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Phase II Environmental Site Assessment

3-33 Selkirk Street
and 2 Montreal Road
Ottawa, Ontario

Prepared For

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 3-33 Selkirk Street and 2 Montreal Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation consisted of drilling ten boreholes, all of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. A total of ten soil samples were submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F₁-F₄), volatile organic compounds (VOCs), metals and inorganics. PHC and BTEX parameters exceeding the MECP Table 3 Standards were identified along the north property line of 3-33 Selkirk Street and were reported on the 2 Montreal Road property by others. Electrical Conductivity exceedances were identified along the east property line as a result of the use of road salt for safety purposes. Paterson was unable to access 2 Montreal Road to confirm the soil quality.

Groundwater was determined to be in compliance with the MECP Table 3 Standards on the 3-33 Selkirk Street property. **Previous reports indicated that impacted groundwater exists on 2 Montreal Road portion of the site.** Paterson was unable to access 2 Montreal Road to confirm the groundwater quality.

Conclusion

Based on the findings of the Phase II ESA, soil impacted with BTEX and PHC concentrations above the MECP Table 3 Coarse Grained Residential Standards is present on the Phase II Property along the north property line of 3-33 Selkirk Street and on the 2 Montreal Road property. Impacted groundwater reportedly exists on the 2 Montreal Road property, although this could not to be confirmed by Paterson. It is our understanding that the subject site is to be redeveloped with several residential and commercial buildings with underground parking covering the majority of the property.

It is our recommendation that an environmental site remediation program, involving the removal of all impacted soil and groundwater, 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 is recommended that all groundwater monitoring wells be tested to confirm groundwater quality and to assess the need for any special disposal/management requirements.

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

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of construction excavation. It is 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 Main and Main Developments Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of 3-33 Selkirk Street and 2 Montreal Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in April 2019.

1.1 Site Description

Address: 3-33 Selkirk Street and 2 Montreal Road, Ottawa, Ontario.

Legal Description: Part of Lots 6 and 7, Gore Junction, Rideau Front, Gloucester Township, City of Ottawa, Ontario.

Property Identification

Number: 04237-0001, 04237-0003

Location: The subject site covers the entire block bound by Montreal Road, North River Road, Selkirk Street and Montgomery Street, in Ottawa, Ontario. No access to the property addressed as 2 Montreal Road was provided as part of the Phase II ESA.

Latitude and Longitude: 45° 25' 56" N, 75° 40' 05" W

Configuration: Irregular

Site Area: 1.64ha (approximate).

1.2 Current and Proposed Future Uses

The Phase II Property is currently occupied by a large commercial plaza and parking areas. It is Paterson's understanding that the site will be redeveloped with a mixed use commercial and residential complex with an underground parking structure covering the majority of the site.

1.3 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. Based on a review of the soil conditions, coarse-grained standards are applicable to the site. Grain size analysis was not completed.

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 is generally flat. The Phase II Property is at a similar grade as the adjacent properties. Site drainage consists primarily of sheet flow to catch basins located within the parking areas and the adjacent roadways. The Phase II Property is situated within a municipally serviced area.

2.2 Past Investigations

Pinchin completed a Phase I ESA in 2013 for the subject site. Based on their historical research Pinchin identified three potential environmental concerns to the subject site;

- A former retail fuel outlet at 2 Montreal Road,
- An existing retail fuel outlet at 42 Montreal Road,
- An existing Automotive Service Garage at 299 Montgomery Street.

Pinchin recommended a Phase II ESA be carried out at the time of site redevelopment. No subsurface investigation work was carried out.

While Paterson did not have access to 2 Montreal Road during this property, Paterson was able to review several reports prepared for the former retail fuel outlet at 2 Montreal Road as part of the historical research. Based on the reports prepared by others for 2 Montreal Road several areas of soil and groundwater impacts remain present on the 2 Montreal Road property.

Based on a 2019 Phase I ESA conducted by Paterson for the subject land, several historical on and off-site potentially contaminating activities (PCAs) were considered to result in areas of potential environmental concern (APECs) on the Phase I and Phase II Property, as presented in Table 1.

Table 1: Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
Former Retail Fuel Outlet	Northern section of Phase I ESA property	Item 28 - Gasoline and Associated Products Storage in Fixed UST	On-Site	PHCs, BTEX	Soil and groundwater
Former Lumber Yard	Southeast corner of Phase I ESA property	Not Applicable	On-Site	Metals	Soil and groundwater
Former Dry Cleaners	South central portion of Phase I ESA property	Item 37 – Operation of Dry Cleaning Equipment (where chemicals are used)	On-Site	VOCs	Soil and groundwater
Existing Retail Fuel Outlet	Northeast corner of Phase I ESA property	Item 28 - Gasoline and Associated Products Storage in Fixed Tanks	Off-Site	PHCs, BTEX	Groundwater
Existing Automotive Service Garage	Eastern property boundary of Phase I ESA property	Item 52 – Storage, Maintenance, Fuelling and repair of equipment, vehicles, and material used to maintain transportation systems.	Off-Site	PHCs, BTEX	Groundwater
Application of Road Salt for safety purposes	Within Parking Areas of Phase I ESA property	Not Applicable	On-Site	EC/SAR, Sodium, Chlorides	Soil and groundwater

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

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted during the interim of April 3 to 11th, 2019. The field program consisted of drilling ten boreholes, all 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 identified in the Phase I ESA.

Contaminants of concern for soil and groundwater include petroleum hydrocarbons (PHCs, fractions F₁-F₄), Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), volatile organic compounds (VOCs), metals (including Mercury and Chrome VI), Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR) and Chlorides.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on the information from NRCAN, bedrock in the area of the site consists of shale of the Billings Formation. Based on the maps, the thickness of overburden ranges from 3 to 10 m. Overburden consists of offshore marine sediments (sand and silt). Groundwater is expected to be encountered in the overburden or the upper weathered shale bedrock.

Contaminants of Potential Concern

As per Section 3.2 of this report, CPCs identified on the subject site include Metals (including Hg, and CrVI), PHCs, BTEX, VOCs, EC, SAR and Chlorides.

Existing Buildings and Structures

The subject site is occupied by a commercial plaza with a partial basement in the southwest corner of the building and mezzanines in several of the units.

Water Bodies

The closest water body is the Rideau River, approximately 35m to the west of the subject site.

Areas of Natural Significance

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

Drinking Water Wells

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

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists of commercial, residential and institutional properties. Land use is shown on Drawing PE4546-2 Surrounding Land Use Plan.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 2.2 of this report, Potentially Contaminating Activities and Areas of Potential Environmental Concern were identified within the Phase I ESA study area. Four PCAs were identified on the subject site during the historical review or Phase I ESA site visit. Two additional off site PCAs representing APECs on the subject site were identified during the historical review;

- Former retail fuel outlet along the northern part of the subject site;
- Former dry cleaner located within the retail plaza on the subject site;
- Former lumber yard, located in the southeastern corner of the subject site;
- Existing Retail fuel outlet located to the east of the subject site;
- Existing automobile service garage located to the east of the subject site;
- Application of road salt for safety purposes.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA is considered to be sufficient to conclude that there are 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 duplicate and trip blank samples. Appropriate trip blank and duplicate sampling is recommended to be completed during a future analytical testing program.

3.5 Impediments

Paterson was unable to access the 2 Montreal Road property as part of the Phase II ESA. No soil or groundwater samples were collected on the 2 Montreal Road property. Borehole locations were adjusted slightly due to underground utilities throughout the subject site, however no significant deviations occurred.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted between April 3rd and 11th, 2019 and consisted of drilling ten boreholes on the Phase II Property. All of the boreholes were instrumented with groundwater monitoring wells. The boreholes were placed to address the aforementioned areas of potential environmental concern (APECs) and to provide coverage of the site from a geotechnical perspective. The boreholes were drilled with a truck mounted power auger drill rig, with the exception of BH10 which was drilled using portable drilling equipment. The truck mounted drill rig was provided by George Downing Estate Drilling of Hawkesbury, Ontario. The portable drilling equipment was provided by CCC Geotechnical and Environmental Drilling of Ottawa, Ontario. Borehole locations are shown on Drawing PE4546-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 99 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 of a pavement structure underlain by fill material and glacial till followed by fractured shale bedrock. Fill material present beneath the pavement structure extended to depths ranging from approximately 1.98m and 5.64m below the existing grade and generally consisted of silty sand with gravel and shale fragments. Glacial till, consisting of silty sand, gravel, and trace clay, was identified in some boreholes beneath the fill material. Fractured shale bedrock was encountered in all boreholes between 1.98m and 5.79m below the existing grade, with the exception of BH9 where bedrock was not encountered and the borehole was terminated in glacial till. The bedrock was cored in several boreholes to facilitate the installation of a groundwater monitoring well.

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 an RKI Eagle Combustible Vapour Monitor.

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 25ppm. 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, with the exception of faint hydrocarbon odours in BH1. Several fill samples were selected for analysis based on a visual evaluation of the soil quality. Several additional soil samples including ones from BH1, were selected for analytical testing.

4.4 Groundwater Monitoring Well Installation

Ten groundwater monitoring wells were installed on the Phase II Property as part of the Phase II investigation. The monitoring wells consisted of 32 mm or 51mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	98.45	8.23	5.23-8.23	4.93-8.23	0.30-4.93	Flushmount
BH2	98.46	8.18	5.18-8.18	4.88-8.18	0.30-4.88	Flushmount
BH3	98.84	7.67	4.67-7.67	4.37-7.67	0.30-4.37	Flushmount
BH4	98.87	8.13	5.13-8.13	4.83-8.13	0.30-4.83	Flushmount
BH5	98.92	7.67	4.67-7.67	4.37-7.67	0.30-4.37	Flushmount
BH6	99.06	8.25	5.25-8.25	4.95-8.25	0.30-4.95	Flushmount
BH7	99.12	7.92	4.92-7.92	4.62-7.92	0.30-4.62	Flushmount
BH8	99.07	7.62	4.62-7.62	4.32-7.62	0.30-4.32	Flushmount
BH9	99.03	8.23	5.23-8.23	4.93-8.23	0.30-4.93	Flushmount
BH10 ¹	NA	7.92	4.92-7.92	4.62-7.92	0.30-4.62	Flushmount

1 - Ground Surface Elevations at BH10 was not recorded

4.5 Field Measurement of Water Quality Parameters

Field measurement of water quality parameters was not completed as part of the Phase II ESA. Significant sediment was encountered in several monitoring wells rendering the equipment unusable. Water quality parameters were abandoned to prevent damage to water sampling equipment.

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 3: Soil Samples Submitted							
Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed					Rationale
		BTEX	PHCs (E ₁ -E ₄)	Metals ¹	VOCs	EC/SAR	
BH1-SS2	0.76-1.37m, Fill			X			Assess Fill Material of Unknown Quality
BH1-SS7	4.57-5.18m, Glacial Till / Weathered Shale	X	X				Assess the former RFO at 2 Montreal Road
BH2-SS8	5.33-5.94m, Glacial Till / Weathered Shale	X	X				Assess the former RFO at 2 Montreal Road
BH3-SS2	0.76-1.37m, Fill			X ¹			Assess Fill Material of Unknown Quality and the application of road salt for safety purposes
BH4-SS2	0.76-1.37m, Fill					X	
BH5-SS2	0.76-1.37m, Fill			X ¹			
BH6-SS2	0.76-1.37m, Fill			X ¹			
BH7-SS8	5.33-5.94m, Glacial Till / Weathered Shale				X		Assess the former Dry Cleaners within the commercial plaza.
BH8-SS3	1.52-2.13m, Fill			X			Assess Fill Material of Unknown Quality the application of road salt for safety purposes
BH9-SS2	0.76-1.37m, Fill			X ¹		X	

1 – Metals including Mercury and Chromium 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 4: Groundwater Samples Submitted							
Sample ID	Screened Interval / Stratigraphic Unit	Parameters Analyzed					Rationale
		BTEX	PHCs (F₁-F₄)	Metals¹	VOCs	Chlorides	
BH1-GW1	5.22-8.22m, Glacial Till / Weathered Shale		X		X		Assess the former retail fuel outlet at 2 Montreal Road
BH2-GW1	5.17-8.17m, Glacial Till / Weathered Shale		X	X ²	X	X	
BH3-GW1	3.45-6.45m Glacial Till / Weathered Shale	X	X				Assess the former retail fuel outlet at 2 Montreal Road and the existing retail fuel outlet to the east of the subject site.
BH4-GW1	4.82-7.82m, Glacial Till / Weathered Shale			X ²		X	Assess the potential impacts related to the application of road salt for safety purposes
BH5-GW1	4.67-7.67, Glacial Till / Weathered Shale		X		X		Assess any offsite impacts from the adjacent automotive service garage
BH6-GW1	5.25-8.25m, Glacial Till / Weathered Shale			X			Assess potential impacts from fill material of unknown quality
BH7-GW1	4.97-7.97m, Glacial Till / Weathered Shale				X		Assess the former Dry Cleaners within the commercial plaza.
BH8-GW1	4.62-7.62m, Glacial Till / Weathered Shale			X	X	X	Assess potential impacts from fill material of unknown quality and road salt
BH9-GW1	5.22-8.22m, Glacial Till / Weathered Shale			X	X	X	
BH10-GW1	4.92-7.92m, Glacial Till / Weathered Shale				X		Assess the former Dry Cleaners within the commercial plaza.
1 – Metals including Mercury and Chromium VI 2 – Analysed for Sodium only							

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

4.8 Residue Management

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

4.9 Elevation Surveying

An elevation survey of all borehole locations (with the exception of BH10) was completed by Paterson at the time of the subsurface investigation. All borehole elevations are relative to the top spindle of a fire hydrant in front of 307 Montgomery Street with an assumed elevation of 100m.

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 a pavement structure over fill material, underlain by native silty clay and/or glacial till. Site stratigraphy is shown on Drawing PE4546-4F – Cross-Section A-A' and Drawing PE4546-5B – Cross-Section B-B'.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on April 12, 2019, using an electronic water level meter. Groundwater levels are summarized below in Table 6. All borehole elevations are relative to the top spindle of a fire hydrant in front of 307 Montgomery Street, a with an assumed elevation 100m

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	98.45	6.02	92.43	April 12, 2019
BH2	98.46	5.56	92.90	April 12, 2019
BH3	98.84	5.94	92.90	April 12, 2019
BH4	98.87	5.95	92.92	April 12, 2019
BH5	98.92	5.98	92.94	April 12, 2019
BH6	99.06	5.56	93.50	April 12, 2019
BH7	99.12	6.22	92.90	April 12, 2019
BH8	99.07	6.16	92.91	April 12, 2019
BH9	99.03	4.04	94.99	April 12, 2019
BH10 ¹	NA	6.43	NA	April 12, 2019

1 – Ground Surface Elevation at BH10 was not recorded.

Based on the groundwater elevations measured during the April 2019 sampling event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4546-3 – Test Hole Location Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property was calculated for the site. The groundwater appears to flow towards the northwest. A horizontal hydraulic gradient of approximately 0.011 m/m was calculated.

5.3 Fine-Coarse Soil Texture

No grain size analysis was completed for the subject site. Based on the observed 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 0ppm to 25ppm. No olfactory indications of potential contamination were identified in the soil samples at the time of the field program, with the exception of a faint hydrocarbon odour from BH1. 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

Various soil samples 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 soil quality at the subject site, based on the analytical testing, follows;

PHCs and BTEX

Two soil samples 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 along the north property line of 3-33 Selkirk Street, adjacent to the former retail fuel outlet at 2 Montreal Road. Based on a review of reports by others, impacted soil exists on the 2 Montreal Road property. The results of the analytical testing for PHCs and BTEX are provided in Table 1A and 2A at the end of this report.

VOCs

One soil sample was submitted for analysis of VOCs. Based on the analytical test results, no VOCs (with the exception of BTEX parameters) were identified in the soil sample analysed. The soil sample is 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 this report.

Metals and Inorganics

Seven soil samples were submitted for analysis of metals (including Cr VI and Hg) and/or Inorganics (Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC)). Based on the analytical test results, the fill material on the subject site is in compliance with the MECP Table 3 Standards for metals. Based on the analytical test results, the shallow soils on the subject site exceed the MECP Table 3 Standards for EC. The results of the analytical testing for Metals and Inorganics are provided in Table 3A at the end of this report.

5.6 Groundwater Quality

Groundwater samples were submitted for various 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 at the subject site, based on the 2019 Phase II ESA, follows;

PHCs and BTEX

Four groundwater samples were submitted for analysis of PHCs (F1-F4) and BTEX. Based on the analytical test results, the groundwater on the subject site is in compliance for PHCs and BTEX. The results of the analytical testing for PHCs is provided in Table 1B at the end of this report. BTEX results are included in Table 2B at the end of this report.

VOCs

Seven groundwater samples were submitted for analysis of VOCs. Based on the analytical test results, the groundwater on the subject site is in compliance for VOCs. The results of the analytical testing for VOCs are provided in Table 2B at the end of this report.

Metals and Inorganics

Five groundwater samples were submitted for analysis of Metals and/or Inorganics. Based on the analytical test results, the groundwater on the subject site is in compliance for Metals and Inorganics. The results of the analytical testing for Metals and Inorganics are provided in Table 3B at the end of this report.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the April 2019 sampling event 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 Retail Fuel outlet on the northern portion of the subject site;
- Former Lumber Yard in the southeast corner of the subject site
- Former Dry Cleaners within the commercial plaza on the southern portion of the subject site;
- Existing Retail Fuel Outlet to the east of the subject site;
- Existing Automotive Service Garage to the east of the subject site;
- Application of Road Salt for safety purposes throughout the parking areas at the subject site.

Contaminants of potential concern associated with the aforementioned PCAs include a combination of Metals (including Hg and Cr(VI)), Inorganics, PHCs, BTEX, and VOCs 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 sewage 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:

- Pavement structure consisting of approximately 0.1m of asphaltic concrete over crushed stone.
- Fill material generally consisting of brown silty sand with crushed stone, gravel and clay, was identified at each borehole location, beneath the pavement structure and extending to depths ranging from approximately 1.98 to 5.64m below grade.
- Glacial till was identified beneath the fill material at three of the borehole locations (BH5, BH9 and BH10). The glacial till is a sandy clay matrix with gravel and shale fragments.
- Fractured black shale was identified in all boreholes (with the exception of BH9), between depths of 1.98 and 5.79m below grade. Groundwater was encountered in the shale.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered within the fractured shale bedrock. These two strata are expected to act as one aquifer throughout the subject site and are at times indistinguishable from each other geologically.

Water levels were measured at the subject site on April 12, 2019, at depths ranging from 4.04-6.43m below grade. Based on the groundwater elevations measured during this monitoring event, groundwater contour mapping was completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject site was in a north-westerly direction, with a hydraulic gradient of approximately 0.011 m/m.

Approximate Depth to Bedrock

Fractured shale was encountered between 1.98m and 5.79m below the existing grade. Based on the soil samples collected, the fractured shale and the native glacial till are at times indistinguishable geologically. Where rock was cored, low recovery and RQD values were encountered, indicating poor quality bedrock.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 4.04 to 6.43m below 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 beneath the pavement structure and extended to depths of 5.64m below grade in select locations. The fill material is suspected to have been placed during previous redevelopments of the subject site and surrounding area.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property will be redeveloped with a multi-storey residential/commercial complex with underground parking and a building footprint covering the majority of the property.

Existing Buildings and Structures

The 3-33 Selkirk Street property is occupied by a large commercial plaza along the south property boundary, with the remaining areas covered by surface parking. 2 Montreal Road is a gravel covered fenced area with no buildings or structures visible.

Water Bodies

There are no water bodies on the subject site. The Rideau River is present approximately 35m to the west of the subject site. No other water bodies are present within the study area.

Areas of Natural Significance

No areas of natural significance are present on or within the study area.

Environmental Condition

Areas Where Contaminants are Present

Based on visual screening and analytical test results, PHC and BTEX impacted soil is present along the north property line of the 3-33 Selkirk Street property. No impacted groundwater was identified on the 3-33 Selkirk Street property. Based on a historical report review, impacted soil and groundwater are present on the 2 Montreal Road property. Paterson was not able to access the 2 Montreal Road property to confirm the soil and groundwater results at this time. Analytical testing also indicated that exceedances related to EC in the soil (related to the application of road salt for safety purposes) were identified on 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 (F1 and F2), Benzene, Ethylbenzene, Xylenes and EC.

Based on the current analytical testing there are no contaminants of concern in the groundwater on the 3-33 Selkirk Street property. The 2 Montreal Road property has previously identified exceedances for PHCs and BTEX in the groundwater, although these impacts were not able to be confirmed as part of this Phase II ESA.

Contaminated Media

Based on the results of the Phase II ESA, shallow fill material (directly beneath the pavement structure) is impacted with EC. Soil/shale impacted with PHCs and BTEX was identified along the north property line of the 3-33 Selkirk Street property, adjacent to 2 Montreal Road.

The groundwater on 3-33 Selkirk Street is not considered to be impacted. The groundwater on the 2 Montreal Road property is considered to be impacted with PHCs and BTEX, although Paterson was not able to access the property to update the groundwater quality information.

What Is Known About Areas Where Contaminants Are Present

Impacted soil/shale related to the former on-site retail fuel outlet is present in the north portion of the subject site. Impacts related to the application of road salt for safety purposes are present along the eastern property boundary, although are expected to extend throughout the parking areas.

Groundwater impacts appear to be confined to the 2 Montreal Road property and do not appear to extend onto the 3-33 Selkirk Street property.

Distribution and Migration of Contaminants

The PHC impacts are expected to be related to the former retail fuel outlet at 2 Montreal Road and appear confined to the 2 Montreal Road property and the northern portion of the Selkirk Street property. The PHC impacts appear to have migrated from the former RFO onto the Selkirk Street property. Migration is affected by seasonal fluctuations in water levels due to precipitation and meltwater on the 2 Montreal Road property.

Discharge of Contaminants

The PHC impacted soil is considered to have resulted from the former uses of the subject site as a retail fuel outlet. The EC exceedances are related to the application of road salt for safety purposes (de-icing) on the subject site and adjacent roadways.

Climatic and Meteorological Conditions

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

Potential for Vapour Intrusion

The potential for vapour intrusion is considered to be low based on the location of the BTEX and PHC impacts. The BTEX and PHC impacts are all located a significant distance from the subject building and are not considered likely to result in vapour intrusion.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the properties addressed 3-33 Selkirk Street and 2 Montreal Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation consisted of drilling ten boreholes, all of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. A total of ten soil samples were submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F₁-F₄), volatile organic compounds (VOCs), metals and inorganics. PHC and BTEX parameters exceeding the MECP Table 3 Standards were identified along the north property line of 3-33 Selkirk Street and were reported on the 2 Montreal Road property by others. Electrical Conductivity exceedances were identified along the east property line as a result of the use of road salt for safety purposes. Paterson was unable to access 2 Montreal Road to confirm the soil quality.

Groundwater was determined to be in compliance with the MECP Table 3 Standards on the 3-33 Selkirk Street property. Previous reports indicated that impacted groundwater exists on 2 Montreal Road portion of the site. Paterson was unable to access 2 Montreal Road to confirm the groundwater quality.

Conclusion

Based on the findings of the Phase II ESA, soil impacted with BTEX and PHC concentrations above the MECP Table 3 Coarse Grained Residential Standards is present on the Phase II Property along the north property line of 3-33 Selkirk Street and on the 2 Montreal Road property. Impacted groundwater reportedly exists on the 2 Montreal Road property, although this could not to be confirmed by Paterson. It is our understanding that the subject site is to be redeveloped with several residential and commercial buildings with underground parking covering the majority of the property.

It is our recommendation that an environmental site remediation program, involving the removal of all impacted soil and groundwater, 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 is recommended that all groundwater monitoring wells be tested to confirm groundwater quality and to assess the need for any special disposal/management requirements.

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

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of construction excavation. It is 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 has been prepared in general accordance with O.Reg. 153/04 as amended, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

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

Paterson Group Inc.



Michael Beaudoin, P.Eng.



Mark S. D'Arcy, P.Eng.



Report Distribution:

- Main and Main
- Paterson Group

FIGURES

Figure 1 - Key Plan

	PE4546-3	Test Hole Location Plan
PE4546-4A		Analytical Testing Plan – Soil (BTEX)
PE4546-4B		Analytical Testing Plan – Soil (PHC)
PE4546-4C		Analytical Testing Plan – Soil (VOC)
PE4546-4D		Analytical Testing Plan – Soil (METALS)
	PE4546-4E	Analytical Testing Plan – Soil (SAR)
	PE4546-4F	Cross Section A-A' Soil
	PE4546-4G	Cross Section B-B' Soil
PE4546-5A		Analytical Testing Plan – Groundwater
PE4546-5B		Cross Section A-A' Groundwater
PE4546-5C		Cross Section B-B' Groundwater

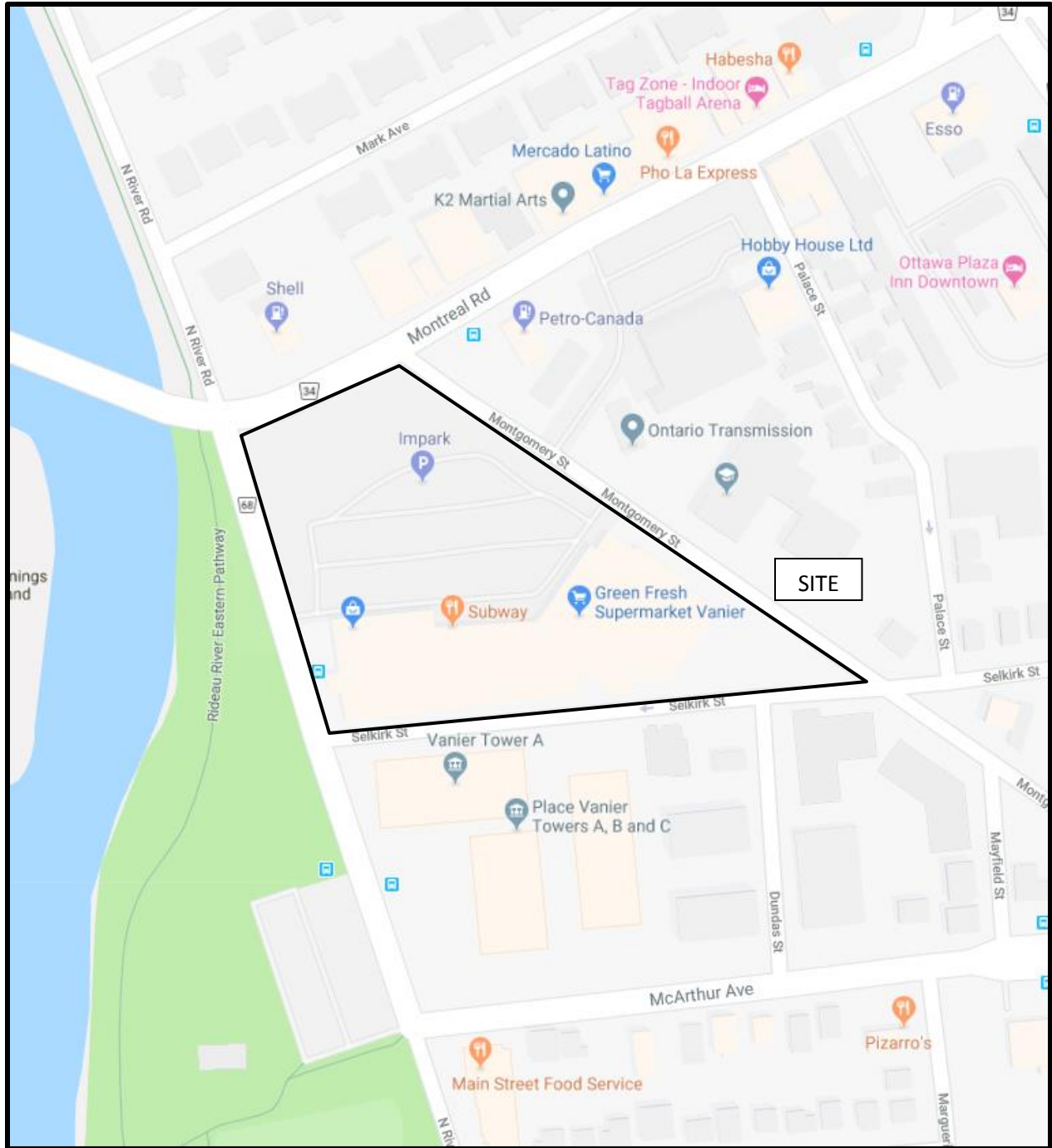
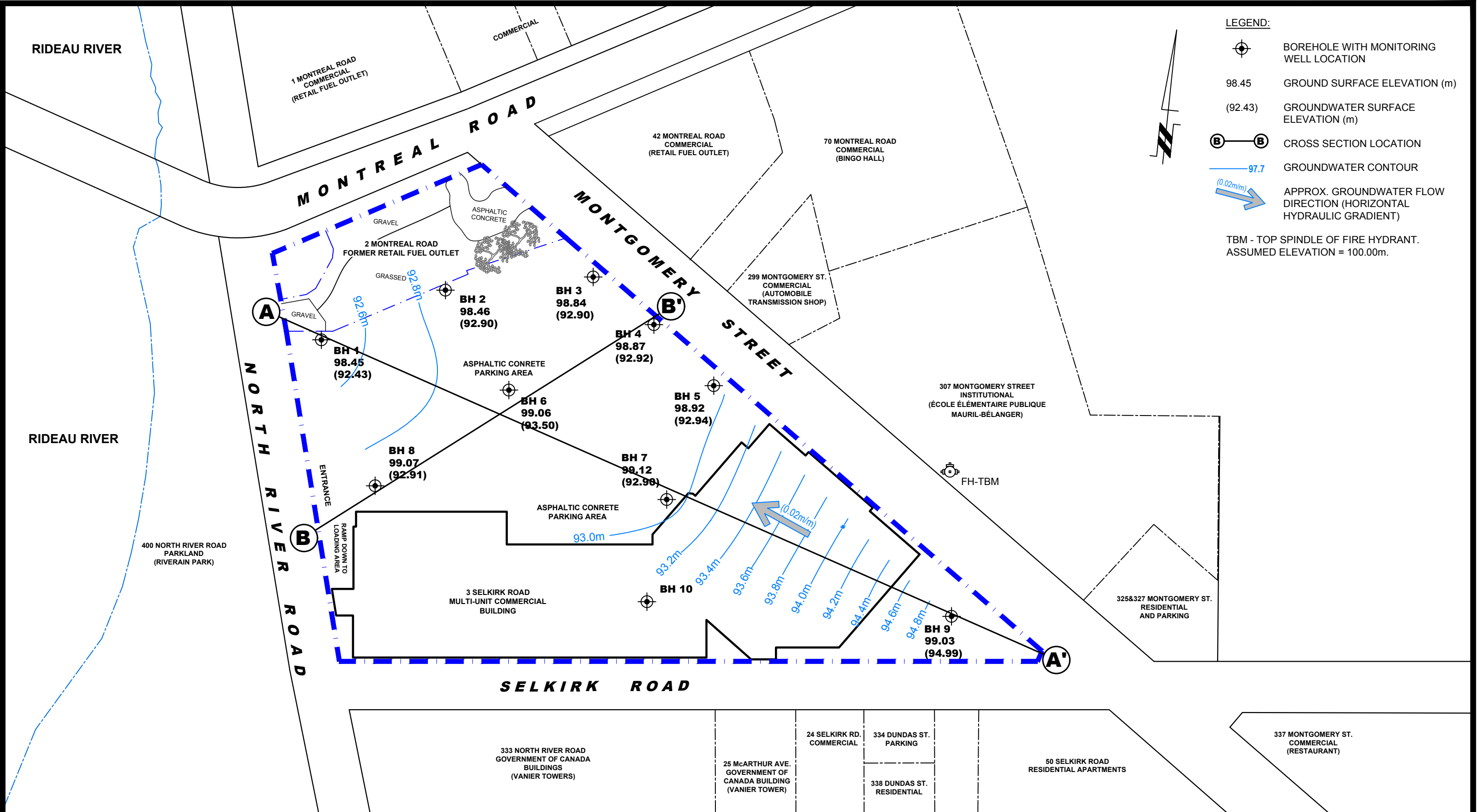


FIGURE 1
KEY PLAN



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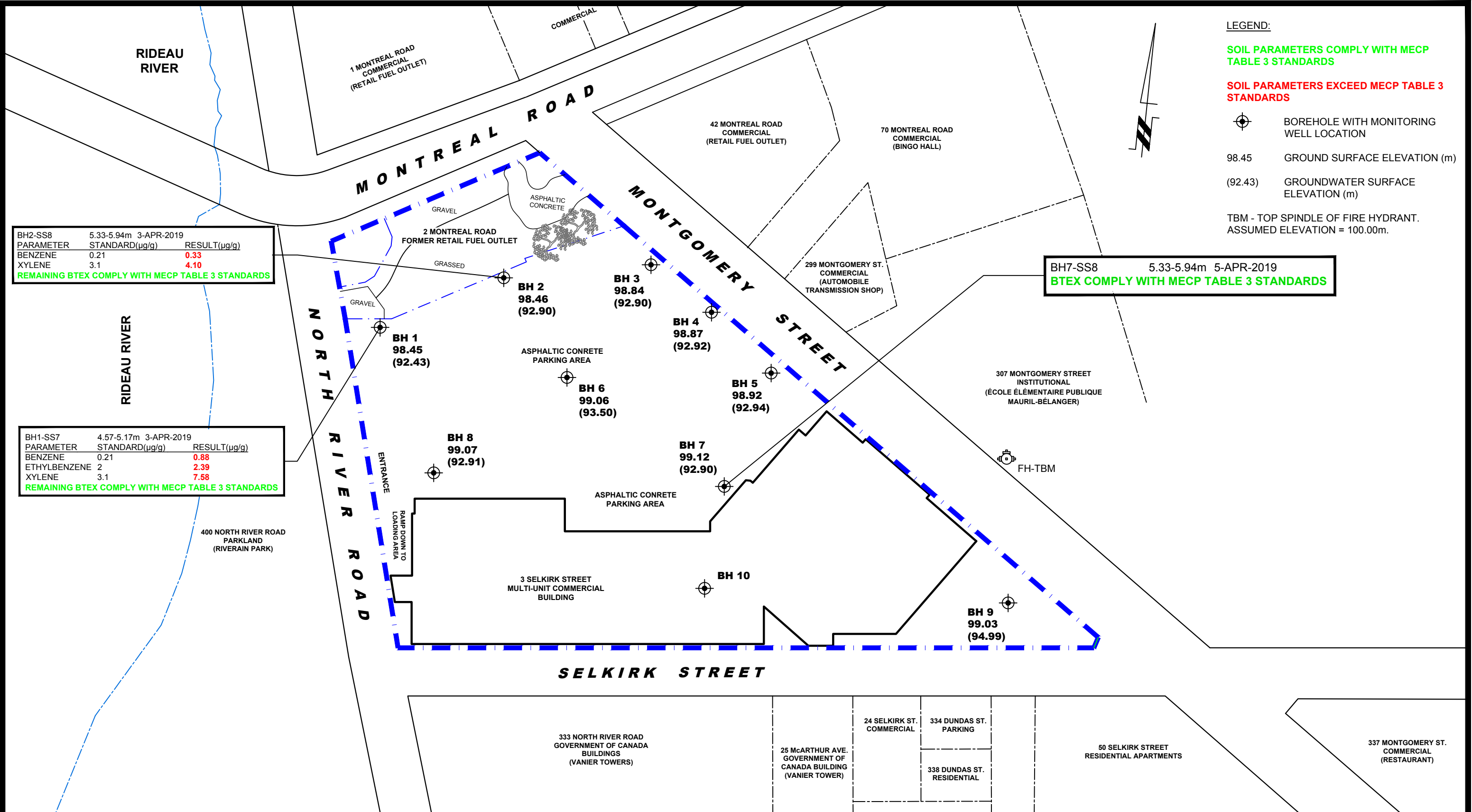
MAIN AND MAIN DEVELOPMENTS
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3-33 SELKIRK STREET AND 2 MONTREAL ROAD

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TEST HOLE LOCATION PLAN

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LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS

☉ BOREHOLE WITH MONITORING WELL LOCATION

98.45 GROUND SURFACE ELEVATION (m)

(92.43) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

BH2-SS8	5.33-5.94m	3-APR-2019
PARAMETER	STANDARD(µg/g)	RESULT(µg/g)
BENZENE	0.21	0.33
XYLENE	3.1	4.10
REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

BH7-SS8	5.33-5.94m	5-APR-2019
BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

BH1-SS7	4.57-5.17m	3-APR-2019
PARAMETER	STANDARD(µg/g)	RESULT(µg/g)
BENZENE	0.21	0.88
ETHYLBENZENE	2	2.39
XYLENE	3.1	7.58
REMAINING BTEX COMPLY WITH MECP TABLE 3 STANDARDS		

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MAIN AND MAIN DEVELOPMENTS

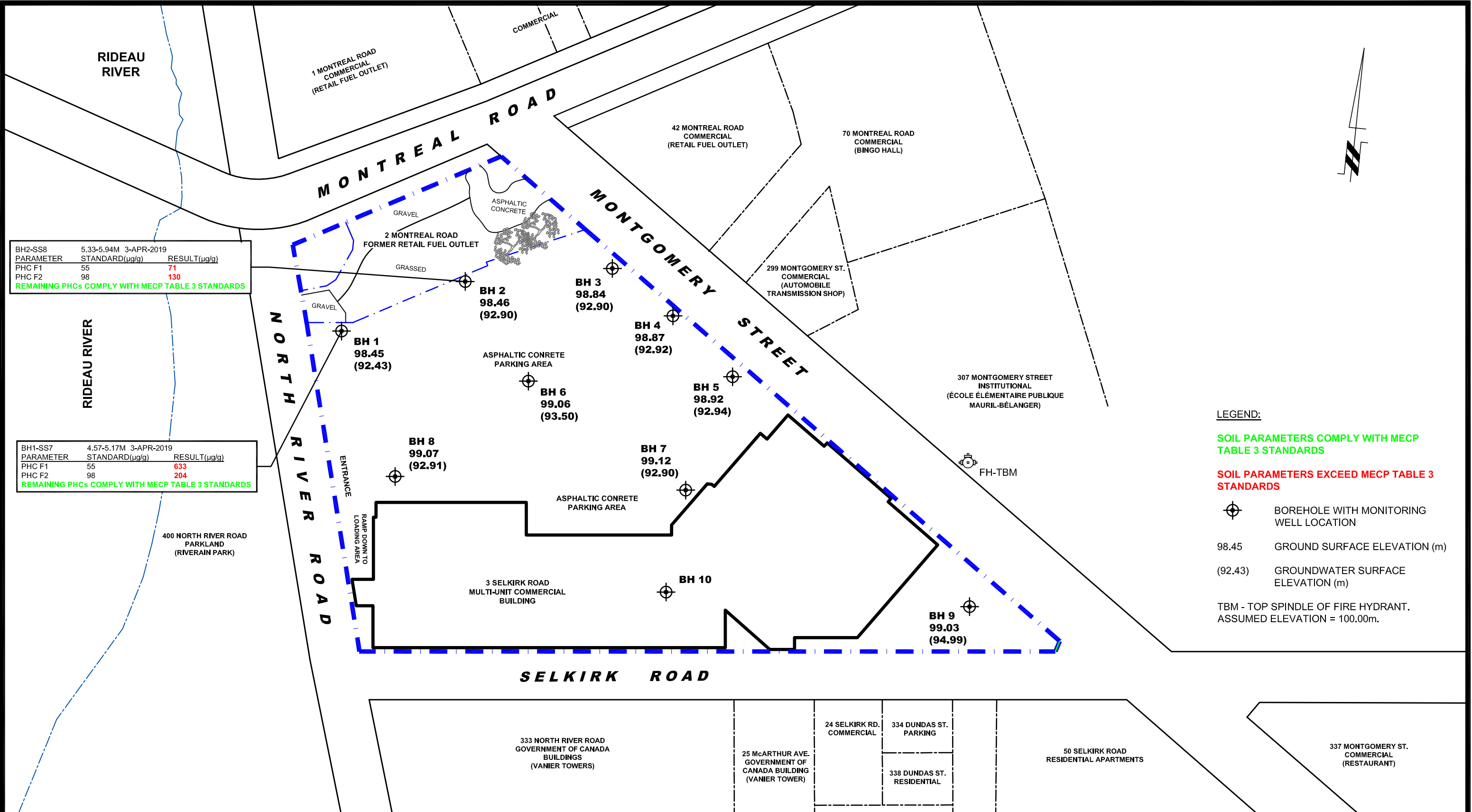
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3-33 SELKIRK STREET AND 2 MONTREAL ROAD

ANALYTICAL TESTING PLAN - SOIL (BTEX)

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BH2-SS8	5.33-5.94M	3-APR-2019	
PARAMETER	STANDARD(µg/g)	RESULT(µg/g)	
PHC F1	55	71	
PHC F2	98	130	
REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS			

BH1-SS7	4.57-5.17M	3-APR-2019	
PARAMETER	STANDARD(µg/g)	RESULT(µg/g)	
PHC F1	55	633	
PHC F2	98	204	
REMAINING PHCs COMPLY WITH MECP TABLE 3 STANDARDS			

- LEGEND:**
- SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS
 - SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS
 - BOREHOLE WITH MONITORING WELL LOCATION
 - 98.45 GROUND SURFACE ELEVATION (m)
 - (92.43) GROUNDWATER SURFACE ELEVATION (m)
 - TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

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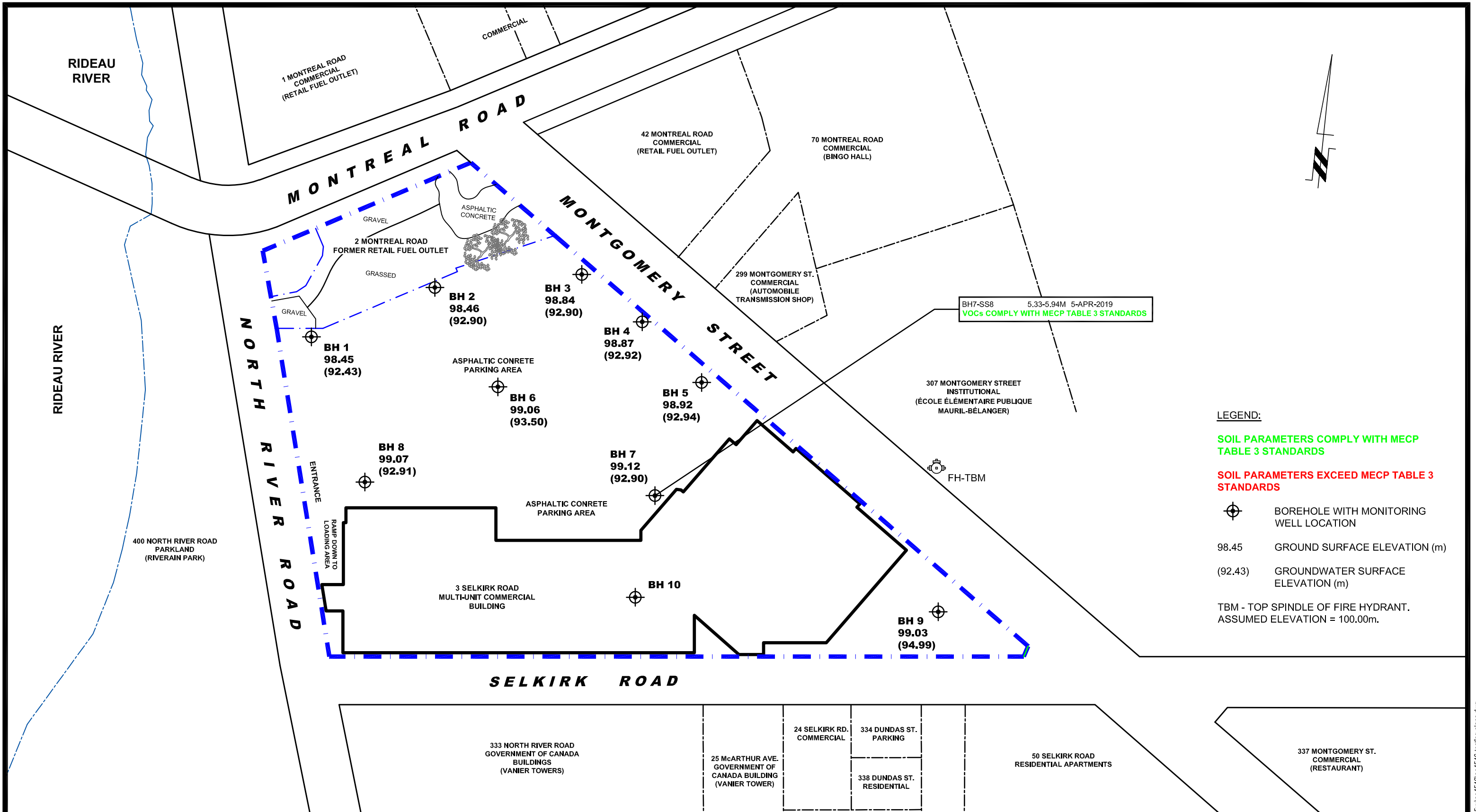
MAIN AND MAIN DEVELOPMENTS
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3-33 SELKIRK STREET AND 2 MONTREAL ROAD

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ANALYTICAL TESTING PLAN - SOIL (PHCs)

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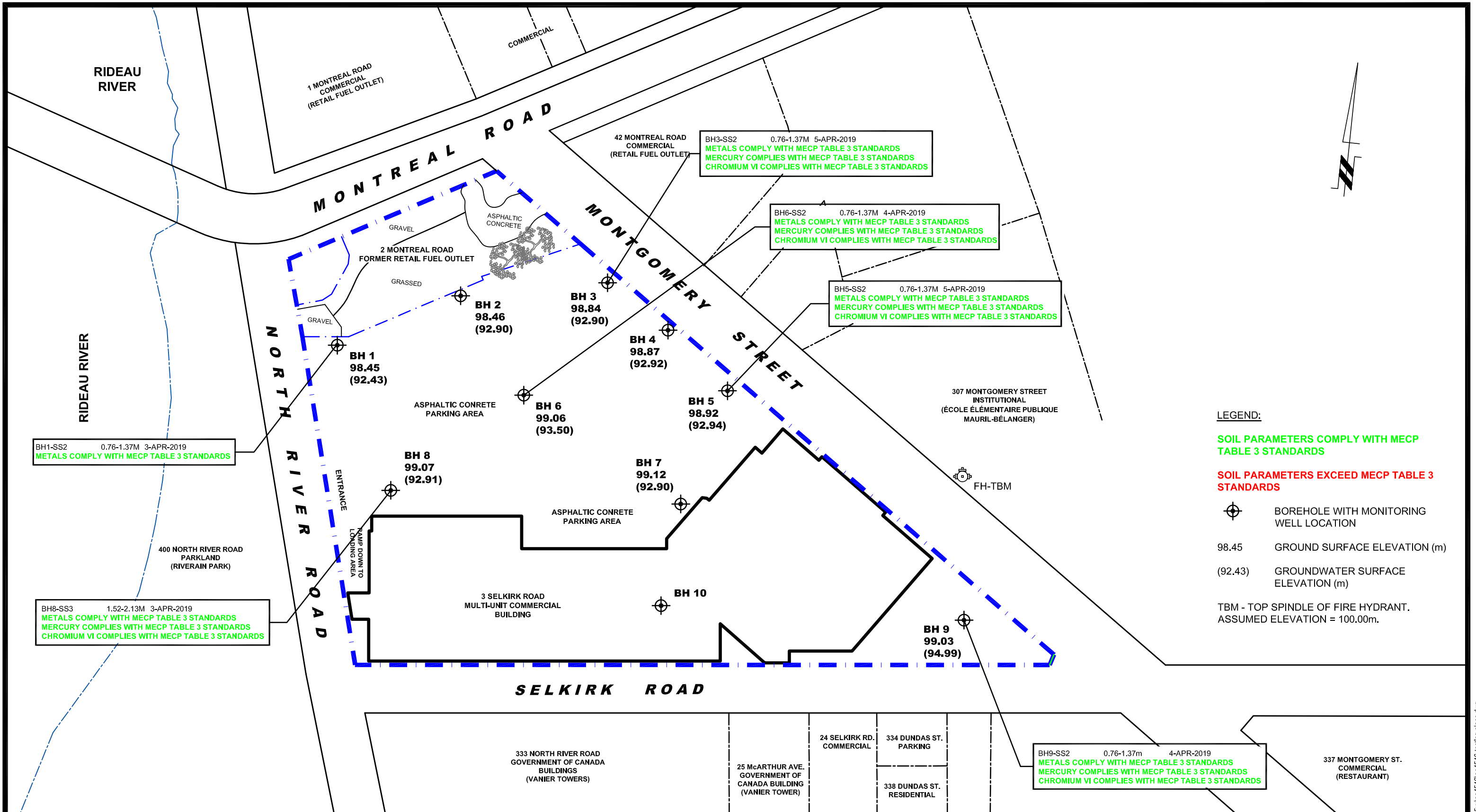
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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
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Title: **ANALYTICAL TESTING PLAN - SOIL (VOCs)**

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- LEGEND:**
- SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS
 - SOIL PARAMETERS EXCEED MECP TABLE 3 STANDARDS
 - ☉ BOREHOLE WITH MONITORING WELL LOCATION
 - 98.45 GROUND SURFACE ELEVATION (m)
 - (92.43) GROUNDWATER SURFACE ELEVATION (m)
 - TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

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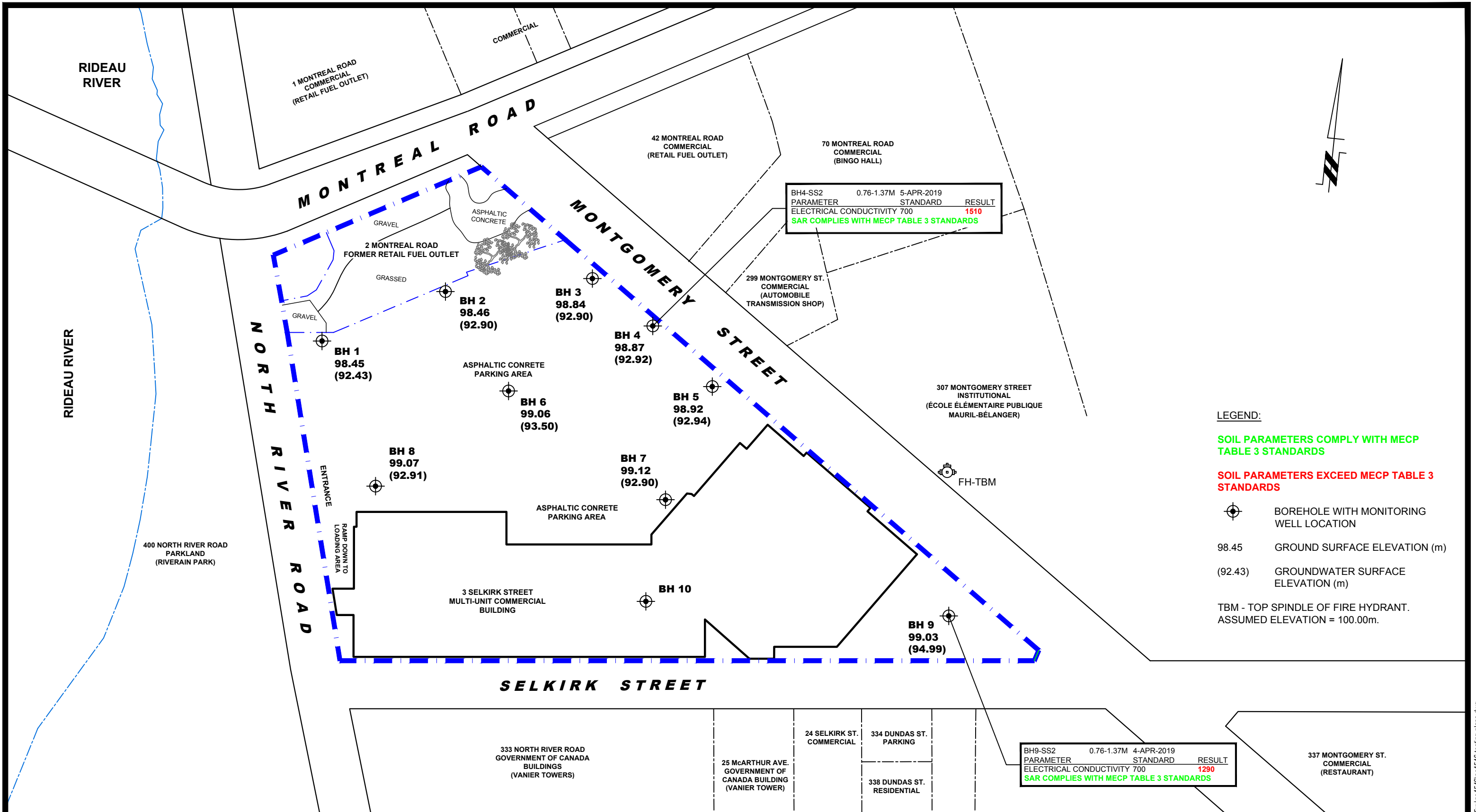
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3-33 SELKIRK STREET AND 2 MONTREAL ROAD

ANALYTICAL TESTING PLAN - SOIL (METALS)

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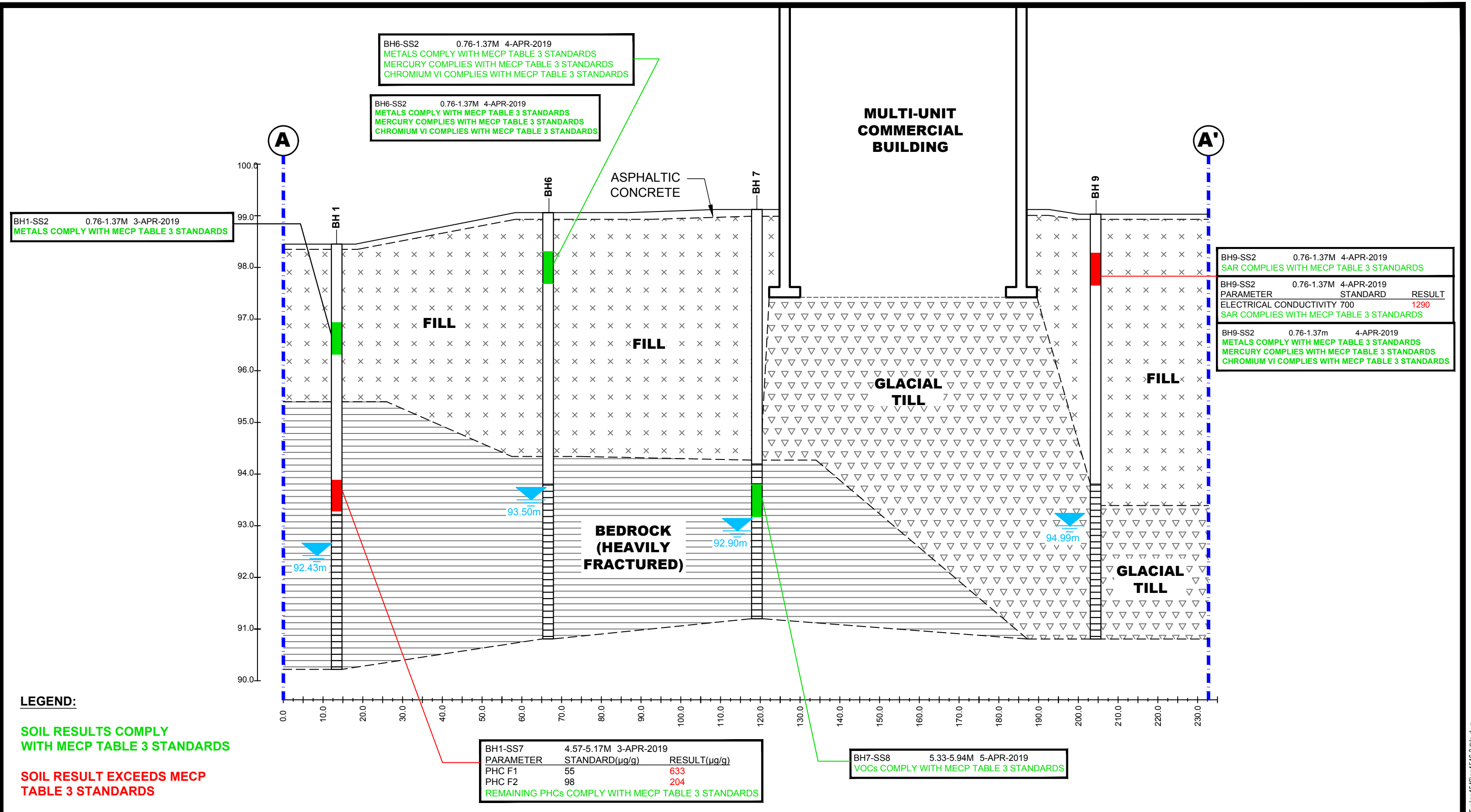
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ANALYTICAL TESTING PLAN - SOIL (EC / SAR)

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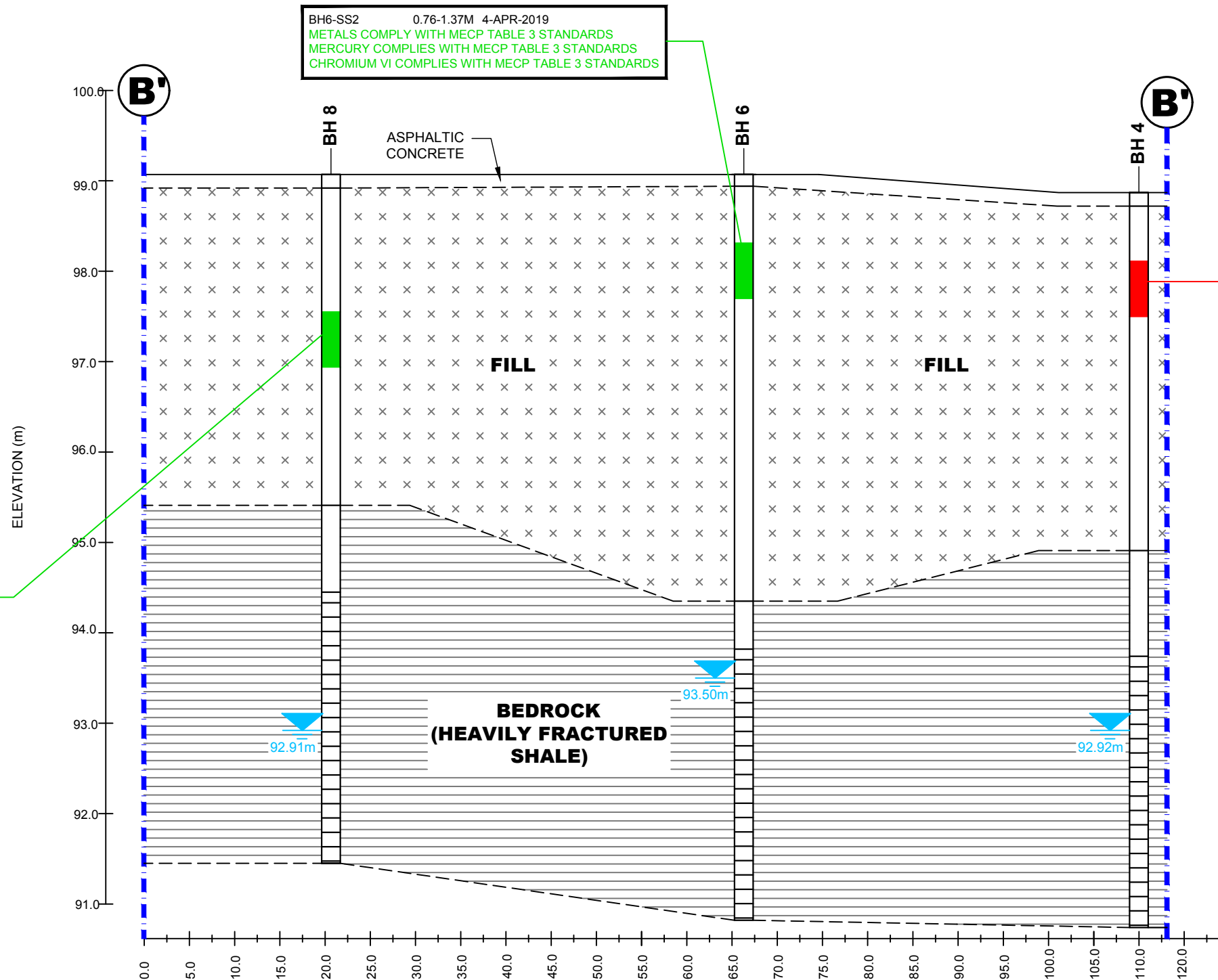
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MAIN AND MAIN DEVELOPMENTS
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3-33 SELKIRK STREET AND 2 MONTREAL ROAD

CROSS SECTION A-A - SOIL

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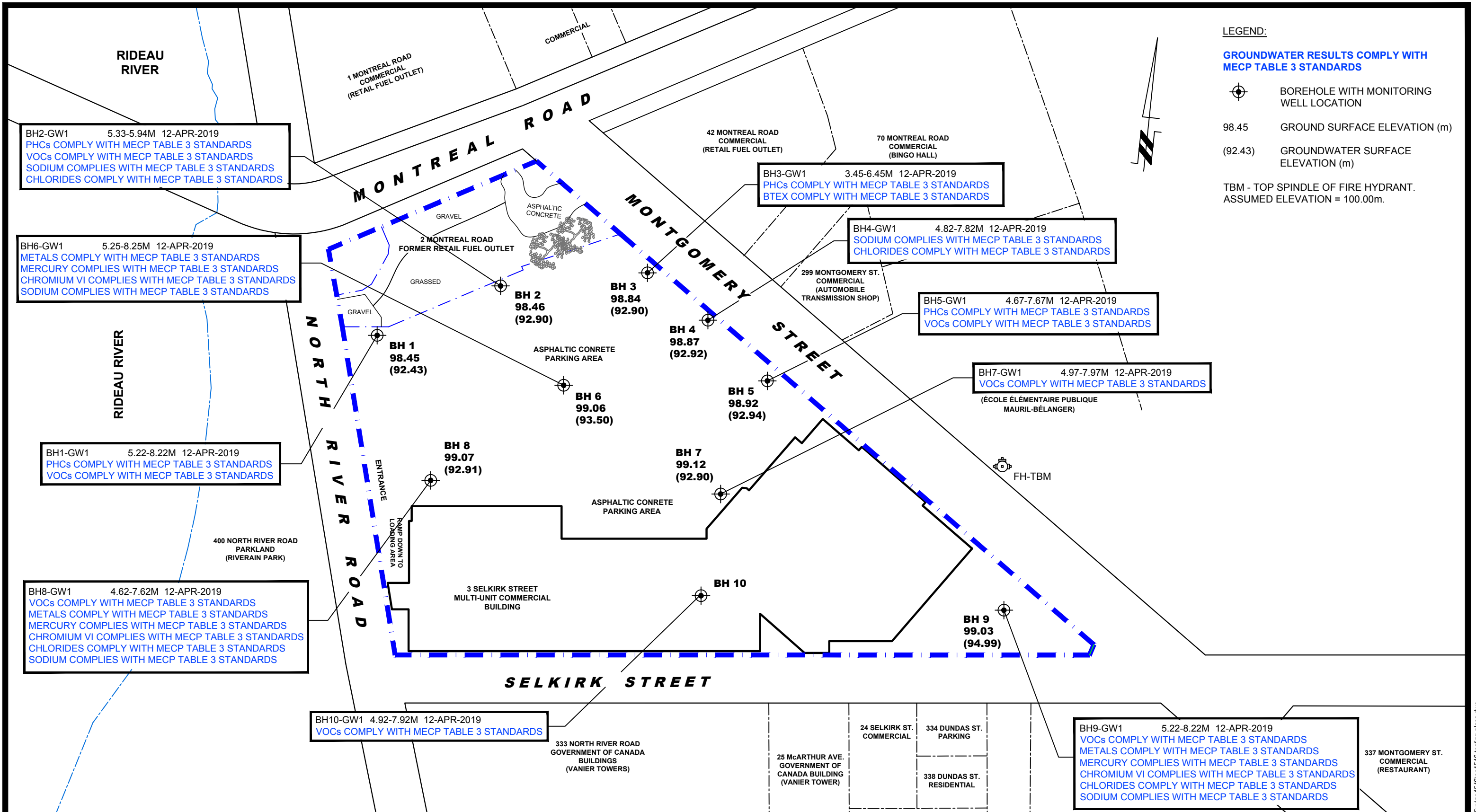
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MAIN AND MAIN DEVELOPMENTS
 PHASE II - ENVIRONMENTAL SITE ASSESSMENT
 3-33 SELKIRK STREET AND 2 MONTREAL ROAD

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CROSS SECTION B-B - SOIL

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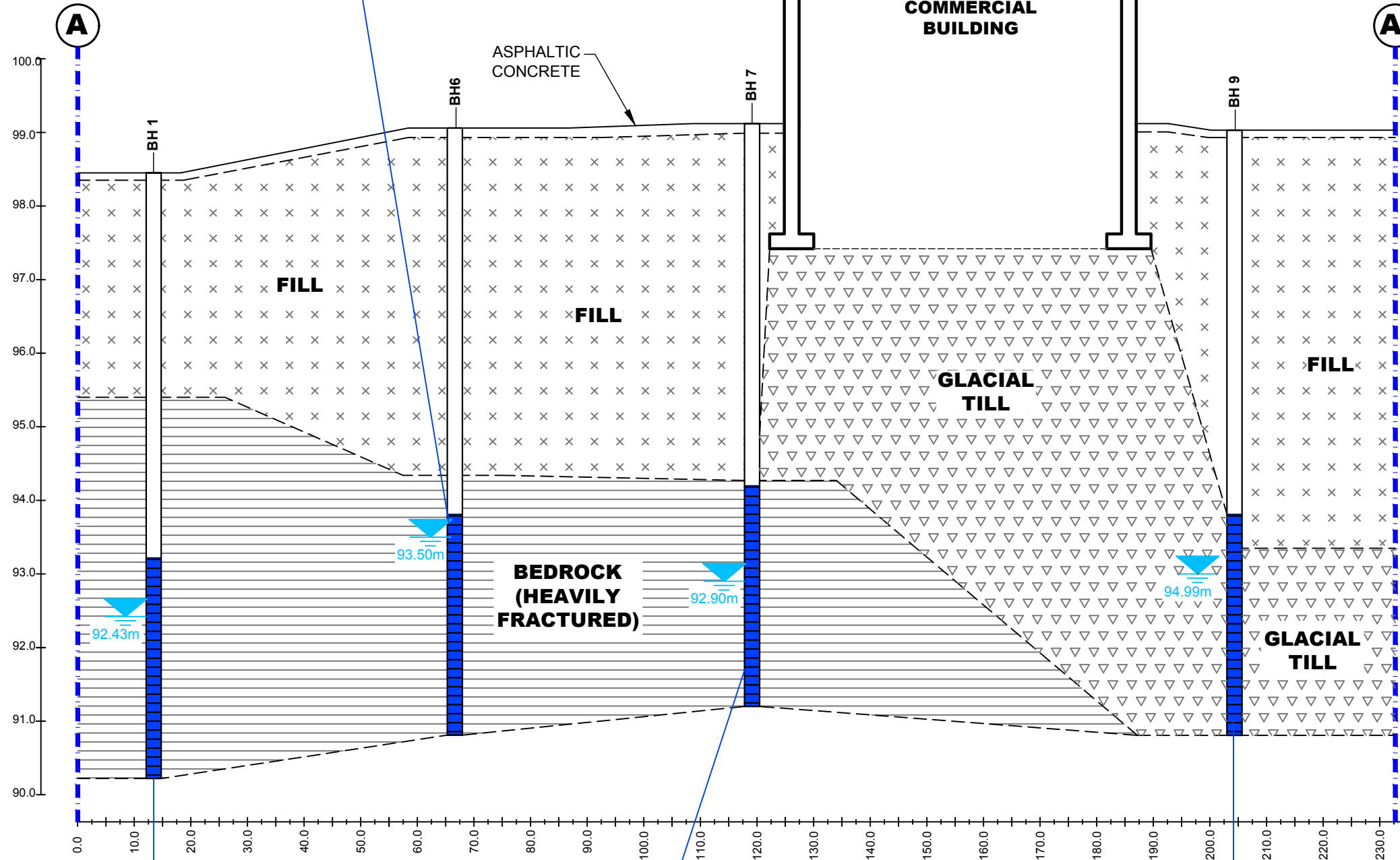
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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3-33 SELKIRK STREET AND 2 MONTREAL ROAD

ANALYTICAL TESTING PLAN - GROUNDWATER

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BH6-GW1 5.25-8.25M 12-APR-2019
 METALS COMPLY WITH MECP TABLE 3 STANDARDS
 MERCURY COMPLIES WITH MECP TABLE 3 STANDARDS
 CHROMIUM VI COMPLIES WITH MECP TABLE 3 STANDARDS
 SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS



BH1-GW1 5.22-8.22M 12-APR-2019
 PHCs COMPLY WITH MECP TABLE 3 STANDARDS
 VOCs COMPLY WITH MECP TABLE 3 STANDARDS

BH7-GW1 4.97-7.97M 12-APR-2019
 VOCs COMPLY WITH MECP TABLE 3 STANDARDS

BH9-GW1 5.22-8.22M 12-APR-2019
 VOCs COMPLY WITH MECP TABLE 3 STANDARDS
 METALS COMPLY WITH MECP TABLE 3 STANDARDS
 MERCURY COMPLIES WITH MECP TABLE 3 STANDARDS
 CHROMIUM VI COMPLIES WITH MECP TABLE 3 STANDARDS
 CHLORIDES COMPLY WITH MECP TABLE 3 STANDARDS
 SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS

LEGEND:

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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 PHASE II - ENVIRONMENTAL SITE ASSESSMENT
 3-33 SELKIRK STREET AND 2 MONTREAL ROAD
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Title: **CROSS SECTION A-A - GROUNDWATER**

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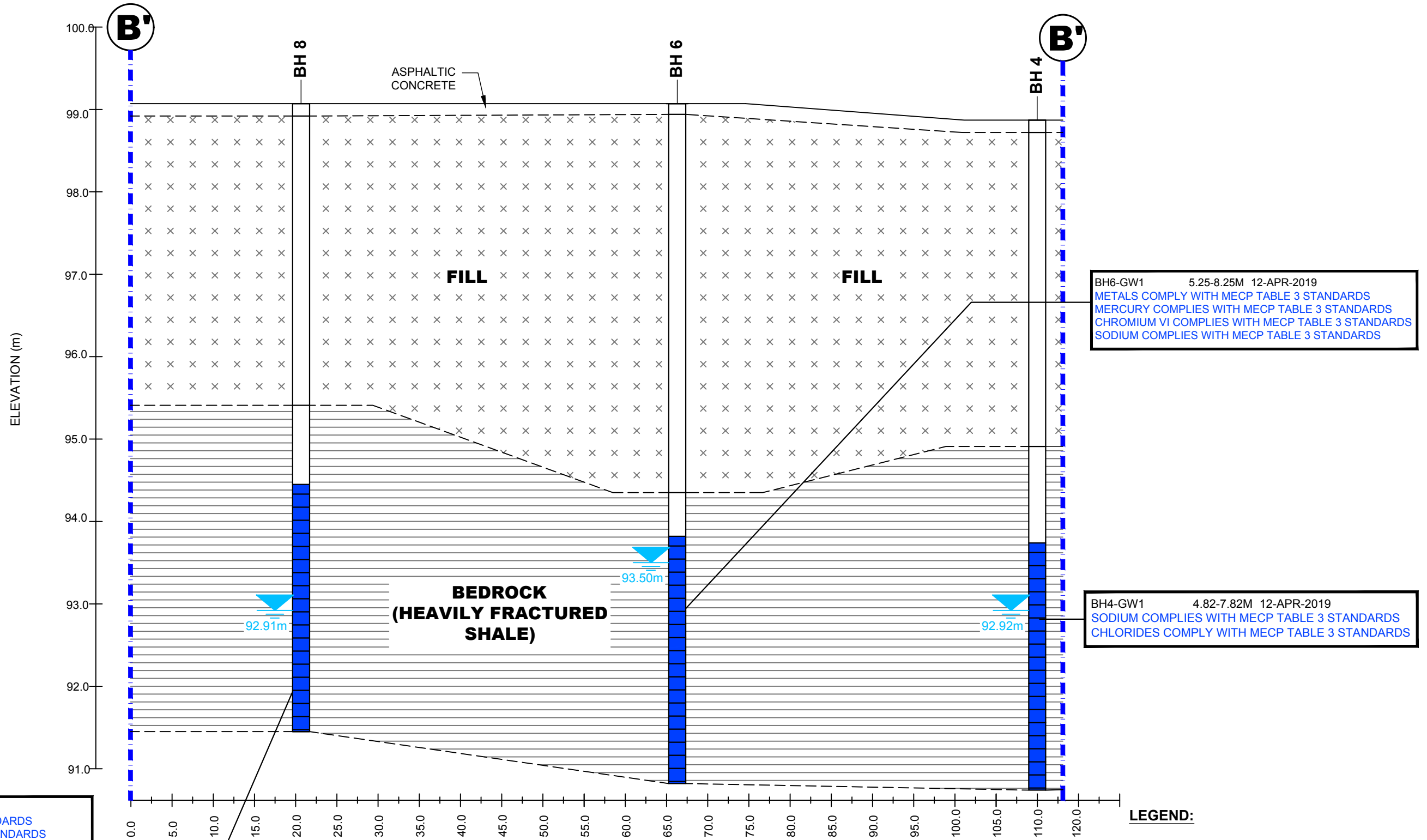
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BH8-GW1 4.62-7.62M 12-APR-2019
 VOCs COMPLY WITH MECP TABLE 3 STANDARDS
 METALS COMPLY WITH MECP TABLE 3 STANDARDS
 MERCURY COMPLIES WITH MECP TABLE 3 STANDARDS
 CHROMIUM VI COMPLIES WITH MECP TABLE 3 STANDARDS
 CHLORIDES COMPLY WITH MECP TABLE 3 STANDARDS
 SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS

BH6-GW1 5.25-8.25M 12-APR-2019
 METALS COMPLY WITH MECP TABLE 3 STANDARDS
 MERCURY COMPLIES WITH MECP TABLE 3 STANDARDS
 CHROMIUM VI COMPLIES WITH MECP TABLE 3 STANDARDS
 SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS

BH4-GW1 4.82-7.82M 12-APR-2019
 SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS
 CHLORIDES COMPLY WITH MECP TABLE 3 STANDARDS

LEGEND:
 GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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MAIN AND MAIN DEVELOPMENTS
 PHASE II - ENVIRONMENTAL SITE ASSESSMENT
 3-33 SELKIRK STREET AND 2 MONTREAL ROAD
 OTTAWA, ONTARIO
 Title: **CROSS SECTION B-B - GROUNDWATER**

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TABLES

Table 1A – Soil Analytical Test Results – PHCs

Table 2A – Soil Analytical Test Results – VOCs and BTEX

Table 3A – Soil Analytical Test Results – Metals and Inorganics

Table 1B – Groundwater Analytical Test Results – PHCs

Table 2B – Groundwater Analytical Test Results – VOCs and BTEX

Table 3B – Groundwater Analytical Test Results – Metals and Inorganics

Parameter	Units	MDL	Regulation	BH1-SS7	BH2-SS8
Sample Depth (m)			Reg 153/04 (2011)- Table 3 Residential, Coarse	4.57-5.18	5.33-5.94
Sample Date				3-Apr-19	3-Apr-19
Hydrocarbons					
F1 PHCs (C6-C10)	ug/g dry	7	55 ug/g dry	633	71
F2 PHCs (C10-C16)	ug/g dry	4	98 ug/g dry	204	130
F3 PHCs (C16-C34)	ug/g dry	8	300 ug/g dry	141	162
F4 PHCs (C34-C50)	ug/g dry	6	2800 ug/g dry	11	13

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

Parameter	Units	MDL	Regulation	BH1-SS7	BH2-SS8	BH7-SS8
Sample Depth (m)			Reg 153/04 (2011)-Table 3 Residential, Coarse	4.57-5.18	5.33-5.94	5.33-5.94
Sample Date				03-Apr-19	03-Apr-19	5-Apr-19
Volatiles						
Acetone	ug/g dry	0.50	16 ug/g dry	NA	NA	ND (0.50)
Benzene	ug/g dry	0.02	0.21 ug/g dry	0.88	0.33	ND (0.02)
Bromodichloromethane	ug/g dry	0.05	13 ug/g dry	NA	NA	ND (0.05)
Bromoform	ug/g dry	0.05	0.27 ug/g dry	NA	NA	ND (0.05)
Bromomethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Carbon Tetrachloride	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Chlorobenzene	ug/g dry	0.05	2.4 ug/g dry	NA	NA	ND (0.05)
Chloroform	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Dibromochloromethane	ug/g dry	0.05	9.4 ug/g dry	NA	NA	ND (0.05)
Dichlorodifluoromethane	ug/g dry	0.05	16 ug/g dry	NA	NA	ND (0.05)
1,2-Dichlorobenzene	ug/g dry	0.05	3.4 ug/g dry	NA	NA	ND (0.05)
1,3-Dichlorobenzene	ug/g dry	0.05	4.8 ug/g dry	NA	NA	ND (0.05)
1,4-Dichlorobenzene	ug/g dry	0.05	0.083 ug/g dry	NA	NA	ND (0.05)
1,1-Dichloroethane	ug/g dry	0.05	3.5 ug/g dry	NA	NA	ND (0.05)
1,2-Dichloroethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
1,1-Dichloroethylene	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
cis-1,2-Dichloroethylene	ug/g dry	0.05	3.4 ug/g dry	NA	NA	ND (0.05)
trans-1,2-Dichloroethylene	ug/g dry	0.05	0.084 ug/g dry	NA	NA	ND (0.05)
1,2-Dichloropropane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
cis-1,3-Dichloropropylene	ug/g dry	0.05		NA	NA	ND (0.05)
trans-1,3-Dichloropropylene	ug/g dry	0.05		NA	NA	ND (0.05)
1,3-Dichloropropene, total	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Ethylbenzene	ug/g dry	0.05	2 ug/g dry	2.39	0.64	ND (0.05)
Ethylene dibromide	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Hexane	ug/g dry	0.05	2.8 ug/g dry	NA	NA	ND (0.05)
Methyl Ethyl Ketone	ug/g dry	0.50	16 ug/g dry	NA	NA	ND (0.50)
Methyl Isobutyl Ketone	ug/g dry	0.50	1.7 ug/g dry	NA	NA	ND (0.50)
Methyl tert-butyl ether	ug/g dry	0.05	0.75 ug/g dry	NA	NA	ND (0.05)
Methylene Chloride	ug/g dry	0.05	0.1 ug/g dry	NA	NA	ND (0.05)
Styrene	ug/g dry	0.05	0.7 ug/g dry	NA	NA	ND (0.05)
1,1,1,2-Tetrachloroethane	ug/g dry	0.05	0.058 ug/g dry	NA	NA	ND (0.05)
1,1,1,2,2-Tetrachloroethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Tetrachloroethylene	ug/g dry	0.05	0.28 ug/g dry	NA	NA	ND (0.05)
Toluene	ug/g dry	0.05	2.3 ug/g dry	1.23	0.78	0.06
1,1,1-Trichloroethane	ug/g dry	0.05	0.38 ug/g dry	NA	NA	ND (0.05)
1,1,2-Trichloroethane	ug/g dry	0.05	0.05 ug/g dry	NA	NA	ND (0.05)
Trichloroethylene	ug/g dry	0.05	0.061 ug/g dry	NA	NA	ND (0.05)
Trichlorofluoromethane	ug/g dry	0.05	4 ug/g dry	NA	NA	ND (0.05)
Vinyl Chloride	ug/g dry	0.02	0.02 ug/g dry	NA	NA	ND (0.02)
m/p-Xylene	ug/g dry	0.05		6.74	3.12	0.11
o-Xylene	ug/g dry	0.05		0.85	0.98	0.09
Xylenes, total	ug/g dry	0.05	3.1 ug/g dry	7.58	4.10	0.19

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

Parameter	Units	MDL	Regulation	BH1-SS2	BH3-SS2	BH4-SS2	BH5-SS2	BH6-SS2	BH8-SS3	BH9-SS2
Sample Depth (m)			Reg 153/04 (2011)-Table 3 Residential, Coarse	0.76-1.37	0.76-1.37	0.76-1.37	0.76-1.37	0.76-1.37	1.52-2.13	0.76-1.52
Sample Date				3-Apr-19	5-Apr-19	5-Apr-19	5-Apr-19	4-Apr-19	3-Apr-19	4-Apr-19
Metals										
Chromium (VI)	ug/g dry	0.2	8 ug/g dry	NA	ND (0.2)	NA	ND (0.2)	ND (0.2)	NA	ND (0.2)
Mercury	ug/g dry	0.1	0.27 ug/g dry	NA	0.2	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)
Antimony	ug/g dry	1.0	7.5 ug/g dry	ND (1.0)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Arsenic	ug/g dry	1.0	18 ug/g dry	4.0	4.3	NA	7.3	3.7	4.2	5.7
Barium	ug/g dry	1.0	390 ug/g dry	91.1	143	NA	110	213	60.4	80.7
Beryllium	ug/g dry	0.5	4 ug/g dry	0.6	0.6	NA	0.9	0.7	ND (0.5)	0.8
Boron	ug/g dry	5.0	120 ug/g dry	5.7	5.5	NA	9.3	7.2	7.0	10.7
Cadmium	ug/g dry	0.5	1.2 ug/g dry	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Chromium	ug/g dry	5.0	160 ug/g dry	21.6	28.4	NA	25.6	32.4	18.5	22.1
Cobalt	ug/g dry	1.0	22 ug/g dry	8.3	7.3	NA	14.7	8.7	7.5	11.1
Copper	ug/g dry	5.0	140 ug/g dry	16.4	16.6	NA	37.5	14.9	19.6	28.0
Lead	ug/g dry	1.0	120 ug/g dry	9.5	88.9	NA	13.8	11.1	10.9	10.6
Molybdenum	ug/g dry	1.0	6.9 ug/g dry	1.3	1.1	NA	4.5	1.5	ND (1.0)	4.0
Nickel	ug/g dry	5.0	100 ug/g dry	24.6	19.0	NA	55.1	23.4	21.4	48.4
Selenium	ug/g dry	1.0	2.4 ug/g dry	ND (1.0)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Silver	ug/g dry	0.3	20 ug/g dry	ND (0.3)	ND (0.3)	NA	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)	NA	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)	NA	1.8	1.1	ND (1.0)	1.8
Vanadium	ug/g dry	10.0	86 ug/g dry	31.5	33.6	NA	41.5	42.9	28.5	35.5
Zinc	ug/g dry	20.0	340 ug/g dry	44.7	83.8	NA	80.7	61.4	44.8	58.1
SAR	N/A	5	5 N/A	NA	NA	0.96	NA	NA	NA	0.95
Conductivity	uS/cm	5	0.7 mS/cm (700 uS/cm)	NA	NA	1510	NA	NA	NA	1290

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	BH1-GW1	BH2-GW1	BH3-GW1	BH5-GW1
Screen Interval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	5.22-8.22	5.17-8.17	3.45-6.45	4.67-7.67
Sample Date				12-Apr-19	12-Apr-19	12-Apr-19	12-Apr-19
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 (100)	ND (100)
F4 PHCs (C34-C50)	ug/g dry	100	500 ug/L	ND (100)	ND (100)	ND (100)	ND (100)

ND (0.5) No concentrations identified above the MDL

MDL Method Detection Limit

Parameter	Units	MDL	Regulation	BH1-GW1	BH2-GW1	BH3-GW1	BH5-GW1	BH7-GW1	BH8-GW2	BH9-GW2	BH10-GW1
Screen Interval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater Coarse	5.22-8.22	5.17-8.17	3.45-6.45	4.67-7.67	4.97-7.97	4.62-7.62	5.22-8.22	4.92-7.92
Sample Date				12-Apr-19	12-Apr-19	12-Apr-19	12-Apr-19	12-Apr-19	12-Apr-19	18-Apr-19	18-Apr-19
Volatiles											
Acetone	ug/L	5.0	130000 ug/L	ND (5.0)	ND (5.0)	NA	80.1	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Benzene	ug/L	0.5	44 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	1.1	ND (0.5)	ND (0.5)	ND (0.5)
Bromodichloromethane	ug/L	0.5	85000 ug/L	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Bromoform	ug/L	0.5	380 ug/L	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Bromomethane	ug/L	0.5	5.6 ug/L	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)	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Chloroform	ug/L	0.5	2.4 ug/L	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Dibromochloromethane	ug/L	0.5	82000 ug/L	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)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
1,2-Dichlorobenzene	ug/L	0.5	4600 ug/L	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)	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)	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,2-Dichloroethane	ug/L	0.5	1.6 ug/L	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
cis-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	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)	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
cis-1,3-Dichloropropylene	ug/L	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-1,3-Dichloropropylene	ug/L	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-Dichloropropene, total	ug/L	0.5	5.2 ug/L	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Ethylbenzene	ug/L	0.5	2300 ug/L	ND (0.5)	ND (0.5)	ND (0.1)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Ethylene dibromide	ug/L	0.2	0.25 ug/L	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)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Methyl Ethyl Ketone	ug/L	5.0	470000 ug/L	ND (5.0)	ND (5.0)	NA	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Methyl Isobutyl Ketone	ug/L	5.0	140000 ug/L	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)	NA	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
Methylene Chloride	ug/L	5.0	610 ug/L	ND (5.0)	ND (5.0)	NA	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Styrene	ug/L	0.5	1300 ug/L	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
1,1,1,2,2-Tetrachloroethane	ug/L	0.5	3.2 ug/L	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Toluene	ug/L	0.5	18000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	4.0	ND (0.5)	ND (0.5)	ND (0.5)
1,1,1-Trichloroethane	ug/L	0.5	640 ug/L	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-Trichloroethane	ug/L	0.5	4.7 ug/L	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)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Trichlorofluoromethane	ug/L	1.0	2500 ug/L	ND (1.0)	ND (1.0)	NA	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Vinyl Chloride	ug/L	0.5	0.5 ug/L	ND (0.5)	ND (0.5)	NA	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
m/p-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	1.8	ND (0.5)	ND (0.5)	ND (0.5)
o-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Xylenes, total	ug/L	0.5	4200 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	1.8	ND (0.5)	ND (0.5)	ND (0.5)

ND (0.5) No concentrations identified above the MDL

MDL Method Detection Limit

NA Parameter Not Analysed

Parameter	Units	MDL	Regulation	BH2-GW1	BH4-GW1	BH6-GW1	BH8-GW1	BH9-GW1
Screen Interval (m)			Reg 153/04 (2011)-Table 3 Non-Potable Groundwater, Coarse	5.22-8.22	4.82-7.82	5.25-8.25	4.62-7.62	5.22-8.22
Sample Date				12-Apr-19	12-Apr-19	12-Apr-19	12-Apr-19	12-Apr-19
Metals								
Mercury	ug/L	0.1	0.29 ug/L	NA	NA	ND (0.1)	ND (0.1)	ND (0.1)
Antimony	ug/L	0.5	20000 ug/L	NA	NA	ND (0.5)	ND (0.5)	1.4
Arsenic	ug/L	1	1900 ug/L	NA	NA	ND (1)	ND (1)	ND (1)
Barium	ug/L	1	29000 ug/L	NA	NA	52	37	159
Beryllium	ug/L	0.5	67 ug/L	NA	NA	ND (0.5)	ND (0.5)	ND (0.5)
Boron	ug/L	10	45000 ug/L	NA	NA	56	46	100
Cadmium	ug/L	0.1	2.7 ug/L	NA	NA	0.1	ND (0.1)	ND (0.1)
Chromium	ug/L	1	810 ug/L	NA	NA	ND (1)	ND (1)	ND (1)
Chromium (VI)	ug/L	10	140 ug/L	NA	NA	ND (10)	ND (10)	ND (10)
Cobalt	ug/L	0.5	66 ug/L	NA	NA	ND (0.5)	1.2	2.7
Copper	ug/L	0.5	87 ug/L	NA	NA	4.6	ND (0.5)	0.6
Lead	ug/L	0.1	25 ug/L	NA	NA	0.3	ND (0.1)	ND (0.1)
Molybdenum	ug/L	0.5	9200 ug/L	NA	NA	1.8	4.2	7.9
Nickel	ug/L	1	490 ug/L	NA	NA	8	11	12
Selenium	ug/L	1	63 ug/L	NA	NA	ND (1)	ND (1)	ND (1)
Silver	ug/L	0.1	1.5 ug/L	NA	NA	ND (0.1)	ND (0.1)	ND (0.1)
Sodium	ug/L	200	2300000 ug/L	472000	1030000	814000	172000	838000
Thallium	ug/L	0.1	510 ug/L	NA	NA	ND (0.1)	ND (0.1)	0.1
Uranium	ug/L	0.1	420 ug/L	NA	NA	10.1	3.5	4.6
Vanadium	ug/L	0.5	250 ug/L	NA	NA	ND (0.5)	ND (0.5)	ND (0.5)
Zinc	ug/L	5	1100 ug/L	NA	NA	20	8	ND (5)
Chloride	mg/L	1	2300000 ug/L	1000000	2010000	NA	323000	2250000

ND (0.5) No concentrations identified above the MDL

MDL Method Detection Limit

N/A Parameter not analysed

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

Sampling & Analysis Plan

Phase II Environmental Site Assessment
3-33 Selkirk Street
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Prepared For

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Report: PE4546-SAP

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6.0	PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN	9

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Main and Main Developments Inc. to conduct a Phase II Environmental Site Assessment (ESA) at 3-33 Selkirk Street and 2 Montreal Road, in the City of Ottawa, Ontario. Based on a Phase I ESA completed by Paterson 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 BH2	Near former RFO at 2 Montreal Road to assess soil and groundwater conditions on 3-33 Selkirk Street.	Borehole to be advanced to intercept both the groundwater table and known hydrocarbon impacts from 2 Montreal Road.
BH3	Northeast corner of 3-33 Selkirk Street to address former RFO at 2 Montreal Road and existing RFO at 42 Montreal Road.	Borehole to be advanced to intercept both the groundwater table and known hydrocarbon impacts from 2 Montreal Road.
BH4	Near east property line to address the existing RFO at 42 Montreal Road and the automotive service garage at 299 Montgomery Street.	Borehole to be advanced to intercept the groundwater table to facilitate installation of a groundwater monitoring well.
BH5	Near east property to address the existing automotive service garage at 299 Montgomery Street.	
BH6	Center of the subject site for general coverage purposes.	
BH7	As near to Units 21/23 to address former dry cleaners.	
BH8	Western portion of subject site for general coverage purposes.	
BH9	Southeast corner of subject site to address former lumber yard.	
BH10	Within vacant Unit 21 to address former dry cleaners.	

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 1/4" [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 1/4" [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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 3

FILE NO. PE4546

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)					
GROUND SURFACE								○ Lower Explosive Limit %					
								20	40	60	80		
Asphaltic concrete	0.10					0	98.45						
FILL: Brown silty clay with sand, gravel, trace brick	0.51	AU	1					△					
FILL: Light brown silty sand with gravel		SS	2	79	23	1	97.45	△					
	1.52												
FILL: Brown sandy silt to silty sand, trace shale fragments and clay		SS	3	83	37	2	96.45	△					
- shale fragments increasing with depth		SS	4	88	27			△					
	3.05					3	95.45	△					
		SS	5	83	45			△					
		SS	6	100	50+	4	94.45	△					
		SS	7	88	87	5	93.45	△					
BEDROCK: Heavily fractured to fractured, black shale		SS	8	78	50+			△					
		SS	9	71	43	6	92.45	△					
			10	90	50+	7	91.45	△					
		SS	11	75	11	8	90.45	△					
End of Borehole	8.23												
(GWL @ 6.02m - April 12, 2019)													

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 3

FILE NO. PE4546

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %				
GROUND SURFACE								20	40	60	80		
Asphaltic concrete	0.13					0	98.46						
FILL: Brown silty sand with crushed stone	0.60	AU	1										
FILL: Brown silty sand, some clay, gravel and shale fragments		SS	2	88	22	1	97.46						
		SS	3	100	50	2	96.46						
	1.98	SS	4	88	50+								
		SS	5	80	50+	3	95.46						
		SS	6	87	45	4	94.46						
BEDROCK: Heavily fractured to fractured, black shale		SS	7	71	50+	5	93.46						
		SS	8	30	36	6	92.46						
		RC	1	100	44								
		RC	2	35	8								
End of Borehole	8.18												
(GWL @ 5.56m - April 12, 2019)													

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 5

FILE NO. PE4546

HOLE NO. BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rgd. (ppm)					
GROUND SURFACE								○ Lower Explosive Limit %					
								20	40	60	80		
Asphaltic concrete	0.15					0	98.84						
FILL: Brown silty sand with crushed stone	0.60	AU	1										
FILL: Brown silty sand with clay, gravel, trace plastic and topsoil		SS	2	54	5	1	97.84						
		SS	3	62	11	2	96.84						
		SS	4	67	51	3	95.84						
FILL: Brown silty sand with gravel and crushed stone, trace clay	2.44												
		SS	5	79	78	4	94.84						
		SS	6	70	50+	5	93.84						
BEDROCK: Heavily fractured to fractured, black shale	4.09												
		SS	7	60	50+	6	92.84						
		SS	8	100	50+	7	91.84						
		SS	9	100	50+	8							
		SS	10	100	50+	9							
End of Borehole (GWL @ 5.94m - April 12, 2019)	7.67	SS	11	0	50+	10							

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 5

FILE NO. PE4546

HOLE NO. BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
GROUND SURFACE								○ Lower Explosive Limit %				
								20	40	60	80	
Asphaltic concrete	0.15					0	98.87					
FILL: Crushed stone with sand	0.60	AU	1									
FILL: Brown silty clay, some sand, gravel, shale fragments, trace topsoil		SS	2	46	5	1	97.87					
	1.45											
		SS	3	42	24	2	96.87					
FILL: Dark brown silty sand with shale fragments and gravel		SS	4	54	71							
		SS	5	100		3	95.87					
	3.96											
		SS	6	100		4	94.87					
		SS	7	100								
		SS	8	100		5	93.87					
BEDROCK: Heavily fractured to fractured, black shale		SS	9	67		6	92.87					
		SS	10	0		7	91.87					
		SS	11	0		8	90.87					
End of Borehole	8.13											
(GWL @ 5.95m - April 12, 2019)												

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 5

FILE NO. PE4546

HOLE NO. BH 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
GROUND SURFACE								○ Lower Explosive Limit %				
								20	40	60	80	
Asphaltic concrete	0.18	AU	1			0	98.92					
FILL: Dark brown silty clay with sand and gravel, some topsoil and shale fragments - clay content decreasing with depth		SS	2	50	7	1	97.92					
		SS	3	54	29	2	96.92					
		SS	4	62	56	3	95.92					
FILL: Brown silty sand with crushed stone, gravel and shale fragments, trace clay	2.21	SS	5	100	65	4	94.92					
GLACIAL TILL: Very dense, grey sandy silt to silty sand, some gravel, trace clay	2.90	SS	6	83	46	5	93.92					
		SS	7	100	68	6	92.92					
		SS	8	33	50+	7	91.92					
BEDROCK: Heavily fractured to fractured, black shale	5.26	SS	9	44	50+	8	90.92					
		SS	10	0	50+	9	89.92					
						10	88.92					
End of Borehole (GWL @ 5.98m - April 12, 2019)	7.67											

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 4

FILE NO. PE4546

HOLE NO. BH 6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rgd. (ppm)	○ Lower Explosive Limit %				
GROUND SURFACE								20	40	60	80		
Asphaltic concrete	0.13					0	99.06						
FILL: Brown silty sand with crushed stone, some clay	0.60	AU	1										
FILL: Light brown silty clay with sand and gravel, trace topsoil		SS	2	67	21	1	98.06						
	1.37	SS	3	88		2	97.06						
		SS	4	100	46								
FILL: Brown silty sand with gravel and shale fragments, trace concrete		SS	5	92	72	3	96.06						
		SS	6	92	70	4	95.06						
	4.72	SS	7	67	50+	5	94.06						
		SS	8	100	58	6	93.06						
BEDROCK: Heavily fractured to fractured, black shale		RC	1	78	31	7	92.06						
		RC	2	79	0	8	91.06						
End of Borehole (GWL @ 5.56m - April 12, 2019)	8.25												

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

FILE NO. PE4546

HOLE NO. BH 7

BORINGS BY CME 45 Power Auger

DATE 2019 April 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
GROUND SURFACE								○ Lower Explosive Limit %				
								20	40	60	80	
Asphaltic concrete	0.13					0	99.12					
FILL: Brown silty sand to sandy silt with crushed stone	0.46	AU	1									
FILL: Dark brown silty clay with sand and gravel, some topsoil, trace organics and shale fragments		SS	2	42	15	1	98.12					
- clay content decreasing with depth		SS	3	33	19	2	97.12					
	2.21	SS	4	58	61	3	96.12					
FILL: Brown silty sand with crushed stone and gravel, some shale fragments		SS	5	100	50+	4	95.12					
		SS	6	0	50+	5	94.12					
	4.85	SS	7	82	50+	6	93.12					
BEDROCK: Heavily fractured to fractured, black shale		SS	8	12	94	7	92.12					
		SS	9	62	51	8						
		SS	10	8	8	9						
		SS	11	0	50+	10						
End of Borehole	7.92											
(GWL @ 6.22`m - April 12, 2019)												

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 3

FILE NO. PE4546

HOLE NO. BH 8

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)				
GROUND SURFACE								○ Lower Explosive Limit %				
								20	40	60	80	
Asphaltic concrete	0.15					0	99.07					
FILL: Brown silty sand with crushed stone	0.51	AU	1									
		SS	2	54	8	1	98.07					
		SS	3	46	9	2	97.07					
FILL: Brown silty sand, trace clay, gravel and brick		SS	4	75	17	3	96.07					
		SS	5	58	62	4	95.07					
	3.66	SS	6	100	87	5	94.07					
BEDROCK: Heavily fractured to fractured, black shale		SS	7	88	53	6	93.07					
		SS	8	0	50+	7	92.07					
		SS	9	25	14	8						
		SS	10	38	33	9						
End of Borehole (GWL @ 6.16m - April 12, 2019)	7.62											

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

DATUM TBM - Top spindle of fire hydrant located in front of 307 Montgomery Street.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 2019 April 4

FILE NO. PE4546

HOLE NO. BH 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rgd. (ppm)				
GROUND SURFACE								○ Lower Explosive Limit %				
								20	40	60	80	
Asphaltic concrete					0	99.03						
FILL: Brown silty sand with crushed stone		AU	1									
					1	98.03						
		SS	2	88	10							
		SS	3	54	12	2	97.03					
		SS	4	83	12							
FILL: Dark brown to black silty clay with gravel, cobbles, sand and shale fragments, trace topsoil		SS	5	100	12	3	96.03					
		SS	6	12	23	4	95.03					
		SS	7	33	13	5	94.03					
		SS	8	75	25	6	93.03					
GLACIAL TILL: Compact to very dense, grey sandy silt to silty sand with gravel and shale fragments		SS	9	100	56	7	92.03					
		SS	10	83	91							
		SS	11	88	67	8	91.03					
End of Borehole (GWL @ 4.04m - April 12, 2019)												

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

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the 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 = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = D_{60} / D_{10}

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

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

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

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

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

CONSOLIDATION TEST

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

PERMEABILITY TEST

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

STRATA PLOT



Topsoil



Asphalt



Fill



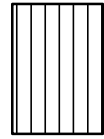
Peat



Sand



Silty Sand



Silt



Sandy Silt



Clay



Silty Clay



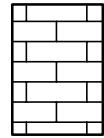
Clayey Silty Sand



Glacial Till



Shale



Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26286
Project: PE4546
Custody: 121631

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

Order #: 1914537

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

Parcel ID	Client ID
1914537-01	BH1-SS2
1914537-02	BH1-SS7
1914537-03	BH2-SS8

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26286

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4546

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Apr-19	9-Apr-19
PHC F1	CWS Tier 1 - P&T GC-FID	8-Apr-19	9-Apr-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Apr-19	7-Apr-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	10-Apr-19	10-Apr-19
Solids, %	Gravimetric, calculation	9-Apr-19	9-Apr-19

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26286

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4546

Client ID:	BH1-SS2	BH1-SS7	BH2-SS8	-
Sample Date:	04/03/2019 09:00	04/03/2019 09:00	04/03/2019 09:00	-
Sample ID:	1914537-01	1914537-02	1914537-03	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	88.2	93.8	95.6	-
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Metals

Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	4.0	-	-	-
Barium	1.0 ug/g dry	91.1	-	-	-
Beryllium	0.5 ug/g dry	0.6	-	-	-
Boron	5.0 ug/g dry	5.7	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	21.6	-	-	-
Cobalt	1.0 ug/g dry	8.3	-	-	-
Copper	5.0 ug/g dry	16.4	-	-	-
Lead	1.0 ug/g dry	9.5	-	-	-
Molybdenum	1.0 ug/g dry	1.3	-	-	-
Nickel	5.0 ug/g dry	24.6	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	31.5	-	-	-
Zinc	20.0 ug/g dry	44.7	-	-	-

Volatiles

Benzene	0.02 ug/g dry	-	0.88	0.33	-
Ethylbenzene	0.05 ug/g dry	-	2.39	0.64	-
Toluene	0.05 ug/g dry	-	1.23	0.78	-
m,p-Xylenes	0.05 ug/g dry	-	6.74	3.12	-
o-Xylene	0.05 ug/g dry	-	0.85	0.98	-
Xylenes, total	0.05 ug/g dry	-	7.58	4.10	-
Toluene-d8	Surrogate	-	111%	109%	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	-	633	71	-
F2 PHCs (C10-C16)	4 ug/g dry	-	204	130	-
F3 PHCs (C16-C34)	8 ug/g dry	-	141	162	-
F4 PHCs (C34-C50)	6 ug/g dry	-	11	13	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26286

Report Date: 10-Apr-2019
 Order Date: 4-Apr-2019
 Project Description: PE4546

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	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Volatiles									
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	8.84		ug/g		110	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26286

Report Date: 10-Apr-2019
 Order Date: 4-Apr-2019
 Project Description: PE4546

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			0.0	30	
Metals									
Antimony	8.5	1.0	ug/g dry	9.2			7.6	30	
Arsenic	6.4	1.0	ug/g dry	6.9			8.0	30	
Barium	58.1	1.0	ug/g dry	65.9			12.6	30	
Beryllium	0.6	0.5	ug/g dry	0.6			2.4	30	
Boron	7.6	5.0	ug/g dry	7.5			1.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	17.0	5.0	ug/g dry	17.2			1.0	30	
Cobalt	4.3	1.0	ug/g dry	4.4			2.5	30	
Copper	66.5	5.0	ug/g dry	68.8			3.5	30	
Lead	530	1.0	ug/g dry	549			3.3	30	
Molybdenum	ND	1.0	ug/g dry	1.0			0.0	30	
Nickel	18.1	5.0	ug/g dry	18.2			0.7	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	19.5			4.5	30	
Zinc	56.8	20.0	ug/g dry	57.0			0.5	30	
Physical Characteristics									
% Solids	86.4	0.1	% by Wt.	86.0			0.5	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	10.3		ug/g dry		106	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26286

Report Date: 10-Apr-2019

Order Date: 4-Apr-2019

Project Description: PE4546

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	181	7	ug/g		90.4	80-120			
F2 PHCs (C10-C16)	93	4	ug/g	ND	100	60-140			
F3 PHCs (C16-C34)	250	8	ug/g	ND	109	60-140			
F4 PHCs (C34-C50)	157	6	ug/g	ND	109	60-140			
Metals									
Antimony	43.8		ug/L	3.7	80.2	70-130			
Arsenic	48.0		ug/L	2.8	90.4	70-130			
Barium	66.2		ug/L	26.4	79.7	70-130			
Beryllium	45.4		ug/L	ND	90.3	70-130			
Boron	45.5		ug/L	ND	85.0	70-130			
Cadmium	44.8		ug/L	ND	89.4	70-130			
Chromium	52.8		ug/L	6.9	91.9	70-130			
Cobalt	46.7		ug/L	1.7	89.9	70-130			
Copper	69.8		ug/L	27.5	84.5	70-130			
Lead	47.7		ug/L		95.4	70-130			
Molybdenum	46.5		ug/L	ND	92.2	70-130			
Nickel	51.0		ug/L	7.3	87.5	70-130			
Selenium	42.6		ug/L	ND	84.8	70-130			
Silver	43.6		ug/L	ND	87.1	70-130			
Thallium	43.1		ug/L	ND	86.1	70-130			
Uranium	44.7		ug/L	ND	88.7	70-130			
Vanadium	54.8		ug/L	ND	94.0	70-130			
Zinc	63.0		ug/L	22.8	80.3	70-130			
Volatiles									
Benzene	3.80	0.02	ug/g		95.1	60-130			
Ethylbenzene	3.70	0.05	ug/g		92.5	60-130			
Toluene	3.46	0.05	ug/g		86.6	60-130			
m,p-Xylenes	7.34	0.05	ug/g		91.7	60-130			
o-Xylene	3.64	0.05	ug/g		91.0	60-130			
Surrogate: Toluene-d8	8.44		ug/g		105	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26286

Report Date: 10-Apr-2019
Order Date: 4-Apr-2019
Project Description: PE4546

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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



Client Name: <i>Paterson Group</i>	Project Reference: <i>PE4546</i>	Turnaround Time: <input checked="" type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <i>Karyn Munch</i>	Quote #	
Address: <i>154 Colonnade Rd.</i>	PO # <i>26286</i>	
Telephone: <i>613-226-7381</i>	Email Address: <i>kmunch@patersongroup.ca</i>	
Criteria: <input checked="" type="checkbox"/> O. Reg. 153/04 (As Amended) Table ___ <input type="checkbox"/> RSC Filing <input type="checkbox"/> O. Reg. 558/00 <input type="checkbox"/> PWQO <input type="checkbox"/> CCME <input type="checkbox"/> SUB (Storm) <input type="checkbox"/> SUB (Sanitary) Municipality: _____ <input type="checkbox"/> Other: _____		

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

Required Analyses

Parcel Order Number: <i>1914537</i>		Matrix	Air Volume	# of Containers	Sample Taken		PHCS F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	Cr-VI	B (HWS)							
Sample ID/Location Name					Date	Time														
1	<i>BH1-SS2</i>	<i>S</i>		<i>1</i>	<i>Apr 3/19</i>				<i>X</i>											<i>250ml</i>
2	<i>BH1-SS7</i>	<i>S</i>		<i>2</i>	<i>↓</i>		<i>X</i>													<i>250ml + 1 vial</i>
3	<i>BH2-SS8</i>	<i>S</i>		<i>2</i>	<i>↓</i>		<i>X</i>													<i>↓</i>
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: _____ Method of Delivery: *Parcel*

Relinquished By (Sign): <i>N. Sullivan</i>	Received by Driver/Depot: <i>A. Drouin</i>	Received at Lab: <i>St. Lawrence</i>	Verified By: <i>D. Gagnier</i>
Relinquished By (Print): <i>Nick Sullivan</i>	Date/Time: <i>04/04/19 4:00 PM</i>	Date/Time: <i>Apr 04, 2019 05:16</i>	Date/Time: <i>Apr 04, 2019</i>
Date/Time: <i>April 4/2019</i>	Temperature: _____	Temperature: <i>16.7 °C</i>	pH Verified [] by: _____

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26288
Project: PE4546
Custody: 121640

Report Date: 15-Apr-2019
Order Date: 9-Apr-2019

Order #: 1915249

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

Parcel ID	Client ID
1915249-01	BH3-SS2
1915249-02	BH4-SS2
1915249-03	BH5-SS2
1915249-04	BH6-SS2
1915249-05	BH7-SS8
1915249-06	BH8-SS3
1915249-07	BH9-SS2

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26288

Report Date: 15-Apr-2019
 Order Date: 9-Apr-2019
Project Description: PE4546

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	9-Apr-19	10-Apr-19
Conductivity	MOE E3138 - probe @25 °C, water ext	12-Apr-19	12-Apr-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	11-Apr-19	12-Apr-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	9-Apr-19	11-Apr-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	11-Apr-19	12-Apr-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	12-Apr-19	15-Apr-19
SAR	Calculated	12-Apr-19	12-Apr-19
Solids, %	Gravimetric, calculation	11-Apr-19	11-Apr-19

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4546

Client ID:	BH3-SS2	BH4-SS2	BH5-SS2	BH6-SS2
Sample Date:	04/05/2019 09:00	04/05/2019 09:00	04/05/2019 09:00	04/04/2019 09:00
Sample ID:	1915249-01	1915249-02	1915249-03	1915249-04
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	76.3	76.4	84.8	82.6
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General Inorganics

SAR	0.01 N/A	-	0.96	-	-
Conductivity	5 uS/cm	-	1510	-	-
pH	0.05 pH Units	-	7.69	-	-

Metals

Antimony	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	4.3	-	7.3	3.7
Barium	1.0 ug/g dry	143	-	110	213
Beryllium	0.5 ug/g dry	0.6	-	0.9	0.7
Boron	5.0 ug/g dry	5.5	-	9.3	7.2
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Chromium	5.0 ug/g dry	28.4	-	25.6	32.4
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	<0.2
Cobalt	1.0 ug/g dry	7.3	-	14.7	8.7
Copper	5.0 ug/g dry	16.6	-	37.5	14.9
Lead	1.0 ug/g dry	88.9	-	13.8	11.1
Mercury	0.1 ug/g dry	0.2	-	<0.1	<0.1
Molybdenum	1.0 ug/g dry	1.1	-	4.5	1.5
Nickel	5.0 ug/g dry	19.0	-	55.1	23.4
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	-	1.8	1.1
Vanadium	10.0 ug/g dry	33.6	-	41.5	42.9
Zinc	20.0 ug/g dry	83.8	-	80.7	61.4

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4546

Client ID:	BH7-SS8	BH8-SS3	BH9-SS2	-
Sample Date:	04/05/2019 09:00	04/03/2019 09:00	04/04/2019 09:00	-
Sample ID:	1915249-05	1915249-06	1915249-07	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	95.5	87.1	84.1	-
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General Inorganics

SAR	0.01 N/A	-	-	0.95	-
Conductivity	5 uS/cm	-	-	1290	-
pH	0.05 pH Units	-	8.13	-	-

Metals

Antimony	1.0 ug/g dry	-	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	-	4.2	5.7	-
Barium	1.0 ug/g dry	-	60.4	80.7	-
Beryllium	0.5 ug/g dry	-	<0.5	0.8	-
Boron	5.0 ug/g dry	-	7.0	10.7	-
Cadmium	0.5 ug/g dry	-	<0.5	<0.5	-
Chromium	5.0 ug/g dry	-	18.5	22.1	-
Chromium (VI)	0.2 ug/g dry	-	-	<0.2	-
Cobalt	1.0 ug/g dry	-	7.5	11.1	-
Copper	5.0 ug/g dry	-	19.6	28.0	-
Lead	1.0 ug/g dry	-	10.9	10.6	-
Mercury	0.1 ug/g dry	-	-	<0.1	-
Molybdenum	1.0 ug/g dry	-	<1.0	4.0	-
Nickel	5.0 ug/g dry	-	21.4	48.4	-
Selenium	1.0 ug/g dry	-	<1.0	<1.0	-
Silver	0.3 ug/g dry	-	<0.3	<0.3	-
Thallium	1.0 ug/g dry	-	<1.0	<1.0	-
Uranium	1.0 ug/g dry	-	<1.0	1.8	-
Vanadium	10.0 ug/g dry	-	28.5	35.5	-
Zinc	20.0 ug/g dry	-	44.8	58.1	-

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	-	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4546

	Client ID:	BH7-SS8	BH8-SS3	BH9-SS2	-
	Sample Date:	04/05/2019 09:00	04/03/2019 09:00	04/04/2019 09:00	-
	Sample ID:	1915249-05	1915249-06	1915249-07	-
	MDL/Units	Soil	Soil	Soil	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Ethylene dibromide (dibromoethar	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	0.06	-	-	-
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	0.11	-	-	-
o-Xylene	0.05 ug/g dry	0.09	-	-	-
Xylenes, total	0.05 ug/g dry	0.19	-	-	-
4-Bromofluorobenzene	Surrogate	79.6%	-	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4546

	Client ID:	BH7-SS8	BH8-SS3	BH9-SS2	-
	Sample Date:	04/05/2019 09:00	04/03/2019 09:00	04/04/2019 09:00	-
	Sample ID:	1915249-05	1915249-06	1915249-07	-
	MDL/Units	Soil	Soil	Soil	-
Dibromofluoromethane	Surrogate	95.8%	-	-	-
Toluene-d8	Surrogate	85.9%	-	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4546

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
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						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019
 Order Date: 9-Apr-2019
 Project Description: PE4546

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	7.66		ug/g		95.8	50-140			
Surrogate: Dibromofluoromethane	7.92		ug/g		99.0	50-140			
Surrogate: Toluene-d8	7.86		ug/g		98.3	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019
 Order Date: 9-Apr-2019
 Project Description: PE4546

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.31	0.01	N/A	0.32			3.2	200	
Conductivity	136	5	uS/cm	138			1.6	5	
pH	8.48	0.05	pH Units	7.89			7.2	10	
Metals									
Antimony	1.2	1.0	ug/g dry	ND			0.0	30	
Arsenic	3.2	1.0	ug/g dry	4.9			40.6	30	
Barium	28.0	1.0	ug/g dry	46.2			48.9	30	QR-01
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	5.9	5.0	ug/g dry	8.0			30.1	30	QR-01
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	14.2	5.0	ug/g dry	14.3			0.9	30	
Cobalt	4.4	1.0	ug/g dry	4.5			2.0	30	
Copper	8.9	5.0	ug/g dry	9.1			2.2	30	
Lead	44.5	1.0	ug/g dry	48.5			8.8	30	
Mercury	0.157	0.1	ug/g dry	0.156			0.8	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	8.7	5.0	ug/g dry	8.7			0.2	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	13.5	10.0	ug/g dry	20.6			41.5	30	
Zinc	59.8	20.0	ug/g dry	91.9			42.4	30	
Physical Characteristics									
% Solids	93.0	0.1	% by Wt.	93.6			0.6	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane)	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4546

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	8.62		ug/g dry		101	50-140			
Surrogate: Dibromofluoromethane	8.66		ug/g dry		101	50-140			
Surrogate: Toluene-d8	8.38		ug/g dry		98.2	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019
 Order Date: 9-Apr-2019
 Project Description: PE4546

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	45.3		ug/L	ND	89.9	70-130			
Arsenic	48.5		ug/L	1.9	93.0	70-130			
Barium	63.1		ug/L	18.5	89.4	70-130			
Beryllium	48.2		ug/L	ND	96.1	70-130			
Boron	46.4		ug/L	ND	86.5	70-130			
Cadmium	48.6		ug/L	ND	96.9	70-130			
Chromium (VI)	0.1		mg/L	ND	70.5	70-130			
Chromium	52.6		ug/L	5.3	94.7	70-130			
Cobalt	49.0		ug/L	1.5	95.1	70-130			
Copper	55.7		ug/L	9.5	92.4	70-130			
Lead	64.5		ug/L	19.4	90.2	70-130			
Mercury	1.26	0.1	ug/g	0.156	73.6	70-130			
Molybdenum	46.9		ug/L	ND	93.4	70-130			
Nickel	48.5		ug/L	ND	90.2	70-130			
Selenium	45.9		ug/L	ND	91.6	70-130			
Silver	50.6		ug/L	ND	101	70-130			
Thallium	47.2		ug/L	ND	94.3	70-130			
Uranium	47.2		ug/L	ND	93.9	70-130			
Vanadium	57.1		ug/L	ND	97.8	70-130			
Zinc	76.1		ug/L	36.8	78.6	70-130			
Volatiles									
Acetone	9.59	0.50	ug/g		95.9	50-140			
Benzene	3.27	0.02	ug/g		81.6	60-130			
Bromodichloromethane	4.29	0.05	ug/g		107	60-130			
Bromoform	3.29	0.05	ug/g		82.2	60-130			
Bromomethane	3.84	0.05	ug/g		96.1	50-140			
Carbon Tetrachloride	3.69	0.05	ug/g		92.3	60-130			
Chlorobenzene	3.37	0.05	ug/g		84.2	60-130			
Chloroform	3.62	0.05	ug/g		90.5	60-130			
Dibromochloromethane	3.28	0.05	ug/g		81.9	60-130			
Dichlorodifluoromethane	3.56	0.05	ug/g		89.1	50-140			
1,2-Dichlorobenzene	3.50	0.05	ug/g		87.5	60-130			
1,3-Dichlorobenzene	3.40	0.05	ug/g		84.9	60-130			
1,4-Dichlorobenzene	3.60	0.05	ug/g		89.9	60-130			
1,1-Dichloroethane	3.71	0.05	ug/g		92.8	60-130			
1,2-Dichloroethane	3.63	0.05	ug/g		90.7	60-130			
1,1-Dichloroethylene	3.69	0.05	ug/g		92.3	60-130			
cis-1,2-Dichloroethylene	3.54	0.05	ug/g		88.6	60-130			
trans-1,2-Dichloroethylene	3.32	0.05	ug/g		83.0	60-130			
1,2-Dichloropropane	3.43	0.05	ug/g		85.7	60-130			
cis-1,3-Dichloropropylene	3.69	0.05	ug/g		92.1	60-130			
trans-1,3-Dichloropropylene	3.06	0.05	ug/g		76.4	60-130			
Ethylbenzene	3.22	0.05	ug/g		80.4	60-130			
Ethylene dibromide (dibromoethane)	2.69	0.05	ug/g		67.1	60-130			
Hexane	2.77	0.05	ug/g		69.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	9.26	0.50	ug/g		92.6	50-140			
Methyl Isobutyl Ketone	8.23	0.50	ug/g		82.3	50-140			
Methyl tert-butyl ether	11.1	0.05	ug/g		111	50-140			
Methylene Chloride	3.84	0.05	ug/g		96.1	60-130			
Styrene	3.49	0.05	ug/g		87.2	60-130			
1,1,1,2-Tetrachloroethane	3.29	0.05	ug/g		82.3	60-130			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26288

Report Date: 15-Apr-2019
 Order Date: 9-Apr-2019
 Project Description: PE4546

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,2,2-Tetrachloroethane	3.19	0.05	ug/g		79.9	60-130			
Tetrachloroethylene	3.16	0.05	ug/g		79.0	60-130			
Toluene	3.21	0.05	ug/g		80.3	60-130			
1,1,1-Trichloroethane	3.38	0.05	ug/g		84.6	60-130			
1,1,2-Trichloroethane	3.78	0.05	ug/g		94.4	60-130			
Trichloroethylene	3.61	0.05	ug/g		90.4	60-130			
Trichlorofluoromethane	3.42	0.05	ug/g		85.5	50-140			
Vinyl chloride	3.88	0.02	ug/g		96.9	50-140			
m,p-Xylenes	6.66	0.05	ug/g		83.2	60-130			
o-Xylene	3.51	0.05	ug/g		87.6	60-130			
Surrogate: 4-Bromofluorobenzene	7.60		ug/g		95.0	50-140			

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 26288

Report Date: 15-Apr-2019
Order Date: 9-Apr-2019
Project Description: **PE4546**

Qualifier Notes:

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.

Parcel ID: 1915249



TF
RE
RE



Lab Office
3-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
1-800-749-1947
paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
No 121640

Page ___ of ___
Turnaround Time:
 1 Day 3 Day
 2 Day Regular
Date Required: _____

Client Name: Paterson Group Inc. Project Reference: PE4546
 Contact Name: Kaylyn Munch Quote # _____
 Address: 154 Colonnade Rd. S. PO # 26288
 Telephone: 613-226-7381 Email Address: kmunch@patersongroup.ca

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)

Parcel Order Number: <u>1915249</u>				Required Analyses														
Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHICS F1-F4+BTEX	VOCs	PAHs	Metals by ICP			B (HWS)	EC/SAR	pH				
				Date	Time				Hg	Cd	Pb							
1 BH3-SS2	S		1	April 5/19					✓	✓	✓							250ml ✓
2 BH4-SS2	S		1	April 5/19					✓	✓	✓		✓					↓
3 BH5-SS2	S		1	April 5/19					✓	✓	✓							120ml ✓
4 BH6-SS2	S		1	Apr. 4/19					✓	✓	✓							250ml ✓
* 5 BH7-SS8	S		2	Apr. 5/19			✓											700ml (+1 vial) ✓
6 BH8-SS3	S		1	Apr. 3/19					✓					✓				250ml ✓
7 BH9-SS2	S		1	Apr. 4/19					✓	✓	✓		✓					↓
8																		
9																		
10																		

Comments: * 2 containers, please hold jarie not needed Method of Delivery: Paracel

Relinquished By (Sign): <u>[Signature]</u>	Received by Driver/Depot: <u>A. J. LEWIS</u>	Received at Lab: <u>Supriya Ravi</u>	Verified By: <u>[Signature]</u>
Relinquished By (Print): <u>Mark St Pierre</u>	Date/Time: <u>09/04/19 3:30 PM</u>	Date/Time: <u>APR 09, 2019 04:20</u>	Date/Time: <u>04/09/19 16:25</u>
Date/Time:	Temperature: <u>7.1</u> °C	Temperature: <u>16.5</u> °C	pH Verified By:

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Philip Price

Client PO: 26334
Project: PE4546
Custody: 121650

Report Date: 16-Apr-2019
Order Date: 15-Apr-2019

Order #: 1916101

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

Parcel ID	Client ID
1916101-01	BH1-GW1
1916101-02	BH2-GW1
1916101-03	BH3-GW1
1916101-04	BH4-GW1
1916101-05	BH5-GW1
1916101-06	BH6-GW1
1916101-07	BH7-GW1
1916101-08	BH8-GW1
1916101-09	BH9-GW1
1916101-10	BH10-GW1

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26334

Report Date: 16-Apr-2019
 Order Date: 15-Apr-2019
Project Description: PE4546

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	15-Apr-19	16-Apr-19
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	16-Apr-19	16-Apr-19
Chromium, hexavalent - water	MOE E3056 - colourimetric	16-Apr-19	16-Apr-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	16-Apr-19	16-Apr-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	16-Apr-19	16-Apr-19
PHC F1	CWS Tier 1 - P&T GC-FID	15-Apr-19	16-Apr-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	15-Apr-19	16-Apr-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	15-Apr-19	16-Apr-19

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	BH4-GW1
Sample Date:	04/12/2019 09:00	04/12/2019 09:00	04/12/2019 09:00	04/12/2019 09:00
Sample ID:	1916101-01	1916101-02	1916101-03	1916101-04
MDL/Units	Water	Water	Water	Water

Anions					
Chloride	1 mg/L	-	1000	-	2010

Metals					
Sodium	200 ug/L	-	472000	-	1030000

Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

	Client ID: Sample Date: Sample ID:	BH1-GW1 04/12/2019 09:00 1916101-01 Water	BH2-GW1 04/12/2019 09:00 1916101-02 Water	BH3-GW1 04/12/2019 09:00 1916101-03 Water	BH4-GW1 04/12/2019 09:00 1916101-04 Water
	MDL/Units				
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	110%	108%	-	-
Dibromofluoromethane	Surrogate	101%	100%	-	-
Toluene-d8	Surrogate	93.5%	93.0%	-	-
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	-	-	91.5%	-

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

	Client ID:	BH5-GW1	BH6-GW1	BH7-GW1	BH8-GW1
	Sample Date:	04/12/2019 09:00	04/12/2019 09:00	04/12/2019 09:00	04/12/2019 09:00
	Sample ID:	1916101-05	1916101-06	1916101-07	1916101-08
	MDL/Units	Water	Water	Water	Water
Anions					
Chloride	1 mg/L	-	-	-	323
Metals					
Mercury	0.1 ug/L	-	<0.1	-	<0.1
Antimony	0.5 ug/L	-	<0.5	-	<0.5
Arsenic	1 ug/L	-	<1	-	<1
Barium	1 ug/L	-	52	-	37
Beryllium	0.5 ug/L	-	<0.5	-	<0.5
Boron	10 ug/L	-	56	-	46
Cadmium	0.1 ug/L	-	0.1	-	<0.1
Chromium	1 ug/L	-	<1	-	<1
Chromium (VI)	10 ug/L	-	<10	-	<10
Cobalt	0.5 ug/L	-	<0.5	-	1.2
Copper	0.5 ug/L	-	4.6	-	<0.5
Lead	0.1 ug/L	-	0.3	-	<0.1
Molybdenum	0.5 ug/L	-	1.8	-	4.2
Nickel	1 ug/L	-	8	-	11
Selenium	1 ug/L	-	<1	-	<1
Silver	0.1 ug/L	-	<0.1	-	<0.1
Sodium	200 ug/L	-	814000	-	172000
Thallium	0.1 ug/L	-	<0.1	-	<0.1
Uranium	0.1 ug/L	-	10.1	-	3.5
Vanadium	0.5 ug/L	-	<0.5	-	<0.5
Zinc	5 ug/L	-	20	-	8
Volatiles					
Acetone	5.0 ug/L	80.1	-	<5.0	-
Benzene	0.5 ug/L	<0.5	-	1.1	-
Bromodichloromethane	0.5 ug/L	<0.5	-	<0.5	-
Bromoform	0.5 ug/L	<0.5	-	<0.5	-
Bromomethane	0.5 ug/L	<0.5	-	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	-	<0.5	-
Chloroform	0.5 ug/L	<0.5	-	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	-	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

	Client ID: Sample Date: Sample ID:	BH5-GW1 04/12/2019 09:00 1916101-05 Water	BH6-GW1 04/12/2019 09:00 1916101-06 Water	BH7-GW1 04/12/2019 09:00 1916101-07 Water	BH8-GW1 04/12/2019 09:00 1916101-08 Water
	MDL/Units				
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	-	<0.2	-
Hexane	1.0 ug/L	<1.0	-	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	-	<5.0	-
Styrene	0.5 ug/L	<0.5	-	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	<0.5	-
Toluene	0.5 ug/L	<0.5	-	4.0	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	-	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	-	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	-	1.8	-
o-Xylene	0.5 ug/L	<0.5	-	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	-	1.8	-
4-Bromofluorobenzene	Surrogate	110%	-	113%	-
Dibromofluoromethane	Surrogate	102%	-	103%	-
Toluene-d8	Surrogate	95.1%	-	90.5%	-

Hydrocarbons

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

	Client ID:	BH5-GW1	BH6-GW1	BH7-GW1	BH8-GW1
	Sample Date:	04/12/2019 09:00	04/12/2019 09:00	04/12/2019 09:00	04/12/2019 09:00
	Sample ID:	1916101-05	1916101-06	1916101-07	1916101-08
	MDL/Units	Water	Water	Water	Water
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	-	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Client ID:	BH9-GW1	BH10-GW1	-	-
Sample Date:	04/12/2019 09:00	04/15/2019 09:00	-	-
Sample ID:	1916101-09	1916101-10	-	-
MDL/Units	Water	Water	-	-

Anions					
Chloride	1 mg/L	2250	-	-	-

Metals					
Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.5 ug/L	1.4	-	-	-
Arsenic	1 ug/L	<1	-	-	-
Barium	1 ug/L	159	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-
Boron	10 ug/L	100	-	-	-
Cadmium	0.1 ug/L	<0.1	-	-	-
Chromium	1 ug/L	<1	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.5 ug/L	2.7	-	-	-
Copper	0.5 ug/L	0.6	-	-	-
Lead	0.1 ug/L	<0.1	-	-	-
Molybdenum	0.5 ug/L	7.9	-	-	-
Nickel	1 ug/L	12	-	-	-
Selenium	1 ug/L	<1	-	-	-
Silver	0.1 ug/L	<0.1	-	-	-
Sodium	200 ug/L	838000	-	-	-
Thallium	0.1 ug/L	0.1	-	-	-
Uranium	0.1 ug/L	4.6	-	-	-
Vanadium	0.5 ug/L	<0.5	-	-	-
Zinc	5 ug/L	<5	-	-	-

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

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

	Client ID:	BH9-GW1	BH10-GW1	-	-
	Sample Date:	04/12/2019 09:00	04/15/2019 09:00	-	-
	Sample ID:	1916101-09	1916101-10	-	-
	MDL/Units	Water	Water	-	-
1,3-Dichlorobenzene	0.5 ug/L	-	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	-	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	-	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	-	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	-	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	-	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	-	<0.5	-	-
Ethylbenzene	0.5 ug/L	-	<0.5	-	-
Ethylene dibromide (dibromoethar	0.2 ug/L	-	<0.2	-	-
Hexane	1.0 ug/L	-	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	-	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	-	<2.0	-	-
Methylene Chloride	5.0 ug/L	-	<5.0	-	-
Styrene	0.5 ug/L	-	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	-	<0.5	-	-
Toluene	0.5 ug/L	-	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	-	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	-	<0.5	-	-
Trichloroethylene	0.5 ug/L	-	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	-	<1.0	-	-
Vinyl chloride	0.5 ug/L	-	<0.5	-	-
m,p-Xylenes	0.5 ug/L	-	<0.5	-	-
o-Xylene	0.5 ug/L	-	<0.5	-	-
Xylenes, total	0.5 ug/L	-	<0.5	-	-
4-Bromofluorobenzene	Surrogate	-	108%	-	-
Dibromofluoromethane	Surrogate	-	103%	-	-
Toluene-d8	Surrogate	-	90.8%	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
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						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	86.5		ug/L		108	50-140			
Surrogate: Dibromofluoromethane	79.8		ug/L		99.8	50-140			
Surrogate: Toluene-d8	77.2		ug/L		96.5	50-140			
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	77.2		ug/L		96.5	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	18.8	1	mg/L	18.8			0.1	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
F2 PHCs (C10-C16)	720	100	ug/L	840			15.4	30	
F3 PHCs (C16-C34)	480	100	ug/L	620			25.5	30	
F4 PHCs (C34-C50)	ND	100	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	52.9	1	ug/L	51.9			1.9	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	54	10	ug/L	56			3.6	20	
Cadmium	0.12	0.1	ug/L	0.11			4.1	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	4.59	0.5	ug/L	4.58			0.3	20	
Lead	0.37	0.1	ug/L	0.33			12.2	20	
Molybdenum	1.92	0.5	ug/L	1.84			4.3	20	
Nickel	7.5	1	ug/L	7.7			2.8	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	743000	2000	ug/L	814000			9.1	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	10.6	0.1	ug/L	10.1			4.9	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	21	5	ug/L	20			1.7	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	2.58	0.5	ug/L	2.74			6.0	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	6.75	0.5	ug/L	6.11			10.0	30	
Dibromochloromethane	1.34	0.5	ug/L	1.58			16.4	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	

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	89.8		ug/L		112	50-140			
Surrogate: Dibromofluoromethane	80.3		ug/L		100	50-140			
Surrogate: Toluene-d8	77.4		ug/L		96.7	50-140			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	77.4		ug/L		96.7	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	28.0	1	mg/L	18.8	92.3	77-123			
Hydrocarbons									
F1 PHCs (C6-C10)	1790	25	ug/L		89.3	68-117			
F2 PHCs (C10-C16)	1690	100	ug/L		105	60-140			
F3 PHCs (C16-C34)	4150	100	ug/L		106	60-140			
F4 PHCs (C34-C50)	2150	100	ug/L		86.9	60-140			
Metals									
Mercury	3.02	0.1	ug/L	ND	101	70-130			
Antimony	50.8		ug/L	ND	101	80-120			
Arsenic	60.5		ug/L	ND	121	80-120			QM-07
Barium	105		ug/L	51.9	106	80-120			
Beryllium	47.6		ug/L	ND	95.1	80-120			
Boron	95		ug/L	56	76.2	80-120			QM-07
Cadmium	49.4		ug/L	0.11	98.6	80-120			
Chromium (VI)	193	10	ug/L	ND	96.5	70-130			
Chromium	68.3		ug/L	ND	136	80-120			QM-07
Cobalt	61.7		ug/L	ND	123	80-120			QM-07
Copper	61.3		ug/L	4.58	113	80-120			
Lead	47.8		ug/L	0.33	94.9	80-120			
Molybdenum	56.2		ug/L	1.84	109	80-120			
Nickel	65.2		ug/L	7.7	115	80-120			
Selenium	52.2		ug/L	ND	103	80-120			
Silver	45.7		ug/L	ND	91.2	80-120			
Sodium	9470		ug/L		94.7	80-120			
Thallium	49.9		ug/L	ND	99.8	80-120			
Uranium	62.7		ug/L	10.1	105	80-120			
Vanadium	72.3		ug/L	ND	144	80-120			QM-07
Zinc	65		ug/L	20	90.3	80-120			
Volatiles									
Acetone	102	5.0	ug/L		102	50-140			
Benzene	38.2	0.5	ug/L		95.5	60-130			
Bromodichloromethane	35.7	0.5	ug/L		89.3	60-130			
Bromoform	32.9	0.5	ug/L		82.2	60-130			
Bromomethane	41.2	0.5	ug/L		103	50-140			
Carbon Tetrachloride	32.2	0.2	ug/L		80.6	60-130			
Chlorobenzene	44.3	0.5	ug/L		111	60-130			
Chloroform	40.8	0.5	ug/L		102	60-130			
Dibromochloromethane	38.4	0.5	ug/L		96.1	60-130			
Dichlorodifluoromethane	40.8	1.0	ug/L		102	50-140			
1,2-Dichlorobenzene	37.5	0.5	ug/L		93.8	60-130			
1,3-Dichlorobenzene	37.4	0.5	ug/L		93.4	60-130			
1,4-Dichlorobenzene	39.9	0.5	ug/L		99.8	60-130			
1,1-Dichloroethane	36.8	0.5	ug/L		92.1	60-130			
1,2-Dichloroethane	47.6	0.5	ug/L		119	60-130			
1,1-Dichloroethylene	34.9	0.5	ug/L		87.4	60-130			
cis-1,2-Dichloroethylene	36.0	0.5	ug/L		90.0	60-130			
trans-1,2-Dichloroethylene	36.6	0.5	ug/L		91.5	60-130			
1,2-Dichloropropane	35.9	0.5	ug/L		89.8	60-130			
cis-1,3-Dichloropropylene	41.8	0.5	ug/L		105	60-130			
trans-1,3-Dichloropropylene	39.1	0.5	ug/L		97.8	60-130			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26334

Report Date: 16-Apr-2019

Order Date: 15-Apr-2019

Project Description: PE4546

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	33.4	0.5	ug/L		83.4	60-130			
Ethylene dibromide (dibromoethane)	44.7	0.2	ug/L		112	60-130			
Hexane	32.4	1.0	ug/L		80.9	60-130			
Methyl Ethyl Ketone (2-Butanone)	75.7	5.0	ug/L		75.7	50-140			
Methyl Isobutyl Ketone	68.7	5.0	ug/L		68.7	50-140			
Methyl tert-butyl ether	81.4	2.0	ug/L		81.4	50-140			
Methylene Chloride	36.9	5.0	ug/L		92.2	60-130			
Styrene	30.1	0.5	ug/L		75.3	60-130			
1,1,1,2-Tetrachloroethane	40.4	0.5	ug/L		101	60-130			
1,1,2,2-Tetrachloroethane	51.0	0.5	ug/L		128	60-130			
Tetrachloroethylene	39.2	0.5	ug/L		98.0	60-130			
Toluene	45.4	0.5	ug/L		113	60-130			
1,1,1-Trichloroethane	34.0	0.5	ug/L		85.0	60-130			
1,1,2-Trichloroethane	37.1	0.5	ug/L		92.6	60-130			
Trichloroethylene	33.2	0.5	ug/L		82.9	60-130			
Trichlorofluoromethane	41.0	1.0	ug/L		102	60-130			
Vinyl chloride	21.4	0.5	ug/L		53.4	50-140			
m,p-Xylenes	76.2	0.5	ug/L		95.3	60-130			
o-Xylene	41.6	0.5	ug/L		104	60-130			
<i>Surrogate: 4-Bromofluorobenzene</i>	<i>77.1</i>		<i>ug/L</i>		<i>96.4</i>	<i>50-140</i>			
Benzene	38.2	0.5	ug/L		95.5	60-130			
Ethylbenzene	33.4	0.5	ug/L		83.4	60-130			
Toluene	45.4	0.5	ug/L		113	60-130			
m,p-Xylenes	76.2	0.5	ug/L		95.3	60-130			
o-Xylene	41.6	0.5	ug/L		104	60-130			

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: **26334**

Report Date: 16-Apr-2019
Order Date: 15-Apr-2019
Project Description: PE4546

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match - Samples read BH10-GW1, CoC read BH9-GW1
Applies to samples: BH9-GW1, BH10-GW1

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.

CCME PHC additional information:

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



LABORATORIES LTD.

Parcel ID: 1916101



Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)

No 121650

Page 2 of 1

Client Name: <u>Paterson Group</u>	Project Reference: <u>PE4546</u>	Turnaround Time: <input checked="" type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input type="checkbox"/> Regular Date Required: _____
Contact Name: <u>Phil Price</u>	Quote #	
Address: <u>154 Colonnade Rd</u>	PO # <u>26334</u>	
Telephone: <u>613 226 7381</u>	Email Address: <u>PRICE@Patersongroup.ca</u>	

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

Parcel Order Number: <u>1916101</u>		Matrix	Air Volume	# of Containers	Sample Taken		PECS F1-F4+BTEX	VOCS	PAHS	Metals by ICP	Hg	CvVI	B (BWS)	Sulfate	Sulfide	Chloride
Sample ID/Location Name					Date	Time										
1	BH1 - GW	W		3	12 April		/	/								
2	BH2 - GW	W		4	12 April		/	/								
3	BH3 - GW	W		3	12 April		/									
4	BH4 - GW	W		1	12 April											
5	BH5 - GW	W		3	12 April		/	/								
6	BH6 - GW	W		3	12 April				/	/	/					
7	BH7 - GW	W		2	12 April		/		/	/	/					
8	BH8 - GW	W		4	12 April				/	/	/					
9	BH9 - GW <u>*Recid BH10</u>	W		4	12 April				/	/	/					
10	BH10 - GW	W		2	15 April		/									

Comments: *Report on BH5 per philip Method of Delivery: walk in

Relinquished By (Sign): <u>[Signature]</u>	Received by Driver/Depot:	Received at Lab: <u>Ken Stewart</u>	Verified By: <u>[Signature]</u>
Relinquished By (Print): <u>PHILIP PRICE</u>	Date/Time:	Date/Time: <u>15 April 19 15:01</u>	Date/Time: <u>04-15-19 15:47</u>
Date/Time: <u>15 April 3pm</u>	Temperature: °C	Temperature: <u>10.3 °C</u>	pH Verified By: <u>ht</u>

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 26458
Project: PE4546
Custody: 121664

Report Date: 22-Apr-2019
Order Date: 18-Apr-2019

Order #: 1916498

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

Parcel ID	Client ID
1916498-01	BH8-GW2
1916498-02	BH9-GW2

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 26458

Report Date: 22-Apr-2019
Order Date: 18-Apr-2019
Project Description: PE4546

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	18-Apr-19	22-Apr-19

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26458

Report Date: 22-Apr-2019

Order Date: 18-Apr-2019

Project Description: PE4546

Client ID:	BH8-GW2	BH9-GW2	-	-
Sample Date:	04/18/2019 09:00	04/18/2019 09:00	-	-
Sample ID:	1916498-01	1916498-02	-	-
MDL/Units	Water	Water	-	-

Volatiles

Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26458

Report Date: 22-Apr-2019

Order Date: 18-Apr-2019

Project Description: PE4546

	Client ID:	BH8-GW2	BH9-GW2	-	-
	Sample Date:	04/18/2019 09:00	04/18/2019 09:00	-	-
	Sample ID:	1916498-01	1916498-02	-	-
	MDL/Units	Water	Water	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	106%	91.5%	-	-
Dibromofluoromethane	Surrogate	102%	103%	-	-
Toluene-d8	Surrogate	83.5%	108%	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26458

Report Date: 22-Apr-2019
 Order Date: 18-Apr-2019
 Project Description: PE4546

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	90.8		ug/L		113	50-140			
Surrogate: Dibromofluoromethane	91.7		ug/L		115	50-140			
Surrogate: Toluene-d8	74.4		ug/L		93.0	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26458

Report Date: 22-Apr-2019

Order Date: 18-Apr-2019

Project Description: PE4546

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane)	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	90.6		ug/L		113	50-140			
Surrogate: Dibromofluoromethane	78.9		ug/L		98.6	50-140			
Surrogate: Toluene-d8	72.9		ug/L		91.1	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 26458

Report Date: 22-Apr-2019
 Order Date: 18-Apr-2019
 Project Description: PE4546

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	94.9	5.0	ug/L		94.9	50-140			
Benzene	39.0	0.5	ug/L		97.4	60-130			
Bromodichloromethane	36.7	0.5	ug/L		91.8	60-130			
Bromoform	36.4	0.5	ug/L		91.1	60-130			
Bromomethane	30.6	0.5	ug/L		76.6	50-140			
Carbon Tetrachloride	35.4	0.2	ug/L		88.6	60-130			
Chlorobenzene	43.8	0.5	ug/L		110	60-130			
Chloroform	40.7	0.5	ug/L		102	60-130			
Dibromochloromethane	38.3	0.5	ug/L		95.8	60-130			
Dichlorodifluoromethane	46.4	1.0	ug/L		116	50-140			
1,2-Dichlorobenzene	32.9	0.5	ug/L		82.3	60-130			
1,3-Dichlorobenzene	33.2	0.5	ug/L		82.9	60-130			
1,4-Dichlorobenzene	35.8	0.5	ug/L		89.6	60-130			
1,1-Dichloroethane	37.8	0.5	ug/L		94.5	60-130			
1,2-Dichloroethane	42.7	0.5	ug/L		107	60-130			
1,1-Dichloroethylene	37.2	0.5	ug/L		93.0	60-130			
cis-1,2-Dichloroethylene	36.0	0.5	ug/L		90.1	60-130			
trans-1,2-Dichloroethylene	37.5	0.5	ug/L		93.6	60-130			
1,2-Dichloropropane	35.5	0.5	ug/L		88.8	60-130			
cis-1,3-Dichloropropylene	45.7	0.5	ug/L		114	60-130			
trans-1,3-Dichloropropylene	43.2	0.5	ug/L		108	60-130			
Ethylbenzene	33.0	0.5	ug/L		82.4	60-130			
Ethylene dibromide (dibromoethane)	41.6	0.2	ug/L		104	60-130			
Hexane	31.7	1.0	ug/L		79.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	75.3	5.0	ug/L		75.3	50-140			
Methyl Isobutyl Ketone	65.3	5.0	ug/L		65.3	50-140			
Methyl tert-butyl ether	78.8	2.0	ug/L		78.8	50-140			
Methylene Chloride	37.7	5.0	ug/L		94.2	60-130			
Styrene	34.7	0.5	ug/L		86.8	60-130			
1,1,1,2-Tetrachloroethane	41.1	0.5	ug/L		103	60-130			
1,1,1,2,2-Tetrachloroethane	48.7	0.5	ug/L		122	60-130			
Tetrachloroethylene	40.9	0.5	ug/L		102	60-130			
Toluene	42.4	0.5	ug/L		106	60-130			
1,1,1-Trichloroethane	37.0	0.5	ug/L		92.5	60-130			
1,1,2-Trichloroethane	38.1	0.5	ug/L		95.2	60-130			
Trichloroethylene	35.8	0.5	ug/L		89.6	60-130			
Trichlorofluoromethane	43.3	1.0	ug/L		108	60-130			
Vinyl chloride	28.6	0.5	ug/L		71.4	50-140			
m,p-Xylenes	71.9	0.5	ug/L		89.9	60-130			
o-Xylene	40.2	0.5	ug/L		101	60-130			
Surrogate: 4-Bromofluorobenzene	70.1		ug/L		87.6	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26458

Report Date: 22-Apr-2019
Order Date: 18-Apr-2019
Project Description: PE4546

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.

Parcel ID: 1916498



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Chain of Custody

(Lab Use Only)

No 121664

Page 1 of 1

Client Name: <i>Peterson</i>	Project Reference: <i>PE4546</i>	Turnaround Time: <input checked="" type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input type="checkbox"/> Regular Date Required: _____
Contact Name: <i>Mark Darcy</i>	Quote #	
Address: <i>156 Colonel W</i>	PO # <i>26458</i>	
Telephone: <i>613 226 7381</i>	Email Address: <i>MDarcy@petersongroup.ca</i>	

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

Parcel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	C/VI	B (UWS)
Sample ID/Location Name					Date	Time							
1	<i>BH8-GW2</i>	<i>W</i>		<i>2</i>	<i>18 Apr 1</i>	<i>AM</i>		<input checked="" type="checkbox"/>					
2	<i>BH9-GW2</i>	<i>W</i>		<i>2</i>	<i>18 Apr 1</i>	<i>AM</i>		<input checked="" type="checkbox"/>					
3													
4													
5													
6													
7													
8													
9													
10													

Comments: _____ Method of Delivery: *Paracel*

Relinquished By (Sign): <i>MP</i>	Received by Driver/Depot: <i>A. FLORE</i>	Received at Lab: <i>SUMPERSON EDHMMI</i>	Verified By: <i>MP</i>
Relinquished By (Print): <i>PHILIP PRICE</i>	Date/Time: <i>18/04/19 3:40</i>	Date/Time: <i>APR 18, 2019 04:25</i>	Date/Time: <i>04-18-19 16:27</i>
Date/Time:	Temperature: <i>17.2</i>	Temperature: <i>17.2</i>	pH Verified [] By: