

MFA collected surface soil samples from four locations (SS01 through SS04) near the former refuse burner at the Property (see Figure 2). Each surface soil sample was collected from approximately 3 inches bgs. One surface soil sample was collected at each location and a field duplicate was collected at location SS01. Surface soil samples were analyzed for polycyclic aromatic hydrocarbons (PAHs) and metals (arsenic, cadmium, chromium, lead, mercury, and zinc), which have been identified as contaminants of potential concern from municipal solid waste incineration (Zhong et al. 2020).

Subsurface Soil Assessment

To complete the subsurface soil assessment scope of work, MFA contracted with Holt Services, Inc., a driller licensed by the State of Washington. Holt Services, Inc., advanced six borings (B01 through B06) using direct-push drilling technology to a maximum depth of 21.5 feet bgs (see Figure 2). Borings were positioned in or near the former landfill area for environmental assessment (soil logging and soil gas monitoring), and/or geotechnical assessment in areas of planned development and adjacent to existing enclosed structures to evaluate methane accumulation risk, as outlined below (MFA 2022b):

- **B01:** In the vicinity of the proposed picnic pavilion for environmental assessment.
- **B02:** In the vicinity of the proposed splash pad, south of an existing restroom, for geotechnical and environmental assessment.
- **B03:** In the vicinity of the miniature railroad and settlement area for geotechnical assessment.
- **B04:** Adjacent to the miniature railroad depot building and in the vicinity of the proposed restroom for geotechnical and environmental assessment.
- **B05:** In the vicinity of the proposed retaining wall associated with the river overlook for geotechnical assessment.
- **B06:** Adjacent to the existing boat launch restroom for environmental assessment.

Continuous soil cores were retrieved for observation of landfill material and cap thickness. Boreholes were decommissioned with bentonite hydrated with potable water, consistent with the site-specific work plan (MFA 2022b). Geologic boring logs are provided in Attachment D.

Borehole Air Monitoring for Explosion Risk Assessment

During drilling, MFA performed methane monitoring of borehole air at locations B03 through B06 (see Figure 2). Methane borehole air monitoring results are provided as Attachment E. Methane monitoring was not conducted at locations B01 and B02, as these boring locations are far from the estimated former landfill area.

Methane concentrations were measured with a GEM 5000 landfill gas meter positioned at the top of the casing. Air monitoring from the drill casing was not collected from leak-proof soil vapor points and was not intended to inform environmental assessment. Measurements were recorded for health and safety purposes at each 5-foot drilling interval to the maximum depth explored. The highest methane concentrations were observed at depths greater than the soil vapor points, which were installed at 5 feet bgs (see Soil Gas Environmental Assessment section, below). The air monitoring was conducted to inform methane concentrations during drilling and evaluate potential explosion risks and mitigation measures. When methane concentrations were elevated (i.e., above the 5 percent lower explosive limit), MFA directed the drillers to fill the borehole with potable water to displace the methane vapors. If this did not reduce concentrations below the lower explosive limit, drilling was stopped and the borehole was filled with hydrated bentonite.

Soil Gas Environmental Assessment

MFA performed methane soil gas monitoring from vapor points with a GEM 5000 landfill gas meter at four boring locations (B01, B02, B04, and B06) and soil gas sampling at three boring locations (B01, B02, and B06; see Figure 2). Methane concentrations were measured every minute and allowed to stabilize for approximately five minutes. MFA was unable to sample soil gas at B04 due to insufficient soil gas production from fine-grained landfill material at the soil vapor sampling depth (5 feet bgs). Soil vapor point monitoring results presented in Attachment F and discussed in the Results section below.

ANALYTICAL METHODS

MFA submitted soil samples to Apex Laboratories LLC of Tigard, Oregon, and soil gas samples to Friedman & Bruya, Inc., of Seattle, Washington, for analysis. Both labs are Washington State and nationally accredited.

Surface soil samples were submitted for the following analyses:

- PAHs by EPA Method 8270D selected ion monitoring
- Arsenic, cadmium, chromium, lead, mercury, and zinc by EPA Method 6020A

Soil gas samples were submitted for the following analyses:

- Volatile organic compounds (VOCs) by Toxics Organics Method 15
- Helium by ASTM International Method D1946

Laboratory reports are provided in Attachment G and a data validation memorandum is provided in Attachment H. All data are considered acceptable for their intended use, with the appropriated data qualifiers assigned.

RESULTS

Surface Soil

MFA screened PAH and metals results against Model Toxics Control Act (MTCA) Method A cleanup levels (CULs) for unrestricted land use (see Table 1) (Ecology 2022). MFA screened metals results against Washington State natural background concentrations when MTCA Method A CULs were unavailable (see Table 1) (Ecology 1994).

No surface soil samples contained concentrations of PAHs or metals above their respective MTCA Method A CULs for unrestricted land use. Chromium and zinc do not have MTCA Method A CULs and were screened to Washington State natural background concentrations. No surface soil samples exceeded Washington State natural background concentrations for chromium or zinc.

Soil Gas

Soil gas samples analyzed for VOCs were screened against MTCA Method B Vapor Intrusion (VI) CULs (see Table 2). Most VOCs were non-detect at method reporting limits well below MTCA Method B VI CULs or were detected at concentrations below MTCA Method B VI CULs.[1] The following constituents were detected above their respective MTCA Method B VI CULs:

- **Acrolein** was detected at concentrations of 2.0 and 1.0 micrograms per cubic meter (ug/m^3) at soil gas sample locations B01 and B02, respectively. The MTCA Method B VI CUL for acrolein is 0.3 ug/m^3.

[1] Three VOCs were non-detect at method reporting limits above MTCA Method B VI CULs in at least one sampling location, including 1,2-dibromoethane; acrolein; and allyl chloride (see Table 1).

- **Benzene** was detected at a concentration of 18 ug/m^3 at sample location B06. The MTCA Method B VI CUL for benzene is 11 ug/m^3.
- **Bromodichloromethane** was detected at a concentration of 5.4 ug/m^3 at location B02. The MTCA Method B VI CUL for bromodichloromethane is 2.3 ug/m^3.
- **Chloroform** was detected at a concentration of 19 ug/m^3 at location B02. The MTCA Method B VI CUL for chloroform is 3.6 ug/m^3.

During landfill gas monitoring at each soil vapor point, methane concentrations were allowed to stabilize for five minutes prior to recording. Methane was detected at a concentration of 10.3 percent by volume at location B04 and was not detected at locations B01, B02, or B06.

CONCLUSIONS

PAHs and metals in surface soil samples collected from locations SS01 through SS04, near the former refuse burner (see Figure 2) were either non-detect or were detected below screening levels (MTCA Method A CULs for unrestricted land use, or Washington State background concentrations when MTCA Method A CULs were unavailable; see Table 1).

During drilling, methane was detected at 5 ft bgs at a concentration of 10.3 percent volume from location B04. Further, select VOCs exceed MTCA Method B VI CULs in soil gas samples from the following locations (see Figure 2):

- B01 (near the proposed picnic pavilion): acrolein.
- B02 (near the proposed splash pad): acrolein, bromodichloromethane, and chloroform.
- B06 (near the existing restroom and boat launch): benzene.

Sources of VOCs in these areas (which are outside of the former landfill area) are unknown. Generally, acrolein is an herbicide used to control plant and algae growth, bromodichloromethane is a byproduct of chlorine addition to drinking water, and chloroform can be used as a solvent. Benzene is a common fuel additive to gasoline, which may be associated with fueling activities at the boat launch historically (though this is unconfirmed).

Sludge and strong odors were observed in borings B03 and B05, likely consistent with landfilled material in these areas.

RECOMMENDATIONS

At location B01, only one VOC (acrolein) exceeds MTCA Method B VI CULs. Given the limited VOC exceedances and that future use in this area includes an open-air picnic pavilion (i.e., no enclosed structures), no additional investigation is recommended at or near B01.

At B02, three VOCs (acrolein, bromodichloromethane, and chloroform) exceed MTCA Method B VI CULs. The intended future use of this area (a splash pad) will include a pad drain system where methane and VOCs could accumulate and pose a potential explosion risk. However, this risk can be effectively mitigated by designing and constructing the pad drain system with bentonite utility dams. Given the recommendation that risk mitigation measures be incorporated into the splash pad design, no additional environmental investigation is recommended at or near B02.

At B06, one VOC (benzene) exceeds MTCA Method B VI CULs. Indoor air sampling for benzene is recommended in the existing restroom, as it is an enclosed structure where benzene concentrations could accumulate and present an inhalation risk.

At B04, indoor air sampling for methane and VOCs is recommended given the elevated methane concentrations in soil gas at 5 feet bgs at B04 (10.3 percent by volume) and the unsuccessful soil gas sample collection attempt for VOCs. Indoor air sampling will inform current inhalation risks in the miniature train depot building and construction considerations for the proposed restroom (see Figure 2).

If you have any questions regarding this report, please contact us.

Sincerely,

Maul Foster & Alongi, Inc.

CAROLYN ROCHELLE WISE 01.03.2023

Carolyn R. Wise, LHG
Project Hydrogeologist

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Staff Geologist

Attachments: Limitations
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Attachment B—Cultural Resources Report
Attachment C—Geotechnical Report
Attachment D—Geologic Boring Logs
Attachment E—Borehole Air Monitoring for Explosion Risk
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Attachment G—Laboratory Reports
Attachment H—Data Validation Memorandum

cc: Stacie de Mestre, Chelan Douglas Regional Port Authority
Justin Erickson, Chelan County Public Utility District

LIMITATIONS

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

REFERENCES

Ecology. 1994. *Natural Background Soil Metals Concentrations in Washington State.* Publication 94-115. Washington State Department of Ecology: Olympia, Washington. October.

Ecology. 2022. *Cleanup Levels and Rick Calculation (CLARC) Table.* Washington State Department of Ecology, Toxics Cleanup Program. July errata.

MFA. 2021. *Programmatic Quality Assurance Project Plan, Chelan Douglas Regional Port Authority, Washington.* Prepared for Chelan Douglas Regional Port Authority. Maul Foster & Alongi, Inc.: Bellingham, Washington. June 3.

MFA. 2022a. *Phase I Environmental Site Assessment, Riverfront Park, North Worthen Street, Wenatchee, Washington.* Prepared for Chelan Douglas Regional Port Authority. Maul Foster & Alongi, Inc.: Bellingham, Washington. May 12.

MFA. 2022b. *Site-Specific Work Plan, Riverfront Park, Wenatchee, Washington.* Prepared for Chelan Douglas Regional Port Authority. Maul Foster & Alongi, Inc.: Bellingham, Washington. September 9.

Zhong, S., Z. Wei, L. Zhang, S. Li, H. Gao, J. Feng, L. Sun, Z. Jiang. 2020. "The Impact of Heavy Metal Emissions from Municipal Solid Waste Incinerator on its Designing Operation Life." *Journal of Material Cycles Waste Management* 22: 768–76. Accessed August 5, 2022. https://doi.org/10.1007/s10163-019-00965-8

TABLES

Table 1
Summary of Surface Soil Analytical Results
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

Location:	MTCA Method A, URLU[1]	WA Background Metals, Statewide[2]	Screening Level Value[a]	SS01		SS02	SS03	SS04
Sample Name:				SS01-S-0.25	SSDUP-S-0.25	SS02-S-0.25	SS03-S-0.25	SS04-S-0.25
Collection Date:				10/19/2022	10/19/2022	10/19/2022	10/19/2022	10/19/2022
Collection Depth (ft bgs):				0.25	0.25	0.25	0.25	0.25
Total Metals (mg/kg)								
Arsenic	20	7	20	7.32	5.71	6.89	10.8	12.0
Cadmium	2	1	2	0.331 U	0.303 U	0.278 U	0.251 U	0.217 U
Chromium	NV	42	42	24.8	25.6	29.1	26.7	33.7
Lead	250	17	250	21.0	21.1	25.3	47.9	37.2
Mercury	2	0.07	2	0.132 U	0.121 U	0.111 U	0.100 U	0.0867 U
Zinc	NV	86	86	61.1	60.5	69.5	55.3	72.4
PAHs (mg/kg)								
1-Methylnaphthalene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
2-Methylnaphthalene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Acenaphthene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Acenaphthylene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Anthracene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Benzo(a)anthracene	NV	NA	NV	0.0375	0.0448	0.0391	0.0179	0.0173
Benzo(a)pyrene	0.1	NA	0.1	0.0594	0.0707	0.0554	0.0258	0.0269
Benzo(b)fluoranthene	NV	NA	NV	0.0907	0.111	0.0931 J	0.0388	0.0395
Benzo(ghi)perylene	NV	NA	NV	0.0579	0.0619	0.0600	0.0228	0.0235
Benzo(k)fluoranthene	NV	NA	NV	0.0342 J	0.0402 J	0.0329 J	0.0146 J	0.0150 J
Chrysene	NV	NA	NV	0.0570	0.0662	0.0603	0.0268	0.0251
Dibenzo(a,h)anthracene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Dibenzofuran	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Fluoranthene	NV	NA	NV	0.0669	0.0797	0.0724	0.0351	0.0279
Fluorene	NV	NA	NV	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Indeno(1,2,3-cd)pyrene	NV	NA	NV	0.0625	0.0703	0.0657	0.0261	0.0270
Naphthalene	5	NA	5	0.0152 U	0.0149 U	0.0136 U	0.0117 U	0.0107 U
Phenanthrene	NV	NA	NV	0.0165	0.0170	0.0192	0.0134	0.0107 U
Pyrene	NV	NA	NV	0.0594	0.0712	0.0647	0.0322	0.0260
cPAH TEQ[b][3]	0.1	NA	0.1	0.0832 J	0.0987 J	0.0798 J	0.0364 J	0.0376 J

Table 1
Summary of Surface Soil Analytical Results
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

Notes

Detected results were compared with MTCA Method A screening criteria; non-detects (U) were not compared with screening criteria. There were no exceedances.

cPAH = carcinogenic polycyclic aromatic hydrocarbon.

ft bgs = feet below ground surface.

J = result is estimated.

mg/kg = milligrams per kilogram.

MTCA = Model Toxics Control Act.

NA = not applicable.

NV = no value.

PAH = polycyclic aromatic hydrocarbon.

TEQ = toxic equivalency.

U = result is non-detect at the method reporting limit.

URLU = unrestricted land use.

WA = Washington state.

[a]Screening level values correspond to MTCA Method A cleanup levels for URLU, where available. When unavailable, Washington state background values are used.

[b]cPAH TEQ calculated with non-detect results multiplied by one-half.

References

[1]Ecology. 2022. *Cleanup Levels and Risk Calculation (CLARC) table*. Washington State Department of Ecology, Toxics Cleanup Program. July errata.

[2]Ecology. 1994. *Natural Background Soil Metals Concentrations in Washington State*. Publication 94-115. Washington State Department of Ecology. October.

[3]Ecology. 2015. *Implementation Memorandum #10: Evaluating the Human Health Toxicity of Carcinogenic PAHs (cPAHs) Using Toxicity Equivalency Factors (TEFs)*. Publication No. 15-09-049. Washington State Department of Ecology, Toxics Cleanup Program. April 20.

Table 2
Summary of Soil Gas Analytical Results
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

Location:	MTCA Method B, Vapor Intrusion, Sub-slab Soil Gas[a][1]	B01	B02	B06
Sample Name:		B01-SV-5.0	B02-SV-5.0	B06-SV-5.0
Collection Date:		10/18/2022	10/18/2022	10/18/2022
Collection Depth (ft bgs):		5.0	5.0	5.0
VOCs (ug/mg^3)				
1,1,1-Trichloroethane	76,000	2.9 U	3.4 U	3.1 U
1,1,2,2-Tetrachloroethane	1.4	0.73 U	0.85 U	0.78 U
1,1,2-Trichloroethane	3	0.29 U	0.34 U	0.31 U
1,1-Dichloroethane	52	2.1 U	2.5 U	2.3 U
1,1-Dichloroethene	3,000	2.1 U	2.5 U	2.3 U
1,2,4-Trichlorobenzene	30	3.9 U	4.6 U	4.2 U
1,2,4-Trimethylbenzene	910	26 U	30 U	28 U
1,2-Dibromoethane	0.14	0.41 U	0.48 U	0.44 U
1,2-Dichlorobenzene	3,000	3.2 U	3.7 U	3.4 U
1,2-Dichloroethane	3.2	0.21 U	0.25 U	0.23 U
1,2-Dichloropropane	23	1.2 U	1.4 U	1.3 U
1,3,5-Trimethylbenzene	910	26 U	30 U	28 U
1,3-Butadiene	2.8	0.23 U	0.27 U	0.25 U
1,3-Dichlorobenzene	NV	3.2 U	3.7 U	3.4 U
1,4-Dichlorobenzene	7.6	1.2 U	1.4 U	1.3 U
1,4-Dioxane	17	1.9 U	2.2 U	2.1 U
2,2,4-Trimethylpentane	NV	25 U	29 U	27 U
2-Butanone	76,000	98	37 U	34 U
2-Chlorotoluene	NV	27 U	32 U	30 U
2-Hexanone	460	22 U	25 U	23 U
2-Propanol	NV	46 U	53 U	49 U
4-Ethyltoluene	NV	26 U	30 U	28 U
4-Methyl-2-pentanone	46,000	22 U	25 U	23 U
Acetone	NV	180	61	86
Acrolein	0.3	2.0	1.0	0.65 U
Allyl chloride	14	17 U	19 U	18 U
Benzene	11	11	3.9	18
Benzyl chloride	1.7	0.27 U	0.32 U	0.3 U
Bromodichloromethane	2.3	0.36 U	5.4	0.38 U
Bromoform	76	11 U	13 U	12 U
Bromomethane	76	21 U	24 U	22 U
Carbon disulfide	11,000	33 U	39 U	100
Carbon tetrachloride	14	1.7 U	2 U	1.8 U
Chlorobenzene	760	2.4 U	2.9 U	2.6 U
Chloroethane	150,000	14 U	16 U	15 U
Chloroform	3.6	2.0	19	1.4
Chloromethane	1,400	20 U	23 U	21 U

Table 2
Summary of Soil Gas Analytical Results
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

Location:	MTCA Method B, Vapor Intrusion, Sub-slab Soil Gas[a][1]	B01	B02	B06
Sample Name:		B01-SV-5.0	B02-SV-5.0	B06-SV-5.0
Collection Date:		10/18/2022	10/18/2022	10/18/2022
Collection Depth (ft bgs):		5.0	5.0	5.0
cis-1,2-Dichloroethene	NV	2.1 U	2.5 U	2.3 U
cis-1,3-Dichloropropene	NV	4.8 U	5.6 U	5.2 U
Cyclohexane	91,000	36 U	43 U	39 U
Dibromochloromethane	NV	0.45 U	0.53 U	0.49 U
Dichlorodifluoromethane (Freon 12)	1,500	5.2 U	6.1 U	5.6 U
Ethanol	NV	40 U	47 U	43 U
Ethyl acetate	1,100	38 U	45 U	41 U
Ethylbenzene	15,000	8.1	2.7 U	5.7
Freon 113	76,000	4.1 U	4.8 U	4.4 U
Freon 114	NV	11 U	13 U	12 U
Heptane	6,100	22 U	25 U	23 U
Hexachlorobutadiene	3.8	1.1 U	1.3 U	1.2 U
Isopropylbenzene	6100	52 U	61 U	56 U
m,p-Xylene	NV	37	5.4 U	16
Methyl methacrylate	11,000	22 U	25 U	23 U
Methyl tert-butyl ether	320	38 U	45 U	41 U
Methylene chloride	2,200	180 U	220 U	200 U
Naphthalene	2.5	1.4 U	1.6 U	1.5 U
n-Butane	NV	77	53	150
n-Hexane	11,000	19 U	22 U	20 U
n-Nonane	NV	28 U	33 U	30 U
n-Pentane	NV	31 U	37 U	63
n-Propylbenzene	15,000	26 U	30 U	28 U
o-Xylene	NV	14	2.7 U	7.2
Propylene	NV	240 J	7.5 U	360 J
Styrene	15,000	4.5 U	5.3 U	4.9 U
tert-Butyl alcohol	NV	64 U	75 U	69 U
Tetrachloroethene	320	36 U	42 U	39 U
Tetrahydrofuran	30,000	3.1 U	3.7 U	3.4 U
Toluene	76,000	100 U	150	110 U
trans-1,2-Dichloroethene	610	2.1 U	2.5 U	2.3 U
trans-1,3-Dichloropropene	NV	2.4 U	2.8 U	2.6 U
Trichloroethene	11	0.57 U	0.67 U	0.61 U
Trichlorofluoromethane (Freon 11)	11,000	12 U	14 U	13 U
Vinyl acetate	3,000	37 U	44 U	40 U
Vinyl bromide	5.6	2.3 U	2.7 U	2.5 U
Vinyl chloride	9.5	1.4 U	1.6 U	1.5 U
Xylenes (total)[b]	1,500	51	5.4 U	23

Table 2
Summary of Soil Gas Analytical Results
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

Notes

Shading indicates values that exceed MTCA Method B screening criteria; non-detects (U) were not compared with screening criteria.

ft bgs = feet below ground surface.

J = result is estimated.

MTCA = Model Toxics Control Act.

NV = no value.

ug/m^3 = micrograms per cubic meter.

U = result is non-detect at the method reporting limit.

VOC = volatile organic compound.

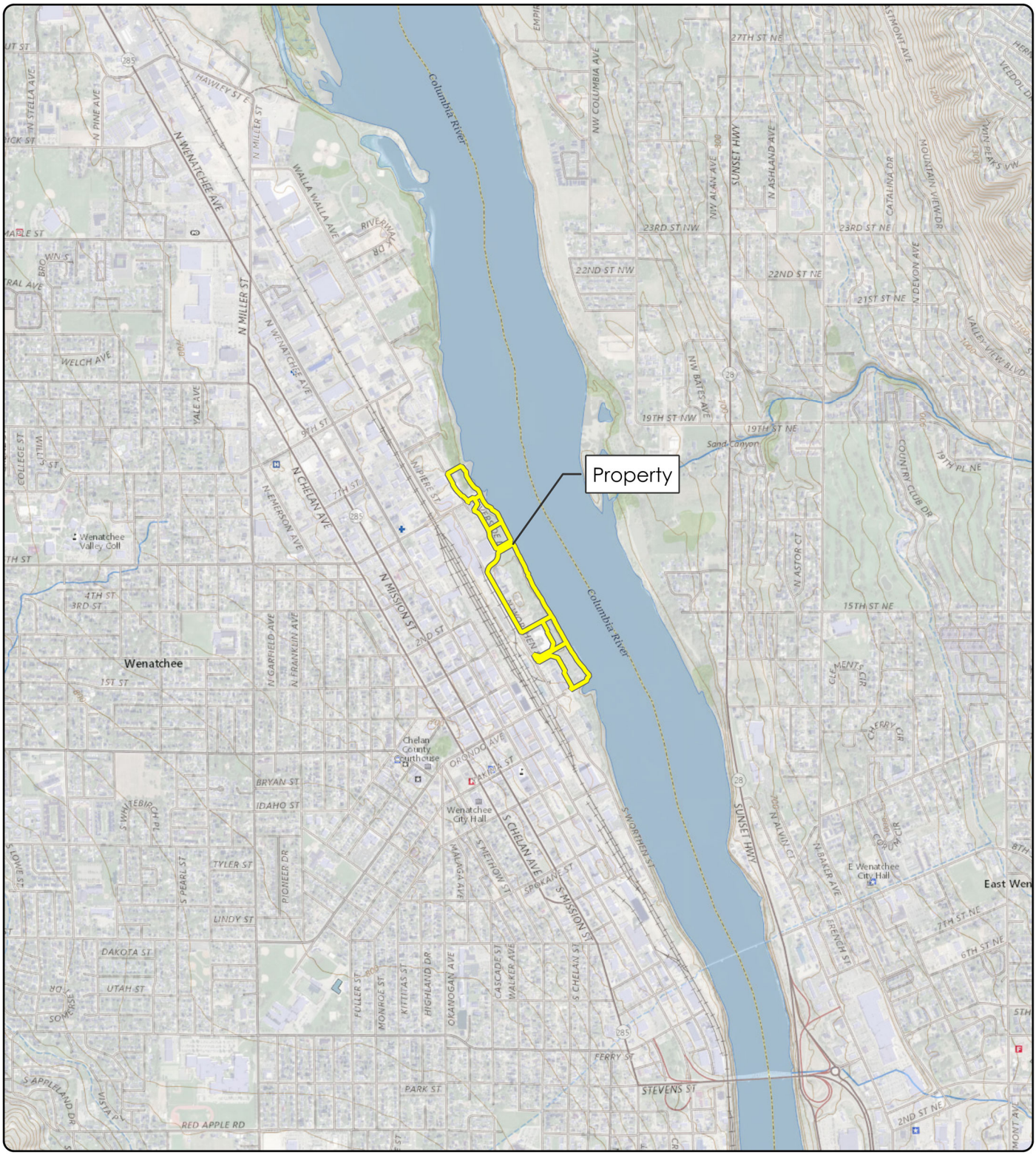
[a]The lower of cancer and noncancer values are shown.

[b]Total xylenes is the sum of m,p-xylene and o-xylene. When both results are non-detect, the highest reporting limit is shown.

References

[1]Ecology. 2022. *Cleanup Levels and Risk Calculation (CLARC) table.* Washington State Department of Ecology, Toxics Cleanup Program. July errata.

FIGURES



Notes:
U.S. Geological Survey 7.5-minute topographic quadrangle: Wenatchee. Township 22 north, range 20 east, section 3.

Data Sources:
Basemap from Esri (2022) and the USGS National Map (2020); parcels from Chelan County.

Legend

Property Parcels

Figure 1
Property Location

Riverfront Park
North Worthen Street
Wenatchee, Washington
Chelan Douglas Regional Port Authority

0 1,000 2,000
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Path: X:\1945_01\02\Riverfront_Park\Projects\Pro\M1945_01_002.aprx
Print Date: 7/20/2022
Reviewed By: clifford
Produced By: jelstratt
Project: M1945.01.002

Notes:
All feature locations are approximate.
Sample locations were recorded with a handheld global positioning system with sub-meter accuracy.
Soil conditions did not allow for soil gas sample collection at location B04.

Legend

- Soil Gas Boring
- Geotechnical Boring
- Soil Gas and Geotechnical Boring
- Surface Soil Sample
- Former Landfill Area
- Property Parcels
- Tax Lots

Sources:
Aerial photograph obtained from ArcGIS Online.
Tax parcels obtained from Chelan County GIS.

0 200 400
Feet

Figure 2
Sample Locations

Riverfront Park
North Worthen Street
Wenatchee, Washington
Chelan Douglas Regional Port Authority

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Path: X:\1945.01\002\Riverfront Park\Fig2-1 SampleLocs.mxd
Print Date: 12/15/2022
Reviewed By: dbixby
Produced By: jelstrott
Project: M1945.01.002

ATTACHMENT A

PHOTOGRAPH LOG

PHOTOGRAPHS

Project Name: Riverfront Park Phase II ESA
Project Number: M1945.01.002
Location: North Worthen Street, Wenatchee, Washington

Photo No. 1.

Description
Drill rig at location B01, near the proposed picnic pavilion. Photograph taken on October 18, 2022.

Photo No. 2.

Description
Soil core from 0 to 10 feet below ground surface (bgs) at B01. Photograph taken on October 18, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase II ESA
Project Number: M1945.01.002
Location: North Worthen Street, Wenatchee, Washington

Photo No. 3.

Description
Drill rig at location B02, near the proposed splash pad. Photograph taken on October 18, 2022.

Photo No. 4.

Description
Helium shroud around soil vapor sampling apparatus at location B02 near the proposed splash pad. Photograph taken on October 18, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase II ESA
Project Number: M1945.01.002
Location: North Worthen Street, Wenatchee, Washington

Photo No. 5.

Description
Drill rig at location B03, near the miniature railroad and settlement area. Photograph taken on October 18, 2022.

Photo No. 6.

Description
Refuse in soil core at B03 from 15 to 20 feet bgs. Photograph taken on October 18, 2022.

PHOTOGRAPHS

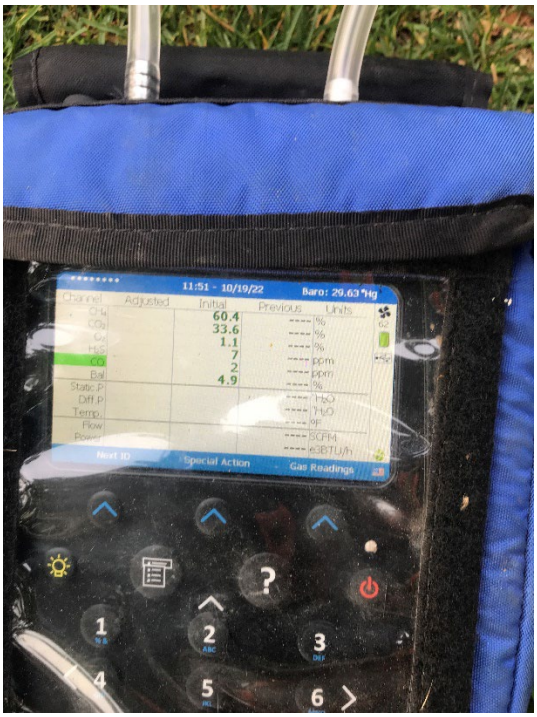
Project Name: Riverfront Park Phase II ESA
Project Number: M1945.01.002
Location: North Worthen Street, Wenatchee, Washington

Photo No. 7.

Description
Drill rig at location B04, near the miniature railroad depot building and the proposed restroom location. Photograph taken on October 19, 2022.

Photo No. 8.

Description
Peak methane concentrations from B04 borehole air at 10 feet bgs. Photograph taken on October 19, 2022.



PHOTOGRAPHS

Project Name: Riverfront Park Phase II ESA
Project Number: M1945.01.002
Location: North Worthen Street, Wenatchee, Washington

Photo No. 9.

Description
Borehole decommissioning with bentonite slurry at B04 near the miniature train depot and proposed restroom location. Photograph taken on October 19, 2022.

Photo No. 10.

Description
Drill rig at location B05 near the proposed retaining wall associated with the river overlook. Photograph taken on October 18, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase II ESA
Project Number: M1945.01.002
Location: North Worthen Street, Wenatchee, Washington

Photo No. 11.

Description
Drill rig at location B06, near the existing restroom near the boat launch. Photograph taken on October 19, 2022.

Photo No. 12.

Description
Field personnel securing 55-gallon drum containing investigation-derived waste. Photograph taken on October 19, 2022.

ATTACHMENT B

CULTURAL RESOURCES REPORT

5309 Shilshole Avenue, NW
Suite 200
Seattle, WA 98107
206.789.9658
www.esassoc.com

Cultural Resources Short Report

Title:	Wenatchee Riverfront Park, Wenatchee, Chelan County, Washington - Results of Cultural Resources Monitoring of Phase II Environmental Site Assessment and Geotechnical Investigation		
Author(s):	Bryan Hoyt and Chris Lockwood, Ph.D.		
Date:	November 2022	**DAHP Project No.**	2022-08-05421
Acreage:	23.7 Acres	**ESA Project No.**	D202201065
Agency:	U.S. Environmental Protection Agency	**Project Proponent:**	Chelan Douglas Regional Port Authority
Regulatory:	National Historic Preservation Act (Section 106)		
USGS Quad:	Wenatchee, WA (7.5')	**Township /Range/Section:**	T 22 N, R 20 E, S 3
Address:	Wenatchee Riverfront Park North Worthen Street	**County:**	Chelan, WA
Parcel(s):	222003821009, 222003821020, 222003821007, 222003821012, 222003861001, 222003861024		

Project Understanding:

Maul Foster & Alongi, Inc. conducted a Phase II Environmental Assessment at Wenatchee Riverfront Park, located along North Worthen Street, in Wenatchee, Washington, on behalf of the Chelan Douglas Regional Port Authority. The project is located within the boundary of Riverfront Park, in Section 3 of Township 22 North, Range 20 East, on the Wenatchee, Washington 7.5' series topographic map (Figure 1).

RH2 Engineering, Inc. conducted a geotechnical investigation concurrent with Phase II Environmental Assessment to support the design of improvements to Riverfront Park previously identified in the park's master plan. Planned improvements include the construction of a splash pad, play area, restroom facilities, a picnic area, and improved pathways to enable mixed trail use. Prior to the development of Riverfront Park, the site was operated as a landfill, active from the 1930's to the 1970's. The Phase II Environmental Assessment is intended to give the City of Wenatchee a better understanding of the environmental impacts and geotechnical considerations (settlement potential) associated with the breakdown of landfill

debris present beneath the property. This assessment will enable the City of Wenatchee to develop park improvement designs that are protective of human health and resilient against impacts from landfill debris breakdown.

This phase of the investigation included four surface soil samples, and six direct-push borings, in or near the former landfill for soil logging and/or soil gas monitoring. ESA was contracted by Maul Foster & Alongi, Inc. to perform archaeological monitoring during surface sampling and borings. This report details the results of archaeological monitoring conducted by ESA.

REGULATORY BACKGROUND

Federal funding of the Project through the US Environmental Protection Agency (EPA) Brownfields Assessment Coalition Grant requires that the Project comply with Section 106 of the National Historic Preservation Act ("Section 106"). Section 106 requires that the EPA, as Lead Federal Agency, consider the effects of this undertaking upon Historic Properties within the Project's Area of Potential Effects (APE). Federal code implementing Section 106, found at 36 Code of Federal Regulations (CFR) Part 800, includes a requirement that an effort be made to identify Historic Properties. In coordination with the State Historic Preservation Office (Washington State Department of Archaeology and Historic Preservation, "DAHP"), the Confederated Tribes of the Colville Reservation, the Sauk-Suiattle Indian Tribe, the Confederated Tribes and Bands of the Yakama Nation, and other stakeholders, the EPA defined the Area of Potential Effects (APE) for the Project (Attachment 1). This report has been prepared to meet the standards of the Section 106 process. This report documents all of the steps taken to consider the effects of the Project on Historic Properties, and the results of the investigation.

Additional laws that apply to archaeological projects conducted within the State of Washington include: Archaeological Sites and Resources (Revised Code of Washington [RCW] 27.53), Indian Graves and Records (RCW 27.44), Human Remains (RCW 68.50), and Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60).

RESULTS OF ARCHAEOLOGICAL MONITORING

No historic or precontact cultural materials were observed during monitoring of surface sampling or borings. ESA followed protocols detailed in an Inadvertent Discovery Plan provided for the Project by the Washington State Department of Ecology (Attachment 1). Archaeological monitoring was conducted by ESA Archaeologist Micca A. Metz, M.S., on October 18 and 19, 2022. Weather conditions included seasonably mild temperatures and clear but smokey skies.

The boring research design planned a total of six direct-push borings (B-01 through B-06) to be advanced across the site by Holt Services, Inc. (Figure 2). After B-03 encountered an unexpected obstruction, the boring was moved slightly and readvanced. The borings were advanced using a Geoprobe direct-push drill rig collecting continuous 2.25-inch diameter cores in 5-foot intervals (Figure 3), with 1.5-foot-long split spoon samples generally collected every 5 feet. Split spoon samples were not collected at some locations due to high methane concentrations. Boring depths ranged from 10 to 21.5 feet below surface (bs).

ESA photographed and characterized each core and split spoon sample (Figure 4). Because split spoon samples could be impaired by gravel, and may not have filled the entire sample tube, the precise top and

bottom elevations of each stratigraphic unit were commonly difficult to determine; in such cases, stratigraphic elevations were approximated. Stratigraphic units, however, retained relative relationship to each other, regardless of depth measurements. A complete description of each boring is included in Attachment 2. Data were recorded using smartphones and tablets with Global Positioning System/Global Navigation Satellite System (GPS+GLONASS), with a positional accuracy of 9.8 feet (3 meters) or less.

Observed stratigraphy across the APE generally consisted of sod and topsoil overlying landfill cap (i.e., imported sandy gravel and clay layers) then landfill deposits. The landfill deposits consisted of a mixture of organics, fragmented bottle glass, fragmented brick, plastic, metal, and Styrofoam. No diagnostic debris was encountered, and all observed debris appeared modern in age (Figure 5).

Landfill was observed between 58 and 240 inches (4.8 to 20 feet) bs. Top elevation of landfill varied between 58 and 84 inches (4.8 to 7 feet) bs. Borings did not reach the bottom of the landfill. No landfill material was observed within boring B-01, B-02, or B-06. B-01 and B-02 are located north of the estimated landfill footprint, and B-06 is located south of the estimated landfill footprint.

The four surface samples each extended 3 inches bs and contained a thin sod cap over brown sandy loam topsoil.

CONCLUSION

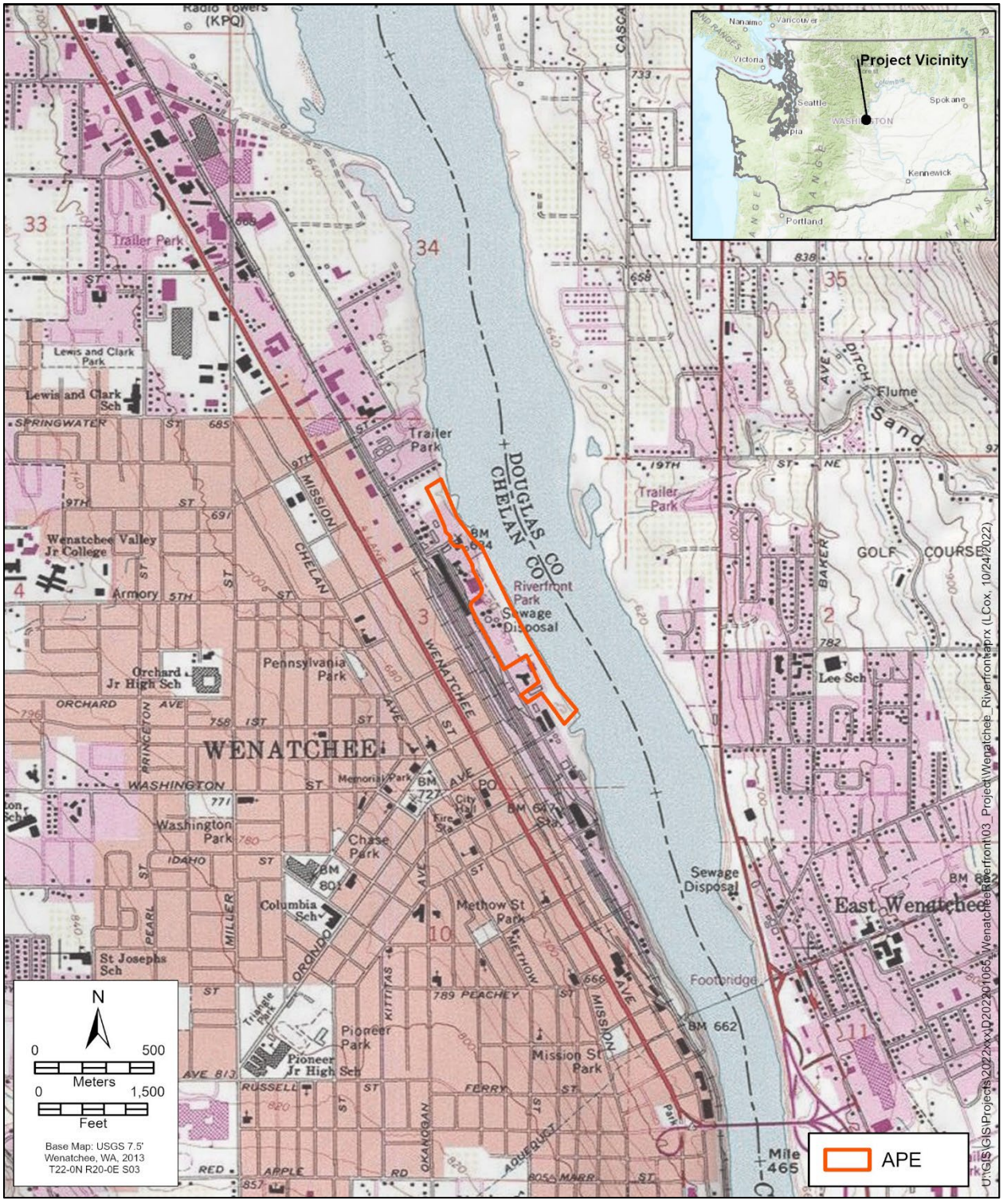
No precontact or definitive historic cultural resources were identified during monitoring of the Project. Observed stratigraphy consists exclusively of fill and landfill deposits. This memorandum evidences Chelan Douglas Regional Port Authorities compliance with the IDP established for the Project.

LIST OF FIGURES

ATTACHMENTS

Attachment 1 Consultation letter sent to Allyson Brooks, DAHP: National Historic Preservation Act Compliance with Conducting a Phase II Environmental Site Assessment of Wenatchee Riverfront Park

Attachment 2 Boring and surface sample stratigraphic table.

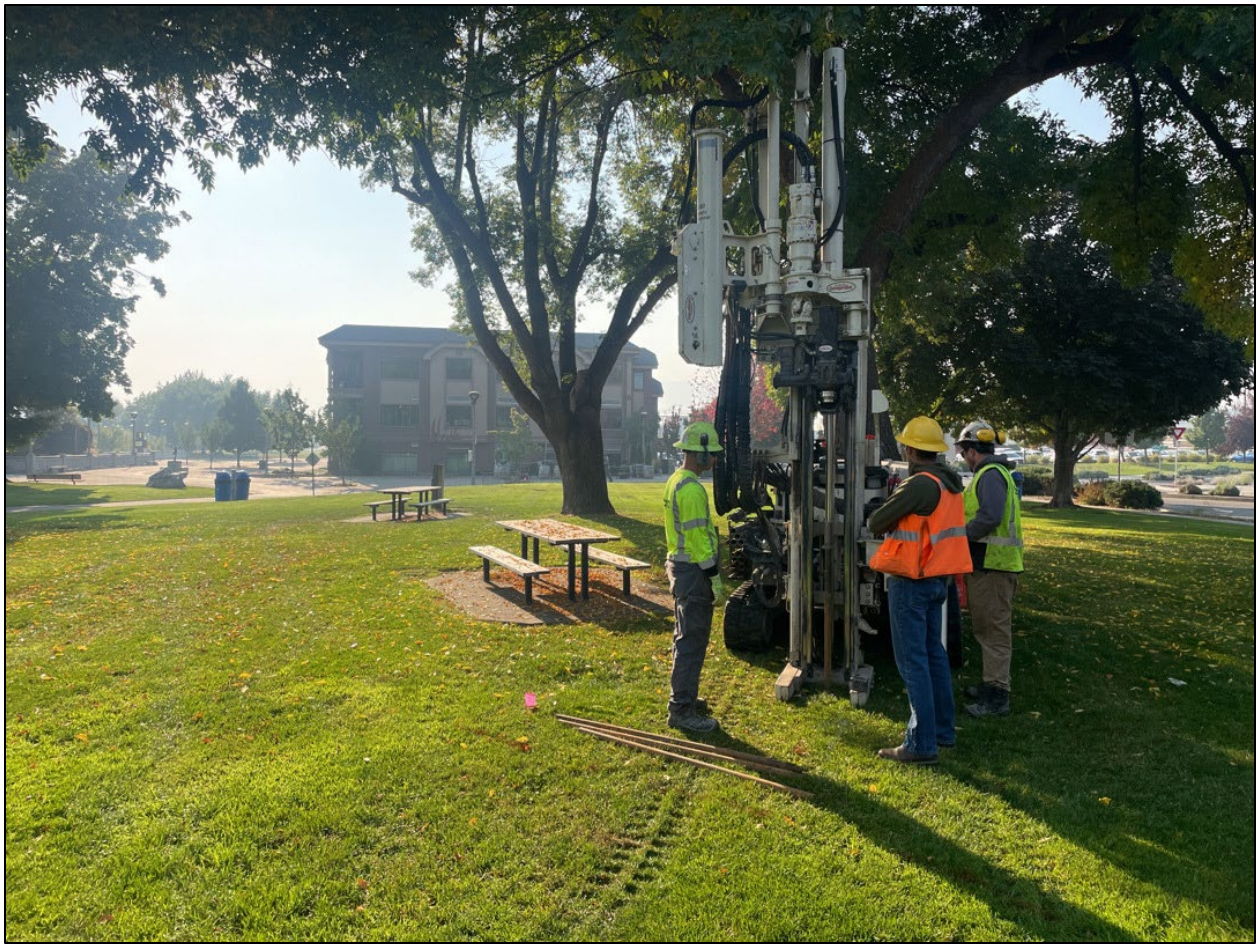


SOURCE: ESA 2022

Figure 1
Wenatchee Riverfront Park Phase II Environmental Site Assessment Geotechnical Explorations Project Area of Potential Effects.

SOURCE: ESA 2022

Figure 2
Wenatchee Riverfront Park Phase II Environmental Site Assessment Sampling and Geotechnical Locations.



SOURCE: ESA 2022

Figure 3
South facing view of B-02 location.

SOURCE: ESA 2022

Figure 4
View of typical boring sample recovery as observed within B-06.

SOURCE: ESA 2022

Figure 5
Typical landfill material (including plastic and Styrofoam) as observed within B-05.

MAUL FOSTER ALONGI
109 East 13th Street | Vancouver, WA 98660 | 360 694 2691 | www.maulfoster.com

August 30, 2022
Project No. M1945.01.002

Allyson Brooks, PhD
State Historic Preservation Officer
Washington State Department of Archaeology and Historic Preservation
1110 S Capitol Way, Suite 30
Olympia, Washington 98501

Re: National Historic Preservation Act Compliance with Conducting a Phase II Environmental Site Assessment of Wenatchee Riverfront Park, Wenatchee, Chelan County, Washington

Dear Dr. Brooks:

Chelan Douglas Regional Port Authority proposes to conduct an environmental assessment of Wenatchee Riverfront Park, located along North Worthen Street, Wenatchee, Washington (the site), with funding provided by U.S. Environmental Protection Agency Brownfields Assessment Coalition Grant Agreement No. BF-01J86501. The environmental assessment will include a Phase II environmental site assessment that will be used by the current property owner to guide future development. The federal grant creates a nexus for review to analyze the effects of the funding decision on historic, cultural, or archaeological resources under Section 106 of the National Historic Preservation Act (NHPA).

As part of our review under Section 106 of the NHPA, we have determined that the proposed federal action has the potential to affect historic properties. We are notifying you of the undertaking, and, given its nature and scope, we propose to expedite consultation by addressing the multiple steps of 36 Code of Federal Regulations § 800.3 through § 800.6 in this letter as provided at 36 Code of Federal Regulations (CFR) § 800.3(g). This letter provides a brief project description, documents the area of potential effect (APE), summarizes the efforts to identify historic properties, and provides findings.

We request your agreement with our finding that there will be no effect on historic or archaeological resources resulting from the proposed site assessment activities at Wenatchee Riverfront Park, and that the preparation and implementation of an Inadvertent Discovery Plan will mitigate any impacts to below-ground cultural and archaeological resources, if encountered.

BACKGROUND AND PURPOSE

The site includes seven parcels (222003821009, 222003821020, 222003821007, 222003821012, 222003861001, 222003861023, and 222003861024) totaling 23.7 acres adjacent to the

Columbia River in Wenatchee, Washington. The area includes the City of Wenatchee Riverfront Park and stretches approximately 3,500 feet from Orondo Avenue on the south to just north of Fifth Street. The City of Wenatchee (City) operates a wastewater treatment plant (WWTP) on the central portion of the site. Multiple structures associated with the City WWTP, including office buildings and treatment rooms, are present in the central portion of the property. These structures were constructed mostly in the 1980s, with periodic renovations and additions. Outside of the WWTP, two small public restroom structures and a building associated with the miniature train track are present on the property.

The site operated as a landfill from the 1930s to the 1970s. Investigations conducted between 1981 and 2014 identified petroleum hydrocarbons, volatile organic compounds (including benzene), polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and metals (arsenic and lead) in soil and/or groundwater on portions of the property. Following its closure, the landfill was capped with clean silty sand and developed into a waterfront park. Because the City plans to continue using the property as a public park, the main concern regarding park improvements is the potential for methane gas generation from the breakdown of landfill material, as methane may accumulate in enclosed structures (e.g., restroom facilities), posing a potential inhalation or explosion risk, or in underground utility vaults (e.g., sewer structures). Additionally, settlement occurs as landfill material decomposes, which may cause cracks in concrete foundations or trails, creating tripping hazards.

The City of Wenatchee and its partner, Public Utility District No. 1 of Chelan County, prepared a master plan for the Riverfront Park property.[1] Riverfront Park is adjacent to restaurants, breweries, and the Pybus Public Market. The City's planned improvements will help maximize park potential and support economic development along the waterfront.

The proposed environmental and geotechnical borings will support the design of the phase one improvements to Riverfront Park identified in the park's master plan, including the construction of a splash pad, play area, restroom facilities, a picnic area, and improved pathways to enable mixed trail use. The proposed assessment activities would give the City a better understanding of the environmental impacts (methane gas generation) and geotechnical considerations (settlement potential) associated with the breakdown of landfill debris present beneath the property. This assessment would enable the City to develop park improvement designs that are protective of human health and resilient against impacts from landfill debris breakdown.

[1] City of Wenatchee, Public Utility District No. 1 of Chelan County, and Greenworks. 2021. *Wenatchee Riverfront Park, Park Development Plan.* December. https://www.chelanpud.org/docs/default-source/default-document-library/riverfront_park_development_plan_sm.pdf.

SCOPE AND AREA OF POTENTIAL EFFECT

The site includes Riverfront Park and stretches approximately 3,500 feet from Orondo Avenue on the south to just north of Fifth Street along the Columbia River.

The investigation includes surface soil sampling and advancement of up to six 2-inch diameter borings via direct-push drilling methods in or near the former landfill for soil logging and soil gas monitoring, as outlined below (see attached figure):

- Four surface soil samples near the former incinerator (SS01 through SS04)
- Six soil borings to a maximum of 20 feet below ground surface and collocated soil vapor points for soil gas monitoring, positioned as follows:
  - B01: In the vicinity of the proposed picnic pavilion. Advance to 10 feet bgs for environmental assessment.
  - B02: In the vicinity of the proposed splash pad, north of an existing restroom. Advance to 20 feet bgs for geotechnical and environmental assessment.
  - B03: In the vicinity of the miniature railroad and settlement area. Advance to 20 feet bgs for geotechnical assessment.
  - B04: Adjacent to the miniature railroad depot in the vicinity of the proposed restroom. Advance to 20 feet bgs for geotechnical and environmental assessment.
  - B05: In the vicinity of the proposed retaining wall associated with the river overlook. Advance to 20 feet bgs for geotechnical assessment.
  - B06: Adjacent to the existing boat launch restroom. Advance to 10 feet bgs for environmental assessment.

Geotechnical work will involve collection of geotechnical samples of landfill material for settlement testing to evaluate the material properties of the native soil underlying landfill debris.

We have determined that the APE includes all areas identified for soil sampling, in addition to access and staging areas. For the purposes of this evaluation, we have assumed that the APE includes the sections of the park in which environmental and geotechnical assessment activities supporting the phase one park improvement work will be conducted. A map identifying the approximate APE is attached to the EZ-1 Project Form provided as Attachment A. A search in the Washington Information System for Architectural and Archaeological Resource Data (WISAARD)[2] returned one site register listing related to the APE: the Columbia and Okanogan Steamship Company Boat Yard. The Washington Heritage Register site (Resource ID 674373)

[2] Accessed July 8, 2022. https://wisaard.dahp.wa.gov/Map

is now a paved area outside the Riverfront Center Building located in Wenatchee Riverfront Park at the foot of Fifth Street. The southern portion of the APE is located 700 feet east of the Downtown Wenatchee Historic District. According to WISAARD's predictive model, there is a very high risk that the site contains archaeological resources.

DETERMINATION OF EFFECT

The identified Washington Heritage Register site is beneath a hardscaped and paved Riverfront Center area and walkway. The closest ground-disturbing action of the proposed environmental assessment, collection of two surface soil samples (SS03 and SS04), will take place in an open field approximately 150 feet southeast of the identified site (see the Property Features and Proposed Sample Locations Figure in Attachment A). The proposed work at sample locations SS03 and SS04 will be a shallow (<1 foot) surface soil sample and will not effect the registered historic site. The project will have no effect on the close-by Downtown Wenatchee Historic District located 700 feet east from the southern portion of the park.

After reviewing all available documentation of the site in WISAARD and the National Register, MFA staff has concluded that the proposed activity will have no effect on the integrity of the archaeological or historic resources in the APE because of the work's distance from identified resources and the shallow depth of the ground-disturbing activities near identified resources. To ensure that cultural and archaeological resources are protected if encountered, an Inadvertent Discovery Plan has been drafted for the project and will be implemented in the event of an inadvertent discovery.

We request your review and agreement with our finding of no effect on historic or archaeological resources at the former Riverfront Park site and the mitigation of impacts to cultural and archaeological resources via the implementation of the Inadvertent Discovery Plan provided as Attachment B. If you have any questions or desire additional information, please contact me at 971-703-4285 or at gaugustyn@maulfoster.com.

Sincerely,

Maul Foster & Alongi, Inc.

Garrett Augustyn
Staff Planner

Attachments: Limitations
A—DAHP EZ-1 Project Form
B—Inadvertent Discovery Plan

cc: Blair C. Kinser, EPA
Madison Sanders-Curry, EPA
Guy Moura, Confederated Tribes of the Colville Reservation
The Honorable Kevin Joseph, Sauk-Suiattle Indian Tribe
Kate Valdez, Confederated Tribes and Bands of the Yakama Nation

LIMITATIONS

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

ATTACHMENT A

DAHP EZ-1 PROJECT FORM

DAHP USE ONLY
Date Received:
DAHP Log #:
Reviewer(s):
☐ ARCHY ☐ BEU

dahp
protect the past, shape the future
DEPT OF ARCHAEOLOGY + HISTORIC PRESERVATION

EZ-1 FORM

Request to initiate consultation for Undertakings subject to Section 106 of the National Historic Preservation Act and 36 CFR 800.
For non-cultural resource professionals only.

Section 106

New Consultation? ☐ YES ☐ NO ☐ ADDITIONAL INFORMATION PROVIDED PER REQUEST

Questions? *Contact DAHP at 106@dahp.wa.gov or (360) 586-3065. You may also find answers to your questions online at www.dahp.wa.gov/section106.*

SECTION 1: DESCRIBE THE UNDERTAKING

Undertaking Title: Brownfield Site Assessment and Cleanup—Planning

Property Name: *if applicable* Wenatchee Riverfront Park

Project Address: North Worthen Street

City / State / Zip: Wenatchee

County: Chelan

Township / Range / Section: *leave blank if unsure*

SECTION 2: IDENTIFY HISTORIC PROPERTIES

Has a project already been started in WISAARD?: ☐ YES ☑ NO If so, DAHP log #: _____ eAPE? ☐ YES ☐ NO

Undertaking includes (check all that apply): ☑ NEW CONSTRUCTION ☐ DEMOLITION ☑ GROUND DISTURBANCE ☑ REHABILITATION / RENOVATION ☐ ACQUISITION

Does the Undertaking involve any buildings, objects, sites, structures or districts that are over 45 years old? ☐ YES ☑ NO ☐ Check here if Undertaking involves multiple resources. If so, attach a table including all information in Sections 1 and 2 for each resource.

Does the Undertaking involve any properties determined eligible for or listed in the National Register of Historic Places? ☐ YES ☑ NO ☐ NOT SURE

Is the building, structure or site already recorded in WISAARD? ☐ YES ☐ NO [!] See Note ☐ NOT SURE *Contact DAHP

If Yes, what is the Property ID # or Site #? _____

☐ **[!] If the resource is not recorded in WISAARD, please contact DAHP Staff.** ***Go to www.dahp.wa.gov/wisaard for more information. Check the box when complete.***

SECTION 3: FEDERAL AGENCY INFORMATION

Federal Agency: Environmental Protection Agency (Grant / Loan Name: Brownfield Assessment Coalition Grant

Contact Person: Madison Sanders-Curry Phone: 206-553-1889 e-mail: sanders-curry.madison@epa.gov

SECTION 4: CONTACT INFORMATION

If different from Federal Agency contact person.

Submitter Name: Garrett Augustyn Submitter Organization: Maul Foster & Alongi, Inc.

Submitter Address: 109 E 13th Street City / State / Zip: Vancouver, WA 98660

Submitter Phone: 971-703-4285 Submitter e-mail: gaugustyn@maulfoster.com

Do you have authority from the Federal Agency to consult on their behalf? ☐ YES ☐ NO

SECTION 5: ATTACHMENTS

Please email completed form and all attachments to:
106@dahp.wa.gov

☑ MAP / APE - Be sure to show the project boundary and location of property(ies). *See Section 7 on Page 3 for optional template. May also submit online through WISAARD using eAPE.*

☑ DESCRIPTION / SCOPE OF WORK - Describe the Undertaking, including any ground disturbance. *See Section 6 on Page 2 for optional template.*

☑ SITE PLAN / DRAWINGS - Indicate location and dates of resources, proposed improvements and ground disturbance, etc.

☑ PHOTOGRAPHS - Attach digital photographs showing the project site, including images of all resources. *Photos submitted through WISAARD may suffice.*

FEDERAL AGENCY DETERMINATION

☐ The Undertaking will have **NO EFFECT** on historic resources.

☐ There are **NO HISTORIC PROPERTIES AFFECTED** by the Undertaking.

☐ The Undertaking will have **NO ADVERSE EFFECT** on historic resources.

☐ The Undertaking will have an **ADVERSE EFFECT** on historic resources.

SHPO CONCURRENCE (DAHP USE ONLY)

AREA OF POTENTIAL EFFECT (APE)
☐ CONCUR
☐ DO NOT CONCUR *See attached for additional information.*

DETERMINATION OF ELIGIBILITY
☐ CONCUR
☐ DO NOT CONCUR *See attached for additional information.*

DETERMINATION OF EFFECT
☐ CONCUR
☐ DO NOT CONCUR *See attached for additional information.*

☐ DAHP requires **ADDITIONAL INFORMATION** in order to complete review (see attached).

DAHP REVIEWER _____ DATE _____

DEPT OF ARCHAEOLOGY + HISTORIC PRESERVATION

Instructions: **Please describe the type of work to be completed. Be as detailed as possible to avoid a request for additional information. Be sure to describe all ground disturbing activities in the appropriate box below, and provide photos of areas of work.**

SECTION 6: ADD'L PROJECT INFORMATION

NOTE: To save this fillable form you must fill it out in Adobe Acrobat or use the PRINT to PDF function in Acrobat Reader. In Reader choose File > Print and choose Adobe PDF as the printer. The fill will save to your computer.

Please be aware that this form may only initiate consultation. For some projects, DAHP may require additional information to complete our review such as plans, specifications, and photographs. An historic property inventory form may need to completed by a qualified cultural resource professional.

Provide a detailed description of the proposed project:

The City of Wenatchee and its partner, Public Utility District No. 1 of Chelan County, prepared a master plan for the Riverfront Park property. Riverfront Park is adjacent to restaurants, breweries, and the Pybus Public Market. The City's planned improvements will help maximize park potential and support economic development along the waterfront.
The proposed environmental and geotechnical borings will support the design of the phase one improvements to Riverfront Park identified in the park's master plan, including the construction of a splash pad, play area, restroom facilities, a picnic area, and improved pathways to enable mixed trail use. The proposed assessment activities would give the City a better understanding of the environmental impacts (methane gas generation) and geotechnical considerations (settlement potential) associated with the breakdown of landfill debris present beneath the property. This assessment would enable the City to develop park improvement designs that are protective of human health and resilient against impacts from landfill debris breakdown.

Describe the existing project site conditions (include building age, if applicable):

The site includes six parcels (222003821009, 222003821020, 222003821007, 222003821012, 222003861001, 222003861024) totaling 23.7 acres located adjacent to the Columbia River in Wenatchee, Washington. The area includes the City's Riverfront Park and stretches approximately 3,500 feet from Orondo Ave on the south to just north of Fifth Street. The City operates a wastewater treatment plant on the central portion of the Property. Multiple structures associated with the City wastewater treatment plant, including office buildings and treatment rooms, are present in the central portion of the Property. These structures were generally constructed in the 1980s, with periodic renovations and additions. Outside of the WWTP, two small public restroom structures and a building associated with the miniature train track are present on the Property.

The site operated as a landfill from the 1930s to the 1970s. Previous investigations conducted between 1981 and 2014 identified petroleum hydrocarbons, volatile organic compounds (including benzene), polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and metals (arsenic and lead) in soil and/or groundwater on portions of the Property. Following its closure, the landfill was capped with clean silty sand and developed into a waterfront park. As the City plans to continue using the property as a public park, the main concern regarding park improvements the potential for methane gas generation from the breakdown of landfill material, as methane may accumulate in enclosed structures (e.g., restroom facilities), posing a potential inhalation or explosion risk, or in underground utility vaults (e.g., sewer structures). Additionally, as landfill material decomposes, settlement occurs, which may cause cracks in concrete foundations or trails, creating tripping hazards.

If there are ground disturbing activities proposed, describe them *including the approximate depth of ground disturbance*:

The subsurface investigation includes surface soil sampling and advancement of up to six 2-inch diameter borings via direct-push drilling methods in or near the former landfill for soil logging and soil gas monitoring, as outlined below (see attached figures):
• Four surface soil samples near the former incinerator (SS01 through SS04)
• Six soil borings to a maximum of 20 feet below ground surface and collocated soil vapor points for soil gas monitoring, positioned as follows:
□B01: In the vicinity of the proposed picnic pavilion. Advance to 10 feet bgs for environmental assessment.
□B02: In the vicinity of the proposed splash pad, north of an existing restroom. Advance to 20 feet bgs for geotechnical and environmental assessment.
□B03: In the vicinity of the miniature railroad and settlement area. Advance to 20 feet bgs for geotechnical assessment.
□B04: Adjacent to the miniature railroad depot in the vicinity of the proposed restroom. Advance to 20 feet bgs for geotechnical and environmental assessment.
□B05: In the vicinity of the proposed retaining wall associated with the river overlook. Advance to 20 feet bgs for geotechnical assessment.
□B06: Adjacent to the existing boat launch restroom. Advance to 10 feet bgs for environmental assessment.

Geotechnical work will involve collection of geotechnical samples of landfill material for settlement testing to evaluate the material properties of the native soil underlying landfill debris.

DEPT OF ARCHAEOLOGY + HISTORIC PRESERVATION

Instructions: Please attach a MAP of the Project Area. (Use WISAARD with USA Topo Basemap background. Click HERE for Snipping Tool Tutorial. Draw an outline of the Area of Potential Effect (APE) that clearly delineates the project boundary.

SECTION 7: MAP / Area of Potential Effect

Notes:
All feature locations are approximate.
BNSF = BNSF Railway.
City = City of Wenatchee.
PUD = public utility district.
unk. = unknown.
WWTP = wastewater treatment plant.

Legend

- <all other values>
- Proposed Soil Vapor Boring
- Proposed Geotechnical Boring
- Proposed Soil Vapor and Geotechnical Boring
- Proposed Surface Soil Sample
- Landfill Area
- Property Parcels
- Tax Lots

Sources:
Aerial photograph obtained from ArcGIS Online.
Tax parcels obtained from Chelan County GIS.

Figure 2-1
Property Features and Proposed Sample Locations

Riverfront Park
Chelan Douglas Regional
Port Authority
Wenatchee, Washington

0 200 400
Feet

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p. 971 544 2139 | www.maulfoster.com

Path: X:\1945.01\02\Riverfront Park\Fig2-1 ProposedSampleLocs.mxd
Print Date: 8/29/2022
Reviewed By: dbixby
Produced By: dbixby
Project: M1945.01.002

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PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 1.

Description
Typical Riverfront Park walkway with miniature train track and City of Wenatchee (City) wastewater treatment plant (WWTP) in background, looking southeast. Photograph taken February 7, 2022.

Photo No. 2.

Description
Typical Riverfront Park grassy area with miniature train track and City WWTP in background, looking southeast. Photograph taken April 28, 2022.

MAUL FOSTER ALONGI

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 3.

Description
Settlement area east of the Simplot site, looking west. Photograph taken February 7, 2022.

Photo No. 4.

Description
Settlement area east of the Simplot site, looking southwest. Photograph taken April 28, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 5.

Description
Potential splash pad area for park improvement plan, looking northwest. Photograph taken February 7, 2022.

Photo No. 6.

Description
Potential splash pad area for park improvement plan, looking northwest. Photograph taken April 28, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 7.

Description
Grassy area south of potential splash pad area for park improvement plan, looking northwest. Photograph taken April 28, 2022.

Photo No. 8.

Description
Walkway near settlement area, looking northwest. Photograph taken April 28, 2022.

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PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 9.

Description
Potential picnic area for park improvement plan, looking north. Photograph taken February 7, 2022.

Photo No. 10.

Description
Potential picnic area for park improvement plan, looking north. Photograph taken April 28, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 11.

Description
Boat launch on south portion of property, looking southeast. Photograph taken February 7, 2022.

Photo No. 12.

Description
Boat launch on south portion of property, looking southeast. Photograph taken April 28, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 13.

Description
Replacement stormwater outfall location in north portion of property, looking east. Photograph taken February 7, 2022.

Photo No. 14.

Description
City WWTP, looking southeast. Photograph taken February 7, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 15.

Description
City WWTP, looking northeast. Photograph taken February 7, 2022.

Photo No. 16.

Description
Digestors (round structures) at the City WWTP, looking north. Photograph taken February 7, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 17.

Description
Aerators at the City WWTP, looking west. Photograph taken February 7, 2022.

Photo No. 18.

Description
Skimming pond post-aeration at the City WWTP, looking north. Photograph taken February 7, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 19.

Description
Ultraviolet wastewater treatment area at the City WWTP prior to discharge to the Columbia River. Photograph taken February 7, 2022.

Photo No. 20.

Description
Lined wastewater overflow retention area on west side of N Worthen Street, looking north. Photograph taken February 7, 2022.

PHOTOGRAPHS

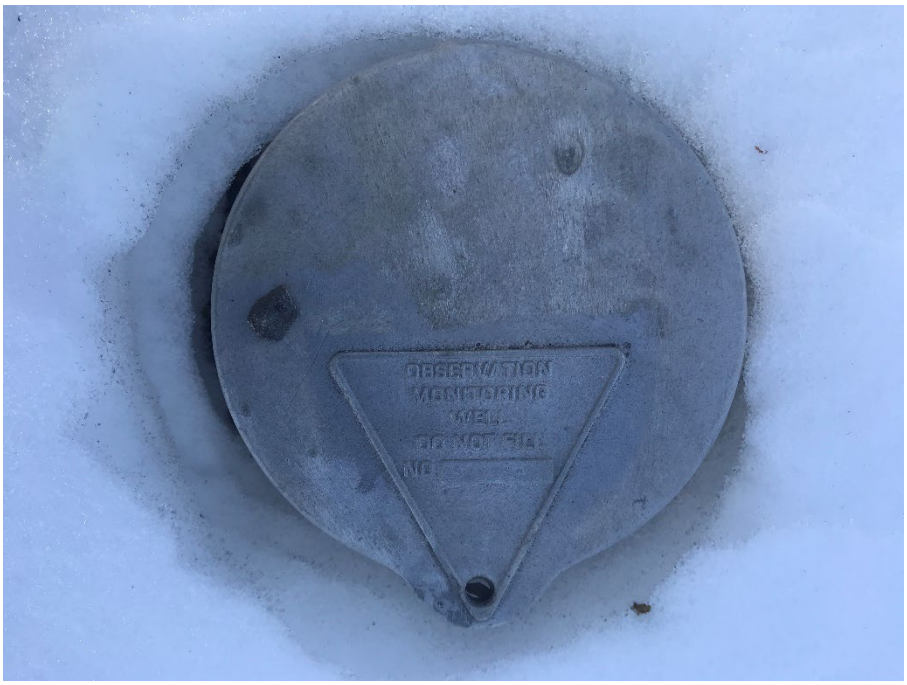
Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 21.

Description
Monitoring well on south side of wastewater overflow retention area, looking north. Photograph taken February 7, 2022.

Photo No. 22.

Description
Close-up of monitoring well on south side of wastewater overflow retention area. Photograph taken February 7, 2022.



MAUL FOSTER ALONGI

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 23.

Description
Monitoring well on north side of wastewater overflow retention area, looking west. Photograph taken February 7, 2022.

Photo No. 24.

Description
N Worthen Street, looking north, with Lineage warehouses in background. Photograph taken February 7, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 25.

Description
Potentially polychlorinated-biphenyl-containing transformers stored on the Lineage property. Photograph taken February 7, 2022.

Photo No. 26.

Description
55-gallon drums on an adjacent west property (former Chelan County Public Utility District substation) near the north portion of the property. Photograph taken February 7, 2022.

PHOTOGRAPHS

Project Name: Riverfront Park Phase I ESA
Project Number: M1945.01.002
Location: N Worthen Street, Wenatchee, Washington

Photo No. 27.

Description
Burlington Northern Santa Fe railway west of the Property, looking north. Photograph taken February 7, 2022.

ATTACHMENT B

INADVERTENT DISCOVERY PLAN

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Riverfront Park Location: North Worthen Street, Wenatchee, Washington

Project Lead/Organization: Chelan Douglas Regional Port Authority County: Chelan

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Stacie de Mestre	Name:	Garrett Augustyn
Organization:	Chelan Douglas Regional	Organization:	Maul Foster & Alongi
Phone:	(509) 884-4700	Phone:	971 703 4285
Email:	stacie@cdrpa.org	Email:	gaugustyn@maulfoster.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Ali Furmall	Name:	
Program:	Toxics Cleanup Program	Program:	
Phone:	509-655-0538	Phone:	
Email:	afur461@ECY.WA.GOV	Email:	

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Sauk-Suiattle Tribe	Tribe:	Confed. Tribes and Bands of the Yakama Nation
Name:	The Honorable Kevin Joseph	Name:	Casey Barney
Title:	THPO	Title:	THPO
Phone:	360-436-0333	Phone:	509-865-5121
Email:	mailto:kJoseph@sauk-suiattle.com	Email:	casey_barney@yakama.com
Tribe:	Colville Confederated Tribes	Tribe:	
Name:	Guy Moura	Name:	
Title:	THPO	Title:	
Phone:	509-634-2695	Phone:	
Email:	mailto:guy.moura@colvilletribes.com	Email:	

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:		State Agency:	
Agency:	US Environmental Protection Agency	Agency:	
Name:	Madison Sanders-Curry	Name:	
Title:	Brownfields Project Manager	Title:	
Phone:	206-553-1889	Phone:	
Email:	sanders-curry.madison@epa.gov	Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: Chelan County Coroner, (509) 667-6431
   - Local Law Enforcement main name and phone: Wenatchee Police Department, (509) 663-9911
   - Local Non-Emergency phone number (911 if without a non-emergency number): (509) 663-9911
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

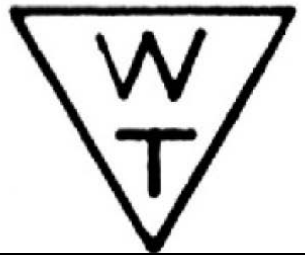
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

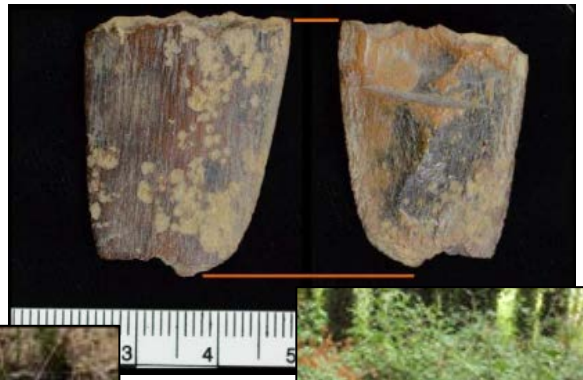
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*

HOLE	LAYER	DEPTH (inch)	TOOL	COLOR	TEXTURE	SAND MODE	GRAVEL MODE	CONSISTENCE	PEDS	BOTTOM BOUNDARY	SOIL HORIZON	SPECIAL FEATURES	MODERN DEBRIS	CULTURAL	COMMENTS
B1	1	0-30	Geoprobe	brown	sandy loam (no bedding)	very coarse poorly-sorted	60-90% poorly-sorted angular coarse	hard	granular/crumb moderate medium	clear smooth	fill	organics	no	no	First sample 0-5ftbs.
B1	2	30-60	Geoprobe	dark brown	loam (no bedding)	fine well-sorted	5-15% well-sorted no gravel shape fine	hard	angular blocky moderate coarse	clear smooth	A	mottled	yes	no	First sample, small piece of glass 23 inbs.
B1	3	60-65	Geoprobe	gray	loam (no bedding)	very fine moderately-sorted	15-35% moderately-sorted subrounded-subangular fine	slightly hard	granular/crumb moderate medium	clear wavy	B	organics	no	no	Second sample - some wood at 48inbs.
B1	4	65-70	Geoprobe	brown	sandy loam (no bedding)	fine moderately-sorted	15-35% well-sorted subrounded fine	extremely hard	subangular blocky moderate medium	diffuse wavy	B	mottled	no	no	
B1	5	70-120	Geoprobe	dark gray	sand (no bedding)	coarse poorly-sorted	60-90% poorly-sorted subrounded-subangular mixed	very hard	angular blocky weak medium	no horizon	C	organics	no	no	Stick at depth, stained with the color of the sediment. Terminated at desired depth.
B2	1	0-234	Geoprobe	light brown	sand (no bedding)	very fine well-sorted	<5% well-sorted subrounded-subangular fine	hard	subangular blocky moderate medium	no horizon	fill	organics mottled	no	no	
B2	2	234-258	Geoprobe	brown	sand (no bedding)	fine well-sorted	35-60% moderately-sorted subangular medium	hard	granular/crumb moderate medium	no horizon	C	groundwater oxidized	no	no	Most likely sandstone bedrock. Terminated at desired depth.
B3	1	0-24	Geoprobe	brown	sandy loam (no bedding)	fine moderately-sorted	no gravel	soft	granular/crumb moderate fine	clear smooth	fill	organics	no	no	Sample 1.
B3	2	24-48	Geoprobe	light brown	silt loam (no bedding)	very fine well-sorted	<5% well-sorted subrounded-subangular fine	moderately hard	subangular blocky moderate medium	clear smooth	fill		no	no	
B3	3	48-60	Geoprobe	yellowish-brown	clay (no bedding)	sand absent	no gravel	moderately hard	subangular blocky strong coarse	clear smooth	fill		no	no	Clay landfill cap.
B3	4	60-180	Geoprobe	dark gray	sandy loam (no bedding)	very coarse poorly-sorted	35-60% poorly-sorted subrounded-subangular mixed	moderately hard	granular/crumb moderate coarse	diffuse irregular	fill	organics	yes	no	Nondiagnostic landfill debris (styrofoam, wood, cardboard).
B3 attempt 2	1	0-30	Geoprobe	brown	sandy loam (no bedding)	very fine well-sorted	no gravel	slightly hard	granular/crumb moderate medium	clear smooth	fill	organics	no	no	
B3 attempt 2	2	30-39	Geoprobe	yellowish-brown	clay (no bedding)	sand absent	no gravel	hard	angular blocky strong coarse	clear smooth	fill		no	no	Clay landfill cap.

HOLE	LAYER	DEPTH (inch)	TOOL	COLOR	TEXTURE	SAND MODE	GRAVEL MODE	CONSISTENCE	PEDS	BOTTOM BOUNDARY	SOIL HORIZON	SPECIAL FEATURES	MODERN DEBRIS	CULTURAL	COMMENTS
B3 attempt 2	3	39-58	Geoprobe	dark gray	sand (no bedding)	coarse poorly-sorted	60-90% poorly-sorted subangular coarse	hard	structureless	clear wavy	fill		no	no	Gravel landfill cap.
B3 attempt 2	4	58-240	Geoprobe	dark gray	sand (no bedding)	sand absent	no gravel	soft	structureless	no horizon	fill	organics	yes	no	Actual landfill materials- no soil. Styrofoam, plastic, wood.
B4	1	0-48	Geoprobe	brown	sand (no bedding)	fine well-sorted	5-15% well-sorted subrounded-subangular fine	soft	granular/crumb no ped grade fine	clear smooth	fill	organics	no	no	
B4	2	48-52	Geoprobe	yellowish-brown	clay (no bedding)	sand absent	no gravel	moderately hard	angular blocky strong no ped size	abrupt smooth	fill		no	no	Clay cap to landfill .
B4	3	52-60	Geoprobe	grayish-brown	sand (no bedding)	fine well-sorted	35-60% moderately-sorted subrounded-subangular medium	moderately hard	granular/crumb moderate medium	diffuse irregular	fill		no	no	
B4	4	60-78	Geoprobe	gray	sand (no bedding)	coarse poorly-sorted	60-90% poorly-sorted subangular coarse	hard	structureless	very diffuse irregular	fill		no	no	Gravel landfill cap.
B4	5	78-102	Geoprobe	dark gray	sand (no bedding)	very coarse poorly-sorted	35-60% poorly-sorted crushed rock mixed	moderately hard	structureless	clear smooth	fill		yes	no	Landfill with crushed gravels, plastics, wood, glass, metal. Non dignostic.
B4	6	102-162	Geoprobe	grayish-brown	sand (no bedding)	coarse poorly-sorted	>90% moderately-sorted subrounded-subangular medium	moderately hard	granular/crumb weak fine	clear smooth	fill		no	no	Water added in order to dilute the contaminations.
B4	7	162-180	Geoprobe	dark grayish-brown	sand (no bedding)	very fine poorly-sorted	no gravel	hard	angular blocky strong coarse	no horizon	fill		no	no	Landfill. Terminated due to high methane levlels.
B5	1	0-30	Geoprobe	light brown	loamy sand (no bedding)	very fine well-sorted	<5% well-sorted subrounded fine	soft	structureless	clear smooth	fill	organics	no	no	
B5	2	30-44	Geoprobe	grayish-brown	sand (no bedding)	medium moderately-sorted	<5% well-sorted subrounded fine	slightly hard	granular/crumb moderate medium	diffuse irregular	fill		no	no	
B5	3	44-60	Geoprobe	light brown	sand (no bedding)	medium poorly-sorted	35-60% poorly-sorted subrounded-subangular medium	slightly hard	granular/crumb moderate medium	clear smooth	fill		no	no	
B5	4	60-84	Geoprobe	grayish-brown	silt (no bedding)	fine moderately-sorted	15-35% poorly-sorted subangular mixed	slightly hard	structureless	diffuse irregular	fill		no	no	Includes the end of sample 1 and all of split sample 2, and 29 inches of second full sample (6.5-11ftbs).

HOLE	LAYER	DEPTH (inch)	TOOL	COLOR	TEXTURE	SAND MODE	GRAVEL MODE	CONSISTENCE	PEDS	BOTTOM BOUNDARY	SOIL HORIZON	SPECIAL FEATURES	MODERN DEBRIS	CULTURAL	COMMENTS
B5	5	84-102	Geoprobe	dark gray	sandy loam (no bedding)	coarse poorly-sorted	60-90% poorly-sorted subangular coarse	hard	granular/crumb moderate coarse	no horizon	fill		no	no	
B5	6	102-150	Geoprobe	dark gray	sandy loam (no bedding)	coarse moderately-sorted	35-60% poorly-sorted subrounded-subangular medium	hard	granular/crumb moderate medium	diffuse wavy	fill		no	no	
B5	7	150-240	Geoprobe	other	sandy loam (no bedding)	Landfill no sand sorting	no gravel	slightly hard	Landfill no ped grade no ped size	no horizon	fill	organics groundwater	yes	no	Landfill: wood, metal, newspaper and high moisture content . Terminated at desired depth.
B6	1	0-9	Geoprobe	light brown	sandy loam (no bedding)	fine well-sorted	no gravel	soft	structureless	diffuse wavy	fill	organics	yes	no	Glass.
B6	2	9-28	Geoprobe	dark brown	silt loam (no bedding)	fine well-sorted	<5% well-sorted subrounded-subangular fine	slightly hard	granular/crumb weak fine	abrupt smooth	fill	common charcoal mottled	yes	no	Glass.
B6	3	28-32	Geoprobe	gray	sand (no bedding)	medium well-sorted	no gravel	loose	structureless	abrupt smooth	fill		no	no	Piece of decomposing granite .
B6	4	32-41	Geoprobe	light brown	clay loam (no bedding)	fine poorly-sorted	5-15% poorly-sorted subrounded-subangular fine	moderately hard	subangular blocky moderate medium	abrupt smooth	fill	trace charcoal mottled	no	no	
B6	5	41-60	Geoprobe	brown	silt loam (no bedding)	medium moderately-sorted	5-15% moderately-sorted subrounded-subangular fine	hard	granular/crumb moderate fine	abrupt smooth	fill	trace charcoal mottled	yes	no	Glass fragments (clear and brown).
B6	6	60-84	Geoprobe	gray	(no bedding)	medium poorly-sorted	60-90% poorly-sorted crushed rock mixed	moderately hard	granular/crumb weak fine	clear smooth	fill		no	no	Heavily disturbed.
B6	7	84-120	Geoprobe	brown	sandy loam (no bedding)	fine poorly-sorted	60-90% poorly-sorted Crushed rock SR/SA mixed	slightly hard	granular/crumb moderate fine	no horizon	fill	trace charcoal organics mottled	yes	no	Landfill. Brick fragments, glass, plastic. Terminated at desired depth.
SS01	1	0-3	shovel	brown	sandy loam (no bedding)	fine well-sorted	no gravel	slightly hard	granular/crumb moderate medium	no horizon	fill	mottled	no	no	Terminated at desired depth.
SS02	1	0-3	shovel	brown	sandy loam (no bedding)	medium well-sorted	no gravel	slightly hard	subangular blocky moderate no ped size	no horizon	fill		no	no	Terminated at desired depth.
SS03	1	0-3	shovel	brown	sandy loam (no bedding)	fine well-sorted	no gravel	slightly hard	granular/crumb moderate medium	no horizon	fill	mottled	no	no	Terminated at desired depth.
SS04	1	0-3	shovel	light brown	sandy loam (no bedding)	fine well-sorted	no gravel	hard	structureless	no horizon	fill		no	no	Very dry. Terminated at desired depth.

ATTACHMENT C

GEOTECHNICAL REPORT

RIVERFRONT PARK IMPROVEMENTS

ENGINEERING GEOLOGY REPORT

Prepared for Maul Foster & Alongi, Inc., and the City of Wenatchee

November 2022

MFA 22.0133

Prepared by:

RH2 Engineering, Inc.

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City of Wenatchee

Riverfront Park Improvements

Engineering Geology Report

November 2022

Engineering Geology Report

This report summarizes the findings of a geologic investigation and evaluation of Riverfront Park in Wenatchee, Washington. This report describes six geotechnical borings, documents the existing subsurface conditions, and evaluates the potential of the site for proposed park improvements consisting of a gazebo, splash pad, restroom building, and trail/park bench.

Sincerely,

RH2 ENGINEERING, INC.

Signed:
11/23/2022

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Introduction

Project Description

The City of Wenatchee (City) is pursuing a series of park and trail improvement projects along Riverfront Park between the Riverside 9 Apartments and the Wenatchee Wastewater Treatment Facility (**Figure 1**). Improvements vary from a splash pad to children's play structures to small kiosks to an open pavilion. Historically, a municipal landfill operated at the park from approximately 1930 to the 1972. The City has retained Maul Foster & Alongi, Inc., (MFA) to evaluate potential risks to human health and the environment associated with planned park improvements in the vicinity of the former landfill . Due to settlement concerns associated with decomposing landfill material, MFA contracted RH2 Engineering, Inc., (RH2) provide geotechnical assistance to facilitate the design and construction of the proposed improvements.

Location and Existing Conditions

The proposed improvements will be sited between Island View Street and Orondo Street east of Worthen/Riverside Drive on parcels owned by the City and managed by Public Utility District No. 1 of Chelan County (PUD). The site is currently developed as a public park that features a pedestrian and bike trail, irrigated lawn, flower beds, miscellaneous artwork, restrooms, and a miniaturized train and train tracks providing the public (mostly kids) with rides.

The site is mostly flat to gently undulating and is located on an alluvial and fill bench approximately 15 to 20 feet above the Columbia River.

Purpose of this Engineering Geology Report

This Engineering Geology Report (Report) is a public document. It is specific to this project and has been prepared to support the planning, permitting, design, and bid documents for this project. This Report was prepared consistent with Chapter 18.220 of the Revised Code of Washington (RCW) and Chapter 308-15 of the Washington Administrative Code (WAC), which regulate the licensed practice of geology and the requirements of geologic investigation and reporting, along with Chapter 11.86 of the Chelan County Code, which regulates the assessment of potential geologically hazardous areas.

This Report, with the attached boring logs from this investigation, will support the design and constructability of the park improvements. This Report includes recommendations for enhancing the constructability of the project based on site-specific characterizations of the fill and earth materials and preparation of the subgrade for the proposed improvements. This

Report does not dictate the means or methods for construction of the project, but it is intended to provide information that should be useful to contractor bid preparation for excavation, grading, and managing water activities that are specific to the conditions of the project area.

This Report also outlines the limitations and liabilities of portions of the site with regard to both the constructability and long-term durability of the proposed improvements.

The conclusions of this Report assume all proposed improvements are single-story, above-grade, "light-weight" structures and shallow utilities.

Based on the results of this investigation, the scope of the proposed improvements span across both native alluvium and historic landfill deposits (**Figure 2**). Therefore, the conclusions will be broken into two separate sections: one addressing construction on the landfill, and one addressing the native alluvium.

Investigation

Previous Work

As part of the geologic investigation, RH2 reviewed applicable and publicly available scientific literature on the existing geology and site conditions, including the following:

- Budinger, F.C. (1981). *Soil and Gas Generation Investigation; Wenatchee Riverfront Park, Wenatchee Washington*. Budinger and Associates.
- Cheney, E. S. (2007). *The Chiwaukum Structural Low on the Eastern Flank of the Cascade Range*. Northwest Geological Society.
- Gresens, R. L. (1983). *Geology of the Wenatchee and Monitor Quadrangles, Chelan and Douglas Counties, Washington*. Washington State Department of Natural Resources (DNR), Division of Geology and Earth Resources. Bulletin 75.
- Neff, A. R. (2016). *Carnival Concerns*. RH2 Engineering, Inc. Prepared for the PUD.
- Neff, A. R. (2012). *Bearing Capacity (Pybus).* RH2 Engineering, Inc. Prepared for the Port of Chelan County.
- Tabor, et al. (1987). *Geologic Map of the Chelan 30-Minute by 60-Minute Quadrangle, Washington*. Prepared for the United States Geological Survey (USGS) Miscellaneous Investigations Series MAP I-1661.
- Tabor, et al. (1982). *Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington*. Prepared for the USGS Miscellaneous Investigations Series MAP I-1311.
- United States Department of Agriculture Natural Resource Conservation Service (NRCS) Web Soil Survey. Retrieved from: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
- Washington State Department of Natural Resources Washington Interactive Geologic Map. Retrieved from: https://geologyportal.dnr.wa.gov/.

Well Logs – Washington State Department of Ecology

- Seventy-three (73) well logs located within the same ¼ section as the project are on file with the Washington State Department of Ecology. All are resource protection wells (geotechnical borings) with varying levels of detail regarding the lithology encountered during drilling. The drill logs with applicable data indicated alluvium consisting of silts, sands, and gravels existing from the ground surface to 20 to 30 feet below ground surface (bgs). The alluvium is underlain by bedrock of the Wenatchee/Chumstick Formations consisting of sandstones and siltstones.

Geotechnical Boring Explorations

On October 18, and 19, 2022, Holt Services, Inc., completed 6 geotechnical borings using a track-mounted direct push drill rig to advance the 2-inch-diameter borings to depths of 15 to 20 feet bgs. Standard penetration tests (SPT) were completed every 5 feet within the borings, with some exceptions. In some locations within the former landfill, SPTs were not collected due to health and safety concerns associated with methane gas. Continuous air monitoring was performed by MFA while drilling within landfill materials. Continuous lithologic logs were maintained for each boring. MFA also was onsite logging the lithology encountered during drilling. Boring locations are shown in **Figure 2**. Complete boring logs are included in **Appendix A**.

Results

Regional Geology

The site is on an alluvial bench adjacent to the Columbia River approximately 15 to 20 feet above the water surface depending on flow conditions, dam operations (Rocky Reach and Rock Island), and the small variations that occur across the site. The area historically has been developed for industrial uses or open space, with the southern portion developed and used as a municipal landfill.

The project site is mapped by USGS and DNR as alluvial deposits consisting of silts, sands, and gravels from alluvial fans, streambed deposits, and lacustrine deposits overlying sedimentary rock (Wenatchee or Chumstick Formation).

Site Geology

The investigation revealed that the site is underlain by two separate and distinctly different units. North of 5th Street the area is underlain by alluvial deposits estimated to exceed 20 feet in depth. The alluvium is comprised of loose to medium dense silts, sands, and gravels, with poorly graded fine sand being the predominant material type encountered. SPTs were only collected in one boring within the alluvium. SPT results range from 4 to 23 blows per foot, with the finer grained material in the 4 to 5 range and the gravelly material at 23. The higher results within the gravel likely are skewed high due to the gravel clasts being larger than the split spoon sampler opening. The material was dry to wet with moisture increasing with depth. No

standing water was observed in the borehole, but groundwater may occur at depths comparable to the Columbia River surface water elevations (15 to 20 feet bgs).

The portion of the site south of 5th Street was used historically as a municipal landfill. Budinger documents the history of the landfill in its report (1981):

> The subject site was used as a refuse dump periodically from approximately 1930 to 1972. During this time, refuse was discarded along the riverbank (in what at the time was a bog). For sometime this refuse was incinerated prior to placement in the landfill, however, this practice was later discontinued. After seasonal high fluctuations of the river level and subsequent erosion of the refuse, a dike was constructed of boulders and concrete construction debris, thereby establishing the eastern margin of the site. According to available records, in 1972 the placement of refuse was discontinued, and the surface of the site graded with 3-5 feet of silty sand.
>
> A steel building erected for the City Sanitation Department of the refuse dump prior to 1970, has experienced approximately 1-2 feet of differential settlement due to consolidation/degradation of the refuse material upon which it bears. It is evident that the rise in pool elevation caused by the modification of Rock Island Dam, inundated portion of the landfill comprising organic solids, thus providing the ideal medium for decomposition/degradation, and subsequent generation of methane and carbon dioxide. The above information was derived through conversations with the Assistant Director of Public Works of the City of Wenatchee, and several Public Works employees.

The majority of the materials observed within the four borings completed within the landfill consisted of wood debris, sands, and gravels, paper products, and plastic products (including Styrofoam). None of the borings were advanced beyond the landfill deposits into native material due to either refusal or excessive methane gas. MFA monitored and oversaw the methane gas concentrations and determined when drilling processes should continue or terminate. The maximum depth achieved was 20 feet in borings B-03 (second attempt), B-04, and B-05. It is likely that the material within the landfill is variable in nature. Some SPTs were collected within the landfill materials with results ranging from 3 to 25 blows per foot; however, these values likely overrepresent the level of consolidation within the materials and are caused by encountering large obstructions (e.g. rocks, wood, and metal).

Geologic Laboratory Tests

No laboratory tests were performed as part of this Report. Representative soil samples from soil borings were described using the Unified Soil Classification System, which is a sufficient level of precision for identifying the site geologic characteristics.

Geologic In-Situ Tests

Appendix A contains soil boring logs with SPT results.

Potential Seismic and Liquefaction Risk Based on DNR Mapping

The DNR Interactive Geologic Map, based on the National Earthquake Hazards Reduction Program, assigns Seismic Site Class D to the site and a very low to low liquefaction potential.

Based on the materials encountered within Borings B-01 and B-02 (poorly graded low-density sands) the risk of liquefaction should be considered low to moderate (Site Class D-E).

Neither of these DNR mapped assumptions can or should be made for the landfill area. The landfill portion of the site would need to be studied in more detail to provide site-specific recommendations for seismic design.

Conclusions (Alluvium)

Geologic Risks, Hazards, and Mitigation

None of the site is mapped by Chelan County as geologically hazardous. However, some risks still exist on the site. All risks associated with this categorization can be reduced by following the recommendations presented within this Report.

Mass wasting in the form of surface erosion and shallow slope stability poses low to moderate risks to the portions of the site along the Columbia River, where steep slopes are exposed to high water flow/erosion events. These risks can be mitigated by not disturbing the existing steep slopes, as well as managing all exposed surfaces during construction to prevent erosion, completing soil stabilization measures post construction, and managing on-site stormwater to prevent erosion.

The risk from flooding on the site is low due to the flow-controlled operation of the river levels due to the many dams along its course.

The site is listed as a seismic design class D_0 per the Federal Emergency Management Agency earthquake hazard mapping. This equates to "very strong shaking. Damage slight in specially designed structures; considerable damage in ordinary substantial building with partial collapse. Damage great in poorly built structures" per FEMA earthquake hazard mapping. Earthquake ground motion parameters for this site are included in **Appendix B** (USGS and Building Seismic Safety Council).

Earth Strength, Bearing Capacity, and Earth Pressure

Bearing capacity and earth pressures were estimated based on observed soil characteristics collected during SPT sampling.

The undisturbed native alluvium is suitable for supporting the proposed improvements if loads can be spread so they do not exceed a net allowable bearing capacity of 2,300 pounds per square foot (psf), assuming all loose material has been removed to a depth below the root zone, and the subgrade is wetted and proof-rolled with a loaded dump truck (or equivalent heavy wheeled equipment). **Appendix C** contains bearing capacity calculations.

Lateral earth pressures based on Rankine's Theory and assuming level ground are presented in **Table 1**. Calculations are presented in **Appendix C**.

Table 1
Lateral Earth Bearing Pressure Native Alluvium

Passive (lbs/ft^3)	144
Active (lbs/ft^3)	35
At Rest (lbs/ft^3)	51

lbs/ft^3 = pounds per cubic foot

Settlement

The estimated post-construction settlement of less than 1.0 inches and differential settlement of 0.5 inches assume the recommendations within the **Construction Recommendations** portion of this Report are followed.

Construction Recommendations

Excavation of Structure Subgrade

The native alluvium may be readily excavated. No bedrock excavation or groundwater difficulties are expected so long as excavations are less than 5 feet from the ground surface.

All excavations and subgrade should be inspected by a Licensed Engineering Geologist (LEG) or Professional Engineer with a geotechnical background (PEG) to confirm whether the earth exposed during excavation is consistent with this Report and favorable for proceeding with the project as planned.

Subgrade Preparation

The subgrade for all structure and utility excavations should be undisturbed and firm. Any loose or soft material should be removed from the trench base and replaced with compacted structural fill.

Base Preparation

Structure foundations should bear on a layer of Crushed Surfacing Base Course (CSBC) at least 6 inches thick per Washington State Department of Transportation (WSDOT) Section 9-03.9(3), and compacted to a firm and unyielding surface to achieve at least 95 percent of maximum dry density as determined by the modified proctor test (ASTM D1557). Placement and compaction of the crushed rock should be observed by an LEG or PEG. CSBC should be within 2 percent of its optimum moisture content when placed. The compacted CSBC layer should be the finished base for the foundations.

Use of Excavated Earth Materials

Excavated alluvium may be used for backfill. However, this material is moderately to highly susceptible to moisture, both in-situ and reworked embankments (fill). Moisture contents need to be within 2 percent of optimal moisture to ensure “pumping” conditions are not created.

Any unsuitable earth materials (pumping soils, organics, etc.) should be exported or stockpiled separately for use as topsoil for landscaping around the site and should not be used as structural fill.

Fill and Compaction (Other)

Earth materials excavated for re-use as fill, as well as all imported fill material, should be tested for moisture content just prior to placement. Structural fill should be within plus or minus 2 percent of its optimum moisture content when placed.

Only after the concrete foundation has cured may excavations within 5 feet of the foundation be backfilled with structural fill. Structural fill should be placed in lifts that are not more than 1-foot thick when loosely placed. Each lift should be compacted to a firm and unyielding surface.

Excavations farther than 5 feet from the foundations should be backfilled with fill meeting WSDOT Section 9-03.14(2) for select borrow. Care must be taken to ensure that placement and compaction of backfill does not damage or undermine the footings or other installed components of the project.

All vehicle areas (driveways, roads, etc.) should have fill provided, placed, and compacted per Method C of WSDOT Section 2-03.3(14)C.

All non-structural fill for non-vehicle areas should be placed and compacted per Method A of WSDOT Section 2-03.3(14)C.

Utility pipe bedding equivalent to WSDOT Section 9-03.12(3) must be used.

Slopes and Shoring

All non-trench temporary cut faces should be no steeper than 1.5H:1V. All temporary slopes should be reviewed for stability at least once a day or as often as necessary to confirm slope integrity. This shall include reviewing the top of the slope for tension cracks, settlement, and erosion.

The alluvium is moderately erodible. All temporary slopes should be protected from erosion. During precipitation events, the surface should be protected with plastic sheeting, matting, or other techniques that prevent rain splash erosion and rilling.

All excavations should comply with all Occupational Safety and Health Administration and Washington Industrial Safety and Health Act safety requirements.

All permanent slopes should be graded so they are not steeper than 2H:1V.

All permanent slopes and swales should be protected from erosion by hydroseeding, planting with landscape fabric, coarse bark placement, quarry spalls, or other materials that prevent rain splash erosion and rilling.

Foundation Recommendation

Spread footings or mat foundations are suitable for the proposed improvements, if designed in accordance with the recommendation provided herein. Pile foundations may be warranted if significantly higher bearing capacities are needed.

On-Site Infiltration Capacity

No infiltration rate testing was conducted as part of this investigation; however, nearby (Pybus) infiltration tests conducted within alluvium have shown a short-term ultimate infiltration rate of 1 to 2 inches per hour. All stormwater from impervious surfaces should be managed in accordance with relevant Chelan County Codes.

Conclusions (Landfill)

Conclusions and recommendations within this section are limited to proposed lightweight structures with suitably designed foundations to accommodate high differential settlement that do not penetrate the landfill cap (clay). Recommendations for construction on top of or within the landfill footprint should not be considered absolutes. Due to the highly variable and generally poor nature of the material, no sureties can be given. There is no one description of material, nor one set of geotechnical parameters that can be made for this material. **Construction recommendations** are a best management practice that do not imply success or longevity. Structures and construction on or within the landfill area should be expected to experience significant differential settlement unless all of the underlying landfill material is removed. In general, the more robust a structure and foundation are designed, the higher the likelihood of long-term useable life. The following recommendations are intended to provide some examples of building practices that can be implemented within the landfill footprint to reduce the effects of differential settlement. Any and all construction on the landfill should be done so at the owner's own risk.

Geologic Risks, Hazards, and Mitigation

The risk to structures from seismically induced earth shaking within the landfill material is great. The existing DNR mapping indicates site Class D. This designation should not be used within the landfill footprint. Based on both previous investigations and this investigation, there exists a considerable amount of unconsolidated material that may act with little to no shear strength during a seismic event. This risk could be exacerbated by placing loads (i.e. structures) on the landfill.

Earth Strength, Bearing Capacity, and Earth Pressure

There is no appreciable bearing capacity within the landslide footprint that will prevent significant settlement. However, if structures must be built within this area, they should be designed for bearing capacities at or less than 500 psf per Budinger (1981). If additional bearing is necessary, the landfill materials will need to be removed.

Settlement

The Budinger report from 1981 indicated that the site may experience up to 2 feet of settlement. Based on existing site topography and the apparent changes in the last 41 years, there appears to be 1 to 2 feet of differential settlement observable across the site. Future settlement likely will continue along the same order of magnitude.

Construction Recommendations

Excavation of Structure Subgrade

There appears to be 3 to 5 feet of clean fill overlying a 3- to 6-inch clay cap covering the landfill. Excavation for any proposed improvements should remain above the clay cap. Any penetration through the cap should be repaired with impermeable clay. Penetration through the clay cap is likely to cause releases in trapped methane. The exploratory boreholes associated with this investigation released methane with concentrations above human health limits (per MFA continuous air monitoring). The more fill that can remain above the landfill deposits the less likelihood of imminent settlement.

Subgrade Preparation

The subgrade for all structure and utility excavations should be undisturbed and firm. Any loose or soft material should be removed from the trench base and replaced with compacted structural fill.

Structure Base Preparation

To decrease the effects of differential settlement, structures may be built on a reinforced based. A reinforced base would consist of base material (CSBC) placed on a non-woven geotextile placed directly on the subgrade surface to separate it from an overlying crushed rock base layer. The non-woven geotextile should have properties equivalent to Tencate Mirafi 500x. Above the geotextile, a layer of geogrid should be placed to provide uniform bearing support across the foundation footprint. The geogrid should be similar to Tensar TriAx TX140 geogrid in properties and function. Both geotextile footprints should be sized 2 feet larger in both directions than the proposed foundation.

The foundation should be poured directly on a firm and unyielding surface of CSBC that is “free of all loose material,” not saturated with water, and undisturbed by construction activity. “Free of all loose material” means that in areas where concrete foundations will be poured, there will not be any loose material, including earth, fill, or construction debris resulting from building the forms and placing rebar.

Use of Excavated Earth Materials

Clean fill, excavated from above the clay cap, may be used for backfill similar to the native alluvium.

However, any and all landfill materials encountered must be properly disposed of at a municipal landfill and may not be used or “reburied” onsite.

All efforts should be made to not excavate into or through the existing clay cap.

Foundation Recommendation

All structures should be placed on reinforced mat or grade-beam foundations. The landfill area is not suitable for spread footings or piles. The latter is due to the differential settlement not being contained to subgrade failures but also due to the degradation and consolidation of the underlying material potentially causing voids in and around piles.

Due to the extreme settlement and differential settlement potential, structural design must incorporate a large, structurally sound foundation where the entire structure can act as one unit.

There is only one existing building within the landfill footprint (railroad building). It would be very difficult to expand this building, tying it into the existing foundation, and ensuring they act as a single unit and do not separate in the future. An addition is not recommended.

Walkway and Trail Recommendation

Trail design, similar to other improvements, may take one of the following two approaches, or a combination thereof:

1. Keep design and construction simple and low cost knowing that the improvements are likely to fail (settle, crack, and/or separate) at a higher than typical rate and require more maintenance at a higher frequency then improvements constructed in areas outside of the landfill.
    a. This may include no or little base material and chip seal or 1-inch hot mixed asphalt (HMA) surfacing.
    b. This may include the addition of crushed surfacing and periodic regrading as settlement occurs.
2. Treat the trail as more of a structure, implementing the proposed reinforced base suggestions for structures in an attempt to bridge the weaker areas along the trail and limit impacts from settlement. Without removing the underlaying landfill material, excessive settlement likely cannot be avoided completely.
3. A combination of these may include the use of geogrid, 2 to 4 inches of CSBC, and 2 to 3 inches of HMA.

Retaining Wall/Embankment Recommendation

The initial improvement plans called for a retaining wall to be constructed south of the WWTP and north of the pedestrian bridge to downtown, right along the bank of the Columbia River to create an overlook. It was thought that this area may be outside of the landfill materials, Boring 5 was completed in that area and encountered landfill material at 10 feet (no clay cap was observed in this area). There will be little that can be done to minimize the impact of potentially severe settlement on a retaining wall in this area. Below are recommendations to minimize the impacts of a retaining wall and overlook in this area.

1. Construct earthen slopes instead of concrete block walls. Slopes are easier to repair and do not necessarily appear as aesthetically unpleasing as settlement within a wall segment.
2. Use lightweight engineered fill/foam blocks for backfill behind the wall/slope, to reduce the overall increased loading on top of the landfill materials.
3. Piles could be drilled to support the wall, but settlement between piles should be expected.

On-Site Infiltration Capacity

No stormwater should be infiltrated within the landfill area. All water should be routed away from the landfill.

Bid Documents

This Report and boring logs should be provided to all contractors interested in submitting bids for the work to ensure the best available data can be used for site-specific estimates for excavation and grading.

Figures

Notes:
All feature locations are approximate.
BNSF = BNSF Railway.
City = City of Wenatchee.
PUD = public utility district.
unk. = unknown.
WWTP = wastewater treatment plant.

Legend

- <all other values>
- Proposed Soil Vapor Boring
- Proposed Geotechnical Boring
- Proposed Soil Vapor and Geotechnical Boring
- Proposed Surface Soil Sample
- Landfill Area
- Property Parcels
- Tax Lots

Sources:
Aerial photograph obtained from ArcGIS Online.
Tax parcels obtained from Chelan County GIS.

Figure 1
Property Features and Proposed Sample Locations

Riverfront Park
Chelan Douglas Regional
Port Authority
Wenatchee, Washington

0 200 400
Feet

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p. 971 544 2139 | www.maulfoster.com

Path: X:\1945.01\02\Riverfront Park\Fig2-1 ProposedSampleLocs.mxd
Print Date: 8/29/2022
Reviewed By: abixby
Produced By: abixby
Project: M1945.01.002

J:\DATA\MFA\22-0133\GIS\GEO REPORT FIGURES.APRX BY: ANEFF PLOT DATE: NOV 15, 2022 COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

RH2

NORTH

1 inch : 400 Feet

0 100 200 400 Feet

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

Figure 2
Results Map
Geotechnical Investigation

Wenatchee Riverfront Part Imp.

Vicinity Map

Appendices

Appendix A

Boring Logs

Project: WEN Riverfront Park Improv.	Project Number: 22-0133	Client: Maul Foster Alongi	Boring No. BH 1
Logged By: Adam Neff	Date: 10/18/2022	Drilling Contractor: Holt	Drill Rig Type: Direct Push
Elevation: 630 (Google Earth®)	Groundwater Depth:	Total Depth of Boring: 5'	Diameter: 2-inch

Depth (feet)	Sample Type	Sample Number	Blow Counts (blows/6-inches)	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifierm color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	SPT Recovery	Moisture Content (%)	Sum of Lower 1-ft SPT
					Coarse sand (fill), moist, loose			
					Poorly graded SAND (SP) to SAND W/SILT (SP)			
					Medium dense to loose, grey, moist			
5								
10								
15								
20								
25								

Standard Penetration Split Spoon Sampler (SPT)

Project: WEN Riverfront Park Improv.	Project Number: 22-0133	Client: Maul Foster Alongi	Boring No. BH 2
Logged By: Adam Neff	Date: 10/18/2022	Drilling Contractor: Holt	Drill Rig Type: Direct Push
Elevation: 630 (Google Earth®)	Groundwater Depth:	Total Depth of Boring (ft): 20	Diameter: 2-inch

Depth (feet)	Sample Type	Sample Number	Blow Counts (blows/6-inches)	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifierm color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	SPT Recovery	Moisture Content (%)	Sum of Lower 1-ft SPT
					Well-graded SAND (SW) with silt and fine gravel			
					loose, dry, medium brown			
5			2			0.9'		
			2		Poorly graded SAND (SP)			
			2		grey-brown, dry to very slightly moist, loose to med. Density			4
			2		trending to just grey, medium grain size	0.9'		
10			2		moist			
			2					4
			3		slightly moist	1.1'		
15			2					
			3					5
			8		Gravelly SAND (SW)			
20			10		saturated, grey, medium dense to dense, some orange oxidation			
			13					23
25								

Standard Penetration Split Spoon Sampler (SPT)

Project: WEN Riverfront Park Improv.	Project Number: 22-0133	Client: Maul Foster Alongi	Boring No. BH 3a
Logged By: Adam Neff	Date: 10/18/2022	Drilling Contractor: Holt	Drill Rig Type: Direct Push
Elevation: 622 (Google Earth®)	Groundwater Depth:	Total Depth of Boring (ft): 11.5	Diameter: 2-inch

Depth (feet)	Sample Type	Sample Number	Blow Counts (blows/6-inches)	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifierm color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	SPT Recovery	Moisture Content (%)	Sum of Lower 1-ft SPT
					Well-graded SAND (SW) with silt and fine gravel			
					loose, dry, medium brown			
					Clay cap at 2.2 feet			
5	◪		2			0.9'		
			2		Garbage, styrofoam, wood, sand, gravel, plastic			
			1		wet, moist, black, smelly			3
10	◪		7			0.9'		
			11					
			14		Refusal at 11.5 feet.			25
15								0
20								0
25								

◪ Standard Penetration Split Spoon Sampler (SPT)

Project: WEN Riverfront Park Improv.	Project Number: 22-0133	Client: Maul Foster Alongi	Boring No. BH 3b
Logged By: Adam Neff	Date: 10/18/2022	Drilling Contractor: Holt	Drill Rig Type: Direct Push
Elevation: 622 (Google Earth®)	Groundwater Depth:	Total Depth of Boring (ft): 11.5	Diameter: 2-inch

Depth (feet)	Sample Type	Sample Number	Blow Counts (blows/6-inches)	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifierm color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	SPT Recovery	Moisture Content (%)	Sum of Lower 1-ft SPT
					Well-graded SAND (SW) with silt and fine gravel			
					loose, dry, medium brown			
					Clay cap at 2.2 feet			
5	◪		2			0.9'		
			2		Garbage, styrofoam, wood, sand, gravel, plastic			
			1		wet, moist, black, smelly			3
10	◪		7			0.9'		
			11					
			14					25
15	◪		4			0.5'		
			8					
			4					12
20					Boring stopped, excessive methane			
								0
25								

◪ Standard Penetration Split Spoon Sampler (SPT)

Project: WEN Riverfront Park Improv.	Project Number: 22-0133	Client: Maul Foster Alongi	Boring No. BH 4
Logged By: Adam Neff	Date: 10/19/2022	Drilling Contractor: Holt	Drill Rig Type: Direct Push
Elevation: 637 (Google Earth®)	Groundwater Depth:	Total Depth of Boring (ft): 15	Diameter: 2-inch

Depth (feet)	Sample Type	Sample Number	Blow Counts (blows/6-inches)	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifierm color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	SPT Recovery	Moisture Content (%)	Sum of Lower 1-ft SPT
					SILTY SAND (SM)			
					Medium dense, dry, medium brown			
					.4' clay cap			
					Grey SANDY GRAVEL (GW)			
5	◪		12 14 7		moist, dense	1.2'		21
					Garbage, wood, sand, gravel, minor plastic			
					wet, moist, smelly			
10					water added to reduce methane (active monitoring)			0
					Still mostly sand and gravel and wood, minor amounts of visible			
					garbage. Very high methane level. More water added.			
15					Still mostly sand and gravel and wood, minor amounts of visible			0
					garbage. Very high methane level. More water added.			
					Boring stopped, too much methane coming from drilling hole			
20								0
25								

◪ Standard Penetration Split Spoon Sampler (SPT)

Project: WEN Riverfront Park Improv.	Project Number: 22-0133	Client: Maul Foster Alongi	Boring No. BH 5
Logged By: Adam Neff	Date: 10/18/2022	Drilling Contractor: Holt	Drill Rig Type: Direct Push
Elevation: 636 (Google Earth®)	Groundwater Depth:	Total Depth of Boring (ft): 20	Diameter: 2-inch

Depth (feet)	Sample Type	Sample Number	Blow Counts (blows/6-inches)	Graphic Log	Lithology **Soil Group Name:** modifier, color, moisture, density/consistency, grain size, other descriptors **Rock Description:** modifierm color, hardness/degree of concentration, bedding and joint characteristics, solutions, void conditions.	SPT Recovery	Moisture Content (%)	Sum of Lower 1-ft SPT
			5		Well-graded SAND (SW) with silt and fine gravel			
					loose to medium dense, dry, medium brown			
5	◪		5		GRAVELLY SAND (SW)	0.8'		
			5					
			6		dry to slightly moist, med dense, last 6" dark staining, smelly			11
10	◪		1			0.5'		
			2		Garbage, styrofoam, plastic, wood			
			2		no clay cap observed			4
15	◪		2		More pastics, some sludge?, silt in 3" layers, very stinky	0.4'		
			3		fairly stiff resistance for drill rig			
			1					4
20								0
25								

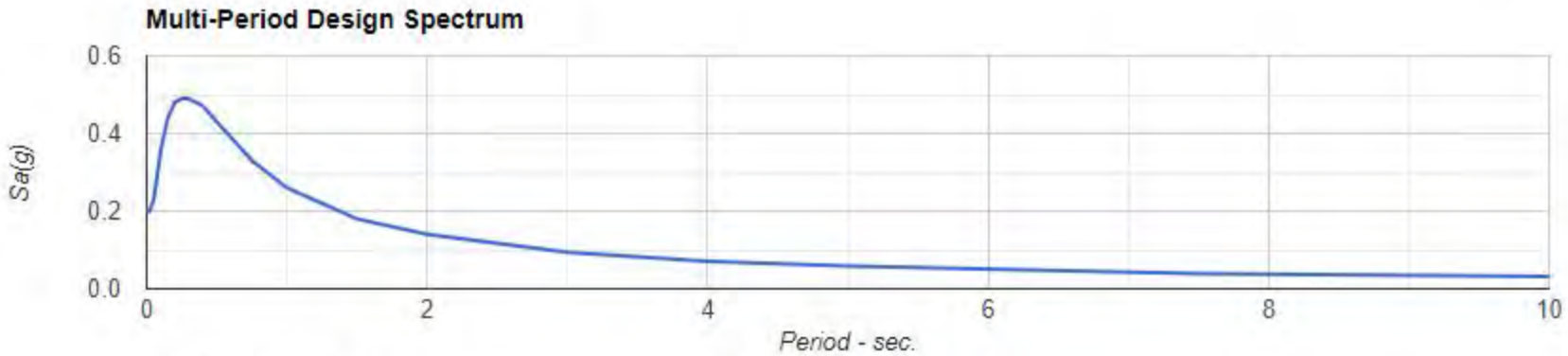
◪ Standard Penetration Split Spoon Sampler (SPT)

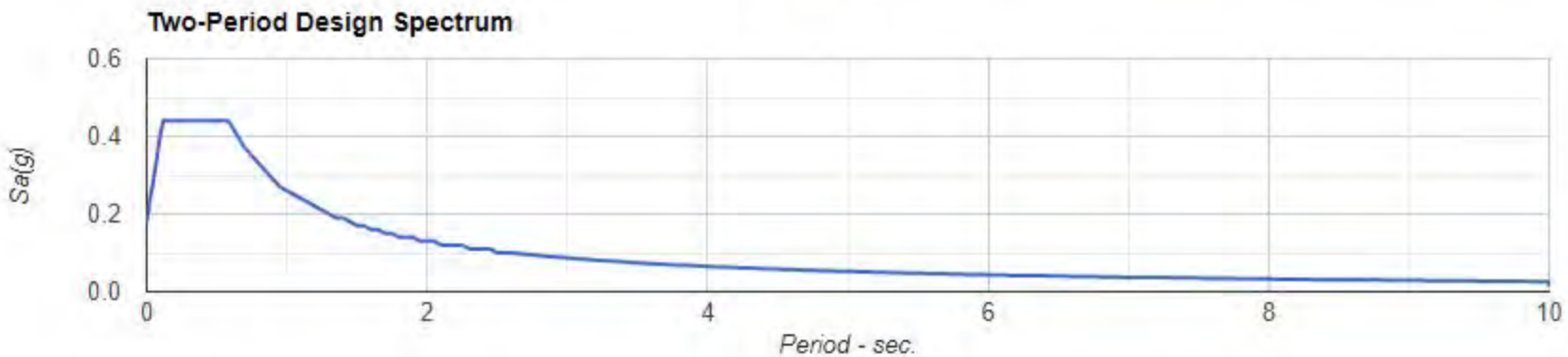
Appendix B

Seismic Information

Latitude 47.4323 / Longitude -120.31229

SEISMIC DATA (RISK CATEGORY I – SITE CLASS D)									
PGA_M	S_{MS}	S_{M1}	S_{DS}	S_{D1}	T_L	S_S	S_1	SDC	V_{S30} (m/s)
0.27	0.67	0.39	0.44	0.26	16	0.49	0.16	D	260





Appendix C

Geological Calculations

Client / Contract	MFA Riverfront	Job Number			Section No.
Phase / Subject		Made By	ARN	Date 11/8/2022	Sheet No.
Design Topic	Soil bearing capacity by various models				

Input Important Information

Task:

Calculate the soil bearing capacity for a shallow strip or square foundation.

Index:

Summary:

Reference	Model	q_a	Structure	Type
USACE EM	Terzaghi	2.331 ksf	Footings	Strip
USACE EM	Meyerhof	2.952 ksf	Footings	Strip
USACE EM	Hansen	3.209 ksf	Footings	Strip
USACE EM	Vesic	3.283 ksf	Footings	Strip

Primary References:

1. Engineer Manual (EM) 1110-1-1905, *Bearing Capacity of Soils* , USACE, 10/30/1992
2. *Foundation Analysis and Design* , Fifth Edition, Joseph E. Bowles, The McGraw-Hill Companies, Inc., 1996
3. *Design of Shallow Foundations* , Samuel E. French, ASCE Press, 1999

Secondary References:

1. *Principles of Foundation Engineeering* , Second Edition, Braja M. Das, PWS-Kent Publishing Company, 1990
2. *Foundation Engineering Handbook* , Second Edition, Hsai-Yang Fang, Van Nostrand Reinhold, 1991

Notes:

1. This worksheet is not a replacement for a Geotechnical Report it is just a tool for a Structural Engineer to become aware of what to expect from a Geotechnical Engineer or to understand how the Geotechnical Engineer determined the allowable bearing capacity. It also give the hint to the Geotechnical Engineer that we are expecting an allowable bearing capacity based on engineering rather than a citation of a code-based prescriptive value.
2. When you use the vocabulary of the problem, specifically the investigator's names, and can provide the input that the Geotechnical Engineer needs to determine the allowable bearing capacity (B, W, D, Q, M, etc.), it informs the Geotechnical Engineer that you are capable of understanding the development of the bearing capacity value and to be prepared for informed questions on their work. If they do not ask for the structural input needed to solve for the allowable bearing capacity, you need to ask them what they assumed and why they assumed what they did.
3. In the unlikely event that a Structural Engineer is forced to proceed with a design that is not based on a Geotechnical Report, this tool documents how we determined the allowable bearing capacity. This tool is geotechnical engineering without the field work, lab work, geotechnical experience or geotechnical judgement. It is just solving the same equations that a Geotechnical Engineer would.
4. There is much more to calculating an allowable soil bearing capacity than is captured in this worksheet. For a more complete discussion of general and local soil shear failure, multi-layerd soil conditions, groundwater, etcetera, read the USACE Engineer Manual 1110-2-1905, *Bearing Capacity of Soils* , Chapters 1 and 4.

Background and Applicability:

The general equation for the ultimate soil bearing capacity is comprised of three terms representing three contributers to the capacity; they are: the bearing capacity related to cohesion, the soil wedge, and surcharge. Solutions of the general equation are provided using the Terzaghi (1943), Meyerhof (1963), Hansen (1970), and Vesic (1975) models. Each of these models have different capabilities for considering foundation and soil conditions and you should use the model that is applicable to your conditions. Two or more models should be used for each, when practical, to increase confidence in the bearing capacity analysis.

Joseph E. Bowles, in his book *Foundation Analysis and Design* , discusses which equations to use. He noted, "The Terzaghi equations, being the first proposed, have been widely used. Because of their greater ease of use (one does not need to compute all the extra shape, depth, and other factors) they are still used - probably more than they should be. They are only suitable for a concentrically loaded footing on horizontal ground. They are not applicable for footings carrying a horizontal shear and/or a moment of for tilted bases." He continues, "Both the Meyerhof and Hansen methods are widely used. The Vesic method has not been much used." A comparison of computed theoretical bearing capacities shows that there is very little difference between the Hansen and Vesic methods, much less than the uncertainty in the input variables.

Use	Best for
Terzaghi	Very cohesive soils where D/B <= 1 or for a quick estimate of q_{ult} to compare with other methods. *Do not use* for footings with moments and/or horizontal forces or for tilted bases and/or sloping ground.
Hansen, Meyerhof, Vesic	Any situation that applies, depending on user preference or famililarity with a particular method.
Hansen, Vesic	When base is tilted; when footing is on a slope or when D/B > 1.

Best practices are to excavate to eliminate a tilted base and if possible, grade the extent of the failure surface to eliminate slopes adjacent to footing.

Client / Contract	MFA Riverfront	Job Number			Section No.
Phase / Subject		Made By	ARN	Date 11/8/2022	Sheet No.
Design Topic	Soil bearing capacity by various models				

Input | Important | Information

In each of the models there are dimensionless coefficients that modify each of the three terms
- N_c for the cohesion term
- N_γ for the wedge term
- N_q for the surcharge term

In each of the models there are correction factors; the number of correction factors vary by model. In the USACE reference, the correction factors are identified by ζ with a subscript for the term, c, γ, or q. A second subscript is used to identify the condition: shape and eccentricity, s; load inclination, i; foundation depth, d; soil slope, β; and base tilt, δ.

Term	Dimensionless Coeffficient	Correction Factor	Shape and Eccentricity	Load Inclination	Foundation Depth	Soil Slope	Base Tilt
Cohesion	N_c	ζ_c	ζ_{cs}	ζ_{ci}	ζ_{cd}	$\zeta_{c\beta}$	$\zeta_{c\delta}$
Wedge	N_γ	ζ_γ	$\zeta_{\gamma s}$	$\zeta_{\gamma i}$	$\zeta_{\gamma d}$	$\zeta_{\gamma\beta}$	$\zeta_{\gamma\delta}$
Surcharge	N_q	ζ_q	ζ_{qs}	ζ_{qi}	ζ_{qd}	$\zeta_{q\beta}$	$\zeta_{q\delta}$

The terms, coefficients, and correction factors are combined to create a general ultimate bearing capacity equation.

q_u = ultimate bearing capacity, ksf $\qquad q_u = [(c)(N_c)(\zeta_c)] + [(1/2\ B'\ \gamma'_H)(N_\gamma)(\zeta_\gamma)] + [(\sigma'_D)(N_q)(\zeta_q)]$

Each model is a subset of the general bearing capacity equation; the dimensionless coefficients and correction factors are specific to each model.

q_a = allowable bearing capacity pressure, ksf $\qquad q_a = q_u / FS$

FS = factor of safety (Often determined to limit settlements to less than 1-inch and is often in the range of 2 to 4.)
There are many references related to the selection of FS; in this worksheet FS is as provided in EM 1110-2-1905, Table 1-2 and is looked up based on the Structure.

Input Data

Structure	Footings
FS	3

Foundation Configuration

B = foundation width, ft	B	2.00 ft	
B' = minimum effective foundation width, ft	B'	2.00 ft	
W = foundation lateral length, ft	W	20.00 ft	
W' = minimum effective foundation length, ft	W'	20.00 ft	
Foundation Type		Strip	
D = depth to bottom of the foundation, ft	D	3.00 ft	
δ = base tilt from horizontal, degrees	δ	0 deg	0.000 rad
β = slope of ground from base, degrees	β	0 deg	0.000 rad

Applied Loads

Q = vertical load applied on foundation, kips	Q	2.500 k	
M_B = bending moment parallel with width B, kip-ft	M_B	0.000 k-ft	
e_B = eccentricity parallel with foundation width B, ft	e_B	0.00 ft	
M_W = bending moment parallel with length W, kip-ft	M_W	0.000 k-ft	
e_W = eccentricity parallel with foundation length W, ft	e_W	0.00 ft	
T = horizontal load on foundation, right +, kips	T	0.000 k	
Orientation of horizontal load, T		Parallel to foundation width, B	

Material Properties

c = unit soil cohesion (undrained shear strength, c_u), ksf		c	0.000 ksf	0 psf
c_a = adhesion of soil to base <= c, ksf		c_a	0.000 ksf	0 psf
ϕ = angle of internal friction, degrees	Adjust ϕ' to match ϕ' in Table 4-1.	ϕ	28 deg	0.489 rad
ϕ' = effective friction angle, degrees	ϕ' must be in table for lookup.	ϕ'	28 deg	0.489 rad Used by Terzaghi (only)
ϕ_a = friction angle between base and soil = ϕ, degrees		ϕ_a	28 deg	
γ'_D = effective unit weight of surcharge soil within depth D, kcf		γ'_D	0.100 kcf	100 pcf
$\sigma'_D = \gamma'_D$ x D, effective soil or surcharge pressure at the foundation depth D, ksf		σ'_D	0.300 ksf	300 psf
γ'_H = effective unit weight beneath foundation base within the failure zone, kips/ft3 (kcf)		γ'_H	0.105 kcf	105 pcf

Client / Contract	MFA Riverfront	Job Number			Section No.
Phase / Subject		Made By	ARN	Date 11/8/2022	Sheet No.
Design Topic	Soil bearing capacity by various models				

Input Important Information

Terzaghi Model [EM 4-2. b.]

q_a	**2.331 ksf**

Native Alluvium

Effective Friction Angle	*F*	*29*	*˚ degrees*	check from Bowles
Unit Weight	***g***	***100***	***lbs/ft^3***	

Lateral At Rest Pressure for Sloped Conditions:

K_o	0.52	At Rest Coefficient	
P_o	**51.5**	**lbs/ft^3**	**No Slope At Rest Earth Pressure**
P_o	**31**	**lbs/ft^3**	**3H:1V Down (Berm around Tank)**
P_o	**70**	**lbs/ft^3**	**3H:1V Up**
P_o	**62**	**lbs/ft^3**	**10 degrees (Native slope conditions included)**

Coeffecient of Friction at Footing to Earth Interface:

0.37	Robert Day Reference

Active Earth Pressures:

K_a	0.35	Active Earth Coefficient (level backfill)		Rankine Theory
K_a	0.75	3H:1V Up 18.4 Degrees		
K_a	0.66	10 degrees Up		
P_a	**35**	**lbs/ft^3**	**Active Earth Coefficient (level backfill)**	
P_a	**75**	**lbs/ft^3**	**3H:1V Up**	
P_a	**66**	**lbs/ft^3**	**10 degrees Up**	

Passive Earth Pressures:

	2	Factor of Safety		Rankine Theory with Safety Factor
K_p	2.9	Passive Earth Coefficient		
P_p	**288**	**lbs/ft^2**		
P_p	**144**	**lbs/ft^3**	Safety Factor - Depends on Situation	

Earthquake Earth Pressures:

P_{EQ}	**8**	**lbs/ft^3**	**Inverted Triangle Distribution**	Robert Day Reference
			Resultant Force at 0.6 of backfilled wall height (H)	

Surcharge Pressures

P_{sp}	**104**	**lbs/ft^2**	(300 lbs/ft2 * Ka)	Robert Day Reference

ATTACHMENT D

GEOLOGIC BORING LOGS

MAUL FOSTER ALONGI

Geologic Borehole Log

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B01**	**1 of 1**

Project Name	**Riverfront Park**		
Project Location	**N Worthen Street, Wenatchee, Washington**	Surface Elevation (feet)	
Start/End Date	**10/18/2022 to 10/18/2022**	Northing	
Driller/Equipment	**Holt Services, Inc./Direct-push Geoprobe**	Easting	
Geologist/Engineer	**A. Bixby & T. Hogue**	Total Depth of Borehole	**10.0 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**2.25 inch**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
1						0.0 to 1.5 feet: SAND WITH SILT (SW-SM); grayish brown; 10% fines, low plasticity; 90% sand, fine to coarse; trace gravel, medium, rounded; trace organic material in upper 0.2 feet (grass); loose; moist; (FILL).
2						1.5 to 3.0 feet: SILTY SAND (SM); dark brownish gray; 30% fines, low plasticity; 70% sand, fine to medium; trace gravel, medium, subangular; trace organic material (rootlets); firm; moist.
3		**60**				@ 2.2 feet: Glass.
4						3.0 to 5.0 feet: NO RECOVERY.
5			**B01-SV-5.0**			5.0 to 7.0 feet: SILTY SAND (SM); dark brownish gray; 30% fines, low plasticity; 70% sand, fine to medium; trace gravel, medium, subangular; trace organic material (rootlets); firm; moist.
6						@ 5.4 to 5.6 feet: Color change to black; no odor.
7						@ 6.1 feet: Becomes grayish brown and dense.
8		**42**				7.0 to 7.1 feet: SAND (SW); dark brown; 5% fines; 95% sand, fine to coarse, subangular to subrounded; trace gravel, fine to medium, subrounded; trace organic material (natural woody debris); moist.
9						7.1 to 10.0 feet: NO RECOVERY.
10						

Total Depth = 10.0 feet bgs

NOTES:

1) bgs = below ground surface 2) Depths are relative to feet bgs. 3) ID = identification. 4) Vapor point set at 5.0 feet bgs.

Borehole Abandonment Details
0 to 10.0 feet: 2.25-inch borehole.
0 to 5.0 feet: Bentonite chips hydrated with potable water.
5.0 to 10.0 feet: 10/20 silica sand.

MFA BOREHOLE W/RECON SCREEN W:\GINT\GINTW\PROJECTS\1945.01.02\RIVERFRONT PARK\2022.10.18-19_B01-B06.GPJ 11/23/22

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Geologic Borehole Log

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B02**	**1 of 2**

Project Name	**Riverfront Park**		
Project Location	**N Worthen Street, Wenatchee, Washington**	Surface Elevation (feet)	
Start/End Date	**10/18/2022 to 10/18/2022**	Northing	
Driller/Equipment	**Holt Services, Inc./Direct-push Geoprobe**	Easting	
Geologist/Engineer	**A. Bixby & T. Hogue**	Total Depth of Borehole	**21.5 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**2.25 inch**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
1						0.0 to 1.2 feet: SAND WITH SILT (SP-SM); light grayish brown; 15% fines, low plasticity; 85% sand, fine to medium, subrounded; trace gravel, fine, subrounded; trace organic material (roots); loose; moist.
2						1.2 to 1.9 feet: SILT (ML); light brown; 90% fines, low plasticity; 10% sand, fine to medium, subrounded; trace organic material (roots); firm; moist.
3		**78**				1.9 to 3.9 feet: SAND WITH SILT (SP-SM); light grayish brown; 15% fines, low plasticity; 85% sand, fine to medium, subrounded; trace gravel, fine, subrounded; trace organic material (roots); loose; grades to 20% fines, 80% fine sand with depth; moist.
4						3.9 to 5.0 feet: NO RECOVERY.
5			**B02-SV-5.0**	**2 2 2**		5.0 to 5.8 feet: SILTY SAND (SM); light grayish brown; 20% fines, low plasticity; 80% sand, fine; loose; moist.
6		**53**				5.8 to 6.5 feet: NO RECOVERY.
7						6.5 to 11.0 feet: SILTY SAND (SM); light grayish brown; 20% fines, low plasticity; 80% sand, fine; loose; moist.
8		**100**				
9						@ 8.5 to 10.0 feet: Some organic material (natural woody debris and roots).
10				**2 2 2**		
11		**67**				11.0 to 11.5 feet: NO RECOVERY.
12						11.5 to 14.4 feet: SILTY SAND (SM); light grayish brown; 20% fines, low plasticity; 80% sand, fine; loose; moist.
13		**83**				@ 12.0 feet: Sand grain size increases to medium.
14						
15						14.4 to 15.0 feet: No recovery.
16		**87**		**3 2 3**		15.0 to 16.3 feet: SILTY SAND (SM); light grayish brown; 20% fines, low plasticity; 80% sand, medium; loose; moist.
17		**63**				16.3 to 16.5 feet: NO RECOVERY. 16.5 to 18.5 feet: SILTY SAND (SM); light grayish brown; 20% fines, low plasticity; 80% sand, medium; loose; moist.
18						

MFA BOREHOLE W/RECON SCREEN W:\GINT\GINTW\PROJECTS\1945.01.02\RIVERFRONT PARK\2022.10.18-19_B01-B06.GPJ 11/23/22

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Geologic Borehole Log

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B02**	**2 of 2**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
19		**63**				18.5 to 18.7 feet: SAND WITH SILT (SW-SM); 10% fines; 90% sand, fine to coarse, angular to subangular; loose to medium dense; wet. 18.7 to 20.0 feet: NO RECOVERY.
20				**8**		SAND WITH GRAVEL (SW); 90% sand, fine to coarse, subangular; 10% gravel, fine to medium, subangular; trace fines; medium dense; wet.
21		**100**		**10** **13**		

Total Depth = 21.5 feet bgs

NOTES:

1) bgs = below ground surface 2) Depths are relative to feet bgs. 3) ID = identification. 4) Vapor point set at 5.0 feet bgs.

Borehole Abandonment Details
0 to 21.5 feet: 2.25-inch borehole.
0 to 5.0 feet: Bentonite chips hydrated with potable water.
5.0 to 8.0 feet: 10/20 silica sand.
8.0 to 21.5 feet: Bentonite chips hydrated with potable water.

Geologic Borehole Log

MAUL FOSTER ALONGI

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B03**	**1 of 2**

Project Name	**Riverfront Park**		
Project Location	**N Worthen Street, Wenatchee, Washington**	Surface Elevation (feet)	
Start/End Date	**10/18/2022 to 10/18/2022**	Northing	
Driller/Equipment	**Holt Services, Inc./Direct-push Geoprobe**	Easting	
Geologist/Engineer	**A. Bixby & T. Hogue**	Total Depth of Borehole	**20.0 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**2.25 inch**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
1						0.0 to 2.2 feet: SILTY SAND (SM); brown; 20% fines, low plasticity; 80% sand, fine to coarse; trace organic material in upper 0.2 feet (grass); loose; moist.
2						@ 1.4 feet: Fines increase to 40%.
3		**82**				2.2 to 3.1 feet: SILT (ML); tan; 100% fines, low plasticity; very stiff; dry to moist; (CLAY CAP).
4						3.1 to 4.1 feet: SAND WITH SILT (SW-SM); gray; 10% fines, low plasticity; 90% sand, fine to coarse; loose; dry to moist. @ 3.4 feet: Cobble, 2.25 inches in size, igneous.
5						4.1 to 5.0 feet: NO RECOVERY.
6				**2** **2** **1**		5.0 to 6.8 feet: SAND WITH SILT (SW-SM); light gray; 10% fines, low plasticity; 90% sand, fine to coarse; loose; dry to moist. @ 5.8 feet: Brown glass. @ 6.4 feet: Becomes styrofoam, yellow.
7						6.8 to 7.5 feet: REFUSE; dark brownish gray; predominently wood; medium dense; dry. @ 6.8 to 7.0 feet: Color change to brown. @ 7.0 feet: Becomes wood.
8		**50**				7.5 to 10.0 feet: NO RECOVERY.
9						
10						
11				**7** **11** **14**		10.0 to 11.5 feet: REFUSE; dark brownish gray; medium dense; predominently wood; dry. @ 10.3 feet: Thin plastic.
12						11.5 to 15.0 feet: NO RECOVERY.
13		**30**				
14						
15						
16		**47**		**4** **8** **4**		15.0 to 15.7 feet: REFUSE; blackish brown; medium dense; wood and brown glass; dry. 15.7 to 16.5 feet: NO RECOVERY.
17		**63**				16.5 to 16.8 feet: SAND WITH SILT AND GRAVEL (SW-SM); dark gray; 15% fines, low plasticity; 70% sand, fine to coarse; 15% gravel, fine to medium; loose; strong petroleum hydrocarbon-like odor; moist. 16.8 to 18.7 feet: SLUDGE; black; strong petroleum hydrocarbon-like odor. @ 17.5 to 18.4 feet: Wood.
18						

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Geologic Borehole Log

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B03**	**2 of 2**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
19		**63**				18.7 to 20.0 feet: NO RECOVERY.
20						

Total Depth = 20.0 feet bgs

NOTES:

1) bgs = below ground surface 2) Depths are relative to feet bgs. 3) ID = identification. 4) Refusal at 11.2 feet bgs on initial attempt. Redrilled borehole 7 feet to the northwest. 5) Stopped drilling at 20.0 feet bgs due to methane concentration of 57.5%.

Borehole Abandonment Details
0 to 20.0 feet: 2.25-inch borehole.
0 to 20.0 feet: Bentonite chips hydrated with potable water.

Geologic Borehole Log

MAUL FOSTER ALONGI

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B04**	**1 of 1**

Project Name	**Riverfront Park**		
Project Location	**N Worthen Street, Wenatchee, Washington**	Surface Elevation (feet)	
Start/End Date	**10/19/2022 to 10/19/2022**	Northing	
Driller/Equipment	**Holt Services, Inc./Direct-push Geoprobe**	Easting	
Geologist/Engineer	**A. Bixby & T. Hogue**	Total Depth of Borehole	**15.0 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**2.25 inch**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
1						0.0 to 2.6 feet: SILTY SAND (SM); light grayish brown; 20% fines, nonplastic; 80% sand, fine to medium; trace gravel, fine to medium, subrounded; trace organic material in upper 0.2 feet; loose; moist.
2						
3		**70**				2.6 to 2.9 feet: SILT (ML); tan; 100% fines, low plasticity; trace sand, fine; very stiff; dry to moist; (CLAY CAP).
4						2.9 to 3.5 feet: SAND WITH SILT (SW-SM); light gray; 10% fines; 85% sand, fine to coarse, subangular; 5% gravel, fine to medium, subangular; medium dense; moist. @ 3.2 feet: Cobble, 2.25 inches in size, granite.
5						3.5 to 5.0 feet: NO RECOVERY.
6		**72**		**12 14 7**		5.0 to 6.1 feet: SAND WITH SILT AND GRAVEL (SW-SM); light gray; 10% fines; 80% sand, fine to coarse, subangular; 10% gravel, fine to medium, subangular; medium dense; strong petroleum hydrocarbon-like odor; moist. @ 5.0 feet: Methane concentration 4.4%. 6.1 to 6.5 feet: NO RECOVERY.
7						6.5 to 7.6 feet: SAND WITH SILT AND GRAVEL (SW-SM); light gray; 10% fines; 80% sand, fine to coarse, subangular, grades to medium to coarse and subangular to subrounded with depth; 10% gravel, fine to medium, subangular; medium dense; strong petroleum hydrocarbon-like odor; wet.
8		**42**				7.6 to 8.6 feet: REFUSE; predominantly wood. @ 7.8 feet: Becomes cardboard and plastic.
9						8.6 to 10.0 feet: NO RECOVERY.
10						
11						10.0 to 11.8 feet: SAND WITH SILT AND GRAVEL (SW-SM); light grayish brown; 15% fines; 75% sand, fine to coarse, subangular to subrounded; 10% gravel, fine to medium, subrounded; loose to medium dense; wet. @ 10.0 feet: Methane concentration 60.4%. @ 10.5 feet: Broken brown glass.
12						11.8 to 13.3 feet: REFUSE; dark gray; medium dense; cardboard, plastic, and glass; wet.
13		**66**				@ 12.3 to 12.7 feet: Becomes a strong blue fiberous material. @ 12.7 to 13.3 feet: Becomes a mixture of styrofoam, blue fibrous material, and wood.
14						13.3 to 15.0 feet: NO RECOVERY.
15						

Total Depth = 15.0 feet bgs

NOTES:

1) bgs = below ground surface 2) Depths are relative to feet bgs. 3) ID = identification. 4) Stopped drilling at 15.0 feet bgs due to methane concentration of 45.5%. Methane concentration dropped to 27.3% after 15 minutes. 5) Vapor point set at 5.0 feet bgs in dedicated boring 2 feet from origional boring.

Borehole Abandonment Details

0 to 15.0 feet: 2.25-inch borehole.
0 to 15.0 feet: Bentonite chips hydrated with potable water.

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Geologic Borehole Log

MAUL FOSTER ALONGI

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B05**	**1 of 2**

Project Name	**Riverfront Park**		
Project Location	**N Worthen Street, Wenatchee, Washington**	Surface Elevation (feet)	
Start/End Date	**10/18/2022 to 10/18/2022**	Northing	
Driller/Equipment	**Holt Services, Inc./Direct-push Geoprobe**	Easting	
Geologist/Engineer	**A. Bixby & T. Hogue**	Total Depth of Borehole	**20.0 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**2.25 inch**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
1						0.0 to 3.5 feet: SILTY SAND (SM); light grayish brown; 20% fines, nonplastic; 80% sand, fine to medium, subangular; trace organic material; loose; dry.
2						@ 1.3 feet: Cobble, igneous. @ 1.4 feet: Becomes moist.
3		**70**				
4						@ 3.2 to 3.5 feet: Trace gravel, fine to medium, subangular; chunks of black material present, potentially asphalt. 3.5 to 5.0 feet: NO RECOVERY.
5				**5** **5** **6**		5.0 to 5.8 feet: SILTY SAND (SM); light grayish brown; 20% fines, nonplastic; 80% sand, fine to medium, subangular; trace gravel, fine to medium, subangular; loose; dry.
6		**53**				@ 5.0 to 5.3 feet: Pulverized cobble. 5.8 to 6.5 feet: NO RECOVERY.
7						6.5 to 8.3 feet: SILTY SAND (SM); light grayish brown; 20% fines, nonplastic; 80% sand, fine to medium, subangular; trace gravel, fine to medium, subangular; loose; dry.
8						
9		**71**				8.3 to 9.0 feet: SAND WITH SILT AND GRAVEL (SP-SM); dark gray; 15% fines, nonplastic; 75% sand, fine to medium, subangular; 10% gravel, fine to medium, subangular to subrounded; loose; dry. 9.0 to 10.0 feet: NO RECOVERY.
10						
11				**1** **2** **2**		10.0 to 11.6 feet: REFUSE; dark brownish gray; brown glass, plastic food packaging, and stryrofoam; slight petroleum hydrocarbon odor. @ 10.4 to 11.5 feet: Becomes wood.
12						@ 11.5 to 11.6 feet: Becomes sludge; slight sewage odor. 11.6 to 15.0 feet: NO RECOVERY.
13		**32**				
14	▽					
15						
16				**2** **3** **1**		15.0 to 17.5 feet: SLUDGE; black; loose; metallic sheen; strong petroleum hydrocarbon odor; wet.
17		**56**				@ 16.6 to 17.8 feet: Trace wood fragments.
18						

MFA BOREHOLE W/RECON SCREEN W:\GINT\GINTW\PROJECTS\1945.01.02\RIVERFRONT PARK\2022.10.18-19_B01-B06.GPJ 11/23/22

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Geologic Borehole Log

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B05**	**2 of 2**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
19		**56**				17.8 to 20.0 feet: NO RECOVERY.
20						

Total Depth = 20.0 feet bgs

NOTES:

1) bgs = below ground surface 2) Depths are relative to feet bgs. 3) ID = identification. 4) Stopped drilling at 20.0 feet bgs due to methane concentration of 20%.

Borehole Abandonment Details
0 to 20.0 feet: 2.25-inch borehole.
0 to 20.0 feet: Bentonite chips hydrated with potable water.

▽ Water level at approximately 13.7 feet bgs at time of drilling.

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Geologic Borehole Log

Project Number	Boring Number	Sheet
M1945.01.002-035D	**B06**	**1 of 1**

Project Name	**Riverfront Park**		
Project Location	**N Worthen Street, Wenatchee, Washington**	Surface Elevation (feet)	
Start/End Date	**10/19/2022 to 10/19/2022**	Northing	
Driller/Equipment	**Holt Services, Inc./Direct-push Geoprobe**	Easting	
Geologist/Engineer	**A. Bixby & T. Hogue**	Total Depth of Borehole	**10.0 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**2.25 inch**

Depth (feet, bgs)	Water Levels	Sample Data: Percent Recovery	Sample Data: Sample ID	Sample Data: Blows/6"	Lithologic Column	Soil Description
1						0.0 to 1.5 feet: SILTY SAND (SM); dark grayish brown; 20% fines, nonplastic; 80% sand, fine to coarse, subangular to subrounded; trace gravel, fine to medium, subangular, (igneous, felsic to intermediate, porphyritic); loose; dry to moist.
2						@ 1.5 to 1.9 feet: Cobble, granite, weathered. 1.9 to 2.5 feet: SILT (ML); light brown and tan; 100% fines, low plasticity; trace sand, fine; very stiff; dry to moist; (CLAY CAP).
3		**70**				2.5 to 3.5 feet: SILTY SAND (SM); dark grayish brown; 25% fines, nonplastic; 75% sand, fine to coarse, subangular to subrounded; trace gravel, medium, subangular; loose to medium dense; moist.
4						3.5 to 5.0 feet: NO RECOVERY.
5			**B06-SV-5.0**			5.0 to 7.5 feet: SAND WITH GRAVEL AND SILT (SP-SM); grayish brown; 10% fines; 75% sand, medium to coarse, subangular to subrounded; medium dense; 15% gravel, medium to coarse, subangular to subrounded, (igneous and meta-sedimentary); moist. @ 5.2 feet: Cobble, 2.25 inches in size, igneous. @ 5.6 to 5.8 feet: Cobble, igneous (felsic).
6						
7		**54**				
8						7.5 to 7.7 feet: SILTY SAND WITH GRAVEL (SM); dark reddish brown; 20% fines; 70% sand, medium to coarse, subangular to subrounded; 10% gravel, medium to coarse, subangular to subrounded; medium dense; black clasts with vitreous luster present, friable, no odor; moist. 7.7 to 10.0 feet: NO RECOVERY.
9						
10						

Total Depth = 10.0 feet bgs

NOTES:

1) bgs = below ground surface 2) Depths are relative to feet bgs. 3) ID = identification. 4) Vapor point set at 5.0 feet bgs.

Borehole Abandonment Details
0 to 10.0 feet: 2.25-inch borehole.
0 to 5.0 feet: Bentonite chips hydrated with potable water.
5.0 to 10.0 feet: 10/20 silica sand.

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ATTACHMENT E

BOREHOLE AIR MONITORING FOR EXPLOSION RISK

Attachment E
Borehole Air Monitoring for Explosion Risk
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

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Location	Date	Depth (ft bgs)	Time	CH_4 (% volume)	O_2 (% volume)
B01	10/18/2022	*No air monitoring during drilling.*			
B02	10/18/2022	*No air monitoring during drilling.*			
B03	10/18/2022	0.0	14:02	57.5	0.4
		0.0	14:12	56.5	0.8
B04[(a)]	10/19/2022	5.0	8:46	4.4	19.2
		10.0	8:50	60.4	1.1
		10.0	8:57	58.2	3.2
		10.0	9:00	12.0	19.0
		10.0	9:03	60.3	1.1
		10.0	9:13	2.3	19.0
		15.0	9:18	45.5	5.0
		15.0	9:23	27.3	13.0
		15.0	9:30	27.3	13.0
B05	10/18/2022	5.0	15:25	0.0	--
		10.0	15:35	0.0	--
		15.0	15:45	2.0	--
		20.0	15:55	20.0	4.0
B06	10/19/2022	0.0	10:50	0.0	20.9
		10.0	11:00	0.0	20.8

Notes

All measurements were taken with a GEM 5000 landfill gas meter.

% = percent.

-- = no measurement.

CH_4 = methane.

ft bgs = feet below ground surface.

O_2 = oxygen.

[(a)]After high methane concentrations were measured in B04 at 10 ft bgs, water was periodically added to the borehole to displace methane gas.

ATTACHMENT F

SOIL GAS ENVIRONMENTAL ASSESSMENT

Attachment F
Soil Gas Environmental Assessment
Riverfront Park, North Worthen Street, Wenatchee, Washington
Chelan Douglas Regional Port Authority

Location	Depth (ft bgs)	Date	Time	CH_4 (% volume)	CO_2 (% volume)	O_2 (% volume)	H_2S (ppm)	CO (ppm)
B01	5.0	10/18/2022	10:00	0.1	1.4	19.7	0	9
			10:01	0.1	1.2	19.2	0	6
			10:02	0.1	1.7	16.8	0	4
			10:03	0.0	2.6	15.5	0	3
			10:04	0.0	3.7	14.4	0	3
			10:05	0.0	4.0	14.0	0	2
			10:06	0.0	4.4	13.6	0	1
B02	5.0	10/18/2022	11:50	0.0	5.6	16.6	0	0
			11:51	0.0	5.7	16.2	0	0
			11:52	0.0	5.7	16.1	0	0
			11:53	0.0	5.7	16.1	0	0
			11:54	0.0	5.7	16.0	0	0
			11:55	0.0	5.7	16.0	0	0
B04	5.0	10/19/2022	9:57	16.8	10.0	9.1	0	24
			9:58	10.6	5.7	14.6	0	7
			9:59	10.2	6.0	14.8	0	5
			10:00	10.2	6.2	14.9	0	4
			10:01	10.3	6.3	14.9	0	5
			10:02	10.2	6.4	15.1	0	4
			10:03	10.3	6.5	15.1	0	4
B06	5.0	10/19/2022	11:33	0.0	0.1	21.4	0	4
			11:34	0.0	0.9	20.7	0	7
			11:35	0.0	1.0	20.5	0	6
			11:36	0.0	1.1	20.4	0	5
			11:37	0.0	1.1	20.3	0	4

Notes

All measurements were taken with a GEM 5000 landfill gas meter.
% = percent.
-- = no measurement.
CH_4 = methane.
CO = carbon monoxide.
CO_2 = carbon dioxide.
ft bgs = feet below ground surface.
H_2S = hydrogen sulfide.
NA = not applicable.
O_2 = oxygen.
ppm = parts per million.

ATTACHMENT G

LABORATORY REPORTS

ANALYTICAL REPORT

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Wednesday, November 2, 2022

Amanda Bixby
Maul Foster & Alongi, INC-Bellingham
1329 North State Street, Suie 301
Bellingham, WA 98225

RE: A2J0647 - Riverfront Park Phase 2 ESA - M1945.01.002

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A2J0647, which was received by the laboratory on 10/20/2022 at 12:11:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: pnerenberg@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of sample receipt, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1	1.5 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.

Apex Laboratories

Philip Nerenberg

Philip Nerenberg, Lab Director

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.

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SS02-S-0.25	A2J0647-01	Soil	10/19/22 13:38	10/20/22 12:11
SS01-S-0.25	A2J0647-02	Soil	10/19/22 13:45	10/20/22 12:11
SSDUP-S-0.25	A2J0647-03	Soil	10/19/22 13:45	10/20/22 12:11
SS03-S-0.25	A2J0647-04	Soil	10/19/22 13:57	10/20/22 12:11
SS04-S-0.25	A2J0647-05	Soil	10/19/22 14:05	10/20/22 12:11

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Philip Nerenberg, Lab Director

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6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SS02-S-0.25 (A2J0647-01)				**Matrix: Soil**		**Batch: 22K0021**		
Acenaphthene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Acenaphthylene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Anthracene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Benz(a)anthracene	**39.1**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Benzo(a)pyrene	**55.4**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Benzo(b)fluoranthene	**93.1**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	**M-05**
Benzo(k)fluoranthene	**32.9**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**60.0**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Chrysene	**60.3**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Dibenz(a,h)anthracene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Fluoranthene	**72.4**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Fluorene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**65.7**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
1-Methylnaphthalene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
2-Methylnaphthalene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Naphthalene	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Phenanthrene	**19.2**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Pyrene	**64.7**	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Dibenzofuran	ND	---	13.6	ug/kg dry	1	11/01/22 16:06	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)		*Recovery:*	*78 %*	*Limits: 44-120 %*	*1*	*11/01/22 16:06*	*EPA 8270E SIM*	
p-Terphenyl-d14 (Surr)			*75 %*	*54-127 %*	*1*	*11/01/22 16:06*	*EPA 8270E SIM*	
SS01-S-0.25 (A2J0647-02)				**Matrix: Soil**		**Batch: 22K0021**		
Acenaphthene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Acenaphthylene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Anthracene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Benz(a)anthracene	**37.5**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Benzo(a)pyrene	**59.4**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Benzo(b)fluoranthene	**90.7**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Benzo(k)fluoranthene	**34.2**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**57.9**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Chrysene	**57.0**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Dibenz(a,h)anthracene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	

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ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SS01-S-0.25 (A2J0647-02)				**Matrix: Soil**		**Batch: 22K0021**		
Fluoranthene	**66.9**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Fluorene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**62.5**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
1-Methylnaphthalene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
2-Methylnaphthalene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Naphthalene	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Phenanthrene	**16.5**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Pyrene	**59.4**	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Dibenzofuran	ND	---	15.2	ug/kg dry	1	11/01/22 17:21	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)		*Recovery:*	*70 %*	*Limits: 44-120 %*	*1*	*11/01/22 17:21*	*EPA 8270E SIM*	
p-Terphenyl-d14 (Surr)			*72 %*	*54-127 %*	*1*	*11/01/22 17:21*	*EPA 8270E SIM*	
SSDUP-S-0.25 (A2J0647-03)				**Matrix: Soil**		**Batch: 22K0021**		
Acenaphthene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Acenaphthylene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Anthracene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Benz(a)anthracene	**44.8**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Benzo(a)pyrene	**70.7**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Benzo(b)fluoranthene	**111**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Benzo(k)fluoranthene	**40.2**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**61.9**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Chrysene	**66.2**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Dibenz(a,h)anthracene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Fluoranthene	**79.7**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Fluorene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**70.3**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
1-Methylnaphthalene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
2-Methylnaphthalene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Naphthalene	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Phenanthrene	**17.0**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Pyrene	**71.2**	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Dibenzofuran	ND	---	14.9	ug/kg dry	1	11/01/22 18:12	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)		*Recovery:*	*79 %*	*Limits: 44-120 %*	*1*	*11/01/22 18:12*	*EPA 8270E SIM*	

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Philip Nerenberg, Lab Director

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ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SSDUP-S-0.25 (A2J0647-03)				**Matrix: Soil**		**Batch: 22K0021**		
Surrogate: p-Terphenyl-d14 (Surr)			*Recovery: 76 %*	*Limits: 54-127 %*	*1*	*11/01/22 18:12*	*EPA 8270E SIM*	
SS03-S-0.25 (A2J0647-04)				**Matrix: Soil**		**Batch: 22K0021**		
Acenaphthene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Acenaphthylene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Anthracene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Benz(a)anthracene	**17.9**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Benzo(a)pyrene	**25.8**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Benzo(b)fluoranthene	**38.8**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Benzo(k)fluoranthene	**14.6**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**22.8**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Chrysene	**26.8**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Dibenz(a,h)anthracene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Fluoranthene	**35.1**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Fluorene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**26.1**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
1-Methylnaphthalene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
2-Methylnaphthalene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Naphthalene	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Phenanthrene	**13.4**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Pyrene	**32.2**	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Dibenzofuran	ND	---	11.7	ug/kg dry	1	11/01/22 18:37	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)			*Recovery: 57 %*	*Limits: 44-120 %*	*1*	*11/01/22 18:37*	*EPA 8270E SIM*	
p-Terphenyl-d14 (Surr)			*65 %*	*54-127 %*	*1*	*11/01/22 18:37*	*EPA 8270E SIM*	
SS04-S-0.25 (A2J0647-05)				**Matrix: Soil**		**Batch: 22K0021**		
Acenaphthene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Acenaphthylene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Anthracene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Benz(a)anthracene	**17.3**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Benzo(a)pyrene	**26.9**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Benzo(b)fluoranthene	**39.5**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Benzo(k)fluoranthene	**15.0**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**23.5**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SS04-S-0.25 (A2J0647-05)				**Matrix: Soil**		**Batch: 22K0021**		
Chrysene	**25.1**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Dibenz(a,h)anthracene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Fluoranthene	**27.9**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Fluorene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**27.0**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
1-Methylnaphthalene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
2-Methylnaphthalene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Naphthalene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Phenanthrene	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Pyrene	**26.0**	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Dibenzofuran	ND	---	10.7	ug/kg dry	1	11/01/22 19:02	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)		*Recovery:*	*60 %*	*Limits: 44-120 %*	*1*	*11/01/22 19:02*	*EPA 8270E SIM*	
p-Terphenyl-d14 (Surr)			*74 %*	*54-127 %*	*1*	*11/01/22 19:02*	*EPA 8270E SIM*	

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SS02-S-0.25 (A2J0647-01)				**Matrix: Soil**				
Batch: 22J1207								
Arsenic	**6.89**	---	1.39	mg/kg dry	10	10/31/22 19:33	EPA 6020B	
Cadmium	ND	---	0.278	mg/kg dry	10	10/31/22 19:33	EPA 6020B	
Chromium	**29.1**	---	1.39	mg/kg dry	10	10/31/22 19:33	EPA 6020B	
Lead	**25.3**	---	0.278	mg/kg dry	10	10/31/22 19:33	EPA 6020B	
Mercury	ND	---	0.111	mg/kg dry	10	10/31/22 19:33	EPA 6020B	
Zinc	**69.5**	---	5.56	mg/kg dry	10	10/31/22 19:33	EPA 6020B	
SS01-S-0.25 (A2J0647-02)				**Matrix: Soil**				
Batch: 22J1207								
Arsenic	**7.32**	---	1.65	mg/kg dry	10	10/31/22 19:55	EPA 6020B	
Cadmium	ND	---	0.331	mg/kg dry	10	10/31/22 19:55	EPA 6020B	
Chromium	**24.8**	---	1.65	mg/kg dry	10	10/31/22 19:55	EPA 6020B	
Lead	**21.0**	---	0.331	mg/kg dry	10	10/31/22 19:55	EPA 6020B	
Mercury	ND	---	0.132	mg/kg dry	10	10/31/22 19:55	EPA 6020B	
Zinc	**61.1**	---	6.62	mg/kg dry	10	10/31/22 19:55	EPA 6020B	
SSDUP-S-0.25 (A2J0647-03)				**Matrix: Soil**				
Batch: 22J1207								
Arsenic	**5.71**	---	1.52	mg/kg dry	10	10/31/22 20:01	EPA 6020B	
Cadmium	ND	---	0.303	mg/kg dry	10	10/31/22 20:01	EPA 6020B	
Chromium	**25.6**	---	1.52	mg/kg dry	10	10/31/22 20:01	EPA 6020B	
Lead	**21.1**	---	0.303	mg/kg dry	10	10/31/22 20:01	EPA 6020B	
Mercury	ND	---	0.121	mg/kg dry	10	10/31/22 20:01	EPA 6020B	
Zinc	**60.5**	---	6.06	mg/kg dry	10	10/31/22 20:01	EPA 6020B	
SS03-S-0.25 (A2J0647-04)				**Matrix: Soil**				
Batch: 22J1207								
Arsenic	**10.8**	---	1.25	mg/kg dry	10	10/31/22 20:06	EPA 6020B	
Cadmium	ND	---	0.251	mg/kg dry	10	10/31/22 20:06	EPA 6020B	
Chromium	**26.7**	---	1.25	mg/kg dry	10	10/31/22 20:06	EPA 6020B	
Lead	**47.9**	---	0.251	mg/kg dry	10	10/31/22 20:06	EPA 6020B	
Mercury	ND	---	0.100	mg/kg dry	10	10/31/22 20:06	EPA 6020B	
Zinc	**55.3**	---	5.01	mg/kg dry	10	10/31/22 20:06	EPA 6020B	

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ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SS04-S-0.25 (A2J0647-05)				**Matrix: Soil**				
Batch: 22J1207								
Arsenic	**12.0**	---	1.08	mg/kg dry	10	10/31/22 20:12	EPA 6020B	
Cadmium	ND	---	0.217	mg/kg dry	10	10/31/22 20:12	EPA 6020B	
Chromium	**33.7**	---	1.08	mg/kg dry	10	10/31/22 20:12	EPA 6020B	
Lead	**37.2**	---	0.217	mg/kg dry	10	10/31/22 20:12	EPA 6020B	
Mercury	ND	---	0.0867	mg/kg dry	10	10/31/22 20:12	EPA 6020B	
Zinc	**72.4**	---	4.33	mg/kg dry	10	10/31/22 20:12	EPA 6020B	

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
SS02-S-0.25 (A2J0647-01)				**Matrix: Soil**		**Batch: 22J0880**		
% Solids	**72.9**	---	1.00	%	1	10/24/22 06:38	EPA 8000D	
SS01-S-0.25 (A2J0647-02)				**Matrix: Soil**		**Batch: 22J0880**		
% Solids	**65.4**	---	1.00	%	1	10/24/22 06:38	EPA 8000D	
SSDUP-S-0.25 (A2J0647-03)				**Matrix: Soil**		**Batch: 22J0880**		
% Solids	**66.8**	---	1.00	%	1	10/24/22 06:38	EPA 8000D	
SS03-S-0.25 (A2J0647-04)				**Matrix: Soil**		**Batch: 22J0880**		
% Solids	**84.7**	---	1.00	%	1	10/24/22 06:38	EPA 8000D	
SS04-S-0.25 (A2J0647-05)				**Matrix: Soil**		**Batch: 22J0880**		
% Solids	**91.4**	---	1.00	%	1	10/24/22 06:38	EPA 8000D	

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Philip Nerenberg, Lab Director

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503-718-2323
ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22K0021 - EPA 3546							Soil					
Blank (22K0021-BLK1)			Prepared: 11/01/22 10:34		Analyzed: 11/01/22 15:16							
EPA 8270E SIM												
Acenaphthene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Acenaphthylene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Anthracene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Benz(a)anthracene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Benzo(a)pyrene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Chrysene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Fluoranthene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Fluorene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
1-Methylnaphthalene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
2-Methylnaphthalene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Naphthalene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Phenanthrene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Pyrene	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Dibenzofuran	ND	---	9.09	ug/kg wet	1	---	---	---	---	---	---	
Surr: 2-Fluorobiphenyl (Surr)			*Recovery: 90 %*		*Limits: 44-120 %*			*Dilution: 1x*				
p-Terphenyl-d14 (Surr)			*93 %*		*54-127 %*			*"*				
LCS (22K0021-BS1)			Prepared: 11/01/22 10:34		Analyzed: 11/01/22 15:41							
EPA 8270E SIM												
Acenaphthene	782	---	10.0	ug/kg wet	1	800	---	98	40-123%	---	---	
Acenaphthylene	781	---	10.0	ug/kg wet	1	800	---	98	32-132%	---	---	
Anthracene	786	---	10.0	ug/kg wet	1	800	---	98	47-123%	---	---	
Benz(a)anthracene	747	---	10.0	ug/kg wet	1	800	---	93	49-126%	---	---	
Benzo(a)pyrene	766	---	10.0	ug/kg wet	1	800	---	96	45-129%	---	---	
Benzo(b)fluoranthene	761	---	10.0	ug/kg wet	1	800	---	95	45-132%	---	---	
Benzo(k)fluoranthene	811	---	10.0	ug/kg wet	1	800	---	101	47-132%	---	---	
Benzo(g,h,i)perylene	865	---	10.0	ug/kg wet	1	800	---	108	43-134%	---	---	
Chrysene	815	---	10.0	ug/kg wet	1	800	---	102	50-124%	---	---	

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Philip Nerenberg, Lab Director

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ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22K0021 - EPA 3546							Soil					
LCS (22K0021-BS1)			Prepared: 11/01/22 10:34		Analyzed: 11/01/22 15:41							
Dibenz(a,h)anthracene	769	---	10.0	ug/kg wet	1	800	---	96	45-134%	---	---	
Fluoranthene	773	---	10.0	ug/kg wet	1	800	---	97	50-127%	---	---	
Fluorene	796	---	10.0	ug/kg wet	1	800	---	100	43-125%	---	---	
Indeno(1,2,3-cd)pyrene	814	---	10.0	ug/kg wet	1	800	---	102	45-133%	---	---	
1-Methylnaphthalene	739	---	10.0	ug/kg wet	1	800	---	92	40-120%	---	---	
2-Methylnaphthalene	741	---	10.0	ug/kg wet	1	800	---	93	38-122%	---	---	
Naphthalene	754	---	10.0	ug/kg wet	1	800	---	94	35-123%	---	---	
Phenanthrene	778	---	10.0	ug/kg wet	1	800	---	97	50-121%	---	---	
Pyrene	790	---	10.0	ug/kg wet	1	800	---	99	47-127%	---	---	
Dibenzofuran	788	---	10.0	ug/kg wet	1	800	---	99	44-120%	---	---	
Surr: 2-Fluorobiphenyl (Surr)			*Recovery: 90 %*		*Limits: 44-120 %*				*Dilution: 1x*			
p-Terphenyl-d14 (Surr)			*85 %*		*54-127 %*				*"*			
Duplicate (22K0021-DUP1)			Prepared: 11/01/22 10:34		Analyzed: 11/01/22 17:47							
QC Source Sample: SS01-S-0.25 (A2J0647-02)												
EPA 8270E SIM												
Acenaphthene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Acenaphthylene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Anthracene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Benz(a)anthracene	**36.9**	---	14.6	ug/kg dry	1	---	37.5	---	---	2	30%	
Benzo(a)pyrene	**60.2**	---	14.6	ug/kg dry	1	---	59.4	---	---	1	30%	
Benzo(b)fluoranthene	**96.3**	---	14.6	ug/kg dry	1	---	90.7	---	---	6	30%	
Benzo(k)fluoranthene	**36.7**	---	14.6	ug/kg dry	1	---	34.2	---	---	7	30%	M-05
Benzo(g,h,i)perylene	**58.3**	---	14.6	ug/kg dry	1	---	57.9	---	---	0.7	30%	
Chrysene	**60.8**	---	14.6	ug/kg dry	1	---	57.0	---	---	6	30%	
Dibenz(a,h)anthracene	ND	---	14.6	ug/kg dry	1	---	9.60	---	---	***	30%	
Fluoranthene	**70.0**	---	14.6	ug/kg dry	1	---	66.9	---	---	4	30%	
Fluorene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Indeno(1,2,3-cd)pyrene	**60.0**	---	14.6	ug/kg dry	1	---	62.5	---	---	4	30%	
1-Methylnaphthalene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
2-Methylnaphthalene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Naphthalene	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Phenanthrene	**14.6**	---	14.6	ug/kg dry	1	---	16.5	---	---	12	30%	
Pyrene	**66.3**	---	14.6	ug/kg dry	1	---	59.4	---	---	11	30%	

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22K0021 - EPA 3546							Soil					
Duplicate (22K0021-DUP1)			Prepared: 11/01/22 10:34		Analyzed: 11/01/22 17:47							
QC Source Sample: SS01-S-0.25 (A2J0647-02)												
Dibenzofuran	ND	---	14.6	ug/kg dry	1	---	ND	---	---	---	30%	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery:*	*79 %*	*Limits:*	*44-120 %*		*Dilution:*	*1x*				
p-Terphenyl-d14 (Surr)			*77 %*		*54-127 %*			*"*				
Matrix Spike (22K0021-MS1)			Prepared: 11/01/22 10:34		Analyzed: 11/01/22 16:31							
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
EPA 8270E SIM												
Acenaphthene	910	---	13.3	ug/kg dry	1	1070	ND	85	40-123%	---	---	
Acenaphthylene	924	---	13.3	ug/kg dry	1	1070	ND	87	32-132%	---	---	
Anthracene	958	---	13.3	ug/kg dry	1	1070	ND	90	47-123%	---	---	
Benz(a)anthracene	910	---	13.3	ug/kg dry	1	1070	39.1	82	49-126%	---	---	
Benzo(a)pyrene	962	---	13.3	ug/kg dry	1	1070	55.4	85	45-129%	---	---	
Benzo(b)fluoranthene	990	---	13.3	ug/kg dry	1	1070	93.1	84	45-132%	---	---	
Benzo(k)fluoranthene	918	---	13.3	ug/kg dry	1	1070	32.9	83	47-132%	---	---	
Benzo(g,h,i)perylene	986	---	13.3	ug/kg dry	1	1070	60.0	87	43-134%	---	---	
Chrysene	965	---	13.3	ug/kg dry	1	1070	60.3	85	50-124%	---	---	
Dibenz(a,h)anthracene	905	---	13.3	ug/kg dry	1	1070	9.01	84	45-134%	---	---	
Fluoranthene	1050	---	13.3	ug/kg dry	1	1070	72.4	91	50-127%	---	---	
Fluorene	915	---	13.3	ug/kg dry	1	1070	ND	86	43-125%	---	---	
Indeno(1,2,3-cd)pyrene	954	---	13.3	ug/kg dry	1	1070	65.7	83	45-133%	---	---	
1-Methylnaphthalene	861	---	13.3	ug/kg dry	1	1070	ND	81	40-120%	---	---	
2-Methylnaphthalene	852	---	13.3	ug/kg dry	1	1070	ND	80	38-122%	---	---	
Naphthalene	874	---	13.3	ug/kg dry	1	1070	ND	82	35-123%	---	---	
Phenanthrene	944	---	13.3	ug/kg dry	1	1070	19.2	87	50-121%	---	---	
Pyrene	1050	---	13.3	ug/kg dry	1	1070	64.7	92	47-127%	---	---	
Dibenzofuran	911	---	13.3	ug/kg dry	1	1070	ND	85	44-120%	---	---	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery:*	*72 %*	*Limits:*	*44-120 %*		*Dilution:*	*1x*				
p-Terphenyl-d14 (Surr)			*70 %*		*54-127 %*			*"*				
Matrix Spike Dup (22K0021-MSD1)			Prepared: 11/01/22 10:35		Analyzed: 11/01/22 16:56							
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
EPA 8270E SIM												

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22K0021 - EPA 3546							Soil					
Matrix Spike Dup (22K0021-MSD1)			Prepared: 11/01/22 10:35		Analyzed: 11/01/22 16:56							
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
Acenaphthene	875	---	12.8	ug/kg dry	1	1020	ND	85	40-123%	4	30%	
Acenaphthylene	892	---	12.8	ug/kg dry	1	1020	ND	87	32-132%	3	30%	
Anthracene	948	---	12.8	ug/kg dry	1	1020	ND	92	47-123%	1	30%	
Benz(a)anthracene	919	---	12.8	ug/kg dry	1	1020	39.1	86	49-126%	1	30%	
Benzo(a)pyrene	977	---	12.8	ug/kg dry	1	1020	55.4	90	45-129%	2	30%	
Benzo(b)fluoranthene	994	---	12.8	ug/kg dry	1	1020	93.1	88	45-132%	0.5	30%	
Benzo(k)fluoranthene	930	---	12.8	ug/kg dry	1	1020	32.9	88	47-132%	1	30%	
Benzo(g,h,i)perylene	984	---	12.8	ug/kg dry	1	1020	60.0	90	43-134%	0.2	30%	
Chrysene	983	---	12.8	ug/kg dry	1	1020	60.3	90	50-124%	2	30%	
Dibenz(a,h)anthracene	914	---	12.8	ug/kg dry	1	1020	9.01	88	45-134%	1	30%	
Fluoranthene	1080	---	12.8	ug/kg dry	1	1020	72.4	98	50-127%	3	30%	
Fluorene	880	---	12.8	ug/kg dry	1	1020	ND	86	43-125%	4	30%	
Indeno(1,2,3-cd)pyrene	987	---	12.8	ug/kg dry	1	1020	65.7	90	45-133%	3	30%	
1-Methylnaphthalene	821	---	12.8	ug/kg dry	1	1020	ND	80	40-120%	5	30%	
2-Methylnaphthalene	818	---	12.8	ug/kg dry	1	1020	ND	80	38-122%	4	30%	
Naphthalene	824	---	12.8	ug/kg dry	1	1020	ND	80	35-123%	6	30%	
Phenanthrene	931	---	12.8	ug/kg dry	1	1020	19.2	89	50-121%	1	30%	
Pyrene	1090	---	12.8	ug/kg dry	1	1020	64.7	100	47-127%	4	30%	
Dibenzofuran	872	---	12.8	ug/kg dry	1	1020	ND	85	44-120%	4	30%	
Surr: 2-Fluorobiphenyl (Surr)			*Recovery: 81 %*		*Limits: 44-120 %*				*Dilution: 1x*			
p-Terphenyl-d14 (Surr)			*81 %*		*54-127 %*				*"*			

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22J1207 - EPA 3051A							Soil					
Blank (22J1207-BLK1)			Prepared: 10/31/22 09:41 Analyzed: 10/31/22 18:26									
EPA 6020B												
Arsenic	ND	---	0.962	mg/kg wet	10	---	---	---	---	---	---	
Cadmium	ND	---	0.192	mg/kg wet	10	---	---	---	---	---	---	
Chromium	ND	---	0.962	mg/kg wet	10	---	---	---	---	---	---	
Lead	ND	---	0.192	mg/kg wet	10	---	---	---	---	---	---	
Mercury	ND	---	0.0769	mg/kg wet	10	---	---	---	---	---	---	
Zinc	ND	---	3.85	mg/kg wet	10	---	---	---	---	---	---	
LCS (22J1207-BS1)			Prepared: 10/31/22 09:41 Analyzed: 10/31/22 18:37									
EPA 6020B												
Arsenic	45.1	---	1.00	mg/kg wet	10	50.0	---	90	80-120%	---	---	
Cadmium	46.3	---	0.200	mg/kg wet	10	50.0	---	93	80-120%	---	---	
Chromium	45.9	---	1.00	mg/kg wet	10	50.0	---	92	80-120%	---	---	
Lead	47.4	---	0.200	mg/kg wet	10	50.0	---	95	80-120%	---	---	
Mercury	0.888	---	0.0800	mg/kg wet	10	1.00	---	89	80-120%	---	---	
Zinc	46.9	---	4.00	mg/kg wet	10	50.0	---	94	80-120%	---	---	
Duplicate (22J1207-DUP1)			Prepared: 10/31/22 09:41 Analyzed: 10/31/22 19:39									
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
EPA 6020B												
Arsenic	**6.60**	---	1.48	mg/kg dry	10	---	6.89	---	---	4	20%	
Cadmium	ND	---	0.297	mg/kg dry	10	---	0.230	---	---	***	20%	
Chromium	**31.6**	---	1.48	mg/kg dry	10	---	29.1	---	---	8	20%	
Lead	**22.9**	---	0.297	mg/kg dry	10	---	25.3	---	---	10	20%	
Mercury	ND	---	0.119	mg/kg dry	10	---	ND	---	---	---	20%	
Zinc	**72.2**	---	5.94	mg/kg dry	10	---	69.5	---	---	4	20%	
Matrix Spike (22J1207-MS1)			Prepared: 10/31/22 09:41 Analyzed: 10/31/22 19:44									
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
EPA 6020B												
Arsenic	72.9	---	1.41	mg/kg dry	10	70.3	6.89	94	75-125%	---	---	
Cadmium	66.6	---	0.281	mg/kg dry	10	70.3	0.230	95	75-125%	---	---	
Chromium	98.3	---	1.41	mg/kg dry	10	70.3	29.1	98	75-125%	---	---	

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Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020B (ICPMS)

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22J1207 - EPA 3051A							**Soil**					
Matrix Spike (22J1207-MS1)			Prepared: 10/31/22 09:41		Analyzed: 10/31/22 19:44							
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
Lead	99.0	---	0.281	mg/kg dry	10	70.3	25.3	105	75-125%	---	---	
Mercury	1.41	---	0.112	mg/kg dry	10	1.41	ND	100	75-125%	---	---	
Zinc	136	---	5.62	mg/kg dry	10	70.3	69.5	95	75-125%	---	---	
Matrix Spike Dup (22J1207-MSD1)			Prepared: 10/31/22 09:41		Analyzed: 10/31/22 19:50							
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
EPA 6020B												
Arsenic	72.3	---	1.46	mg/kg dry	10	73.1	6.89	89	75-125%	0.9	20%	
Cadmium	67.3	---	0.292	mg/kg dry	10	73.1	0.230	92	75-125%	0.9	20%	
Chromium	97.6	---	1.46	mg/kg dry	10	73.1	29.1	94	75-125%	0.6	20%	
Lead	92.8	---	0.292	mg/kg dry	10	73.1	25.3	92	75-125%	6	20%	
Mercury	1.38	---	0.117	mg/kg dry	10	1.46	ND	95	75-125%	2	20%	
Zinc	138	---	5.85	mg/kg dry	10	73.1	69.5	94	75-125%	2	20%	

Apex Laboratories

Philip Nerenberg, Lab Director

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503-718-2323
ORELAP ID: OR100062

ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 22J0880 - Total Solids (Dry Weight)							**Soil**					
Duplicate (22J0880-DUP1)			Prepared: 10/21/22 13:04		Analyzed: 10/24/22 06:38							**PRO**
QC Source Sample: Non-SDG (A2J0426-02)												
% Solids	**98.8**	---	1.00	%	1	---	98.7	---	---	0.01	10%	
Duplicate (22J0880-DUP2)			Prepared: 10/21/22 13:04		Analyzed: 10/24/22 06:38							**PRO**
QC Source Sample: Non-SDG (A2J0426-04)												
% Solids	**98.8**	---	1.00	%	1	---	98.8	---	---	0.08	10%	
Duplicate (22J0880-DUP3)			Prepared: 10/21/22 13:04		Analyzed: 10/24/22 06:38							**PRO**
QC Source Sample: Non-SDG (A2J0426-06)												
% Solids	**98.6**	---	1.00	%	1	---	98.7	---	---	0.09	10%	
Duplicate (22J0880-DUP4)			Prepared: 10/21/22 13:04		Analyzed: 10/24/22 06:38							**PRO**
QC Source Sample: Non-SDG (A2J0468-02)												
% Solids	**93.8**	---	1.00	%	1	---	93.8	---	---	0.008	10%	
Duplicate (22J0880-DUP5)			Prepared: 10/21/22 13:04		Analyzed: 10/24/22 06:38							
QC Source Sample: SS02-S-0.25 (A2J0647-01)												
EPA 8000D												
% Solids	**74.7**	---	1.00	%	1	---	72.9	---	---	2	10%	
Duplicate (22J0880-DUP6)			Prepared: 10/21/22 15:57		Analyzed: 10/24/22 06:38							
QC Source Sample: Non-SDG (A2J0686-01)												
% Solids	**70.0**	---	1.00	%	1	---	74.6	---	---	6	10%	

No Client related Batch QC samples analyzed for this batch. See notes page for more information.

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

SAMPLE PREPARATION INFORMATION

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E (SIM)

Prep: EPA 3546

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 22K0021							
A2J0647-01	Soil	EPA 8270E SIM	10/19/22 13:38	11/01/22 10:34	10.06g/5mL	10g/5mL	0.99
A2J0647-02	Soil	EPA 8270E SIM	10/19/22 13:45	11/01/22 10:34	10.03g/5mL	10g/5mL	1.00
A2J0647-03	Soil	EPA 8270E SIM	10/19/22 13:45	11/01/22 10:34	10.06g/5mL	10g/5mL	0.99
A2J0647-04	Soil	EPA 8270E SIM	10/19/22 13:57	11/01/22 10:34	10.12g/5mL	10g/5mL	0.99
A2J0647-05	Soil	EPA 8270E SIM	10/19/22 14:05	11/01/22 10:34	10.27g/5mL	10g/5mL	0.97

Total Metals by EPA 6020B (ICPMS)

Prep: EPA 3051A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 22J1207							
A2J0647-01	Soil	EPA 6020B	10/19/22 13:38	10/31/22 09:41	0.493g/50mL	0.5g/50mL	1.01
A2J0647-02	Soil	EPA 6020B	10/19/22 13:45	10/31/22 09:41	0.462g/50mL	0.5g/50mL	1.08
A2J0647-03	Soil	EPA 6020B	10/19/22 13:45	10/31/22 09:41	0.494g/50mL	0.5g/50mL	1.01
A2J0647-04	Soil	EPA 6020B	10/19/22 13:57	10/31/22 09:41	0.471g/50mL	0.5g/50mL	1.06
A2J0647-05	Soil	EPA 6020B	10/19/22 14:05	10/31/22 09:41	0.505g/50mL	0.5g/50mL	0.99

Percent Dry Weight

Prep: Total Solids (Dry Weight)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 22J0880							
A2J0647-01	Soil	EPA 8000D	10/19/22 13:38	10/21/22 13:04			NA
A2J0647-02	Soil	EPA 8000D	10/19/22 13:45	10/21/22 13:04			NA
A2J0647-03	Soil	EPA 8000D	10/19/22 13:45	10/21/22 13:04			NA
A2J0647-04	Soil	EPA 8000D	10/19/22 13:57	10/21/22 13:04			NA
A2J0647-05	Soil	EPA 8000D	10/19/22 14:05	10/21/22 13:04			NA

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Philip Nerenberg, Lab Director

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Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

M-05	Estimated results. Peak separation for structural isomers is insufficient for accurate quantification.
PRO	Sample has undergone sample processing prior to extraction and analysis.

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Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.

ND Analyte NOT DETECTED at or above the detection or reporting limit.

NR Result Not Reported

RPD Relative Percent Difference. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.

" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.

" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) may not be included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

Apex Laboratories

Philip Nerenberg, Lab Director

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Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

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Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: Riverfront Park Phase 2 ESA	
1329 North State Street, Suie 301	Project Number: M1945.01.002	Report ID:
Bellingham, WA 98225	Project Manager: Amanda Bixby	A2J0647 - 11 02 22 1641

LABORATORY ACCREDITATION INFORMATION

ORELAP Certification ID: OR100062 (Primary Accreditation) -
EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation

All reported analytes are included in Apex Laboratories' current ORELAP scope.

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

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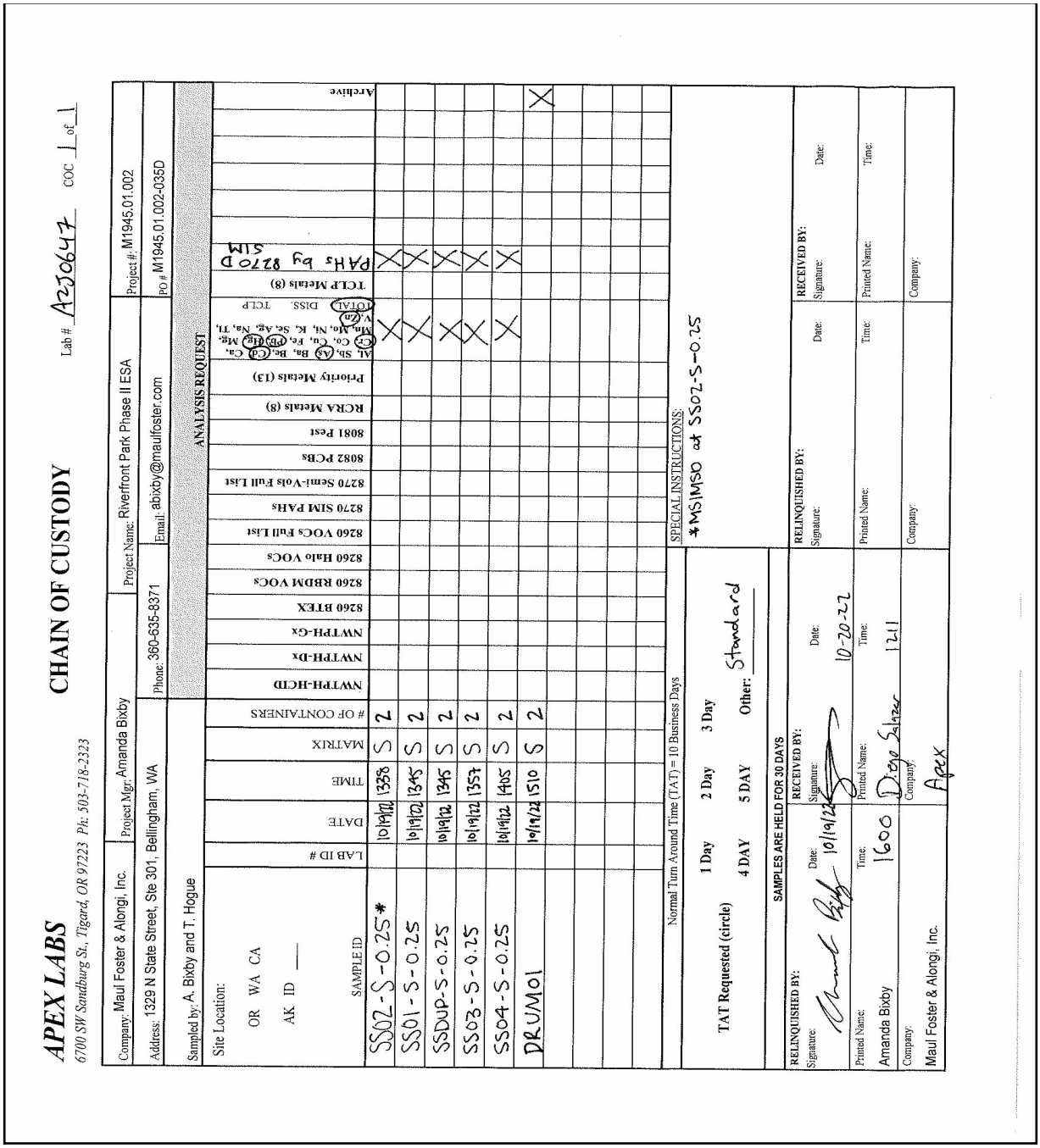
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**



APEX LABS
6700 SW Sandburg St., Tigard, OR 97223 Ph: 503-718-2323

CHAIN OF CUSTODY

Lab # A2J0647 COC 1 of 1

Company: Maul Foster & Alongi, Inc. | Project Mgr: Amanda Bixby | Project Name: Riverfront Park Phase II ESA | Project #: M1945.01.002
Address: 1329 N State Street, Ste 301, Bellingham, WA | Phone: 360-635-8371 | Email: abixby@maulfoster.com | PO # M1945.01.002-035D
Sampled by: A. Bixby and T. Hogue

Site Location: OR WA CA AK ID ____

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs Full List	8270 SIM PAHs	8270 Semi-Vols Full List	8082 PCBs	8081 Pest	RCRA Metals (8)	Priority Metals (13)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn (TOTAL / DISS.)	TCLP Metals (8)	TCLP	PAHs by 8270D SIM	Archive
SS02-S-0.25*		10/19/22	1330	S	2																	
SS01-S-0.25		10/19/22	1345	S	2																	
SSDUP-S-0.25		10/19/22	1345	S	2																	
SS03-S-0.25		10/19/22	1357	S	2																	
SS04-S-0.25		10/19/22	1405	S	2																	
DRUM01		10/19/22	1510	S	2																	

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: Standard

SPECIAL INSTRUCTIONS:
*MS/MSD at SS02-S-0.25

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Date: 10/19/22	Date: 10-20-22	Date:	Date:
Time: 1600	Time: 1211	Time:	Time:
Printed Name: Amanda Bixby	Printed Name: Diane Shaw	Printed Name:	Printed Name:
Company: Maul Foster & Alongi, Inc.	Company: Apex	Company:	Company:

Apex Laboratories

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Philip Nerenberg

Philip Nerenberg, Lab Director

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ANALYTICAL REPORT

Maul Foster & Alongi, INC-Bellingham	Project: **Riverfront Park Phase 2 ESA**	
1329 North State Street, Suie 301	Project Number: **M1945.01.002**	**Report ID:**
Bellingham, WA 98225	Project Manager: **Amanda Bixby**	**A2J0647 - 11 02 22 1641**

APEX LABS COOLER RECEIPT FORM

Client: Maul Foster & Along, Inc Element WO#: A2J0647

Project/Project #: River Front Park Phase II ESA M1945.01.002

Delivery Info:

Date/time received: 10-20-22 @ 1211 By: DSS

Delivered by: Apex____Client____ESS____FedEx X UPS____Swift____Senvoy ___SDS___Other_____

Cooler Inspection Date/time inspected: 10-20-22 @ 1212 By: DSS

Chain of Custody included? Yes X No _____ Custody seals? Yes_____ No X

Signed/dated by client? Yes X No _____

Signed/dated by Apex? Yes X No _____

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	1.5						
Received on ice? (Y/N)	Y						
Temp. blanks? (Y/N)	N						
Ice type: (Gel/Real/Other)	Real						
Condition (In/Out):	In						

Cooler out of temp? (Y/(N)) Possible reason why:_____

Green dots applied to out of temperature samples? Yes/(No)

Out of temperature samples form initiated? Yes/(No)

Sample Inspection: Date/time inspected: 10-20-22 @ 1400 By: DSS

All samples intact? Yes X No ___ Comments:_____

Bottle labels/COCs agree? Yes X No ___ Comments: _____

COC/container discrepancies form initiated? Yes ___ No X

Containers/volumes received appropriate for analysis? Yes X No ___ Comments: _____

Do VOA vials have visible headspace? Yes ___ No ___ NA X

Comments_____

Water samples: pH checked: Yes___No___NA X pH appropriate? Yes___No___NA X

Comments: _____

Additional information: 2793 5744 8631

Labeled by: DSS Witness: [signature] Cooler Inspected by: DSS

Form Y-003 R-00

Apex Laboratories

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Philip Nerenberg

Philip Nerenberg, Lab Director

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

November 2, 2022

Amanda Bixby, Project Manager
Maul Foster Alongi
1329 N State St, Suite 301
Bellingham, WA 98225

Dear Ms Bixby:

Included are the results from the testing of material submitted on October 20, 2022 from the Riverfront Park M1945.01.002-035-00D, F&BI 210297 project. There are 12 pages included in this report.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
MFA1102R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on October 20, 2022 by Friedman & Bruya, Inc. from the Maul Foster Alongi Riverfront Park M1945.01.002-035-00D, F&BI 210297 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
210297 -01	B01-SV-5.0
210297 -02	B02-SV-5.0
210297 -03	B06-SV-5.0

The propene concentration in samples B01-SV-5.0 and B06-SV-5.0 exceeded the calibration range of the instrument. The data were flagged accordingly.

All other quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	B01-SV-5.0	Client:	Maul Foster Alongi
Date Received:	10/20/22	Project:	M1945.01.002-035-00D
Date Collected:	10/18/22	Lab ID:	210297-01 1/5.3
Date Analyzed:	10/29/22	Data File:	102825.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	95	70	130

Compounds:	Concentration ug/m3	Concentration ppbv	Compounds:	Concentration ug/m3	Concentration ppbv
Propene	240 ve	140 ve	1,2-Dichloropropane	<1.2	<0.26
Dichlorodifluoromethane	<5.2	<1.1	1,4-Dioxane	<1.9	<0.53
Chloromethane	<20	<9.5	2,2,4-Trimethylpentane	<25	<5.3
F-114	<11	<1.6	Methyl methacrylate	<22	<5.3
Vinyl chloride	<1.4	<0.53	Heptane	<22	<5.3
1,3-Butadiene	<0.23	<0.11	Bromodichloromethane	<0.36	<0.053
Butane	77	32	Trichloroethene	<0.57	<0.11
Bromomethane	<21	<5.3	cis-1,3-Dichloropropene	<4.8	<1.1
Chloroethane	<14	<5.3	4-Methyl-2-pentanone	<22	<5.3
Vinyl bromide	<2.3	<0.53	trans-1,3-Dichloropropene	<2.4	<0.53
Ethanol	<40	<21	Toluene	<100	<26
Acrolein	2.0	0.89	1,1,2-Trichloroethane	<0.29	<0.053
Pentane	<31	<11	2-Hexanone	<22	<5.3
Trichlorofluoromethane	<12	<2.1	Tetrachloroethene	<36	<5.3
Acetone	180	75	Dibromochloromethane	<0.45	<0.053
2-Propanol	<46	<19	1,2-Dibromoethane (EDB)	<0.41	<0.053
1,1-Dichloroethene	<2.1	<0.53	Chlorobenzene	<2.4	<0.53
trans-1,2-Dichloroethene	<2.1	<0.53	Ethylbenzene	8.1	1.9
Methylene chloride	<180	<53	1,1,2,2-Tetrachloroethane	<0.73	<0.11
t-Butyl alcohol (TBA)	<64	<21	Nonane	<28	<5.3
3-Chloropropene	<17	<5.3	Isopropylbenzene	<52	<11
CFC-113	<4.1	<0.53	2-Chlorotoluene	<27	<5.3
Carbon disulfide	<33	<11	Propylbenzene	<26	<5.3
Methyl t-butyl ether (MTBE)	<38	<11	4-Ethyltoluene	<26	<5.3
Vinyl acetate	<37	<11	m,p-Xylene	37	8.6
1,1-Dichloroethane	<2.1	<0.53	o-Xylene	14	3.3
cis-1,2-Dichloroethene	<2.1	<0.53	Styrene	<4.5	<1.1
Hexane	<19	<5.3	Bromoform	<11	<1.1
Chloroform	2.0	0.42	Benzyl chloride	<0.27	<0.053
Ethyl acetate	<38	<11	1,3,5-Trimethylbenzene	<26	<5.3
Tetrahydrofuran	<3.1	<1.1	1,2,4-Trimethylbenzene	<26	<5.3
2-Butanone (MEK)	98	33	1,3-Dichlorobenzene	<3.2	<0.53
1,2-Dichloroethane (EDC)	<0.21	<0.053	1,4-Dichlorobenzene	<1.2	<0.2
1,1,1-Trichloroethane	<2.9	<0.53	1,2-Dichlorobenzene	<3.2	<0.53
Carbon tetrachloride	<1.7	<0.26	1,2,4-Trichlorobenzene	<3.9	<0.53
Benzene	11	3.3	Naphthalene	<1.4	<0.26
Cyclohexane	<36	<11	Hexachlorobutadiene	<1.1	<0.11

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	B02-SV-5.0	Client:	Maul Foster Alongi
Date Received:	10/20/22	Project:	M1945.01.002-035-00D
Date Collected:	10/18/22	Lab ID:	210297-02 1/6.2
Date Analyzed:	10/29/22	Data File:	102826.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	95	70	130

Compounds:	Concentration ug/m3	Concentration ppbv	Compounds:	Concentration ug/m3	Concentration ppbv
Propene	<7.5	<4.3	1,2-Dichloropropane	<1.4	<0.31
Dichlorodifluoromethane	<6.1	<1.2	1,4-Dioxane	<2.2	<0.62
Chloromethane	<23	<11	2,2,4-Trimethylpentane	<29	<6.2
F-114	<13	<1.9	Methyl methacrylate	<25	<6.2
Vinyl chloride	<1.6	<0.62	Heptane	<25	<6.2
1,3-Butadiene	<0.27	<0.12	Bromodichloromethane	5.4	0.81
Butane	53	22	Trichloroethene	<0.67	<0.12
Bromomethane	<24	<6.2	cis-1,3-Dichloropropene	<5.6	<1.2
Chloroethane	<16	<6.2	4-Methyl-2-pentanone	<25	<6.2
Vinyl bromide	<2.7	<0.62	trans-1,3-Dichloropropene	<2.8	<0.62
Ethanol	<47	<25	Toluene	150	39
Acrolein	1.0	0.45	1,1,2-Trichloroethane	<0.34	<0.062
Pentane	<37	<12	2-Hexanone	<25	<6.2
Trichlorofluoromethane	<14	<2.5	Tetrachloroethene	<42	<6.2
Acetone	61	26	Dibromochloromethane	<0.53	<0.062
2-Propanol	<53	<22	1,2-Dibromoethane (EDB)	<0.48	<0.062
1,1-Dichloroethene	<2.5	<0.62	Chlorobenzene	<2.9	<0.62
trans-1,2-Dichloroethene	<2.5	<0.62	Ethylbenzene	<2.7	<0.62
Methylene chloride	<220	<62	1,1,2,2-Tetrachloroethane	<0.85	<0.12
t-Butyl alcohol (TBA)	<75	<25	Nonane	<33	<6.2
3-Chloropropene	<19	<6.2	Isopropylbenzene	<61	<12
CFC-113	<4.8	<0.62	2-Chlorotoluene	<32	<6.2
Carbon disulfide	<39	<12	Propylbenzene	<30	<6.2
Methyl t-butyl ether (MTBE)	<45	<12	4-Ethyltoluene	<30	<6.2
Vinyl acetate	<44	<12	m,p-Xylene	<5.4	<1.2
1,1-Dichloroethane	<2.5	<0.62	o-Xylene	<2.7	<0.62
cis-1,2-Dichloroethene	<2.5	<0.62	Styrene	<5.3	<1.2
Hexane	<22	<6.2	Bromoform	<13	<1.2
Chloroform	19	4.0	Benzyl chloride	<0.32	<0.062
Ethyl acetate	<45	<12	1,3,5-Trimethylbenzene	<30	<6.2
Tetrahydrofuran	<3.7	<1.2	1,2,4-Trimethylbenzene	<30	<6.2
2-Butanone (MEK)	<37	<12	1,3-Dichlorobenzene	<3.7	<0.62
1,2-Dichloroethane (EDC)	<0.25	<0.062	1,4-Dichlorobenzene	<1.4	<0.24
1,1,1-Trichloroethane	<3.4	<0.62	1,2-Dichlorobenzene	<3.7	<0.62
Carbon tetrachloride	<2	<0.31	1,2,4-Trichlorobenzene	<4.6	<0.62
Benzene	3.9	1.2	Naphthalene	<1.6	<0.31
Cyclohexane	<43	<12	Hexachlorobutadiene	<1.3	<0.12

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	B06-SV-5.0	Client:	Maul Foster Alongi
Date Received:	10/20/22	Project:	M1945.01.002-035-00D
Date Collected:	10/18/22	Lab ID:	210297-03 1/5.7
Date Analyzed:	10/29/22	Data File:	102827.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	91	70	130

Compounds:	Concentration ug/m3	Concentration ppbv	Compounds:	Concentration ug/m3	Concentration ppbv
Propene	360 ve	210 ve	1,2-Dichloropropane	<1.3	<0.28
Dichlorodifluoromethane	<5.6	<1.1	1,4-Dioxane	<2.1	<0.57
Chloromethane	<21	<10	2,2,4-Trimethylpentane	<27	<5.7
F-114	<12	<1.7	Methyl methacrylate	<23	<5.7
Vinyl chloride	<1.5	<0.57	Heptane	<23	<5.7
1,3-Butadiene	<0.25	<0.11	Bromodichloromethane	<0.38	<0.057
Butane	150	65	Trichloroethene	<0.61	<0.11
Bromomethane	<22	<5.7	cis-1,3-Dichloropropene	<5.2	<1.1
Chloroethane	<15	<5.7	4-Methyl-2-pentanone	<23	<5.7
Vinyl bromide	<2.5	<0.57	trans-1,3-Dichloropropene	<2.6	<0.57
Ethanol	<43	<23	Toluene	<110	<28
Acrolein	<0.65	<0.28	1,1,2-Trichloroethane	<0.31	<0.057
Pentane	63	21	2-Hexanone	<23	<5.7
Trichlorofluoromethane	<13	<2.3	Tetrachloroethene	<39	<5.7
Acetone	86	36	Dibromochloromethane	<0.49	<0.057
2-Propanol	<49	<20	1,2-Dibromoethane (EDB)	<0.44	<0.057
1,1-Dichloroethene	<2.3	<0.57	Chlorobenzene	<2.6	<0.57
trans-1,2-Dichloroethene	<2.3	<0.57	Ethylbenzene	5.7	1.3
Methylene chloride	<200	<57	1,1,2,2-Tetrachloroethane	<0.78	<0.11
t-Butyl alcohol (TBA)	<69	<23	Nonane	<30	<5.7
3-Chloropropene	<18	<5.7	Isopropylbenzene	<56	<11
CFC-113	<4.4	<0.57	2-Chlorotoluene	<30	<5.7
Carbon disulfide	100	32	Propylbenzene	<28	<5.7
Methyl t-butyl ether (MTBE)	<41	<11	4-Ethyltoluene	<28	<5.7
Vinyl acetate	<40	<11	m,p-Xylene	16	3.6
1,1-Dichloroethane	<2.3	<0.57	o-Xylene	7.2	1.7
cis-1,2-Dichloroethene	<2.3	<0.57	Styrene	<4.9	<1.1
Hexane	<20	<5.7	Bromoform	<12	<1.1
Chloroform	1.4	0.30	Benzyl chloride	<0.3	<0.057
Ethyl acetate	<41	<11	1,3,5-Trimethylbenzene	<28	<5.7
Tetrahydrofuran	<3.4	<1.1	1,2,4-Trimethylbenzene	<28	<5.7
2-Butanone (MEK)	<34	<11	1,3-Dichlorobenzene	<3.4	<0.57
1,2-Dichloroethane (EDC)	<0.23	<0.057	1,4-Dichlorobenzene	<1.3	<0.22
1,1,1-Trichloroethane	<3.1	<0.57	1,2-Dichlorobenzene	<3.4	<0.57
Carbon tetrachloride	<1.8	<0.28	1,2,4-Trichlorobenzene	<4.2	<0.57
Benzene	18	5.8	Naphthalene	<1.5	<0.28
Cyclohexane	<39	<11	Hexachlorobutadiene	<1.2	<0.11

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	M1945.01.002-035-00D
Date Collected:	Not Applicable	Lab ID:	02-2618 MB
Date Analyzed:	10/28/22	Data File:	102810.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	90	70	130

Compounds:	Concentration ug/m3	Concentration ppbv	Compounds:	Concentration ug/m3	Concentration ppbv
Propene	<1.2	<0.7	1,2-Dichloropropane	<0.23	<0.05
Dichlorodifluoromethane	<0.99	<0.2	1,4-Dioxane	<0.36	<0.1
Chloromethane	<3.7	<1.8	2,2,4-Trimethylpentane	<4.7	<1
F-114	<2.1	<0.3	Methyl methacrylate	<4.1	<1
Vinyl chloride	<0.26	<0.1	Heptane	<4.1	<1
1,3-Butadiene	<0.044	<0.02	Bromodichloromethane	<0.067	<0.01
Butane	<4.8	<2	Trichloroethene	<0.11	<0.02
Bromomethane	<3.9	<1	cis-1,3-Dichloropropene	<0.91	<0.2
Chloroethane	<2.6	<1	4-Methyl-2-pentanone	<4.1	<1
Vinyl bromide	<0.44	<0.1	trans-1,3-Dichloropropene	<0.45	<0.1
Ethanol	<7.5	<4	Toluene	<19	<5
Acrolein	<0.11	<0.05	1,1,2-Trichloroethane	<0.055	<0.01
Pentane	<5.9	<2	2-Hexanone	<4.1	<1
Trichlorofluoromethane	<2.2	<0.4	Tetrachloroethene	<6.8	<1
Acetone	<4.8	<2	Dibromochloromethane	<0.085	<0.01
2-Propanol	<8.6	<3.5	1,2-Dibromoethane (EDB)	<0.077	<0.01
1,1-Dichloroethene	<0.4	<0.1	Chlorobenzene	<0.46	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1	Ethylbenzene	<0.43	<0.1
Methylene chloride	<35	<10	1,1,2,2-Tetrachloroethane	<0.14	<0.02
t-Butyl alcohol (TBA)	<12	<4	Nonane	<5.2	<1
3-Chloropropene	<3.1	<1	Isopropylbenzene	<9.8	<2
CFC-113	<0.77	<0.1	2-Chlorotoluene	<5.2	<1
Carbon disulfide	<6.2	<2	Propylbenzene	<4.9	<1
Methyl t-butyl ether (MTBE)	<7.2	<2	4-Ethyltoluene	<4.9	<1
Vinyl acetate	<7	<2	m,p-Xylene	<0.87	<0.2
1,1-Dichloroethane	<0.4	<0.1	o-Xylene	<0.43	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1	Styrene	<0.85	<0.2
Hexane	<3.5	<1	Bromoform	<2.1	<0.2
Chloroform	<0.049	<0.01	Benzyl chloride	<0.052	<0.01
Ethyl acetate	<7.2	<2	1,3,5-Trimethylbenzene	<4.9	<1
Tetrahydrofuran	<0.59	<0.2	1,2,4-Trimethylbenzene	<4.9	<1
2-Butanone (MEK)	<5.9	<2	1,3-Dichlorobenzene	<0.6	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01	1,4-Dichlorobenzene	<0.23	<0.038
1,1,1-Trichloroethane	<0.55	<0.1	1,2-Dichlorobenzene	<0.6	<0.1
Carbon tetrachloride	<0.31	<0.05	1,2,4-Trichlorobenzene	<0.74	<0.1
Benzene	<0.32	<0.1	Naphthalene	<0.26	<0.05
Cyclohexane	<6.9	<2	Hexachlorobutadiene	<0.21	<0.02

Date of Report: 11/02/22
Date Received: 10/20/22
Project: Riverfront Park M1945.01.002-035-00D, F&BI 210297
Date Extracted: 11/01/22
Date Analyzed: 11/01/22

RESULTS FROM THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Results Reported as % Helium

Sample ID Laboratory ID	Helium
B01-SV-5.0 210297-01	<0.6
B02-SV-5.0 210297-02	<0.6
B06-SV-5.0 210297-03	<0.6
Method Blank 02-2677 MB	<0.6

Date of Report: 11/02/22
Date Received: 10/20/22
Project: Riverfront Park M1945.01.002-035-00D, F&BI 210297

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 210407-01 1/5 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Propene	ug/m3	<6	<6	nm
Dichlorodifluoromethane	ug/m3	<4.9	<4.9	nm
Chloromethane	ug/m3	<19	<19	nm
F-114	ug/m3	<10	<10	nm
Vinyl chloride	ug/m3	<1.3	<1.3	nm
1,3-Butadiene	ug/m3	<0.22	<0.22	nm
Butane	ug/m3	<24	<24	nm
Bromomethane	ug/m3	<19	<19	nm
Chloroethane	ug/m3	<13	<13	nm
Vinyl bromide	ug/m3	<2.2	<2.2	nm
Ethanol	ug/m3	420	470	11
Acrolein	ug/m3	0.83	0.83	0
Pentane	ug/m3	<30	<30	nm
Trichlorofluoromethane	ug/m3	<11	<11	nm
Acetone	ug/m3	200	200	0
2-Propanol	ug/m3	380	370	3
1,1-Dichloroethene	ug/m3	<2	<2	nm
trans-1,2-Dichloroethene	ug/m3	<2	<2	nm
Methylene chloride	ug/m3	<170	<170	nm
t-Butyl alcohol (TBA)	ug/m3	<61	<61	nm
3-Chloropropene	ug/m3	<16	<16	nm
CFC-113	ug/m3	<3.8	<3.8	nm
Carbon disulfide	ug/m3	<31	<31	nm
Methyl t-butyl ether (MTBE)	ug/m3	<36	<36	nm
Vinyl acetate	ug/m3	<35	<35	nm
1,1-Dichloroethane	ug/m3	<2	<2	nm
cis-1,2-Dichloroethene	ug/m3	<2	<2	nm
Hexane	ug/m3	<18	<18	nm
Chloroform	ug/m3	<0.24	<0.24	nm
Ethyl acetate	ug/m3	<36	<36	nm
Tetrahydrofuran	ug/m3	15	15	0
2-Butanone (MEK)	ug/m3	<29	<29	nm
1,2-Dichloroethane (EDC)	ug/m3	<0.2	<0.2	nm
1,1,1-Trichloroethane	ug/m3	<2.7	<2.7	nm
Carbon tetrachloride	ug/m3	<1.6	<1.6	nm
Benzene	ug/m3	<1.6	<1.6	nm
Cyclohexane	ug/m3	<34	<34	nm
1,2-Dichloropropane	ug/m3	<1.2	<1.2	nm
1,4-Dioxane	ug/m3	<1.8	<1.8	nm
2,2,4-Trimethylpentane	ug/m3	<23	<23	nm

Date of Report: 11/02/22
Date Received: 10/20/22
Project: Riverfront Park M1945.01.002-035-00D, F&BI 210297

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: 210407-01 1/5 (Duplicate, continued)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Methyl methacrylate	ug/m3	<20	<20	nm
Heptane	ug/m3	<20	<20	nm
Bromodichloromethane	ug/m3	<0.34	<0.34	nm
Trichloroethene	ug/m3	<0.54	<0.54	nm
cis-1,3-Dichloropropene	ug/m3	<4.5	<4.5	nm
4-Methyl-2-pentanone	ug/m3	<20	<20	nm
trans-1,3-Dichloropropene	ug/m3	<2.3	<2.3	nm
Toluene	ug/m3	<94	<94	nm
1,1,2-Trichloroethane	ug/m3	<0.27	<0.27	nm
2-Hexanone	ug/m3	<20	<20	nm
Tetrachloroethene	ug/m3	<34	<34	nm
Dibromochloromethane	ug/m3	<0.43	<0.43	nm
1,2-Dibromoethane (EDB)	ug/m3	<0.38	<0.38	nm
Chlorobenzene	ug/m3	<2.3	<2.3	nm
Ethylbenzene	ug/m3	<2.2	<2.2	nm
1,1,2,2-Tetrachloroethane	ug/m3	<0.69	<0.69	nm
Nonane	ug/m3	<26	<26	nm
Isopropylbenzene	ug/m3	<49	<49	nm
2-Chlorotoluene	ug/m3	<26	<26	nm
Propylbenzene	ug/m3	<25	<25	nm
4-Ethyltoluene	ug/m3	<25	<25	nm
m,p-Xylene	ug/m3	<4.3	<4.3	nm
o-Xylene	ug/m3	<2.2	<2.2	nm
Styrene	ug/m3	<4.3	<4.3	nm
Bromoform	ug/m3	<10	<10	nm
Benzyl chloride	ug/m3	<0.26	<0.26	nm
1,3,5-Trimethylbenzene	ug/m3	<25	<25	nm
1,2,4-Trimethylbenzene	ug/m3	<25	<25	nm
1,3-Dichlorobenzene	ug/m3	<3	<3	nm
1,4-Dichlorobenzene	ug/m3	<1.1	<1.1	nm
1,2-Dichlorobenzene	ug/m3	<3	<3	nm
1,2,4-Trichlorobenzene	ug/m3	<3.7	<3.7	nm
Naphthalene	ug/m3	<1.3	<1.3	nm
Hexachlorobutadiene	ug/m3	<1.1	<1.1	nm

Date of Report: 11/02/22
Date Received: 10/20/22
Project: Riverfront Park M1945.01.002-035-00D, F&BI 210297

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Propene	ug/m3	23	112	70-130
Dichlorodifluoromethane	ug/m3	67	103	70-130
Chloromethane	ug/m3	28	102	70-130
F-114	ug/m3	94	94	70-130
Vinyl chloride	ug/m3	35	102	70-130
1,3-Butadiene	ug/m3	30	95	70-130
Butane	ug/m3	32	111	70-130
Bromomethane	ug/m3	52	106	70-130
Chloroethane	ug/m3	36	103	70-130
Vinyl bromide	ug/m3	59	98	70-130
Ethanol	ug/m3	25	85	70-130
Acrolein	ug/m3	31	100	70-130
Pentane	ug/m3	40	106	70-130
Trichlorofluoromethane	ug/m3	76	103	70-130
Acetone	ug/m3	32	96	70-130
2-Propanol	ug/m3	33	100	70-130
1,1-Dichloroethene	ug/m3	54	96	70-130
trans-1,2-Dichloroethene	ug/m3	54	100	70-130
Methylene chloride	ug/m3	94	97	70-130
t-Butyl alcohol (TBA)	ug/m3	41	99	70-130
3-Chloropropene	ug/m3	42	99	70-130
CFC-113	ug/m3	100	108	70-130
Carbon disulfide	ug/m3	42	106	70-130
Methyl t-butyl ether (MTBE)	ug/m3	49	96	70-130
Vinyl acetate	ug/m3	48	103	70-130
1,1-Dichloroethane	ug/m3	55	104	70-130
cis-1,2-Dichloroethene	ug/m3	54	95	70-130
Hexane	ug/m3	48	92	70-130
Chloroform	ug/m3	66	102	70-130
Ethyl acetate	ug/m3	49	104	70-130
Tetrahydrofuran	ug/m3	40	97	70-130
2-Butanone (MEK)	ug/m3	40	95	70-130
1,2-Dichloroethane (EDC)	ug/m3	55	104	70-130
1,1,1-Trichloroethane	ug/m3	74	102	70-130
Carbon tetrachloride	ug/m3	85	105	70-130
Benzene	ug/m3	43	93	70-130
Cyclohexane	ug/m3	46	94	70-130
1,2-Dichloropropane	ug/m3	62	103	70-130
1,4-Dioxane	ug/m3	49	101	70-130
2,2,4-Trimethylpentane	ug/m3	63	100	70-130

Date of Report: 11/02/22
Date Received: 10/20/22
Project: Riverfront Park M1945.01.002-035-00D, F&BI 210297

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample (continued)

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Methyl methacrylate	ug/m3	55	109	70-130
Heptane	ug/m3	55	101	70-130
Bromodichloromethane	ug/m3	90	107	70-130
Trichloroethene	ug/m3	73	101	70-130
cis-1,3-Dichloropropene	ug/m3	61	103	70-130
4-Methyl-2-pentanone	ug/m3	55	89	70-130
trans-1,3-Dichloropropene	ug/m3	61	105	70-130
Toluene	ug/m3	51	100	70-130
1,1,2-Trichloroethane	ug/m3	74	107	70-130
2-Hexanone	ug/m3	55	106	70-130
Tetrachloroethene	ug/m3	92	108	70-130
Dibromochloromethane	ug/m3	120	107	70-130
1,2-Dibromoethane (EDB)	ug/m3	100	102	70-130
Chlorobenzene	ug/m3	62	105	70-130
Ethylbenzene	ug/m3	59	91	70-130
1,1,2,2-Tetrachloroethane	ug/m3	93	103	70-130
Nonane	ug/m3	71	107	70-130
Isopropylbenzene	ug/m3	66	106	70-130
2-Chlorotoluene	ug/m3	70	103	70-130
Propylbenzene	ug/m3	66	100	70-130
4-Ethyltoluene	ug/m3	66	95	70-130
m,p-Xylene	ug/m3	120	96	70-130
o-Xylene	ug/m3	59	99	70-130
Styrene	ug/m3	58	94	70-130
Bromoform	ug/m3	140	112	70-130
Benzyl chloride	ug/m3	70	112	70-130
1,3,5-Trimethylbenzene	ug/m3	66	107	70-130
1,2,4-Trimethylbenzene	ug/m3	66	97	70-130
1,3-Dichlorobenzene	ug/m3	81	111	70-130
1,4-Dichlorobenzene	ug/m3	81	109	70-130
1,2-Dichlorobenzene	ug/m3	81	107	70-130
1,2,4-Trichlorobenzene	ug/m3	100	102	70-130
Naphthalene	ug/m3	71	89	70-130
Hexachlorobutadiene	ug/m3	140	110	70-130

Date of Report: 11/02/22
Date Received: 10/20/22
Project: Riverfront Park M1945.01.002-035-00D, F&BI 210297

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR HELIUM USING METHOD ASTM D1946

Laboratory Code: 210297-01 (Duplicate)

Analyte	Sample Result (%)	Duplicate Result (%)	Relative Percent Difference	Acceptance Criteria
Helium	<0.6	<0.6	nm	0-20

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY

210297

10/20/22

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Report To Amanda Bixby
Company Maul Foster & Alongi
Address 1329 N State St, Suite 301
City, State, ZIP Bellingham, WA 98225
Phone (360) 635-8371 Email abixby@maulfoster.com

SAMPLERS (*signature*): Amanda Bixby

PROJECT NAME & ADDRESS: Riverfront Park

PO # M1945.01.002 -035-000

NOTES:

INVOICE TO accounting@maulfoster.com

TURNAROUND TIME
☒ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
Default: Clean following final report delivery
☐ Hold (Fee may apply):

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	VOCs by TO-15	Notes
B01-SV-5.0	01	8535	224	IA / (SG)	10/18/22	-30	1030	-5	1036					X	X	
B02-SV-5.0	02	8346	299	IA / (SG)	10/18/22	-26	1208	-5	1214					X	X	
B06-SV-5.0	03	8209	231	IA / (SG)	10/19/22	-30+	1220	-5	1225					X	X	
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Amanda Bixby	Amanda Bixby	MFA	10/19/22	1600
Received by: HONG	HONG NGUYEN	FBI	10/20/22	16:15
Relinquished by:				
Received by:				

Samples received at 19°C

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

ATTACHMENT H

DATA VALIDATION MEMORANDUM

DATA QUALITY ASSURANCE/QUALITY CONTROL REVIEW

PROJECT NO. M1945.01.002 | NOVEMBER 7, 2022 | CHELAN DOUGLAS REGIONAL PORT AUTHORITY

Maul Foster & Alongi, Inc. (MFA), conducted an independent Stage 2A review of the quality of analytical results for soil, soil vapor, and associated quality control samples collected on October 18 and 19, 2022, at the Riverfront Park along North Worthen Street in Wenatchee, Washington.

Apex Laboratories, LLC (Apex), and Friedman & Bruya, Inc. (FBI), performed the analyses. MFA reviewed Apex report number A2J0647 and FBI report number 210297. The analyses performed and the samples analyzed are listed in the following tables. An investigation-derived waste sample was submitted with report A2J0647 and is not indicated below, as it was reported separately at MFA's request and did not require validation.

Analysis	Reference
Helium	ASTM D1946
Percent dry weight	EPA 8000D
Polycyclic aromatic hydrocarbons	EPA 8270E-SIM
Total metals	EPA 6020B
Volatile organic compounds	EPA TO-15

Notes
ASTM = ASTM International.
EPA = U.S. Environmental Protection Agency.
SIM = selected ion monitoring.
TO = toxic organics.

Samples Analyzed	
Report A2J0647	**Report 210297**
SS02-S-0.25	B01-SV-5.0
SS01-S-0.25	B02-SV-5.0
SSDUP-S-0.25	B06-SV-5.0
SS03-S-0.25	--
SS04-S-0.25	--

DATA QUALIFICATION

Analytical results were evaluated according to applicable sections of U.S. Environmental Protection Agency (EPA) guidelines for data review (EPA 2020a, 2020b) and appropriate laboratory- and method-specific guidelines (Apex 2022, EPA 1986, FBI 2019).

Data validation procedures were modified, as appropriate, to accommodate quality control requirements for methods that EPA data review procedures do not specifically address (e.g., ASTM International [ASTM] Method D1946).

Based on the results of the data quality review procedures described below, the data, with the appropriate final data qualifiers assigned, are considered acceptable for their intended use. Final data qualifiers represent qualifiers originating from the laboratory and accepted by the reviewer, and data qualifiers assigned by the reviewer during validation.

Final data qualifiers:

- J = result is estimated.
- U = result is non-detect at the method reporting limit (MRL).

The reviewer confirmed that soil gas samples in report 210297 were collected under a helium shroud to detect leaks in the collection system. The associated sample results were non-detect for helium by ASTM Method D1946.

In report 210297, FBI noted that the EPA Method TO-15 propene results for B01-SV-5.0 and B06-SV-5.0 exceeded the calibration range of the instrument and are considered estimates. The reviewer qualified the sample results with J, as shown in the following table.

Report	Sample	Analyte	Original Result (ug/m^3)	Qualified Result (ug/m^3)
210297	B01-SV-5.0	Propene	240	240 J
	B06-SV-5.0		360	360 J
Notes J = result is estimated. ug/m^3 = micrograms per cubic meter.				

According to report A2J0647, several EPA Method 8270E-SIM results were flagged as estimated due to insufficient peak separation of structural isomers for accurate quantification. The reviewer qualified the sample results with J, as shown in the following table.

Report	Sample	Analyte	Original Result (ug/kg)	Qualified Result (ug/kg)
A2J0647	SS02-S-0.25	Benzo(b)fluoranthene	93.1	93.1 J
		Benzo(k)fluoranthene	32.9	32.9 J
	SS01-S-0.25		34.2	34.2 J
	SSDUP-S-0.25		40.2	40.2 J
	SS03-S-0.25		14.6	14.6 J
	SS04-S-0.25		15.0	15.0 J

Notes
J = result is estimated.
ug/kg = micrograms per kilogram.

SAMPLE CONDITIONS

Sample Custody

Sample custody was appropriately documented on the chain-of-custody forms accompanying the reports.

Holding Times

Extractions and analyses were performed within the recommended holding times.

Preservation and Sample Storage

The samples were preserved and stored appropriately.

REPORTING LIMITS

The laboratories evaluated results to MRLs. Samples that required dilutions because of high analyte concentrations, matrix interferences, and/or dilutions necessary for preparation and/or analysis were reported with raised MRLs.

For report A2J0647, the reviewer confirmed that EPA Method 6020B soil results were reported with a base dilution factor of 10 due to a dilution required for analysis.

For report 210297, the reviewer confirmed that when samples were diluted for analysis or when a higher sample volume was used for the extraction, FBI provided the preparation or dilution factor after the laboratory sample identification number (e.g., 210297-01 1/5.3 indicates a dilution factor of 5.3).

BLANKS

Method Blanks

Laboratory method blanks are used to assess whether laboratory contamination was introduced during sample preparation and analysis. Laboratory method blank analyses were performed at the required frequencies. For purposes of data qualification, the laboratory method blanks were associated with all samples prepared in the analytical batch.

All laboratory method blank results were non-detect to MRLs.

Equipment Rinsate Blanks

Equipment rinsate blanks are used to evaluate field equipment decontamination. These blanks were not required for this sampling event.

Trip Blanks

Trip blanks are used to evaluate whether volatile organic compound contamination was introduced during sample storage and during shipment between the sampling location and the laboratory.

Trip blank samples were not required for this soil gas sampling event.

LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE RESULTS

A laboratory control sample (LCS) and a laboratory control sample duplicate (LCSD) are spiked with target analytes to provide information about laboratory precision and accuracy.

Apex and FBI did not report LCSD for any methods. Laboratory accuracy was evaluated using laboratory duplicate and/or matrix spike (MS) and matrix spike duplicate (MSD) results. FBI additionally did not report LCS for ASTM Method D1946, as it is not required by the method; the reviewer confirmed that the daily calibration passed for this method. The remaining LCS were prepared and analyzed at the required frequency.

All LCS results were within acceptance limits for percent recovery.

LABORATORY DUPLICATE RESULTS

Laboratory duplicate results are used to evaluate laboratory precision. All laboratory duplicate samples were prepared and analyzed at the required frequency.

Laboratory duplicate results greater than five times the MRL were evaluated using laboratory relative percent difference (RPD) control limits. Laboratory duplicate results less than five times the MRL, including non-detects, were evaluated using a control limit of the MRL of the parent sample; the absolute difference of the laboratory duplicate sample result and the parent sample result, or the MRL for non-detects, was compared to the MRL of the parent sample.

All laboratory duplicate results met the acceptance criteria.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RESULTS

MS and MSD results are used to evaluate laboratory precision, accuracy, and the effect of the sample matrix on sample preparation and analysis.

FBI did not report MS or MSD in report 210297, as it is not required by EPA Method TO-15 or ASTM Method D1946. In report A2J0647, all MS and MSD samples were prepared and analyzed at the required frequency.

All MS and MSD results were within acceptance limits for percent recovery and RPD.

SURROGATE RECOVERY RESULTS

The samples were spiked with surrogate compounds to evaluate laboratory performance for individual samples for organic analyses.

All surrogate results were within percent recovery acceptance limits.

FIELD DUPLICATE RESULTS

Field duplicate samples measure both field and laboratory precision. The following field duplicate and parent sample pair was submitted for analysis:

Report	Parent Sample	Field Duplicate Sample
A2J0647	SS01-S-0.25	SSDUP-S-0.25

MFA uses acceptance criteria of 100 percent RPD for results that are less than five times the MRL or 50 percent RPD for results that are greater than five times the MRL. RPD was not evaluated when both results in the sample pair were non-detect.

All field duplicate results met the RPD acceptance criteria.

DATA PACKAGE

The data package was reviewed for transcription errors, omissions, and anomalies. None were found.

REFERENCES

Apex. 2022. *Quality Systems Manual.* Rev. 10. Apex Laboratories, LLC: Tigard, OR. June 20.

EPA. 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* EPA publication SW-846. 3rd ed. U.S. Environmental Protection Agency. Final updates I (1993), II (1995), IIA (1994), IIB (1995), III (1997), IIIA (1999), IIIB (2005), IV (2008), V (2015), VI phase I (2017), VI phase II (2018), VI phase III (2019), VII phase I (2019), and VII phase II (2020).

EPA. 2020a. *National Functional Guidelines for Inorganic Superfund Methods Data Review.* EPA 542-R-20-006. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation: Washington, DC. November.

EPA. 2020b. *National Functional Guidelines for Organic Superfund Methods Data Review.* EPA 540-R-20-005. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation: Washington, DC. November.

FBI. 2019. *Quality Assurance Manual.* Rev. 17. Friedman & Bruya, Inc.: Seattle, WA. November 6.