

**a s s o c i a t e d earth sciences** incorporated

## **Technical Memorandum**

Date:	December 2, 2016 Revised December 8, 2016	From:	Otto K. Paris, L.G., L.Hg. Colored Strain Science (Colored Science) (Colored Science				
To:	Pacific Topsoils, Inc.	Project Manager:	Otto K. Paris, L.G., L.Hg.				
	805 80 <sup>th</sup> Street SW	Principal in Charge:	Jon N. Sondergaard, L.G., L.E.G. Otto K. Paris, L.G., L.Hg.				
	Everett, Washington 98203	Project Name:	Mill E Site				
Attn:	Mr. Janusz Bajsarowicz	Project No:	KV050654A				
Subject:	Mill E 2016 Ground Water Monitoring Summary						

## GROUND WATER MONITORING

Associated Earth Sciences, Inc. (AESI) performed annual ground water monitoring at the Mill E site on September 21, 2016, consistent with the Mill E's "Performance and Compliance Monitoring Plan" (PCMP) dated October 1998. During the September 2016 monitoring event, depth to water measurements were made in all of the site's six piezometers (PZ-1A, PZ-1B, PZ-2A, PZ-2B, PZ-3A, and PZ-3B). The ground water levels were measured during a falling tide following a high tide at 9:37 AM (10.4 feet elevation) and prior to the subsequent low tide at 3:11 PM (5.03 feet elevation) based on the National Oceanic and Atmospheric Administration tide chart for Everett, Washington. The depth to water measurements are summarized in Table 1. A site plan showing the approximate well locations is presented as Figure 1. The ground water elevations measured on September 21, 2016, and the approximate timing of the measurements relative to the 24-hour tidal cycle are also included on Figure 1.

Piezometer	Date	Time	Reference Elevation (feet) Top of PVC <sup>(1)</sup>	Depth to Water (feet) <sup>(2)</sup>	Ground Water Elevation (feet) <sup>(3)</sup>
PZ-1A	9/21/2016	13:44	9.9	6.61	3.29
PZ-1B	9/21/2016	13:42	7.93	3.65	4.28
PZ-2A	9/21/2016	13:30	9.4	5.89	3.51
PZ-2B	9/21/2016	13:36	8.38	4.25	4.13
PZ-3A	9/21/2016	13:09	10.31	7.92	2.39
PZ-3B	9/21/2016	13:14	7.54	5.02	2.52

 Table 1

 Ground Water Elevation Measurements<sup>(1)</sup>

<sup>(1)</sup> Top of well casing and ground water elevations referenced to mean sea level (Shaw Environmental, Inc., 2003).

<sup>(2)</sup> Measurements collected at outgoing (falling) tide.

 $^{(3)}$  "A" wells are located inside the containment area; "B" wells are located outside the containment area. PVC = polyvinyl chloride. Ground water samples were collected from piezometer PZ-3A only. Piezometer PZ-3A was purged and sampled using a disposable bailer, consistent with the facility's PCMP. Field measurements (depth to water, pH, conductivity, and temperature) were recorded at the time of sampling. The field measurements are summarized in Table 2. After purging and recording of field measurements, ground water samples were obtained for off-site analytical testing. The ground water samples were collected in laboratory-prepared bottles. The samples were placed in a cooler packed with ice and delivered under chain-of-custody (COC) procedures to Aquatic Research, Inc. in Seattle, Washington. The COC form outlining the requested analyses is attached.

## Table 2 Field Monitoring Parameters September 2016

Sample Location	Sample Date	Depth to Water (ft-BTOC)	Gallons Removed	рН (S.U.)	Specific Conductance (µS/cm)	Temperature (ºC)
PZ-3A	9/21/2016	7.92	2	6.27	654	22.97

ft-BTOC = feet below top of polyvinyl chloride (PVC) casing. S.U. = standard pH units.  $\mu$ S/cm = microSiemens per centimeter.

°C = degrees Celsius.

## QUALITY ASSURANCE/QUALITY CONTROL

Laboratory quality assurance/quality control (QA/QC) analyses were performed in conjunction with the September 2016 ground water quality monitoring event. Routine laboratory QA procedures included analyzing surrogate spikes, matrix spikes, matrix duplicates, laboratory control samples, and method blanks. The Lab Control Spike percent recovery for both the neutral blank and the samples analyzed are within the quality control limits. All other QA/QC results were judged to be acceptable for their intended use. The test results are presented in Table 3 below and the Aquatic Research, Inc. laboratory certificates are attached to this memorandum.

## **GROUND WATER ELEVATIONS**

Elevations for the top of the well casings and historic ground water elevations were obtained by reviewing the "2003 Annual Ground Water Compliance Monitoring and Five Year Data Review Report," prepared by Shaw Environmental, Inc. (Shaw) and obtained from the Washington State Department of Ecology (Ecology). Ground water elevations for the year 2005 could not be found. All "A" series wells (PZ-1A, PZ-2A, and PZ-3A) are located inside of the barrier wall and all "B" series wells (PZ-1B, PZ-2B, and PZ-3B) are located outside of the barrier wall.

Figures 2A, 2B, and 2C show a comparison of historical ground water elevation data obtained for the site. Review of the data indicates that generally after 2001, ground water elevations outside of the barrier wall are higher than inside the barrier, with the exception of the 2007 measurement for well PZ-1A. The higher than expected water level in PZ-1A in 2007 was examined, and was determined to

be a result of surface water collecting in the well monument. This problem has been corrected by raising the elevation of the top of the well monument to prevent surface water from seeping into the monument (Technical Memorandum dated December 17, 2009).

The data for wells PZ-1A/1B, PZ-2A/2B, and PZ-3A/3B suggests the barrier wall is generally performing as intended and isolating ground water inside the barrier from that outside the barrier.

## GROUND WATER QUALITY RESULTS

The September 2016 ground water analytical results for the Mill E site were compared to the Model Toxics Control Act (MTCA) cleanup levels established in the 1998 Consent Decree. The analytical results are presented in Table 3. Concentrations of all analytical parameters detected in the PZ-3A ground water sample were below the established cleanup standards, except for arsenic. The September 2016 PZ-3A result of 457 micrograms per liter ( $\mu$ g/L) for arsenic exceeds the MTCA cleanup standard of 5  $\mu$ g/L. Review of historic ground water quality data for the site indicates the 2016 results for pentachlorophenol (PCP) and total petroleum hydrocarbons (TPH) are generally lower than 2015, except for the detected TPH-motor oil concentration detected in the 2016 ground water sample is slightly higher than the concentration detected in 2015. All of the detected analyte concentrations were within the range of past ground water concentrations (Figures 3 through 5).

Sample Location	Sample Date	TPH-D (µg/L)	TPH-G (µg/L)	TPH-M (µg/L)	PCP (µg/L)	Arsenic (μg/L)
PZ-3A	9/21/2016	830	38	1070	<0.40	457
MT	CA <sup>(1)</sup>	10,000	10,000	10,000	7.29	5

#### Table 3 Comparison of Ground Water Analytical Results and MTCA Cleanup Standard for Ground Water September 2016

TPH-D = total petroleum hydrocarbons-diesel.

TPH-G = total petroleum hydrocarbons-gasoline.

TPH-M = total petroleum hydrocarbons-motor oil.

**Bold** denotes an exceedance of the MTCA cleanup standard for ground water.

 $^{(1)}$  MTCA = Model Toxics Control Act cleanup standards for ground water per the 1998 Consent Decree.

## ASPHALT CAP AND SOIL COVER

An asphalt cap and soil cover inspection was performed on September 21, 2016 by a professional engineer from AESI. A copy of the field report from that visit is attached. All of the cap was visible at the time of our visit as no operations were occurring at the site. Where observed, the asphalt cap exhibited little evidence of deterioration and no signs of excessive settlement. Small shallow

PCP = pentachlorophenol.

 $<sup>\</sup>mu$ g/L = micrograms per liter.

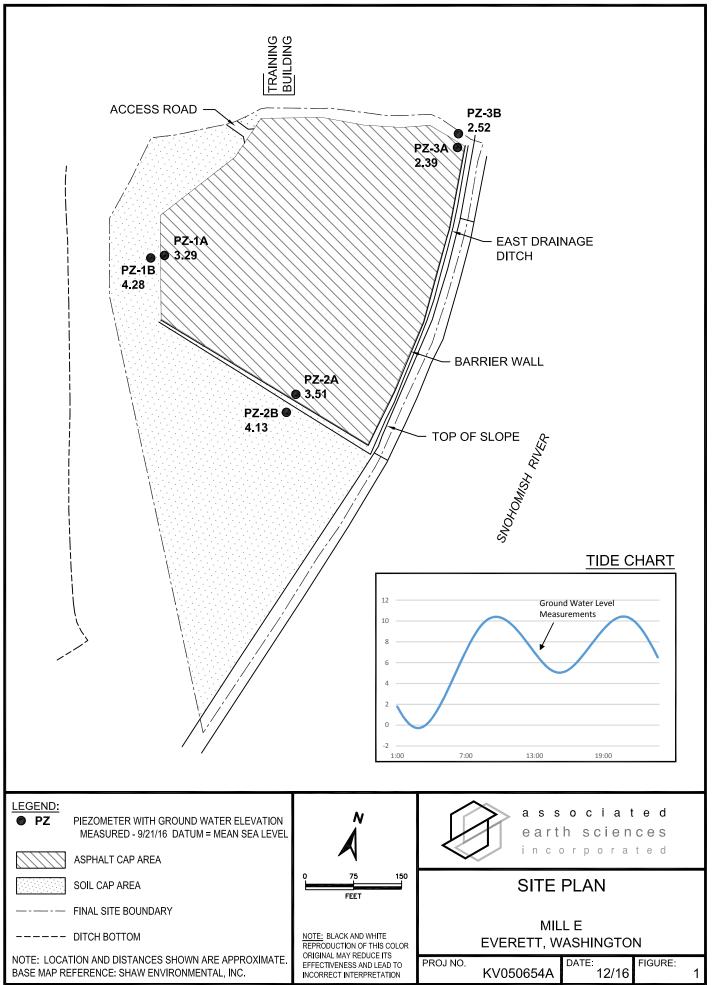
depressions in the cover were observed in some places. Photos taken at the time of our visit are included in the attached field report.

The areas to the south of the asphalt cap are covered with a 1-foot-thick soil cover with grass and some scattered brush. The soil cap appeared intact and was performing as intended, in our opinion.

We trust the information presented meets your current needs. Please do not hesitate to contact us if you have any questions or require additional information.

Attachments:Figure 1:Site PlanFigure 2A:Ground Water Elevations Wells PZ-1A and PZ-1BFigure 2B:Ground Water Elevations Wells PZ-2A and PZ-2BFigure 2C:Ground Water Elevations Wells PZ-3A and PZ-3BFigure 3:TPH Concentrations in Well PZ-3AFigure 4A:PCP Concentrations in Well PZ-3AFigure 4B:PCP Concentrations in Well PZ-3AFigure 5:Arsenic Concentrations in Well PZ-3ALaboratory Test Certificates and Chain of CustodyField Report of Cap Inspection

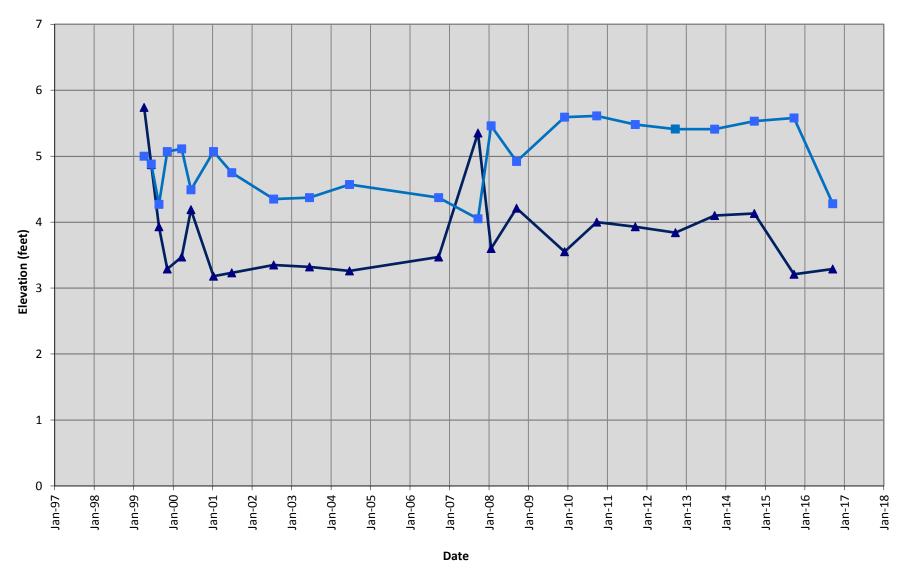
OKP/ld KV050654A19 Projects\20050654\KV\WP



05654 Mill E \ 05654 site 12-16.dwg LAYOUT: F1 Site

Figure 2A Ground Water Elevations: Wells PZ-1A and PZ-1B

"A" Wells inside containment "B" Wells outside containment

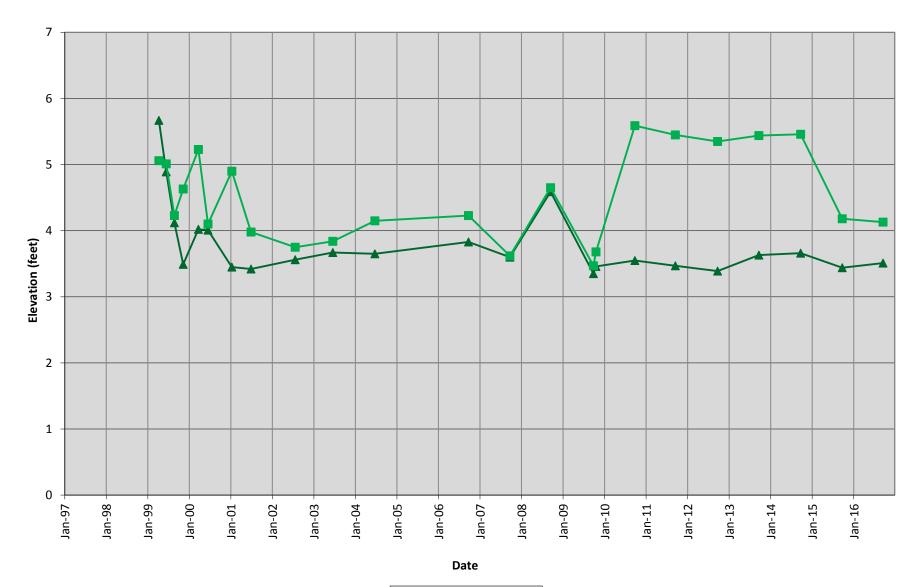


→ PZ-1A → PZ-1B



Figure 2B Ground Water Elevations: Wells PZ-2A and PZ-2B

"A" Wells inside containment "B" Wells outside containment

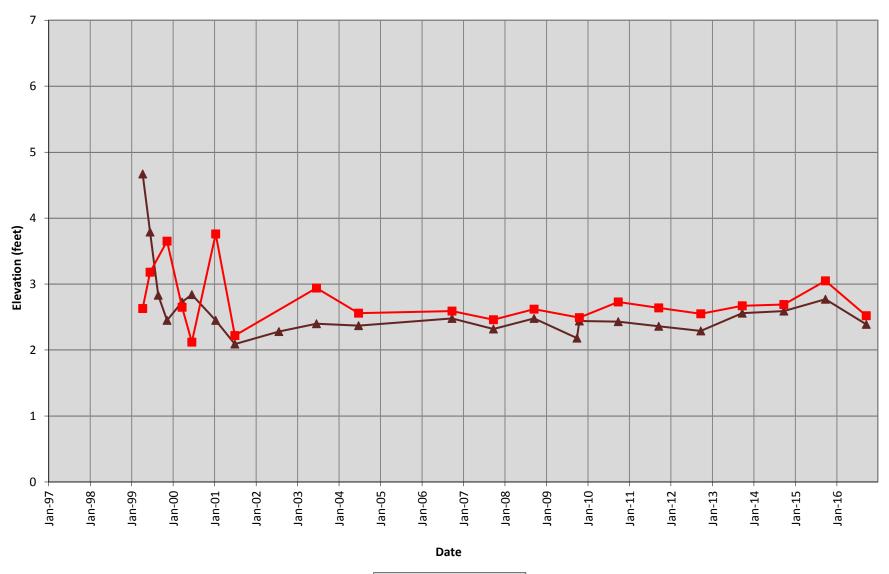


PZ-2A PZ-2B



## Figure 2C Ground Water Elevations: Wells PZ-3A and PZ-3B

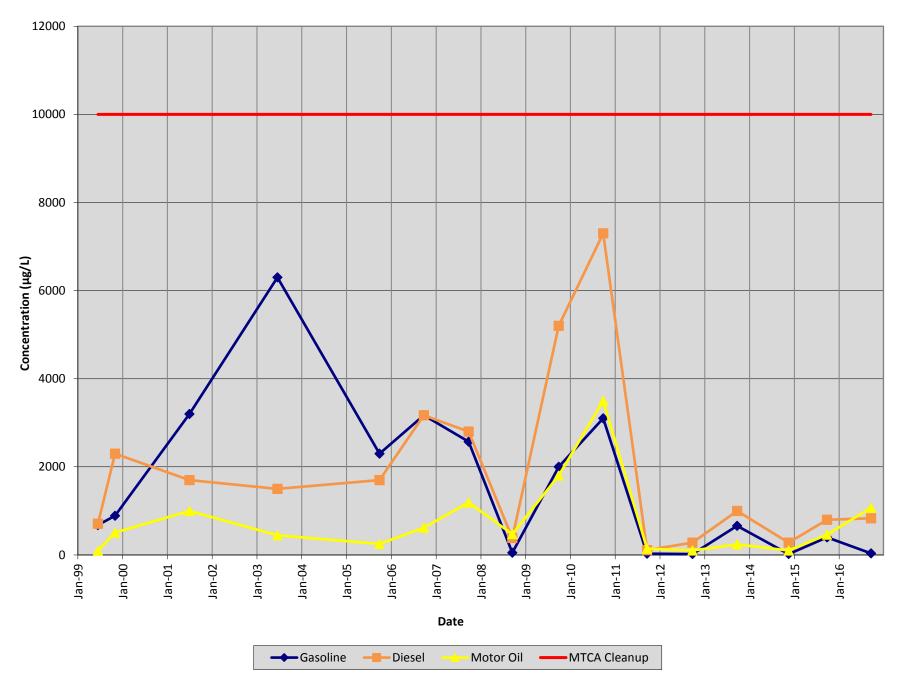
"A" Wells inside containment "B" Wells outside containment



PZ-3A PZ-3B



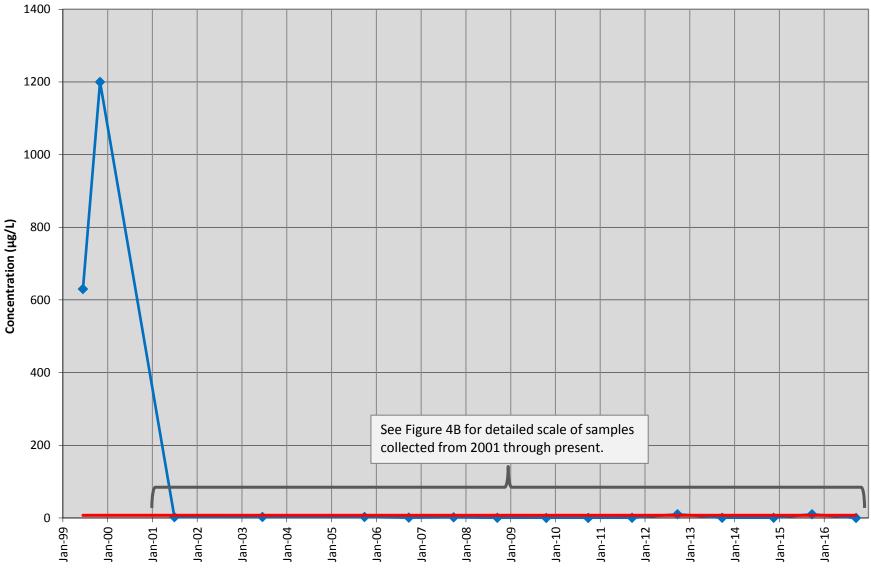
## Figure 3: Well PZ-3A TPH Concentrations





## Figure 4A: Well PZ-3A PCP Concentrations

Non-detectable concentrations plotted as 1/2 of the reporting limit.



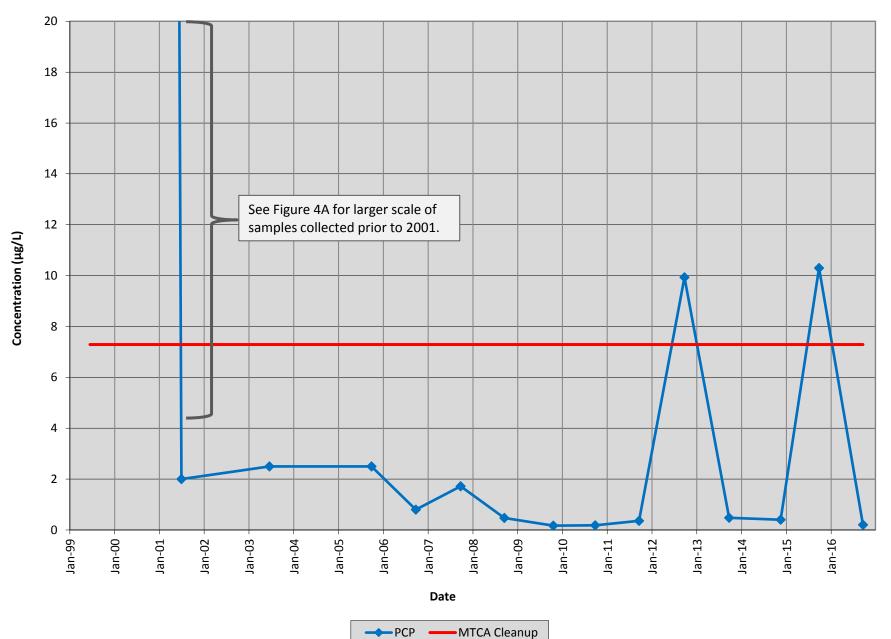
Date

-----PCP ------MTCA Cleanup



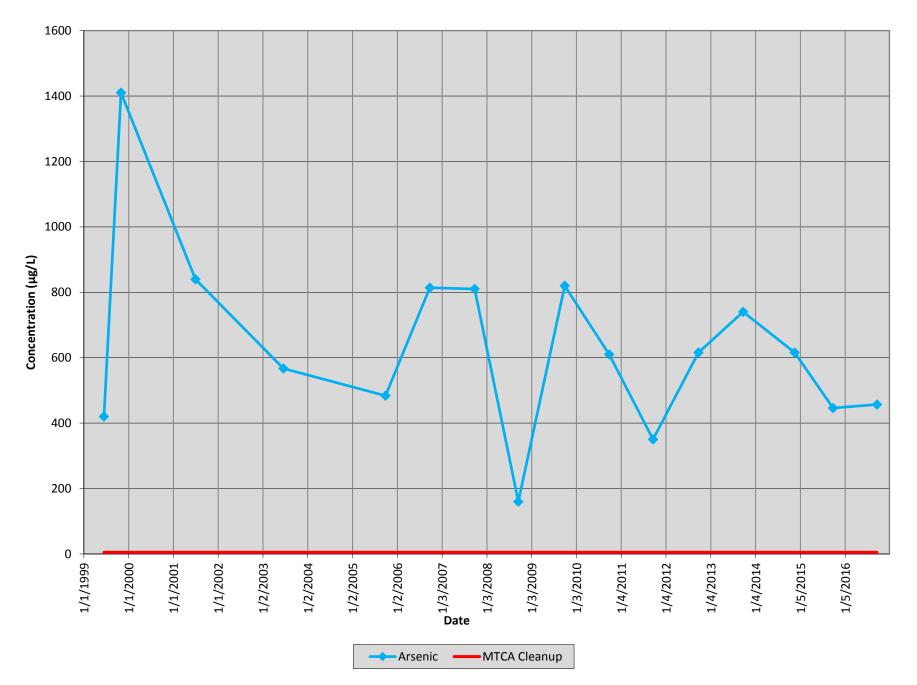
## Figure 4B: Well PZ-3A PCP Concentrations

Non-detectable concentrations plotted as 1/2 of the reporting limit.



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## Figure 5: Well PZ-3A Arsenic Concentrations







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## **VOLATILE ORGANIC CHEMICAL REPORT**

#### Results of Analysis by EPA Method 8260 Measurement of Purgeable Organic Compounds by Capillary Column Gas Chromatography/Mass Spectrometry

	Case File Number:	ASE00165/	A1			Matrix:	Water	
	Sample ID No.:	PZ-03A				Sample Wt/Vol. (gm/ml)	25.0	
	Date Collected:	09/21/16				Dilution Factor:	1	
	Date Received:	09/23/16						
	Date Analyzed	09/30/16				Analyst:	тм	
	Date of Report:	10/04/16				Supervisor's Initials:	DG	
	Data File Path:	C:\HPCHE	M\1\DATA	AVO	A\160930	\ 1201012.D		
CAS#	Name of Compound	Amount (mg/L)	Flag		CAS#	Name of Compound	Amount (ppb)	Flag
	TPH-G	0.038						

		QC limits		
Surrogate Recoveries	%Rec.	Water	Soil	
Dibromofluoromethane	105%	66-118%	66-118%	
Toluene-d8	99%	51-143%	51-143%	
4-Bromofluorobenzene	72%	63 - 119	63 - 119%	

FLAGS:	
U	Indicates compound was analyzed for, but not detected at the specified detection limit.
В	Blank contaminated with this analyte.
J	Estimated value - compound positively identified, but below specified detection limit.
Е	Estimated value - compound exceeded calibration range.
D	Compound analyzed at a secondary dilution factor of from data file:
PP	Compound Purges Poorly, requiring elevated detection limit.
NOTE:	ppb Amounts are in µg/L or µg/KG dry weight.



## SEMI-VOLATILE ORGANIC CHEMICAL REPORT

Results of Analysis by EPA Method 8270 Measurement of Extractable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry

	Case File Number:	9/27/16-MB			Matrix:	Water
	Sample ID No.:	Method Blar	nk		Sample Vol. (ml)	1000
	Date Collected:	n/a			Final Volume (ml)	1.0
	Date Received:	n/a			Dilution Factor:	1
	Date Extracted:	09/27/16				
	Date Analyzed	09/29/16			Analyst:	T. Meadows
	Date of Report:	11/08/16			Supervisor's Initials:	
	Data File Path:	D:\5975 Data	a\8270\2	016\092716\	009.D	
CAS#	Name of Compound	Amount (ppb)	Flag			

FLAGS:

87-86-5

U Indicates compound was analyzed for, but not detected at the specified detection limit.

U

B Blank contaminated with this analyte.

Pentachlorophenol

- J Estimated value compound positively identified, but below specified detection limit.
- E Estimated value compound exceeded calibration range.
- D Compound analyzed at a secondary dilution factor of \_\_\_\_\_\_ from data file: \_\_\_\_

0.40

PP Compound Purges Poorly, requiring elevated detection limit.

#### NOTE: ppm Amounts are in mg/L or mg/KG dry weight.

		QC limits	
Surrogate Recoveries	%Rec.	Water	Soil
2,4,6-Tribromophenol	90%	0-183%	65-135%



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## SEMI-VOLATILE ORGANIC CHEMICAL REPORT

Results of Analysis by EPA Method 8270 Measurement of Extractable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry

	Case File Number:	ASE00165A1	1		Matrix:	Water
	Sample ID No.:	PZ-03A			Sample Vol. (ml)	1070
	Date Collected:	09/21/16			Final Volume (ml)	1.0
	Date Received:	09/21/16			Dilution Factor:	1
	Date Extracted:	09/27/16				
	Date Analyzed	09/29/16			Analyst:	T. Meadows
	Date of Report:	11/08/16			Supervisor's Initials:	
	Data File Path:	D:\5975 Data	a\8270\2	016\092716\	011.D	
CAS#	Name of Compound	Amount (ppb)	Flag			

FLAGS:

87-86-5

U Indicates compound was analyzed for, but not detected at the specified detection limit.

U

B Blank contaminated with this analyte.

Pentachlorophenol

J Estimated value - compound positively identified, but below specified detection limit.

- E Estimated value compound exceeded calibration range.
- D Compound analyzed at a secondary dilution factor of \_\_\_\_\_\_ from data file: \_\_\_

0.4

PP Compound Purges Poorly, requiring elevated detection limit.

#### NOTE: ppm Amounts are in mg/L or mg/KG dry weight.

		QC limits	
Surrogate Recoveries	%Rec.	Water	Soil
2,4,6-Tribromophenol	105%	0-183%	65-135%



## SEMI-VOLATILE ORGANIC CHEMICAL REPORT

Results of Analysis by EPA Method 8270 Measurement of Extractable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry

	Case File Number:	ASE00165A1	MS		Matrix:	Water
	Sample ID No.:	PZ-03A			Sample Vol. (ml)	500
	Date Collected:	09/21/16			Final Volume (ml)	1.0
	Date Received:	09/21/16			Dilution Factor:	1
	Date Extracted:	09/27/16				
	Date Analyzed	09/29/16			Analyst:	T. Meadows
	Date of Report:	11/08/16			Supervisor's Initials:	
	Data File Path:	D:\5975 Data	\8270\2	016\092716\	012.D	
CAS#	Name of Compound	Recovery (%)	Flag			

FLAGS:

87-86-5

- U Indicates compound was analyzed for, but not detected at the specified detection limit.
- B Blank contaminated with this analyte.

Pentachlorophenol

- J Estimated value compound positively identified, but below specified detection limit.
- E Estimated value compound exceeded calibration range.
- D Compound analyzed at a secondary dilution factor of \_\_\_\_\_\_ from data file: \_

99%

- PP Compound Purges Poorly, requiring elevated detection limit.
- NOTE: ppm Amounts are in mg/L or mg/KG dry weight.

		C	QC limits
Surrogate Recoveries	%Rec.	Water	Soil
2,4,6-Tribromophenol	103%	0-183%	65-135%



## SEMI-VOLATILE ORGANIC CHEMICAL REPORT

Results of Analysis by EPA Method 8270 Measurement of Extractable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry

	Case File Number:	ASE00165A1	MSD		Matrix:	Water
	Sample ID No.:	PZ-03A			Sample Vol. (ml)	500
	Date Collected:	09/21/16			Final Volume (ml)	1.0
	Date Received:	09/21/16			Dilution Factor:	1
	Date Extracted:	09/27/16				
	Date Analyzed	09/29/16			Analyst:	T. Meadows
	Date of Report:	11/08/16			Supervisor's Initials:	
	Data File Path:	D:\5975 Data\8270\2016\092716\		013.D		
CAS#	Name of Compound	Recovery (%)	Flag			

FLAGS:

87-86-5

- U Indicates compound was analyzed for, but not detected at the specified detection limit.
- B Blank contaminated with this analyte.

Pentachlorophenol

- J Estimated value compound positively identified, but below specified detection limit.
- E Estimated value compound exceeded calibration range.
- D Compound analyzed at a secondary dilution factor of \_\_\_\_\_\_ from data file: \_\_

91%

- PP Compound Purges Poorly, requiring elevated detection limit.
- NOTE: ppm Amounts are in mg/L or mg/KG dry weight.

		C	QC limits
Surrogate Recoveries	%Rec.	Water	Soil
2,4,6-Tribromophenol	112%	0-183%	65-135%



## IEH ANALYTICAL LABORATORIES

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	ASE001-65	PAG	E 1					
<b>REPORT DATE:</b>	11/08/16							
DATE SAMPLED:	09/21/16	DATE RECEIVED:	09/21/16					
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER								
SAMPLES FROM ASSOCIATED EARTH SCIENCES, INC								

#### CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

#### **SAMPLE DATA**

_	NWTI		
	DIESEL	MOTOR OIL	TOTAL ARSENIC
SAMPLE ID	(mg/L)	(mg/L)	(ug/L)
PZ-03A	0.83	1.07	457



## **IEH ANALYTICAL LABORATORIES**

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	ASE001-65	PAG	E 2
<b>REPORT DATE:</b>	11/08/16		
DATE SAMPLED:	09/21/16	DATE RECEIVED:	09/21/16
FINAL REPORT, LABORA	TORY ANALYSIS OF	SELECTED PARAMETERS ON V	WATER
SAMPLES FROM ASSOCIA	ATED EARTH SCIENC	CES, INC	

## **QA/QC DATA**

QC PARAMETER	DIESEL	MOTOR OIL	TOTAL ARSENIC
	(mg/L)	(mg/L)	(ug/L)
METHOD	NWTPH-DX	NWTPH-DX	EPA 6020
DATE ANALYZED	09/30/16	09/30/16	09/30/16
DETECTION LIMIT	0.05	0.10	2.0
DUPLICATE			
			DATICI
SAMPLE ID	PZ-03A	PZ-03A	BATCH
ORIGINAL	0.83	1.07	<2.0
DUPLICATE	0.74	0.90	<2.0
RPD	11.46%	17.26%	NC
SPIKE SAMPLE			
SAMPLE ID			BATCH
ORIGINAL			<2.0
SPIKED SAMPLE			49.9
SPIKE ADDED			50.0
% RECOVERY	NA	NA	99.80%
QC CHECK			
FOUND	0.25	0.48	53.2
TRUE	0.25	0.50	50.0
% RECOVERY	100.00%	96.00%	106.40%
		1	
PREP BLANK	< 0.05	< 0.10	<2.0

RPD = RELATIVE PERCENT DIFFERENCE.

NA = NOT APPLICABLE OR NOT AVAILABLE.

NC = NOT ALLEABLE OWN AVAILABLE. NC = NOT ALLEABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

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Damien Gadomski **Project Manager** 

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## IEH Analytical Laboratories

## Chain of Custody Form

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# **FIELD REPORT**

							Page 1 of 1	
	911 Fifth Avenue	Date	F	Project Nam	ne		Project No.	
	Kirkland, Washington 98033	9/21/16	6 Mill E Site			KV050654		
	Phone: 425-827-7701	Location		Municipality			Weather	
	Fax: 425-827-5424						60s, overcast	
		Riversid	Riverside Business Park Permit No. DPD		Everett		rain	
	www.aesgeo.com	Permit N			DPD No.		Report No.	
							8	
		Engineer	/Archi	itect				
то:	Pacific Topsoil Inc.	AESI	AESI Client/Owner					
	805 80 <sup>th</sup> Street SW	Client/O						
	Everett, WA 98203							
ATTN:	Mr. Januz Bajsarowicz	Excavato	r					

#### Performance and Compliance Monitoring Plan Update

As part of the Mill E Performance and Compliance Monitoring Plan, Associated Earth Sciences, Inc. (AESI) arrived on site to observe the existing asphalt section and fill soil covering previously identified contaminated soils on site.

Matthew A. Miller, PE a professional engineer with our firm was on site and performed site observations. The property is currently vacant. During our site visit, the asphalt cap was observed to be in a serviceable condition with no obvious signs of cracking, fissures, or pumping. There are areas where shallow depressions were noted that result in bird baths on the asphalt. These are mainly in the areas noted previously. See Photos below looking towards the northeast to east at the entrance:

The soil cap to the south of the asphalt cap appeared intact and in our opinion is performing as intended.

AESI should be contacted if indications of pavement distress are observed before our next scheduled site visit.



Copies To:		Field Rep:	
Date Mailed:	I	Principal / PM:	Matthew A. Miller, P.E.
v. 6/14	This document is considered a	DRAFT until signed	or initialed by an AESI Principal or Project Manager