

154 Colonnade Road South
Ottawa, Ontario
Canada, K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344

October 1, 2019
File: PE4276-LET.01R

Arnon Corporation Inc.
1801 Woodward Drive
Ottawa, Ontario
K2C 0R3

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Archaeological Studies

Attention: **Mr. David Young**

www.patersongroup.ca

Subject: **Phase II- Environmental Site Assessment Update**
367, 369 and 371 Preston Street
and 450 Rochester Street
Ottawa, Ontario

Dear Mr. Young,

Further to your request, Paterson Group (Paterson) carried out a Phase II - Environmental Site Assessment (ESA) Update for the aforementioned property. This report updates a previous Phase II-ESA report entitled, "Phase I-II Environmental Site Assessment – 450 Rochester Street, Ottawa, Ontario," completed by Paterson, dated August 1, 2006.

Introduction

Current and Proposed Future Uses

The Phase II Property is currently used for residential purposes at 367 and 369 Preston Street and commercial purposes at 371 Preston Street (restaurant) and 450 Rochester Street (vehicular parking).

It is our understanding that the proposed site development for the Phase II Property includes a commercial/retail building situated on the southwest corner of the subject land; a residential building fronting Aberdeen Street with commercial storefront on Beech Street; and a mixed-use (residential high-rise and commercial ground level) building situated on the east end of the subject land (450 Rochester Street) fronting Rochester Street.

Applicable Site Condition Standards

The site condition standards for the property were obtained from Table 3 of the document entitled “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act”, prepared by the Ministry of the Environment, Conservation and Parks (MECP), April 2011.

The selected MECP Table 3 Standards are based on the following considerations:

- ☐ Coarse-grained soil conditions
- ☐ Full depth generic site conditions
- ☐ Non-potable groundwater conditions
- ☐ Residential land use

Residential standards were selected based on the future land use of the Phase II Property. Coarse grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

Background Information

Physical Setting

The original Phase I-II ESA was completed for 450 Rochester Street, Ottawa, Ontario. The Phase II ESA Update applies to a larger Phase II Property that also includes 367, 369 and 371 Preston Street, Ottawa, Ontario.

The subject land is bounded on the west and east by Preston Street and Rochester Street and bounded by the north and south by Aberdeen Street and Beech Street. The site is an irregular shaped lot with an approximate footprint of 0.92 hectares. The western portion of the property is situated in a Traditional Mainstreet, mixed-use zone, while the remaining portion is zoned for fifth density residential. The Phase II Property is situated in an urban setting where neighbouring lands are designated for both residential and commercial purposes.

The southwestern portion of the Phase II Property is occupied by two residential dwellings and a restaurant. Ground coverage on these lots are landscaped with paved concrete structures for private parking. The remaining land is a gravelled lot used for vehicular parking.

The regional topography in the area slopes down towards the south, in the direction of Dows Lake, while the site is relatively flat and at grade with Preston Street, although,

slightly above the grade of Rochester Street. The site appears to slope down in a westerly/southwesterly direction.

Past Investigations

The report: “Phase I & II Environmental Site Assessment, 450 Rochester Street, Ottawa, Ontario” prepared by Paterson Group (Paterson), dated August 2006 was reviewed. Based on the report, several historical environmental concerns were identified on the subject site, such as a transportation company (transport shed and garage) and a retail fuel outlet. A Phase II ESA was conducted to address the potential concerns. Seven (7) boreholes (BH1 through BH7) were drilled and three (3) were completed as monitoring wells. Soil and groundwater samples were submitted for BTEX, PHCs, PAHs, metals and/or VOCs analysis. Based on the 2006 results, several PAHs, and metal concentrations in soil were in excess of the applicable standards (MOE Table 3 Commercial Standards). Chloroform and several PAH concentrations in groundwater were in excess of the standards at that time.

Since the 2006 report was completed, the MECP issued new soil and groundwater standards that are more stringent than the previous ones. A Supplemental Phase II ESA was conducted by Paterson in 2017 to conduct an assessment of the groundwater for the possible redevelopment of the site.

The Supplemental Phase II ESA consisted of two (2) deep boreholes (BH8-17 and BH9-17) with groundwater monitoring wells that were screened from 9 to 14 m depth. Beneath the asphaltic pavement structure in BH9-17, the fill and native soil deposits were observed to be contaminated with petroleum hydrocarbons, which was confirmed by a laboratory analysis. This borehole is situated in the eastern portion of the site, near the former retail fuel outlet, as presented on Drawing PE4276-4A –Test Hole Location Plan.

The second borehole (BH8-17) was situated in the western portion of the site. Beneath the crushed stone surface, there was a layer of fill that extended to bedrock at an approximate depth of 2.1 m. No visually obvious contaminants were identified, however, when tested for metals, a number of metal parameters were detected at concentrations in excess of the applicable standards.

Groundwater samples were recovered from both wells after a period of stabilization and tested for volatile organic compounds (VOCs). The sample from BH9-17 was also tested for PHCs. BH8-17 could not be analyzed for PHCs, as the well produced an insufficient amount of water to test for these parameters. With the exception of chloroform, all test parameters complied with the applicable MECP standards.

Based on the former report, several historical environmental concerns were adequately addressed, however for the purpose of this Phase I ESA and to address all on-site PCAs in accordance with the O.Reg. 153/04, as amended, the contaminated fill has been classified as Item 30 (as per Table 2 of O.Reg. 153/04, as amended) and therefore, represents an APEC on the Phase I Property.

Paterson completed a Phase I ESA in September 2019 for the Phase II Property. Based on the findings of the Phase I ESA, five (5) potentially contaminating activities (PCAs) were identified on the Phase II Property:

- ❑ PCA 1: *Item 52, "Storage. Maintenance fuelling and repairing of equipment, vehicles, and materials used to maintain transportation systems"* – this PCA was identified on the Phase I as a former drive shed (transport storage shed) operating at 10 Aberdeen Street (currently addressed 450 Rochester Street).
- ❑ PCA 2: *Item 52, "Storage. Maintenance fuelling and repairing of equipment, vehicles, and materials used to maintain transportation systems"* – this PCA was identified as a former truck repair garage operating at 550 Rochester Street (currently 450 Rochester Street).
- ❑ PCA 3: *Item 28, "Gasoline and Associated Products Storage in Fixed Tanks"* – this PCA was identified as a former retail fuel outlet on the northeastern side of 450 Rochester Street.
- ❑ PCA 4: *Item 11: "Commercial trucking and container terminals"* – this PCA was identified as a former transportation company with loading bays and storage shed operating at 552 Rochester Street (currently 450 Rochester Street).
- ❑ PCA 5: *Item 30: "Importation of fill material of unknown quality"* – this PCA was identified on the entire property of 450 Rochester Street during the previous Phase I&II ESA for 450 Rochester.

The following PCAs that were considered to represent APECs on the Phase I Property, as per Table 2, O.Reg 153/04, as amended, were identified within the Phase I Study Area:

- ❑ PCA 6: *Item 28, "Gasoline and Associated Products Storage in Fixed Tanks"* – this PCA was identified as presence of a former UST on the adjacent property to the north at 5 Aberdeen Street.
- ❑ PCA 7: *Item 52, "Storage. Maintenance fuelling and repairing of equipment, vehicles, and materials used to maintain transportation systems"* – this PCA was identified as a former automotive repair garage on the property to the north at 5 Aberdeen Street.

These two off-site PCAs are considered to result in an APEC on the Phase I Property. The remaining off-site PCAs within the Phase I Study Area were not considered to represent APECs on the Phase I Property, based on their separation distance and/or down-gradient location from the Phase I Property. The locations of PCAs within the Phase I Study Area are shown on Drawing PE4276-2 –Surrounding Land Use Plan.

A Phase II ESA was recommended to address the aforementioned PCAs that resulted in APECs on the Phase II Property.

Impediments

No physical impediments were encountered during the Phase II ESA program.

Investigation Method

Subsurface Investigation

The Phase II-ESA was carried out in conjunction with a geotechnical investigation which was conducted on August 13 and 14, 2019. The field program consisted of drilling ten (10) boreholes, three (3) of which were instrumented with groundwater monitoring wells. Boreholes were drilled to a maximum depth of 7.21 m below the ground surface (m BGS).

The boreholes were drilled using a truck mounted drill by Downing Drilling Ltd. of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4276-4A – Test Hole Location Plan, appended to this report.

Soil Sampling

A total of thirty-nine (39) soil samples were obtained from the boreholes by means of split spoon sampling and grab sampling from auger flights. Split spoon samples were taken at approximate 0.76 m intervals. The bedrock was cored to facilitate the installation of groundwater monitoring wells.

The depths from auger flights where samples and split spoon samples were obtained from the boreholes are shown as “**AU**” and “**SS**” on the Soil Profile and Test Data Sheets, appended to this report.

Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the Phase II Property as part of the subsurface investigation. The monitoring wells consisted of 35 mm diameter, Schedule 40 threaded PVC risers and screens.

Monitoring well construction details are listed below in Table 1 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix B.

Boreholes were surveyed using the top spindle of a fire hydrant located on Beech Street. An arbitrary elevation of 100 m above sea level (m ASL) was assigned to the temporary benchmark.

TABLE 1: Monitoring Well Construction Details						
Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH2	98.42	6.73	3.73-6.73	3.51-6.73	0.15-3.51	Flushmount
BH3	99.23	7.21	4.21-7.21	3.71-7.21	0.15-3.71	Flushmount
BH7	99.15	7.01	4.01-7.01	3.01-7.01	0.13-3.00	Flushmount

Field Measurement of Water Quality Parameters

Groundwater samples were collected on September 17, 2019. The water level was the only field parameter measured. No other field parameters were measured.

Analytical Testing

Soil and/or groundwater samples were submitted for polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHC, F1 through F4), volatile organic compounds (VOCs) and metals (including mercury and hexavalent chromium) analysis.

TABLE 2: Soil Samples Submitted and Analyzed Parameters (2019)				
Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed		Rationale
		PAHs	Metals ¹	
August 13, 2019				
BH1-SS2	0.76-1.40 m Fill	X	X	Assess the quality of the fill material.
BH2-SS2	0.76-1.40 m Fill	X	X	Assess the quality of the fill material.
BH3-SS3	1.53-2.13m Fill	X	X	Assess potential impact resulting from the past industrial use of 450 Rochester Street.
BH4-SS2	0.76-1.40 m Fill		X	Assess the quality of the fill material.
August 14, 2019				
BH7-SS3	1.53-2.13m Fill	X	X	Assess potential impact resulting from the past industrial use of 450 Rochester Street.
BH8-SS2	0.76-1.40 m Fill		X	Assess the quality of the fill material.

TABLE 2: Soil Samples Submitted and Analyzed Parameters (2019)				
Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed		Rationale
		PAHs	Metals ¹	
BH10-SS3	1.53-2.13m Fill		X	Assess potential impact resulting from the past industrial use of 450 Rochester Street.
Notes: <input type="checkbox"/> ¹ included hexavalent chromium (CrVI) and Mercury (Hg) parameters				

TABLE 3: Groundwater Samples Submitted and Analyzed Parameters (2019)						
Sample ID	Screened Interval	Parameters Analyzed				Rationale
		PHCs (F1-F4)	VOCs	Metals ¹	PAHs	
September 17, 2019						
BH7-19-GW1	4.01-7.01m	X	X	X	X	Assess potential impact resulting from the past industrial use of 450 Rochester Street.
Notes: <input type="checkbox"/> ¹ included hexavalent chromium (CrVI) and Mercury (Hg) parameters						

Paracel Laboratories (Paracel), of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing. Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA). Paracel is accredited and certified by SCC/CALA for specific tests registered with the association.

Review and Evaluation

Geology

Site soils generally consisted of a fill material (silty sand with crushed stones), followed by a layer of peat (BH2, BH8, BH9 and BH10), underlain by limestone bedrock.

Practical refusal to augering was encountered in BH1, BH4, BH5, BH6, BH8, BH9 and BH10 at depths ranging from 1.98 to 3.53 m BGS, while the remaining boreholes (BH2, BH3 and BH7) were cored and terminated in bedrock at depths ranging from 6.73 to 7.21 m BGS.

Groundwater was encountered within the bedrock at depths ranging from approximately 3.07 to 4.39 m BGS.

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix B.

Groundwater Elevations, Flow Direction and Hydraulic Gradient

Groundwater levels were measured during the most recent groundwater sampling event on August 22, 2019, using an electronic water level meter. Groundwater levels are summarized below in Table 4.

TABLE 4: Groundwater Level Measurements				
Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m BGS)	Water Level Elevation (m ASL)	Date of Measurement
BH2	98.42	4.39	94.04	August 22, 2019
BH3	99.23	4.23	95.00	August 22, 2019
BH7	99.15	3.07	96.08	August 22, 2019

Based on the groundwater elevations measured during the sampling event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4276-4B – Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the Phase II Property is in a southeasterly direction. A horizontal hydraulic gradient of approximately 0.021 m/m was calculated. It should be noted that groundwater levels are expected to fluctuate seasonally.

Soil Quality

Seven (7) soil samples were submitted for BTEX, PHC (fractions F1 through F4), metals (including mercury and hexavalent chromium) and PAH analysis. The analytical test results are presented below in Tables 5 and 6. The laboratory certificate of analysis is provided in Appendix B.

TABLE 5: Analytical Test Results – Soil – PAH						
Parameter	MDL (µg/g)	Soil Samples (ug/g)				MECP Table 3 Residential Standards (µg/g)
		August 13, 2019			August 14, 2019	
		BH1-SS2	BH2-SS2	BH3-SS3	BH7-SS3	
Acenaphthene	0.02	0.24	1.35	nd	nd	21
Acenaphthylene	0.02	0.21	9.75	0.04	0.02	0.15
Anthracene	0.02	0.46	8.74	0.04	0.10	0.67
Benzo[a]anthracene	0.02	1.10	18.6	0.07	0.41	0.96
Benzo[a]pyrene	0.02	0.90	16.2	0.06	0.29	0.3
Benzo[b]fluoranthene	0.02	1.53	29.4	0.09	0.48	0.96
Benzo[g,h,i]perylene	0.02	0.73	12.1	0.05	0.18	9.6
Benzo[k]fluoranthene	0.02	0.89	16.5	0.06	0.27	0.96
Chrysene	0.02	1.22	22.6	0.06	0.31	9.6
Dibenz[a,h]anthracene	0.02	0.19	3.88	nd	0.06	0.1
Fluoranthene	0.02	2.68	45.6	0.15	0.82	9.6

Fluorene	0.02	0.24	1.18	nd	nd	62
Indeno[1,2,3-cd]pyrene	0.02	0.70	12.4	0.06	0.19	0.76
1-Methylnaphthalene	0.02	0.06	nd	nd	nd	30
2-Methylnaphthalene	0.02	0.08	0.70	nd	nd	30
Methylnaphthalene (1&2)	0.02	0.14	1.08	nd	nd	60
Naphthalene	0.01	0.11	0.63	nd	nd	9.6
Phenanthrene	0.02	1.80	16.2	0.08	0.24	12
Pyrene	0.02	2.03	37.7	0.11	0.66	9.6
Notes:						
<input type="checkbox"/> MDL - Method Detection Limit <input type="checkbox"/> nd - Not Detected (i.e <MDL) <input type="checkbox"/> <u>Bold and underlined</u> – Results exceed selected MECP standard						

Several PAH parameter concentrations were detected in BH1-SS2, BH2-SS2 and BH7-SS3 in excess of the selected MECP Table 3 Residential Standards.

TABLE 6: Analytical Test Results - Soil – Metals						
Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 3 Residential Standards (µg/g)
		August 13, 2019				
		BH1- SS2	BH2- SS2	BH3- SS3	BH4- SS2	
Antimony	1.0	4.40	8.3	nd	3.5	7.5
Arsenic	1.0	38.4	55.4	4.2	6.0	18
Barium	1.0	164	319	169	228	390
Beryllium	0.5	nd	1.2	0.6	0.6	4
Boron	5.0	10	24.4	9.8	10.9	120
Cadmium	0.5	2.1	1.9	nd	nd	1.2
Chromium	5.0	27	236	49.7	30.4	160
Chromium (VI)	0.2	nd	nd	nd	nd	8
Cobalt	1.0	7.4	10.9	10.7	6.6	22
Copper	5.0	60.5	245	37.6	90.9	140
Lead	1.0	277	1070	48.5	392	120
Mercury	0.1	0.1	1.5	0.2	0.4	0.27
Molybdenum	1.0	2.8	11.2	nd	nd	6.9
Nickel	5.0	27.7	54.4	33.3	15.6	100
Selenium	1.0	23.8	1.3	nd	nd	2.4
Silver	0.3	0.4	1.0	nd	nd	20
Thallium	1.0	1.7	nd	nd	nd	1
Uranium	1.0	nd	1.8	nd	nd	23
Vanadium	10.0	33.7	49.9	55.7	28.6	86
Zinc	20.0	479	479	93.3	388	340
Notes:						
<input type="checkbox"/> MDL – Method Detection Limit						
<input type="checkbox"/> nd – not detected above the MDL						
<input type="checkbox"/> Bold and Underlined – Value exceeds selected MECP Standards						

TABLE 6 Continued: Analytical Test Results - Soil – Metals					
Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		August 14, 2019			
		BH7-SS3	BH8-SS2	BH10-SS3	
Antimony	1.0	nd	nd	7.0	7.5
Arsenic	1.0	3.2	2.9	19.2	18
Barium	1.0	287	274	332	390
Beryllium	0.5	1.0	1.0	0.7	4
Boron	5.0	10.8	11.1	8.9	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	5.0	50.7	46.8	20.4	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	15.1	13.4	8.5	22
Copper	5.0	27.8	25.0	126	140
Lead	1.0	13.4	13.0	551	120
Mercury	0.1	nd	nd	0.3	0.27
Molybdenum	1.0	nd	nd	2.9	6.9
Nickel	5.0	31.9	29.4	39.0	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.3	nd	nd	0.3	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	10.0	65.7	61.0	26.4	86
Zinc	20.0	77.6	70.4	322	340
Notes:					
<input type="checkbox"/> MDL – Method Detection Limit					
<input type="checkbox"/> nd – not detected above the MDL					
<input type="checkbox"/> Bold and Underlined – Value exceeds selected MECP Standards					

Several metal parameter concentrations were detected in BH1-SS2, BH2-SS2, BH4-SS2 and BH10-SS3 in excess of the selected MECP Table 3 Residential Standards.

The analytical results for metals and PAHs tested in soil are shown on Drawing PE4276-5B and 5C, which have been appended to this report. The maximum concentrations of analyzed parameters in the soil on-site are summarized in Table 7.

TABLE 7: Maximum Concentrations – Soil – 2019			
Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Acenaphthene	1.35	BH2-SS2	0.76-1.40m, Fill
Acenaphthylene	9.75	BH2-SS2	0.76-1.40m, Fill
Anthracene	8.74	BH2-SS2	0.76-1.40m, Fill
Benzo[a]anthracene	18.6	BH2-SS2	0.76-1.40m, Fill
Benzo[a]pyrene	16.2	BH2-SS2	0.76-1.40m, Fill
Benzo[b]fluoranthene	29.4	BH2-SS2	0.76-1.40m, Fill
Benzo[g,h,i]perylene	12.1	BH2-SS2	0.76-1.40m, Fill
Benzo[k]fluoranthene	16.5	BH2-SS2	0.76-1.40m, Fill
Chrysene	22.6	BH2-SS2	0.76-1.40m, Fill
Dibenzo[a,h]anthracene	3.88	BH2-SS2	0.76-1.40m, Fill
Fluoranthene	45.6	BH2-SS2	0.76-1.40m, Fill
Fluorene	1.18	BH2-SS2	0.76-1.40m, Fill
Indeno[1,2,3-cd]pyrene	12.4	BH2-SS2	0.76-1.40m, Fill
1-Methylnaphthalene	0.06	BH1-SS2	0.76-1.40m, Fill
2-Methylnaphthalene	0.70	BH2-SS2	0.76-1.40m, Fill

TABLE 7: Maximum Concentrations – Soil – 2019			
Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Methylnaphthalene (1&2)	<u>1.08</u>	BH2-SS2	0.76-1.40m, Fill
Naphthalene	<u>0.63</u>	BH2-SS2	0.76-1.40m, Fill
Phenathrene	<u>16.2</u>	BH2-SS2	0.76-1.40m, Fill
Pyrene	37.7	BH2-SS2	0.76-1.40m, Fill
Antimony	<u>8.3</u>	BH2-SS2	0.76-1.40m, Fill
Arsenic	<u>55.4</u>	BH2-SS2	0.76-1.40m, Fill
Barium	319	BH2-SS2	0.76-1.40m, Fill
Beryllium	1.2	BH2-SS2	0.76-1.40m, Fill
Boron	24.4	BH2-SS2	0.76-1.40m, Fill
Cadmium	<u>1.9</u>	BH2-SS2	0.76-1.40m, Fill
Chromium	<u>236</u>	BH2-SS2	0.76-1.40m, Fill
Cobalt	10.9	BH2-SS2	0.76-1.40m, Fill
Copper	<u>245</u>	BH2-SS2	0.76-1.40m, Fill
Lead	<u>1070</u>	BH2-SS2	0.76-1.40m, Fill
Mercury	<u>1.5</u>	BH2-SS2	0.76-1.40m, Fill
Molybdenum	<u>11.2</u>	BH2-SS2	0.76-1.40m, Fill
Nickel	54.4	BH2-SS2	0.76-1.40m, Fill
Selenium	<u>23.8</u>	BH1-SS2	0.76-1.40m, Fill
Silver	1.0	BH2-SS2	0.76-1.40m, Fill
Thallium	<u>1.7</u>	BH1-SS2	0.76-1.40m, Fill
Uranium	1.8	BH2-SS2	0.76-1.40m, Fill
Vanadium	55.7	BH3-SS2	1.53-2.13m, Fill
Zinc	<u>479</u>	BH1-SS2, BH2-SS2	0.76-1.40m, Fill
Notes:			
<input type="checkbox"/> <u>Bold and Underlined</u> – Value exceeds the selected MECP Table 3 Standards			

Several PAH and metal parameter concentrations exceed the MECP Table 3 Residential Standards. All other parameters were non-detect and comply with selected standards.

Groundwater Quality

One groundwater sample was collected and submitted on September 17, 2019 for PHCs, PAHs, VOCs, and Metals (including CrVI and Hg) analysis. The analytical test results are presented below in Tables 8, 9, 10 and 11. The laboratory certificate of analysis is provided in Appendix B.

TABLE 8: Analytical Test Results – Groundwater – PHC (F1-F4)			
Parameter	MDL (µg/L)	Groundwater Sample (µg/L)	MECP Table 3 Standards (µg/L)
		September 17, 2019	
		BH7-19-GW1	
PHCs F1	25	nd	750
PHCs F2	100	nd	150
PHCs F3	100	nd	500
PHCs F4	100	nd	500
Notes:			
<input type="checkbox"/> MDL – Method Detection Limit			
<input type="checkbox"/> nd – Not detected above the MDL			

No detectable PHC concentrations were identified in the groundwater sample analyzed. All parameter concentrations are in compliance with the MECP Table 3 Standards.

TABLE 9: Analytical Test Results – Groundwater – PAHs			
Parameter	MDL (µg/L)	Groundwater Sample (ug/L)	MECP Table 3 Standards (µg/L)
		September 17, 2019	
		BH7-19-GW1	
Acenaphthene	0.05	nd	600
Acenaphthylene	0.05	nd	1.8
Anthracene	0.01	nd	2.4
Benzo[a]anthracene	0.01	nd	4.7
Benzo[a]pyrene	0.01	nd	0.81
Benzo[b]fluoranthene	0.05	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	0.2
Benzo[k]fluoranthene	0.05	nd	0.4
Chrysene	0.05	nd	1.0
Dibenz[a,h]anthracene	0.05	nd	0.52
Fluoranthene	0.01	nd	130
Fluorene	0.05	nd	400
Indeno[1,2,3-cd]pyrene	0.05	nd	0.2
1-Methylnaphthalene	0.05	nd	1800
2-Methylnaphthalene	0.05	nd	1800
Methylnaphthalene (1&2)	0.10	nd	3600
Naphthalene	0.05	nd	1400
Phenanthrene	0.05	nd	580
Pyrene	0.01	nd	68
Notes: <input type="checkbox"/> MDL - Method Detection Limit <input type="checkbox"/> nd - Not Detected (i.e <MDL)			

No detectable PAH concentrations were identified in the groundwater sample analyzed. All parameter concentrations are in compliance with the MECP Table 3 Standards.

TABLE 10: Analytical Test Results – Groundwater – VOCs			
Parameter	MDL (µg/L)	Groundwater Samples(µg/L)	MECP Table 3 Standards (µg/L)
		September 17, 2019	
		BH7-19-GW1	
Acetone	5	850	130,000
Benzene	0.5	nd	44
Bromodichloromethane	0.5	nd	85,000
Bromoform	0.5	nd	380
Bromomethane	0.5	nd	5.6
Carbon Tetrachloride	0.2	nd	0.79
Chlorobenzene	0.5	nd	630
Chloroform	0.5	nd	2.4
Dibromochloromethane	0.5	nd	82,000
Dichlorodifluoromethane	1	nd	4,400
1,2-Dichlorobenzene	0.5	nd	4,600
1,3-Dichlorobenzene	0.5	nd	9,600
1,4-Dichlorobenzene	0.5	nd	8
1,1-Dichloroethane	0.5	nd	320

TABLE 10: Analytical Test Results – Groundwater – VOCs			
Parameter	MDL (µg/L)	Groundwater Samples(µg/L)	MECP Table 3 Standards (µg/L)
		September 17, 2019	
		BH7-19-GW1	
1,2-Dichloroethane	0.5	nd	1.6
1,1-Dichloroethylene	0.5	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	1.6
1,2-Dichloropropane	0.5	nd	16
1,3-Dichloropropene, total	0.5	nd	5.2
Ethylbenzene	0.5	nd	2,300
Ethylene dibromide	0.2	nd	0.25
Hexane	1	nd	51
Methyl Ethyl Ketone	5	nd	470,000
Methyl Isobutyl Ketone	5	nd	140,000
Methyl tert-butyl ether	2	nd	190
Methylene Chloride	5	nd	610
Styrene	0.5	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	3.2
Tetrachloroethylene	0.5	nd	1.6
Toluene	0.5	nd	18,000
1,1,1-Trichloroethane	0.5	nd	640
1,1,2-Trichloroethane	0.5	nd	4.7
Trichloroethylene	0.5	nd	1.6
Trichlorofluoromethane	1	nd	2,500
Vinyl Chloride	0.5	nd	0.5
Xylenes, total	0.5	nd	4,200
Notes: <input type="checkbox"/> MDL – Method Detection Limit <input type="checkbox"/> nd – not detected above the MDL			

With the exception of acetone, all other VOC concentrations were non-detect in the groundwater sample analyzed. All parameter concentrations are in compliance with the MECP Table 3 Standards.

TABLE 11: Analytical Test Results – Groundwater – Metals			
Parameter	MDL (µg/L)	Groundwater Sample (µg/L)	MECP Table 3 Standards (µg/L)
		September 17, 2019	
		BH7-19-GW1	
Antimony	0.5	nd	20,000
Arsenic	1	nd	1,900
Barium	1	366	29,000
Beryllium	0.5	nd	67
Boron	10	189	45,000
Cadmium	0.1	nd	2.7
Chromium	1	nd	810
Chromium (VI)	10	nd	140
Cobalt	0.5	2.5	66
Copper	0.5	0.8	87
Lead	0.1	nd	25
Mercury	0.1	nd	0.29
Molybdenum	0.5	11.4	9,200

Nickel	1	10.1	490
Selenium	1	6.3	63
Silver	0.1	nd	1.5
Sodium	200	1,420,000	2,300,000
Thallium	0.1	nd	510
Uranium	0.1	7.7	420
Vanadium	0.5	nd	250
Zinc	5	nd	1,100
Notes: <input type="checkbox"/> MDL – Method Detection Limit <input type="checkbox"/> nd – not detected above the MDL			

Detected metal parameters were identified in the groundwater sample analyzed; however, all test results are in compliance with the MECP Table 3 Standards. The analytical results for PHCs, PAHs, VOCs and metals tested in groundwater are shown on Drawing PE4276-6A through PE4276-6C, which have been appended to this report.

The maximum concentrations of analyzed parameters in the groundwater sample obtained from on-site are summarized in Table 12.

TABLE 12: Maximum Concentrations – Groundwater – 2019			
Parameter	Maximum Concentration (µg/L)	Borehole	Screened Interval (m BGS)
Acetone	850	BH7-19	3.01-7.01
Barium	366	BH7-19	3.01-7.01
Boron	189	BH7-19	3.01-7.01
Cobalt	2.5	BH7-19	3.01-7.01
Copper	0.8	BH7-19	3.01-7.01
Molybdenum	11.4	BH7-19	3.01-7.01
Nickel	6.3	BH7-19	3.01-7.01
Sodium	1,420,000	BH7-19	3.01-7.01
Uranium	7.7	BH7-19	3.01-7.01
Notes: <input type="checkbox"/> <u>Value exceeds the selected MECP Table 3 Standards</u>			

All maximum concentrations identified in the groundwater sample comply with selected MECP Table 3 Standards. All other parameters were non-detect and comply with selected standards.

Quality Assurance and Quality Control Results

All samples submitted as part of the August 13 and August 14, 2019 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

As per the O.Reg 153/04, as amended, a duplicate soil sample, DUP was obtained at BH3-SS3 on August 13, 2019 and analyzed for metals. A duplicate sample was obtained from BH7-19 on September 17, 2019 and analyzed for VOCs.

The relative percent different (RPD) for the original and the duplicate sample for concentrations detected above the laboratory limit is present in Tables 12 and 14.

TABLE 13: QA/QC Results – Soil – Metals			
Parameters	BH3-SS3	DUP	RPD (%)
Arsenic	4.2	3.2	6.76
Barium	169	102	12.36
Beryllium	0.6	0.5	4.55
Boron	9.8	7.2	7.65
Chromium	49.7	33.5	9.74
Cobalt	10.7	7.6	8.47
Copper	37.6	20.7	14.49
Lead	48.5	25.6	15.45
Nickel	33.3	24.1	8.01
Vanadium	55.7	51.1	2.15
Zinc	93.3	61.0	10.47

TABLE 14: QA/QC Results – Groundwater – VOCs			
Parameters	BH7-19-GW1	DUP	RPD (%)
Acetone	850	751	3.09

Overall, the quality of the field data collected during this Phase II -ESA is considered to be sufficient to meet the overall objectives of this assessment.

Phase II Conceptual Site Model

Contaminants of Potential Concern

The following Contaminants of Potential Concern (CPC) were identified with respect to the Phase II Property:

- ☐ Volatile Organic Compounds (VOCs, includes BTEX);
- ☐ Petroleum Hydrocarbons (PHCs, fraction 1-4);
- ☐ Polycyclic Aromatic Hydrocarbons (PAH); and
- ☐ Metals including mercury (Hg) and hexavalent chromium (CrVI)

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Based on the results of the Phase I ESA, five (5) on-site and two (2) off-site PCAs were identified, resulting in areas of potential environmental concern (APECs) to the Phase II

Property. APECs on the Phase II Property have been presented and summarized in Table 13.

TABLE 13: Areas of Potential Environmental Concern					
Area of Potential Environmental Concern (APEC)	Location of APEC on Phase II Property	Potentially Contaminating Activity (PCA)	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Soil and/or Groundwater)
<u>APEC 1:</u> Former drive shed (transportation storage)	Central portion of the Phase I Property	Item 52: Storage Maintenance fuelling and repairing of equipment, vehicles, and materials used to maintain transportation systems	On-site	VOCs PHC (F ₁ -F ₄), PAHs	Soil and/or Groundwater
<u>APEC 2:</u> Former transportation truck repair garage	Northeastern corner of the Phase I Property	Item 52: Storage Maintenance fuelling and repairing of equipment, vehicles, and materials used to maintain transportation systems	On-site	BTEX PHC (F ₁ -F ₄) Metals	Soil and/or Groundwater
<u>APEC 3:</u> Former retail fuel outlet	Eastern portion of the Phase I Property	Item 28: Gasoline and associated product storage in fixed tanks	On-site	BTEX, PHC (F ₁ -F ₄)	Soil and Groundwater
<u>APEC 4:</u> Former transportation company with loading bays and storage shed	Southeastern portion of the Phase I Property	Item 11: Commercial tucking and container terminals	On-site	VOCs PHC (F ₁ -F ₄), PAHs	Soil and/or Groundwater
<u>APEC 5:</u> Fill material of unknown quality	Entire portion of the 450 Rochester Street property	Item 30: Importation of fill material of unknown quality	On-site	PHC (F ₁ -F ₄), PAHs	Soil and Groundwater
<u>APEC 6:</u> Former transportation truck repair garage	Northeastern corner of the Phase I Property	Item 28: Gasoline and associated product storage in fixed tanks Item 52: Storage Maintenance fuelling and repairing of equipment, vehicles, and materials used to maintain transportation systems	On-site	BTEX PHC (F ₁ -F ₄) VOCs, PAHs Metals	Soil and/or Groundwater

The rationale for identifying the above PCAs is based on the historical research and field observations.

Subsurface Structures and Utilities

Utilities on the Phase II Property were located prior to the field component of the Phase II ESA Update. Utilities below the Phase II Property include municipal water and sewers that run perpendicular to Preston Street.

Based on standard practice for subsurface utility installation, service trenches are expected to be present approximately 1 to 2m below grade. Based on the depth of the water table in combination with the findings of the Phase II ESA, subsurface utilities on the Phase II Property would not have impacted contaminant distribution. Approximate locations of the subsurface utilities are shown on Drawings PE4276-2 – Site Plan.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE4276-7A and PE4276-7B. The stratigraphy consists of:

- ☐ Asphaltic concrete was encountered at BH1 and BH3, approximately 0.08 to 0.1 m thick.
- ☐ Fill material consisting of silty sand with crushed stones and/or some gravel was identified at ground surface and beneath the paved concrete in all boreholes, extending to depths ranging from 0.6 to 2.36 m BGS. Practical refusal (interred bedrock) was reached in BH1 and BH5 at depths of 1.98 and 2.19 m BGS, respectively.
- ☐ Glacial till consisting of silt with sand and gravel was encountered in BH4 at 2.13 m BGS and terminated in this unit. Groundwater was not encountered in this layer.
- ☐ Peat with some traces of sand was encountered beneath the fill material in BH2, Practical refusal was reached in BH8, BH9 and BH10 at depths ranging from 3.0 to 3.53 m BGS. Groundwater was not encountered in this layer (likely a perched water table).
- ☐ Limestone bedrock was encountered below the fill and/or peat material in BH2, BH3 and BH7 at depths ranging from 2.03 to 3.15 m BGS. These boreholes were terminated at depths ranging from 6.73 to 7.21 m BGS in bedrock. Groundwater was encountered in this layer.

Hydrogeological Characteristics

Groundwater was generally encountered in limestone bedrock beneath the Phase II Property. Groundwater flow was measured to be in a southeasterly direction, with a hydraulic gradient of approximately 0.021m/m. Groundwater contours are shown on Drawing PE4276-4B – Groundwater Contour Plan.

Approximate Depth to Bedrock

During the drilling program, bedrock was encountered at depths ranging from 2.03 to 3.15 m BGS across the Phase II Property. Based on information reported by NRCAN, bedrock in the area of the Phase II Property consists primarily of interbedded limestone and shale of the Verulam Formation. The surficial geology in the area of the site consists of plain till with a drift thickness ranging from 2 to 5 m.

Based on the well records identified within the 250 m search radius, limestone bedrock was encountered between 0.9 m to 4.2 m below ground surface. However, the findings of our past and present geotechnical investigations indicated that bedrock on-site was encountered between 2.2 to 3.2 m BGS.

Approximate Depth to Water Table

Depth to water table at the Phase II Property varies between approximately 3.07 to 4.39 m BGS.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the Phase II Property is not within 30 m of an Environmentally Sensitive Area. The reported pH values ranging from 7.39 to 7.58 in the subsurface soil samples are within the acceptable range to use the MECP Table 3 Residential Standards.

Section 43.1 of the Regulation does not apply to the subject land as bedrock is not located less than 2 m below ground surface and the Phase II Property does not include all or part of a water body, is not adjacent to a water body, and does not include land that is within 30 m of a water body.

Fill Placement

Fill material of unknown quality was expected to have been used to backfill the previous on-site buildings in the 1960s and 1970s, and again, following the demolition of the transportation/trucking company and the former retail fuel outlet in the late 1980s and mid-1990s, respectively.

Our previous subsurface investigation in 2006 and 2017 however, identified fill containing demolition debris at 450 Rochester Street. It is likely that the demolition debris was used to backfill the former on-site buildings rather than the importation of fill material of unknown quality. The 2006 and 2017 analytical results (from the Phase I-II ESA and Supplemental Phase II ESA) identified fill material to be contaminated with BTEX, PHCs, PAHs and metals, and therefore, represented an APEC on the Phase II Property.

Existing Buildings and Structures

Three (3) of the four (4) parcels of land that make up the Phase I Property were occupied by two-storey residential style buildings. Properties addressed 367 and 369 Preston Street are occupied by residential dwellings and 371 Preston Street is occupied by a commercial building that is being used as a restaurant.

450 Rochester Street is a vacant lot, currently used for vehicular parking. There are three (3) streetlight fixtures on-site, as well as concrete barriers along the perimeter of the parking lot.

Proposed Buildings and Other Structures

The proposed development for the Phase II Property includes a commercial/retail building situated on the southwest corner of the subject land, a residential building fronting Aberdeen Street with commercial storefront on Beech Street, and a mixed-use (residential high-rise and commercial ground level) building situated on the east end of the subject land (450 Rochester Street) fronting Rochester Street.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of the 2006 Phase I-II ESA, the 2017 Supplemental Phase II ESA and this Phase II ESA Update, soil, specifically the fill material across the majority of the Phase II property is impacted with PAHs and/or metals in excess of the selected standards. Soil localized in the immediate area of the former retail fuel outlet and the commercial trucking company are also impacted with PHCs and BTEX in excess of the MECP Table 3 Residential Standards. The analytical soil results are presented on Drawing PE4276-5A through 5C.

The updated groundwater results at BH7 did not indicate any impact in that location, however, previous results have identified several PAH parameters and PHC, F1 and F2 exceedances. It is expected that groundwater beneath the northeastern portion of the

Phase II Property is impacted, however additional monitoring is required to confirm this. The analytical groundwater results are presented on Drawing PE4276-6A through 6C.

Types of Contaminants

Based on the findings of the 2006 Phase I-II ESA, 2017 Supplemental Phase II ESA and this current update, the confirmed contaminants of concern on-site include several PAH and metal parameters, BTEX and PHCs.

Contaminated Media

Based on the analytical results, soil on the Phase II Property is impacted with BTEX, PAHs, PHCs and metals. The groundwater beneath the Phase II Property is contaminated with PAHs and PHCs. Chloroform concentrations from the 2017 investigation is expected to be a result of the municipal water used during bedrock coring.

What Is Known About Areas where Contaminants are Present

The majority of the Phase II Property contains impacted fill material. Groundwater in the northeastern portion of the property is impacted with PAHs and PHCs. With the exception of chloroform, no VOCs were present in the groundwater. The chloroform identified in the 2017 analytical results is likely due to the use of municipal water during bedrock coring.

Distribution of Contaminants

The distribution of petroleum hydrocarbon contamination is considered to be confined to the eastern portion of the property in the approximate vicinity of the former retail fuel outlet and garages. The metal and PAH impacts appear to be present at various locations across the site. Groundwater impacts appear to be located on the northeastern and central portion of the Phase II Property, although additional monitoring is required to confirm this.

Discharge of Contaminants

The presence of PAH, PHC, BTEX and metal parameters in the soil on-site is considered to be a result of the former the retail fuel outlet, truck repair garage and commercial trucking company and building demolition debris to backfill the former on-site buildings in the late 60s and 80s.

The chloroform identified in the 2017 results is related to the municipal drinking water used as part of the rock coring process.

There are currently no activities currently taking place on the subject site that are expected to discharge contaminants.

Migration of Contaminants

Contaminants in the soil do not appear to have migrate beyond the property. With the exception of the eastern part of the property, soil results from locations closest along the property boundaries were in compliance with the selected standards. Due to low mobility, vertical distribution of metals and PAHs is considered to be limited and confined in the fill material of the Phase II Property.

There appears to be no indication that migration of contaminants in groundwater. Additional monitoring is required to confirm and delineate the potential groundwater impacts.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally. Based on the results of the subsurface investigation, the contaminated areas appear to be restricted to the overburden soils, and as such, the aforementioned climatic and meteorological conditions are not considered to have affected contaminant distribution at the Phase II Property.

Potential for Vapour Intrusion

There is no potential for vapour intrusion since there are no buildings currently onsite within the immediate vicinity of any BTEX or PHC impacts. It is our understanding that the soil and groundwater contamination will be fully remediated prior to the redevelopment of the site. As such, the potential for vapour intrusion is considered to be negligible.

Recommendations

Soil and Groundwater

Based on the above results, soil exists at the subject site with BTEX, PHC, PAH and metal concentrations in excess of the MECP Table 3 Residential Standards. It is our understanding that the Phase II Property is to be redeveloped with a commercial/retail storefront on Preston Street and two (2) buildings designated for residential and

commercial use on the Rochester Street portion of the Phase II Property, and a Record of Site Condition (RSC) will be required for the subject land.

It is our recommendation that an environmental site remediation program, involving the removal of all contaminated soil and groundwater, be completed concurrently with site redevelopment. The excavation and removal of the soil from the property should be monitored and confirmed by Paterson. Any impacted fill/soil and construction debris being removed from the property is to be disposed of at an approved waste disposal facility.

Prior to the commencement of excavation activities, it is recommended that additional groundwater sampling be carried out to confirm the quality of the water and determine the appropriate means of handling/managing the groundwater.

Monitoring Wells

It is our recommendation that the monitoring wells remain on-site for additional groundwater monitoring. If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

Statement of Limitations

This Phase II - Environmental Site Assessment Update report has been prepared in general accordance with Ontario Regulation 153/04, as amended, by O.Reg. 269/11 under the Environmental Protection Act. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Arnon Corporation. Permission and notification from Arnon Corporation and Paterson will be required to release this report to any other party.

We trust that this submission satisfies your current requirements. Should you have any questions please contact the undersigned.

Paterson Group Inc.



Mandy Witteman, B.Eng., M.A.Sc.



Mark D'Arcy, P. Eng., QP_{ESA}



Report Distribution

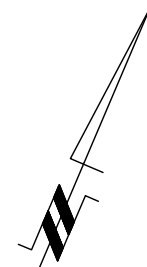
- ☐ Arnon Corporation
- ☐ Paterson Group (1 copy)

Appendix A

- ☐ Drawing PE4276-4A – Test Hole Location Plan
- ☐ Drawing PE4276-4B – Groundwater Contour Plan
- ☐ Drawing PE4276-5A – Analytical Testing Plan – Soils (BTEX, PHC)
- ☐ Drawing PE4276-5B – Analytical Testing Plan – Soils (Metals)
- ☐ Drawing PE4276-5C – Analytical Testing Plan – Soils (PAH)
- ☐ Drawing PE4276-6A – Analytical Testing Plan – Groundwater (PHC)
- ☐ Drawing PE4276-6B – Analytical Testing Plan – Groundwater (VOC)
- ☐ Drawing PE4276-6C – Analytical Testing Plan – Groundwater (PAH)
- ☐ Drawing PE4276-7A – Cross Section A-A' – Soil
- ☐ Drawing PE4276-7B – Cross Section A-A' – Groundwater

Appendix B

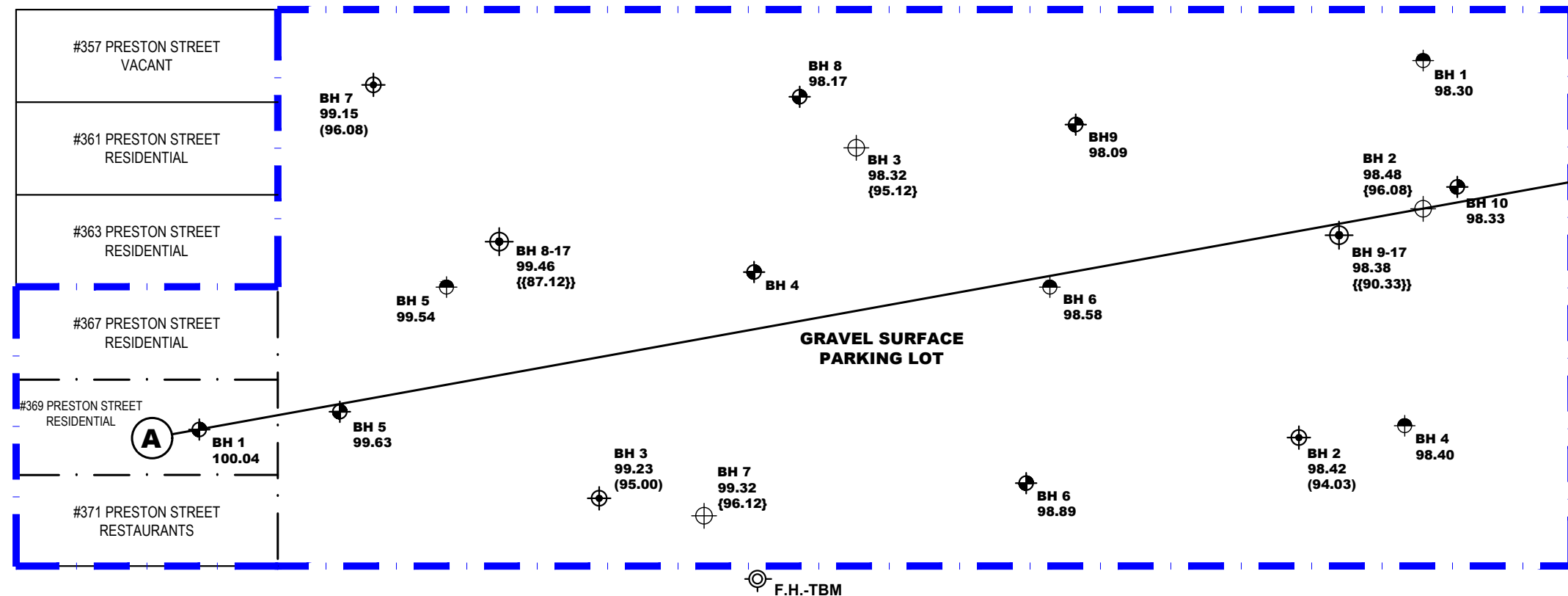
- ☐ Soil Profile and Test Data Sheets
- ☐ Symbols and Terms
- ☐ Laboratory Certificates of Analysis



P R E S T O N
S T R E E T

A B E R D E E N
S T R E E T

R O C H E S T E R
S T R E E T



LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PE0843, 2006
- BOREHOLE WITH MONITORING WELL LOCATION PATERSON GROUP REPORT PE0843, 2006
- CROSS SECTION LOCATION
- 98.89 GROUND SURFACE ELEVATION (m)
- (92.2) GROUNDWATER ELEVATION (AUG. 2019)
- {96.8} GROUNDWATER SURFACE ELEVATION (m) JULY 12, 2006
- {{90.33}} GROUNDWATER SURFACE ELEVATION (m) OCTOBER 17, 2017

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ACROSS FROM 58 BEECH STREET. AN ASSUMED ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM

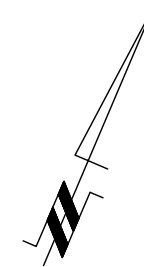
patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION	
PHASE II - ENVIRONMENTAL SITE ASSESSMENT	
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET	
OTTAWA,	ONTARIO
Title: TEST HOLE LOCATION PLAN	

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-4A
Approved by:	MSD	Revision No.:	0

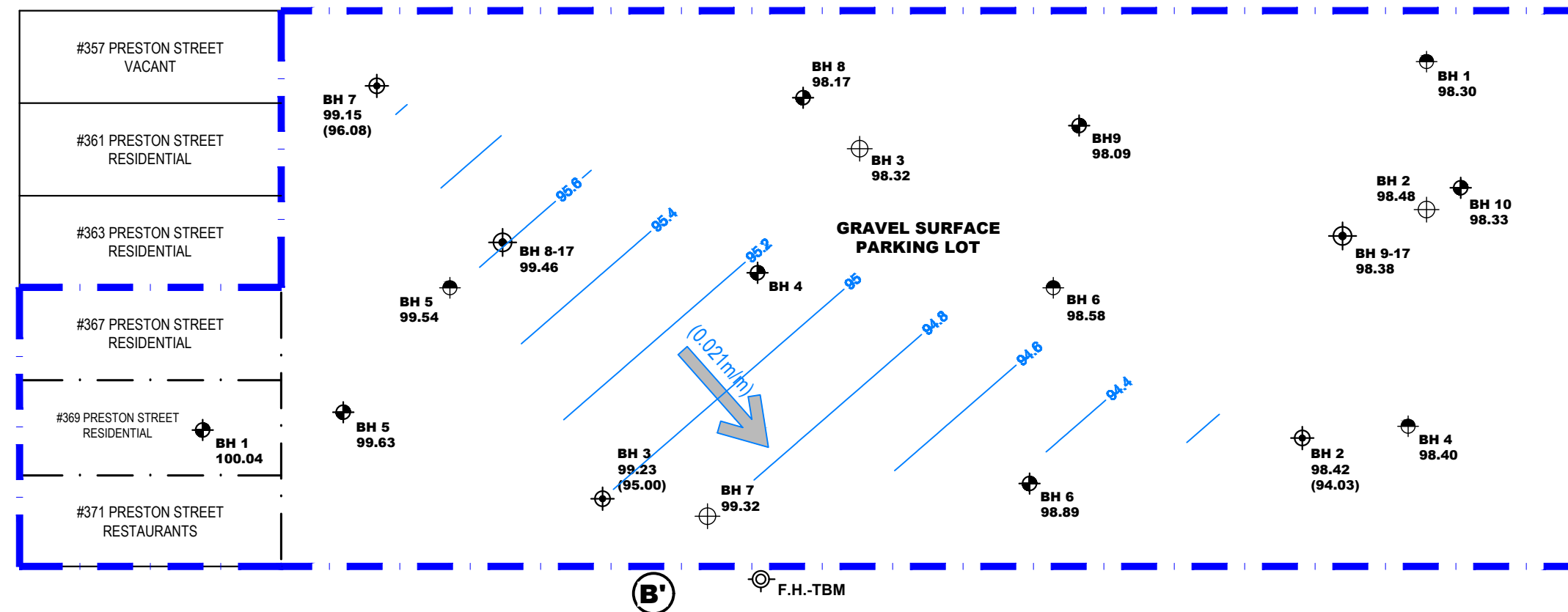


P R E S T O N S T R E E T

A B E R D E E N S T R E E T

R O C H E S T E R S T R E E T

B E E C H S T R E E T



LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PE0843, 2006
- BOREHOLE WITH MONITORING WELL LOCATION PATERSON GROUP REPORT PE0843, 2006

- 97.7 GROUNDWATER CONTOUR
- (0.06m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)
- 98.89 GROUND SURFACE ELEVATION (m)
- (92.2) GROUNDWATER ELEVATION (AUG. 2019)

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ACROSS FROM 58 BEECH STREET. AN ASSUMED ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM

patersongroup
consulting engineers

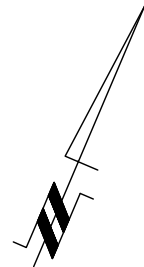
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION	
PHASE II - ENVIRONMENTAL SITE ASSESSMENT	
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET	
OTTAWA,	ONTARIO
Title: GROUNDWATER CONTOUR PLAN	

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-4B
Approved by:	MSD	Revision No.:	0

p:\autocad drawings\environmental\pe42xx\pe4276\pe4276 phase ii (final).dwg

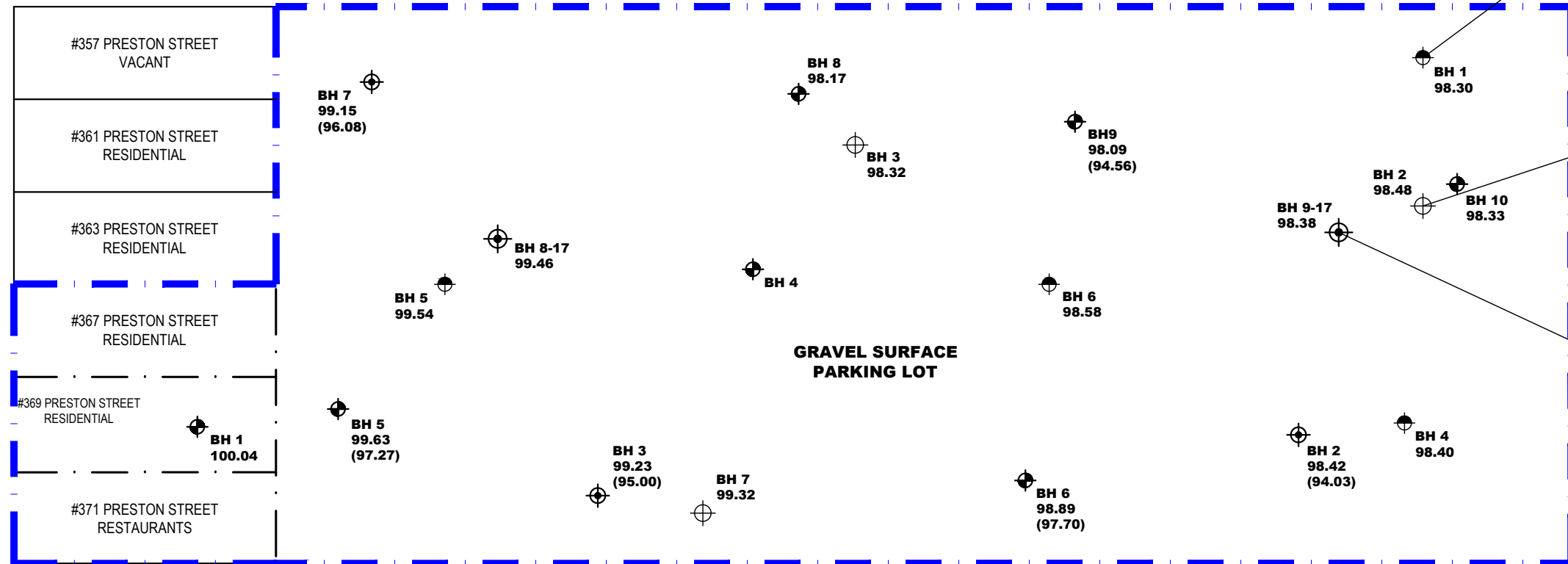


P R E S T O N
S T R E E T

A B E R D E E N
S T R E E T

R O C H E S T E R
S T R E E T

B E E C H
S T R E E T



BH1-SS3	1.52-2.13 m	15-JUN-06
Parameter	Result (µg/g)	Table 3 (µg/g)
PHC (F2)	150	98

BH1-SS5	1.67-2.89 m	15-JUN-06
Parameter	Result (µg/g)	Table 3 (µg/g)
Benzene	0.57	0.21
Ethylbenzene	5.0	2
Xylenes	29.8	3.1

BH9-SS7	1.67-2.89 m	11-OCT-17
Parameter	Result (µg/g)	Table 3 (µg/g)
PHC (F1)	193	55
PHC (F2)	1920	98
PHC (F3)	1610	300

LEGEND:	
	BOREHOLE LOCATION,CURRENT INVESTIGATION
	BOREHOLE WITH MONITORING WELL LOCATION CURRENT INVESTIGATION
	BOREHOLE LOCATION, PATERSON GROUP REPORT PE0843, 2006
	BOREHOLE WITH MONITORING WELL LOCATION PATERSON GROUP REPOR PE0843, 2006
98.89	GROUND SURFACE ELEVATION (m)
(92.2)	GROUNDWATER ELEVATION (AUG. 2019)

SOIL RESULT IN COMPLIANCE WITH MECP TABLE 3
STANDARDS

SOIL RESULTS EXCEEDS MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX, PHC)

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE0843-5A
Approved by:	MSD	Revision No.:	0

BH8-17-SS2	0.76-1.08 m	11-OCT-17
Parameter	Result (µg/g)	Table 3 (µg/g)
Lead	130	120
Zinc	990	340

BH7-SS3 1.52-2.13 m 14-AUG-19
Metals comply with MECP Table 3 Standards

BH5-SS2	0.76-1.40 m	15-JUN-06
Parameter	Result (µg/g)	Table 3(µg/g)
Mercury	0.5	0.27
Zinc	1000	340

BH1-SS2	0.76-1.40 m	13-AUG-19
Parameter	Result (µg/g)	Table 3(µg/g)
Arsenic	38.4	18
Cadmium	2.1	1.2
Lead	277	120
Selenium	23.8	2.4
Thallium	1.7	1
Zinc	479	34

BH3-SS3 1.52-2.13 m 13-AUG-19
Metals comply with MECP Table 3 Standards

BH8-SS2 0.76-1.40 m 14-AUG-19
Metals comply with MECP Table 3 Standards

BH10-SS3	1.52-2.13 m	14-AUG-19
Parameter	Result (µg/g)	Table 3 (µg/g)
Arsenic	19.2	18
Lead	551	120
Mercury	0.3	0.27

BH4-SS2	0.76-1.40 m	13-AUG-19
Parameter	Result (µg/g)	Table 3(µg/g)
Lead	392	1.2
Mercury	0.4	0.27
Zinc	388	34

BH2-SS2	0.76-1.40 m	13-AUG-19
Parameter	Result (µg/g)	Table 3 (µg/g)
Antimony	8.3	7.5
Arsenic	55.4	18
Cadmium	1.9	1.2
Chromium	236	160
Copper	245	140
Lead	1070	120
Mercury	1.5	0.27
Molybdenum	11.2	6.9
Zinc	479	340

LEGEND:

- BOREHOLE LOCATION,CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PE0843, 2006
- BOREHOLE WITH MONITORING WELL LOCATION PATERSON GROUP REPOR PE0843, 2006
- 98.89 GROUND SURFACE ELEVATION (m)
- (92.2) GROUNDWATER ELEVATION (AUG. 2019)

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ACROSS FROM 58 BEECH STREET. AN ASSUMED ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM

SOIL RESULT IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEEDS MECP TABLE 3 STANDARDS

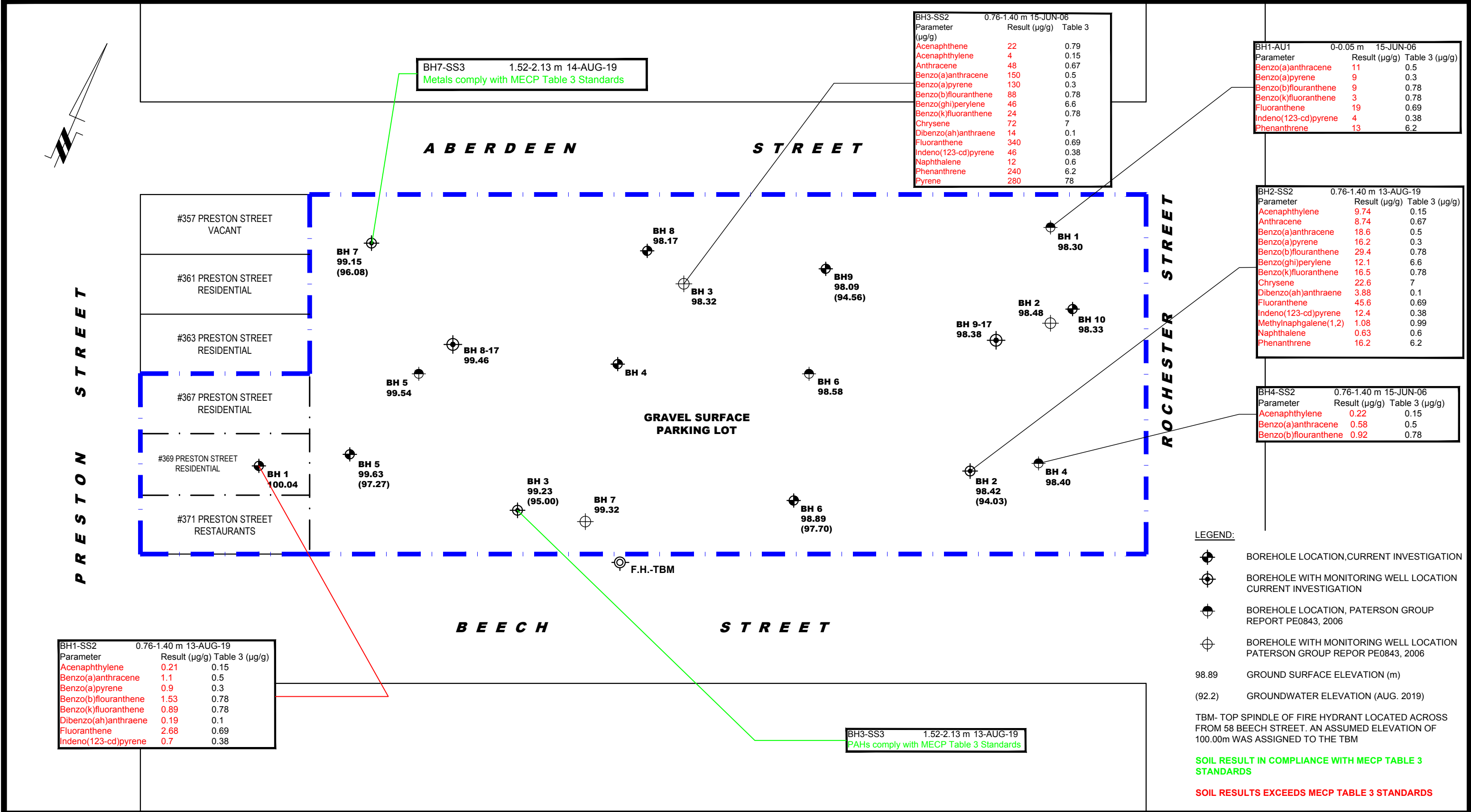
patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET
OTTAWA, ONTARIO
Title:
ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-5B
Approved by:	MSD	Revision No.:	0



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION

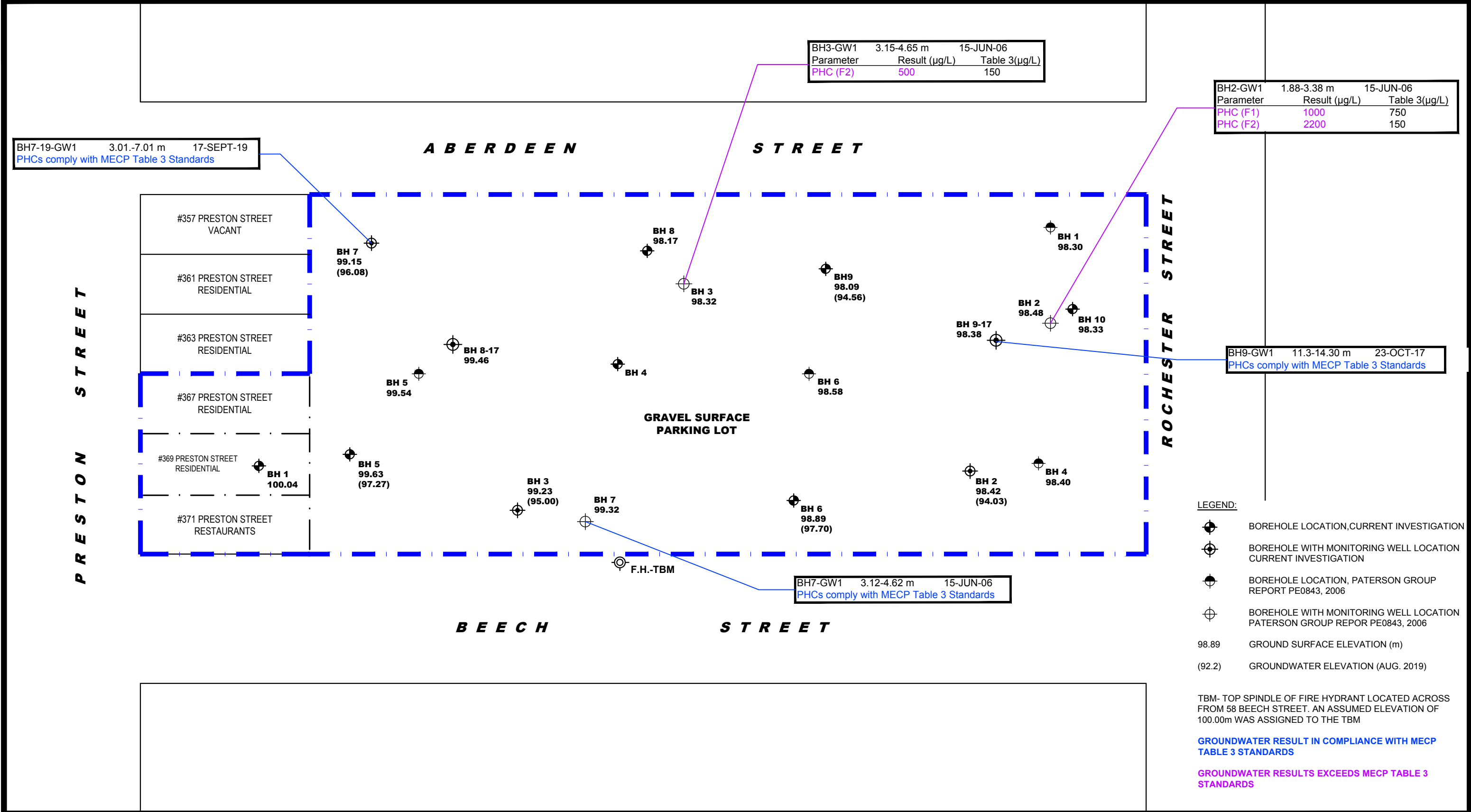
PHASE II - ENVIRONMENTAL SITE ASSESSMENT

367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET

OTTAWA, ONTARIO

Title: ANALYTICAL TESTING PLAN- SOIL (PAH)

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-5C
Approved by:	MSD	Revision No.:	0



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT

367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN- GROUNDWATER (PHC)

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-6A
Approved by:	MSD	Revision No.:	0

p:\autocad drawings\environmental\pe42xx\pe4276\pe4276 phase ii(yaz).dwg

BH8-GW1	10.91-13.91 m	23-OCT-17
Parameter	Result (µg/L)	Table 3 (µg/L)
Chloroform	7	2.4

BH7-19-GW1	3.01.-7.01 m	17-SEPT-19
VOCs comply with MECP Table 3 Standards		

BH3-GW1	3.15-4.65 m	15-JUN-06
VOCs comply with MECP Table 3 Standards		

BH2-GW1	1.88-3.38 m	15-JUN-06
VOCs comply with MECP Table 3 Standards		

BH9-GW1	11.3-14.30 m	23-OCT-17
Parameter	Result (µg/L)	Table 3 (µg/L)
Chloroform	14.2	2.4

BH7-GW1	3.12-4.62 m	15-JUN-06
VOCs comply with MECP Table 3 Standards		

LEGEND:	
	BOREHOLE LOCATION,CURRENT INVESTIGATION
	BOREHOLE WITH MONITORING WELL LOCATION CURRENT INVESTIGATION
	BOREHOLE LOCATION, PATERSON GROUP REPORT PE0843, 2006
	BOREHOLE WITH MONITORING WELL LOCATION PATERSON GROUP REPOR PE0843, 2006
98.89	GROUND SURFACE ELEVATION (m)
(92.2)	GROUNDWATER ELEVATION (AUG. 2019)

TBM- TOP SPINDLE OF FIRE HYDRANT LOCATED ACROSS FROM 58 BEECH STREET. AN ASSUMED ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM

GROUNDWATER RESULT IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEEDS MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344





0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION	
PHASE II - ENVIRONMENTAL SITE ASSESSMENT	
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET	
OTTAWA,	ONTARIO
Title: ANALYTICAL TESTING PLAN- GROUNDWATER (VOC)	

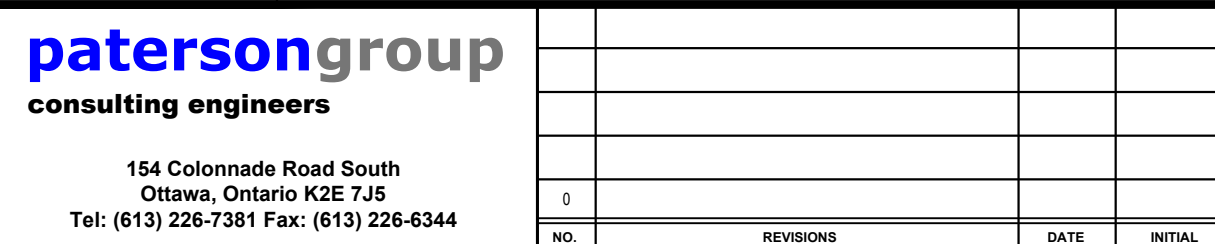
Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-6B
Approved by:	MSD	Revision No.:	0

p:\autocad drawings\environmental\pe42xx\pe4276\pe4276 phase ii(yaz).dwg

Parameter	Result (µg/L)	Table 3 (µg/L)
Benzo(a)pyrene	3.0	0.81
Benzo(b)fluoranthene	4.3	0.75
Benzo(ghi)perylene	2.3	0.2
Benzo(k)fluoranthene	2.5	0.4
Chrysene	3.2	1
Dibenzo(ah)anthraene	0.7	0.52
Indeno(123-cd)pyrene	2.0	0.2

	BOREHOLE LOCATION, CURRENT INVESTIGATION
	BOREHOLE WITH MONITORING WELL LOCATION CURRENT INVESTIGATION
	BOREHOLE LOCATION, PATERSON GROUP REPORT PE0843, 2006
	BOREHOLE WITH MONITORING WELL LOCATION PATERSON GROUP REPOR PE0843, 2006
98.89	GROUND SURFACE ELEVATION (m)
(92.2)	GROUNDWATER ELEVATION (AUG. 2019)

GROUNDWATER RESULTS EXCEEDS MECP TABLE 3 STANDARDS



BEECH STREET

GRAVEL SURFACE PARKING LOT

 F.H.-TBM

ARNON CORPORATION
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET

OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN- GROUNDWATER (PAH)**

Scale:	1:600	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-6C
Approved by:	MSD	Revision No.:	

BH1-SS2	0.76-1.40 m	13-AUG-19
Parameter	Result (µg/g)	Table 3 (µg/g)
Acenaphthylene	0.21	0.15
Benzo(a)anthracene	1.1	0.5
Benzo(a)pyrene	0.9	0.3
Benzo(b)fluoranthene	1.53	0.78
Benzo(k)fluoranthene	0.89	0.78
Dibenzo(ah)anthraene	0.19	0.1
Fluoranthene	2.68	0.69
Indeno(123-cd)pyrene	0.7	0.38

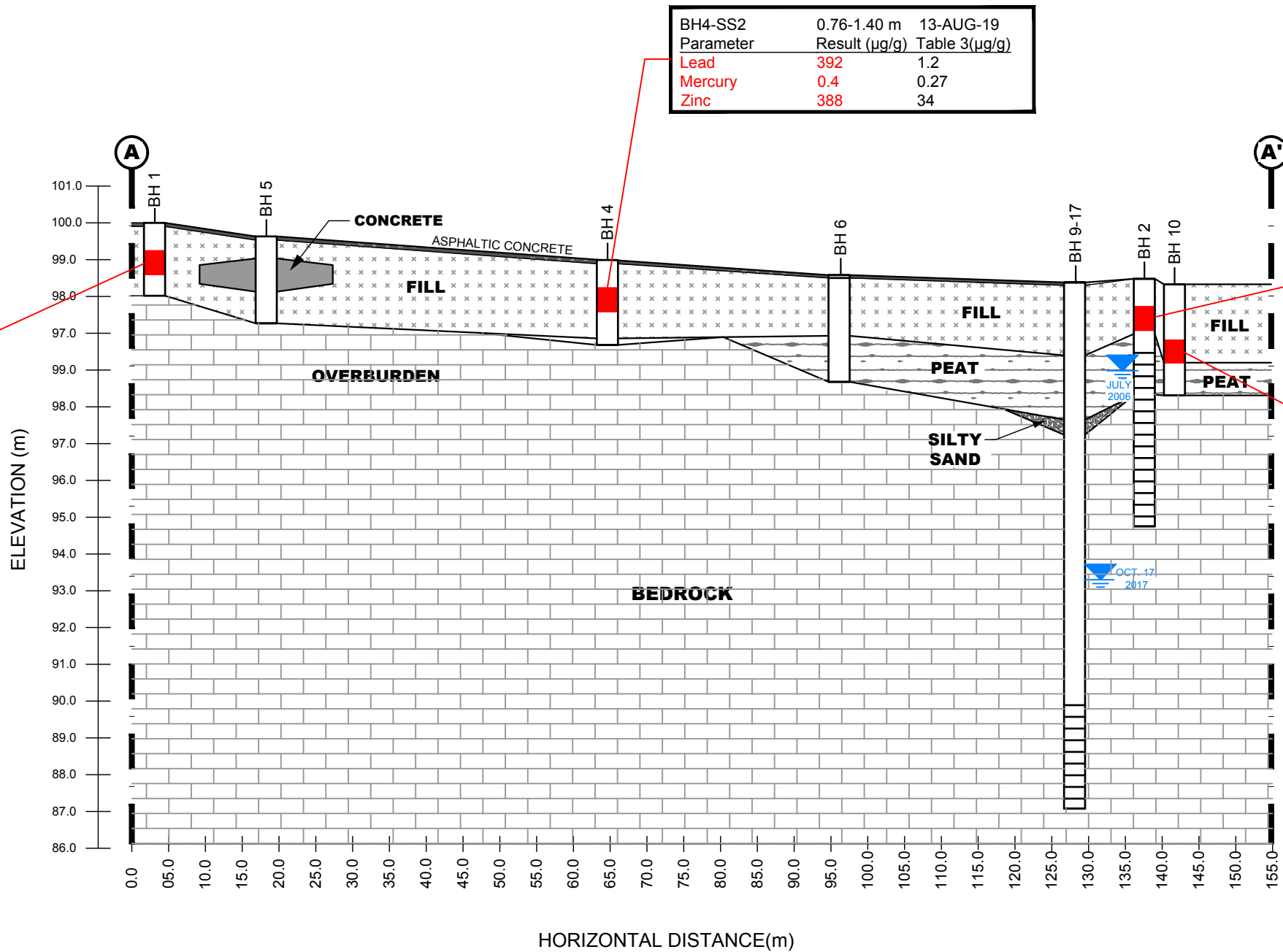
BH1-SS2	0.76-1.40 m	13-AUG-19
Parameter	Result (µg/g)	Table 3 (µg/g)
Arsenic	38.4	18
Cadmium	2.1	1.2
Lead	277	120
Selenium	23.8	2.4
Thallium	1.7	1
Zinc	479	34

BH4-SS2	0.76-1.40 m	13-AUG-19
Parameter	Result (µg/g)	Table 3 (µg/g)
Lead	392	1.2
Mercury	0.4	0.27
Zinc	388	34

BH2-G6	0.76-1.40 m	15-JUN-06
Parameter	Result (µg/g)	Table 3 (µg/g)
Xylenes	4.6	3.1

BH2-G6	0.76-1.40 m	15-JUN-06
Parameter	Result (µg/g)	Table 3 (µg/g)
PHC (F1)	100	55
PHC (F2)	230	98

BH10-SS3	1.52-2.13 m	14-AUG-19
Parameter	Result (µg/g)	Table 3 (µg/g)
Arsenic	19.2	18
Lead	551	120
Mercury	0.3	0.27



LEGEND:

SOIL RESULT IN COMPLIANCE WITH
MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEEDS MECP
TABLE 3 STANDARDS

patersongroup
consulting engineers

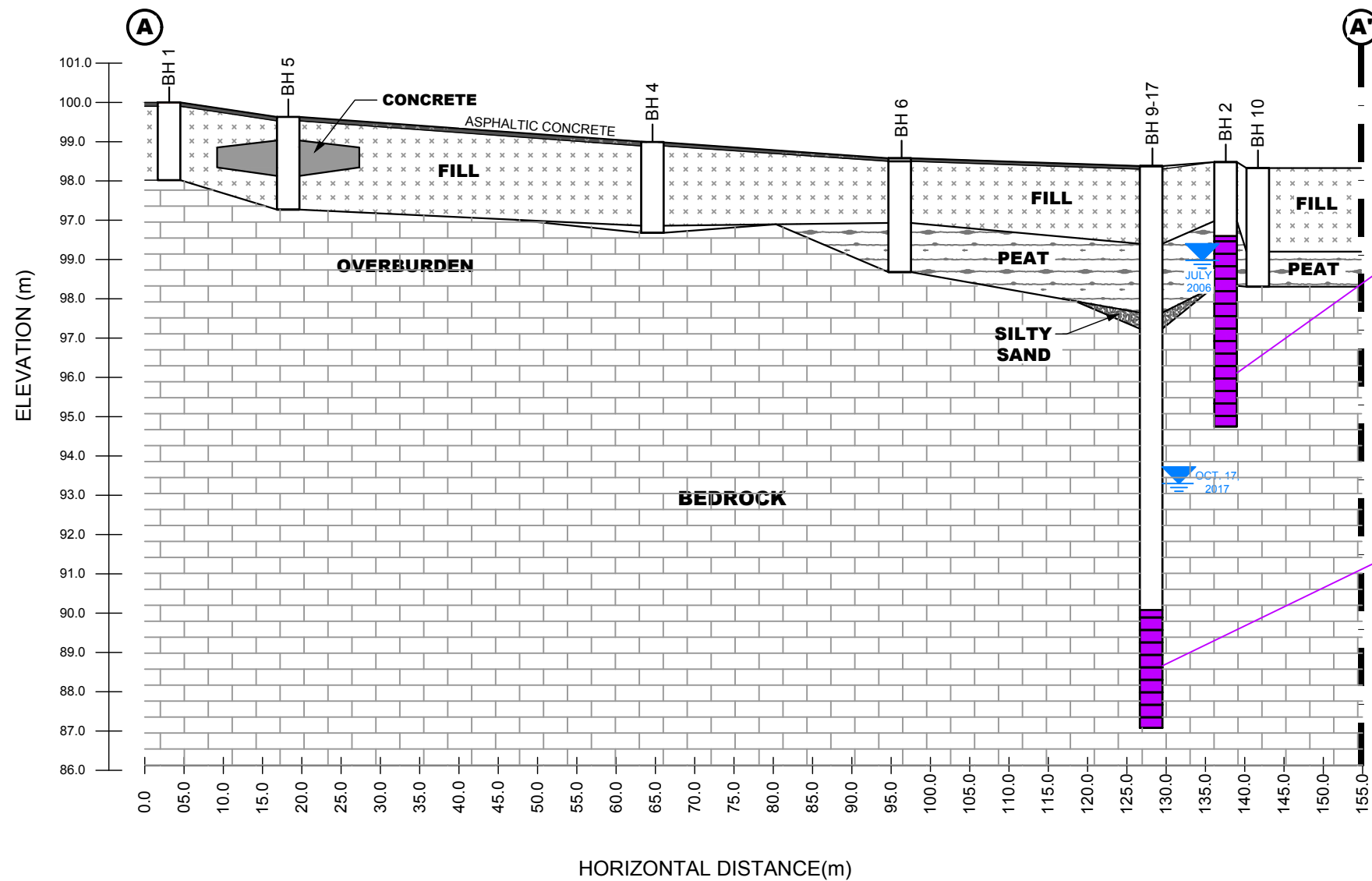
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION	
PHASE II - ENVIRONMENTAL SITE ASSESSMENT	
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET	
OTTAWA,	ONTARIO
Title:	
CROSS SECTION A-A - SOIL	

Scale:	AS SHOWN	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-LET.01
Checked by:	MW	Dwg. No.:	PE4276-7A
Approved by:	MSD	Revision No.:	0

p:\autocad drawings\environmental\pe42xx\pe4276\pe4276 phase ii (final).dwg



BH2-GW1	1.88-3.38 m	15-JUN-06
VOCs comply with MECP Table 3 Standards		

BH2-GW1	1.88-3.38 m	15-JUN-06
Parameter	Result (µg/L)	Table 3(µg/L)
PHC (F1)	1000	750
PHC (F2)	2200	150

BH9-GW1	11.3-14.30 m	23-OCT-17
PHCs comply with MECP Table 3 Standards		

BH9-GW1	11.3-14.30 m	23-OCT-17
Parameter	Result (µg/L)	Table 3 (µg/L)
Chloroform	14.2	2.4

LEGEND:

GROUNDWATER RESULT IN COMPLIANCE
WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS
MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

ARNON CORPORATION
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
367, 369, 371 PRESTON STREET & 450 ROCHESTER STREET
OTTAWA, ONTARIO
Title: **CROSS SECTION A-A - GROUNDWATER**

Scale:	AS SHOWN	Date:	09/2019
Drawn by:	RCG	Report No.:	PE4276-2
Checked by:	MW	Dwg. No.:	PE4276-7B
Approved by:	MSD	Revision No.:	0

SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario**

DATUM	TBM - Top spindle of fire hydrant located in front of subject site, along Beech Street. An arbitrary elevation of 100.00m was assigned to the TBM.
--------------	--

FILE NO. **PE4276**

REMARKS

HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger

DATE 2019 August 13

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
GROUND SURFACE								20	40	60	80	
Asphaltic concrete	0.08	AU	1			0	100.04					
FILL: Brown silty sand with gravel - trace clay by 1.5m depth		SS	2	33	4	1	99.04					
		SS	3	67	50+							
End of Borehole	1.98											
Practical refusal to augering at 1.98m depth.												

100200300400500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA

HOLE NO. **BH 2**[illegible]

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of subject site, along Beech Street. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 13

FILE NO.
PE4276

HOLE NO.
BH 3

SOIL DESCRIPTION		STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
			TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
GROUND SURFACE									20	40	60	80	
Asphaltic concrete		0.10	AU	1			0	99.23					
FILL: Brown silty sand with crushed stone, trace asphalt			SS	2	8	6	1	98.23					
		SS	3		50+		2	97.23					
		2.03	RC	1	100	33		3	96.23				
BEDROCK: Poor to good quality, grey limestone			RC	2	100	42		4	95.23				
			RC	3	100	78		5	94.23				
			RC	4	100	81		6	93.23				
								7	92.23				
End of Borehole		7.21											
(GWL @ 4.23m - August 22, 2019)													
								100	200	300	400	500	
								RKI Eagle Rdg. (ppm)					
								▲ Full Gas Resp. △ Methane Elim.					

DATUM	TBM - Top spindle of fire hydrant located in front of subject site, along Beech Street. An arbitrary elevation of 100.00m was assigned to the TBM.
--------------	--

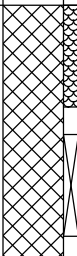
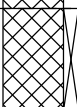

FILE NO. PE4276

REMARKS

HOLE NO. **BH 4**

BORINGS BY CME 55 Power Auger

DATE 2019 August 13

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			<div><div>● Volatile Organic Rdg. (ppm)</div><div>○ Lower Explosive Limit %</div></div>	20	40	60		80
GROUND SURFACE						0							
FILL: Brown silty sand with crushed stone		AU	1										
		SS	2	50	7	1							
FILL: Brown silty sand with gravel and peat		SS	3	17	2	2							
GLACIAL TILL: Grey silt with gravel		SS	4	33	50+								
End of Borehole													
Practical refusal to augering at 2.31m depth.													

100200300400500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

[illegible]

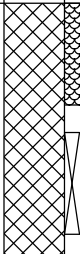
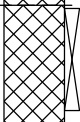
SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario**

FILE NO. PE4276

HOLE NO. **BH 6**

DATE 2019 August 15

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			<input checked="" type="radio"/> Volatile Organic Rdg. (ppm)	<input type="radio"/> Lower Explosive Limit %			
								20	40	60	80	
GROUND SURFACE						0	98.89					
FILL: Brown silty sand with crushed stone		AU	1									
		SS	2	46	9	1	97.89					
1.50												
FILL: Brown silty sand with gravel, trace organics		SS	3	38	6	2	96.89					
2.19												
End of Borehole												
Practical refusal to augering at 2.19m depth												

100200300400500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located in front of subject site, along Beech Street. An arbitrary elevation of 100.00m was assigned to the TBM.

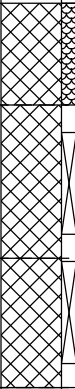


REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 14

FILE NO.
PE4276

HOLE NO.
BH 7

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
								○ Lower Explosive Limit %				
GROUND SURFACE								20	40	60	80	
FILL: Brown silty sand with crushed stone		AU	1			0	99.15					
0.60												
FILL: Concrete with wood, sand, metal, plastic		SS	2	8	9	1	98.15					
1.50												
FILL: Brown silty sand with gravel, trace concrete	SS	3	54	21	2	97.15						
2.26												
BEDROCK: Good quality, grey limestone		RC	1	100	90	3	96.15					
		RC	2	97	89	4	95.15					
		RC	3	100	82	6	93.15					
7.01												
End of Borehole						7	92.15					
(GWL @ 3.07 - August 22, 2019)												
								100	200	300	400	500
								RKI Eagle Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario**

FILE NO. **PE4276**

HOLE NO. **BH 8**

DATE 2019 August 14

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
GROUND SURFACE								20	40	60	80	
FILL: Brown silty sand with gravel 0.51		AU	1			0	98.17					
FILL: Brown silty sand 1.50		SS	2	62	10	1	97.17					
PEAT with sand, trace marl 2.13		SS	3	71	3	2	96.17					
PEAT, trace marl 3.00		SS	4	92	2							
End of Borehole Practical refusal to augering at 3.00m depth.						3	95.17					

100200300400500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario**

DATUM	TBM - Top spindle of fire hydrant located in front of subject site, along Beech Street. An arbitrary elevation of 100.00m was assigned to the TBM.
--------------	--

REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 14

FILE NO. **PE4276**

HOLE NO. **BH 9**[illegible]

SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment
Prop. Mixed-Use Buildings - 450 Rochester Street
Ottawa, Ontario**

DATUM	TBM - Top spindle of fire hydrant located in front of subject site, along Beech Street. An arbitrary elevation of 100.00m was assigned to the TBM.
--------------	--




REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 August 14

FILE NO. **PE4276**

HOLE NO. **BH10**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			<div><div><div></div></div> Volatile Organic Rdg. (ppm)</div> <div><div></div> Lower Explosive Limit %</div>				
GROUND SURFACE						0	98.33	20	40	60	80	
FILL: Brown silty sand with gravel		AU	1									
		SS	2	33	21	1	97.33					
FILL: Brown silty sand		SS	3	21	6	2	96.33					
PEAT		SS	4	46	3							
End of Borehole						3	95.33					
Practical refusal to augering at 3.02m depth.												

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site. Assumed elevation = 100.00m.

REMARKS

FILE NO. PE0843

HOLE NO. BH 8-17

BORINGS BY CME 55 Power Auger

DATE October 11, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
								○ Lower Explosive Limit %				
GROUND SURFACE								20	40	60	80	
FILL: Crushed stone	0.15	AU	1			0	99.46	●				
FILL: Brown silty sand with concrete, some gravel, trace clay		SS	2	67	50+	1	98.46			●		
	2.06	RC	1	100		2	97.46					
BEDROCK: Grey limestone		RC	2	98	53	3	96.46					
		RC	3	100	77	4	95.46					
		RC	4	100	85	5	94.46					
		RC	5	100	96	6	93.46					
		RC	6	100	96	7	92.46					
		RC	7	100	100	8	91.46					
		RC	8	100	91	9	90.46					
		RC	9	100	100	10	89.46					
		RC				11	88.46					
					12	87.46						
					13	86.46						
End of Borehole	13.91											
(GWL @ 12.34m-Oct. 17, 2017)												
								100	200	300	400	500
								RKI Eagle Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

BEDROCK: Grey limestone

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site. Assumed elevation = 100.00m.

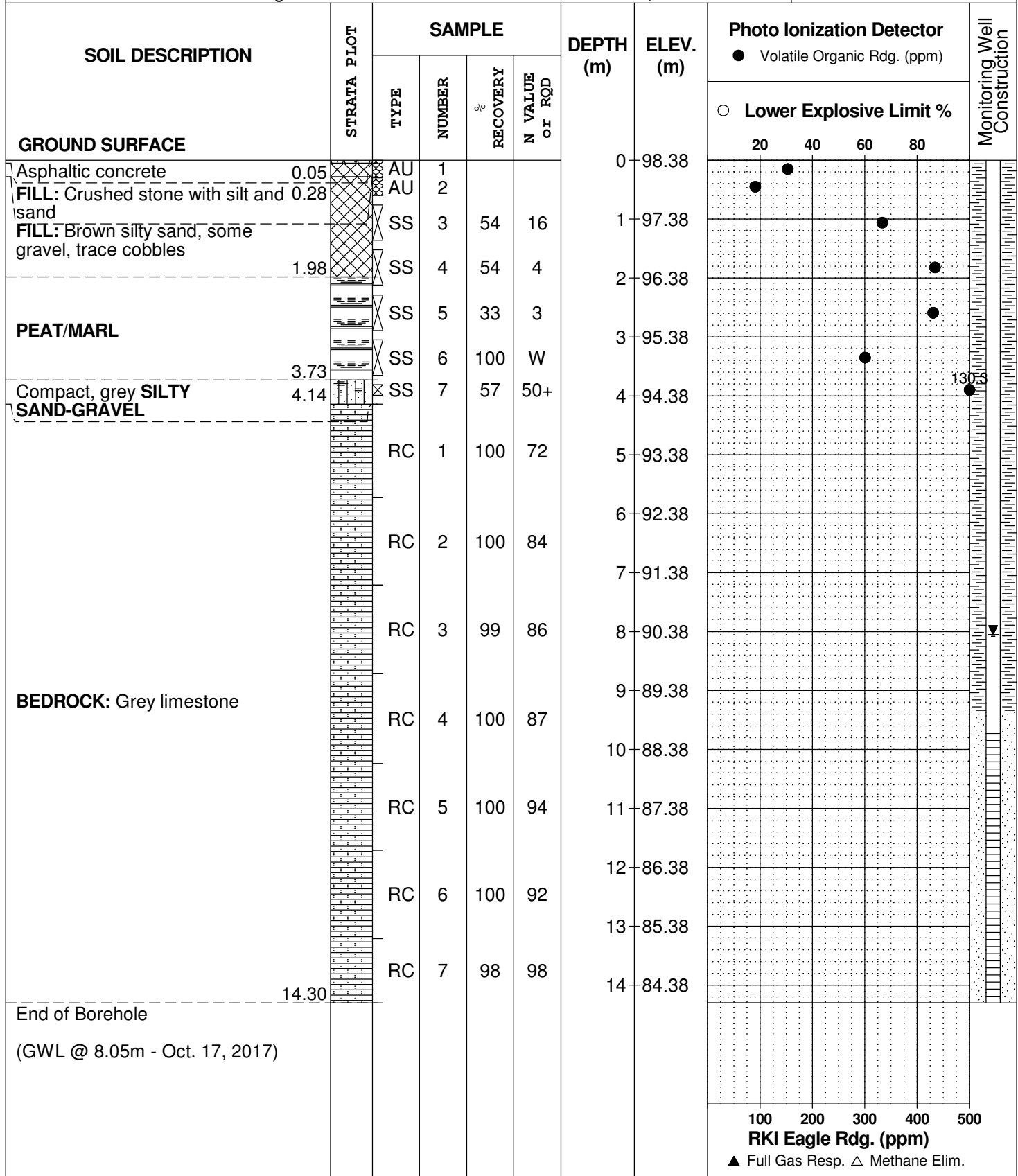
REMARKS

BORINGS BY CME 55 Power Auger

DATE October 11, 2017

FILE NO. PE0843

HOLE NO. BH 9-17



SOIL PROFILE & TEST DATA

Phase I-II Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site.
Assumed elevation = 100.00m.

REMARKS

FILE NO.

PE0843

HOLE NO.

BH 1

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Lower Explosive Limit %				
						20	40	60	80			
GROUND SURFACE						0	-98.30					
FILL: Black silty sand with gravel	AU	1										
- brown by 0.6m depth	SS	2	23	50 +		1	-97.30					
Concrete												
FILL: Grey silty sand with staining (possible native)	SS	3	50	4		2	-96.30					
PEAT: Dark brown to black organic matter	SS	4	50	5		3	-95.30					
End of Borehole	SS	5	80	50 +								
Practical refusal to augering @ 3.20m depth												

100200300400500

Gastech 1314 Rdg. (ppm)

▲ Full Gas Resp. Δ Methane Elim.

SOIL PROFILE & TEST DATA

Phase I-II Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site.
REMARKS Assumed elevation = 100.00m.

FILE NO. **PE0843**

HOLE NO. **BH 2**

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Lower Explosive Limit %				
								20	40	60	80	
GROUND SURFACE												
FILL: Crushed stone with sand	0.15	AU	1			0	98.48					
FILL: Brown silty sand		SS	2	50	13	1	97.48					
		SS	3	50	18							
		SS	4	50	6							
		SS	5	31	50+	3	95.48					
- dark grey by 2.9m depth (stained)		SS G	6									
End of Borehole	3.38											
Practical refusal to augering @ 3.38m depth (GWL @ 2.40m-July 12/06)												
								100	200	300	400	500
								Gastech 1314 Rdg. (ppm)				
								▲ Full Gas Resp. Δ Methane Elim.				

SOIL PROFILE & TEST DATA

Phase I-II Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site.
REMARKS Assumed elevation = 100.00m.

FILE NO. **PE0843**

REMARKS

HOLE NO. **BH 3**

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Lower Explosive Limit %				
								20	40	60	80	
GROUND SURFACE												
25mm Asphalt						0	98.32					
FILL: Crushed stone with sand and boulders		AU	1									
0.60												
FILL: Black sand with cobbles (stained)												
0.94												
FILL: Brown silty sand with gravel		SS	2	29	25	1	97.32					
1.68												
Compact, grey SILTY SAND, some peat		SS	3	25	22	2	96.32					
2.49												
		SS	4	50	50+							
		RC	1	92	84	3	95.32					
BEDROCK: Good to excellent quality, grey limestone												
		RC	2	100	98	4	94.32					
4.65												
End of Borehole (GWL @ 3.20m-July 12/06)												
								100	200	300	400	500
								Gastech 1314 Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

SOIL PROFILE & TEST DATA

FILE NO. **PE0843**

HOLE NO. BH 4

REMARKS

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

[illegible]

SOIL PROFILE & TEST DATA

Phase I-II Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM	TBM - Top spindle of fire hydrant on Beech Street, front of subject site. Assumed elevation = 100.00m.
-------	---

REMARKS

FILE NO.

PE0843

HOLE NO.

BH 5

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

[illegible]

SOIL PROFILE & TEST DATA

Phase I-II Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site.
Assumed elevation = 100.00m.

FILE NO. **PE0843**

REMARKS

HOLE NO. **BH 6**

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	% RECOVERY	N VALUE OF RQD			○ Lower Explosive Limit %				
								20	40	60	80	
GROUND SURFACE												
Asphaltic concrete	0.05	XXXX	AU	1		0	98.58	Δ				
FILL: Crushed stone	0.30											
FILL: Brown silty sand												
- black by 0.6m depth	0.76											
		SS	2	50	34	1	97.58	Δ				
FILL: Brown sand with gravel and wood pieces												
	1.65											
		SS	3	21	4	2	96.58	Δ				
PEAT: Dark brown to black organic matter												
		SS	4	63	4			Δ				
	2.90											
End of Borehole												
Practical refusal to augering @ 2.90m depth												

SOIL PROFILE & TEST DATA

Phase I-II Environmental Site Assessment
450 Rochester Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant on Beech Street, front of subject site.
REMARKS Assumed elevation = 100.00m.

FILE NO. **PE0843**

HOLE NO. **BH 7**

BORINGS BY CME 55 Power Auger

DATE 15 JUN 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	% RECOVERY	N VALUE OF RQD			○ Lower Explosive Limit %				
								20	40	60	80	
GROUND SURFACE												
Concrete	0.13					0	99.32					
FILL: Crushed stone												
	1.22	SS	1	2	7	1	98.32					
FILL: Brown silty sand		SS	2	0	50+							
		AU	3			2	97.32					
	2.44											
		RC	1	100	100	3	96.32					
BEDROCK: Very good to excellent quality, grey limestone												
		RC	2	98	93	4	95.32					
	4.62											
End of Borehole (GWL @ 3.20m-July 12/06)												
								100	200	300	400	500
								Gastech 1314 Rdg. (ppm)				
								▲ Full Gas Resp. Δ Methane Elim.				

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t , is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = D_{60} / D_{10}

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$

Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

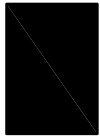
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.
---	---	--

SYMBOLS AND TERMS (continued)

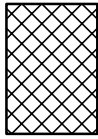
STRATA PLOT



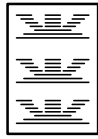
Topsoil



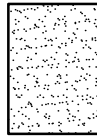
Asphalt



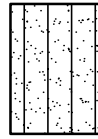
Fill



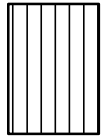
Peat



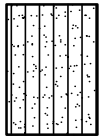
Sand



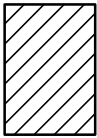
Silty Sand



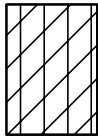
Silt



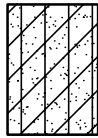
Sandy Silt



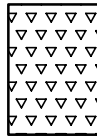
Clay



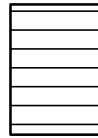
Silty Clay



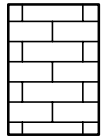
Clayey Silty Sand



Glacial Till



Shale



Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 27114
Project: PE4276
Custody: 123182

Report Date: 17-Sep-2019
Order Date: 9-Sep-2019

Revised Report

Order #: 1937095

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1937095-01	BH1-SS2
1937095-02	BH2-SS2
1937095-03	BH3-SS3
1937095-04	BH4-SS2
1937095-05	BH7-SS3
1937095-06	BH8-SS2
1937095-07	BH10-SS3
1937095-08	Dup

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27114

Report Date: 17-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4276

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	10-Sep-19	11-Sep-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	11-Sep-19	11-Sep-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	16-Sep-19	17-Sep-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	11-Sep-19	12-Sep-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	10-Sep-19	12-Sep-19
Solids, %	Gravimetric, calculation	10-Sep-19	10-Sep-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27114

Report Date: 17-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4276

Client ID:	BH1-SS2	BH2-SS2	BH3-SS3	BH4-SS2
Sample Date:	13-Aug-19 09:00	13-Aug-19 09:00	13-Aug-19 09:00	13-Aug-19 09:00
Sample ID:	1937095-01	1937095-02	1937095-03	1937095-04
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	90.6	84.6	86.1	85.1
----------	--------------	------	------	------	------

General Inorganics

pH	0.05 pH Units	-	7.58 [3]	-	7.39 [3]
----	---------------	---	----------	---	----------

Metals

Antimony	1.0 ug/g dry	4.4	8.3	<1.0	3.5
Arsenic	1.0 ug/g dry	38.4	55.4	4.2	6.0
Barium	1.0 ug/g dry	164	319	169	228
Beryllium	0.5 ug/g dry	<0.5	1.2	0.6	0.6
Boron	5.0 ug/g dry	10.0	24.4	9.8	10.9
Cadmium	0.5 ug/g dry	2.1	1.9	<0.5	<0.5
Chromium	5.0 ug/g dry	27.0	236	49.7	30.4
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	7.4	10.9	10.7	6.6
Copper	5.0 ug/g dry	60.5	245	37.6	90.9
Lead	1.0 ug/g dry	277	1070	48.5	392
Mercury	0.1 ug/g dry	0.1 [2]	1.5 [2]	0.2 [2]	0.4 [2]
Molybdenum	1.0 ug/g dry	2.8	11.2	<1.0	<1.0
Nickel	5.0 ug/g dry	27.7	54.4	33.3	15.6
Selenium	1.0 ug/g dry	23.8	1.3	<1.0	<1.0
Silver	0.3 ug/g dry	0.4	1.0	<0.3	<0.3
Thallium	1.0 ug/g dry	1.7	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	1.8	<1.0	<1.0
Vanadium	10.0 ug/g dry	33.7	49.9	55.7	28.6
Zinc	20.0 ug/g dry	479	479	93.3	388

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	0.24	1.35	<0.02	-
Acenaphthylene	0.02 ug/g dry	0.21	9.75	0.04	-
Anthracene	0.02 ug/g dry	0.46	8.74	0.04	-
Benzo [a] anthracene	0.02 ug/g dry	1.10	18.6	0.07	-
Benzo [a] pyrene	0.02 ug/g dry	0.90	16.2	0.06	-
Benzo [b] fluoranthene	0.02 ug/g dry	1.53	29.4	0.09	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.73	12.1	0.05	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.89	16.5	0.06	-
Chrysene	0.02 ug/g dry	1.22	22.6	0.06	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.19	3.88	<0.02	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27114
Report Date: 17-Sep-2019
Order Date: 9-Sep-2019
Project Description: PE4276

	Client ID:	BH1-SS2	BH2-SS2	BH3-SS3	BH4-SS2
	Sample Date:	13-Aug-19 09:00	13-Aug-19 09:00	13-Aug-19 09:00	13-Aug-19 09:00
	Sample ID:	1937095-01	1937095-02	1937095-03	1937095-04
	MDL/Units	Soil	Soil	Soil	Soil
Fluoranthene	0.02 ug/g dry	2.68	45.6	0.15	-
Fluorene	0.02 ug/g dry	0.24	1.18	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.70	12.4	0.06	-
1-Methylnaphthalene	0.02 ug/g dry	0.06	<0.40 [1]	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	0.08	0.70	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	0.14	1.08	<0.04	-
Naphthalene	0.01 ug/g dry	0.11	0.63	<0.01	-
Phenanthrene	0.02 ug/g dry	1.80	16.2	0.08	-
Pyrene	0.02 ug/g dry	2.03	37.7	0.11	-
2-Fluorobiphenyl	Surrogate	69.0%	58.6%	50.2%	-
Terphenyl-d14	Surrogate	107%	113%	62.1%	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27114

Report Date: 17-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4276

Client ID:	BH7-SS3	BH8-SS2	BH10-SS3	Dup
Sample Date:	14-Aug-19 09:00	14-Aug-19 09:00	14-Aug-19 09:00	13-Aug-19 09:00
Sample ID:	1937095-05	1937095-06	1937095-07	1937095-08
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	96.2	96.4	83.2	94.5
----------	--------------	------	------	------	------

General Inorganics

pH	0.05 pH Units	-	-	7.45 [3]	-
----	---------------	---	---	----------	---

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	7.0	<1.0
Arsenic	1.0 ug/g dry	3.2	2.9	19.2	3.2
Barium	1.0 ug/g dry	287	274	339	102
Beryllium	0.5 ug/g dry	1.0	1.0	0.7	0.5
Boron	5.0 ug/g dry	10.8	11.1	8.9	7.2
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	50.7	46.8	20.4	33.5
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	15.1	13.4	8.5	7.6
Copper	5.0 ug/g dry	27.8	25.0	126	20.7
Lead	1.0 ug/g dry	13.4	13.0	551	25.6
Mercury	0.1 ug/g dry	<0.1 [2]	<0.1 [2]	0.3 [2]	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	2.9	<1.0
Nickel	5.0 ug/g dry	31.9	29.4	39.0	24.1
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	65.7	61.0	26.4	51.1
Zinc	20.0 ug/g dry	77.6	70.4	322	61.0

Semi-Volatiles

Acenaphthene	0.02 ug/g dry	<0.02	-	-	-
Acenaphthylene	0.02 ug/g dry	0.02	-	-	-
Anthracene	0.02 ug/g dry	0.10	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.41	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.29	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.48	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.18	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.27	-	-	-
Chrysene	0.02 ug/g dry	0.31	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.06	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27114
Report Date: 17-Sep-2019
Order Date: 9-Sep-2019
Project Description: PE4276

	Client ID:	BH7-SS3	BH8-SS2	BH10-SS3	Dup
	Sample Date:	14-Aug-19 09:00	14-Aug-19 09:00	14-Aug-19 09:00	13-Aug-19 09:00
	Sample ID:	1937095-05	1937095-06	1937095-07	1937095-08
	MDL/Units	Soil	Soil	Soil	Soil
Fluoranthene	0.02 ug/g dry	0.82	-	-	-
Fluorene	0.02 ug/g dry	<0.02	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.19	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	-	-	-
Naphthalene	0.01 ug/g dry	<0.01	-	-	-
Phenanthrene	0.02 ug/g dry	0.24	-	-	-
Pyrene	0.02 ug/g dry	0.66	-	-	-
2-Fluorobiphenyl	Surrogate	54.9%	-	-	-
Terphenyl-d14	Surrogate	91.2%	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27114

Report Date: 17-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4276

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	0.872		ug/g		65.4	50-140			
Surrogate: Terphenyl-d14	1.33		ug/g		100	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 27114

Report Date: 17-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4276

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.51	0.05	pH Units	7.46			0.7	2.3	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	3.0	1.0	ug/g dry	2.7			11.5	30	
Barium	196	1.0	ug/g dry	201			2.2	30	
Beryllium	1.0	0.5	ug/g dry	0.8			17.0	30	
Boron	13.3	5.0	ug/g dry	12.7			4.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	38.3	5.0	ug/g dry	38.8			1.3	30	
Cobalt	10.9	1.0	ug/g dry	10.7			1.7	30	
Copper	22.3	5.0	ug/g dry	21.9			1.7	30	
Lead	23.1	1.0	ug/g dry	20.2			13.3	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	25.2	5.0	ug/g dry	24.6			2.2	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	47.2	10.0	ug/g dry	48.4			2.4	30	
Zinc	74.7	20.0	ug/g dry	68.2			9.1	30	
Physical Characteristics									
% Solids	95.3	0.1	% by Wt.	95.1			0.2	25	
Semi-Volatiles									
Acenaphthylene	0.174	0.02	ug/g dry	0.208			18.2	40	QR-04
Anthracene	0.225	0.02	ug/g dry	0.461			69.0	40	QR-04 QR-04
Benzo [a] anthracene	0.587	0.02	ug/g dry	1.10			61.1	40	QR-04 QR-04
Benzo [a] pyrene	0.506	0.02	ug/g dry	0.904			56.5	40	QR-04 QR-04
Benzo [b] fluoranthene	0.897	0.02	ug/g dry	1.53			52.3	40	QR-04 QR-04
Benzo [g,h,i] perylene	0.462	0.02	ug/g dry	0.731			45.1	40	QR-04 QR-04
Benzo [k] fluoranthene	0.516	0.02	ug/g dry	0.890			53.3	40	QR-04 QR-04
Chrysene	0.600	0.02	ug/g dry	1.22			68.4	40	QR-04 QR-04
Dibenzo [a,h] anthracene	0.118	0.02	ug/g dry	0.190			46.8	40	QR-04 QR-04
Indeno [1,2,3-cd] pyrene	0.418	0.02	ug/g dry	0.696			49.8	40	QR-04 QR-04
1-Methylnaphthalene	0.043	0.02	ug/g dry	0.056			25.6	40	QR-04
2-Methylnaphthalene	0.061	0.02	ug/g dry	0.081			27.9	40	QR-04
Naphthalene	0.064	0.01	ug/g dry	0.107			50.4	40	QR-04
Phenanthrene	0.643	0.02	ug/g dry	1.80			94.5	40	QR-04
Pyrene	1.05	0.02	ug/g dry	2.03			63.3	40	QR-04
Surrogate: 2-Fluorobiphenyl	0.959		ug/g dry		65.2	50-140			QR-04
Surrogate: Terphenyl-d14	1.33		ug/g dry		90.4	50-140			QR-04

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27114

Report Date: 17-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4276

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	46.0		ug/L	ND	92.0	70-130			
Arsenic	47.2		ug/L	1.1	92.2	70-130			
Barium	128		ug/L	80.2	96.0	70-130			
Beryllium	49.7		ug/L	ND	98.6	70-130			
Boron	47.0		ug/L	5.1	83.9	70-130			
Cadmium	43.2		ug/L	ND	86.4	70-130			
Chromium (VI)	4.4	0.2	ug/g		89.0	70-130			
Chromium	63.5		ug/L	15.5	95.9	70-130			
Cobalt	52.7		ug/L	4.3	96.9	70-130			
Copper	54.5		ug/L	8.8	91.5	70-130			
Lead	53.0		ug/L	8.1	89.8	70-130			
Mercury	1.85	0.1	ug/g	ND	123	70-130			
Molybdenum	42.6		ug/L	ND	85.0	70-130			
Nickel	56.4		ug/L	9.8	93.1	70-130			
Selenium	44.2		ug/L	ND	88.1	70-130			
Silver	44.4		ug/L	ND	88.7	70-130			
Thallium	46.3		ug/L	ND	92.3	70-130			
Uranium	47.3		ug/L	ND	94.2	70-130			
Vanadium	66.2		ug/L	19.4	93.7	70-130			
Zinc	71.2		ug/L	27.3	87.8	70-130			
Semi-Volatiles									
Acenaphthene	0.126	0.02	ug/g		75.9	50-140			
Acenaphthylene	0.117	0.02	ug/g		70.0	50-140			
Anthracene	0.113	0.02	ug/g		68.0	50-140			
Benzo [a] anthracene	0.131	0.02	ug/g		78.3	50-140			
Benzo [a] pyrene	0.116	0.02	ug/g		69.3	50-140			
Benzo [b] fluoranthene	0.195	0.02	ug/g		117	50-140			
Benzo [g,h,i] perylene	0.127	0.02	ug/g		76.2	50-140			
Benzo [k] fluoranthene	0.182	0.02	ug/g		109	50-140			
Chrysene	0.136	0.02	ug/g		81.8	50-140			
Dibenzo [a,h] anthracene	0.137	0.02	ug/g		82.5	50-140			
Fluoranthene	0.122	0.02	ug/g		73.2	50-140			
Fluorene	0.128	0.02	ug/g		76.8	50-140			
Indeno [1,2,3-cd] pyrene	0.120	0.02	ug/g		71.7	50-140			
1-Methylnaphthalene	0.109	0.02	ug/g		65.1	50-140			
2-Methylnaphthalene	0.174	0.02	ug/g	0.081	50.4	50-140			
Naphthalene	0.221	0.01	ug/g	0.107	61.8	50-140			
Phenanthrene	0.095	0.02	ug/g		56.8	50-140			
Pyrene	0.121	0.02	ug/g		72.7	50-140			
Surrogate: 2-Fluorobiphenyl	0.887		ug/g		60.3	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27114

Report Date: 17-Sep-2019
Order Date: 9-Sep-2019
Project Description: PE4276

Qualifier Notes:

Sample Qualifiers :

- 1 : Elevated detection limit due to dilution required because of high target analyte concentration.
- 2 : Holding time had been exceeded upon receipt of the sample at the laboratory.
- 3 : This analysis was conducted after the accepted holding time had been exceeded.

QC Qualifiers :

QR-04 : Duplicate results exceeds RPD limits due to non-homogeneous matrix.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 This report includes an updated parameter list.

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.



Chain of Custody
(Lab Use Only)
No 123182

Page 1 of 1

Date Required: _____

Email Address: mdaarcy@patersongroup.ca

☐ Other

Required Analyses

1937095

Comments:

Method of Delivery:

[pH Verified] ☐ By:

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 27696
Project: PE4276
Custody: 123223

Report Date: 24-Sep-2019
Order Date: 18-Sep-2019

Order #: 1938428

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1938428-01	BH7-19-GW1
1938428-02	Dup

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	24-Sep-19	24-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	20-Sep-19	21-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	20-Sep-19	23-Sep-19
REG 153: Mercury by CVAA	EPA 245.2 - Cold Vapour AA	24-Sep-19	24-Sep-19
REG 153: Metals by ICP/MS, water	EPA 200.8, ICP-MS	20-Sep-19	20-Sep-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	20-Sep-19	21-Sep-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	20-Sep-19	22-Sep-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Client ID:	BH7-19-GW1	Dup	-	-
Sample Date:	17-Sep-19 13:00	17-Sep-19 13:00	-	-
Sample ID:	1938428-01	1938428-02	-	-
MDL/Units	Water	Water	-	-

Metals

Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.5 ug/L	<0.5	-	-	-
Arsenic	1.0 ug/L	<1.0	-	-	-
Barium	1.0 ug/L	366	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-
Boron	10.0 ug/L	189	-	-	-
Cadmium	0.2 ug/L	<0.2	-	-	-
Chromium	1.0 ug/L	<1.0	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.5 ug/L	2.5	-	-	-
Copper	0.5 ug/L	0.8	-	-	-
Lead	0.2 ug/L	<0.2	-	-	-
Molybdenum	0.5 ug/L	11.4	-	-	-
Nickel	1.0 ug/L	10.1	-	-	-
Selenium	1.0 ug/L	6.3	-	-	-
Silver	0.2 ug/L	<0.2	-	-	-
Sodium	200 ug/L	1420000	-	-	-
Thallium	0.5 ug/L	<0.5	-	-	-
Uranium	0.2 ug/L	7.7	-	-	-
Vanadium	0.5 ug/L	<0.5	-	-	-
Zinc	5.0 ug/L	<5.0	-	-	-

Volatiles

Acetone	5.0 ug/L	850	751	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

	Client ID: Sample Date: Sample ID:	BH7-19-GW1 17-Sep-19 13:00 1938428-01 Water	Dup 17-Sep-19 13:00 1938428-02 Water	-	-
	MDL/Units			-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	108%	103%	-	-
Dibromofluoromethane	Surrogate	92.0%	82.4%	-	-
Toluene-d8	Surrogate	89.3%	88.9%	-	-

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

	Client ID:	BH7-19-GW1	Dup	-	-
	Sample Date:	17-Sep-19 13:00	17-Sep-19 13:00	-	-
	Sample ID:	1938428-01	1938428-02	-	-
	MDL/Units	Water	Water	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Semi-Volatiles

Acenaphthene	0.05 ug/L	<0.05	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-
Anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	-	-
Chrysene	0.05 ug/L	<0.05	-	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-
Fluoranthene	0.01 ug/L	<0.01	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	-
Naphthalene	0.05 ug/L	<0.05	-	-	-
Phenanthrene	0.05 ug/L	<0.05	-	-	-
Pyrene	0.01 ug/L	<0.01	-	-	-
2-Fluorobiphenyl	Surrogate	101%	-	-	-
Terphenyl-d14	Surrogate	101%	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1.0	ug/L						
Barium	ND	1.0	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10.0	ug/L						
Cadmium	ND	0.2	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1.0	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.2	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1.0	ug/L						
Selenium	ND	1.0	ug/L						
Silver	ND	0.2	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.5	ug/L						
Uranium	ND	0.2	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5.0	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	20.5		ug/L		102	50-140			
Surrogate: Terphenyl-d14	22.9		ug/L		114	50-140			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	93.9		ug/L		117	50-140			
Surrogate: Dibromofluoromethane	77.4		ug/L		96.8	50-140			
Surrogate: Toluene-d8	75.1		ug/L		93.8	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27696

Report Date: 24-Sep-2019
Order Date: 18-Sep-2019
Project Description: PE4276

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1.0	ug/L	ND			0.0	20	
Barium	210	10.0	ug/L	209			0.5	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	24.5	10.0	ug/L	23.9			2.3	20	
Cadmium	ND	0.2	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND			0.0	20	
Chromium	ND	1.0	ug/L	ND			0.0	20	
Cobalt	1.5	0.5	ug/L	1.5			1.9	20	
Copper	ND	0.5	ug/L	ND			0.0	20	
Lead	ND	0.2	ug/L	ND			0.0	20	
Molybdenum	0.6	0.5	ug/L	ND			0.0	20	
Nickel	1.6	1.0	ug/L	1.6			1.7	20	
Selenium	ND	1.0	ug/L	ND			0.0	20	
Silver	ND	0.2	ug/L	ND			0.0	20	
Sodium	62200	2000	ug/L	61500			1.1	20	
Thallium	ND	0.5	ug/L	ND			0.0	20	
Uranium	2.5	0.2	ug/L	2.5			1.5	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	ND	5.0	ug/L	ND			0.0	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	83.5		ug/L		104	50-140			
Surrogate: Dibromofluoromethane	70.0		ug/L		87.5	50-140			
Surrogate: Toluene-d8	71.7		ug/L		89.7	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1550	25	ug/L		77.6	68-117			
F2 PHCs (C10-C16)	1330	100	ug/L		83.2	60-140			
F3 PHCs (C16-C34)	3770	100	ug/L		96.3	60-140			
F4 PHCs (C34-C50)	3180	100	ug/L		128	60-140			
Metals									
Mercury	3.03	0.1	ug/L	ND	101	70-130			
Antimony	41.4	0.5	ug/L	ND	82.7	70-130			
Arsenic	58.9	1.0	ug/L	ND	118	70-130			
Barium	235	1.0	ug/L	209	50.6	70-130			QM-4X
Beryllium	55.9	0.5	ug/L	ND	112	70-130			
Boron	74.1	10.0	ug/L	23.9	100	70-130			
Cadmium	46.5	0.2	ug/L	ND	92.9	70-130			
Chromium (VI)	195	10	ug/L	ND	97.5	70-130			
Chromium	48.3	1.0	ug/L	ND	96.6	70-130			
Cobalt	46.8	0.5	ug/L	1.5	90.7	70-130			
Copper	44.6	0.5	ug/L	ND	89.2	70-130			
Lead	51.1	0.2	ug/L	ND	102	70-130			
Molybdenum	47.8	0.5	ug/L	ND	95.6	70-130			
Nickel	46.7	1.0	ug/L	1.6	90.3	70-130			
Selenium	56.9	1.0	ug/L	ND	114	70-130			
Silver	39.2	0.2	ug/L	ND	78.5	70-130			
Sodium	908	200	ug/L		90.8	80-120			
Thallium	51.9	0.5	ug/L	ND	104	70-130			
Uranium	50.1	0.2	ug/L	2.5	95.2	70-130			
Vanadium	49.9	0.5	ug/L	ND	99.9	70-130			
Zinc	47.6	5.0	ug/L	ND	95.3	70-130			
Semi-Volatiles									
Acenaphthene	3.26	0.05	ug/L		65.2	50-140			
Acenaphthylene	3.12	0.05	ug/L		62.3	50-140			
Anthracene	4.14	0.01	ug/L		82.8	50-140			
Benzo [a] anthracene	3.85	0.01	ug/L		77.1	50-140			
Benzo [a] pyrene	4.62	0.01	ug/L		92.4	50-140			
Benzo [b] fluoranthene	3.97	0.05	ug/L		79.4	50-140			
Benzo [g,h,i] perylene	4.71	0.05	ug/L		94.1	50-140			
Benzo [k] fluoranthene	4.58	0.05	ug/L		91.6	50-140			
Chrysene	5.34	0.05	ug/L		107	50-140			
Dibenzo [a,h] anthracene	3.90	0.05	ug/L		78.0	50-140			
Fluoranthene	4.41	0.01	ug/L		88.2	50-140			
Fluorene	3.72	0.05	ug/L		74.4	50-140			
Indeno [1,2,3-cd] pyrene	4.29	0.05	ug/L		85.8	50-140			
1-Methylnaphthalene	4.61	0.05	ug/L		92.2	50-140			
2-Methylnaphthalene	4.82	0.05	ug/L		96.5	50-140			
Naphthalene	4.65	0.05	ug/L		92.9	50-140			
Phenanthrene	3.92	0.05	ug/L		78.4	50-140			
Pyrene	5.11	0.01	ug/L		102	50-140			
Surrogate: 2-Fluorobiphenyl	18.2		ug/L		91.0	50-140			
Volatiles									
Acetone	60.9	5.0	ug/L		60.9	50-140			
Benzene	35.1	0.5	ug/L		87.8	60-130			
Bromodichloromethane	30.4	0.5	ug/L		76.1	60-130			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	35.0	0.5	ug/L		87.6	60-130			
Bromomethane	29.5	0.5	ug/L		73.8	50-140			
Carbon Tetrachloride	31.5	0.2	ug/L		78.7	60-130			
Chlorobenzene	35.2	0.5	ug/L		88.0	60-130			
Chloroform	36.8	0.5	ug/L		92.1	60-130			
Dibromochloromethane	30.4	0.5	ug/L		76.0	60-130			
Dichlorodifluoromethane	36.8	1.0	ug/L		92.0	50-140			
1,2-Dichlorobenzene	31.6	0.5	ug/L		78.9	60-130			
1,3-Dichlorobenzene	31.3	0.5	ug/L		78.4	60-130			
1,4-Dichlorobenzene	33.3	0.5	ug/L		83.2	60-130			
1,1-Dichloroethane	39.4	0.5	ug/L		98.6	60-130			
1,2-Dichloroethane	32.9	0.5	ug/L		82.2	60-130			
1,1-Dichloroethylene	36.9	0.5	ug/L		92.2	60-130			
cis-1,2-Dichloroethylene	37.8	0.5	ug/L		94.4	60-130			
trans-1,2-Dichloroethylene	39.2	0.5	ug/L		98.0	60-130			
1,2-Dichloropropane	35.4	0.5	ug/L		88.6	60-130			
cis-1,3-Dichloropropylene	29.6	0.5	ug/L		74.0	60-130			
trans-1,3-Dichloropropylene	30.8	0.5	ug/L		77.0	60-130			
Ethylbenzene	32.0	0.5	ug/L		80.0	60-130			
Ethylene dibromide (dibromoethane)	33.2	0.2	ug/L		83.0	60-130			
Hexane	32.4	1.0	ug/L		81.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	103	5.0	ug/L		103	50-140			
Methyl Isobutyl Ketone	86.5	5.0	ug/L		86.5	50-140			
Methyl tert-butyl ether	79.6	2.0	ug/L		79.6	50-140			
Methylene Chloride	39.0	5.0	ug/L		97.4	60-130			
Styrene	32.0	0.5	ug/L		79.9	60-130			
1,1,1,2-Tetrachloroethane	33.0	0.5	ug/L		82.5	60-130			
1,1,2,2-Tetrachloroethane	45.0	0.5	ug/L		113	60-130			
Tetrachloroethylene	33.2	0.5	ug/L		83.1	60-130			
Toluene	33.6	0.5	ug/L		84.1	60-130			
1,1,1-Trichloroethane	30.6	0.5	ug/L		76.6	60-130			
1,1,2-Trichloroethane	36.3	0.5	ug/L		90.6	60-130			
Trichloroethylene	30.0	0.5	ug/L		75.0	60-130			
Trichlorofluoromethane	28.4	1.0	ug/L		70.9	60-130			
Vinyl chloride	32.9	0.5	ug/L		82.2	50-140			
m,p-Xylenes	70.7	0.5	ug/L		88.4	60-130			
o-Xylene	33.5	0.5	ug/L		83.8	60-130			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27696

Report Date: 24-Sep-2019

Order Date: 18-Sep-2019

Project Description: PE4276

Qualifier Notes:

QC Qualifiers :

QM-4X : The spike recovery was outside of QC acceptance limits due to elevated analyte concentration.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

10:49a