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August 18, 2023
Project No. M0615.20.008

Steve Teel, LHG, Cleanup Project Manager/Hydrogeologist
Washington State Department of Ecology
Toxics Cleanup Program, Southwest
P.O. Box 47775
Olympia, WA 98504

Re: Supplemental Investigation, Port Parcel 110
Taylor Way and Alexander Avenue Fill Area

Dear Steve Teel:

On behalf of the Port of Tacoma (the Port), Maul Foster & Alongi, Inc. (MFA), has prepared this investigation report to describe the field activities performed and data collected to support the ongoing data gaps investigation at the Taylor Way and Alexander Avenue Fill Area Site (TWAAFA site) (Facility/Site ID No. 1403183; Cleanup Site ID No. 4692). This report describes investigation activities at the Port-owned Parcel 110 property, located at 3401 Lincoln Avenue in Tacoma, Washington (the Parcel 110 Property) (see Figure 1).

MFA performed field activities at the Parcel 110 Property consistent with the Washington State Department of Ecology (Ecology)-approved *Supplemental Investigation Work Plan* (MFA 2023).

Purpose

The investigation activities described in this report were conducted in response to Ecology's November 9, 2022, comments (Ecology 2022) on quarterly groundwater monitoring results at the TWAAFA site. First and second quarter 2022 groundwater monitoring data at CCW-1A showed concentrations of trichloroethene (TCE) exceeding Model Toxics Control Act (MTCA) Method B groundwater vapor intrusion (VI) screening levels for commercial workers (DOF 2022a,b). Ecology requested additional investigation of "soil vapor and/or groundwater" southeast of monitoring well CCW-1A (Ecology 2022).

The field investigation activities described in this report included investigation on the Parcel 110 Property for chlorinated volatile organic compounds (CVOCs) in soil and groundwater hydraulically downgradient from monitoring well CCW-1A. MFA also assessed CVOCs in soil and soil gas near the historical sampling location SG-3, where TCE was previously detected above sub-slab soil gas MTCA Method C non-cancer screening levels.

Background

Property Description

The Parcel 110 Property (Pierce County tax parcel number 321351051) is an approximately 9-acre lot located southeast-adjacent to the TWAAFA site (see Figures 1 and 2). Parcel 110 is occupied by

the Port's tenant, Article, a furniture manufacturer that uses a building on the Parcel 110 Property for warehousing and shipping furniture. A wood-framed structure referred to as the Educator Building (Floyd Snider 2007) formerly existed on Parcel 110 and was demolished between 2018 and 2019.

The Parcel 110 Property is generally flat and situated approximately 10 to 15 feet above mean sea level (Floyd Snider 2007). At nearby monitoring wells CCW-1A, CCW-1B, and CCW-8B, located on the CleanCare parcel within the TWAAFA site, groundwater elevation fluctuates seasonally with groundwater often encountered at less than 5 feet below ground surface (bgs) in the winter and spring; CCW-1A has been observed as dry during summer monitoring events (DOF 2022c).

Property History and Previous Investigations

In 2007, Floyd Snider prepared a Phase I environmental site assessment for the Parcel 110 Property that identified recognized environmental conditions including potential groundwater contamination originating from a landfill at the adjacent CleanCare property (Floyd Snider 2007).

In 2010, Environmental Partners, Inc., prepared a site assessment and closure report documenting the cleanup of soil impacted by motor oil released from a railcar at the railroad spur east of the Parcel 110 Property (EPI 2010). Soil samples did not exhibit concentrations of volatile organic compounds (VOCs), fuel additives, or petroleum compounds above MTCA Method A screening levels.

In 2018, Floyd Snider collected soil, reconnaissance groundwater, and soil gas samples from the Parcel 110 Property as part of a Phase II environmental site assessment (Floyd Snider 2018) (see Figure 2). VOCs were non-detect in soil and groundwater samples except for one detection of vinyl chloride in groundwater at 0.21 micrograms per liter (ug/L). Soil gas samples from three locations (SG-1 through SG-3) were analyzed for VOCs. The following VOCs (locations) exceeded the sub-slab soil gas MTCA Method C non-cancer screening level:

- Acetaldehyde (SG-1)
- Acrolein (SG-1 and SG-2)
- TCE (SG-3)

Floyd Snider noted that acetaldehyde and acrolein were associated with former operations at the Educator Building and the sources of these chemicals ceased when former tenant operations ceased. Sources of TCE near location SG-3 were not identified.

In 2018, a stormwater line originating from the adjacent CleanCare property was encountered and capped (Ecology 2018) and two underground storage tanks (USTs) (an 8,000-gallon heavy heating oil UST and a 400-gallon diesel heating oil UST) were encountered and removed during demolition of the Educator Building (ES 2018). A total of 65 tons of diesel impacted soil was removed during the excavation. Confirmation sampling was conducted around both USTs and the results indicated petroleum hydrocarbon concentrations remained below MTCA Method A screening levels.

In 2019, the current warehouse building with a dedicated stormwater system was constructed on the Parcel 110 Property. The building was constructed with a 6-inch-thick concrete slab-on-grade foundation, with a sub-slab vapor barrier beneath the office areas (see Figure 2).

Field Investigation Activities

On June 27 and 28, 2023, MFA conducted fieldwork activities in accordance with the Ecology-approved *Supplemental Investigation Work Plan* (MFA 2023). Investigation and sampling methods were performed consistent with the *Final Data Gaps Sampling and Analysis Plan* and *Soil Vapor*

Sampling and Analysis Plan (Appendixes K and M, respectively, of the *Final Data Gaps Work Plan* [DOF 2020]). Field photographs from the investigation are provided in Attachment A.

MFA coordinated public and private utility locates to identify subsurface utilities in the proposed investigation areas on the Parcel 110 Property. Under MFA oversight, Anderson Environmental Contracting, LLC, of Kelso, Washington, advanced two borings (TWA-11 and TW-14) using direct-push drilling methods (see Figure 3). Boring TWA-11 was advanced to 12 feet bgs near the northwestern side of the Parcel 110 Property, hydraulically downgradient from monitoring well CCW-1A. BoringTW-14 was advanced to 10 feet bgs near the northeast corner of the Parcel 110 Property, near historical soil-gas sampling location SG-3. Neither boring penetrated the silt layer separating the shallow and deep aquifers that have been observed beneath the TWAAFA site. Locations were recorded in the field using a handheld GPS device.

MFA prepared geologic boring logs for each location under the direct supervision of a geologist licensed in the State of Washington (see Attachment B). Soil types were described; visual and olfactory observations recorded; and soil headspace screened for VOCs using a photoionization detector. A piece of textile (potentially a geotextile or landscaping fabric) was observed at 2.5 feet bgs in the soil core retrieved from TWA-11. Soil conditions during drilling generally consisted of sandy silty gravel/silty sandy gravel to approximately 6 feet bgs overlaying a unit of silty sand/sandy silt to a maximum observed depth of 12 feet bgs. No visual or olfactory indications of contamination were observed in soil from either location.

Soil Sampling

At TWA-11, field staff collected one soil sample from the capillary fringe immediately above the water table (between 6.4 and 6.6 feet bgs). Groundwater was not encountered at TW-14, so MFA field staff collected two soil samples (a primary and a field duplicate) between 5.9 and 6.1 feet bgs. TW-14 was backfilled with hydrated bentonite and the ground surface was restored to match existing grade.

All soil samples were collected with a disposable core sampler operated using a gloved hand and were transferred directly into labeled, laboratory-supplied containers to analyze for CVOCs.

Groundwater Sampling

Following soil sample collection, TWA-11 was converted to a permanent monitoring well. The well was constructed from a 2-inch-diameter polyvinyl chloride well casing with a 5 foot well screen set from 7 to 12 feet bgs. MFA field staff developed the well using a bailer and removed approximately 7 gallons of water until turbidity was visibly reduced. Field staff continued purging with a peristaltic pump set at a low flow rate (i.e., less than 500 milliliters per minute). During purging, volume removed, water levels, and water quality parameters (pH, temperature, specific conductance, and turbidity) were recorded on a well development form (see Attachment C). MFA ceased purging when the minimum well bore volume was removed and water quality field parameters stabilized within the acceptance criteria specified in Appendix L of the *Final Data Gaps Work Plan* (DOF 2020).[1] In total, approximately 10.6 gallons of water were removed during purging.

Approximately 24 hours after well development, MFA field staff collected two groundwater samples (a primary and a field duplicate) from TWA-11. MFA purged the well using a peristaltic pump, and

[1] Acceptance criteria for new monitoring well development states that at least three well volumes have been removed and water quality parameters have stabilized for three consecutive readings: turbidity is below 5 nephelometric turbidity units, specific conductivity within 10 percent of previous reading, and pH within 0.5 standard units of the previous reading (DOF 2020).

purge volumes, water levels, and water quality parameters (pH, temperature, specific conductance, dissolved oxygen, oxygen-reduction potential, and turbidity) were recorded on a water field sampling data sheet (see Attachment D). Once water quality parameters stabilized within acceptance criteria, field staff collected groundwater samples directly into laboratory-supplied containers for analysis for CVOCs.

Groundwater was not encountered at TW-14 and therefore a reconnaissance groundwater sample was not collected.

Soil Gas Sampling

Because groundwater at TW-14 was sufficiently low to expose the vadose zone (i.e., greater than 5 feet bgs), a soil gas sample (TWSV-1) was collected at 5 feet bgs from a stepped-out location approximately 1 foot from TW-14 (see Figure 3 and photograph 5 in Attachment A). Soil gas sampling used the post-run tubing methodology described in the *Supplemental Investigation Work Plan* (MFA 2023). Initially, field staff encountered issues setting the vapor pin and achieving a satisfactory seal with a new O-ring. Once successfully set and sealed, an equilibration period longer than 60 minutes was observed.

After the equilibration period, the line was purged, and purge and leak tests were performed. Helium was introduced as the leak-check compound. After successful completion of the purge and leak tests, a soil gas sample was collected into a laboratory-supplied 1-liter stainless steel Summa canister for analysis for CVOCs. Field data before and after sampling, including start and stop times and initial and final canister vacuum readings, were recorded on a soil gas sampling data sheet (see Attachment E).

Management of Investigation-Derived Waste

Investigation-derived waste (i.e., soil cuttings and purge water) was drummed, labeled, and stored on the Parcel 110 Property in Washington State Department of Transportation-approved containers, pending offsite disposal.

Analytical Methods and Quality Control/Quality Assurance

All samples were submitted to Friedman & Bruya, Inc., a Washington-State accredited laboratory located in Seattle, Washington. Samples were analyzed for the following, consistent with the Ecology-approved *Supplemental Investigation Work Plan*:

- Soil samples from TWA-11 and TW-14 were analyzed for CVOCs by U.S. Environmental Protection Agency (EPA) Method 8260D
- Groundwater samples from TWA-11 were analyzed for CVOCs by EPA Method 8260D
- The soil gas sample from TWSV-1 was analyzed for CVOCs by EPA Method Toxic Organics-15 and helium by ASTM International Method D1946

The analytical laboratory reports are provided as Attachment F. Sample analytical data and the laboratory's internal quality assurance and quality control data were reviewed to assess whether they met project-specific data quality objectives. A data validation memorandum summarizing data evaluation procedures, data usability, and deviations from specific field and/or laboratory methods is included as Attachment G. The data are considered acceptable for their intended use, with appropriate data qualifiers assigned.

Results

Soil

Soil samples from TWA-11 and TW-14 were screened against site-specific screening levels (DOF 2020), which include MTCA Method A for unrestricted land use and Method B values. A summary of soil analytical results is provided in Table 1. Nearly all CVOCs were non-detect in soil samples collected from TWA-11 and TW-14. The only CVOC detection in soil was tetrachloroethene at TWA-11, which was detected at a concentration of 0.0031 milligrams per kilogram, an order of magnitude below the MTCA Method A screening level of 0.05 milligrams per kilogram.

Groundwater

A summary of groundwater analytical results is provided in Table 2. The groundwater samples from TWA-11 were screened against site-specific screening levels, which include MTCA Method A and Method B values. The groundwater samples from TWA-11 were also screened against MTCA Method B groundwater VI screening levels to qualitatively evaluate the VI risk to building occupants at the Parcel 110 Property. Nearly all CVOCs were non-detect in groundwater samples collected from TWA-11. The only CVOC detection in groundwater was vinyl chloride, which was detected at a concentration of 0.021 ug/L,[2] below all screening levels, including the most stringent MTCA Method B screening level of 0.029 ug/L.

First and second quarter 2022 groundwater monitoring at CCW-1A (located approximately 60 feet north-northwest of the warehouse on the Parcel 110 Property) exhibited concentrations (up to 24 ug/L) of TCE above MTCA Method B groundwater VI screening levels for commercial workers (DOF 2022a,b). At TWA-11, TCE was non-detect in groundwater at a method reporting limit below the MTCA Method B groundwater VI screening level.

Soil Gas

A summary of soil gas analytical results is provided in Table 3. The soil gas sample from TWSV-1 was screened against MTCA Method B and Method C sub-slab soil gas VI screening levels. TCE concentrations in soil gas were also compared to the short-term action level of 250 micrograms per cubic meter (ug/m^3). Nearly all CVOCs were non-detect in the soil gas sample collected from TWSV-1. The only CVOC detections in soil gas were cis-1,2-dichloroethene and TCE, which were detected at concentrations below MTCA Method B and C screening levels and the short-term action level for TCE. Helium was not detected in the soil gas sample, confirming that no leaks were detected in the sample train.

In 2018, TCE exceeded the sub-slab soil gas MTCA Method C non-cancer screening level at a concentration of 210 ug/m^3 at sample location SG-3 (see Figure 3). However, as noted in the *Supplemental Investigation Work Plan* (MFA 2023), Floyd Snider collected the sample using post-run tubing methodology at a depth shallower than 5 feet bgs, likely due to the shallow groundwater table. The shallow sampling depth increases the likelihood for ambient air to be drawn into the sampling train. Further, Floyd Snider did not use a leak-check compound to evaluate sample train leaks or ambient air infiltration. During this 2023 investigation, TCE was detected at TWSV-1 at a

[2] Vinyl chloride was detected in the field duplicate sample from TWA-11 at a concentration of 0.026 ug/L.

concentration of 6.5 ug/m^3, well below the 2018 detection at SG-3, below the MTCA Method B and MTCA Method C screening levels, and below the short-term action limit.

Summary

As requested by Ecology, soil and groundwater samples were collected to evaluate whether CVOCs (observed in the nearby CleanCare monitoring well CCW-1A) present a potential VI risk to the building located on the Parcel 110 Parcel Property. A soil gas sample was also collected near a historical sampling location that exhibited TCE concentrations above MTCA Method C screening levels.

Soil and groundwater collected from the downgradient boring/well advanced on Parcel 110 Property (TWA-11) did not exhibit CVOC concentrations above screening levels, including VI screening levels for groundwater.

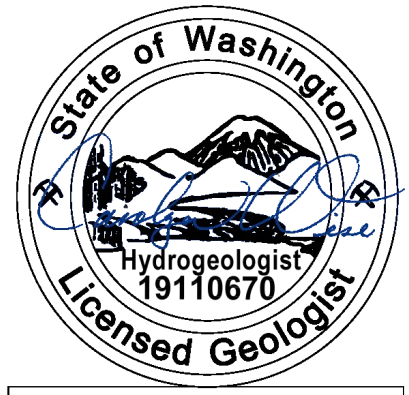
Additionally, CVOCs in the soil gas sample collected near the northeast corner of the Parcel 110 Property (in the vicinity of historical soil gas sample SG-3) were below screening levels; the historical exceedance near this location is not representative of current conditions.

In 2019, the existing building was constructed with a 6-inch-thick concrete slab and vapor barriers installed beneath the offices of the building. Based on the data collected during this investigation and the existing vapor mitigation measures, contaminated groundwater from the CleanCare parcel does not appear to present a VI risk to occupants of the building located on the Parcel 110 Property.

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

Sincerely,

Maul Foster & Alongi, Inc.



8/18/2023

Carolyn Wise, LHG
Project Hydrogeologist

Audrey Hackett
Senior Environmental Scientist

Attachments

References

Limitations

Figures

Tables

A—Photograph Log

B—Boring Logs

C—Well Development Form

D—Water Field Sampling Data Sheet

E—Soil Gas Sampling Data Sheet

F—Analytical Laboratory Reports

G—Data Validation Memorandum

cc: Scott Hooton, Port of Tacoma

Tasya Gray, Dalton Olmsted & Fuglevand

Kim Seely, Coastline Law Group PLLC

Douglas Steding, Northwest Resource Law PLLC

References

DOF. 2020. *Final Data Gaps Work Plan, Taylor Way and Alexander Avenue Fill Area Site, Tacoma, Washington.* Dalton, Olmsted & Fuglevand, Inc.: Seattle, WA. July.

DOF. 2022a. *First Quarter 2022 Groundwater Data Analysis Report, Taylor Way and Alexander Avenue Fill Area Site, Tacoma, Washington.* Dalton, Olmsted, & Fuglevand Inc.: Seattle, WA. May 6.

DOF. 2022b. *Second Quarter 2022 Groundwater Data Analysis Report, Taylor Way and Alexander Avenue Fill Area Site, Tacoma, Washington.* Dalton, Olmsted, & Fuglevand Inc.: Seattle, WA. August 10.

DOF. 2022c. *Third Quarter 2022 Groundwater Data Analysis Report, Taylor Way and Alexander Avenue Fill Area Site, Tacoma, Washington.* Dalton, Olmsted, & Fuglevand Inc.: Seattle, WA. November 23.

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MFA. 2023. *Supplemental Investigation Work Plan, Port Parcel 110 and Potter Property, Taylor Way and Alexander Avenue Fill Area.* Prepared for the Port of Tacoma. Maul Foster & Alongi, Inc.: Seattle, WA. February 21.

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.

Figures

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Note:
TWAAFA = Taylor Way and Alexander Avenue Fill Area.

Legend

- Parcel 110 Property
- TWAAFA Site Boundary

Figure 1
Property Location

Port of Tacoma
Parcel 110
3401 Lincoln Avenue
Tacoma, Washington

0 1,000 2,000
Feet

Data Sources
U.S. Geological Survey (2021) 7.5-minute topographic quadrangle: Tacoma, Washington.
Township 21 North, Range 3 East, Section 35.
Tax parcel obtained from Pierce County Assessor.
TWAAFA site boundary obtained from Exhibit A of Agreed Order No. DE 14260.

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Produced By: sturner
Project: M0615.20.008

Figure 2
Property Features

Port of Tacoma
Parcel 110
3401 Lincoln Avenue
Tacoma, Washington

Legend

- 1994 CleanCare Monitoring Well (Pacific Groundwater Group)

2018 Phase II ESA Samples (Floyd Snider)

- Soil Boring
- Soil Gas Boring
- Soil and Soil Gas Boring
- Soil and Reconnaissance Groundwater Boring
- Vapor Barrier/Office Area
- Former UST
- TWAAFA Site Boundary
- Parcel 110 Property Boundary

Notes
DOF = Dalton, Olmsted & Fuglevand, Inc.
ES = Environmental Specialties.
ESA = environmental site assessment.
TWAAFA = Taylor Way and Alexander Avenue Fill Area.
UST = underground storage tank.

0 30 60
Feet

Data Sources
Aerial photographs obtained from Esri; parcels obtained from Pierce County Assessor; existing monintoring well locations obtained from the DOF 2022 *Final Data Gaps Report*; previous sample locations obtained from Figure 3.1 of the 2018 Floyd Snider *Phase II Environmental Site Assessment* report; vapor barrier locations obtained from the June 2018 Avenue 55 Site Plan; former UST locations obtained from the ES 2018 *Heating Oil Storage Tank Removals Site Assessment, Remediation and Closure Report*.

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Figure 3
Sample Locations

Port of Tacoma
Parcel 110
3401 Lincoln Avenue
Tacoma, Washington

Legend

- 1994 CleanCare Monitoring Well (Pacific Groundwater Group)
- 2018 Soil Gas Boring (Floyd Snider)
- 2023 Soil Gas Boring
- 2023 Soil Boring
- 2023 Monitoring Well
- Vapor Barrier/Office Area
- TWAAFA Site Boundary
- Parcel 110 Property Boundary

Notes
Sample locations were measured in the field using a differential GPS device.
Only detected CVOCs and associated concentrations are shown. Analytical data summaries are provided in Tables 1-3.
CVOC = chlorinated volatile organic compound.
DCE = dichloroethene.
DOF = Dalton, Olmsted & Fuglevand, Inc.
mg/kg = milligrams per kilogram.
PCE = tetrachloroethene.
TCE = trichloroethene.
TWAAFA = Taylor Way and Alexander Avenue Fill Area.
ug/L = micrograms per liter.
ug/m^3 = micrograms per cubic meter.
VC = vinyl chloride.

0 30 60
Feet

Data Sources
Aerial photographs obtained from Esri; parcels obtained from Pierce County Assessor; 1994 monitoring well locations obtained from the DOF 2022 *Final Data Gaps Report*; 2018 soil gas boring locations obtained from Figure 3.1 of the 2018 Floyd Snider *Phase II Environmental Site Assessment Report*; vapor barrier locations obtained from the June 2018 Avenue 55 site plan.

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Tables

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Table 1
Summary of Soil Analytical Results
Parcel 110 Supplemental Investigation, Port of Tacoma

Location:	MTCA Method A, Unrestricted Land Use[1]	MTCA Method B[a][1]	TWA-11	TW-14	
Sample Name:			TWA-11_6.4-6.6_0627	TW-14_5.9-6.1_0627	TW-9-14_5.9-6.1_0627
Sample Date:			06/27/2023	06/27/2023	06/27/2023
Sample Type:			N	N	FD
Sample Depth (ft bgs):			6.4-6.6	5.9-6.1	5.9-6.1
VOCs (mg/kg)					
1,1,1-Trichloroethane	2	160,000	0.002 U	0.002 U	0.002 U
1,1-Dichloroethane	NV	180	0.002 U	0.002 U	0.002 U
1,1-Dichloroethene	NV	4,000	0.002 U	0.002 U	0.002 U
1,2-Dichloroethane	NV	11	0.002 U	0.002 U	0.002 U
Chloroethane	NV	NV	0.1 U	0.1 U	0.1 U
cis-1,2-Dichloroethene	NV	160	0.002 U	0.002 U	0.002 U
Methylene chloride	0.02	94	0.2 U	0.2 U	0.2 U
Tetrachloroethene	0.05	480	0.0031	0.002 U	0.002 U
trans-1,2-Dichloroethene	NV	1,600	0.002 U	0.002 U	0.002 U
Trichloroethene	0.03	12	0.002 U	0.002 U	0.002 U
Vinyl chloride	NV	0.67	0.002 U	0.002 U	0.002 U

Notes

Detected results were compared with screening criteria. There were no exceedances.

FD = field duplicate sample.

ft bgs = feet below ground surface.

mg/kg = milligrams per kilogram.

MTCA = Model Toxics Control Act.

N = normal environmental sample.

NV = no value.

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

VOC = volatile organic compound.

[a]Lower of cancer and noncancer values are shown.

Reference

[1]Ecology. 2023. *Cleanup Levels and Risk Calculation (CLARC) table.* Washington State Department of Ecology, Toxics Cleanup Program: Union Gap, WA. January.

Table 2
Summary of Groundwater Analytical Results
Parcel 110 Supplemental Investigation, Port of Tacoma

Location:	MTCA Method A[1]	MTCA Method B[a][1]	MTCA Method B, Vapor Intrusion, Groundwater[a][1]	TWA-11	
Sample Name:				TWA-11_7-12_0628	TWA-9-11_7-12_0628
Sample Date:				06/28/2023	06/28/2023
Sample Type:				N	FD
Sample Depth (ft bgs):				10	10
VOCs (ug/L)					
1,1,1-Trichloroethane	200	16,000	5400	1 U	1 U
1,1-Dichloroethane	NV	7.7	11	1 U	1 U
1,1-Dichloroethene	NV	400	130	1 U	1 U
1,2-Dichloroethane	5	0.48	3.5	0.2 U	0.2 U
Chloroethane	NV	NV	15,000	1 U	1 U
cis-1,2-Dichloroethene	NV	16	180	1 U	1 U
Methylene chloride	5	5.8	780	5 U	5 U
Tetrachloroethene	5	21	25	1 U	1 U
trans-1,2-Dichloroethene	NV	160	77	1 U	1 U
Trichloroethene	5	0.54	1.4	0.5 U	0.5 U
Vinyl chloride	0.2	0.029	0.33	0.021	0.026

Notes

Detected results were compared with screening criteria. There were no exceedances.

FD = field duplicate sample.

ft bgs = feet below ground surface.

MTCA = Model Toxics Control Act.

N = normal environmental sample.

NV = no value.

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

ug/L = micrograms per liter.

VOC = volatile organic compound.

[a]Lower of cancer and noncancer values are shown.

Reference

[1]Ecology. 2023. *Cleanup Levels and Risk Calculation (CLARC) table.* Washington State Department of Ecology, Toxics Cleanup Program: Union Gap, WA. January.

Table 3
Summary of Soil Gas Analytical Results
Parcel 110 Supplemental Investigation, Port of Tacoma

Location:	MTCA Method B, Vapor Intrusion, Sub-Slab Soil Gas[a][1]	MTCA Method C, Vapor Intrusion, Sub-Slab Soil Gas[a][1]	Short-Term Action Level, Subsurface Soil Gas, Nonresidential[2]	TWSV-1
Sample Name:				TWSV-1-062723
Sample Date:				06/27/2023
VOCs (ug/m^3)				
1,1,1-Trichloroethane	76,000	170,000	NV	4.7 U
1,1,2-Trichloroethane	3	6.7	NV	0.48 U
1,1-Dichloroethane	52	520	NV	3.5 U
1,1-Dichloroethene	3,000	6,700	NV	3.4 U
1,2-Dichloroethane	3.2	32	NV	0.35 U
Chloroethane	150,000	330,000	NV	23 U
cis-1,2-Dichloroethene	610	1,300	NV	5.5
Tetrachloroethene	320	1,300	NV	59 U
trans-1,2-Dichloroethene	610	1,300	NV	3.4 U
Trichloroethene	11	67	250	6.5
Vinyl chloride	9.5	95	NV	2.2 U

Notes

Detected results were compared with screening criteria. There were no exceedances.

MTCA = Model Toxics Control Act.

NV = no value.

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

ug/m^3 = micrograms per cubic meter.

VOC = volatile organic compound.

[a]Lower of cancer and noncancer values are shown.

Reference

[1]Ecology. 2023. *Cleanup Levels and Risk Calculation (CLARC) table.* Washington State Department of Ecology, Toxics Cleanup Program: Union Gap, WA. January.

[2]Ecology. 2022. *Guidance for Evaluating Vapor Intrusion in Washington State.* Publication No. 09-09-047. Washington State Department of Ecology, Toxics Cleanup Program: Olympia, WA. March.

Attachment A

Photograph Log

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Photographs

Project Name: Supplemental Investigation, Port Parcel 110
Project Number: M0615.20.008
Location: 3401 Lincoln Avenue, Tacoma, Washington

Photo No. 1.

Description

Geoprobe drill rig at location TWA-11 near the northern corner of 3401 Lincoln Avenue, Tacoma, Washington (the Parcel 110 Property). Photograph taken during field activities on June 27, 2023.

Photo No. 2.

Description

Unknown material (potentially a piece of textile fabric) observed at 2.5 feet below ground surface (bgs) from soil boring taken from TWA-11 on the northern portion of the Parcel 110 Property. Photograph taken during field activities on June 27, 2023.

Photographs

Project Name: Supplemental Investigation, Port Parcel 110
Project Number: M0615.20.008
Location: 3401 Lincoln Avenue, Tacoma, Washington

Photo No. 3.

Description

Soil core from 0 to 12 feet bgs taken from location TWA-11 on the northern portion of the Parcel 110 Property. Photograph taken during field activities on June 27, 2023.

Photo No. 4.

Description

Soil core from 0 to 10 feet bgs taken from location TW-14 on the southeast portion of the Parcel 110 Property. Photograph taken during field activities on June 27, 2023.

Photographs

Project Name: Supplemental Investigation, Port Parcel 110
Project Number: M0615.20.008
Location: 3401 Lincoln Avenue, Tacoma, Washington

Photo No. 5.

Description

Soil vapor sample train at location TWSV-1 (stepped out approximately 1 foot from soil boring TW-14) on the southeast portion of the Parcel 110 Property. Photograph taken during field activities on June 27, 2023.

Photo No. 6.

Description

Investigation-derived waste (IDW) container locations on the eastern portion of the Parcel 110 Property. Photograph taken during field activities on June 27, 2023.

Photographs

Project Name: Supplemental Investigation, Port Parcel 110
Project Number: M0615.20.008
Location: 3401 Lincoln Avenue, Tacoma, Washington

Photo No. 7.

Description

IDW drum label for soil cuttings. Photograph taken during field activities on June 27, 2023.

Photo No. 8.

Description

IDW drum label for water. Photograph taken during field activities on June 27, 2023.

Photographs

Project Name: Supplemental Investigation, Port Parcel 110
Project Number: M0615.20.008
Location: 3401 Lincoln Avenue, Tacoma, Washington

Photo No. 9.

Description

Groundwater sample collection set up at monitoring well TWA-11 on the northern portion of the Parcel 110 Property. Photograph taken during groundwater sampling on June 28, 2023.

Attachment B

Boring Logs

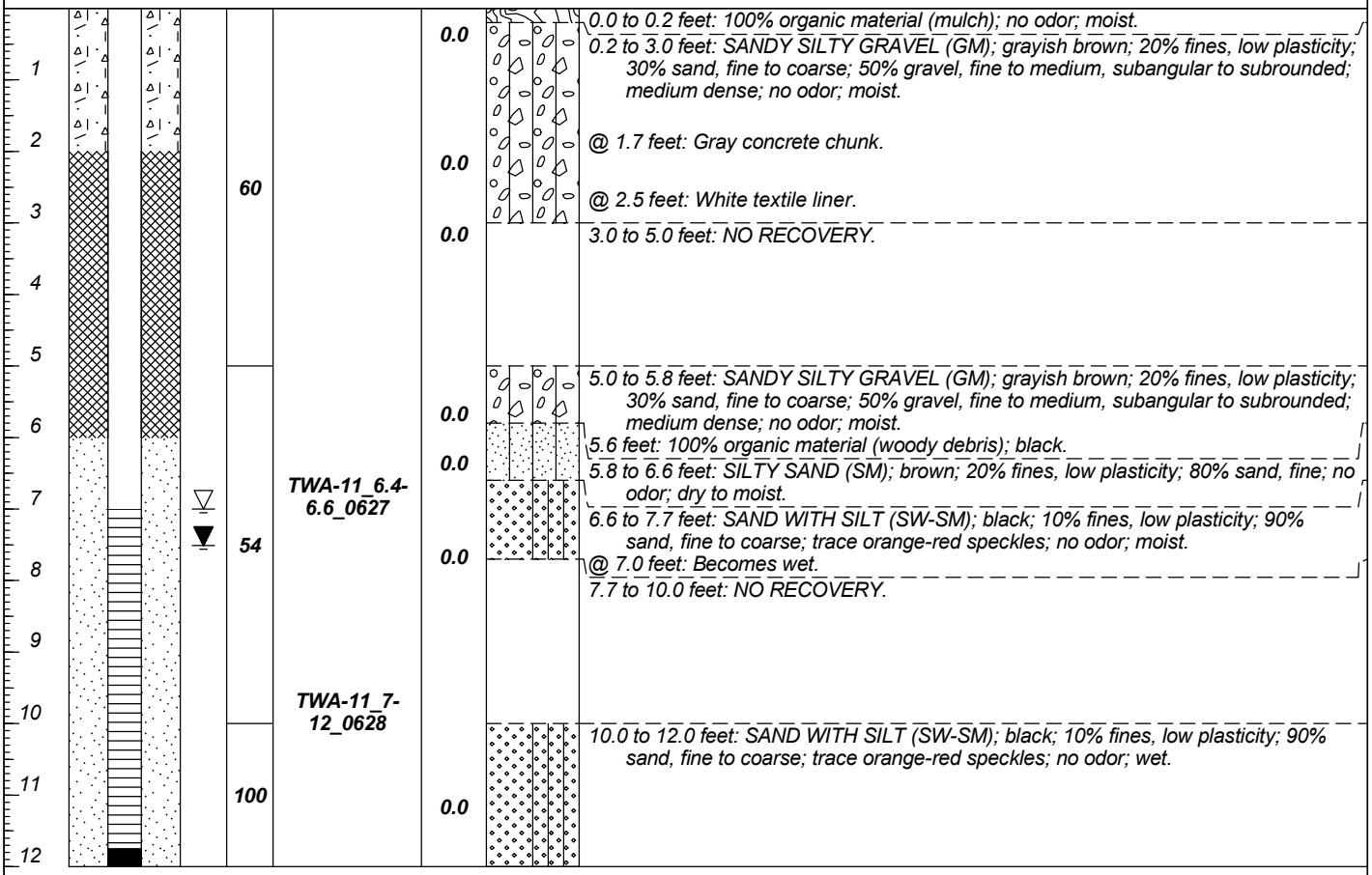
MAUL FOSTER ALONGI

Geologic Borehole Log

MAUL FOSTER ALONG

Project Number	Well Number	Sheet
M0615.20.008	**TWA-11**	**1 of 1**

Project Name	**Parcel 110 Investigation**	TOC Elevation (feet)	
Project Location	**3401 Lincoln Avenue, Tacoma, WA**	Surface Elevation (feet)	
Start/End Date	**6/27/2023 to 6/27/2023**	Northing	
Driller/Equipment	**Anderson Environmental Contracting, LLC/Direct-Push Probe**	Easting	
Geologist/Engineer	**A. Bixby**	Total Depth of Borehole	**12.0 feet**
Sample Method	**Core Barrel**	Outer Hole Diam	**4.25 inch**



Total Depth = 12.0 feet bgs

NOTES:

1. Depths are relative to feet below ground surface. 2. bgs = below ground surface. 3. ID = identification. 4. PID = photoionization detector. 5. ppm = parts per million.

Borehole Completion Details
0.0 to 12.0 feet bgs: 2.25-inch borehole.

Monitoring Well Completion Details
0.0 to 2.0 feet bgs: Concrete.
2.0 to 6 feet bgs: Bentonite chips hydrated with potable water.
6.0 to 12.0 feet bgs: 12x20 Colorado silica sand filter pack.

Washington State Department of Ecology Well No. BNM694
Traffic grade, flush-mounted monitoring well monument.
0.0 to 7.0 feet bgs: 2-inch diameter, schedule 40, PVC blank riser pipe.
7.0 to 12.0 feet bgs: 2-inch diameter, schedule 40, 0.010-inch machine slot PVC, prepacked well screen (12/20 Colorado silica sand).
12.0 to 12.25 feet: 2-inch-diameter, flush-threaded PVC end cap.

▽ Water level at approximately 7.0 feet bgs at time of drilling on 6/27/2023. ▼ Depth to water was 7.51 feet bgs at 10:40 on 6/28/2023 prior to groundwater sampling.

MFA BOREHOLE W/WELL W:\GINT\GINTWPROJECTS\0615.20.008\PARCEL 110 INVESTIGATION.GPJ 8/9/23

Geologic Borehole Log

MAUL FOSTER ALONG

Project Number	Well Number	Sheet
M0615.20.008	**TW-14**	**1 of 1**

Project Name	**Parcel 110 Investigation**	TOC Elevation (feet)	
Project Location	**3401 Lincoln Avenue, Tacoma, WA**	Surface Elevation (feet)	
Start/End Date	**6/27/2023 to 6/27/2023**	Northing	
Driller/Equipment	**Anderson Environmental Contracting, LLC/Direct-Push Probe**	Easting	
Geologist/Engineer	**A. Bixby**	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: PID (ppm)	Lithologic Column	Soil Description
1				0.0		@ 0.0 to 0.2 feet: Asphalt; gray; no odor; dry. 0.2 to 1.1 feet: SILTY SANDY GRAVEL (GM); brownish gray; 30% fines, low plasticity; 20% sand, fine to coarse; 50% gravel, fine to medium, subangular to subrounded; medium dense; no odor; dry.
2				0.0		@ 0.7 feet: Becomes moist. 1.1 to 1.5 feet: CONCRETE; gray; pulverized; dry.
3		54				1.5 to 2.7 feet: SILTY SANDY GRAVEL (GM); brownish gray; 30% fines, low plasticity; 20% sand, fine to coarse; 50% gravel, fine to medium, subangular to subrounded; medium dense; no odor; dry. 2.7 to 5.0 feet: NO RECOVERY.
4						
5						
6			TWSV-1_062723	0.0		5.0 to 5.7 feet: SILTY SANDY GRAVEL (GM); brownish gray; 30% fines, low plasticity; 20% sand, fine to coarse; 50% gravel, fine to medium, subangular to subrounded; medium dense; no odor; dry.
7			TW-14_5.9-6.1_0627 TW-9-14_5.9-6.1_0627	0.0		5.7 to 6.5 feet: SANDY GRAVELLY SILT (ML); dark brownish gray; 60% fines, low plasticity; 20% sand, fine to coarse; 20% gravel, fine to coarse, subangular to subrounded; medium dense; no odor; moist.
8		52		0.0		6.5 to 7.0 feet: SILTY GRAVELLY SAND (SM); blackish brown; 30% fines, low plasticity; 50% sand, fine to coarse; 20% gravel, fine to medium, subangular to subrounded; medium dense; no odor; moist. @ 6.8 feet: Trace organic material (wood).
9						7.0 to 7.6 feet: Blackish brown; 100% organic material (wood). 7.6 to 10.0 feet: NO RECOVERY.
10						

Total Depth = 10.0 feet bgs

NOTES:

1. Depths are relative to feet below ground surface. 2. bgs = below ground surface. 3. ID = identification. 4. PID = photoionization detector. 5. ppm = parts per million. 6. Soil gas sample TWSV-1_062723 was collected at 5.0 feet bgs from an adjacent boring within a 5-foot radius of TWA-14.

Borehole Completion Details
0.0 to 10.0 feet bgs: 2.25-inch borehole.

Borehole Abandonment Details
0.0 to 10.0 feet: Borehole backfilled with bentonite.

Attachment C

Well Development Form

MAUL FOSTER ALONGI

MAUL FOSTER ALONGI

Well Development Form

Project No.:	M0615.20.008	Date:	6/27/2023
Site Location:	Parcel 110; 3401 Lincoln Avenue, Tacoma, WA	Well:	TWA-11
Name:	J. Lenahansen	Initial DTB: 11.92 ft	Final DTB: 11.93 ft
Development Method:	Surge and purge	Initial DTW: 7.51 ft	Final DTW: 7.51 ft
Total Water Removed:	10.6 gallons	Pore Volume:	1.26 gallons
Water Contained:	5-gallon buckets	Casing Diameter:	2 inches

Time	Cumltv. Vol Removed (gal)	Turbidity (NTU)	pH	Conductivity (uS/cm)	Temp (°C)	DO (mg/L)	ORP	Comments
10:00	7.25	309	6.86	0.73	17.6	--	--	
10:15	8	18.1	6.91	0.75	16.9	--	--	
10:30	9.0	6.42	6.91	0.75	16.8	--	--	
10:40	9.5	3.30	6.89	0.75	16.8	--	--	
10:45	9.8	2.73	6.93	0.75	16.8	--	--	
10:50	10.0	2.34	6.91	0.74	16.8	--	--	
10:55	10.3	2.29	6.91	0.74	16.8	--	--	
11:00	10.6	--	--	--	--	--	--	Stop purging well.

Notes:

PID reading prior to well development was 0.0 parts per million.

Cumltv. = cumulative.

DO = dissolved oxygen.

DTB = depth to bottom.

DTW = depth to water.

ft = feet.

gal = gallon.

mg/L = milligrams per liter.

NTU = nephelometric turbidity unit.

ORP = oxygen reduction potential.

PID = photoionization detector.

uS/cm = microsiemens per centimeter.

Attachment D

Water Field Sampling Data Sheet

MAUL FOSTER ALONGI

Water Field Sampling Data Sheet
Parcel 110—Port of Tacoma
3401 Lincoln Avenue, Tacoma, Washington

MAUL FOSTER ALONGI

Client Name	Port of Tacoma	**Sampling Location**	TWA-11
Project #	M0615.20.008	**Sampling Date**	06/28/2023
Project Name	Parcel 110 Subsurface Investigation	**Sampler(s)**	A. Bixby
Sampling Event	June 2023	**Sample Name**	TWA-11_7-12_0628
Sub Area	Parcel 110		
FSDS QA	F. Bellows	**Sample Depth**	10.0
Hydrology/Level Measurements		**Purge Method**	Peristaltic pump

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Pore Volume
06/28/2023	10:40	11.93	--	7.51	--	4.42	1.26

All depths measured from top of casing of monitoring well.

Water Quality Data

Time	Purge Volume	Water Level	Flowrate (L/min)	pH	Temp (C)	E Cond (uS/cm)	DO (mg/L)	ORP (mV)	Turbidity
BEGAN PURGE AT: 10:45; allowed to clear prior to taking readings with water quality meter.									
11:15	1.5	7.54	0.3	6.91	16.2	730	0.36	-237.0	6.52
11:18	1.6	7.54	0.3	6.91	16.2	729	0.34	-250.1	6.32
11:21	1.7	7.55	0.3	6.91	16.2	727	0.33	-257.6	6.17
11:24	1.9	7.55	0.3	6.92	16.3	720	0.35	-265.6	5.78
11:27	2.0	7.55	0.3	6.89	16.2	720	0.31	-261.7	5.31
11:30	2.2	7.55	0.3	6.91	16.2	722	0.29	-266.3	5.49

Water Quality Observations:

Initially slightly turbid, then clear; no tint; no odor; no sheen.

Sample Information:

Sampling Method	Sample Type	Sampling Time	Container Code/Preservative	#	Filtered
Peristaltic pump	Groundwater	11:40	VOA-Glass	3	N
			Amber Glass		
			Yellow Poly		
			Green Poly		
			Red Total Poly		
			Red Dissolved Poly		
			Total Bottles	3	

General Sampling Comments:

Casing diameter = 2 inches; well borehole diameter = 4.25 inches.

Field duplicate TWA-9-11_7-12_0628 collected here.

Equipment Used:

Water Level Meter: Solinst Model 101 P7; Serial No. 531501

Water Quality Meter: YSI Pro Plus; Serial No. 19M100460

Turbidity Meter: Hach 2100P; Serial No. 040500036330

Total purge volume prior to sampling: 2.2 gallons

Attachment E

Soil Gas Sampling Data Sheet

MAUL FOSTER ALONGI

Soil Gas Sampling Data Sheet
Parcel 110—Port of Tacoma
3401 Lincoln Avenue, Tacoma, Washington

Sample ID	Date	Shut-in Test Pass/ Fail	Summa Canister ID	Manifold ID	Canister Size (L)	Purge				Helium		Sample			
						Begin Time	End Time	Volume (L)	Helium (ppm)	Indoor Ambient Air (ppm)	Under Shroud (%) (ideal = 40)	Begin Time	End Time	Initial Pressure ("Hg)	Final Pressure ("Hg)
TWSV-1-062723	6/27/2023	Pass	3230	301	1	16:37	16:42	1	17,125	0	49.9	16:51	16:56	-29.5	-5
TWSV-2-062723[(a)]	6/27/2023	Pass	3281	241	1	17:40	17:45	1	17,000	0	41.7	17:47	17:52	-30+	-5

Notes:

To avoid data rejection during validation, the amount of helium in the sample must be less than 5% of the helium concentration under the shroud. For example, if there is 50% helium in the shroud, your sample may contain up to 2.5%, (25,000 ppm) helium.

1% = 10,000 ppm.

"Hg = inches of mercury.

ID = identification.

L = liter.

ppm = parts per million.

[(a)]Soil gas sample TWSV-2-062723 was collected as a contingency in case soil gas sample TWSV-1-062723 did not pass the helium quality assurance check. TWSV-1-062723 was non-detect for helium; therefore, TWSV-2-062723 was not analyzed.

Attachment F

Analytical Laboratory Reports

MAUL
FOSTER
ALONGI

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.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

August 3, 2023

Audrey Hackett, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Hackett:

Included is the amended report from the testing of material submitted on June 28, 2023 from the Parcel 110 M0615.20.008, F&BI 306442 project. Per your request, two sample IDs have been amended.

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
c: Amanda Bixby, Fiona Bellows
MFA0707R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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Eric Young, B.S.

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July 7, 2023

Audrey Hackett, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Hackett:

Included are the results from the testing of material submitted on June 28, 2023 from the Parcel 110 M0615.20.008, F&BI 306442 project. There are 13 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Amanda Bixby MFA0707R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 28, 2023 by Friedman & Bruya, Inc. from the Maul Foster Alongi Parcel 110 M0615.20.008, F&BI 306442 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
306442 -01	TWA-11_6.4-6.6_0627
306442 -02	TWA-11_10.9-11.1_0627
306442 -03	TW-14_5.9-6.1_0627
306442 -04	TW-9-14_5.9-6.1_0627
306442 -05	Trip Blank 1-0627
306442 -06	TWA-11_7-12_0628
306442 -07	TWA-9-11_7-12_0628

All quality control requirements were acceptable.

Date of Report: 07/07/23
Date Received: 06/28/23
Project: Parcel 110 M0615.20.008, F&BI 306442
Date Extracted: NA
Date Analyzed: 06/29/23

RESULTS FROM THE ANALYSIS OF THE SOIL SAMPLES FOR PERCENT MOISTURE USING ASTM D2216-98

Sample ID Laboratory ID	% Moisture
TWA-11_6.4-6.6_0627 306442-01	11
TW-14_5.9-6.1_0627 306442-03	9
TW-9-14_5.9-6.1_0627 306442-04	5

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition LL

Client Sample ID:	TWA-11_6.4-6.6_0627	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/03/23	Lab ID:	306442-01 1/0.5
Date Analyzed:	07/03/23	Data File:	070310.D
Matrix:	Soil	Instrument:	GCMS13
Units:	mg/kg (ppm) Dry Weight	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	104	84	120
Toluene-d8	101	73	128
4-Bromofluorobenzene	95	57	146

Compounds:	Concentration mg/kg (ppm)
Vinyl chloride	<0.002
Chloroethane	<0.1
1,1-Dichloroethene	<0.002
Methylene chloride	<0.2
trans-1,2-Dichloroethene	<0.002
1,1-Dichloroethane	<0.002
cis-1,2-Dichloroethene	<0.002
1,2-Dichloroethane (EDC)	<0.002
1,1,1-Trichloroethane	<0.002
Trichloroethene	<0.002
Tetrachloroethene	0.0031

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition LL

Client Sample ID:	TW-14_5.9-6.1_0627	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/03/23	Lab ID:	306442-03 1/0.5
Date Analyzed:	07/03/23	Data File:	070311.D
Matrix:	Soil	Instrument:	GCMS13
Units:	mg/kg (ppm) Dry Weight	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	84	120
Toluene-d8	102	73	128
4-Bromofluorobenzene	96	57	146

Compounds:	Concentration mg/kg (ppm)
Vinyl chloride	<0.002
Chloroethane	<0.1
1,1-Dichloroethene	<0.002
Methylene chloride	<0.2
trans-1,2-Dichloroethene	<0.002
1,1-Dichloroethane	<0.002
cis-1,2-Dichloroethene	<0.002
1,2-Dichloroethane (EDC)	<0.002
1,1,1-Trichloroethane	<0.002
Trichloroethene	<0.002
Tetrachloroethene	<0.002

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition LL

Client Sample ID:	TW-9-14_5.9-6.1_0627	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/03/23	Lab ID:	306442-04 1/0.5
Date Analyzed:	07/03/23	Data File:	070312.D
Matrix:	Soil	Instrument:	GCMS13
Units:	mg/kg (ppm) Dry Weight	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	84	120
Toluene-d8	102	73	128
4-Bromofluorobenzene	99	57	146

Compounds:	Concentration mg/kg (ppm)
Vinyl chloride	<0.002
Chloroethane	<0.1
1,1-Dichloroethene	<0.002
Methylene chloride	<0.2
trans-1,2-Dichloroethene	<0.002
1,1-Dichloroethane	<0.002
cis-1,2-Dichloroethene	<0.002
1,2-Dichloroethane (EDC)	<0.002
1,1,1-Trichloroethane	<0.002
Trichloroethene	<0.002
Tetrachloroethene	<0.002

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition LL

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/03/23	Lab ID:	03-1525 mb 1/0.5
Date Analyzed:	07/03/23	Data File:	070309.D
Matrix:	Soil	Instrument:	GCMS13
Units:	mg/kg (ppm) Dry Weight	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	84	120
Toluene-d8	102	73	128
4-Bromofluorobenzene	98	57	146

Compounds:	Concentration mg/kg (ppm)
Vinyl chloride	<0.002
Chloroethane	<0.1
1,1-Dichloroethene	<0.002
Methylene chloride	<0.2
trans-1,2-Dichloroethene	<0.002
1,1-Dichloroethane	<0.002
cis-1,2-Dichloroethene	<0.002
1,2-Dichloroethane (EDC)	<0.002
1,1,1-Trichloroethane	<0.002
Trichloroethene	<0.002
Tetrachloroethene	<0.002

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Trip Blank 1-0627	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/05/23	Lab ID:	306442-05
Date Analyzed:	07/05/23	Data File:	070512.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	71	132
Toluene-d8	101	68	139
4-Bromofluorobenzene	100	62	136

Compounds:	Concentration ug/L (ppb)
Vinyl chloride	<0.02
Chloroethane	<1
1,1-Dichloroethene	<1
Methylene chloride	<5
trans-1,2-Dichloroethene	<1
1,1-Dichloroethane	<1
cis-1,2-Dichloroethene	<1
1,2-Dichloroethane (EDC)	<0.2
1,1,1-Trichloroethane	<1
Trichloroethene	<0.5
Tetrachloroethene	<1

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	TWA-11_7-12_0628	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/05/23	Lab ID:	306442-06
Date Analyzed:	07/05/23	Data File:	070513.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	92	71	132
Toluene-d8	91	68	139
4-Bromofluorobenzene	100	62	136

Compounds:	Concentration ug/L (ppb)
Vinyl chloride	0.021
Chloroethane	<1
1,1-Dichloroethene	<1
Methylene chloride	<5
trans-1,2-Dichloroethene	<1
1,1-Dichloroethane	<1
cis-1,2-Dichloroethene	<1
1,2-Dichloroethane (EDC)	<0.2
1,1,1-Trichloroethane	<1
Trichloroethene	<0.5
Tetrachloroethene	<1

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	TWA-9-11_7-12_0628	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/05/23	Lab ID:	306442-07
Date Analyzed:	07/05/23	Data File:	070514.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	98	71	132
Toluene-d8	103	68	139
4-Bromofluorobenzene	98	62	136

Compounds:	Concentration ug/L (ppb)
Vinyl chloride	0.026
Chloroethane	<1
1,1-Dichloroethene	<1
Methylene chloride	<5
trans-1,2-Dichloroethene	<1
1,1-Dichloroethane	<1
cis-1,2-Dichloroethene	<1
1,2-Dichloroethane (EDC)	<0.2
1,1,1-Trichloroethane	<1
Trichloroethene	<0.5
Tetrachloroethene	<1

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Parcel 110 M0615.20.008
Date Extracted:	07/05/23	Lab ID:	03-1532 mb
Date Analyzed:	07/05/23	Data File:	070507.D
Matrix:	Water	Instrument:	GCMS13
Units:	ug/L (ppb)	Operator:	MD

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	91	71	132
Toluene-d8	94	68	139
4-Bromofluorobenzene	95	62	136

Compounds:	Concentration ug/L (ppb)
Vinyl chloride	<0.02
Chloroethane	<1
1,1-Dichloroethene	<1
Methylene chloride	<5
trans-1,2-Dichloroethene	<1
1,1-Dichloroethane	<1
cis-1,2-Dichloroethene	<1
1,2-Dichloroethane (EDC)	<0.2
1,1,1-Trichloroethane	<1
Trichloroethene	<0.5
Tetrachloroethene	<1

Date of Report: 07/07/23
Date Received: 06/28/23
Project: Parcel 110 M0615.20.008, F&BI 306442

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 306440-03 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Vinyl chloride	mg/kg (ppm)	2	<0.05	78	79	10-138	1
Chloroethane	mg/kg (ppm)	2	<0.5	58	59	10-176	2
1,1-Dichloroethene	mg/kg (ppm)	2	<0.05	85	88	10-160	3
Methylene chloride	mg/kg (ppm)	2	<0.5	81	83	10-156	2
trans-1,2-Dichloroethene	mg/kg (ppm)	2	<0.05	94	95	14-137	1
1,1-Dichloroethane	mg/kg (ppm)	2	<0.05	92	92	19-140	0
cis-1,2-Dichloroethene	mg/kg (ppm)	2	<0.05	94	95	25-135	1
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2	<0.05	94	95	12-160	1
1,1,1-Trichloroethane	mg/kg (ppm)	2	<0.05	97	96	10-156	1
Trichloroethene	mg/kg (ppm)	2	<0.02	95	97	21-139	2
Tetrachloroethene	mg/kg (ppm)	2	<0.025	95	97	20-133	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Vinyl chloride	mg/kg (ppm)	2	81	22-139
Chloroethane	mg/kg (ppm)	2	60	10-163
1,1-Dichloroethene	mg/kg (ppm)	2	91	47-128
Methylene chloride	mg/kg (ppm)	2	92	10-184
trans-1,2-Dichloroethene	mg/kg (ppm)	2	97	64-132
1,1-Dichloroethane	mg/kg (ppm)	2	96	64-135
cis-1,2-Dichloroethene	mg/kg (ppm)	2	100	64-135
1,2-Dichloroethane (EDC)	mg/kg (ppm)	2	98	56-135
1,1,1-Trichloroethane	mg/kg (ppm)	2	102	62-131
Trichloroethene	mg/kg (ppm)	2	98	63-139
Tetrachloroethene	mg/kg (ppm)	2	95	68-128

Date of Report: 07/07/23
Date Received: 06/28/23
Project: Parcel 110 M0615.20.008, F&BI 306442

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR VOLATILES BY EPA METHOD 8260D

Laboratory Code: 307013-03 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Vinyl chloride	ug/L (ppb)	10	<0.02	104	16-176
Chloroethane	ug/L (ppb)	10	<1	119	50-150
1,1-Dichloroethene	ug/L (ppb)	10	<1	107	50-150
Methylene chloride	ug/L (ppb)	10	<5	100	40-143
trans-1,2-Dichloroethene	ug/L (ppb)	10	<1	105	50-150
1,1-Dichloroethane	ug/L (ppb)	10	<1	101	50-150
cis-1,2-Dichloroethene	ug/L (ppb)	10	<1	104	50-150
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	<0.2	102	50-150
1,1,1-Trichloroethane	ug/L (ppb)	10	<1	102	50-150
Trichloroethene	ug/L (ppb)	10	<0.5	106	43-133
Tetrachloroethene	ug/L (ppb)	10	11	107 b	50-150

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Vinyl chloride	ug/L (ppb)	10	102	103	43-149	1
Chloroethane	ug/L (ppb)	10	118	119	59-157	1
1,1-Dichloroethene	ug/L (ppb)	10	106	107	67-138	1
Methylene chloride	ug/L (ppb)	10	96	98	29-192	2
trans-1,2-Dichloroethene	ug/L (ppb)	10	103	104	70-130	1
1,1-Dichloroethane	ug/L (ppb)	10	102	102	70-130	0
cis-1,2-Dichloroethene	ug/L (ppb)	10	104	104	70-130	0
1,2-Dichloroethane (EDC)	ug/L (ppb)	10	104	103	70-130	1
1,1,1-Trichloroethane	ug/L (ppb)	10	103	103	70-130	0
Trichloroethene	ug/L (ppb)	10	106	107	70-130	1
Tetrachloroethene	ug/L (ppb)	10	106	107	70-130	1

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, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. 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 standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

442

SAMPLE CHAIN OF CUSTODY 06/28/23 VW2/N2

Page # 1 of 1

Report To Audrey Hackett

Company Maul Foster & Alongi

Address 2815 2nd Ave, Ste 540

City, State, ZIP Seattle, WA 98121

Phone (206) 331-1835 Email ahackett@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME: Parcel 110

PO #: M0615.20.008

REMARKS: X = analyze. O = hold. Project specific RLs? - Yes / No

INVOICE TO: accounting@maulfoster.com

TURNAROUND TIME: ☒ Standard turnaround ☐ RUSH ____ Rush charges authorized by: ____

SAMPLE DISPOSAL: ☐ Archive samples ☐ Other ____ Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	cVOCs by EPA 8260				Notes
TWA-11_6.4-6.6_0627	01 A-D	6/27/23	1030	S	4								X				IDs updated per FB 08/02/23 ME
TWA-11_10.9-11.1_0627	02	6/27/23	1035	S	4								O				
TWA-14_5.9-6.1_0627	03	6/27/23	1230	S	4								X				TW-14_5.9-6.1_0627
TWA-9-14_5.9-6.1_0627	04	6/27/23	1230	S	4								X				TW-9-14_5.9-6.1_0627
Trip Blank #1-0627	05 A B	6/27/23	NA	W	2								X				
TWA-11_7-12_0628	06 A-C	6/28/23	1140	W	3								X				
TWA-9-11_7-12_0628	07 A-C	6/28/23	1140	W	3								X				
													Samples received at 4 °C				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Amanda Bixby	MFA	6/28/23	1300
Received by:	Khan Phan	FEDEX	06/28/23	1300
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
Ph. (206) 285-8282

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.

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

July 17, 2023

Audrey Hackett, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Hackett:

Included is the amended report from the testing of material submitted on June 28, 2023 from the Parcel 110 M0615.20.008, F&BI 306443 project. Sample IDs have been updated from TW-SV-1-062723 and TW-SV-2-062723 to TWSV-1-062723 and TWSV-2-062723.

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
c: Amanda Bixby
MFA0707R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

5500 4th Avenue South
Seattle, WA 98108
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

July 7, 2023

Audrey Hackett, Project Manager
Maul Foster Alongi
2815 2nd Ave, Suite 540
Seattle, WA 98121

Dear Ms Hackett:

Included are the results from the testing of material submitted on June 28, 2023 from the Parcel 110 M0615.20.008, F&BI 306443 project. There are 7 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
c: Amanda Bixby
MFA0707R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on June 28, 2023 by Friedman & Bruya, Inc. from the Maul Foster Alongi Parcel 110 M0615.20.008, F&BI 306443 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Maul Foster Alongi
306443 -01	TWSV-1-062723
306443 -02	TWSV-2-062723

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	TWSV-1-062723	Client:	Maul Foster Alongi
Date Received:	06/28/23	Project:	Parcel 110 M0615.20.008
Date Collected:	06/27/23	Lab ID:	306443-01 1/8.7
Date Analyzed:	06/29/23	Data File:	062835.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	113	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<2.2	<0.87
Chloroethane	<23	<8.7
1,1-Dichloroethene	<3.4	<0.87
trans-1,2-Dichloroethene	<3.4	<0.87
1,1-Dichloroethane	<3.5	<0.87
cis-1,2-Dichloroethene	5.5	1.4
1,2-Dichloroethane (EDC)	<0.35	<0.087
1,1,1-Trichloroethane	<4.7	<0.87
Trichloroethene	6.5	1.2
1,1,2-Trichloroethane	<0.48	<0.087
Tetrachloroethene	<59	<8.7

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Maul Foster Alongi
Date Received:	Not Applicable	Project:	Parcel 110 M0615.20.008
Date Collected:	Not Applicable	Lab ID:	03-1467 MB
Date Analyzed:	06/28/23	Data File:	062817.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	bat

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	89	70	130

Compounds:	Concentration ug/m3	ppbv
Vinyl chloride	<0.26	<0.1
Chloroethane	<2.6	<1
1,1-Dichloroethene	<0.4	<0.1
trans-1,2-Dichloroethene	<0.4	<0.1
1,1-Dichloroethane	<0.4	<0.1
cis-1,2-Dichloroethene	<0.4	<0.1
1,2-Dichloroethane (EDC)	<0.04	<0.01
1,1,1-Trichloroethane	<0.55	<0.1
Trichloroethene	<0.11	<0.02
1,1,2-Trichloroethane	<0.055	<0.01
Tetrachloroethene	<6.8	<1

Date of Report: 07/07/23
Date Received: 06/28/23
Project: Parcel 110 M0615.20.008, F&BI 306443
Date Extracted: 07/05/23
Date Analyzed: 07/05/23

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

Results Reported as % Helium

Sample ID Laboratory ID	Helium
TWSV-1-062723 306443-01	<0.6
Method Blank 03-1534 MB	<0.6

Date of Report: 07/07/23
Date Received: 06/28/23
Project: Parcel 110 M0615.20.008, F&BI 306443

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

Laboratory Code: 306421-01 1/5.1 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 30)
Vinyl chloride	ug/m3	<1.3	<1.3	nm
Chloroethane	ug/m3	<13	<13	nm
1,1-Dichloroethene	ug/m3	<2	<2	nm
trans-1,2-Dichloroethene	ug/m3	<2	<2	nm
1,1-Dichloroethane	ug/m3	<2.1	<2.1	nm
cis-1,2-Dichloroethene	ug/m3	<2	<2	nm
1,2-Dichloroethane (EDC)	ug/m3	<0.21	<0.21	nm
1,1,1-Trichloroethane	ug/m3	<2.8	<2.8	nm
Trichloroethene	ug/m3	<0.55	<0.55	nm
1,1,2-Trichloroethane	ug/m3	<0.28	<0.28	nm
Tetrachloroethene	ug/m3	<35	<35	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Vinyl chloride	ug/m3	35	108	70-130
Chloroethane	ug/m3	36	115	70-130
1,1-Dichloroethene	ug/m3	54	107	70-130
trans-1,2-Dichloroethene	ug/m3	54	109	70-130
1,1-Dichloroethane	ug/m3	55	113	70-130
cis-1,2-Dichloroethene	ug/m3	54	108	70-130
1,2-Dichloroethane (EDC)	ug/m3	55	109	70-130
1,1,1-Trichloroethane	ug/m3	74	112	70-130
Trichloroethene	ug/m3	73	105	70-130
1,1,2-Trichloroethane	ug/m3	74	106	70-130
Tetrachloroethene	ug/m3	92	110	70-130

Date of Report: 07/07/23
Date Received: 06/28/23
Project: Parcel 110 M0615.20.008, F&BI 306443

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

Laboratory Code: 306443-01 (duplicate)

Analyte	Sample Result (%)	Duplicate Result (%)	Relative Percent Difference	Acceptance Criteria
Helium	<6	<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, biased low; or, the calibration results for the analyte were outside of acceptance criteria, biased high, with a detection for the analyte in the sample. 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 standard reporting limit. 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.

k – The calibration results for the analyte were outside of acceptance criteria, biased high, and the analyte was not detected in the sample.

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.

~~306341~~ (ND) ~~306437~~ 43

SAMPLE CHAIN OF CUSTODY

06/28/23

Report To AUDREY HACKETT

Company MAUL FOSTER & ALONGI

Address 2815 2ND AVE STE 540

City, State, ZIP SEATTLE, WA 98121

Phone 206-331-1836 Email ahackett@maulfoster.com

SAMPLERS (*signature*)

PROJECT NAME & ADDRESS: PARCEL 110, 3401 LINCOLN AVE, TACOMA, WA

PO # MGGIS.20.008

NOTES: TW-SV-2 on hold

INVOICE TO accounting@maulfoster.com

Page # 1 of 1

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 IDs updated per F.B. 7/12/23 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		Notes
~~TW-SV-1-062723~~ TWSV	01	3230	301	IA / (SG)	6/27/23	-29.5	1651	-5	1656			X		X		
~~TW-SV-2-062723~~ TWSV	02	3287	241	IA / (SG)	6/27/23	-30+	1747	-5	1752			⊗		⊗		⊗ = HOLD
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												
				IA / SG												

Friedman & Bruya, Inc.
5500 4th Avenue South
Seattle, WA 98108
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:		Amanda Bixby	MFA	6/28/23	1300
Received by:		Noam Phan	FEBI	6/28/23	1300
Relinquished by:					
Received by:			Samples received at 24 °C		

FORMS\COC\COCTO-15.DOC

Attachment G

Data Validation Memorandum

MAUL
FOSTER
ALONGI

Data Quality Assurance/Quality Control Review

Project No. M0615.20.008 | August 3, 2023 | Port of Tacoma

Maul Foster & Alongi, Inc. (MFA), conducted an independent review of the quality of analytical results for groundwater, soil, soil vapor, and associated quality control samples collected on June 27 and 28, 2023. Samples were collected in the Taylor Way and Alexander Avenue Fill Area at Parcel 110, 3401 Lincoln Avenue, Tacoma, Washington.

Friedman & Bruya, Inc. (F&B), performed the analyses. MFA reviewed F&B report numbers 306442 and 306443. The analyses performed and the samples analyzed are listed in the following tables. Samples submitted on hold are indicated below. Not all analyses were performed on all samples.

Analysis	Reference
Helium	ASTM D1946
Percent moisture	ASTM D2216-98
Volatile organic compounds (soil and groundwater)	EPA 8260D
Volatile organic compounds (soil vapor)	EPA TO-15

Notes
ASTM = ASTM International.
EPA = U.S. Environmental Protection Agency.
TO = toxic organics.

Samples Analyzed	
Report 306442	
TWA-11_6.4-6.6_0627	Trip Blank 1-0627
TWA-11_10.9-11.1_0627 (hold)	TWA-11_7-12_0628
TW-14_5.9-6.1_0627	TWA-9-11_7-12_0628
TW-9-14_5.9-6.1_0627	--
Report 306443	
TWSV-1-062723	TWSV-2-062723 (hold)

Data Qualification

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

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 qualifier:

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

The reviewer confirmed that soil vapor samples were collected under a helium shroud to detect leaks in the collection system. Sample TWSV-1-062723 was non-detect for helium by ASTM Method D1946 in report 306443. Sample TWSV-2-062723 was submitted on hold.

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 laboratory 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.

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, as all samples were collected using dedicated, single-use equipment.

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.

A trip blank (Trip Blank 1-0627) was submitted with the sample delivery group 306442 for EPA Method 8260D analysis.

The trip blank was non-detect to MRLs for all target analytes.

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.

F&B reported LCS results for EPA Method TO-15 and EPA Method 8260D soils, and LCS and LCSD results for EPA Method 8260D groundwater; the LCS and LCSD were extracted and analyzed at the required frequency. F&B did not report LCS or LCSD results for ASTM D1946, as these are not required by the method; the reviewer confirmed with the laboratory that initial calibration and continuing calibration passed for this method.

All LCS and LCSD results were within acceptance limits for percent recovery and relative percent difference (RPD).

Laboratory Duplicate Results

Laboratory duplicate results are used to evaluate laboratory precision. F&B did not report laboratory duplicate results for EPA Method 8260D; laboratory precision was evaluated using LCS and LCSD or matrix spike (MS) and matrix spike duplicate (MSD) results for this method. The EPA Method TO-15 and ASTM Method D1946 laboratory duplicate samples were prepared and analyzed at the required frequency.

Laboratory duplicate results greater than five times the MRL were evaluated using laboratory 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.

F&B reported MS and MSD results for EPA Method 8260D soils, and MS results for EPA Method 8260D groundwater; the MS and MSD were extracted and analyzed at the required frequency. F&B did not report MS or MSD results for EPA Method TO-15 or ASTM D1946, in accordance with the methods.

When MS and MSD were prepared from samples with high concentrations of target analytes, associated MS and/or MSD percent recovery and/or RPD control limit exceedances did not require qualification because spike concentrations could not be accurately quantified. High concentrations of target analytes are defined as four times the spike amount for all analyses.

When MS and MSD were prepared with samples from unrelated projects, the MS and/or MSD percent recovery and/or RPD control limit exceedances did not require qualification because these sample matrices were not representative of project sample matrices.

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 of 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 pairs were submitted for analysis:

Report	Parent Sample	Field Duplicate Sample
306442	TW-14_5.9-6.1_0627	TW-9-14_5.9-6.1_0627
	TWA-11_7-12_0628	TWA-9-11_7-12_0628

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.

According to report 306442, sample "Trip Blank#1-0627" was reported by F&B as Trip Blank 1-0627. The reviewer confirmed with the laboratory that this is due to system limitations that do not allow special characters in sample names. The original sample names provided on the chain-of-custody form will be used in MFA's electronic database and for reporting.

At MFA's request, report 306443 was revised on July 17, 2023, to update the sample names.

At MFA's request, report 306442 was revised on August 3, 2023, to include ASTM D2216-98 percent moisture results for soil samples and to update some sample names.

No other issues were found.

References

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. 2020. *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.

F&B. 2022. *Quality Assurance Manual.* Rev. 18. Friedman & Bruya, Inc.: Seattle, WA. December 9.