Remedial Action Work Plan for Tacoma Smelter Plume Impacts

Site Name:	Olympic View Elementary School
Site Address:	2626 SW 327th Street, Federal Way, Washington
VCP Project ID:	Not assigned

Prepared for:
Mike Kwaske
Federal Way Public Schools
Capital Projects
33330 8th Avenue South
Federal Way, Washington, 98003

PBS Project No. 41519.008

March 3, 2021

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Supporting Data

FIGURES

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1 COVER LETTER

March 3, 2021

Eva Barber
Technical Assistance Coordinator
WA Department of Ecology Toxics Cleanup Program – Southwest Regional Office
300 Desmond Drive SE
Lacey, Washington 98503

Site Name:	Olympic View Elementary School
Site Address:	2626 SW 327th Street, Federal Way, WA
VCP Project ID:	Not Assigned

Dear Ms. Barber,

PBS has prepared this Remedial Action Work Plan for Tacoma Smelter Plume Impacts (work plan) for Federal Way Public Schools (FWPS) to address elevated arsenic concentrations in soil at Olympic View Elementary School (site) resulting from the former Tacoma Smelter Plume. The site is located at 2626 SW 327th Street in Federal Way, Washington.

On behalf of FWPS, PBS requests an opinion from Ecology relating to the following questions:

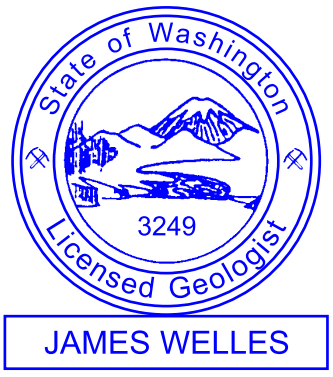
- Will Ecology provide a No Further Action (NFA) Likely opinion letter to FWPS based on the remediation activities proposed in this work plan for the site?

It is noted that the NFA Likely opinion letter from Ecology will be necessary to apply for and obtain permits necessary for construction of a new school at the site from the City of Federal Way. It is further noted that upon completion of remediation activities, PBS will submit a report to Ecology detailing the results of remediation and confirmation sampling, and requesting an NFA opinion letter for the site.

Sincerely,
PBS Engineering and Environmental Inc.

Digitally signed by James Welles
Date: 2021.03.03 09:23:29 -08'00'

James Welles, LG — Date
Project Geologist



2 INTRODUCTION

This Remedial Action Work Plan (work plan) was prepared on behalf of Federal Way Public Schools (FWPS) to guide the remediation of arsenic impacted soils at Olympic View Elementary School (the Project / site). The site is located at 2626 SW 327th Street in Federal Way, Washington (see Site Vicinity Map, Figure 1). The work plan is intended to outline the approach and potential actions needed to address the soil contamination at the project site during a planned construction project.

2.1 Project Location

The site consists of one tax lot (King County Assessor Parcel 1321039008) comprising approximately 9.4 acres of land in a residential neighborhood. The Site is bounded to the north and west by residential lots and a golf course, to the east by 26th Avenue SW, and to the south by SW 327th Street. (see Figure 2 – Site Plan).

3 BACKGROUND

3.1 Site History

The site is located within the widespread soil contamination plume of the former Asarco smelter operation. The Asarco Company operated a copper smelter in Tacoma from 1890 to 1985. Smelter operations emitted an airborne plume of particulates with arsenic, lead, and other heavy metals that were distributed over a wide region of the Puget Sound. As a result, these metals have been found in near surface soils at concentrations which may pose a threat to human health and/or the environment.

Ecology's Tacoma Smelter Plume Model Remedies Guidance (Smelter Plume Guidance) recommends soil sampling at properties in areas with estimated arsenic levels above the state cleanup level of 20 parts per million (ppm). Ecology's Dirt Alert website (https://apps.ecology.wa.gov/dirtalert/) maps the site within an area of predicted arsenic concentrations ranging from 20 to 40 ppm. Thus, the 20 to 40 ppm range can be considered the "baseline" for arsenic concentrations in near surface soils expected on site. Based on the predicted arsenic concentration at the site and the approximate 9.4 acre area of the parcel, the Smelter Plume Guidance recommends samples be collected from a minimum of 44 locations.

3.2 Regulatory Criteria

Ecology's Model Toxics Control Act (MTCA) has established cleanup levels for arsenic and lead for unrestricted land use that are protective of human health and the environment. Ecology's MTCA Method A cleanup levels (CULs) for unrestricted land use for arsenic and lead are:

- The CUL for arsenic is 20 milligrams per kilogram (mg/kg)
- The CUL for lead is 250 mg/kg.

Per Ecology's Tacoma Smelter Plume Model Remedies Guidance (Smelter Plume Guidance), *"if arsenic or lead levels are elevated for any decision unit on the property, that decision unit needs cleanup."* According to the Smelter Plume Guidance, elevated is defined as:

- Average arsenic > 20 parts per million (ppm, equivalent to mg/kg) or average lead > 250 ppm; **or**
- Maximum (any one sample) arsenic >40 ppm or maximum lead > 500 ppm.

3.3 Initial Soil Characterization – September 2020

In September 2020 PBS performed soil characterization sampling at the site to determine the levels of arsenic and lead in shallow soil. Soil characterization was conducted in accordance with the Smelter Plume Guidance. Findings of the sampling activities were presented in PBS's *Olympic View Elementary School - Arsenic and Lead Soil Sampling Report* dated September 16, 2020 (Appendix A). The report identified one location at the site

where arsenic concentrations are defined as elevated per the Smelter Plume Guidance (See Section 3.2). As such, this location requires remediation to comply with the Smelter Plume Guidance and MTCA.

3.4 Supplemental Soil Characterization – December 2020

In December 2020 PBS performed supplemental soil characterization sampling at the site in the vicinity of the sample location with elevated arsenic concentrations identified in the September 2020 sampling event. The purpose of supplemental sampling was to better define the area of elevated arsenic concentrations surrounding the original sample location. Soil characterization was conducted in accordance with the Smelter Plume Guidance. Findings of the sampling activities were presented in PBS's *Olympic View Elementary School – Supplemental Arsenic and Lead Soil Sampling Report* dated January 7, 2021 (Appendix A). Concentrations of arsenic and lead in soil samples collected surrounding the previously identified area of elevated arsenic were below CULs. As such, the supplemental sampling event was successful at defining the lateral and vertical extents of elevated arsenic concentrations at the site.

3.5 Remediation Goals

FWPS intends to remediate sample locations with elevated concentrations of arsenic or lead as directed by the Smelter Plume Guidance. Based on the intended land use as a school, FWPS has also elected to remediate areas where single sample locations contained concentrations of arsenic or lead exceeding the CUL, even if average concentrations within the decision unit are below the cleanup level, and as such are not defined as "elevated" per the Smelter Plume Guidance.

4 SOIL REMEDIATION PLAN

4.1 Remediation Area

Based on the results of soil characterization sampling conducted at the site, and FWPS's goal of remediating any sample location where soil concentrations exceeded the CUL, one remediation area was identified at the site based on detected arsenic concentrations. The remediation area is presented in Figure 3. A more sophisticated drawing sheet depicting the remediation area will be developed with demolition and construction specifications for the Project upon completion of additional design work. The drawing sheet will include extents of the remediation area in state plane coordinates, and additional notes for the general contractor and earthwork subcontractor.

4.2 Proposed Model Remedy – Mixing in Place

The Smelter Plume Guidance presents four model remedies for arsenic and lead contaminated soils based on concentrations detected at the site. "Mixing in place" has been selected as the model remedy for the site. The Smelter Plume Guidance considers mixing a permanent remedy that is acceptable for sites that meet the following criteria:

- Average (arithmetic mean) arsenic concentrations are less than 40 ppm and average lead concentrations less than 500 ppm
- Contamination is not deeper than 12 inches
- Arsenic and lead levels in deeper soils (12-18" and 18-24") have low enough arsenic and lead levels to dilute surface soils.

Based on soil characterization conducted in 2020, the site meets the above criteria, and mixing in place is considered an acceptable and permanent remediation technique for the site.

4.3 Implementation of Model Remedy

Chapter Four of the Smelter Plume Guidance provides a worksheet to calculate the depth of mixing required to achieve CULs. Because the site surface consists of relatively undisturbed soils, Example B of the worksheet was used to calculate mixing depth for the remediation area. Below is the equation presented in Example B:

$$\frac{\text{(Surface Soil Arsenic Concentration x depth) + (Deeper Soil Arsenic Concentration x depth)}}{\text{Surface depth + deeper depth}}$$

The equation is applied to the remediation area as follows:

Average arsenic concentration in top 6 inches of soil as represented by original sample location 2-02 and supplemental sample locations 2-02-10W, 2-02-10N, 2-02-08E and 2-02-10S is calculated below:

$Arsenic_{(Ave)}$ 0-6 inch = (53.1 ppm + 4.27 ppm + 3.60 ppm + 4.15 ppm + 4.20 ppm) / 5 samples
$Arsenic_{(Ave)}$ 0-6 inch = 13.9 ppm

Average arsenic concentration from 6 – 12 inches as represented by sample 2-02b collected from 6 to 12 inches below ground surface (bgs):

$Arsenic_{(Ave)}$ 6-12 inch = 4.43 ppm

Thus, using the equation from Example B in the Chapter Four worksheet:

$$\frac{Arsenic_{(Ave)}\ \text{Mixed} = (13.9\ \text{ppm} \times 6'') + (4.43\ \text{ppm} \times 6'')}{(6'' + 6'')}$$

$Arsenic_{(Ave)}$ Mixed = 9.2 ppm

Because 9.2 ppm meets the CUL for arsenic, mixing to a depth of 12 inches in Remediation Area 1 is expected to achieve the CUL.

4.4 Means and Methods for Remediation

Means and methods for soil remediation by mixing in place will be determined by the contractor selected by FWPS to perform the remediation, based on project specifications prepared by PBS and presented to the contractor by FWPS in the bid package for the project. Means and methods include equipment to be used, as well as mixing techniques such as mixing in place, piling into rows or stockpiles for mixing and spreading back out, or other methods determined to be efficient and cost effective for the contractor and FWPS. The contractor will be required to follow the health and safety procedures outlined in Section 4.5.

4.5 Protection of Human Health and the Environment During Remediation

The contractor selected by FWPS to perform the remediation of soils at the site will be responsible for the health and safety of its own personnel and employees, as well as that of any subcontractors hired to perform the work. The contractor will follow the requirements of the Washington State Department of Labor and Industries Safety Standards for Arsenic.

Work will be performed with the periodic wetting of soils to prevent the generation of fugitive dust. Wetting of soils will be conducted such that surface runoff of water and/or sediment from the remediation area is

prevented in accordance with the contractor's Construction Storm Water Pollution Prevention Plan specific to the project.

PBS will perform air monitoring at the perimeter of remediation areas while mixing activities are taking place. Air samples will be analyzed for particulate arsenic and lead to ensure that contaminants are not escaping the remediation area during the work.

5 POST-REMOVAL COMPLIANCE SOIL SAMPLING

Chapter Seven of the Smelter Plume Guidance specifies that compliance samples be collected after mixing is complete to determine if mixing worked, and that concentrations of arsenic and/or lead within the remediated area meet CULs. Table 4 in Chapter Seven of the Smelter Plume Guidance presents the number of compliance samples required for each remediation area based on acreage and mapped arsenic concentrations. The number of compliance sample locations required for the remediation area based on the table is presented below:

- [0.1 acres (400 sq ft), mapped arsenic concentration <100 ppm] = 4 sample locations

Following completion of the model remedy (mixing in place), the remediation area will be divided into an evenly spaced grid of four sample location points (as outlined above) in accordance with Chapter Seven of the Smelter Plume Guidance. Soil samples will be collected at each grid point at depth ranges of 0 to 6 inches and 6 to 12 inches in the remediation area. Soil samples will be collected and analyzed following the Smelter Plume Guidance Sampling Process as outlined in Chapter Seven of the guidance. Compliance soil samples will be analyzed for total arsenic and lead by EPA Method 6010/6020 at an Ecology-accredited laboratory.

6 INTERPRETATION OF SAMPLING RESULTS

Concentrations of arsenic and lead in soil samples as determined by laboratory analysis will be compared to arsenic and lead CULs. If all concentrations meet CULs, remediation will be considered complete. If concentrations of either arsenic or lead in compliance samples exceed CULs, the area represented by the compliance samples in exceedance of CULs will be mixed in place to a depth of 6 to 12 inches below the maximum mixing depth achieved in the prior remediation effort. Additional remediation by mixing in place will be conducted following the same procedures outlined in Section 3 and as specified in Chapter 4 of the Smelter Plume Guidance.

7 REPORTING

Upon completion of the soil removal and compliance sampling, a project completion report will be prepared that documents the specific depths and locations of the mixing of arsenic-impacted soil, locations and results of compliance soil samples, and evaluation of the lab results with respect to cleanup levels. An accompanying narrative will describe the sampling operations, and any deviations to the procedures that occurred. Corrective actions will be identified as needed, and the resolution of any discrepancies will be reported.

8 LIMITATIONS AND CLOSURE

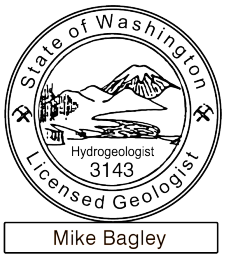
PBS has prepared this work plan for use by FWPS. FWPS plans to submit a VCP application for the site along with this work plan and request for opinion. It is understood that this report may become available to the public.

Sincerely,
PBS Engineering and Environmental Inc.

Digitally signed by
James Welles
Date: 2021.03.03
09:23:50 -08'00'

James Welles, LG — Date
Project Geologist

Digitally signed by
Michael Bagley
Date: 2021.03.03
17:19:18 -08'00'

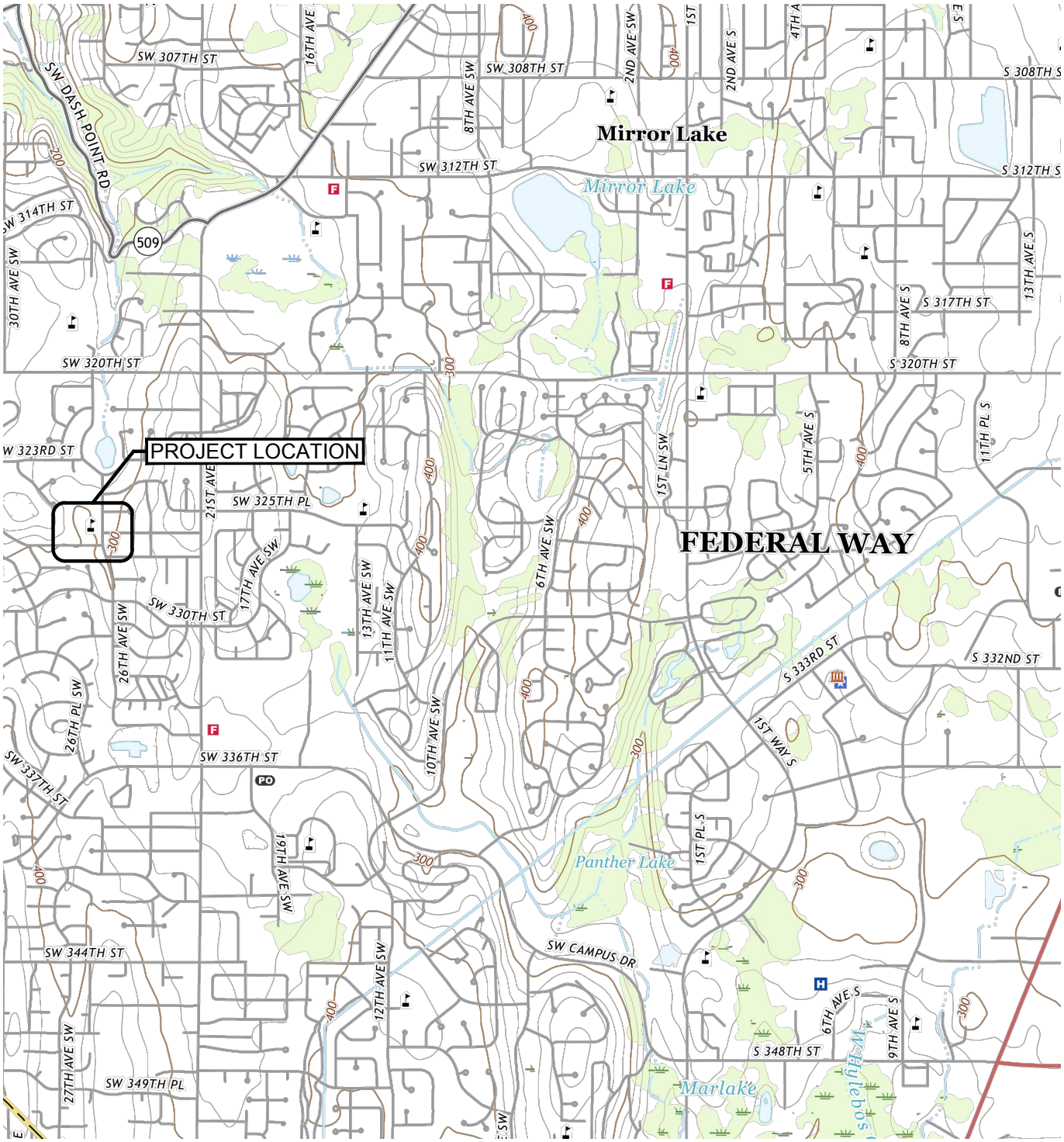


Mike Bagley, LHG — Date
Project Hydrogeologist

9 REFERENCES

(WA Dept of Ecology, 2019) *Tacoma Smelter Plume Model Remedies Guidance, Sampling and cleanup of arsenic and lead contaminated soils,* Publication No. 19-09-101 July 2019.

Figures



SOURCE: USGS POVERTY BAY, WA QUADRANGLE 2020.

WASHINGTON

SCALE 1" = 2000'

0' 1,000' 2,000' 4,000'

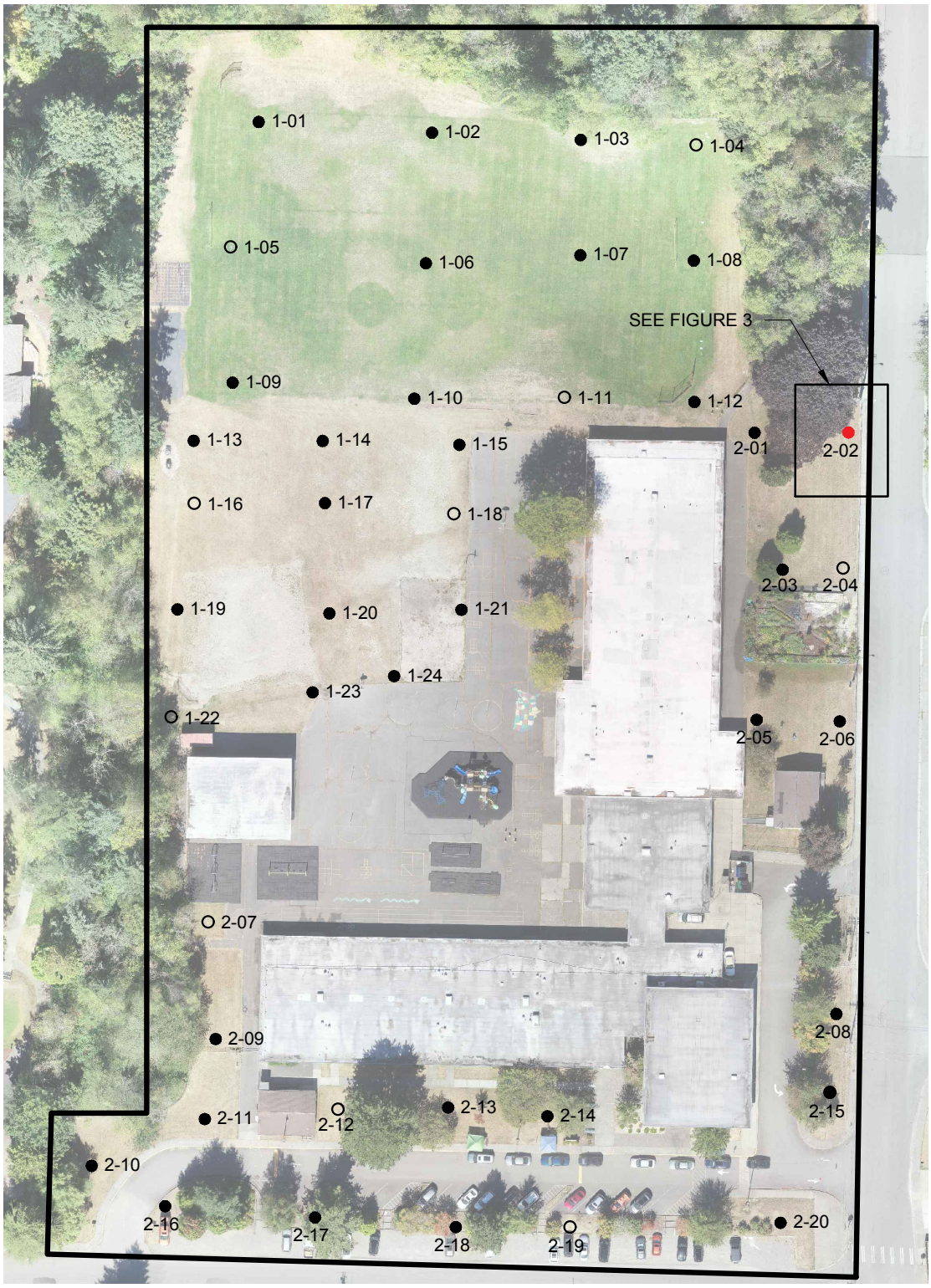
PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

VICINITY MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 327TH STREET
FEDERAL WAY, WASHINGTON

MAR 2021
41519.008

FIGURE
1



SOURCE: © 2018 GOOGLE EARTH PRO

LEGEND

● 1-01	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6"), As/Pb < MTCA
○ 1-04	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6", 6-12"), As/Pb < MTCA
● 2-02	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6"), As > MTCA

SCALE 1" = 100'

0' 50' 100' 200'

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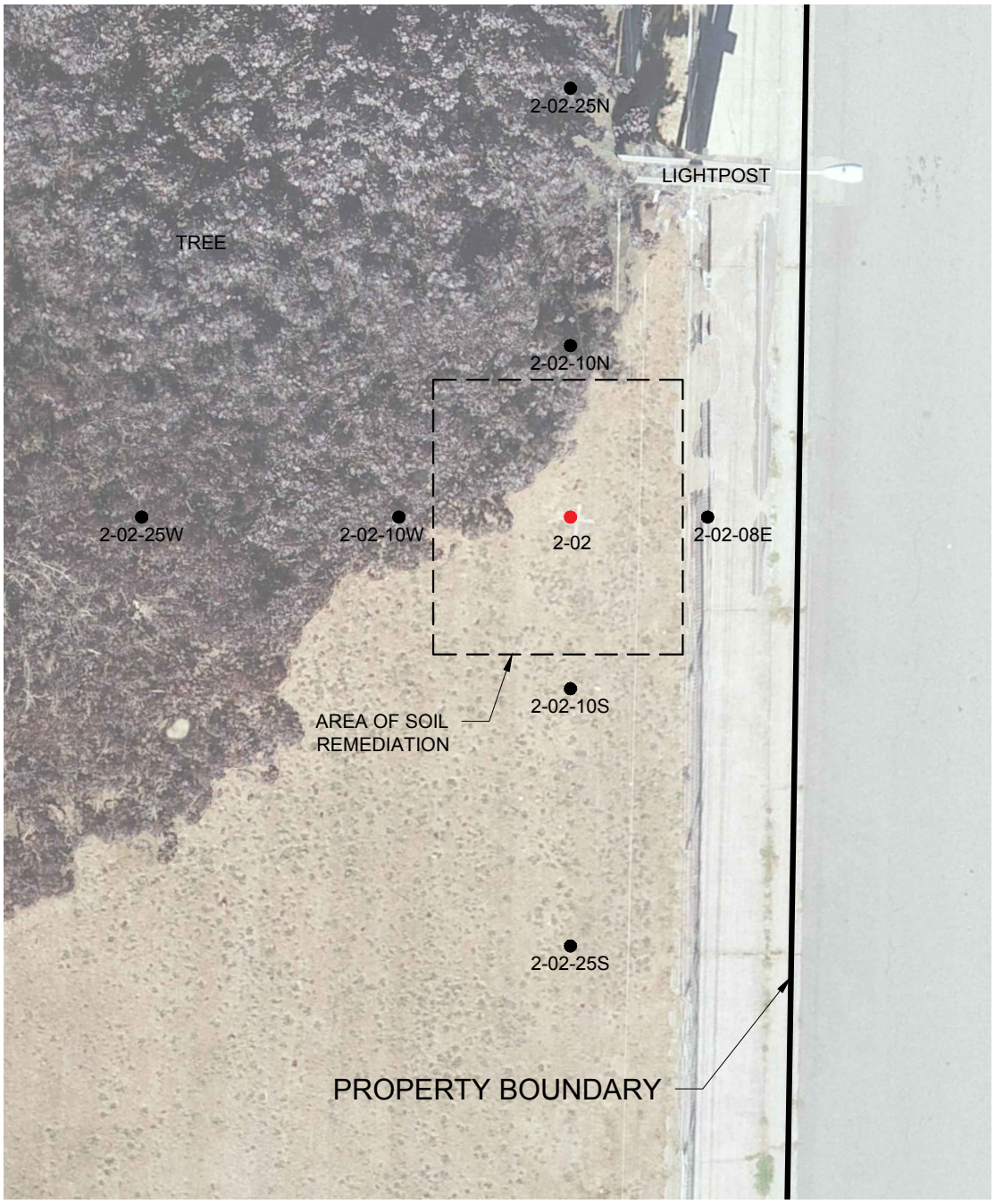
As / Pb SOIL SAMPLE LOCATION MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 SOUTHWEST 327TH STREET
FEDERAL WAY, WASHINGTON

MAR 2021
41519.008

FIGURE
2



SOURCE: © 2018 GOOGLE EARTH PRO

LEGEND

● 2-02-10W	STEP OUT SAMPLE LOCATION WITH ARSENIC AND LEAD CONCENTRATIONS <MTCA METHOD A CLEANUP LEVELS
● 2-02	ORIGINAL SAMPLE LOCATIONS WITH ELEVATED ARSENIC CONCENTRATIONS FROM 0-6 INCHES BGS

SCALE 1" = 10'

0' 5' 10' 20'

PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

PBS

SUPPLEMENTAL As / Pb SOIL SAMPLE LOCATION MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 SOUTHWEST 327TH STREET
FEDERAL WAY, WASHINGTON

MAR 2021
41519.008

FIGURE
3

Appendix A

Initial and Supplemental Soil Characterization Reports for Olympic View Elementary School

September 16, 2020

Federal Way Public Schools
Capital Projects
1211 S 232nd St
Federal Way, WA 98004
Email: fwpscp18@fwps.org

RE: Olympic View Elementary School – Arsenic and Lead Soil Sampling
2626 SW 327th Street, Federal Way, Washington
PBS Project #41519.008

Federal Way Public Schools (FWPS) contracted PBS Engineering and Environmental Inc. (PBS) to evaluate the potential for arsenic and lead contaminants in near surface soils at the site of Olympic View Elementary School (OLV) prior to site redevelopment as part of the Olympic View Elementary School Replacement Project.

On September 1, 2020 PBS performed soil sampling activities to determine the levels of arsenic and lead in shallow soil at OLV in Federal Way, Washington (Figure 1). This report presents the findings of the sampling activities and provides recommendations for regulatory compliance as well as for the handling and management of impacted soils during future redevelopment. The scope of services was presented in the Proposal for Arsenic and Lead Soil Testing (WA31072) by PBS, dated August 17, 2020.

BACKGROUND

OLV is located within the widespread soil contamination plume of the former Asarco smelter operation. The Asarco Company operated a copper smelter in Tacoma from 1890 to 1985. Smelter operations emitted an airborne plume of particulates with arsenic, lead, and other heavy metals that were distributed over a wide region of the Puget Sound. As a result, these metals have been found in near surface soils at concentrations which may pose a threat to human health and/or the environment.

Ecology's Tacoma Smelter Plume Model Remedies Guidance (Smelter Plume Guidance) recommends soil sampling at properties in areas with estimated arsenic levels above the state cleanup level of 20 parts per million (ppm)[1]. Ecology's Dirt Alert website[2] maps the site within an area of predicted arsenic concentrations ranging from 20 to 40 ppm. Thus, the 20 to 40 ppm range can be considered the "baseline" for arsenic concentrations in near surface soils expected on site. Based on the predicted arsenic concentration at the site and the approximate 9.5-acre area of the parcel, the Smelter Plume Guidance recommends samples be collected from a minimum of 44 locations.

REGULATORY CRITERIA

Per the Smelter Plume Guidance "if arsenic or lead levels are elevated for any decision unit on the property, that decision unit needs cleanup." Per the Smelter Plume Guidance, elevated is defined as:

- Average arsenic > 20 ppm, equivalent to milligrams per kilogram (mg/kg) or average lead > 250 ppm; **or**
- Maximum (any one sample) arsenic > 40 ppm or maximum lead > 500 ppm.

[1] *"Tacoma Smelter Plume Model Remedies Guidance: Sampling and cleanup of arsenic and lead contaminated soils"*, Washington State Department of Ecology, July 2019, Publication No. 19-09-101
[2] https://apps.ecology.wa.gov/dirtalert/

Ecology's Model Toxics Control Act (MTCA) has established cleanup levels for arsenic and lead for unrestricted land use that are protective of human health and the environment[3]. Ecology's MTCA Method A cleanup levels (CULs) for unrestricted land use for arsenic and lead are applicable for comparison to any single soil sample concentration. The CULs for arsenic and lead are presented below:

- The CUL for arsenic is 20 milligrams per kilogram (mg/kg)
- The CUL for lead is 250 mg/kg.

Based on the land use as a school, FWPS has elected to clean up site soils found to be in exceedance of CULs, even if the soils are not defined as elevated per the Smelter Plume Guidance.

CHARACTERIZATION SOIL SAMPLING

On September 1, 2020, fifty-five (55) discrete soil samples were collected from forty-four (44) locations around the building landscaping and playfields of OLV. Following Ecology guidance, the property was divided into two decision units based on current use as playfield or landscaped area. Decision units and sample locations are shown on Figure 2. A summary of the decision units is provided below. The number of samples collected for analysis per decision unit for this project is based on the Smelter Plume Guidance.

Decision Units

Decision Unit ID	Soil disturbance planned?	Number of samples collected (0-6″)	Number of samples collected (6-12″)	Acres (approximate)	Total Number of Samples
1	unknown	24	6	4.5	30
2	unknown	20	5	5	25

0-6″ = Soil samples were collected from the 0-6 inch depth interval
6-12″ = Soil samples were collected from the 6-12 inch depth interval

Per the Smelter Plume Guidance, one (1) discrete sample was collected at each sample location from a depth interval of 0 to 6 inches below ground surface (bgs). A second discrete sample was collected at every fourth location from a depth interval of 6 to 12 inches bgs. Sample locations were chosen in a manner that maximized coverage of the decision units and did not contain areas with surface cover or buildings during the sampling activities.

Soil sample collection started just below any surface cover layer (e.g., sod or grass). A hand spade and a hand auger were used to complete 6-inch deep test holes. A soil sample was collected at a depth of less than 6 inches below ground surface at each location. At every fourth location, upon collection of the 0- to 6-inch sample, the hole was advanced to a depth of 12 inches, and a second sample was collected from the 6- to 12-inch depth interval using the same methods described above.

PBS personnel wore disposable nitrile gloves to protect against cross-contamination between samples. Soil retained for analysis was packed into laboratory-provided containers, labeled and transported on ice under chain of custody documentation to Friedman and Bruya, Inc. in Seattle, an Ecology accredited analytical laboratory.

[3] *"Model Toxics Control Act Regulation and Statute",* Washington State Department of Ecology, 2013 Revision, Publication No. 94-06

Samples were analyzed for total arsenic and lead using EPA Method 6020. Total arsenic and lead results were reported on a dry weight basis.

ANALYTIC RESULTS

Analytical results from soil samples collected on site are below MTCA Method A CULs for arsenic, except for one (1) sample from a single location (Sample ID: 2-02) on the eastern side of Decision Unit 2 adjacent to 26th Avenue SW (See Figure 2). The sample collected from 0 to 6 inches bgs at location 2-02 contained arsenic at a concentration of 53.1 mg/kg. The concentration is both in exceedance of the CUL and considered elevated per the Smelter Plume Guidance. All other sample results for arsenic were below the MTCA Method A cleanup level of 20 mg/kg.

All analytical results for lead from soil samples collected on-site are below the MTCA Method A cleanup level of 250 mg/kg.

Based on the analytical results of soil samples collected on-site, average arsenic and lead concentrations were calculated for each decision unit and are presented below.

Average Concentrations per Decision Unit

Decision Unit ID	Mean Concentration (0-6″)		Mean Concentration (6-12″)	
	As	Pb	As	Pb
1	4.48	22.19	3.20	5.98
2	8.89	20.12	4.59	13.49
MTCA A Cleanup Level	20	250	20	250

(0-6″) (Pb / As) = Average Concentration at the 0 to 6-inch interval for arsenic (As) and lead (Pb) in mg/kg
(6-12″) (Pb / As) = Average Concentration at the 6 to 12-inch interval for arsenic (As) and lead (Pb) in mg/kg

Analytical results from soil samples collected on-site are summarized in Table 1. Figure 2 depicts the decision unit boundaries and the locations where analytical results indicated lead or arsenic concentrations above MTCA Method A CULs. Laboratory reports are provided in Attachment A.

CONCLUSIONS

Based on the analytical results of the soil sampling, and using Ecology's Tacoma Smelter Plume Model Remedy Guidance, June 2019, the following conclusion and recommendations were made regarding the handling and management of project site soils.

Decision Unit 1

No further action is advised within Decision Unit 1 based on the results of soil sampling conducted on September 1, 2020.

Decision Unit 2

Analytical results from the discrete soil sample collected at sample location 2-02 indicated arsenic concentrations are above MTCA Method A CULs and Smelter Plume Guidance elevated levels in the top 6" bgs. A deeper sample was not collected in this location.

Further action will be required to address the arsenic concentrations in soil at the above referenced location and achieve compliance with Ecology regulations. According to Ecology's Model Remedies Guidance, the impacted soil can be managed in-place or removed by excavation. Strategies for management of impacted soil in-place include dilution of arsenic concentrations via mixing of impacted soil with clean imported soil or capping of soil in place with clean soil and a geotextile or a hard cap. Mixing of soils is accepted for arsenic-impacted soil with an average concentration less than 40 ppm. Ecology does not consider capping in-place a permanent remediation strategy given the potential for exposure if the cap is removed. Capping in-place may require annual inspection of the cap's integrity, as well as the filing of an environmental land covenant for the property. Based on average arsenic concentrations within Decision Unit 2 mixing in place is proposed as the preferred model remedy at the site. PBS recommends additional sampling to further delineate the lateral and vertical extents of elevated arsenic concentrations in the vicinity of sample location 2-02.

Remediation of impacted soils can be conducted by the contractor as part of the Olympic View Elementary School Replacement Project under PBS's supervision, but must be completed prior to any grading, excavation or earthwork activities that disturb on-site soil. The construction design and specifications for remediation of the arsenic-impacted soil as part of the Olympic View Elementary School Replacement Project shall incorporate health and safety requirements, methods for soil removal, disposal and confirmation sampling and soil management strategies.

LIMITATIONS

This investigation was conducted to characterize lead and arsenic distributions in shallow soils on-site, with a focus on protection of human health and the environment. The data collected in this investigation are not intended for the purposes of waste profiling for offsite disposal, or for estimation of volume or tonnage of soil requiring disposal.

PBS has prepared this report for use by FWPS. This report is not intended for use by others without the written consent of the FWPS. Our interpretation of soil conditions in this study was based on field observations and analytical data from the indicated explorations. Regulated substances may exist in portions of the site that were

not explored or analyzed. The conclusions in this report are not to be considered a legal opinion as the client's duty concerning due diligence relating to potential liabilities in leasing, owning, or purchasing real estate.

PBS ENGINEERING AND ENVIRONMENTAL INC.

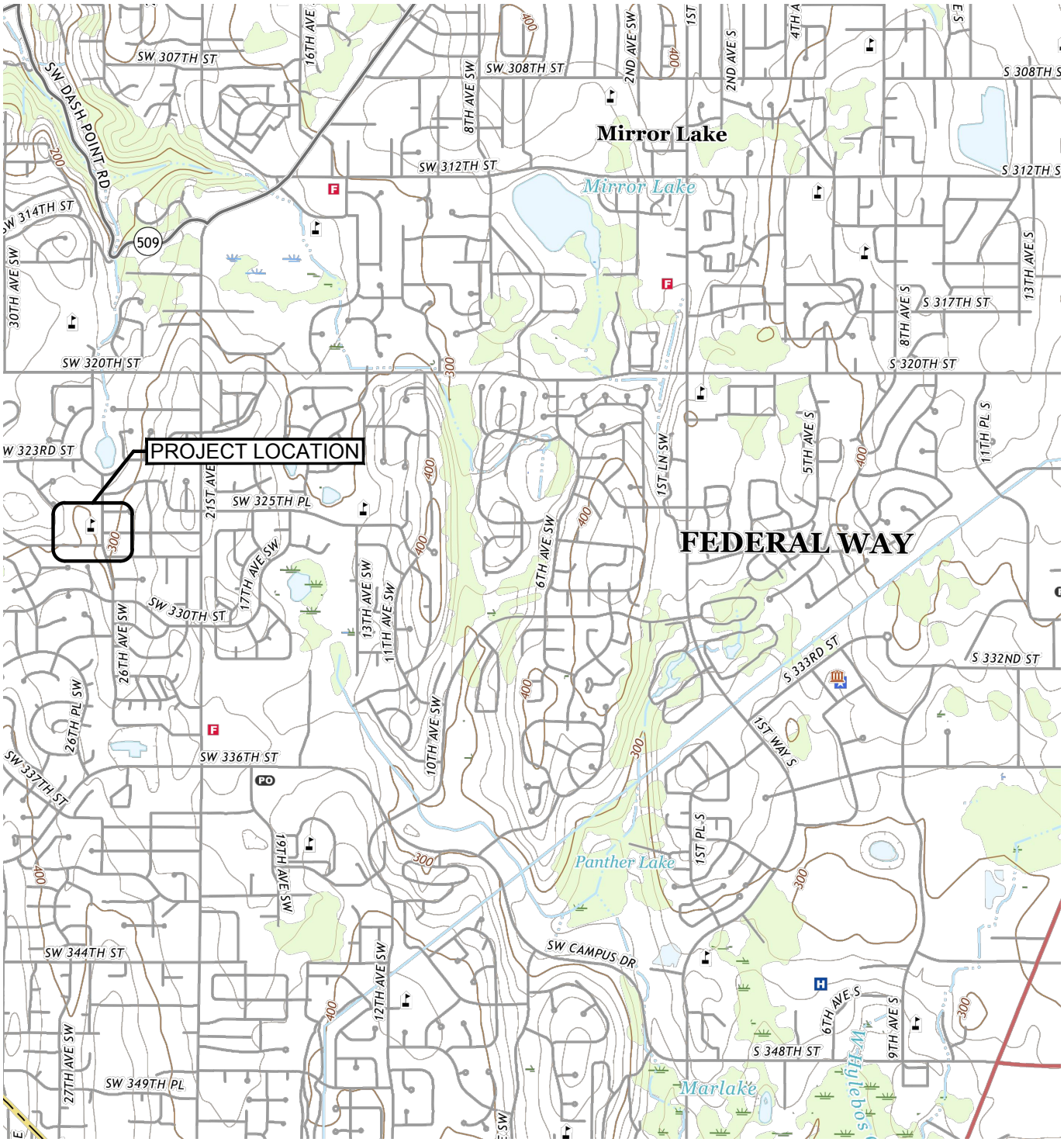
James Welles, LG
Project Geologist

Reviewed By:

Melanie Young, PE
Senior Environmental Engineer

Attachments:
Figure 1: Vicinity Map
Figure 2: Sample Location Map
Table 1: Laboratory Data Summary Table
Attachment A: Laboratory Data

Figures



SOURCE: USGS POVERTY BAY, WA QUADRANGLE 2020.

WASHINGTON

SCALE 1" = 2000'

0' 1,000' 2,000' 4,000'

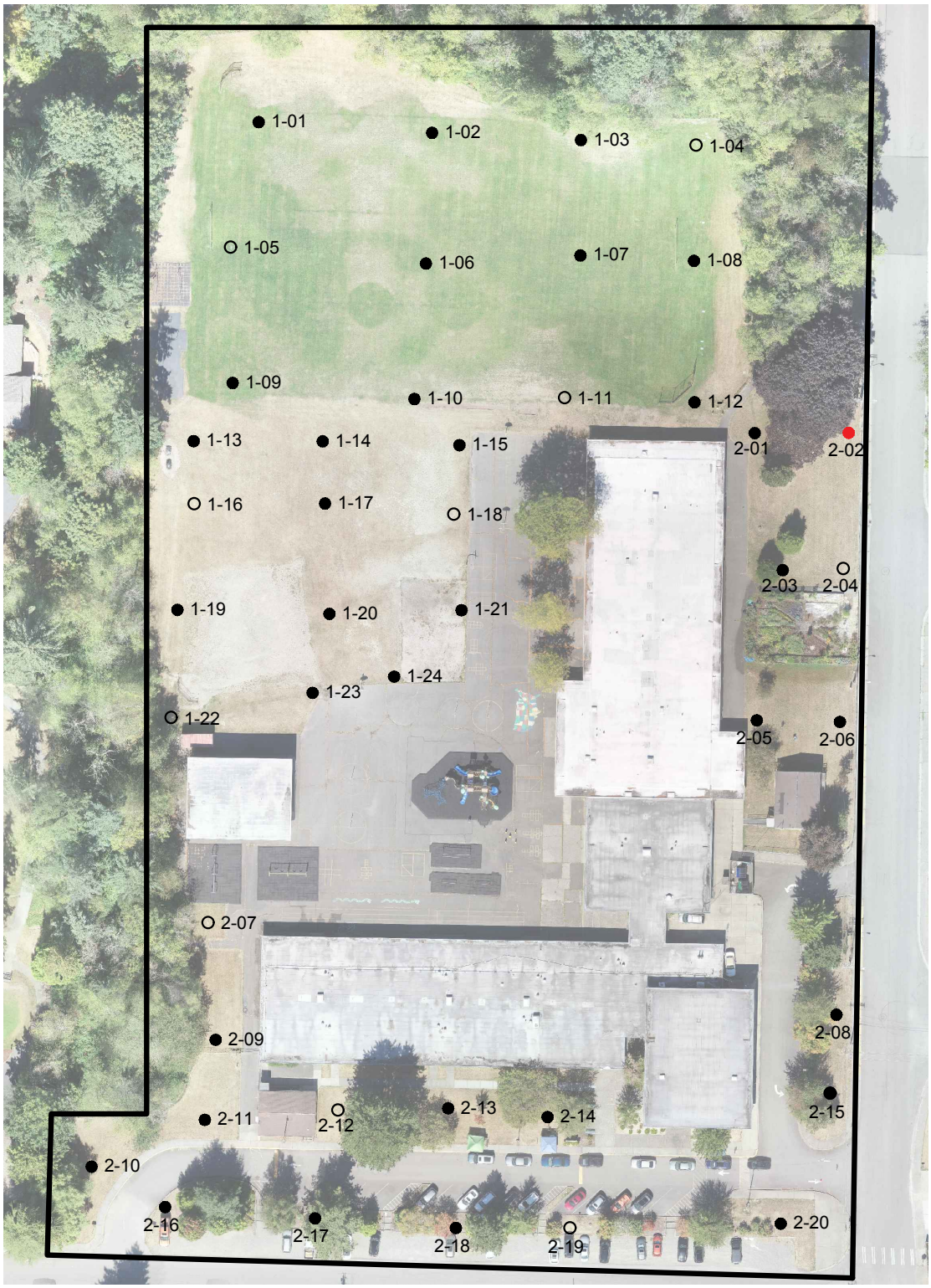
PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

VICINITY MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 SW 327TH STREET
FEDERAL WAY, WASHINGTON

SEP 2020
41519.008

FIGURE
1



SOURCE: © 2018 GOOGLE EARTH PRO

LEGEND

● 1-01	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6"), As/Pb < MTCA
○ 1-04	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6", 6-12"), As/Pb < MTCA
● 2-02	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6"), As > MTCA

SCALE 1" = 100'

0' 50' 100' 200'

PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

As / Pb SOIL SAMPLE LOCATION MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 SW 327TH STREET
FEDERAL WAY, WASHINGTON

SEP 2020
41519.008

FIGURE
2

Tables

TABLE 1
SOIL ANALYTICAL RESULTS
Olympic View Elementary School
2626 SW 327th Street, Federal Way, Washington
PBS Project No. 41519.008

Location	Sample Depth Range inches bgs	Metals	
		Arsenic mg/kg	**Lead** mg/kg
Decision Unit 1			
1-01	0-6	4.34	9.22
1-02	0-6	3.95	9.98
1.03	0-6	3.81	13.4
1-04a	0-6	3.33	7.03
1-05a	0-6	<5	8.63
1-06	0-6	<5	9.16
1-07	0-6	2.90	7.76
1-08	0-6	3.14	7.18
1-09	0-6	3.93	8.35
1-10	0-6	1.81	3.88
1-11a	0-6	3.80	8.28
1-12	0-6	3.51	9.88
1-13	0-6	5.11	12.5
1-14	0-6	5.84	10.8
1-15	0-6	5.67	16.4
1-16a	0-6	3.75	6.47
1-17	0-6	4.14	7.03
1-18a	0-6	16.0	27.9
1-19	0-6	3.08	5.83
1-20	0-6	3.38	6.31
1-21	0-6	<5	231
1-22a	0-6	3.62	7.16
1-23	0-6	6.18	62.1
1-24	0-6	7.22	43.6
Average		4.69	22.49
1-04b	6-12	3.07	8.54
1-05b	6-12	3.41	8.24
1-11b	6-12	2.34	5.83
1-16b	6-12	2.36	2.52
1-18b	6-12	4.35	5.01
1-22b	6-12	4.03	6.34
Average		3.26	6.08
Decision Unit 2			
2-01	0-6	4.1	7.02
2-02	0-6	**53.1**	84.1
2-03	0-6	6.33	9.37
2-04a	0-6	5.35	9.59
2-05	0-6	6.21	14.6
2-06	0-6	4.18	9.65
2-07a	0-6	3.51	10.2
2-08	0-6	3.77	14.5
2-09	0-6	11.6	23.1
2-10	0-6	13.4	23.5
2-11	0-6	9.16	14.4
2-12a	0-6	12.8	25.3
2-13	0-6	16.3	29.6
2-14	0-6	9.38	26.6
2-15a	0-6	4.81	11.5
2-16	0-6	5.20	17.3
2-17	0-6	6.46	17.1
2-18	0-6	4.27	16.3
2-19a	0-6	4.53	46.8
2-20	0-6	4.37	18.9
Average		9.44	21.47
2-04b	6-12	5.25	10.20
2-07b	6-12	3.34	9.05
2-12b	6-12	7.20	14.7
2-15b	6-12	4.54	12.7
2-19b	6-12	4.06	27.2
Average		4.88	14.77
AVERAGE CONCENTRATION FOR SITE		6.37	19.63
Adopted Criteria	**MTCA Method A Cleanup Levels For Soil[a]**	**20**	**250**
	Elevated Concentration[b]	**40**	**500**

Bold - Sample result exceeds adopted criteria

[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

[b] - Washington State Department of Ecology Tacoma Smelter Plume Model Remedies Guidance, Sampling and cleanup of arsenic and lead contaminated soils, Publication Number 19-09-101, July 2019.

Abbreviations & Acronyms:
mg/kg - milligrams per kilogram
bgs - below ground surface

Attachment A

Laboratory Report and Chain of Custody Documentation

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
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September 14, 2020

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

Dear Mr Welles:

Included are the results from the testing of material submitted on September 1, 2020 from the Olympic View PO 41519.008, F&BI 009022 project. There are 64 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
PBS0914R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on September 1, 2020 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental Olympic View PO 41519.008, F&BI 009022 roject. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	PBS Engineering and Environmental
009022 -01	1-01
009022 -02	1-02
009022 -03	1-03
009022 -04	1-04a
009022 -05	1-04b
009022 -06	1-05a
009022 -07	1-05b
009022 -08	1-06
009022 -09	1-07
009022 -10	1-08
009022 -11	1-09
009022 -12	1-10
009022 -13	1-11a
009022 -14	1-11b
009022 -15	1-12
009022 -16	1-13
009022 -17	1-14
009022 -18	1-15
009022 -19	1-16a
009022 -20	1-16b
009022 -21	1-17
009022 -22	1-18a
009022 -23	1-18b
009022 -24	1-19
009022 -25	1-20
009022 -26	1-21
009022 -27	1-22a
009022 -28	1-22b
009022 -29	1-23
009022 -30	1-24
009022 -31	2-01
009022 -32	2-02
009022 -33	2-03
009022 -34	2-04a
009022 -35	2-04b

CASE NARRATIVE (continued)

Laboratory ID	PBS Engineering and Environmental
009022 -36	2-05
009022 -37	2-06
009022 -38	2-07a
009022 -39	2-07b
009022 -40	2-08
009022 -41	2-09
009022 -42	2-10
009022 -43	2-11
009022 -44	2-12a
009022 -45	2-12b
009022 -46	2-13
009022 -47	2-14
009022 -48	2-15a
009022 -49	2-15b
009022 -50	2-16
009022 -51	2-17
009022 -52	2-18
009022 -53	2-19a
009022 -54	2-19b
009022 -55	2-20

All quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-01	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-01
Date Analyzed:	09/04/20	Data File:	009022-01.063
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.34
Lead	9.22

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-02	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-02
Date Analyzed:	09/04/20	Data File:	009022-02.064
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.95
Lead	9.98

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-03	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-03
Date Analyzed:	09/04/20	Data File:	009022-03.069
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.81
Lead	13.4

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-04a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-04
Date Analyzed:	09/04/20	Data File:	009022-04.070
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.33
Lead	7.03

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-04b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-05
Date Analyzed:	09/04/20	Data File:	009022-05.071
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.07
Lead	8.54

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-05a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-06 x5
Date Analyzed:	09/04/20	Data File:	009022-06 x5.080
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Lead	8.63

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-05b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-07
Date Analyzed:	09/04/20	Data File:	009022-07.076
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.41
Lead	8.24

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-06	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-08 x5
Date Analyzed:	09/04/20	Data File:	009022-08 x5.081
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Lead	9.16

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-07	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-09
Date Analyzed:	09/04/20	Data File:	009022-09.078
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	2.90
Lead	7.76

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-08	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-10
Date Analyzed:	09/04/20	Data File:	009022-10.079
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.14
Lead	7.18

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-09	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-11
Date Analyzed:	09/09/20	Data File:	009022-11.264
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.93
Lead	8.35

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-10	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-12
Date Analyzed:	09/09/20	Data File:	009022-12.265
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	1.81
Lead	3.88

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-11a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-13
Date Analyzed:	09/09/20	Data File:	009022-13.266
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.80
Lead	8.28

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-11b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-14
Date Analyzed:	09/09/20	Data File:	009022-14.267
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	2.34
Lead	5.83

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-12	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-15
Date Analyzed:	09/09/20	Data File:	009022-15.268
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.51
Lead	9.88

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-13	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-16
Date Analyzed:	09/09/20	Data File:	009022-16.269
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.11
Lead	12.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-14	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-17
Date Analyzed:	09/09/20	Data File:	009022-17.273
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.84
Lead	10.8

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-15	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-18
Date Analyzed:	09/09/20	Data File:	009022-18.274
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.67
Lead	16.4

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-16a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-19
Date Analyzed:	09/09/20	Data File:	009022-19.275
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.75
Lead	6.47

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-16b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-20
Date Analyzed:	09/09/20	Data File:	009022-20.276
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	2.36
Lead	2.52

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-17	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-21
Date Analyzed:	09/09/20	Data File:	009022-21.277
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.14
Lead	7.03

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-18a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-22
Date Analyzed:	09/09/20	Data File:	009022-22.278
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	16.0
Lead	27.9

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-18b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-23
Date Analyzed:	09/09/20	Data File:	009022-23.279
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.35
Lead	5.01

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-19	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-24
Date Analyzed:	09/09/20	Data File:	009022-24.280
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.08
Lead	5.83

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-20	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-25
Date Analyzed:	09/09/20	Data File:	009022-25.281
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.38
Lead	6.31

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-21	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-26 x5
Date Analyzed:	09/10/20	Data File:	009022-26 x5.061
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<5
Lead	231

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-22a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-27
Date Analyzed:	09/10/20	Data File:	009022-27.076
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.62
Lead	7.16

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-22b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-28
Date Analyzed:	09/10/20	Data File:	009022-28.077
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.03
Lead	6.34

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-23	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-29
Date Analyzed:	09/10/20	Data File:	009022-29.078
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	6.18
Lead	62.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	1-24	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-30
Date Analyzed:	09/10/20	Data File:	009022-30.079
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	7.22
Lead	43.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-01	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-31
Date Analyzed:	09/10/20	Data File:	009022-31.080
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.12
Lead	7.02

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-32
Date Analyzed:	09/10/20	Data File:	009022-32.081
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	53.1
Lead	84.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-03	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-33
Date Analyzed:	09/10/20	Data File:	009022-33.082
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	6.33
Lead	9.37

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-04a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-34
Date Analyzed:	09/10/20	Data File:	009022-34.083
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.35
Lead	9.59

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-04b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-35
Date Analyzed:	09/10/20	Data File:	009022-35.084
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.25
Lead	10.2

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-05	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-36
Date Analyzed:	09/10/20	Data File:	009022-36.085
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	6.21
Lead	14.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-06	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-37
Date Analyzed:	09/10/20	Data File:	009022-37.114
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.18
Lead	9.65

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-07a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-38
Date Analyzed:	09/10/20	Data File:	009022-38.115
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.51
Lead	10.2

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-07b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-39
Date Analyzed:	09/10/20	Data File:	009022-39.116
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.34
Lead	9.05

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-08	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-40
Date Analyzed:	09/10/20	Data File:	009022-40.117
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.77
Lead	14.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-09	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-41
Date Analyzed:	09/10/20	Data File:	009022-41.122
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	11.6
Lead	23.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-10	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-42
Date Analyzed:	09/03/20	Data File:	009022-42.050
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	13.4
Lead	23.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-11	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-43
Date Analyzed:	09/03/20	Data File:	009022-43.051
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	9.16
Lead	14.4

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-12a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-44
Date Analyzed:	09/03/20	Data File:	009022-44.052
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	12.8
Lead	25.3

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-12b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-45
Date Analyzed:	09/10/20	Data File:	009022-45.123
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	7.20
Lead	14.7

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-13	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-46
Date Analyzed:	09/10/20	Data File:	009022-46.124
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	16.3
Lead	29.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-14	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-47
Date Analyzed:	09/03/20	Data File:	009022-47.159
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	9.38
Lead	26.6

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-15a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-48
Date Analyzed:	09/10/20	Data File:	009022-48.125
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.81
Lead	11.5

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-15b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-49
Date Analyzed:	09/10/20	Data File:	009022-49.126
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.54
Lead	12.7

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-16	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-50
Date Analyzed:	09/10/20	Data File:	009022-50.127
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.20
Lead	17.3

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-17	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-51
Date Analyzed:	09/10/20	Data File:	009022-51.128
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	6.46
Lead	17.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-18	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-52
Date Analyzed:	09/03/20	Data File:	009022-52.166
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.27
Lead	16.3

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-19a	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-53
Date Analyzed:	09/03/20	Data File:	009022-53.167
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.53
Lead	46.8

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-19b	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-54
Date Analyzed:	09/03/20	Data File:	009022-54.168
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.06
Lead	27.2

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-20	Client:	PBS Engineering and Environmental
Date Received:	09/01/20	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	009022-55
Date Analyzed:	09/03/20	Data File:	009022-55.169
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.37
Lead	18.9

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	I0-511 mb
Date Analyzed:	09/02/20	Data File:	I0-511 mb.130
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<1
Lead	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	I0-512 mb
Date Analyzed:	09/02/20	Data File:	I0-512 mb.132
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<1
Lead	<1

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	Olympic View PO 41519.008
Date Extracted:	09/02/20	Lab ID:	I0-513 mb
Date Analyzed:	09/03/20	Data File:	I0-513 mb.057
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<1
Lead	<1

Date of Report: 09/14/20
Date Received: 09/01/20
Project: Olympic View PO 41519.008, F&BI 009022

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 009022-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/kg (ppm)	10	3.04	84	80	75-125	5
Lead	mg/kg (ppm)	50	5.94	86	82	75-125	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	82	80-120
Lead	mg/kg (ppm)	50	94	80-120

Date of Report: 09/14/20
Date Received: 09/01/20
Project: Olympic View PO 41519.008, F&BI 009022

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 009022-21 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/kg (ppm)	10	3.97	81	77	75-125	5
Lead	mg/kg (ppm)	50	6.07	86	86	75-125	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	81	80-120
Lead	mg/kg (ppm)	50	94	80-120

Date of Report: 09/14/20
Date Received: 09/01/20
Project: Olympic View PO 41519.008, F&BI 009022

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 009022-41 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/kg (ppm)	10	9.40	91	98	75-125	7
Lead	mg/kg (ppm)	50	17.3	82	86	75-125	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	87	80-120
Lead	mg/kg (ppm)	50	91	80-120

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.

009022

Report To James Welles

Company PBS

Address

City, State, ZIP Seattle

Phone (206) 348 6317 Email james.welles@pbsusa.com

SAMPLERS (*signature*) ME 09-01-20

PROJECT NAME: Olympic View ES

PO # 41519.008

REMARKS: Project specific RLs? - Yes / No

INVOICE TO

Page # 1 of 6

BI4

TURNAROUND TIME
- [x] 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	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	As/Pb 6020				Notes
1-01	01	9/1/20	1000	SOIL	1								X				
1-02	02		1004		1								X				
1-03	03		1008		1								X				
1-04a	04		1012		1								X				
1-04b	05		1013		1								X				
1-05a	06		1031		1								X				
1-05b	07		1032		1								X				
1-06	08		1027		1								X				
1-07	09		1021		1								X				
1-08	10		1017		1								X				

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	J Welles	PBS	9/1/20	1445
Received by:	Liz Webber-Bruya	F+B	9/1/20	1445
Relinquished by:				
Received by:		Samples received at 24 °C		

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

SAMPLE CHAIN OF CUSTODY

009022

Report To J Welles

Company PBS

Address 1

City, State, ZIP Seattle

Phone _____ Email _____

SAMPLERS (*signature*) ME 09-01-20

PROJECT NAME

PO # 41519.008

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME BI 4

☒ 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	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	As|Pb (6020)				Notes
						ANALYSES REQUESTED											
1-09	11	9/1/20	1036	SOIL	1								X				
1-10	12		1040		1								X				
1-11a	13		1044		1								X				
1-11b	14		1045		1								X				
1-12	15		1051		1								X				
1-13	16		1058		1								X				
1-14	17		1101		1								X				
1-15	18		1107		1								X				
1-16a	19		1110		1								X				
1-16b	20	↓	1111	↓	1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	J Welles	PBS	9/1/20	1445
Received by:	Liz Webber-Bruya	F?B	9/1/20	1445
Relinquished by:				
Received by:				

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SAMPLE CHAIN OF CUSTODY

Page # 3 of 6

009022

Report To J Welles

Company PBS

Address

City, State, ZIP

Phone Email

SAMPLERS (*signature*) ME 09-01-20

PROJECT NAME

PO # 41519.008

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME BTY

☒ 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	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	As/Pb (6020)				Notes
						ANALYSES REQUESTED											
1-17	21	9/1/20	1117	SOIL	1								X				
1-18a	22		1121		1								X				
1-18b	23		1122		1								X				
1-19	24		1130		1								X				
1-20	25		1135		1								X				
1-21	26		1139		1								X				
1-22a	27		1155		1								X				
1-22b	28		1156		1								X				
1-23	29		1150		1								X				
1-24	30		1144		1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	J Welles	PBS	9/1/20	1445
Received by:	Liz Webber-Bruya	F?B	9/1/20	1445
Relinquished by:				
Received by:				

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SAMPLE CHAIN OF CUSTODY

Page # 4 of 6

009022 J Welles

Rep

Company PBS

Address

City, State, ZIP

Phone Email

SAMPLERS (*signature*) ME 09-01-20

PROJECT NAME: 41519.008

PO #

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME

☒ Standard turnaround

☐ RUSH

Rush charges authorized by:

SAMPLE DISPOSAL

☐ Archive samples

☐ Other

Default: Dispose after 30 days

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	As/Pb (6020)				Notes
2-01	31	9/1/20	1219	SOIL	1								X				
2-02	32		1223		1								X				
2-03	33		1235		1								X				
2-04a	34		1228		1								X				
2-04b	35		1229		1								X				
2-05	36		1240		1								X				
2-06	37		1244		1								X				
2-07a	38		1200		1								X				
2-07b	39		1201		1								X				
2-08	40		1250		1								X				

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	J Welles	PBS	9/1/20	1445
Received by:	Liz Webber-Bruya	F:B	9/1/20	1445
Relinquished by:				
Received by:				

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Seattle, WA 98119-2029
Ph. (206) 285-8282

Page # 5 of 6

009022

Report To J Welles

Company PBS

Address

City, State, ZIP

Phone Email

SAMPLERS (*signature*) ME 09-01-20

PROJECT NAME

PO # 41519.008

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- [x] Standard turnaround
- [ ] RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Archive samples
- [ ] Other
Default: Dispose after 30 days

BT4

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	As/Pb (6020)				Notes
2-09	41	9/1/20	1206	Soil	1								X				
2-10	42		1215		1								X				
2-11	43		1209		1								X				
2-12a	44		1301		1								X				
2-12b	45		1302		1								X				
2-13	46		1308		1								X				
2-14	47		1311		1								X				
2-15a	48		1256		1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	J Welles	PBS	9/1/20	1445
Received by:	Liz Wabber-Bruya	FTB	9/1/20	1445
Relinquished by:				
Received by:				

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3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

SAMPLE CHAIN OF CUSTODY

Page # 6 of 6 BIG

009022

Report to: J Welles

Company: PBS

Address:

City, State, ZIP:

Phone: Email:

SAMPLERS (*signature*): ME 09-01-20

PROJECT NAME: 41519.008

PO #:

REMARKS:

Project specific RLs? - Yes / No

INVOICE TO:

TURNAROUND TIME
- [x] 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	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	4 Pb (6020)				Notes
						ANALYSES REQUESTED											
2-15b	49	9/1/20	1257	SOIL	1								X				
2-16	50		1315		1								X				
2-17	51		1320		1								X				
2-18	52		1326		1								X				
2-19a	53		1330		1								X				
2-19b	54		1331		1								X				
2-20	55		1336		1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	J Welles	PBS	9/1/20	1445
Received by:	Liz Webber-Bruya	FJB	9/1/20	1445
Relinquished by:				
Received by:				

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3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

January 7, 2021

Mike Kwaske
Federal Way Public Schools
Capital Projects
1211 S 232nd St
Federal Way, WA 98004
Email: mkwaske@fwps.org

RE: Olympic View Elementary School – Supplemental Arsenic and Lead Soil Sampling
2626 SW 327th Street, Federal Way, Washington
PBS Project #41519.008

Federal Way Public Schools (FWPS) contracted PBS Engineering and Environmental Inc. (PBS) to evaluate the potential for arsenic and lead contaminants in near surface soils at the site of Olympic View Elementary School (OLV) prior to site redevelopment as part of the Olympic View Elementary School Replacement Project.

This *Supplemental Arsenic and Lead Soil Sampling Report* presents the findings of supplemental sampling performed surrounding locations with arsenic exceedances in December 2020 to delineate the extent of impacted soil. Results of supplemental sampling provide basis for soil requiring remediation. Soil remediation will be outlined in project specifications prepared by PBS and included in the bid package for construction of the new Olympic View Elementary School. The scope of services for supplemental sampling was presented in the Proposal to Provide Additional Soil Sampling, Contract Document Development and Construction Period Services (WA31123) by PBS, dated October 14, 2020.

BACKGROUND

OLV is located within the widespread soil contamination plume of the former Asarco smelter operation. The Asarco Company operated a copper smelter in Tacoma from 1890 to 1985. Smelter operations emitted an airborne plume of particulates with arsenic, lead, and other heavy metals that were distributed over a wide region of the Puget Sound. As a result, these metals have been found in near surface soils at concentrations which may pose a threat to human health and/or the environment.

The Washington State Department of Ecology's (Ecology) *Tacoma Smelter Plume Model Remedies Guidance* (Smelter Plume Guidance) recommends soil sampling at properties in areas with estimated arsenic levels above the state cleanup level of 20 parts per million (ppm)[1]. Ecology's Dirt Alert website[2] maps the site within an area of predicted arsenic concentrations ranging from 20 to 40 ppm. Thus, the 20 to 40 ppm range can be considered the "baseline" for arsenic concentrations in near surface soils expected on site.

Based on the predicted arsenic concentration at the site soil characterization sampling was performed at the site as recommended by the Smelter Plume Guidance.

[1] *"Tacoma Smelter Plume Model Remedies Guidance: Sampling and cleanup of arsenic and lead contaminated soils"*, Washington State Department of Ecology, July 2019, Publication No. 19-09-101
[2] https://apps.ecology.wa.gov/dirtalert/

On September 1, 2020, PBS performed soil sampling activities to determine the levels of arsenic and lead in shallow soil at OLV in Federal Way, Washington. Findings of the sampling activities and recommendations for regulatory compliance of impacted soils were presented in the Olympic View Elementary School Arsenic and Lead Soil Sampling Report dated September 16, 2020[3]. The report identified one location ("2-02") where the detected arsenic concentration exceeded Washington State Department of Ecology's Model Toxics Control Act (MTCA) Method A cleanup level (CUL) criteria for unrestricted land use (see Figure 2). This report presents the results of additional soil samples collected surrounding the exceedance to delineate the extent of impacted soil.

REGULATORY CRITERIA

Per the Smelter Plume Guidance: "if arsenic or lead levels are elevated for any decision unit on the property, that decision unit needs cleanup." Per the Smelter Plume Guidance, elevated is defined as:

- Average arsenic > 20 ppm, equivalent to milligrams per kilogram (mg/kg) or average lead > 250 ppm; **or**
- Maximum (any one sample) arsenic > 40 ppm or maximum lead > 500 ppm.

Ecology's Model Toxics Control Act (MTCA) has established cleanup levels for arsenic and lead for unrestricted land use that are protective of human health and the environment[4]. Ecology's MTCA Method A cleanup levels (CULs) for unrestricted land use for arsenic and lead are applicable for comparison to any single soil sample concentration. The CULs for arsenic and lead are presented below:

- The CUL for arsenic is 20 milligrams per kilogram (mg/kg)
- The CUL for lead is 250 mg/kg.

Based on the land use as a school, FWPS has elected to clean up site soils found to be in exceedance of CULs, even if the soils are not defined as elevated per the Smelter Plume Guidance.

SUPPLEMENTAL SOIL SAMPLING

Supplemental sampling was conducted in December 2020 to further assess the extent of arsenic-contaminated soil surrounding location 2-02.

Three (3) discrete samples were collected from locations 10 feet, 25 feet, and 50 feet to the north, south, and west of location 2-02, and from a location on the site property boundary 8 feet east from location 2-02. The purpose of these samples was to bound the lateral extent of elevated arsenic concentrations surrounding sample location 2-02. The discrete samples were taken at depth intervals of zero to six inches below ground surface (bgs), six to twelve inches bgs, and twelve to eighteen inches bgs, respectively. Samples collected 25 feet and 50 feet from the location and samples collected from six to eighteen inches bgs were submitted to the laboratory on hold pending results of shallower soil samples collected more proximal to the original sample location (2-02). If closer or shallower sample results exceeded cleanup levels, additional samples would have been analyzed to bound the extent of impacted soil. Because the surface sample at the location exceeded the Method A CUL, three (3) discrete

[3] *Olympic View Elementary School – Arsenic and Lead Soil Sampling*, PBS Engineering and Environmental, September 16, 2020.
[4] *"Model Toxics Control Act Regulation and Statute",* Washington State Department of Ecology, 2013 Revision, Publication No. 94-06

samples were collected from that location at depth intervals of six to twelve inches, twelve to eighteen inches, and eighteen and twenty-four inches bgs to bound the vertical extent of impacted soil.

Soil sample collection started just below any surface cover layer (e.g., sod or grass). A hand spade and a hand auger were used to complete 6-inch deep test holes. A soil sample was collected at a depth of less than six inches below ground surface at each location. The test holes were then advanced to a depth of twelve inches, and a soil sample was collected at a depth between six and twelve inches bgs. In locations of deeper samples, test holes were then advanced to depths of eighteen and twenty-four inches bgs for collection of samples between twelve and eighteen, and eighteen and twenty-four inches bgs, respectively.

PBS personnel wore disposable nitrile gloves to protect against cross-contamination between samples. Soil retained for analysis was packed into laboratory-provided containers, labeled and transported on ice under chain of custody documentation to Friedman and Bruya, Inc. in Seattle, an Ecology accredited analytical laboratory.

Samples were analyzed for total arsenic and lead using EPA Method 6020. Total arsenic and lead results were reported on a dry weight basis.

ANALYTICAL RESULTS

Detected concentrations of arsenic and lead in supplemental soil samples collected on site are below the MTCA Method A CULs for arsenic (20 mg/kg) and lead (250 mg/kg), respectively.

CONCLUSIONS

Based on the analytical results of the supplemental soil sampling the following conclusion and recommendations were made regarding the handling and management of project site soils.

While the original location sample result exceeded the MTCA Method A CUL for arsenic and lead, no supplemental sample results exceeded the CUL and average concentrations in the surrounding area did not exceed the Method A CUL. PBS recommends enrollment of the site in the Ecology Voluntary Cleanup Program (VCP) and remediation of the area containing elevated arsenic concentrations. Based on the concentrations detected in the characterization sampling and supplementary sampling, PBS proposes using the Model Remedy of Mixing in Place, as described in Chapter 4 of Ecology's *Tacoma Smelter Plume Model Remedies Guidance*[5]. Mixing involves diluting the concentration of contaminants by mixing the contaminated material with clean soils usually found beneath and surrounding the subject area.

Prior to completing the model remedy, PBS recommends preparation of a Soil Remediation Plan for submittal to and approval by Ecology. The plan will detail remediation methods for soil surrounding sample location 2-02. The area requiring remediation will be depicted graphically in the Soil Remediation Plan and procedures and

[5] *"Tacoma Smelter Plume Model Remedies Guidance: Sampling and cleanup of arsenic and lead contaminated soils",* Washington State Department of Ecology, July 2019, Publication No. 19-09-101

requirements of soil mixing presented project specifications, included in the bid package for construction of the new Olympic View Elementary School.

LIMITATIONS

This investigation was conducted to characterize lead and arsenic distributions in shallow soils surrounding previously identified arsenic and lead contaminated locations on-site, with a focus on protection of human health and the environment. The data collected in this investigation are not intended for the purposes waste profiling for offsite disposal, or for estimation of volume or tonnage of soil requiring disposal.

PBS has prepared this report for use by FWPS. This report is not intended for use by others without the written consent of the FWPS. Our interpretation of soil conditions in this study was based on field observations and analytical data from the indicated explorations. Regulated substances may exist in portions of the site that were not explored or analyzed.

PBS ENGINEERING AND ENVIRONMENTAL INC.

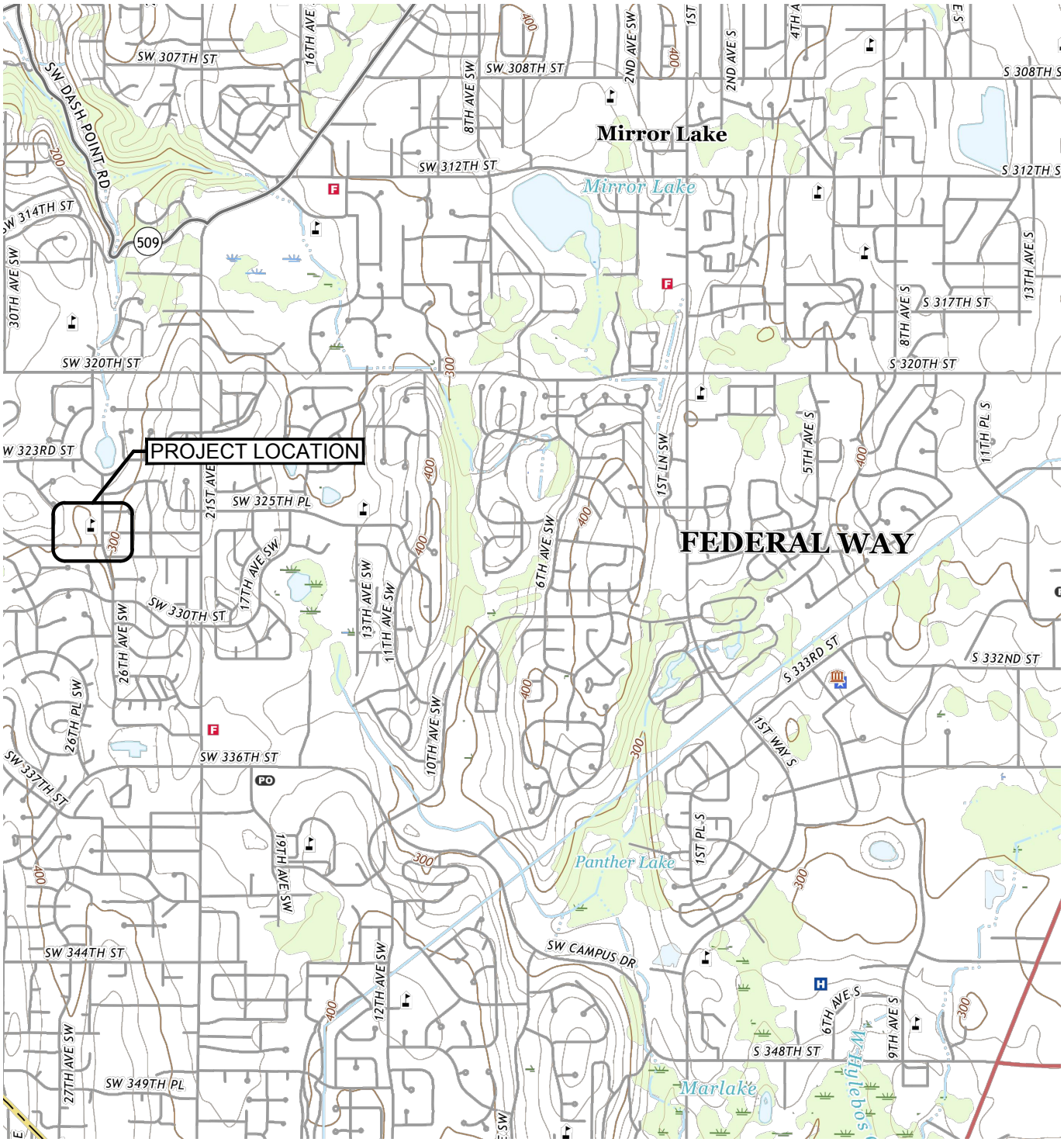
Reviewed By:

Nathan Dickey, LG
Staff Geologist

James Welles, LG
Project Geologist

Attachments:
Figure 1: Vicinity Map
Figure 2: As/Pb Soil Sample Location Map
Figure 3: Supplemental As/Pb Soil Sample Location Map
Table 1: Laboratory Data Summary Table
Attachment A: Laboratory Data

Figures



SOURCE: USGS POVERTY BAY, WA QUADRANGLE 2020.

WASHINGTON

SCALE 1" = 2000'

0' 1,000' 2,000' 4,000'

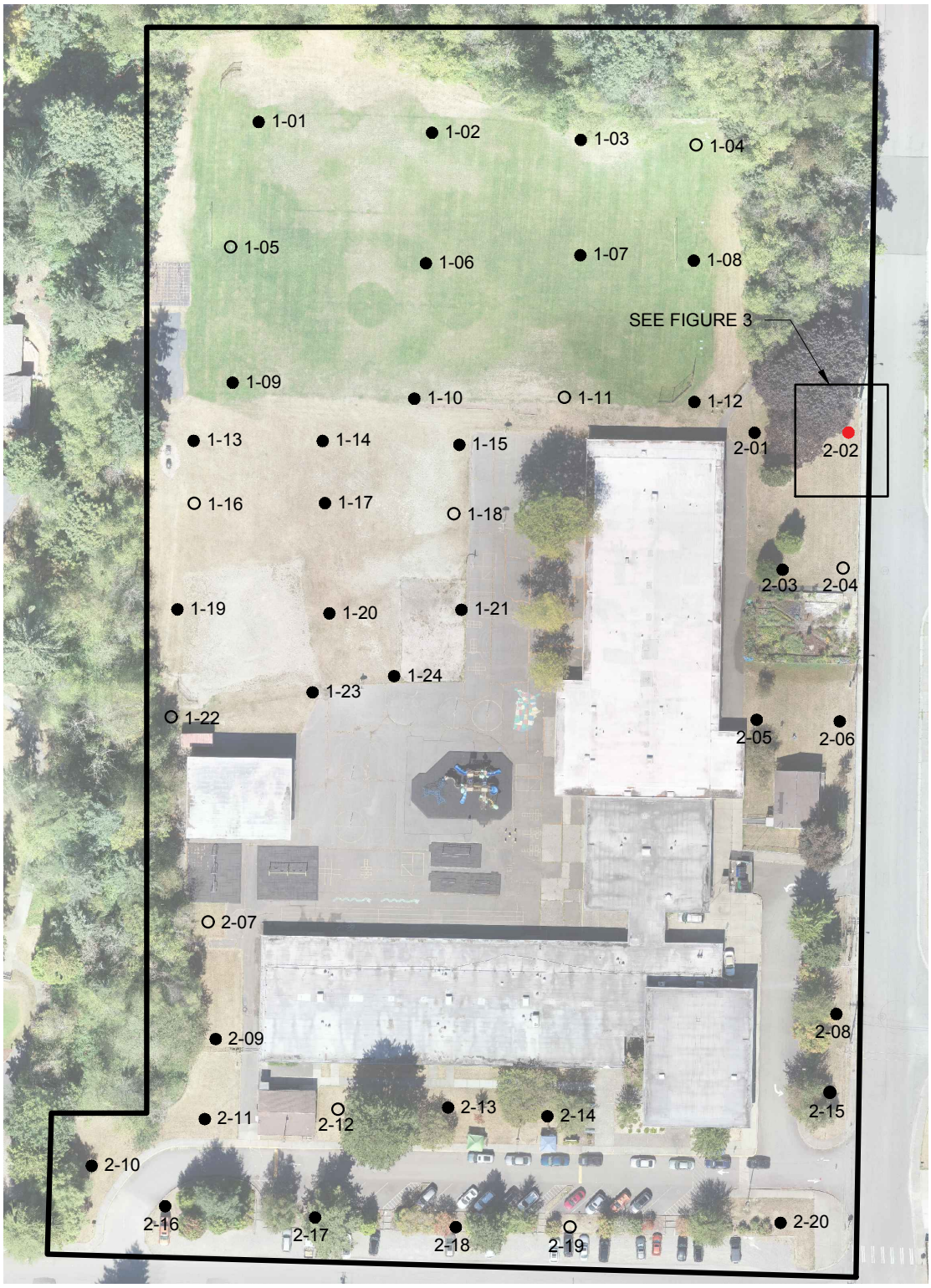
PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

VICINITY MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 327TH STREET
FEDERAL WAY, WASHINGTON

JAN 2021
41519.008

FIGURE
1



SOURCE: © 2018 GOOGLE EARTH PRO

LEGEND

● 1-01	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6"), As/Pb < MTCA
○ 1-04	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6", 6-12"), As/Pb < MTCA
● 2-02	SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6"), As > MTCA

SCALE 1" = 100'

0' 50' 100' 200'

PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

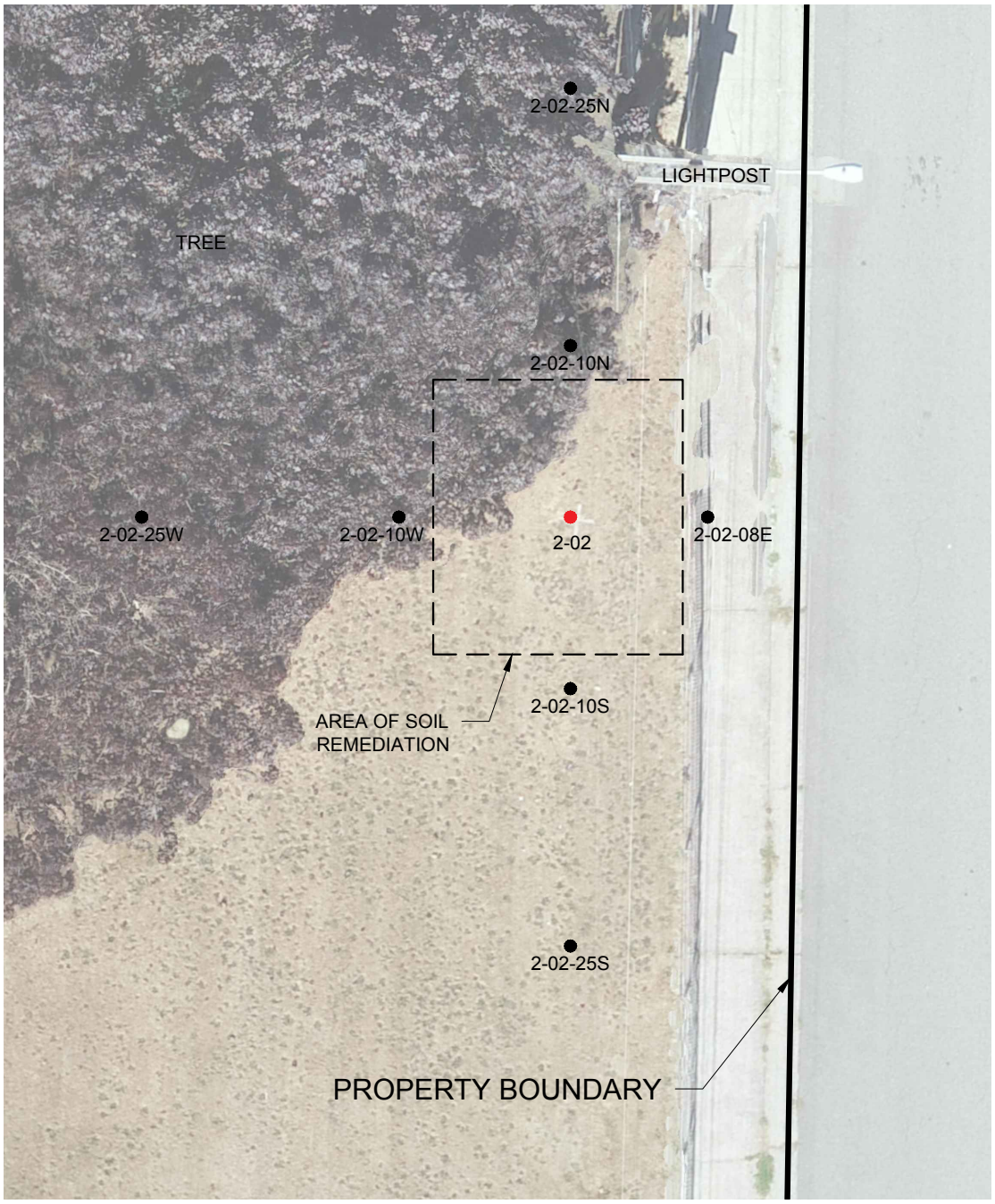
PBS

As / Pb SOIL SAMPLE LOCATION MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 SOUTHWEST 327TH STREET
FEDERAL WAY, WASHINGTON

JAN 2021
41519.008

FIGURE
2



SOURCE: © 2018 GOOGLE EARTH PRO

LEGEND

● 2-02-10W	STEP OUT SAMPLE LOCATION WITH ARSENIC AND LEAD CONCENTRATIONS <MTCA METHOD A CLEANUP LEVELS
● 2-02	ORIGINAL SAMPLE LOCATIONS WITH ELEVATED ARSENIC CONCENTRATIONS FROM 0-6 INCHES BGS

SCALE 1" = 10'

0' 5' 10' 20'

PREPARED FOR: FEDERAL WAY PUBLIC SCHOOLS

PBS

SUPPLEMENTAL As / Pb SOIL SAMPLE LOCATION MAP

OLYMPIC VIEW ELEMENTARY SCHOOL
2626 SOUTHWEST 327TH STREET
FEDERAL WAY, WASHINGTON

JAN 2021
41519.008

FIGURE
3

Tables

Table 1 - Soil Sample Analytical Results

Site: Olympic View Elementary School
Address: 2626 327th Street, Federal Way, Washington
PBS Project No. 41519.008

Location / Sample Identification	Description	Sample Depth (inches bgs)	Metals	
			Arsenic (mg/kg)	Lead (mg/kg)
	Regulatory Criteria	**MTCA Method A Cleanup Level**	**20**	**250**
Delineation Samples Surrounding Sample 2-02				
2-02-10Na	10 feet north of 2-02	0-6	3.60	6.78
2-02-25Na	25 feet north of 2-02	0-6	5.76	235
2-02-10Wa	10 feet west of 2-02	0-6	4.27	7.59
2-02-25Wa	25 feet west of 2-02	0-6	4.59	7.56
2-02-10Sa	10 feet south of 2-02	0-6	4.20	9.58
2-02-25Sa	25 feet south of 2-02	0-6	3.76	8.58
2-02-08Ea	8 feet east of 2-02	0-6	4.15	23.1
Average			4.3	42.6
2-02b	six inches below 2-02	6-12	4.43	6.54
2-02c	twelve inches below 2-02	12-18	5.38	7.36
Average			4.9	7.0

Arsenic and lead analyzed by US EPA Method 6020
mg/kg - milligrams per kilogram
bgs = below ground surface

Attachment A

Laboratory Report and Chain of Custody Documentation

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

3012 16th Avenue West
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(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

January 4, 2021

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

Dear Mr Welles:

Included are the results from the testing of material submitted on December 23, 2020 from the 41519.008, F&BI 012407 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: Nathan Dickey
PBS0104R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 23, 2020 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental 41519.008, F&BI 012407 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	PBS Engineering and Environmental
012407 -01	2-02b
012407 -02	2-02c
012407 -03	2-02d
012407 -04	2-02-10Na
012407 -05	2-02-10Nb
012407 -06	2-02-10Nc
012407 -07	2-02-25Na
012407 -08	2-02-25Nb
012407 -09	2-02-25Nc
012407 -10	2-02-50Na
012407 -11	2-02-50Nb
012407 -12	2-02-50Nc
012407 -13	2-02-08Ea
012407 -14	2-02-08Eb
012407 -15	2-02-08Ec
012407 -16	2-02-10Sa
012407 -17	2-02-10Sb
012407 -18	2-02-10Sc
012407 -19	2-02-25Sa
012407 -20	2-02-25Sb
012407 -21	2-02-25Sc
012407 -22	2-02-50Sa
012407 -23	2-02-50Sb
012407 -24	2-02-50Sc
012407 -25	2-02-10Wa
012407 -26	2-02-10Wb
012407 -27	2-02-10Wc
012407 -28	2-02-25Wa
012407 -29	2-02-25Wb
012407 -30	2-02-25Wc

All quality control requirements were acceptable.

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02b	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-01
Date Analyzed:	12/24/20	Data File:	012407-01.077
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.43
Lead	6.54

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02c	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-02
Date Analyzed:	12/24/20	Data File:	012407-02.084
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.38
Lead	7.36

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-10Na	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-04
Date Analyzed:	12/24/20	Data File:	012407-04.093
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.60
Lead	6.78

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-25Na	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-07 x5
Date Analyzed:	12/29/20	Data File:	012407-07 x5.038
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	5.76
Lead	235

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-08Ea	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-13
Date Analyzed:	12/24/20	Data File:	012407-13.095
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.15
Lead	23.1

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-10Sa	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-16
Date Analyzed:	12/24/20	Data File:	012407-16.096
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.20
Lead	9.58

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-25Sa	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-19
Date Analyzed:	12/24/20	Data File:	012407-19.097
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	3.76
Lead	8.58

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-10Wa	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-25
Date Analyzed:	12/24/20	Data File:	012407-25.106
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.27
Lead	7.59

Analysis For Total Metals By EPA Method 6020B

Client ID:	2-02-25Wa	Client:	PBS Engineering and Environmental
Date Received:	12/23/20	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	012407-28
Date Analyzed:	12/24/20	Data File:	012407-28.107
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	4.59
Lead	7.56

Analysis For Total Metals By EPA Method 6020B

Client ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	41519.008, F&BI 012407
Date Extracted:	12/24/20	Lab ID:	I0-796 mb2
Date Analyzed:	12/24/20	Data File:	I0-796 mb2.038
Matrix:	Soil	Instrument:	ICPMS2
Units:	mg/kg (ppm) Dry Weight	Operator:	SP

Analyte:	Concentration mg/kg (ppm)
Arsenic	<1
Lead	<1

Date of Report: 01/04/20
Date Received: 12/23/20
Project: 41519.008, F&BI 012407

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TOTAL METALS USING EPA METHOD 6020B

Laboratory Code: 012382-02 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	mg/kg (ppm)	10	3.35	86	90	75-125	5
Lead	mg/kg (ppm)	50	28.1	88	118	75-125	29 b

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	mg/kg (ppm)	10	91	80-120
Lead	mg/kg (ppm)	50	99	80-120

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.

012407

SAMPLE CHAIN OF CUSTODY

ME 12/23/20 BEM 3

Page # 1 of 3

Report To James Welles

Company PBS

Address Seattle

City, State, ZIP

Phone Email James.welles@pbsusa.com

SAMPLERS (*signature*)

PROJECT NAME: FWPS OLV Supplemental Soil Sampling

PO #: 41519.008

REMARKS: cc: mathew.dickey@pbsusa.com

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- [x] 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	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	Total As (PS)				Notes
						ANALYSES REQUESTED											
2-02b	01	12/22	1200	S	1								X				
2-02c	02		1205										X				
2-02d	03		1210														Hold (H)
2-02-10Na	04		1215										X				
2-02-10Nb	05		1220														H
2-02-10Nc	06		1225														H
2-02-25Na	07		1230										X				
2-02-25Nb	08		1235														H
2-02-25Nc	09		1240														
2-02-50Na	10		1245														

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Nathan Dickey	PBS	12/23	1230
Received by: S. Olson	S. Olson	F+B, Inc	12/23/20	12:12
Relinquished by:				
Received by:				

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

Samples received at 14 °C

012407

SAMPLE CHAIN OF CUSTODY ME 12/23/20 BTY

Page # 2 of ~~5~~ 3

Report To James Welles

Company PBS

Address

City, State, ZIP

Phone Email

SAMPLERS (*signature*)

PROJECT NAME: PO # 41519.008

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

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	As / Pb (Arsenic only)				Notes
2-02-SONb	11	12/22	1250	S	1												Hold (H)
2-02-SONc	12		1255														1
2-02-~~VOE~~08Ea	13		1300										X				
2-02-~~VOE~~08Eb	14		1305														H
2-02-~~VOE~~08Ec	15		1315														1
2-02-10Sa	16		1320										X				
2-02-10Sb	17		1325														H
2-02-10Sc	18		1330														1
2-02-25Sa	19		1340										X				
2-02-25Sb	20		1345														H

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Nathan Dickey	PBS	12/23	~~1215~~ 1215
Received by:	S. Olson	FRB, Inc	12/23/20	12:12
Relinquished by:				
Received by:				

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

Samples received at 14 °C

012407

SAMPLE CHAIN OF CUSTODY ME 12/23/20 BIY

Page # 3 of ~~3~~ 3

Report To J. Welles

Company PBS

Address

City, State, ZIP

Phone Email

SAMPLERS (*signature*)

PROJECT NAME | PO # 41519.000

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

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	Total As/Pb				Notes
						ANALYSES REQUESTED											
2-02-25Sc	21	12/22	1350	S	1												Hold (H)
2-02-50Sa	22	"	1400	"	"												"
2-02-50Sb	23	"	1405	"	"												"
2-02-50Sc	24	"	1410	"	"												"
2-02-10Wa	25	"	1420	"	"								X				
2-02-10Wb	26	"	1425	"	"												H
2-02-10Wc	27	"	1430	"	"												"
2-02-25Wa	28	"	1440	"	"								X				
2-02-25Wb	29	"	1445	"	"												H
2-02-25Wc	30	"	1450	"	"												"

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Nathan Dickey	PBS	12/23	1[illegible]13
Received by: S. Olson	S. Olson	FTB, Inc	12/23/20	12:12
Relinquished by:				
Received by:				

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

Samples received at 14 °C