



November 30, 2018

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

**RE: Star Lake Elementary School – Arsenic and Lead Soil Sampling
4014 S 270th Street, Kent, Washington
PBS Project #41519.001**

Federal Way Public Schools (FWPS) has contracted PBS Engineering and Environmental Inc. (PBS) to evaluate the potential for arsenic and lead contaminants in near surface soils at the site of Star Lake Elementary School (SLES) prior to site redevelopment as part of the Star Lake Elementary School Replacement Project. On November 5, 2018 PBS performed soil sampling activities to determine the levels of arsenic and lead in shallow soil at SLES in Kent, 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 (WA28800) by PBS, dated August 2, 2018.

BACKGROUND

SLES 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 (Ecology) recommends soil sampling at properties in areas with estimated arsenic levels above the state cleanup level of 20 ppm¹. Ecology's "Everett and Tacoma Smelter Search" web page <https://fortress.wa.gov/ecy/smeltersearch/> maps the SLES site within a zone of potential arsenic concentrations ranging from 40 milligram per kilogram (mg/kg) to 100 mg/kg. Thus, the 40mg/kg to 100 mg/kg range can be considered the "baseline" for arsenic concentrations in near surface soils expected on site.

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 environment². Results of soil sampling will be compared to the applicable MTCA standards.

¹ "Tacoma Smelter Plume Model Remedies Guidance: Sampling and cleanup of arsenic and lead contaminated soils", Washington State Department of Ecology, June 2012, Publication No. 12-09-086-A

² "Model Toxics Control Act Regulation and Statute", Washington State Department of Ecology, 2013 Revision, Publication No. 94-06

Ecology's MTCA Method A cleanup levels (CULs) for unrestricted land use for arsenic and lead are the applicable regulatory criteria for this project.

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

For reference, Ecology conducted a study to determine natural background concentrations of metals in soil for the Puget Sound area³. The study found that the natural background concentration for arsenic in soil is 7.0 parts per million (ppm) and 24 ppm for lead. Parts per million is roughly equivalent to mg/kg.

CHARACTERIZATION SOIL SAMPLING

On November 5, 2018, sixty (60) discrete soil samples were collected from forty-eight (48) locations around the building landscaping and playfields of SLES. Following Ecology guidance, the property was divided into two decision units (DUs) based on current use as playfield or landscape area. Decision units and sample locations are shown on Figure 2. A summary of the decision units is provided below. The number of samples screened and collected for analysis per DU for this project is based on the Ecology 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	27	7	4.3	34
2	unknown	21	5	4.2	26

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

One (1) discrete sample was collected at each sample location from a depth interval of zero to six inches below ground surface (bgs). A second discrete sample was collected at every fourth location from a depth interval of six to twelve 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 zero to six-inch sample, the hole was advanced to a depth of twelve inches, and a second sample was collected from the six to twelve-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 "Natural Background Soil Metals Concentrations in Washington State", Washington State Department of Ecology, October 1994, Publication No. 94-115

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 five (5) samples from five different locations. Arsenic was detected in exceedance of the CUL in samples SL1-18a, SL1-20, SL1-24 and SL1-25 within DU1; and SL2-15 within DU2 at a maximum concentration of 72.7 mg/kg. 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	12.5	21.7	6.1	9.0
2	9.9	16.9	8.5	14.5
MTCA A Cleanup Level	20	250	20	250

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

(6-12") (Pb / As) = Average Concentration at the six to twelve-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 2012*¹, the following conclusion and recommendations were made regarding the handling and management of project site soils.

Decision Units 1 and 2

Analytical results from discrete soil samples collected within both decision units 1 and 2 of the SLES site identified four (4) locations within decision unit 1 (SL1-18, SL1-20, SL1-24 and SL1-25) and one (1) location within decision unit 2 (SL2-15) where arsenic concentrations are above MTCA Method A CULs in the top 6" bgs.

Further action will be required to address the arsenic concentrations in soil at the above referenced locations and achieve compliance with MTCA 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. Because arsenic has been detected on-site at concentrations greater than 40 ppm, mixing of soils is not an appropriate remedial action for the site. 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. Given the intended land use, PBS recommends removal of the impacted soil from the site.

Remediation of impacted soils can be conducted by the contractor as part of the Star Lake 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 Star Lake 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.

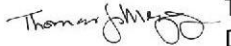
PBS ENGINEERING AND ENVIRONMENTAL INC.



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James Welles
Date: 2018.11.30
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James Welles, LG
Project Geologist

Reviewed By:



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Thomas Mergy
Date: 2018.11.30
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Thomas Mergy, LHG
Environmental Services Manager

Attachments:

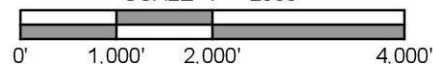
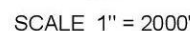
Figure 1: Vicinity Map

Figure 2: Sample Location Map

Table 1: Laboratory Data Summary Table

Attachment A: Laboratory Data

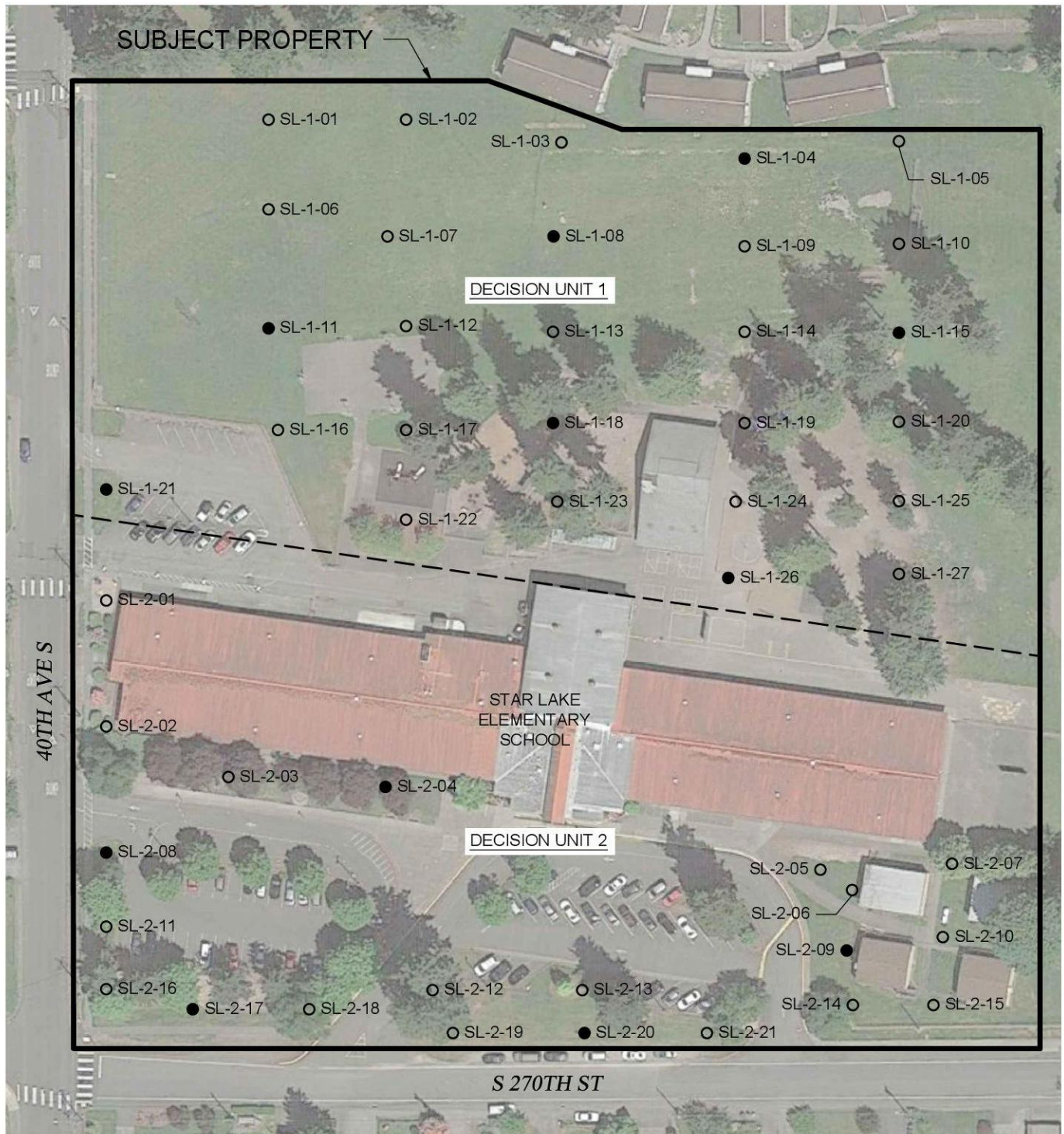
Figures



VICINITY MAP
STAR LAKE ELEMENTARY SCHOOL
4014 SOUTH 270TH STREET
KENT, WASHINGTON

1





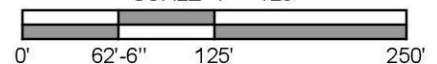
SOURCE: © 2018 GOOGLE EARTH PRO

LEGEND

- SL-1-01 SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6")
- SL-2-04 SOIL SAMPLE LOCATION, DECISION UNIT AND IDENTIFICATION (0-6", 6-12")



SCALE 1" = 125'



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As / Pb SOIL SAMPLE LOCATION MAP
 STAR LAKE ELEMENTARY SCHOOL
 4014 SOUTH 270TH STREET
 KENT, WASHINGTON

NOV 2018
 41519.001

FIGURE

2

Tables

Table 1 - Soil Sample Analytical Results

Site: Star Lake Elementary School
Address: 4014 S 270th Street, Kent, WA
PBS Project No. 41519.001

Location / Sample Identification	Sample Depth (inches bgs)	Metals	
		Arsenic (mg/kg)	Lead (mg/kg)
Regulatory Criteria	MTCA Method A Cleanup Level	20	250
Decision Unit 1 (~4.3 acres)			
SL1-01	0-6	6.37	8.35
SL1-02	0-6	6.21	6.61
SL1-03	0-6	4.73	5.32
SL1-04a	0-6	7.43	7.09
SL1-05	0-6	4.73	4.86
SL1-06	0-6	6.96	10.8
SL1-07	0-6	6.33	10.8
SL1-08a	0-6	7.45	10.2
SL1-09	0-6	8.31	17.2
SL1-10	0-6	17	28.7
SL1-11a	0-6	13.2	23.2
SL1-12	0-6	13.8	17.5
SL1-13	0-6	5.64	19.4
SL1-14	0-6	5.66	21.3
SL1-15a	0-6	4.99	16.9
SL1-16	0-6	10.6	12.2
SL1-17	0-6	6.49	18.8
SL1-18a	0-6	26.6	11.3
SL1-19	0-6	7.84	21.8
SL1-20	0-6	22.6	51.1
SL1-21a	0-6	12.5	27.4
SL1-22	0-6	5.83	18.2
SL1-23	0-6	7.69	17.6
SL1-24	0-6	72.7	122
SL1-25	0-6	25.1	39.8
SL1-26a	0-6	9.38	17.3
SL1-27	0-6	12.5	21
Average		12.5	21.7
SL1-04b	6-12	4.36	4.9
SL1-08b	6-12	5.39	4.9
SL1-11b	6-12	11.3	17.1
SL1-15b	6-12	4.35	15.9
SL1-18b	6-12	6.88	5.4
SL1-21b	6-12	6.5	11.3
SL1-26b	6-12	4.13	3.9
Average		6.1	9.0