Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

patersongroup

Phase II-Environmental Site Assessment

603 Cummings Avenue
Ottawa, Ontario

Prepared For

681 Montreal Inc.

September 19, 2017

Report: PE4084-2

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

TABLE OF CONTENTS

List of Figures

Appendix 1

EXECUTIVE SUMMARY

Assessment

A Phase II - Environmental Site Assessment (ESA) was conducted for 603 Cummings Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the APECs identified in the Phase I-ESA conducted for the site.

Soil

Three (3) boreholes were advanced on the subject site, each of which were equipped with groundwater monitoring wells. Based on soil vapour measurements and field observations, no apparent signs of contamination or deleterious substances were noted.

Two (2) samples were submitted for analysis of petroleum hydrocarbons (PHCs) and, benzene, toluene, ethylbenzene, xylenes (BTEX), and a third sample for metals. All analytical test parameters were found to be in compliance with the MOECC Table 7 standards for the subject property.

Groundwater

Three groundwater samples were recovered from the monitoring wells installed at BH1, BH2 and BH3. No signs of hydrocarbon sheen or odours were noted in the water collected from the wells. The groundwater samples were submitted for analysis of PHCs and BTEX, and in the case of BH1 and BH2, for volatile organic compounds. All analytical test parameters were found to be in compliance with the MOECC Table 3 standards for the subject property with the exception of chloroform in the water samples from BH1 and BH2. No obvious sources of chloroform were noted, however chloroform is generally associated with municipally treated drinking water, and may be present in the groundwater below the subject site due to a ruptured or leaking City water main.

Recommendations

Consideration should be given to retesting the groundwater from the monitoring wells to re-assess the chloroform concentrations, prior to site redevelopment. Prior to mass excavation at the site (in preparation for construction activities), the groundwater monitoring wells should be decommissioned in accordance with Ontario Regulation 903, unless the site excavation extends below the monitoring wells, in which case they may be removed through the excavation of the site.

1.0 INTRODUCTION

At the request of 681 Montreal Inc., Paterson Group Inc. (Paterson) conducted a Phase II - Environmental Site Assessment (ESA) of the property located at 603 Cummings Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the areas of potential environmental concern (APEC) identified in the Phase I-ESA conducted by Paterson in September 2017.

This report has been prepared specifically and solely for the above noted project which is described herein. It contains all of our findings and results of the environmental conditions at this site.

1.1 Site Description

Address:	603 Cummings Avenue, Ottawa, Ontario.
Parcel Identification Number:	04269-0140
Legal Description:	Part of Lot 25, Concession 1 Ottawa Front (geographic Township of Gloucester)

Site Description:

Configuration/Area:	Rectangular / 696 m^2.
Zoning:	AM10, arterial mainstreet
Current Use:	The property is currently vacant, and used for vehicle parking.
Services:	The site is located in a municipally serviced area.

1.2 Property Ownership

The registered owner of the property is 681 Montreal Inc. Paterson was engaged to conduct this Phase II – ESA by Mr. Anatolij Koniouchine with 681 Montreal Inc., representing the registered property owner.

1.3 Current and Proposed Future Uses

The site is currently vacant; it is used for vehicle parking. The proposed development will consist of a multi-storey residential building.

1.4 Applicable Site Condition Standard

The soil and groundwater standards for the subject property were obtained from Table 3 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ontario Ministry of Environment (MOE), April 15, 2011. The MOECC Table 3 Standards are based on the following considerations:

- ❏ Coarse grained soil conditions.
- ❏ Full depth soil conditions
- ❏ Non-potable groundwater situation.
- ❏ Residential land use.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site consists of an asphalt covered parking lot. No structures exist on the property.

Sheet drainage to catch basins located along Cummings Avenue is the primary method of removing surface water from the site. No ponded water was observed at the time of the site assessment. No signs of significant surficial staining were noted at the time of the site assessment.

The site topography slopes down to the west with a slight slope. The regional topography slopes down to the south. Regional groundwater is considered to flow in a northerly direction, towards the Ottawa River

2.2 Past Investigations

A Phase I ESA completed by Paterson earlier in September 2017, recommended a Phase II-ESA to address potential impacts from the adjacent retail fuel outlet and automotive service garage to the north.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on August 18, 2017, and consisted of the placement of three (3) boreholes (BH1 to BH3) on the subject property. The boreholes were advanced using a truck mounted drill rig under the full time supervision of Paterson personnel. Groundwater monitoring wells were installed at all three borehole locations. The borehole locations are illustrated on Drawing No. PE4084-3 - Test Hole Location Plan in the Figures section following the text.

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 analysing these media is based on the Contaminants of Potential Concern (CPCs) identified during the Phase I-ESA: benzene, ethylbenzene, toluene and xylene (BTEX) in the soil, volatile organic compounds (VOCs) in the groundwater, and petroleum

hydrocarbons (PHCs) in both soil and groundwater. Although not considered a potentially contaminating activity, a sample of the fill material was submitted for analysis of metals.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on the information from Natural Resources Canada, the subject site is located in a transition area between bedrock of limestone and shale of the Lindsay and Bobcaygeon formations. Surface soils consist of till or alluvial sediment ranging in thickness between 3 to 10 m.

Contaminants of Potential Concern

The following CPCs were identified at the time of the Phase I-ESA:

- Petroleum Hydrocarbons, fractions 1 through 4 (PHCs F_1-F_4) - PHCs were selected as CPCs for the Phase I-ESA property based the historical operation of a retail fuel outlet and automotive service garage both located adjacent to the north of the subject site. Gasoline (F_1) and diesel (F_2) are commonly used motor vehicle fuels and diesel-fraction hydrocarbons were commonly used as oil. Heavy oils (F_3/F_4) may be present in the form of lubricants and transmission or hydraulic fluids. PHCs are generally considered to be LNAPLs - light non-aqueous phase liquids, which indicates that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their low density.

- Volatile Organic Compounds (VOCs) - this suite of parameters includes benzene, toluene, ethylbenzene and xylenes (BTEX), associated with gasoline, and with automotive de-greasing which are typically toluene-based. These parameters were selected as CPCs for the Phase I-ESA property due to the retail fuel outlet and automotive service garage located adjacent to the north of the subject site. VOCs may be present in the soils and groundwater.

Metals were analysed in a soil sample of fill material on the property for general assessment purposes only, and not because they are considered to be a contaminant of potential concern.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion and diffusion. Advection and dispersion will be the dominant mechanisms of contaminant transport in soils with higher hydraulic conductivities, such as sands, gravels, silts, some glacial till soils and highly fractured bedrock, whereas diffusion will dominate in soils with lower hydraulic conductivity, such as clays and more competent bedrock.

Existing Buildings and Structures

There are no buildings or structures on the subject property.

Water Bodies

There are no water bodies on the subject site.

Areas of Natural and Scientific Interest (ANSI)

According to the Ministry of Natural Resources' (MNR) electronic mapping website, the subject property is not listed as an area of natural and scientific interest.

Drinking Water Wells

Based on the results of the well record search, four old records of potable wells were located within the study area, however based on the availability of municipally treated water in the study area, it is considered unlikely that the wells are still in use.

Groundwater Monitoring Wells

Based on the results of the well record search, nine groundwater monitoring wells were identified within the study area.

Neighbouring Land Use

Neighbouring land use in the Phase I-ESA study area consists of commercial uses along Montreal Road to the north, and residential uses along secondary streets. Neighbouring land use within the Phase I-ESA study area is depicted on Drawing: PE4084-2 - Surrounding Land Use Plan, provided in the Phase I ESA report.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Column A of Table 2 outlined in Ontario Regulation 153/04 as amended, Potentially Contaminating Activities (PCAs) were identified to the north of the Phase II property, resulting in areas of potential environmental concern (APECs) on part of the subject site. No PCAs were identified on the subject site. The following off-site PCAs resulted in Areas of Potential Environmental Concern (APECs) on the Phase II property:

- ❏ APEC1 - Automotive service garage (adjacent property to the north); Item 52, Table 2, O.Reg. 153/04 as amended: "Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems."

- ❏ APEC2 - Retail fuel outlet (adjacent property to the north); Item 28, Table 2, O.Reg. 153/04 as amended:"Gasoline and associated products storage in fixed tanks".

Other off-site PCAs within the Phase I study area are not considered to pose an environmental concern to the Phase II property due to their separation distance and/or location downgradient or cross-gradient with respect to the groundwater flow direction in the area of the Phase II property.

Table 1
Areas of Potential Environmental Concern

Area of Potential Environmental Concern (APEC)	Location of APEC on Phase One Property	Potentially Contaminating Activities (PCA)	Location of PCA	Contaminants of Potential concern (CPC)	Media Potentially Impacted (Groundwater Soil and/or Sediment)
Automotive Service Garage (APEC 1)	Northern eastern portion of subject site	Item 52 - Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems	off-site, adjacent property north	VOC, BTEX, PHC	Soil (PHC/BTEX) and Groundwater (PHC/BTEX, VOC)

Table 1 - continued
Areas of Potential Environmental Concern

Area of Potential Environmental Concern (APEC)	Location of APEC on Phase One Property	Potentially Contaminating Activities (PCA)	Location of PCA	Contaminants of Potential concern (CPC)	Media Potentially Impacted (Groundwater Soil and/or Sediment)
Retail fuel outlet (APEC2)	Northern portion of subject site	Item 28 - Gasoline and associated products storage in fixed tanks	off-site, adjacent property north	BTEX, PHC	Soil (PHC/BTEX) and Groundwater (PHC/BTEX)

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 sufficient to conclude that there are areas of potential environmental concern on the subject site and neighbouring properties, which have or have had the potential to impact the subject property. The presence of potentially contaminating activities was confirmed by a variety of independent sources, including in some cases, observations made during the Phase I-ESA site visit. 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 the Appendix of this report. No significant deviations were encountered with the exception of the collection of duplicate soil and groundwater samples.

3.5 Impediments

No impediments were encountered during the Phase II-ESA.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on August 18, 2017 and consisted of the placement of three boreholes (BH1 to BH3) on the subject property. A monitoring well was installed at each of the borehole locations. The borehole locations are illustrated on Drawing No. PE4084-3 - Test Hole Location Plan. The boreholes were advanced using a truck mounted drill rig under the full time supervision of Paterson personnel.

4.2 Soil Sampling

The boreholes were sampled to depths of 8.38 m, 8.48 m, and 7.62 m below grade in boreholes BH1, BH2 and BH3, respectively. Upon recovery, all samples were immediately sealed in appropriate containers to facilitate the preliminary screening procedure. The depths at which the auger and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" respectively, on the Soil Profile and Test Data sheet in the Appendix.

Soil sampling protocols were followed using the MOECC document titled "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", dated May 1996.

The samples were recovered using a stainless steel split spoon, using protective gloves (changed after each sample). The samples were placed into plastic bags. If significant contamination was encountered, the samples were placed into glass jars. Sampling equipment was washed in soapy water and rinsed with methylhydrate after each split spoon to prevent cross contamination of the samples. Samples were stored in coolers to reduce analyte volatilization during transportation.

4.3 Field Screening Measurements

An RKI Eagle gas detector was used to measure the vapour concentrations in the headspace of the soil samples recovered from the boreholes. The instrument is calibrated regularly using hexane. The detection limit is 0.1 ppm, with a precision of +/- 0.1 ppm.

The soil samples recovered from the boreholes 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 room temperature prior to conducting the

vapour survey, ensuring consistency of readings between samples.

To measure the soil vapours, the analyser probe was inserted into the nominal headspace above the soil sample. The sample was agitated/manipulated gently as the measurement was taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The parts per million (ppm) scale was used to measure concentrations of organic/combustible vapours.

Vapour readings for the soil samples were all below 1 ppm. The vapour readings are not considered to be representative of elevated concentrations of volatile substances. Vapour readings cannot be used to identify the presence of heavier hydrocarbon products such as engine oil. The results of the vapour survey are presented on the Soil Profile and Test Data sheets appended to this report.

4.4 Groundwater Monitoring Well Installations

As part of the Phase II-ESA investigation, three groundwater monitoring wells were installed on the subject property by George Downing Estate Drilling of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. All of the monitoring wells consisted of 50 mm diameter, Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided in the borehole logs in the Appendix. A summary of 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	80.98 m	8.38	5.3 - 8.38	5.0 - 8.38	0.6 - 5.0	Flushmount
BH2	80.89 m	8.48	5.4 - 8.48	5.0 - 8.48	0.6 - 5.0	Flushmount
BH3	80.56 m	7.62	4.0 - 7.10	3.5 - 7.10	0.6 - 3.5	Flushmount

Notes: ❑ m BGS - metres below ground surface

4.5 Field Measurement of Water Quality Parameters

Prior to groundwater sampling, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, electrical conductivity, pH, and total dissolved solids. Wells were purged prior to sampling until at least three well volumes had been removed or until the well was purged dry. Field parameter values prior to sampling are summarized below in Table 3.

Table 3
Field Measurement of Water Quality Parameters (August 24, 2017)

Parameter	BH1	BH2	BH3
Temperature (°C)	12.7	14.5	13.7
Electrical Conductivity (mS/cm)	13.45	12.47	12.54
Salinity (ppt)	7.77	7.2	7.1
Total Dissolved Solids (ppt)	9.37	8.69	8.77
pH	7.27	7.18	7.23

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MOECC document entitled "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", dated May, 1996. Groundwater samples were obtained from the monitoring wells installed in BH1, BH2 and BH3 using dedicated sampling equipment as part of this Phase II-ESA. To ensure low sediment and non-stagnant water was sampled, when possible, approximately three (3) well volumes were purged prior to the collection of groundwater samples. The monitoring wells were also purged after installation, during the field drilling program. 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 the Appendix.

4.7 Analytical Testing

Paracel Laboratories (Paracel), of Ottawa, Ontario performed the laboratory analysis on the samples submitted for analytical testing as part of the Phase II-ESA. Paracel is a member of the Standards Council of Canada/Canadian Association for Environmental Analytical Laboratories (SCC/CAEL). Paracel is accredited and certified by SCC/CAEL for specific tests registered with the association. Soil and groundwater samples submitted for analytical testing are presented in Tables 4 and 5 below.

Table 4
Soil Samples Submitted for Analytical Testing - August 18, 2017

Sample ID	Sample Depth/ Stratigraphic Unit or Screened Interval	Parameters Analyzed			Rationale
		PHCs	BTEX	Metals	
BH1-SS11	7.61 - 8.22 m, glacial till	X	X		Analysis of soil from APECs 1 and 2, near water table
BH2-SS9	6.11 - 6.72 m, glacial till	X	X		Analysis of soil from APECs 1 and 2, near water table
BH3-AU1	0 - 0.61 m, fill			X	General assessment of fill material

Table 5
Groundwater Samples Submitted for Analytical Testing - August 24, 2017

Sample ID	Sample Depth/ Stratigraphic Unit or Screened Interval	Parameters Analyzed			Rationale
		BTEX	PHCs	VOC	
BH1-GW1	5.3 - 8.38 m, glacial till	X	X	X	Analysis of groundwater from APEC 1 and 2
BH2-GW1	5.4 - 8.48 m, glacial till	X	X	X	Analysis of groundwater from APEC 1 and 2
BH3-GW1	4.0 - 7.62 m, glacial till	X	X		General coverage

4.8 Residue Management

Soil cuttings, fluids from equipment cleaning and purge water resulting from Paterson's Phase II-ESA were retained on site.

4.9 Elevation Surveying

Borehole elevations were surveyed using a laser level. Elevations were surveyed relative to the top of a fire hydrant spindle, located near the nortwest corner of the subject site. The elevation of the top of spindle was 80.89 metres above sea level (m ASL) based on a survey plan prepared by Annis, O'Sullivan, Vollebekk Ltd. The location of the benchmark is shown on Drawing: PE4084-3 - Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

The soil profile encountered at the borehole locations consisted of asphaltic concrete, over fill consisting of crushed stone and/or brown silty sand, followed by native brown silty sand then glacial till. Borehole BH2 was terminated at inferred bedrock. Specific details of the soil profile at the test hole locations can be seen on the Soil Profile and Test Data sheets in the Appendix.

5.2 Groundwater Elevations, Flow Direction and Hydraulic Gradient

Groundwater levels were measured on August 24, 2017 using an electronic water level meter. Elevations are relative to the top of spindle of the fire hydrant located near the northwest corner of the property. The top of spindle has a geodetic elevation of 80.89 m, as indicated on the survey plan prepared by Annis, O'Sullivan, Vollebekk. Groundwater elevations are summarized below in Table 6.

Table 6
Groundwater Level Measurements

Monitoring Well	Water Level (m below grade)	Water Level Elevation (m ASL)	Screened Interval (m below grade)	Date of Measurement
BH1	6.61	74.37	5.3 - 8.38	August 24, 2017
BH2	6.59	74.3	5.4 - 8.48	August 24, 2017
BH3	6.28	74.28	4.0 - 7.62	August 24, 2017

The above water level measurements were used to determine groundwater flow direction. The groundwater flow was determined to be in a westerly direction, with a hydraulic gradient of 0.002 m/m, as shown on Drawing PE4084-3-Test Hole Location Plan.

5.3 Soil Texture

Based on field soil observations, coarse-grained soil conditions are applicable to the subject site.

5.4 Soil Field Screening

An RKI Eagle Gas Detector Photoionization Detector was used to measure the combustible vapour concentrations in the headspace of the soil samples recovered from the boreholes. The technical protocol was obtained from Appendix C of the MOECC document titled "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 room temperature prior to conducting the vapour survey, ensuring consistency of readings between samples. To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement. The parts per million (ppm) scale is used to measure concentrations of combustible vapours.

Combustible vapour readings for all of the soil samples did not exceed 1 ppm. These vapour readings are not considered to be representative of elevated concentrations of highly volatile substances such as gasoline. Vapour readings cannot be used to identify the presence of heavier hydrocarbon products such as engine oil.

The results of the vapour survey are presented on the Soil Profile and Test Data sheets appended to this report.

5.5 Soil Quality

Three (3) soil samples were submitted for analysis. The results of all soil analyses are presented in Tables 7 and 8. Copies of the laboratory certificates of analysis are included in the Appendix.

Table 7
Analytical Test Results - Soil
BTEX and PHCs (Fractions 1 to 4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MOECC Table 3 Standards Residential Land Use (µg/g)
		August 18, 2017		
		BH1-SS11	BH2-SS9	
Benzene	0.02	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	2
Toluene	0.05	nd	nd	2.3
Xylenes (Total)	0.05	nd	nd	3.1
F_1 PHCs (C_6-C_{10})	7	nd	nd	55
F_2 PHCs (C_{10}-C_{16})	4	nd	nd	98
F_3 PHCs (C_{16}-C_{34})	8	nd	nd	300
F_4 PHCs (C_{34}-C_{50})	6	nd	nd	2800

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)
- nt - not tested for this parameter
- **Bold & Underline** values exceed selected MOECC Standards

No BTEX or PHC parameters were detected in the soil samples submitted for analysis. All parameter concentrations are in compliance with MOECC Table 3 standards.

Table 8
Analytical Test Results - Soil
Metals

Parameter	MDL (µg/g)	Soil Sample (µg/g)	MOECC Table 3 Standards Residential Land Use (µg/g)
		August 18, 2017	
		BH3-AU1	
Antimony	1.0	nd	7.5
Arsenic	1.0	nd	18
Barium	1.0	239	390
Beryllium	1.0	nd	4
Boron	1.0	7.3	120
Cadmium	0.5	nd	1.2
Chromium	1.0	10.2	160
Cobalt	1.0	3.3	22
Copper	1.0	7.7	140
Lead	1.0	12.1	120
Molybdenum	1.0	nd	6.9
Nickel	1.0	8.4	100
Selenium	1.0	nd	2.4
Silver	0.5	nd	20
Thallium	1.0	nd	1
Uranium	1.0	nd	23
Vanadium	1.0	15.9	86
Zinc	1.0	27.3	340

Notes:
- ❑ MDL - Method Detection Limit
- ❑ nd - Not Detected (< MDL)
- ❑ **Bold & Underline** - values exceed selected MOECC Standards

All detected parameter concentrations in Sample BH3-AU1 were found to be in compliance with the MOECC Table 3 standards.

Table 9
Maximum Concentrations - Soil

Parameter	Maximum Concentration (µg/g)	Sample	Depth Interval (m BGS)
Barium	239	BH3-AU1	0 - 0.61 m, fill
Boron	7.3	BH3-AU1	0 - 0.61 m, fill
Chromium	10.2	BH3-AU1	0 - 0.61 m, fill
Cobalt	3.3	BH3-AU1	0 - 0.61 m, fill
Copper	7.7	BH3-AU1	0 - 0.61 m, fill
Lead	12.1	BH3-AU1	0 - 0.61 m, fill
Nickel	8.4	BH3-AU1	0 - 0.61 m, fill
Vanadium	15.9	BH3-AU1	0 - 0.61 m, fill
Zinc	27.3	BH3-AU1	0 - 0.61 m, fill

Notes:
- **Bold & Underline** values exceed selected MOECC Standards

All other analytical soil concentrations were below the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples were collected from the monitoring wells installed in BH1, BH2 and BH3, on August 24, 2017. Groundwater samples were submitted for a combination of BTEX, PHC (F_1-F_4), and VOC parameters. The results of the analytical testing, and the selected site standards are presented in Tables 10 and 11. The laboratory reports are included in the Appendix.

Table 10
Analytical Test Results - Groundwater
BTEX and PHCs (Fractions 1 to 4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MOECC Table 3 Standards (µg/L)
		BH1-GW1	BH2-GW1	BH3-GW1	
Benzene	0.5	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	2,300
Toluene	0.5	nd	nd	nd	18,000
Xylenes (total)	0.5	nd	nd	nd	4,200
F_1 PHCs (C_6-C_{10})	25	nd	nd	nd	750
F_2 PHCs (C_{10}-C_{16})	100	nd	nd	nd	150
F_3 PHCs (C_{16}-C_{34})	100	nd	nd	nd	500
F_4 PHCs (C_{34}-C_{50})	100	nd	nd	nd	500

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)
- **Bold & Underline** values exceed selected MOECC Standards

No BTEX or PHC parameters were detected in the groundwater samples. All parameters are in compliance with MOECC Table 3 standards.

Table 11
Analytical Test Results - Groundwater
Volatile Organic Compounds (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MOECC Table 3 Standards Residential Land Use (µg/L)
		BH1-GW1	BH2-GW1	
Acetone	5	nd	nd	130000
Benzene	0.5	nd	nd	44
Bromodichloromethane	0.5	0.8	0.6	8500
Bromoform	0.5	nd	nd	380
Bromomethane	0.5	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	630
Chloroform	0.5	**8.8**	**10.1**	2.4
Dibromochloromethane	0.5	nd	nd	82000
Dichlorodifluoromethane	1	nd	nd	4400
1,2-Dichlorobenzene	0.5	nd	nd	4600
1,3-Dichlorobenzene	0.5	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	16
cis-1,3-Dichloropropylene	0.5	nd	nd	N/V
trans-1,3-Dichloropropylene	0.5	nd	nd	N/V
1,3-Dichloropropene	0.5	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	2300
Ethylene dibromide	0.2	nd	nd	0.25

Notes:
- MDL - Method Detection Limit
- nd - not detected above the MDL
- N/V - no value provided by the MOE
- **Bold & Underline** values exceed selected MOECC Standards

Table 11-Continued
Analytical Test Results - Groundwater
Volatile Organic Compounds (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MOECC Table 3 Standards Residential Land Use (µg/L)
		BH1-GW1	BH2-GW1	
Hexane	1	nd	nd	51
Methyl Ethyl Ketone	5	nd	nd	470000
Methyl Isobutyl Ketone	5	nd	nd	140000
Methyl tert-butyl ketone	2	nd	nd	190
Methylene Chloride	5	nd	nd	610
Styrene	0.5	nd	nd	1300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	1.6
Toluene	0.5	nd	nd	18000
1,1,1-Trichloroethane	0.5	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	2500
Vinyl chloride	0.5	nd	nd	0.5
Xylenes, total	0.5	nd	nd	4200

Notes:
- ❑ MDL - Method Detection Limit
- ❑ nd - not detected above the MDL
- ❑ N/V - no value provided by the MOE
- ❑ **Bold & Underline** values exceed selected MOECC Standards

No VOC parameters were detected in the groundwater samples, with the exception of bromodichloromethane and chloroform. All parameter concentrations, including the bromodichloromethane, were in compliance with the MOECC Table 3 standards with the exception of chloroform in both samples. No apparent sources of chloroform were identified during the Phase I-ESA, however chloroform is often encountered in groundwater due to leaking municipal water mains. Chlorinated municipal water is known to contain chloroform, as well as bromodichloromethane, which are byproducts of the municipal potable water treatment system. A ruptured or leaking municipal water line on or adjacent to the subject property is suspected to be the source of the chloroform exceedance.

Table 12
Maximum Concentrations - Groundwater

Parameter	Maximum Concentration (µg/L)	Sample	Depth Interval (m BGS)
Bromodichloromethane	0.8	BH1-GW1	5.3 - 8.38
Chloroform	**10.1**	BH2-GW1	5.4 - 8.48

Notes:
❑ **Bold & Underline** values exceed selected MOECC Standards

All remaining analytical test parameters were non-detect.

5.7 Quality Assurance and Quality Control Measures

All samples submitted as part of this Phase II-ESA were handled in accordance with the Analytical Protocol, with respect to holding time, preservation method, storage requirement and container type.

As per Subsection 47(3) of O.Reg 153/04 as amended by O.Reg 269/11, a Certificate of Analysis has been received for each sample submitted for analytical testing. All Certificates of Analysis are appended to this report.

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

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 269/11 amending O.Reg. 153/04 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

SITE DESCRIPTION

The Phase II property is located on the east side of Cummings Avenue, south of Montreal Road, in the City of Ottawa, Ontario. The Phase II property has an area of approximately 696 m^2. At the time of the Phase I Environmental Site Assessment (ESA), the property was vacant and used as an asphaltic parking lot.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Column A of Table 2 outlined in Ontario Regulation 153/04 as amended, Potentially Contaminating Activities (PCAs) were identified on the adjacent property to the north. The following PCAs resulted in Areas of Potential Environmental Concern (APECs) on the Phase II property:

- ❏ APEC1 - Automotive service garage (adjacent property to the north); Item 52, Table 2, O.Reg. 153/04 as amended: “Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems.”

- ❏ APEC2 - Retail fuel outlet (adjacent property to the north); Item 28, Table 2, O.Reg. 153/04 as amended:“Gasoline and associated product in fixed tanks”.

Other PCAs within the Phase I study area are not considered to pose an environmental concern to the Phase II property due to their separation distance and/or location downgradient or cross-gradient of the Phase II property.

Contaminants of Potential Concern (CPCs)

The following Contaminants of Potential Concern were identified with respect to the Phase II property:

- Petroleum Hydrocarbons, Fractions 1 through 4 (PHCs F1-F4) - this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F1-F4 were selected as CPCs for the Phase II property based on the presence of an automotive garage, as well as a retail fuel outlet, to the north. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs - light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase, usually above the water table, due to their lower density in most cases.

- Volatile Organic Compounds (VOCs) - this suite of parameters includes benzene, toluene, ethylbenzene, and xylenes (BTEX), associated with gasoline and diesel fuel, as well as chlorinated solvents associated with de-greasing. These parameters were selected as CPCs for groundwater at the Phase II property based on the potential for their use in the automotive garage building to the north, as well as the presence of the retail fuel outlet

Metals were analysed in a soil sample of fill material on the property for general assessment purposes only, and not because they are considered to be a contaminant of potential concern.

Subsurface Structures and Utilities

No subsurface structure or utilities were identified on the subject site.

Potable Water Source

The subject property was serviced with municipal water, as are all properties within the Phase-II study area.

PHYSICAL SETTING

Site Stratigraphy

The soil profile encountered at the borehole locations located on the property consisted of asphalt over granular fill, followed by a sandy fill. Native sand was encountered below the fill, followed by glacial till.

Specific details of the soil profile at the test hole location can be seen on the Soil Profile and Test Data sheets in the Appendix.

The site stratigraphy from ground surface to the deepest aquifer investigated, is illustrated on Drawing PE4084-6 - Cross Section A-A'. The stratigraphy consists of the following:

- **Asphaltic Concrete** was encountered from ground surface to depths ranging from 0.05 m to 0.1 m below ground surface.
- **Fill material (crushed stone with sand)** was encountered below the asphalt, to approximately 0.6 m below ground surface.
- **Fill material (brown silty sand)**: was encountered in boreholes BH2 and BH3 to depths up to 1.65 m below ground surface.
- **Silty sand:** A native brown silty sand was encountered to depths of 4.11 and 6.55 m below ground surface.
- **Glacial till:** a brown silty sand with gravel, cobbles, boulders and some clay (depending on location) was encountered to depths between 7.62 and 8.48 m below ground surface. Groundwater was identified in the glacial till layer.

Hydrogeological Characteristics

Groundwater was encountered in the glacial till unit, which is interpreted to function as a local unconfined aquifer on the property. Groundwater was encountered at depths ranging from 6.28 to 6.61 m below ground surface.

Based on the groundwater elevations from the monitoring event conducted on August 24, 2017, groundwater contours for the property were completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject property appeared to be in a western direction with a hydraulic gradient of approximately 0.002 m/m. Groundwater contours are illustrated on Drawing PE4084-3 - Test Hole Location Plan.

Approximate Depth to Bedrock

Bedrock was not confirmed in any of the boreholes, however practical refusal to augering was encountered in BH2 at 8.48 m below grade, which appears to be consistent with the published bedrock depths in the area.

Approximate Depth to Water Table

As discussed above, the depth to the water table at the subject site varies between approximately 6.28 m to 6.61 m below ground surface.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the subject site. Section 43.1 of the Regulation does not apply to the subject site, as the subject site is not considered to be a shallow soil property. The property is not located within 30 m of a water body.

Fill Placement

Fill placement has occurred at the subject site. As noted previously, a layer of granular material and silty sand was identified over the subject property (for the pavement structure). No signs of deleterious material was identified in the fill, and it was not considered to be a potentially contaminating activity. The fill was analysed for metals for general coverage purposes. The fill was in compliance with site standards.

Proposed Buildings and Other Structures

The proposed development consists of a multi storey residential structure.

Existing Buildings and Structures

No buildings or structures are located on the subject property. The property is vacant.

Water Bodies

There are no water bodies on the subject site.

Areas of Natural Significance

No areas of natural significance were identified on or in the immediate vicinity of the property.

6.0 CONCLUSIONS

Assessment

A Phase II - Environmental Site Assessment (ESA) was conducted for 603 Cummings Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the APECs identified in the Phase I-ESA conducted for the site.

Soil

Three (3) boreholes were advanced on the subject site, each of which were equipped with groundwater monitoring wells. Based on soil vapour measurements and field observations, no apparent signs of contamination or deleterious substances were noted.

Two (2) samples were submitted for analysis of petroleum hydrocarbons (PHCs) and, benzene, toluene, ethylbenzene, xylenes (BTEX), and a third sample for metals. All analytical test parameters were found to be in compliance with the MOECC Table 7 standards for the subject property.

Groundwater

Three groundwater samples were recovered from the monitoring wells installed at BH1, BH2 and BH3. No signs of hydrocarbon sheen or odours were noted in the water collected from the wells. The groundwater samples were submitted for analysis of PHCs and BTEX, and in the case of BH1 and BH2, for volatile organic compounds. All analytical test parameters were found to be in compliance with the MOECC Table 3 standards for the subject property with the exception of chloroform in the water samples from BH1 and BH2. No obvious sources of chloroform were noted, however chloroform is generally associated with municipally treated drinking water, and may be present in the groundwater below the subject site due to a ruptured or leaking City water main.

Recommendations

Consideration should be given to retesting the groundwater from the monitoring wells to re-assess the chloroform concentrations, prior to site redevelopment. Prior to mass excavation at the site (in preparation for construction activities), the groundwater monitoring wells should be decommissioned in accordance with Ontario Regulation 903, unless the site excavation extends below the monitoring wells, in which case they may be removed through the excavation of the site.

7.0 STATEMENT OF LIMITATIONS

This Phase II-ESA report has been prepared in general accordance with Ontario Regulation 269/11 amending O.Reg. 153/04 and meets the requirements of CSA Z768-00. 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. Should any conditions be encountered at the subject site that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

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 described by the test holes themselves.

This report was prepared for the sole use of 681 Montreal Ltd. Permission and notification from the abovenoted party and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Adrian Menyhart, P.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution

- ❑ 681 Montreal Ltd. (6 copies)
- ❑ Paterson Group (1 copy)

FIGURES

FIGURE 1 - KEY PLAN

DRAWING PE4084-3 - TEST HOLE LOCATION PLAN

DRAWING PE4084-4 - ANALYTICAL TESTING PLAN - SOIL

DRAWING PE4084-5 - ANALYTICAL TESTING PLAN - GROUNDWATER

DRAWING PE4084-6 - CROSS-SECTION A-A' - SOIL

DRAWING PE4084-7 - CROSS-SECTION A-A' - GROUNDWATER

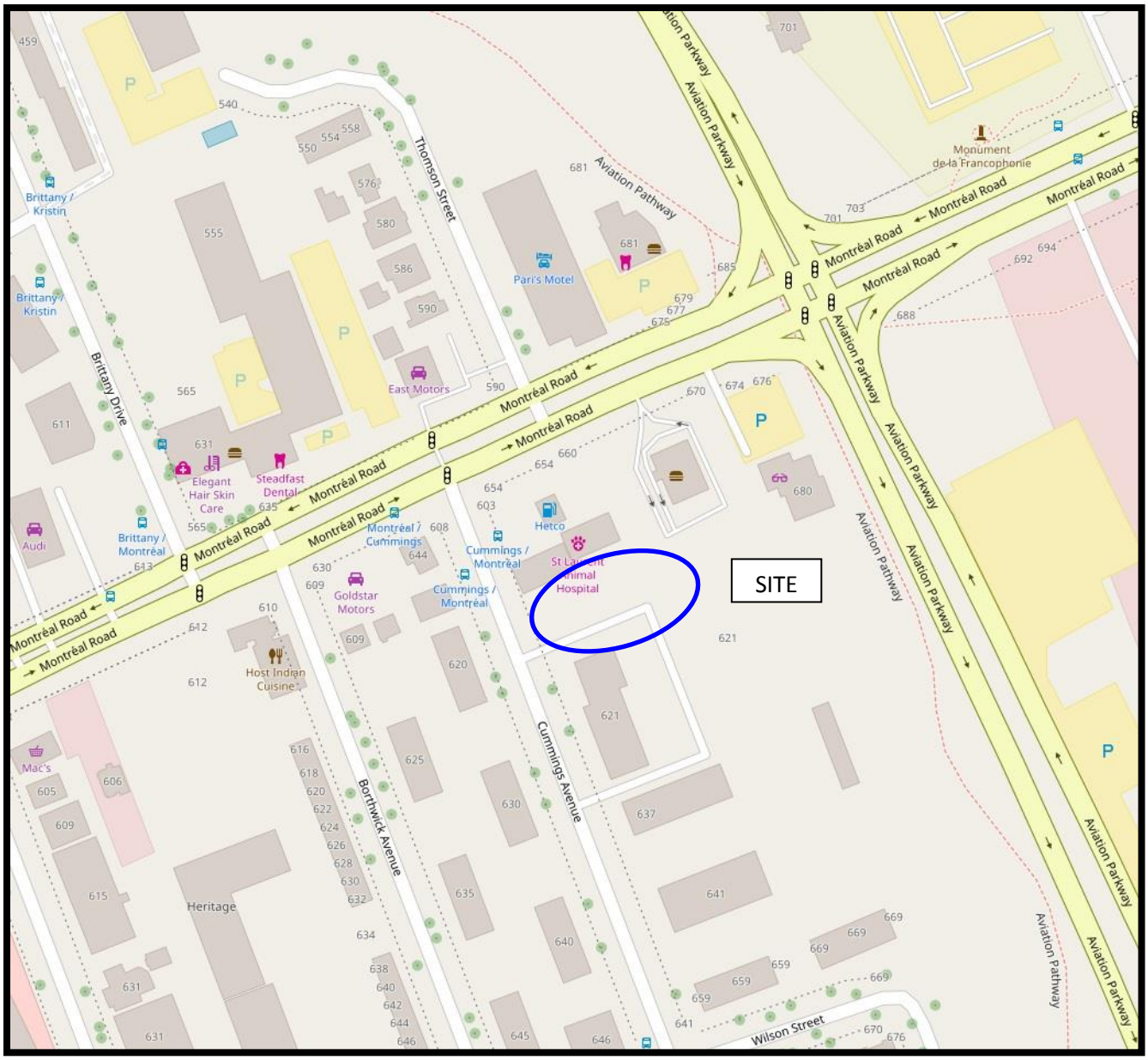
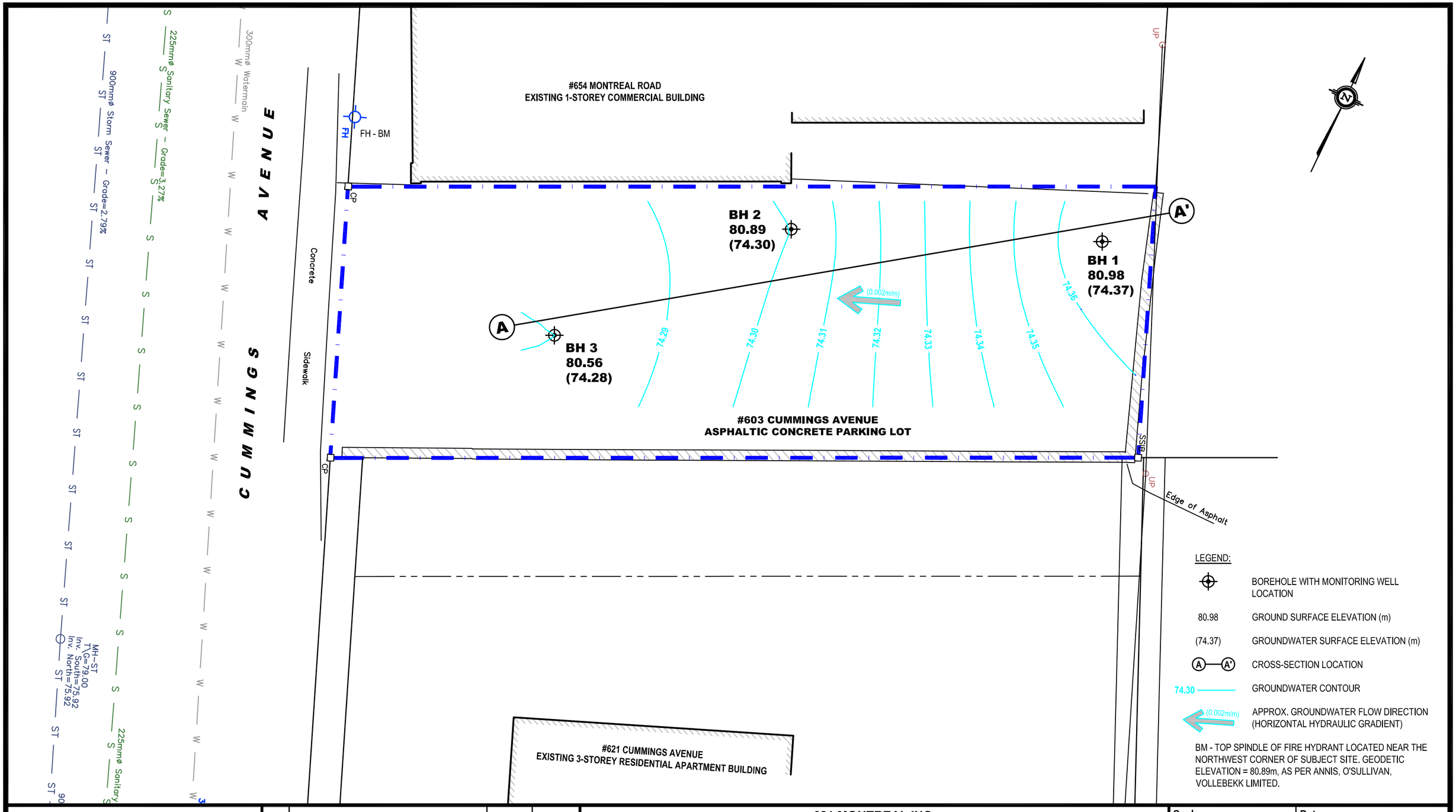


FIGURE 1

KEY PLAN



LEGEND:

⊕	BOREHOLE WITH MONITORING WELL LOCATION
80.98	GROUND SURFACE ELEVATION (m)
(74.37)	GROUNDWATER SURFACE ELEVATION (m)
A — A'	CROSS-SECTION LOCATION
74.30	GROUNDWATER CONTOUR
(0.002m/m)	APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

BM - TOP SPINDLE OF FIRE HYDRANT LOCATED NEAR THE NORTHWEST CORNER OF SUBJECT SITE. GEODETIC ELEVATION = 80.89m, AS PER ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

681 MONTREAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
603 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:200	Date: 09/2017
Drawn by: MPG	Report No.: PE4084-2
Checked by: AM	Dwg. No.: PE4084-3
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe40xx\pe4084\pe4084 phase ii.dwg

#654 MONTREAL ROAD
EXISTING 1-STOREY COMMERCIAL BUILDING

FH - BM

BH2-SS9 (6.11 - 6.72 m) - August 18, 2017
PHC (F1-F4) - Comply with MOECC Table 3
BTEX - Comply with MOECC Table 3

BH 2
80.89
(74.30)

BH 1
80.98
(74.37)

BH1-SS11 (7.61 - 8.22 m) - August 18, 2017
PHC (F1-F4) - Comply with MOECC Table 3
BTEX - Comply with MOECC Table 3

#603 CUMMINGS AVENUE
ASPHALTIC CONCRETE PARKING LOT

BH 3
80.56
(74.28)

BH3-AU1 (0 - 0.61) - August 18, 2017
Metals - Comply with MOECC Table 3

#621 CUMMINGS AVENUE
EXISTING 3-STOREY RESIDENTIAL APARTMENT BUILDING

CUMMINGS AVENUE

Concrete

Sidewalk

Edge of Asphalt

900mmø Storm Sewer – Grade=2.79%

225mmø Sanitary Sewer – Grade=3.27%

300mmø Watermain

MH–ST
TYG=79.00
Inv. South=75.92
Inv. North=75.92

225mmø Sanitary Sewer

LEGEND:

SOIL PARAMETERS IN COMPLIANCE WITH MOECC TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MOECC TABLE 3 STANDARDS

BOREHOLE WITH MONITORING WELL LOCATION

80.98 GROUND SURFACE ELEVATION (m)

(74.37) GROUNDWATER SURFACE ELEVATION (m)

BM - TOP SPINDLE OF FIRE HYDRANT LOCATED NEAR THE NORTHWEST CORNER OF SUBJECT SITE. GEODETIC ELEVATION = 80.89m, AS PER ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED.

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

681 MONTREAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
603 CUMMINGS AVENUE

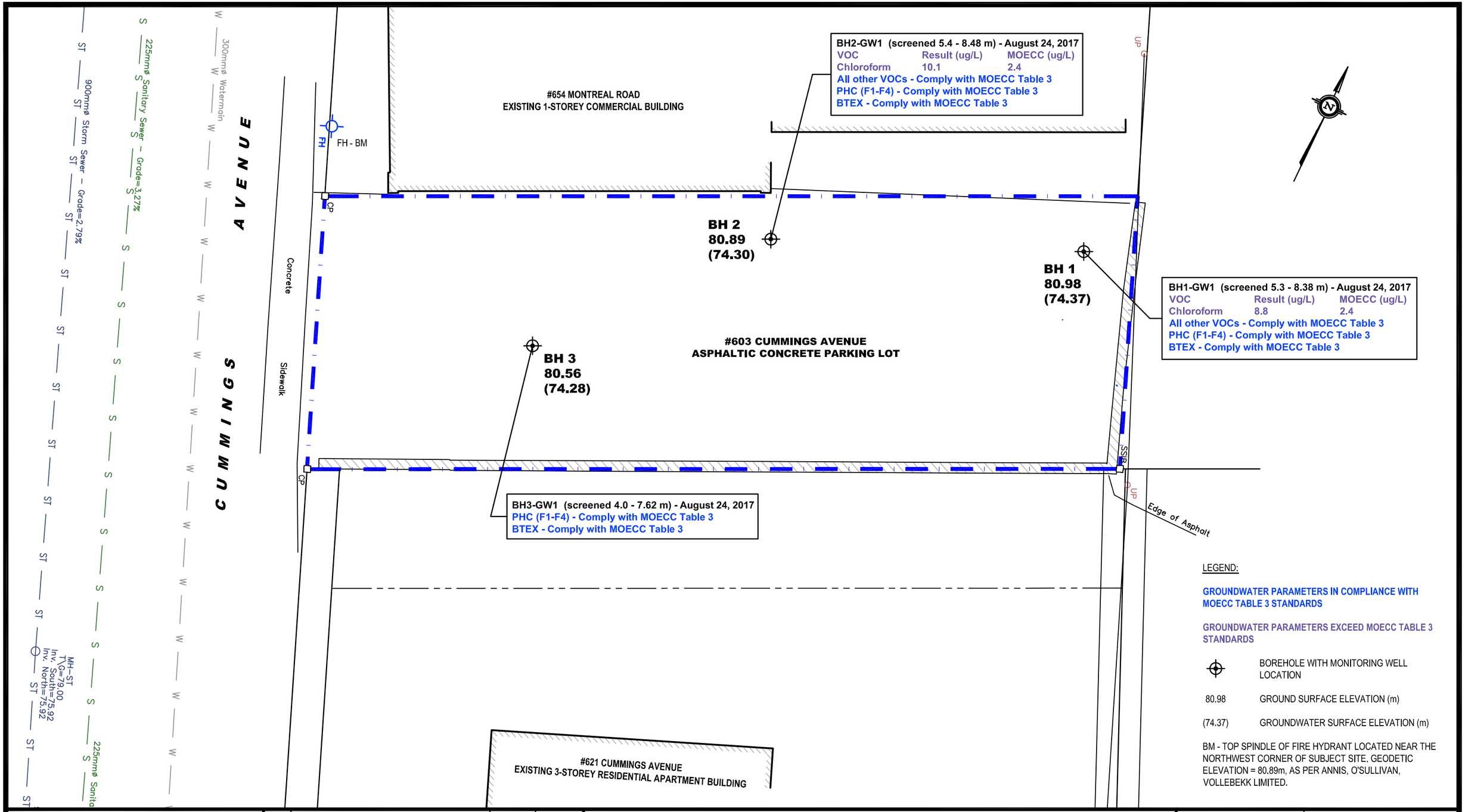
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:200	Date: 09/2017
Drawn by: MPG	Report No.: PE4084-2
Checked by: AM	Dwg. No.: PE4084-4
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe40xx\pe4084\pe4084 phase ii.dwg



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

NO.	REVISIONS	DATE	INITIAL
0			

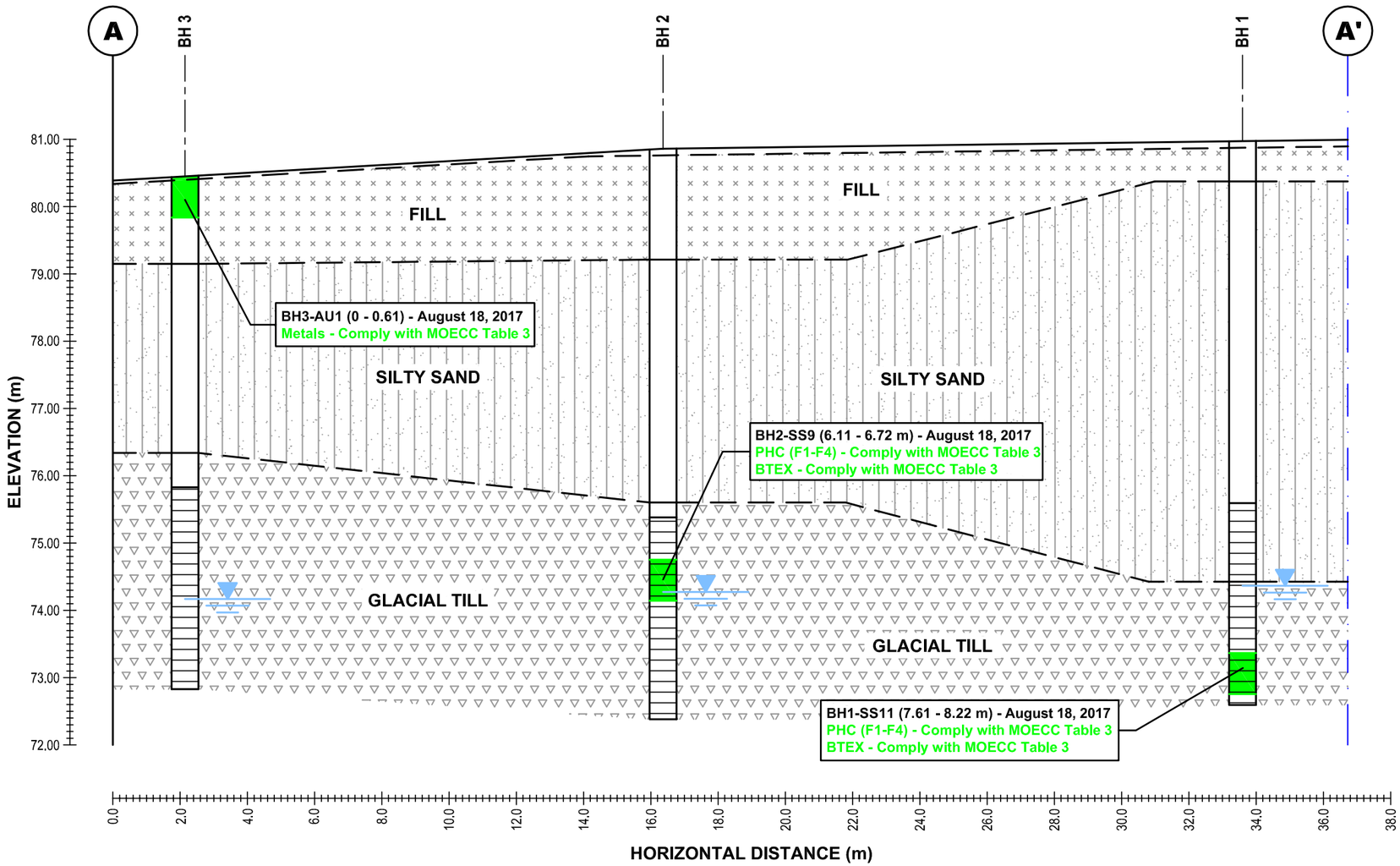
681 MONTREAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
603 CUMMINGS AVENUE
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:200	Date: 09/2017
Drawn by: MPG	Report No.: PE4084-2
Checked by: AM	Dwg. No.: PE4084-5
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe40xx\pe4084\pe4084 phase ii.dwg



SOIL PARAMETERS COMPLY WITH MOECC TABLE 3 STANDARD

SOIL PARAMETERS EXCEED MOECC TABLE 3 STANDARD

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

681 MONTREAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
603 CUMMINGS AVENUE

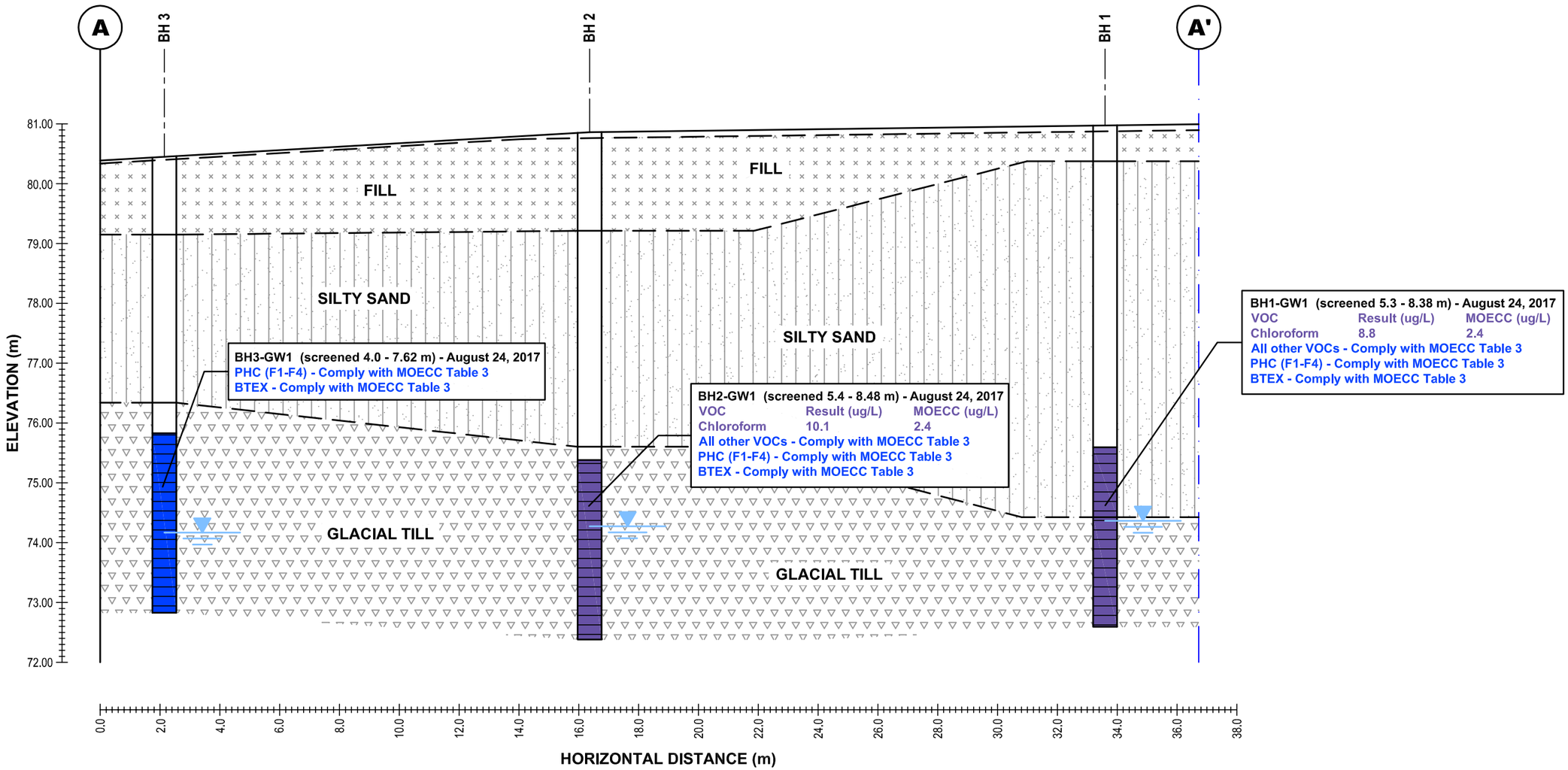
OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL

Scale: AS SHOWN	Date: 09/2017
Drawn by: MPG	Report No.: PE4084-2
Checked by: AM	Dwg. No.: PE4084-6
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe40xx\pe4084\pe4084-6 section a.dwg



GROUNDWATER PARAMETERS COMPLY WITH MOECC TABLE 3 STANDARD

GROUNDWATER PARAMETERS EXCEED MOECC TABLE 3 STANDARD

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

681 MONTREAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
603 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 09/2017
Drawn by: MPG	Report No.: PE4084-2
Checked by: AM	Dwg. No.: PE4084-7
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe40xx\pe4084\pe4084-6 section a.dwg

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 and Analysis Plan

603 Cummings Avenue
Ottawa, Ontario

Prepared For

681 Montreal Inc.

August, 2017

Report: PE4084-SAP.01

Table of Contents

1.0 Sampling Program

Paterson Group (Paterson) was commissioned by 681 Montreal Inc. to conduct a Phase II ESA for the property located at 603 Cummings Avenue, in the City of Ottawa, Ontario.

The following subsurface investigation program was developed to address the areas of potential environmental concern identified in the Phase I-ESA:

Test Hole	Location and Rationale	Proposed Depth and Rationale
BH1	Northern property line, adjacent to garage and retail fuel outlet	Drilled to intercept groundwater table
BH2	Northern property line, adjacent to garage and retail fuel outlet	Drilled to intercept groundwater table
BH3	West side of property, central, located within former building footprint	Drilled to intercept groundwater table

Borehole locations are shown on the Test Hole Location Plan appended to the main report.

At each borehole, split spoon of overburden soils will be obtained at 0.76 m (2'6'') intervals until spoon refusal is encountered. Grab samples will be obtained from each stratigraphic unit encountered in the test pits. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

If it is considered necessary to drill into bedrock to intercept the groundwater table, boreholes will be advanced into bedrock as required using diamond coring equipment. Rock core samples will be retained for review. Following borehole drilling, monitoring wells will be installed in selected boreholes for the measurement of water levels and the collection of groundwater samples.

2.0 Analytical Testing Program

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

- In borehole where there is visual or olfactory evidence of contamination, or where photoionization detector (PID) readings indicate the presence of contamination, the 'worst-case' sample from each test pit 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 vertically downward.
- At least one sample from each borehole should be submitted to delineate the horizontal extent of contamination across the site.
- Parameters analyzed should be consistent with the contaminants of potential concern identified in the Phase II-ESA.
- Samples will be submitted for analysis of VOC parameters.

3.0 Standard Operating Procedures

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to assess the soil conditions and facilitate the installation of groundwater monitoring wells.

Equipment

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

- Glass soil sample jars
- Plastic sample bags 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 and Test pit Locations

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

After drilling/excavation is completed a plan with the borehole/test pit locations must be provided. Distances and orientations of test pits with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a geodetic benchmark, if one is available, or a temporary site benchmark which can be tied in at a later date if necessary.

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. Sleeve samples are to be collected when utilizing GeoProbe direct push drill.
- 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. Sleeves are disposable and will not require washing.
- 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, visual observations, 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.

The spoon-washing procedure may be bypassed if a GeoProbe direct-push drill rig with disposable plastic sampling tubes is used.

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3.2 cm 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
- Portable pH/Temperature/Conductivity analyzer
- 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.

Instrument Washing Procedure

All sampling equipment (shovels, trowels, spatulas, 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 instrument with brush in soapy water, inside and out, including tip
- Rinse in clean water
- Apply a small amount of methyl hydrate to the exposed faces of the instrument. (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 equipment, 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.

4.0 Quality Assurance/Quality Control (QA/QC)

The QA/QC program for this subsurface investigation is as follows:

- All non-dedicated sampling equipment (shovels, split spoons, etc.) will be decontaminated according to the SOPs listed above.
- Approximately one field duplicate will be submitted for every ten samples submitted for laboratory analysis. A minimum of one field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples where possible.
- Where multi-parameter analyzers are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 Physical Impediments to Sampling and Analysis Plan

Physical impediments to the Sampling and Analysis plan may include:

- The location of underground utilities
- Shallow bedrock or limited presence of fill
- Insufficient groundwater volume for groundwater samples (if encountered)
- 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
- Mechanical Equipment breakdowns
- Winter conditions
- Other site-specific impediments

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
603 Cummings Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located near the northwest corner of subject site. Geodetic elevation = 80.89m, as per Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4084

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** August 18, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.10						0	80.98		
FILL: Crushed stone with silt and sand 0.60		AU	1						
		SS	2	50	8	1	79.98		
		SS	3	54	5	2	78.98		
		SS	4	58	5				
		SS	5	58	5	3	77.98		
Loose, brown **SILTY SAND**		SS	6	58	7	4	76.98		
		SS	7	58	5	5	75.98		
		SS	8	62	9	6	74.98		
6.55		SS	9	62	21				
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders		SS	10	75	38	7	73.98		
		SS	11	58	18	8	72.98		
8.38									
End of Borehole									
(GWL @ 6.61m - August 24, 2017)									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
603 Cummings Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located near the northwest corner of subject site. Geodetic elevation = 80.89m, as per Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4084

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** August 18, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	80.89
Asphaltic concrete 0.10		AU	1				
FILL: Crushed stone with silt and sand 0.38							
FILL: Brown silty sand, trace gravel and cobbles		SS	2	33	4	1	79.89
1.65		SS	3	54	5	2	78.89
Loose to compact, brown **SILTY SAND,** some clay, trace gravel		SS	4	58	6	3	77.89
		SS	5	54	13		
		SS	6	58	8	4	76.89
5.26		SS	7	50	9	5	75.89
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles and boulders		SS	8	67	11	6	74.89
		SS	9	67	19		
		SS	10	42	37	7	73.89
		SS	11	0	8	8	72.89
8.48							
End of Borehole							
Practical refusal to augering at 8.48m depth							
(GWL @ 6.59m - August 24, 2017)							

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
603 Cummings Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located near the northwest corner of subject site. Geodetic elevation = 80.89m, as per Annis, O'Sullivan, Vollebekk Ltd.

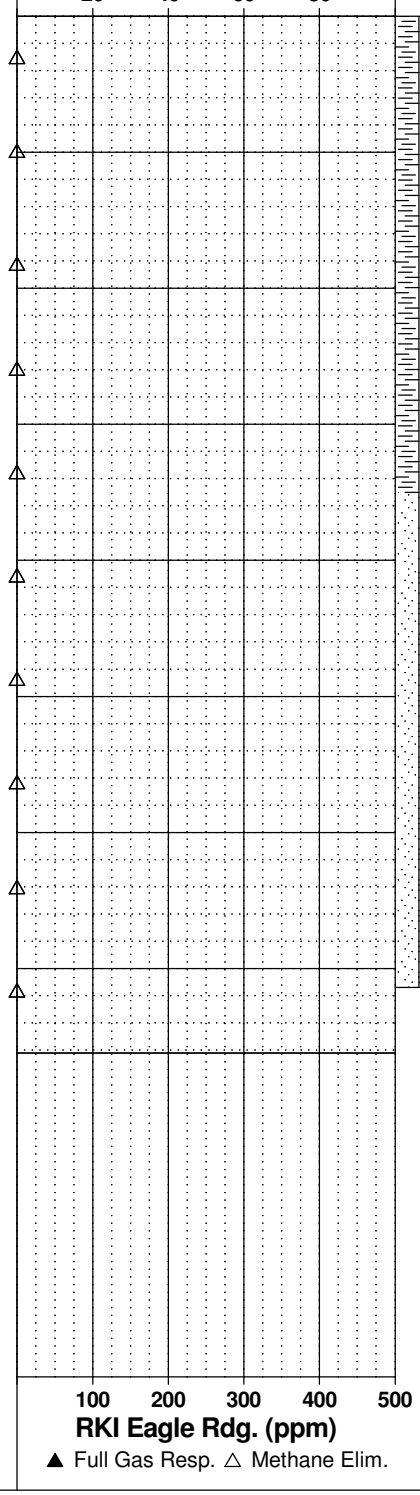
FILE NO. PE4084

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** August 18, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.05									
FILL: Crushed stone with silt and sand 0.43		AU	1						
FILL: Brown silty sand, trace gravel, cobbles and boulders 1.30		G	2		50+	0	80.56		
Loose, brown **SILTY SAND**		SS	3	67	7	1	79.56		
		SS	4	75	10	2	78.56		
- trace clay by 3.0m depth		SS	5	96	8	3	77.56		
4.11		SS	6	62	9	4	76.56		
GLACIAL TILL: Loose to compact, brown silty sand with gravel, cobbles and boulders		SS	7	58	8	5	75.56		
		SS	8	17	51	6	74.56		
		SS	9	75	30				
		SS	10	42	18	7	73.56		
7.62									
End of Borehole									
(GWL @ 6.28m - August 24, 2017)									



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 strength of cohesionless soils is the relative density, 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.

Relative Density	'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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

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 NXL size core. However, it can be used on smaller core sizes, such as BX, 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
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture 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 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 x 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

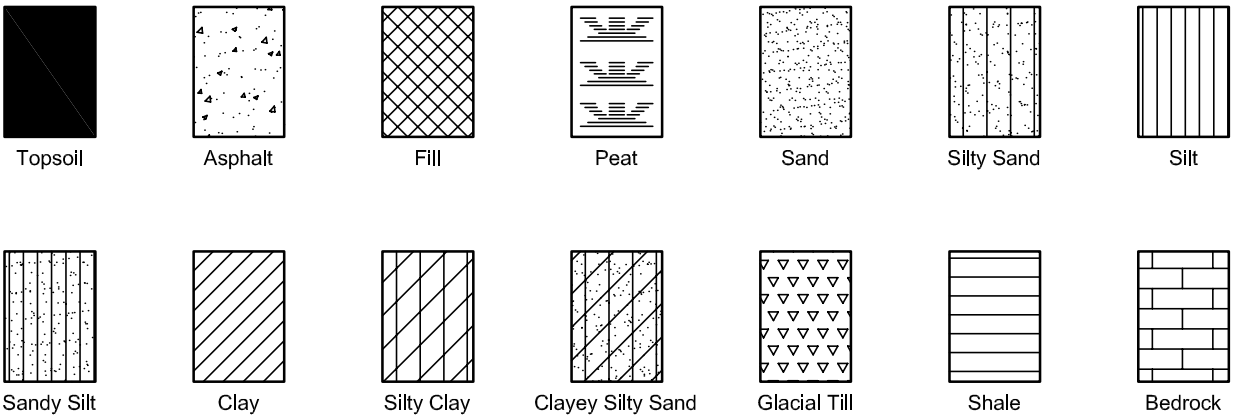
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

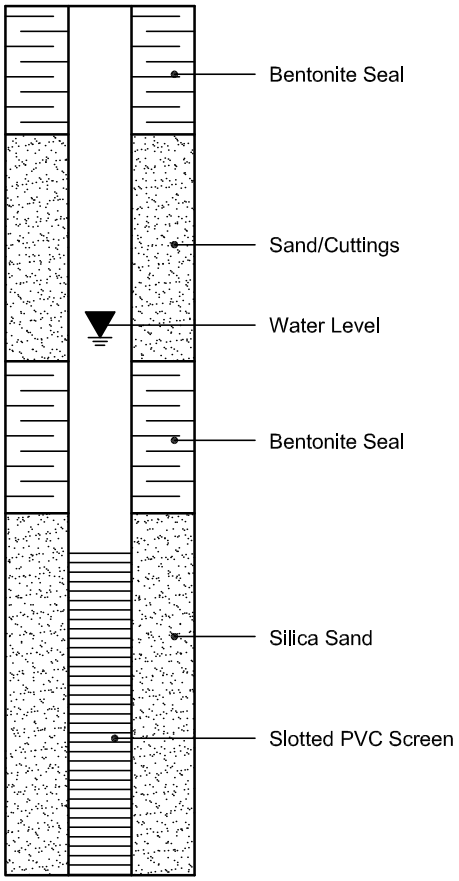
SYMBOLS AND TERMS (continued)

STRATA PLOT

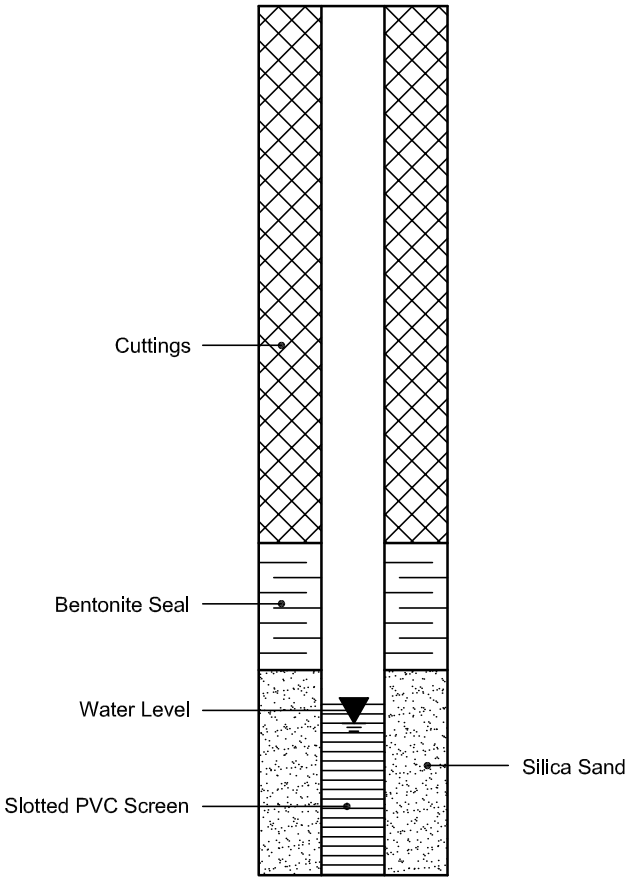


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 22251
Project: PE4084
Custody: 113645

Report Date: 25-Aug-2017
Order Date: 21-Aug-2017

Order #: 1734112

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

Paracel ID	Client ID
1734112-01	BH1-SS11
1734112-02	BH2-SS9
1734112-03	BH3-AU1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 22251

Report Date: 25-Aug-2017
Order Date: 21-Aug-2017
Project Description: PE4084

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	24-Aug-17	25-Aug-17
PHC F1	CWS Tier 1 - P&T GC-FID	24-Aug-17	25-Aug-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	22-Aug-17	24-Aug-17
REG 153: Metals by ICP/OES, soil	based on MOE E3470, ICP-OES	23-Aug-17	23-Aug-17
Solids, %	Gravimetric, calculation	23-Aug-17	23-Aug-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22251

Report Date: 25-Aug-2017

Order Date: 21-Aug-2017

Project Description: PE4084

	Client ID:	BH1-SS11	BH2-SS9	BH3-AU1	-
	Sample Date:	18-Aug-17	18-Aug-17	18-Aug-17	-
	Sample ID:	1734112-01	1734112-02	1734112-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	86.5	94.7	95.6	-
Metals					
Antimony	1.0 ug/g dry	-	-	<1.0	-
Arsenic	1.0 ug/g dry	-	-	<1.0	-
Barium	1.0 ug/g dry	-	-	239	-
Beryllium	1.0 ug/g dry	-	-	<1.0	-
Boron	1.0 ug/g dry	-	-	7.3	-
Cadmium	0.5 ug/g dry	-	-	<0.5	-
Chromium	1.0 ug/g dry	-	-	10.2	-
Cobalt	1.0 ug/g dry	-	-	3.3	-
Copper	1.0 ug/g dry	-	-	7.7	-
Lead	1.0 ug/g dry	-	-	12.1	-
Molybdenum	1.0 ug/g dry	-	-	<1.0	-
Nickel	1.0 ug/g dry	-	-	8.4	-
Selenium	1.0 ug/g dry	-	-	<1.0	-
Silver	0.5 ug/g dry	-	-	<0.5	-
Thallium	1.0 ug/g dry	-	-	<1.0	-
Uranium	1.0 ug/g dry	-	-	<1.0	-
Vanadium	1.0 ug/g dry	-	-	15.9	-
Zinc	1.0 ug/g dry	-	-	27.3	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	107%	99.7%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	-

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						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	1.0	ug/g						
Boron	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.5	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	1.0	ug/g						
Zinc	ND	1.0	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	*3.32*		*ug/g*		*104*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 22251

Report Date: 25-Aug-2017
Order Date: 21-Aug-2017
Project Description: PE4084

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				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	3.37	1.0	ug/g dry	3.41			1.1	30	
Barium	86.0	1.0	ug/g dry	93.7			8.5	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron	9.08	1.0	ug/g dry	10.6			15.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	17.0	1.0	ug/g dry	18.6			8.5	30	
Cobalt	8.26	1.0	ug/g dry	8.83			6.6	30	
Copper	14.5	1.0	ug/g dry	15.7			7.5	30	
Lead	15.5	1.0	ug/g dry	16.0			3.2	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	17.4	1.0	ug/g dry	20.9			18.3	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND				30	
Vanadium	27.0	1.0	ug/g dry	29.7			9.7	30	
Zinc	55.3	1.0	ug/g dry	61.0			9.9	30	
Physical Characteristics									
% Solids	77.0	0.1	% by Wt.	81.4			5.5	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*4.15*		*ug/g dry*		*102*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	184	7	ug/g		92.1	80-120			
F2 PHCs (C10-C16)	86	4	ug/g	ND	83.1	60-140			
F3 PHCs (C16-C34)	200	8	ug/g	ND	92.8	60-140			
F4 PHCs (C34-C50)	149	6	ug/g	ND	104	60-140			
Metals									
Antimony	274		ug/L	ND	110	70-130			
Arsenic	342		ug/L	68.2	110	70-130			
Barium	250		ug/L		100	70-130			
Beryllium	248		ug/L	3.15	97.8	70-130			
Boron	451		ug/L	211	95.8	70-130			
Cadmium	243		ug/L	4.81	95.1	70-130			
Chromium	584		ug/L	371	85.2	70-130			
Cobalt	399		ug/L	177	89.1	70-130			
Copper	558		ug/L	313	98.0	70-130			
Lead	533		ug/L	321	84.7	70-130			
Molybdenum	238		ug/L	17.9	88.0	70-130			
Nickel	595		ug/L	419	70.3	70-130			
Selenium	222		ug/L	5.78	86.3	70-130			
Silver	246		ug/L	ND	98.1	70-130			
Thallium	233		ug/L	14.0	87.4	70-130			
Uranium	305		ug/L	ND	122	70-130			
Vanadium	825		ug/L	595	92.2	70-130			
Zinc	221		ug/L		88.4	70-130			
Volatiles									
Benzene	3.41	0.02	ug/g		85.2	60-130			
Ethylbenzene	3.50	0.05	ug/g		87.5	60-130			
Toluene	3.33	0.05	ug/g		83.2	60-130			
m,p-Xylenes	6.90	0.05	ug/g		86.2	60-130			
o-Xylene	3.70	0.05	ug/g		92.6	60-130			
Surrogate: Toluene-d8	*2.80*		*ug/g*		*87.5*	*50-140*			

Qualifier Notes:

None

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.

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.

PARACEL LABORATORIES LTD.

TRUSTED . RESPONSIVE . RELIABLE .

Paracel ID: 1734112

lvd. J8 .com

Chain of Custody (Lab Use Only)

№ 113645

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE4084		**Turnaround Time:**
Contact Name: ADRIAN MONYMAKER	Quote #		☐ 1 Day ☐ 3 Day
Address: 154 COLONNADE RD. S.	PO # 22251		☐ 2 Day ☑ Regular
Telephone: 613-226-7381	Email Address: amonymaker@patersongroup.ca		Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) ☐ Municipality: ☐ Other:

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

Paracel Order Number: 1734112

	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-SS11	S		2	AUG18'17		✓										250mL(+1 vial) - ✓		
2	BH2-SS9	↓		2	↓		✓										↓		✓
3	BH3-AU1	↓		1	↓					✓							250mL		✓
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Jeause	Received at Lab: SUNEEPORN DOKMAI	Verified By:
Relinquished By (Print): A MONYMAKER	Date/Time: 21/08/17 3:35 PM	Date/Time: AUG 21, 2017 09:10	Date/Time: 08/22/17 11:58
Date/Time: AUG 21 2017	Temperature: °C	Temperature: 19.2 °C	pH Verified [ ] By:

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 22256
Project: PE4084
Custody: 113646

Report Date: 30-Aug-2017
Order Date: 24-Aug-2017

Order #: 1734430

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

Paracel ID	Client ID
1734430-01	BH1-GW1
1734430-02	BH2-GW1
1734430-03	BH3-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	30-Aug-17	30-Aug-17
PHC F1	CWS Tier 1 - P&T GC-FID	29-Aug-17	30-Aug-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	28-Aug-17	29-Aug-17
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	29-Aug-17	30-Aug-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22256

Report Date: 30-Aug-2017

Order Date: 24-Aug-2017

Project Description: PE4084

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	24-Aug-17	24-Aug-17	24-Aug-17	-
	Sample ID:	1734430-01	1734430-02	1734430-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	0.8	0.6	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	8.8	10.1	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22256

Report Date: 30-Aug-2017

Order Date: 24-Aug-2017

Project Description: PE4084

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	24-Aug-17	24-Aug-17	24-Aug-17	-
	Sample ID:	1734430-01	1734430-02	1734430-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	100%	95.2%	-	-
Dibromofluoromethane	Surrogate	94.0%	91.2%	-	-
Toluene-d8	Surrogate	94.8%	92.4%	-	-
Benzene	0.5 ug/L	-	-	<0.5	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-
Toluene	0.5 ug/L	-	-	<0.5	-
m,p-Xylenes	0.5 ug/L	-	-	<0.5	-
o-Xylene	0.5 ug/L	-	-	<0.5	-
Xylenes, total	0.5 ug/L	-	-	<0.5	-
Toluene-d8	Surrogate	-	-	94.2%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<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	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	*82.0*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*74.4*		*ug/L*		*93.0*	*50-140*			
Surrogate: Toluene-d8	*77.6*		*ug/L*		*97.0*	*50-140*			
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	*77.6*		*ug/L*		*97.0*	*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				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*78.9*		*ug/L*		*98.7*	*50-140*			
Surrogate: Dibromofluoromethane	*77.9*		*ug/L*		*97.4*	*50-140*			
Surrogate: Toluene-d8	*76.1*		*ug/L*		*95.2*	*50-140*			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*76.1*		*ug/L*		*95.2*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1990	25	ug/L		99.6	68-117			
F2 PHCs (C10-C16)	2190	100	ug/L		121	60-140			
F3 PHCs (C16-C34)	3880	100	ug/L		104	60-140			
F4 PHCs (C34-C50)	2500	100	ug/L		101	60-140			
Volatiles									
Acetone	80.2	5.0	ug/L		80.2	50-140			
Benzene	33.2	0.5	ug/L		83.0	60-130			
Bromodichloromethane	42.5	0.5	ug/L		106	60-130			
Bromoform	38.4	0.5	ug/L		96.1	60-130			
Bromomethane	26.5	0.5	ug/L		66.2	50-140			
Carbon Tetrachloride	46.9	0.2	ug/L		117	60-130			
Chlorobenzene	32.8	0.5	ug/L		82.0	60-130			
Chloroform	38.5	0.5	ug/L		96.2	60-130			
Dibromochloromethane	44.5	0.5	ug/L		111	60-130			
Dichlorodifluoromethane	34.9	1.0	ug/L		87.4	50-140			
1,2-Dichlorobenzene	32.5	0.5	ug/L		81.3	60-130			
1,3-Dichlorobenzene	33.8	0.5	ug/L		84.5	60-130			
1,4-Dichlorobenzene	31.4	0.5	ug/L		78.4	60-130			
1,1-Dichloroethane	37.9	0.5	ug/L		94.8	60-130			
1,2-Dichloroethane	42.2	0.5	ug/L		106	60-130			
1,1-Dichloroethylene	37.3	0.5	ug/L		93.2	60-130			
cis-1,2-Dichloroethylene	39.2	0.5	ug/L		98.0	60-130			
trans-1,2-Dichloroethylene	39.7	0.5	ug/L		99.2	60-130			
1,2-Dichloropropane	35.8	0.5	ug/L		89.4	60-130			
cis-1,3-Dichloropropylene	42.8	0.5	ug/L		107	60-130			
trans-1,3-Dichloropropylene	46.0	0.5	ug/L		115	60-130			
Ethylbenzene	40.2	0.5	ug/L		100	60-130			
Ethylene dibromide (dibromoethane	33.6	0.2	ug/L		84.0	60-130			
Hexane	30.4	1.0	ug/L		76.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	75.8	5.0	ug/L		75.8	50-140			
Methyl Isobutyl Ketone	89.4	5.0	ug/L		89.4	50-140			
Methyl tert-butyl ether	86.0	2.0	ug/L		86.0	50-140			
Methylene Chloride	26.8	5.0	ug/L		67.0	60-130			
Styrene	45.5	0.5	ug/L		114	60-130			
1,1,1,2-Tetrachloroethane	43.7	0.5	ug/L		109	60-130			
1,1,2,2-Tetrachloroethane	29.8	0.5	ug/L		74.6	60-130			
Tetrachloroethylene	34.8	0.5	ug/L		87.0	60-130			
Toluene	34.6	0.5	ug/L		86.5	60-130			
1,1,1-Trichloroethane	38.9	0.5	ug/L		97.2	60-130			
1,1,2-Trichloroethane	37.8	0.5	ug/L		94.6	60-130			
Trichloroethylene	41.9	0.5	ug/L		105	60-130			
Trichlorofluoromethane	41.8	1.0	ug/L		104	60-130			
Vinyl chloride	47.2	0.5	ug/L		118	50-140			
m,p-Xylenes	79.0	0.5	ug/L		98.8	60-130			
o-Xylene	39.9	0.5	ug/L		99.8	60-130			
Surrogate: 4-Bromofluorobenzene	*78.0*		*ug/L*		*97.5*	*50-140*			
Benzene	33.2	0.5	ug/L		83.0	60-130			
Ethylbenzene	40.2	0.5	ug/L		100	60-130			
Toluene	34.6	0.5	ug/L		86.5	60-130			
m,p-Xylenes	79.0	0.5	ug/L		98.8	60-130			
o-Xylene	39.9	0.5	ug/L		99.8	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1734430

PARACEL LABORATORIES LTD.

TRUSTED . RESPONSIVE . RELIABLE .

e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 113646

Page 1 of 1

Client Name: The Paterson Group	Project Reference: PE4084	**Turnaround Time:**
Contact Name: Adrian Menyhart	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 22256.	☐ 2 Day ☑ Regular
Telephone:	Email Address: amenyhart@patersongroup.ca.	Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

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

Required Analyses

Paracel Order Number: 1734430

	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-GW1	GW		3	AUG 24 '17	PM	✓												✓
2	BH2-GW1	"		3	"	PM	✓												✓
3	BH3-GW1	"		3	"	PM	✓												✓
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Sauve	Received at Lab: SUREEPORN DOUNTI	Verified By:
Relinquished By (Print): A. Menyhart	Date/Time: 24/08/17 4:00 PM	Date/Time: AUG 24, 2017 09:34	Date/Time: 08/25/17 0:19
Date/Time: AUG 24 2017,	Temperature: °C	Temperature: 19.0 °C	pH Verified [ ] By: