2017 ANNUAL REPORT

Remedy Implementation
Crownhill Elementary School Site

Prepared for: Bremerton School District

Project No. 100094-005-01 • January 29, 2018 Final

Aspect CONSULTING

earth + water

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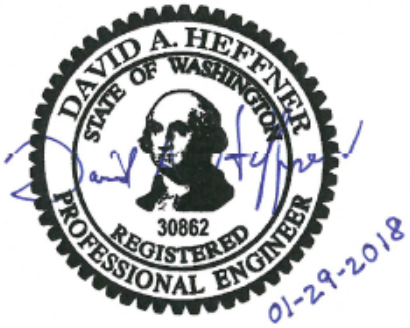

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1 Introduction

1.1 General

Historical landfill activities at the Bremerton School District (BSD) Crownhill Elementary School site (Site) have resulted in soil and groundwater contamination, including the presence of light non-aqueous-phase liquid (LNAPL) floating on the water table. The Washington State Department of Ecology (Ecology) and BSD entered into two Agreed Orders (AOs) to provide for remedial action at the Site. The first AO (No. DE7916) required BSD to conduct a Remedial Investigation (RI) and Feasibility Study (FS) in accordance with the Washington State Model Toxics Control Act (MTCA) Cleanup Regulation (WAC 173-340). Upon completion of those activities in 2014, Ecology selected a cleanup remedy and prepared a Cleanup Action Plan (CAP) for the Site (Ecology, 2014). As documented in the CAP, requirements of the selected remedy include the following:

- Periodic monitoring of groundwater quality and LNAPL layer thickness;
- Periodic removal and offsite recycling/disposal of LNAPL from existing wells;
- Periodic inspection and maintenance of the existing cover system to prevent direct contact exposures to landfilled materials and impacted soils;
- Running the HVAC system in the main school building continuously during the school day (to address the soil vapor intrusion pathway);
- Periodic sub-slab soil vapor and/or indoor air sampling to reconfirm that vapor intrusion is not a concern[1]; and
- Defining requirements for performing invasive work in soil[2].

The second AO (No. DE11107) required BSD to develop Site-specific work plans addressing the above requirements, and to implement the cleanup remedy in accordance with those work plans. The following remedy implementation work plans were prepared by BSD and approved by Ecology in 2015:

- *Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2015a);
- *LNAPL Removal Work Plan* (Aspect, 2015b); and
- *Cover System Inspection and Maintenance Plan* (Aspect, 2015c).

[1] Requirements for sampling sub-slab soil vapor are specified in the *Cover System Inspection and Maintenance Plan* (Aspect, 2015a). Sub-slab soil vapor sampling was last conducted in November 2015, and is next required in November 2020. If sub-slab sampling indicates a potential vapor intrusion concern, then follow-up indoor air sampling may be warranted.

[2] Requirements for performing invasive work in soil are specified in Appendix A of the *Cover System Inspection and Maintenance Plan* (Aspect, 2015a).

Reports documenting remedy implementation activities completed by BSD in 2015 and 2016 were submitted to Ecology in January 2016 (Aspect, 2016) and January 2017 (Aspect, 2017), respectively. This report documents activities completed in 2017.

1.2 Project Background

Located in Bremerton, Washington (Figure 1), the Site includes both the Crownhill Elementary School (School) property at 1500 Rocky Point Road and the northern portion of the Bremerton United Methodist Church (BUMC) property at 1150 Marine Drive. A Site Plan is provided as Figure 2. The Site was used for sand and gravel mining up to the 1930s, and the mined area was backfilled with municipal and industrial wastes in the 1930s and 1940s. The original school building was constructed in 1956, and partially burned down in 1993. A series of environmental investigations were conducted during the period between that fire and construction of the current school building, which was completed in 1996. Additional investigations were conducted beginning in 2009, culminating in preparation of the *Remedial Investigation Report* (Aspect, 2014a; herein referred to as the RI report).

The purpose of the RI was to collect data necessary to adequately characterize the nature and extent of Site contamination. Using multiple lines of evidence (e.g., historical photographs, site assessment activity, construction observations), the RI identified two generalized areas of landfill accumulation, designated the 'north' and 'south' landfill areas. Figure 2 shows the interpreted boundaries of these two areas. Landfilled materials were found at up to 40-foot depth in the north landfill area, and at up to 20-foot depth in the south landfill area. Extensive sampling identified the following constituents of potential concern (COPCs) in Site soils:

- Total petroleum hydrocarbon (TPH) in the diesel and motor oil ranges;
- Trichloroethene (TCE);
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs); and
- The metals/metalloids antimony, arsenic, chromium III, copper, lead, and zinc.

Three monitoring wells (MW-1 through MW-3) were installed at the Site in December 1994/January 1995, and another 13 wells (MW-4 through MW-16) during the RI (between March 2011 and October 2012; refer to Figure 2 for well locations). This network of 2-inch-diameter wells was used to periodically monitor groundwater, which is encountered beneath the Site at roughly 110-foot depth, for a wide range of contaminants. Monitoring identified TPH in the diesel and motor oil ranges, TCE, arsenic, and lead as COPCs dissolved in groundwater in the northern portion of the Site.

In addition to dissolved contaminants, separate-phase oil was observed floating on the groundwater table (as LNAPL) in well MW-8, which is installed in the north landfill area. The primary reason for installing the last five RI monitoring wells (MW-12 through MW-16) was to investigate the areal extent and thickness of the LNAPL accumulation. LNAPL was observed in three of these wells (MW-13, MW-14, and MW-16), and periodic removal of LNAPL via bailing began in November 2012. At the recommendation of Ecology, a 4-inch-diameter well designed specifically for LNAPL extraction (EW-17) was installed in October 2015.

Site cleanup alternatives were developed and comparatively evaluated with respect to MTCA-specified criteria in the *Feasibility Study* report (Aspect, 2014b). Based on the

information provided in the RI report and on the FS evaluation, the CAP (Ecology, 2014) then established Site-specific cleanup levels for constituents of concern (COCs) in Site soil, groundwater, and air, and selected a cleanup remedy for implementation. Figure 2 shows the estimated TPH, TCE, and arsenic plumes[3] (i.e., areas where concentrations in groundwater exceed the respective groundwater cleanup levels) as depicted in the CAP. Refer to the CAP for a full description of the selected cleanup remedy for the Site.

2 Activities Completed in 2017

This section documents cleanup-related activities completed by BSD during the 2017 calendar year. Periodic monitoring of groundwater and LNAPL thickness is documented in Section 2.1, LNAPL removal in Section 2.2, Site inspections in Section 2.3, and regulatory agency interactions in Section 2.4.

2.1 Periodic Monitoring Activities

2.1.1 Groundwater Monitoring

Semiannual groundwater monitoring was conducted on April 4 and October 27, 2017, in general accordance with the requirements of the *Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2015a). Well locations are shown on Figure 2. Table 1 identifies which Site wells are included in the monitoring program, which of those wells contain LNAPL, and the specific COCs analyzed in groundwater samples collected from the wells that do not contain LNAPL. Monitoring results for the non-LNAPL wells are summarized in Table 2. Results going back to December 2013 are included in Table 2; refer to the RI report (Aspect, 2014a) for results prior to December 2013 and for information on Site wells not included in the monitoring program. Laboratory reports for groundwater samples submitted for analysis in 2017 are provided in Appendix C.

Groundwater cleanup levels are 500 micrograms per liter (µg/L) for diesel- and motor-oil-range TPH, and 5 µg/L for TCE and total arsenic. Well MW-10 is the conditional point of compliance for achieving these cleanup levels. This well has been sampled on 17 occasions through October 2017, and arsenic is the only COC detected in any of those sampling rounds. Well MW-6, the only well with arsenic cleanup level exceedances since early 2012[4], is located approximately 130 feet upgradient of MW-10 and serves as a sentinel well for dissolved contaminant plume migration. The *Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2015a) specifies contingency actions that will be taken if arsenic is detected above 40 µg/L at MW-6 or above 4.5 µg/L at MW-10. Neither of these concentration limits was exceeded in 2017.

[3] Lead is also a COC in groundwater. However, as discussed in the *Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2015a), compliance with the groundwater cleanup level for lead has been demonstrated. Therefore, lead is not included in the groundwater monitoring program.

[4] As shown on Figure 3, the arsenic cleanup level was also exceeded at MW-10 the first two times it was sampled following its installation in December 2011. Arsenic at MW-10 has been consistently below its cleanup level in the last 15 monitoring rounds.

Figure 3 shows arsenic concentrations measured in MW-6 and MW-10 since they were installed. In October 2017, the concentration at MW-6 rose back up to its April 2016 peak value (29 µg/L) after large declines had been observed in October 2016 and April 2017. The cause(s) of the erratic concentration fluctuations are unknown. Results from October 2014 through October 2016 suggested a seasonal fluctuation with the higher concentrations occurring in the wet season (April), but the more recent results strongly contradict that trend. The groundwater elevation measured at MW-6 increased by about 2 feet between October 2015 and October 2017, whereas previous measurements exhibit an apparently random variation over a relatively narrow range (refer to Table 2). It is not clear whether there is any link between increasing groundwater elevation and the large fluctuations in arsenic concentration at MW-6.

The arsenic concentrations measured at MW-10 in 2017 continue the "slow but steady" decreasing concentration trend observed at that well over the previous 2 years. The concentration of 2.1 µg/L measured in October 2017 is the lowest detection to date at that well.

Well MW-9 is the only well with TCE cleanup level exceedances. The TCE concentration detected at this well in the most recent monitoring round (6.8 µg/L in October 2017) is the lowest detection to date.

Well MW-15 is located immediately downgradient of the LNAPL area and serves as a sentinel well for TPH plume migration[5]. Neither diesel-range nor motor-oil-range TPH was detected at MW-15 in 2017, which is consistent with previous monitoring rounds. TPH concentrations detected in wells MW-5 and MW-12 in 2017 are within the range of previous detections. TPH concentrations in these two wells remain above the corresponding groundwater cleanup levels.

Water samples collected from the McKinney domestic well (sampled in both 2017 monitoring rounds) are analyzed for TCE only. As shown in Table 2, TCE has never been detected in any of the water samples collected from the McKinney well.

2.1.2 LNAPL Thickness Monitoring

LNAPL thickness monitoring was conducted concurrent with groundwater monitoring in April and October 2017. Consistent with previous monitoring rounds, LNAPL was detected in five wells (MW-8, MW-13, MW-14, MW-16, and EW-17). Table 3 summarizes LNAPL thicknesses measured in these wells since they were installed. Thicknesses measured in 2017 ranged from 0.04 feet in MW-13 to 2.15 feet in MW-16 (both measurements made in the October round).

2.2 LNAPL Removal

Bottom-filling bailers are used to periodically remove LNAPL from Site wells. LNAPL removal is attempted whenever an LNAPL layer thickness of at least 0.3 foot is measured in a well (prior to bailing). In 2017, LNAPL removal was conducted concurrent with the two LNAPL thickness/groundwater monitoring rounds discussed above, in general accordance with the requirements of the *LNAPL Removal Work Plan* (Aspect, 2015b). LNAPL was removed from two wells (MW-14 and EW-17) in the April round, and from three wells

[5] Well MW-15 is also the conditional point of compliance for LNAPL migration.

(MW-14, MW-16, and EW-17) in the October round. A total of 2.95 liters of LNAPL was removed in 2017, and 13 liters have been removed overall. Table 3 provides a summary of LNAPL volumes removed from each of the five LNAPL-containing wells since they were installed, and Figure 4 shows cumulative LNAPL removal from each well over time.

2.3 Site Inspections

Semiannual Site inspections were conducted on June 2 and December 1, 2017, in accordance with the requirements of the *Cover System Inspection and Maintenance Plan* (Aspect, 2015c). The completed inspection records are provided in Appendices A and B, along with photos taken during the inspections. The photos were taken from four specific vantage points, identified on Figure 2, to provide photo-documentation of the following cover features:

- Photo Location 1 – Pavement in the parking area along Bertha Avenue NW, where an RI soil sample collected from beneath the pavement (composite sample to 3-foot depth) contained lead at a concentration exceeding the cleanup level.
- Photo Locations 2 and 4 – Soil/sod covers next to the portable classroom building and in the southeast corner of the school property, where lead cleanup level exceedances were identified in soil samples collected from the 1- to 3-foot depth range. In summer 2013, these two areas were covered with a geotextile fabric (placed directly on the undisturbed ground surface) and an additional 1-foot thickness of fill soil was imported and hydroseeded to supplement the pre-existing clean soil cover layer.
- Photo Location 3 – A soil/sod cover in the northwest corner of the BUMC property (and extending approximately 10 feet onto the school property), where an interim action was completed in spring 2012 in which contaminated surface soils were removed to a 1-foot depth, a geotextile fabric was placed on remaining contaminated soils, and a 1-foot thickness of fill soil was imported and hydroseeded.

Potholes and extensive cracks were observed in the pavement in the northern portion of the Bertha Avenue NW parking area. (See close-up photos in Appendix B.) However, the pavement still appears to provide an effective barrier to direct-contact exposure to the underlying soils (i.e., the paved surface remains intact, with no exposed soil areas).

The soil/sod cover at Photo Location 2 appeared to be in good condition in both inspection events. In June, localized areas of bare soil were observed on the school property at Photo Locations 3 and 4; however, improved sod coverage was observed in December.

As depicted on the Photo Location 3 photo in Appendix B, vegetation had been cleared from much of the northern portion of the BUMC property sometime between the June and December inspection events. It was initially suspected that the scope of the BUMC construction project discussed in Section 2.4.2 may have been expanded to include construction in the former landfill area (e.g., construction of additional paved parking). On December 5, 2017, Aspect contacted Lee Crawford, the church's point of contact for the Crownhill Site cleanup. Mr. Crawford stated that the northern portion of the BUMC property had been used as a laydown area by a different contractor who was constructing sidewalks in the neighborhood, and that no digging or other intrusive activities had occurred. (Mr.

Crawford is aware of the restrictions and Ecology notification requirements in the Environmental Covenant for the BUMC property [Exhibit E of AO No. DE11107].)

The 2017 inspections did not identify any cover system deficiencies in other areas of the Site or other action items.

2.4 Regulatory Agency Interactions

2.4.1 Quarterly Progress Reports to Ecology

Progress reports dated March 6, June 7, September 7, and December 8, 2017, were submitted to Ecology in compliance with the requirements of Agreed Order No. DE11107.

2.4.2 Review of Construction Plan Set, BUMC Expansion

In early 2017, BUMC submitted a construction permit application to the City of Bremerton Department of Community Development for expansion of the church building. During the permit review process, Kitsap Public Health District (KPHD) expressed concern that the proposed construction may be impacted by the presence of landfilled materials and contamination in the northern portion of the BUMC property. At the request of Ecology, Aspect reviewed the construction plan set (Permit Set dated January 4, 2017). Aspect determined that the proposed work area was situated well outside the boundary of the historical landfill materials, and outside the constraints of the recorded environmental covenant for the BUMC property. The construction permit was granted and subgrade construction for the church building expansion was completed in September/October 2017.

3 Statement of Compliance

On behalf of BSD, Aspect certifies that the remedy implementation activities completed at the Site in 2017 complied with the requirements of the CAP, Agreed Order No. DE11107, and the remedy implementation work plans approved by Ecology.

4 Plans for 2018

The following remedy implementation activities are planned for 2018:

- Conduct semiannual rounds of groundwater/LNAPL monitoring and LNAPL removal (scheduled for April and October 2018)[6]; and
- Conduct semiannual Site inspections (scheduled for June and December 2018).

Other activities, as specified in the remedy implementation work plans, may also be required based on monitoring and/or inspection results.

[6] If an LNAPL thickness greater than 4 feet is measured in the April monitoring round, an LNAPL removal round will also be required in July 2018.

5 References

Aspect Consulting, LLC (Aspect), 2014a, Remedial Investigation, Crownhill Elementary School, prepared for Bremerton School District, November 2014.

Aspect Consulting, LLC, 2014b, Feasibility Study, Crownhill Elementary School, prepared for Bremerton School District, October 21, 2014.

Aspect Consulting, LLC, 2015a, Groundwater/LNAPL Monitoring and Contingency Plan, Crownhill Elementary School Site, prepared for Bremerton School District, November 19, 2015.

Aspect Consulting, LLC, 2015b, LNAPL Removal Work Plan, Crownhill Elementary School Site, prepared for Bremerton School District, November 19, 2015.

Aspect Consulting, LLC, 2015c, Cover System Inspection and Maintenance Plan, Crownhill Elementary School Site, prepared for Bremerton School District, December 17, 2015.

Aspect Consulting, LLC, 2016, 2015 Annual Report, Remedy Implementation, Crownhill Elementary School Site, prepared for Bremerton School District, January 14, 2016.

Aspect Consulting, LLC, 2017, 2016 Annual Report, Remedy Implementation, Crownhill Elementary School Site, prepared for Bremerton School District, January 9, 2017.

Washington State Department of Ecology (Ecology), 2014, Cleanup Action Plan, Bremerton School District, Crownhill Elementary School Site, Washington State Department of Ecology, December 10, 2014.

6 Limitations

Work for this project was performed for the Bremerton School District (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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TABLES

Table 1 - 2017 Well Monitoring Program Summary

Project No. 100094-005-01, Crownhill Elementary, Bremerton, Washington

Well Included in Monitoring Program[1]	LNAPL Present in Well[2]	Groundwater Samples Collected for Analysis of COCs[1]			Additional Notes
		TPH[3]	Total Arsenic[4]	TCE[5]	
MW-5		spring			
MW-6			spring/fall		6
MW-8	X				
MW-9				spring/fall	
MW-10		spring/fall	spring/fall	spring/fall	7
MW-12		fall			
MW-13	X				
MW-14	X				
MW-15		spring/fall			8
MW-16	X				
EW-17	X				
McKinney				spring/fall	9

COC constituent of concern
LNAPL light non-aqueous-phase liquid
TCE trichloroethene
TPH total petroleum hydrocarbon

Notes

1) The *Groundwater/LNAPL Monitoring and Contingency Plan* (Aspect, 2015a) provides the rationale for including a well in the monitoring program, and for selecting well-specific COC analytes. Refer to Table 2 for groundwater monitoring results.

2) All wells except McKinney are monitored for LNAPL. If LNAPL is detected, its thickness is measured (refer to Table 3) and groundwater samples are not collected for analysis.

3) TPH is analyzed for using Method NWTPH-Dx. Both diesel-range TPH and motor-oil-range TPH are COCs.

4) Total arsenic is analyzed for using EPA Method 6010.

5) TCE is analyzed for using EPA Method 8260.

6) Well MW-6 provides early warning of potential arsenic migration.

7) Well MW-10 is the conditional point of compliance for achieving groundwater cleanup levels.

8) Well MW-15 is the conditional point of compliance for LNAPL migration.

9) The McKinney domestic well water sample is collected from the outdoor faucet on the north side of the residence at 1724 Dora Ave NW.

Table 2 - Groundwater Monitoring Data Summary

Project No. 100094-005-01, Crownhill Elementary, Bremerton, Washington

Well ID and Top-of-Casing Elevation[1,2]	Date	Depth to Water (feet below top-of-casing)	Groundwater Elevation (feet)[2]	Constituent of Concern/Concentration[3]			
				Diesel-Range TPH	Motor-Oil-Range TPH	TCE	Total Arsenic
MW-5 136.95 ft	12/18/13	117.36	19.59	**2,100 x**	**750 x**	1.8	1.0
	04/03/14	117.17	19.78	**2,400 x**	**770 x**	na	1.2
	07/01/14	116.23	20.72	**2,000 x**	490 x	na	1.0
	10/13/14	117.56	19.39	**1,300**	260 x	na	1.0
	04/07/15	116.49	20.46	**2,000**	430 x	na	na
	04/05/16	113.41	23.54	**1,800**	**600 x**	na	na
	04/04/17	112.13	24.82	**2,200 x**	**750 x**	na	na
MW-6 133.87 ft	12/18/13	124.36	9.51	50 U	250 U	1.0 U	**16.6**
	04/03/14	124.70	9.17	50 U	250 U	na	**20.5**
	07/01/14	124.40	9.47	50 U	250 U	na	**19.9**
	10/13/14	124.54	9.33	50 U	250 U	na	**20.4**
	04/07/15	124.61	9.26	na	na	na	**26.7**
	10/28/15	124.84	9.03	na	na	na	**22.8**
	04/05/16	124.54	9.33	na	na	na	**29.1**
	10/28/16	123.70	10.17	na	na	na	**23.3**
	04/04/17	123.21	10.66	na	na	na	**12.5**
	10/27/17	122.79	11.08	na	na	na	**29.3**
MW-9 134.39 ft	12/17/13	114.49	19.90	110 x	250 U	**11**	1.0 U
	04/03/14	114.35	20.04	210 x	280 x	**11**	1.0 U
	07/01/14	113.44	20.95	180 x	250 U	**12**	1.0 U
	10/13/14	114.71	19.68	180 x	250 U	**10**	1.0 U
	04/07/15	114.50	19.89	na	na	**11**	na
	10/28/15	115.30	19.09	na	na	**10**	na
	04/05/16	110.60	23.79	na	na	**11**	na
	10/28/16	112.35	22.04	na	na	**8.6**	na
	04/04/17	109.23	25.16	na	na	**9.5**	na
	10/27/17	110.58	23.81	na	na	**6.8**	na
MW-10 132.33 ft	12/18/13	120.87	11.46	50 U	250 U	1.0 U	3.3
	04/03/14	121.21	11.12	50 U	250 U	1.0 U	3.9
	07/01/14	120.55	11.78	50 U	250 U	1.0 U	3.0
	10/13/14	121.48	10.85	50 U	250 U	1.0 U	3.0
	04/07/15	120.60	11.73	50 U	250 U	1.0 U	2.8
	10/28/15	121.30	11.03	80 U	400 U	1.0 U	2.7
	04/05/16	119.33	13.00	50 U	250 U	1.0 U	2.6
	10/28/16	120.35	11.98	50 U	250 U	1.0 U	2.6
	04/04/17	118.58	13.75	50 U	250 U	1.0 U	2.2
	10/27/17	119.30	13.03	50 U	250 U	1.0 U	2.1
MW-12 133.87 ft	12/17/13	114.24	19.63	**2,000 x**	**800 x**	1.0 U	1.5
	04/03/14	114.11	19.76	**2,800 x**	**850 x**	na	1.4
	07/01/14	113.17	20.70	**1,800 x**	420 x	na	1.7
	10/13/14	114.45	19.42	**1,600**	250 U	na	1.7
	10/28/15	115.02	18.85	**2,400 x**	**620 x**	na	na
	10/28/16	112.19	21.68	**1,500 x**	**680 x**	na	na
	10/27/17	110.40	23.47	**1,700 x**	**570 x**	na	na
MW-15 133.37 ft	12/17/13	nm[4]	--	50 U	250 U	1.0 U	4.6
	04/03/14	nm[4]	--	50 U	250 U	na	1.2
	07/01/14	nm[4]	--	50 U	250 U	na	1.0 U
	10/13/14	nm[4]	--	50 U	250 U	na	1.1
	04/07/15	nm[4]	--	50 U	250 U	na	na
	10/28/15	nm[4]	--	50 U	250 U	na	na
	04/05/16	109.88	23.49	50 U	250 U	na	na
	10/28/16	111.65	21.72	50 U	250 U	na	na
	04/04/17	109.61	23.76	50 U	250 U	na	na
	10/27/17	109.90	23.47	50 U	250 U	na	na
McKinney (domestic well)	10/6/2014[5]	nm	--	100 U	200 U	0.2 U	0.4
	2/19/2015[5]	nm	--	100 U	200 U	0.2 U	0.4
	6/1/2015[5]	nm	--	100 U	200 U	0.2 U	0.3
	10/28/15	nm	--	na	na	1.0 U	na
	04/05/16	nm	--	na	na	1.0 U	na
	10/28/16	nm	--	na	na	1.0 U	na
	04/04/17	nm	--	na	na	1.0 U	na
	10/27/17	nm	--	na	na	1.0 U	na

na not analyzed
nm not measured
TCE trichloroethene
TPH total petroleum hydrocarbon
U analyte not detected at or above the reported result
x sample chromatographic pattern does not resemble the fuel standard used for quantitation

Notes

1) Only wells included in the current monitoring program that do not contain LNAPL are shown in this table. Refer to Table 3 for wells containing LNAPL. Refer to the *Remedial Investigation Report* (Aspect, 2014a) for data prior to December 2013 and for information on other wells.

2) Elevations are based on NAVD88 vertical datum.

3) All concentrations are in micrograms per liter (µg/L). Cleanup levels are 500 µg/L for diesel- and motor-oil-range TPH, and 5 µg/L for TCE and total arsenic. Cleanup level exceedances are bolded.

4) Water level was below top of pump and could not be measured.

5) Sample was collected for analysis by the Kitsap Public Health District and analyzed by Analytical Resources, Inc.

Table 3 - LNAPL Thickness Measurements and Removal Summary

Project No. 100094-005-01, Crownhill Elementary, Bremerton, Washington

Well ID	Date	Initial Thickness in ft[1]	LNAPL Removal in Liters[2]	Notes
MW-8	10/26/12	0.20		Well installed on 12/20/11.
	11/21/12	nm		
	01/31/13	0.10		
	05/03/13	0.03		
	08/07/13	0.23		
	12/17/13	0.86		
	04/02/14	0.39	0.18	(Note 5)
	05/23/14	0.38	0.11	(Note 4)
	07/01/14	0.23		
	10/13/14	0.28		
	04/07/15	0.27		Not bailed because initial thickness was <0.3 feet.
	10/28/15	0.90	0.36	(Note 4)
	01/18/16	0.10		Not bailed because initial thickness was <0.3 feet.
	04/05/16	0.01		Not bailed because initial thickness was <0.3 feet.
	10/28/16	0.40	0.01	(Note 4)
	04/04/17	0.13		Not bailed because initial thickness was <0.3 feet.
	10/27/17	0.15		Not bailed because initial thickness was <0.3 feet.
Cumulative LNAPL Removal			0.66	
MW-13	11/01/12	1.46		Well installed on 10/25/12.
	11/21/12	0.99	0.90	(Note 4)
	01/31/13	0.10		
	05/03/13	0.31		
	08/07/13	0.49		
	12/17/13	4.90		
	04/02/14	1.35	0.02	Water detected above LNAPL. (Note 4)
	05/23/14	2.08	0.18	Water detected above LNAPL. (Note 4)
	07/01/14	0.84		
	10/13/14	3.39		
	04/07/15	1.00	0.17	(Note 4)
	10/28/15	4.15	0.02	(Note 4)
	01/18/16	1.39	0.52	(Note 4)
	04/05/16	1.31	0.26	(Note 4)
	10/28/16	0.05		Not bailed because initial thickness was <0.3 feet.
	04/04/17	0.20		Not bailed because initial thickness was <0.3 feet.
	10/27/17	0.04		Not bailed because initial thickness was <0.3 feet.
Cumulative LNAPL Removal			2.06	
MW-14	11/01/12	nd		Well installed on 10/26/12.
	01/31/13	nd		
	05/03/13	nd		
	08/07/13	0.12		
	12/17/13	0.10		
	04/02/14	0.08		Not bailed because initial thickness was <0.1 feet.
	05/23/14	0.09		Not bailed because initial thickness was <0.1 feet.
	07/01/14	0.46		
	10/13/14	0.71		
	04/07/15	0.23		Not bailed because initial thickness was <0.3 feet.
	10/28/15	1.48	0.35	(Note 4)
	01/18/16	0.32	0.20	(Note 4)
	04/05/16	0.01		Not bailed because initial thickness was <0.3 feet.
	10/28/16	0.37	0.03	(Note 5)
	04/04/17	0.77	0.32	(Note 4)
	10/27/17	0.60	0.64	(Note 5)
Cumulative LNAPL Removal			1.53	
MW-16	11/01/12	nd		Well installed on 10/26/12.
	01/31/13	0.50		
	05/03/13	0.48		
	08/07/13	2.61		
	12/17/13	2.83		
	04/02/14	3.02	0.85	(Note 5)
	05/23/14	4.25	2.06	(Note 5)
	07/01/14	3.79		
	10/13/14	3.25		
	04/07/15	2.64	1.19	(Note 5)
	10/28/15	2.18	0.35	(Note 4)
	01/18/16	0.45	0.17	Bailing was stopped after measuring <0.01 foot LNAPL thickness.
	04/05/16	0.39	0.00	Four bailing attempts recovered only a trace of LNAPL.
	10/28/16	0.87	0.10	Third bailing attempt recovered only 20 ml of LNAPL.
	04/04/17	0.24		Not bailed because initial thickness was <0.3 feet.
	10/27/17	2.15	1.35	(Note 4)
Cumulative LNAPL Removal			6.07	
EW-17	10/28/15	0.45	0.03	Well installed on 10/13/15.
	01/18/16	0.40	0.21	LNAPL observed to be much more viscous (sludge-like) than in other wells. (Note 4)
	04/05/16	0.44	1.66	LNAPL appears to be less viscous than in previous rounds. (Note 4)
	10/28/16	0.47	0.11	Fourth bailing attempt recovered only 5 ml of LNAPL.
	04/04/17	1.95	0.52	Initial thickness measurements ranged from 0.23 to 3.45 ft. (Note 4)
	10/27/17	0.85	0.12	(Note 4)
Cumulative LNAPL Removal			2.64	
TOTAL LNAPL REMOVED			**13.0**	**(ALL WELLS)**

LNAPL light non-aqueous-phase liquid nd no detectable LNAPL thickness nm not measured

Notes:

1) The viscous, sticky nature of the LNAPL results in inconsistent readings of the interface probe (used to measure depth-to-LNAPL and depth-to-water). Therefore, the reported LNAPL thicknesses can only be regarded as estimates.

2) Water has been observed to separate out from LNAPL samples over a period of months. Therefore, actual volumes of non-aqueous-phase liquid removed from the subsurface are likely less than the LNAPL volumes reported in this table.

3) Well EW-17 (4-inch ID) has a unit volume of approximately 2.5 liters per vertical foot of well casing. All other wells are 2-inch ID and have unit volumes of approximately 0.62 liter per vertical foot of well casing.

4) Bailing was stopped after bailer retrieved a relatively large volume of water with little or no LNAPL.

5) Bailing was stopped because bailer would no longer go down well due to LNAPL buildup on inside well casing.

FIGURES

Vicinity Map

2017 Annual Report

Crownhill Elementary, Bremerton, Washington

Aspect CONSULTING	JAN-2018	BY: PPW	FIGURE NO. 1
	PROJECT NO. 100094	REV BY: SCC	

GIS Path: T:\projects_8\CrownHillElementary\Delivered\Annual Report 2017\01_VicinityMap.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 1/15/2018 || User: scudd || Print Date: 1/15/2018

1724 Dora Avenue NW (Note 2)

North Landfill Area

MW-2

Estimated Extent of TPH Cleanup Level Exceedance

Estimated Extent of TCE Cleanup Level Exceedance

BERTHA AVE NW

MW-9

MW-16 (Note 1) MW-14

EW-17 MW-13

MW-12

MW-8

MW-15

MW-5

Geotextile at 1 Foot Below Ground Surface (Summer 2013 Interim Action)

Estimated Extent of Arsenic Cleanup Level Exceedance

ROCKY POINT RD

PORTABLE CLASSROOM BUILDING

MW-6

MW-10

MAIN SCHOOL BUILDING

MW-4

MW-3

Bertha Ave NW Parking Area

South Landfill Area

MW-1

Geotextile at 1 Foot Below Ground Surface (Summer 2013 Interim Action)

MW-7

Geotextile at 1 Foot Below Ground Surface (Spring 2012 Interim Action)

MW-11

MARINE DR

DORA AVE

0 100 200 Feet

Well Locations:

- Extraction Well Included in Monitoring Program
- Monitoring Well Included in Monitoring Program
- Monitoring Well Not Included in Monitoring Program
- McKinney Domestic Well (Note 2)
- Approximate photo location & orientation for semiannual cover system inspections

Other Site Features and Interpretation:

- Interpreted Extent of Landfill Activity
- Estimated Extent of Groundwater Cleanup Level Exceedances in 2014 (Ecology, 2014)
- Bremerton School District Property Boundary
- Bremerton United Methodist Church Property Boundary
- Inferred Direction of Groundwater Flow

Note:

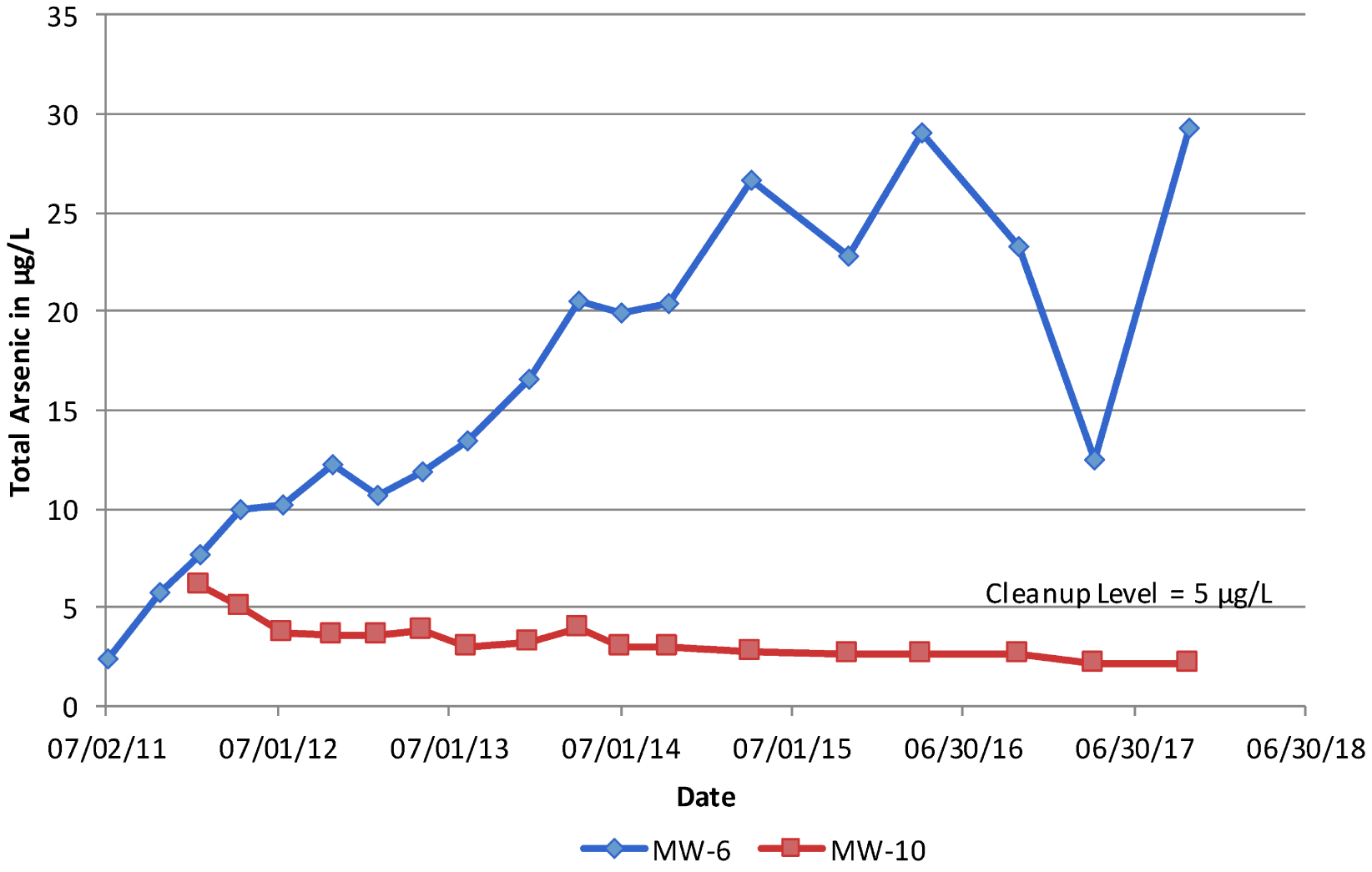
(1) LNAPL has been observed in Wells EW-17, MW-8, MW-13, MW-14, and MW-16.
(2) The McKinney well water sample is collected from the outdoor faucet on the north side of the residence at 1724 Dora Avenue NW.

Site Plan

2017 Annual Report
Crownhill Elementary, Bremerton, Washington

Aspect CONSULTING	JAN-2018	BY: DLH / PPW	FIGURE NO. 2
	PROJECT NO. 100094	REVISED BY: SCC	

GIS Path: T:\projects_8\CrownHillElementary\Delivered\Annual Report 2017\02_Site Plan.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 1/15/2018 || User: scudd || Print Date: 1/15/2018



Notes:

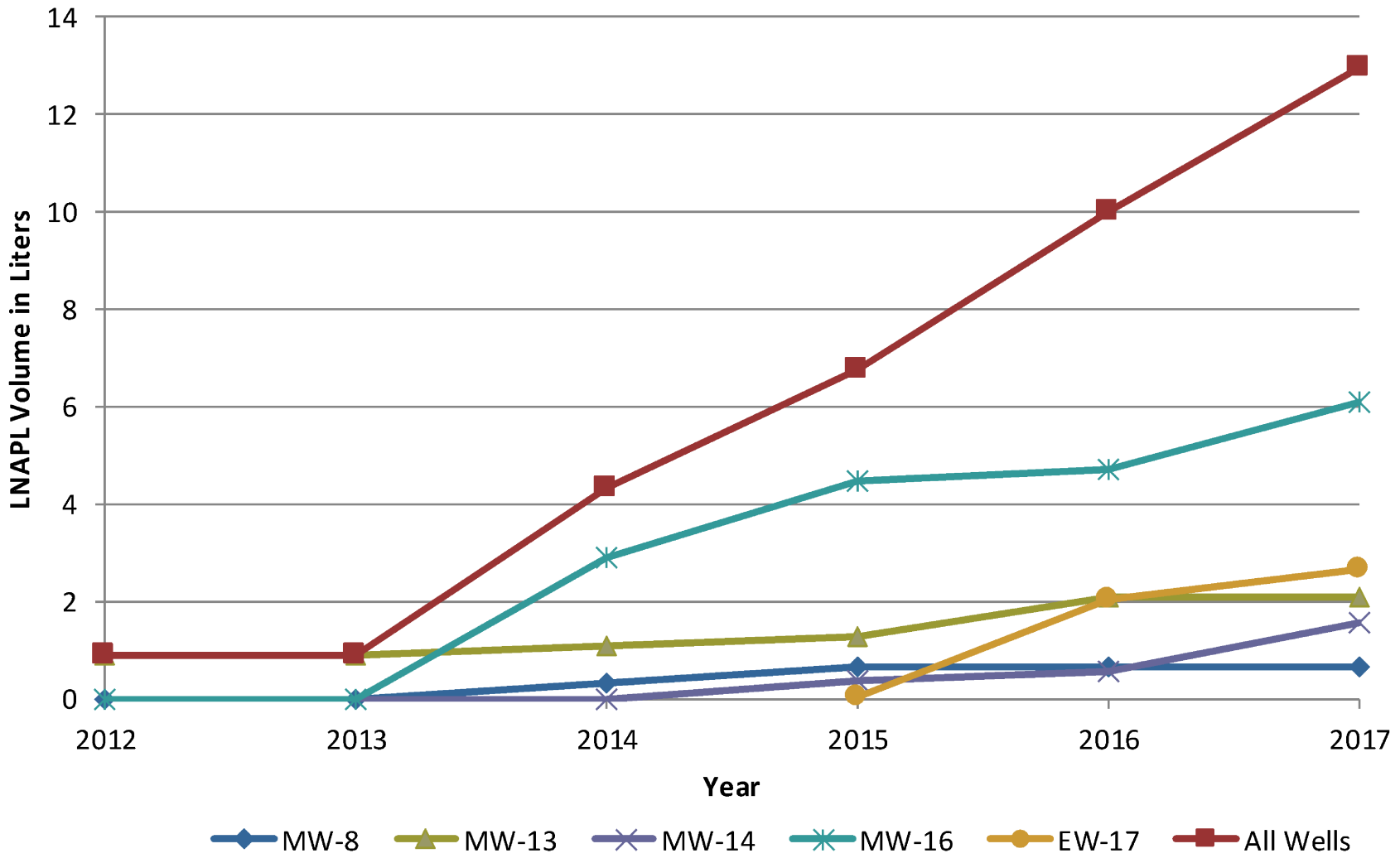
1. Well MW-6, installed in March 2011, provides early warning of potential arsenic migration.
2. Well MW-10, installed in December 2011, is the conditional point of compliance for arsenic in groundwater.

Arsenic in Wells MW-6 and MW-10

2017 Annual Report

Crownhill Elementary, Bremerton, Washington

Aspect Consulting	Jan-2018	BY: DAH/SCC	FIGURE NO. 3
	PROJECT NO. 100094	REVISED BY: -	



Cumulative LNAPL Removal Over Time

2017 Annual Report

Crownhill Elementary, Bremerton, Washington

Aspect CONSULTING	Jan-2018	BY: DAH/SCC	FIGURE NO. 4
	PROJECT NO. 100094	REVISED BY: -	

APPENDIX A

June 2017 Inspection Record and Photos

Aspect CONSULTING

Project Name: **Crownhill Elementary School**

Project No.: 100094

Weather Conditions: Sunny, Low 70°Fs

Date: 6/2/17

Inspector's Name: Matthew M. Lewis

Inspector's Signature: Matth M. Lewis

Inspector's Title/Affiliation: Sr. Staff Hydrogeo w/ Aspect Consulting

FORM 1 - INSPECTION RECORD

INSPECTION ITEM	YES	NO	COMMENTS/NOTES
1. North Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Pavement deterioration/damage along Bertha Ave NW?[1]	X		Some damage as noted in previous inspections. Depressions & cracks.
c. Evidence of soil disturbance?		X	
d. Geotextile fabric visible in interim action area?		X	
2. South Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Evidence of soil disturbance?	X		Some shallow scrapes have removed two small patches of grass.
c. Geotextile fabric visible in interim action areas?		X	
3. Other Inspection Items			
a. Are all wells (MW-1 through EW-17) accessible?	X		
b. Evidence of well monument damage/tampering?		X	
c. HVAC system operates continuously during school day?[2]	X		System on all day, heating/cooling runs intermittently based on temperature settings.

Deficient Action Items & Other Comments:

See photos for locations 1 through 4

Notes

1. Item 1b refers to the paved parking area described in Section 1.3.
2. The inspector should describe under COMMENTS/NOTES how the determination is made regarding HVAC system operation.

Revision: December 2015

Photo Location 1, 6/2/17 site inspection

Photo Location 2, 6/2/17 site inspection

Photo Location 3, 6/2/17 site inspection

Photo Location 4, 6/2/17 site inspection

Photo Location 4 showing bare soil patches in southwest portion of interim action area, 6/2/17 site inspection

Photo Location 4 showing bare soil patches in the eastern portion of interim action area, 6/2/17 site inspection

APPENDIX B

December 2017 Inspection Record and Photos

Aspect CONSULTING

Project Name: **Crownhill Elementary School**

Project No.: 10694

Date: 12/1/17

Inspector's Name: Matthew M. Lewis

Inspector's Signature: Matthew M. Lewis

Weather Conditions: 50°Fs, Rainy

Inspector's Title/Affiliation: Sr. Staff Hydrogeologist / Aspect Consulting

FORM 1 - INSPECTION RECORD

INSPECTION ITEM	YES	NO	COMMENTS/NOTES
1. North Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Pavement deterioration/damage along Bertha Ave NW?[1]	X		Same as noted in 6/2/17 inspection: depressions and cracks.
c. Evidence of soil disturbance?		X	
d. Geotextile fabric visible in interim action area?		X	
2. South Environmental Covenant Area			
a. Building or pavement modifications since last inspection?		X	
b. Evidence of soil disturbance?	X		Same as noted in 6/2/17 inspection; grass regrowing
c. Geotextile fabric visible in interim action areas?		X	
3. Other Inspection Items			
a. Are all wells (MW-1 through EW-17) accessible?	X		
b. Evidence of well monument damage/tampering?		X	
c. HVAC system operates continuously during school day?[2]	X		System is always circulating air, but heating/cooling as needed based on thermostat, - Based on conversation with David Herrington by phone on 12/4/2017.

Deficient Action Items & Other Comments:

- See photos for locations 1-4.

Notes

1. Item 1b refers to the paved parking area described in Section 1.3.
2. The inspector should describe under COMMENTS/NOTES how the determination is made regarding HVAC system operation.

Revision: December 2015

Photograph 1. Photo location 1, 12/1/17 site inspection.

Photograph 2. Photo Location 1 showing pavement deterioration (1st view), 12/1/17 site inspection.

Photograph 3. Photo Location 1 showing pavement deterioration (2nd view), 12/1/17 site inspection.

Photograph 4. Photo Location 2, 12/1/17 site inspection.

Photograph 5. Photo Location 3, 12/1/17 site inspection. Note the absence of vegetation in much of the northern portion of the church property.

Photograph 6. Photo location 4, 12/1/17 site inspection.

APPENDIX C

Laboratory Reports, April and October 2017 Groundwater Monitoring Rounds

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
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

April 13, 2017

Dave Heffner, Project Manager
Aspect Consulting, LLC
401 2nd Ave S, Suite 201
Seattle, WA 98104

Dear Mr Heffner:

Included are the results from the testing of material submitted on April 5, 2017 from the Crown Hill Elementary, F&BI 704045 project. There are 13 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. 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 have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: data@aspectconsulting.com
ASP0413R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on April 5, 2017 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Crown Hill Elementary, F&BI 704045 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
704045 -01	MW-9-040417
704045 -02	MW-15-040417
704045 -03	MW-5-040417
704045 -04	MW-6-040417
704045 -05	MW-10-040417
704045 -06	McKinney-040417

All quality control requirements were acceptable.

Date of Report: 04/13/17
Date Received: 04/05/17
Project: Crown Hill Elementary, F&BI 704045
Date Extracted: 04/05/17
Date Analyzed: 04/05/17

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
MW-15-040417 704045-02	<50	<250	111
MW-5-040417 704045-03	2,200 x	750 x	ip
MW-10-040417 704045-05	<50	<250	93
Method Blank 07-697 MB2	<50	<250	91

Analysis For Total Metals By EPA Method 200.8

Client ID:	MW-6-040417	Client:	Aspect Consulting, LLC
Date Received:	04/05/17	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/06/17	Lab ID:	704045-04
Date Analyzed:	04/11/17	Data File:	704045-04.056
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	12.5

Analysis For Total Metals By EPA Method 200.8

Client ID:	MW-10-040417	Client:	Aspect Consulting, LLC
Date Received:	04/05/17	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/06/17	Lab ID:	704045-05
Date Analyzed:	04/11/17	Data File:	704045-05.057
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.22

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/06/17	Lab ID:	I7-178 mb
Date Analyzed:	04/06/17	Data File:	I7-178 mb.078
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-9-040417	Client:	Aspect Consulting, LLC
Date Received:	04/05/17	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/05/17	Lab ID:	704045-01
Date Analyzed:	04/06/17	Data File:	040539.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	101	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	9.5

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-10-040417	Client:	Aspect Consulting, LLC
Date Received:	04/05/17	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/05/17	Lab ID:	704045-05
Date Analyzed:	04/06/17	Data File:	040540.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	100	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	101	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	McKinney-040417	Client:	Aspect Consulting, LLC
Date Received:	04/05/17	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/05/17	Lab ID:	704045-06
Date Analyzed:	04/06/17	Data File:	040541.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	57	121
Toluene-d8	102	63	127
4-Bromofluorobenzene	101	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Crown Hill Elementary, F&BI 704045
Date Extracted:	04/05/17	Lab ID:	07-673 mb
Date Analyzed:	04/05/17	Data File:	040520.D
Matrix:	Water	Instrument:	GCMS4
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	57	121
Toluene-d8	103	63	127
4-Bromofluorobenzene	100	60	133

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<1

Date of Report: 04/13/17
Date Received: 04/05/17
Project: Crown Hill Elementary, F&BI 704045

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	75	90	63-142	18

Date of Report: 04/13/17
Date Received: 04/05/17
Project: Crown Hill Elementary, F&BI 704045

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 704042-01 x10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<10	96	96	70-130	0

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	89	85-115

Date of Report: 04/13/17
Date Received: 04/05/17
Project: Crown Hill Elementary, F&BI 704045

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

Laboratory Code: 704061-15 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	50	<1	100	66-135

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	50	106	106	80-120	0

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 compound 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. Compounds in the sample matrix interfered with the quantitation of the analyte.

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.

704045

SAMPLE CHAIN OF CUSTODY

ME 04/05/17 VW2/RL2/BB3

Page # 1 of 1

Report To Dave Heffner

Company Aspect

Address Seattle office

City, State, ZIP

Phone Email

SAMPLERS (*signature*) Matthew M. Lewis

PROJECT NAME: Crown Hill Elementary

PO #

REMARKS

INVOICE TO

TURNAROUND TIME
- [X] Standard Turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [X] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	TCE	Total As			Notes
MW-9-040417	01 A-C	4/4/17	0955	GW	3								X				
MW-15-040417	02		1045		1		X										
MW-5-040417	03		1130		1		X										
MW-6-040417	04		1240		1									X			
MW-10-040417	05 A-E		1340		5		X						X	X			
McKinney-040417	06 A-C		1430		3								X				

Samples received at 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Matthew M. Lewis	Matthew M. Lewis	Aspect	4/5/17	0700
Received by:	Jarel Underdown	FedEx	4-5-17	9:15 am
Relinquished by:				
Received by:	Nhan Pham	FEBI	4-5-17	1130

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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

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

November 6, 2017

Dave Heffner, Project Manager
Aspect Consulting, LLC
401 2nd Ave S, Suite 201
Seattle, WA 98104

Dear Mr Heffner:

Included are the results from the testing of material submitted on October 30, 2017 from the Crownhill Elementary PO 100094, F&BI 710474 project. There are 13 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. 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 have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: data@aspectconsulting.com
ASP1106R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 30, 2017 by Friedman & Bruya, Inc. from the Aspect Consulting, LLC Crownhill Elementary PO 100094, F&BI 710474 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Aspect Consulting, LLC
710474 -01	MW-6-102717
710474 -02	MW-9-102717
710474 -03	MW-10-102717
710474 -04	MW-12-102717
710474 -05	MW-15-102717
710474 -06	McKinney-102717

All quality control requirements were acceptable.

Date of Report: 11/06/17
Date Received: 10/30/17
Project: Crownhill Elementary PO 100094, F&BI 710474
Date Extracted: 10/31/17
Date Analyzed: 10/31/17

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

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW-10-102717 710474-03	<50	<250	85
MW-12-102717 710474-04	1,700 x	570 x	91
MW-15-102717 710474-05	<50	<250	84
Method Blank 07-2412 MB2	<50	<250	78

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	MW-6-102717	Client:	Aspect Consulting, LLC
Date Received:	10/30/17	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/31/17	Lab ID:	710474-01
Date Analyzed:	11/02/17	Data File:	710474-01.084
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	29.3

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Total Metals By EPA Method 200.8

Client ID:	MW-10-102717	Client:	Aspect Consulting, LLC
Date Received:	10/30/17	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/31/17	Lab ID:	710474-03
Date Analyzed:	11/02/17	Data File:	710474-03.085
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	2.14

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	NA	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/31/17	Lab ID:	I7-613 mb
Date Analyzed:	10/31/17	Data File:	I7-613 mb.023
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-9-102717	Client:	Aspect Consulting, LLC
Date Received:	10/30/17	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/30/17	Lab ID:	710474-02
Date Analyzed:	10/31/17	Data File:	103108.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	97	85	117
Toluene-d8	98	91	108
4-Bromofluorobenzene	108	76	126

Compounds:	Concentration ug/L (ppb)
Trichloroethene	6.8

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW-10-102717	Client:	Aspect Consulting, LLC
Date Received:	10/30/17	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/30/17	Lab ID:	710474-03
Date Analyzed:	10/31/17	Data File:	103109.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	85	117
Toluene-d8	97	91	108
4-Bromofluorobenzene	107	76	126

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	McKinney-102717	Client:	Aspect Consulting, LLC
Date Received:	10/30/17	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/30/17	Lab ID:	710474-06
Date Analyzed:	10/31/17	Data File:	103110.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	85	117
Toluene-d8	98	91	108
4-Bromofluorobenzene	106	76	126

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<1

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	Aspect Consulting, LLC
Date Received:	Not Applicable	Project:	Crownhill Elementary PO 100094
Date Extracted:	10/30/17	Lab ID:	07-2422 mb
Date Analyzed:	10/30/17	Data File:	103007.D
Matrix:	Water	Instrument:	GCMS9
Units:	ug/L (ppb)	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	85	117
Toluene-d8	106	91	108
4-Bromofluorobenzene	108	76	126

Compounds:	Concentration ug/L (ppb)
Trichloroethene	<1

Date of Report: 11/06/17
Date Received: 10/30/17
Project: Crownhill Elementary PO 100094, F&BI 710474

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	96	108	61-133	12

Date of Report: 11/06/17
Date Received: 10/30/17
Project: Crownhill Elementary PO 100094, F&BI 710474

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 710478-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	<1	104	110	70-130	6

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Arsenic	ug/L (ppb)	10	99	85-115

Date of Report: 11/06/17
Date Received: 10/30/17
Project: Crownhill Elementary PO 100094, F&BI 710474

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

Laboratory Code: 710458-21 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Acceptance Criteria
Trichloroethene	ug/L (ppb)	50	<1	90	73-122

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Trichloroethene	ug/L (ppb)	50	95	93	72-119	2

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 compound 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. Compounds in the sample matrix interfered with the quantitation of the analyte.

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.

710474 [redacted]

SAMPLE CHAIN OF CUSTODY

ME 10-30-17 [redacted]

E04 / VW2 / AI2

Page # 1 of 1

Report To: Dave Hefner
Company: Aspect Consulting
Address: Seattle
City, State, ZIP: WA
Phone ______ Email ______

SAMPLERS (signature)	[signature]
PROJECT NAME: Crownhill Elementary	PO #: 100094
REMARKS	INVOICE TO

TURNAROUND TIME
- [X] Standard Turnaround
- [ ] RUSH ______
- Rush charges authorized by: ______

SAMPLE DISPOSAL
- [X] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other ______

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Total As (Arsenic)	TCE			Notes
MW-6-102717	01	10/27/17	1255	GW	1								X				
MW-9-102717	02 A-C	↓	0940	↓	3									X			
MW-10-102717	03 A-E	↓	1400	↓	5		X						X	X			
MW-12-102717	04	↓	1110	↓	1		X										
MW-15-102717	05	↓	1025	↓	1		X										
McKinney-102717	06 A-C	↓	1150	↓	3									X			

Samples received at 3 °C

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	[signature]	Matthew M. Lewis	Aspect	10/30/17	0600
Received by:	[signature]	Rick Vasquez	FedEx	10-30-17	10:55
Relinquished by:					
Received by:	[signature]	[illegible]	F&B	10-30-17	11:18

Friedman & Bruya, Inc.
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Seattle, WA 98119-2029
Ph. (206) 285-8282