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Phase II Environmental Site Assessment

1090 Cummings Avenue
Ottawa, Ontario

Prepared For

Huntington Property Group

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Report: PE4577-1

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for 1090 Cummings Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to delineate soil and groundwater impacts identified during previous investigations conducted by Paterson (2016) and others (2018). The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling five (5) boreholes, three (3) of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Three (3) soil samples were submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), volatile organic compound (VOC), petroleum hydrocarbons (PHCs, F_1-F_4) and metal parameters. Two (2) soil samples were submitted for laboratory analysis of EC and SAR. A PHC, F_3 concentration exceeding the MECP Table 7 standard was identified in BH6-19, while EC and SAR concentrations exceed the MECP Table 7 standards were identified at BH2-19. Otherwise, parameter concentrations identified in the soil were in compliance with the MECP Table 7 standards.

Groundwater samples from monitoring wells installed in BH1-19, BH5-19 and BH6-19, as well as MW2 and BH3, were recovered and analyzed for BTEX, VOC and/or PHC parameters. Benzene concentrations exceeding the MECP Table 7 standards were identified in each of the groundwater samples, in addition to chloroform and hexane in the initial sample recovered from BH6-19.

It should be noted that based on the chloroform concentration identified in BH6-19-GW1, the results were not considered to be representative of the groundwater at this location. The groundwater in BH6-19 was subsequently re-sampled and analysed for VOC parameters on two separate occasions. Based on the analytical test results, no VOC concentrations were identified above the laboratory method detection limits in Samples BH6-19-GW2 and BH6-19-GW3.

Conclusion

Soil

Based on the findings of the Phase II ESA, an area of benzene and PHC F_1 impacted soil was identified beneath the auto body shop; the impacted area is not expected to extend beyond the footprint of the building. Near surface soils impacted with PHC F_3 and/or F_4 concentrations exceeding MECP Table 7 standards are present on the exterior of the Phase II Property, south of the subject structure. The impacts are considered to be related to small leaks and spills associated with on-site vehicles and equipment, are surficial in nature and may be encountered in pockets across the southern portion of the site.

Soil impacted with EC and SAR concentrations was identified on the northwestern portion of the property in the vicinity of the salt and brine storage. The extent of the impacts are expected to be confined to the immediate vicinity of the storage area.

It is our understanding that a portion of the Phase II Property is to be redeveloped with a residential building with one basement level. It is recommended that an environmental site remediation program, involving the removal of all impacted soil, be completed prior to site redevelopment. Prior to offsite disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

It is also recommended that Paterson personnel be onsite during construction activities to direct the excavation and segregation of impacted soil and to conduct confirmatory sampling as required.

Groundwater

Groundwater impacted with benzene is present beneath the subject structure on the southwest and south-central portions of the site. It is recommended that further investigatory work be conducted to delineate the full lateral extent of the impacted groundwater. Once additional information is available, it is recommended that a groundwater remediation program or risk assessment be implemented at the Phase II Property.

It is recommended that the integrity of the monitoring wells be maintained, prior to construction, for possible future groundwater monitoring events. Once they are no longer required, it is recommended that they be abandoned in accordance with O.Reg.903. This may be done in conjunction with the construction excavation.

1.0 INTRODUCTION

At the request of Huntington Property Group, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for the property addressed 1068 to 1100 Cummings Avenue, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the previous Phase I ESA (August 2016) and Phase I ESA Update (March 2019) conducted by Paterson.

1.1 Site Description

Address:	1090 Cummings Avenue, Ottawa, Ontario. It should be noted that the Phase II Property includes civic addresses 1068 through 1100 Cummings Avenue.
Property Identification Number:	04266-0067
Location:	Lot 5 and Part of Lot 6, Plan 217, in the City of Ottawa
Configuration:	Irregular
Site Area:	1.52 ha (approximate)

1.2 Property Ownership

The registered owner of the property is Cummings Caron Property Ltd. Paterson was engaged to conduct this Phase II – ESA by Mr. Derek Noble of Huntington Property Group, the property owner representative. Mr. Noble can be reached by telephone at (613) 592-1818.

1.3 Current and Proposed Future Uses

An automotive body shop, steel storage and sales office, and landscaping business currently occupy the Phase II Property. It is our understanding that the subject site will be redeveloped for a residential use.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 7 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ministry of the Environment, Conservation and Parks (MECP), April 2011. The MECP Table 7 Standards are based on the following considerations:

- Coarse grained soil conditions;
- Surface soil and groundwater conditions;
- Shallow bedrock conditions;
- Non-potable groundwater situation; and
- Residential land use.

The residential standards were selected based on the proposed future use of the subject site. Based on site observations, coarse-grained soil standards were selected. Grain size analysis was not completed as part of this investigation.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The portion of the Phase II Property not occupied by the building is covered with asphaltic concrete or granular materials.

Sheet drainage to catch basins located along Cummings Avenue, as well as infiltration in areas with granular cover are the primary methods of removing surface water from the site. No ponded water was observed at the time of the site assessment. Surficial staining was noted on the ground surfaces in the southern area of the site, near the body shop bay doors. Surficial staining (due to rust) was noted around the exterior steel storage area.

The site topography is relatively flat. The regional topography slopes down to the north. Regional groundwater is considered to flow in a northerly direction, towards the Ottawa River.

2.2 Past Investigations

The following reports were reviewed as part of our assessment:

- "Phase I-Environmental Site Assessment, 1090 Cummings Avenue, Ottawa, Ontario", prepared by Paterson, dated August 31, 2016.

A Phase I-ESA completed by Paterson in August 2016, recommended a Phase II-ESA to address five different potentially contaminating activities located on the property, resulting in five areas of potential environmental concern. These included a commercial auto body shop, a metal fabricator, three (3) aboveground fuel storage tanks, and a salt and brine storage area.

- ❒ "Phase II-Environmental Site Assessment, 1090 Cummings Avenue, Ottawa, Ontario", prepared by Paterson, dated November 17, 2016.

The above noted investigation consisted of drilling seven (7) boreholes on the subject property, one of which was placed inside the garage area of the auto body shop. Seven (7) soil samples were analysed for metals, volatile organic compounds (VOCs), petroleum hydrocarbons (PHCs), sodium absorption ratio (SAR), and conductivity. Concentrations of PHC F3 and F4, SAR and electrical conductivity exceeding the MECP Table 7 standards, were identified on the subject property at BH1 and BH4.

Three (3) boreholes (BH1, BH2 and BH3) were instrumented with groundwater monitoring wells. Groundwater samples recovered from the monitoring wells were analysed for a combination of sodium, chlorides, VOCs and PHCs. All water samples were found to be in compliance with the site standards with the exception of benzene, chloroform and hexane identified in the groundwater recovered from BH3.

Additional investigation was recommended to delineate the horizontal and vertical extents of the impacts identified in the soil and groundwater samples.

- ❒ "Phase II-Environmental Site Assessment, 1068 and 1090 Cummings Avenue, Ottawa, Ontario", prepared by Pinchin, dated August 14, 2018.

Pinchin drilled an additional three (3) boreholes instrumented with groundwater monitoring wells (MW-1, MW-2 and MW-3). Selected soil samples were tested for PHC and VOC parameters. Based on the analytical test results, PHC F_1 and benzene were identified at concentrations exceeding the MECP Table 7 standards at MW-2.

Groundwater samples recovered from MW-1, MW-2 and BH3 (installed by Paterson and referred to as EX-1 by Pinchin) were analysed for BTEX, VOCs, PHCs and polynuclear aromatic hydrocarbons (PAHs). Concentrations of benzene exceeding the Table 7 standard were identified at BH3 (EX-1) and MW-2, while a concentration of 1,1,2,2-Tetrachloroethane exceeding the Table 7 standard was also identified at MW-2. Pinchin recommended that a Remedial Action Plan be developed for the property.

- "Phase I-Environmental Site Assessment Update, 1068-1090 Cummings Avenue, Ottawa, Ontario", prepared by Paterson, dated March 18, 2019.

A Phase I-ESA Update was completed for the property in general accordance with the MECP standard O.Reg. 153/04 as amended. On-site PCAs resulting in APECs on the Phase I Property, as well as Contaminants of Potential Concern (CPCs), are presented in Table 1.

Table 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern (APEC)	Location of APEC with respect to Phase I Property	Potentially Contaminating Activity (PCA)	Contaminants of Potential Concern (CPC)	Media Potentially Impacted
APEC 1 Belko Automotive -Commercial Auto body shop	West-central portion of Phase I Property	Item 10: Commercial Auto Body Shop	BTEX VOCs PHC (F_1-F_4)	Soil and Groundwater
APEC 2 Encore Steel – Metal Fabrication	Central portion of Phase I Property	Item 34: Metal Fabrication	Metals As, Sb, Se Hg, CrVI	Soil
APEC 3 Aboveground Gasoline Fuel Storage Tanks	Central portion of Phase I Property	Item 28: Gasoline and Associated Products Storage in Fixed Tanks	BTEX PHC (F_1-F_4)	Soil and Groundwater
APEC 4 Aboveground Diesel Fuel Tank	Northern portion of Phase I Property	Item 28: Gasoline and Associated Products Storage in Fixed Tanks	BTEX PHC (F_1-F_4)	Soil and Groundwater
APEC 5 Storage of salt and brine	Northwestern portion of Phase I Property	Item 48: Salt Manufacturing, Processing and Bulk Storage	Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR)	Soil
			Sodium (Na) Chlorides	Groundwater
APEC 6 1000-1027 Cummings Avenue – Former Construction Yard	Eastern portion of Phase I Property	Other: resulting from a former off-site construction yard	BTEX VOCs PHC (F_1-F_4)	Groundwater

Following a review of the historical information and a site visit, it was our opinion that the former construction yard across Cummings Avenue represents a potential environmental concern on the Phase I Property. It was recommended that a Supplemental Phase II ESA be conducted to address the additional APEC and to further delineate the previously identified soil and groundwater impacts.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted in conjunction with a Geotechnical Investigation, on March 26 and 27, 2019. The field program consisted of drilling six (6) boreholes, three (3) of which were completed with groundwater monitoring well installations. Boreholes were drilled to depths ranging from 3.05 to 9.55 m below the existing grade.

3.2 Media Investigated

During the subsurface investigation, soil and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these samples is based on the Contaminants of Potential Concern identified in the updated Phase I ESA.

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 this information, bedrock in the area of the site consists of shale of the Billings Formation. The site is located in an area of alluvial sediment overburden, with some till in the southeast corner, with a drift thickness of 2 to 3 m.

The regional topography slopes downwards to the west. Based on previous groundwater monitoring results, the groundwater flow direction is considered to be in a westerly direction.

Existing Buildings and Structures

The subject site is occupied by a single building containing an automotive body shop, a steel fabrication shop, and several offices. The building is of slab-on-grade construction with a basement level beneath the eastern portion of the building only. A dome enclosure is also present on the northern end of the site, which was vacant at the time of the site visit.

Drinking Water Wells

No drinking water wells were identified on the Phase I Property, however, multiple drinking water well records were identified in the Phase I study area. Since the wells were drilled in the 1950s and 1960s, and the Phase I study area has been municipally serviced with drinking water infrastructure, these wells are not considered to be in current use.

Areas of Natural Significance

No areas of natural significance were identified on the site or in the Phase I study area.

Neighbouring Land Use

Neighbouring land use in the Phase I study area comprised of roadways, residential dwellings, an Ambico Steel windows and doors production business to the south, and a park to the north. Land use is shown on Drawing PE4577-2 - Surrounding Land Use Plan.

Potentially Contaminating Activities and Areas of Potential Environmental Concerns

The steel fabrication shop, automotive body shop, aboveground storage tanks, and salt and brine storage on the Phase I Property are considered to be PCAs. Off-site, the Ambico steel business to the south, the former construction yard to the east, and an RSC property to the north are also PCAs. The on-site PCAs, and the former off-site construction yard are considered to be Areas of Potential Environmental Concern.

Contaminants of Potential Concern

VOCs, PHCs, metals, sodium, chlorine, electrical conductivity, and sodium absorption ratio were identified as contaminants/parameters of concern on the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA is considered to be sufficient to conclude that there are potentially contaminating activities (PCAs) which have the potential to have impacted the Phase I property, resulting in APECs.

The presence of PCAs/APECs was confirmed by a variety of independent sources. 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

There was insufficient groundwater in the monitoring well at BH6-19, to conduct analyses for both VOC and PHC F_1-F_4 parameters; Sample BH6-19-GW1 was analysed for VOCs and PHC F_1 only. There were no other deviations from the Sampling and Analysis Plan, which is included in Appendix 1 of this report.

3.5 Impediments

With the exception of buried services and stored material, no physical impediments were encountered during the Phase II ESA program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted in conjunction with a Geotechnical Investigation on March 26 and March 27, 2019. The field program consisted of drilling six (6) boreholes on the Phase II Property, three (3) of which were completed with groundwater monitoring well installations. Boreholes BH1-19, BH5-19 and BH6-19 were cored into bedrock to depths ranging from approximately 7.06 to 9.55m, to intercept the groundwater table. The remaining boreholes were placed to provide general coverage of the site for geotechnical purposes and completed upon auger refusal at depths ranging from approximately 2.8 to 4.2m below grade.

Boreholes BH1-19 and BH5-19 were placed to address APEC 6 as noted in Table 1, and to provide horizontal delineation of impacted groundwater identified in BH3, while BH6-19 was placed to determine the vertical extent of the impacted groundwater. The remaining boreholes were placed to provide coverage of the site from a geotechnical perspective.

The boreholes were drilled with a truck mounted power auger drill rig. The truck mounted drill rig was provided by George Downing Estate Drilling of Hawkesbury, Ontario. Borehole locations are shown on Drawing PE4577-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of twenty seven (27) soil samples were obtained from the boreholes by means of sampling from shallow auger flights and split spoon sampling. Boreholes BH1-19, BH5-19 and BH6-19 were cored to 7.06, 7.09 and 9.55 m respectively below grade, into the underlying bedrock with a further thirteen (13) rock core samples collected. The depths at which auger samples, split spoon samples and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**" and "**RC**" on the Soil Profile and Test Data Sheets, appended to this report.

Soil sampling protocols were followed using the MECP 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.

In BH5-19 and BH6-19 up to 0.08 m of asphaltic concrete was encountered. Below this and in the other four (4) boreholes, site soils consisted of fill described as brown silty sand with gravel. This layer extended to between 1.52 m and 1.90 m depth. In BH1-19, BH2-19, BH3-19 and BH4-19, a historical topsoil layer and/or brown silty sand was present beneath the fill. Beneath the fill in BH5-19 and BH6-19 and underlying the silty sand in the remaining locations, bedrock consisting of black shale, was encountered.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, followed by soils vapour screening.

A MiniRAE Photo Ionization Detector (PID) portable 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.

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. Allowing the samples to stabilize to room temperature ensures 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 organic vapours.

Vapour readings for the soil samples were recorded at a maximum of 65.1 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.

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

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the Phase II Property as part of the current subsurface investigation. The monitoring wells consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

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
BH1-19	72.44	7.06	7.06-4.01	3.54	2.92	Flushmount
BH5-19	72.22	7.09	7.09-4.04	2.44	1.22	Flushmount
BH6-19	72.30	9.55	9.55-8.03	7.62	6.25	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at MW2, BH3 and BH6-19 on April 3, 2019. During this sampling event, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, pH, and electrical conductivity.

Field parameters were measured after each well volume purged. Wells were purged prior to sampling until the well was purged dry, at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized in Table 3.

Table 3: Field Measurement of Water Quality Parameters – April 3, 2019

Parameter	MW2	BH3	BH6-19
Temperature (°C)	17	13.9	11.6
pH	7	6.9	9.5
Electrical Conductivity (µS/cm)	14,380	18,080	12,880

It should be noted that BH1-19 and BH5-19 could not be located during the April 3 sampling event and were subsequently sampled on April 12, 2019, at which time water quality parameters were not recorded.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan, appended to this report, the following soil and groundwater samples were submitted for analysis:

Table 4: Soil Samples Submitted for Analysis

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		PHCs (F_1-F_4)	VOCs	Metals	EC/ SAR	
BH2-19-SS2	0.76- 1.37 Fill				X	To delineate SAR and EC exceedance identified at BH1, during 2016 investigation.
BH2-19-SS3	1.52-2.13 Fill				X	To delineate SAR and EC exceedance identified at BH1, during 2016 investigation.
BH3-19-SS2	0.76- 1.37 Fill			X		To assess potential impacts in the area of the dome where former sandblasting was carried out.
BH5-19-SS2	0.76- 1.37 Fill	X	X	X		To assessment potential impacts based on highest organic vapour screening result; to assess potential metal impacts associated with the metal fabrication shop/storage area.
BH6-19-SS2	0.76- 1.37 Fill	X	X			To assess potential impacts based on visual and olfactory in combination with organic vapour screening results.

Table 5: Groundwater Samples Submitted for Analysis

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed			Rationale
		PHCs (F_1-F_4)	PHCs (F_4)	VOCs	
BH3-GW2	7.34-4.25 Bedrock	X		X	To confirm contaminant concentrations previously identified (2016, 2018).
BH1-19-GW1	7.06-4.01 Bedrock			X	To laterally delineate contaminant concentrations previously identified in BH3 (2016, 2018).
BH5-19-GW1	7.09-4.04 Bedrock			X	To laterally delineate contaminant concentrations previously identified in BH3 (2016, 2018).
BH6-19-GW1	9.55-8.03 Bedrock		X	X	To vertically delineate contaminant concentrations previously identified at BH3 (2016, 2018).
BH6-19-GW2	9.55-8.03 Bedrock			X	To confirm the groundwater quality at BH6-19.
BH6-19-GW3	9.55-8.03 Bedrock			X	To confirm the groundwater quality at BH6-19.

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

4.8 Residue Management

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

4.9 Elevation Surveying

An elevation survey of all borehole locations was completed by Paterson at the time of the subsurface investigation. All borehole elevations are relative to the top spindle of a fire hydrant located at the corner of Cummings Avenue and Snow Street, with a geodetic elevation of 73.86m above sea level (asl), as provided by Annis O'Sullivan Vollebekk Ltd. and presented on Drawing PE4577-3 – Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

The soil profile consists of a pavement structure (asphaltic concrete over sand and gravel) or sand and gravel, underlain by native silty sand and/or black shale bedrock. A layer of topsoil was identified beneath the granular material at BH1-19, BH2-19 and BH3-19. The site stratigraphy is shown on Drawing PE4577-7– Cross-Section A-A' and Drawing PE4577-8 – Cross-Section B-B'.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on the respective monitoring dates using an electronic water level meter.

Groundwater levels are summarized below in Table 6. All borehole elevations are relative to a fire hydrant spindle with a geodetic elevation of 73.86m asl.

Table 6: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m)	Date of Measurement
MW2	-	2.10	-	April 3, 2019
BH3	72.27	1.93	70.34	April 3, 2019
BH1-19	72.44	2.08	70.36	April 12, 2019
BH5-19	72.22	1.61	70.61	April 12, 2019
BH6-19	72.30	2.40	69.90	April 3, 2019
BH6-19	72.30	9.37	62.93	May 9, 2019

As BH6-19 was drilled to a greater depth than the remaining wells, and BH1-19, BH3-19 and BH5-19 are nearly in a straight line, the groundwater elevations recorded during the previous 2016 assessment were used to calculate a groundwater flow direction. Based on the 2016 groundwater elevations, the groundwater is believed to flow in a westerly direction with a gradient of around 0.014m/m.

5.3 Soil Texture

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

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 0.0 ppm to 65.1 ppm. No visual or olfactory indications of potential contamination were identified in the soil samples at the time of the field program with the exception of Samples SS2 and SS3 from BH6-19. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

A total of five soil samples were analysed for a combination of VOCs (including BTEX), PHCs, metals and/or EC and SAR parameters. The results of the analytical testing are presented below in Tables 7 through 10. The laboratory certificates of analysis are provided in Appendix 1.

Table 7: Analytical Test Results – Soil
PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 7 Residential Soil Standards (µg/g)
		March 26, 2019	March 27, 2019	
		BH5-19-SS2	BH6-19-SS2	
PHC F_1	7	nd	36	55
PHC F_2	4	16	38	98
PHC F_3	8	37	**384**	300
PHC F_4	6	52	503*	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** exceeds MECP Table 7 Residential Coarse soil Standard
- *GC-FID signal did not return to baseline by C50

The PHC concentrations identified in the soil samples are in compliance with MECP Table 7 Standards with the exception of the PHC F_3 fraction identified in soil Sample BH6-19-SS2 (384 µg/g) which exceeds the MECP Table 7 standard of 300 µg/g. The analytical test results are presented on Drawing PE4577-5 - Analytical Testing Plan - Soil.

Table 8: Analytical Test Results – Soil
VOCs (including BTEX)

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 7 Residential Soil Standards (µg/g)
		March 26, 2019	March 27, 2019	
		BH5-19-SS2	BH6-19-SS2	
Acetone	0.50	nd	nd	16
Benzene	0.02	nd	0.18	0.21
Bromodichloromethane	0.05	nd	nd	13
Bromoform	0.05	nd	nd	0.27
Bromomethane	0.05	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	0.05
Chlorobenzene	0.05	nd	nd	2.4
Chloroform	0.05	nd	nd	0.05
Dibromochloromethane	0.05	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	3.4
1,3-Dichlorobenzene	0.05	nd	nd	4.8
1,4-Dichlorobenzene	0.05	nd	nd	0.083
1,1-Dichloroethane	0.05	nd	nd	3.5
1,2-Dichloroethane	0.05	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	0.084
1,2-Dichloropropane	0.05	nd	nd	0.05
1,3-Dichloropropene, total	0.05	nd	nd	0.05
Ethylbenzene	0.05	nd	0.17	2

Table 8 Continued: Analytical Test Results – Soil
VOCs (including BTEX)

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 7 Residential Soil Standards (µg/g)
		March 26, 2019	March 27, 2019	
		BH5-19-SS2	BH6-19-SS2	
Ethylene dibromide	0.05	nd	nd	0.05
Hexane	0.05	nd	nd	2.8
Methyl Ethyl Ketone (2-Butanone)	0.50	nd	nd	16
Methyl Isobutyl Ketone	0.50	nd	nd	1.7
Methyl tert-butyl ether	0.05	nd	nd	0.75
Methylene Chloride	0.05	nd	nd	0.1
Styrene	0.05	nd	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	0.28
Toluene	0.05	nd	0.11	2.3
1,1,1-Trichloroethane	0.05	nd	nd	0.38
1,1,2-Trichloroethane	0.05	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	0.061
Trichlorofluoromethane	0.05	nd	nd	4
Vinyl Chloride	0.02	nd	nd	0.02
Xylenes, total	0.05	nd	0.30	3.1

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

No VOC parameters were identified in Sample BH5-19-SS2, at concentrations above the laboratory method detection limits. BTEX parameters were identified in Sample BH6-19-SS2 at concentrations below the MECP Table 7 standards. Analytical results of soil sampled with respect to borehole locations is shown on Drawing PE4577-5 – Analytical Testing Plan - Soil.

Table 9: Analytical Test Results – Soil
Metals (including As, Sb, Se, B-HWS, Hg and CrVI)

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 7 Residential Soil Standards (µg/g)
		March 26, 2019		
		BH3-19-SS2	BH5-19-SS2	
Boron-HWS	0.5	nd	nd	1.5
Chromium (VI)	0.2	nd	nd	8
Mercury	0.1	nd	nd	0.27
Antimony	1.0	nd	nd	7.5
Arsenic	1.0	3.3	2.8	18
Barium	1.0	83.5	146	390
Beryllium	0.5	nd	0.5	4
Boron	5.0	6.6	6.4	120
Cadmium	0.5	nd	nd	1.2
Chromium	5.0	27.4	35.0	160
Cobalt	1.0	7.4	8.8	22
Copper	5.0	22.9	22.4	140
Lead	1.0	18.3	34.7	120
Molybdenum	1.0	2.5	nd	6.9
Nickel	5.0	19.0	22.8	100
Selenium	1.0	nd	nd	2.4
Silver	0.3	nd	nd	20
Thallium	1.0	nd	nd	1
Uranium	1.0	nd	nd	23
Vanadium	10.0	30.0	41.0	86
Zinc	20.0	45.3	67.9	340

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

The metal concentrations identified in the soil samples analysed are in compliance with MECP Table 7 Standards. Analytical test results are presented on Drawing PE4577-5 – Analytical Testing Plan – Soil.

Table 10: Analytical Test Results – Soil
SAR and EC

Parameter	Units	Soil Samples (March 26, 2019)		MECP Table 7 Residential Soil Standards
		BH2-19-SS2	BH2-19-SS3	
Sodium Adsorption Ratio (SAR)	-	**24.7**	**23.6**	5
Electrical Conductivity (EC)	µS/cm	**10,300**	**5,630**	700 µS/cm

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** exceeds MECP Table 7 Residential Coarse soil Standard

The EC and SAR concentrations identified in each sample analysed exceed the MECP Table 7 standards.

The maximum concentrations of analyzed parameters in the soil at the Phase II Property are summarized below in Table 11.

Table 11: Maximum Concentrations – Soil

Parameter	Maximum Concentrations (µg/g)	Borehole	Depth Interval (m BGS)
PHC F_1	36	BH6-19-SS2	0.76- 1.37; Fill
PHC F_2	38		
PHC F_3	384		
PHC F_4	503		
Benzene	0.18		
Ethylbenzene	0.17		
Toluene	0.11		
Xylenes, total	0.30		
Arsenic	3.3	BH3-19-SS2	0.76- 1.37; Fill
Barium	146	BH5-19-SS2	0.76- 1.37; Fill
Beryllium	0.5		
Boron	6.6	BH3-19-SS2	0.76- 1.37; Fill
Chromium	35.0	BH5-19-SS2	0.76- 1.37; Fill
Cobalt	8.8		
Copper	22.9	BH3-19-SS2	0.76- 1.37; Fill
Lead	34.7	BH5-19-SS2	0.76- 1.37; Fill
Molybdenum	2.5	BH3-19-SS2	0.76- 1.37; Fill
Nickel	22.8	BH5-19-SS2	0.76- 1.37; Fill
Vanadium	41		
Zinc	67.9		
SAR	24.7	BH2-19-SS2	0.76- 1.37; Fill
EC	10300		

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples recovered from BH1-19, BH5-19, BH6-19, MW2 and BH3 were submitted for analytical testing of PHCs and/or VOCs (including BTEX). The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented below in Tables 12 and 13. The laboratory certificates of analysis are provided in Appendix 1.

Table 12: Analytical Test Results – Groundwater
PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) April 3, 2019			MECP Table 7 Standards (µg/L)
		MW2-GW2	BH3-GW2	BH6-19-GW1	
PHC F_1	25	269	141	80	420
PHC F_2	100	nd	nd	NA	150
PHC F_3	100	nd	nd	NA	500
PHC F_4	100	nd	nd	NA	500

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

Concentrations of PHC F_1 were identified in each groundwater sample analysed. Fractions F_2 to F_4 were not identified in Samples MW2-GW2 and BH3-GW2, while Sample BH6-19-GW1 was not analysed for these fractions due to insufficient groundwater at the time of sampling. The analytical test results are in compliance with the MECP Table 7 standards. Analytical test results are presented on Drawing PE4577-6 – Analytical Testing Plan – Groundwater.

Table 13: Analytical Test Results – Groundwater
VOCs (including BTEX)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) April 3, 2019				MECP Table 7 Standards (µg/L)
		MW2-GW2	BH3-GW2	BH6-19-GW1	DUP1	
Acetone	5.0	401	nd	nd	260	100,000
Benzene	0.5	**31.1**	**4.3**	**13.6**	**63.8**	0.5
Bromodichloromethane	0.5	nd	nd	2.0	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	140
Chloroform	0.5	nd	nd	**16.8**	nd	2
Dibromochloromethane	0.5	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	0.58
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	6.2	nd	1.9	15.5	54
Ethylene dibromide	0.2	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	**31.7**	nd	5
Methyl Ethyl Ketone (2-Butanone)	5.0	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	0.5
Toluene	0.5	3.4	0.8	83.5	5.9	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylenes, total	0.5	7.1	4.0	28.8	20.9	72

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** exceeds MECP Table 7 Residential Standard
- DUP1 is a duplicate of Sample MW2-GW2

Table 13 Continued: Analytical Test Results – Groundwater
VOCs (including BTEX)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 7 Standards (µg/L)
		April 12, 2019		May 9, 2019	May 24, 2019	
		BH1-19-GW1	BH5-19-GW1	BH6-19-GW2	BH6-19-GW3	
Acetone	5.0	nd	nd	nd	nd	100,000
Benzene	0.5	**7.0**	**1.6**	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	140
Chloroform	0.5	nd	nd	nd	nd	2
Dibromochloromethane	0.5	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	0.58
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	0.8	0.7	nd	nd	54
Ethylene dibromide	0.2	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	nd	nd	5
Methyl Ethyl Ketone (2-Butanone)	5.0	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	0.5
Toluene	0.5	27.7	8.5	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylenes, total	0.5	14.0	7.7	nd	nd	72

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** exceeds MECP Table 7 Residential Standard

The benzene concentrations identified in Samples BH3-GW2, BH6-19-GW1, BH1-19-GW1 and BH5-19-GW1, as well as chloroform and hexane in the samples BH6-19-GW1, exceed the MECP Table 7 standards. All other detected parameters were in compliance with the Table 7 standards.

The presence of chloroform in Sample BH6-19-GW1 is considered to have resulted from the municipal water introduced during the drilling process (coring of bedrock). As such, the groundwater from BH6-19 was resampled on two subsequent sampling events to confirm the quality of the groundwater at this location. No detection was made of any analyte in the re-samples. Analytical test results are presented on Drawing PE4577-6 – Analytical Testing Plan – Groundwater.

Where in excess of the laboratory method detection limit, the maximum concentrations of analyzed parameters in the water at the Phase II Property are summarized below in Table 14.

Table 14: Maximum Concentrations – Groundwater

Parameter	Maximum Concentrations (µg/L)	Borehole	Depth Interval (m BGS)
PHC F1	269	MW2	0.94-2.44
Acetone	401		
Benzene	63.8	DUP1	0.94-2.44
Ethylbenzene	15.5		
Toluene	27.7	BH1-19	4.01-7.06
Xylenes, total	20.9	DUP1	0.94-2.44

5.7 Quality Assurance and Quality Control Results

All soil and groundwater samples 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 analysis and all Certificates of Analysis are appended to this report.

A duplicate groundwater sample was obtained from MW2. The RPD calculations for the original and duplicate sample are provided below in Table 15.

Table 15
QA/QC Calculations – Soil

Parameter	MDL (µg/L)	MW2-GW2	DUP1	RPD (%)	QA/QC Result
Acetone	5.0	401	260	42.6	Outside the acceptable range
Benzene	0.5	31.1	63.8	68.9	Outside the acceptable range
Ethylbenzene	0.5	6.2	15.5	85.7	Outside the acceptable range
Toluene	0.5	3.4	5.9	53.8	Outside the acceptable range
Xylenes	5.0	7.1	20.9	98.6	Outside the acceptable range

Notes:
- All other parameter concentrations were below laboratory detection limits for both Samples MW2-GW2 and DUP1, and as such, are within acceptable QA/QC parameters.

As noted above, the RPD for each parameter is outside of the acceptable range. Regardless of the QA/QC results, both Samples MW2-GW2 and DUP1 exceed the MECP Table 7 standards and therefore the findings and conclusions of the report are not affected. The overall quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As per Table 1 in Section 2.2, PCA's considered to result in APECs on the Phase II Property include:

- Item 10, Table 2, O.Reg. 153/04 as amended: "Commercial Auto Body Shop" – this PCA was identified due to the presence of Belko Automotive body shop on the Phase II Property;
- Item 28, Table 2, O.Reg. 153/04 as amended: "Gasoline and associated products storage in fixed tanks" – this PCA was identified based the presence of aboveground fuel storage tanks (ASTs) on the Phase II Property;
- Item 30, Table 2, O.Reg. 153/04 as amended: "Importation of Fill Material of Unknown Quality" – this PCA was identified due to the presence of fill material across the Phase II Property;

- Item 34, Table 2, O.Reg. 153/04 as amended: “Metal Fabrication” – this PCA was identified based on the presence of a metal fabricator (Encore Steel) on the Phase II Property; and
- Item 48, Table 2, O.Reg. 153/04 as amended: “Salt manufacturing, processing and bulk storage” – this PCA was identified based storage of salt and brine on the Phase II Property.

Though not identified as a PCA in Table 2, the former construction yard across Cummings Avenue was considered to represent an APEC on the Phase II Property.

Contaminants of potential concern associated with the aforementioned PCAs include a combination of PHCs (F_1-F_4), VOCs (including BTEX) and/or metals in the soil and/or groundwater, as well as Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) in the soil, and sodium and chlorides in the groundwater.

Subsurface Structures and Utilities

The subject building has a partial basement; otherwise there are no subsurface structures on the Phase II Property.

Subsurface utilities on site include municipal water and sewer services as well as natural gas. Groundwater levels measured in the monitoring wells during the Phase II-ESA were detected in bedrock, well below the anticipated service trench depths. Service utility trenches are not considered to be preferential pathways for migration of contaminants of concern.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE4577-7 and 8. The stratigraphy consists of:

- Asphaltic concrete was encountered in BH5-19 and BH6-19, from surface to a maximum depth of 0.08 m.
- Fill material (crushed stone and/or silty sand and gravel) was encountered at surface in some areas to depths up to 1.90 m below grade.
- Silty sand: below fill material up to depths of 4.24 m. Not identified in BH5-19 and BH6-19.
- Bedrock: black shale bedrock was encountered between 1.78 and 9.55 m below grade. Groundwater was encountered within this unit.

Hydrogeological Characteristics

Groundwater was encountered in the upper portion of the shale bedrock unit, near the bedrock-overburden interface, which is interpreted to function as a local unconfined aquifer on the property. Groundwater monitoring wells were installed in the shale unit of BH1-19, BH5-19 and BH6-19, to depths of 7.06, 7.09, 9.55 m below ground surface, respectively. Groundwater levels were measured at these well locations prior to groundwater sampling. Groundwater was encountered at depths ranging from 1.61 to 9.37 m below ground surface.

Based on the groundwater elevations from the monitoring events conducted, 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 westerly direction with a hydraulic gradient of approximately 0.014 m/m. Groundwater contours are illustrated on Drawing PE4577-4 - Groundwater Contour Plan.

Approximate Depth to Bedrock

Depth to bedrock at the Phase II Property ranges from approximately 1.78 to 4.24m below grade.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 1.61 to 9.37 m below the existing grade.

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 in that the Phase II Property is not within 30m of an environmentally sensitive area.

Section 43.1 of the Regulation does apply to the subject site in that the subject site is a Shallow Soil Property.

Fill Placement

Fill material consists of crushed stone or sand and gravel. No deleterious material was identified in the fill.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property will be redeveloped with a multi-storey residential building with one basement level.

Existing Buildings and Structures

The Phase II Property is occupied by an industrial building with a partial basement beneath the office space. The remainder of the building consists of a warehouse style, slab on grade structure. The building is currently divided into four areas occupied by Encore Steel (steel fabrication), Belko Auto (an auto body shop), vacant office and warehouse space. A dome structure is present on the northeast portion of the Phase II Property. There are no other buildings or structures on the subject land.

Areas of Natural Significance and Water Bodies

No areas of natural significance are present on or within the vicinity of the Phase II Property.

There are no waterbodies on the Phase II Property or within the 250m study area.

Environmental Condition

Areas Where Contaminants are Present

Based on the results of the Phase II ESA, soil impacted with EC and SAR concentrations exceeding the MECP Table 7 standards is present on the northwestern portion of the Phase II Property, while soil impacted with benzene and PHC F_1 or PHC F_3 and/or F_4 concentrations exceeding the MECP Table 7 standards are present on the south central portion of the Phase II Property.

Impacted groundwater was encountered at BH1-19, BH5-19, BH3 and MW2 on the south-central portion of the Phase II Property, beneath and to the south of the subject building.

Types of Contaminants

The following parameters were identified in the soil at concentrations exceeding the MECP Table 7 standards:

- Benzene;
- PHC, F_1, F_3 and F_4;

- ❒ Electrical Conductivity; and
- ❒ Sodium Adsorption Ration.

Groundwater samples were found to exceed Table 7 standards for benzene.

Contaminated Media

Based on the results of the Phase II ESA, soil impacted with petroleum hydrocarbons is present on the south-central portion of the site, while soil impacted with EC and SAR concentrations exceeding MECP Table 7 standards is present on the northwestern portion of the Phase II Property.

Groundwater beneath the Phase II Property is impacted with benzene concentrations exceeding the MECP Table 7 standard.

Known Areas Where Contaminants Are Present

Soil impacted with PHCs is present beneath the subject structure, specifically the unit occupied by the body shop. Petroleum hydrocarbon impacted soil is also present just south of the subject structure and also further to the southwest of the subject structure.

Soil impacted with EC and SAR concentrations is present on the northwestern portion of the Phase II Property, in the vicinity of the brine storage silos.

Impacted groundwater was identified at BH1-19, BH5-19, BH3 and MW2 on the central portion of the site. The most significant benzene concentration was identified at MW2, with the body shop.

Distribution and Migration of Contaminants

The PHC impacts are considered to be limited to the overburden and upper layers of the fractured shale bedrock. PHC parameters identified in the groundwater were in compliance with the MECP Table 7 standards and are therefore not considered to have extended into the bedrock. Benzene concentrations identified in the soil beneath the auto body shop however, are considered to have migrated to the groundwater based on the findings of the Phase II ESA.

The EC and SAR impacts are also considered to be limited to the overburden as sodium and chloride concentrations in the groundwater on the northwestern portion of the site are in compliance with the MECP Table 7 standards.

Contaminant distribution is presented in both plan view and cross-section, on Drawings PE4577-5 through PE4577-8.

Discharge of Contaminants

Based on the findings of the Phase I ESA, some staining was observed on the concrete floor within the auto body shop; the floor was in fair condition at the time with some cracks noted. While no oil-water separators were observed in the garage, several self-contained catch basins were noted in the work area. It was reported that they are not interconnected and simply serve as reservoirs to collect water. Certain catch basins were dry, while others contained water with a dusty film on the surface.

The benzene and PHC F_1 impacts beneath the subject structure are suspected to have been discharged to the ground surface through cracks in the floor slab and/or catch basins, resulting from small leaks or spills within the garage. Based on analytical test results, the impacted soil at this location is considered to be the source of the benzene impacted groundwater.

The PHC F_3 and/or F_4 impacts identified on the exterior of the property, south and southwest of the building structure are considered to be associated with small surficial leaks or spills associated with on-site vehicles or equipment.

The EC and SAR impacted soil is considered to be the result salt or brine solution have been discharged directly to the ground surface.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two (2) ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

As the most significant concentration of benzene was identified in the groundwater beneath the subject structure, leaching is not considered to have affected contaminant distribution. Based on the findings of the Phase II ESA, the groundwater is present near the interface of the overburden and fractured shale bedrock. The benzene concentrations identified in the soil are considered to have migrated to the groundwater through fluctuations of the groundwater table. Groundwater flow is considered to have resulted in lateral migration of the contaminants.

Potential for Vapour Intrusion

There is potential for vapour intrusion given the volatile nature of the PHC F_1, in combination with occasional cracks identified within the floor slab during the Phase I ESA. However, based on the concentration identified through analytical testing, the potential for vapour intrusion is considered to be low. Vapours resulting from the impacted soil are considered to be negligible in comparison to those already produced within the building given the nature of the on-site activities and slab-on-grade building construction.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for 1090 Cummings Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to delineate soil and groundwater impacts identified during previous investigations conducted by Paterson (2016) and others (2018). The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling five (5) boreholes, three (3) of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Three (3) soil samples were submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), volatile organic compound (VOC), petroleum hydrocarbons (PHCs, F_1-F_4) and metal parameters. Two (2) soil samples were submitted for laboratory analysis of EC and SAR. A PHC, F_3 concentration exceeding the MECP Table 7 standard was identified in BH6-19, while EC and SAR concentrations exceed the MECP Table 7 standards were identified at BH2-19. Otherwise, parameter concentrations identified in the soil were in compliance with the MECP Table 7 standards.

Groundwater samples from monitoring wells installed in BH1-19, BH5-19 and BH6-19, as well as MW2 and BH3, were recovered and analyzed for BTEX, VOC and/or PHC parameters. Benzene concentrations exceeding the MECP Table 7 standards were identified in each of the groundwater samples, in addition to chloroform and hexane in the initial sample recovered from BH6-19.

It should be noted that based on the chloroform concentration identified in BH6-19-GW1, the results were not considered to be representative of the groundwater at this location. The groundwater in BH6-19 was subsequently re-sampled and analysed for VOC parameters on two separate occasions. Based on the analytical test results, no VOC concentrations were identified above the laboratory method detection limits in Samples BH6-19-GW2 and BH6-19-GW3.

Conclusion

Soil

Based on the findings of the Phase II ESA, an area of benzene and PHC F_1 impacted soil was identified beneath the auto body shop; the impacted area is not expected to extend beyond the footprint of the building. Near surface soils impacted with PHC F_3 and/or F_4 concentrations exceeding MECP Table 7 standards are present on the exterior of the Phase II Property, south of the subject structure. The impacts are considered to be related to small leaks and spills associated with on-site vehicles and equipment, are surficial in nature and may be encountered in pockets across the southern portion of the site.

Soil impacted with EC and SAR concentrations was identified on the northwestern portion of the property in the vicinity of the salt and brine storage. The extent of the impacts are expected to be confined to the immediate vicinity of the storage area.

It is our understanding that a portion of the Phase II Property is to be redeveloped with a residential building with one basement level. It is recommended that an environmental site remediation program, involving the removal of all impacted soil, be completed prior to site redevelopment. Prior to offsite disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

It is also recommended that Paterson personnel be onsite during construction activities to direct the excavation and segregation of impacted soil and to conduct confirmatory sampling as required.

Groundwater

Groundwater impacted with benzene is present beneath the subject structure on the southwest and south-central portions of the site. It is recommended that further investigatory work be conducted to delineate the full lateral extent of the impacted groundwater. Once additional information is available, it is recommended that a groundwater remediation program or risk assessment be implemented at the Phase II Property.

It is recommended that the integrity of the monitoring wells be maintained, prior to construction, for possible future groundwater monitoring events. Once they are no longer required, it is recommended that they be abandoned in accordance with O.Reg.903. This may be done in conjunction with the construction excavation.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

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

Paterson Group Inc.

Karyn Munch, P.Eng., QP_{ESA}

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

Report Distribution:

- Huntington Property Group
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4577-3 – TEST HOLE LOCATION PLAN

DRAWING PE4577-4 – GROUNDWATER CONTOUR PLAN

DRAWING PE4577-5 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4577-6 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4577-7A – CROSS-SECTION A-A' – SOIL

DRAWING PE4577-7B – CROSS-SECTION A-A' – GROUNDWATER

DRAWING PE4577-8A – CROSS-SECTION B-B' – SOIL

DRAWING PE4577-8B – CROSS-SECTION B-B' – GROUNDWATER

DRAWING PE4577-9 – CONTAMINANT TRANSPORT DIAGRAM

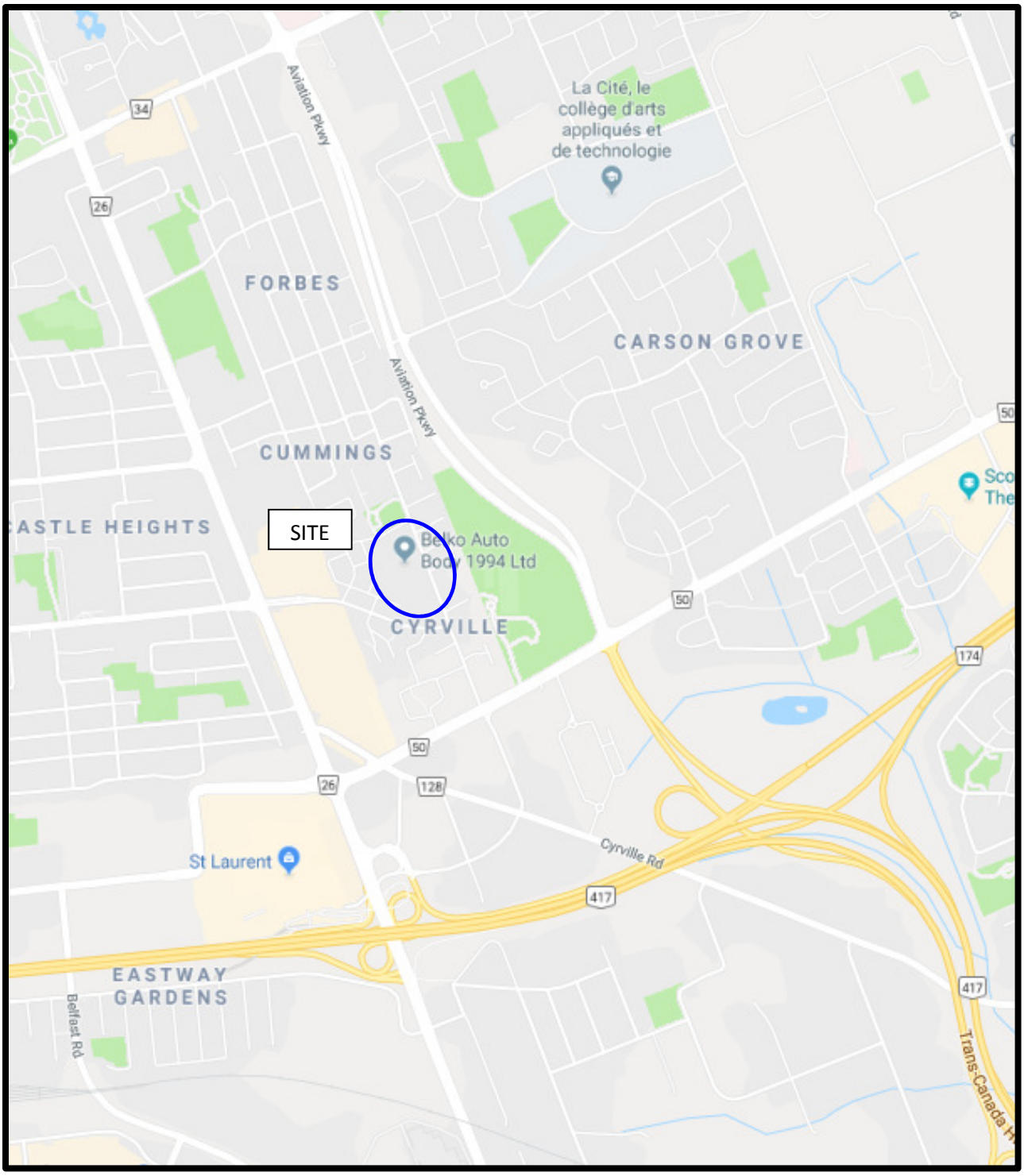
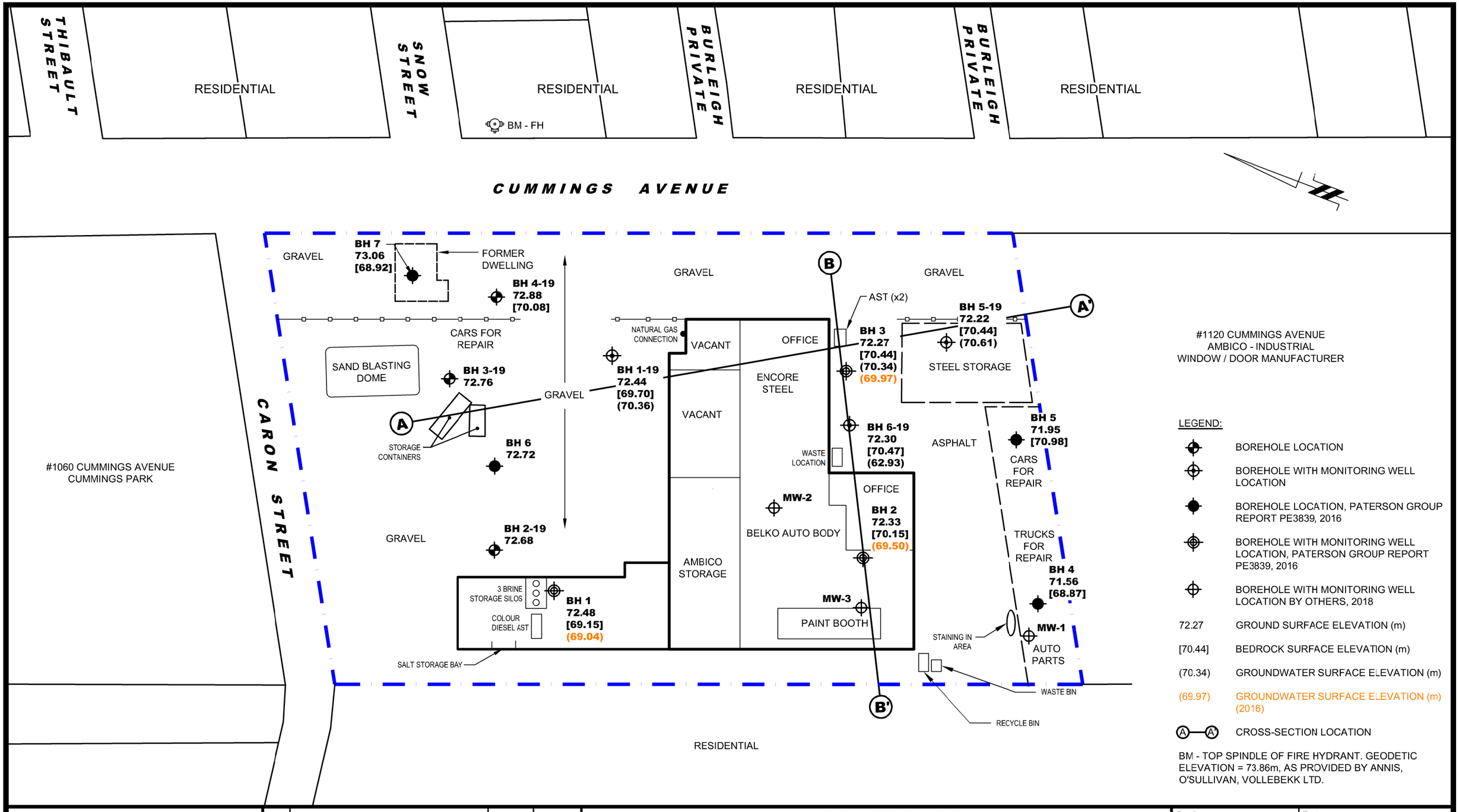


FIGURE 1

KEY PLAN



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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:750	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	Dwg. No.: PE4577-3
Approved by: MSD	Revision No.: 0

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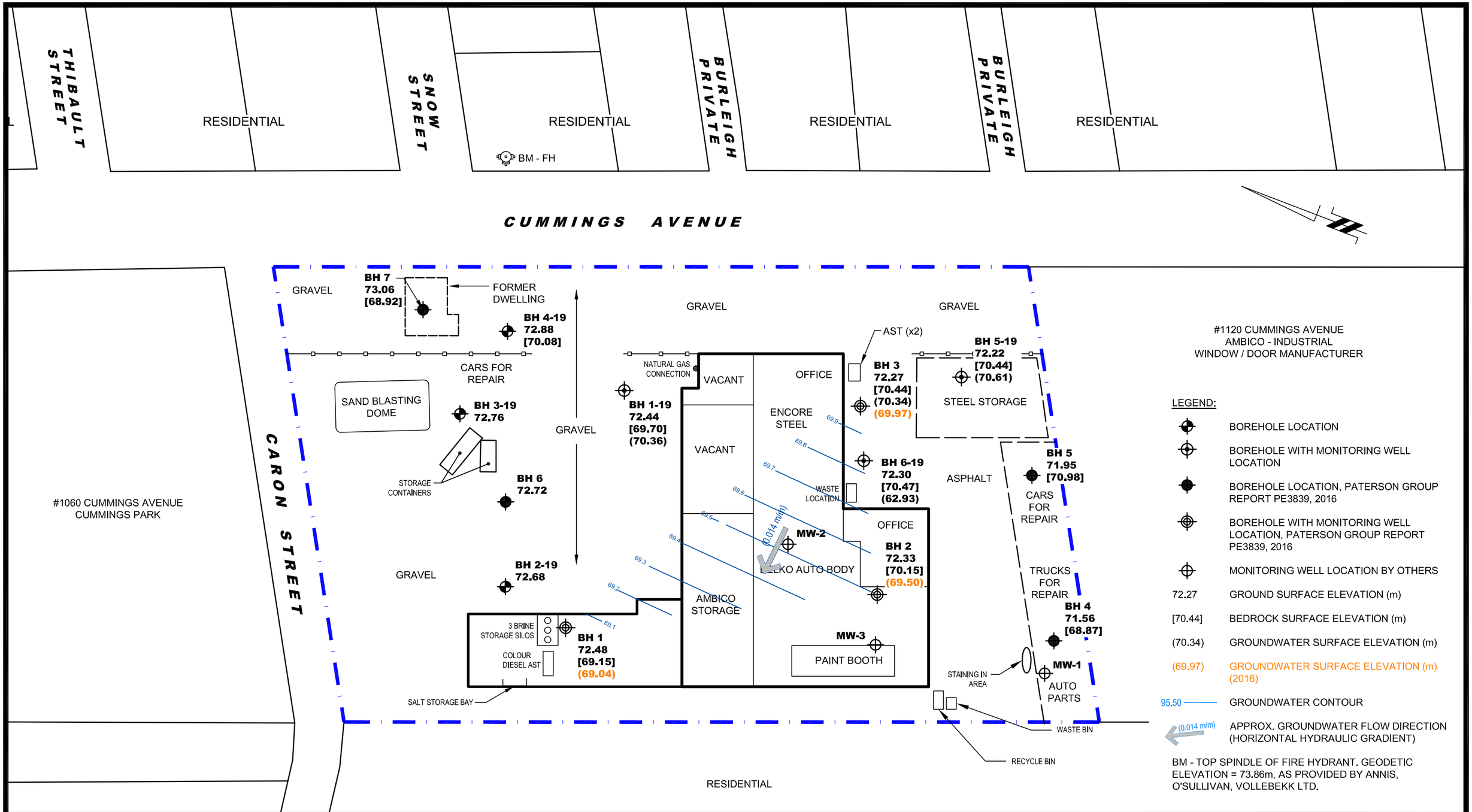

#1120 CUMMINGS AVENUE
AMBICO - INDUSTRIAL
WINDOW / DOOR MANUFACTURER

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PE3839, 2016
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PE3839, 2016
- MONITORING WELL LOCATION BY OTHERS
- 72.27 — GROUND SURFACE ELEVATION (m)
- [70.44] — BEDROCK SURFACE ELEVATION (m)
- (70.34) — GROUNDWATER SURFACE ELEVATION (m)
- (69.97) — GROUNDWATER SURFACE ELEVATION (m) (2016)
- 95.50 — GROUNDWATER CONTOUR
- (0.014 m/m) — APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

BM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 73.86m, AS PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:750	Date: 05/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	Dwg. No.: PE4577-4
Approved by: MSD	Revision No.: 0

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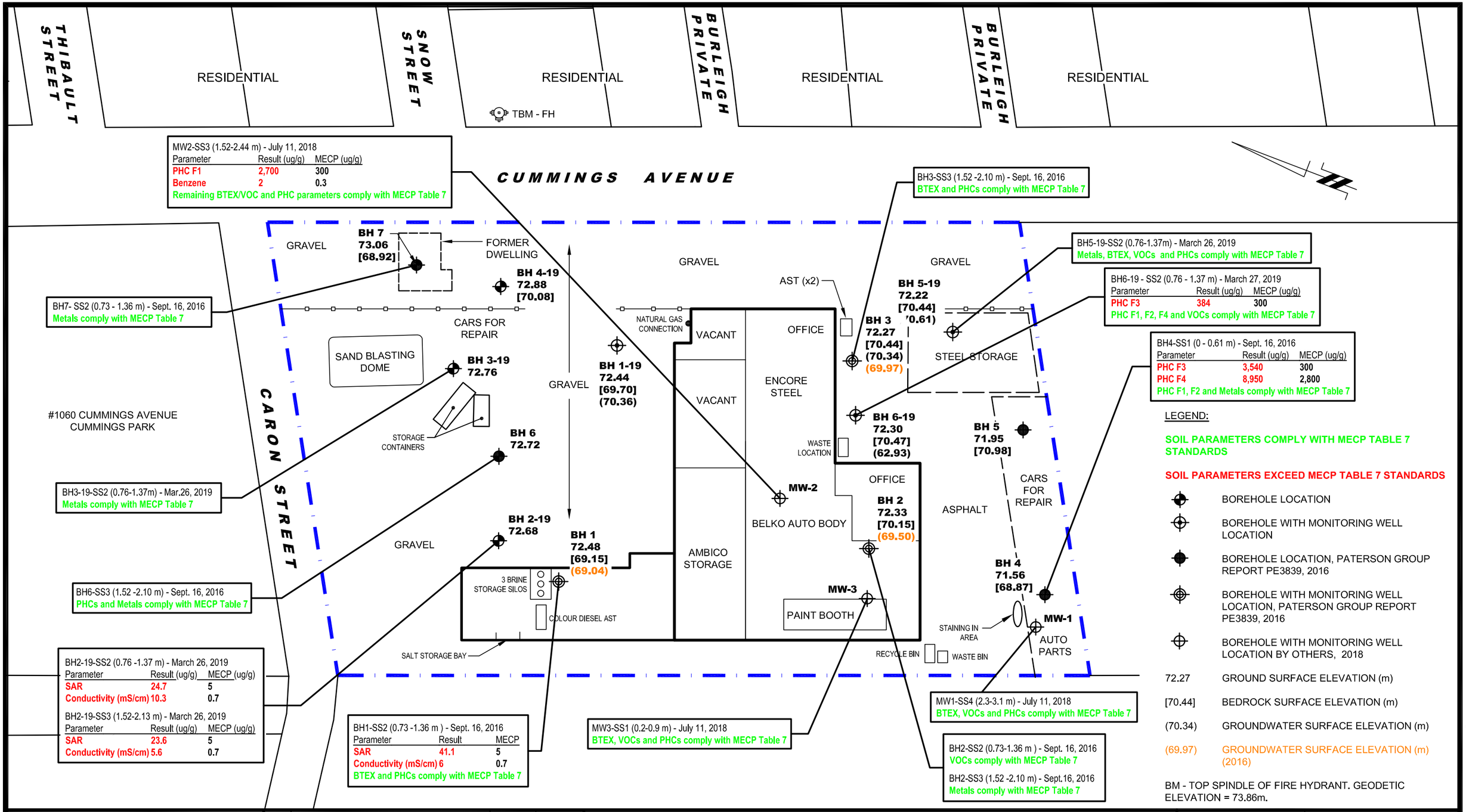

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:750	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	Dwg. No.: PE4577-5
Approved by: MSD	Revision No.: 0

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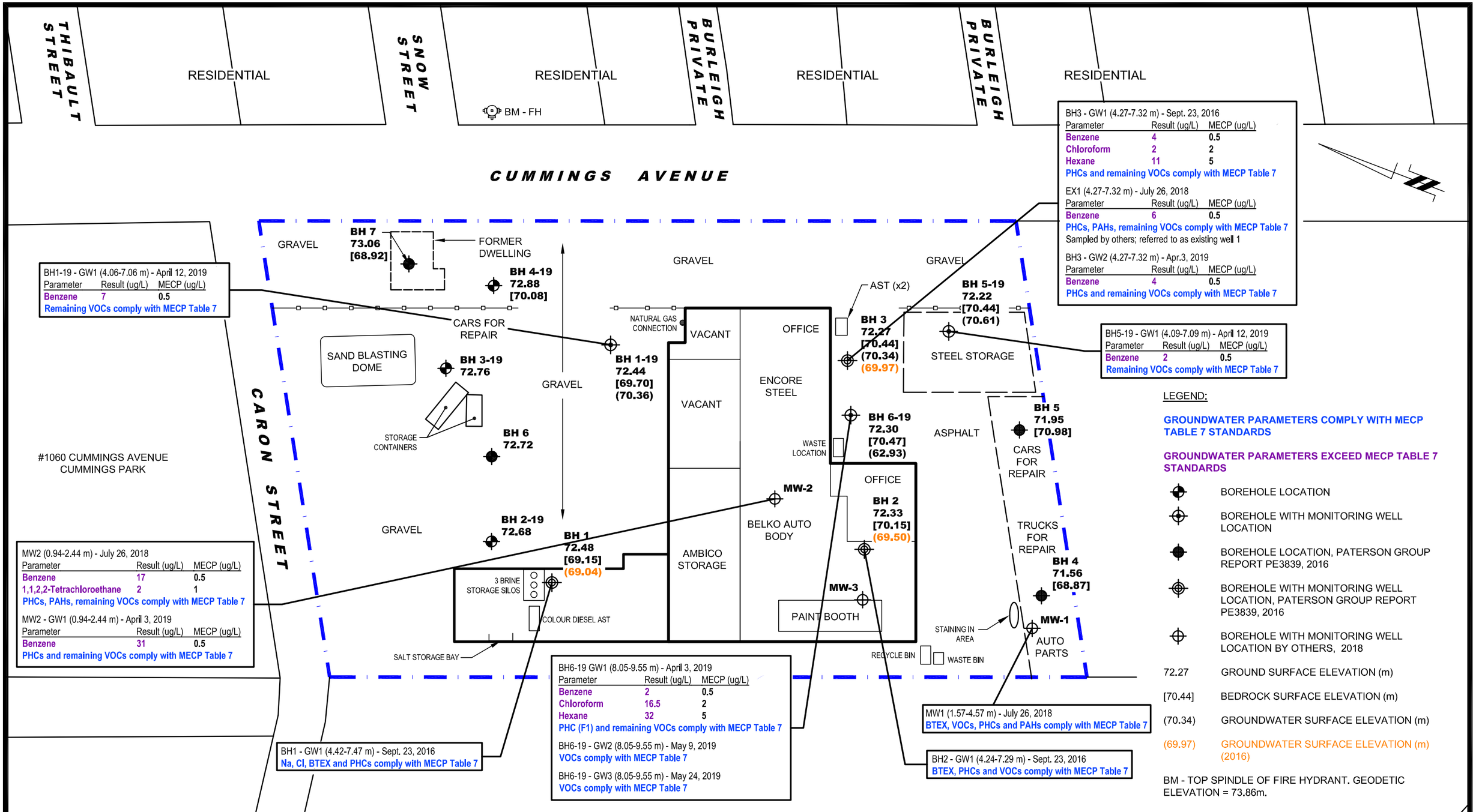

BH1-19 - GW1 (4.06-7.06 m) - April 12, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	7	0.5

Remaining VOCs comply with MECP Table 7

BH3 - GW1 (4.27-7.32 m) - Sept. 23, 2016

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	4	0.5
Chloroform	2	2
Hexane	11	5

PHCs and remaining VOCs comply with MECP Table 7

EX1 (4.27-7.32 m) - July 26, 2018

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	6	0.5

PHCs, PAHs, remaining VOCs comply with MECP Table 7

Sampled by others; referred to as existing well 1

BH3 - GW2 (4.27-7.32 m) - Apr.3, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	4	0.5

PHCs and remaining VOCs comply with MECP Table 7

BH5-19 - GW1 (4.09-7.09 m) - April 12, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	2	0.5

Remaining VOCs comply with MECP Table 7

MW2 (0.94-2.44 m) - July 26, 2018

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	17	0.5
1,1,2,2-Tetrachloroethane	2	1

PHCs, PAHs, remaining VOCs comply with MECP Table 7

MW2 - GW1 (0.94-2.44 m) - April 3, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	31	0.5

PHCs and remaining VOCs comply with MECP Table 7

BH6-19 GW1 (8.05-9.55 m) - April 3, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	2	0.5
Chloroform	16.5	2
Hexane	32	5

PHC (F1) and remaining VOCs comply with MECP Table 7

BH6-19 - GW2 (8.05-9.55 m) - May 9, 2019

VOCs comply with MECP Table 7

BH6-19 - GW3 (8.05-9.55 m) - May 24, 2019

VOCs comply with MECP Table 7

BH1 - GW1 (4.42-7.47 m) - Sept. 23, 2016

Na, Cl, BTEX and PHCs comply with MECP Table 7

MW1 (1.57-4.57 m) - July 26, 2018

BTEX, VOCs, PHCs and PAHs comply with MECP Table 7

BH2 - GW1 (4.24-7.29 m) - Sept. 23, 2016

BTEX, PHCs and VOCs comply with MECP Table 7

LEGEND:

GROUNDWATER PARAMETERS COMPLY WITH MECP TABLE 7 STANDARDS

GROUNDWATER PARAMETERS EXCEED MECP TABLE 7 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PE3839, 2016
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PE3839, 2016
- BOREHOLE WITH MONITORING WELL LOCATION BY OTHERS, 2018
- 72.27 GROUND SURFACE ELEVATION (m)
- [70.44] BEDROCK SURFACE ELEVATION (m)
- (70.34) GROUNDWATER SURFACE ELEVATION (m)
- (69.97) GROUNDWATER SURFACE ELEVATION (m) (2016)

BM - TOP SPINDLE OF FIRE HYDRANT. GEODETIC ELEVATION = 73.86m.

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:750	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	Dwg. No.: PE4577-6
Approved by: MSD	Revision No.: 0

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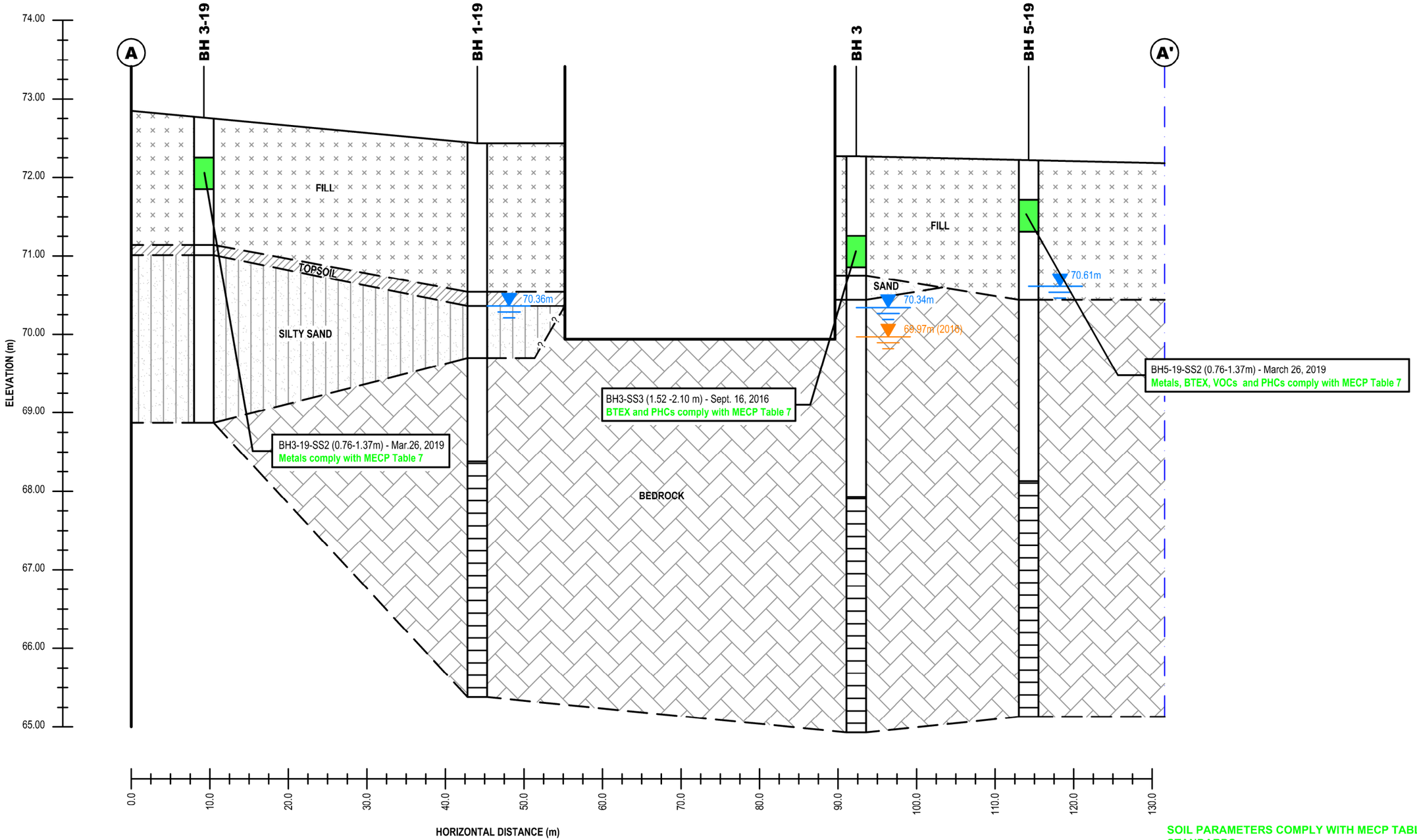

SOIL PARAMETERS COMPLY WITH MECP TABLE 7 STANDARDS

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL

Scale: AS SHOWN	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	PE4577-7A
Approved by: MSD	Revision No.:

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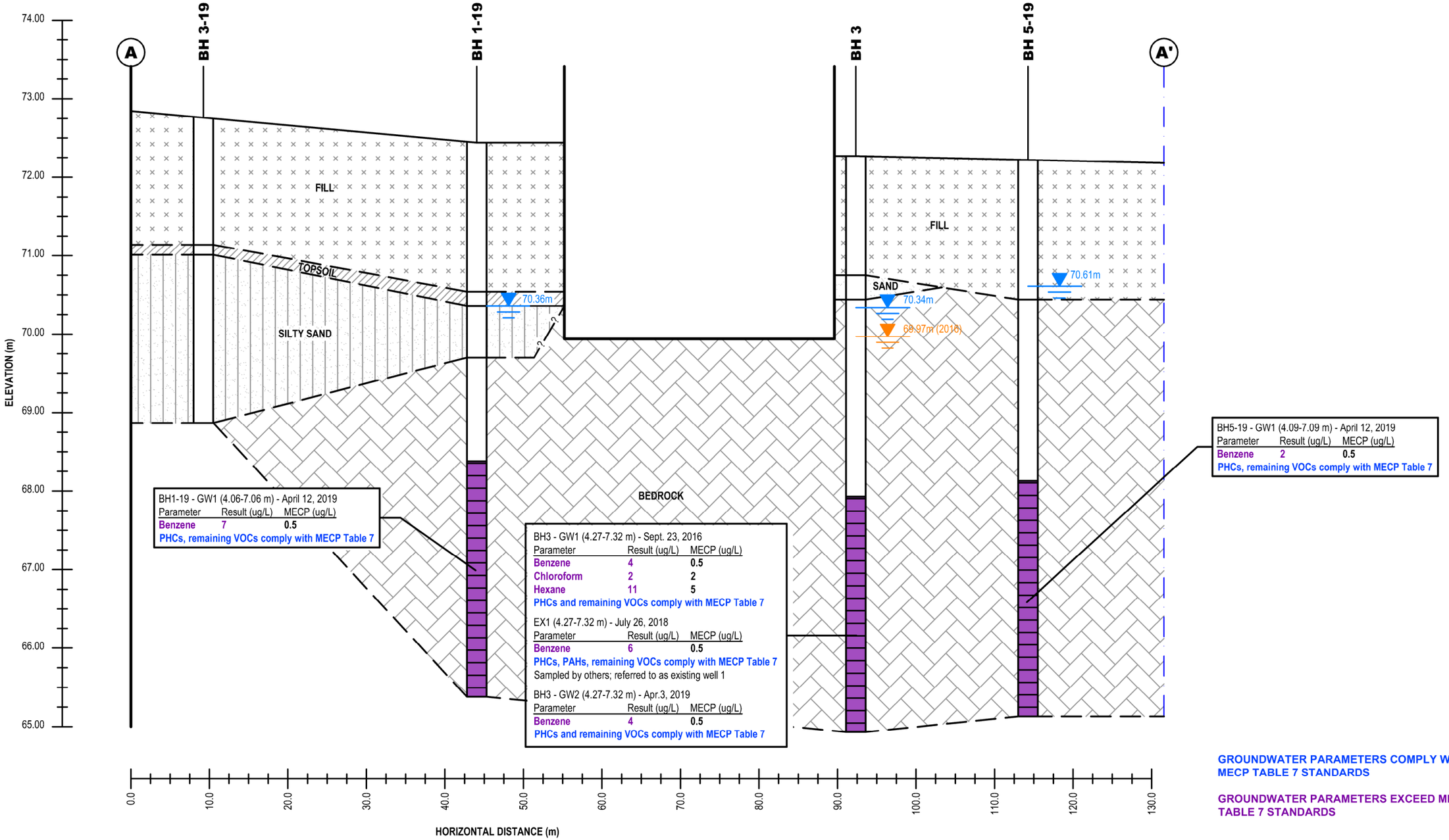

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	PE4577-7B
Approved by: MSD	Revision No.:

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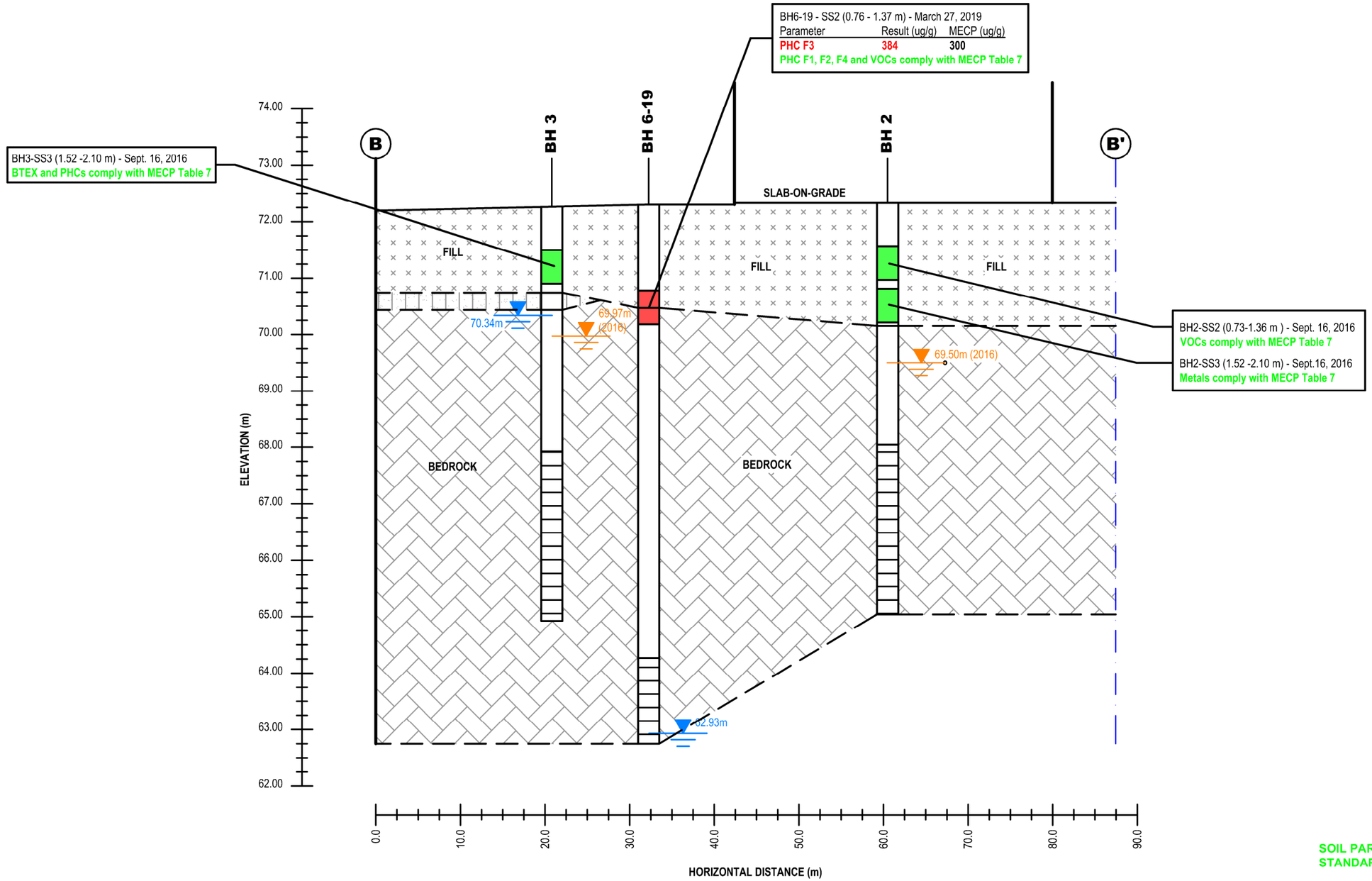

SOIL PARAMETERS COMPLY WITH MECP TABLE 7 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 7 STANDARDS

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL

Scale: AS SHOWN	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	PE4577-8A
Approved by: MSD	Revision No.:

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BH3 - GW1 (4.27-7.32 m) - Sept. 23, 2016

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	4	0.5
Chloroform	2	2
Hexane	11	5

PHCs and remaining VOCs comply with MECP Table 7

EX1 (4.27-7.32 m) - July 26, 2018

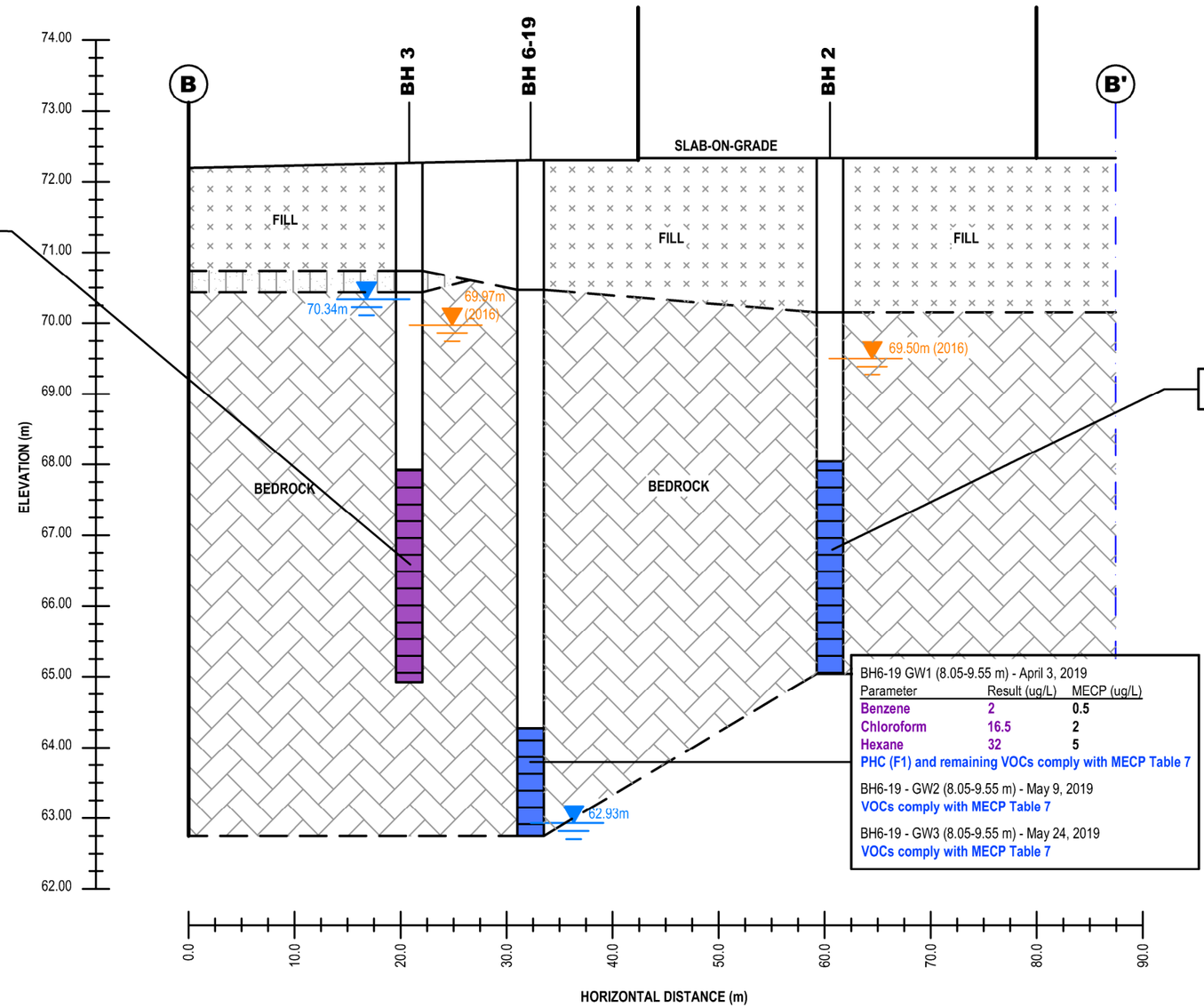
Parameter	Result (ug/L)	MECP (ug/L)
Benzene	6	0.5

PHCs, PAHs, remaining VOCs comply with MECP Table 7
Sampled by others; referred to as existing well 1

BH3 - GW2 (4.27-7.32 m) - Apr.3, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	4	0.5

PHCs and remaining VOCs comply with MECP Table 7



BH2 - GW1 (4.24-7.29 m) - Sept. 23, 2016
BTEX, PHCs and VOCs comply with MECP Table 7

BH6-19 GW1 (8.05-9.55 m) - April 3, 2019

Parameter	Result (ug/L)	MECP (ug/L)
Benzene	2	0.5
Chloroform	16.5	2
Hexane	32	5

PHC (F1) and remaining VOCs comply with MECP Table 7

BH6-19 - GW2 (8.05-9.55 m) - May 9, 2019
VOCs comply with MECP Table 7

BH6-19 - GW3 (8.05-9.55 m) - May 24, 2019
VOCs comply with MECP Table 7

GROUNDWATER PARAMETERS COMPLY WITH MECP TABLE 7 STANDARDS

GROUNDWATER PARAMETERS EXCEED MECP TABLE 7 STANDARDS

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - GROUNDWATER

Scale: AS SHOWN	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	PE4577-8B
Approved by: MSD	Revision No.:

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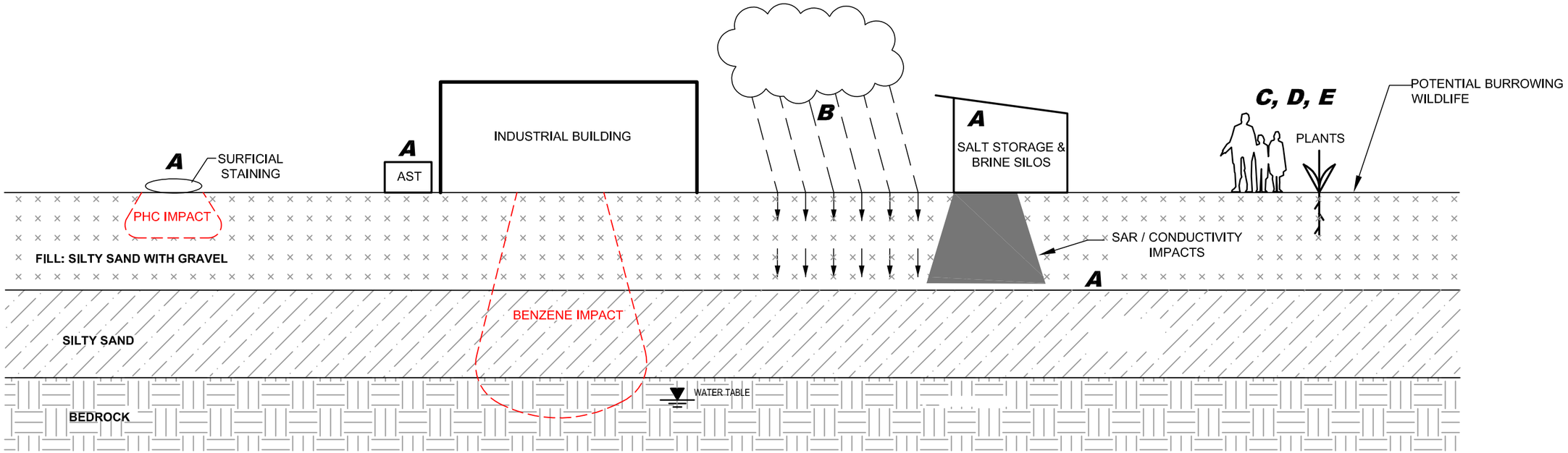

NARRATIVE NOTES:

A

CONTAMINANT RELEASE MECHANISMS

Contaminants of concern in the Phase II-ESA property include Benzene, Petroleum Hydrocarbons (PHC F1, F3 and/or F4), Sodium Adsorption Ration (SAR) and Electrical Conductivity (EC). Contaminants of concern in the groundwater include benzene. Benzene and PHC F1 were identified beneath the floor slab of the body shop and are considered to have resulted from improper disposal practices or an interior release; based on observations during the Phase I ESA, cracks were observed in the concrete floor of the garage, which may have provided migratory pathways. F3 and F4 concentrations identified near surface on the exterior of the property area considered to have resulted from small leaks or spills associated with on-site vehicles and equipment. EC and SAR impacted soil is considered to have resulted from direct releases of brine and salt to the ground surface. The concentrations of benzene in the groundwater are considered to be associated with the benzene impacts identified in the soil beneath the subject structure.

B

CONTAMINANT TRANSPORT PATHWAYS

1. PHYSICAL TRANSPORT - One potential contaminant transport pathway is the physical transport from one location to another of contaminated soil, either intentionally or unintentionally,by backfill excavated soil, by earth moving equipment, vehicle traffic, or pedestrian traffic. Based on observations during the Phase I and Phase II ESA, physical transport of contaminants at the subject site is considered to be negligible.
2. PRECIPITATION/INFILTRATION/LEACHING - Leaching is considered to have had litlle effect on contaminant transport as the source of the benzene impacted groundwater is considered to be beneath the building. All other parameter concentrations within the groundwater are in compliance with MECP Table 7 standards; shallow PHC impacts on the exterior of the property and EC/SAR impacts are not considered to have reach the groundwater table.
VOCs are considered to have migrated downward. VOCs concentrations exceeding Table 7 were identified in groundwater. Benzene is considered to have migrated downward from the soil due to the proximity of the groundwater to the soil-bedrock interface. Fluctuations of the groundwater table and groundwater flow may account for some lateral contaminant transport within the soil beneath the subject structure.
3. DIFFUSION AND DISPERSION - Upon entering the groundwater table contaminants will move from an area of greater concentration toward an area where it is less concentrated as long as a concentration gradient exists (diffusion).

C

HUMAN AND ECOLOGICAL RECEPTORS

1. HUMAN RECEPTORS - With the exception of the building location, the subject property is covered with asphaltic concrete and granular fill. The general public is therefore not exposed to the impacted soil. Potential human receptors are considered to be limited to construction workers and environmental professionals who may contact the soil/groundwater in the event of a site remediation program and/or redevelopment activities.
2. ECOLOGICAL RECEPTORS - Potential ecological receptors include plants whose root structures may intercept the contaminated soil layer, wildlife which may contact the contaminated soil at ground surface or during burrowing activities, and groundwater/surface water receptors downgradient of the subject site at groundwater discharge points. As noted above, the subject property is largely paved and therefore potential for ecological receptors is considered to be low.

D

RECEPTOR EXPOSURE POINTS

1. HUMAN RECEPTORS - There are limited exposure points for humans at this point. In the event of a site redevelopment exposure points for humans consist of remedial excavation, excavation for site building.
2. ECOLOGICAL RECEPTORS - Given the location of the subject site in a built-up area, there are limited ecological receptor exposure points in the general vicinity of the site.

E

ROUTES OF EXPOSURE

1. HUMAN RECEPTORS - Routes of exposure for human receptors (construction workers and environmental professionals) include dermal contact, accidental ingestion, and inhalation (PHC and BTEX vapours, or particulate dust containing metals)
2. ECOLOGICAL RECEPTORS - Routes of exposure for ecological receptors include ingestion, dermal contact, and inhalation.

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HUNTINGTON PROPERTY GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1090 CUMMINGS AVENUE

OTTAWA, ONTARIO

Title:

CONTAMINANT DISTRIBUTION DIAGRAM

Scale: N.T.S	Date: 06/2019
Drawn by: MPG	Report No.: PE4577-1
Checked by: KM	Dwg. No.: PE4577-9
Approved by: MSD	Revision No.: 0

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment
1090 Cummings Avenue
Ottawa, Ontario

Prepared For

Huntington Property Group

March 2019

Report: PE4577-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Huntington Property Group to conduct a supplemental Phase II Environmental Site Assessment (ESA) for the property addressed 1090 Cummings Avenue in the City of Ottawa, Ontario. Note that the property includes civic addresses 1068 through 1100 Cummings Avenue. A subsurface investigation program, consisting of borehole drilling, was developed based on previous environmental reports prepared by Paterson. The purpose of the Phase II ESA was to investigation an additional area of potential environmental concern identified during the 2019 Phase I ESA Update, to further delineate soil and groundwater impacts previously identified and to obtain geotechnical information for the proposed development.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-19	Place borehole to the north of BH3 to delineate the cross-gradient vertical extent of the benzene impacted groundwater and to assess potential impacts within APEC 6.	Drill to intercept water table for monitoring well installation. Core bedrock if required to approximate depth of 7.0m.
BH2-19	Place borehole to northeast of BH1 to investigate extent of SAR and EC exceedances in the soil.	Drill to auger refusal on inferred bedrock surface.
BH3-19	Primarily for geotechnical purposes; place to address potential for impacts related to former sandblasting activities.	Drill to auger refusal on inferred bedrock surface.
BH4-19	For geotechnical purposes.	Drill to auger refusal on inferred bedrock surface.
BH5-19	Place borehole to the south of BH3 to delineate the cross-gradient vertical extent of the benzene impacted groundwater and to assess potential impacts within APEC 6.	Drill to intercept water table for monitoring well installation. Core bedrock if required to approximate depth of 7.0m.
BH6-19	Place borehole between BH3 and MW2 to delineate vertical extent of benzene impacted groundwater.	Core bedrock to a depth of approximately 9.5 below grade for monitoring well installation.

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis. Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples.

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

2.0 ANALYTICAL TESTING PROGRAM

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

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.

- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.

- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MECPsite condition standards.

- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.

- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

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

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).

- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.

- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.

- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed a plan with the borehole locations must be provided. Distances and orientations of boreholes 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 fire hydrant located on south side of Lisgar Street (300 Lisgar Street), with geodetic elevation of 72.57m above sea level (asl).

Drilling Procedure

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

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

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.

- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).

- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.

- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples.

- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

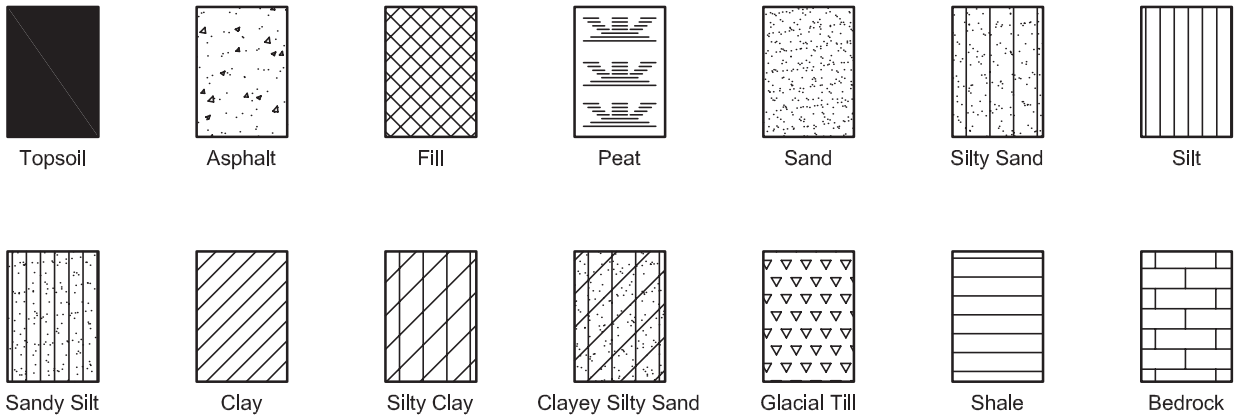
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

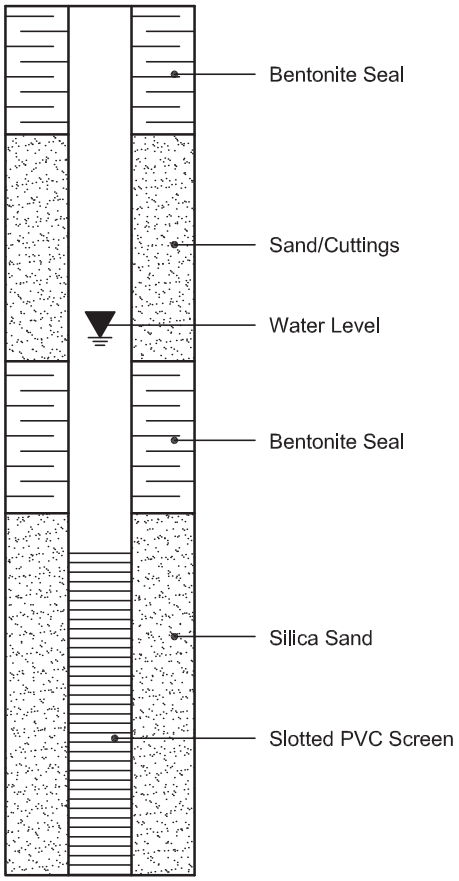
SYMBOLS AND TERMS (continued)

STRATA PLOT

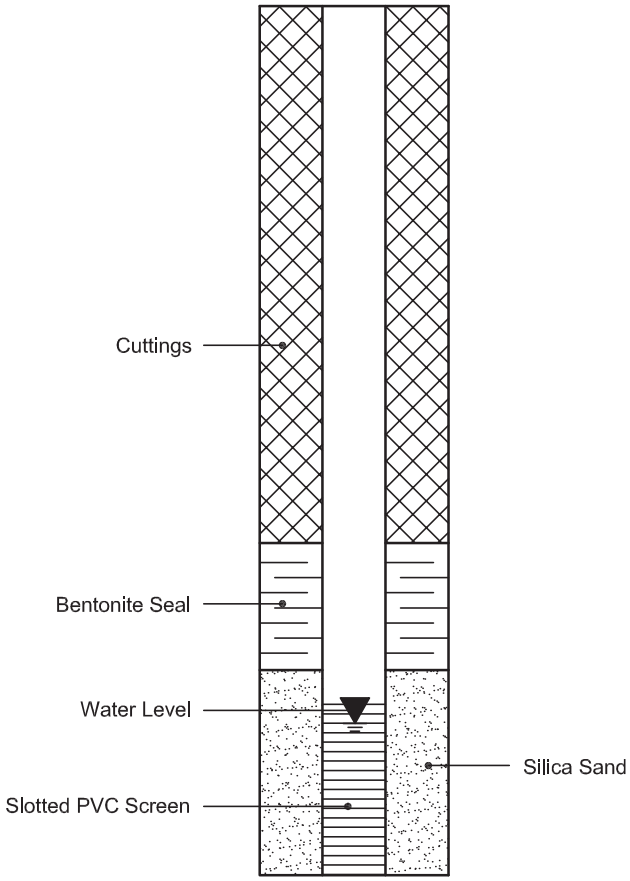


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 26051
Project: PE4577
Custody: 121060

Report Date: 2-Apr-2019
Order Date: 27-Mar-2019

Order #: 1913434

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

Paracel ID	Client ID
1913434-01	BH2-19-SS2
1913434-02	BH2-19-SS3
1913434-03	BH3-19-SS2
1913434-04	BH5-19-SS2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26051

Report Date: 02-Apr-2019
Order Date: 27-Mar-2019
Project Description: PE4577

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.7 - ICP-OES	1-Apr-19	1-Apr-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	29-Mar-19	1-Apr-19
Conductivity	MOE E3138 - probe @25 °C, water ext	2-Apr-19	2-Apr-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	1-Apr-19	2-Apr-19
PHC F1	CWS Tier 1 - P&T GC-FID	30-Mar-19	1-Apr-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	29-Mar-19	31-Mar-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	1-Apr-19	1-Apr-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	30-Mar-19	1-Apr-19
SAR	Calculated	2-Apr-19	2-Apr-19
Solids, %	Gravimetric, calculation	2-Apr-19	2-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26051

Report Date: 02-Apr-2019

Order Date: 27-Mar-2019

Project Description: PE4577

	Client ID:	BH2-19-SS2	BH2-19-SS3	BH3-19-SS2	BH5-19-SS2
	Sample Date:	03/26/2019 09:00	03/26/2019 09:00	03/26/2019 09:00	03/26/2019 09:00
	Sample ID:	1913434-01	1913434-02	1913434-03	1913434-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	89.2	77.3	93.5	88.1
General Inorganics					
SAR	0.01 N/A	24.7	23.6	-	-
Conductivity	5 uS/cm	10300	5630	-	-
Metals					
Antimony	1.0 ug/g dry	-	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	-	-	3.3	2.8
Barium	1.0 ug/g dry	-	-	83.5	146
Beryllium	0.5 ug/g dry	-	-	<0.5	0.5
Boron	5.0 ug/g dry	-	-	6.6	6.4
Boron, available	0.5 ug/g dry	-	-	<0.5	<0.5
Cadmium	0.5 ug/g dry	-	-	<0.5	<0.5
Chromium	5.0 ug/g dry	-	-	27.4	35.0
Chromium (VI)	0.2 ug/g dry	-	-	<0.2	<0.2
Cobalt	1.0 ug/g dry	-	-	7.4	8.8
Copper	5.0 ug/g dry	-	-	22.9	22.4
Lead	1.0 ug/g dry	-	-	18.3	34.7
Mercury	0.1 ug/g dry	-	-	<0.1	<0.1
Molybdenum	1.0 ug/g dry	-	-	2.5	<1.0
Nickel	5.0 ug/g dry	-	-	19.0	22.8
Selenium	1.0 ug/g dry	-	-	<1.0	<1.0
Silver	0.3 ug/g dry	-	-	<0.3	<0.3
Thallium	1.0 ug/g dry	-	-	<1.0	<1.0
Uranium	1.0 ug/g dry	-	-	<1.0	<1.0
Vanadium	10.0 ug/g dry	-	-	30.0	41.0
Zinc	20.0 ug/g dry	-	-	45.3	67.9
Volatiles					
Acetone	0.50 ug/g dry	-	-	-	<0.50
Benzene	0.02 ug/g dry	-	-	-	<0.02
Bromodichloromethane	0.05 ug/g dry	-	-	-	<0.05
Bromoform	0.05 ug/g dry	-	-	-	<0.05
Bromomethane	0.05 ug/g dry	-	-	-	<0.05
Carbon Tetrachloride	0.05 ug/g dry	-	-	-	<0.05
Chlorobenzene	0.05 ug/g dry	-	-	-	<0.05
Chloroform	0.05 ug/g dry	-	-	-	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26051

Report Date: 02-Apr-2019

Order Date: 27-Mar-2019

Project Description: PE4577

	Client ID:	BH2-19-SS2	BH2-19-SS3	BH3-19-SS2	BH5-19-SS2
	Sample Date:	03/26/2019 09:00	03/26/2019 09:00	03/26/2019 09:00	03/26/2019 09:00
	Sample ID:	1913434-01	1913434-02	1913434-03	1913434-04
	MDL/Units	Soil	Soil	Soil	Soil
Dibromochloromethane	0.05 ug/g dry	-	-	-	<0.05
Dichlorodifluoromethane	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,4-Dichlorobenzene	0.05 ug/g dry	-	-	-	<0.05
1,1-Dichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	-	-	<0.05
1,2-Dichloropropane	0.05 ug/g dry	-	-	-	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	-	-	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	-	-	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	-	-	-	<0.05
Ethylbenzene	0.05 ug/g dry	-	-	-	<0.05
Ethylene dibromide (dibromoethan	0.05 ug/g dry	-	-	-	<0.05
Hexane	0.05 ug/g dry	-	-	-	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	-	-	<0.50
Methyl Isobutyl Ketone	0.50 ug/g dry	-	-	-	<0.50
Methyl tert-butyl ether	0.05 ug/g dry	-	-	-	<0.05
Methylene Chloride	0.05 ug/g dry	-	-	-	<0.05
Styrene	0.05 ug/g dry	-	-	-	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	-	-	<0.05
Tetrachloroethylene	0.05 ug/g dry	-	-	-	<0.05
Toluene	0.05 ug/g dry	-	-	-	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	-	-	-	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	-	-	-	<0.05
Trichloroethylene	0.05 ug/g dry	-	-	-	<0.05
Trichlorofluoromethane	0.05 ug/g dry	-	-	-	<0.05
Vinyl chloride	0.02 ug/g dry	-	-	-	<0.02
m,p-Xylenes	0.05 ug/g dry	-	-	-	<0.05
o-Xylene	0.05 ug/g dry	-	-	-	<0.05
Xylenes, total	0.05 ug/g dry	-	-	-	<0.05
4-Bromofluorobenzene	Surrogate	-	-	-	107%
Dibromofluoromethane	Surrogate	-	-	-	100%

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26051

Report Date: 02-Apr-2019

Order Date: 27-Mar-2019

Project Description: PE4577

	Client ID:	BH2-19-SS2	BH2-19-SS3	BH3-19-SS2	BH5-19-SS2
	Sample Date:	03/26/2019 09:00	03/26/2019 09:00	03/26/2019 09:00	03/26/2019 09:00
	Sample ID:	1913434-01	1913434-02	1913434-03	1913434-04
	MDL/Units	Soil	Soil	Soil	Soil
Toluene-d8	Surrogate	-	-	-	101%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	-	16
F3 PHCs (C16-C34)	8 ug/g dry	-	-	-	37
F4 PHCs (C34-C50)	6 ug/g dry	-	-	-	52

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26051

Report Date: 02-Apr-2019
Order Date: 27-Mar-2019
Project Description: PE4577

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
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	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26051

Report Date: 02-Apr-2019
Order Date: 27-Mar-2019
Project Description: PE4577

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*9.33*		*ug/g*		*117*	*50-140*			
Surrogate: Dibromofluoromethane	*7.70*		*ug/g*		*96.2*	*50-140*			
Surrogate: Toluene-d8	*9.18*		*ug/g*		*115*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	5.41	0.01	N/A	5.37			0.7	200	
Conductivity	686	5	uS/cm	702			2.4	6.2	
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	2.2	1.0	ug/g dry	2.1			5.1	30	
Barium	17.0	1.0	ug/g dry	16.7			1.7	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron, available	ND	0.5	ug/g dry	ND			0.0	35	
Boron	ND	5.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	11.7	5.0	ug/g dry	11.1			5.2	30	
Cobalt	4.4	1.0	ug/g dry	4.0			7.6	30	
Copper	8.4	5.0	ug/g dry	8.0			4.9	30	
Lead	5.9	1.0	ug/g dry	5.7			3.3	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	9.1	5.0	ug/g dry	8.2			11.4	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	20.2	10.0	ug/g dry	19.1			5.1	30	
Zinc	ND	20.0	ug/g dry	ND			0.0	30	
Physical Characteristics									
% Solids	65.5	0.1	% by Wt.	65.0			0.8	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*10.6*		*ug/g dry*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*9.70*		*ug/g dry*		*99.4*	*50-140*			
Surrogate: Toluene-d8	*10.6*		*ug/g dry*		*108*	*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)	193	7	ug/g		96.3	80-120			
F2 PHCs (C10-C16)	81	4	ug/g	ND	85.0	60-140			
F3 PHCs (C16-C34)	237	8	ug/g	ND	102	60-140			
F4 PHCs (C34-C50)	185	6	ug/g	ND	126	60-140			
Metals									
Antimony	49.8		ug/L	ND	98.9	70-130			
Arsenic	54.1		ug/L	ND	106	70-130			
Barium	60.8		ug/L	6.7	108	70-130			
Beryllium	58.1		ug/L	ND	116	70-130			
Boron, available	4.47	0.5	ug/g	ND	89.4	70-122			
Boron	50.8		ug/L	ND	98.7	70-130			
Cadmium	53.7		ug/L	ND	107	70-130			
Chromium (VI)	5.6	0.2	ug/g	ND	92.5	70-130			
Chromium	58.0		ug/L	ND	107	70-130			
Cobalt	51.3		ug/L	1.6	99.4	70-130			
Copper	57.8		ug/L	ND	109	70-130			
Lead	51.2		ug/L	2.3	97.9	70-130			
Mercury	1.41	0.1	ug/g	ND	94.1	70-130			
Molybdenum	54.0		ug/L	ND	108	70-130			
Nickel	59.3		ug/L	ND	112	70-130			
Selenium	53.1		ug/L	ND	106	70-130			
Silver	49.4		ug/L	ND	98.9	70-130			
Thallium	51.9		ug/L	ND	104	70-130			
Uranium	54.8		ug/L	ND	109	70-130			
Vanadium	64.3		ug/L	ND	113	70-130			
Zinc	61.2		ug/L	ND	108	70-130			
Volatiles									
Acetone	10.4	0.50	ug/g		104	50-140			
Benzene	4.44	0.02	ug/g		111	60-130			
Bromodichloromethane	5.07	0.05	ug/g		127	60-130			
Bromoform	3.56	0.05	ug/g		88.9	60-130			
Bromomethane	4.71	0.05	ug/g		118	50-140			
Carbon Tetrachloride	4.54	0.05	ug/g		114	60-130			
Chlorobenzene	3.52	0.05	ug/g		88.0	60-130			
Chloroform	4.71	0.05	ug/g		118	60-130			
Dibromochloromethane	3.57	0.05	ug/g		89.2	60-130			
Dichlorodifluoromethane	5.04	0.05	ug/g		126	50-140			
1,2-Dichlorobenzene	3.69	0.05	ug/g		92.2	60-130			
1,3-Dichlorobenzene	3.65	0.05	ug/g		91.3	60-130			
1,4-Dichlorobenzene	3.74	0.05	ug/g		93.4	60-130			
1,1-Dichloroethane	5.16	0.05	ug/g		129	60-130			
1,2-Dichloroethane	5.02	0.05	ug/g		126	60-130			
1,1-Dichloroethylene	3.80	0.05	ug/g		94.9	60-130			
cis-1,2-Dichloroethylene	4.48	0.05	ug/g		112	60-130			
trans-1,2-Dichloroethylene	4.17	0.05	ug/g		104	60-130			
1,2-Dichloropropane	4.71	0.05	ug/g		118	60-130			
cis-1,3-Dichloropropylene	4.38	0.05	ug/g		109	60-130			
trans-1,3-Dichloropropylene	3.84	0.05	ug/g		96.0	60-130			
Ethylbenzene	3.69	0.05	ug/g		92.3	60-130			
Ethylene dibromide (dibromoethane	3.66	0.05	ug/g		91.5	60-130			
Hexane	3.05	0.05	ug/g		76.3	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	12.0	0.50	ug/g		120	50-140			
Methyl Isobutyl Ketone	10.5	0.50	ug/g		105	50-140			
Methyl tert-butyl ether	13.2	0.05	ug/g		132	50-140			
Methylene Chloride	4.17	0.05	ug/g		104	60-130			
Styrene	3.79	0.05	ug/g		94.7	60-130			
1,1,1,2-Tetrachloroethane	3.73	0.05	ug/g		93.2	60-130			
1,1,2,2-Tetrachloroethane	3.90	0.05	ug/g		97.5	60-130			
Tetrachloroethylene	3.68	0.05	ug/g		91.9	60-130			
Toluene	3.60	0.05	ug/g		90.1	60-130			
1,1,1-Trichloroethane	4.81	0.05	ug/g		120	60-130			
1,1,2-Trichloroethane	4.47	0.05	ug/g		112	60-130			
Trichloroethylene	4.05	0.05	ug/g		101	60-130			
Trichlorofluoromethane	3.80	0.05	ug/g		94.9	50-140			
Vinyl chloride	4.88	0.02	ug/g		122	50-140			
m,p-Xylenes	7.40	0.05	ug/g		92.5	60-130			
o-Xylene	3.86	0.05	ug/g		96.5	60-130			
Surrogate: 4-Bromofluorobenzene	*7.03*		*ug/g*		*87.9*	*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.

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Paracel ID: 1913434

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awa, Ontario K1G 4J8
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paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
Nº 121060

Page ___ of ___

Client Name: Paterson Group Inc.
Contact Name: Kaylyn Munch
Address: 154 Colonnade Rd S.
Telephone: 613-226-7381

Project Reference: PE4577
Quote #
PO # 26051
Email Address: kmunch@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: ___

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 7 ☐ 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: 1913434

	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)	EC/SAR
1	BH1-19-SS2	S		1	Mar. 26/19									✓
2	BH2-19-SS3	S		1	Mar. 26/19									✓
3	BH3-19-SS2	S		1	Mar. 26/19					✓	✓	✓	✓	
4	BH5-19-SS2	S		2	Mar. 26/19		✓	✓		✓	✓	✓	✓	
5														
6														
7														
8														
9														
10														

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): W. Sullivan
Relinquished By (Print): Nick Sullivan
Date/Time: Mar. 27, 2019

Received by Driver/Depot: A. Scouse
Date/Time: 27/03/19 4:20 PM
Temperature: ___

Received at Lab: SURREPOR RCV MAI
Date/Time: MAR 27 2019 05:07
Temperature: 19.4 °C

Verified By: D Gamm
Date/Time: 28 Mar 19 9:30
pH Verified [ ] By: ___

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 26055
Project: PE4577
Custody: 121601

Report Date: 3-Apr-2019
Order Date: 28-Mar-2019

Order #: 1913549

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

Paracel ID	Client ID
1913549-01	BH6-19-SS2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26055

Report Date: 03-Apr-2019
Order Date: 28-Mar-2019
Project Description: PE4577

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	2-Apr-19	3-Apr-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	29-Mar-19	31-Mar-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	2-Apr-19	3-Apr-19
Solids, %	Gravimetric, calculation	2-Apr-19	2-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26055

Report Date: 03-Apr-2019

Order Date: 28-Mar-2019

Project Description: PE4577

	Client ID:	BH6-19-SS2	-	-	-
	Sample Date:	03/27/2019 09:00	-	-	-
	Sample ID:	1913549-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	94.9	-	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	0.18	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	0.17	-	-	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26055

Report Date: 03-Apr-2019

Order Date: 28-Mar-2019

Project Description: PE4577

	Client ID:	BH6-19-SS2	-	-	-
	Sample Date:	03/27/2019 09:00	-	-	-
	Sample ID:	1913549-01	-	-	-
	MDL/Units	Soil	-	-	-
Toluene	0.05 ug/g dry	0.11	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	0.23	-	-	-
o-Xylene	0.05 ug/g dry	0.07	-	-	-
Xylenes, total	0.05 ug/g dry	0.30	-	-	-
4-Bromofluorobenzene	Surrogate	86.9%	-	-	-
Dibromofluoromethane	Surrogate	87.6%	-	-	-
Toluene-d8	Surrogate	87.9%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	36	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	38	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	384	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	503 [1]	-	-	-

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						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*3.01*		*ug/g*		*94.0*	*50-140*			
Surrogate: Dibromofluoromethane	*3.23*		*ug/g*		*101*	*50-140*			
Surrogate: Toluene-d8	*2.70*		*ug/g*		*84.4*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				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	
Physical Characteristics									
% Solids	86.1	0.1	% by Wt.	82.7			4.0	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	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: 4-Bromofluorobenzene	*3.02*		*ug/g dry*		*86.5*	*50-140*			
Surrogate: Dibromofluoromethane	*3.12*		*ug/g dry*		*89.3*	*50-140*			
Surrogate: Toluene-d8	*2.76*		*ug/g dry*		*79.0*	*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)	196	7	ug/g		97.9	80-120			
F2 PHCs (C10-C16)	81	4	ug/g	ND	85.0	60-140			
F3 PHCs (C16-C34)	237	8	ug/g	ND	102	60-140			
F4 PHCs (C34-C50)	185	6	ug/g	ND	126	60-140			
Volatiles									
Acetone	6.56	0.50	ug/g		65.6	50-140			
Benzene	3.04	0.02	ug/g		75.9	60-130			
Bromodichloromethane	2.74	0.05	ug/g		68.6	60-130			
Bromoform	2.73	0.05	ug/g		68.2	60-130			
Bromomethane	3.02	0.05	ug/g		75.4	50-140			
Carbon Tetrachloride	2.61	0.05	ug/g		65.3	60-130			
Chlorobenzene	3.42	0.05	ug/g		85.6	60-130			
Chloroform	2.74	0.05	ug/g		68.6	60-130			
Dibromochloromethane	3.17	0.05	ug/g		79.1	60-130			
Dichlorodifluoromethane	2.77	0.05	ug/g		69.3	50-140			
1,2-Dichlorobenzene	3.82	0.05	ug/g		95.4	60-130			
1,3-Dichlorobenzene	3.80	0.05	ug/g		95.0	60-130			
1,4-Dichlorobenzene	3.08	0.05	ug/g		76.9	60-130			
1,1-Dichloroethane	3.15	0.05	ug/g		78.7	60-130			
1,2-Dichloroethane	3.18	0.05	ug/g		79.4	60-130			
1,1-Dichloroethylene	3.37	0.05	ug/g		84.3	60-130			
cis-1,2-Dichloroethylene	3.03	0.05	ug/g		75.7	60-130			
trans-1,2-Dichloroethylene	2.74	0.05	ug/g		68.4	60-130			
1,2-Dichloropropane	3.08	0.05	ug/g		77.0	60-130			
cis-1,3-Dichloropropylene	2.61	0.05	ug/g		65.2	60-130			
trans-1,3-Dichloropropylene	2.81	0.05	ug/g		70.4	60-130			
Ethylbenzene	3.17	0.05	ug/g		79.3	60-130			
Ethylene dibromide (dibromoethane	3.99	0.05	ug/g		99.7	60-130			
Hexane	3.20	0.05	ug/g		80.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.38	0.50	ug/g		73.8	50-140			
Methyl Isobutyl Ketone	8.41	0.50	ug/g		84.1	50-140			
Methyl tert-butyl ether	6.97	0.05	ug/g		69.7	50-140			
Methylene Chloride	2.73	0.05	ug/g		68.4	60-130			
Styrene	3.92	0.05	ug/g		98.0	60-130			
1,1,1,2-Tetrachloroethane	3.09	0.05	ug/g		77.3	60-130			
1,1,2,2-Tetrachloroethane	3.31	0.05	ug/g		82.7	60-130			
Tetrachloroethylene	3.75	0.05	ug/g		93.8	60-130			
Toluene	3.14	0.05	ug/g		78.4	60-130			
1,1,1-Trichloroethane	2.61	0.05	ug/g		65.3	60-130			
1,1,2-Trichloroethane	3.25	0.05	ug/g		81.2	60-130			
Trichloroethylene	3.30	0.05	ug/g		82.5	60-130			
Trichlorofluoromethane	2.46	0.05	ug/g		61.5	50-140			
Vinyl chloride	3.37	0.02	ug/g		84.3	50-140			
m,p-Xylenes	8.17	0.05	ug/g		102	60-130			
o-Xylene	3.37	0.05	ug/g		84.3	60-130			
Surrogate: 4-Bromofluorobenzene	*3.08*		*ug/g*		*96.1*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

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TR
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RE

Paracel ID: 1913549

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awa, Ontario K1G 4J8
-800-749-1947
aracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 121601

Page ___ of ___

Client Name: Paterson Group	Project Reference: PE4577
Contact Name: Kaitlyn Munch	Quote #
Address: 154 Colonnade Rd S.	PO # 26055
Telephone: 613-226-7381	Email Address: kmunch@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: ___

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 7 ☐ 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: 1913549

	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	BH16-19-SS2	S		2	Mar. 27/19		✓	✓												- 1Bottle 1Jar -
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Louie	Received at Lab: Dumfries DOK MM	Verified By:
Relinquished By (Print):	Date/Time: 28/03/19 3:20 PM	Date/Time: MAR 28, 2019 04:09	Date/Time:
Date/Time: March. 28/19.	Temperature: °C	Temperature: 15.9 °C	pH Verified ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 26285
Project: PE4577
Custody: 121630

Report Date: 10-Apr-2019
Order Date: 4-Apr-2019

Order #: 1914532

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

Paracel ID	Client ID
1914532-01	MW2-GW1
1914532-02	BH3-GW2
1914532-03	BH6-19-GW1
1914532-04	DUP1
1914532-05	Trip Blank

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26285

Report Date: 10-Apr-2019
Order Date: 4-Apr-2019
Project Description: PE4577

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	5-Apr-19	8-Apr-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Apr-19	5-Apr-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	5-Apr-19	8-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26285

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4577

	Client ID:	MW2-GW1	BH3-GW2	BH6-19-GW1	DUP1
	Sample Date:	04/03/2019 09:00	04/03/2019 09:00	04/03/2019 09:00	04/03/2019 09:00
	Sample ID:	1914532-01	1914532-02	1914532-03	1914532-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	401	<5.0	<5.0	260
Benzene	0.5 ug/L	31.1	4.3	13.6	63.8
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	2.0	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	16.8	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	6.2	<0.5	1.9	15.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	31.7	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	3.4	0.8	83.5	5.9
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26285

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4577

	Client ID:	MW2-GW1	BH3-GW2	BH6-19-GW1	DUP1
	Sample Date:	04/03/2019 09:00	04/03/2019 09:00	04/03/2019 09:00	04/03/2019 09:00
	Sample ID:	1914532-01	1914532-02	1914532-03	1914532-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	7.1	3.5	21.7	18.6
o-Xylene	0.5 ug/L	<0.5	0.5	7.1	2.3
Xylenes, total	0.5 ug/L	7.1	4.0	28.8	20.9
4-Bromofluorobenzene	Surrogate	98.5%	101%	105%	99.1%
Dibromofluoromethane	Surrogate	81.4%	89.6%	85.4%	87.6%
Toluene-d8	Surrogate	102%	101%	99.1%	103%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	269	141	80	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26285

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4577

	Client ID:	Trip Blank	-	-	-
	Sample Date:	04/01/2019 09:00	-	-	-
	Sample ID:	1914532-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethar	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26285

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4577

Client ID:		Trip Blank	-	-	-
Sample Date:		04/01/2019 09:00	-	-	-
Sample ID:		1914532-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	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	-	-	-
4-Bromofluorobenzene	Surrogate	97.6%	-	-	-
Dibromofluoromethane	Surrogate	90.5%	-	-	-
Toluene-d8	Surrogate	97.2%	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26285

Report Date: 10-Apr-2019
Order Date: 4-Apr-2019
Project Description: PE4577

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	*79.0*		*ug/L*		*98.7*	*50-140*			
Surrogate: Dibromofluoromethane	*88.4*		*ug/L*		*111*	*50-140*			
Surrogate: Toluene-d8	*78.2*		*ug/L*		*97.7*	*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	*78.8*		*ug/L*		*98.5*	*50-140*			
Surrogate: Dibromofluoromethane	*96.2*		*ug/L*		*120*	*50-140*			
Surrogate: Toluene-d8	*76.3*		*ug/L*		*95.3*	*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)	1630	25	ug/L		81.5	68-117			
F2 PHCs (C10-C16)	1380	100	ug/L		86.1	60-140			
F3 PHCs (C16-C34)	3730	100	ug/L		95.3	60-140			
F4 PHCs (C34-C50)	2260	100	ug/L		91.3	60-140			
Volatiles									
Acetone	115	5.0	ug/L		115	50-140			
Benzene	42.0	0.5	ug/L		105	60-130			
Bromodichloromethane	37.0	0.5	ug/L		92.4	60-130			
Bromoform	26.3	0.5	ug/L		65.8	60-130			
Bromomethane	46.3	0.5	ug/L		116	50-140			
Carbon Tetrachloride	34.8	0.2	ug/L		87.1	60-130			
Chlorobenzene	41.2	0.5	ug/L		103	60-130			
Chloroform	46.4	0.5	ug/L		116	60-130			
Dibromochloromethane	35.6	0.5	ug/L		89.0	60-130			
Dichlorodifluoromethane	43.8	1.0	ug/L		110	50-140			
1,2-Dichlorobenzene	34.2	0.5	ug/L		85.5	60-130			
1,3-Dichlorobenzene	34.1	0.5	ug/L		85.2	60-130			
1,4-Dichlorobenzene	31.4	0.5	ug/L		78.6	60-130			
1,1-Dichloroethane	47.1	0.5	ug/L		118	60-130			
1,2-Dichloroethane	51.8	0.5	ug/L		130	60-130			
1,1-Dichloroethylene	39.7	0.5	ug/L		99.3	60-130			
cis-1,2-Dichloroethylene	41.7	0.5	ug/L		104	60-130			
trans-1,2-Dichloroethylene	42.3	0.5	ug/L		106	60-130			
1,2-Dichloropropane	42.2	0.5	ug/L		105	60-130			
cis-1,3-Dichloropropylene	27.1	0.5	ug/L		67.7	60-130			
trans-1,3-Dichloropropylene	28.7	0.5	ug/L		71.8	60-130			
Ethylbenzene	33.3	0.5	ug/L		83.2	60-130			
Ethylene dibromide (dibromoethane	46.2	0.2	ug/L		115	60-130			
Hexane	26.3	1.0	ug/L		65.6	60-130			
Methyl Ethyl Ketone (2-Butanone)	90.7	5.0	ug/L		90.7	50-140			
Methyl Isobutyl Ketone	75.1	5.0	ug/L		75.1	50-140			
Methyl tert-butyl ether	91.1	2.0	ug/L		91.1	50-140			
Methylene Chloride	41.6	5.0	ug/L		104	60-130			
Styrene	29.6	0.5	ug/L		74.1	60-130			
1,1,1,2-Tetrachloroethane	40.3	0.5	ug/L		101	60-130			
1,1,2,2-Tetrachloroethane	51.1	0.5	ug/L		128	60-130			
Tetrachloroethylene	37.2	0.5	ug/L		92.9	60-130			
Toluene	45.0	0.5	ug/L		112	60-130			
1,1,1-Trichloroethane	37.9	0.5	ug/L		94.6	60-130			
1,1,2-Trichloroethane	42.5	0.5	ug/L		106	60-130			
Trichloroethylene	37.0	0.5	ug/L		92.4	60-130			
Trichlorofluoromethane	43.4	1.0	ug/L		109	60-130			
Vinyl chloride	26.5	0.5	ug/L		66.3	50-140			
m,p-Xylenes	73.9	0.5	ug/L		92.4	60-130			
o-Xylene	42.2	0.5	ug/L		105	60-130			
Surrogate: 4-Bromofluorobenzene	*70.5*		*ug/L*		*88.1*	*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.

CCME PHC additional information:

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

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TRU
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Paracel ID: 1914532

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a, Ontario K1G 4J8
0-749-1947
cel@paracellabs.com

Chain of Custody
(Lab Use Only)
Nº 121630

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE4577
Contact Name: Kaugn Munch	Quote #
Address: 154 Colonnade Rd S.	PO # 26285
Telephone: 613-226-7381	Email Address: kmunch@patwoongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required: _____

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 7 ☐ 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: 1914532

	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)	* Li
1	MW2-GW1	GW		3	Apr. 3/19		✓	✓						
2	BH3-GW2	GW	6	3	Apr. 3/19		✓	✓						
3	BH6-19-GW1	GW	2	1	April 3/19			✓						✓
4	DUP1	GW		2	April 3/19			✓						
5	TRIP BLANK			1	April 1/19			✓						
6														
7														
8														
9														
10														

* For No. 2 = Sample ID the All Sets read = BH3-GW1.

Comments: * if possible since there is only 1 vial

Hold Hg, CrVI, Metals

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. LEDUC	Received at Lab: SUMMERSIDE DONNAI	Verified By: D Gamon
Relinquished By (Print): Mark St Pierre	Date/Time: 04/04/19 4 00 PM	Date/Time: APR 04,2019 05:10	Date/Time: 5/APR/19 953
Date/Time: April 4, 2019	Temperature: °C	Temperature: 16.1 °C	pH Verified ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 26501
Project: PE4577
Custody: 121651

Report Date: 17-Apr-2019
Order Date: 15-Apr-2019

Order #: 1916125

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

Paracel ID	Client ID
1916125-01	BH1-19-GW1
1916125-02	BH5-19-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26501

Report Date: 17-Apr-2019
Order Date: 15-Apr-2019
Project Description: PE4577

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	16-Apr-19	17-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26501

Report Date: 17-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4577

	Client ID:	BH1-19-GW1	BH5-19-GW1	-	-
	Sample Date:	04/12/2019 09:00	04/12/2019 09:00	-	-
	Sample ID:	1916125-01	1916125-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	7.0	1.6	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
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	0.8	0.7	-	-
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	27.7	8.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26501

Report Date: 17-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4577

	Client ID:	BH1-19-GW1	BH5-19-GW1	-	-
	Sample Date:	04/12/2019 09:00	04/12/2019 09:00	-	-
	Sample ID:	1916125-01	1916125-02	-	-
	MDL/Units	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	10.3	5.0	-	-
o-Xylene	0.5 ug/L	3.7	2.6	-	-
Xylenes, total	0.5 ug/L	14.0	7.7	-	-
4-Bromofluorobenzene	Surrogate	115%	110%	-	-
Dibromofluoromethane	Surrogate	103%	104%	-	-
Toluene-d8	Surrogate	95.9%	93.9%	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26501

Report Date: 17-Apr-2019
Order Date: 15-Apr-2019
Project Description: PE4577

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*91.8*		*ug/L*		*115*	*50-140*			
Surrogate: Dibromofluoromethane	*78.7*		*ug/L*		*98.4*	*50-140*			
Surrogate: Toluene-d8	*77.2*		*ug/L*		*96.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*87.0*		*ug/L*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*81.3*		*ug/L*		*102*	*50-140*			
Surrogate: Toluene-d8	*73.3*		*ug/L*		*91.6*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	113	5.0	ug/L		113	50-140			
Benzene	42.6	0.5	ug/L		106	60-130			
Bromodichloromethane	37.5	0.5	ug/L		93.8	60-130			
Bromoform	36.4	0.5	ug/L		91.0	60-130			
Bromomethane	35.9	0.5	ug/L		89.8	50-140			
Carbon Tetrachloride	37.0	0.2	ug/L		92.6	60-130			
Chlorobenzene	44.6	0.5	ug/L		111	60-130			
Chloroform	43.3	0.5	ug/L		108	60-130			
Dibromochloromethane	39.5	0.5	ug/L		98.8	60-130			
Dichlorodifluoromethane	43.3	1.0	ug/L		108	50-140			
1,2-Dichlorobenzene	37.2	0.5	ug/L		93.0	60-130			
1,3-Dichlorobenzene	36.9	0.5	ug/L		92.3	60-130			
1,4-Dichlorobenzene	40.1	0.5	ug/L		100	60-130			
1,1-Dichloroethane	41.2	0.5	ug/L		103	60-130			
1,2-Dichloroethane	46.2	0.5	ug/L		115	60-130			
1,1-Dichloroethylene	37.9	0.5	ug/L		94.8	60-130			
cis-1,2-Dichloroethylene	38.8	0.5	ug/L		97.0	60-130			
trans-1,2-Dichloroethylene	40.7	0.5	ug/L		102	60-130			
1,2-Dichloropropane	38.0	0.5	ug/L		94.9	60-130			
cis-1,3-Dichloropropylene	47.7	0.5	ug/L		119	60-130			
trans-1,3-Dichloropropylene	46.4	0.5	ug/L		116	60-130			
Ethylbenzene	34.9	0.5	ug/L		87.3	60-130			
Ethylene dibromide (dibromoethane	46.3	0.2	ug/L		116	60-130			
Hexane	43.6	1.0	ug/L		109	60-130			
Methyl Ethyl Ketone (2-Butanone)	81.1	5.0	ug/L		81.1	50-140			
Methyl Isobutyl Ketone	69.2	5.0	ug/L		69.2	50-140			
Methyl tert-butyl ether	82.0	2.0	ug/L		82.0	50-140			
Methylene Chloride	40.1	5.0	ug/L		100	60-130			
Styrene	29.7	0.5	ug/L		74.2	60-130			
1,1,1,2-Tetrachloroethane	44.5	0.5	ug/L		111	60-130			
1,1,2,2-Tetrachloroethane	50.5	0.5	ug/L		126	60-130			
Tetrachloroethylene	43.6	0.5	ug/L		109	60-130			
Toluene	48.0	0.5	ug/L		120	60-130			
1,1,1-Trichloroethane	38.4	0.5	ug/L		95.9	60-130			
1,1,2-Trichloroethane	41.8	0.5	ug/L		104	60-130			
Trichloroethylene	37.1	0.5	ug/L		92.8	60-130			
Trichlorofluoromethane	44.6	1.0	ug/L		112	60-130			
Vinyl chloride	31.2	0.5	ug/L		78.1	50-140			
m,p-Xylenes	77.4	0.5	ug/L		96.8	60-130			
o-Xylene	41.6	0.5	ug/L		104	60-130			
Surrogate: 4-Bromofluorobenzene	*75.4*		*ug/L*		*94.3*	*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.

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Chain of Custody
(Lab Use Only)
№ 121651

Page __ of __

Client Name: Paterson Group Inc.	Project Reference: PE4577
Contact Name: Karyn Munch	Quote #
Address: 154 Colonnade Rd S.	PO # 26501
	Email Address: kmunch@patersongroup.ca
Telephone: 613-226-7381	

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table __ ☐ 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: 1916125

Required Analyses

	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	BH1-19-GW1	GW		2	Apr.12/19			✓												
2	BH5-19-GW1	GW		2	"			✓												
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: [signature]	Received at Lab: Sumeeporn Dokmai	Verified By: [signature]
Relinquished By (Print): Mark St Pierre	Date/Time: 15/04/19 3:40	Date/Time: Apr 15, 2019 04.32	Date/Time: 04-15-19 16:38
Date/Time:	Temperature: °C	Temperature: 13.4 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 26718
Project: PE4577
Custody: 122108

Report Date: 14-May-2019
Order Date: 9-May-2019

Order #: 1919520

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

Paracel ID	Client ID
1919520-01	BH6-19-GW2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26718

Report Date: 14-May-2019
Order Date: 9-May-2019
Project Description: PE4577

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	10-May-19	11-May-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26718

Report Date: 14-May-2019

Order Date: 9-May-2019

Project Description: PE4577

	Client ID:	BH6-19-GW2	-	-	-
	Sample Date:	09-May-19 11:00	-	-	-
	Sample ID:	1919520-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26718

Report Date: 14-May-2019

Order Date: 9-May-2019

Project Description: PE4577

	Client ID:	BH6-19-GW2	-	-	-
	Sample Date:	09-May-19 11:00	-	-	-
	Sample ID:	1919520-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	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	-	-	-
4-Bromofluorobenzene	Surrogate	112%	-	-	-
Dibromofluoromethane	Surrogate	111%	-	-	-
Toluene-d8	Surrogate	110%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*35.2*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*30.3*		*ug/L*		*94.6*	*50-140*			
Surrogate: Toluene-d8	*37.1*		*ug/L*		*116*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*32.3*		*ug/L*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*36.6*		*ug/L*		*114*	*50-140*			
Surrogate: Toluene-d8	*35.8*		*ug/L*		*112*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	138	5.0	ug/L		138	50-140			
Benzene	36.2	0.5	ug/L		90.4	60-130			
Bromodichloromethane	40.1	0.5	ug/L		100	60-130			
Bromoform	46.4	0.5	ug/L		116	60-130			
Bromomethane	27.8	0.5	ug/L		69.6	50-140			
Carbon Tetrachloride	38.0	0.2	ug/L		95.1	60-130			
Chlorobenzene	36.1	0.5	ug/L		90.4	60-130			
Chloroform	37.2	0.5	ug/L		93.0	60-130			
Dibromochloromethane	46.2	0.5	ug/L		115	60-130			
Dichlorodifluoromethane	31.2	1.0	ug/L		78.0	50-140			
1,2-Dichlorobenzene	36.6	0.5	ug/L		91.4	60-130			
1,3-Dichlorobenzene	36.9	0.5	ug/L		92.3	60-130			
1,4-Dichlorobenzene	35.5	0.5	ug/L		88.7	60-130			
1,1-Dichloroethane	31.6	0.5	ug/L		79.0	60-130			
1,2-Dichloroethane	33.5	0.5	ug/L		83.8	60-130			
1,1-Dichloroethylene	32.3	0.5	ug/L		80.7	60-130			
cis-1,2-Dichloroethylene	46.3	0.5	ug/L		116	60-130			
trans-1,2-Dichloroethylene	37.0	0.5	ug/L		92.6	60-130			
1,2-Dichloropropane	40.1	0.5	ug/L		100	60-130			
cis-1,3-Dichloropropylene	30.8	0.5	ug/L		77.1	60-130			
trans-1,3-Dichloropropylene	34.4	0.5	ug/L		86.0	60-130			
Ethylbenzene	31.9	0.5	ug/L		79.8	60-130			
Ethylene dibromide (dibromoethane	49.5	0.2	ug/L		124	60-130			
Hexane	35.8	1.0	ug/L		89.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	105	5.0	ug/L		105	50-140			
Methyl Isobutyl Ketone	115	5.0	ug/L		115	50-140			
Methyl tert-butyl ether	83.1	2.0	ug/L		83.1	50-140			
Methylene Chloride	32.2	5.0	ug/L		80.6	60-130			
Styrene	32.6	0.5	ug/L		81.6	60-130			
1,1,1,2-Tetrachloroethane	43.2	0.5	ug/L		108	60-130			
1,1,2,2-Tetrachloroethane	50.7	0.5	ug/L		127	60-130			
Tetrachloroethylene	45.2	0.5	ug/L		113	60-130			
Toluene	36.0	0.5	ug/L		89.9	60-130			
1,1,1-Trichloroethane	35.2	0.5	ug/L		88.0	60-130			
1,1,2-Trichloroethane	32.5	0.5	ug/L		81.3	60-130			
Trichloroethylene	32.6	0.5	ug/L		81.6	60-130			
Trichlorofluoromethane	26.5	1.0	ug/L		66.4	60-130			
Vinyl chloride	33.4	0.5	ug/L		83.5	50-140			
m,p-Xylenes	68.4	0.5	ug/L		85.5	60-130			
o-Xylene	29.9	0.5	ug/L		74.7	60-130			
Surrogate: 4-Bromofluorobenzene	*26.2*		*ug/L*		*81.8*	*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.

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Paracel ID: 1919520

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Chain of Custody
(Lab Use Only)
Nº 122108

Page __ of __

Client Name: Paterson Group	Project Reference: PE4577
Contact Name: Karyn Munch	Quote #
Address: 154 Colonnade Rd. S	PO # 26718
	Email Address: kmunch@patersongroup.ca
Telephone:	

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 7 ☐ 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: 1919520

Required Analyses

	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	BH6-19-GW2	GW		1	May 9, 2019	11:00am		✓												
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: We were only able to fill one vial with the groundwater.

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: [signature]	Received at Lab: Smeepanm Dokmai	Verified By: [signature]
Relinquished By (Print): Mark St Pierre	Date/Time: 09/05/19 4:00	Date/Time: May 09, 2019 04.59	Date/Time: 05-9-19 17:22
Date/Time:	Temperature: °C	Temperature: 20.5 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 26744
Project: PE4577
Custody: 122148

Report Date: 30-May-2019
Order Date: 27-May-2019

Order #: 1922144

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

Paracel ID	Client ID
1922144-01	BH6-19-GW3

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26744

Report Date: 30-May-2019
Order Date: 27-May-2019
Project Description: PE4577

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	29-May-19	30-May-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26744

Report Date: 30-May-2019

Order Date: 27-May-2019

Project Description: PE4577

	Client ID:	BH6-19-GW3	-	-	-
	Sample Date:	24-May-19 13:30	-	-	-
	Sample ID:	1922144-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26744

Report Date: 30-May-2019

Order Date: 27-May-2019

Project Description: PE4577

	Client ID:	BH6-19-GW3	-	-	-
	Sample Date:	24-May-19 13:30	-	-	-
	Sample ID:	1922144-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	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	-	-	-
4-Bromofluorobenzene	Surrogate	101%	-	-	-
Dibromofluoromethane	Surrogate	100%	-	-	-
Toluene-d8	Surrogate	104%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*83.9*		*ug/L*		*105*	*50-140*			
Surrogate: Dibromofluoromethane	*75.3*		*ug/L*		*94.1*	*50-140*			
Surrogate: Toluene-d8	*84.7*		*ug/L*		*106*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*82.8*		*ug/L*		*104*	*50-140*			
Surrogate: Dibromofluoromethane	*80.6*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*81.5*		*ug/L*		*102*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	64.5	5.0	ug/L		64.5	50-140			
Benzene	38.5	0.5	ug/L		96.2	60-130			
Bromodichloromethane	35.8	0.5	ug/L		89.5	60-130			
Bromoform	36.1	0.5	ug/L		90.4	60-130			
Bromomethane	27.6	0.5	ug/L		69.0	50-140			
Carbon Tetrachloride	33.4	0.2	ug/L		83.4	60-130			
Chlorobenzene	35.8	0.5	ug/L		89.4	60-130			
Chloroform	34.0	0.5	ug/L		85.1	60-130			
Dibromochloromethane	35.0	0.5	ug/L		87.5	60-130			
Dichlorodifluoromethane	25.8	1.0	ug/L		64.5	50-140			
1,2-Dichlorobenzene	42.3	0.5	ug/L		106	60-130			
1,3-Dichlorobenzene	40.9	0.5	ug/L		102	60-130			
1,4-Dichlorobenzene	41.4	0.5	ug/L		103	60-130			
1,1-Dichloroethane	33.3	0.5	ug/L		83.3	60-130			
1,2-Dichloroethane	34.7	0.5	ug/L		86.8	60-130			
1,1-Dichloroethylene	33.7	0.5	ug/L		84.2	60-130			
cis-1,2-Dichloroethylene	39.6	0.5	ug/L		99.0	60-130			
trans-1,2-Dichloroethylene	33.1	0.5	ug/L		82.8	60-130			
1,2-Dichloropropane	38.1	0.5	ug/L		95.2	60-130			
cis-1,3-Dichloropropylene	38.2	0.5	ug/L		95.4	60-130			
trans-1,3-Dichloropropylene	38.6	0.5	ug/L		96.4	60-130			
Ethylbenzene	36.9	0.5	ug/L		92.3	60-130			
Ethylene dibromide (dibromoethane	39.0	0.2	ug/L		97.5	60-130			
Hexane	35.7	1.0	ug/L		89.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	89.3	5.0	ug/L		89.3	50-140			
Methyl Isobutyl Ketone	112	5.0	ug/L		112	50-140			
Methyl tert-butyl ether	88.1	2.0	ug/L		88.1	50-140			
Methylene Chloride	29.2	5.0	ug/L		72.9	60-130			
Styrene	37.7	0.5	ug/L		94.3	60-130			
1,1,1,2-Tetrachloroethane	35.3	0.5	ug/L		88.2	60-130			
1,1,2,2-Tetrachloroethane	44.3	0.5	ug/L		111	60-130			
Tetrachloroethylene	35.0	0.5	ug/L		87.6	60-130			
Toluene	37.0	0.5	ug/L		92.4	60-130			
1,1,1-Trichloroethane	34.0	0.5	ug/L		85.1	60-130			
1,1,2-Trichloroethane	39.9	0.5	ug/L		99.8	60-130			
Trichloroethylene	35.7	0.5	ug/L		89.2	60-130			
Trichlorofluoromethane	31.0	1.0	ug/L		77.5	60-130			
Vinyl chloride	25.3	0.5	ug/L		63.3	50-140			
m,p-Xylenes	79.9	0.5	ug/L		99.9	60-130			
o-Xylene	42.1	0.5	ug/L		105	60-130			
Surrogate: 4-Bromofluorobenzene	*62.8*		*ug/L*		*78.4*	*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.

PARACEL LABORATORIES LTD.

TRU RES REL **PARACEL WO: 1922144**

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Chain of Custody
(Lab Use Only)
No 122148

Page ___ of ___

Client Name: PatersonGroup	Project Reference: PE4577
Contact Name: Karyn Munch	Quote #
Address: 154 Colonnade St. S	PO # 216744
Telephone: (613) 226-7381	Email Address: kmunch@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required: ___

Criteria: ☑ O. Reg. 153/04 (As Amended) Table _ ☐ 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: 1922144

	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	BH6-19-GW3	GW		1	24/05/19	1:30pm		✓												
2																				
3																				
4																				
5																				
6																				
7																				
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Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Flouse	Received at Lab: Sivapavan Rahmai
Relinquished By (Print): Mark D'Arcy	Date/Time: 27/05/19 4:10 pm	Date/Time: May 27 2019 05:05
Date/Time: May 27, 2019	Temperature: ___ °C	Temperature: 19.6 °C
		Verified By: D. Gauvreau
		Date/Time: 28 May 19 955
		pH Verified [ ] By: