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Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

patersongroup

Phase II Environmental Site Assessment

1619 Carling Avenue
Ottawa, Ontario

Prepared For

Surface Developments

November 26, 2020

Report: PE4987-3

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed 1619 Carling Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern (APECs) that were identified on the Phase II Property during the Phase I ESA.

The Phase II ESA consisted of drilling four (4) boreholes on the Phase II Property, all of which were constructed with groundwater monitoring well installations.

The soil profile encountered generally consisted of a layer of granular fill, consisting of silty sand and crushed stone/gravel, underlain by limestone bedrock at depths ranging from 1.42-1.65 mbgs. The boreholes were cored in bedrock, where they were terminated at 5.5 to 5.69mbgs. Soil samples were obtained from the boreholes and screened using vapour measurements along with visual and olfactory observations. No staining or unusual odours were noted during the subsurface investigation.

Based on the screening results in combination with sample depth and location, three (3) soil samples were submitted for BETX and PHC (fractions 1 to 4) analyses. All but one soil sample (BH1-AU1) complied with the MECP Table 7 Residential Standards.

Groundwater samples were recovered from the monitoring wells installed in BH1 through BH4. A slight sheen was observed the during the groundwater sampling event at BH2. The groundwater samples were submitted for BTEX/VOCs and and PHC (F1-F4) analyses. Benzene and PHCs (F2-F3) concentrations in excess of the selected MECP Table 7 Standards were identified in the groundwater samples from BH2 and BH3, along the eastern side of the Phase II Property.

Recommendations

Soil

Based on the findings of the analytical results, fill material impacted and with PHC-F3 concentration in excess of the selected MECP Table 7 Standards is present on the southwestern portion of the Phase II Property. Concentrations of PHCs (F3 and F4) also at BH1-AU1 exceed the MECP Table 1 Standards.

It is our understanding that the subject site is to be redeveloped with a multi-storey residential building with two (2) levels of underground parking.

It is our recommendation that an environmental site remediation program, involving the removal of all impacted fill material, be completed concurrently with the site redevelopment. Prior to offsite disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater

The benzene concentrations identified in groundwater samples BH2-GW1 and BH3-GW1 as well as the PHC (F2 and F3) in BH2-GW1 were in excess of the MECP Table 7 Standards. Based on the groundwater data, the impacted groundwater appears to be predominantly along the eastern portion of the subject site. The groundwater was identified within the upper portion of the bedrock at depths ranging from 1.7 to 2.7m.

Until the site is redeveloped, it is recommended that an annual groundwater testing program be implemented to monitor the contaminant concentrations (and any degradation trends).

It is our understanding that the subject site is to be redeveloped with three (3) levels underground. Based on the depth of the impacted groundwater, which is suspected to reside above 6m, the groundwater below the base of the excavation is not anticipated to be impacted with petroleum hydrocarbon concentrations.

The impacted groundwater on site and any such water entering the future excavations will have to be removed from site by a licensed pumping contractor or treated on site by means of a portable granular activated carbon system. This system would have to remain on site until groundwater concentrations comply with the MECP standards and/or the city of Ottawa sewer use criteria.

Given that the source of the impacted groundwater may be off-site to the east, it will be necessary to prevent further migration of this waste onto the site in order to comply with MECP standards and be able to acquire a record of site condition. To accomplish this, it is recommended that the perimeter rock walls of the excavation be covered with an impermeable elastomeric coating and the base of the excavation will be covered with a waterproofing membrane. To facilitate the placement of the membrane, a reinforced concrete slab will be constructed along the entire excavation bottom. The concrete base slab may be anchored to the bedrock and the foundation walls will be structurally reinforced to address hydrostatic pressure.

It is recommended that an annual groundwater testing program be implemented to monitor the contaminant concentrations (and any degradation trends).

Monitoring Wells

It is recommended that all monitoring wells be maintained (not abandoned) in order to allow for potential future groundwater monitoring. If the monitoring wells are to be abandoned, it should be done according to the O.Reg 903. The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Surface Developments, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for the property addressed 1619 Carling Avenue, in the City of Ottawa, Ontario, herein referred to as the Phase II Property. The purpose of this Phase II ESA was to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson.

1.1 Site Description

Address:	1619 Carling Avenue, in Ottawa Ontario.
Location:	The Phase I Property is located on the north side of Carling Avenue approximately 40m west of Churchill Avenue North, in the City of Ottawa, Ontario Refer to Figure 1 - Key Plan in the Figures section following the text.
Legal Description:	Part of Lot 30, Concession 1 Ottawa River, Nepean, now in the City of Ottawa, Ontario.
Latitude and Longitude:	45° 22' 50" N, 75° 44' 52" W
Zoning:	AM10 – Mixed-Use Zone
Configuration:	Irregular
Site Area:	0.11 hectares (approximate)

1.2 Property Ownership

Paterson was retained to complete the Phase II-ESA by Mr. Jakub Ulak, of Surface Developments. The head office of Surface Developments is located at 88 Spadina Avenue, Ottawa, Ontario. Mr. Ulak can be reached by telephone at (613) 255-5065.

1.3 Current and Proposed Future Uses

The Phase II Property is occupied by a 2-storey commercial building, currently used for commercial retail purposes.

It is our understanding that the proposed development for the Phase II Property includes a residential high-rise condominium building with the ground level used for commercial purposes. The footprint of the development will cover the majority of the of the site and it will be serviced by the municipality.

Due to the change in land use to more sensitive land use (commercial to residential), a Record of Site Condition (RSC) will be required for the Phase I/Phase II ESA Property.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 7 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 7 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Generic site conditions for shallow soils
- Non-Potable groundwater conditions
- Residential land use

Section 38 of O.Reg. 153/04 does not apply to the Phase II Property in that the property relies upon municipal water.

Section 41 of O.Reg. 153/04 does not apply to the Phase II Property, as the property is not within 30m of an environmentally sensitive area.

Section 43.1 of the Regulation does apply to the Phase II Property as it is a shallow soil property.

The proposed use of the Phase II ESA property is residential; therefore, the Residential Standards are selected for the purpose of this Phase II ESA.

A comparison of the soil test data to the MECP Table 1 Standards was also conducted. The Table 1 Standards are considered to be indicative of typical

Ontario background concentrations and are commonly used to assess whether soil is clean for off-site disposal purposes.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is situated in a mixed-use area consisting mainly of commercial land use along Carling Avenue and residential on the adjacent streets.

The Phase II Property is occupied by a two-storey commercial retail building with an access laneway to the east of the building and paved parking on the north and south sides of the property.

Site drainage on the Phase II Property consists of sheet flow the catch basins on-site and along Carling Avenue. The site is relatively at the grade of the adjacent properties with the regional topography sloping downwards in a northerly direction.

2.2 Past Investigations

An environmental report, entitled *"Phase III – ESA and Groundwater Treatment Program, 1619 Carling Avenue, Ottawa, Ontario,"* prepared by A & A Consultants Inc. (A & A), dated July 30, 2018, was reviewed as part of this assessment.

An environmental report, entitled *"Phase III – ESA and Groundwater Treatment Program, 1619 Carling Avenue, Ottawa, Ontario,"* prepared by A & A Consultants Inc. (A&A), dated July 30, 2018, was reviewed as part of this assessment.

A&A reported that a Phase I-ESA was completed for the subject site by Golder Associates in 2001. According to the report, the subject building was formerly heated by means of an underground fuel oil tank situated on the northwest portion of the subject site. A subsequent Phase II-ESA was completed by Golder to assess the potential impact of the former UST. It was reported that groundwater was encountered in the bedrock. At that time, groundwater was observed to be impacted by heating oil. No reported soil impact was identified in the area of the former UST.

In 2002, a Phase III ESA and Groundwater Treatment Program was conducted on the subject site. The soil analytical data collected at the monitoring well locations did not indicate the presence of a significant contaminant source at the

subject site. The groundwater analytical data indicated that the groundwater contaminant concentrations in the monitoring wells at the east property boundary of the site were significantly higher than the concentrations detected in the monitoring wells at the west property boundary, as well as, at the location of the former UST. This, along with other documented evidence, suggested that the retail fuel outlet (Shell) located immediately east of the site was the source of contamination found along the east property boundary.

In 2017-2018, A & A conducted a Phase III ESA and Groundwater Treatment Program, during which six (6) monitoring wells were installed to address these concerns. A & A indicated that the groundwater flows in a westward direction.

Additional groundwater recovery and injection wells were installed on site for a pump and treat program and subsequent oxidant injection program were completed from March to June of 2018. Groundwater sampling in June 2018 indicated that the water complied with the MECP Table 7 Standards. It was recommended that further groundwater testing be completed to confirm the results of the testing program.

Based on test results provided, it appears that two (2) additional groundwater testing events were completed in November and December of 2018, when eight (8) and six (6) wells were tested, respectively. The test results were all reported as non-detect.

Regardless of the previous work conducted on the Phase I Property, it is our opinion that the retail fuel outlet immediately east currently represents an APEC on the Phase I Property.

A Phase I-ESA was conducted by Paterson in November of 2020 in general accordance with the Ontario Regulation (O.Reg.) 153/04, as amended. The Phase I ESA identified the following PCAs that generated APECs on the Phase I Property:

- PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks*" associated with a former UST situated on the north side of the subject building on the Phase I Property (APEC 1).
- PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks*" associated with the retail fuel outlet immediately east of the Phase I Property at 1607 Carling Avenue (APEC 2).

A Phase II ESA was recommended to address the aforementioned APECs on the Phase I Property.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on August 17, 2020, which consisted of drilling four (4) boreholes, all of which were instrumented with groundwater monitoring wells. The boreholes were drilled to depths ranging from 5.51 to 5.69 m below the ground surface (mbgs).

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing this media is based on the Contaminants of Potential Concern (CPCs) identified in the Phase I ESA. These CPCs include benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs) fractions F1-F4 in soil and/or groundwater.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

According to the Geological Survey of Canada website, the bedrock in the area of the Phase I Property is reported to consist of limestone interbedded with dolomite of the Gull River Formation. The overburden is reported to consist of plain till with a drift thickness of 1 to 3 m across the site.

Based on the previous environmental work conducted on-site, groundwater beneath the site is expected to flow in a westerly direction.

Existing Buildings and Structures

The Phase I Property is occupied by a 2-storey commercial building with two (2) tenants utilizing the space as a retailer of salon products and furniture. The second level is used for storage space by the furniture store. The building was constructed circa 1961 with a slab-on-grade foundation, finished in concrete blocks and a flat-tar and gravel style roof. The subject building is heated by natural gas fired furnaces and cooled by central air-conditioning units.

Drinking Water Wells

There are no domestic wells on-site.

Monitoring Water Wells

Six (6) groundwater monitoring wells were noted on-site at the time of the site visit. Three (3) monitoring wells were located on the eastern and western property boundaries.

Subsurface Structures and Utilities

The Phase I Property is serviced by natural gas, electricity, municipal water and sewer. A catch basin is situated on the northeastern corner of the property and drains to Churchill Avenue. All other services enter the Phase I Property from Carling Avenue.

Areas of Natural Significance and Water Bodies

No areas of natural significance or water bodies were identified within the Phase I Study Area.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area consists of commercial along Carling Avenue and residential on the adjacent streets.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, two (2) PCAs were considered to result in APECs on the Phase I Property. These APECs have been summarized in Table 1, along with their respective locations and contaminants of potential concern (CPCs) on the Phase I Property.

TABLE 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)

TABLE 1: Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	**Location of Area of Potential Environmental Concern**	**Potentially Contaminating Activity**	**Location of PCA (on-site or off-site)**	**Contaminants of Potential Concern**	**Media Potentially Impacted (Groundwater, Soil, and/or Sediment)**
APEC 1: Resulting from the former presence of a UST	Northwestern portion of the Phase I Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	On-site	BTEX PHCs	Soil and/or Groundwater
APEC 2: Resulting from the current retail fuel outlet	Entire Phase I Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	Off-site	BTEX PHCs	Soil and/or Groundwater

Contaminants of Potential Concern

As per the APECs identified in Table 1, the contaminants of potential concern (CPCs) in soil and/or groundwater include:

- ❒ Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX).
- ❒ Petroleum hydrocarbons (PHCs, Fractions F1-F_4).

The CPCs are expected to be present in the soil and/or groundwater of the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I-ESA is considered to be sufficient to conclude that there are PCAs that have resulted in APECs on the Phase I Property.

A variety of independent sources were consulted as part of this assessment, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report.

3.5 Impediments

No physical impediments were encountered during the Phase II ESA program, aside form the underground utilities along the eastern portion of the property as well as on the southeastern corner.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on August 17, 2020. The field program consisted of drilling four (4) boreholes across the Phase II Property to address the APECs.

The boreholes were drilled to a maximum depth of 5.69 mbgs. All four (4) boreholes were completed as groundwater monitoring wells to access the groundwater table. All boreholes were completed using a track mounted drill rig provided by Downing Drilling Ltd. of Hawksbury, Ontario, under the full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4987-4 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of eight (8) soil samples were obtained from the boreholes by means of grab sampling from auger flights and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**G**" and "**SS**" on the Soil Profile and Test Data Sheets appended to this report.

The soil profile encountered generally consisted of a layer of asphaltic concrete, followed by a granular fill layer of silty sand and crushed stone/gravel, underlain by limestone bedrock. The boreholes were terminated in bedrock at depths ranging from 5.51 to 5.69 mbgs.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a MiniRAE 2000 Portable VOC Monitor.

The technical protocol was obtained from Appendix C of the MECP document entitled “Interim Guidelines for the Remediation of Petroleum Contamination at Operating Retail and Private Fuel Outlets in Ontario”, dated March 1992.

Soil samples recovered at the time of sampling were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to ambient temperature prior to conducting the vapour survey. Allowing the samples to stabilize to ambient temperature ensures consistency of readings between samples.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated/manipulated gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement.

The vapour readings were found to be less than 1.0 ppm in all of the soil samples. No obvious visual or olfactory indications of potential environmental contaminants were identified in the soil samples. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Soil samples were selected based on a combination of the results of the vapour screening, visual and olfactory screening, sample depth and/or sample location.

4.4 Groundwater Monitoring Well Installation

Four (4) groundwater monitoring wells were installed on the Phase II Property as part of the subsurface investigation in August of 2020. The monitoring wells consisted of 35 mm diameter, Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1. A summary of the monitoring well construction details is provided below in Table 2.

TABLE 2: 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
BH1	100.24	5.64	2.64-5.64	2.20-5.64	0.15-2.20	Flushmount
BH2	100.09	5.69	2.38-5.38	2.00-5.38	0.15-2.00	Flushmount
BH3	100.15	5.51	2.51-5.51	2.15-5.51	0.15-2.15	Flushmount
BH4	100.18	5.54	2.54-5.54	2.20-5.54	0.15-2.20	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater samples were collected on August 25 and November 17, 2020. The water levels were the only parameter measured in the field during the sampling event.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling.

Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan in Appendix 1, the soil and groundwater samples submitted for analytical testing are presented in Tables 3 and 4.

TABLE 3: Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth (m) and Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX	PHCs (F1-F4)	
August 17, 2020				
BH1-AU1	0-0.76 Fill	X	X	Assess the potential soil impact.
BH2-SS2	0.76-1.52 Fill	X	X	Assess the potential soil impact.
BH3-SS2	0.76-1.52 Fill	X	X	Assess the potential soil impact.

A soil sample from BH4 could not be analyzed due to the limited recovery and coarse nature of the material (gravel and crushed stones).

TABLE 4: Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Interval (m) and Stratigraphy Unit	Parameters Analyzed			Rationale
		BTEX	PHCs (F1-F4)	VOCs	
August 25, 2020					
BH1-GW1	2.64-5.64 Bedrock	X	X	X	Assess the potential groundwater impact.
BH2-GW2	2.38-5.38 Bedrock	X	X	X	Assess the potential groundwater impact.
BH3-GW1	2.51-5.51 Bedrock	X	X	X	Assess the potential groundwater impact.
BH4-GW1	2.54-5.54 Bedrock	X	X	X	Assess the potential groundwater impact.
November 17, 2020					
BH2-GW2	2.38-5.38 Bedrock	X	X		Assess the potential groundwater impact.
MW12-GW (DUP)*	2.38-5.38 Bedrock	X	X		Duplicate sample for QA/QC purposes.

Note:
* only PHC-F1 analyzed

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.

4.8 Residue Management

All soil cuttings, purge water and fluids from equipment cleaning were retained on-site.

4.9 Elevation Surveying

The borehole locations were selected by Paterson for coverage to assess the potential impact on-site. The borehole elevations were surveyed to the top of the grate of the catch basins location on the northeast corner of the site, which was assigned an arbitrary elevation of 100 m .

The locations and elevations of the boreholes are presented on Drawing PE4987-4 – Test Hole Location Plan, appended to this report.

4.10 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils generally generally consisted of a paved asphaltic concrete structure overlying a layer of a granular fill underlain by limestone bedrock, which was encountered at depths ranging from 1.42 to 1.65 m below the ground surface (mbgs). The boreholes were cored and terminated in bedrock at depths of approximately 5.51 to 5.69 mbgs.

Groundwater was encountered in bedrock at depths ranging from approximately of 1.71 to 3.0 mbgs. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations. Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling events on August 25, 2020 and November 17, 2020 using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	100.24	2.23	98.01	August 25, 2020
BH2	100.09	2.69	97.40	August 25, 2020
BH3	100.15	2.06	98.09	August 25, 2020
BH4	100.18	2.24	97.94	August 25, 2020
BH1	100.24	2.71	97.53	November 17, 2020
BH2	100.09	3.00	97.09	November 17, 2020
BH3	100.15	2.45	97.70	November 17, 2020
BH4	100.18	2.24	97.94	November 17, 2020

Based on the most recent groundwater sampling event, a groundwater contour plan was completed. The groundwater contour mapping is shown on Drawing

PE4987-4 – Groundwater Contour Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property is in a southerly direction. A horizontal hydraulic gradient of approximately 0.03 m/m was calculated.

5.3 Fine-Course Soil Texture

No grain size analysis was completed for the subject site. Coarse grained standards were chosen as a conservative approach.

5.4 Soil: Field Screening

Field screening of the soil samples collected resulted in vapour readings less than 1.0 ppm.

No staining was observed in the granular fill material during the field program. A slight odour was noted at BH2 during the coring of bedrock. Soil samples were selected based on a combination of the results of the vapour screening, visual and olfactory screening, sample depth and/or sample location. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets, appended to this report.

5.5 Soil Quality

Three (3) soil samples were submitted for BTEX and PHCs (F1-F4). The results of the analytical testing are summarized in Table 6 along with the selected MECP Table 7 Standards. The laboratory certificate of analysis is included in Appendix 1 of this report.

TABLE 6: Analytical Test Results
Soil – BTEX and PHCs F_1-F_4

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 17, 2020			MECP Table 7 Residential Standards (µg/g)
		BH1-AU1	BH2-SS2	BH3-SS2	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	3.1
PHC F_1	7	nd	nd	nd	55
PHC F_2	4	nd	nd	nd	98
PHC F_3	8	**(311)**	27	nd	300
PHC F_4	6	(701)	37	nd	2800
PHC F_4 (gravimetric)	50	(938)	n/a	n/a	2800

TABLE 6: Analytical Test Results Soil – BTEX and PHCs F_1-F_4					
Parameter	**MDL (µg/g)**	**Soil Samples (µg/g) August 17, 2020**			**MECP Table 7 Residential Standards (µg/g)**
		BH1-AU1	**BH2-SS2**	**BH3-SS2**	
Notes: ▪ MDL – Method Detection Limit ▪ nd – not detected above the MDL ▪ 1 - GC-FID signal did not return to baseline by C50 ▪ **Bold and Underlined** – value exceeds selected standard ▪ (-) – value exceeds Table 1 Standards					

No detectable BTEX or F1 of F2 concentrations were identified in the soil samples analyzed. The detected PHCs (F3 and F4) concentrations identified in the analysed soil samples BH1-AU1 and BH2-SS2 comply with the MECP Table 7 standards with the exception of the F3 concentration in sample BH1-AU1. The concentrations of PHCs (F3 and F4) in BH1-AU1 exceed the MECP Table 1 Standards and will require disposal at an accredited waste disposal facility during development.

The analytical results of the soil samples analyzed with respect to borehole locations are shown on Drawing PE4987-5- Analytical Testing Plan – Soil.

The maximum concentrations of analyzed parameters in the groundwater beneath the site are summarized in Table 7.

TABLE 7: Maximum Concentrations – Soil			
Parameter	**Maximum Concentration (µg/g)**	**Soil Sample**	**Interval (m BGS)**
PHC F_3	**(311)**	BH1-AU1	0-0.76m, Fill
PHC F_4	(701)	BH1-AU1	0-0.76m, Fill
PHC $F_{4\ Gravimetric}$	(938)	BH1-AU1	0-0.76m, Fill

The remaining parameters were not detected above the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples from each of the monitoring wells were submitted for VOCs and PHCs (F1-F4) during the August 25 and 26, 2020 sampling event.

An additional groundwater sample from BH2 was collected during the more recent sampling event and submitted for BTEX and PHCs (F1-F4) analyses.

The results of the analytical testing are presented in Table 8 along with the MECP Table 7 Standards. The laboratory certificates of analysis are included in Appendix 1 of this report.

TABLE 8: Analytical Test Results
Groundwater – BTEX and PHCs F_1 to F_4

Parameter	MDL (µg/L)	Water Samples (µg/L) August 25 and 26, 2020				MECP Table 7 Standards (µg/L)
		BH1-GW1	BH2-GW1	BH3-GW1	BH4-GW1	
Benzene	0.5	nd	**5.8**	**3.8**	nd	0.5
Ethylbenzene	0.5	nd	nd	0.5	1.7	54
Toluene	0.5	nd	nd	nd	nd	320
Xylenes	0.5	nd	1.5	0.6	1.4	72
PHC F_1	25	nd	84	41	nd	420
PHC F_2	100	nd	**1890**	nd	nd	150
PHC F_3	100	nd	**1690**	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected standard

TABLE 8 Continued: Analytical Test Results
Groundwater – BTEX and PHCs F_1 to F_4

Parameter	MDL (µg/L)	Water Samples (µg/L) November 17, 2020		MECP Table 7 Standards (µg/L)
		BH2-GW2	BH12-GW (DUP)	
Benzene	0.5	**3.8**	**4.2**	0.5
Ethylbenzene	0.5	nd	nd	54
Toluene	0.5	nd	nd	320
Xylenes	0.5	3.3	2.9	72
PHC F_1	25	238	81	420
PHC F_2	100	**2520**	N/A	150
PHC F_3	100	**1820**	N/A	500
PHC F_4	100	nd	N/A	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected standard

PHC concentrations were identified in two (2) of the groundwater samples analyzed during the August 2020 sampling event.

TABLE 9: Analytical Test Results - Groundwater – VOCs

Parameter	MDL (µg/L)	Water Samples (µg/L) August 25 and 26, 2020				MECP Table 7 Standards (µg/L)
		BH1-GW1	BH2-GW1	BH3-GW1	BH4-GW1	
Acetone	5.0	nd	nd	nd	nd	100000
Benzene	0.5	nd	**5.8**	**3.8**	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	67000
Bromoform	0.5	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	140
Chloroform	0.5	nd	nd	nd	nd	2
Dibromochloromethane	0.5	nd	nd	nd	nd	65000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	3500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	7600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	0.58
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	0.5	1.7	54
Ethylene dibromide	0.2	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	nd	nd	5
Methyl Ethyl Ketone (2-Butanone)	5.0	nd	nd	nd	nd	21000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	5200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	0.5
Toluene	0.5	nd	nd	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2000
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylenes, total	0.5	nd	1.5	0.6	1.4	72

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

Elevated VOCs and PHC (F2 and F3) concentrations were detected in BH2-GW1, as well as elevated benzene concentrations in BH2-GW1 and BH3-GW1.

An additional groundwater sample from BH2 was submitted as part of the November 2020 sampling event, as well as a duplicate sample from this borehole (BH12-GW). In both samples (BH2-GW2 and BH12-GW), benzene and PHCs F2 and F3 were in excess of the selected standards.

The analytical results in the groundwater with respect to borehole locations are shown on Drawing PE4987-6- Analytical Testing Plan – Groundwater.

The maximum concentrations of analyzed parameters in the groundwater beneath the site are summarized in Table 10.

TABLE 10: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Groundwater Sample	Screened Interval (m BGS)
Benzene	**4.2**	BH12-GW (DUP)	2.38-5.38
Xylenes	3.3	BH2-GW2	2.38-5.38
PHC F_1	238	BH2-GW2	2.38-5.38
PHC F_2	**2520**	BH2-GW2	2.38-5.38
PHC F_3	**1820**	BH2-GW2	2.38-5.38

The remaining parameters were not detected above the laboratory method detection limits.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the August and November 2020 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04, as amended, a Certificate of Analysis has been received for each sample submitted for analysis. The Certificates of Analysis are appended to this report.

A duplicate groundwater sample (BH12-GW) was obtained from BH2-GW2 and analyzed for BTEX and PHC-F1. Test results for the duplicate groundwater sample and RPD calculations are provided below in Table 11.

TABLE 11: QA/QC Results – Groundwater (Metals)				
Parameter	**BH3-20-GW1**	**DUP**	**RPD (%)**	**QA/QC Results**
Benzene	3.8	4.2	10	Within the acceptable range
Xylenes	3.3	2.9	13	Within the acceptable range
PHC-F1	238	81	98	Outside the acceptable range

The majority of the RPD results are within the acceptable range, with the exception of one parameter.

Based on the analytical laboratory results, it is our opinion that the overall quality of the field data collected during this Phase II-ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in general accordance with the requirements of O.Reg. 153/04, as amended. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in Section 2.2 of this report, PCAs were identified to result in APECs on the Phase II Property.

TABLE 12: Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	**Location of Area of Potential Environmental Concern**	**Potentially Contaminating Activity**	**Location of PCA (on-site or off-site)**	**Contaminants of Potential Concern**	**Media Potentially Impacted (Groundwater, Soil, and/or Sediment)**
APEC 1: Resulting from the former presence of a UST	Northwestern portion of the Phase II Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	On-site	BTEX PHCs	Soil and/or Groundwater
APEC 2: Resulting from the current retail fuel outlet	Entire Phase II Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	Off-site	BTEX PHCs	Soil and/or Groundwater

Contaminants of Potential Concern

Based on the APECs identified on the Phase II Property, the contaminants of potential concern (CPCs) are:

- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX).
- Petroleum hydrocarbons (PHCs, Fractions F_1-F_4).

Subsurface Structures and Utilities

The Phase II Property is serviced by natural gas, electricity, municipal water and sewer. A catch basin is situated in the northeastern corner of the property and drains to Churchill Avenue. All other services enter the Phase II Property from Carling Avenue.

Physical Setting

Site Stratigraphy

The site stratigraphy consists of:

- An asphaltic concrete paved layer is underlain by a layer Fill material consisting of silty sand with crushed stones and gravel was encountered in all of the boreholes, extending to depths ranging from 1.42 to 1.65 mbgs. Groundwater was not encountered in this layer.

- Limestone bedrock was encountered in all of the boreholes and terminated at depths ranging from 5.5 to 5.69 mbgs. Groundwater was encountered in this layer in all of the boreholes.

Hydrogeological Characteristics

Groundwater at the Phase II Property was generally encountered in the bedrock at depths of approximately 1.71 to 3.0 mbgs. Based on the most recent groundwater levels, groundwater flow was measured in a southerly direction with a hydraulic gradient of 0.03 m/m. Groundwater contours are shown on Drawing PE4987-4–Test Hole Location Plan.

Approximate Depth to Water Table

The depth to the water table at the subject site varies between approximately 1.71 to 3.0 mbgs.

Approximate Depth to Bedrock

Bedrock was encountered at depths ranging from 1.42 to 1.65 mbgs.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the subject property is not within 30m of an environmentally sensitive area.

Section 43.1 of the Regulation does apply to the Phase II Property as it is a shallow soil property.

Existing Buildings and Structures

The Phase II Property is occupied by a slab-on-grade, 2-storey commercial building with two (2) tenants utilizing the space as a retailer of salon products and furniture. The second level is used for storage space by the furniture store. The building was constructed circa 1961 and is finished in concrete blocks and a flat-tar and gravel style roof. The subject building is heated by natural gas fired furnaces and cooled by central air-conditioning units.

Proposed Buildings and Other Structures

The proposed development for the Phase II Property includes a residential high-rise condominium building with the ground level dedicated for commercial use. The footprint of the development will cover the majority of the site and it will be serviced by the municipality.

Due to the change in land use to more sensitive land use (commercial to residential), a Record of Site Condition (RSC) will be required for the Phase II ESA Property.

Drinking Water Wells

No potable water wells are present on the Phase II Property, as the subject site is municipally serviced.

Water Bodies and Areas of Natural Significance

No areas of natural significance or water bodies were identified within the study area.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical results, PHC-F3 impact was identified in the fill material on the southwestern corner of the Phase II Property. Benzene and PHCs (F2-F3) impacts were identified in the groundwater along the eastern portion of the Phase II Property. Soil and Groundwater analytical results are shown on Drawings PE4987-5 and PE4987-6, respectively.

Types of Contaminants

Based on the analytical results for soil and groundwater, the contaminants of concern on the Phase II Property are PHCs (F2-F3) and benzene.

Contaminated Media

Based on the findings of the Phase II ESA, the fill material is contaminated with PHC-F2 and groundwater is contaminated with PHCs (F2-F3) and benzene.

What Is Known About Areas Where Contaminants Are Present

It is our opinion that the impacted fill is specific to location BH1.

The groundwater impact along the eastern portion of the Phase II Property is considered likely to be a result of the RFO operating immediately east of the subject site.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, the distribution of contaminants appears to be localized along the eastern portion of the Phase II Property.

Discharge of Contaminants

Based on the findings of the Phase II ESA, the discharge of potential contaminants is identified in the groundwater and is considered likely to have occurred from the RFO located immediately east of the Phase II Property.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two (2) 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.

Potential for Vapour Intrusion

Based the depth of the water table, locate din the bedrock, and the slab-on-grade construction of the existing building, vapour intrusion is not considered to be a concern.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 1619 Carling Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern (APECs) that were identified on the Phase II Property during the Phase I ESA.

The Phase II ESA consisted of drilling four (4) boreholes on the Phase II Property, all of which were constructed with groundwater monitoring well installations.

The soil profile encountered generally consisted of a layer of granular fill, consisting of silty sand and crushed stone/gravel, underlain by limestone bedrock at depths ranging from 1.42-1.65 mbgs. The boreholes were cored in bedrock, where they were terminated at 5.5 to 5.69mbgs. Soil samples were obtained from the boreholes and screened using vapour measurements along with visual and olfactory observations. No staining or unusual odours were noted during the subsurface investigation.

Based on the screening results in combination with sample depth and location, three (3) soil samples were submitted for BETX and PHC (fractions 1 to 4) analyses. All but one soil sample (BH1-AU1) complied with the MECP Table 7 Residential Standards.

Groundwater samples were recovered from the monitoring wells installed in BH1 through BH4. A slight sheen was observed the during the groundwater sampling event at BH2. The groundwater samples were submitted for BTEX/VOCs and and PHC (F1-F4) analyses. Benzene and PHCs (F2-F3) concentrations in excess of the selected MECP Table 7 Standards were identified in the groundwater samples from BH2 and BH3, along the eastern side of the Phase II Property.

Recommendations

Soil

Based on the findings of the analytical results, fill material impacted and with PHC-F3 concentration in excess of the selected MECP Table 7 Standards is present on the southwestern portion of the Phase II Property. Concentrations of PHCs (F3 and F4) also at BH1-AU1 exceed the MECP Table 1 Standards.

It is our understanding that the subject site is to be redeveloped with a multi-storey residential building with two (2) levels of underground parking.

It is our recommendation that an environmental site remediation program, involving the removal of all impacted fill material, be completed concurrently with the site redevelopment. Prior to offsite disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater

The benzene concentrations identified in groundwater samples BH2-GW1 and BH3-GW1 as well as the PHC (F2 and F3) in BH2-GW1 were in excess of the MECP Table 7 Standards. Based on the groundwater data, the impacted groundwater appears to be predominantly along the eastern portion of the subject site. The groundwater was identified within the upper portion of the bedrock at depths ranging from 1.7 to 2.7m.

Until the site is redeveloped, it is recommended that an annual groundwater testing program be implemented to monitor the contaminant concentrations (and any degradation trends).

It is our understanding that the subject site is to be redeveloped with three (3) levels underground. Based on the depth of the impacted groundwater, which is suspected to reside above 6m, the groundwater below the base of the excavation is not anticipated to be impacted with petroleum hydrocarbon concentrations.

The impacted groundwater on site and any such water entering the future excavations will have to be removed from site by a licensed pumping contractor or treated on site by means of a portable granular activated carbon system. This system would have to remain on site until groundwater concentrations comply with the MECP standards and/or the city of Ottawa sewer use criteria.

Given that the source of the impacted groundwater may be off-site to the east, it will be necessary to prevent further migration of this waste onto the site in order to comply with MECP standards and be able to acquire a record of site condition. To accomplish this, it is recommended that the perimeter rock walls of the excavation be covered with an impermeable elastomeric coating and the base of the excavation will be covered with a waterproofing membrane. To facilitate the placement of the membrane, a reinforced concrete slab will be constructed along the entire excavation bottom. The concrete base slab may be anchored to the

bedrock and the foundation walls will be structurally reinforced to address hydrostatic pressure.

It is recommended that an annual groundwater testing program be implemented to monitor the contaminant concentrations (and any degradation trends).

Monitoring Wells

It is recommended that all monitoring wells be maintained (not abandoned) in order to allow for potential future groundwater monitoring. If the monitoring wells are to be abandoned, it should be done according to the O.Reg 903. The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04, as amended, and meets the requirements of CSA Z769-00. 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.

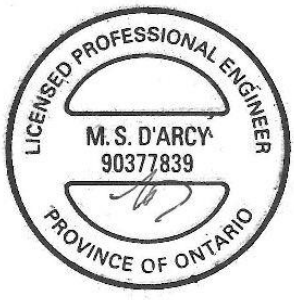
Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Surface Developments Notification from Surface Developments and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

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

Mark D'Arcy, P.Eng., QP$_{ESA}$



Report Distribution:

- Surface Developments
- Paterson Group

FIGURES

Figure 1 - Key Plan

Drawing PE4987-4 – Test Hole Location Plan and Groundwater Contour Plan

Drawing PE4987-5 – Analytical Testing Plan – Soil

Drawing PE4987-6 – Analytical Testing Plan – Groundwater

Drawing PE4987-7 – Cross-Section A-A'– Soil and Groundwater

Drawing PE4987-7 – Cross-Section B-B'– Soil and Groundwater

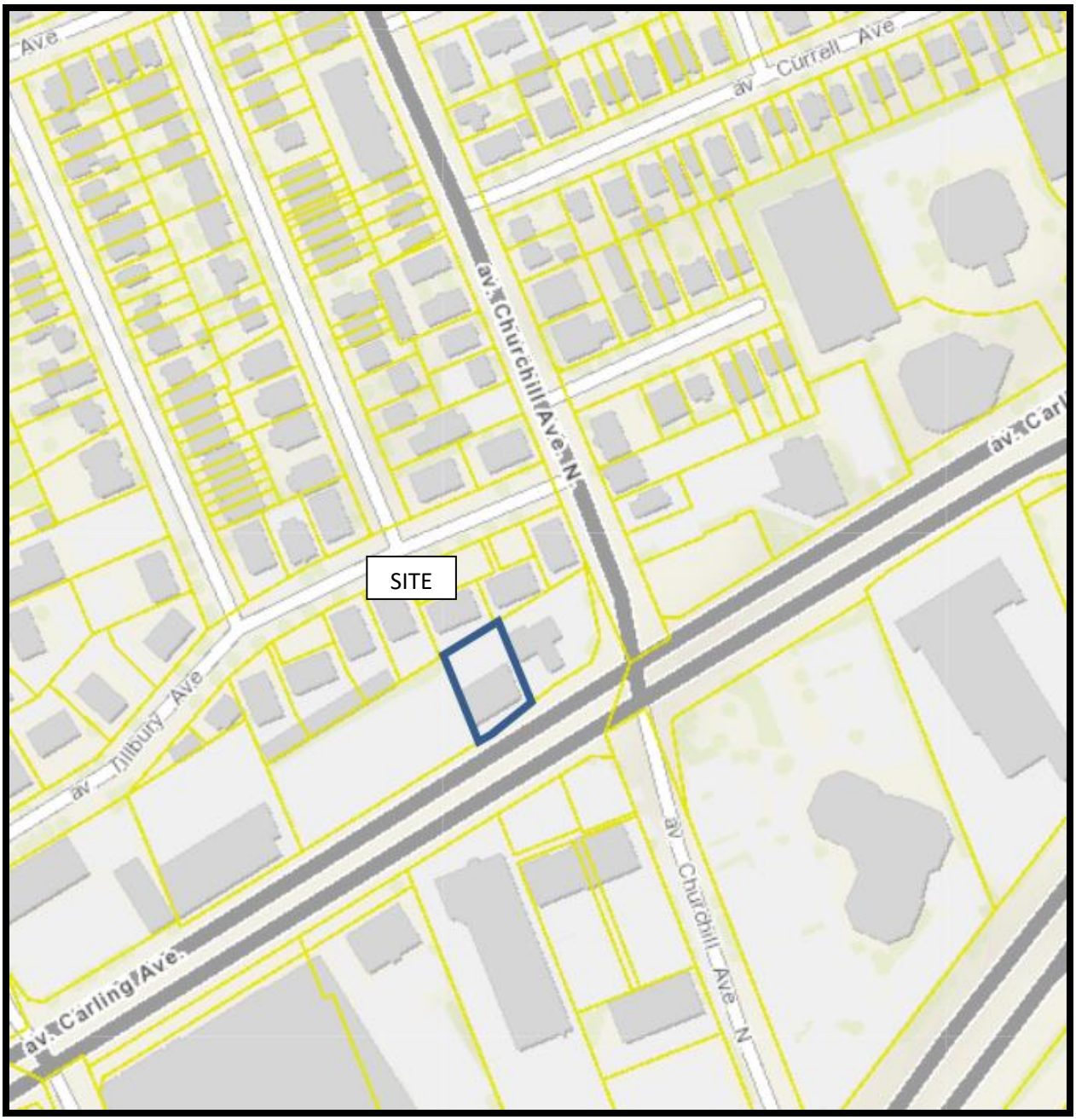


FIGURE 1

KEY PLAN

#358 TILLBURY AVENUE
RESIDENTIAL

#352 TILLBURY AVENUE
RESIDENTIAL

#346 TILLBURY AVENUE
RESIDENTIAL

CB-TBM

B

A'

BH 4
100.18
[98.53]
(97.94)

BH 3
100.15
[98.57]
(97.70)

#1609 CARLING AVENUE
SHELL SERVICE STATION

#1655 CARLING AVENUE
ASPHALT/GRAVEL PARKING LOT

97.8

97.7

97.6

97.1

97.5

97.6

97.5

(0.03m/m)

97.4

97.5

#1619 CARLING AVENUE

97.3

97.4

97.2

PUMP CANOPY

APPROX. LOCATION OF
UNDERGROUND
STORAGE TANK NEST

BH 1
100.24
[98.82]
(97.53)

BH 2
100.09
[98.54]
(97.09)

A

B'

C A R L I N G A V E N U E

C H U R C H I L L A V E N U E N O R T H

LEGEND:

⊕	BOREHOLE WITH MONITORING WELL LOCATION
100.24	GROUND SURFACE ELEVATION (m)
[98.82]	BEDROCK SURFACE ELEVATION (m)
(97.53)	GROUND SURFACE ELEVATION (m)
97.7	GROUNDWATER CONTOUR
(0.03m/m)	APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

TBM - TOP OF GRATE OF CATCH BASIN IN NORTHEAST CORNER OF SITE. ASSUMED ELEVATION = 100.00m.

SCALE: 1:250

0 1 2 3 4 5 10 15m

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

SURFACE DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1619 CARLING AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:250	**Date:** 11/2020
Drawn by: MPG	**Report No.:** PE4987-3
Checked by: MSD	**Dwg. No.:** PE4987-4
Approved by: MSD	**Revision No.:**

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#358 TILLBURY AVENUE
RESIDENTIAL

#352 TILLBURY AVENUE
RESIDENTIAL

#346 TILLBURY AVENUE
RESIDENTIAL

CB-TBM

BH3-SS2 0.76-1.52m 17-Aug-20
BTEX comply with the MECP Table 7 Standards
PHCs comply with the MECP Table 7 Standards

BH 4
100.18
[98.53]
(97.94)

BH 3
100.15
[98.57]
(97.70)

#1609 CARLING AVENUE
SHELL SERVICE STATION

#1655 CARLING AVENUE
ASPHALT/GRAVEL PARKING LOT

#1619 CARLING AVENUE

PUMP CANOPY

APPROX. LOCATION OF
UNDERGROUND
STORAGE TANK NEST

CHURCHILL AVENUE NORTH

BH2-SS2 0.76-1.52m 17-Aug-20
BTEX comply with the MECP Table 7 Standards
PHCs comply with the MECP Table 7 Standards

BH 2
100.09
[98.54]
(97.09)

BH 1
100.24
[98.82]
(97.53)

BH1-AU1	0-0.60m	17-Aug-20
Parameter	Results	Table 7 (ug/g)
PHC-F3	311	300

BTEX comply with the MECP Table 7 Standards

CARLING AVENUE

SCALE: 1:250

0 1 2 3 4 5 10 15m

LEGEND:

SOIL RESULTS COMPLY WITH MECP TABLE 7 STANDARDS

SOIL RESULTS EXCEED MECP TABLE 7 STANDARDS

⊕ BOREHOLE WITH MONITORING WELL LOCATION

100.24 GROUND SURFACE ELEVATION (m)

[98.82] BEDROCK SURFACE ELEVATION (m)

(97.53) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP OF GRATE OF CATCH BASIN IN NORTHEAST CORNER OF SITE. ASSUMED ELEVATION = 100.00m.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
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SURFACE DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1619 CARLING AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:250	**Date:** 11/2020
Drawn by: MPG	**Report No.:** PE4987-3
Checked by: MSD	**Dwg. No.:** PE4987-5
Approved by: MSD	**Revision No.:**

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#358 TILLBURY AVENUE
RESIDENTIAL

#352 TILLBURY AVENUE
RESIDENTIAL

#346 TILLBURY AVENUE
RESIDENTIAL

BH3-GW1 2.51-5.51m 25-Aug-20

Parameter	Results	Table 7 (ug/L)
Benzene	3.8	0.5

All other BTEX comply with the MECP Table 7
PHCs comply with the MECP Table 7 Standards

CB-TBM

BH 4
100.18
[98.53]
(97.94)

BH 3
100.15
[98.57]
(97.70)

BH4-GW1 2.54-5.54m 25-Aug-20
BTEX comply with the MECP Table 7 Standards
PHCs comply with the MECP Table 7 Standards

#1609 CARLING AVENUE
SHELL SERVICE STATION

#1655 CARLING AVENUE
ASPHALT/GRAVEL PARKING LOT

#1619 CARLING AVENUE

PUMP CANOPY

APPROX. LOCATION OF UNDERGROUND STORAGE TANK NEST

C H U R C H I L L A V E N U E N O R T H

BH2-GW1 2.38-5.38m 25-Aug-20

Parameter	Results	Table 7 (ug/L)
Benzene	5.8	0.5
PHC-F2	1890	50
PHC-F3	1690	500

All other BTEX comply with the MECP Table 7
All other PHCs comply with the MECP Table 7

BH2-GW2 2.38-5.38m 17-Nov-20

Parameter	Results	Table 7 (ug/L)
Benzene	3.8	0.5
PHC-F2	2520	150
PHC-F3	1820	500

All other BTEX comply with the MECP Table 7
All other PHCs comply with the MECP Table 7

BH2-GW(DUP) 2.38-5.38m 17-Nov-20

Parameter	Results	Table 7 (ug/L)
Benzene	4.2	0.5

PHC-F1 comply with the MECP Table 7

BH 2
100.09
[98.54]
(97.09)

BH 1
100.24
[98.82]
(97.53)

BH1-GW1 2.64-5.64m 25-Aug-20
BTEX comply with the MECP Table 7 Standards
PHCs comply with the MECP Table 7 Standards

C A R L I N G A V E N U E

SCALE: 1:250

0 1 2 3 4 5 10 15m

LEGEND:

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 7 STANDARDS

BOREHOLE WITH MONITORING WELL LOCATION

100.24 GROUND SURFACE ELEVATION (m)

[98.82] BEDROCK SURFACE ELEVATION (m)

(97.53) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP OF GRATE OF CATCH BASIN IN NORTHEAST CORNER OF SITE. ASSUMED ELEVATION = 100.00m.

patersongroup
consulting engineers

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

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SURFACE DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1619 CARLING AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:250	**Date:** 11/2020
Drawn by: MPG	**Report No.:** PE4987-3
Checked by: MSD	**Dwg. No.:** PE4987-6
Approved by: MSD	**Revision No.:**

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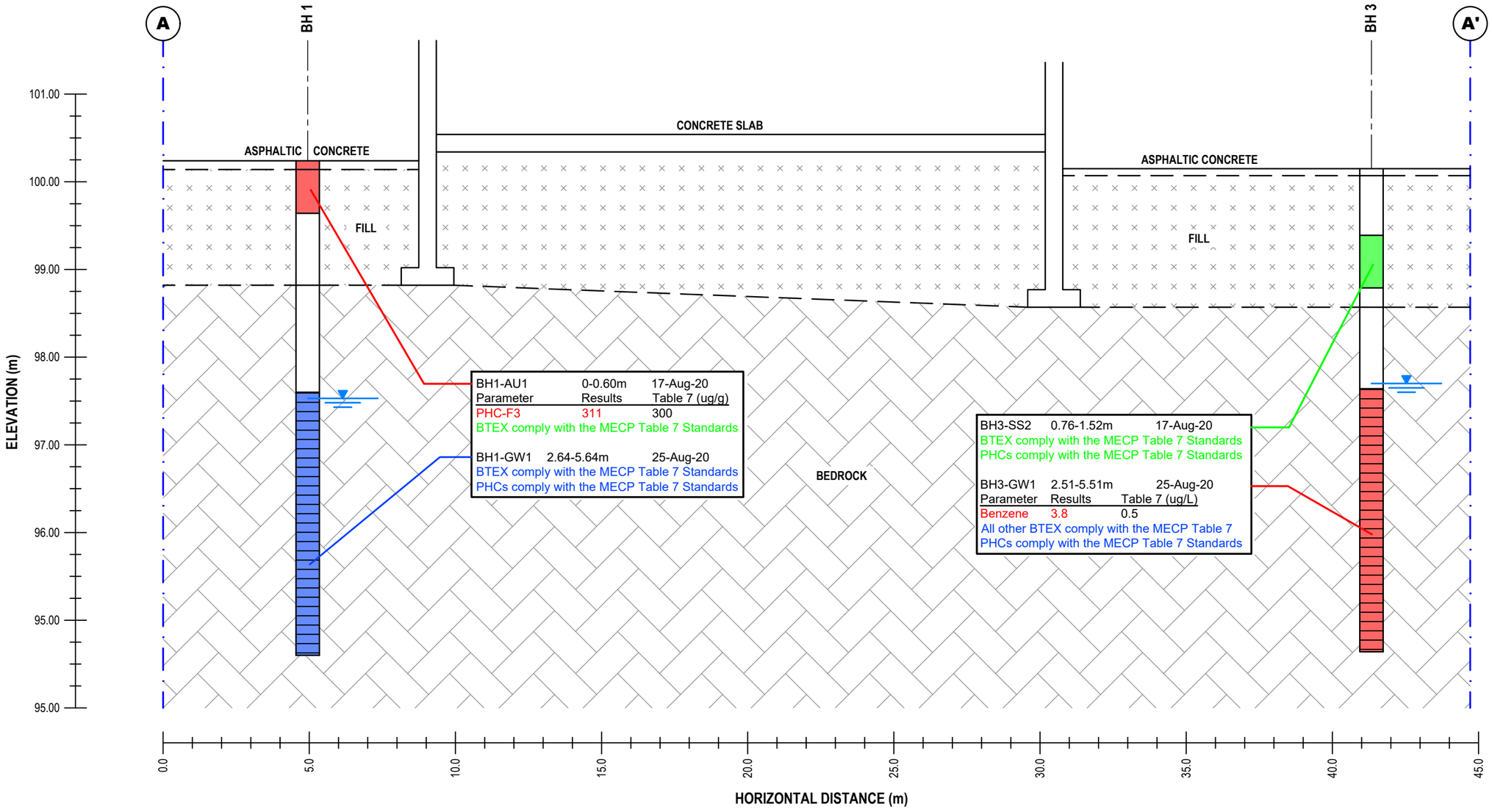

SOIL RESULTS COMPLY WITH MECP TABLE 7 STANDARDS

SOIL RESULTS EXCEED MECP TABLE 7 STANDARDS

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

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SURFACE DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1619 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A'

Scale: AS SHOWN	Date: 11/2020
Drawn by: MPG	Report No.: PE4987-3
Checked by: MW	Dwg. No.: PE4987-7
Approved by: MSD	Revision No.:

11x17

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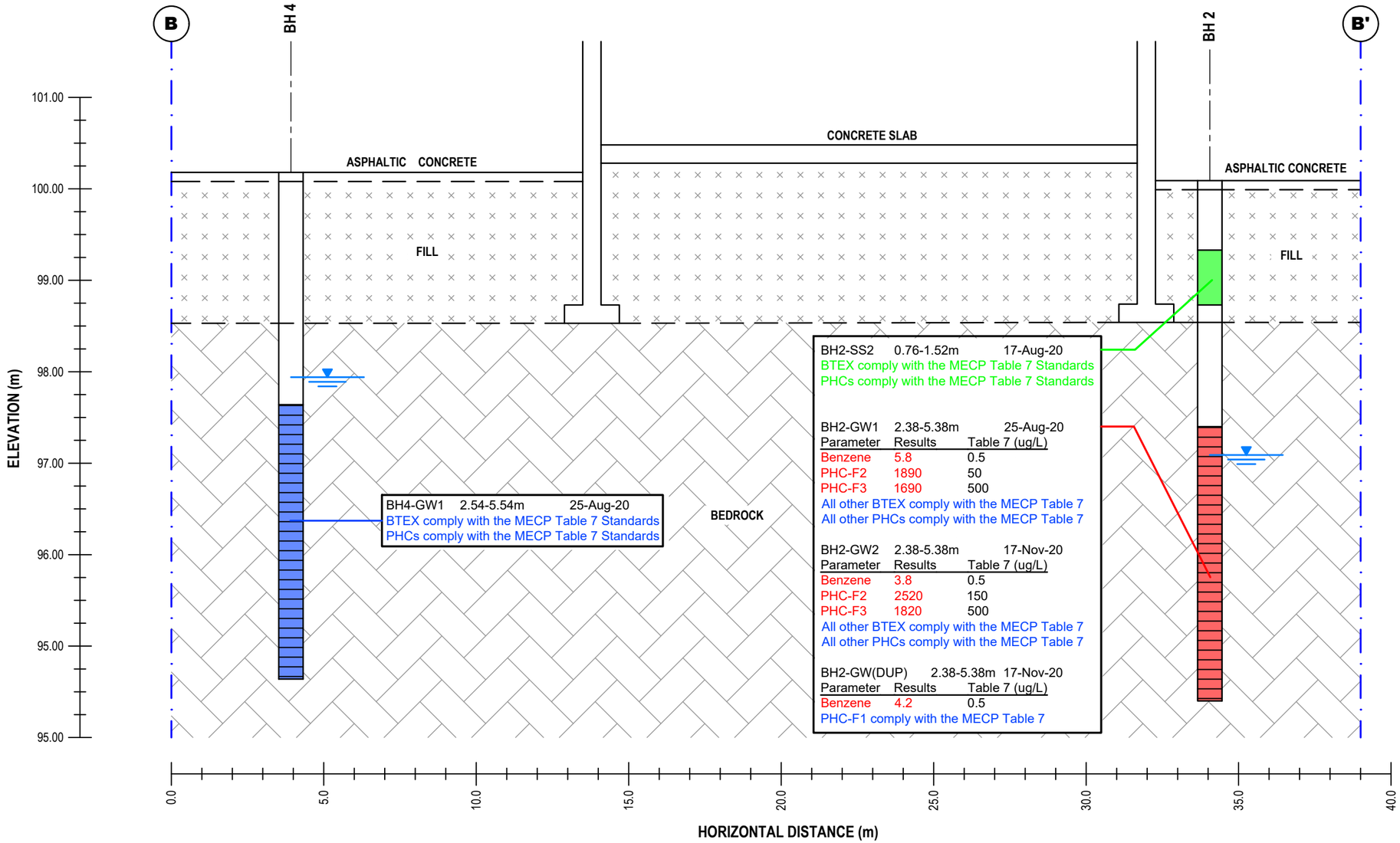

SOIL RESULTS COMPLY WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

SURFACE DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1619 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B'

Scale: AS SHOWN	Date: 11/2020
Drawn by: MPG	Report No.: PE4987-3
Checked by: MW	Dwg. No.: PE4987-8
Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment
1619 Carling Avenue
Ottawa, Ontario

Prepared For

Surface Developments

August 2020

Report: PE4987-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson was retained by Surface Developments, to conduct a Phase II Environmental Site Assessment (ESA) for the property addressed1619 Carling Avenue, in the City of Ottawa, Ontario.

The Phase II ESA was carried out to address the areas of potential environmental concern on the Phase II Property. The following subsurface investigation program was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place on the southwestern side of the Phase II Property to assess the potential impact due to APEC 2.	Borehole to be advanced to approximately 5 mbgs to install monitoring well.
BH2	Place on the southeastern side of the Phase II Property to assess the potential impact due to APEC 2.	Borehole to be advanced to approximately 5 mbgs to install monitoring well.
BH3	Place on the northeastern side of the Phase II Property to assess the potential impact due to APEC 2.	Borehole to be advanced to approximately 5 mbgs to install monitoring well.
BH4	Place on the northwestern side of the Phase II Property to assess the potential impact due to APEC 1 and APEC 2.	Borehole to be advanced to approximately 5 mbgs to install monitoring well.

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

2.0 ANALYTICAL TESTING PROGRAM

The analytical testing program for soil at the subject site is based on the following general considerations:

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.
- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.
- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MOECC site condition standards.
- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

The analytical testing program for groundwater at the subject site is based on the following general considerations:

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).
- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.
- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.
- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to identify and/or delineate contamination within the soil and/or to install groundwater monitoring wells in order to identify contamination within the groundwater.

Equipment

The following is a list of equipment that is in addition to regular drilling equipment stated in the geotechnical drilling SOP:

- ❒ glass soil sample jars
- ❒ two buckets
- ❒ cleaning brush (toilet brush works well)
- ❒ dish detergent
- ❒ methyl hydrate
- ❒ water (if not available on site - water jugs available in trailer)
- ❒ latex or nitrile gloves (depending on suspected contaminant)
- ❒ RKI Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)

Determining Borehole Locations

If conditions on site are not as suspected, and planned borehole locations cannot be drilled, **call the office to discuss**. Alternative borehole locations will be determined in conversation with the field technician and supervising engineer.

After drilling is completed a plan with the borehole locations must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Boreholes were located and surveyed in the field by Paterson, where a benchmark was assumed to be 100 masl at the top of a grate of a catch basin located on the northeastern corner of the site.

Drilling Procedure

The actual drilling procedure for environmental boreholes is the same as geotechnical boreholes (see SOP for drilling and sampling) with a few exceptions as follows:

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

All sampling equipment (spilt spoons, etc.) must be washed between samples in order to prevent cross contamination of soil samples.

- ❒ Obtain two buckets of water (preferably hot if available)
- ❒ Add a small amount of dish soap to one bucket
- ❒ Scrub spoons with brush in soapy water, inside and out, including tip
- ❒ Rinse in clean water
- ❒ Apply a small amount of methyl hydrate to the inside of the spoon. (A spray bottle or water bottle with a small hole in the cap works well)
- ❒ Allow to dry (takes seconds)
- ❒ Rinse with distilled water, a spray bottle works well.

The methyl hydrate eliminates any soap residue that may be on the spoon, and is especially important when dealing with suspected VOCs.

Screening Procedure

The RKI Eagle is used to screen most soil samples, particularly where petroleum hydrocarbon contamination is suspected. The MiniRae is used when VOCs are suspected, however it also can be useful for detecting petroleum. These tools are for screening purposes only and cannot be used in place of laboratory testing. Vapour results obtained from the RKI Eagle and the PID are relative and must be interpreted.

Screening equipment should be calibrated on an approximately monthly basis, more frequently if heavily used.

- ❒ Samples should be brought to room temperature; this is specifically important in colder weather. Soil must not be frozen.
- ❒ Turn instrument on and allow to come to zero - calibrate if necessary
- ❒ If using RKI Eagle, ensure instrument is in methane elimination mode unless otherwise directed.
- ❒ Ensure measurement units are ppm (parts per million) initially. RKI Eagle will automatically switch to %LEL (lower explosive limit) if higher concentrations are encountered.
- ❒ Break up large lumps of soil in the sample bag, taking care not to puncture bag.
- ❒ Insert probe into soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in bag while observing instrument readings.
- ❒ Record the highest value obtained in the first 15 to 25 seconds
- ❒ Make sure to indicate scale (ppm or LEL); also note which instrument was used (RKI Eagle 1 or 2, or MiniRae).
- ❒ Jar samples and refrigerate as per Sampling and Analysis Plan.

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

- ❒ Drill borehole to required depth, using drilling and sampling procedures described above.
- ❒ If borehole is deeper than required monitoring well, backfill with bentonite chips to required depth. This should only be done on wells where contamination is not suspected, in order to prevent downward migration of contamination.
- ❒ Only one monitoring well should be installed per borehole.
- ❒ Monitoring wells should not be screened across more than one stratigraphic unit to prevent potential migration of contaminants between units.
- ❒ Where LNAPLs are the suspected contaminants of concern, monitoring wells should be screened straddling the water table in order to capture any free product floating on top of the water table.
- ❒ Thread the end cap onto a section of screen. Thread second section of screen if required. Thread risers onto screen. Lower into borehole to required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials entering well.
- ❒ As drillers remove augers, backfill borehole annulus with silica sand until the level of sand is approximately 0.3 m above the top of the screen.
- ❒ Backfill with holeplug until at least 0.3 m of holeplug is present above the top of the silica sand.
- ❒ Backfill remainder of borehole with holeplug or with auger cuttings (if contamination is not suspected).
- ❒ Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

- ❒ Water level metre or interface probe on hydrocarbon/LNAPL sites
- ❒ Spray bottles containing water and methanol to clean water level tape or interface probe
- ❒ Peristaltic pump
- ❒ Polyethylene tubing for peristaltic pump
- ❒ Flexible tubing for peristaltic pump
- ❒ Latex or nitrile gloves (depending on suspected contaminant)
- ❒ Allen keys and/or 9/16" socket wrench to remove well caps
- ❒ Graduated bucket with volume measurements
- ❒ pH/Temperature/Conductivity combo pen
- ❒ Laboratory-supplied sample bottles

Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The QA/QC program for this Phase II ESA is as follows:

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.
- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).
- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.
- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples
- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 DATA QUALITY OBJECTIVES

The purpose of setting data quality objectives (DQOs) is to ensure that the level of uncertainty in data collected during the Phase II ESA is low enough that decision-making is not affected, and that the overall objectives of the investigation are met.

The quality of data is assessed by comparing field duplicates with original samples. If the relative percent difference (RPD) between the duplicate and the sample is within 20%, the data are considered to be of sufficient quality so as not to affect decision-making. The RPD is calculated as follows:

$$RPD = \left| \frac{x_1 - x_2}{(x_1 + x_2)/2} \right| \times 100\%$$

Where x_1 is the concentration of a given parameter in an original sample and x_2 is the concentration of that same parameter in the field duplicate sample.

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (0.5 x) the laboratory detection limit.

It is also important to consider data quality in the overall context of the project. For example, if the DQOs are not met for a given sample, yet the concentrations of contaminants in both the sample and the duplicate exceed the MECP site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples which meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

- ❒ The location of underground utilities
- ❒ Poor recovery of split-spoon soil samples
- ❒ Insufficient groundwater volume for groundwater samples
- ❒ Breakage of sampling containers following sampling or while in transit to the laboratory
- ❒ Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)
- ❒ Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

Site-specific impediments to the Sampling and Analysis plan are discussed in the body of the Phase II ESA report.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1619 Carling Avenue
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the northeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE4987

REMARKS

HOLE NO. BH 1

BORINGS BY Track-Mouont Power Auger **DATE** August 17, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.24
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with crushed stone		SS	2	17	13	1	99.24
1.42							
		RC	1	100	49	2	98.24
BEDROCK: Poor to excellent quality, grey limestone		RC	2	100	67	3	97.24
		RC	3	100	100	4	96.24
5.64						5	95.24
End of Borehole							
(GWL @ 2.71m - Nov. 17, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1619 Carling Avenue
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the northeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE4987

REMARKS

HOLE NO. BH 2

BORINGS BY Track-Mouont Power Auger **DATE** August 17, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.09
Asphaltic concrete 0.10							
FILL: Brown silty sand with crushed stone 0.59		AU	1				
FILL: Brown silty sand, some gravel and crushed stone 1.55		SS	2	38	8	1	99.09
		RC	1	100	65	2	98.09
BEDROCK: Fair to excellent quality, grey limestone		RC	2	82	38	3	97.09
		RC	3	100	100	4	96.09
5.69						5	95.09
End of Borehole							
(GWL @ 3.00m - Nov. 17, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1619 Carling Avenue
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the northeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE4987

REMARKS

HOLE NO. BH 3

BORINGS BY Track-Mouont Power Auger **DATE** August 17, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.08						0	100.15
FILL: Brown silty sand with crushed stone 0.66		AU	1				
FILL: Brown silty sand, trace organics 1.58		SS	2	46	9	1	99.15
		RC	1	100	70	2	98.15
BEDROCK: Fair to excellent quality, grey limestone		RC	2	100	58	3	97.15
		RC	3	100	100	4	96.15
5.51						5	95.15
End of Borehole							
(GWL @ 2.45m - Nov. 17, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
1619 Carling Avenue
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin located near the northeast corner of subject site. Assumed elevation = 100.00m.

FILE NO. PE4987

REMARKS

HOLE NO. BH 4

BORINGS BY Track-Mouont Power Auger **DATE** August 17, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.10						0	100.18
FILL: Brown silty sand with crushed stone 0.61		AU	1				
FILL: Brown silty sand with gravel and crushed stone 1.65		SS	2	17	20	1	99.18
		RC	1	100	29	2	98.18
BEDROCK: Poor to excellent quality, grey limestone		RC	2	100	66	3	97.18
		RC	3	100	100	4	96.18
5.54						5	95.18
End of Borehole							
(GWL @ 2.24m - Nov. 17, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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 = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

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

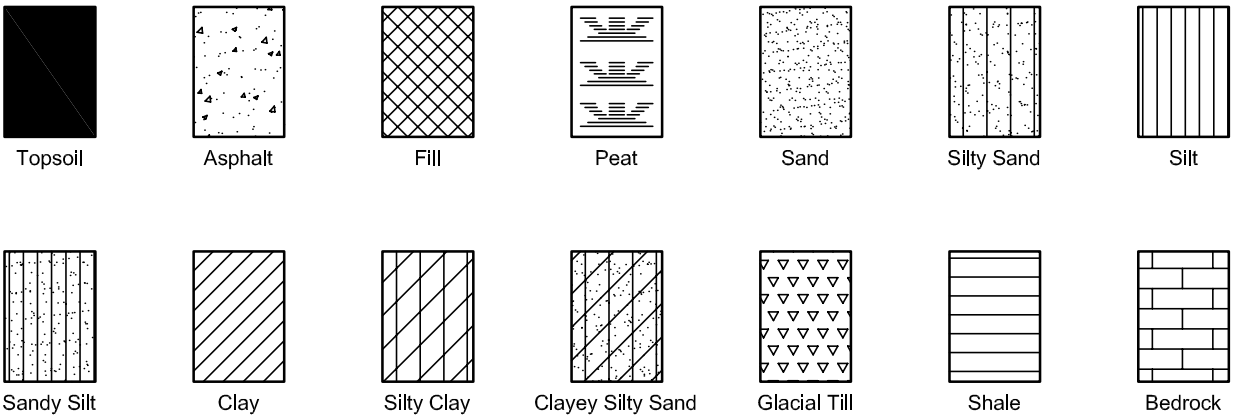
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

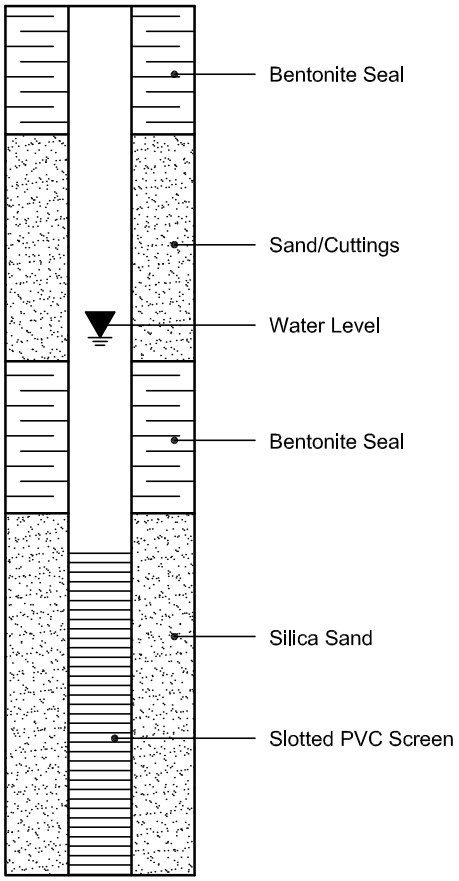
SYMBOLS AND TERMS (continued)

STRATA PLOT

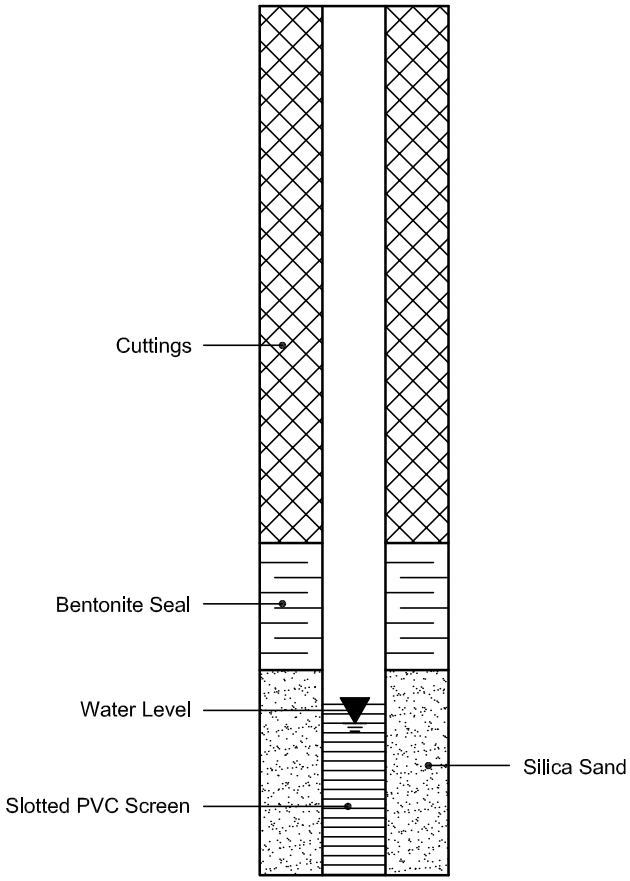


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30377
Project: PE4987
Custody: 128110

Report Date: 2-Sep-2020
Order Date: 27-Aug-2020

Order #: 2035562

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

Paracel ID	Client ID
2035562-01	BH1-GW1
2035562-02	BH2-GW1
2035562-03	BH3-GW1
2035562-04	BH4-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30377

Report Date: 02-Sep-2020

Order Date: 27-Aug-2020

Project Description: PE4987

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	28-Aug-20	29-Aug-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	31-Aug-20	2-Sep-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	28-Aug-20	29-Aug-20

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30377

Project Description: PE4987

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	BH4-GW1
	Sample Date:	25-Aug-20 09:00	26-Aug-20 09:00	25-Aug-20 09:00	25-Aug-20 09:00
	Sample ID:	2035562-01	2035562-02	2035562-03	2035562-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	5.8	3.8	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	0.5	1.7
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30377

Project Description: PE4987

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	BH4-GW1
	Sample Date:	25-Aug-20 09:00	26-Aug-20 09:00	25-Aug-20 09:00	25-Aug-20 09:00
	Sample ID:	2035562-01	2035562-02	2035562-03	2035562-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	0.8	0.6	1.4
o-Xylene	0.5 ug/L	<0.5	0.7	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	1.5	0.6	1.4
4-Bromofluorobenzene	Surrogate	110%	112%	111%	112%
Dibromofluoromethane	Surrogate	108%	110%	116%	113%
Toluene-d8	Surrogate	103%	104%	103%	103%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	84	41	<25
F2 PHCs (C10-C16)	100 ug/L	<100	1890	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	1690	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

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						
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						
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, 1,2	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	*89.0*		*ug/L*		*111*	*50-140*			
Surrogate: Dibromofluoromethane	*71.0*		*ug/L*		*88.8*	*50-140*			
Surrogate: Toluene-d8	*85.5*		*ug/L*		*107*	*50-140*			

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			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*90.0*		*ug/L*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*78.4*		*ug/L*		*98.0*	*50-140*			
Surrogate: Toluene-d8	*83.1*		*ug/L*		*104*	*50-140*			

Certificate of Analysis

Report Date: 02-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 27-Aug-2020

Client PO: 30377

Project Description: PE4987

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1620	25	ug/L	ND	80.9	68-117			
F2 PHCs (C10-C16)	1570	100	ug/L	ND	98.1	60-140			
F3 PHCs (C16-C34)	4090	100	ug/L	ND	104	60-140			
F4 PHCs (C34-C50)	2980	100	ug/L	ND	120	60-140			
Volatiles									
Acetone	106	5.0	ug/L	ND	106	50-140			
Benzene	40.9	0.5	ug/L	ND	102	60-130			
Bromodichloromethane	31.7	0.5	ug/L	ND	79.2	60-130			
Bromoform	48.8	0.5	ug/L	ND	122	60-130			
Bromomethane	44.6	0.5	ug/L	ND	112	50-140			
Carbon Tetrachloride	33.9	0.2	ug/L	ND	84.8	60-130			
Chlorobenzene	39.1	0.5	ug/L	ND	97.6	60-130			
Chloroform	37.3	0.5	ug/L	ND	93.2	60-130			
Dibromochloromethane	35.3	0.5	ug/L	ND	88.3	60-130			
Dichlorodifluoromethane	50.0	1.0	ug/L	ND	125	50-140			
1,2-Dichlorobenzene	38.2	0.5	ug/L	ND	95.4	60-130			
1,3-Dichlorobenzene	38.0	0.5	ug/L	ND	95.1	60-130			
1,4-Dichlorobenzene	39.4	0.5	ug/L	ND	98.6	60-130			
1,1-Dichloroethane	32.0	0.5	ug/L	ND	80.1	60-130			
1,2-Dichloroethane	47.8	0.5	ug/L	ND	119	60-130			
1,1-Dichloroethylene	25.0	0.5	ug/L	ND	62.5	60-130			
cis-1,2-Dichloroethylene	35.2	0.5	ug/L	ND	87.9	60-130			
trans-1,2-Dichloroethylene	29.5	0.5	ug/L	ND	73.8	60-130			
1,2-Dichloropropane	39.3	0.5	ug/L	ND	98.2	60-130			
cis-1,3-Dichloropropylene	45.5	0.5	ug/L	ND	114	60-130			
trans-1,3-Dichloropropylene	47.0	0.5	ug/L	ND	118	60-130			
Ethylbenzene	41.4	0.5	ug/L	ND	104	60-130			
Ethylene dibromide (dibromoethane, 1,2-	28.6	0.2	ug/L	ND	71.4	60-130			
Hexane	39.0	1.0	ug/L	ND	97.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	90.8	5.0	ug/L	ND	90.8	50-140			
Methyl Isobutyl Ketone	94.0	5.0	ug/L	ND	94.0	50-140			
Methyl tert-butyl ether	86.1	2.0	ug/L	ND	86.1	50-140			
Methylene Chloride	37.4	5.0	ug/L	ND	93.4	60-130			
Styrene	32.4	0.5	ug/L	ND	81.0	60-130			
1,1,1,2-Tetrachloroethane	37.5	0.5	ug/L	ND	93.7	60-130			
1,1,2,2-Tetrachloroethane	42.0	0.5	ug/L	ND	105	60-130			
Tetrachloroethylene	35.3	0.5	ug/L	ND	88.3	60-130			
Toluene	40.7	0.5	ug/L	ND	102	60-130			
1,1,1-Trichloroethane	30.3	0.5	ug/L	ND	75.8	60-130			
1,1,2-Trichloroethane	36.8	0.5	ug/L	ND	92.0	60-130			
Trichloroethylene	33.7	0.5	ug/L	ND	84.4	60-130			
Trichlorofluoromethane	36.4	1.0	ug/L	ND	91.1	60-130			
Vinyl chloride	36.8	0.5	ug/L	ND	92.0	50-140			
m,p-Xylenes	82.5	0.5	ug/L	ND	103	60-130			
o-Xylene	41.1	0.5	ug/L	ND	103	60-130			
Surrogate: 4-Bromofluorobenzene	*90.8*		*ug/L*		*114*	*50-140*			
Surrogate: Dibromofluoromethane	*81.3*		*ug/L*		*102*	*50-140*			
Surrogate: Toluene-d8	*82.6*		*ug/L*		*103*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match - no date on coc

Applies to samples: BH1-GW1, BH2-GW1, BH3-GW1, BH4-GW1

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.
NC: Not Calculated

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.

PARACEL LABORATORIES L

Paracel ID: 2035562

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2035562	№ 128110

Client Name: Paterson	Project Ref: PE4987	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address:	PO #: 30377	☐ 1 day ☐ 3 day
	E-mail:	☐ 2 day ☑ Regular
Telephone: 226-7381		Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☑ Table 1	Mun:
For RSC: ☐ Yes ☒ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-GW1	GW		3	Aug		✓	✓					
2	BH2-GW1	"		3	2020		✓	✓					
3	BH3-GW1	"		3			✓	✓					
4	BH4-GW1	"		3			✓	✓					
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received By Driver/Depot: A. Brouse	Received at Lab: BCrm	Verified By:
Relinquished By (Print): Mark D'Arcy	Date/Time: 27/08/20 3:26	Date/Time: Aug 27, 2020 17:15	Date/Time: 28 Aug 2020 8:44
Date/Time: Aug. 27, 2020	Temperature: °C FH	Temperature: 16.8 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mandy Witteman

Client PO: 31247
Project: PE4987
Custody: 52594

Report Date: 18-Nov-2020
Order Date: 17-Nov-2020

Order #: 2047245

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

Paracel ID	Client ID
2047245-01	BH2-GW2
2047245-02	BH12-GW

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31247

Project Description: PE4987

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	18-Nov-20	18-Nov-20
PHC F1	CWS Tier 1 - P&T GC-FID	18-Nov-20	18-Nov-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	17-Nov-20	18-Nov-20

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31247

Project Description: PE4987

	Client ID:	BH2-GW2	BH12-GW	-	-
	Sample Date:	17-Nov-20 09:00	17-Nov-20 09:00	-	-
	Sample ID:	2047245-01	2047245-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Benzene	0.5 ug/L	3.8	4.2	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	2.1	1.8	-	-
o-Xylene	0.5 ug/L	1.2	1.1	-	-
Xylenes, total	0.5 ug/L	3.3	2.9	-	-
Toluene-d8	Surrogate	107%	106%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	238	81	-	-
F2 PHCs (C10-C16)	100 ug/L	2520	-	-	-
F3 PHCs (C16-C34)	100 ug/L	1820	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31247

Project Description: PE4987

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						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	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: Toluene-d8	*84.1*		*ug/L*		*105*	*50-140*			

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31247

Project Description: PE4987

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	4600	25	ug/L	4080			11.9	30	
Volatiles									
Benzene	59.5	0.5	ug/L	59.0			0.8	30	
Ethylbenzene	ND	0.5	ug/L	332			NC	30	
Toluene	ND	0.5	ug/L	729			NC	30	
m,p-Xylenes	2940	0.5	ug/L	2740			7.0	30	
o-Xylene	1380	0.5	ug/L	1230			11.3	30	
Surrogate: Toluene-d8	*84.6*		*ug/L*		*106*	*50-140*			

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31247

Project Description: PE4987

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2100	25	ug/L	ND	105	68-117			
F2 PHCs (C10-C16)	1420	100	ug/L	ND	89.0	60-140			
F3 PHCs (C16-C34)	3750	100	ug/L	ND	95.6	60-140			
F4 PHCs (C34-C50)	1940	100	ug/L	ND	78.3	60-140			
Volatiles									
Benzene	40.4	0.5	ug/L	ND	101	60-130			
Ethylbenzene	42.4	0.5	ug/L	ND	106	60-130			
Toluene	42.4	0.5	ug/L	ND	106	60-130			
m,p-Xylenes	81.0	0.5	ug/L	ND	101	60-130			
o-Xylene	40.4	0.5	ug/L	ND	101	60-130			
Surrogate: Toluene-d8	*83.2*		*ug/L*		*104*	*50-140*			

Certificate of Analysis

Report Date: 18-Nov-2020

Client: Paterson Group Consulting Engineers

Order Date: 17-Nov-2020

Client PO: 31247

Project Description: PE4987

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - Labelled as BH12-GW2

Applies to samples: BH12-GW

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.
NC: Not Calculated

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.

Paracel ID: 2047245

PARA LABORATORI

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49-1947
@paracellabs.com
www.paracellabs.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2047245	Nº 52594

Client Name: Paterson	Project Ref: PE 4987	Page __ of __
Contact Name: Mandy Witteman	Quote #:	Turnaround Time: ☑ 1 day ☐ 3 day ☑ 2 day ☐ Regular
Address: 154 colonnade road	PO #: 31247	
Telephone: 613 226 7381	E-mail: MWitteman@Patersongroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun:
For RSC: ☐ Yes ☐ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Btex + F1-F4	Required Analysis: Btex + F1
1	BH2-GW2	GW		3	Nov 17 2020		✓	
2	~~BH~~ BH12-GW1	GW		2	↓			✓
3								
4								
5								
6								
7								
8								
9								
10								

Comments: 1 Day Turn around

Method of Delivery: DIB

Relinquished By (Sign): GPat	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Grant Paterson	Date/Time:	Date/Time: 11-17-20 15:40	Date/Time: 11-17-20 16:48
Date/Time: Nov 17 2020	Temperature: °C	Temperature: 11.3 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30801
Project: PE4987
Custody: 128073

Report Date: 21-Aug-2020
Order Date: 18-Aug-2020

Order #: 2034167

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

Paracel ID	Client ID
2034167-01	BH1-AU1
2034167-02	BH2-SS2
2034167-03	BH3-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 21-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Aug-2020

Client PO: 30801

Project Description: PE4987

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	18-Aug-20	19-Aug-20
PHC F1	CWS Tier 1 - P&T GC-FID	18-Aug-20	19-Aug-20
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	21-Aug-20	21-Aug-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	18-Aug-20	20-Aug-20
Solids, %	Gravimetric, calculation	19-Aug-20	19-Aug-20

Certificate of Analysis

Report Date: 21-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Aug-2020

Client PO: 30801

Project Description: PE4987

	Client ID:	BH1-AU1	BH2-SS2	BH3-SS2	-
	Sample Date:	17-Aug-20 09:00	17-Aug-20 09:00	17-Aug-20 09:00	-
	Sample ID:	2034167-01	2034167-02	2034167-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	94.9	91.2	89.2	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	111%	111%	112%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	311	27	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	701 [1]	37	<6	-
F4G PHCs (gravimetric)	50 ug/g dry	938	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30801

Report Date: 21-Aug-2020

Order Date: 18-Aug-2020

Project Description: PE4987

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.22*		*ug/g*		*90.2*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	285	8	ug/g dry	311			8.8	30	
F4 PHCs (C34-C50)	591	6	ug/g dry	701			17.0	30	
Physical Characteristics									
% Solids	94.0	0.1	% by Wt.	94.3			0.3	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*10.6*		*ug/g dry*		*106*	*50-140*			

Certificate of Analysis

Report Date: 21-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Aug-2020

Client PO: 30801

Project Description: PE4987

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	202	7	ug/g	ND	101	80-120			
F2 PHCs (C10-C16)	96	4	ug/g	ND	114	60-140			
F3 PHCs (C16-C34)	538	8	ug/g	311	110	60-140			
F4 PHCs (C34-C50)	862	6	ug/g	701	124	60-140			
F4G PHCs (gravimetric)	930	50	ug/g	ND	93.0	80-120			
Volatiles									
Benzene	4.61	0.02	ug/g	ND	115	60-130			
Ethylbenzene	4.49	0.05	ug/g	ND	112	60-130			
Toluene	4.45	0.05	ug/g	ND	111	60-130			
m,p-Xylenes	8.89	0.05	ug/g	ND	111	60-130			
o-Xylene	4.51	0.05	ug/g	ND	113	60-130			
Surrogate: Toluene-d8	*7.65*		*ug/g*		*95.7*	*50-140*			

Certificate of Analysis

Report Date: 21-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 18-Aug-2020

Client PO: 30801

Project Description: PE4987

Qualifier Notes:

Sample Qualifiers :

1 : GC-FID signal did not return to baseline by C50

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.
NC: Not Calculated

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.

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.

PARACE LABORATORIES LT

Paracel ID: 2034167

vd. 18 com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2034167	Nº 128073

Client Name: Paterson	Project Ref: PG 4987	Page __ of __
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address: 154 colonnade road	PO #: 30801	☐ 1 day ☐ 3 day
	E-mail: mdarcy@patersongroup.ca	☐ 2 day ☒ Regular
Telephone: 613 226 7381		Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☒ Table 7	Mun:
For RSC: ☐ Yes ☐ No	☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH1 - Au1	S		2	Aug 17 2020		✓												
2	BH2 - SS2	S		2	Aug 17 2020		✓												
3	BH3 - SS2	S		2	Aug 17 2020		✓												
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): G Pat	Received By Driver/Depot: A. Louise	Received at Lab: Sumeeporn Dohmai	Verified By:
Relinquished By (Print): Grant Paterson	Date/Time: 18/08/20 10 32	Date/Time: Aug 18, 2020 11:08	Date/Time: Aug 18, 2020 11:20
Date/Time: Aug 18 2020	Temperature: °C AH	Temperature: 8.3 °C	pH Verified: ☐ By: