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Phase II Environmental Site Assessment

Re-Development Property
2 Robinson Avenue
Ottawa, Ontario

Prepared For

2 Robinson Property Limited Partnership

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Report: PE4528-1

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Assessment

A Phase II ESA was conducted for the property addressed 2 Robinson Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during a Phase I ESA by others and historical research completed by Paterson and considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling twelve boreholes, six of which were instrumented with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. One sample from each borehole was submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and/or metals. BTEX, PHC, Metals and PAH parameters exceeding the MECP Table 3 Standards were identified in the fill to the east and west of the building.

Groundwater samples were obtained from each monitoring well installed during the Phase II ESA. One sample from each monitoring well was submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and/or metals. No impacted groundwater was identified on the subject site.

Conclusion

Based on the findings of the Phase II ESA, impacted fill material exceeding MECP Table 3 standards for residential land use is present throughout the Phase II Property. It is our understanding that the subject site is to be redeveloped with a multi-storey residential/hotel building with several underground parking levels covering the majority of the site.

It’s our recommendation that an environmental site remedial program, involving the removal of all impacted soil, be completed concurrently with the site redevelopment.

Prior to offsite disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Prior to the commencement of construction activities, it's recommended that all groundwater monitoring wells be tested to confirm groundwater quality and to assess the need for any special disposal/management requirements.

It's 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. It's expected that the subject site will qualify for a Brownfield Redevelopment Grant from the City of Ottawa which will require a Record of Site Condition to be filed with the MECP.

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of construction excavation. It's recommended that the integrity of the monitoring wells be maintained, prior to future construction, for future groundwater monitoring purposes.

1.0 INTRODUCTION

At the request of 2 Robinson Limited Partnership, Paterson Group (Paterson) conducted a Phase II-Environmental Site Assessment (ESA) of 2 Robinson Avenue, in the City of Ottawa. The purpose of this Phase II-ESA was to address areas of potential environmental concern (APECs) during historical research for the subject site

1.1 Site Description

Address:	2 Robinson Avenue, Ottawa, Ontario.
Legal Description:	Part of Lot F, Concession D (Rideau Front), Geographic Township of Nepean, City of Ottawa.
Property Identification	
Number:	04204-0243, 04204-0245, 04204-0267, 04204-0270
Location:	The subject site is located on the north side of Lees Avenue at the intersection of Robinson Avenue, in Ottawa, Ontario.
Latitude and Longitude:	45° 25' 07" N, 75° 40' 20" W
Configuration:	Irregular (approximate)
Site Area:	2 ha (approximate)

1.2 Property Ownership

Paterson was retained to complete this Phase II-ESA by Mr. Marc-Andre Palerme of 2 Robinson Property Limited Partnership. 2 Robinson Property Limited Partnerships offices are located at 1 Westmount Square, in Montreal, Quebec. Mr. Palerme can be contacted by telephone at 514-932-5355.

1.3 Current and Proposed Future Uses

The Phase II Property is currently occupied by a single storey cultural centre with no basement level. It's our understanding that the Phase II Property will be redeveloped several residential buildings spread throughout the property.

1.4 Applicable Site Condition Standard

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

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

The residential standards were selected based on the proposed future use of the subject site. Coarse grained soil standards were chosen based on the observed soil conditions.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is located in an urban area surrounded by various sized residential, commercial, and institutional structures. Site topography slopes steeply east to west. The Phase II Property is at a similar grade as the adjacent properties. Site drainage consists primarily of infiltration to the landscaped areas and overland flow to catchbasins. The Phase II Property is situated within a municipally serviced area.

2.2 Past Investigations

Pinchin completed a Phase I and recommended a Phase II ESA based on several concerns, including a database record of an inactive underground storage tanks (UST), coal storage yards, and a former light industrial facility on the subject site. The Phase II ESA for the subject site was completed in September 2018. Eleven boreholes were placed on the property, six of which were instrumented with groundwater monitoring wells.

Based on the analytical testing completed at the subject site, large portions of the fill material on the subject site exceed the MECP Table 3 Standards for residential land use. Limited amounts of native soil were identified to be impacted. The groundwater on the subject site was in compliance with the MECP Table 3 Standards.

Several of the boreholes advanced as part of the Phase II ESA terminated in fill material and/or did not reach the groundwater table.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted between February 7 and 15, 2019, in conjunction with a Geotechnical Investigation. The field program consisted of drilling 12 boreholes, six of which were instrumented with groundwater monitoring wells.

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 media is based on the Contaminants of Potential Concern (CPCs) identified during the historical review.

Contaminants of concern for soil and groundwater include petroleum hydrocarbons (PHCs, fractions F_1-F_4), volatile organic compounds (VOCs), benzene, toluene, ethylbenzne, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs) and metals.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on the information from NRCAN, bedrock in the area of the site consists of shale of the Carlsbad Formation. Based on the maps, the thickness of overburden ranges from 10 to 15m. Overburden consists of sand and reworked glaciofluvial sediments. Based on the results of the previous subsurface investigations on the subject site, the groundwater is expected to be encountered in the overburden between 3 and 7m below the existing grade.

Contaminants of Potential Concern

As per Subsection 7.1 of this report, CPCs identified on the subject site include metals (including Hg, and CrVI), PAHs, VOCs, PHCs and BTEX.

Existing Buildings and Structures

The subject site is occupied by a single-storey cultural centre which is currently vacant and unused.

Water Bodies

There are no waterbodies on the subject property or within the study area.

Areas of Natural Significance

There are no areas of natural and scientific interest on the subject property or within the study area.

Drinking Water Wells

The subject site is located within a municipally supplied area and drinking water wells are not considered to be present within the study area.

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists of commercial, residential and institutional properties.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Subsection 7.1 of this report, Potentially Contaminating Activities and Areas of Potential Environmental Concern were identified within the study area. Three APECs were identified on the subject site during the 2018 Pinchin Phase I ESA and during Paterson's historical research;

- ❑ Former underground storage tanks
- ❑ Former coal storage yards
- ❑ Former light industrial facility
- ❑ Former rail lines
- ❑ Former roadway
- ❑ Fill material of unknown quality

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the historical review is considered to be sufficient to conclude that there are areas of potential environmental concern on the subject site which have the potential to have impacted the subject site. The presence of potentially contaminating activities was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. There were no deviations from the Sampling and Analysis Plan, with the exception of the lack of Trip Blanks and Duplicate samples. It is expected that additional groundwater sampling and a soil remediation program will take place and that trip blanks and sufficient duplicate samples will be collected at that time.

3.5 Impediments

A significant quantity of snow was present throughout the site at the time of the field program causing additional distance from underground utilities to be maintained during the field program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted between February 7 and 15, 2019, in conjunction with a Geotechnical Investigation, and consisted of drilling 12 boreholes on the Phase II Property, six of which were instrumented with a groundwater monitoring well. The boreholes were located on site to address data gaps, areas of potential environmental concern (APECs) and to provide coverage of the site from a geotechnical perspective. The boreholes were drilled with a track mounted power auger drill rig. The track mounted drill rig was provided by George Downing Estate Drilling of Hawkesbury, Ontario. Borehole locations are illustrated on Drawing PE4528-1 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 152 soil samples were obtained from the boreholes by means of sampling from shallow auger flights and split spoon sampling. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist fill material followed by sand and/or glacial till. Fill material was present from ground surface in the majority of locations and extended to depths ranging from approximately 2.1 m and 8.4 m below the existing grade and generally consisted of silty sand with crushed stone, gravel or clay. Throughout the southeastern portion of the site a layer a coal/slag was identified at the coal/native soil interface.

Inferred bedrock was identified at depths ranging from 10.2 to 11.5 m below the existing grade.

4.3 Field Screening Measurements

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

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

The combustible vapour readings were found to range from 0 ppm to 20ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No obvious olfactory indications of potential environmental concerns were identified in the soil samples. Several fill samples were selected for analysis based on a visual evaluation of the soil quality. One soil sample from each borehole was selected for analytical testing.

4.4 Groundwater Monitoring Well Installation

Six groundwater monitoring wells were installed on the Phase II Property as part of the current Phase II investigation. The monitoring wells consisted of 51 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 1 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Table 1: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
Monitoring wells Installed by Paterson						
BH2	NA	10.67	7.67-10.67	7.37-10.67	0.30-7.37	Stickup
BH4	NA	10.67	7.67-10.67	7.37-10.67	0.30-7.37	Stickup
BH6	NA	9.20	6.20-9.20	5.90-9.20	0.30-5.90	Stickup
BH10	NA	9.20	6.20-9.20	5.90-9.20	0.30-5.90	Stickup
BH11	NA	9.20	6.20-9.20	5.90-9.20	0.30-5.90	Stickup
BH12	NA	5.40	2.40-5.40	2.10-5.40	0.30-2.10	Stickup
Monitoring Wells Installed by Others						
MW-1	NA	6.80	3.80-6.80	3.50-6.80	0.30-3.50	Stickup
MW-2	NA	4.57	1.57-4.57	1.27-4.57	0.30-1.27	Stickup
MW-4	NA	3.05	1.55-3.05	1.25-3.05	0.30-1.25	Stickup
MW-5	NA	4.57	1.57-4.57	1.27-4.57	0.30-1.27	Stickup
MW-6	NA	6.60	3.60-6.60	3.30-6.60	0.30-3.30	Stickup
MW-7	NA	6.10	3.10-6.10	2.80-6.10	0.30-2.80	Stickup

4.5 Field Measurement of Water Quality Parameters

Parameters typically measured in the field included temperature, pH and electrical conductivity. During the water sampling program, no field parameters were able to be collected due to errors in the sampling probe. These errors have been attributed to the cold weather at the time of sampling.

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 samples were submitted for analysis:

Table 2: Soil Samples Submitted

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed					Rationale
		BTEX	PHCs (F_1-F_4)	PAHs	Metals[1]	VOCs	
Samples Submitted by Pinchin							
MW1-SS3	1.5-2.3m, Fill	X	X	X		X	Samples submitted by others. Soil sampling rationale not included in previous report.
MW2-SS2	0.8-1.5m, Fill	X	X	X		X	
BH3-SS3	1.5-2.3, Silty Clay	X	X	X		X	
MW4-SS4	2.3-3.1m, Fill	X	X	X		X	
MW5-SS4	2.3-3.1m, Fill	X	X	X		X	
MW7-SS8	5.3-6.1m, Fill	X	X	X		X	
BH8-SS6	3.8-4.6m, Fill	X	X	X		X	
BH9-SS4	2.3-3.1m, Silty Clay	X	X	X		X	
BH10-SS3	1.5-2.3m, Fill	X	X	X		X	
BH11-SS3	1.5-2.3m, Fill	X	X	X		X	
Samples Submitted by Paterson							
BH1-SS9	6.1-6.8m, Fill			X	X		Investigate potentially impacted fill material
BH2-SS4	5.3-6.0m, Fill			X	X		
BH3-SS9	6.2-6.9m, Fill			X	X		
BH4-SS8	5.3-6.0m, Fill			X	X		
BH5-SS7	4.5-5.2m, Fill			X	X		
BH6-SS5	3.0-3.7m, Fill	X	X				
BH7-SS5	3.0-3.7m, Fill				X		
BH8-SS3	1.5-2.2m, Fill			X	X		
BH9-SS3	1.5-2.2m, Fill			X	X		
BH10-SS5	3.0-3.7m, Fill			X	X		
BH11-SS5	3.0-3.7m, Fill	X	X			X	
BH12-SS4	2.2-2.9m, Fill	X	X			X	
1 – Metals including Mercury and Cr (VI)							

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

Table 3: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed				Rationale
		VOCs	PHCs (F_1-F_4) and BTEX	PAHs	Metals[1]	
Samples Submitted by Pinchin						
MW1	3.8-6.8, Overburden	X	X	X		Samples submitted by others. Groundwater sampling rationale not included in previous report.
MW2	1.5-4.5m, Overburden	X	X	X		
MW4	1.5-3.0m, Overburden	X	X	X		
MW5	1.5-4.5, Overburden	X	X	X		
MW6	3.5-6.5m, Overburden	X	X	X		
Samples Submitted by Paterson						
BH2-GW1	7.67-10.67m, Overburden	X		X		Assess the groundwater quality on the site based on the soil quality results.
BH4-GW1	2.77-5.77m, Overburden			X	X	
BH6-GW1	6.10-9.10m, Overburden	X	X	X		
BH10-GW1	6.10-9.10m, Overburden	X		X		
BH11-GW1	6.10-9.10m, Overburden			X		
BH12-GW1	2.30-5.30m, Overburden		X	X		
1 – Metals including Chrome VI and Mercury						

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.

Samples submitted by others were analysed by Maxxam Analytics Inc., an accredited laboratory for the selected testing.

4.8 Residue Management

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

4.9 Elevation Surveying

The elevations of the boreholes have not been surveyed as part of the Phase II ESA report at this time. Approximate elevations based on City of Ottawa mapping have been used for the cross-section drawings.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils generally consist of fill material underlain by sand and glacial till. Site stratigraphy is shown on Drawing PE4528-4 – Cross-Section A-A' and Drawing PE4528-6 – Cross-Section B-B'.

Groundwater was encountered within the overburden at depths ranging from approximately 3.1 to 9.6 m below the existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on February 22, 2019, using an electronic water level meter. Groundwater levels are summarized below in Table 6. Borehole elevations were not surveyed at the time of issuing this Phase II ESA report. However, surface elevations were extrapolated from topographical survey mapping.

Based on the elevations of the subject site and surrounding topography, a groundwater flow direction of south-southeast was determined for the area in the direction of the Rideau River.

5.3 Fine-Coarse Soil Texture

No grain size analysis was completed for the subject site. Based on the observed native soil conditions, the site is considered to be coarse textured.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 0 to 20 ppm. No olfactory indications of potential contamination were identified in the soil samples at the time of the field program. Visual signs of potentially impacted fill material were identified in the throughout the subject site, consistent with the previous investigation results. 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

Soil samples from the 2019 subsurface investigation were submitted for analytical testing. The results of the analytical testing from 2019 and from the previous investigation (2018) are presented in the Tables at the end of the report. The laboratory certificates of analysis are provided in Appendix 1. A discussion of the soil quality of the subject site, based on the 2018 and 2019 Phase II ESA follows:

PHCs and BTEX

A total of 13 soil samples from both investigations were submitted for analysis of PHCs (F1-F4) and BTEX. Based on the analytical test results, PHCs and BTEX exceeding the MECP Table 3 Standards were identified in two areas, to the west of the existing building, extending to the western property line and to east of the existing building. The remaining soil samples were in compliance with MECP Table 3 Standards (residential land use) for PHCs and BTEX. The results of the analytical testing for PHCs and BTEX are provided in Table 2A (BTEX) and Table 4A (PHCs) at the end of the report.

VOCs

A total of 12 soil samples were submitted for analysis of VOCs. Based on the analytical test results, no VOCs (with the exception of BTEX parameters) were identified in any of the soil samples analysed. The soil samples are in compliance with the MECP Table 3 Standards for VOCs. The results of the analytical testing for VOCs are provided in Table 2A at the end of the report.

Metals

A total of 8 soil samples from both investigations were submitted for analysis of metals (including Cr VI and Hg). Based on the analytical test results, metals impacted fill material is present on the northern and eastern portions of the site Metals impacts, including Arsenic and Lead are present within the fill material. Impacts are not expected to extend into the native soils on the subject site. The results of the analytical testing for Metals are provided in Table 1A at the end of the report.

PAHs

A total of 18 soil samples from both investigations were submitted for analytical testing of PAHs. Based on the analytical test results impacted fill material is

present on the site below the pavement structure. Impacts are not expected to significantly extend into the native soils on the subject site. The results of the analytical testing for PAHs are provided in Table 3A at the end of the report.

5.6 Groundwater Quality

Groundwater samples from both the 2012 and 2018 subsurface investigation were submitted for analytical testing. The results of the analytical testing are presented in the Tables at the end of the report. The laboratory certificates of analysis are provided in Appendix 1. A discussion of the groundwater quality of the subject site, based on the 2012 and 2018 Phase II ESA work follows;

PHCs and BTEX

No PHC or BTEX parameters were detected above the MECP Table 3 Standards in the groundwater on the subject site. The results of the analytical testing for PHCs and BTEX are provided in Table 2B (BTEX) and Table 4B (PHCs) the end of the report.

VOCs

No VOC parameters were detected above the MECP Table 3 Standards in the groundwater on the subject site. The results of the analytical testing for VOCs are provided in Table 2B at the end of the report.

Metals

No metals parameters were identified above the MECP Table 3 Standards in the groundwater on the subject site. The results of the analytical testing for Metals are provided in Table 1B at the end of the report.

PAHs

No PAH parameters were identified above the MECP Table 3 Standards in the groundwater on the subject site. The results of the analytical testing for PAHs are provided in Table 3B at the end of the report.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the Phase II ESA were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type. As per Subsection 47(3) of O.Reg. 153/04 as amended 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.

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

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report and Section 2.2 of this report, the following PCAs are considered to result in APECs on the Phase I and Phase II Property:

- ❒ Former underground storage tanks
- ❒ Former coal storage yards
- ❒ Former light industrial facility
- ❒ Former rail lines
- ❒ Former roadway
- ❒ Fill material of unknown quality

Contaminants of potential concern associated with the aforementioned PCAs include a combination of VOCs, Metals (including Hg and Cr (VI)), PAHs, PHCs and BTEX in the groundwater and/or soil.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the Phase II Property include natural gas, electrical, communications, water, and septic services. No private wells or sewage systems are present on the Phase II Property or within the Phase I Study Area.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on the cross sections attached in the figures section of this report. Stratigraphy consists of:

- Fill material generally consisting of brown silty sand with crushed stone, sand and clay, was identified at each borehole location, beneath the pavement structure and extending to depths ranging from approximately 2.13m and 8.38m below grade. Significant quantities of coal and slag were identified at the bottom of the fill material in several boreholes. Groundwater was identified in this unit in some areas of the site.
- Glacial till was identified beneath the fill material. The glacial till is a sandy clay matrix with gravel and cobbles throughout. Groundwater is identified in this unit throughout most of the site. The glacial till is the deepest unit investigated on the subject site.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered within the glacial till. This unit is interpreted to function as the local aquifer at the subject site.

Water levels were measured at the subject site on February 22, 2019, at depths ranging from 3.14m to 9.55m below grade. Based on the local topographical relief and the surrounding properties the groundwater flow is expected to be in a south-southeast direction.

Approximate Depth to Bedrock

Inferred bedrock was encountered during the Phase II ESA program at depths ranging from 10.2 and 11.5 m below the existing grade. Bedrock is expected between 10 to 15m below the subject site based on geological mapping.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 3.1 to 9.6 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.

Section 43.1 of the Regulation does not apply to the subject site in that the subject site is not a Shallow Soil Property.

Fill Placement

Fill material was identified across the Phase II Property from ground surface to 2.1 and 8.4 m below the existing grade. The origin and time of placement of the fill material is unknown.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property will be redeveloped with several multi-storey residential buildings with an underground parking level and building footprints covering the majority of the subject site.

Existing Buildings and Structures

The subject site is occupied by a single-storey cultural centre which is currently vacant and unused.

Water Bodies

There are no water bodies on the subject land or within 250m of the Phase II Property.

Areas of Natural Significance

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

Environmental Condition

Areas Where Contaminants are Present

Based on visual screening and analytical test results, impacted fill material is present throughout the subject site ranging from approximately grounds surface to approximately 7 m, depending on the fill depth. Groundwater was in compliance with the MECP Table 3 standards at the monitoring wells tested throughout the subject site.

Types of Contaminants

Based on the PCAs resulting in APECs on the Phase II Property and current analytical testing, contaminants of concern in the soil include the following: PHCs (F_1 and F_2), BTEX, Metals, and PAHs.

Based on the analytical test the groundwater is in compliance with the MECP Table 3 Standards. No contaminants of concern were identified in the groundwater on the subject site.

Contaminated Media

Based on the results of the Phase II ESA, some of the fill material throughout the subject site is impacted with PAHs, Metals, PHCs and/or BTEX. Small pockets of native soils are expected to be impacted with these parameters at the fill material/native soil interface.

What is Known about Areas where Contaminants are Present

Impacted fill from previous site activities is present throughout the site. The source of the fill material is unknown. However, it's suspected to be related to the multiple redevelopments of the site and the previous use of stockpiling coal.

Distribution and Migration of Contaminants

As previously noted, the impacted fill material is present throughout the site. No anthropogenic migration of contaminants is expected at this time. Small quantities of impacted native soil are expected to be present.

Discharge of Contaminants

Metal and PAH concentrations are considered to be related to the former uses of the site and importation of fill material for grading purposes.

The BTEX and PHC impacted soil is considered to have resulted from the former underground storage tanks or the importation of fill material.

No ongoing discharge of contaminants is currently taking place on the subject site.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two ways by which climatic and meteorological conditions may affect contaminant distribution include:

- the downward leaching of contaminants by means of the infiltration of precipitation
- the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

The fluctuation of groundwater levels is not considered to have significantly affected contaminant transport as the groundwater levels were identified to be below the level of the majority of the impacts, with the exception of some impacts to the west of the building on the subject site.

Potential for Vapour Intrusion

The potential for vapour intrusion is considered to be low based on the non-volatile nature of the metals and PAH impacts. The PHC impacts are all located a significant distance from the subject building and are not considered to be likely to result in vapour intrusion.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 2 Robinson Avenue, in the City of Ottawa. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during a Phase I ESA by others and historical research completed by Paterson and considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation was carried out in conjunction with a geotechnical investigation and consisted of drilling 12 boreholes, six of which were instrumented with a groundwater monitoring well installation.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. One sample from each borehole was submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and/or metals. BTEX, PHC, Metals and PAH parameters exceeding the MECP Table 3 Standards were identified in the fill to the east and west of the building.

Groundwater samples were obtained from each monitoring well installed during the Phase II ESA. One sample from each monitoring well was submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and/or metals. No impacted groundwater was identified on the subject site.

Conclusion

Based on the findings of the Phase II ESA, impacted fill material exceeding MECP Table 3 standards is present throughout the Phase II Property. It's our understanding that the subject site is to be redeveloped with a multi-storey residential/hotel building with several underground parking levels covering the majority of the site.

It's our recommendation that an environmental site remediation program, involving the removal of all impacted soil, be completed concurrently with the site redevelopment.

Prior to offsite disposal at a licenced landfill site, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Prior to the commencement of construction program, it's recommended that all groundwater monitoring wells be tested to confirm groundwater quality and to assess the need for any special disposal/management requirements.

It's 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. It's expected that the subject site will qualify for a Brownfield Redevelopment Grant from the City of Ottawa which will require a Record of Site Condition to be filed with the MECP.

It's expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of construction excavation. It's recommended that the integrity of the monitoring wells be maintained, prior to future construction, for future groundwater monitoring purposes.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report was 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 soil 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 2 Robinson Property Limited Partnership and Scotiabank Real Estate Banking. Notification from 2 Robinson Limited Partnership and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Michael Beaudoin, P.Eng., QP_{ESA}

Carlos P. Da Silva, P.Eng., ing., QP_{ESA}

Report Distribution

- 2 Robinson Property Limited Partnership
- Paterson Group

Figures

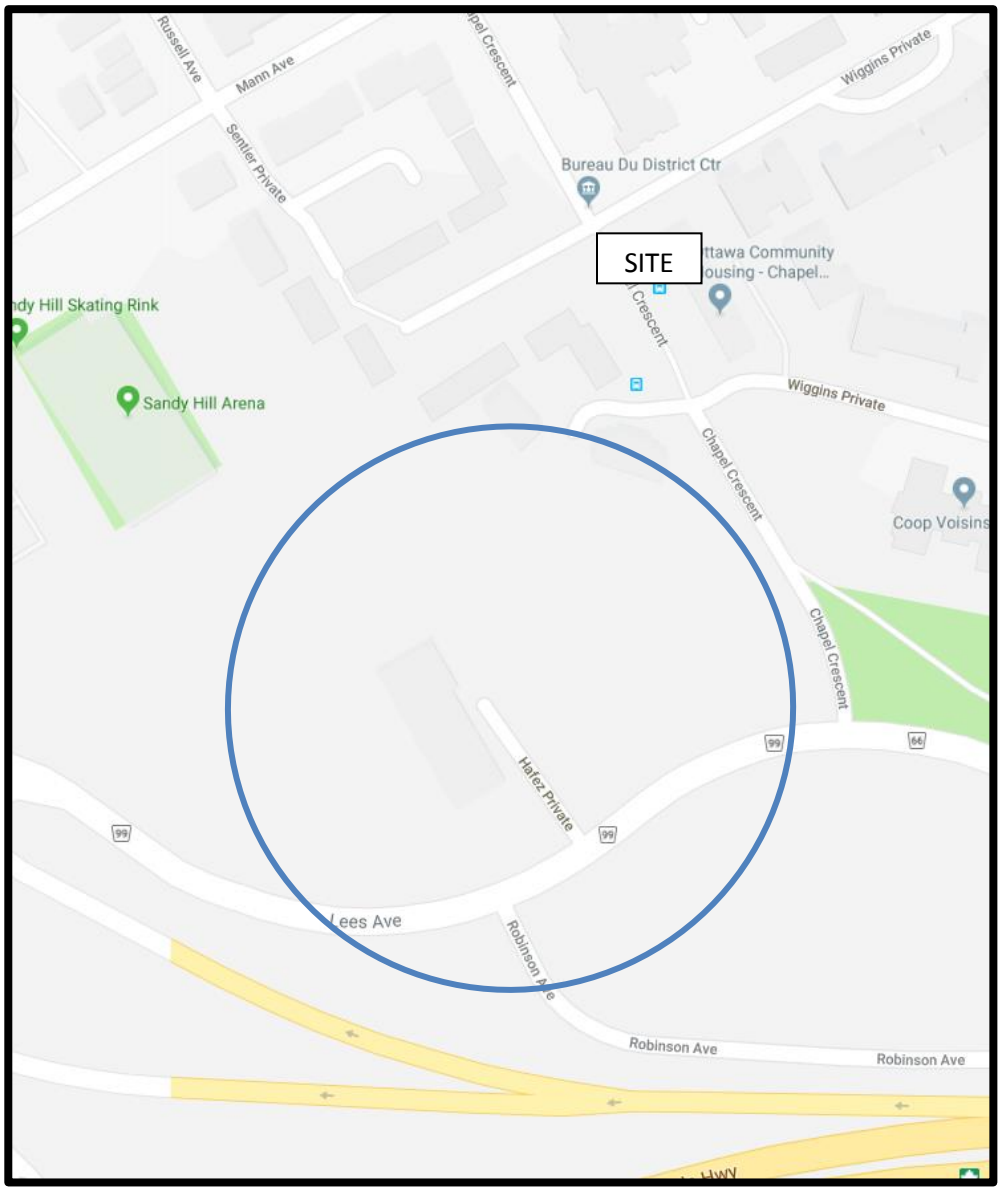
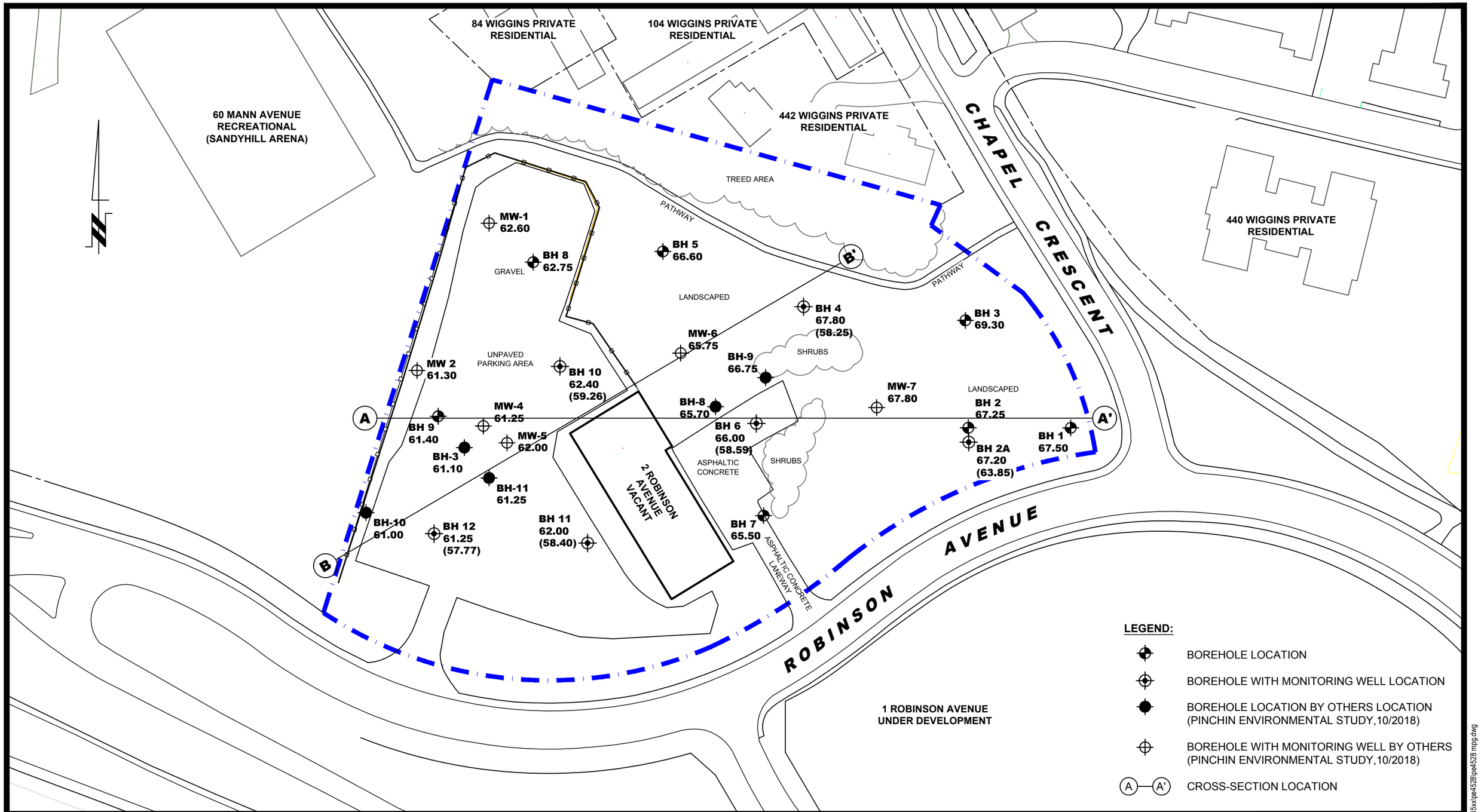


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-1
Approved by: MSD	Revision No.:

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84 WIGGINS PRIVATE RESIDENTIAL

104 WIGGINS PRIVATE RESIDENTIAL

60 MANN AVENUE RECREATIONAL (SANDYHILL ARENA)

442 WIGGINS PRIVATE RESIDENTIAL

CHAPEL CRES.

440 WIGGINS PRIVATE RESIDENTIAL

TREED AREA

PATHWAY

PATHWAY

GRAVEL

LANDSCAPED

UNPAVED PARKING AREA

SHRUBS

LANDSCAPED

SHRUBS

ASPHALTIC CONCRETE

2 ROBINSON AVENUE VACANT

ASPHALTIC CONCRETE LANEWAY

ROBINSON AVENUE

MW1-SS3 1.5-2.3M 14-AUG-18
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW4-SS4 2.3-3.1M 14-AUG-18
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW2-SS2 0.8-1.5M 14-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
XYLENES	5.7	3.1

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH3-SS3 1.5-2.3M 14-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	1.4	0.21

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH10-SS3 1.5-2.3M 15-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.45	0.21

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW5-SS4 2.3-3.1M 14-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.48	0.21

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH11-SS3 1.5-2.3M 15-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.45	0.21

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH8-SS6 3.8-4.6M 15-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	4.2	0.21
TOLUENE	7	2.3

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW6-SS6 3.8-4.6M 15-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.48	0.21
XYLENES	3.5	3.1

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH9-SS4 2.3-3.1M 15-AUG-18
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH2-SS4 5.3-6.0m 8-Feb-19
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW7-SS8 5.3-6.1M 15-AUG-18

BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	4.2	0.21
TOLUENE	7	2.3

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH6-SS5 3.0-3.7m 12-Feb-19
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW-1 62.60
BH 8 62.75
BH 5 66.60
BH 4 67.80 (58.25)
BH 3 69.30
MW-6 65.75
BH-9 66.75
MW 2 61.30
BH 10 62.40 (59.26)
MW-4 61.25
BH 9 61.40
MW-5 62.00
BH-3 61.10
BH-11 61.25
BH-8 65.70
BH 6 66.00 (58.59)
MW-7 67.80
BH 2 67.25
BH 2A 67.20 (63.85)
BH 1 67.50
BH-10 61.00
BH 12 61.25 (57.77)
BH 11 62.00 (58.40)
BH 7 65.50

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION BY OTHERS LOCATION (PINCHIN ENVIRONMENTAL STUDY,10/2018)
- BOREHOLE WITH MONITORING WELL BY OTHERS (PINCHIN ENVIRONMENTAL STUDY,10/2018)
- 67.20 GROUND SURFACE ELEVATION(m) (INTERPOLATED FROM CITY TOPOGRAPHICAL MAPPING)
- (58.25) GROUNDWATER SURFACE ELEVATION (m) (BASED ON INTERPOLATED GROUND SURFACE ELEVATION FROM CITY TOPOGRAPHICAL MAPPING

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NO.	REVISIONS	DATE	INITIAL

PLACE DORÉE PROPERTY MANAGEMENT

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX)

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-2A
Approved by: MSD	Revision No.:

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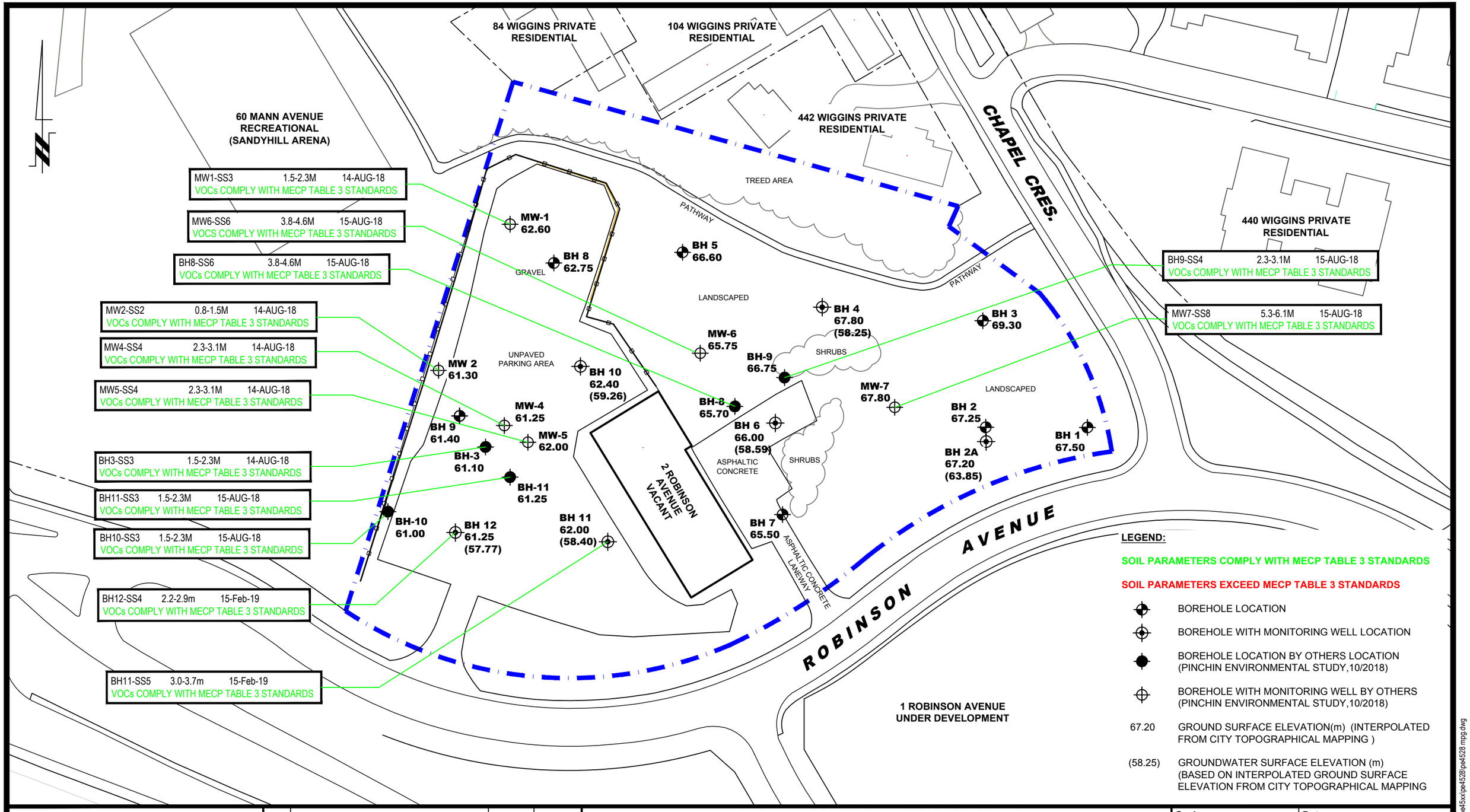

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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (VOCs)

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-2B
Approved by: MSD	Revision No.:

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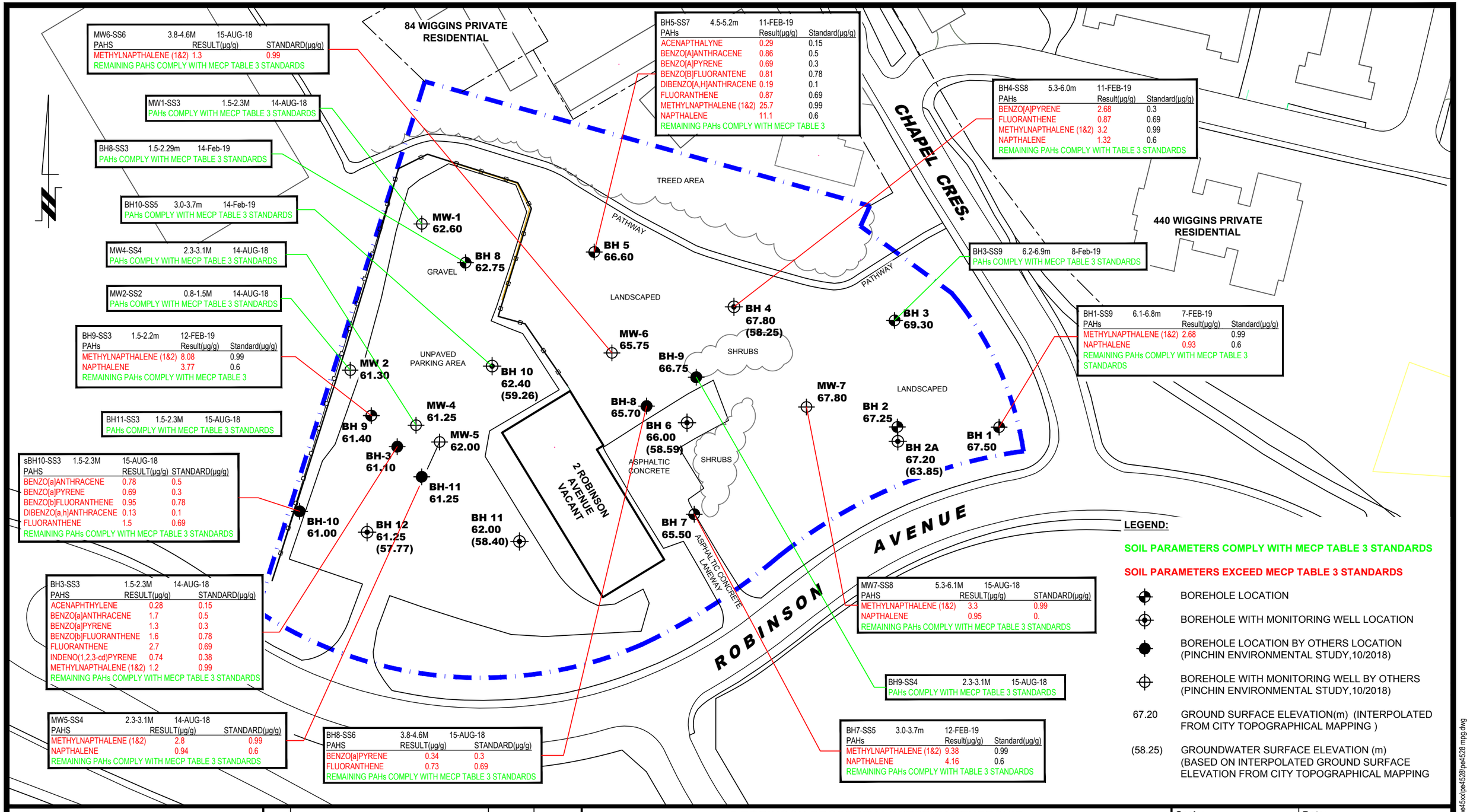

MW6-SS6 3.8-4.6M 15-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
METHYLNAPTHALENE (1&2)	1.3	0.99

REMAINING PAHS COMPLY WITH MECP TABLE 3 STANDARDS

MW1-SS3 1.5-2.3M 14-AUG-18
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH8-SS3 1.5-2.29m 14-Feb-19
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH10-SS5 3.0-3.7m 14-Feb-19
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

MW4-SS4 2.3-3.1M 14-AUG-18
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

MW2-SS2 0.8-1.5M 14-AUG-18
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH9-SS3 1.5-2.2m 12-FEB-19

PAHs	Result(µg/g)	Standard(µg/g)
METHYLNAPTHALENE (1&2)	8.08	0.99
NAPTHALENE	3.77	0.6

REMAINING PAHs COMPLY WITH MECP TABLE 3

BH11-SS3 1.5-2.3M 15-AUG-18
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

sBH10-SS3 1.5-2.3M 15-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
BENZO[a]ANTHRACENE	0.78	0.5
BENZO[a]PYRENE	0.69	0.3
BENZO[b]FLUORANTHENE	0.95	0.78
DIBENZO[a,h]ANTHRACENE	0.13	0.1
FLUORANTHENE	1.5	0.69

REMAINING PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH3-SS3 1.5-2.3M 14-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
ACENAPHTHYLENE	0.28	0.15
BENZO[a]ANTHRACENE	1.7	0.5
BENZO[a]PYRENE	1.3	0.3
BENZO[b]FLUORANTHENE	1.6	0.78
FLUORANTHENE	2.7	0.69
INDENO(1,2,3-cd)PYRENE	0.74	0.38
METHYLNAPTHALENE (1&2)	1.2	0.99

REMAINING PAHs COMPLY WITH MECP TABLE 3 STANDARDS

MW5-SS4 2.3-3.1M 14-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
METHYLNAPTHALENE (1&2)	2.8	0.99
NAPTHALENE	0.94	0.6

REMAINING PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH8-SS6 3.8-4.6M 15-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
BENZO[a]PYRENE	0.34	0.3
FLUORANTHENE	0.73	0.69

REMAINING PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH5-SS7 4.5-5.2m 11-FEB-19

PAHs	Result(µg/g)	Standard(µg/g)
ACENAPTHALYNE	0.29	0.15
BENZO[A]ANTHRACENE	0.86	0.5
BENZO[A]PYRENE	0.69	0.3
BENZO[B]FLUORANTENE	0.81	0.78
DIBENZO[A,H]ANTHRACENE	0.19	0.1
FLUORANTHENE	0.87	0.69
METHYLNAPTHALENE (1&2)	25.7	0.99
NAPTHALENE	11.1	0.6

REMAINING PAHs COMPLY WITH MECP TABLE 3

BH4-SS8 5.3-6.0m 11-FEB-19

PAHs	Result(µg/g)	Standard(µg/g)
BENZO[A]PYRENE	2.68	0.3
FLUORANTHENE	0.87	0.69
METHYLNAPTHALENE (1&2)	3.2	0.99
NAPTHALENE	1.32	0.6

REMAINING PAHs COMPLY WITH TABLE 3 STANDARDS

BH3-SS9 6.2-6.9m 8-Feb-19
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH1-SS9 6.1-6.8m 7-FEB-19

PAHs	Result(µg/g)	Standard(µg/g)
METHYLNAPTHALENE (1&2)	2.68	0.99
NAPTHALENE	0.93	0.6

REMAINING PAHs COMPLY WITH MECP TABLE 3 STANDARDS

MW7-SS8 5.3-6.1M 15-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
METHYLNAPTHALENE (1&2)	3.3	0.99
NAPTHALENE	0.95	0.

REMAINING PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH9-SS4 2.3-3.1M 15-AUG-18
PAHs COMPLY WITH MECP TABLE 3 STANDARDS

BH7-SS5 3.0-3.7m 12-FEB-19

PAHs	Result(µg/g)	Standard(µg/g)
METHYLNAPTHALENE (1&2)	9.38	0.99
NAPTHALENE	4.16	0.6

REMAINING PAHs COMPLY WITH TABLE 3 STANDARDS

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION BY OTHERS LOCATION (PINCHIN ENVIRONMENTAL STUDY,10/2018)
- BOREHOLE WITH MONITORING WELL BY OTHERS (PINCHIN ENVIRONMENTAL STUDY,10/2018)
- 67.20 GROUND SURFACE ELEVATION(m) (INTERPOLATED FROM CITY TOPOGRAPHICAL MAPPING)
- (58.25) GROUNDWATER SURFACE ELEVATION (m) (BASED ON INTERPOLATED GROUND SURFACE ELEVATION FROM CITY TOPOGRAPHICAL MAPPING

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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PAHs)

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-2C
Approved by: MSD	Revision No.:

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84 WIGGINS PRIVATE RESIDENTIAL

104 WIGGINS PRIVATE RESIDENTIAL

442 WIGGINS PRIVATE RESIDENTIAL

440 WIGGINS PRIVATE RESIDENTIAL

60 MANN AVENUE RECREATIONAL (SANDYHILL ARENA)

CHAPEL CRES.

TREED AREA

PATHWAY

PATHWAY

GRAVEL

LANDSCAPED

UNPAVED PARKING AREA

SHRUBS

LANDSCAPED

ASPHALTIC CONCRETE

SHRUBS

2 ROBINSON AVENUE VACANT

ASPHALTIC CONCRETE LANEWAY

ROBINSON AVENUE

MW-1 62.60

BH 8 62.75

BH 5 66.60

MW-6 65.75

BH 4 67.80 (58.25)

BH 3 69.30

MW 2 61.30

BH 10 62.40 (59.26)

BH-9 66.75

MW-7 67.80

BH-8 65.70

BH 2 67.25

BH 1 67.50

MW-4 61.25

BH 9 61.40

BH 6 66.00 (58.59)

BH 2A 67.20 (63.85)

MW-5 62.00

BH-3 61.10

BH-11 61.25

BH-10 61.00

BH 12 61.25 (57.77)

BH 11 62.00 (58.40)

BH 7 65.50

MW1-SS3 1.5-2.3M 14-AUG-18
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

MW2-SS2 0.8-1.5M 14-AUG-18
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

MW6-SS6 3.8-4.6M 15-AUG-18
PHCS COMPLY WITH MECP TABLE 3 STANDARDS

MW4-SS4 2.3-3.1M 14-AUG-18
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH9-SS4 2.3-3.1M 15-AUG-18
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

MW7-SS8 5.3-6.1M 15-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	360	300

REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH3-SS3 1.5-2.3M 14-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	330	300

REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH2-SS4 5.3-6.0m 8-Feb-19
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

MW5-SS4 2.3-3.1M 14-AUG-18
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH10-SS3 1.5-2.3M 15-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	500	300

REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH6-SS5 3.0-3.7m 12-Feb-19
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH12-SS4 2.2-2.9m 15-Feb-19
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH8-SS6 3.8-4.6M 15-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	490	300

REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH11-SS3 1.5-2.3M 15-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	460	300

REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH11-SS5 3.0-3.7m 15-Feb-19
PHCs COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PHCs)

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-2D
Approved by: MSD	Revision No.:

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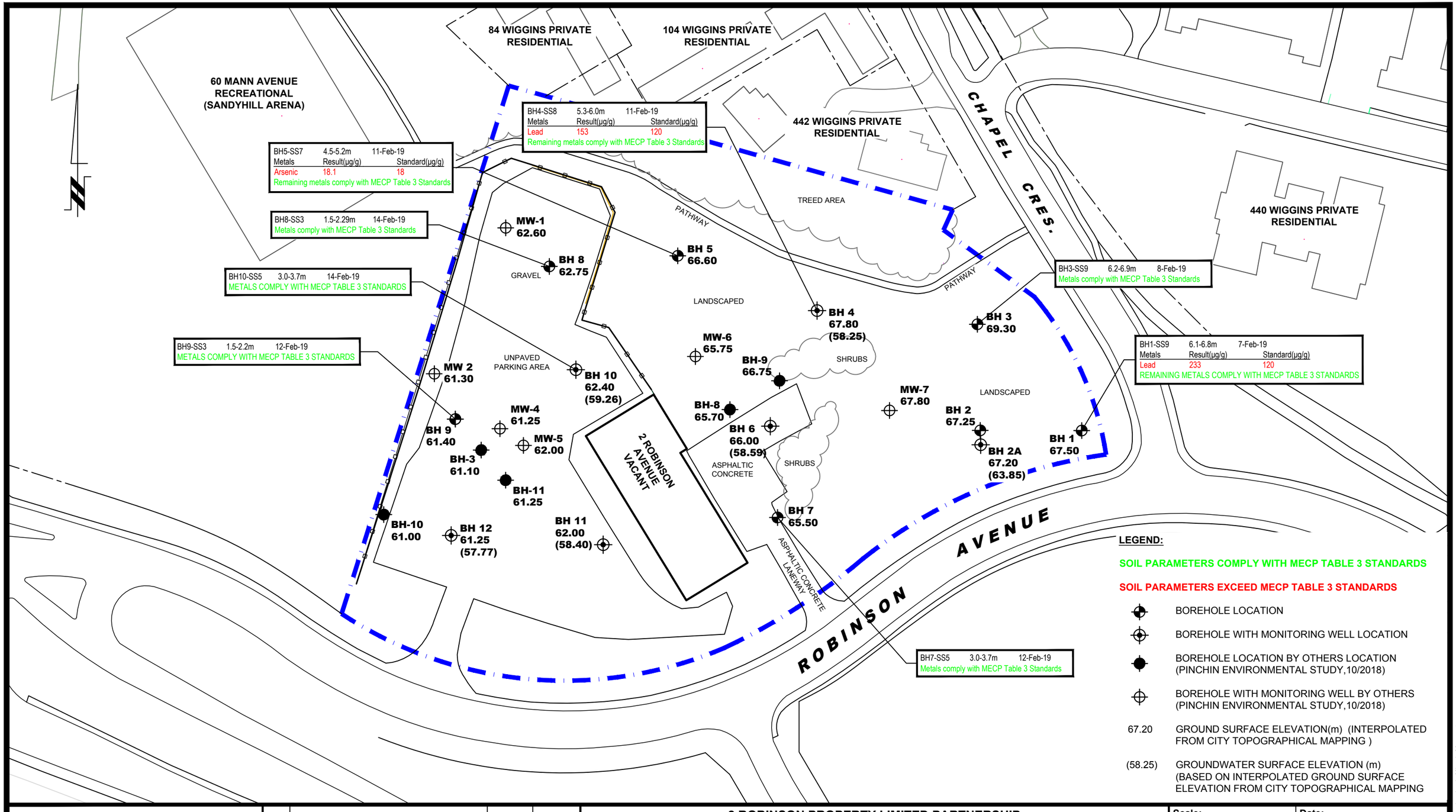

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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-2E
Approved by: MSD	Revision No.:

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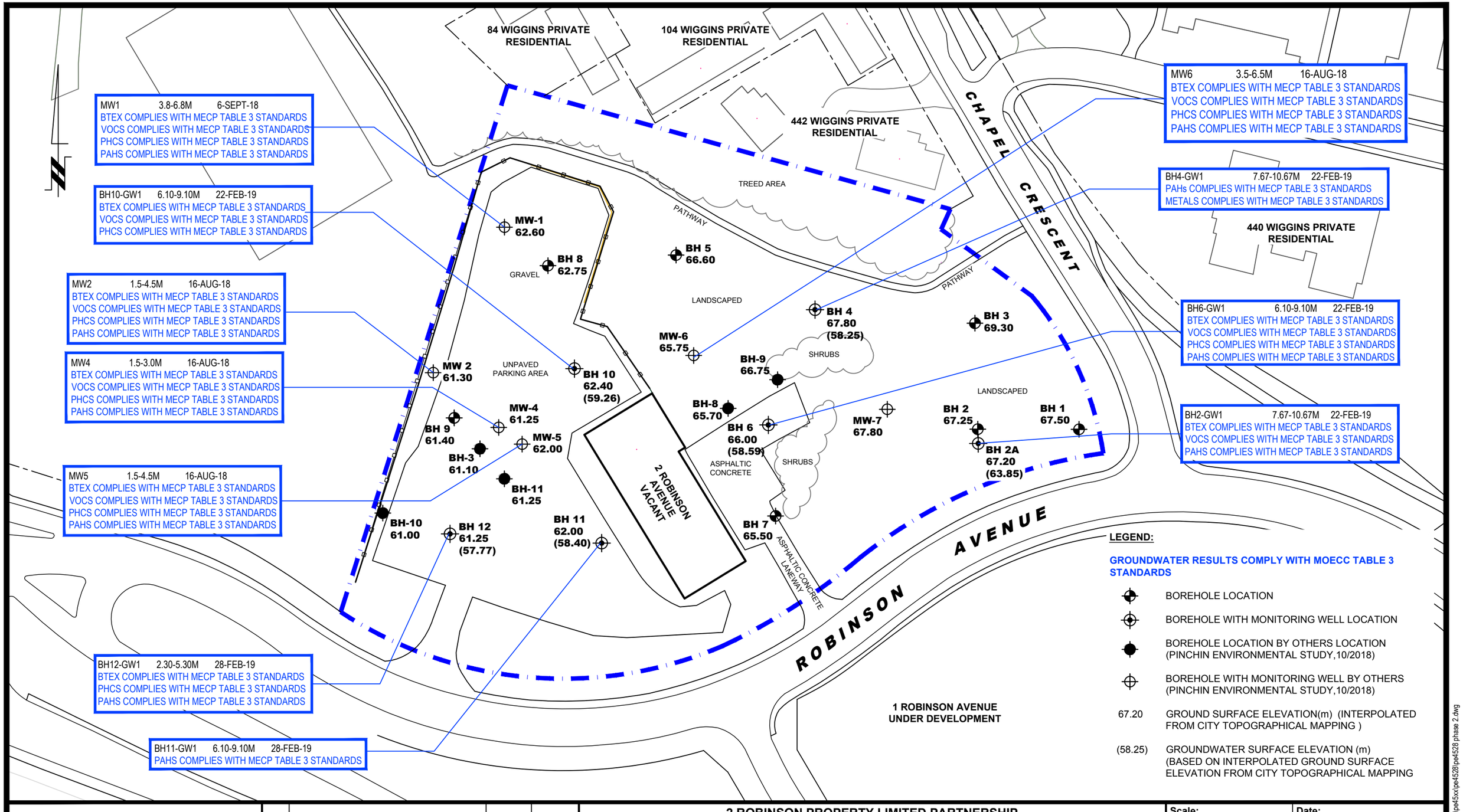

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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:1000	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-1
Checked by: MB	PE4528-3
Approved by: MSD	Revision No.:

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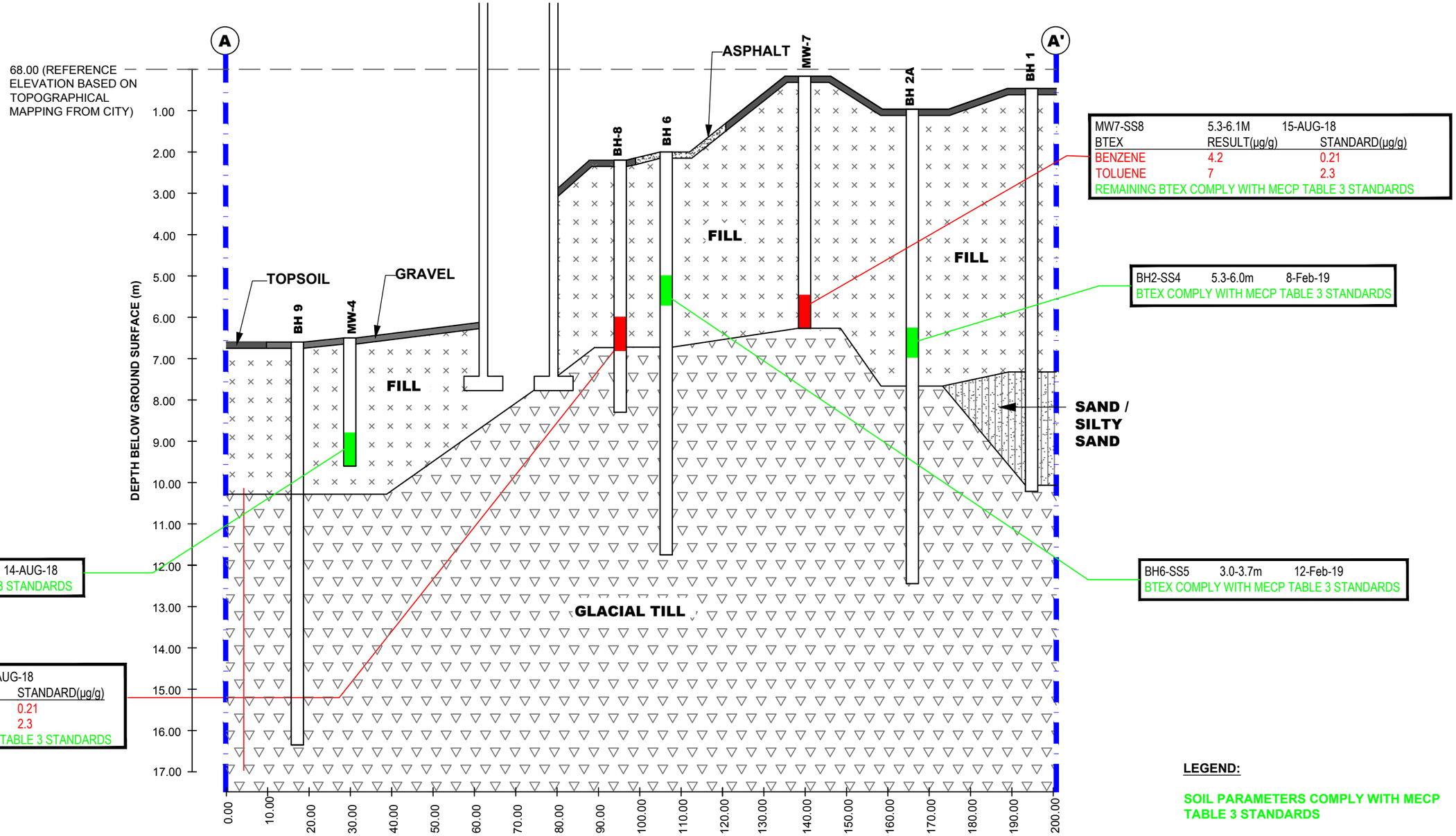

MW7-SS8	5.3-6.1M	15-AUG-18
BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	4.2	0.21
TOLUENE	7	2.3

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH2-SS4 5.3-6.0m 8-Feb-19
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

MW4-SS4 2.3-3.1M 14-AUG-18
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH6-SS5 3.0-3.7m 12-Feb-19
BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH8-SS6	3.8-4.6M	15-AUG-18
BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	4.2	0.21
TOLUENE	7	2.3

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL (BTEX)

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
Checked by: MB	PE4528-4A
Approved by: CDS	Revision No.:

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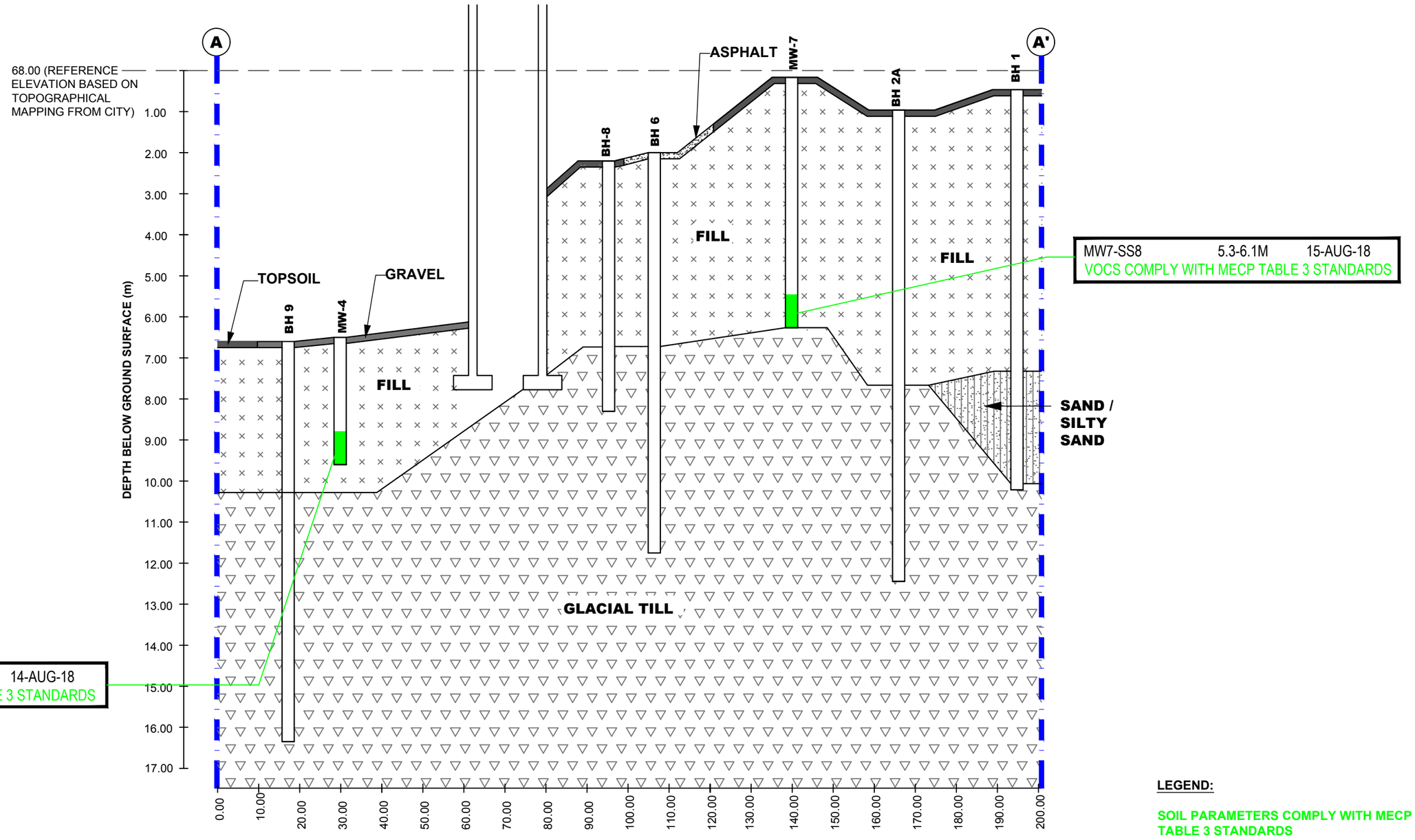

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL (VOC)

Scale: AS SHOWN	Date: 03/2019
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Checked by: MB	PE4528-4B
Approved by: CDS	Revision No.:

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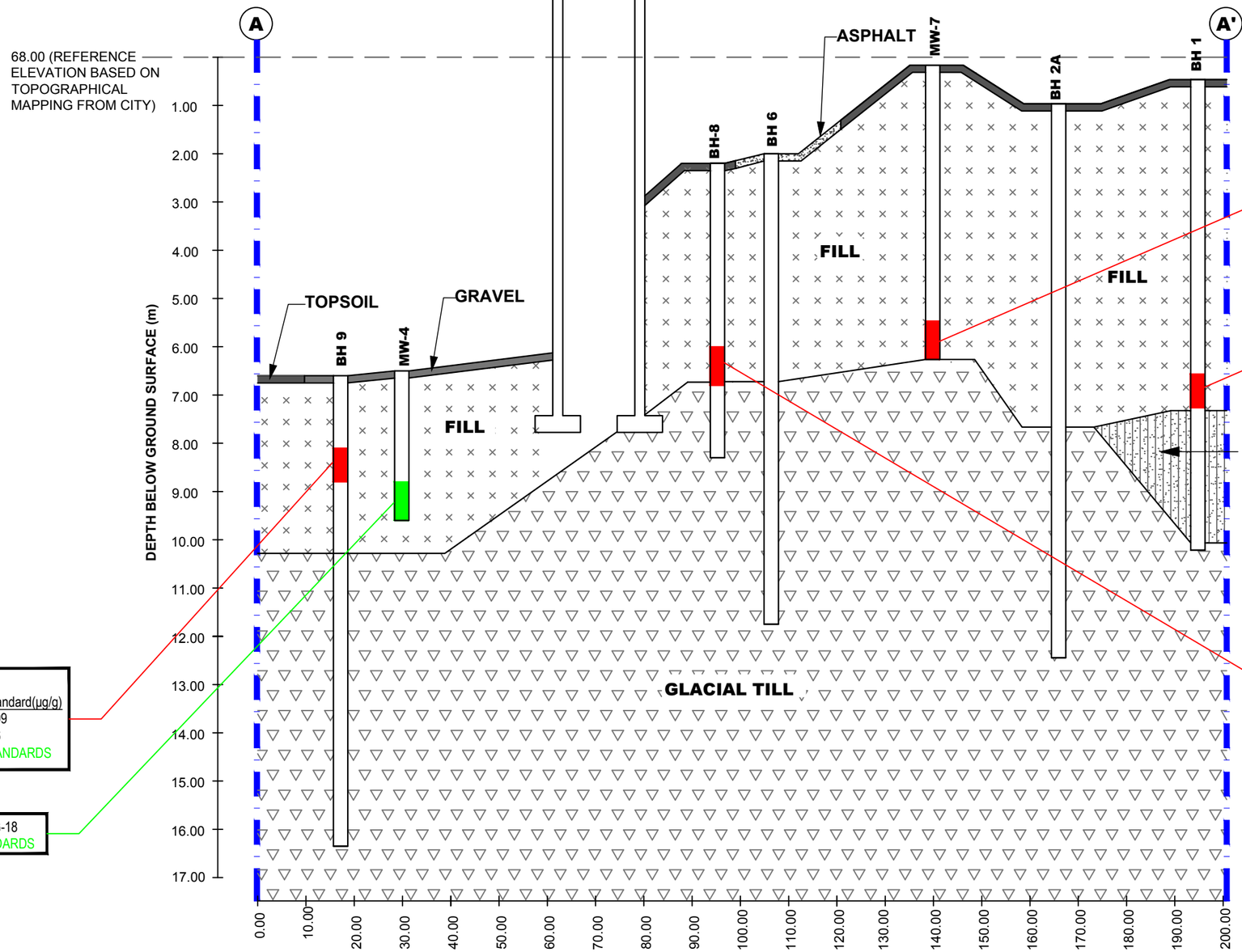

MW7-SS8	5.3-6.1M	15-AUG-18
PAHS	RESULT(µg/g)	STANDARD(µg/g)
METHYLNAPTHALENE (1&2)	3.3	0.99
NAPTHALENE	0.95	0.
REMAINING PAHS COMPLY WITH MECP TABLE 3 STANDARDS		

BH1-SS9	6.1-6.8m	7-FEB-19	
PAHs		Result(µg/g)	Standard(µg/g)
METHYLNAPTHALENE (1&2)		2.68	0.99
NAPTHALENE		0.93	0.6
REMAINING PAHS COMPLY WITH TABLE 3 STANDARDS			

BH8-SS6	3.8-4.6M	15-AUG-18
PAHS	RESULT(µg/g)	STANDARD(µg/g)
BENZO[a]PYRENE	0.34	0.3
FLUORANTHENE	0.73	0.69
REMAINING PAHS COMPLY WITH MECP TABLE 3 STANDARDS		

BH9-SS3	1.5-2.2m	12-FEB-19	
PAHs		Result(µg/g)	Standard(µg/g)
METHYLNAPTHALENE (1&2)		8.08	0.99
NAPTHALENE		3.77	0.6
REMAINING PAHS COMPLY WITH TABLE 3 STANDARDS			

MW4-SS4	2.3-3.1M	14-AUG-18
PAHS COMPLY WITH MECP TABLE 3 STANDARDS		

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL (PAH)

Scale: AS SHOWN	Date: 03/2019
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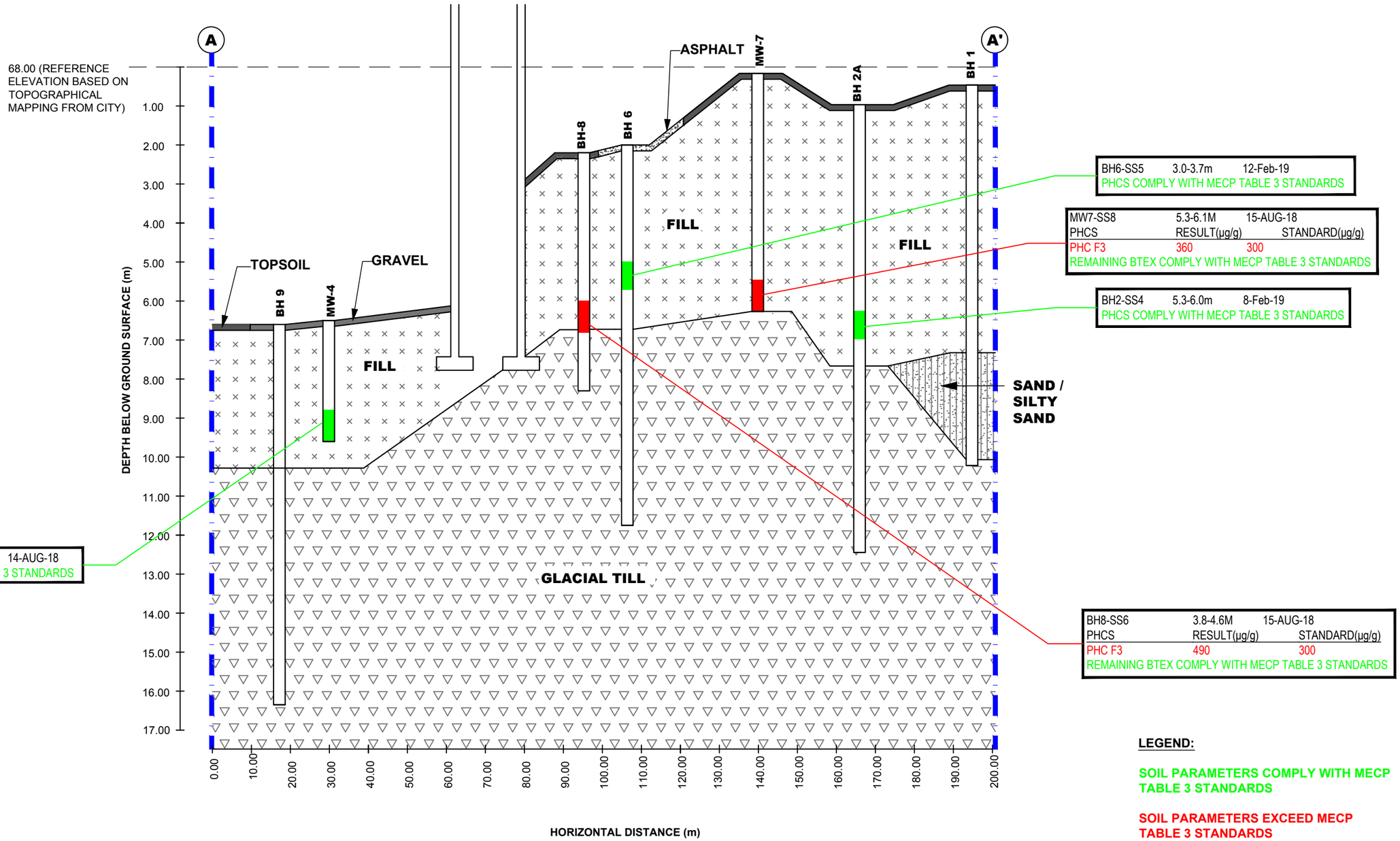

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL (PHC)

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
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Approved by: CDS	Revision No.:

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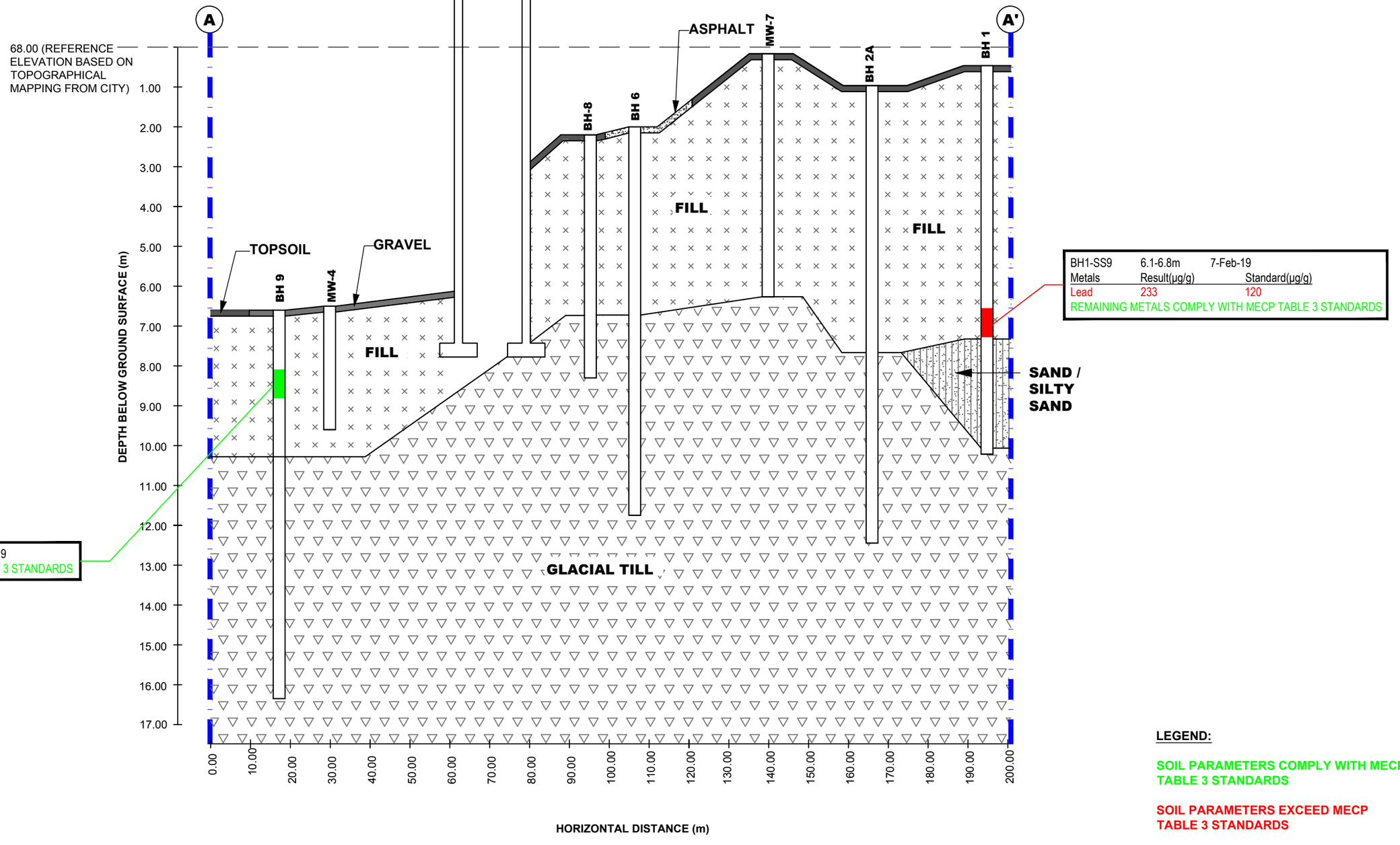

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL (METALS)

Scale: AS SHOWN	Date: 03/2019
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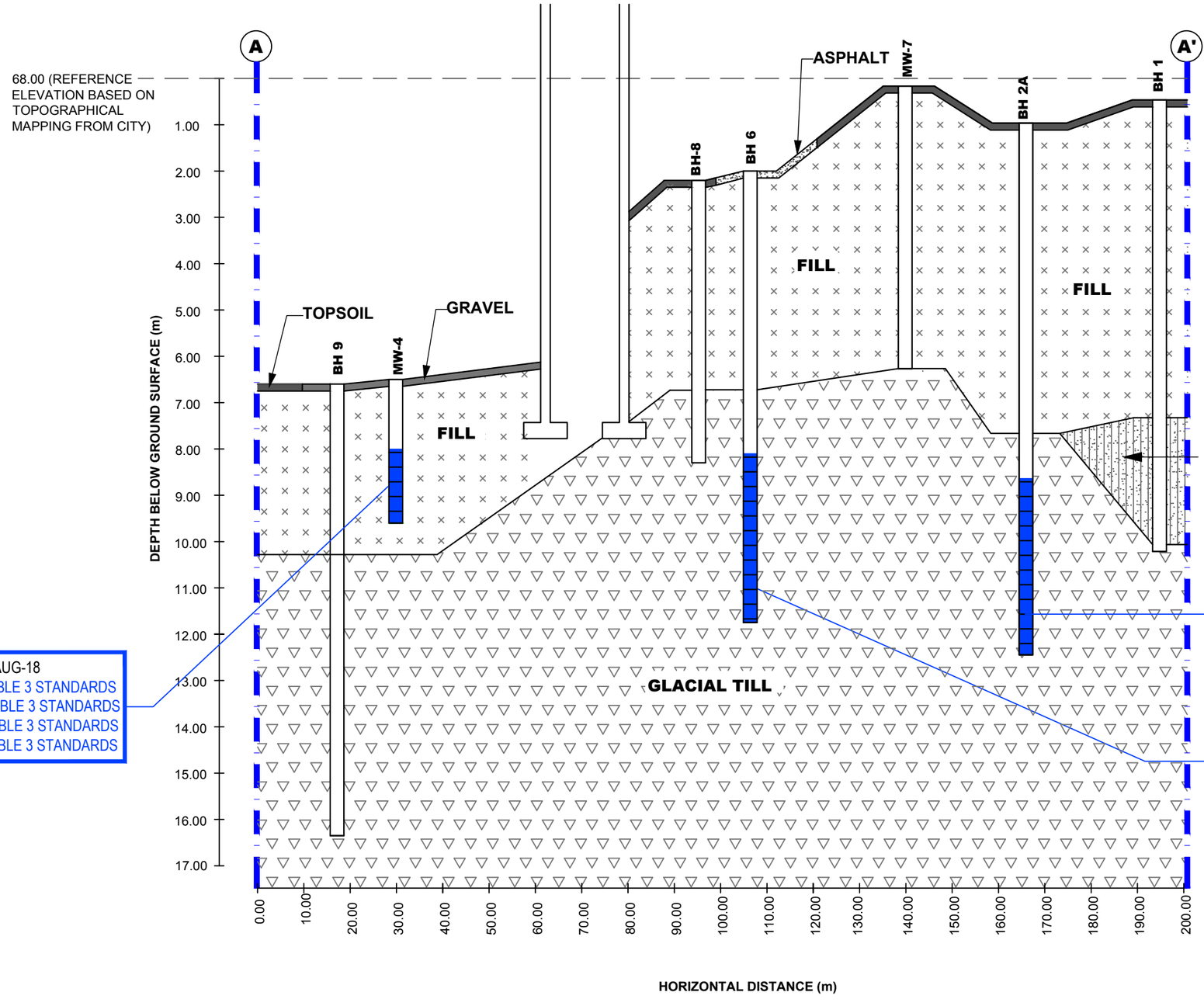

MW4 1.5-3.0M 16-AUG-18
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
VOCS COMPLIES WITH MECP TABLE 3 STANDARDS
PHCS COMPLIES WITH MECP TABLE 3 STANDARDS
PAHS COMPLIES WITH MECP TABLE 3 STANDARDS

BH2-GW1 7.67-10.67M 22-FEB-19
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
VOCS COMPLIES WITH MECP TABLE 3 STANDARDS
PAHS COMPLIES WITH MECP TABLE 3 STANDARDS

BH6-GW1 6.10-9.10M 22-FEB-19
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
VOCS COMPLIES WITH MECP TABLE 3 STANDARDS
PHCS COMPLIES WITH MECP TABLE 3 STANDARDS
PAHS COMPLIES WITH MECP TABLE 3 STANDARDS

LEGEND:

GROUNDWATER RESULTS COMPLY WITH MOECC TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEED MOECC TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
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Approved by: CDS	Revision No.:

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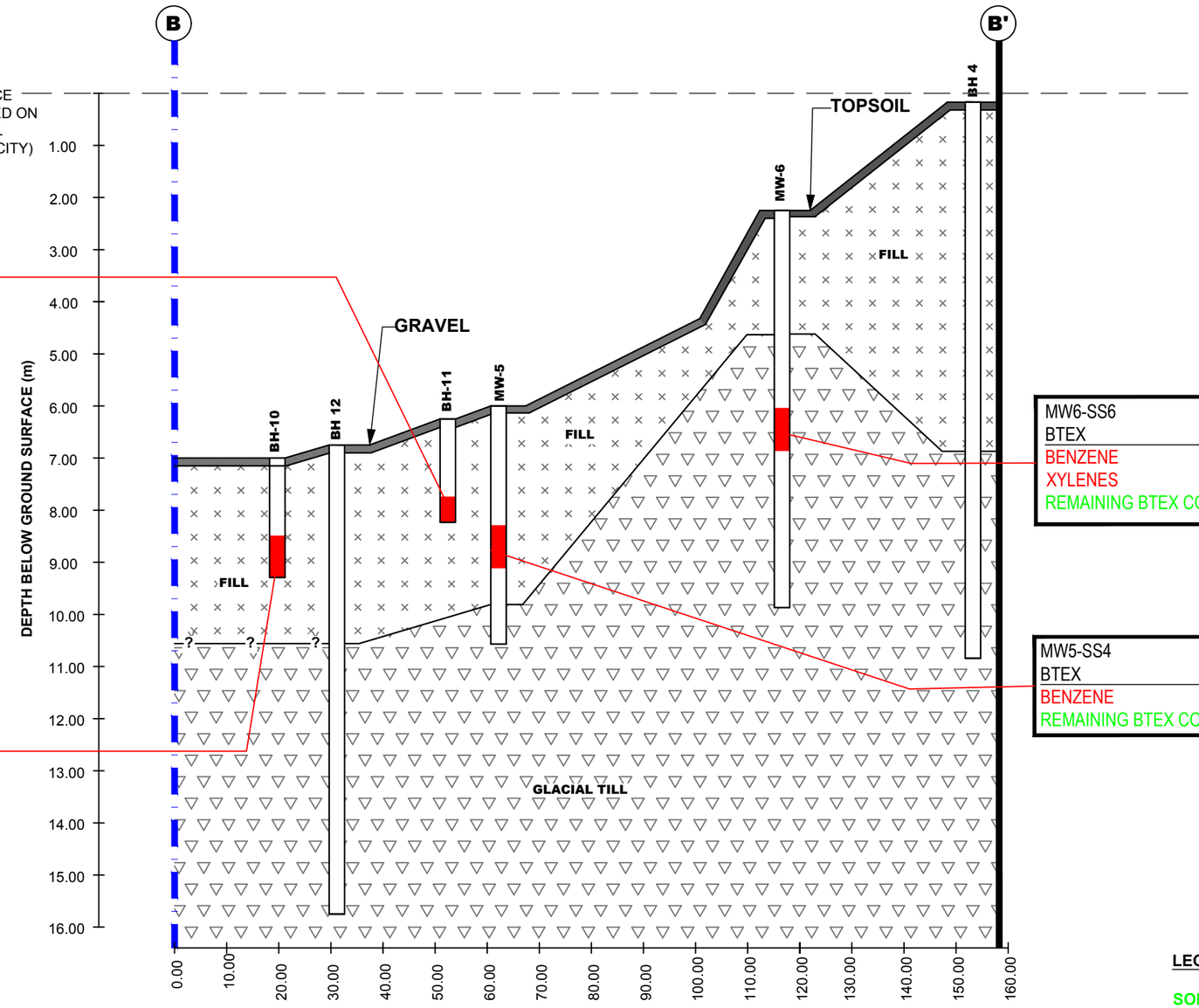

BH11-SS3	1.5-2.3M	15-AUG-18
BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.45	0.21
REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

BH10-SS3	1.5-2.3M	15-AUG-18
BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.45	0.21
REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

MW6-SS6	3.8-4.6M	15-AUG-18
BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.48	0.21
XYLENES	3.5	3.1
REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

MW5-SS4	2.3-3.1M	14-AUG-18
BTEX	RESULT(µg/g)	STANDARD(µg/g)
BENZENE	0.48	0.21
REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL (BTEX)

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
Checked by: MB	PE4528-6A
Approved by: CDS	Revision No.:

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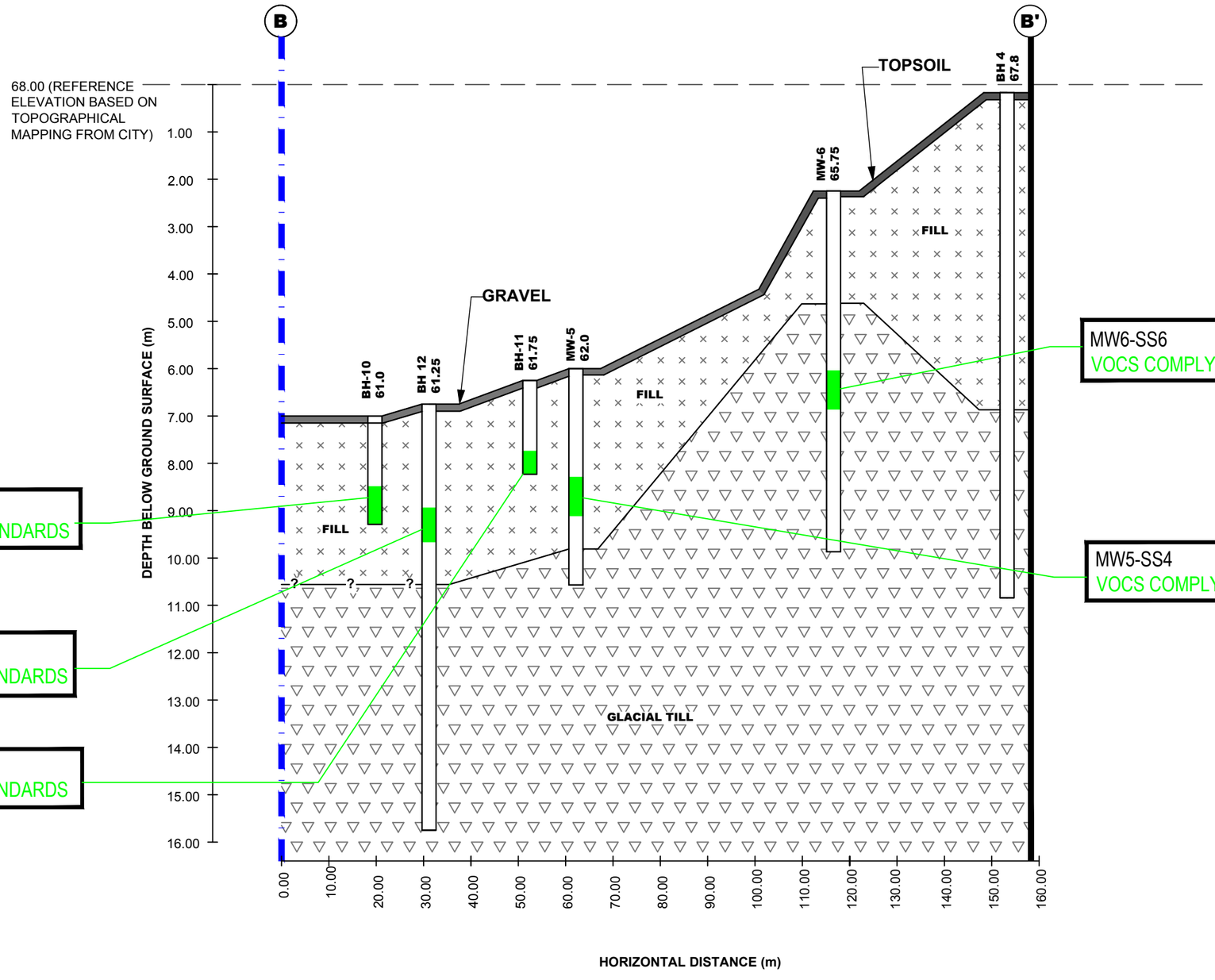

BH10-SS3 1.5-2.3M 15-AUG-18
VOCS COMPLY WITH MECP TABLE 3 STANDARDS

BH12-SS4 2.2-2.9m 15-Feb-19
VOCS COMPLY WITH MECP TABLE 3 STANDARDS

BH11-SS3 1.5-2.3M 15-AUG-18
VOCS COMPLY WITH MECP TABLE 3 STANDARDS

MW6-SS6 3.8-4.6M 15-AUG-18
VOCS COMPLY WITH MECP TABLE 3 STANDARDS

MW5-SS4 2.3-3.1M 14-AUG-18
VOCS COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL (VOC)

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
Checked by: MB	PE4528-6B
Approved by: CDS	Revision No.:

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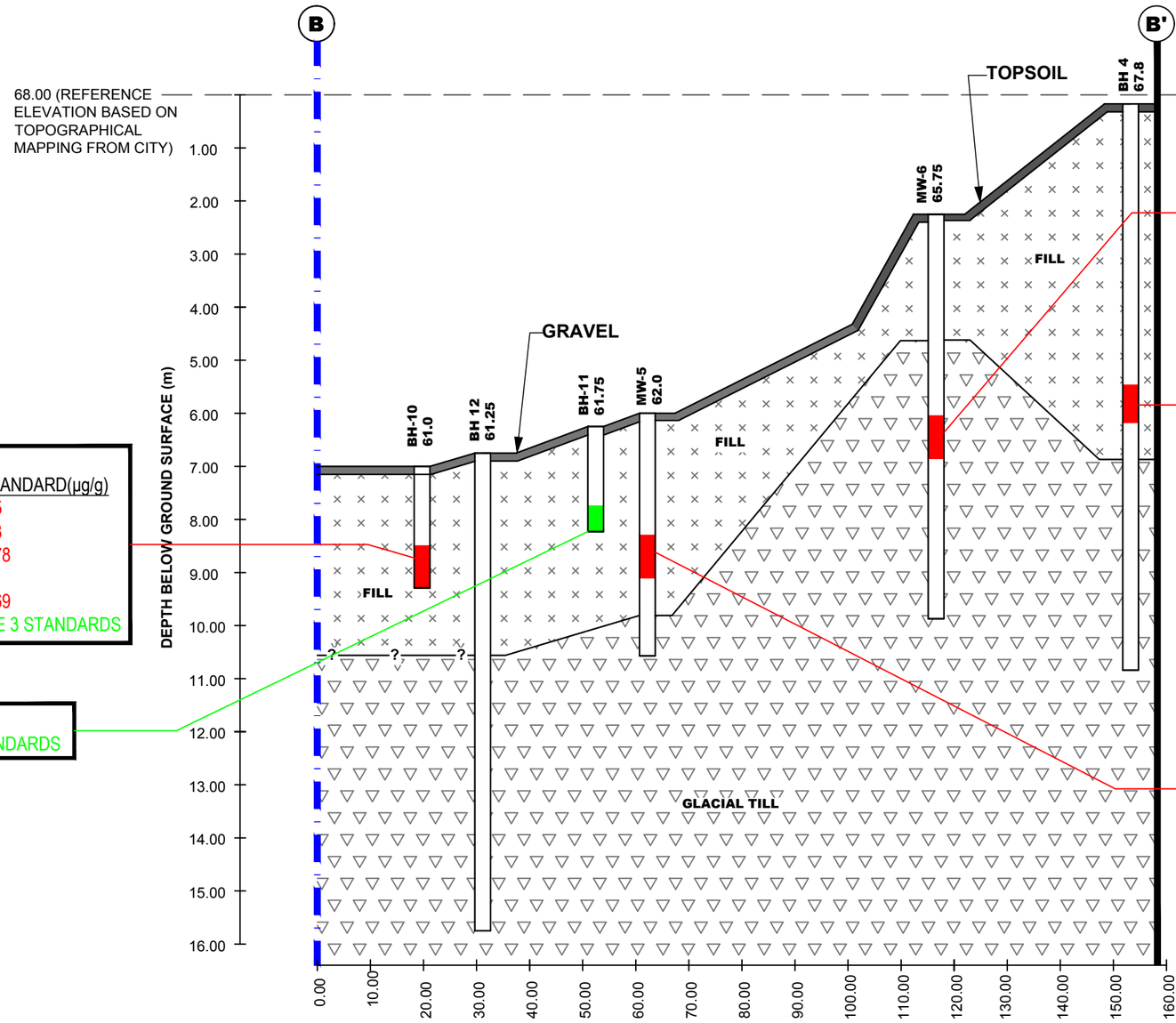

BH10-SS3 1.5-2.3M 15-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
BENZO[a]ANTHRACENE	0.78	0.5
BENZO[a]PYRENE	0.69	0.3
BENZO[b]FLUORANTHENE	0.95	0.78
DIBENZO[a,h]ANTHRACENE	0.13	0.1
FLUORANTHENE	1.5	0.69

REMAINING PAHS COMPLY WITH MECP TABLE 3 STANDARDS

BH11-SS3 1.5-2.3M 15-AUG-18

PAHS COMPLY WITH MECP TABLE 3 STANDARDS

MW6-SS6 3.8-4.6M 15-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
METHYLNAPTHALENE (1&2)	1.3	0.99

REMAINING PAHS COMPLY WITH MECP TABLE 3 STANDARDS

BH4-SS8 5.3-6.0m 11-FEB-19

PAHs	Result(µg/g)	Standard(µg/g)
BENZO[A]PYRENE	2.68	0.3
FLUORANTHENE	0.87	0.69
METHYLNAPTHALENE (1&2)	3.2	0.99
NAPTHALENE	1.32	0.6

REMAINING PAHS COMPLY WITH TABLE 3 STANDARDS

MW5-SS4 2.3-3.1M 14-AUG-18

PAHS	RESULT(µg/g)	STANDARD(µg/g)
METHYLNAPTHALENE (1&2)	2.8	0.99
NAPTHALENE	0.94	0.6

REMAINING PAHS COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL (PAH)

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
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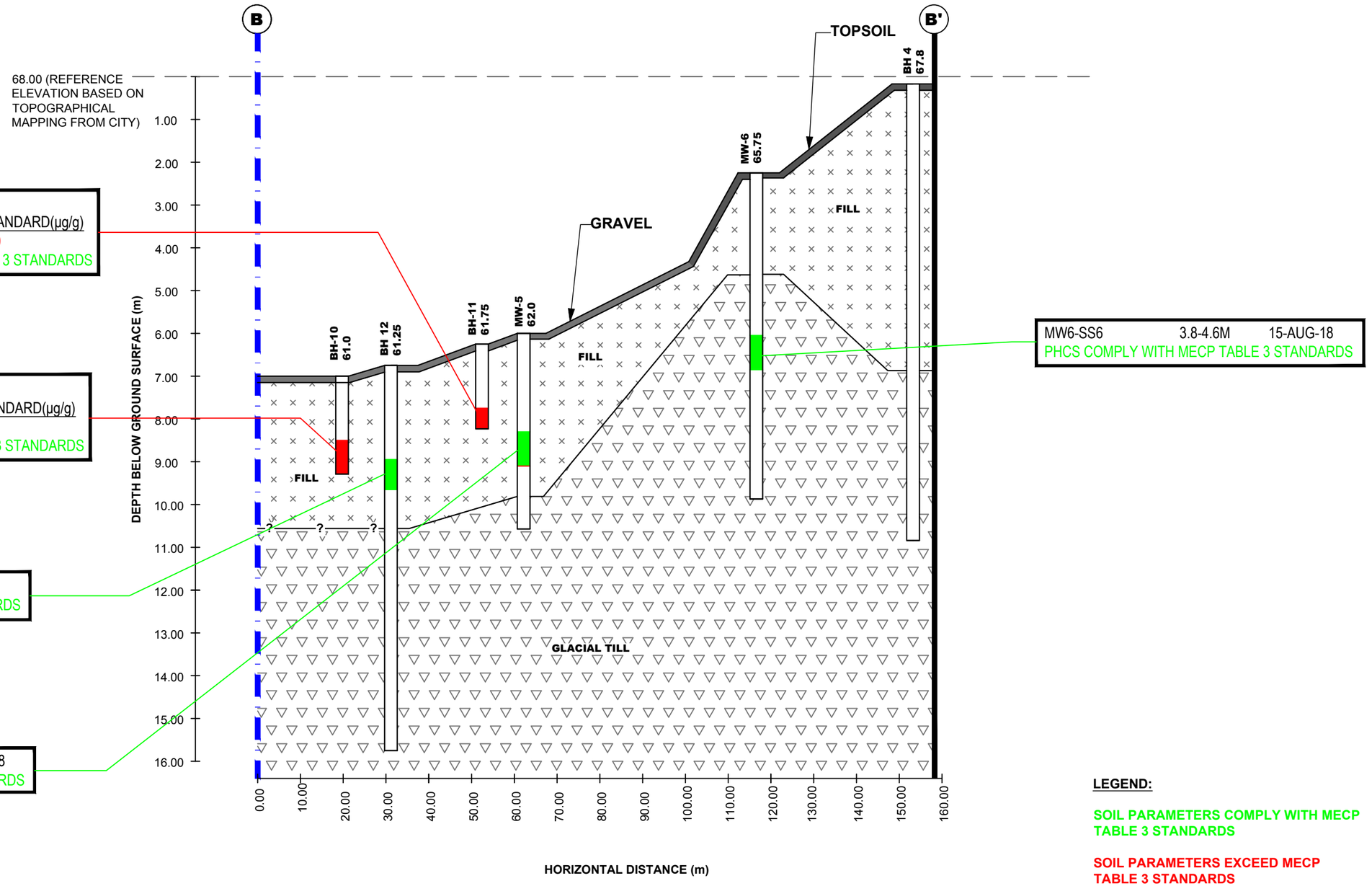

BH11-SS3 1.5-2.3M 15-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	460	300

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH10-SS3 1.5-2.3M 15-AUG-18

PHCS	RESULT(µg/g)	STANDARD(µg/g)
PHC F3	500	300

REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS

BH12-SS4 2.2-2.9m 15-Feb-19

PHCS COMPLY WITH MECP TABLE 3 STANDARDS

MW5-SS4 2.3-3.1M 14-AUG-18

PHCS COMPLY WITH MECP TABLE 3 STANDARDS

MW6-SS6 3.8-4.6M 15-AUG-18

PHCS COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL (PHC)

Scale: AS SHOWN	Date: 03/2019
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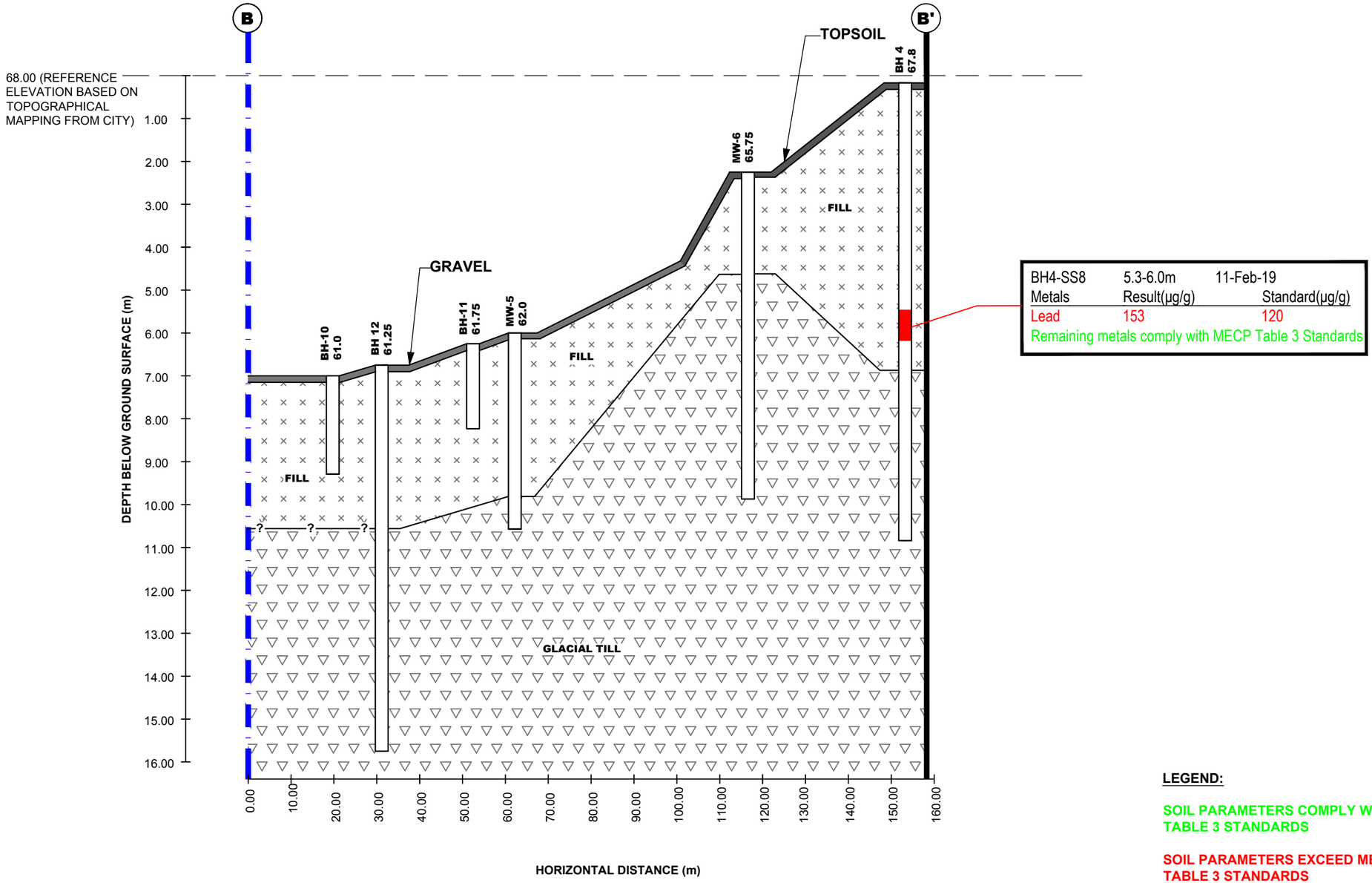

BH4-SS8	5.3-6.0m	11-Feb-19
Metals	Result(µg/g)	Standard(µg/g)
Lead	153	120
Remaining metals comply with MECP Table 3 Standards		

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

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2 ROBINSON PROPERTY LIMITED PARTNERSHIP

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL (METALS)

Scale: AS SHOWN	Date: 03/2019
Drawn by: RCG	Report No.: PE4528-2
Checked by: MB	PE4528-6B
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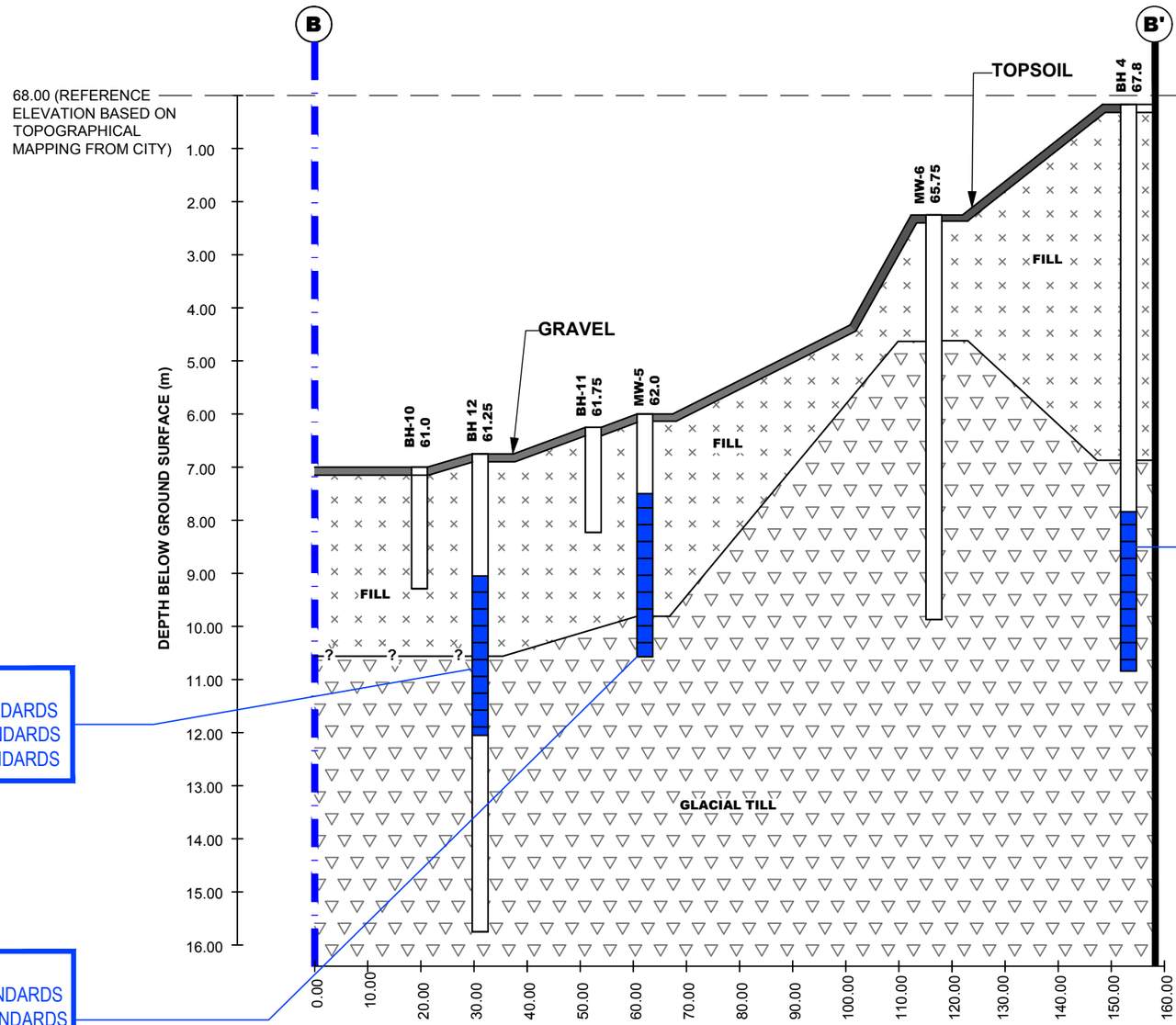

BH4-GW1 7.67-10.67M 22-FEB-19
PAHs COMPLIES WITH MECP TABLE 3 STANDARDS
METALS COMPLIES WITH MECP TABLE 3 STANDARDS

BH12-GW1 2.30-5.30M 28-FEB-19
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
PHCS COMPLIES WITH MECP TABLE 3 STANDARDS
PAHS COMPLIES WITH MECP TABLE 3 STANDARDS

MW5 1.5-4.5M 16-AUG-18
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
VOCS COMPLIES WITH MECP TABLE 3 STANDARDS
PHCS COMPLIES WITH MECP TABLE 3 STANDARDS
PAHS COMPLIES WITH MECP TABLE 3 STANDARDS

LEGEND:

GROUNDWATER RESULTS COMPLY WITH MOECC TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEED MOECC TABLE 3 STANDARDS

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PHASE I - ENVIRONMENTAL SITE ASSESSMENT
2 ROBINSON AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - GROUNDWATER

Scale: AS SHOWN	Date: 03/2019
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Tables

Parameter	Units	MDL	Regulation	BH1-SS9	BH3-SS9	BH4-SS8	BH5-SS7	BH8-SS3	BH9-SS3	BH10-SS5
Sample Depth (m)			Reg 153/04 (2011)-Table 3 Residential, Coarse	6.1-6.8	6.2-6.9	5.3-6.0	4.5-5.2	3.65-4.25	2.45-3.00	5.50-5.60
Sample Date				7-Feb-19	8-Feb-19	11-Feb-19	11-Feb-19	16-Oct-12	18-Oct-12	31-Oct-12
Metals										
Chromium (VI)	ug/g dry	0.2	8 ug/g dry	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Mercury	ug/g dry	0.1	0.27 ug/g dry	0.2	ND (0.1)	0.2	ND (0.1)	ND (0.1)	0.1	0.2
Antimony	ug/g dry	1.0	7.5 ug/g dry	7.2	ND (1.0)	1.3	ND (1.0)	ND (1.0)	2.2	1.6
Arsenic	ug/g dry	1.0	18 ug/g dry	9.9	2.3	9.7	18.1	3.5	16.2	9.0
Barium	ug/g dry	1.0	390 ug/g dry	153	89.0	136	35.1	83.1	144	71.8
Beryllium	ug/g dry	1.0	4 ug/g dry	0.5	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	0.6	ND (0.5)
Boron	ug/g dry	1.0	120 ug/g dry	10.6	5.8	7.1	ND (5.0)	11.2	9.7	7.2
Cadmium	ug/g dry	0.5	1.2 ug/g dry	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Chromium	ug/g dry	1.0	160 ug/g dry	14.1	27.7	37.3	16.8	15.6	17.4	20.4
Cobalt	ug/g dry	1.0	22 ug/g dry	6.7	6.4	8.2	2.6	8.1	10.4	5.7
Copper	ug/g dry	1.0	140 ug/g dry	43.9	21.9	34.8	39.8	17.5	31.2	17.8
Lead	ug/g dry	1.0	120 ug/g dry	233	15.5	153	14.6	5.9	43.1	38.4
Molybdenum	ug/g dry	1.0	6.9 ug/g dry	2.0	ND (1.0)	1.4	ND (1.0)	1.0	3.3	1.2
Nickel	ug/g dry	1.0	100 ug/g dry	14.7	15.7	24.5	8.6	18.0	24.2	13.6
Selenium	ug/g dry	1.0	2.4 ug/g dry	1.3	ND (1.0)	ND (1.0)	1.2	ND (1.0)	ND (1.0)	ND (1.0)
Silver	ug/g dry	0.5	20 ug/g dry	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
Thallium	ug/g dry	1.0	1 ug/g dry	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Uranium	ug/g dry	1.0	23 ug/g dry	ND (1.0)	ND (1.0)	ND (1.0)	1.2	ND (1.0)	ND (1.0)	ND (1.0)
Vanadium	ug/g dry	1.0	86 ug/g dry	20.3	35.3	41.5	21.4	26.7	25.8	28.6
Zinc	ug/g dry	1.0	340 ug/g dry	75.5	42.8	124	24.6	32.4	52.5	57.0

2	Sample exceeds MECP Table 3 Residential Coarse Grained Standard
ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit for Samples Submitted during 2018 Field program
NA	Parameter not analysed

Parameter	Units	MDL	Regulation	BH4-GW1
Screen Interval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	7.67-10.67
Sample Date				22-Feb-19
Metals				
Mercury	ug/L	0.1	0.29 ug/L	ND (0.1)
Antimony	ug/L	0.5	20000 ug/L	ND (0.5)
Arsenic	ug/L	1	1900 ug/L	4
Barium	ug/L	1	29000 ug/L	52
Beryllium	ug/L	0.5	67 ug/L	ND (0.5)
Boron	ug/L	10	45000 ug/L	65
Cadmium	ug/L	0.1	2.7 ug/L	0.3
Chromium	ug/L	1	810 ug/L	14
Chromium (VI)	ug/L	10	140 ug/L	ND (10)
Cobalt	ug/L	0.5	66 ug/L	14.5
Copper	ug/L	0.5	87 ug/L	19.0
Lead	ug/L	0.1	25 ug/L	7.2
Molybdenum	ug/L	0.5	9200 ug/L	1.9
Nickel	ug/L	1	490 ug/L	40
Selenium	ug/L	1	63 ug/L	2
Silver	ug/L	0.1	1.5 ug/L	ND (0.1)
Sodium	ug/L	200	2300000 ug/L	356000
Thallium	ug/L	0.1	510 ug/L	0.2
Uranium	ug/L	0.1	420 ug/L	10.1
Vanadium	ug/L	0.5	250 ug/L	15.9
Zinc	ug/L	5	1100 ug/L	34

ND (0.5) No concentrations identified above the MDL

MDL Method Detection Limit

Table 2A: Soil Analytical Test Results
VOCs and BTEX

Parameter	Units	MDL	Regulation	BH2-SS4	BH6-SS5	BH11-SS5	BH12-SS4	MW1-SS3	MW2-SS2	BH3-SS3	MW4-SS4	MW5-SS4
Sample Depth (m)			Reg 153/04 (2011)-Table 3 Residential, Coarse	5.3-6.0	3.0-3.7	3.0-3.7	2.2-2.9	1.5-2.3	0.8-1.5	1.5-2.3	2.3-3.1	2.3-3.1
Sample Date				8-Feb-19	12-Feb-19	15-Feb-19	15-Feb-19	14-Aug-18	14-Aug-18	14-Aug-18	14-Aug-18	14-Aug-18
Volatiles												
Acetone	ug/g dry	0.50	16 ug/g dry	NA	NA	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Benzene	ug/g dry	0.02	0.21 ug/g dry	ND (0.02)	ND (0.02)	0.14	ND (0.02)	ND (0.02)	0.15	1.3	ND (0.02)	0.48
Bromodichloromethane	ug/g dry	0.05	13 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Bromoform	ug/g dry	0.05	0.27 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Bromomethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Carbon Tetrachloride	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Chlorobenzene	ug/g dry	0.05	2.4 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Chloroform	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Dibromochloromethane	ug/g dry	0.05	9.4 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Dichlorodifluoromethane	ug/g dry	0.05	16 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,2-Dichlorobenzene	ug/g dry	0.05	3.4 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,3-Dichlorobenzene	ug/g dry	0.05	4.8 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,4-Dichlorobenzene	ug/g dry	0.05	0.083 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1-Dichloroethane	ug/g dry	0.05	3.5 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,2-Dichloroethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1-Dichloroethylene	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
cis-1,2-Dichloroethylene	ug/g dry	0.05	3.4 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
trans-1,2-Dichloroethylene	ug/g dry	0.05	0.084 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,2-Dichloropropane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
cis-1,3-Dichloropropylene	ug/g dry	0.05		NA	NA	ND (0.05)	ND (0.05)	ND (0.03)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
trans-1,3-Dichloropropylene	ug/g dry	0.05		NA	NA	ND (0.05)	ND (0.05)	ND (0.04)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,3-Dichloropropene, total	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Ethylbenzene	ug/g dry	0.05	2 ug/g dry	ND (0.02)	ND (0.02)	ND (0.05)	ND (0.05)	ND (0.02)	0.94	0.28	0.021	0.35
Ethylene dibromide	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Hexane	ug/g dry	0.05	2.8 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	0.27	0.51	ND (0.05)	0.31
Methyl Ethyl Ketone	ug/g dry	0.50	16 ug/g dry	NA	NA	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Methyl Isobutyl Ketone	ug/g dry	0.50	1.7 ug/g dry	NA	NA	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Methyl tert-butyl ether	ug/g dry	0.05	0.75 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Methylene Chloride	ug/g dry	0.05	0.1 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Styrene	ug/g dry	0.05	0.7 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1,1,2-Tetrachloroethane	ug/g dry	0.05	0.058 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1,2,2-Tetrachloroethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Tetrachloroethylene	ug/g dry	0.05	0.28 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Toluene	ug/g dry	0.05	2.3 ug/g dry	ND (0.02)	ND (0.02)	0.65	ND (0.05)	0.021	1.2	1.9	0.12	1.5
1,1,1-Trichloroethane	ug/g dry	0.05	0.38 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1,2-Trichloroethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Trichloroethylene	ug/g dry	0.05	0.061 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Trichlorofluoromethane	ug/g dry	0.05	4 ug/g dry	NA	NA	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Vinyl Chloride	ug/g dry	0.02	0.02 ug/g dry	NA	NA	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
m/p-Xylene	ug/g dry	0.05		ND (0.04)	ND (0.04)	0.17	ND (0.05)	ND (0.05)	2.9	1.6	0.084	1.5
o-Xylene	ug/g dry	0.05		ND (0.02)	ND (0.02)	0.10	ND (0.05)	ND (0.05)	2.8	0.61	0.027	1.2
Xylenes, total	ug/g dry	0.05	3.1 ug/g dry	ND (0.04)	ND (0.04)	0.27	ND (0.05)	ND (0.05)	5.7	1.8	0.11	2.6

ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit
N/A	Parameter not analysed
2	Sample exceeds MECP Table 3 Residential Coarse Grained Standard

Table 2A: Soil Analytical Test Results
VOCs and BTEX

Parameter	Units	MDL	Regulation	MW6-SS6	MW7-SS8	BH8-SS6	BH9-SS4	BH10-SS3	BH11-SS3
Sample Depth (m)			Reg 153/04 (2011)-Table 3 Residential, Coarse	3.8-4.6	5.3-6.1	3.8-4.6	2.3-3.1	1.5-2.3	1.5-2.3
Sample Date				15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18
Volatiles									
Acetone	ug/g dry	0.50	16 ug/g dry	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Benzene	ug/g dry	0.02	0.21 ug/g dry	0.91	4.2	1.8	ND (0.02)	0.45	0.023
Bromodichloromethane	ug/g dry	0.05	13 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Bromoform	ug/g dry	0.05	0.27 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Bromomethane	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Carbon Tetrachloride	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Chlorobenzene	ug/g dry	0.05	2.4 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Chloroform	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Dibromochloromethane	ug/g dry	0.05	9.4 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Dichlorodifluoromethane	ug/g dry	0.05	16 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,2-Dichlorobenzene	ug/g dry	0.05	3.4 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,3-Dichlorobenzene	ug/g dry	0.05	4.8 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,4-Dichlorobenzene	ug/g dry	0.05	0.083 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1-Dichloroethane	ug/g dry	0.05	3.5 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,2-Dichloroethane	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1-Dichloroethylene	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
cis-1,2-Dichloroethylene	ug/g dry	0.05	3.4 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
trans-1,2-Dichloroethylene	ug/g dry	0.05	0.084 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,2-Dichloropropane	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
cis-1,3-Dichloropropylene	ug/g dry	0.05		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
trans-1,3-Dichloropropylene	ug/g dry	0.05		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,3-Dichloropropene, total	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Ethylbenzene	ug/g dry	0.05	2 ug/g dry	0.59	1	0.4	ND (0.02)	0.14	0.023
Ethylene dibromide	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Hexane	ug/g dry	0.05	2.8 ug/g dry	0.47	1.3	0.62	ND (0.05)	0.25	ND (0.05)
Methyl Ethyl Ketone	ug/g dry	0.50	16 ug/g dry	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Methyl Isobutyl Ketone	ug/g dry	0.50	1.7 ug/g dry	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
Methyl tert-butyl ether	ug/g dry	0.05	0.75 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Methylene Chloride	ug/g dry	0.05	0.1 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Styrene	ug/g dry	0.05	0.7 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1,1,2-Tetrachloroethane	ug/g dry	0.05	0.058 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1,2,2-Tetrachloroethane	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Tetrachloroethylene	ug/g dry	0.05	0.28 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Toluene	ug/g dry	0.05	2.3 ug/g dry	2.2	7	2.9	0.039	0.73	0.06
1,1,1-Trichloroethane	ug/g dry	0.05	0.38 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1,1,2-Trichloroethane	ug/g dry	0.05	0.05 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Trichloroethylene	ug/g dry	0.05	0.061 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Trichlorofluoromethane	ug/g dry	0.05	4 ug/g dry	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Vinyl Chloride	ug/g dry	0.02	0.02 ug/g dry	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
m/p-Xylene	ug/g dry	0.05		2.1	4.9	1.9	0.047	0.78	0.1
o-Xylene	ug/g dry	0.05		1.4	2	0.82	0.029	0.37	0.072
Xylenes, total	ug/g dry	0.05	3.1 ug/g dry	3.5	6.9	2.8	0.076	1.1	0.17

ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit
N/A	Parameter not analysed
2	Sample exceeds MECP Table 3 Residential Coarse Grained Standard

Table 2B: Groundwater Analytical Test Results
VOCs and BTEX

Parameter	Units	MDL	Regulation	BH2-GW1	BH6-GW1	BH10-GW1	BH12-GW1	MW1	MW2	MW4	MW5	MW6
Screen Interval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	7.67-10.67	6.10-9.10	6.10-9.10	2.30-5.30	3.8-6.8	1.5-4.5	1.5-3.0	1.5-4.5	3.5-6.5
Sample Date				22-Feb-19	22-Feb-19	22-Feb-19	28-Feb-19	06-Sep-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18
Volatiles												
Acetone	ug/L	5.0	130000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	NA	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
Benzene	ug/L	0.5	44 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Bromodichloromethane	ug/L	0.5	85000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Bromoform	ug/L	0.5	380 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromomethane	ug/L	0.5	5.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Carbon Tetrachloride	ug/L	0.2	0.79 ug/L	ND (0.2)	ND (0.2)	ND (0.2)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Chlorobenzene	ug/L	0.5	630 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Chloroform	ug/L	0.5	2.4 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Dibromochloromethane	ug/L	0.5	82000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Dichlorodifluoromethane	ug/L	1.0	4400 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	NA	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichlorobenzene	ug/L	0.5	4600 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,3-Dichlorobenzene	ug/L	0.5	9600 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,4-Dichlorobenzene	ug/L	0.5	8 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1-Dichloroethane	ug/L	0.5	320 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
1,2-Dichloroethane	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
cis-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
trans-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,2-Dichloropropane	ug/L	0.5	16 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
cis-1,3-Dichloropropylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
trans-1,3-Dichloropropylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)
1,3-Dichloropropene, total	ug/L	0.5	5.2 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	NA	NA	NA	NA	NA
Ethylbenzene	ug/L	0.5	2300 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Ethylene dibromide	ug/L	0.2	0.25 ug/L	ND (0.2)	ND (0.2)	ND (0.2)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Hexane	ug/L	1.0	51 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	NA	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Methyl Ethyl Ketone	ug/L	5.0	470000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	NA	ND (10)	ND (10)	ND (10)	ND (10)	ND (10)
Methyl Isobutyl Ketone	ug/L	5.0	140000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	NA	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Methyl tert-butyl ether	ug/L	2.0	190 ug/L	ND (2.0)	ND (2.0)	ND (2.0)	NA	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Methylene Chloride	ug/L	5.0	610 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	NA	ND (2)	ND (2)	ND (2)	ND (2)	ND (2)
Styrene	ug/L	0.5	1300 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,1,2-Tetrachloroethane	ug/L	0.5	3.3 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,2,2-Tetrachloroethane	ug/L	0.5	3.2 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Tetrachloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Toluene	ug/L	0.5	18000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
1,1,1-Trichloroethane	ug/L	0.5	640 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
1,1,2-Trichloroethane	ug/L	0.5	4.7 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Trichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Trichlorofluoromethane	ug/L	1.0	2500 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Vinyl Chloride	ug/L	0.5	0.5 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	NA	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
m/p-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
o-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
Xylenes, total	ug/L	0.5	4200 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)

ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit
NA	Parameter Not Analysed

Parameter	Units	MDL	Regulation	BH1-SS9	BH3-SS9	BH4-SS8	BH5-SS7	BH7-SS5	BH8-SS3	BH9-SS3	BH10-SS5	MW1-SS3
Sample Depth (m)			Reg 153/04 (2011)- Table 3 Residential, fine	6.1-6.8	6.2-6.9	5.3-6.0	4.5-5.2	3.0-3.7	1.5-2.3	1.5-2.3	3.0-3.7	1.5-2.3
Sample Date				7-Feb-19	8-Feb-19	11-Feb-19	11-Feb-19	12-Feb-19	14-Feb-19	12-Feb-19	14-Feb-19	14-Aug-18
Semi-Volatiles												
Acenaphthene	ug/g dry	0.02	7.9 ug/g dry	0.04	0.14	0.08	0.26	0.11	ND (0.02)	0.08	ND (0.02)	ND (0.005)
Acenaphthylene	ug/g dry	0.02	0.15 ug/g dry	0.09	ND (0.02)	0.11	0.29	0.10	ND (0.02)	0.11	ND (0.02)	ND (0.005)
Anthracene	ug/g dry	0.02	0.67 ug/g dry	0.08	0.21	0.22	0.59	0.09	ND (0.02)	0.15	ND (0.02)	ND (0.005)
Benzo[a]anthracene	ug/g dry	0.02	0.5 ug/g dry	0.21	0.20	0.42	0.86	0.28	0.07	0.25	ND (0.02)	ND (0.005)
Benzo[a]pyrene	ug/g dry	0.02	0.3 ug/g dry	0.22	0.24	0.50	0.69	0.24	0.13	0.22	ND (0.02)	ND (0.005)
Benzo[b]fluoranthene	ug/g dry	0.02	0.78 ug/g dry	0.32	0.21	0.67	0.81	0.28	0.14	0.32	0.02	ND (0.005)
Benzo[g,h,i]perylene	ug/g dry	0.02	6.6 ug/g dry	0.19	0.21	0.36	0.42	0.23	0.11	0.18	0.02	ND (0.005)
Benzo[k]fluoranthene	ug/g dry	0.02	0.78 ug/g dry	0.12	0.10	0.40	0.35	0.10	0.06	0.12	ND (0.02)	ND (0.005)
Chrysene	ug/g dry	0.02	7 ug/g dry	0.30	0.19	0.48	0.99	0.32	0.08	0.33	ND (0.02)	ND (0.005)
Dibenzo[a,h]anthracene	ug/g dry	0.02	0.1 ug/g dry	0.05	ND (0.02)	0.09	0.19	0.06	ND (0.02)	0.05	ND (0.02)	ND (0.005)
Fluoranthene	ug/g dry	0.02	0.69 ug/g dry	0.38	0.57	0.87	1.50	0.37	0.11	0.40	0.02	ND (0.005)
Fluorene	ug/g dry	0.02	62 ug/g dry	0.07	0.12	0.10	0.40	0.12	ND (0.02)	0.11	ND (0.02)	ND (0.005)
Indeno[1,2,3-cd]pyrene	ug/g dry	0.02	0.38 ug/g dry	0.14	0.13	0.30	0.31	0.11	0.09	0.13	ND (0.02)	ND (0.005)
1-Methylnaphthalene	ug/g dry	0.02	0.99 ug/g dry	1.07	0.04	1.36	10.2	3.67	ND (0.02)	3.23	ND (0.02)	NA
2-Methylnaphthalene	ug/g dry	0.02	0.99 ug/g dry	1.61	0.05	1.96	15.5	5.70	ND (0.02)	4.85	ND (0.02)	NA
Methylnaphthalene (1&2)	ug/g dry	0.04	0.99 ug/g dry	2.68	0.10	3.32	25.7	9.38	ND (0.04)	8.08	ND (0.04)	0.028
Naphthalene	ug/g dry	0.01	0.6 ug/g dry	0.93	0.08	1.39	11.1	4.16	0.02	3.77	ND (0.01)	0.0099
Phenanthrene	ug/g dry	0.02	6.2 ug/g dry	0.72	0.68	1.05	3.76	1.30	0.04	1.23	ND (0.02)	0.0085
Pyrene	ug/g dry	0.02	78 ug/g dry	0.41	0.52	0.78	1.42	0.41	0.11	0.41	0.02	ND (0.005)

ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit
2	Sample exceeds MECP Table 3 Residential Coarse Grained Standard

Table 3A: Soil Analytical Test Results
PAHs

Parameter	Units	MDL	Regulation	MW2-SS2	BH3-SS3	MW4-SS4	MW5-SS4	MW6-SS6	MW7-SS8	BH8-SS6	BH9-SS4	BH10-SS3	BH11-SS3
Sample Depth (m)			Reg 153/04 (2011)- Table 3 Residential, fine	0.8-1.5	1.5-2.3	2.3-3.1	2.3-3.1	3.8-4.6	5.3-6.1	3.8-4.6	2.3-3.1	1.5-2.3	1.5-2.3
Sample Date				14-Aug-18	14-Aug-18	14-Aug-18	14-Aug-18	15-Aug-19	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18
Semi-Volatiles													
Acenaphthene	ug/g dry	0.02	7.9 ug/g dry	0.0093	0.091	ND (0.005)	0.023	ND (0.005)	0.047	ND (0.005)	ND (0.005)	0.057	ND (0.005)
Acenaphthylene	ug/g dry	0.02	0.15 ug/g dry	0.0091	0.28	ND (0.005)	0.019	ND (0.005)	0.03	0.057	ND (0.005)	0.11	0.074
Anthracene	ug/g dry	0.02	0.67 ug/g dry	0.012	0.64	ND (0.005)	0.047	ND (0.005)	0.054	0.12	ND (0.005)	0.23	0.11
Benzo[a]anthracene	ug/g dry	0.02	0.5 ug/g dry	0.036	1.7	ND (0.005)	0.14	0.15	0.17	0.38	0.078	0.78	0.26
Benzo[a]pyrene	ug/g dry	0.02	0.3 ug/g dry	0.025	1.3	ND (0.005)	0.091	0.13	0.093	0.34	0.083	0.69	0.25
Benzo[b]fluoranthene	ug/g dry	0.02	0.78 ug/g dry	0.047	1.5	ND (0.005)	0.14	0.23	0.23	0.51	0.14	0.95	0.37
Benzo[g,h,i]perylene	ug/g dry	0.02	6.6 ug/g dry	0.018	0.74	ND (0.005)	0.056	0.12	0.067	0.26	0.083	0.48	0.26
Benzo[k]fluoranthene	ug/g dry	0.02	0.78 ug/g dry	0.011	0.51	ND (0.005)	0.035	0.076	0.054	0.18	ND (0.005)	0.32	0.12
Chrysene	ug/g dry	0.02	7 ug/g dry	0.047	1.4	ND (0.005)	0.14	0.17	0.26	0.34	0.079	0.69	0.24
Dibenzo[a,h]anthracene	ug/g dry	0.02	0.1 ug/g dry	0.058	0.22	ND (0.005)	0.019	ND (0.005)	0.025	0.064	ND (0.005)	0.13	0.051
Fluoranthene	ug/g dry	0.02	0.69 ug/g dry	0.049	2.7	ND (0.005)	0.15	0.21	0.33	0.73	0.15	1.5	0.54
Fluorene	ug/g dry	0.02	62 ug/g dry	0.0084	0.39	ND (0.005)	0.035	ND (0.005)	0.071	0.055	ND (0.005)	0.078	0.069
Indeno[1,2,3-cd]pyrene	ug/g dry	0.02	0.38 ug/g dry	0.016	0.74	ND (0.005)	0.042	0.12	0.061	0.27	0.078	0.5	0.24
1-Methylnaphthalene	ug/g dry	0.02	0.99 ug/g dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	ug/g dry	0.02	0.99 ug/g dry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylnaphthalene (1&2)	ug/g dry	0.04	0.99 ug/g dry	0.58	1.2	ND (0.0071)	2.8	1.3	3.3	0.9	ND (0.0071)	0.77	0.61
Naphthalene	ug/g dry	0.01	0.6 ug/g dry	0.16	0.43	0.0099	0.94	0.37	0.95	0.34	ND (0.005)	0.26	0.19
Phenanthrene	ug/g dry	0.02	6.2 ug/g dry	0.17	2.4	0.0085	0.63	0.41	1.1	0.58	0.081	0.85	0.47
Pyrene	ug/g dry	0.02	78 ug/g dry	0.051	3.5	ND (0.005)	0.17	0.19	0.03	0.62	0.12	1.2	0.44

ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit
2	Sample exceeds MECP Table 3 Residential Coarse Grained Standard

Parameter	Units	MDL	Regulation	BH2-GW1	BH4-GW1	BH6-GW1	BH11-GW1	BH12-GW1	MW1	MW2	MW4	MW5	MW6
Screen Interval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	7.39-10.39	6.86-9.86	1.80-4.80	2.72-5.72	2.60-5.60	3.8-6.8	1.5-4.5	1.5-3.0	1.5-4.5	3.5-6.5
Sample Date				22-Feb-19	22-Feb-19	22-Feb-19	28-Feb-19	28-Feb-19	06-Sep-18	16-Aug-18	16-Aug-18	16-Aug-18	16-Aug-18
Semi-Volatiles													
Acenaphthene	ug/L	0.05	600 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Acenaphthylene	ug/L	0.05	1.8 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Anthracene	ug/L	0.05	2.4 ug/L	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Benzo[a]anthracene	ug/L	0.05	4.7 ug/L	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Benzo[a]pyrene	ug/L	0.01	0.81 ug/L	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Benzo[b]fluoranthene	ug/L	0.05	0.75 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Benzo[g,h,i]perylene	ug/L	0.05	0.2 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Benzo[k]fluoranthene	ug/L	0.05	0.4 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Chrysene	ug/L	0.05	1 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Dibenzo[a,h]anthracene	ug/L	0.05	0.52 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Fluoranthene	ug/L	0.05	130 ug/L	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Fluorene	ug/L	0.05	400 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Indeno[1,2,3-cd]pyrene	ug/L	0.05	0.2 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
1-Methylnaphthalene	ug/L	0.05	1800 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	NA	NA	NA	NA	NA
2-Methylnaphthalene	ug/L	0.05	1800 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	NA	NA	NA	NA	NA
Methylnaphthalene (1&2)	ug/L	0.071	1800 ug/L	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Naphthalene	ug/L	0.05	1400 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Phenanthrene	ug/L	0.03	580 ug/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.03)	ND (0.03)	ND (0.03)	ND (0.03)	ND (0.03)
Pyrene	ug/L	0.05	68 ug/L	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)

ND (0.5) No concentrations identified above the MDL

MDL Method Detection Limit

Parameter	Units	MDL	Regulation	BH2-SS4	BH6-SS5	BH11-SS5	BH12-SS4	MW1-SS3	MW2-SS2	BH3-SS3
Sample Depth (m)			Reg 153/04 (2011)- Table 3 Residential, Coarse	5.3-6.0	3.0-3.7	3.0-3.7	2.2-2.9	1.5-2.3	0.8-1.5	1.5-2.3
Sample Date				8-Feb-19	12-Feb-19	15-Feb-19	15-Feb-19	14-Aug-18	14-Aug-18	14-Aug-18
Hydrocarbons										
F1 PHCs (C6-C10)	ug/g dry	7	55 ug/g dry	ND (7)	ND (7)	ND (7)	ND (7)	ND (10)	38	15
F2 PHCs (C10-C16)	ug/g dry	4	98 ug/g dry	ND (4)	10	ND (4)	5	ND (10)	12	21
F3 PHCs (C16-C34)	ug/g dry	8	300 ug/g dry	ND (8)	65	ND (8)	143	ND (50)	54	330
F4 PHCs (C34-C50)	ug/g dry	6	2800 ug/g dry	ND (6)	1130	ND (6)	95	ND (50)	ND (50)	1800

Parameter	Units	MDL	Regulation	MW4-SS4	MW5-SS4	MW6-SS6	MW7-SS8	BH8-SS6	BH9-SS4	BH10-SS3	BH11-SS3
Sample Depth (m)			Reg 153/04 (2011)- Table 3 Residential, Coarse	2.3-3.1	2.3-3.1	3.8-4.8	5.3-6.1	3.8-4.6	2.3-3.1	1.5-2.3	1.5-2.3
Sample Date				14-Aug-18	14-Aug-18	14-Feb-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18	15-Aug-18
Hydrocarbons											
F1 PHCs (C6-C10)	ug/g dry	7	55 ug/g dry	ND (10)	25	30	50	19	ND (10)	ND (10)	ND (10)
F2 PHCs (C10-C16)	ug/g dry	4	98 ug/g dry	ND (10)	47	31	60	20	ND (10)	19	19
F3 PHCs (C16-C34)	ug/g dry	8	300 ug/g dry	ND (50)	190	160	360	490	56	500	460
F4 PHCs (C34-C50)	ug/g dry	6	2800 ug/g dry	ND (50)	83	100	130	1700	280	2200	11000

ND (0.5)	No concentrations identified above the MDL
MDL	Method Detection Limit
2	Sample exceeds MECP Table 3 Residential Coarse Grained Standard

Parameter	Units	MDL	Regulation	BH6-GW1	BH12-GW1	MW1	MW2
Screen Inverval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	6.10-9.10	2.30-5.30	3.8-6.8	1.5-4.5
Sample Date				22-Feb-19	28-Feb-19	06-Sep-18	16-Aug-18
Hydrocarbons							
F1 PHCs (C6-C10)	ug/g dry	25	750 ug/L	ND (25)	ND (25)	ND (25)	ND (25)
F2 PHCs (C10-C16)	ug/g dry	100	150 ug/L	ND (100)	ND (100)	ND (100)	ND (100)
F3 PHCs (C16-C34)	ug/g dry	100	500 ug/L	ND (100)	ND (100)	ND (200)	ND (200)
F4 PHCs (C34-C50)	ug/g dry	100	500 ug/L	ND (100)	ND (100)	ND (200)	ND (200)

Parameter	Units	MDL	Regulation	MW4	MW5	MW6
Screen Inverval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	1.5-3.0	1.5-4.5	3.5-6.5
Sample Date				16-Aug-18	16-Aug-18	16-Aug-18
Hydrocarbons						
F1 PHCs (C6-C10)	ug/g dry	25	750 ug/L	ND (25)	ND (25)	ND (25)
F2 PHCs (C10-C16)	ug/g dry	100	150 ug/L	ND (100)	ND (100)	ND (100)
F3 PHCs (C16-C34)	ug/g dry	100	500 ug/L	ND (200)	ND (200)	ND (200)
F4 PHCs (C34-C50)	ug/g dry	100	500 ug/L	ND (200)	ND (200)	ND (200)

ND (0.5) No concentrations identified above the MDL
MDL Method Detection Limit

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
2 Robinson Avenue
Ottawa, Ontario

Prepared For

2 Robinson Property Limited Partnership

January 2019

Report: PE4528-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by 2 Robinson Property Limited Partnership to conduct a Phase II Environmental Site Assessment (ESA) at 2 Robinson Avenue, in the City of Ottawa, Ontario. Based on a historical research for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed. A geotechnical investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-BH12	General Coverage of the subject site for both environmental and geotechnical purposes.	Boreholes to be advanced through the fill material and into the native material. All boreholes advanced a minimum below the existing ground surface, unless otherwise discussed. Monitoring wells to be installed at six locations, depth and locations to be discussed during field program.

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

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed a plan with the borehole locations must be provided. Distances 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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 1

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	67.50		
		AU	1						
		SS	2	25	7	1	66.50		
		SS	3	83	8	2	65.50		
		SS	4	17	6				
FILL: Brown sandy silty with gravel.		SS	5	46	50+	3	64.50		
- some cobbles by 1.5m depth		SS	6	25	12	4	63.50		
		SS	7	58	15	5	62.50		
		SS	8	58	20				
6.25						6	61.50		
FILL: Black sand with coal, some organics		SS	9	83	29				
6.86						7	60.50		
		SS	10	92	25				
Compact, brown **SAND**		SS	11	92	27	8	59.50		
8.69									
		SS	12	100	29	9	58.50		
Compact, brown **SILTY SAND**									
9.60		SS	13	92	41				
GLACIAL TILL: Silty sand, some gravel and clay 9.75									
End of Borehole									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

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Ottawa, Ontario

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FILE NO. PE4528

REMARKS

HOLE NO. BH 2

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	67.25		
FILL : Brown sand some silt, gravel and clay		AU	1						
		SS	2	67	3	1	66.25		
		SS	3	42	5	2	65.25		
		SS	4	58	22				
3.20		SS	5	0	50+	3	64.25		
End of Borehole									
Practical refusal to augering @ 3.20m depth.									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

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FILE NO. PE4528

REMARKS

HOLE NO. BH 2A

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.20
FILL: Brown sand with silt, clay and gravel		SS	1		6	1	66.20
		SS	2	25	11	2	65.20
		SS	3	83	22	3	64.20
5.33						4	63.20
FILL: Coal 5.49		SS	4	17	26	5	62.20
FILL: Brown sand 6.10						6	61.20
FILL: Brown clayey silt with sand, some gravel 6.70		SS	5	46	48	7	60.20
		SS	6	25	50+	8	59.20
GLACIAL TILL: Very dense, brown silty sand to sandy silt, some gravel, trace clay		SS	7	58	73	9	58.20
		SS	8	58	59	10	57.20
		SS	9	83	50+		
		SS	10	92	95		
10.67							
Dynamic Cone Penetration Test commenced at 10.67m depth. Practical DCPT refusal at 11.48m depth.							
(GWL @ 3.35m - Feb. 22, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**
20 40 60 80

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 3

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	69.30		
		AU	1						
		SS	2	92	25	1	68.30		
		SS	3	100	19	2	67.30		
FILL: Brown silty sand, some gravel, trace clay		SS	4	75	5				
		SS	5	67	8	3	66.30		
		SS	6	67	4	4	65.30		
		SS	7	75	5	5	64.30		
		SS	8	75	38				
		SS	9	92	27	6	63.30		
6.65									
FILL: Coal 6.70									
FILL: Brown sand, silt and gravel		SS	10	83	51	7	62.30		
		SS	11	108	28	8	61.30		
8.38									
GLACIAL TILL: Dense, brown silty sand, some gravel, trace clay		SS	12	83	48	9	60.30		
		SS	13	92	38				
9.75									
End of Borehole									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 4

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.15		AU	1			0	67.80
		SS	2	58	10	1	66.80
		SS	3	75	5	2	65.80
FILL: Brown silty clay, some sand and gravel		SS	4	33	5	3	64.80
		SS	5	25	7	4	63.80
		SS	6	25	5	5	62.80
		SS	7	58	9		
5.33							
FILL: Coal 5.79		SS	8	100	16		
FILL: Brown sand 5.94						6	61.80
FILL: Coal 6.70		SS	9	100	56		
		SS	10	8	23	7	60.80
		SS	11	60	50+		
GLACIAL TILL: Very dense to dense, brown silty sand with gravel, cobbles and boulders		SS	12	83	87	8	59.80
		SS	13	75	54	9	58.80
		SS	14	83	40	10	57.80
10.67							
End of Borehole							
(GWL @ 9.55m - Feb. 22, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 5

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	66.60		
		AU	1						
FILL: Brown silty clay, some sand and gravel		SS	2	75	7	1	65.60		
		SS	3	75	6	2	64.60		
		SS	4	67	11				
3.05						3	63.60		
FILL: Brown sand with silt, clay and gravel		SS	5	58	10				
3.81									
FILL: Brown silty clay 4.11		SS	6	67	7	4	62.60		
FILL: Coal									
4.98		SS	7	75	24	5	61.60		
		SS	8	83	18				
		SS	9	83	53	6	60.60		
Compact to very dense, brown **SILTY SAND to SANDY SILT**		SS	10	78	85	7	59.60		
		SS	11	100	41	8	58.60		
		SS	12	92	67				
		SS	13	75	29	9	57.60		
9.75									
Dynamic Cone Penetration Test commenced at 9.75m depth. 10.21						10	56.60		
End of Borehole									
Practical DCPT refusal at 10.21m depth									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 6

BORINGS BY CME 75 Power Auger **DATE** February 7, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.08						0	66.00
FILL: Crushed stone 0.46		AU	1				
		SS	2	50	10	1	65.00
		SS	3	67	15	2	64.00
		SS	4	83	5		
FILL: Sand and silty clay, some gravel and cobbles		SS	5	50	38	3	63.00
		SS	6	75	13	4	62.00
		SS	7	67	24	5	61.00
		SS	8	96	50		
		SS	9	71	65	6	60.00
6.86							
		SS	10	79	53	7	59.00
Very dense to dense, brown **SILTY SAND,** some gravel, trace black sand		SS	11	83	32	8	58.00
		SS	12	79	31		
		SS	13	100	45	9	57.00
9.75							
End of Borehole							
(GWL @ 7.41m - Feb. 22, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 7

BORINGS BY CME 75 Power Auger **DATE** February 12, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.10		AU	1			0	65.50		
FILL: Brown silty sand with gravel		SS	2	54	7	1	64.50		
		SS	3	58	6	2	63.50		
		SS	4	46	18	3	62.50		
3.10		SS	5	54	3				
FILL: Brown silty sand, trace black sand and gravel		SS	6	88	10	4	61.50		
		SS	7	83	11	5	60.50		
		SS	8	79	25	6	59.50		
		SS	9	92	31	7	58.50		
7.47		SS	10	83	26				
Compact, brown **SILTY SAND**		SS	11	88	30	8	57.50		
		SS	12	88	29	9	56.50		
9.75		SS	13	0	29				
End of Borehole									

Lower Explosive Limit % scale: 20 40 60 80

RKI Eagle Rdg. (ppm) scale: 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 8

BORINGS BY CME 75 Power Auger **DATE** February 14, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
FILL: Brown silty sand, trace organics (0.18)		AU	1			0	62.75		
FILL: Brown silty sand		SS	2	42	18	1	61.75		
(2.13)		SS	3	83	18	2	60.75		
Compact, brown **SILTY SAND,** trace clay		SS	4	92	10	3	59.75		
		SS	5	63	12				
		SS	6	96	19	4	58.75		
(5.18)		SS	7	100	29	5	57.75		
End of Borehole									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH 9

BORINGS BY CME 75 Power Auger **DATE** February 14, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	61.40
FILL: Brown silty sand with gravel		AU	1				
		SS	2	46	12	1	60.40
		SS	3	63	19	2	59.40
2.18							
FILL: Brown silty sand with organics		SS	4	8	13		
		SS	5	17	8	3	58.40
3.68							
Compact to very dense, brown **SILTY SAND** with gravel		SS	6	50	11	4	57.40
		SS	7	38	11	5	56.40
		SS	8	75	22		
		SS	9	83	21	6	55.40
		SS	10	38	15	7	54.40
		SS	11	33	18	8	53.40
		SS	12	21	37	9	52.40
		SS	13	33	54		
9.75							
End of Borehole							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH10

BORINGS BY CME 75 Power Auger **DATE** February 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	62.40
		AU	1				
		SS	2	58	28	1	61.40
FILL: Brown silty sand with gravel		SS	3	75	13	2	60.40
		SS	4	88	7		
		SS	5	75	2	3	59.40
3.66							
		SS	6	71	6	4	58.40
PEAT		SS	7	38	46	5	57.40
		SS	8		27		
6.10						6	56.40
		SS	9	83	25		
Compact to very dense, brown **SANDY SILT**		SS	10	88	31	7	55.40
		SS	11	83	26	8	54.40
- some gravel by 8.4m depth		SS	12	96	59		
		SS	13	88	50	9	53.40
9.75							
End of Borehole							
(GWL @ 3.14m - Feb. 22, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH11

BORINGS BY CME 75 Power Auger **DATE** February 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	62.00
FILL: Brown silty sand, some gravel, trace clay, occasional cobbles and boulders		AU	1				
		SS	2	67	50+	1	61.00
1.52							
FILL: Grey silty clay, trace sand and gravel		SS	3	88	7	2	60.00
2.29							
FILL: Brown silty sand, some gravel		SS	4	79	39		
- trace organics by 3.0m depth		SS	5	83	24	3	59.00
3.81							
PEAT		SS	6	75	6	4	58.00
4.57							
Compact, brown **SILTY SAND to SANDY SILT,** trace gravel and clay		SS	7	13	24	5	57.00
		SS	8	83	50		
6.10						6	56.00
		SS	9	92	29		
		SS	10	88	15	7	55.00
Compact, brown **SANDY SILT**		SS	11	83	23		
- dense to very dense with some gravel by 8.4m depth		SS	12	79	34	8	54.00
		SS	13	96	56	9	53.00
9.75							
Dynamic Cone Penetration Test commenced at 9.75m depth.						10	52.00
10.64							
End of Borehole							
Practical refusal to DCPT @ 10.64m depth							
(GWL @ 3.60m - Feb. 22, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2 Robinson Avenue
Ottawa, Ontario

DATUM Approx. geodetic

FILE NO. PE4528

REMARKS

HOLE NO. BH12

BORINGS BY CME 75 Power Auger **DATE** February 15, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	61.25
		AU	1				
FILL: Brown silty sand, trace gravel, occasional cobbles and boulders		SS	2	100	50+	1	60.25
		SS	3	88	25	2	59.25
2.29							
FILL: Brown silty sand, some gravel, trace clay		SS	4	25	16	3	58.25
		SS	5	83	8		
3.81						4	57.25
		SS	6	100	10		
		SS	7	92	10	5	56.25
GLACIAL TILL: Brown silty clay, trace sand and gravel		SS	8	92	11		
		SS	9	83	10	6	55.25
		SS	10	88	9	7	54.25
		SS	11	83	10	8	53.25
		SS	12	58	16		
8.99							
End of Borehole							
(GWL @ 3.48m - Feb. 22, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

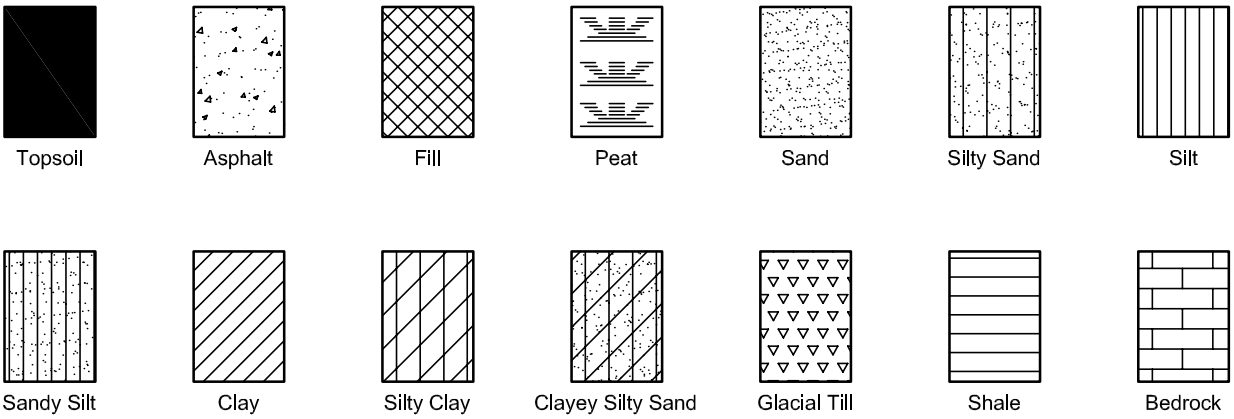
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

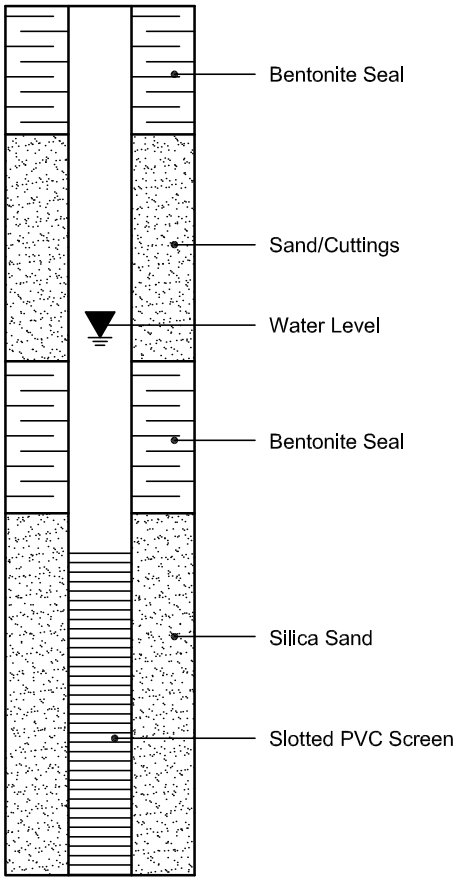
SYMBOLS AND TERMS (continued)

STRATA PLOT

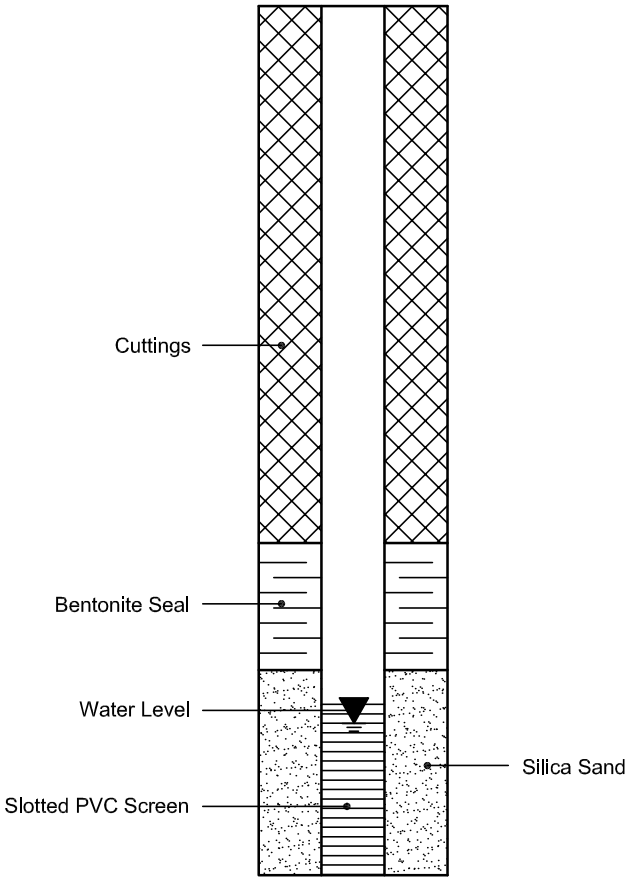


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25849
Project: PE4528
Custody: 118601

Report Date: 15-Feb-2019
Order Date: 11-Feb-2019

Order #: 1907121

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

Paracel ID	Client ID
1907121-01	BH1-SS9
1907121-02	BH2-SS4
1907121-03	BH3-SS9

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25849

Report Date: 15-Feb-2019
Order Date: 11-Feb-2019
Project Description: PE4528

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	11-Feb-19	13-Feb-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	11-Feb-19	14-Feb-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	13-Feb-19	13-Feb-19
PHC F1	CWS Tier 1 - P&T GC-FID	11-Feb-19	13-Feb-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	12-Feb-19	13-Feb-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	13-Feb-19	13-Feb-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	12-Feb-19	14-Feb-19
Solids, %	Gravimetric, calculation	15-Feb-19	15-Feb-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25849

Report Date: 15-Feb-2019

Order Date: 11-Feb-2019

Project Description: PE4528

	Client ID:	BH1-SS9	BH2-SS4	BH3-SS9	-
	Sample Date:	02/07/2019 09:00	02/08/2019 09:00	02/08/2019 09:00	-
	Sample ID:	1907121-01	1907121-02	1907121-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	86.9	91.3	90.9	-
Metals					
Antimony	1.0 ug/g dry	7.2	-	<1.0	-
Arsenic	1.0 ug/g dry	9.9	-	2.3	-
Barium	1.0 ug/g dry	153	-	89.0	-
Beryllium	0.5 ug/g dry	0.5	-	<0.5	-
Boron	5.0 ug/g dry	10.6	-	5.8	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	14.1	-	27.7	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	6.7	-	6.4	-
Copper	5.0 ug/g dry	43.9	-	21.9	-
Lead	1.0 ug/g dry	233	-	15.5	-
Mercury	0.1 ug/g dry	0.2	-	<0.1	-
Molybdenum	1.0 ug/g dry	2.0	-	<1.0	-
Nickel	5.0 ug/g dry	14.7	-	15.7	-
Selenium	1.0 ug/g dry	1.3	-	<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	20.3	-	35.3	-
Zinc	20.0 ug/g dry	75.5	-	42.8	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
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	-	-
Toluene-d8	Surrogate	-	99.0%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25849

Report Date: 15-Feb-2019

Order Date: 11-Feb-2019

Project Description: PE4528

	Client ID:	BH1-SS9	BH2-SS4	BH3-SS9	-
	Sample Date:	02/07/2019 09:00	02/08/2019 09:00	02/08/2019 09:00	-
	Sample ID:	1907121-01	1907121-02	1907121-03	-
	MDL/Units	Soil	Soil	Soil	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	0.04	-	0.14	-
Acenaphthylene	0.02 ug/g dry	0.09	-	<0.02	-
Anthracene	0.02 ug/g dry	0.08	-	0.21	-
Benzo [a] anthracene	0.02 ug/g dry	0.21	-	0.20	-
Benzo [a] pyrene	0.02 ug/g dry	0.22	-	0.24	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.32	-	0.21	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.19	-	0.21	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.12	-	0.10	-
Chrysene	0.02 ug/g dry	0.30	-	0.19	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.05	-	<0.02	-
Fluoranthene	0.02 ug/g dry	0.38	-	0.57	-
Fluorene	0.02 ug/g dry	0.07	-	0.12	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.14	-	0.13	-
1-Methylnaphthalene	0.02 ug/g dry	1.07	-	0.04	-
2-Methylnaphthalene	0.02 ug/g dry	1.61	-	0.05	-
Methylnaphthalene (1&2)	0.04 ug/g dry	2.68	-	0.10	-
Naphthalene	0.01 ug/g dry	0.93	-	0.08	-
Phenanthrene	0.02 ug/g dry	0.72	-	0.68	-
Pyrene	0.02 ug/g dry	0.41	-	0.52	-
2-Fluorobiphenyl	Surrogate	96.7%	-	79.3%	-
Terphenyl-d14	Surrogate	97.0%	-	102%	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25849

Report Date: 15-Feb-2019
Order Date: 11-Feb-2019
Project Description: PE4528

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.09*		*ug/g*		*82.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.17*		*ug/g*		*87.4*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.93*		*ug/g*		*99.1*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25849

Report Date: 15-Feb-2019
Order Date: 11-Feb-2019
Project Description: PE4528

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	6.0	1.0	ug/g dry	7.2			18.0	30	
Arsenic	10.1	1.0	ug/g dry	9.9			2.3	30	
Barium	148	1.0	ug/g dry	153			3.2	30	
Beryllium	0.7	0.5	ug/g dry	0.5			26.0	30	
Boron	10.1	5.0	ug/g dry	10.6			4.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g wet	ND				35	
Chromium	13.8	5.0	ug/g dry	14.1			2.8	30	
Cobalt	6.9	1.0	ug/g dry	6.7			3.0	30	
Copper	45.6	5.0	ug/g dry	43.9			3.9	30	
Lead	239	1.0	ug/g dry	233			2.5	30	
Mercury	0.128	0.1	ug/g dry	0.123			3.5	30	
Molybdenum	2.2	1.0	ug/g dry	2.0			6.9	30	
Nickel	15.0	5.0	ug/g dry	14.7			1.8	30	
Selenium	1.5	1.0	ug/g dry	1.3			16.2	30	
Silver	0.3	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	19.4	10.0	ug/g dry	20.3			4.6	30	
Zinc	78.4	20.0	ug/g dry	75.5			3.7	30	
Physical Characteristics									
% Solids	95.4	0.1	% by Wt.	95.4			0.0	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	0.048	0.02	ug/g dry	0.111			79.1	40	QR-01
Anthracene	0.061	0.02	ug/g dry	0.118			63.5	40	QR-01
Benzo [a] anthracene	0.128	0.02	ug/g dry	0.280			74.9	40	QR-01
Benzo [a] pyrene	0.175	0.02	ug/g dry	0.386			75.3	40	QR-01
Benzo [b] fluoranthene	0.139	0.02	ug/g dry	0.301			74.0	40	QR-01
Benzo [g,h,i] perylene	0.169	0.02	ug/g dry	0.361			72.5	40	QR-01
Benzo [k] fluoranthene	0.085	0.02	ug/g dry	0.143			51.3	40	QR-01
Chrysene	0.134	0.02	ug/g dry	0.301			76.9	40	QR-01
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	0.029			0.0	40	
Fluoranthene	0.343	0.02	ug/g dry	0.760			75.5	40	QR-01
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	0.118	0.02	ug/g dry	0.266			77.5	40	QR-01
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.142	0.02	ug/g dry	0.356			85.8	40	QR-01
Pyrene	0.448	0.02	ug/g dry	0.987			75.1	40	QR-01
Surrogate: 2-Fluorobiphenyl	*1.69*		*ug/g dry*		*96.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.82*		*ug/g dry*		*104*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*9.28*		*ug/g dry*		*100*	*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)	ND	7	ug/g			80-120			
F2 PHCs (C10-C16)	95	4	ug/g	ND	105	60-140			
F3 PHCs (C16-C34)	254	8	ug/g	ND	114	60-140			
F4 PHCs (C34-C50)	163	6	ug/g	ND	117	60-140			
Metals									
Antimony	52.8		ug/L	2.9	99.7	70-130			
Arsenic	56.2		ug/L	4.0	105	70-130			
Barium	142		ug/L	61.1	162	70-130			QM-07
Beryllium	53.9		ug/L	ND	107	70-130			
Boron	54.2		ug/L	ND	99.9	70-130			
Cadmium	52.0		ug/L	ND	104	70-130			
Chromium (VI)	0.1		mg/L	ND	74.0	70-130			
Chromium	57.0		ug/L	5.7	103	70-130			
Cobalt	51.7		ug/L	2.7	98.0	70-130			
Copper	67.4		ug/L	17.5	99.6	70-130			
Lead	178		ug/L	93.3	169	70-130			QM-07
Mercury	1.59	0.1	ug/g	0.123	97.6	70-130			
Molybdenum	51.2		ug/L	ND	101	70-130			
Nickel	58.7		ug/L	5.9	106	70-130			
Selenium	49.4		ug/L	ND	97.8	70-130			
Silver	48.6		ug/L	ND	97.0	70-130			
Thallium	48.9		ug/L	ND	97.7	70-130			
Uranium	50.5		ug/L	ND	101	70-130			
Vanadium	64.8		ug/L	ND	113	70-130			
Zinc	89.9		ug/L	30.2	119	70-130			
Semi-Volatiles									
Acenaphthene	0.242	0.02	ug/g	ND	111	50-140			
Acenaphthylene	0.282	0.02	ug/g	0.111	78.1	50-140			
Anthracene	0.288	0.02	ug/g	0.118	77.6	50-140			
Benzo [a] anthracene	0.154	0.02	ug/g		92.4	50-140			
Benzo [a] pyrene	0.186	0.02	ug/g		112	50-140			
Benzo [b] fluoranthene	0.463	0.02	ug/g	0.301	73.7	50-140			
Benzo [g,h,i] perylene	0.476	0.02	ug/g	0.361	52.9	50-140			
Benzo [k] fluoranthene	0.347	0.02	ug/g	0.143	92.8	50-140			
Chrysene	0.463	0.02	ug/g	0.301	74.1	50-140			
Dibenzo [a,h] anthracene	0.296	0.02	ug/g	0.029	122	50-140			
Fluoranthene	0.162	0.02	ug/g		97.0	50-140			
Fluorene	0.232	0.02	ug/g	ND	106	50-140			
Indeno [1,2,3-cd] pyrene	0.384	0.02	ug/g	0.266	53.9	50-140			
1-Methylnaphthalene	0.194	0.02	ug/g	ND	88.6	50-140			
2-Methylnaphthalene	0.217	0.02	ug/g	ND	99.0	50-140			
Naphthalene	0.203	0.01	ug/g	ND	92.8	50-140			
Phenanthrene	0.161	0.02	ug/g		96.3	50-140			
Pyrene	0.162	0.02	ug/g		97.4	50-140			
Surrogate: 2-Fluorobiphenyl	*1.46*		*ug/g*		*83.5*	*50-140*			
Volatiles									
Benzene	4.55	0.02	ug/g		114	60-130			
Ethylbenzene	3.33	0.05	ug/g		83.3	60-130			
Toluene	3.16	0.05	ug/g		79.1	60-130			
m,p-Xylenes	6.73	0.05	ug/g		84.1	60-130			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25849

Report Date: 15-Feb-2019
Order Date: 11-Feb-2019
Project Description: PE4528

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	3.33	0.05	ug/g		83.3	60-130			

Qualifier Notes:

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

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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Chain of Custody
(Lab Use Only)
№ 118601

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4528	**Turnaround Time:**
Contact Name: MIKE BEAUDOIN	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 25849 asper Michael B. KV	☐ 2 Day ~~☐ Regular~~
Telephone: 613-226-7381	Email Address: mbeaudoin@patersongroup.ca	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: 1907121

	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-SS9	S		1	Feb 7/19				X	X	X	X								
2	BH2-SS4	S		2	Feb 8/19		X								12oz					
3	BH3-SS9	S		1	Feb 8/19				X	X	X	X								
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Krouse	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B	Date/Time: 11/02/19 4:10 PM	Date/Time: Feb 11/19 5:15	Date/Time: 02/12/19 9:30 am
Date/Time:	Temperature: °C	Temperature: 21.4 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25959
Project: PE4528
Custody: 118604

Report Date: 20-Feb-2019
Order Date: 13-Feb-2019

Order #: 1907253

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

Paracel ID	Client ID
1907253-01	BH4-SS8
1907253-02	BH5-SS7
1907253-03	BH6-SS5
1907253-04	BH7-SS5

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25959

Report Date: 20-Feb-2019
Order Date: 13-Feb-2019
Project Description: PE4528

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	14-Feb-19	15-Feb-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	14-Feb-19	15-Feb-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	14-Feb-19	15-Feb-19
PHC F1	CWS Tier 1 - P&T GC-FID	14-Feb-19	15-Feb-19
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	19-Feb-19	19-Feb-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	14-Feb-19	17-Feb-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	19-Feb-19	20-Feb-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	14-Feb-19	19-Feb-19
Solids, %	Gravimetric, calculation	19-Feb-19	19-Feb-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25959

Report Date: 20-Feb-2019

Order Date: 13-Feb-2019

Project Description: PE4528

	Client ID:	BH4-SS8	BH5-SS7	BH6-SS5	BH7-SS5
	Sample Date:	02/11/2019 09:00	02/11/2019 09:00	02/12/2019 09:00	02/12/2019 09:00
	Sample ID:	1907253-01	1907253-02	1907253-03	1907253-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	86.3	85.4	91.1	86.4
Metals					
Antimony	1.0 ug/g dry	1.3	<1.0	-	<1.0
Arsenic	1.0 ug/g dry	9.7	18.1	-	4.1
Barium	1.0 ug/g dry	136	35.1	-	139
Beryllium	0.5 ug/g dry	<0.5	<0.5	-	<0.5
Boron	5.0 ug/g dry	7.1	<5.0	-	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	<0.5
Chromium	5.0 ug/g dry	37.3	16.8	-	42.5
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	<0.2
Cobalt	1.0 ug/g dry	8.2	2.6	-	9.4
Copper	5.0 ug/g dry	34.8	39.8	-	20.1
Lead	1.0 ug/g dry	153	14.6	-	45.4
Mercury	0.1 ug/g dry	0.2	<0.1	-	<0.1
Molybdenum	1.0 ug/g dry	1.4	<1.0	-	<1.0
Nickel	5.0 ug/g dry	24.5	8.6	-	24.1
Selenium	1.0 ug/g dry	<1.0	1.2	-	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	-	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	-	<1.0
Uranium	1.0 ug/g dry	<1.0	1.2	-	<1.0
Vanadium	10.0 ug/g dry	41.5	21.4	-	43.4
Zinc	20.0 ug/g dry	124	24.6	-	66.3
Volatiles					
Benzene	0.02 ug/g dry	-	-	<0.02	-
Ethylbenzene	0.05 ug/g dry	-	-	<0.05	-
Toluene	0.05 ug/g dry	-	-	<0.05	-
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	-
Toluene-d8	Surrogate	-	-	99.4%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	-	-	10	-
F3 PHCs (C16-C34)	8 ug/g dry	-	-	65	-
F4 PHCs (C34-C50)	6 ug/g dry	-	-	145 [2]	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25959

Report Date: 20-Feb-2019

Order Date: 13-Feb-2019

Project Description: PE4528

	Client ID:	BH4-SS8	BH5-SS7	BH6-SS5	BH7-SS5
	Sample Date:	02/11/2019 09:00	02/11/2019 09:00	02/12/2019 09:00	02/12/2019 09:00
	Sample ID:	1907253-01	1907253-02	1907253-03	1907253-04
	MDL/Units	Soil	Soil	Soil	Soil
F4G PHCs (gravimetric)	50 ug/g dry	-	-	1130	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	0.08	0.26	-	0.11
Acenaphthylene	0.02 ug/g dry	0.11	0.29	-	0.10
Anthracene	0.02 ug/g dry	0.22	0.59	-	0.09
Benzo [a] anthracene	0.02 ug/g dry	0.42	0.86	-	0.28
Benzo [a] pyrene	0.02 ug/g dry	0.50	0.69	-	0.24
Benzo [b] fluoranthene	0.02 ug/g dry	0.67	0.81	-	0.28
Benzo [g,h,i] perylene	0.02 ug/g dry	0.36	0.42	-	0.23
Benzo [k] fluoranthene	0.02 ug/g dry	0.40	0.35	-	0.10
Chrysene	0.02 ug/g dry	0.48	0.99	-	0.32
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.09	0.19	-	0.06
Fluoranthene	0.02 ug/g dry	0.87	1.50	-	0.37
Fluorene	0.02 ug/g dry	0.10	0.40	-	0.12
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.30	0.31	-	0.11
1-Methylnaphthalene	0.02 ug/g dry	1.36	10.2	-	3.67
2-Methylnaphthalene	0.02 ug/g dry	1.96	15.5	-	5.70
Methylnaphthalene (1&2)	0.04 ug/g dry	3.32	25.7	-	9.38
Naphthalene	0.01 ug/g dry	1.39	11.1	-	4.16
Phenanthrene	0.02 ug/g dry	1.05	3.76	-	1.30
Pyrene	0.02 ug/g dry	0.78	1.42	-	0.41
2-Fluorobiphenyl	Surrogate	105%	107%	-	103%
Terphenyl-d14	Surrogate	94.3%	90.5%	-	86.0%

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25959

Report Date: 20-Feb-2019
Order Date: 13-Feb-2019
Project Description: PE4528

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.29*		*ug/g*		*97.0*	*50-140*			
Surrogate: Terphenyl-d14	*1.48*		*ug/g*		*111*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.79*		*ug/g*		*97.4*	*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)	13	4	ug/g dry	14			4.5	30	
F3 PHCs (C16-C34)	19	8	ug/g dry	25			30.3	30	QR-01
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			0.0	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	2.0	1.0	ug/g dry	1.8			7.7	30	
Barium	32.1	1.0	ug/g dry	32.9			2.3	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	5.3	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	13.3	5.0	ug/g dry	12.2			8.4	30	
Cobalt	3.7	1.0	ug/g dry	3.7			1.9	30	
Copper	8.8	5.0	ug/g dry	8.7			1.1	30	
Lead	11.7	1.0	ug/g dry	10.0			15.6	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	8.2	5.0	ug/g dry	7.9			3.6	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	18.7	10.0	ug/g dry	19.1			2.4	30	
Zinc	35.3	20.0	ug/g dry	44.1			22.1	30	
Physical Characteristics									
% Solids	90.7	0.1	% by Wt.	91.9			1.4	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND				40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND				40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND				40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND				40	
Surrogate: 2-Fluorobiphenyl	*1.70*		*ug/g dry*		*98.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.85*		*ug/g dry*		*108*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*9.46*		*ug/g dry*		*97.5*	*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)	180	7	ug/g		90.1	80-120			
F2 PHCs (C10-C16)	90	4	ug/g	14	86.5	60-140			
F3 PHCs (C16-C34)	232	8	ug/g	25	95.7	60-140			
F4 PHCs (C34-C50)	137	6	ug/g	ND	100	60-140			
F4G PHCs (gravimetric)	1000	50	ug/g		100	80-120			
Metals									
Antimony	41.5		ug/L	ND	82.8	70-130			
Arsenic	45.1		ug/L	ND	88.8	70-130			
Barium	57.9		ug/L	13.1	89.5	70-130			
Beryllium	45.4		ug/L	ND	90.6	70-130			
Boron	40.7		ug/L	ND	77.7	70-130			
Cadmium	45.1		ug/L	ND	90.1	70-130			
Chromium (VI)	3.7	0.2	ug/g		73.5	70-130			
Chromium	51.4		ug/L	ND	93.1	70-130			
Cobalt	42.9		ug/L	1.5	82.9	70-130			
Copper	48.0		ug/L	ND	89.1	70-130			
Lead	43.7		ug/L	4.0	79.4	70-130			
Mercury	1.57	0.1	ug/g	ND	105	70-130			
Molybdenum	44.3		ug/L	ND	88.4	70-130			
Nickel	48.6		ug/L	ND	90.9	70-130			
Selenium	44.4		ug/L	ND	88.6	70-130			
Silver	38.7		ug/L	ND	77.3	70-130			
Thallium	41.6		ug/L	ND	83.1	70-130			
Uranium	43.0		ug/L	ND	85.6	70-130			
Vanadium	53.2		ug/L	ND	91.0	70-130			
Zinc	59.4		ug/L	ND	83.6	70-130			
Semi-Volatiles									
Acenaphthene	0.260	0.02	ug/g	ND	121	50-140			
Acenaphthylene	0.233	0.02	ug/g	ND	108	50-140			
Anthracene	0.225	0.02	ug/g	ND	105	50-140			
Benzo [a] anthracene	0.214	0.02	ug/g	ND	99.9	50-140			
Benzo [a] pyrene	0.245	0.02	ug/g	ND	114	50-140			
Benzo [b] fluoranthene	0.248	0.02	ug/g	ND	115	50-140			
Benzo [g,h,i] perylene	0.248	0.02	ug/g	ND	116	50-140			
Benzo [k] fluoranthene	0.227	0.02	ug/g	ND	106	50-140			
Chrysene	0.247	0.02	ug/g	ND	115	50-140			
Dibenzo [a,h] anthracene	0.234	0.02	ug/g	ND	109	50-140			
Fluoranthene	0.217	0.02	ug/g	ND	101	50-140			
Fluorene	0.235	0.02	ug/g	ND	110	50-140			
Indeno [1,2,3-cd] pyrene	0.218	0.02	ug/g	ND	102	50-140			
1-Methylnaphthalene	0.222	0.02	ug/g	ND	104	50-140			
2-Methylnaphthalene	0.240	0.02	ug/g	ND	112	50-140			
Naphthalene	0.238	0.01	ug/g	ND	111	50-140			
Phenanthrene	0.214	0.02	ug/g	ND	99.8	50-140			
Pyrene	0.219	0.02	ug/g	ND	102	50-140			
Surrogate: 2-Fluorobiphenyl	*1.82*		*ug/g*		*106*	*50-140*			
Volatiles									
Benzene	4.36	0.02	ug/g		109	60-130			
Ethylbenzene	3.50	0.05	ug/g		87.6	60-130			
Toluene	3.39	0.05	ug/g		84.7	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	6.96	0.05	ug/g		87.1	60-130			
o-Xylene	3.50	0.05	ug/g		87.5	60-130			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH7-SS5

Sample Qualifiers :

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

QC Qualifiers :

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1907253

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Chain of Custody
(Lab Use Only)
№ 118604

Page 1 of 1

Client Name: Paterson	Project Reference: PE4528	**Turnaround Time:**
Contact Name: Mike Beaudoin	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 25959	☐ 2 Day ☒ ~~Regular~~
Telephone: 613-226-7381	Email Address: mbeaudoin@patersongroup.ca	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: 1907253

	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	BH4-SS8	1		5	Feb 11/19				X	X	X	X								✓
2	BH5-SS7	1		5	Feb 11/19				X	X	X	X								✓
3	BH6-SS5	2		5	Feb 12/19		X											120 uL		✓
4	BH7-SS5	1		5	Feb 12/19				X	X	X	X								✓
5																				
6																				
7																				
8																				
9																				
10																				

Comments: #4 jar reads BH7-SS8 on the jar. KW
Heptane 555 per mike. RM

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot: 1413	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B.	Date/Time:	Date/Time: 02/13/19 1:50 pm	Date/Time: 02/13/19 2:17 pm
Date/Time:	Temperature: °C	Temperature: 8.7 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25961
Project: PE4528
Custody: 118605

Report Date: 25-Feb-2019
Order Date: 19-Feb-2019

Order #: 1908167

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

Paracel ID	Client ID
1908167-01	BH8-SS3
1908167-02	BH9-SS3
1908167-03	BH10-SS5
1908167-04	BH11-SS5
1908167-05	BH12-SS4

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 25-Feb-2019

Client: Paterson Group Consulting Engineers

Order Date: 19-Feb-2019

Client PO: 25961

Project Description: PE4528

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	16-Feb-19	21-Feb-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	25-Feb-19	25-Feb-19
PHC F1	CWS Tier 1 - P&T GC-FID	21-Feb-19	22-Feb-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	20-Feb-19	21-Feb-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	22-Feb-19	22-Feb-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	20-Feb-19	23-Feb-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	21-Feb-19	22-Feb-19
Solids, %	Gravimetric, calculation	25-Feb-19	25-Feb-19

Certificate of Analysis

Report Date: 25-Feb-2019

Client: Paterson Group Consulting Engineers

Order Date: 19-Feb-2019

Client PO: 25961

Project Description: PE4528

	Client ID:	BH8-SS3	BH9-SS3	BH10-SS5	BH11-SS5
	Sample Date:	02/14/2019 00:00	02/14/2019 00:00	02/14/2019 00:00	02/15/2019 00:00
	Sample ID:	1908167-01	1908167-02	1908167-03	1908167-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	86.0	87.3	79.0	85.4
Metals					
Antimony	1.0 ug/g dry	<1.0	2.2	1.6	-
Arsenic	1.0 ug/g dry	3.5	16.2	9.0	-
Barium	1.0 ug/g dry	83.1	144	71.8	-
Beryllium	0.5 ug/g dry	<0.5	0.6	<0.5	-
Boron	5.0 ug/g dry	11.2	9.7	7.2	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	15.6	17.4	20.4	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	8.1	10.4	5.7	-
Copper	5.0 ug/g dry	17.5	31.2	17.8	-
Lead	1.0 ug/g dry	5.9	43.1	38.4	-
Mercury	0.1 ug/g dry	<0.1	0.1	0.2	-
Molybdenum	1.0 ug/g dry	1.0	3.3	1.2	-
Nickel	5.0 ug/g dry	18.0	24.2	13.6	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	26.7	25.8	28.6	-
Zinc	20.0 ug/g dry	32.4	52.5	57.0	-
Volatiles					
Acetone	0.50 ug/g dry	-	-	-	<0.50
Benzene	0.02 ug/g dry	-	-	-	0.14
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

Certificate of Analysis

Report Date: 25-Feb-2019

Client: Paterson Group Consulting Engineers

Order Date: 19-Feb-2019

Client PO: 25961

Project Description: PE4528

	Client ID:	BH8-SS3	BH9-SS3	BH10-SS5	BH11-SS5
	Sample Date:	02/14/2019 00:00	02/14/2019 00:00	02/14/2019 00:00	02/15/2019 00:00
	Sample ID:	1908167-01	1908167-02	1908167-03	1908167-04
	MDL/Units	Soil	Soil	Soil	Soil
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 (dibromoethane, 1	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	-	-	-	0.65
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	-	-	-	0.17
o-Xylene	0.05 ug/g dry	-	-	-	0.10
Xylenes, total	0.05 ug/g dry	-	-	-	0.27
4-Bromofluorobenzene	Surrogate	-	-	-	107%
Dibromofluoromethane	Surrogate	-	-	-	77.9%
Toluene-d8	Surrogate	-	-	-	122%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	-	<4

Certificate of Analysis

Report Date: 25-Feb-2019

Client: Paterson Group Consulting Engineers

Order Date: 19-Feb-2019

Client PO: 25961

Project Description: PE4528

	Client ID:	BH8-SS3	BH9-SS3	BH10-SS5	BH11-SS5
	Sample Date:	02/14/2019 00:00	02/14/2019 00:00	02/14/2019 00:00	02/15/2019 00:00
	Sample ID:	1908167-01	1908167-02	1908167-03	1908167-04
	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	-	-	-	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	-	-	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	0.08	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	0.11	<0.02	-
Anthracene	0.02 ug/g dry	<0.02	0.15	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	0.07	0.25	<0.02	-
Benzo [a] pyrene	0.02 ug/g dry	0.13	0.22	<0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.14	0.32	0.02	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.11	0.18	0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.06	0.12	<0.02	-
Chrysene	0.02 ug/g dry	0.08	0.33	<0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	0.05	<0.02	-
Fluoranthene	0.02 ug/g dry	0.11	0.40	0.02	-
Fluorene	0.02 ug/g dry	<0.02	0.11	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.09	0.13	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	3.23	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	4.85	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	8.08	<0.04	-
Naphthalene	0.01 ug/g dry	0.02	3.77	<0.01	-
Phenanthrene	0.02 ug/g dry	0.04	1.23	<0.02	-
Pyrene	0.02 ug/g dry	0.11	0.41	0.02	-
2-Fluorobiphenyl	Surrogate	92.7%	111%	108%	-
Terphenyl-d14	Surrogate	89.1%	94.5%	101%	-

Certificate of Analysis

Report Date: 25-Feb-2019

Client: Paterson Group Consulting Engineers

Order Date: 19-Feb-2019

Client PO: 25961

Project Description: PE4528

	Client ID:	BH12-SS4	-	-	-
	Sample Date:	02/15/2019 00:00	-	-	-
	Sample ID:	1908167-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.1	-	-	-
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	-	-	-
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 (dibromoethane, 1	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	-	-	-

Certificate of Analysis

Report Date: 25-Feb-2019

Client: Paterson Group Consulting Engineers

Order Date: 19-Feb-2019

Client PO: 25961

Project Description: PE4528

	Client ID:	BH12-SS4	-	-	-
	Sample Date:	02/15/2019 00:00	-	-	-
	Sample ID:	1908167-05	-	-	-
	MDL/Units	Soil	-	-	-
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	127%	-	-	-
Dibromofluoromethane	Surrogate	98.2%	-	-	-
Toluene-d8	Surrogate	124%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	5	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	143	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	95	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.22*		*ug/g*		*91.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.11*		*ug/g*		*83.4*	*50-140*			
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						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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, 1,2	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	*4.20*		*ug/g*		*131*	*50-140*			
Surrogate: Dibromofluoromethane	*2.17*		*ug/g*		*67.7*	*50-140*			
Surrogate: Toluene-d8	*3.88*		*ug/g*		*121*	*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	
Metals									
Antimony	1.2	1.0	ug/g dry	ND			0.0	30	
Arsenic	8.4	1.0	ug/g dry	8.0			4.3	30	
Barium	293	1.0	ug/g dry	276			6.1	30	
Beryllium	0.8	0.5	ug/g dry	ND			0.0	30	
Boron	17.9	5.0	ug/g dry	15.8			12.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	17.2	5.0	ug/g dry	16.5			3.8	30	
Cobalt	5.6	1.0	ug/g dry	5.4			3.9	30	
Copper	15.8	5.0	ug/g dry	15.2			3.8	30	
Lead	12.2	1.0	ug/g dry	12.6			3.0	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	2.7	1.0	ug/g dry	2.4			11.4	30	
Nickel	16.9	5.0	ug/g dry	16.6			2.2	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	1.6	1.0	ug/g dry	1.5			6.4	30	
Vanadium	28.0	10.0	ug/g dry	27.6			1.4	30	
Zinc	59.7	20.0	ug/g dry	56.7			5.3	30	
Physical Characteristics									
% Solids	85.0	0.1	% by Wt.	84.6			0.5	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND				40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND				40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND				40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND				40	
Surrogate: 2-Fluorobiphenyl	*1.39*		*ug/g dry*		*98.4*	*50-140*			
Surrogate: Terphenyl-d14	*1.38*		*ug/g dry*		*97.5*	*50-140*			
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	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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, 1,2-	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	*5.29*		*ug/g dry*		*137*	*50-140*			
Surrogate: Dibromofluoromethane	*2.69*		*ug/g dry*		*69.7*	*50-140*			
Surrogate: Toluene-d8	*4.49*		*ug/g dry*		*116*	*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)	183	7	ug/g		91.3	80-120			
F2 PHCs (C10-C16)	115	4	ug/g	ND	121	60-140			
F3 PHCs (C16-C34)	274	8	ug/g	ND	118	60-140			
F4 PHCs (C34-C50)	166	6	ug/g	ND	113	60-140			
Metals									
Antimony	52.4		ug/L	ND	105	70-130			
Arsenic	63.5		ug/L	3.2	121	70-130			
Barium	165		ug/L	110	109	70-130			
Beryllium	66.4		ug/L	ND	132	70-130			QM-07
Boron	62.8		ug/L	6.3	113	70-130			
Cadmium	57.2		ug/L	ND	114	70-130			
Chromium (VI)	3.5	0.2	ug/g		70.5	70-130			
Chromium	64.4		ug/L	6.6	116	70-130			
Cobalt	57.9		ug/L	2.2	111	70-130			
Copper	60.2		ug/L	6.1	108	70-130			
Lead	54.2		ug/L	5.0	98.4	70-130			
Mercury	1.70	0.1	ug/g	ND	113	70-130			
Molybdenum	57.9		ug/L	1.0	114	70-130			
Nickel	67.0		ug/L	6.6	121	70-130			
Selenium	63.9		ug/L	ND	128	70-130			
Silver	47.4		ug/L	ND	94.8	70-130			
Thallium	52.4		ug/L	ND	105	70-130			
Uranium	52.9		ug/L	ND	105	70-130			
Vanadium	73.6		ug/L	11.0	125	70-130			
Zinc	79.1		ug/L	22.7	113	70-130			
Semi-Volatiles									
Acenaphthene	0.184	0.02	ug/g	ND	104	50-140			
Acenaphthylene	0.161	0.02	ug/g	ND	91.1	50-140			
Anthracene	0.163	0.02	ug/g	ND	92.1	50-140			
Benzo [a] anthracene	0.158	0.02	ug/g	ND	89.6	50-140			
Benzo [a] pyrene	0.191	0.02	ug/g	ND	108	50-140			
Benzo [b] fluoranthene	0.203	0.02	ug/g	ND	115	50-140			
Benzo [g,h,i] perylene	0.218	0.02	ug/g	ND	123	50-140			
Benzo [k] fluoranthene	0.164	0.02	ug/g	ND	93.1	50-140			
Chrysene	0.186	0.02	ug/g	ND	105	50-140			
Dibenzo [a,h] anthracene	0.197	0.02	ug/g	ND	111	50-140			
Fluoranthene	0.167	0.02	ug/g	ND	94.6	50-140			
Fluorene	0.157	0.02	ug/g	ND	88.9	50-140			
Indeno [1,2,3-cd] pyrene	0.196	0.02	ug/g	ND	111	50-140			
1-Methylnaphthalene	0.134	0.02	ug/g	ND	75.7	50-140			
2-Methylnaphthalene	0.151	0.02	ug/g	ND	85.7	50-140			
Naphthalene	0.165	0.01	ug/g	ND	93.2	50-140			
Phenanthrene	0.165	0.02	ug/g	ND	93.6	50-140			
Pyrene	0.166	0.02	ug/g	ND	93.7	50-140			
Surrogate: 2-Fluorobiphenyl	*1.21*		*ug/g*		*85.9*	*50-140*			
Volatiles									
Acetone	12.6	0.50	ug/g		126	50-140			
Benzene	3.34	0.02	ug/g		83.5	60-130			
Bromodichloromethane	3.22	0.05	ug/g		80.6	60-130			
Bromoform	4.26	0.05	ug/g		107	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromomethane	2.67	0.05	ug/g		66.8	50-140			
Carbon Tetrachloride	3.20	0.05	ug/g		80.0	60-130			
Chlorobenzene	3.76	0.05	ug/g		94.1	60-130			
Chloroform	3.17	0.05	ug/g		79.2	60-130			
Dibromochloromethane	4.03	0.05	ug/g		101	60-130			
Dichlorodifluoromethane	3.01	0.05	ug/g		75.3	50-140			
1,2-Dichlorobenzene	3.74	0.05	ug/g		93.4	60-130			
1,3-Dichlorobenzene	3.86	0.05	ug/g		96.6	60-130			
1,4-Dichlorobenzene	3.53	0.05	ug/g		88.3	60-130			
1,1-Dichloroethane	3.32	0.05	ug/g		83.0	60-130			
1,2-Dichloroethane	3.62	0.05	ug/g		90.4	60-130			
1,1-Dichloroethylene	2.93	0.05	ug/g		73.4	60-130			
cis-1,2-Dichloroethylene	3.08	0.05	ug/g		76.9	60-130			
trans-1,2-Dichloroethylene	2.95	0.05	ug/g		73.8	60-130			
1,2-Dichloropropane	3.45	0.05	ug/g		86.2	60-130			
cis-1,3-Dichloropropylene	3.34	0.05	ug/g		83.4	60-130			
trans-1,3-Dichloropropylene	3.39	0.05	ug/g		84.8	60-130			
Ethylbenzene	3.48	0.05	ug/g		87.1	60-130			
Ethylene dibromide (dibromoethane, 1,2-	4.30	0.05	ug/g		107	60-130			
Hexane	3.27	0.05	ug/g		81.6	60-130			
Methyl Ethyl Ketone (2-Butanone)	11.8	0.50	ug/g		118	50-140			
Methyl Isobutyl Ketone	12.4	0.50	ug/g		124	50-140			
Methyl tert-butyl ether	8.34	0.05	ug/g		83.4	50-140			
Methylene Chloride	2.89	0.05	ug/g		72.2	60-130			
Styrene	4.11	0.05	ug/g		103	60-130			
1,1,1,2-Tetrachloroethane	3.91	0.05	ug/g		97.9	60-130			
1,1,2,2-Tetrachloroethane	4.55	0.05	ug/g		114	60-130			
Tetrachloroethylene	3.90	0.05	ug/g		97.6	60-130			
Toluene	3.87	0.05	ug/g		96.8	60-130			
1,1,1-Trichloroethane	3.20	0.05	ug/g		80.1	60-130			
1,1,2-Trichloroethane	3.64	0.05	ug/g		91.1	60-130			
Trichloroethylene	3.30	0.05	ug/g		82.4	60-130			
Trichlorofluoromethane	2.61	0.05	ug/g		65.3	50-140			
Vinyl chloride	3.22	0.02	ug/g		80.4	50-140			
m,p-Xylenes	8.52	0.05	ug/g		107	60-130			
o-Xylene	4.20	0.05	ug/g		105	60-130			

Qualifier Notes:

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1908167

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Page 1 of 1

Client Name: PATERSON	Project Reference: PE4528
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 COLONNADE	PO # 25961
Telephone: 613-226-7381	Email Address: mbeaudoin@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: 1908167

	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	BH8-SS3	S		1	Feb 14/19				X	X	X	X					250			
2	BH9-SS3	S		1	↓				X	X	X	X					↓			
3	BH10-SS5	S		1	↓				X	X	X	X					250 + vial			
4	BH11-SS5	S		4	Feb 15/19		X	X									120 one trial			
5	BH12-SS4	S		4	↓		X	X												
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel.

Relinquished By (Sign):	Received by Driver/Depot: A. DeLuise	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B	Date/Time: 19/02/19 3:45 PM	Date/Time: Feb 19/19 4:40 p	Date/Time: Feb 20/19 9:50a
Date/Time:	Temperature: °C	Temperature: 16.1 °C	pH Verified [ ] By: N/A

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25973
Project: PE4528
Custody: 118608

Report Date: 5-Mar-2019
Order Date: 27-Feb-2019

Order #: 1909325

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

Paracel ID	Client ID
1909325-01	BH2-GW1
1909325-02	BH4-GW1
1909325-03	BH6-GW1
1909325-04	BH10-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25973

Report Date: 05-Mar-2019
Order Date: 27-Feb-2019
Project Description: PE4528

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	28-Feb-19	28-Feb-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	28-Feb-19	28-Feb-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	4-Mar-19	4-Mar-19
PHC F1	CWS Tier 1 - P&T GC-FID	4-Mar-19	5-Mar-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	1-Mar-19	2-Mar-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	28-Feb-19	1-Mar-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	4-Mar-19	5-Mar-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25973

Report Date: 05-Mar-2019

Order Date: 27-Feb-2019

Project Description: PE4528

	Client ID:	BH2-GW1	BH4-GW1	BH6-GW1	BH10-GW1
	Sample Date:	02/22/2019 09:00	02/22/2019 09:00	02/22/2019 09:00	02/22/2019 09:00
	Sample ID:	1909325-01	1909325-02	1909325-03	1909325-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	-	<0.1	-	-
Antimony	0.5 ug/L	-	<0.5	-	-
Arsenic	1 ug/L	-	4	-	-
Barium	1 ug/L	-	52	-	-
Beryllium	0.5 ug/L	-	<0.5	-	-
Boron	10 ug/L	-	65	-	-
Cadmium	0.1 ug/L	-	0.3	-	-
Chromium	1 ug/L	-	14	-	-
Chromium (VI)	10 ug/L	-	<10	-	-
Cobalt	0.5 ug/L	-	14.5	-	-
Copper	0.5 ug/L	-	19.0	-	-
Lead	0.1 ug/L	-	7.2	-	-
Molybdenum	0.5 ug/L	-	1.9	-	-
Nickel	1 ug/L	-	40	-	-
Selenium	1 ug/L	-	2	-	-
Silver	0.1 ug/L	-	<0.1	-	-
Sodium	200 ug/L	-	356000	-	-
Thallium	0.1 ug/L	-	0.2	-	-
Uranium	0.1 ug/L	-	10.1	-	-
Vanadium	0.5 ug/L	-	15.9	-	-
Zinc	5 ug/L	-	34	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	-	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	-	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25973

Report Date: 05-Mar-2019

Order Date: 27-Feb-2019

Project Description: PE4528

	Client ID:	BH2-GW1	BH4-GW1	BH6-GW1	BH10-GW1
	Sample Date:	02/22/2019 09:00	02/22/2019 09:00	02/22/2019 09:00	02/22/2019 09:00
	Sample ID:	1909325-01	1909325-02	1909325-03	1909325-04
	MDL/Units	Water	Water	Water	Water
1,1-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	-	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	-	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	-	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	115%	-	109%	123%
Dibromofluoromethane	Surrogate	99.3%	-	99.0%	95.6%
Toluene-d8	Surrogate	106%	-	105%	107%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	<25	<25
F2 PHCs (C10-C16)	100 ug/L	-	-	<100	<100
F3 PHCs (C16-C34)	100 ug/L	-	-	<100	<100

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25973

Report Date: 05-Mar-2019

Order Date: 27-Feb-2019

Project Description: PE4528

	Client ID:	BH2-GW1	BH4-GW1	BH6-GW1	BH10-GW1
	Sample Date:	02/22/2019 09:00	02/22/2019 09:00	02/22/2019 09:00	02/22/2019 09:00
	Sample ID:	1909325-01	1909325-02	1909325-03	1909325-04
	MDL/Units	Water	Water	Water	Water
F4 PHCs (C34-C50)	100 ug/L	-	-	<100	<100
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Chrysene	0.05 ug/L	<0.05	<0.05	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	<0.01	<0.01	<0.01	-
Fluorene	0.05 ug/L	<0.05	<0.05	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	<0.05	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	<0.10	-
Naphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	<0.05	-
Pyrene	0.01 ug/L	<0.01	<0.01	<0.01	-
2-Fluorobiphenyl	Surrogate	83.5%	88.7%	91.7%	-
Terphenyl-d14	Surrogate	87.5%	102%	89.7%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*18.5*		*ug/L*		*92.3*	*50-140*			
Surrogate: Terphenyl-d14	*20.3*		*ug/L*		*101*	*50-140*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25973

Report Date: 05-Mar-2019
Order Date: 27-Feb-2019
Project Description: PE4528

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*93.8*		*ug/L*		*117*	*50-140*			
Surrogate: Dibromofluoromethane	*78.9*		*ug/L*		*98.6*	*50-140*			
Surrogate: Toluene-d8	*82.7*		*ug/L*		*103*	*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	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	24.6	1	ug/L	24.1			1.9	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	25	10	ug/L	24			5.3	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	0.92	0.5	ug/L	0.89			3.3	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	1.27	0.5	ug/L	1.19			6.5	20	
Nickel	ND	1	ug/L	ND			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	18300	200	ug/L	17900			2.4	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	8	5	ug/L	8			0.1	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	2.46	0.5	ug/L	3.22			26.8	30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25973

Report Date: 05-Mar-2019
Order Date: 27-Feb-2019
Project Description: PE4528

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*95.9*		*ug/L*		*120*	*50-140*			
Surrogate: Dibromofluoromethane	*77.0*		*ug/L*		*96.2*	*50-140*			
Surrogate: Toluene-d8	*84.9*		*ug/L*		*106*	*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)	1730	25	ug/L		86.7	68-117			
F2 PHCs (C10-C16)	1220	100	ug/L		76.2	60-140			
F3 PHCs (C16-C34)	3370	100	ug/L		86.0	60-140			
F4 PHCs (C34-C50)	2400	100	ug/L		96.8	60-140			
Metals									
Mercury	3.15	0.1	ug/L	ND	105	70-130			
Antimony	48.6		ug/L	ND	96.8	80-120			
Arsenic	50.9		ug/L	ND	101	80-120			
Barium	74.6		ug/L	24.1	101	80-120			
Beryllium	53.9		ug/L	ND	108	80-120			
Boron	72		ug/L	24	96.1	80-120			
Cadmium	49.7		ug/L	ND	99.4	80-120			
Chromium (VI)	188	10	ug/L	ND	94.0	70-130			
Chromium	53.8		ug/L	ND	107	80-120			
Cobalt	47.4		ug/L	ND	94.8	80-120			
Copper	51.4		ug/L	0.89	101	80-120			
Lead	44.9		ug/L	ND	89.7	80-120			
Molybdenum	48.5		ug/L	1.19	94.6	80-120			
Nickel	51.2		ug/L	ND	101	80-120			
Selenium	44.9		ug/L	ND	89.4	80-120			
Silver	46.1		ug/L	ND	92.3	80-120			
Sodium	27000		ug/L	17900	91.1	80-120			
Thallium	47.0		ug/L	ND	94.0	80-120			
Uranium	48.6		ug/L	ND	97.2	80-120			
Vanadium	53.3		ug/L	ND	106	80-120			
Zinc	54		ug/L	8	92.5	80-120			
Semi-Volatiles									
Acenaphthene	5.01	0.05	ug/L		100	50-140			
Acenaphthylene	4.62	0.05	ug/L		92.4	50-140			
Anthracene	4.92	0.01	ug/L		98.4	50-140			
Benzo [a] anthracene	5.05	0.01	ug/L		101	50-140			
Benzo [a] pyrene	4.13	0.01	ug/L		82.7	50-140			
Benzo [b] fluoranthene	6.46	0.05	ug/L		129	50-140			
Benzo [g,h,i] perylene	4.18	0.05	ug/L		83.5	50-140			
Benzo [k] fluoranthene	6.23	0.05	ug/L		125	50-140			
Chrysene	5.83	0.05	ug/L		117	50-140			
Dibenzo [a,h] anthracene	3.89	0.05	ug/L		77.8	50-140			
Fluoranthene	4.87	0.01	ug/L		97.4	50-140			
Fluorene	4.11	0.05	ug/L		82.1	50-140			
Indeno [1,2,3-cd] pyrene	3.95	0.05	ug/L		79.0	50-140			
1-Methylnaphthalene	4.58	0.05	ug/L		91.5	50-140			
2-Methylnaphthalene	5.06	0.05	ug/L		101	50-140			
Naphthalene	4.83	0.05	ug/L		96.6	50-140			
Phenanthrene	4.73	0.05	ug/L		94.5	50-140			
Pyrene	4.88	0.01	ug/L		97.5	50-140			
Surrogate: 2-Fluorobiphenyl	*18.2*		*ug/L*		*91.0*	*50-140*			
Volatiles									
Acetone	85.7	5.0	ug/L		85.7	50-140			
Benzene	41.0	0.5	ug/L		103	60-130			
Bromodichloromethane	40.1	0.5	ug/L		100	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	34.5	0.5	ug/L		86.3	60-130			
Bromomethane	32.5	0.5	ug/L		81.4	50-140			
Carbon Tetrachloride	49.2	0.2	ug/L		123	60-130			
Chlorobenzene	33.7	0.5	ug/L		84.3	60-130			
Chloroform	33.1	0.5	ug/L		82.7	60-130			
Dibromochloromethane	41.0	0.5	ug/L		102	60-130			
Dichlorodifluoromethane	43.3	1.0	ug/L		108	50-140			
1,2-Dichlorobenzene	32.9	0.5	ug/L		82.3	60-130			
1,3-Dichlorobenzene	33.5	0.5	ug/L		83.8	60-130			
1,4-Dichlorobenzene	38.3	0.5	ug/L		95.8	60-130			
1,1-Dichloroethane	34.0	0.5	ug/L		85.1	60-130			
1,2-Dichloroethane	35.3	0.5	ug/L		88.2	60-130			
1,1-Dichloroethylene	31.3	0.5	ug/L		78.2	60-130			
cis-1,2-Dichloroethylene	32.3	0.5	ug/L		80.8	60-130			
trans-1,2-Dichloroethylene	32.7	0.5	ug/L		81.8	60-130			
1,2-Dichloropropane	33.9	0.5	ug/L		84.8	60-130			
cis-1,3-Dichloropropylene	32.2	0.5	ug/L		80.5	60-130			
trans-1,3-Dichloropropylene	37.9	0.5	ug/L		94.7	60-130			
Ethylbenzene	30.4	0.5	ug/L		76.1	60-130			
Ethylene dibromide (dibromoethane	37.9	0.2	ug/L		94.8	60-130			
Hexane	32.0	1.0	ug/L		80.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	84.1	5.0	ug/L		84.1	50-140			
Methyl Isobutyl Ketone	123	5.0	ug/L		123	50-140			
Methyl tert-butyl ether	89.6	2.0	ug/L		89.6	50-140			
Methylene Chloride	38.5	5.0	ug/L		96.4	60-130			
Styrene	31.3	0.5	ug/L		78.3	60-130			
1,1,1,2-Tetrachloroethane	36.1	0.5	ug/L		90.2	60-130			
1,1,2,2-Tetrachloroethane	44.9	0.5	ug/L		112	60-130			
Tetrachloroethylene	31.3	0.5	ug/L		78.2	60-130			
Toluene	35.5	0.5	ug/L		88.8	60-130			
1,1,1-Trichloroethane	36.6	0.5	ug/L		91.6	60-130			
1,1,2-Trichloroethane	37.0	0.5	ug/L		92.6	60-130			
Trichloroethylene	31.4	0.5	ug/L		78.4	60-130			
Trichlorofluoromethane	37.9	1.0	ug/L		94.8	60-130			
Vinyl chloride	37.7	0.5	ug/L		94.2	50-140			
m,p-Xylenes	71.3	0.5	ug/L		89.1	60-130			
o-Xylene	41.6	0.5	ug/L		104	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

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Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
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Chain of Custody
(Lab Use Only)
№ 118608

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE4528	**Turnaround Time:**
Contact Name: MIKE BEAUDOIN	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 25973	☐ 2 Day ☒ Regular
Telephone: 613-226-7381	Email Address: mbeaudoin@patersongroup.ca.	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: 1909325

	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	BH2-GW1	~~GW~~		3	Feb 22/19			X	X				
2	BH4-GW1	GW		4					X	X	X	X	
3	BH6-GW1	GW		~~3~~ 4			X	X	X				
4	BH10-GW1	GW		3			X	X					
5													
6													
7													
8													
9													
10													

Method of Delivery: Paracel

Comments:

Relinquished By (Sign):	Received by Driver/Depot: A. LOUISE	Received at Lab:	Verified By: D. POWER
Relinquished By (Print): MIKE B.	Date/Time: 27/02/19 4:40 PM	Date/Time: FEB 27/19 5:15	Date/Time: FEB 27/19 5:30
Date/Time: Feb 27/19 @ 4:15 PM	Temperature: °C	Temperature: 13.1 °C	pH Verified ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 25976
Project: PE4528
Custody: 118610

Report Date: 7-Mar-2019
Order Date: 1-Mar-2019

Revised Report

Order #: 1909519

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

Paracel ID	Client ID
1909519-01	BH11-GW1
1909519-02	BH12-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25976

Report Date: 07-Mar-2019
Order Date: 1-Mar-2019
Project Description: PE4528

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	5-Mar-19	5-Mar-19
PHC F1	CWS Tier 1 - P&T GC-FID	4-Mar-19	5-Mar-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	6-Mar-19	6-Mar-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	5-Mar-19	5-Mar-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25976

Report Date: 07-Mar-2019

Order Date: 1-Mar-2019

Project Description: PE4528

	Client ID:	BH11-GW1	BH12-GW1	-	-
	Sample Date:	02/28/2019 09:00	02/28/2019 09:00	-	-
	Sample ID:	1909519-01	1909519-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Benzene	0.5 ug/L	-	<0.5	-	-
Ethylbenzene	0.5 ug/L	-	<0.5	-	-
Toluene	0.5 ug/L	-	<0.5	-	-
m,p-Xylenes	0.5 ug/L	-	<0.5	-	-
o-Xylene	0.5 ug/L	-	<0.5	-	-
Xylenes, total	0.5 ug/L	-	<0.5	-	-
Toluene-d8	Surrogate	-	109%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	-	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	-	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	-	<100	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	-	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	-	-
Anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	-	-
Chrysene	0.05 ug/L	<0.05	<0.05	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	-	-
Fluoranthene	0.01 ug/L	<0.01	<0.01	-	-
Fluorene	0.05 ug/L	<0.05	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	-	-
Naphthalene	0.05 ug/L	<0.05	<0.05	-	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	-	-
Pyrene	0.01 ug/L	<0.01	<0.01	-	-
2-Fluorobiphenyl	Surrogate	87.9%	92.8%	-	-
Terphenyl-d14	Surrogate	96.1%	111%	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25976

Report Date: 07-Mar-2019
Order Date: 1-Mar-2019
Project Description: PE4528

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						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*20.0*		*ug/L*		*100*	*50-140*			
Surrogate: Terphenyl-d14	*17.7*		*ug/L*		*88.7*	*50-140*			
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*82.7*		*ug/L*		*103*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25976

Report Date: 07-Mar-2019
Order Date: 1-Mar-2019
Project Description: PE4528

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									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*84.9*		*ug/L*		*106*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25976

Report Date: 07-Mar-2019
Order Date: 1-Mar-2019
Project Description: PE4528

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1730	25	ug/L		86.7	68-117			
F2 PHCs (C10-C16)	1590	100	ug/L		99.1	60-140			
F3 PHCs (C16-C34)	4090	100	ug/L		104	60-140			
F4 PHCs (C34-C50)	2870	100	ug/L		116	60-140			
Semi-Volatiles									
Acenaphthene	5.26	0.05	ug/L		105	50-140			
Acenaphthylene	4.86	0.05	ug/L		97.3	50-140			
Anthracene	5.20	0.01	ug/L		104	50-140			
Benzo [a] anthracene	5.27	0.01	ug/L		105	50-140			
Benzo [a] pyrene	4.54	0.01	ug/L		90.8	50-140			
Benzo [b] fluoranthene	6.04	0.05	ug/L		121	50-140			
Benzo [g,h,i] perylene	4.95	0.05	ug/L		99.1	50-140			
Benzo [k] fluoranthene	5.79	0.05	ug/L		116	50-140			
Chrysene	5.87	0.05	ug/L		117	50-140			
Dibenzo [a,h] anthracene	4.68	0.05	ug/L		93.5	50-140			
Fluoranthene	5.30	0.01	ug/L		106	50-140			
Fluorene	4.37	0.05	ug/L		87.4	50-140			
Indeno [1,2,3-cd] pyrene	4.51	0.05	ug/L		90.3	50-140			
1-Methylnaphthalene	4.95	0.05	ug/L		99.0	50-140			
2-Methylnaphthalene	5.45	0.05	ug/L		109	50-140			
Naphthalene	5.15	0.05	ug/L		103	50-140			
Phenanthrene	5.01	0.05	ug/L		100	50-140			
Pyrene	5.30	0.01	ug/L		106	50-140			
Surrogate: 2-Fluorobiphenyl	*19.0*		*ug/L*		*95.2*	*50-140*			
Volatiles									
Benzene	41.0	0.5	ug/L		103	60-130			
Ethylbenzene	30.4	0.5	ug/L		76.1	60-130			
Toluene	35.5	0.5	ug/L		88.8	60-130			
m,p-Xylenes	71.3	0.5	ug/L		89.1	60-130			
o-Xylene	41.6	0.5	ug/L		104	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 This report includes an updated project reference.

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1909519

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Page 1 of 1

Client Name: PATERSON	Project Reference: PE ~~4755~~ 4528	**Turnaround Time:**
Contact Name: MIKE BEAUDOIN	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 COLONNADE RD S.	PO # 25976	☐ 2 Day ☐ ~~Regular~~
Telephone: 613-226-7381	Email Address: mbeaudoin@patersongroup.ca	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: 1909519

	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	~~BH~~BH11-GW1	GW		1	Feb 20/19		~~X~~	~~X~~	X				
2	BH12-GW1	GW		4	↓		X		X				
3													
4													
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. LOUISE	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B	Date/Time: 01/03/19 4 40 PM	Date/Time: Mar 1/19	Date/Time: Mar 1/19
Date/Time:	Temperature: °C	Temperature: 14.5 °C 5:25p	pH Verified [ ] By: MP 5:34p