

Site Characterization Report

AST System Fuel Release

Washington State Fire Training Academy
50810 SE Grouse Ridge Road
North Bend, Washington

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1 INTRODUCTION

PBS Engineering and Environmental Inc. (PBS) provided consulting services to Washington State Patrol (WSP) and Washington State Department of Enterprise Services (DES) regarding site characterization work conducted at the Fire Training Academy facility, located at 50810 SE Grouse Ridge Road in North Bend, WA (Property or Site). Site characterization was conducted to investigate potential petroleum fuel impact to soil and groundwater resulting from failure of a fuel aboveground storage tank (AST).

1.1 General Site Information

The FTA facility is located on Grouse Ridge Road, near the southwest side of Mailbox Peak; Township 23, Range 9, Section 28. The facility was first developed in the 1980's and comprises approximately 50 acres of developed area. Access to the subject property is via Grouse Ridge Road, which begins at the terminus of SE Homestead Valley Road, near the trailhead for Dirty Harry's Balcony trail.

1.2 Site Use

The FTA facility includes numerous training props for various firefighting scenarios, such as at a container ship, apartment buildings, or aircraft. The facility also includes offices, classrooms, mechanical/maintenance garages, and vehicle storage.

1.3 AST System

The props are supplied with fuel from an AST system comprising three 20,000-gallon ASTs, a containment basin and associated piping. The containment basin comprises a vertical concrete stem wall supporting the filling area (where trucks can load/unload fuel), and three sloped earthen walls sealed with asphalt and a hydrocarbon resistant surface coating/liner. The AST containment basin drains to an oil/water separation and oil-water treatment system that processes the oily runoff resulting from training exercises, which comprises a 250,000-gallon capacity oil/water separator pool and three sequential treatment ponds.

1.4 Regional Geology and Hydrogeology

The site lies on Grouse Ridge, a glacial moraine near the base of Mailbox Peak in the Snoqualmie Pass. The site is reportedly underlain by recessional glacial outwash, consisting of loose, stratified fluvial silt, sand, and gravel; well-rounded and moderately to well sorted¹.

2 ADOPTED REGULATORY CRITERIA

Contaminated site assessment and cleanup is conducted in accordance with the substantive requirements of the Model Toxics Control Act (MTCA), Chapter 70.105D of the Revised Code of Washington (RCW) and its implementation regulations, Chapter 173-340 of the Washington Administrative Code (WAC).

Site assessment and cleanup activities have been performed under MTCA. This section summarizes the cleanup standards established for this site.

In accordance with MTCA, development of preliminary cleanup levels includes identifying potential exposure pathways for human and ecological impacts based on the planned land use. MTCA provides for three methods (Method A, B, or C) for establishing cleanup standards. Method A (unrestricted land use) is typically used as the default criterion. Methods B and C are used when developing site-specific cleanup levels.

¹ *Geologic Map of the Snoqualmie Pass 30x60 Minute Quadrangle Washington*, R. W. Tabor et al, 2000

Considering the current land use as a training/educational facility, the MTCA Method A Soil Cleanup Levels (Table 740-1), and Groundwater Cleanup Levels (Table 720-1) are the adopted screening criteria for site characterization.

The contaminants of potential concern (COPC) are gasoline-, diesel-, and heavy oil-range total petroleum hydrocarbons (TPH), along with benzene, toluene, ethylbenzene, and xylenes (BTEX).

Cleanup levels for COPC at this site are as follows:

Contaminant of Potential Concern	MTCA Method A Soil Cleanup Level (mg/kg)	MTCA Method A Groundwater Cleanup Level (µg/L)
TPH – Gasoline	100 (30 if benzene is present)	1,000 (800 if benzene is present)
TPH – Diesel	2,000	500
TPH – Heavy Oil	2,000	500
Benzene	0.03	5
Toluene	7	1,000
Ethylbenzene	6	700
Xylenes	9	1,000

3 SITE CHARACTERIZATION

3.1 Release and Initial Response

On August 6, 2021, the site maintenance supervisor discovered a leak in one AST (Fuel Tank #1) of the AST system. The AST reportedly contained aviation gas, which released from the bottom of the AST and flowed from the containment area through a drain line and connected to the “burn pad” training facility drainage system, which in turn flowed into the site’s oil/water separation and treatment pond system.

Vacuum trucks were utilized to drain the leaking tank of as much fuel as possible and pump floating fuel from the oil/water separator to a temporary storage tank on site.

PBS visited the site on August 11, 2021 to conduct a visual inspection of the release area and the water treatment ponds. Evidence of fuel impacts was not observed in the three sequential treatment ponds, indicating the impact of the release did not significantly impact the system “downstream” of the oil/water separator pool.

PBS observed that the containment basin liner was perforated in several locations, exposing underlying asphalt and soil. Vegetation had grown through the liner in several locations.

3.2 AST System Inspection

On October 6, 2021, PBS oversaw a closed-circuit television video (CCTV) study of the containment basin drainage system. The CCTV study of the drainage system leading out of the AST containment basin revealed no evidence of damage in the drain line running down the hill to the east-southeast and connecting to the “burn pad” training area drainage system that then leads to the oil/water separator.

3.3 Sampling and Analysis Plan

A Sampling and Analysis Plan (SAP) *Sampling and Analysis Plan - AST System Fuel Release, PBS, November 11, 2021*, was developed and describes the scope of work, anticipated sample collection methods and analytical procedures to be implemented. The SAP detailed the drilling scope, which includes three temporary soil borings and installation of three groundwater monitoring wells, as well as subsequent surveying and groundwater sampling of those wells.

3.4 Subsurface Investigation

PBS completed a subsurface investigation at the site January 19 through January 21, 2022, with drilling services provided by Holt Services of Edgewood, Washington. The purpose of the subsurface investigation was to assess the potential for contamination in soil and groundwater in the vicinity of the AST system. The work was conducted in accordance with the SAP.

Prior to drilling, PBS supervised a private utility line location company, Applied Professional Services (APS) of North Bend, WA, while they conducted borehole clearance for subsurface obstructions at all planned drilling locations.

The drilling and sampling program included the advancement of three soil borings (SB-1 to SB-3) for the collection of soil samples, and three borings (MW-1 to MW-3) for the collection of soil samples and the installation of groundwater monitoring wells. A sonic drilling rig was utilized for drilling at the six locations.

Soils were logged continuously during drilling, noting grain size, density, color, odor, and moisture. During the advancement of boreholes, soil was screened for volatiles using a photoionization detector (PID). Cursory PID readings were taken along the runs of soil as they were brought to the surface and bagged. PID readings were also taken from select soil intervals by partially filling a sealable plastic bag and taking headspace readings within the bag.

Groundwater was encountered at depths of approximately 8 to 12 feet bgs at the boring locations at the base of the hill below the AST containment area, and at a depth of approximately 22 feet bgs in borings at the top of the hill, adjacent to the AST containment area.

Two to three soil samples were collected from each of the borings. In the absence of field indications of contamination, the samples were collected from representative intervals and/or at changes in lithology.

The samples were collected in laboratory-supplied containers, placed on ice in a cooler and transported to Friedman and Bruya Laboratory, within specified holding times and under chain-of-custody documentation. Analyses were conducted under standard turnaround time and included the following:

- Diesel and Heavy Oil range Total Petroleum Hydrocarbons (TPH) by Method NWTPH-Dx
- Gasoline range TPH by Method NWTPH-Gx
- Benzene, toluene, ethylbenzene and xylene (BTEX) by EPA Method 8260B

Soil boring and monitoring well locations are presented on Figure 2: Site Plan. Graphic soil boring logs and well construction details are presented in Appendix A.

3.5 Survey

Accurately measuring the top of casing (TOC) elevation of monitoring wells allows for the determination of groundwater elevation, by measuring the depth to water from the TOC. On February 2, 2022, surveying of TOC, latitude, and longitude of monitoring wells MW-1 through MW-3 was completed by a Registered Professional Land Surveyor licensed in the State of Washington.

The survey report is included as Appendix B.

3.6 Groundwater Sampling

A groundwater monitoring event (GME) was conducted on February 2, 2022, and included the gauging and sampling of three monitoring wells (MW-1 – MW-3). Prior to sampling, the wells were gauged using an interface probe. Static water levels (SWLs) ranged from 4.59 feet below top of casing (fbTOC) in MW3 to 20.39 fbTOC in MW1.

Groundwater purging and sampling was conducted using a peristaltic pump, employing low flow sampling methodology with pumping rates not exceeding 0.6 liters/minute and creating minimal drawdown in the well. The sample intake was placed approximately 2.5-feet below the water table and within the screened interval, with the exception of at MW-3, where the top of the screened interval was 0.4 feet below the static water table.

Groundwater field parameters (conductivity, pH, temperature, dissolved oxygen and oxidation-reduction potential) were recorded during purging using a YSI Model 556MSP water-quality analyzer equipped with a flow-through cell. Once groundwater parameters stabilized, which indicates groundwater is representative of the aquifer formation and is not well column water, a sample was collected. PBS personnel wore new disposable nitrile gloves when collecting samples.

All samples were collected in laboratory-supplied containers, placed on ice in a cooler and transported to Friedman and Bruya laboratory in Seattle, Washington, within specified holding times and under chain-of-custody documentation. Analyses were conducted under a 5-day turnaround time and included the following:

- Gasoline range Total Petroleum Hydrocarbons (TPH) by method NWTPH-Gx
- Diesel range Total Petroleum Hydrocarbons (TPH) by method NWTPH-Dx
- Benzene, toluene, ethylbenzene and xylenes by EPA method 8021

Groundwater monitoring well locations are presented on Figure 2: Site Plan.

Groundwater sampling information is presented in Appendix C: Groundwater Sampling Datasheets.

4 FINDINGS

4.1 Field Observations

Native material was generally encountered throughout the borings. The subsurface soil profile encountered is presented in the table below:

Subsurface Profile		
Classification	Description	Approximate Depth Range (feet bgs)
Native Soil	Loose well-graded gravel with sand (GW-GM) and mixed organic material.	0.0 to 1.0
Native Soil	Loose well-sorted gravel with sand (GW)	1.0 to 24.0
Native Soil	Medium-dense tan lean clay (CL)	24.0 to 26.0
Native Soil	Loose well-sorted coarse to medium sand (SW)	26.0 to 30.0

Hydrocarbon odors and PID readings were observed at depths of approximately 15 feet bgs in MW-2, 10 feet bgs in MW-3, and 5 feet bgs in SB-3.

4.2 Soil Analytical Results

Soil sampling results are presented as follows:

- 13 samples were analyzed for TPH as gasoline, diesel and heavy oil; and BTEX.
- Concentrations of benzene exceeded the CUL in three samples (SB3-16, MW2-13 and MW3-10).
- Concentrations of remaining analyzed contaminants of concern did not exceed CULs.

Soil analytical results are presented in Table 1.

Copies of the laboratory report and chain-of-custody documentation are presented in Appendix D.

4.3 Groundwater Analytical Results

Groundwater sampling results are presented as follows:

- Concentrations of gasoline and diesel range TPH, benzene, toluene, and xylene exceeded the CULs in samples MW-2 and MW-3.
- Analyzed contaminants of concern were not detected in sample MW-1.

Groundwater analytical results are presented in Table 2.

Copies of the laboratory report and chain-of-custody documentation are presented in Appendix D.

5 SUMMARY AND CONCLUSIONS

Regarding the environmental site characterization at the Fire Training Academy AST System, the summary and conclusions are presented:

- Site characterization was undertaken in accordance with a Sampling and Analysis Plan (SAP): *Sampling and Analysis Plan - AST System Fuel Release, PBS, November 11, 2021*, which was developed for the site.
- A total of six soil borings were advanced using sonic drilling methods, and monitoring wells were installed in 3 of those locations.
- Thirteen soil samples were collected from the borings. Benzene was detected in samples from locations SB-3, MW-2, and MW-3 at concentrations exceeding the MTCA Method A Cleanup Level.
- Groundwater samples were collected from the three monitoring wells. Gasoline- and diesel-range hydrocarbons, benzene, toluene, and xylenes were detected in the samples from MW-2 and MW-3 at concentrations exceeding MTCA Method A Cleanup Levels.
- Based on these analytical results, the site will require additional site characterization to meet MTCA cleanup criteria.

6 LIMITATIONS

PBS has prepared this report for use by the Washington State Patrol and Dept. of Enterprise Services and is not intended for use by others without the written consent of PBS. This study was limited to the tests, locations and depths as indicated to determine the absence or presence of certain contaminants. The findings and conclusions of this report are not scientific certainties, but rather probabilities based on professional judgment concerning the significance of the data gathered during this investigation.

Sincerely,
PBS Engineering and Environmental Inc.

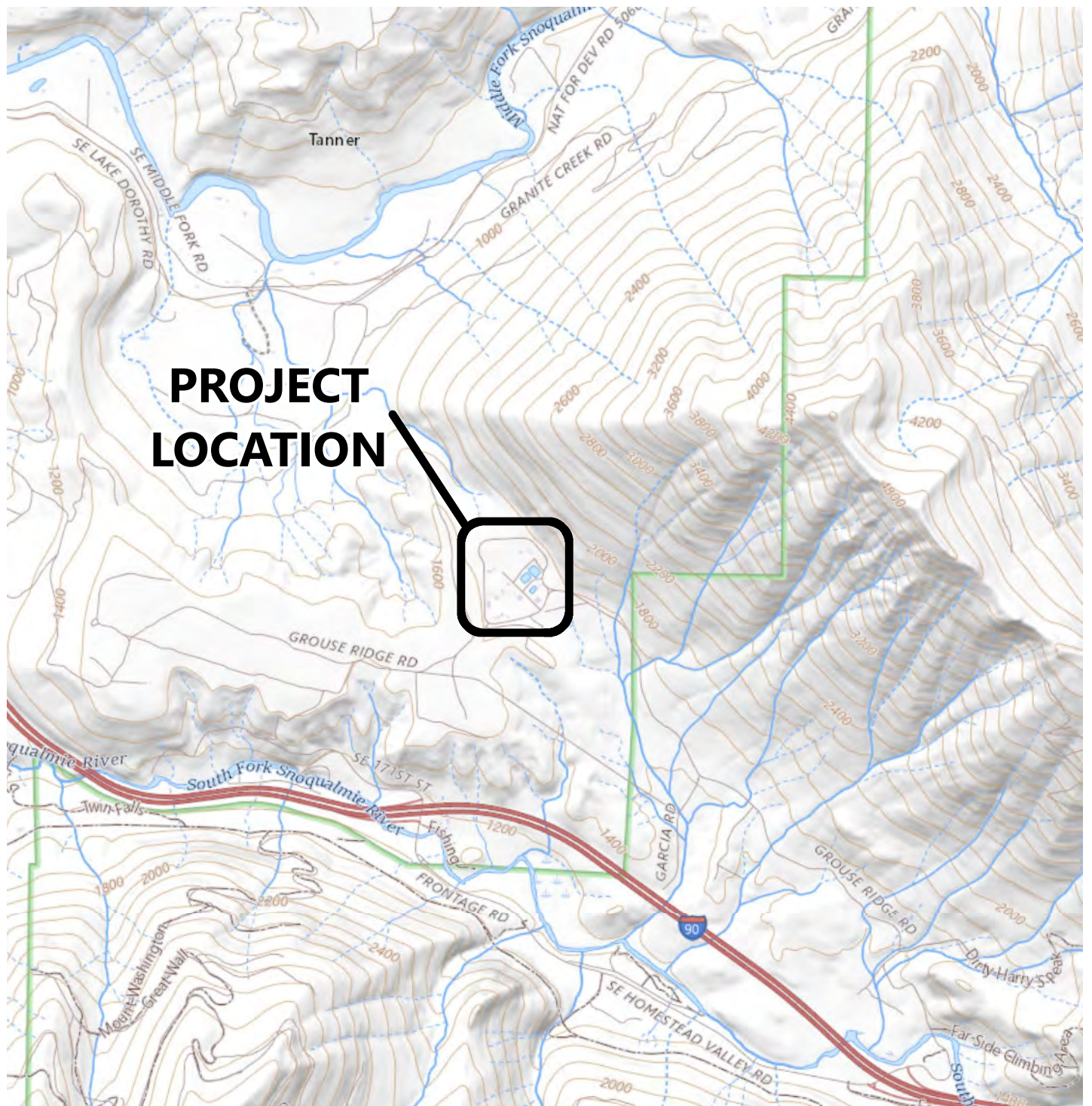


Ken Nogeire, LHG
Senior Hydrogeologist

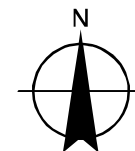
Reviewed by Melanie Young, PE

FIGURES

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SOURCES: USGS NATIONAL MAP, 2020
PROJECTION: NAD 2011 WA STATE PLANE NORTH LAMBERT US FT



SCALE: 1" = 2,543 feet

0 1,000 2,000 4,000 Feet

PREPARED FOR: WDES/WSF



Site Vicinity Map

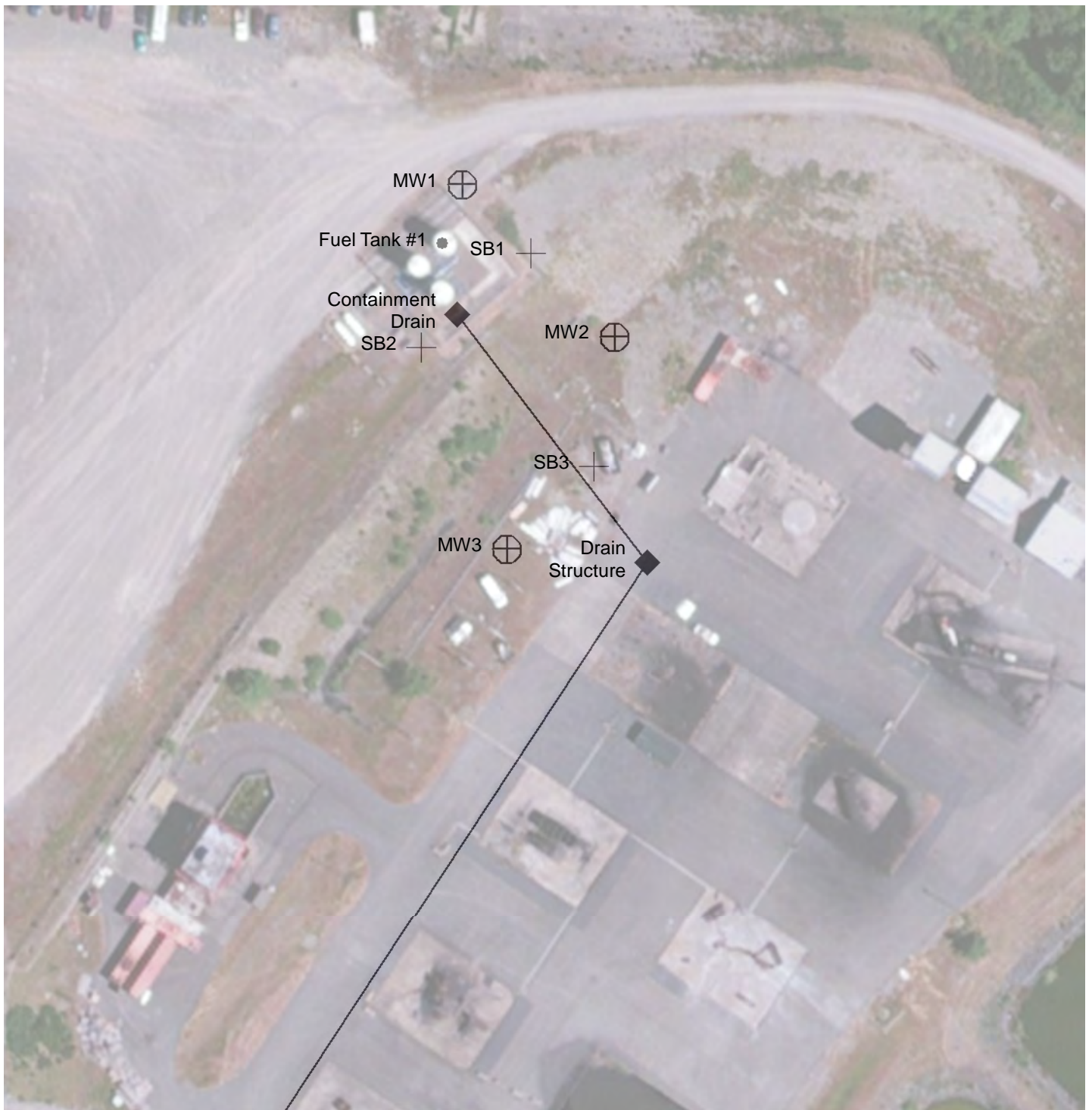
FIRE TRAINING ACADEMY
50810 SE GROUSE RIDGE ROAD, NORTH BEND, WASHINGTON

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40535.498

FIGURE

1

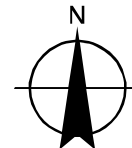
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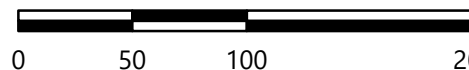
LEGEND

- AST
- ◆ Containment Drain
- ⊕ Monitoring Well Locations
- ⊕ Soil Boring Locations
- Drain Line (approx. location)

BASEMAP: ESRI WORLD IMAGERY
PROJECTION: NAD 2011 WA STATE PLANE NORTH LAMBERT US FT



SCALE: 1" = 84 feet



PREPARED FOR: WDES and WSP



Site Plan - Sample Locations
FIRE TRAINING ACADEMY
50810 SE GROUSE RIDGE ROAD, NORTH BEND, WASHINGTON

FEB 2022
40535.498

FIGURE

2

TABLES

TABLE 1
SOIL ANALYTICAL RESULTS

FIRE TRAINING ACADEMY
50810 GROUSE RIDGE ROAD NORTH BEND, WASHINGTON 98045
PBS PROJECT NO. 40535.498

Location-Depth	Results mg/Kg										
	TPHs			VOCs							PAHs
	Gx	Dx	Oil	Benzene	Toluene	Ethylbenzene	Xylene	MTBE	EDB	EDC	
Adopted Criteria: MTCA Method A Cleanup Levels For Soil^a	100	2000	2000	0.03	7	6	9	0.1	0.005	NE	0.1
Subsurface Investigation Conducted on January 21, 2022											
SB1-15	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
SB1-25	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
SB2-10	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
SB2-16	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
SB3-5	<5	180	800	<0.02	<0.02	<0.02	<0.06	--	--	--	--
SB3-16	<5	<50	<250	0.092	0.36	<0.02	0.18	<0.05	<0.005	<0.05	<0.1
MW1-12	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
MW1-15	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
MW2-9	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
MW2-13	<5	<50	<250	0.031	0.24	<0.02	0.57	--	--	--	--
MW2-25	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--
MW3-10	<5	<50	<250	0.080	0.55	<0.02	<0.06	--	--	--	--
MW3-18	<5	<50	<250	<0.02	<0.02	<0.02	<0.06	--	--	--	--

^aWashington State Department of Ecology Model Toxics Control Act Method A Cleanup Level for Unrestricted Land Use as established in WAC 173-340-900

BOLD indicates above MTCA Method A Cleanup Levels for Soil

mg/kg - milligrams per kilogram

TPH - total petroleum hydrocarbons

Gx - gasoline range hydrocarbons analyzed by Method NWTPH-Gx

Dx - diesel range hydrocarbons analyzed by Method NWTPH-Dx, method also included reporting of TPH in the heavy oil range

MTBE - methyl tertiary-butyl ether

EDB - 1,2-dibromoethane

EDC - 1,2-dichloroethane

PAHs - polycyclic aromatic hydrocarbons analyzed by US EPA Method 8270 SIM

VOCs - volatile organic compounds analyzed by US EPA Method 8260B

NE - Not established

<50 - less than the laboratory reporting limit

- not analyzed

TABLE 2
GROUNDWATER ANALYTICAL RESULTS

FIRE TRAINING ACADEMY
50810 GROUSE RIDGE ROAD NORTH BEND, WASHINGTON 98045
PBS PROJECT NO. 40535.498

Sample Identification	Results µg/L									
	TPHs			VOCs						
	Gx	Dx	Heavy Oil	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	EDB	EDC
Adopted Criteria: MTCA Method A Cleanup Levels For Groundwater^a	800	500	500	5	1,000	700	1,000	0.1	0.005	NE
Groundwater samples collected February 2, 2022										
MW1	<100	<50	<250	<1	<1	<1	<3	--	--	--
MW2	30,000	1,300	<250	680	4,800	410	2,600	--	--	--
MW3	56,000	1,400	<250	990	10,000	610	4,000	<100	<100	<20

^a Washington State Department of Ecology Model Toxics Control Act Method A Cleanup Level for Unrestricted Land Use as established in WAC 173-340-900

µg/L - micrograms per litre

BOLD indicates above MTCA Method A Cleanup Levels for Groundwater

<50 - less than the laboratory reporting limit

MTCA - Washington State Department of Ecology Model Toxic Control Act

TPH - total petroleum hydrocarbons

Gx - gasoline range hydrocarbons analyzed by Method NWTPH-Gx

Dx - diesel range hydrocarbons analyzed by Method NWTPH-Dx, method includes reporting TPH in the heavy oil range

MTBE - methyl tertiary-butyl ether

EDB - 1,2-dibromoethane

EDC - 1,2-dichloroethane

VOCs - volatile organic compounds analyzed by US EPA Method 8260B

ND - not detected above laboratory method detection limit

ug/L - micrograms per liter

BGS - below ground surface

TABLE 3
GROUNDWATER ELEVATION DATA

FIRE TRAINING ACADEMY
50810 GROUSE RIDGE ROAD NORTH BEND, WASHINGTON 98045
PBS PROJECT NO. 40535.498

Well ID	Date	Well Screen Interval (ft bgs)	Depth to Water (ft btoc)	TOC Elevation (ft amsl)	Groundwater Elevation (ft amsl)
MW1	2/2/2022	12 - 32	20.39	1574.72	1554.33
MW2	2/2/2022	5 - 25	5.75	1558.06	1552.31
MW3	2/2/2022	5 - 15	4.59	1556.05	1551.46

Abbreviations & Acronyms:

ft = feet

bgs = below ground surface

toc = top of casing

btoc = below top of casing

amsl = above mean sea level - NAVD 88 via Washington State Reference Network (WSRN)

APPENDIX A

Soil Boring and Well Construction Logs



WSP FTA AST FUEL RELEASE
NORTH BEND, WASHINGTON

BORING MW-1

PBS PROJECT NUMBER:
40535.498

BORING MW-1 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND- WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL(S)	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Loose, dark gray-brown, well-graded GRAVEL (GW) with cobbles; fine to coarse, subrounded gravel; moist						Tag ID# BNN183
5.0				0.0				Flush-Mount Monument
10.0				0.0				Bentonite Chips
15.0		Loose, dark gray-brown, well-graded GRAVEL (GW-GM) with silt, sand, and occasional cobbles; non-plastic; fine to medium sand; fine to coarse, subrounded gravel; moist		0.0	MW1-15			PVC Pipe
20.0				0.0				Sand
25.0			ATD ▼	0.0	MW1-22			Slotted Screen
30.0		Loose, dark tan, poorly graded SAND (SP) with gravel and occasional cobbles; medium to coarse sand; fine, subrounded gravel; wet		0.0	MW1-020222 GW			Temporary screen set to collect groundwater
32.0		Final depth 32.0 feet bgs. Monitoring well installed to 32.0 feet bgs.						
35.0								

BORING METHOD: Sonic Drilling
DRILLED BY: Holt Services
BORING BIT DIAMETER: 4-inch

LOGGED BY: M. Bagley
COMPLETED: 1/19/22



WSP FTA AST FUEL RELEASE
NORTH BEND, WASHINGTON

BORING MW-2

PBS PROJECT NUMBER:
40535.498

BORING MW-2 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND- WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL(S)	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Loose, gray and tan, poorly graded SAND (SP) with gravel; medium to coarse sand; fine to coarse, subrounded gravel; moist						Tag ID# BNL610
								Flush-Mount Monument
								Bentonite Chips
								PVC Pipe
5.0				0.0				
			ATD					
10.0				0.0	MW2-9			Sand
					MW2-13			Slight petroleum odor
15.0		becomes wet		15				Slotted Screen
20.0				0.0	MW2-020222 GW			Temporary screen set to collect groundwater
25.0		Stiff, tan, lean CLAY (CL) with sand; medium plasticity; fine to medium sand; wet		0.0				
		Gray, poorly graded SAND (SP) with gravel; medium to coarse sand; fine, subrounded gravel; wet						Bentonite Chips
30.0		Gray, silty SAND (SM); medium plasticity; fine to medium sand; wet		0.0				
		Final depth 30.0 feet bgs. Monitoring well installed to 25.0 feet bgs.						
35.0								

BORING METHOD: Sonic Drilling
DRILLED BY: Holt Services
BORING BIT DIAMETER: 4-inch

LOGGED BY: M. Bagley
COMPLETED: 1/20/22



WSP FTA AST FUEL RELEASE
NORTH BEND, WASHINGTON

BORING MW-3

PBS PROJECT NUMBER:
40535.498

BORING MW-3 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND- WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL(S)	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Loose, tan, well-graded GRAVEL (GW) with sand; medium to coarse sand; fine to coarse, subrounded gravel; moist		0.0				Tag ID# BNL611
		Loose, tan, poorly graded SAND (SP) with gravel; fine to coarse sand; fine, subrounded gravel; moist						Flush-Mount Monument
5.0								Bentonite Chips
								PVC Pipe
10.0		becomes tan and gray	ATD	11.2	MW3-10			Sand
								Slight petroleum odor
		Soft, light tan, lean CLAY (CL) with sand; medium plasticity; fine sand; wet						Slotted Screen
15.0				0.0	MW3-020222 GW			Temporary screen set to collect groundwater
		Loose, gray and tan, well-graded SAND (SW); wet						Bentonite Chips
20.0					MW3-18			
		Final depth 20.0 feet bgs. Monitoring well installed to 15.0 feet bgs.						
25.0								
30.0								
35.0								

BORING METHOD: Sonic Drilling
DRILLED BY: Holt Services
BORING BIT DIAMETER: 4-inch

LOGGED BY: M. Bagley
COMPLETED: 1/20/22



WSP FTA AST FUEL RELEASE
NORTH BEND, WASHINGTON

BORING SB-1

PBS PROJECT NUMBER:
40535.498

BORING SB-1 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND- WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL(S)	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		TOPSOIL						
		GRAVEL FILL with sand						
5.0		Loose, dark gray, well-graded GRAVEL (GW) with sand and cobbles; medium to coarse sand; fine to coarse, subrounded gravel; moist		0.0				
10.0				0.0				
15.0				0.0	SB1-15			
20.0								
25.0				0.0	SB1-25			
		Loose, gray, poorly graded SAND (SP) with gravel and cobbles; coarse sand; fine to coarse, subrounded gravel; moist						
30.0		Final depth 30.0 feet bgs; boring backfilled with bentonite. Groundwater not encountered at time of exploration.						
35.0								

BORING METHOD: Sonic Drilling
DRILLED BY: Holt Services
BORING BIT DIAMETER: 4-inch

LOGGED BY: M. Bagley
COMPLETED: 1/19/22



WSP FTA AST FUEL RELEASE
NORTH BEND, WASHINGTON

BORING SB-2

PBS PROJECT NUMBER:
40535.498

BORING SB-2 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND- WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL(S)	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		TOPSOIL						
		Loose, dark gray, well-graded GRAVEL (GW) with sand and cobbles; medium to coarse sand; fine to coarse, subrounded gravel; moist		0.0				
5.0								
10.0				0.0	SB2-10			
15.0		Loose, gray, poorly graded SAND (SP) with gravel; medium to coarse sand; fine, subrounded gravel; moist			SB2-16			
20.0								
		becomes wet						
		becomes dark gray; fine sand		0.0				
25.0		Final depth 25.0 feet bgs; boring backfilled with bentonite.						
30.0								
35.0								

BORING METHOD: Sonic Drilling
DRILLED BY: Holt Services
BORING BIT DIAMETER: 4-inch

LOGGED BY: M. Bagley
COMPLETED: 1/19/22



WSP FTA AST FUEL RELEASE
NORTH BEND, WASHINGTON

BORING SB-3

PBS PROJECT NUMBER:
40535.498

BORING SB-3 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND- WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL(S)	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Loose, brown to tan; well-graded GRAVEL (GW) with sand; medium to coarse sand; fine to coarse, subrounded gravel; moist						
5.0				0.5	SB3-5			
10.0		Loose, gray, silty SAND (SM) with gravel; medium plasticity; fine sand; fine, subrounded gravel; wet						
15.0		Dark gray, poorly graded SAND (SP) with gravel; coarse sand; fine, subrounded gravel; wet			SB3-16			
20.0		Final depth 20.0 feet bgs; boring backfilled with bentonite.		10				
25.0								
30.0								
35.0								

BORING METHOD: Sonic Drilling
DRILLED BY: Holt Services
BORING BIT DIAMETER: 4-inch

LOGGED BY: M. Bagley
COMPLETED: 1/20/22

APPENDIX B

Surveyor Report



Site Visit: February 2, 2022
Well Monitoring at WSP Fire Training Academy
50810 SE Grouse Ridge Road
North Bend, Washington 98045
PBS project #40535.498

WELL ID	LATITUDE	LONGITUDE	TOP PIPE ELEV.	GROUND ELEV.
MW-1	47-27-22.1900	121-39-43.2446	1574.72'	1574.91'
MW-2	47-27-21.2966	121-39-42.1180	1558.06'	1558.44'
MW-3	47-27-20.3664	121-39-42.4861	1556.05'	1556.29'

Benchmark: 47-26-16.4986 121-38-59.9745 1328.363"

Description: WSDOT Benchmark ID #5798 ("GP17090-291") is a brass disc set in the top of a round concrete monument and under a WSDOT case and cover, set level with the ground.

TBM #1 47-27-21.5903 121-39-42.5796 1575.46'
PBS CP #1- 60D Spike/Nail

TBM #2 47-27-22.6779 121-39-41.6599 1574.21'
PBS CP #2- 60D Spike/Nail

Horizontal Datum: Latitude/Longitude derived from NAD 83/2011 (2010.00 Epoch) Washington North Zone via Washington State Reference Network (WSRN).

Vertical Datum: NAVD 88 via Washington State Reference Network (WSRN).

A Trimble SX-10 one second robotic total station/scanner and Topcon DL-502 digital level was used for on-site horizontal and vertical values.

A Trimble R12i was used for WSRN observations on site control and benchmark verifications.


Accuracy for TBM and monitoring well elevations is +/- 0.01'.

Regan Schaller, WA PLS #54471
PBS Engineering + Environmental
415 W 6th Street, Suite 601
Vancouver, WA 98660
P: 360.567.2111
Regan.schaller@pbsusa.com



APPENDIX C

Groundwater Sampling Datasheets

	PBS Engineering and Environmental Inc. GROUNDWATER SAMPLING DATASHEET	Project No: 40535.498 Project Name/ Location: Fire Training Academy Date: February 2, 2022	
		Monitoring Well ID	MW-1
Initial DTW (feet bgs)	20.39	Sample ID (if not well ID)	-
Screen Interval (feet bgs)	12 - 32	Sample Time	1030
Well depth (feet bgs)	32	QC Sample type: _____ <input checked="" type="checkbox"/> Not collected ID _____ Time _____	
Depth of pump/tubing inlet (feet bgs)	23		
Sampling method (describe pump or sampler)	Peristaltic – low flow	Field Personnel	M. Bagley
Purge Rate (L/min)	0.6	Weather Conditions	Overcast, 32° F

WELL PURGING INFORMATION									
Time <input type="checkbox"/> elapsed <input checked="" type="checkbox"/> actual	DTW (feet)	Temp. (F)	Dissolved oxygen (mg/L)	Specific conductivity <input checked="" type="checkbox"/> mS/cm <input type="checkbox"/> µS/cm	pH	ORP (mV)	Turbidity (NTU)	Observations	Volume purged <input checked="" type="checkbox"/> ltr <input type="checkbox"/> gal
1019	20.39	42.2	11.56	0.026	7.36	63.4			0
1022	20.41	42.4	11.44	0.021	6.57	90.1			1
1026	20.41	42.2	12.11	0.021	6.43	99			3
1029	20.41	42.5	12.14	0.022	6.41	101.6			3.6
Total Volume Purged									3.6

FIELD OBSERVATIONS / NOTES (such as well head condition, groundwater color, sediment load, recovery, sheen, odor, equipment) Clear, no odor.
Signature of Field Personnel:

WELL PURGING INFORMATION									
<div>Time</div> <div><input type="checkbox"/> elapsed</div> <div><input checked="" type="checkbox"/> actual</div>	DTW (feet)	Temp. (F)	Dissolved oxygen (mg/L)	<div>Specific conductivity</div> <div><input checked="" type="checkbox"/> mS/cm</div> <div><input type="checkbox"/> μS/cm</div>	pH	ORP (mV)	Turbidity (NTU)	Observations	<div>Volume purged</div> <div><input checked="" type="checkbox"/> ltr</div> <div><input type="checkbox"/> gal</div>
1122	5.50	42.4	3.58	0.034	5.54	121.6			0
1126	5.51	42.2	3.38	0.033	5.49	120.9			1.5
1130	5.53	42.1	3.52	0.033	5.45	122.4			3
1134	5.81	42.1	3.53	0.033	5.43	123.4			4
Total Volume Purged									4

Revised 2/23/2015

WELL PURGING INFORMATION									
<div><div><input type="checkbox"/> elapsed <input checked="" type="checkbox"/> actual</div></div>	DTW (feet)	Temp. (F)	Dissolved oxygen (mg/L)	Specific conductivity <div><input checked="" type="checkbox"/> mS/cm <input type="checkbox"/> μS/cm</div>	pH	ORP (mV)	Turbidity (NTU)	Observations	Volume purged <div><input checked="" type="checkbox"/> ltr <input type="checkbox"/> gal</div>
1206	4.60	43.6	2.10	0.050	5.70	144.4			0
1210	4.60	44.1	1.37	0.050	5.65	135.1			1
1214	4.61	43.8	1.24	0.050	5.65	125.4			1.8
1218	4.62	43.8	1.15	0.051	5.62	122.1			2.8
Total Volume Purged									2.8

Revised 2/23/2015

APPENDIX D

Laboratory Report and Chain-of-Custody

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

January 27, 2022

Mike Bagley, Project Manager
PBS Engineering and Environmental, Inc.
214 E. Galer St, Suite 300
Seattle, WA 98102

Dear Mr Bagley:

Included are the results from the testing of material submitted on January 21, 2022 from the FTA-ASTs 40535.498, F&BI 201304 project. There are 8 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

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

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl
Project Manager

Enclosures
PBS0127R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on January 21, 2022 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental FTA-ASTs 40535.498, F&BI 201304 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>PBS Engineering and Environmental</u>
201304 -01	MW1-15
201304 -02	MW1-12
201304 -03	SB1-15
201304 -04	SB1-25
201304 -05	SB2-10
201304 -06	SB2-16
201304 -07	MW2-9
201304 -08	MW2-13
201304 -09	SB3-5
201304 -10	SB3-16
201304 -11	SB2-25
201304 -12	SB3-10
201304 -13	SB3-18

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/27/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

Date Extracted: 01/24/22

Date Analyzed: 01/24/22 and 01/25/22

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR BENZENE, TOLUENE, ETHYLBENZENE,
XYLENES AND TPH AS GASOLINE
USING METHODS 8021B AND NWTPH-Gx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl Benzene</u>	<u>Total Xylenes</u>	<u>Gasoline Range</u>	<u>Surrogate (% Recovery)</u> (Limit 50-150)
MW1-15 201304-01	<0.02	<0.02	<0.02	<0.06	<5	81
MW1-12 201304-02	<0.02	<0.02	<0.02	<0.06	<5	86
SB1-15 201304-03	<0.02	<0.02	<0.02	<0.06	<5	89
SB1-25 201304-04	<0.02	<0.02	<0.02	<0.06	<5	89
SB2-10 201304-05	<0.02	<0.02	<0.02	<0.06	<5	87
SB2-16 201304-06	<0.02	<0.02	<0.02	<0.06	<5	76
MW2-9 201304-07	<0.02	<0.02	<0.02	<0.06	<5	90
MW2-13 201304-08	0.031	0.24	<0.02	0.57	<5	84
SB3-5 201304-09	<0.02	<0.02	<0.02	<0.06	<5	89
SB3-16 201304-10	0.092	0.36	<0.02	0.18	<5	88

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/27/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

Date Extracted: 01/24/22

Date Analyzed: 01/24/22 and 01/25/22

**RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR BENZENE, TOLUENE, ETHYLBENZENE,
XYLENES AND TPH AS GASOLINE
USING METHODS 8021B AND NWTPH-Gx**

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl Benzene</u>	<u>Total Xylenes</u>	<u>Gasoline Range</u>	<u>Surrogate (% Recovery)</u> (Limit 50-150)
SB2-25 201304-11	<0.02	<0.02	<0.02	<0.06	<5	73
SB3-10 201304-12	0.080	0.55	<0.02	0.24	<5	86
SB3-18 201304-13	<0.02	<0.02	<0.02	<0.06	<5	88
Method Blank 02-155 MB	<0.02	<0.02	<0.02	<0.06	<5	90

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/27/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

Date Extracted: 01/24/22

Date Analyzed: 01/24/22

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

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C ₁₀ -C ₂₅)	<u>Motor Oil Range</u> (C ₂₅ -C ₃₆)	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
MW1-15 201304-01	<50	<250	91
MW1-12 201304-02	<50	<250	91
SB1-15 201304-03	<50	<250	92
SB1-25 201304-04	<50	<250	94
SB2-10 201304-05	<50	<250	92
SB2-16 201304-06	<50	<250	91
MW2-9 201304-07	<50	<250	91
MW2-13 201304-08	<50	<250	92
SB3-5 201304-09	180 x	800	90
SB3-16 201304-10	<50	<250	91

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/27/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

Date Extracted: 01/24/22

Date Analyzed: 01/24/22

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

Results Reported on a Dry Weight Basis

Results Reported as mg/kg (ppm)

<u>Sample ID</u> Laboratory ID	<u>Diesel Range</u> (C ₁₀ -C ₂₅)	<u>Motor Oil Range</u> (C ₂₅ -C ₃₆)	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 53-144)
SB2-25 201304-11	<50	<250	92
SB3-10 201304-12	<50	<250	91
SB3-18 201304-13	<50	<250	91
Method Blank 02-237 MB	<50	<250	94

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/27/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES
FOR BENZENE, TOLUENE, ETHYLBENZENE,
XYLENES, AND TPH AS GASOLINE
USING METHOD 8021B AND NWTPH-G_x**

Laboratory Code: 201304-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Benzene	mg/kg (ppm)	<0.02	<0.02	nm
Toluene	mg/kg (ppm)	<0.02	<0.02	nm
Ethylbenzene	mg/kg (ppm)	<0.02	<0.02	nm
Xylenes	mg/kg (ppm)	<0.06	<0.06	nm
Gasoline	mg/kg (ppm)	<5	<5	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent	
			Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	0.5	104	69-120
Toluene	mg/kg (ppm)	0.5	95	70-117
Ethylbenzene	mg/kg (ppm)	0.5	94	65-123
Xylenes	mg/kg (ppm)	1.5	94	66-120
Gasoline	mg/kg (ppm)	20	120	71-131

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/27/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

**QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS AS
DIESEL EXTENDED USING METHOD NWTPH-D_x**

Laboratory Code: 201307-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	96	94	64-133	2

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	94	58-147

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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.

201304

Report To: Mike Bagley

Company: P&S Eng. + Env.

Address: 214 E. Galer St. Suite 300

City, State, ZIP: Seattle, WA 98102

Phone: 206303359 Email: mkbagley@pssusa.com

SAMPLE CHAIN OF CUSTODY

SAMPLERS (signature) *[Signature]*

PROJECT NAME

FTA - AST's

PO #

40535.498

REMARKS

INVOICE TO

Project specific RLS? - Yes / No

Page # 1 of 2

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							Notes
						NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	
MW1-15	01 A-E	1/19	10:45	Soil	5	x	x	x					
MW1-22	02	1/19	10:55	Soil	5	x	x	x					
SB1-15	03	1/19	13:40	Soil	5	x	x	x					
SB1-25	04	1/19	13:55	Soil	5	x	x	x					
SB2-10	05	1/19	15:10	Soil	5	x	x	x					
SB2-16	06	1/19	15:15	Soil	5	x	x	x					
MW2-9	07	1/20	9:40	Soil	5	x	x	x					
MW2-13	08	1/20	9:05	Soil	5	x	x	x					
SB3-5	09	1/20	11:30	Soil	5	x	x	x					
SB3-16	10	1/20	11:45	Soil	5	x	x	x					

SIGNATURE

Relinquished by: *[Signature]*

PRINT NAME

Mike Bagley

COMPANY

P&S

DATE TIME

1/21/22 2:30

Received by:

[Signature]

V. Mitt

FBM

1/21/22 2:30

Relinquished by:

Received by:

Samples received at 4

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

Mike Bagley

Company PBS Eng. + Env.

Address 214 E. Galer St, Suite 300

City, State, ZIP Seattle, WA 98102

Phone _____ Email _____

SAMPLE CHAIN OF CUSTODY

01-21-22

Vs2/B06

Page # _____ of _____

PROJECT NAME

PO#

FTA - AST's

40535.498

REMARKS

INVOICE TO

Project specific RLS? - Yes / No

TURNAROUND TIME

☒ Standard turnaround

☐ RUSH

Rush charges authorized by: _____

SAMPLE DISPOSAL

☐ Archive samples

☐ Other _____

Default: Dispose after 30 days

ANALYSES REQUESTED

[illegible]

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

SIGNATURE _____

PRINT NAME _____

COMPANY

DATE	TIME
------	------

Received by:

Belimaischaf hv.

Received by:

Mike Bagley
VIN#

PBS
FB

1/21/22	2:30	1
1/22/22	2:30	A

Samples received at	7
---------------------	---

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

February 9, 2022

Mike Bagley, Project Manager
PBS Engineering and Environmental, Inc.
214 E. Galer St, Suite 300
Seattle, WA 98102

Dear Mr Bagley:

Included are the additional results from the testing of material submitted on January 21, 2022 from the FTA-ASTs 40535.498, F&BI 201304 project. There are 8 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
PBS0209R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on January 21, 2022 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental FTA-ASTs 40535.498, F&BI 201304 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>PBS Engineering and Environmental</u>
201304 -01	MW1-15
201304 -02	MW1-12
201304 -03	SB1-15
201304 -04	SB1-25
201304 -05	SB2-10
201304 -06	SB2-16
201304 -07	MW2-9
201304 -08	MW2-13
201304 -09	SB3-5
201304 -10	SB3-16
201304 -11	SB2-25
201304 -12	SB3-10
201304 -13	SB3-18

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	SB3-16	Client:	PBS Engineering and Environmental
Date Received:	01/21/22	Project:	40535.498, F&BI 201304
Date Extracted:	02/03/22	Lab ID:	201304-10 1/0.25
Date Analyzed:	02/03/22	Data File:	020320.D
Matrix:	Soil	Instrument:	GCMS11
Units:	mg/kg (ppm) Dry Weight	Operator:	RF

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	104	79	128
Toluene-d8	97	84	121
4-Bromofluorobenzene	98	84	116

Compounds:	Concentration mg/kg (ppm)
Methyl t-butyl ether (MTBE)	<0.05
1,2-Dibromoethane (EDB)	<0.005
1,2-Dichloroethane (EDC)	<0.05

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260D Dual Acquisition

Client Sample ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	40535.498, F&BI 201304
Date Extracted:	02/03/22	Lab ID:	02-286 mb2 1/0.25
Date Analyzed:	02/03/22	Data File:	020308.D
Matrix:	Soil	Instrument:	GCMS11
Units:	mg/kg (ppm) Dry Weight	Operator:	RF

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	105	79	128
Toluene-d8	95	84	121
4-Bromofluorobenzene	95	84	116

Compounds:	Concentration mg/kg (ppm)
Methyl t-butyl ether (MTBE)	<0.05
1,2-Dibromoethane (EDB)	<0.005
1,2-Dichloroethane (EDC)	<0.05

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	SB3-16	Client:	PBS Engineering and Environmental
Date Received:	01/21/22	Project:	40535.498, F&BI 201304
Date Extracted:	02/02/22	Lab ID:	201304-10 1/5
Date Analyzed:	02/02/22	Data File:	020215.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	52	24	111
Phenol-d6	73	37	116
Nitrobenzene-d5	74	38	117
2-Fluorobiphenyl	77	45	117
2,4,6-Tribromophenol	79	11	158
Terphenyl-d14	106	50	124

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270E

Client Sample ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	40535.498, F&BI 201304
Date Extracted:	02/02/22	Lab ID:	02-276 mb2 1/5
Date Analyzed:	02/02/22	Data File:	020209.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
2-Fluorophenol	69	24	111
Phenol-d6	98	37	116
Nitrobenzene-d5	101	38	117
2-Fluorobiphenyl	104	45	117
2,4,6-Tribromophenol	81	11	158
Terphenyl-d14	113	50	124

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/09/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

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

Laboratory Code: 201425-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	1	<0.05	91	97	21-145	6
1,2-Dichloroethane (EDC)	mg/kg (ppm)	1	<0.05	91	96	12-160	5
1,2-Dibromoethane (EDB)	mg/kg (ppm)	1	<0.05	83	94	28-142	12

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Methyl t-butyl ether (MTBE)	mg/kg (ppm)	1	108	60-123
1,2-Dichloroethane (EDC)	mg/kg (ppm)	1	110	56-135
1,2-Dibromoethane (EDB)	mg/kg (ppm)	1	104	74-132

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/09/22

Date Received: 01/21/22

Project: FTA-ASTs 40535.498, F&BI 201304

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR SEMIVOLATILES BY EPA METHOD 8270E

Laboratory Code: 201434-01 1/5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	mg/kg (ppm)	0.83	<0.01	86	85	50-150	1
2-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	81	83	50-150	2
1-Methylnaphthalene	mg/kg (ppm)	0.83	<0.01	84	85	50-150	1
Acenaphthylene	mg/kg (ppm)	0.83	<0.01	88	91	50-150	3
Acenaphthene	mg/kg (ppm)	0.83	<0.01	91	93	50-150	2
Fluorene	mg/kg (ppm)	0.83	<0.01	87	91	50-150	4
Phenanthrene	mg/kg (ppm)	0.83	<0.01	95	94	50-150	1
Anthracene	mg/kg (ppm)	0.83	<0.01	91	90	50-150	1
Fluoranthene	mg/kg (ppm)	0.83	<0.01	91	90	50-150	1
Pyrene	mg/kg (ppm)	0.83	<0.01	92	96	50-150	4
Benz(a)anthracene	mg/kg (ppm)	0.83	<0.01	96	96	50-150	0
Chrysene	mg/kg (ppm)	0.83	<0.01	97	95	50-150	2
Benzo(a)pyrene	mg/kg (ppm)	0.83	<0.01	91	92	50-150	1
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	<0.01	99	101	50-150	2
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	<0.01	97	98	50-150	1
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	<0.01	116	111	50-150	4
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	<0.01	124	117	50-150	6
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	<0.01	124	116	50-150	7

Laboratory Code: Laboratory Control Sample 1/5

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Naphthalene	mg/kg (ppm)	0.83	94	61-102
2-Methylnaphthalene	mg/kg (ppm)	0.83	89	62-108
1-Methylnaphthalene	mg/kg (ppm)	0.83	92	62-108
Acenaphthylene	mg/kg (ppm)	0.83	95	61-111
Acenaphthene	mg/kg (ppm)	0.83	98	61-110
Fluorene	mg/kg (ppm)	0.83	93	62-114
Phenanthrene	mg/kg (ppm)	0.83	101	64-112
Anthracene	mg/kg (ppm)	0.83	99	63-111
Fluoranthene	mg/kg (ppm)	0.83	97	66-115
Pyrene	mg/kg (ppm)	0.83	97	65-112
Benz(a)anthracene	mg/kg (ppm)	0.83	101	64-116
Chrysene	mg/kg (ppm)	0.83	101	66-119
Benzo(a)pyrene	mg/kg (ppm)	0.83	91	62-116
Benzo(b)fluoranthene	mg/kg (ppm)	0.83	98	61-118
Benzo(k)fluoranthene	mg/kg (ppm)	0.83	99	65-119
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.83	117	64-130
Dibenz(a,h)anthracene	mg/kg (ppm)	0.83	124	67-131
Benzo(g,h,i)perylene	mg/kg (ppm)	0.83	126	67-126

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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.

201304

Report To Mike BagleyCompany PBS Eng. + Env.Address 214 E. Galer St. Suite 300City, State, ZIP Seattle, WA 98102Phone 2063033559 Email mike.bagley@pbsu.com

SAMPLE CHAIN OF CUSTODY

01-21-22

VSA/B03

Page # 1 of 2

SAMPLERS (signature) <u>[Signature]</u>		PO #
PROJECT NAME <u>FTA-ASTIS</u>		<u>40535.498</u>
REMARKS	INVOICE TO	
Project specific RLS? - Yes / No		

TURNAROUND TIME	
<input checked="" type="checkbox"/> Standard turnaround	
<input type="checkbox"/> RUSH	
Rush charges authorized by:	
SAMPLE DISPOSAL	
<input type="checkbox"/> Archive samples	
<input type="checkbox"/> Other	
Default: Dispose after 30 days	

										ANALYSES REQUESTED							Notes
Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	MTBE, EDB, DOL				
NW1-15	01 A-B	1/19	10:45	Soil	5	x	x	x									(Y) per MB 2/1/22 ME
NW1-22	02	1/19	10:55	Soil	5	x	x	x									
SB1-15	03	1/19	13:40	Soil	5	x	x	x									
SB1-25	04	1/19	13:55	Soil	5	x	x	x									
SB2-10	05	1/19	15:10	Soil	5	x	x	x									
SB2-16	06	1/19	15:15	Soil	5	x	x	x									
NW2-9	07	1/20	9:40	Soil	5	x	x	x									
NW2-13	08	1/20	9:05	Soil	5	x	x	x									
SB3-5	09	1/20	11:30	Soil	5	x	x	x									
SB3-10	10	1/20	11:45	Soil	5	x	x	x		(X)		(Y)					

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

SIGNATURE		PRINT NAME		COMPANY		DATE	TIME
Relinquished by: <u>[Signature]</u>		Mike Bagley		PBS		1/21/22	2:30
Received by: <u>[Signature]</u>		V. Nitt		FBI		1/21/22	2:30
Relinquished by:							
Received by:							
				Samples received at		4	

Mike Bailey

01-21-22

152/1805

2

THIRNAROLAND TISSOT

Report To Mike Bagley
Company PBS Eng. + Env.

Company PBS Eng. + Env.

Address 214 E. Galer St. Suite 300

City, State, ZIP Seattle WA 98102

Phone _____ Email _____

2

Standard turnaround

☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL

☐ Archive samples
☐ Other _____

Default: Dispose after 30 days

ANALYSES REQUESTED

[illegible]

SIGNATURE

PRINT NAME _____

COMPANY

[illegible]

Friedman & Bryda, Inc.

Ph. (206) 285-8282

Relinquished by:

FINI IN A

COMPANY

DATE	TIME
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Printed on 2025-09-24 10:10:10 AM by 10.10.10.10

M. K. Bagley

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12/12/23

Received by:

11/11/77

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|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|

Relinquished by:

11/17

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21222.2

Received by:

10

FRIEDMAN & BRUYA, INC.

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ENVIRONMENTAL CHEMISTS

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

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

February 9, 2022

Mike Bagley, Project Manager  
PBS Engineering and Environmental, Inc.  
214 E. Galer St, Suite 300  
Seattle, WA 98102

Dear Mr Bagley:

Included are the results from the testing of material submitted on February 2, 2022 from the FTA AST's 40535.498, F&BI 202039 project. There are 6 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  
PBS0209R.DOC

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### CASE NARRATIVE

This case narrative encompasses samples received on February 2, 2022 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental FTA AST's 40535.498, F&BI 202039 project. Samples were logged in under the laboratory ID's listed below.

| <u>Laboratory ID</u> | <u>PBS Engineering and Environmental</u> |
|----------------------|------------------------------------------|
| 202039 -01           | MW1-020222                               |
| 202039 -02           | MW2-020222                               |
| 202039 -03           | MW3-020222                               |
| 202039 -04           | DUP-020222                               |

All quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/09/22

Date Received: 02/02/22

Project: FTA AST's 40535.498, F&BI 202039

Date Extracted: 02/04/22

Date Analyzed: 02/06/22

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES  
FOR BENZENE, TOLUENE, ETHYLBENZENE,  
XYLENES AND TPH AS GASOLINE  
USING METHODS 8021B AND NWTPH-Gx**

Results Reported as ug/L (ppb)

| <u>Sample ID</u><br>Laboratory ID | <u>Benzene</u> | <u>Toluene</u> | <u>Ethyl<br/>Benzene</u> | <u>Total<br/>Xylenes</u> | <u>Gasoline<br/>Range</u> | <u>Surrogate<br/>(% Recovery)</u><br>(Limit 52-124) |
|-----------------------------------|----------------|----------------|--------------------------|--------------------------|---------------------------|-----------------------------------------------------|
| MW1-020222<br>202039-01           | <1             | <1             | <1                       | <3                       | <100                      | 82                                                  |
| MW2-020222<br>202039-02 1/80      | 680            | 4,800          | 410                      | 2,600                    | 30,000                    | 83                                                  |
| MW3-020222<br>202039-03 1/200     | 910            | 10,000         | 620                      | 4,000                    | 56,000                    | 83                                                  |
| DUP-020222<br>202039-04 1/200     | 990            | 10,000         | 610                      | 4,000                    | 55,000                    | 82                                                  |
| Method Blank<br>02-310 MB         | <1             | <1             | <1                       | <3                       | <100                      | 80                                                  |

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/09/22

Date Received: 02/02/22

Project: FTA AST's 40535.498, F&BI 202039

Date Extracted: 02/03/22

Date Analyzed: 02/03/22

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

Results Reported as ug/L (ppb)

| <u>Sample ID</u><br>Laboratory ID | <u>Diesel Range</u><br>(C <sub>10</sub> -C <sub>25</sub> ) | <u>Motor Oil Range</u><br>(C <sub>25</sub> -C <sub>36</sub> ) | <u>Surrogate</u><br><u>(% Recovery)</u><br>(Limit 41-152) |
|-----------------------------------|------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------|
| MW1-020222<br>202039-01           | <50                                                        | <250                                                          | 118                                                       |
| MW2-020222<br>202039-02           | 1,300 x                                                    | <250                                                          | 130                                                       |
| MW3-020222<br>202039-03           | 1,400 x                                                    | <250                                                          | 133                                                       |
| Method Blank<br>02-371 MB         | <50                                                        | <250                                                          | 133                                                       |

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/09/22

Date Received: 02/02/22

Project: FTA AST's 40535.498, F&BI 202039

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER  
SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE,  
XYLENES, AND TPH AS GASOLINE  
USING EPA METHOD 8021B AND NWTPH-Gx**

Laboratory Code: 202015-01 (Duplicate)

| Analyte      | Reporting<br>Units | Sample<br>Result | Duplicate<br>Result | RPD<br>(Limit 20) |
|--------------|--------------------|------------------|---------------------|-------------------|
| Benzene      | ug/L (ppb)         | <1               | <1                  | nm                |
| Toluene      | ug/L (ppb)         | <1               | <1                  | nm                |
| Ethylbenzene | ug/L (ppb)         | <1               | <1                  | nm                |
| Xylenes      | ug/L (ppb)         | <3               | <3                  | nm                |
| Gasoline     | ug/L (ppb)         | <100             | <100                | nm                |

Laboratory Code: Laboratory Control Sample

| Analyte      | Reporting<br>Units | Spike<br>Level | Percent         | Acceptance<br>Criteria |
|--------------|--------------------|----------------|-----------------|------------------------|
|              |                    |                | Recovery<br>LCS |                        |
| Benzene      | ug/L (ppb)         | 50             | 108             | 65-118                 |
| Toluene      | ug/L (ppb)         | 50             | 104             | 72-122                 |
| Ethylbenzene | ug/L (ppb)         | 50             | 109             | 73-126                 |
| Xylenes      | ug/L (ppb)         | 150            | 104             | 74-118                 |
| Gasoline     | ug/L (ppb)         | 1,000          | 104             | 69-134                 |



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/09/22

Date Received: 02/02/22

Project: FTA AST's 40535.498, F&BI 202039

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER  
SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS  
DIESEL EXTENDED USING METHOD NWTPH-D<sub>x</sub>**

Laboratory Code: Laboratory Control Sample

| Analyte         | Reporting<br>Units | Spike<br>Level | Percent<br>Recovery<br>LCS | Percent<br>Recovery<br>LCSD | Acceptance<br>Criteria | RPD<br>(Limit 20) |
|-----------------|--------------------|----------------|----------------------------|-----------------------------|------------------------|-------------------|
| Diesel Extended | ug/L (ppb)         | 2,500          | 124                        | 124                         | 63-142                 | 0                 |

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **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.

AI3/DO4

Other \_\_\_\_\_

| SIGNATURE                            | PRINT NAME    | COMPANY | DATE   | TIME  |
|--------------------------------------|---------------|---------|--------|-------|
| Relinquished by: <i>Karen DeLaur</i> | Karen DeMouin | PS      | 2/2/22 | 16:00 |
| Received by: <i>Mark</i>             | VINT          | FBI     | 2/2/22 | 16:00 |
| Relinquished by:                     |               |         |        |       |
| Received by:                         |               |         |        |       |

FRIEDMAN & BRUYA, INC.

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ENVIRONMENTAL CHEMISTS

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

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

February 21, 2022

Mike Bagley, Project Manager  
PBS Engineering and Environmental, Inc.  
214 E. Galer St, Suite 300  
Seattle, WA 98102

Dear Mr Bagley:

Included are the additional results from the testing of material submitted on February 2, 2022 from the FTA AST's 40535.498, F&BI 202039 project. There are 6 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: Ken Nogeire

PBS0221R.DOC

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### CASE NARRATIVE

This case narrative encompasses samples received on February 2, 2022 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental FTA AST's 40535.498, F&BI 202039 project. Samples were logged in under the laboratory ID's listed below.

| <u>Laboratory ID</u> | <u>PBS Engineering and Environmental</u> |
|----------------------|------------------------------------------|
| 202039 -01           | MW1-020222                               |
| 202039 -02           | MW2-020222                               |
| 202039 -03           | MW3-020222                               |
| 202039 -04           | DUP-020222                               |

All quality control requirements were acceptable.

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

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

|                   |            |             |                                   |
|-------------------|------------|-------------|-----------------------------------|
| Client Sample ID: | MW3-020222 | Client:     | PBS Engineering and Environmental |
| Date Received:    | 02/02/22   | Project:    | FTA AST's 40535.498, F&BI 202039  |
| Date Extracted:   | 02/15/22   | Lab ID:     | 202039-03 1/100                   |
| Date Analyzed:    | 02/16/22   | Data File:  | 021616.D                          |
| Matrix:           | Water      | Instrument: | GCMS11                            |
| Units:            | ug/L (ppb) | Operator:   | RF                                |

| Surrogates:           | % Recovery: | Lower Limit: | Upper Limit: |
|-----------------------|-------------|--------------|--------------|
| 1,2-Dichloroethane-d4 | 105         | 78           | 126          |
| Toluene-d8            | 97          | 87           | 115          |
| 4-Bromofluorobenzene  | 94          | 92           | 112          |

| Compounds:                  | Concentration<br>ug/L (ppb) |
|-----------------------------|-----------------------------|
| Methyl t-butyl ether (MTBE) | <100                        |
| 1,2-Dibromoethane (EDB)     | <100                        |
| 1,2-Dichloroethane (EDC)    | <20                         |

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

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

|                   |                |             |                                   |
|-------------------|----------------|-------------|-----------------------------------|
| Client Sample ID: | Method Blank   | Client:     | PBS Engineering and Environmental |
| Date Received:    | Not Applicable | Project:    | FTA AST's 40535.498, F&BI 202039  |
| Date Extracted:   | 02/15/22       | Lab ID:     | 02-404 mb                         |
| Date Analyzed:    | 02/15/22       | Data File:  | 021507.D                          |
| Matrix:           | Water          | Instrument: | GCMS11                            |
| Units:            | ug/L (ppb)     | Operator:   | RF                                |

| Surrogates:           | % Recovery: | Lower Limit: | Upper Limit: |
|-----------------------|-------------|--------------|--------------|
| 1,2-Dichloroethane-d4 | 102         | 78           | 126          |
| Toluene-d8            | 96          | 87           | 115          |
| 4-Bromofluorobenzene  | 96          | 92           | 112          |

| Compounds:                  | Concentration<br>ug/L (ppb) |
|-----------------------------|-----------------------------|
| Methyl t-butyl ether (MTBE) | <1                          |
| 1,2-Dibromoethane (EDB)     | <1                          |
| 1,2-Dichloroethane (EDC)    | <0.2                        |

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/21/22

Date Received: 02/02/22

Project: FTA AST's 40535.498, F&BI 202039

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

Laboratory Code: 202272-01 (Matrix Spike)

| Analyte                     | Reporting<br>Units | Spike<br>Level | Sample<br>Result | Percent        | Acceptance<br>Criteria |
|-----------------------------|--------------------|----------------|------------------|----------------|------------------------|
|                             |                    |                |                  | Recovery<br>MS |                        |
| Methyl t-butyl ether (MTBE) | ug/L (ppb)         | 10             | <1               | 101            | 50-150                 |
| 1,2-Dichloroethane (EDC)    | ug/L (ppb)         | 10             | <0.2             | 102            | 50-150                 |
| 1,2-Dibromoethane (EDB)     | ug/L (ppb)         | 10             | <1               | 96             | 50-150                 |



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 02/21/22

Date Received: 02/02/22

Project: FTA AST's 40535.498, F&BI 202039

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

Laboratory Code: Laboratory Control Sample

| Analyte                     | Reporting<br>Units | Spike<br>Level | Percent<br>Recovery<br>LCS | Percent<br>Recovery<br>LCSD | Acceptance<br>Criteria | RPD<br>(Limit 20) |
|-----------------------------|--------------------|----------------|----------------------------|-----------------------------|------------------------|-------------------|
| Methyl t-butyl ether (MTBE) | ug/L (ppb)         | 10             | 92                         | 96                          | 70-130                 | 4                 |
| 1,2-Dichloroethane (EDC)    | ug/L (ppb)         | 10             | 100                        | 104                         | 70-130                 | 4                 |
| 1,2-Dibromoethane (EDB)     | ug/L (ppb)         | 10             | 96                         | 100                         | 70-130                 | 4                 |

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **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.

AI3/DO4

Email [mike.bagley@pbsusa.com](mailto:mike.bagley@pbsusa.com)

Other

# INVOICE TO

ANALYSES REQUESTED

|            |        |              |              |             |           | ANALYSES REQUESTED                  |                                     |                                     |               |               |               |                        |  |  |                          |
|------------|--------|--------------|--------------|-------------|-----------|-------------------------------------|-------------------------------------|-------------------------------------|---------------|---------------|---------------|------------------------|--|--|--------------------------|
| Sample ID  | Lab ID | Date Sampled | Time Sampled | Sample Type | # of Jars | NWTPH-Dx                            | NWTPH-Gx                            | BTEX EPA 8021                       | VOCs EPA 8260 | PAHs EPA 8270 | PCBs EPA 8082 | 8260<br>MTBE, EDG, EDC |  |  | Notes                    |
| MW1-020222 | 01A-E  | 2/2/22       | 10:30        | GW          | 5         | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |               |               |               |                        |  |  | (X) per KN               |
| MW2-020222 | 02A-I  | 2/2/22       | 11:30        | GW          | 5         | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |               |               |               |                        |  |  | 2/14/22 ME               |
| MW3-020222 | 03A-J  | 2/2/22       | 12:30        | GW          | 5         | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |               |               |               |                        |  |  |                          |
| DUP-020222 | 04A-L  | 2/2/22       | 12:00        | GW          | 3         |                                     | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |               |               |               |                        |  |  |                          |
|            |        |              |              |             |           |                                     |                                     |                                     |               |               |               |                        |  |  |                          |
|            |        |              |              |             |           |                                     |                                     |                                     |               |               |               |                        |  |  |                          |
|            |        |              |              |             |           |                                     |                                     |                                     |               |               |               |                        |  |  |                          |
|            |        |              |              |             |           |                                     |                                     |                                     |               |               |               |                        |  |  |                          |
|            |        |              |              |             |           |                                     |                                     |                                     |               |               |               |                        |  |  |                          |
|            |        |              |              |             |           |                                     |                                     |                                     |               |               |               |                        |  |  | Samples received at 4:00 |

# TIME

PL# (206) 285-8282

Received by:

45

22

6-3