Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

patersongroup

Phase II – Environmental Site Assessment

2006, 2020, & 2026 Scott Street and
314 & 318 Athlone Avenue
Ottawa, Ontario

Prepared For

Morley Hoppner Group

July 16, 2021

Report: PE5303-2

Paterson Group Inc.

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

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

TABLE OF CONTENTS

PAGE

List of Figures

List of Appendices

EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 2006, 2020, & 2026 Scott Street and 314 & 318 Athlone Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation for this assessment was conducted on May 25 and May 26, 2021, and consisted of drilling eleven boreholes (BH1-BH11) throughout the subject site, of which five were instrumented with groundwater monitoring wells (BH1-BH4 and BH8). Boreholes BH1-BH4 and BH8 were advanced to depths ranging from approximately 5.99 m to 6.17 m below the existing ground surface and terminated within the bedrock, whereas the remaining boreholes were terminated at depths ranging from approximately 0.64 m to 1.80 m below the existing ground surface and terminated on practical refusal to augering on inferred bedrock. In general, the subsurface soil profile encountered at the borehole locations consists of a thin layer of asphaltic concrete over top of brown silty sand with crushed stone (engineered fill material placed as part of the pavement structure).

Ten soil samples were submitted for laboratory analysis of BTEX, PHCs (F1-F4), VOCs, and metal parameters. Based on the analytical test results, the concentration of PHCs (F_2 and F_3) detected within the soil at BH4 and BH7 are in excess of the selected MECP Table 7 residential standards.

Based on the analytical test results obtained from a previous 2005 subsurface investigation, the concentration of PHCs F_3 in the soil beneath the former auto body shop at 314 Athlone Avenue is also in excess of the MECP Table 7 residential standards.

Groundwater samples were recovered from the monitoring wells installed in BH1, BH3, BH4, and BH8 and submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), and VOC parameters. Based on the analytical results, the concentration of benzene and xylenes detected in the groundwater at BH1, are in excess of the selected MECP Table 7 residential standards.

Recommendations

Soil

Based on the findings of this assessment, PHC impacted soil/fill was identified within the eastern (314 Athlone Avenue) and northeastern portion of the subject site (2020 Scott Street), requiring some remedial work. It is our understanding that the subject site is to be redeveloped for residential purposes in the future.

It is our recommendation that an environmental site remediation program be completed in conjunction with site redevelopment activities. This will require the segregation of clean soil from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

Based on the soil test results, the majority of the on-site soils comply with Table 2.1 of the excess soil regulation (Ontario Regulation 406/19), for off-site disposal. Additional excess soil testing will likely be required at the time of future site excavation activities.

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

It is recommended that Paterson personnel be present on-site during remediation activities to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

Groundwater

Based on the findings of this assessment, the groundwater beneath the northwestern portion of the subject site is impacted with benzene and xylenes (BTEX). In order to assess the horizontal and vertical extent of the contaminated groundwater, further investigative work may be required. The delineation and identification of the source of the contamination would also be required to accurately establish potential remediation methodologies and associated costs, as well as to confirm that the impacted groundwater is not migrating off-site.

Regardless of methodology, it is expected that the groundwater would be remediated in conjunction with site redevelopment. The removal of impacted groundwater can be conducted by a licensed pumping contractor during site excavation (a feasible option for smaller volumes), while an on-site treatment system could be used for larger volumes over a longer period of time.

Any on-site treatment system would require discharging to the City of Ottawa sewer system. Prior to any discharging to the municipal system, a Sanitary Sewer Agreement will be required by the City of Ottawa's Sewer Use Program.

Although several groundwater retesting events have already been completed, the significant reduction in contaminant concentrations observed indicate that further groundwater quality testing should be carried out prior to any assessment of potential remediation methodologies.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future construction activities, then they must be decommissioned according to Ontario Regulation 903 (Ontario Water Resources Act), however, we recommend that the wells be maintained for future sampling purposes. The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Morley Hoppner Group, Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment (Phase II ESA) for the properties addressed 2006, 2020, & 2026 Scott Street and 314 & 318 Athlone Avenue, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address the areas of potential environmental concern (APECs) identified on the subject site as a result the findings of the Phase I ESA.

1.1 Site Description

Address:	2006 Scott Street, Ottawa, Ontario; 2020 Scott Street, Ottawa, Ontario; 2026 Scott Street, Ottawa, Ontario; 314 Athlone Avenue, Ottawa, Ontario; 318 Athlone Avenue, Ottawa, Ontario.
Legal Description:	Part of Lot 31, Concession 1 (Ottawa Front), Formerly the Township of Nepean, in the City of Ottawa.
Location:	The subject site is located on the south side of Scott Street, between Athlone Avenue and Winona Avenue, in the City of Ottawa, Ontario. Refer to Figure 1 – Key Plan, appended to this report.
Latitude and Longitude:	45° 23' 44" N, 75° 45' 10" W.

Site Description:

Configuration:	Irregular
Site Area:	0.75 hectares (approximate)
Zoning:	L1 – Community Leisure Facility Zone; TM – Traditional Main Street Zone; R4 – Residential Fourth Density Zone.
Current Uses:	The subject site is currently occupied with a community curling arena, a semi-detached residential dwelling, two commercial office buildings, and one mixed-use building.
Services:	The subject site is located within a municipally serviced area.

1.2 Property Ownership

The properties addressed 2006 & 2020 Scott Street and 314 Athlone Avenue are currently owned by 7520948 Canada Inc. and 9387056 Canada Inc. The property addressed 318 Athlone Avenue is currently owned by Mr. George Murray. The property addressed 2026 Scott Street is currently owned by the Granite Curling Club of West Ottawa.

Paterson was retained to complete this Phase II ESA by Mr. David Derouin of Morley Hoppner Group, whose offices are located at 1818 Bradley Side Road, Carp, Ontario. Mr. Derouin can be contacted via telephone at 613-831-5490.

1.3 Current and Proposed Future Uses

The subject site is currently occupied with a community curling arena, a semi-detached residential dwelling, two commercial office buildings, and one mixed-use building. It is our understanding that the subject site is to be redeveloped with three residential high-rise buildings.

1.4 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 7 of the document entitled, *"Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act"*, prepared by the Ministry of the Environment, Conservation and Parks (MECP), and dated April 15, 2011. The selected MECP standards are based on the following considerations:

- ❒ Shallow soil conditions;
- ❒ Coarse-grained soil conditions;
- ❒ Non-potable groundwater conditions;
- ❒ Residential land use.

The residential standards were selected based on the future intended land use of the subject site.

Grain size analysis was not conducted as part of this assessment. The coarse-grained soil standards were selected as a conservative approach.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is currently occupied with a community curling arena, a semi-detached residential dwelling, two commercial office buildings, and one mixed-use building. The remainder of the subject site is largely paved with asphaltic concrete, with the exception of some landscaped areas fronting Athlone Avenue.

The site topography is relatively flat, whereas the regional topography appears to slope down to the northwest, in the general direction of the Ottawa River. The subject site is considered to be at grade with respect to the adjacent streets and the neighbouring properties.

Water drainage on the subject site occurs primarily via sheet flow towards catch basins located either within the asphaltic concrete parking lots or the adjacent streets

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation for this assessment was conducted on May 25 and May 26, 2021, and consisted of drilling eleven boreholes (BH1-BH11) throughout the subject site, of which five were instrumented with groundwater monitoring wells (BH1-BH4 and BH8).

Boreholes BH1-BH4 and BH8 were advanced to depths ranging from approximately 5.99 m to 6.17 m below the existing ground surface and terminated within the bedrock, whereas the remaining boreholes were terminated at depths ranging from approximately 0.64 m to 1.80 m below the existing ground surface and terminated on practical refusal to augering on inferred bedrock.

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.

The contaminants of potential concern for the soil and groundwater on the subject site include the following:

- Volatile Organic Compounds (VOCs);
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);
- Metals.

3.3 Phase I ESA Conceptual Site Model

Geological and Hydrogeological Setting

Based on the available information, the bedrock in the area of the subject site consists of interbedded limestone and dolomite of the Gull River Formation. The surficial geology consists of glacial till plains, with an overburden thickness ranging from approximately 1 m to 3 m.

Groundwater is anticipated to be encountered within the bedrock and flow in a northwesterly direction towards the Ottawa River.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural significance are present on the subject site or within the Phase I study area. The nearest named water body with respect to the subject site is the Ottawa River, located approximately 615 m to the west.

Existing Buildings and Structures

The subject site is currently occupied with a community curling arena, a semi-detached residential dwelling, two commercial office buildings, and one mixed-use building.

Neighbouring Land Use

The neighbouring lands within the Phase I study area consist of a combination of residential, parkland, and commercial properties.

Drinking Water Wells

Based on the availability of municipal services, no drinking water wells are expected to be present within the Phase I study area.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, six potentially contaminating activities (PCAs), resulting in areas of potential environmental concern (APECs), were identified as pertaining to the subject site. These APECs include:

- A former on-site auto body repair shop, located in the northeastern portion of the subject site (314 Athlone Avenue);
- A former on-site auto service garage, located in the northeastern portion of the subject site (2020 Scott Street);
- A possible former aboveground oil storage tank, historically associated with a former weigh scale building located in the northern portion of the subject site (2026 Scott Street);
- Possible poor quality fill material, generated and/or imported on-site following the demolition of the former weigh scale building, located in the northern portion of the subject site (2026 Scott Street).
- A possible former aboveground oil storage tank, historically associated with the curling arena, located in the central portion of the subject site (2026 Scott Street);
- An existing off-site auto service garage, located adjacent to the west of the subject site (2046 Scott Street);

Other off-site PCAs were identified within the Phase I study area but were deemed not to be of any environmental concern to the subject site based on their separation distances as well as their inferred down-gradient or cross-gradient orientation with respect to anticipated groundwater flow.

Contaminants of Potential Concern

The contaminants of potential concern (CPCs) associated with the aforementioned APECs are considered to be:

- Volatile Organic Compounds (VOCs);
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);

- Metals.

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are PCAs and APECs associated with the subject site.

The presence of any PCAs 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.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation for this assessment was conducted on May 25 and May 26, 2021, and consisted of drilling eleven boreholes (BH1-BH11) throughout the subject site, of which five were instrumented with groundwater monitoring wells (BH1-BH4 and BH8).

Boreholes BH1-BH4 and BH8 were advanced to depths ranging from approximately 5.99 m to 6.17 m below the existing ground surface and terminated within the bedrock, whereas the remaining boreholes were terminated at depths ranging from approximately 0.64 m to 1.80 m below the existing ground surface and terminated on practical refusal to augering on inferred bedrock.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a low-clearance drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. The locations of the boreholes are illustrated on Drawing PE5303-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

Soil 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.

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

A total of 33 soil samples were obtained from the boreholes by means of auger and split spoon sampling. The depths at which auger, split spoon, and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**", and "**RC**", respectively, on the Soil Profile and Test Data Sheets, appended to this report.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a Photo Ionization Detector.

The recovered soil samples were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey, ensuring consistency of readings between samples. To measure the soil vapours, the analyser probe was inserted into the nominal headspace above the sample. The sample was then agitated and manipulated gently by hand as the measurement was taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The parts per million (ppm) scale was used to measure concentrations of organic vapours.

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

4.4 Groundwater Monitoring Well Installation

Five groundwater monitoring wells were installed on the subject site as part of this Phase II ESA investigation. These monitoring wells were constructed using 32 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen and a bentonite seal was placed above the screen to minimize cross-contamination.

A summary of the monitoring well construction details are listed below in Table 1 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

Upon completion, the groundwater monitoring wells were developed using a dedicated inertial lift pump, with a minimum of three well volumes being removed from the wells at the time of installation. The wells were developed until the appearance of the water was noted to have stabilized. In addition, the ground surface elevations of each borehole were subsequently surveyed with respect to a known geodetic elevation.

Table 1
Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m ASL)	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	63.37	5.94	2.94 – 5.94	2.59 – 5.94	2.29 – 2.59	Flushmount
BH2	63.37	5.94	2.94 – 5.94	2.59 – 5.94	2.29 – 2.59	Flushmount
BH3	63.22	6.02	3.02 – 6.02	2.62 – 6.02	2.36 – 2.62	Flushmount
BH4	62.63	5.94	2.94 – 5.94	2.59 – 5.94	2.29 – 2.59	Flushmount
BH8	62.75	6.10	3.10 – 6.10	2.74 – 6.10	2.44 – 2.74	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater monitoring and sampling was initially conducted at BH1-BH4 and BH8 on June 2, 2021. Following their development and stabilization, water quality parameters were measured at each monitoring well location using a multi-reader probe, the results of which are summarized below in Table 2.

Table 2
Measurement of Water Quality Parameters

Well ID	Temperature (˚C)	Conductivity (µS)	pH (Units)
BH1	32.1	6.56	8.05
BH2	N/A	N/A	N/A
BH3	18.2	10.01	8.42
BH4	15.1	11.29	7.77
BH8	22.3	7.52	8.31

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. Standing water was purged from each monitoring well prior to the recovery of the groundwater samples using dedicated sampling equipment. The samples were then stored in coolers to reduce possible analyte volatilization during their transportation. Further details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan, appended to this report.

4.7 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis:

Table 3
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed				Rationale
		VOCs	BTEX	PHCs (F_1-F_4)	Metals	
BH1-21-SS2	0.76 – 1.37 m Fill Material		X	X	X	To assess for potential impacts resulting from a possible former on-site fuel storage tank as well as the presence of fill material of unknown quality.
BH1-21-SS3	1.52 – 2.13 m Fill Material		X	X		To assess for potential impacts resulting from a possible former on-site fuel storage tank as well as the presence of fill material of unknown quality.
BH2-21-SS2	1.52 – 2.13 m Fill Material	X	X	X		To assess for potential impacts resulting from an existing off-site auto service garage.
BH3-21-SS3	1.52 – 2.13 m Fill Material	X	X	X		To assess for potential impacts resulting from a former on-site auto body repair shop.
BH4-21-SS4	1.52 – 2.13 m Fill Material	X	X	X		To assess for potential impacts resulting from a former on-site auto service garage.
BH5-21-SS4	1.52 – 2.13 m Fill Material		X	X		To assess for potential impacts resulting from the presence of fill material of unknown quality.
BH7-21-AU2	0.30 – 0.46 m Fill Material		X	X		To assess for potential impacts resulting from a former on-site auto service garage as well as from the presence of fill material of unknown quality.
BH7-21-SS3	0.76 – 1.37 m Fill Material		X	X	X	To assess for potential impacts resulting from a former on-site auto service garage as well as from the presence of fill material of unknown quality.
BH8-21-AU2	0.30 – 0.46 m Fill Material		X	X		To assess for potential impacts resulting from a possible former on-site fuel storage tank.
BH10-21-AU1	0.15 – 0.30 m Fill Material		X	X	X	To assess for potential impacts resulting from the presence of fill material of unknown quality.
DUP-1[1]	0.15 – 0.30 m Fill Material				X	For laboratory QA/QC purposes.

1 – Duplicate sample of BH10-21-AU1

Table 4
Testing Parameters for Submitted Groundwater Samples

Sample ID	Screened Interval & Stratigraphic Unit	Parameters Analyzed			Rationale
		VOCs	BTEX	PHCs (F_1-F_4)	
BH1-21-GW1	2.94 – 5.94 m Bedrock	X	X	X	To assess for potential impacts resulting from a possible former on-site fuel storage tank.
BH3-21-GW1	3.02 – 6.02 m Bedrock	X		X	To assess for potential impacts resulting from a former on-site auto body repair shop.
BH4-21-GW1	2.94 – 5.94 m Bedrock	X		X	To assess for potential impacts resulting from a former on-site auto service garage.
BH8-21-GW1	3.10 – 6.10 m Bedrock		X	X	To assess for potential impacts resulting from a possible former on-site fuel storage tank.
DUP-1[1]	3.02 – 6.02 m Bedrock	X			For laboratory QA/QC purposes.
BH1-21-GW2	2.94 – 5.94 m Bedrock	X	X	X	To assess for potential impacts resulting from a possible former on-site fuel storage tank.
BH3-21-GW2	3.02 – 6.02 m Bedrock	X	X	X	To assess for potential impacts resulting from a former on-site auto body repair shop.
BH4-21-GW2	2.94 – 5.94 m Bedrock	X	X	X	To assess for potential impacts resulting from a former on-site auto service garage.
BH8-21-GW2	3.10 – 6.10 m Bedrock	X	X	X	To assess for potential impacts resulting from a possible former on-site fuel storage tank.
DUP-2[2]	3.02 – 6.02 m Bedrock	X			For laboratory QA/QC purposes.
BH1-21-GW3	2.94 – 5.94 m Bedrock		X	X	To assess for potential impacts resulting from a possible former on-site fuel storage tank.
BH3-21-GW3	3.02 – 6.02 m Bedrock		X	X	To assess for potential impacts resulting from a former on-site auto body repair shop.

1 – Duplicate sample of BH3-21-GW1
2 – Duplicate sample of BH3-21-GW2

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) and is accredited and certified by the SCC/CALA for specific tests registered with the association.

4.8 Residue Management

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

4.9 Elevation Surveying

The ground surface elevations at each borehole location were surveyed using a GPS device by Paterson personnel and referenced to a geodetic datum.

4.10 Quality Assurance and Quality Control Measures

A summary of the quality assurance and quality control (QA/QC) measures, undertaken as part of this assessment, is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

In general, the subsurface soil profile encountered at the borehole locations consists of a thin layer of asphaltic concrete over top of brown silty sand with crushed stone (engineered fill material placed as part of the pavement structure).

Bedrock, consisting of interbedded limestone and dolostone, was encountered in BH1-BH4 and BH8 at depths ranging from approximately 1.04 m to 2.57 m below the existing ground surface. Practical refusal to augering on inferred bedrock was encountered in the other remaining boreholes at depths ranging from approximately 0.63 m to 1.80 m below the existing ground surface.

Site geology details are provided in the Soil Profile and Test Data Sheets in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter at boreholes BH1-BH4 and BH8 on June 2, 2021. The groundwater levels are summarized below in Table 5.

Table 5
Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	63.37	5.06	58.31	June 2, 2021
BH2	63.37	5.96	57.41	
BH3	63.22	3.85	59.36	
BH4	62.63	3.79	58.84	
BH8	62.75	3.72	59.03	

The groundwater at the subject site was encountered within the bedrock at depths ranging from approximately 3.72 m to 5.06 m below the existing ground surface. It should be noted that the monitoring well installed in BH2 contained an insufficient amount of groundwater at the time of the field sampling event and no water level could be measured at this location.

No unusual visual observations were identified within the recovered groundwater samples, however, faint petroleum hydrocarbon odours were noted within the groundwater obtained from BH1 and BH4.

Using the groundwater elevations recorded during the sampling event, groundwater contour mapping was completed as part of this assessment. According to the mapped contour data, illustrated on Drawing PE5303-3 – Test Hole Location Plan in the appendix, the groundwater flow on the subject site is interpreted to be in a westerly direction. A horizontal hydraulic gradient of approximately 0.026 m/m was also calculated as part of this assessment.

It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

5.3 Fine/Coarse Soil Texture

Grain size analysis was not completed as part of this investigation. As a result, the coarse-grained soil standards were chosen as a conservative approach.

5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0.0 ppm to 109.4 ppm. In general, the organic vapour readings obtained from the field screening of the soil samples indicate that there is a negligible potential for the presence of volatile substances, with one exception. The soil encountered at BH4, particularly that situated at a depth ranging from approximately 1.5 m to 2.1 m below the existing ground surface, was noted to contain odours and visible evidence indicating the potential presence of petroleum hydrocarbons. The soil sample obtained from BH4 at this depth range (BH4-21-SS4) was selected for further laboratory analysis.

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

Ten soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), VOCs, and metal parameters. The results of the analytical testing are presented below in Tables 6 to 8, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 6
Analytical Test Results – Soil
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Residential Soil Standards (µg/g)
		May 25, 2021						
		BH1-21-SS2	BH1-21-SS3	BH2-21-SS2	BH3-21-SS3	BH4-21-SS4	BH5-21-SS4	
Benzene	0.02	nd	nd	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	nd	nd	nd	3.1
PHCs F_1	7	nd	nd	nd	nd	28	nd	55
PHCs F_2	4	nd	nd	nd	nd	**2,000**	10	98
PHCs F_3	8	124	34	nd	16	**2,280**	84	300
PHCs F_4	6	236	92	nd	24	630	154	2,800
PHCs F_{4G}	50	374	nt	nt	nt	2,040	463	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- **Bold and Underlined** – value exceeds selected MECP standards

Table 6 (Continued)
Analytical Test Results – Soil
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 7 Residential Soil Standards (µg/g)
		May 26, 2021				
		BH7-21-AU2	BH7-21-SS3	BH8-21-AU2	BH10-21-AU1	
Benzene	0.02	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	0.06	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	nd	2.3
Xylenes	0.05	0.35	nd	nd	nd	3.1
PHCs F_1	7	9	nd	nd	nd	55
PHCs F_2	4	**364**	29	nd	nd	98
PHCs F_3	8	**735**	148	70	83	300
PHCs F_4	6	1,500	206	174	241	2,800
PHCs F_{4G}	50	nt	nt	nt	nt	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nt – not tested for this parameter
- **Bold and Underlined** – value exceeds selected MECP standards

The concentration of PHCs F_2 and F_3 identified in soil samples BH4-21-SS4 and BH7-21-AU2 are in excess of the selected MECP Table 7 residential standards. All remaining detected BTEX and PHC concentrations are in compliance with the selected MECP Table 7 residential standards.

Table 7
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (ug/g)			MECP Table 7 Residential Soil Standards (µg/g)
		May 25, 2021			
		BH2-21-SS2	BH3-21-SS3	BH4-21-SS4	
Acetone	0.50	nd	nd	nd	16
Benzene	0.02	nd	nd	nd	0.21
Bromodichloromethane	0.05	nd	nd	nd	13
Bromoform	0.05	nd	nd	nd	0.27
Bromomethane	0.05	nd	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	0.05
Chlorobenzene	0.05	nd	nd	nd	2.4
Chloroform	0.05	nd	nd	nd	0.05
Dibromochloromethane	0.05	nd	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	3.4
1,3-Dichlorobenzene	0.05	nd	nd	nd	4.8
1,4-Dichlorobenzene	0.05	nd	nd	nd	0.083
1,1-Dichloroethane	0.05	nd	nd	nd	3.5
1,2-Dichloroethane	0.05	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	0.084
1,2-Dichloropropane	0.05	nd	nd	nd	0.05
1,3-Dichloropropene	0.05	nd	nd	nd	0.05
Ethylbenzene	0.05	nd	nd	nd	2
Ethylene Dibromide	0.05	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	2.8
Methyl Ethyl Ketone	0.50	nd	nd	nd	16
Methyl Isobutyl Ketone	0.50	nd	nd	nd	1.7
Methyl tert-butyl ether	0.05	nd	nd	nd	0.75
Methylene Chloride	0.05	nd	nd	nd	0.1
Styrene	0.05	nd	nd	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	0.28
Toluene	0.05	nd	nd	nd	2.3
1,1,1-Trichloroethane	0.05	nd	nd	nd	0.38
1,1,2-Trichloroethane	0.05	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	0.061
Trichlorofluoromethane	0.05	nd	nd	nd	4
Vinyl Chloride	0.02	nd	nd	nd	0.02
Xylenes	0.05	nd	nd	nd	3.1

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

All VOC parameters were non-detect in the soil samples analyzed. The results are in compliance with the MECP Table 7 residential standards.

Table 8
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 7 Residential Soil Standards (µg/g)
		May 26, 2021			
		BH1-21-SS2	BH7-21-SS3	BH10-21-AU1	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	2.7	1.9	3.6	18
Barium	1.0	86.7	80.4	280	390
Beryllium	0.5	nd	nd	nd	4
Boron	5.0	10.0	5.7	11.5	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	5.0	17.7	23.7	15.8	160
Cobalt	1.0	6.0	5.6	5.8	22
Copper	5.0	15.4	14.5	17.2	140
Lead	1.0	15.8	22.5	50.7	120
Molybdenum	1.0	1.4	nd	nd	6.9
Nickel	5.0	12.7	22.4	13.3	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	10.0	30.7	21.8	20.4	86
Zinc	20.0	37.1	55.2	71.2	340

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

All detected metal concentrations in the soil samples analyzed are in compliance with the MECP Table 7 residential standards.

Table 9
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
Ethylbenzene	0.06	BH7-21-AU2	0.30 – 0.46
Xylenes	0.35	BH7-21-AU2	0.30 – 0.46
PHCs F_1	28	BH4-21-SS4	1.52 – 2.13
PHCs F_2	**2,000**	BH4-21-SS4	1.52 – 2.13
PHCs F_3	**2,280**	BH4-21-SS4	1.52 – 2.13
PHCs F_4	1,500	BH7-21-AU2	0.30 – 0.46
PHCs F_{4G}	2,040	BH4-21-SS4	1.52 – 2.13
Arsenic	3.6	BH10-21-AU1	0.15 – 0.30
Barium	280	BH10-21-AU1	0.15 – 0.30
Boron	11.5	BH10-21-AU1	0.15 – 0.30
Chromium	23.7	BH7-21-SS3	0.76 – 1.37
Cobalt	6.0	BH1-21-SS2	0.76 – 1.37
Copper	17.2	BH10-21-AU1	0.15 – 0.30
Lead	50.7	BH10-21-AU1	0.15 – 0.30
Molybdenum	1.4	BH1-21-SS2	0.76 – 1.37
Nickel	22.4	BH7-21-SS3	0.76 – 1.37
Vanadium	30.7	BH1-21-SS2	0.76 – 1.37
Zinc	71.2	BH10-21-AU1	0.15 – 0.30

Notes:
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits. The laboratory certificates of analysis are provided in Appendix 1.

5.6 Groundwater Quality

Groundwater samples were recovered from the monitoring wells installed in BH1-BH4 and BH8 and submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), and VOC parameters. The results of the analytical testing are presented below in Tables 10 and 11, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 10
Analytical Test Results – Groundwater
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 7 Residential Groundwater Standards (µg/L)
		June 2, 2021				
		BH1-GW1	BH3-GW1	BH4-GW1	BH8-GW1	
Benzene	0.5	**63.4**	**0.9**	**0.6**	**1.6**	0.5
Ethylbenzene	0.5	**176**	5.2	0.8	1.8	54
Toluene	0.5	49.7	nd	nd	nd	320
Xylenes	0.5	**885**	4.4	3.2	1.2	72
PHC F_1	25	nd	31	60	nd	420
PHC F_2	100	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

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

The concentration of benzene, ethylbenzene, and xylene parameters detected in BH1-GW1, as well as the concentration of benzene detected in BH3-GW1, BH4-GW1, and BH8-GW1, were in excess of the selected MECP Table 7 residential standards.

Table 11
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (ug/L)			MECP Table 7 Residential Groundwater Standards (µg/L)
		June 2, 2021			
		BH1-GW1	BH3-GW1	BH4-GW1	
Acetone	5.0	nd	nd	nd	100,000
Benzene	0.5	**63.4**	**0.9**	**0.6**	0.5
Bromodichloromethane	0.5	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	140
Chloroform	0.5	**5.0**	nd	nd	2
Dibromochloromethane	0.5	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	0.5
Ethylbenzene	0.5	**176**	5.2	0.8	54
Ethylene Dibromide	0.2	nd	nd	nd	0.2
Hexane	1.0	**6.2**	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	0.5
Toluene	0.5	49.7	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	0.5
Xylenes	0.5	**885**	4.4	3.2	72

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

The concentration of benzene, chloroform, ethylbenzene, hexane, and xylenes in BH1-GW1, as well as the concentration of benzene in BH3-GW1 and BH4-GW1, were in excess of the selected MECP Table 7 residential standards.

It should be noted that the concentration of chloroform detected within the groundwater in BH1 is considered to be the result of the use of municipal water for the rock coring process, and thus is not considered to be a contaminant issue. This chloroform concentration will dissipate readily in the near future.

Based on the initial groundwater test results, it was our opinion that the test result data was not fully representative of the overall groundwater conditions beneath the subject site. As a result, a second round of groundwater sampling was carried out on June 17, 2021 to confirm the results obtained from the initial sampling program.

The results of the analytical testing are presented below in Tables 12 and 13, as well as on the laboratory certificates of analysis included in Appendix 1.

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

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 7 Residential Groundwater Standards (µg/L)
		June 17, 2021				
		BH1-GW2	BH3-GW2	BH4-GW2	BH8-GW2	
Benzene	0.5	**32.6**	**2.3**	nd	nd	0.5
Ethylbenzene	0.5	7.0	8.0	nd	nd	54
Toluene	0.5	21.8	0.7	nd	nd	320
Xylenes	0.5	**287**	7.2	nd	nd	72
PHC F_1	25	122	93	nd	nd	420
PHC F_2	100	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

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

The concentration of benzene and/or xylenes detected in BH1-GW2 and BH3-GW2, were in excess of the selected MECP Table 7 residential standards.

Table 13
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (ug/L)				MECP Table 7 Residential Groundwater Standards (µg/L)
		June 17, 2021				
		BH1-GW2	BH3-GW2	BH4-GW2	BH8-GW2	
Acetone	5.0	nd	nd	nd	nd	100,000
Benzene	0.5	**32.6**	**2.3**	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	nd	140
Chloroform	0.5	1.4	nd	nd	0.6	2
Dibromochloromethane	0.5	nd	nd	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	nd	0.5
Ethylbenzene	0.5	7.0	8.0	nd	nd	54
Ethylene Dibromide	0.2	nd	nd	nd	nd	0.2
Hexane	1.0	nd	nd	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	5,200
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	nd	0.5
Toluene	0.5	21.8	0.7	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylenes	0.5	**287**	7.2	nd	nd	72

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

The concentration of benzene and/or xylenes detected in BH1-GW2 and BH3-GW2, were in excess of the selected MECP Table 7 residential standards.

While still remaining in excess of the selected MECP Table 7 residential standards, it should be noted that the concentrations of the aforementioned BTEX parameters were significantly lower than the those obtained from the initial groundwater sampling event.

A third round of groundwater sampling was carried out on July 13, 2021 to determine if the BTEX concentrations identified in BH1 and BH3 were exhibiting a decreasing trend. These final groundwater test results are considered to supersede the previous groundwater testing data.

The results of the analytical testing are presented below in Table 14, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 14
Analytical Test Results – Groundwater
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 7 Residential Groundwater Standards (µg/L)
		July 13, 2021		
		BH1-GW3	BH3-GW3	
Benzene	0.5	**3.7**	nd	0.5
Ethylbenzene	0.5	10.7	nd	54
Toluene	0.5	3.7	nd	320
Xylenes	0.5	**90.3**	nd	72
PHC F_1	25	nd	nd	420
PHC F_2	100	nd	nd	150
PHC F_3	100	nd	nd	500
PHC F_4	100	nd	nd	500

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

The concentrations of benzene and xylenes detected in BH1-GW3 are in excess of the selected MECP Table 7 residential standards.

While still remaining in excess of the selected MECP Table 7 residential standards, it should be noted that the concentrations of the aforementioned BTEX parameters are significantly lower than the those obtained from the second groundwater sampling event.

Table 15
Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Sample ID	Depth Interval (m BGS)
Benzene	**32.6**	BH1-GW2	2.94 – 5.94
Chloroform	1.4	BH1-GW2	2.94 – 5.94
Ethylbenzene	8.0	BH3-GW2	2.94 – 5.94
Toluene	21.8	BH1-GW2	2.94 – 5.94
Xylenes	**287**	BH1-GW2	2.94 – 5.94
PHCs F_1	122	BH1-GW2	2.94 – 5.94

Notes:
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits. The laboratory certificates of analysis are provided in Appendix 1.

5.7 Quality Assurance and Quality Control Results

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

As per Subsection 47(3) of O. Reg. 153/04, as amended by the Environmental Protection Act, the certificates of analysis have been received for each sample submitted for laboratory analysis and have been appended to this report.

As per the Sampling and Analysis Plan, a duplicate soil sample was obtained from sample BH10-21-AU1 and submitted for laboratory analysis of metal parameters. The relative percent difference (RPD) calculations for the original and duplicate samples are provided below in Table 16.

Table 16
QA/QC Calculations – Soil

Parameter	MDL (µg/g)	BH10-21-AU1	DUP-1	RPD (%)	QA/QC Result (Target: <20% RPD)
Antimony	1.0	nd	nd	0	Meets Target
Arsenic	1.0	3.6	2.5	36.1	Does Not Meet Target
Barium	1.0	280	236	17.1	Meets Target
Beryllium	0.5	nd	nd	0	Meets Target
Boron	5.0	11.5	12.2	5.9	Meets Target
Cadmium	0.5	nd	nd	0	Meets Target
Chromium	5.0	15.8	15.3	3.2	Meets Target
Cobalt	1.0	5.8	5.2	10.9	Meets Target
Copper	5.0	17.2	16.4	4.8	Meets Target
Lead	1.0	50.7	50.7	0	Meets Target
Molybdenum	1.0	nd	nd	0	Meets Target
Nickel	5.0	13.3	12.2	8.6	Meets Target
Selenium	1.0	nd	nd	0	Meets Target
Silver	0.3	nd	nd	0	Meets Target
Thallium	1.0	nd	nd	0	Meets Target
Uranium	1.0	nd	nd	0	Meets Target
Vanadium	10.0	20.4	19.5	4.5	Meets Target
Zinc	20.0	71.2	70.7	0.7	Meets Target

Notes:
- **Bold and Underlined** – value exceeds selected MECP standards

The relative percent difference (RPD) calculated for one of the parameters fell outside of the acceptable range of 20%, and thus does not meet the data quality objectives outlined in the Sampling and Analysis Plan, appended to this report. It should be noted, however, that the analytical test results comply with the MECP Table 7 residential standards and that the detected parameters were consistent between the original and the duplicate samples.

Similarly, a duplicate groundwater sample was obtained from sample BH3-21-GW1 and submitted for laboratory analysis of VOC parameters. The relative percent difference (RPD) calculations for the original and duplicate samples are provided below in Table 17.

Table 17
QA/QC Calculations – Groundwater

Parameter	MDL (µg/L)	BH3-21-GW1	DUP-1	RPD (%)	QA/QC Result (Target: <20% RPD)
Acetone	5.0	nd	nd	0	Meets Target
Benzene	0.5	**0.9**	**1.0**	10.5	Meets Target
Bromodichloromethane	0.5	nd	nd	0	Meets Target
Bromoform	0.5	nd	nd	0	Meets Target
Bromomethane	0.5	nd	nd	0	Meets Target
Carbon Tetrachloride	0.2	nd	nd	0	Meets Target
Chlorobenzene	0.5	nd	nd	0	Meets Target
Chloroform	0.5	nd	nd	0	Meets Target
Dibromochloromethane	0.5	nd	nd	0	Meets Target
Dichlorodifluoromethane	1.0	nd	nd	0	Meets Target
1,2-Dichlorobenzene	0.5	nd	nd	0	Meets Target
1,3-Dichlorobenzene	0.5	nd	nd	0	Meets Target
1,4-Dichlorobenzene	0.5	nd	nd	0	Meets Target
1,1-Dichloroethane	0.5	nd	nd	0	Meets Target
1,2-Dichloroethane	0.5	nd	nd	0	Meets Target
1,1-Dichloroethylene	0.5	nd	nd	0	Meets Target
cis-1,2-Dichloroethylene	0.5	nd	nd	0	Meets Target
trans-1,2-Dichloroethylene	0.5	nd	nd	0	Meets Target
1,2-Dichloropropane	0.5	nd	nd	0	Meets Target
1,3-Dichloropropene	0.5	nd	nd	0	Meets Target
Ethylbenzene	0.5	5.2	6.0	14.3	Meets Target
Ethylene Dibromide	0.2	nd	nd	0	Meets Target
Hexane	1.0	nd	nd	0	Meets Target
Methyl Ethyl Ketone	5.0	nd	nd	0	Meets Target
Methyl Isobutyl Ketone	5.0	nd	nd	0	Meets Target
Methyl tert-butyl ether	2.0	nd	nd	0	Meets Target
Methylene Chloride	5.0	nd	nd	0	Meets Target
Styrene	0.5	nd	nd	0	Meets Target
1,1,1,2-Tetrachloroethane	0.5	nd	nd	0	Meets Target
1,1,2,2-Tetrachloroethane	0.5	nd	nd	0	Meets Target
Tetrachloroethylene	0.5	nd	nd	0	Meets Target
Toluene	0.5	nd	nd	0	Meets Target
1,1,1-Trichloroethane	0.5	nd	nd	0	Meets Target
1,1,2-Trichloroethane	0.5	nd	nd	0	Meets Target
Trichloroethylene	0.5	nd	nd	0	Meets Target
Trichlorofluoromethane	1.0	nd	nd	0	Meets Target
Vinyl Chloride	0.5	nd	nd	0	Meets Target
Xylenes	0.5	4.4	5.6	24.0	Does Not Meet Target

Notes:
- **Bold and Underlined** – value exceeds selected MECP standards

The relative percent difference (RPD) calculated for one of the parameters fell outside of the acceptable range of 20%, and thus does not meet the data quality objectives outlined in the Sampling and Analysis Plan, appended to this report.

It should be noted, however, that the analytical test results for this particular parameter comply with the MECP Table 7 residential standards and that all detected parameters were consistent between the original and the duplicate samples.

Another duplicate groundwater sample was obtained from sample BH3-21-GW2 and submitted for laboratory analysis of VOC parameters. The relative percent difference (RPD) calculations for the original and duplicate samples are provided below in Table 18.

Table 18
QA/QC Calculations – Groundwater

Parameter	MDL (µg/L)	BH3-21-GW2	DUP-2	RPD (%)	QA/QC Result (Target: <20% RPD)
Acetone	5.0	nd	nd	0	Meets Target
Benzene	0.5	**2.3**	**3.8**	49.2	Does Not Meet Target
Bromodichloromethane	0.5	nd	nd	0	Meets Target
Bromoform	0.5	nd	nd	0	Meets Target
Bromomethane	0.5	nd	nd	0	Meets Target
Carbon Tetrachloride	0.2	nd	nd	0	Meets Target
Chlorobenzene	0.5	nd	nd	0	Meets Target
Chloroform	0.5	nd	nd	0	Meets Target
Dibromochloromethane	0.5	nd	nd	0	Meets Target
Dichlorodifluoromethane	1.0	nd	nd	0	Meets Target
1,2-Dichlorobenzene	0.5	nd	nd	0	Meets Target
1,3-Dichlorobenzene	0.5	nd	nd	0	Meets Target
1,4-Dichlorobenzene	0.5	nd	nd	0	Meets Target
1,1-Dichloroethane	0.5	nd	nd	0	Meets Target
1,2-Dichloroethane	0.5	nd	nd	0	Meets Target
1,1-Dichloroethylene	0.5	nd	nd	0	Meets Target
cis-1,2-Dichloroethylene	0.5	nd	nd	0	Meets Target
trans-1,2-Dichloroethylene	0.5	nd	nd	0	Meets Target
1,2-Dichloropropane	0.5	nd	nd	0	Meets Target
1,3-Dichloropropene	0.5	nd	nd	0	Meets Target
Ethylbenzene	0.5	8.0	15.7	65.0	Does Not Meet Target
Ethylene Dibromide	0.2	nd	nd	0	Meets Target
Hexane	1.0	nd	nd	0	Meets Target
Methyl Ethyl Ketone	5.0	nd	nd	0	Meets Target
Methyl Isobutyl Ketone	5.0	nd	nd	0	Meets Target
Methyl tert-butyl ether	2.0	nd	nd	0	Meets Target
Methylene Chloride	5.0	nd	nd	0	Meets Target
Styrene	0.5	nd	nd	0	Meets Target
1,1,1,2-Tetrachloroethane	0.5	nd	nd	0	Meets Target
1,1,2,2-Tetrachloroethane	0.5	nd	nd	0	Meets Target
Tetrachloroethylene	0.5	nd	nd	0	Meets Target
Toluene	0.5	0.7	1.1	44.4	Does Not Meet Target
1,1,1-Trichloroethane	0.5	nd	nd	0	Meets Target
1,1,2-Trichloroethane	0.5	nd	nd	0	Meets Target
Trichloroethylene	0.5	nd	nd	0	Meets Target
Trichlorofluoromethane	1.0	nd	nd	0	Meets Target
Vinyl Chloride	0.5	nd	nd	0	Meets Target
Xylenes	0.5	7.2	14.7	68.5	Does Not Meet Target

Notes:
- **Bold and Underlined** – value exceeds selected MECP standards

The relative percent difference (RPD) calculated for four parameters fell outside of the acceptable range of 20%, and thus does not meet the data quality objectives outlined in the Sampling and Analysis Plan, appended to this report. It should be noted, however, that that all detected parameters were consistent between the original and the duplicate samples.

Based on the results of the QA/QC analysis, 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. 153/04 amended by 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 described in Section 7.1 of the Phase I ESA report, as well as Section 2.2 of this report, the following PCAs, as described by Table 2 of O. Reg. 153/04, are considered to result in a APECs on the subject site:

- *Item 10: "Commercial Auto Body Shops"*

This PCA was identified as a result of the presence of a former on-site auto body repair shop, located within the eastern portion of the subject site (314 Athlone Avenue).

- *Item 28: "Gasoline and Associated Products Storage in Fixed Tanks"*

This PCA was identified as a result of the possible presence of two former on-site fuel storage tanks, located within the northern and central portions of the subject site (2026 Scott Street).

- *Item 30: "Importation of Fill Material of Unknown Quality"*

This PCA was identified as a result of the presence of fill material of unknown quality, situated beneath the asphaltic concrete parking throughout the subject site.

- *Item 52: "Storage, Maintenance, Fuelling, and Repair of Equipment, Vehicles, and Material Used to Maintain Transportation Systems"*

This PCA was identified as a result of the presence of a former on-site auto service garage, located in the northeastern portion of the subject site (2020 Scott Street), as well as a result of the presence of an existing auto service garage, located on the adjacent property to the west of the subject site (2046 Scott Street).

Contaminants of Potential Concern

The contaminants of potential concern (CPCs) associated with the aforementioned APECs are considered to be:

- Volatile Organic Compounds (VOCs);
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons, fractions 1 - 4 (PHCs F_1-F_4);
- Metals.

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the subject site include electrical cables, natural gas pipelines, as well as municipal water and wastewater services.

Physical Setting

Site Stratigraphy

The stratigraphy of the subject site generally consists of:

- Pavement structure; generally consisting of a 0.05 m to 0.10 m thick layer of asphaltic concrete laid over top of engineered fill material (brown silty sand with crushed stone) and extending to depths ranging from approximately 0.63 m to 2.57 m below the existing ground surface;
- Interbedded limestone and dolostone bedrock; encountered at depths ranging from approximately 0.63 m to 2.57 m below the existing ground surface.

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets in Appendix 1.

Hydrogeological Characteristics

The groundwater at the subject site was encountered within the bedrock at BH1, BH3, BH4, and BH8 at depths ranging from approximately 3.72 m to 5.06 m below the existing ground surface. Based on the measured groundwater levels, the groundwater is interpreted to flow in a westerly direction.

Approximate Depth to Bedrock

Bedrock, consisting of interbedded limestone and dolostone encountered in BH1-BH4 and BH8 at depths ranging from approximately 1.04 m to 2.57 m below the existing ground surface. Practical refusal to augering on inferred bedrock was encountered in the other remaining boreholes (BH5, BH6, BH7, BH9, BH10, and BH11) at depths ranging from approximately 0.63 m to 1.80 m below the existing ground surface.

Approximate Depth to Water Table

The depth to the water table is approximately 3.72 m to 5.06 m below the existing ground surface.

Sections 41 and 43.1 of Ontario Regulation 153/04

Section 41 of the Regulation does not apply to the subject site, as there are no bodies of water or areas of natural significance located on or within 30 m of the subject site. The subject site is therefore not considered to be environmentally sensitive.

Section 43.1 of the Regulation does apply to the subject site, since the bedrock is situated at depths less than 2 m below ground surface, and thus is considered to be a shallow soil property.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural significance are present on the subject site or within the Phase I study area. The nearest named water body with respect to the subject site is the Ottawa River, located approximately 615 m to the west.

Existing Buildings and Structures

The subject site is currently occupied with a community curling arena, a semi-detached residential dwelling, two commercial office buildings, and one mixed-use building.

Proposed Buildings and Other Structures

It is our understanding that the subject site is to be redeveloped with three residential high-rise buildings. Since the future use of the land is more sensitive than the current use, a record of site condition (RSC) will be required to be filed with the MECP.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical test results, PHC impacted soil/fill was identified in BH4 and BH7, located in the northeastern portion of the subject site and situated on the property addressed 2020 Scott Street.

Based on the results of a previous 2005 subsurface investigation, PHC impacted soil/fill was identified beneath the floor slab of the former auto body shop at 314 Athlone Avenue.

Additionally, benzene and xylene impacted groundwater was identified in the monitoring well at BH1, located in the northwestern portion of the subject site.

Types of Contaminants

The soil/fill within BH4 and BH7 contains both of the following contaminants of concern at concentrations exceeding the selected MECP Table 7 residential standards:

- *Petroleum Hydrocarbons:*
  - *Fraction 2 (BH4, BH7);*
  - *Fraction 3 (BH4, BH7).*

The soil/fill within beneath the floor slab of the former auto body shop at 314 Athlone Avenue contains the following contaminants of concern at concentrations exceeding the selected MECP Table 7 residential standards:

- *Petroleum Hydrocarbons:*
  - *Fraction 3.*

The groundwater within the vicinity of BH1 contains both of the following contaminants of concern at concentrations exceeding the selected MECP Table 7 residential standards:

- *BTEX:*
  - *Benzene (BH1);*
  - *Xylenes (BH1).*

Contaminated Media

Based on the findings of this Phase II ESA, the soil/fill within the northeastern portion of the subject site (2020 Scott Street) is contaminated with petroleum hydrocarbons.

Additionally, the groundwater beneath the northwestern portion of the subject site is impacted with benzene and xylenes.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of this Phase II ESA, PHC (F_2 and F_3) impacted soil/fill was identified within the eastern and northeastern portion of the subject site (BH4 and BH7). These contaminants are generally associated with fuels and/or light oil products, such as diesel and motor oils.

Due to the shallow nature of this contamination, the source of these contaminants is suspected to have been the result of the operation of a former on-site auto service garage in this location.

BTEX impacted groundwater was identified within the northwestern portion of the subject site (BH1). These contaminants are generally associated with light fuel products, such as gasoline. The groundwater contamination identified within this location is suspected to have resulted from an unknown discharge of fuel on the subject site.

Distribution and Migration of Contaminants

As previously noted, PHC impacted soil/fill was identified within the eastern and northeastern portions of the subject site (BH4 and BH7). Based on the low concentration of PHCs detected in the groundwater, this contamination is anticipated to be limited to the soil/fill in this location.

BTEX impacted groundwater was identified within the northwestern portion of the subject site (BH1). The groundwater contamination in this area is suspected to have resulted from an unknown discharge of fuel on the subject site.

Discharge of Contaminants

The PHC impacted soil/fill identified within the eastern and northeastern portions of the subject site (BH4 and BH7) is suspected to have resulted from the discharge of fuel and/or oil products from a former on-site auto service garage in this location.

The BTEX impacted groundwater identified within the northwestern portion of the subject site (BH1) is suspected to have resulted from an unknown discharge of fuel and/or oil products.

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 via the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

Downward leaching is not considered to have affected contaminant distribution at the subject site, as the site is largely paved and the groundwater test results obtained at BH4 comply with the MECP Table 7 residential standards. Fluctuations in the groundwater level and groundwater flow are also not considered to have affected contaminant distribution based on the depth of the water table within the bedrock, well below the shallow soil/fill material.

Potential for Vapour Intrusion

Given the low-volatility of the soil contaminants, the potential for vapours to be present within the subject buildings is considered to be low and does not pose a safety hazard to the current occupants.

During redevelopment of the subject site, all soils and groundwater exceeding the selected MECP Table 7 residential standards will be removed and disposed of off-site. As such, there is no anticipated potential for future vapour intrusion at the subject site.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the properties addressed 2006, 2020, & 2026 Scott Street and 314 & 318 Athlone Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the subject site.

The subsurface investigation for this assessment was conducted on May 25 and May 26, 2021, and consisted of drilling eleven boreholes (BH1-BH11) throughout the subject site, of which five were instrumented with groundwater monitoring wells (BH1-BH4 and BH8). Boreholes BH1-BH4 and BH8 were advanced to depths ranging from approximately 5.99 m to 6.17 m below the existing ground surface and terminated within the bedrock, whereas the remaining boreholes were terminated at depths ranging from approximately 0.64 m to 1.80 m below the existing ground surface and terminated on practical refusal to augering on inferred bedrock. In general, the subsurface soil profile encountered at the borehole locations consists of a thin layer of asphaltic concrete over top of brown silty sand with crushed stone (engineered fill material placed as part of the pavement structure).

Ten soil samples were submitted for laboratory analysis of BTEX, PHCs (F1-F4), VOCs, and metal parameters. Based on the analytical test results, the concentration of PHCs (F_2 and F_3) detected within the soil at BH4 and BH7 are in excess of the selected MECP Table 7 residential standards.

Based on the analytical test results obtained from a previous 2005 subsurface investigation, the concentration of PHCs F_3 in the soil beneath the former auto body shop at 314 Athlone Avenue is also in excess of the MECP Table 7 residential standards.

Groundwater samples were recovered from the monitoring wells installed in BH1, BH3, BH4, and BH8 and submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), and VOC parameters. Based on the analytical results, the concentration of benzene and xylenes detected in the groundwater at BH1, are in excess of the selected MECP Table 7 residential standards.

Recommendations

Soil

Based on the findings of this assessment, PHC impacted soil/fill was identified within the eastern (314 Athlone Avenue) and northeastern portion of the subject site (2020 Scott Street), requiring some remedial work. It is our understanding that the subject site is to be redeveloped for residential purposes in the future.

It is our recommendation that an environmental site remediation program be completed in conjunction with site redevelopment activities. This will require the segregation of clean soil from impacted soils, the latter of which will require disposal at an approved waste disposal facility.

Based on the soil test results, the majority of the on-site soils comply with Table 2.1 of the excess soil regulation (Ontario Regulation 406/19), for off-site disposal. Additional excess soil testing will likely be required at the time of future site excavation activities.

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

It is recommended that Paterson personnel be present on-site during remediation activities to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

Groundwater

Based on the findings of this assessment, the groundwater beneath the northwestern portion of the subject site is impacted with benzene and xylenes (BTEX). In order to assess the horizontal and vertical extent of the contaminated groundwater, further investigative work may be required. The delineation and identification of the source of the contamination would also be required to accurately establish potential remediation methodologies and associated costs, as well as to confirm that the impacted groundwater is not migrating off-site.

Regardless of methodology, it is expected that the groundwater would be remediated in conjunction with site redevelopment. The removal of impacted groundwater can be conducted by a licensed pumping contractor during site excavation (a feasible option for smaller volumes), while an on-site treatment system could be used for larger volumes over a longer period of time.

Any on-site treatment system would require discharging to the City of Ottawa sewer system. Prior to any discharging to the municipal system, a Sanitary Sewer Agreement will be required by the City of Ottawa's Sewer Use Program.

Although several groundwater retesting events have already been completed, the significant reduction in contaminant concentrations observed indicate that further groundwater quality testing should be carried out prior to any assessment of potential remediation methodologies.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future construction activities, then they must be decommissioned according to Ontario Regulation 903 (Ontario Water Resources Act), however, we recommend that the wells be maintained for future sampling purposes. The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

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

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

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

This report was prepared for the sole use of Morley Hoppner Group. Permission and notification from Morley Hoppner Group and Paterson Group will be required prior to the release of this report to any other party.

Paterson Group Inc.

Nick Sullivan, B.Sc.

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

Report Distribution:

- Morley Hoppner Group
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE5303-3 – TEST HOLE LOCATION PLAN

DRAWING PE5303-4 – ANALYTICAL TESTING PLAN – SOIL (PHCs)

DRAWING PE5303-4A – CROSS SECTION A-A' – SOIL (PHCs)

DRAWING PE5303-4B – CROSS SECTION B-B' – SOIL (PHCs)

DRAWING PE5303-5 – ANALYTICAL TESTING PLAN – SOIL (BTEX, VOCs, METALS)

DRAWING PE5303-5A – CROSS SECTION A-A' – SOIL (BTEX, VOCs, METALS)

DRAWING PE5303-5B – CROSS SECTION B-B' – SOIL (BTEX, VOCs, METALS)

DRAWING PE5303-6 – ANALYTICAL TESTING PLAN – GROUNDWATER (BTEX & VOCs)

DRAWING PE5303-6A – CROSS SECTION A-A' – GROUNDWATER (BTEX & VOCs)

DRAWING PE5303-6B – CROSS SECTION B-B' – GROUNDWATER (BTEX & VOCs)

DRAWING PE5303-7 – ANALYTICAL TESTING PLAN – GROUNDWATER (PHCs)

DRAWING PE5303-7A – CROSS SECTION A-A' – GROUNDWATER (PHCs)

DRAWING PE5303-7B – CROSS SECTION B-B' – GROUNDWATER (PHCs)

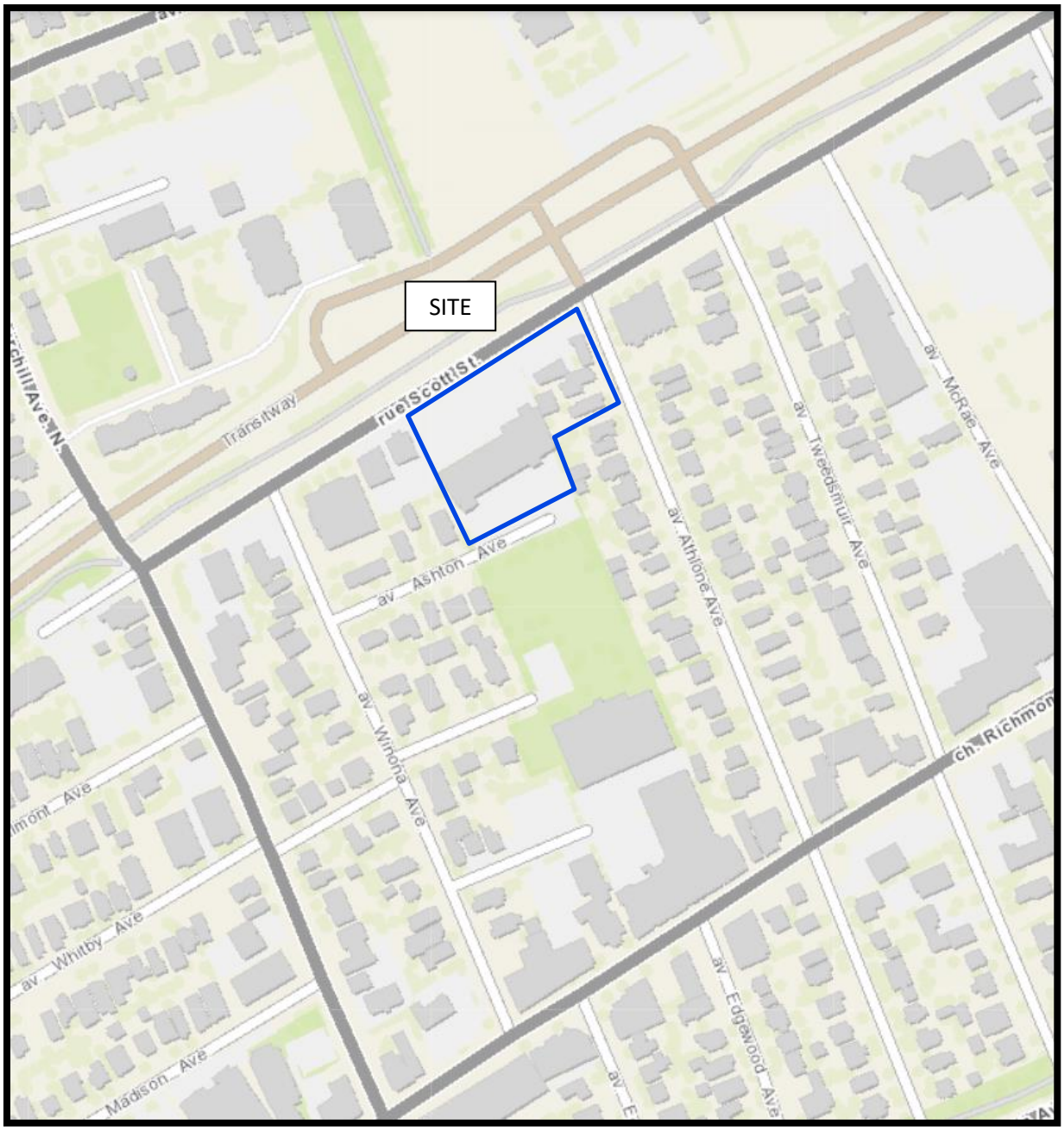
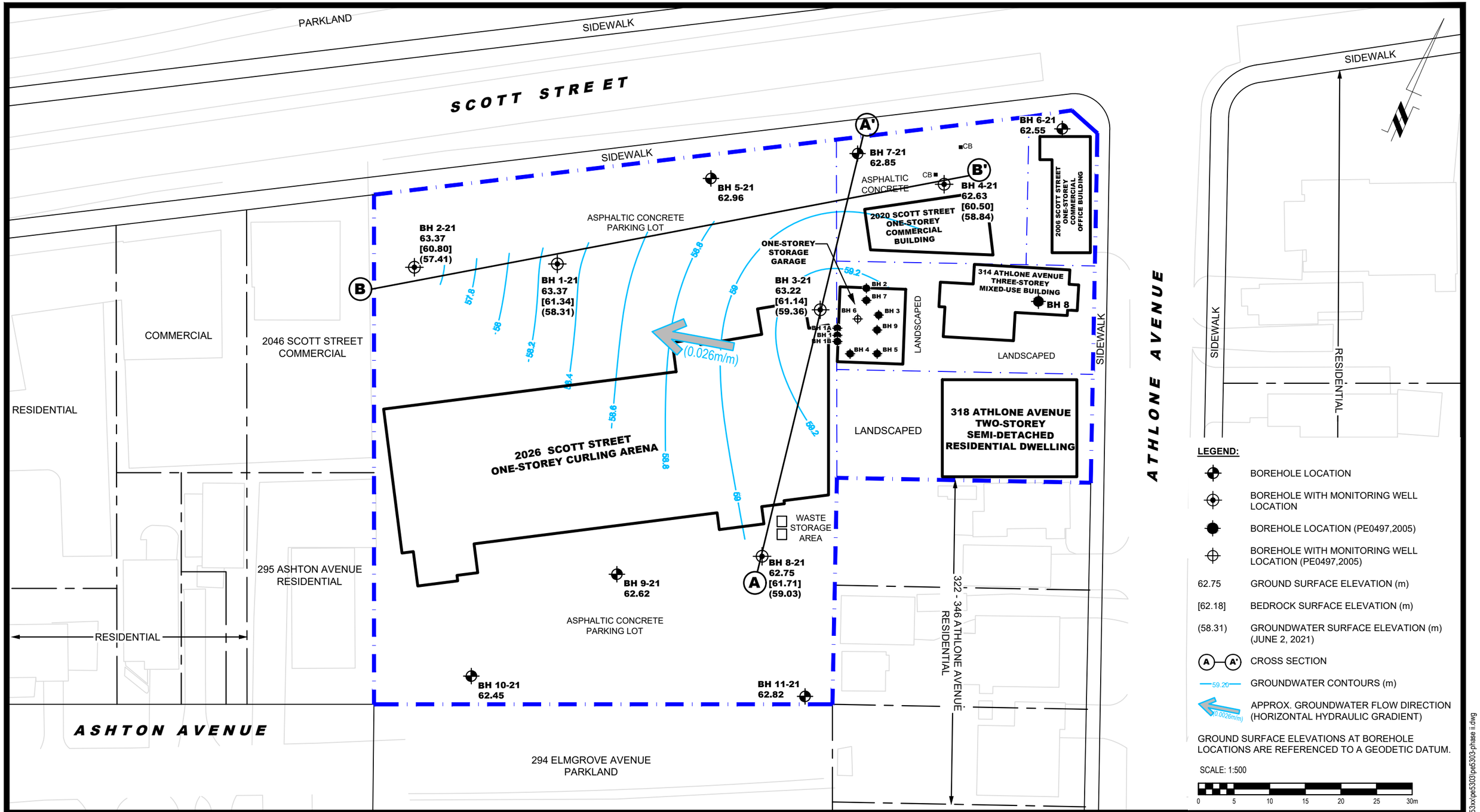


FIGURE 1

KEY PLAN



patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

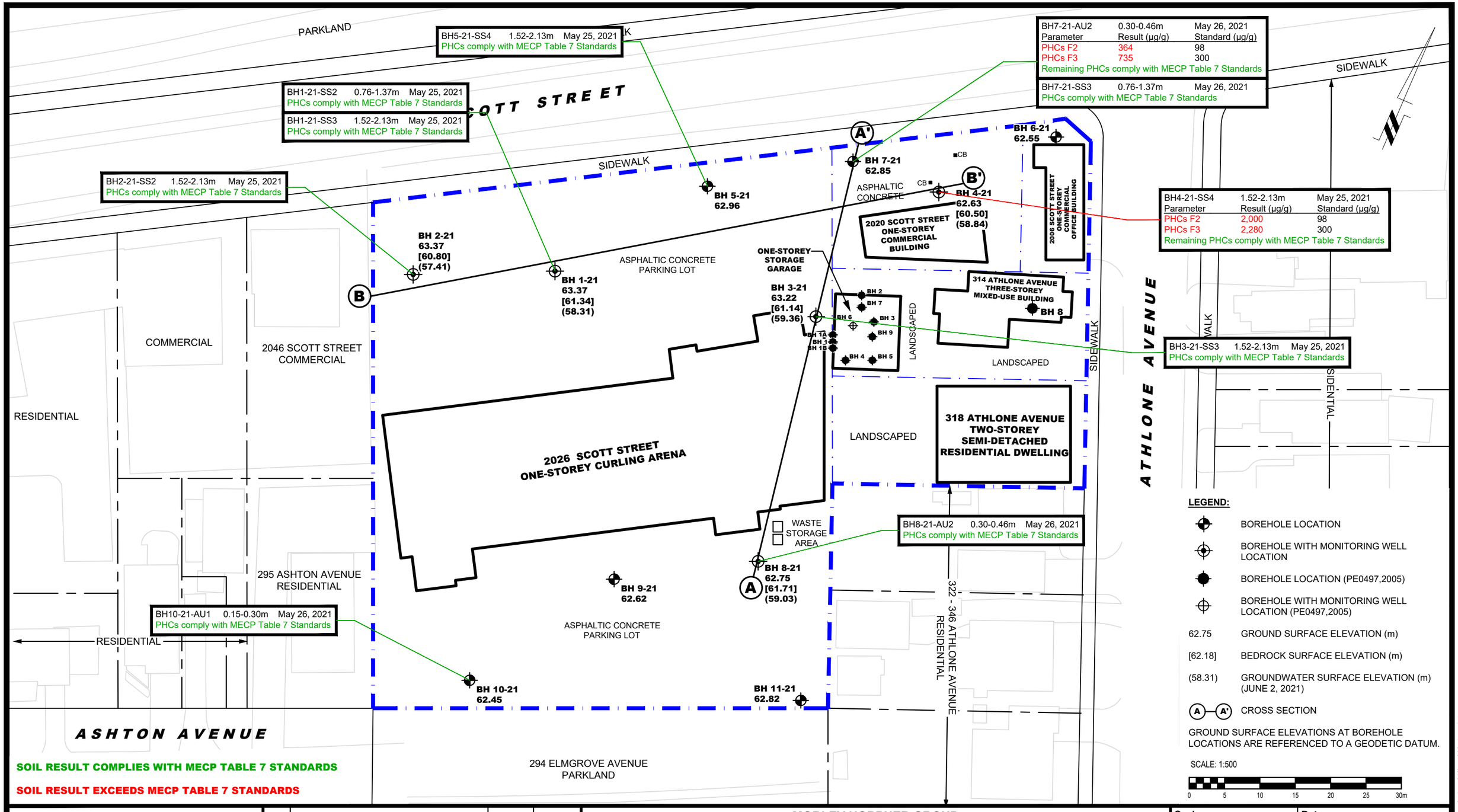
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 07/2021
Drawn by: JM	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-3
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe5303\pe5303-phase ii.dwg



patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

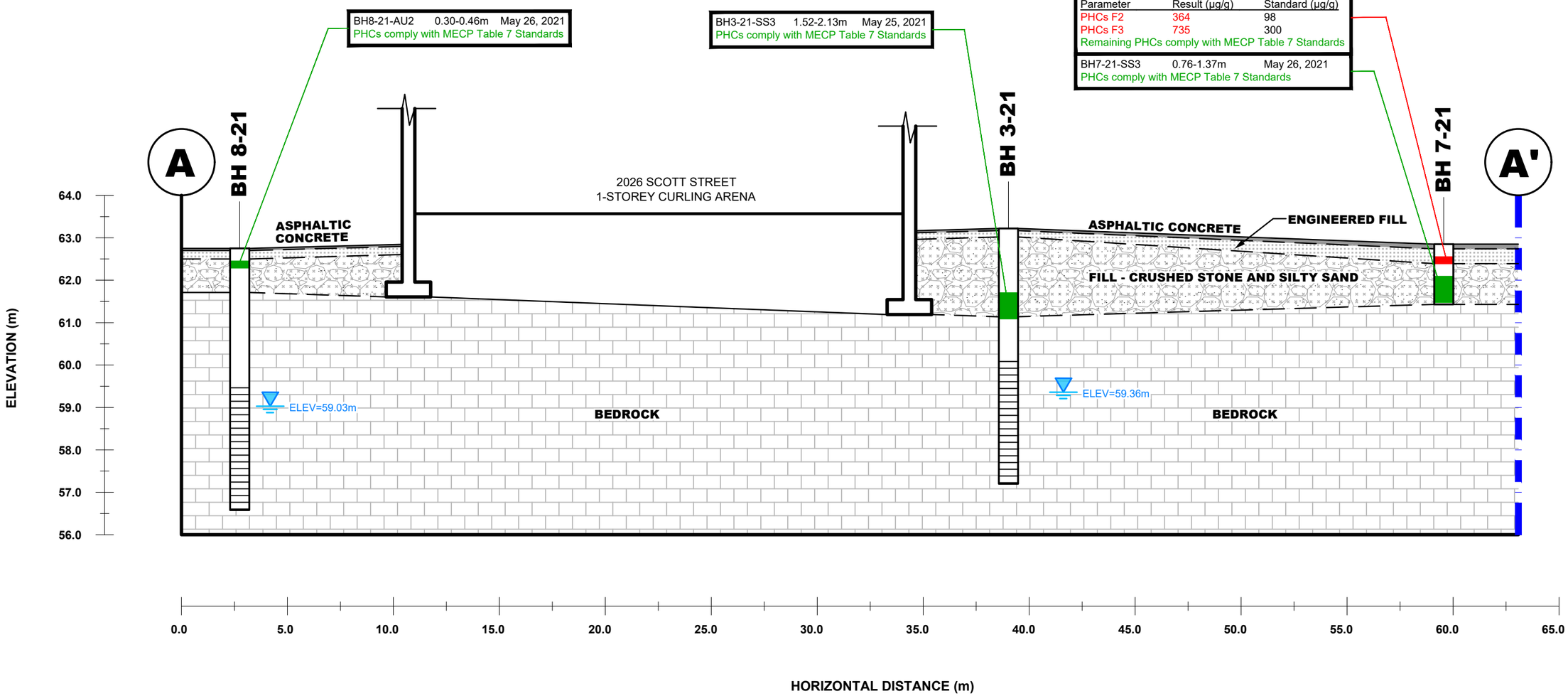
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PHCs)

Scale: 1:500	Date: 07/2021
Drawn by: JM	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-4
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe5303\pe5303-phase ii.dwg



SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (PHCs)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-4A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg

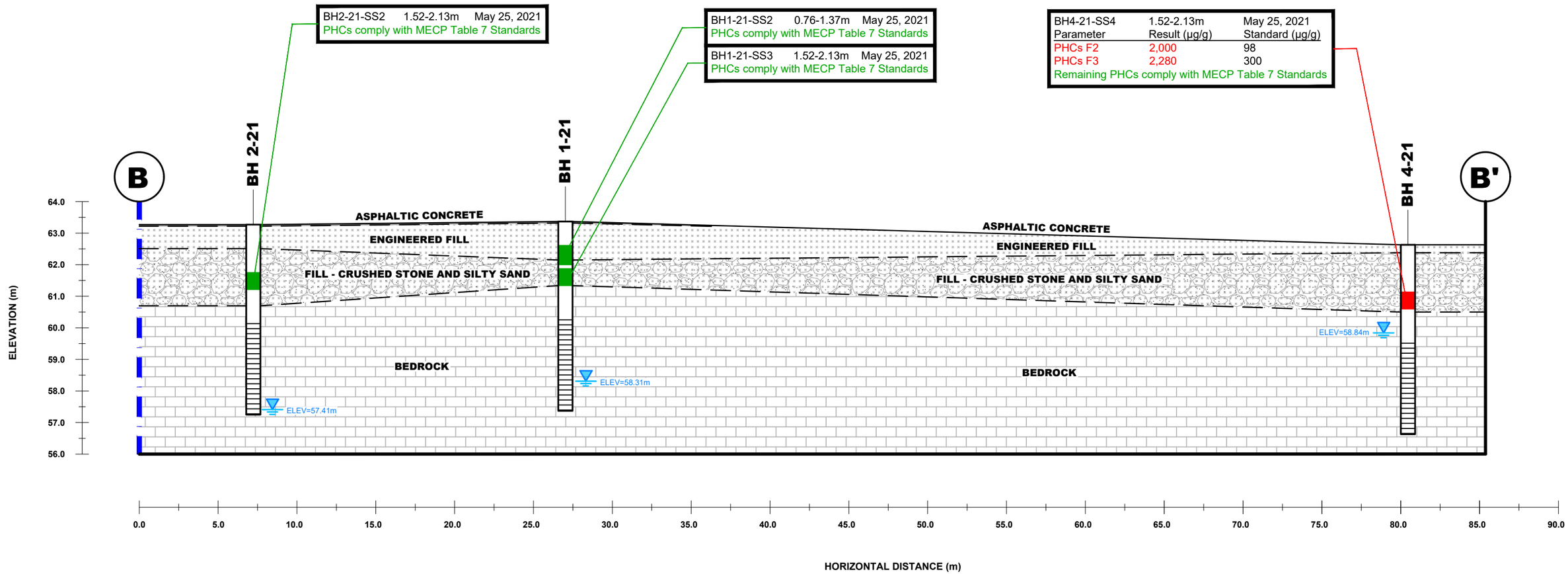
BH2-21-SS2 1.52-2.13m May 25, 2021
PHCs comply with MECP Table 7 Standards

BH1-21-SS2 0.76-1.37m May 25, 2021
PHCs comply with MECP Table 7 Standards

BH1-21-SS3 1.52-2.13m May 25, 2021
PHCs comply with MECP Table 7 Standards

BH4-21-SS4	1.52-2.13m	May 25, 2021
Parameter	Result (µg/g)	Standard (µg/g)
PHCs F2	2,000	98
PHCs F3	2,280	300

Remaining PHCs comply with MECP Table 7 Standards



SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

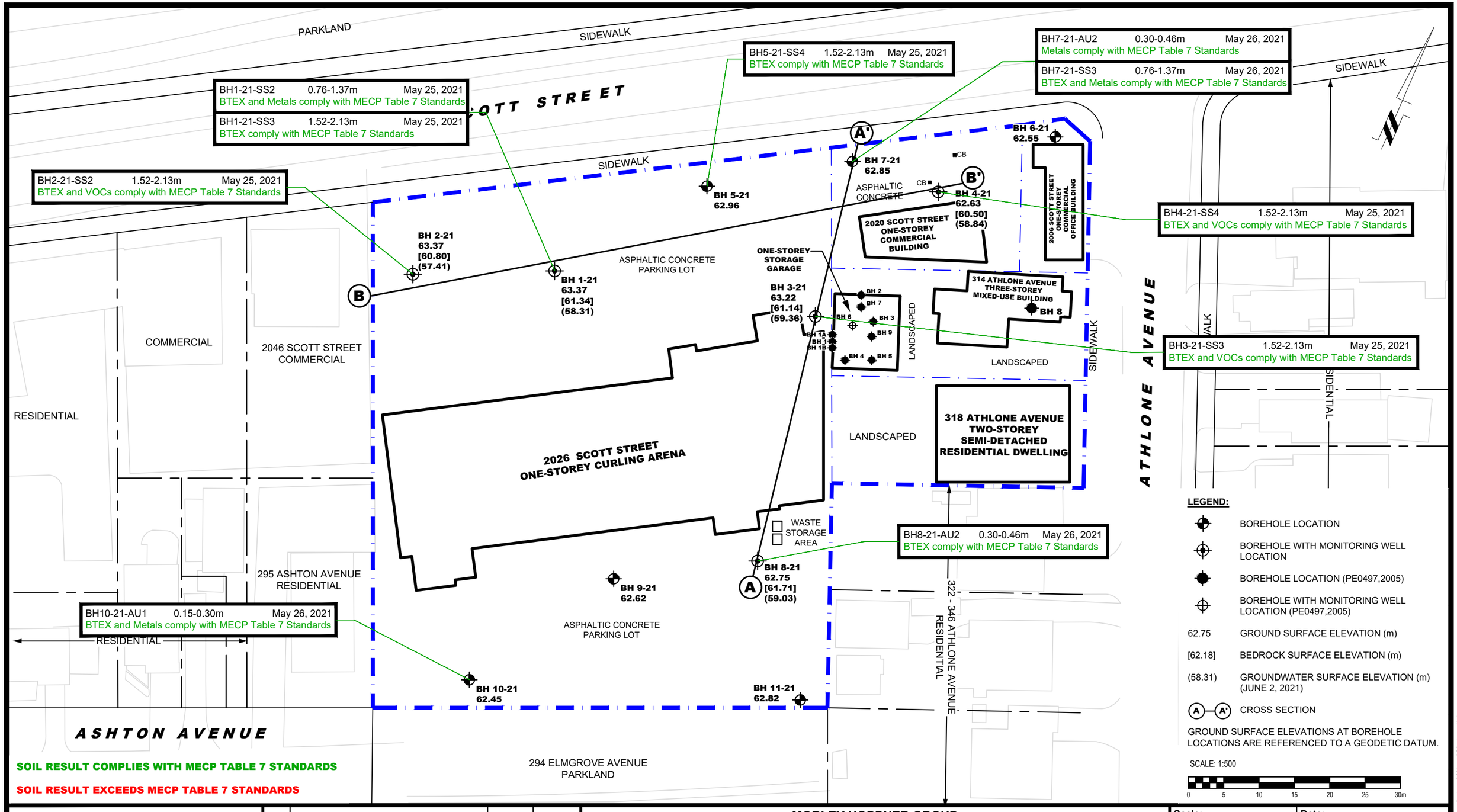
OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - SOIL (PHCs)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-4B
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg



patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

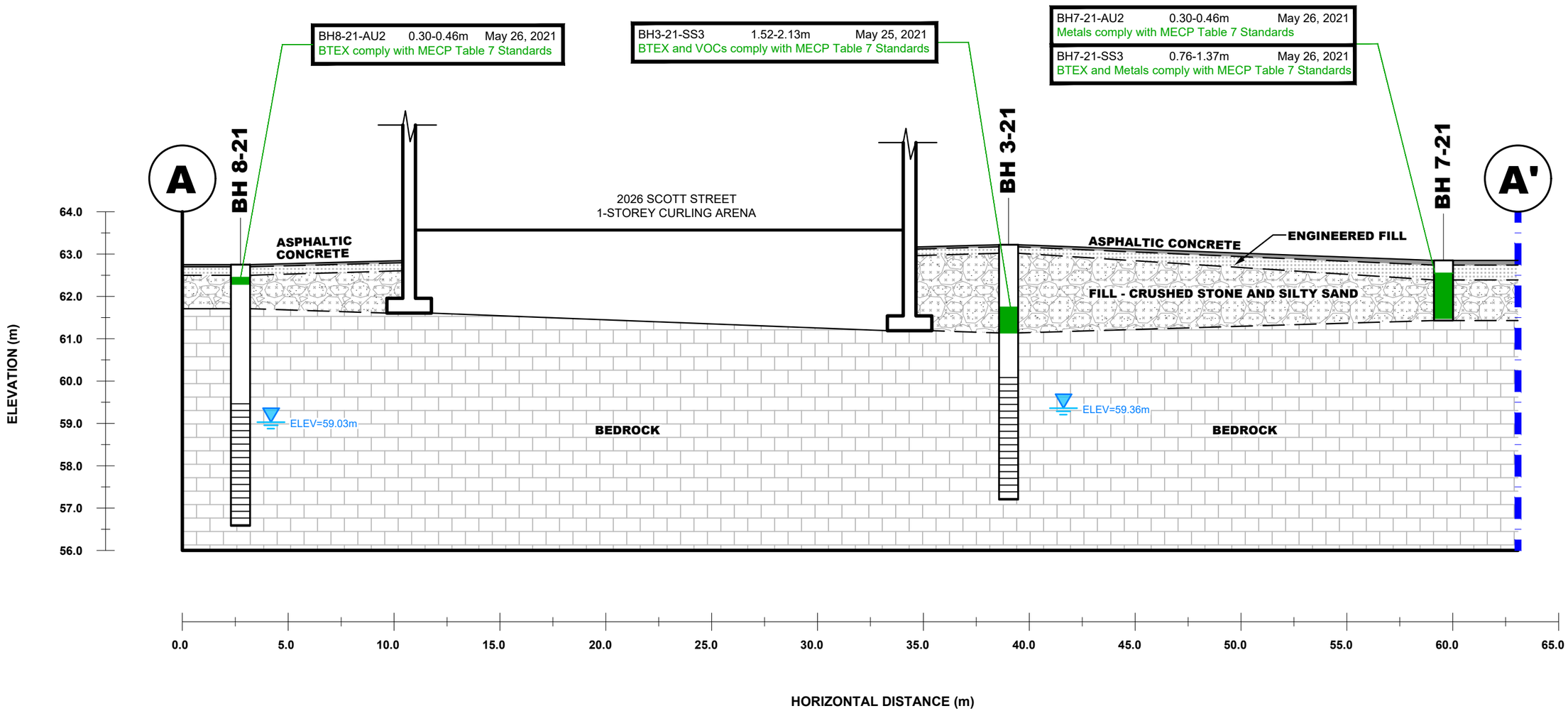
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX, VOCs, METALS)

Scale: 1:500	Date: 07/2021
Drawn by: JM	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-5
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg



SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - SOIL (BTEX, VOCs, METALS)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-5A
Approved by: MSD	Revision No.:

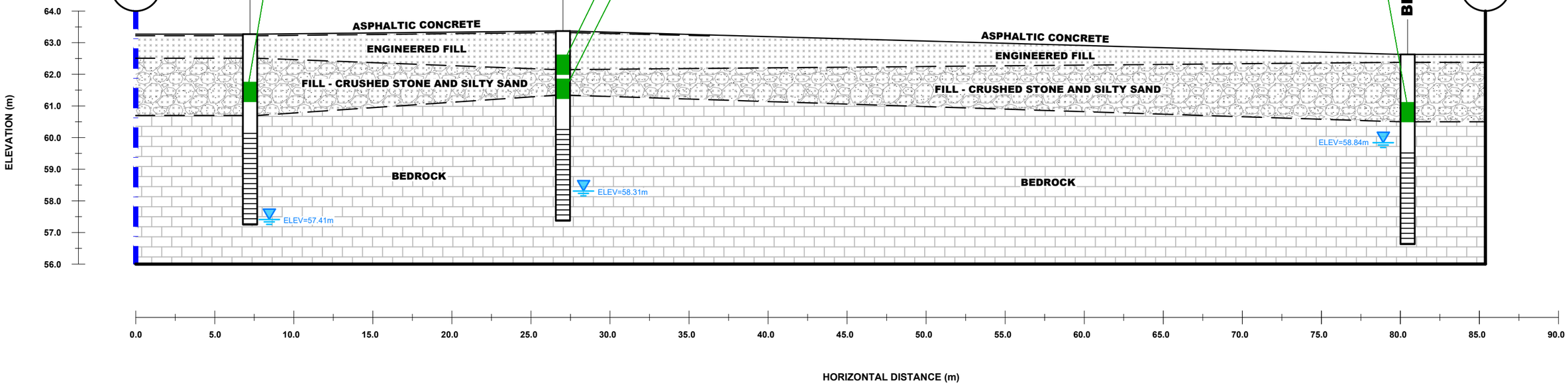
p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg

BH2-21-SS2 1.52-2.13m May 25, 2021
BTEX and VOCs comply with MECP Table 7 Standards

BH1-21-SS2 0.76-1.37m May 25, 2021
BTEX and Metals comply with MECP Table 7 Standards

BH1-21-SS3 1.52-2.13m May 25, 2021
BTEX comply with MECP Table 7 Standards

BH4-21-SS4 1.52-2.13m May 25, 2021
BTEX and VOCs comply with MECP Table 7 Standards



SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:
CROSS SECTION B-B' - SOIL (BTEX, VOCs, METALS)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-5B
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg

BH1-21-GW1	2.94-5.94m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	63.4	0.5
Chloroform	5.0	2
Ethylbenzene	176	54
Hexane	6.2	5
Xylenes	885	72
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH1-21-GW2	2.94-5.94m	June 17, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	32.6	0.5
Xylenes	287	72
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH1-21-GW3	2.94-5.94m	July 13, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	3.7	0.5
Xylenes	90.3	72
Remaining BTEX comply with MECP Table 7 Standards		

BH3-21-GW1	3.02-6.02m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	0.9	0.5
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH3-21-GW2	3.02-6.02m	June 17, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	2.3	0.5
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH3-21-GW3	3.02-6.02m	July 13, 2021
BTEX comply with MECP Table 7 Standards		

BH4-21-GW1	2.94-5.94m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	0.6	0.5
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH4-21-GW2	2.94-5.94m	June 17, 2021
BTEX and VOCs comply with MECP Table 7 Standards		

BH8-21-GW1	3.10-6.10m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	1.6	0.5
Remaining BTEX comply with MECP Table 7 Standards		

BH8-21-GW2	3.10-6.10m	June 17, 2021
BTEX and VOCs comply with MECP Table 7 Standards		

PARKLAND

SIDEWALK

SCOTT STREET

SIDEWALK

BH 6-21
62.55

BH 7-21
62.85

ASPHALTIC CONCRETE

CB

CB

B'

BH 4-21
62.63
[60.50]
(58.84)

2020 SCOTT STREET
ONE-STOREY
COMMERCIAL
BUILDING

2006 SCOTT STREET
ONE-STOREY
COMMERCIAL
OFFICE BUILDING

A'

BH 5-21
62.96

BH 2-21
63.37
[60.80]
(57.41)

B

BH 1-21
63.37
[61.34]
(58.31)

ASPHALTIC CONCRETE
PARKING LOT

ONE-STOREY
STORAGE
GARAGE

BH 3-21
63.22
[61.14]
(59.36)

BH 2
BH 7
BH 6
BH 3
BH 9
BH 1A
BH 1
BH 1B
BH 4
BH 5

LANDSCAPED

314 ATHLONE AVENUE
THREE-STOREY
MIXED-USE BUILDING

BH 8

LANDSCAPED

SIDEWALK

ATHLONE AVENUE

SIDEWALK

RESIDENTIAL

COMMERCIAL

2046 SCOTT STREET
COMMERCIAL

RESIDENTIAL

2026 SCOTT STREET
ONE-STOREY CURLING ARENA

LANDSCAPED

318 ATHLONE AVENUE
TWO-STOREY
SEMI-DETACHED
RESIDENTIAL DWELLING

WASTE
STORAGE
AREA

BH 8-21
62.75
[61.71]
(59.03)

A

BH 9-21
62.62

ASPHALTIC CONCRETE
PARKING LOT

295 ASHTON AVENUE
RESIDENTIAL

RESIDENTIAL

346 ATHLONE AVENUE
RESIDENTIAL

BH 10-21
62.45

BH 11-21
62.82

ASHTON AVENUE

294 ELMGROVE AVENUE
PARKLAND

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION (PE0497,2005)
- BOREHOLE WITH MONITORING WELL LOCATION (PE0497,2005)
- 62.75 GROUND SURFACE ELEVATION (m)
- [62.18] BEDROCK SURFACE ELEVATION (m)
- (58.31) GROUNDWATER SURFACE ELEVATION (m) (JUNE 2, 2021)
- A—A' CROSS SECTION

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:500

0 5 10 15 20 25 30m

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:

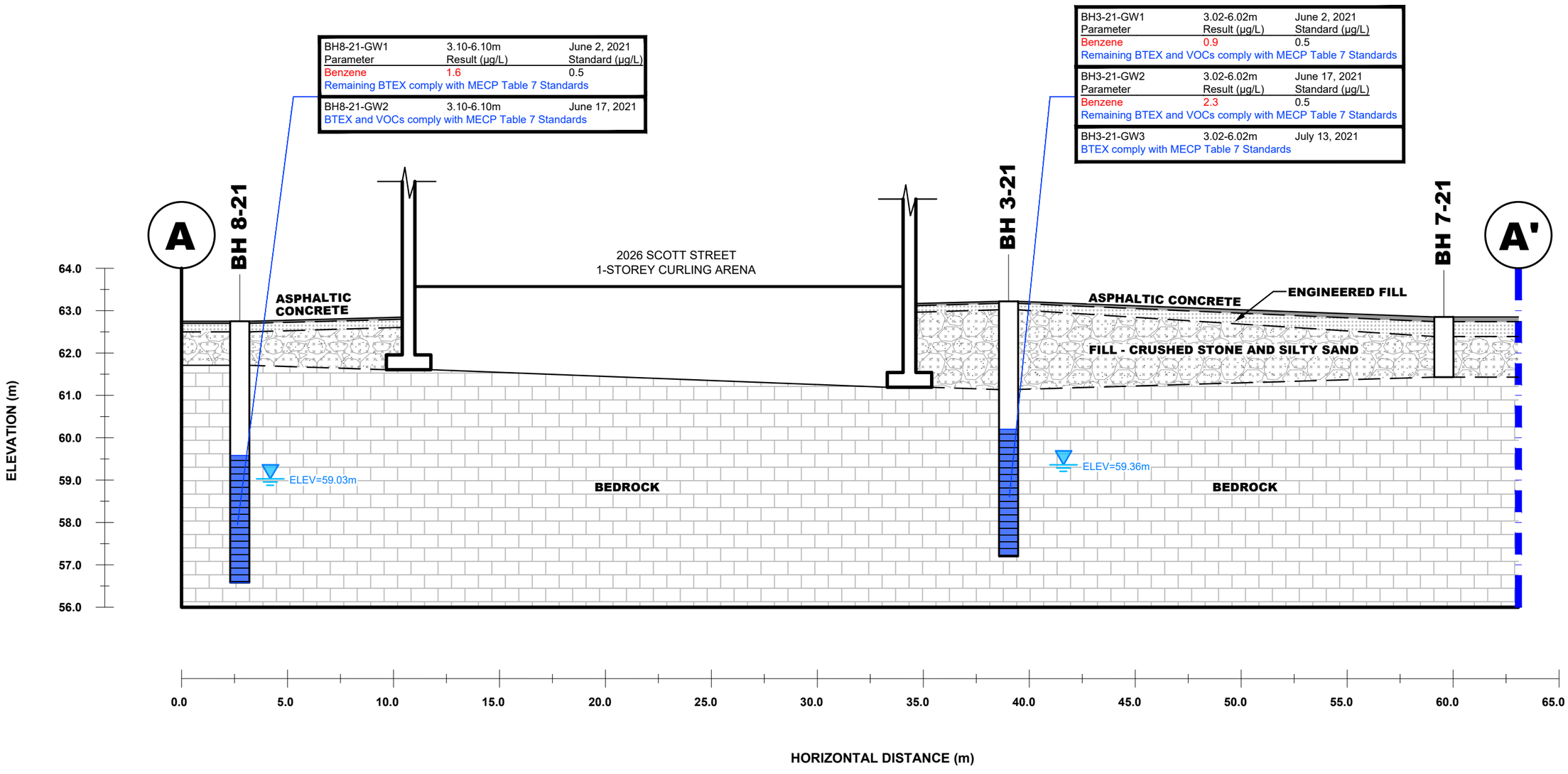
ANALYTICAL TESTING PLAN - GROUNDWATER (BTEX, VOCs)

Scale: 1:500	Date: 07/2021
Drawn by: JM	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-6
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe5303xx\pe5303\pe5303-phase ii.dwg

BH8-21-GW1	3.10-6.10m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	1.6	0.5
Remaining BTEX comply with MECP Table 7 Standards		
BH8-21-GW2	3.10-6.10m	June 17, 2021
BTEX and VOCs comply with MECP Table 7 Standards		

BH3-21-GW1	3.02-6.02m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	0.9	0.5
Remaining BTEX and VOCs comply with MECP Table 7 Standards		
BH3-21-GW2	3.02-6.02m	June 17, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	2.3	0.5
Remaining BTEX and VOCs comply with MECP Table 7 Standards		
BH3-21-GW3	3.02-6.02m	July 13, 2021
BTEX comply with MECP Table 7 Standards		



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER (BTEX, VOCs)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-6A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg

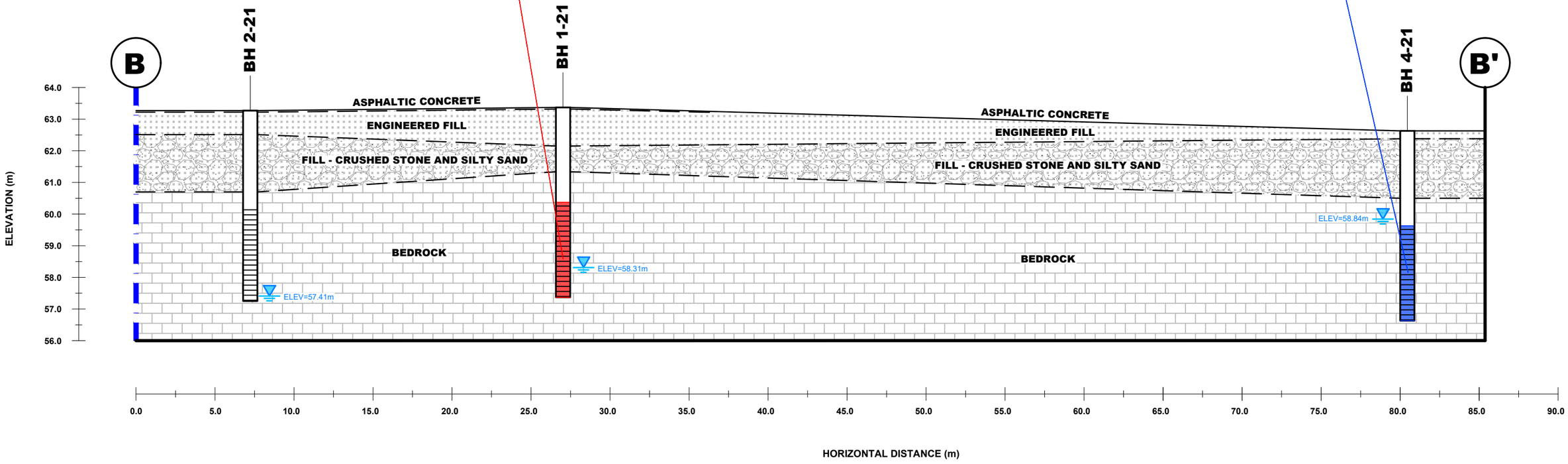
BH1-21-GW1	2.94-5.94m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	63.4	0.5
Chloroform	5.0	2
Ethylbenzene	176	54
Hexane	6.2	5
Xylenes	885	72
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH1-21-GW2	2.94-5.94m	June 17, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	32.6	0.5
Xylenes	287	72
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH1-21-GW3	2.94-5.94m	July 13, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	3.7	0.5
Xylenes	90.3	72
Remaining BTEX comply with MECP Table 7 Standards		

BH4-21-GW1	2.94-5.94m	June 2, 2021
Parameter	Result (µg/L)	Standard (µg/L)
Benzene	0.6	0.5
Remaining BTEX and VOCs comply with MECP Table 7 Standards		

BH4-21-GW2	2.94-5.94m	June 17, 2021
BTEX and VOCs comply with MECP Table 7 Standards		



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

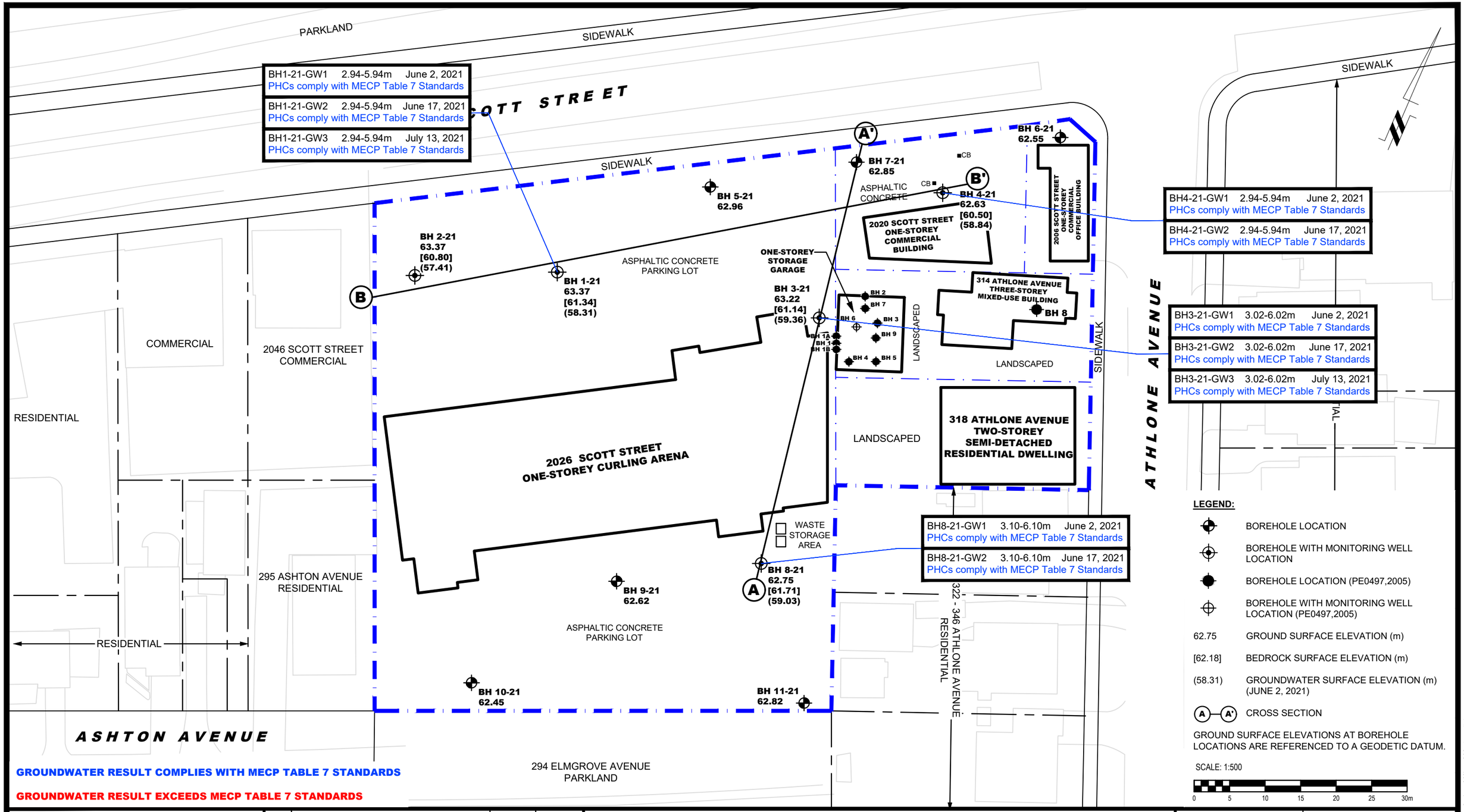
OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - GROUNDWATER (BTEX, VOCs)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: **PE5303-6B**
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg



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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

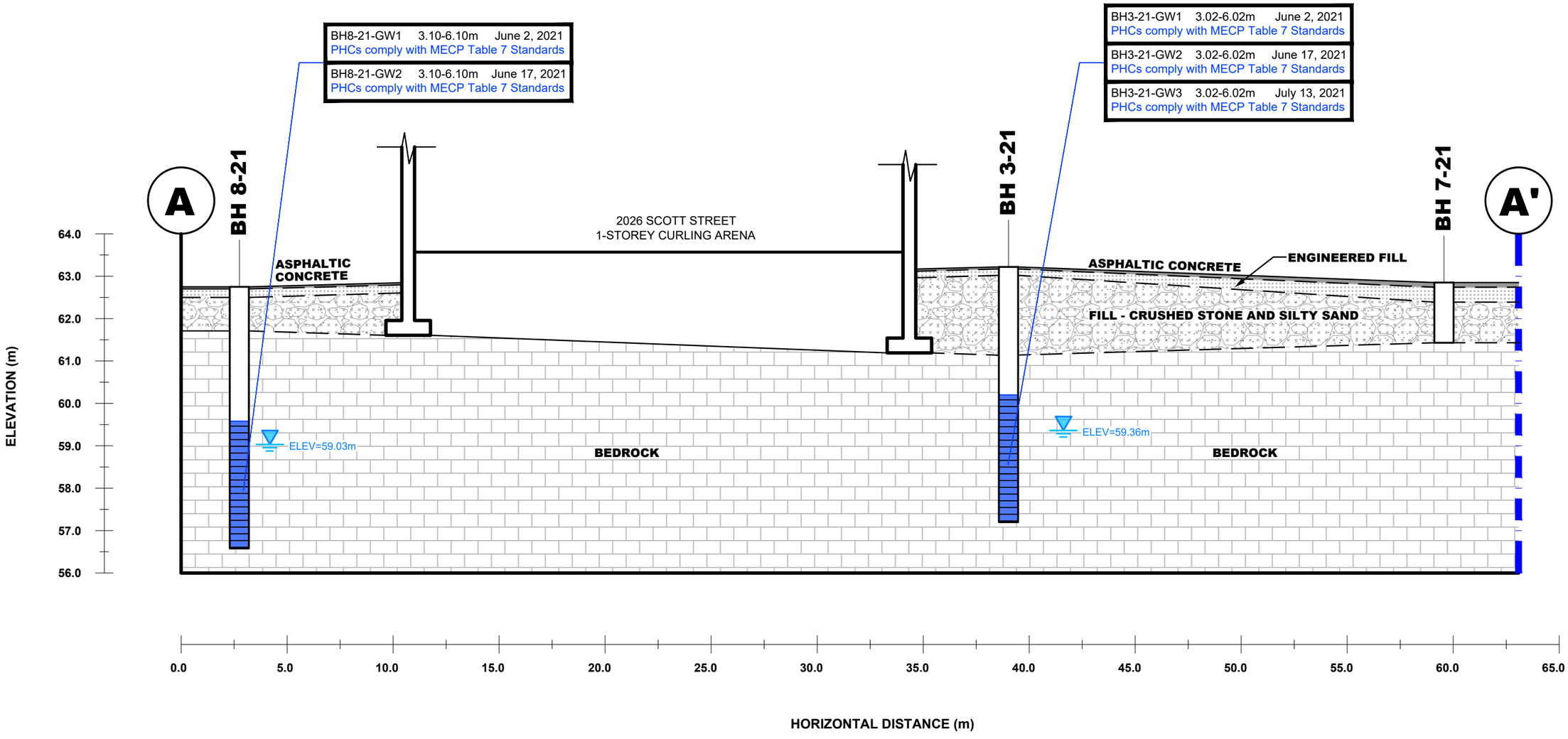
OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (PHCs)

Scale: 1:500	Date: 07/2021
Drawn by: JM	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-7
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER (PHCs)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-7A
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg

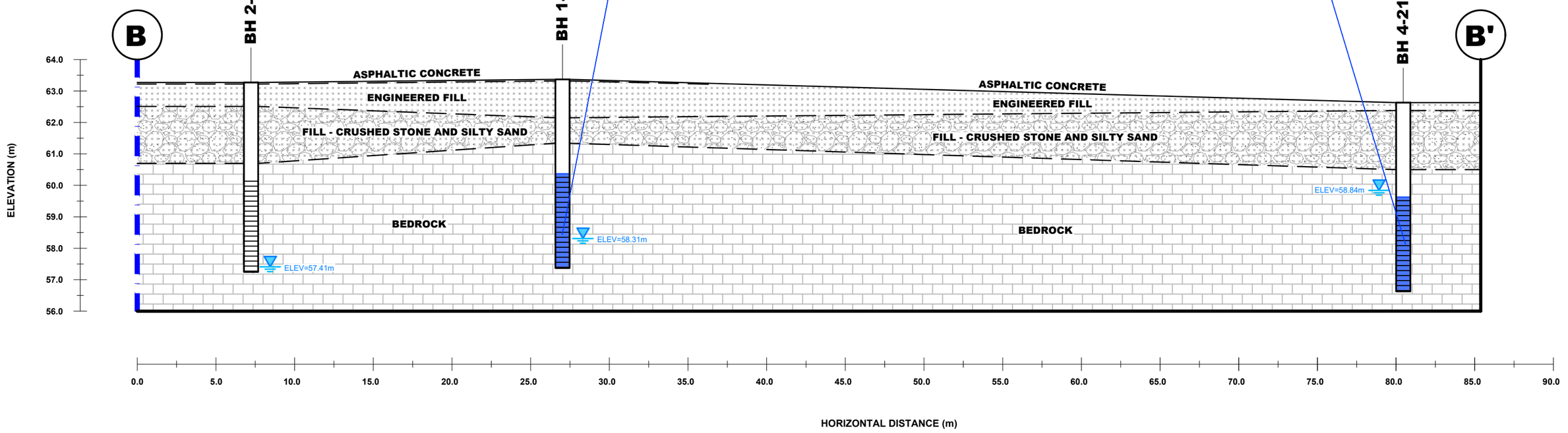
BH1-21-GW1 2.94-5.94m June 2, 2021
PHCs comply with MECP Table 7 Standards

BH1-21-GW2 2.94-5.94m June 17, 2021
PHCs comply with MECP Table 7 Standards

BH1-21-GW3 2.94-5.94m July 13, 2021
PHCs comply with MECP Table 7 Standards

BH4-21-GW1 2.94-5.94m June 2, 2021
PHCs comply with MECP Table 7 Standards

BH4-21-GW2 2.94-5.94m June 17, 2021
PHCs comply with MECP Table 7 Standards



GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL

MORLEY HOPPNER GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2006, 2020 & 2026 SCOTT STREET
314 & 318 ATHLONE AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION B-B' - GROUNDWATER (PHCs)

Scale: AS SHOWN	Date: 07/2021
Drawn by: YA	Report No.: PE5303-2
Checked by: NS	Dwg No.: PE5303-7B
Approved by: MSD	Revision No.:

p:\autocad drawings\environmental\pe53xx\pe5303\pe5303-phase ii.dwg

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Paterson Group Inc.

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

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

patersongroup

Sampling & Analysis Plan

Phase II – Environmental Site Assessment
2006, 2020, & 2026 Scott Street and
314 & 318 Athlone Avenue
Ottawa, Ontario

Prepared For

Morley Hoppner Group

June 1, 2021

Report: PE5303-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Morley Hoppner Group, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for the properties addressed 2006, 2020, & 2026 Scott Street and 314 & 318 Athlone Avenue, in the City of Ottawa, Ontario.

Based on the findings of the Phase I ESA, the following subsurface investigation program was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Northern portion of subject site; to assess for potential impacts resulting from a possible former on-site fuel storage tank.	5-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2	Northwestern portion of subject site; to assess for potential impacts resulting from the presence of an existing off-site auto service garage.	5-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH3	Northern portion of subject site; to assess for potential impacts resulting from a former on-site auto body repair shop.	5-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH4	Northeastern portion of subject site; to assess for potential impacts resulting from a former on-site auto service garage.	5-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH8	South-central portion of subject site; to assess for potential impacts resulting from a possible former on-site fuel storage tank.	5-7 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH5, BH6, BH7, BH9, BH10, and BH11	Throughout the subject site; for geotechnical and general coverage purposes.	1-3 m; for geotechnical and general coverage purposes.

Borehole locations are shown on Drawing PE5303-3 – Test Hole Location Plan, appended to the main report.

At each borehole, split-spoon samples of the 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 the borehole drilling, groundwater monitoring wells will be installed in boreholes BH1, BH2, BH3, BH4, and BH8 for the collection of groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

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

- ❒ 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 MECP 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 soil 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 geodetic benchmark, if one is available, or a temporary site benchmark which can be tied in at a later date if necessary.

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ 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 F_1, 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" threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" if installing in cored hole in bedrock)
- ❒ 5' x 2" threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" 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 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

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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 1-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 25, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.37
Asphaltic concrete 0.04		AU	1				
FILL: Brown silty sand with crushed stone		SS	2	25	25	1	62.37
1.22							
FILL: Brown silty sand, some crushed stone and gravel, trace clay		SS	3	50	50+	2	61.37
2.03							
		RC	1	100	71	3	60.37
BEDROCK: Good to excellent quality, grey silty dolostone interbedded with limestone		RC	2	100	100	4	59.37
		RC	3	100	97	5	58.37
6.00						6	57.37
End of Borehole							
(GWL @ 5.06m - June 2, 2021)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

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

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

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 2-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 25, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.37
Asphaltic concrete 0.05		AU	1				
FILL: Brown silty sand with crushed stone 0.76						1	62.37
FILL: Brown silty sand with crushed stone and gravel, occasional cobbles, boulders and rock fragments		SS	2	50	50+	2	61.37
2.57		RC	1	100	85	3	60.37
		RC	2	100	93	4	59.37
BEDROCK: Good to excellent quality, grey silty dolostone interbedded with limestone						5	58.37
		RC	3	100	100	6	57.37
6.12 End of Borehole							
(GWL @ 5.96m - June 2, 2021)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 3-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 25, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.22
Asphaltic concrete 0.05		AU	1				
FILL: Crushed stone with brown silty sand 0.20							
FILL: Brown sity sand, some crushed stone and gravel, occasional cobbles		SS	2	17	18	1	62.22
		SS	3	18	9	2	61.22
2.08							
		RC	1	100	83	3	60.22
BEDROCK: Good to excellent quality, grey silty dolostone interbedded with limestone		RC	2	100	92	4	59.22
		RC	3	100	100	5	58.22
6.02						6	57.22
End of Borehole							
(GWL @ 3.86m - June 2, 2021)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

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

Monitoring Well Construction

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 4-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 25, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
FILL: 25mm Asphaltic concrete over crushed stone with silty sand		AU	1			0	62.63
0.25		AU	2				
FILL: Brown silty sand with crushed stone and gravel, occasional cobbles		SS	3	58	11	1	61.63
		SS	4	55	17	2	60.63
2.13							
		RC	1	100	84	3	59.63
BEDROCK: Good to excellent quality, grey silty dolostone interbedded with limestone		RC	2	100	88	4	58.63
		RC	3	100	100	5	57.63
6.00						6	56.63
End of Borehole							
(GWL @ 3.79m - June 2, 2021)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

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

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

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 5-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 25, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	62.96
Asphaltic concrete 0.08		AU	1				
FILL: Crushed stone with brown silty sand		AU	2				
0.76							
FILL: Brown silty sand with gravel, some clay, occasional cobbles and boulders		SS	3	58	20	1	61.96
		SS	4	20	50+		
1.80							
End of Borehole							
Practical refusal to augering at 1.80m depth							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 6-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 26, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.04						0	62.55		
FILL: Crushed stone, trace sand 0.30		AU	1						
FILL: Brown silty sand with crushed stone, gravel and rock fragments		SS	2	11	50+	1	61.55		
1.22									
End of Borehole									
Practical refusal to augering at 1.22m depth									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 7-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 26, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.11		AU	1				
FILL: Crushed stone with silty sand 0.46		AU	2			0	62.85
FILL: Brown silty sand with crushed stone, gravel, trace asphalt and topsoil		SS	3	67	50+		
1.42		AU	4			1	61.85
End of Borehole							
Practical refusal to augering at 1.42m depth							

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

20 40 60 80

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

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 8-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 26, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.04						0	62.75
FILL: Crushed stone with silty sand 0.25		AU	1				
		AU	2				
FILL: Brown silty sand with gravel, occasional cobbles, boulders, trace clay 1.04		SS	3	18	50+	1	61.75
		RC	1	59	54		
						2	60.75
		RC	2	88	87		
BEDROCK: Fair to excellent quality, grey dolostone interbedded with limestone						3	59.75
		RC	3	100	97	4	58.75
						5	57.75
		RC	4	100	100		
6.17						6	56.75
End of Borehole							
(GWL @ 3.72m - June 2, 2021)							

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

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH 9-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 26, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.04						0	62.62		
FILL: Crushed stone with silty sand 0.30		AU	1						
FILL: Brown to grey silty sand, some wood		SS	2	33	22	1	61.62		
1.73		SS	3	50	50+				
End of Borehole									
Practical refusal to augering at 1.73m depth									

Lower Explosive Limit % scale: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

REMARKS

HOLE NO. BH10-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 26, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.04						0	62.45
FILL: Brown silty sand, some crushed stone 0.30		AU	1				
FILL: Brown silty sand, some gravel, occasional cobbles, trace wood		SS	2	67	33	1	61.45
1.62		SS	3	100	50+		
End of Borehole							
Practical refusal to augering at 1.62m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
2026, 2020 & 2006 Scott St. and 314 & 318 Athlone Ave.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5303

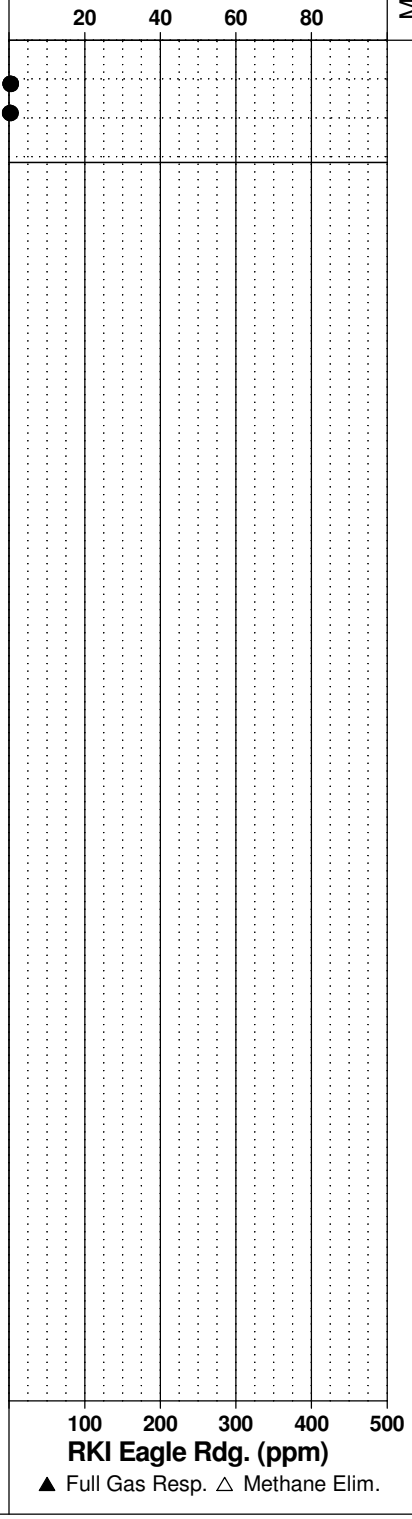
REMARKS

HOLE NO. BH11-21

BORINGS BY CME-55 Low Clearance Drill **DATE** May 26, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	62.82
Asphaltic concrete 0.04							
FILL: Crushed stone with silty sand 0.25		AU	1				
FILL: Brown silty sand, some crushed stone and gravel 0.63		AU	2				
End of Borehole							
Practical refusal to augering at 0.63m depth							

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



▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

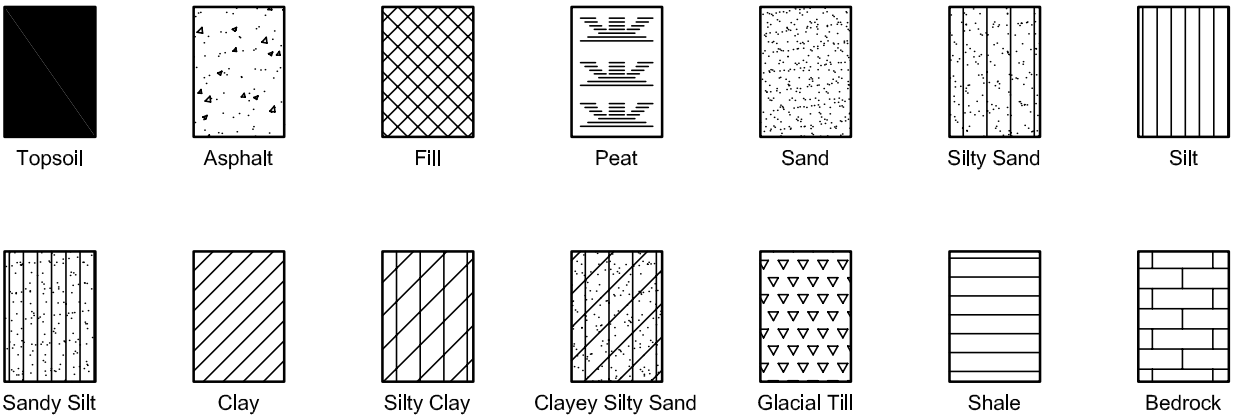
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

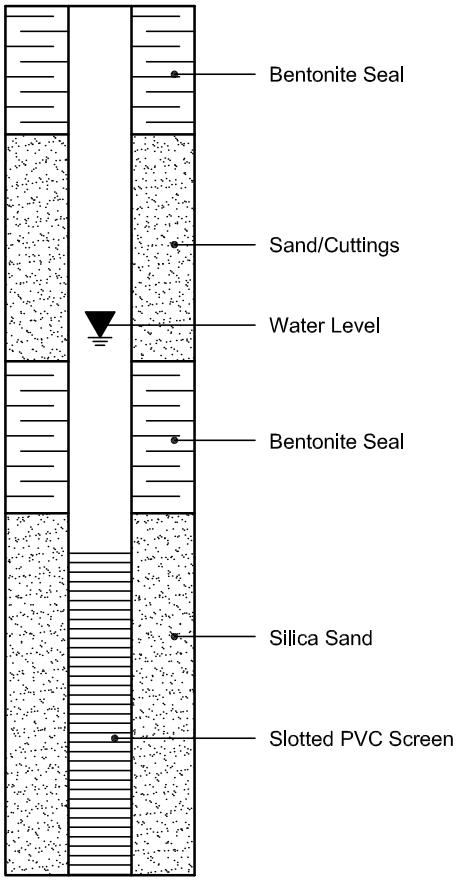
SYMBOLS AND TERMS (continued)

STRATA PLOT

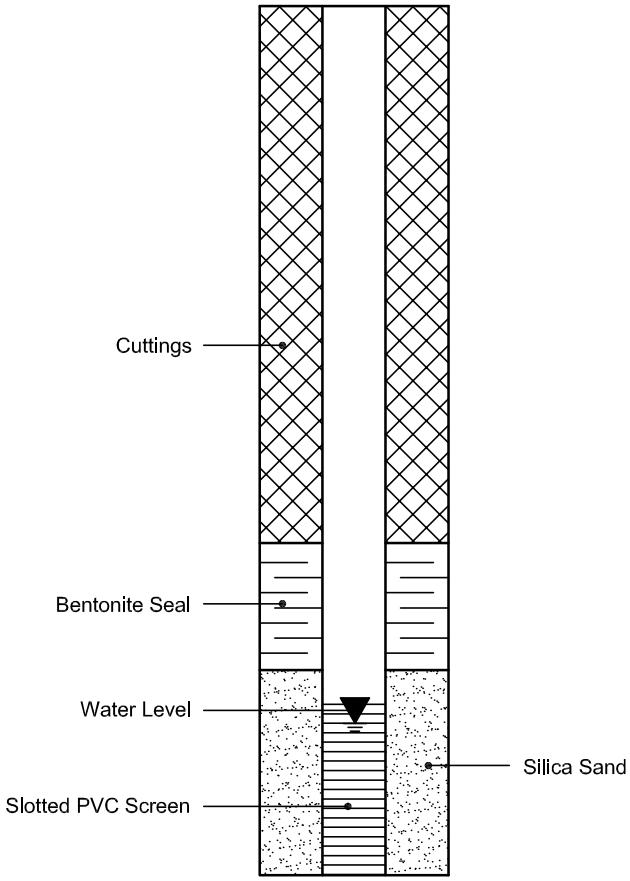


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Giamberardino

Client PO: 31798
Project: PE5303
Custody: 131160

Report Date: 1-Jun-2021
Order Date: 26-May-2021

Order #: 2122268

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

Paracel ID	Client ID
2122268-01	BH1-21-SS2
2122268-02	BH1-21-SS3
2122268-03	BH2-21-SS2
2122268-04	BH3-21-SS3
2122268-05	BH4-21-SS4
2122268-06	BH5-21-SS4

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 01-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 26-May-2021

Client PO: 31798

Project Description: PE5303

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	28-May-21	28-May-21
PHC F1	CWS Tier 1 - P&T GC-FID	28-May-21	28-May-21
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	1-Jun-21	1-Jun-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	27-May-21	1-Jun-21
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	31-May-21	31-May-21
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	28-May-21	28-May-21
Solids, %	Gravimetric, calculation	1-Jun-21	1-Jun-21

Certificate of Analysis

Report Date: 01-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 26-May-2021

Client PO: 31798

Project Description: PE5303

	Client ID:	BH1-21-SS2	BH1-21-SS3	BH2-21-SS2	BH3-21-SS3
	Sample Date:	25-May-21 09:00	25-May-21 09:00	25-May-21 09:00	25-May-21 09:00
	Sample ID:	2122268-01	2122268-02	2122268-03	2122268-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.6	89.4	92.2	86.0
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.7	-	-	-
Barium	1.0 ug/g dry	86.7	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	10.0	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	17.7	-	-	-
Cobalt	1.0 ug/g dry	6.0	-	-	-
Copper	5.0 ug/g dry	15.4	-	-	-
Lead	1.0 ug/g dry	15.8	-	-	-
Molybdenum	1.0 ug/g dry	1.4	-	-	-
Nickel	5.0 ug/g dry	12.7	-	-	-
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	30.7	-	-	-
Zinc	20.0 ug/g dry	37.1	-	-	-
Volatiles					
Acetone	0.50 ug/g dry	-	-	<0.50	<0.50
Benzene	0.02 ug/g dry	-	-	<0.02	<0.02
Bromodichloromethane	0.05 ug/g dry	-	-	<0.05	<0.05
Bromoform	0.05 ug/g dry	-	-	<0.05	<0.05
Bromomethane	0.05 ug/g dry	-	-	<0.05	<0.05
Carbon Tetrachloride	0.05 ug/g dry	-	-	<0.05	<0.05
Chlorobenzene	0.05 ug/g dry	-	-	<0.05	<0.05
Chloroform	0.05 ug/g dry	-	-	<0.05	<0.05
Dibromochloromethane	0.05 ug/g dry	-	-	<0.05	<0.05
Dichlorodifluoromethane	0.05 ug/g dry	-	-	<0.05	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	<0.05
1,4-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	<0.05
1,1-Dichloroethane	0.05 ug/g dry	-	-	<0.05	<0.05

Certificate of Analysis

Report Date: 01-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 26-May-2021

Client PO: 31798

Project Description: PE5303

	Client ID:	BH1-21-SS2	BH1-21-SS3	BH2-21-SS2	BH3-21-SS3
	Sample Date:	25-May-21 09:00	25-May-21 09:00	25-May-21 09:00	25-May-21 09:00
	Sample ID:	2122268-01	2122268-02	2122268-03	2122268-04
	MDL/Units	Soil	Soil	Soil	Soil
1,2-Dichloroethane	0.05 ug/g dry	-	-	<0.05	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	<0.05
1,2-Dichloropropane	0.05 ug/g dry	-	-	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	-	<0.05	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	-	<0.05	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	-	-	<0.05	<0.05
Ethylbenzene	0.05 ug/g dry	-	-	<0.05	<0.05
Ethylene dibromide (dibromoethane, 1,2-)	0.05 ug/g dry	-	-	<0.05	<0.05
Hexane	0.05 ug/g dry	-	-	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	-	<0.50	<0.50
Methyl Isobutyl Ketone	0.50 ug/g dry	-	-	<0.50	<0.50
Methyl tert-butyl ether	0.05 ug/g dry	-	-	<0.05	<0.05
Methylene Chloride	0.05 ug/g dry	-	-	<0.05	<0.05
Styrene	0.05 ug/g dry	-	-	<0.05	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	-	<0.05	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	-	<0.05	<0.05
Tetrachloroethylene	0.05 ug/g dry	-	-	<0.05	<0.05
Toluene	0.05 ug/g dry	-	-	<0.05	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	-	-	<0.05	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	-	-	<0.05	<0.05
Trichloroethylene	0.05 ug/g dry	-	-	<0.05	<0.05
Trichlorofluoromethane	0.05 ug/g dry	-	-	<0.05	<0.05
Vinyl chloride	0.02 ug/g dry	-	-	<0.02	<0.02
m,p-Xylenes	0.05 ug/g dry	-	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	-	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	-	-	<0.05	<0.05
4-Bromofluorobenzene	Surrogate	-	-	114%	105%
Dibromofluoromethane	Surrogate	-	-	106%	114%
Toluene-d8	Surrogate	-	-	111%	87.5%
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis

Report Date: 01-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 26-May-2021

Client PO: 31798

Project Description: PE5303

	Client ID:	BH1-21-SS2	BH1-21-SS3	BH2-21-SS2	BH3-21-SS3
	Sample Date:	25-May-21 09:00	25-May-21 09:00	25-May-21 09:00	25-May-21 09:00
	Sample ID:	2122268-01	2122268-02	2122268-03	2122268-04
	MDL/Units	Soil	Soil	Soil	Soil
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	102%	107%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	124	34	<8	16
F4 PHCs (C34-C50)	6 ug/g dry	236 [1]	92	<6	24
F4G PHCs (gravimetric)	50 ug/g dry	374	-	-	-

Certificate of Analysis

Report Date: 01-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 26-May-2021

Client PO: 31798

Project Description: PE5303

	Client ID:	BH4-21-SS4	BH5-21-SS4	-	-
	Sample Date:	25-May-21 09:00	25-May-21 09:00	-	-
	Sample ID:	2122268-05	2122268-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.9	89.0	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Ethylene dibromide (dibromoethane, 1	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis

Report Date: 01-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 26-May-2021

Client PO: 31798

Project Description: PE5303

	Client ID:	BH4-21-SS4	BH5-21-SS4	-	-
	Sample Date:	25-May-21 09:00	25-May-21 09:00	-	-
	Sample ID:	2122268-05	2122268-06	-	-
	MDL/Units	Soil	Soil	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	102%	-	-	-
Dibromofluoromethane	Surrogate	93.7%	-	-	-
Toluene-d8	Surrogate	83.6%	-	-	-
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	92.1%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	28	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	2000	10	-	-
F3 PHCs (C16-C34)	8 ug/g dry	2280	84	-	-
F4 PHCs (C34-C50)	6 ug/g dry	630 [1]	154 [1]	-	-
F4G PHCs (gravimetric)	50 ug/g dry	2040	463	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	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									
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, 1,2-	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.82*		*ug/g*		*119*	*50-140*			
Surrogate: Dibromofluoromethane	*3.96*		*ug/g*		*124*	*50-140*			
Surrogate: Toluene-d8	*3.40*		*ug/g*		*106*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.40*		*ug/g*		*106*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	77	8	ug/g dry	124			46.5	30	QR-04
F4 PHCs (C34-C50)	130	6	ug/g dry	236			58.2	30	QR-04
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	1.9	1.0	ug/g dry	1.9			2.3	30	
Barium	95.3	1.0	ug/g dry	107			11.5	30	
Beryllium	ND	0.5	ug/g dry	ND			NC	30	
Boron	5.2	5.0	ug/g dry	6.2			16.8	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	31.4	5.0	ug/g dry	32.6			4.0	30	
Cobalt	8.5	1.0	ug/g dry	8.8			3.6	30	
Copper	16.9	5.0	ug/g dry	17.8			5.0	30	
Lead	7.4	1.0	ug/g dry	8.4			12.8	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	18.9	5.0	ug/g dry	20.0			5.8	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	38.0	10.0	ug/g dry	40.5			6.5	30	
Zinc	34.1	20.0	ug/g dry	35.0			2.8	30	
Physical Characteristics									
% Solids	86.5	0.1	% by Wt.	85.5			1.3	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND			NC	50	
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Bromodichloromethane	ND	0.05	ug/g dry	ND			NC	50	
Bromoform	ND	0.05	ug/g dry	ND			NC	50	
Bromomethane	ND	0.05	ug/g dry	ND			NC	50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND			NC	50	
Chlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
Chloroform	ND	0.05	ug/g dry	ND			NC	50	
Dibromochloromethane	ND	0.05	ug/g dry	ND			NC	50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND			NC	50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND			NC	50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND			NC	50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.05	ug/g dry	ND			NC	50	
Hexane	ND	0.05	ug/g dry	ND			NC	50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND			NC	50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND			NC	50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND			NC	50	
Methylene Chloride	ND	0.05	ug/g dry	ND			NC	50	
Styrene	ND	0.05	ug/g dry	ND			NC	50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND			NC	50	

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			NC	50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND			NC	50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND			NC	50	
Trichloroethylene	ND	0.05	ug/g dry	ND			NC	50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND			NC	50	
Vinyl chloride	ND	0.02	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: 4-Bromofluorobenzene	*4.13*		*ug/g dry*		*111*	*50-140*			
Surrogate: Dibromofluoromethane	*3.79*		*ug/g dry*		*102*	*50-140*			
Surrogate: Toluene-d8	*3.22*		*ug/g dry*		*86.7*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*3.22*		*ug/g dry*		*86.7*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	212	7	ug/g	ND	106	80-120			
F2 PHCs (C10-C16)	85	4	ug/g	ND	99.2	60-140			
F3 PHCs (C16-C34)	421	8	ug/g	124	142	60-140			QM-06
F4 PHCs (C34-C50)	445	6	ug/g	236	157	60-140			QM-06
F4G PHCs (gravimetric)	890	50	ug/g	ND	89.0	80-120			
Metals									
Antimony	42.7	1.0	ug/g	ND	85.2	70-130			
Arsenic	49.3	1.0	ug/g	ND	97.0	70-130			
Barium	76.9	1.0	ug/g	42.8	68.3	70-130			QM-07
Beryllium	43.5	0.5	ug/g	ND	86.6	70-130			
Boron	40.1	5.0	ug/g	ND	75.2	70-130			
Cadmium	45.3	0.5	ug/g	ND	90.5	70-130			
Chromium	60.3	5.0	ug/g	13.1	94.5	70-130			
Cobalt	51.1	1.0	ug/g	3.5	95.1	70-130			
Copper	52.3	5.0	ug/g	7.1	90.3	70-130			
Lead	46.4	1.0	ug/g	3.4	86.1	70-130			
Molybdenum	45.7	1.0	ug/g	ND	91.0	70-130			
Nickel	53.6	5.0	ug/g	8.0	91.2	70-130			
Selenium	44.5	1.0	ug/g	ND	88.8	70-130			
Silver	35.7	0.3	ug/g	ND	71.3	70-130			
Thallium	42.4	1.0	ug/g	ND	84.7	70-130			
Uranium	43.6	1.0	ug/g	ND	86.7	70-130			
Vanadium	62.9	10.0	ug/g	16.2	93.5	70-130			
Zinc	56.8	20.0	ug/g	ND	85.6	70-130			
Volatiles									
Acetone	9.24	0.50	ug/g	ND	92.4	50-140			
Benzene	4.54	0.02	ug/g	ND	114	60-130			
Bromodichloromethane	4.36	0.05	ug/g	ND	109	60-130			
Bromoform	3.27	0.05	ug/g	ND	81.7	60-130			
Bromomethane	4.77	0.05	ug/g	ND	119	50-140			
Carbon Tetrachloride	4.56	0.05	ug/g	ND	114	60-130			
Chlorobenzene	3.19	0.05	ug/g	ND	79.8	60-130			
Chloroform	5.01	0.05	ug/g	ND	125	60-130			
Dibromochloromethane	3.45	0.05	ug/g	ND	86.3	60-130			
Dichlorodifluoromethane	4.63	0.05	ug/g	ND	116	50-140			
1,2-Dichlorobenzene	3.05	0.05	ug/g	ND	76.3	60-130			
1,3-Dichlorobenzene	2.98	0.05	ug/g	ND	74.5	60-130			
1,4-Dichlorobenzene	3.07	0.05	ug/g	ND	76.9	60-130			
1,1-Dichloroethane	4.74	0.05	ug/g	ND	118	60-130			
1,2-Dichloroethane	4.28	0.05	ug/g	ND	107	60-130			
1,1-Dichloroethylene	4.12	0.05	ug/g	ND	103	60-130			
cis-1,2-Dichloroethylene	4.08	0.05	ug/g	ND	102	60-130			
trans-1,2-Dichloroethylene	4.18	0.05	ug/g	ND	104	60-130			
1,2-Dichloropropane	4.37	0.05	ug/g	ND	109	60-130			
cis-1,3-Dichloropropylene	4.13	0.05	ug/g	ND	103	60-130			
trans-1,3-Dichloropropylene	4.84	0.05	ug/g	ND	121	60-130			
Ethylbenzene	3.24	0.05	ug/g	ND	81.0	60-130			
Ethylene dibromide (dibromoethane, 1,2	3.26	0.05	ug/g	ND	81.4	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hexane	4.72	0.05	ug/g	ND	118	60-130			
Methyl Ethyl Ketone (2-Butanone)	12.7	0.50	ug/g	ND	127	50-140			
Methyl Isobutyl Ketone	9.73	0.50	ug/g	ND	97.3	50-140			
Methyl tert-butyl ether	10.9	0.05	ug/g	ND	109	50-140			
Methylene Chloride	4.72	0.05	ug/g	ND	118	60-130			
Styrene	2.98	0.05	ug/g	ND	74.4	60-130			
1,1,1,2-Tetrachloroethane	3.66	0.05	ug/g	ND	91.6	60-130			
1,1,2,2-Tetrachloroethane	2.80	0.05	ug/g	ND	70.0	60-130			
Tetrachloroethylene	3.38	0.05	ug/g	ND	84.4	60-130			
Toluene	3.66	0.05	ug/g	ND	91.4	60-130			
1,1,1-Trichloroethane	4.62	0.05	ug/g	ND	115	60-130			
1,1,2-Trichloroethane	4.29	0.05	ug/g	ND	107	60-130			
Trichloroethylene	4.47	0.05	ug/g	ND	112	60-130			
Trichlorofluoromethane	4.37	0.05	ug/g	ND	109	50-140			
Vinyl chloride	4.33	0.02	ug/g	ND	108	50-140			
m,p-Xylenes	6.58	0.05	ug/g	ND	82.3	60-130			
o-Xylene	3.60	0.05	ug/g	ND	90.0	60-130			
Surrogate: 4-Bromofluorobenzene	*3.17*		*ug/g*		*99.2*	*50-140*			
Surrogate: Dibromofluoromethane	*3.28*		*ug/g*		*102*	*50-140*			
Surrogate: Toluene-d8	*2.75*		*ug/g*		*86.0*	*50-140*			
Benzene	4.54	0.02	ug/g	ND	114	60-130			
Ethylbenzene	3.24	0.05	ug/g	ND	81.0	60-130			
Toluene	3.66	0.05	ug/g	ND	91.4	60-130			
m,p-Xylenes	6.58	0.05	ug/g	ND	82.3	60-130			
o-Xylene	3.60	0.05	ug/g	ND	90.0	60-130			
Surrogate: Toluene-d8	*2.75*		*ug/g*		*86.0*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

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

QC Qualifiers :

QM-06 : Due to noted non-homogeneity of the QC sample matrix, the spike recoveries were out side the accepted range. Batch data accepted based on other QC.

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

QR-04 : Duplicate results exceeds RPD limits due to non-homogeneous matrix.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARAC LABORATORIES

Paracel ID: 2122268

...urent Blvd.
...K1G 4J8
...47
...cellabs.com
...s.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2122268	№ 131160

Client Name: PATERSON GROUP	Project Ref: PE5303	Page __ of __
Contact Name: NICK SULLIVAN & ERIC LEVESQUE	Quote #:	Turnaround Time
Address: 154 COLONNADE RD SOUTH OTTAWA ONT	PO #: 31798	☐ 1 day ☐ 3 day
	E-mail: nsullivan@patersongroup.ca	☐ 2 day ☒ Regular
Telephone: 613 226-7381	elevesque@patersongroup.ca.	Date Required:

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

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-21-SS2	S		2	May 25/21		✓			✓	✓	✓	
2	BH1-21-SS3	S		2	"	"	✓						
3	BH2-21-SS2	S		2	"	"	✓	✓					
4	BH3-21-SS3	S		2	"	"	✓	✓					
5	BH4-21-SS4	S		2	"	"	✓	✓					
6	BH5-21-SS4	S		2	"	"	✓						
7													
8													
9													
10													

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: M. SLOUSE	Received at Lab:	Verified By:
Relinquished By (Print): ERIC LEVESQUE	Date/Time: 26/05/21 3:15	Date/Time: May 26/21 5:10p	Date/Time:
Date/Time: May 26/21	Temperature: °C PM.	Temperature: 13.1 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 31797
Project: PE5303
Custody: 131170

Report Date: 2-Jun-2021
Order Date: 27-May-2021

Order #: 2122408

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

Paracel ID	Client ID
2122408-01	BH7-21-AU2
2122408-02	BH7-21-SS3
2122408-03	BH8-21-AU2
2122408-04	BH10-21-AU1
2122408-05	DUP-1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 02-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 27-May-2021

Client PO: 31797

Project Description: PE5303

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	28-May-21	29-May-21
PHC F1	CWS Tier 1 - P&T GC-FID	28-May-21	29-May-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	27-May-21	31-May-21
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	31-May-21	1-Jun-21
Solids, %	Gravimetric, calculation	2-Jun-21	2-Jun-21

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31797

Report Date: 02-Jun-2021

Order Date: 27-May-2021

Project Description: PE5303

	Client ID:	BH7-21-AU2	BH7-21-SS3	BH8-21-AU2	BH10-21-AU1
	Sample Date:	26-May-21 09:00	26-May-21 09:00	26-May-21 09:00	26-May-21 09:00
	Sample ID:	2122408-01	2122408-02	2122408-03	2122408-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.5	90.3	91.9	90.5
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	<1.0
Arsenic	1.0 ug/g dry	-	1.9	-	3.6
Barium	1.0 ug/g dry	-	80.4	-	280
Beryllium	0.5 ug/g dry	-	<0.5	-	<0.5
Boron	5.0 ug/g dry	-	5.7	-	11.5
Cadmium	0.5 ug/g dry	-	<0.5	-	<0.5
Chromium	5.0 ug/g dry	-	23.7	-	15.8
Cobalt	1.0 ug/g dry	-	5.6	-	5.8
Copper	5.0 ug/g dry	-	14.5	-	17.2
Lead	1.0 ug/g dry	-	22.5	-	50.7
Molybdenum	1.0 ug/g dry	-	<1.0	-	<1.0
Nickel	5.0 ug/g dry	-	22.4	-	13.3
Selenium	1.0 ug/g dry	-	<1.0	-	<1.0
Silver	0.3 ug/g dry	-	<0.3	-	<0.3
Thallium	1.0 ug/g dry	-	<1.0	-	<1.0
Uranium	1.0 ug/g dry	-	<1.0	-	<1.0
Vanadium	10.0 ug/g dry	-	21.8	-	20.4
Zinc	20.0 ug/g dry	-	55.2	-	71.2
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	0.06	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	0.24	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	0.11	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	0.35	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	104%	104%	106%	105%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	9	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	364	29	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	735	148	70	83
F4 PHCs (C34-C50)	6 ug/g dry	1500 [1]	206 [1]	174 [1]	241 [1]

Certificate of Analysis

Report Date: 02-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 27-May-2021

Client PO: 31797

Project Description: PE5303

	Client ID:	DUP-1	-	-	-
	Sample Date:	26-May-21 09:00	-	-	-
	Sample ID:	2122408-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	89.7	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.5	-	-	-
Barium	1.0 ug/g dry	236	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	12.2	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	15.3	-	-	-
Cobalt	1.0 ug/g dry	5.2	-	-	-
Copper	5.0 ug/g dry	16.4	-	-	-
Lead	1.0 ug/g dry	50.7	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	12.2	-	-	-
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	19.5	-	-	-
Zinc	20.0 ug/g dry	70.7	-	-	-

Certificate of Analysis

Report Date: 02-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 27-May-2021

Client PO: 31797

Project Description: PE5303

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	*8.53*		*ug/g*		*107*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g wet	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g wet	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g wet	ND			NC	30	
Metals									
Antimony	1.1	1.0	ug/g dry	ND			NC	30	
Arsenic	2.6	1.0	ug/g dry	2.7			5.0	30	
Barium	65.3	1.0	ug/g dry	63.2			3.3	30	
Beryllium	ND	0.5	ug/g dry	ND			NC	30	
Boron	7.3	5.0	ug/g dry	6.2			15.7	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	13.6	5.0	ug/g dry	13.0			4.1	30	
Cobalt	5.3	1.0	ug/g dry	4.9			8.5	30	
Copper	10.3	5.0	ug/g dry	9.9			3.7	30	
Lead	7.8	1.0	ug/g dry	8.1			3.4	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	11.4	5.0	ug/g dry	10.6			7.2	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	18.1	10.0	ug/g dry	18.0			0.4	30	
Zinc	61.4	20.0	ug/g dry	54.6			11.7	30	
Physical Characteristics									
% Solids	98.6	0.1	% by Wt.	99.6			1.0	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	0.056	0.05	ug/g dry	0.052			6.9	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*8.54*		*ug/g dry*		*102*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	223	7	ug/g	ND	112	80-120			
F2 PHCs (C10-C16)	74	4	ug/g	ND	92.5	60-140			
F3 PHCs (C16-C34)	214	8	ug/g	ND	109	60-140			
F4 PHCs (C34-C50)	156	6	ug/g	ND	126	60-140			
Metals									
Antimony	45.3	1.0	ug/g	ND	90.6	70-130			
Arsenic	50.2	1.0	ug/g	1.1	98.3	70-130			
Barium	71.2	1.0	ug/g	25.3	91.9	70-130			
Beryllium	46.0	0.5	ug/g	ND	91.8	70-130			
Boron	43.5	5.0	ug/g	ND	82.0	70-130			
Cadmium	46.1	0.5	ug/g	ND	92.1	70-130			
Chromium	54.0	5.0	ug/g	5.2	97.6	70-130			
Cobalt	50.5	1.0	ug/g	2.0	97.0	70-130			
Copper	50.4	5.0	ug/g	ND	92.8	70-130			
Lead	46.9	1.0	ug/g	3.2	87.3	70-130			
Molybdenum	47.1	1.0	ug/g	ND	93.8	70-130			
Nickel	51.3	5.0	ug/g	ND	94.1	70-130			
Selenium	44.9	1.0	ug/g	ND	89.7	70-130			
Silver	35.7	0.3	ug/g	ND	71.5	70-130			
Thallium	44.6	1.0	ug/g	ND	89.1	70-130			
Uranium	45.6	1.0	ug/g	ND	91.0	70-130			
Vanadium	56.3	10.0	ug/g	ND	98.2	70-130			
Zinc	67.6	20.0	ug/g	21.8	91.5	70-130			
Volatiles									
Benzene	3.54	0.02	ug/g	ND	88.5	60-130			
Ethylbenzene	3.81	0.05	ug/g	ND	95.3	60-130			
Toluene	3.65	0.05	ug/g	ND	91.2	60-130			
m,p-Xylenes	7.32	0.05	ug/g	ND	91.5	60-130			
o-Xylene	3.72	0.05	ug/g	ND	93.0	60-130			
Surrogate: Toluene-d8	*8.09*		*ug/g*		*101*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD

Paracel ID: 2122408

Paracel Order Number (Lab Use Only): 2122408

Chain Of Custody (Lab Use Only)

№ 131170

Client Name: PATERSON GROUP

Project Ref: PE5303

Contact Name: NICK SULLIVAN & ERIC LEVESQUE

Quote #:

Address: 154 COLONNADE RD SOUTH OTTAWA ONT

PO #: 31797

E-mail: nsullivan@patersongroup.ca eleveque@patersongroup.ca

Telephone: 226-7381

Page __ of __

Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular

Date Required:

Regulation 153/04: ☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☑ Table 3 ☐ Agri/Other ☐ Table ___ For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm Mun: ___ ☐ Other:

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

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH7-21-AU2	S		2	May 26/2021		✓												✓
2	BH7-21-SS3	S		2	"	"	✓			✓									✓
3	BH8-21-AU2	S		2	"	"	✓												✓
4	BH10-21-AU1	S		2	"	"	✓			✓									✓
5	DUP-1	S		1	"	"				✓									✓
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): [signature]	Received By Driver/Depot: M. [signature]	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): May 26/2021	Date/Time: 27/05/21 3:35	Date/Time: May 27, 2021 04.16	Date/Time: May 27, 2021 17:05
Date/Time:	Temperature: °C PH.	Temperature: 13.0 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 32216
Project: PE5303
Custody: 131346

Report Date: 9-Jun-2021
Order Date: 3-Jun-2021

Order #: 2123462

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

Paracel ID	Client ID
2123462-01	BH1-21-GW1
2123462-02	BH3-21-GW1
2123462-03	BH4-21-GW1
2123462-04	BH8-21-GW1
2123462-05	DUP-1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 09-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2021

Client PO: 32216

Project Description: PE5303

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	5-Jun-21	5-Jun-21
PHC F1	CWS Tier 1 - P&T GC-FID	4-Jun-21	5-Jun-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Jun-21	9-Jun-21
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	4-Jun-21	7-Jun-21

Certificate of Analysis

Report Date: 09-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2021

Client PO: 32216

Project Description: PE5303

	Client ID:	BH1-21-GW1	BH3-21-GW1	BH4-21-GW1	BH8-21-GW1
	Sample Date:	02-Jun-21 09:00	02-Jun-21 09:00	02-Jun-21 09:00	02-Jun-21 09:00
	Sample ID:	2123462-01	2123462-02	2123462-03	2123462-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	63.4	0.9	0.6	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	5.0	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	176	5.2	0.8	-
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	6.2	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	49.7	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Report Date: 09-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2021

Client PO: 32216

Project Description: PE5303

	Client ID:	BH1-21-GW1	BH3-21-GW1	BH4-21-GW1	BH8-21-GW1
	Sample Date:	02-Jun-21 09:00	02-Jun-21 09:00	02-Jun-21 09:00	02-Jun-21 09:00
	Sample ID:	2123462-01	2123462-02	2123462-03	2123462-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	782	4.4	2.5	-
o-Xylene	0.5 ug/L	103	<0.5	0.7	-
Xylenes, total	0.5 ug/L	885	4.4	3.2	-
4-Bromofluorobenzene	Surrogate	76.2%	84.9%	88.0%	-
Dibromofluoromethane	Surrogate	92.4%	98.3%	102%	-
Toluene-d8	Surrogate	90.6%	91.7%	86.5%	-
Benzene	0.5 ug/L	-	-	-	1.6
Ethylbenzene	0.5 ug/L	-	-	-	1.8
Toluene	0.5 ug/L	-	-	-	<0.5
m,p-Xylenes	0.5 ug/L	-	-	-	1.2
o-Xylene	0.5 ug/L	-	-	-	<0.5
Xylenes, total	0.5 ug/L	-	-	-	1.2
Toluene-d8	Surrogate	-	-	-	91.4%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	31	60	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

Certificate of Analysis

Report Date: 09-Jun-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 3-Jun-2021

Client PO: **32216**

Project Description: PE5303

	Client ID:	DUP-1	-	-	-
	Sample Date:	02-Jun-21 09:00	-	-	-
	Sample ID:	2123462-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	1.0	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	6.0	-	-	-
Ethylene dibromide (dibromoethane, 1	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Report Date: 09-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2021

Client PO: 32216

Project Description: PE5303

	Client ID:	DUP-1	-	-	-
	Sample Date:	02-Jun-21 09:00	-	-	-
	Sample ID:	2123462-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	5.6	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	5.6	-	-	-
4-Bromofluorobenzene	Surrogate	87.6%	-	-	-
Dibromofluoromethane	Surrogate	93.2%	-	-	-
Toluene-d8	Surrogate	88.8%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*65.4*		*ug/L*		*81.7*	*50-140*			
Surrogate: Dibromofluoromethane	*81.8*		*ug/L*		*102*	*50-140*			
Surrogate: Toluene-d8	*71.0*		*ug/L*		*88.8*	*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	*71.0*		*ug/L*		*88.8*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*68.3*		*ug/L*		*85.4*	*50-140*			
Surrogate: Dibromofluoromethane	*67.4*		*ug/L*		*84.2*	*50-140*			
Surrogate: Toluene-d8	*75.0*		*ug/L*		*93.8*	*50-140*			
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: Toluene-d8	*75.0*		*ug/L*		*93.8*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1730	25	ug/L	ND	86.3	68-117			
F2 PHCs (C10-C16)	1360	100	ug/L	ND	85.2	60-140			
F3 PHCs (C16-C34)	3380	100	ug/L	ND	86.3	60-140			
F4 PHCs (C34-C50)	1790	100	ug/L	ND	72.1	60-140			
Volatiles									
Acetone	106	5.0	ug/L	ND	106	50-140			
Benzene	37.7	0.5	ug/L	ND	94.3	60-130			
Bromodichloromethane	42.6	0.5	ug/L	ND	106	60-130			
Bromoform	44.2	0.5	ug/L	ND	111	60-130			
Bromomethane	38.7	0.5	ug/L	ND	96.8	50-140			
Carbon Tetrachloride	36.5	0.2	ug/L	ND	91.3	60-130			
Chlorobenzene	45.4	0.5	ug/L	ND	114	60-130			
Chloroform	42.8	0.5	ug/L	ND	107	60-130			
Dibromochloromethane	34.5	0.5	ug/L	ND	86.2	60-130			
Dichlorodifluoromethane	42.9	1.0	ug/L	ND	107	50-140			
1,2-Dichlorobenzene	39.4	0.5	ug/L	ND	98.6	60-130			
1,3-Dichlorobenzene	37.7	0.5	ug/L	ND	94.4	60-130			
1,4-Dichlorobenzene	38.4	0.5	ug/L	ND	96.0	60-130			
1,1-Dichloroethane	43.4	0.5	ug/L	ND	108	60-130			
1,2-Dichloroethane	33.3	0.5	ug/L	ND	83.4	60-130			
1,1-Dichloroethylene	38.1	0.5	ug/L	ND	95.3	60-130			
cis-1,2-Dichloroethylene	39.9	0.5	ug/L	ND	99.8	60-130			
trans-1,2-Dichloroethylene	40.2	0.5	ug/L	ND	101	60-130			
1,2-Dichloropropane	40.3	0.5	ug/L	ND	101	60-130			
cis-1,3-Dichloropropylene	44.4	0.5	ug/L	ND	111	60-130			
trans-1,3-Dichloropropylene	44.2	0.5	ug/L	ND	111	60-130			
Ethylbenzene	43.7	0.5	ug/L	ND	109	60-130			
Ethylene dibromide (dibromoethane, 1,2-	41.0	0.2	ug/L	ND	103	60-130			
Hexane	36.2	1.0	ug/L	ND	90.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	126	5.0	ug/L	ND	126	50-140			
Methyl Isobutyl Ketone	120	5.0	ug/L	ND	120	50-140			
Methyl tert-butyl ether	120	2.0	ug/L	ND	120	50-140			
Methylene Chloride	43.1	5.0	ug/L	ND	108	60-130			
Styrene	45.4	0.5	ug/L	ND	114	60-130			
1,1,1,2-Tetrachloroethane	36.4	0.5	ug/L	ND	91.0	60-130			
1,1,2,2-Tetrachloroethane	44.7	0.5	ug/L	ND	112	60-130			
Tetrachloroethylene	36.1	0.5	ug/L	ND	90.3	60-130			
Toluene	44.2	0.5	ug/L	ND	110	60-130			
1,1,1-Trichloroethane	41.8	0.5	ug/L	ND	104	60-130			
1,1,2-Trichloroethane	36.0	0.5	ug/L	ND	90.1	60-130			
Trichloroethylene	37.3	0.5	ug/L	ND	93.2	60-130			
Trichlorofluoromethane	39.2	1.0	ug/L	ND	97.9	60-130			
Vinyl chloride	42.0	0.5	ug/L	ND	105	50-140			
m,p-Xylenes	90.8	0.5	ug/L	ND	114	60-130			
o-Xylene	36.9	0.5	ug/L	ND	92.3	60-130			
Surrogate: 4-Bromofluorobenzene	*59.2*		*ug/L*		*74.0*	*50-140*			
Surrogate: Dibromofluoromethane	*77.1*		*ug/L*		*96.3*	*50-140*			
Surrogate: Toluene-d8	*62.6*		*ug/L*		*78.2*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	37.7	0.5	ug/L	ND	94.3	60-130			
Ethylbenzene	43.7	0.5	ug/L	ND	109	60-130			
Toluene	44.2	0.5	ug/L	ND	110	60-130			
m,p-Xylenes	90.8	0.5	ug/L	ND	114	60-130			
o-Xylene	36.9	0.5	ug/L	ND	92.3	60-130			
Surrogate: Toluene-d8	*62.6*		*ug/L*		*78.2*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2123462

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2123462	№ 132346

Client Name: Paterson Group	Project Ref: PE5303
Contact Name: Nick Sullivan	Quote #:
Address: 154 Colonnade Rd. S.	PO #: 32216
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca

Page 1 of 1

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular

Date Required:

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

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-21-GW1	GW		3	June 2/21	AM	X	X					
2	BH3-21-GW1	↓		↓	↓	↓	X	X					
3	BH4-21-GW1						X	X					
4	BH8-21-GW1						X						
5	DUP-1	↓		2	↓	↓		X					
6													
7													
8													
9													
10													

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot: M. Keuse	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Nick Sullivan	Date/Time: 03/06/21 3 30	Date/Time: June 3/21 4:15pm	Date/Time: June 3rd, 2021 17:14
Date/Time: June 3/2021	Temperature: °C	Temperature: 10.0 °C	pH Verified: ☐ By:

Chain of Custody (Env.) xlsx

Revision 3.0

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 32305
Project: PE5303
Custody: 1324690

Report Date: 24-Jun-2021
Order Date: 18-Jun-2021

Order #: 2125637

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

Paracel ID	Client ID
2125637-01	BH1-21
2125637-02	BH3-21
2125637-03	BH4-21
2125637-04	BH8-21
2125637-05	DUP 2

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 32305

Report Date: 24-Jun-2021

Order Date: 18-Jun-2021

Project Description: PE5303

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	21-Jun-21	22-Jun-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	22-Jun-21	24-Jun-21
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	21-Jun-21	22-Jun-21

Certificate of Analysis

Report Date: 24-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 18-Jun-2021

Client PO: 32305

Project Description: PE5303

	Client ID:	BH1-21	BH3-21	BH4-21	BH8-21
	Sample Date:	17-Jun-21 09:00	17-Jun-21 09:00	17-Jun-21 09:00	17-Jun-21 09:00
	Sample ID:	2125637-01	2125637-02	2125637-03	2125637-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	32.6	2.3	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	1.4	<0.5	<0.5	0.6
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	7.0	8.0	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	21.8	0.7	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 24-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 18-Jun-2021

Client PO: 32305

Project Description: PE5303

	Client ID:	BH1-21	BH3-21	BH4-21	BH8-21
	Sample Date:	17-Jun-21 09:00	17-Jun-21 09:00	17-Jun-21 09:00	17-Jun-21 09:00
	Sample ID:	2125637-01	2125637-02	2125637-03	2125637-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	224	7.2	<0.5	<0.5
o-Xylene	0.5 ug/L	63.7	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	287	7.2	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	97.9%	100%	101%	99.7%
Dibromofluoromethane	Surrogate	105%	98.6%	104%	106%
Toluene-d8	Surrogate	102%	101%	102%	102%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	122	93	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

Certificate of Analysis

Report Date: 24-Jun-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 18-Jun-2021

Client PO: **32305**

Project Description: **PE5303**

	Client ID:	DUP 2	-	-	-
	Sample Date:	17-Jun-21 09:00	-	-	-
	Sample ID:	2125637-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	3.8	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	15.7	-	-	-
Ethylene dibromide (dibromoethane, 1	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	1.1	-	-	-

Certificate of Analysis

Report Date: 24-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 18-Jun-2021

Client PO: 32305

Project Description: PE5303

	Client ID:	DUP 2	-	-	-
	Sample Date:	17-Jun-21 09:00	-	-	-
	Sample ID:	2125637-05	-	-	-
	MDL/Units	Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	14.7	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	14.7	-	-	-
4-Bromofluorobenzene	Surrogate	97.6%	-	-	-
Dibromofluoromethane	Surrogate	103%	-	-	-
Toluene-d8	Surrogate	102%	-	-	-

Certificate of Analysis

Report Date: 24-Jun-2021

Client: Paterson Group Consulting Engineers

Order Date: 18-Jun-2021

Client PO: 32305

Project Description: PE5303

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*80.1*		*ug/L*		*100*	*50-140*			
Surrogate: Dibromofluoromethane	*88.2*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*80.6*		*ug/L*		*101*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*78.2*		*ug/L*		*97.7*	*50-140*			
Surrogate: Dibromofluoromethane	*73.2*		*ug/L*		*91.5*	*50-140*			
Surrogate: Toluene-d8	*80.5*		*ug/L*		*101*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2050	25	ug/L	ND	102	68-117			
F2 PHCs (C10-C16)	1330	100	ug/L	ND	83.2	60-140			
F3 PHCs (C16-C34)	3460	100	ug/L	ND	88.3	60-140			
F4 PHCs (C34-C50)	2320	100	ug/L	ND	93.4	60-140			
Volatiles									
Acetone	89.6	5.0	ug/L	ND	89.6	50-140			
Benzene	34.3	0.5	ug/L	ND	85.8	60-130			
Bromodichloromethane	39.9	0.5	ug/L	ND	99.6	60-130			
Bromoform	39.8	0.5	ug/L	ND	99.5	60-130			
Bromomethane	33.0	0.5	ug/L	ND	82.6	50-140			
Carbon Tetrachloride	41.5	0.2	ug/L	ND	104	60-130			
Chlorobenzene	37.9	0.5	ug/L	ND	94.8	60-130			
Chloroform	36.4	0.5	ug/L	ND	91.1	60-130			
Dibromochloromethane	48.4	0.5	ug/L	ND	121	60-130			
Dichlorodifluoromethane	38.4	1.0	ug/L	ND	96.0	50-140			
1,2-Dichlorobenzene	36.6	0.5	ug/L	ND	91.5	60-130			
1,3-Dichlorobenzene	35.5	0.5	ug/L	ND	88.7	60-130			
1,4-Dichlorobenzene	35.1	0.5	ug/L	ND	87.8	60-130			
1,1-Dichloroethane	35.4	0.5	ug/L	ND	88.5	60-130			
1,2-Dichloroethane	36.6	0.5	ug/L	ND	91.5	60-130			
1,1-Dichloroethylene	37.6	0.5	ug/L	ND	94.1	60-130			
cis-1,2-Dichloroethylene	35.4	0.5	ug/L	ND	88.4	60-130			
trans-1,2-Dichloroethylene	35.4	0.5	ug/L	ND	88.5	60-130			
1,2-Dichloropropane	35.0	0.5	ug/L	ND	87.4	60-130			
cis-1,3-Dichloropropylene	40.1	0.5	ug/L	ND	100	60-130			
trans-1,3-Dichloropropylene	37.2	0.5	ug/L	ND	92.9	60-130			
Ethylbenzene	36.4	0.5	ug/L	ND	91.0	60-130			
Ethylene dibromide (dibromoethane, 1,2-	39.8	0.2	ug/L	ND	99.6	60-130			
Hexane	29.1	1.0	ug/L	ND	72.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	87.2	5.0	ug/L	ND	87.2	50-140			
Methyl Isobutyl Ketone	93.9	5.0	ug/L	ND	93.9	50-140			
Methyl tert-butyl ether	95.7	2.0	ug/L	ND	95.7	50-140			
Methylene Chloride	33.2	5.0	ug/L	ND	83.0	60-130			
Styrene	38.5	0.5	ug/L	ND	96.2	60-130			
1,1,1,2-Tetrachloroethane	34.9	0.5	ug/L	ND	87.2	60-130			
1,1,2,2-Tetrachloroethane	28.8	0.5	ug/L	ND	72.1	60-130			
Tetrachloroethylene	37.5	0.5	ug/L	ND	93.8	60-130			
Toluene	39.1	0.5	ug/L	ND	97.7	60-130			
1,1,1-Trichloroethane	38.2	0.5	ug/L	ND	95.6	60-130			
1,1,2-Trichloroethane	36.5	0.5	ug/L	ND	91.3	60-130			
Trichloroethylene	43.0	0.5	ug/L	ND	108	60-130			
Trichlorofluoromethane	38.3	1.0	ug/L	ND	95.7	60-130			
Vinyl chloride	41.6	0.5	ug/L	ND	104	50-140			
m,p-Xylenes	79.4	0.5	ug/L	ND	99.2	60-130			
o-Xylene	39.2	0.5	ug/L	ND	98.1	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

Paracel ID: 2125637

Chain Of Custody
(Lab Use Only)
№ 132460

Page __ of __

Client Name: Paterson	Project Ref: PE 5303
Contact Name: Nick Sullivan	Quote #:
Address: 154 Colonnade	PO #: 32305
	E-mail: NSullivan@Patersongroup.ca
Telephone:	

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☒ Regular
Date Required:

Regulation 153/04
☒ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

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

Required Analysis

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH1-21	GW		3	June 17		✓	✓											
2	BH3-21	↓		2	↓		✓	✓											
3	BH4-21	↓		3	↓		✓	✓											
4	BH8-21	↓		3	↓		✓	✓											
5	Dup 2	↓		2	↓			✓											
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): G Pat	Received By Driver/Depot: [signature] Rouse	Received at Lab: Sreeporn Dolmai	Verified By: [signature]
Relinquished By (Print): Grant Paterson	Date/Time: 18/06/21 3.10	Date/Time: Jun 18, 2021 03.55	Date/Time: 4:27 June 18 2021
Date/Time: June 18 2021	Temperature: °C PH.	Temperature: 16.6 °C	pH Verified: ☐ By:

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Nick Sullivan

Client PO: 32471
Project: PE5303
Custody: 132964

Report Date: 15-Jul-2021
Order Date: 13-Jul-2021

Order #: 2129273

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

Paracel ID	Client ID
2129273-01	BH1-21-GW3
2129273-02	BH3-21-GW3

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 32471

Report Date: 15-Jul-2021

Order Date: 13-Jul-2021

Project Description: PE5303

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	14-Jul-21	14-Jul-21
PHC F1	CWS Tier 1 - P&T GC-FID	13-Jul-21	14-Jul-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	14-Jul-21	14-Jul-21

Certificate of Analysis

Report Date: 15-Jul-2021

Client: Paterson Group Consulting Engineers

Order Date: 13-Jul-2021

Client PO: 32471

Project Description: PE5303

	Client ID:	BH1-21-GW3	BH3-21-GW3	-	-
	Sample Date:	13-Jul-21 09:00	13-Jul-21 09:00	-	-
	Sample ID:	2129273-01	2129273-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Benzene	0.5 ug/L	3.7	<0.5	-	-
Ethylbenzene	0.5 ug/L	10.7	<0.5	-	-
Toluene	0.5 ug/L	3.7	<0.5	-	-
m,p-Xylenes	0.5 ug/L	76.4	<0.5	-	-
o-Xylene	0.5 ug/L	14.0	<0.5	-	-
Xylenes, total	0.5 ug/L	90.3	<0.5	-	-
Toluene-d8	Surrogate	104%	104%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*84.1*		*ug/L*		*105*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: Toluene-d8	*83.2*		*ug/L*		*104*	*50-140*			

Certificate of Analysis

Report Date: 15-Jul-2021

Client: Paterson Group Consulting Engineers

Order Date: 13-Jul-2021

Client PO: 32471

Project Description: PE5303

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2190	25	ug/L	ND	109	68-117			
F2 PHCs (C10-C16)	1460	100	ug/L	ND	91.2	60-140			
F3 PHCs (C16-C34)	3500	100	ug/L	ND	89.2	60-140			
F4 PHCs (C34-C50)	2350	100	ug/L	ND	94.6	60-140			
Volatiles									
Benzene	37.0	0.5	ug/L	ND	92.6	60-130			
Ethylbenzene	39.0	0.5	ug/L	ND	97.5	60-130			
Toluene	41.4	0.5	ug/L	ND	104	60-130			
m,p-Xylenes	78.0	0.5	ug/L	ND	97.6	60-130			
o-Xylene	39.8	0.5	ug/L	ND	99.5	60-130			
Surrogate: Toluene-d8	*82.9*		*ug/L*		*104*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

Paracel ID: 2129273

Chain Of Custody
(Lab Use Only)
№ 132964

Page 1 of 1

Client Name: Paterson Group	Project Ref: PE5303
Contact Name: Nick Sullivan	Quote #:
Address: 154 Colonnade Rd. S.	PO #: 32471
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca

Turnaround Time
☐ 1 day ☐ 3 day
☒ 2 day ☐ Regular
Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☒ Coarse
☐ Table 3 ☐ Agri/Other
☒ Table 7
For RSC: ☐ Yes ☐ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)					
1	BH1-21-GW3	GW		3	July 13/21	AM	X											
2	BH3-21-GW3	GW		2	↓	↓	X											
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot: A. LEDUC	Received at Lab: C	Verified By: C
Relinquished By (Print): Nick Sullivan	Date/Time: 13/07/21 3:25	Date/Time: 4:15 July 13 2021	Date/Time: July 14 July 13 2021
Date/Time: July 13, 2021	Temperature: °C PM	Temperature: 7.4 °C	pH Verified: ☐ By: