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Phase II Environmental Site Assessment

383 Slater Street, 388-400 Albert Street
and 156-160 Lyon Street
Ottawa, Ontario

Prepared For

Main & Main Developments

April 15, 2019

Report: PE4581-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 383 Slater Street, 388-400 Albert Street and 156-160 Lyon Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address a potentially contaminating activity (PCA) that was identified during the Phase I ESA and considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The subsurface investigation consisted of nine (9) test pits and drilling three (3) boreholes, all of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the test pits located on the western portion of the subject property and screened using visual observations. Five (5) soil samples were submitted for laboratory analysis of metals. All metal parameter concentrations were in compliance with the MECP Table 3 Standards.

Soil results from the 2012 and 2017 Phase II ESAs conducted by Golder Associates and Paterson, respectively, identified mercury and lead concentrations in excess of the MECP Table 3 Standards. Impacted soil was identified on the eastern portion of Phase II Property. The extent of contamination is considered to be limited to the fill material beneath the asphaltic concrete and/or gravel layer.

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were recovered and analyzed for volatile organic compounds (VOCs) to confirm that groundwater beneath the site is free of contaminants. All VOC parameter concentrations were in compliance with the MECT Table 3 Standards, with the exception of chloroform detected in two monitoring wells (BH1 and BH2). Chloroform is considered to be related to the municipal water used to core the bedrock on the subject site and is expected to dissipate in the near future. Therefore, groundwater is considered to be in compliance with the selected MECP standards.

Groundwater results from the 2012 and 2017 Phase II ESAs concluded all analyzed parameters were in compliance with the MECP Table 3 Standards.

Recommendations

Soil

Based on the findings of the Phase II ESA, soil/fill impacted with mercury and lead is present on the eastern portion of the Phase II Property. It is expected that the impacted fill will be removed from the subject site during the redevelopment process. The

excavation of the fill from the property should be monitored and confirmed by Paterson. Any impacted fill and construction debris being removed from the property is to be disposed of at an approved waste disposal facility.

Groundwater

It is recommended that any monitoring wells that had elevated chloroform concentrations in them be resampled to confirm that the chloroform has dissipated.

Monitoring Wells

If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of Mr. Rooie Ash of Main & Main Developments, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of 383 Slater Street, 388-400 Albert Street, 156-160 Lyon Street, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in March 2019 and previous Phase II ESAs conducted by Golder Associates and Paterson in January 2012 and May 2017, respectively.

1.1 Site Description

Address:	383 Slater Street, 388-400 Albert Street, 156-160 Lyon Street, Ottawa, Ontario.
Legal Description:	West Part Lot 16; Lots 12, 13, 14, 15, 16, and Part of Lot 17 (North Slater Street) and Lots 14 and 15 (South Albert Street), Registered Plan 3922, City of Ottawa, Ontario; Part of Lot 16 (East Albert Street); Part of Lot 17, Registered Plan 3922, City of Ottawa, Ontario.
Property Identification Number(s):	04114-0008; 04114-0011; 04114-0012; 04114-0010 and 04114-0009
Location:	The subject site is bound by Bay Street to the West, Lyon Street to the East, Slater Street to the South, and Albert Street to the North. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 23' 04" N, 75° 44' 12" W
Zoning:	R5A – Residential 5th Density
Configuration:	Irregular
Site Area:	1.05 hectares (approximate)

1.2 Property Ownership

Paterson was retained to complete this Phase II ESA by Mr. Rooie Ash of Main & Main Developments, the prospective buyer. Main & Main Developments' office is located at 109 Atlantic Avenue, Suite 302B, Toronto, Ontario. Mr. Ash can be reached by telephone at (416) 530-2438.

1.3 Current and Proposed Future Uses

The Phase II Property is currently occupied by a vacant two (2) storey commercial restaurant building. The site is primarily used for vehicular parking. It is our understanding that the Phase II Property will be redeveloped with three (3) residential complexes with retail/commercial space available on the ground level and multiple levels of underground parking.

1.4 Applicable Site Condition Standard

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

- ❒ Coarse-grained soil conditions
- ❒ Surface soil and groundwater conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

The residential standards were selected based on the future land use of the subject site. Coarse grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is bound by Bay Street to the West, Lyon Street to the East, Slater Street to the South, and Albert Street to the north. The site is in a downtown urban setting. The ground surface at the site is gravel covered along the western portion of the property, while the eastern portion is asphaltic concrete covered. The site is at the grade of Albert Street and Slater Street, sloping down in a north-to-south direction. The regional topography slopes downwards in a northerly direction towards the Ottawa River, approximately 520 m away.

2.2 Past Investigations

Paterson completed a Phase I ESA in March 2019 for the subject site. Based on the findings of the Phase I ESA, one Potentially Contaminating Activity (PCA) was identified, metal impacted fill material on site. This PCA was considered to represent an APEC on the Phase I Property.

PCAs that represented APECs on the Phase I and II Property as well as the Contaminants of Potential Concern (CPCs) are presented in Table 1.

Table 1. Areas of Potential Environmental Concern

Area of Potential Environmental Concern and location	Potentially Contaminating Activity, as per Table 2 of O.Reg 153/04, as amended by, O.Reg 269/11	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Fill Material located on the site	Item 30, “Importation of Fill Material of Unknown Quality”	On Site – southern portion and northeast quadrant of the site	Metals	Soil

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

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The original subsurface investigation was conducted in April 2017, while recent cork was conducted in March 2019 in conjunction with a Geotechnical Investigation. In 2017, four (4) boreholes were drilled at the subject site. Boreholes were drilled through overburden soils and into bedrock to a maximum depth of 8.3 m below ground surface (GBS). Groundwater monitoring wells were installed in three (3) boreholes. Five (5) additional boreholes which had been previously drilled for geotechnical purposes were also reviewed as part of the 2017 Phase II ESA.

The field program in March 2019 consisted of nine (9) test pits to assess the quality of the fill material on the western half of the 383 Slater Street. Three (3) deep boreholes were drilled to depths of 17.9 to 19.4 m BGS and completed as groundwater monitoring wells.

3.2 Media Investigated

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

Contaminants of potential environmental concern for soil include metals (chromium VI and mercury). Additional testing of groundwater included volatile organic compounds (VOCs) for confirmatory purposes only.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of interbedded limestone and dolomite of the Gull River Formation. Overburden is reported to consist of Glacial Till of depths ranging from 0-5m.

Based on the findings of the Geotechnical investigation conducted by Paterson, overburden generally consists of fill material in former building locations over silty

slay and/or glacial till over bedrock. Bedrock ranges in depth from approximately 3-5 m below grade.

The regional topography slopes down in a northerly direction, however the topography in the immediate vicinity of the Phase I Property slopes down towards the south. The local groundwater flow beneath the Phase I Property is inferred to be in a north-westerly/northerly direction.

Contaminants of Potential Concern

As per Section 7.1 of the Phase I ESA report, metals were identified as contaminants of potential concern (CPCs) in the fill on the subject site.

Existing Buildings and Structures

The Phase I Property is occupied by a vacant two (2) storey building that was constructed pre-1920 with a stone and mortar foundation, finished in red brick and a sloped style shingle roof. The building was used as a restaurant since the mid 1990s. Remnants (foundation walls) of the former building on the northwest corner of the property are present.

Water Bodies

There are no water bodies on the Phase I Property or within the Phase I study area. The closest water body is the Ottawa River, located approximately 500 m to the north.

Areas of Natural Significance

No areas of natural significance were identified on the Phase I Property or in the Phase I Study Area.

Drinking Water Wells

No drinking water wells are located on the Phase I Property or within the Phase I Study Area.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area is a combination of residential, commercial retail, restaurants and an institution. Land use is shown on Drawing PE4581-2 - Surrounding Land Use Plan in the Phase I ESA report.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 5 in Section 7.1, one Potentially Contaminating Activity (PCA) was identified on the Phase I Property resulting in an Area of Potential Environmental Concern (APEC):

- Fill material of unknown quality in select areas of the Phase I Property

Historical PCAs were identified within the Phase I Study Area, however these activities were previously addressed and are no longer considered to represent APECs on the Phase I Property based on their respective separation distances and/or orientations with respect to the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

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

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report.

3.5 Impediments

No physical impediments were encountered during the Phase II ESA program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation conducted for this Phase II ESA consisted of drilling three (3) boreholes that were completed as groundwater monitoring wells. Boreholes were drilled through overburden soils and into bedrock to a maximum depth of 19.4 m BGS to intercept groundwater. Nine (9) additional test pits were conducted to assess the quality of the fill on site. This subsurface investigation was conducted in conjunction with a Geotechnical Investigation.

The test pits were placed to address the aforementioned APEC in the southwestern quadrant of the property. The boreholes were advanced using a truck-mounted CME 55 power auger drill rig. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Drilling occurred under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4581-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of nine (9) soil samples were obtained from the test pits by means of sampling from grab samples.

A total of sixteen (16) soil samples were obtained from the boreholes by means of split spoon sampling and grab sampling from auger flights. Split spoon samples were taken at approximate 0.76 m intervals. The bedrock was cored to facilitate the installation of groundwater monitoring wells. The depths at which grab samples and split spoon samples were obtained from the boreholes are shown as "**G**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

The borehole profiles generally consist of asphaltic concrete or gravel over crushed stone and silty sand with gravel fill material, underlain silty sand and/or till and bedrock. Fill material present beneath the pavement structure extended to depths ranging from 2.39 to 3.28 m. Till was present beneath the fill and extended to depths ranging from 2.84 to 4.29 m below the existing grade.

4.3 Field Screening Measurements

Soil samples recovered at the time of sampling were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey. Allowing the samples to stabilize to room temperature ensures consistency of readings between samples.

To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. A photo ionization detector (PID) was used to measure the volatile organic vapour concentrations. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement.

The PID readings were found to be zero in the soil samples obtained. These results do not indicate the potential for significant contamination from volatile

contaminants. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No olfactory indications of potential contamination were identified in the soil samples; however, some demolition debris was identified in a few samples.

4.4 Groundwater Monitoring Well Installation

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

Boreholes were surveyed using a benchmark elevation of the top grate of a manhole located on Bay Street, at the Slater Street at Bay Street intersection as presented in Drawing PE4581-3, with a geodetic elevation of 72.77 m above sea level (m ASL).

TABLE 2: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	73.24	18.01	15.01-18.01	13.70-18.01	0.61-13.70	Flushmount
BH2	71.99	17.88	14.88-17.88	13.66-17.88	0.61-13.66	Flushmount
BH3	72.28	19.38	16.38-19.38	13.70-19.38	0.61-13.70	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1, BH2 and BH3 on April 9, 2019. Water levels were measured. No other field parameters were measured.

4.6 Groundwater Sampling

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

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the following soil and groundwater samples as well as analyzed parameters are presented in Tables 3 and 4. For reference purposes, previous sample ID(s) and analyzed parameters from the 2012 and 2017 Phase II ESAs conducted by Golder and Paterson, respectively, have been included in the table.

TABLE 3. Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	BTEX / VOCs	PAHs	PHCs (F1-F4)	
March 29, 2019						
TP1-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP2-G1	0.1-0.2 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP3-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP4-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP5-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
April 18-27, 2017 (Paterson, 2017)						
BH9-SS2	0.76-1.37 m, Fill	X		X		Assess fill material of unknown quality
BH10-SS1B	0.31-0.76 m, Fill	X				Assess former garage, welding shop and fill quality
BH10-SS2	0.76-1.37 m, Fill		X	X	X	Assess former garage, welding shop and fill quality
BH10-SS4	2.29-2.90 m, silty sand	X				Vertical delineation of Mercury impacts
BH11-SS1B	0.25-0.91 m, Fill	X				Assess fill material of unknown quality
BH11-SS2A	0.91-1.37 m, Fill	X				Vertical delineation of Mercury and

TABLE 3. Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	BTEX / VOCs	PAHs	PHCs (F1-F4)	
						Lead impacts
BH11-SS3	1.52-2.13 m, Till	X				Vertical delineation of Mercury impacts
BH11-SS6	3.81-4.22 m, Till		X			Assess former cleaners and fill material of unknown quality
BH12-SS1B	0.31-0.76 m, Fill	X				Assess fill material of unknown quality
BH12-SS2	0.76-1.37 m, Fill	X				Vertical delineation of Mercury impacts
BH12-SS5	3.04-3.66 m, Till		X		X	Assess former cleaners
May 19, 2011 (Golder, 2012)						
T-72 SA1	0.76-1.37 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-72 SA4	3.04-3.66 m, Till	X	X		X	Assess APECs on northwest corner of the subject site
T-306 SA1	0.76-1.37 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-306 SA3	2.29-2.90 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-307 SA1	0.76-1.37 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-307 SA5	3.80-4.42 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-308 SA3	2.29-2.90 m, silty clay		X		X	Assess APECs on northwest corner of the subject site
T-308 SA6*	3.80-4.27 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-309 SA1	0.91-1.52 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-309 SA4	3.05-3.66 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-309 SA4A	3.05-3.66 m, Till		X		X	Duplicate Sample

Notes:
1 – Metals including Chromium VI and/or Mercury
* - Identified as SA5 on borehole log

TABLE 4. Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Depth/ Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	VOCs	PAHs	PHCs (F1-F4)	
April 9, 2019						
BH1-GW1	15.01-18.01 m, Limestone bedrock		X			Confirm that there are no VOC impacts beneath the subject site
BH2-GW1	14.88-17.88 m, Limestone bedrock		X			Confirm that there are no VOC impacts beneath the subject site
BH3-GW1	16.38-19.38 m, Limestone bedrock		X			Confirm that there are no VOC impacts beneath the subject site
April 27, 2017 (Paterson, 2017)						
BH9-GW1	3.81-7.14 m, Limestone bedrock	X		X	X	Assess potential groundwater impacts due to the presence of the former welding shop and garage
BH10-GW1	3.73- 8.31 m, Limestone bedrock		X	X	X	Assess potential groundwater impacts due to the presence of the former drycleaners and garage
BH11-GW1	4.89-6.81 m Limestone bedrock	X	X			Assess potential groundwater impacts due to the presence of the former drycleaners and welding shop
June 28 – December 5, 2011 (Golder, 2012)						
T-72A	33.3-39.3 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner
T-72B	12.2-15.2 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner
T-306A	13.6-15.1 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-306B	4.9-6.4 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner
T-307A	13.5-15.0 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-308A	13.5-15.0 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-308B	5.5-7.0 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner

TABLE 4. Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Depth/ Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	VOCs	PAHs	PHCs (F1-F4)	
T-309A	12.2-15.1 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-309B	5.5-7.0 m, Limestone bedrock				X	Assess potential groundwater impacts due to the presence of the former drycleaner

Notes:
A, B – Indicates 'Deep Well' and 'Shallow Well,' respectively

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

4.8 Residue Management

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

4.9 Elevation Surveying

An elevation survey of all borehole locations was completed by Paterson at the time of the subsurface investigation. Elevations were surveyed relative to a geodetic benchmark (manhole cover located along east side of Bay Street, just north of Slater Street). The elevation of the benchmark was 72.77 metres above sea level (m ASL). The location of the site benchmark is shown on Drawing PE4581-3 – Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils consist of an asphaltic paved layer or gravel, underlain by fill material (crushed stone and silty sand with some gravel), overlying glacial till (clayey silt with sand and gravel) and subsequent limestone bedrock.

Groundwater was encountered within bedrock at depths ranging from approximately 2.20 to 4.37 m BGS.

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

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on April 9, 2019 using an electronic water level meter. 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	73.24	4.37	68.87	April 9, 2019
BH2	71.99	2.20	69.79	April 9, 2019
BH3	72.28	3.50	68.78	April 9, 2019

Based on the groundwater elevations measured during the April 2019 sampling event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4581-3. Based on the contour mapping, groundwater flow at the subject site appears to be in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.04 m/m was calculated.

5.3 Fine-Coarse Soil Texture

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

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in zero-vapour readings. No obvious olfactory indications of potential environmental concerns were identified in the soil samples; however, some demolition debris

was present in a few samples. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Five (5) soil samples were submitted for metals analysis. The results of the analytical testing are presented below in Table 6. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 6: Analytical Test Results - Soil – Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) March 29, 2019					MECP Table 3 Residential Standards (µg/g)
		TP1-G1	TP2-G1	TP3-G1	TP4-G1	TP5-G1	
Antimony	1.0	nd	nd	1.1	nd	1.2	7.5
Arsenic	1.0	1.8	3.3	3.8	2.9	4.2	18
Barium	1.0	20.0	123	53.0	102	104	390
Beryllium	0.5	nd	nd	nd	nd	nd	4
Boron	5.0	nd	26.1	7.5	8.7	8.9	120
Cadmium	0.5	nd	nd	nd	nd	nd	1.2
Chromium	5.0	8.8	10.3	11.5	19.8	16.3	160
Chromium (VI)	0.2	nd	nd	nd	nd	nd	8
Cobalt	1.0	3.5	4.1	4.4	6.9	5.7	22
Copper	5.0	6.5	15.3	12.7	17.0	17.6	140
Lead	1.0	3.9	16.0	10.3	26.3	29.8	120
Mercury	0.1	nd	nd	nd	nd	nd	0.27
Molybdenum	1.0	nd	2.5	3.0	1.0	4.2	6.9
Nickel	5.0	6.1	10.2	9.2	17.2	13.2	100
Selenium	1.0	nd	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	1.4	23
Vanadium	10.0	18.7	13.6	17.4	34.8	21.9	86
Zinc	20.0	nd	51.6	25.3	86.5	48.7	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – Value exceeds selected MECP Standards
- NA – Parameter not tested

Several metal parameters were detected in the soil samples; however, the concentrations are in compliance with the MECP Table 3 Standards. Analytical results for metals with respect to borehole locations are shown on Drawing PE4581-4 – Analytical Testing Plan – Soils (Metals). It should be noted, that the 2012 and 2017 Phase II ESA results for metals have been included in the above noted drawing.

Based on the combined analytical results for soil, mercury and/or lead concentrations exceeded the selected MECP standards in boreholes T-306, T-307, BH10, BH11 and BH12. Metal contamination was identified in samples retrieved from the fill layer.

The analytical results for all other parameters (BTEX, PAHs, PHCs, and VOCs) tested in soil from the 2012 and 2017 Phase II ESAs are shown on Drawing PE4581-5 – Analytical Testing Plan – Soils (BTEX, PAHs, PHCs, VOCs). All other parameter concentrations were in compliance with the MECP Table 3 Standards.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 7.

TABLE 7. Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Antimony	1.2	TP5-G1	0.2-0.3 m, Fill
Arsenic	4.2		
Barium	123	TP2-G1	0.1-0.2 m, Fill
Boron	26.1		
Chromium	19.8	TP4-G1	0.2-0.3 m, Fill
Cobalt	6.9		
Copper	17.6	TP5-G1	0.2-0.3 m, Fill
Lead	29.8		
Molybdenum	4.2		
Nickel	17.2	TP4-G1	0.2-0.3 m, Fill
Vanadium	34.8		
Zinc	86.5		

Notes:
- **Bold and Underlined** – Value exceeds MECP Table 3, Residential Standards

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were submitted for laboratory analysis of VOC parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented in Table 8. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 8. Analytical Test Results – Groundwater (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) April 9, 2019			MECP Table 3 Residential Standards (µg/L)
		BH1-GW1	BH2-GW1	BH3-GW1	
Acetone	5	nd	nd	nd	130,000
Benzene	0.5	nd	nd	nd	44
Bromodichloromethane	0.5	3.2	3.0	nd	85,000
Bromoform	0.5	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	630
Chloroform	0.5	**27.1**	**25.7**	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	82,000
Dichlorodifluoromethane	1	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6
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	16
1,3-Dichloropropene, total	0.5	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	2,300
Ethylene dibromide	0.2	nd	nd	nd	0.25
Hexane	1	nd	nd	nd	51
Methyl Ethyl Ketone	5	nd	nd	nd	470,000
Methyl Isobutyl Ketone	5	nd	nd	nd	140,000
Methyl tert-butyl ether	2	nd	nd	nd	190
Methylene Chloride	5	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	0.5
Xylenes, total	0.5	nd	nd	nd	4,200

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

VOC parameter concentrations were not detected in the groundwater samples analyzed, with the exception of bromodichloromethane and chloroform. Chloroform concentrations were identified in BH1 and BH2 in excess of the selected MECP standard; however, the chloroform concentrations are considered to be residual from the municipal water used during rock coring and thus, are not considered contaminants. All remaining VOC parameters comply with the MECP Table 3 Standards.

Analytical results of groundwater sampled with respect to borehole locations are shown on Drawing PE4581-6 – Analytical Testing Plan – Groundwater.

The maximum concentrations of analyzed parameters in the groundwater at the site are summarized in Table 9.

TABLE 9. Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole	Screened Interval (m BGS)
Bromodichloromethane	3.1	BH1-GW1	15.01-18.01 m
Chloroform	**27.1**	BH1-GW1	15.01-18.01 m

Notes:
- **Bold and Underlined** – Value exceeds MECP Table 3, Residential Standards

All other parameter concentrations were below laboratory detection limits.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the April 2017 and 2019 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type. As per Subsection 47(3) of O.Reg. 153/04, as amended, under the Environmental Protection Act, a Certificate of Analysis has been received for each sample submitted for analysis and all Certificates of Analysis are appended to this report.

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

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04, as 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 indicated in the Phase I-ESA report and Section 2.2 of this report, the following PCA, as per Table 2, O.Reg. 153/04, as amended, under the Environmental Protection Act, is considered to result in an APEC on the Phase I and Phase II Property:

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

Former onsite PCAs and off-site PCAs in the area are not considered to have resulted in APECs, based on available documentation regarding those concerns (2012 and 2017 Phase II ESAs) and/or their location relative to the subject site.

Contaminants of Potential Concern

The CPCs for the Phase II Property include metals present in the fill material.

Subsurface Structures and Utilities

The subject site is located in a municipally serviced area. The site is currently vacant and based on the underground service locates completed prior to the field program no utilities remain on the subject site.

Physical Setting

Site Stratigraphy

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 and is depicted in Drawings PE4581-6 to PE4581-9 – Cross-Sections A – A' Soil/Groundwater. The stratigraphy of the subject site generally consists of:

- Paved asphalt/concrete, approximately 0.05 m below grade;
- Fill material (crushed stone and silty sand with gravel and some clay), extending to depths ranging from approximately 2.39 to 3.28 m below grade;
- Glacial till (clayey silt with sand and gravel), extending to depths ranging from approximately 2.84 to 4.29 m below grade;
- Bedrock (limestone), extending to depths ranging from approximately 17.88 to 19.38 m below grade.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered in the glacial till and limestone bedrock. The bedrock is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on April 9, 2019, at depths ranging from 2.20 to 4.37 m BGS. Based on the groundwater elevations measured, a groundwater contour map was completed. Groundwater contours are shown on Drawing PE4581-3. Based on the contour mapping, groundwater flow at the subject site appears to be in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.04 m/m was calculated.

Approximate Depth to Bedrock

Bedrock is present at approximately 2.84 to 4.29 m below the existing grade, as determined by rock coring at the subject site.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 2.20 to 4.37 m below the existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site as bedrock is located more than 2 m below ground surface and thus, not considered a Shallow Soil Property.

Fill Placement

Fill placement has occurred at the subject site. The fill material consists of fill material of unknown quality in areas of former asphaltic concrete paved areas except within the former building footprints, where traces of demolition debris had been identified. Analytical results for metals indicate that the impacted fill material is present in the eastern portion of the subject site. Soil results for metals are shown in Drawing PE4581- 4 – Analytical Testing Plan – Soil (Metals).

It is understood that the impacted fill material and any demolition debris will be removed in conjunction with the redevelopment of the Phase II Property.

Existing Buildings and Structures

The Phase II Property is occupied by an uninhabited/vacant two (2) storey building that was constructed pre-1920 with a stone and mortar foundation, finished in red brick and a sloped style shingle roof. The building was used as a restaurant since the mid 1990s. Retaining walls are present on the northwest corner of the property.

Proposed Buildings and Other Structures

It is our understanding that combined commercial/residential high-rise buildings with multiple levels of underground parking are proposed for the site. The footprint of the development will cover the majority of the site.

Areas of Natural Significance and Water Bodies

No areas of natural significance or water bodies are present on or within the vicinity of the Phase II Property. The closest water body is the Ottawa River, located approximately 500 m to the north/northwest.

Environmental Condition

Areas Where Contaminants are Present

The impacted fill material is present on the eastern potion of the subject property. The southwestern and northern limits of contamination have been delineated, based on the analytical results of the 2017 Phase II ESA conducted by Paterson. It appears that the contamination is confined in the fill material, as shown in Drawing PE4581-7-Cross-Section A-A'. It is not expected that the contaminants have penetrated the underlying clayey layer.

Chloroform was present in the groundwater in wells (BH1 and BH2) in excess of the MECP Table 3 Standard, however, it is considered to be residual from the core water utilized during rock coring and is not a contaminant.

Analytical test results for soil and groundwater are shown on Drawings PE4581-4 through PE4581-7 – Analytical Testing Plans.

Types of Contaminants

The confirmed contaminants of concern in the soil/fill include mercury and lead.

Contaminated Media

Based on the results of the Phase II ESA, the fill material on the eastern portion of the subject site is impacted with mercury and/or lead.

What Is Known About Areas Where Contaminants Are Present

The fill material is impacted on the eastern portion of the Phase II Property. Analytical test results identified mercury and lead exceeding the MECP Table 3 Standards. No other contaminants were identified in soil or groundwater.

Distribution and Migration of Contaminants

As previously noted, impacted soil was identified in the eastern portion of the subject site. The marginal metals impacts identified in the fill are not expected to migrate into the native soil. Based on the vertical delineation samples the native soil/till has not been impacted.

Chloroform in groundwater exceeding the selected MECP Standards is believed to be remnant from the municipal core water used during the bedrock coring process. As a result, chloroform concentrations are not considered an environmental concern. Groundwater beneath the Phase II Property has not been impacted.

Discharge of Contaminants

The metal impacted soil is considered to have been associated with the historical land use and the possible importation of fill material. No activities currently taking place on the subject site are expected to discharge contaminants.

The chloroform is related to the municipal drinking water used as part of the rock coring process.

Climatic and Meteorological Conditions

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

Leaching is not an issue since metals do not readily dissolve and contaminants are under asphaltic concrete and above the water table. Therefore, contaminants are not exposed to the groundwater on the Phase II Property.

Potential for Vapour Intrusion

Based on the soil and groundwater results vapour intrusion is not considered to be a concern at the Phase II-ESA Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the properties addressed 383 Slater Street, 388-400 Albert Street and 156-160 Lyon Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address a potentially contaminating activity (PCA) that was identified during the Phase I ESA and considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The subsurface investigation consisted of nine (9) test pits and drilling three (3) boreholes, all of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the test pits located on the western portion of the subject property and screened using visual observations. Five (5) soil samples were submitted for laboratory analysis of metals. All metal parameter concentrations were in compliance with the MECP Table 3 Standards.

Results of the 2012 and 2017 Phase II ESAs conducted by Golder Associates and Paterson, respectively, identified mercury and lead concentrations in excess of the MECP Table 3 Standards. Impacted soil was identified on the eastern portion of Phase II Property. The extent of contamination is considered to be limited to the fill material beneath the asphaltic concrete and/or gravel layer.

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were recovered and analyzed for volatile organic compounds (VOCs) to confirm that groundwater beneath the site is free of contaminants. All VOC parameter concentrations were in compliance with the MECT Table 3 Standards, with the exception of chloroform detected in two monitoring wells (BH1 and BH2). Chloroform is considered to be related to the municipal water used to core the bedrock on the subject site and is expected to dissipate in the near future. Therefore, groundwater is considered to be in compliance with the selected MECP standards.

Groundwater results from the 2012 and 2017 Phase II ESAs concluded all analyzed parameters were in compliance with the MECP Table 3 Standards.

Recommendations

<u>Soil</u>

Based on the findings of the Phase II ESA, soil/fill impacted with mercury and lead is present on the eastern portion of the Phase II Property. It is expected that

the impacted fill will be removed from the subject site during the redevelopment process. The excavation of the fill from the property should be monitored and confirmed by Paterson. Any impacted fill and construction debris being removed from the property is to be disposed of at an approved waste disposal facility.

Groundwater

It is recommended that any monitoring wells that had elevated chloroform concentrations in them be resampled to confirm that the chloroform has dissipated.

Monitoring Wells

If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

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

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

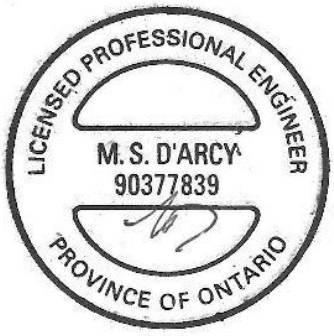
Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

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

Paterson Group Inc.

Mandy Witteman, M.A.Sc.

Mark S. D'Arcy, P.Eng.



Report Distribution:

- Main & Main Developments
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4581-3 – TEST HOLE LOCATION PLAN

DRAWING PE4581-4 – ANALYTICAL TESTING PLAN – SOIL (METALS)

DRAWING PE4581-5– ANALYTICAL TESTING PLAN – SOIL (BTEX, PAHs, PHCs, VOCs)

DRAWING PE4581-6 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4581-7 – CROSS-SECTION A – A' – SOIL (METALS)

DRAWING PE4581-8 – CROSS-SECTION A – A' – SOIL (BTEXs, PHCs, PAHs, VOCs)

DRAWING PE4581-9 – CROSS-SECTION A – A' –GROUNDWATER

FIGURE 1

KEY PLAN

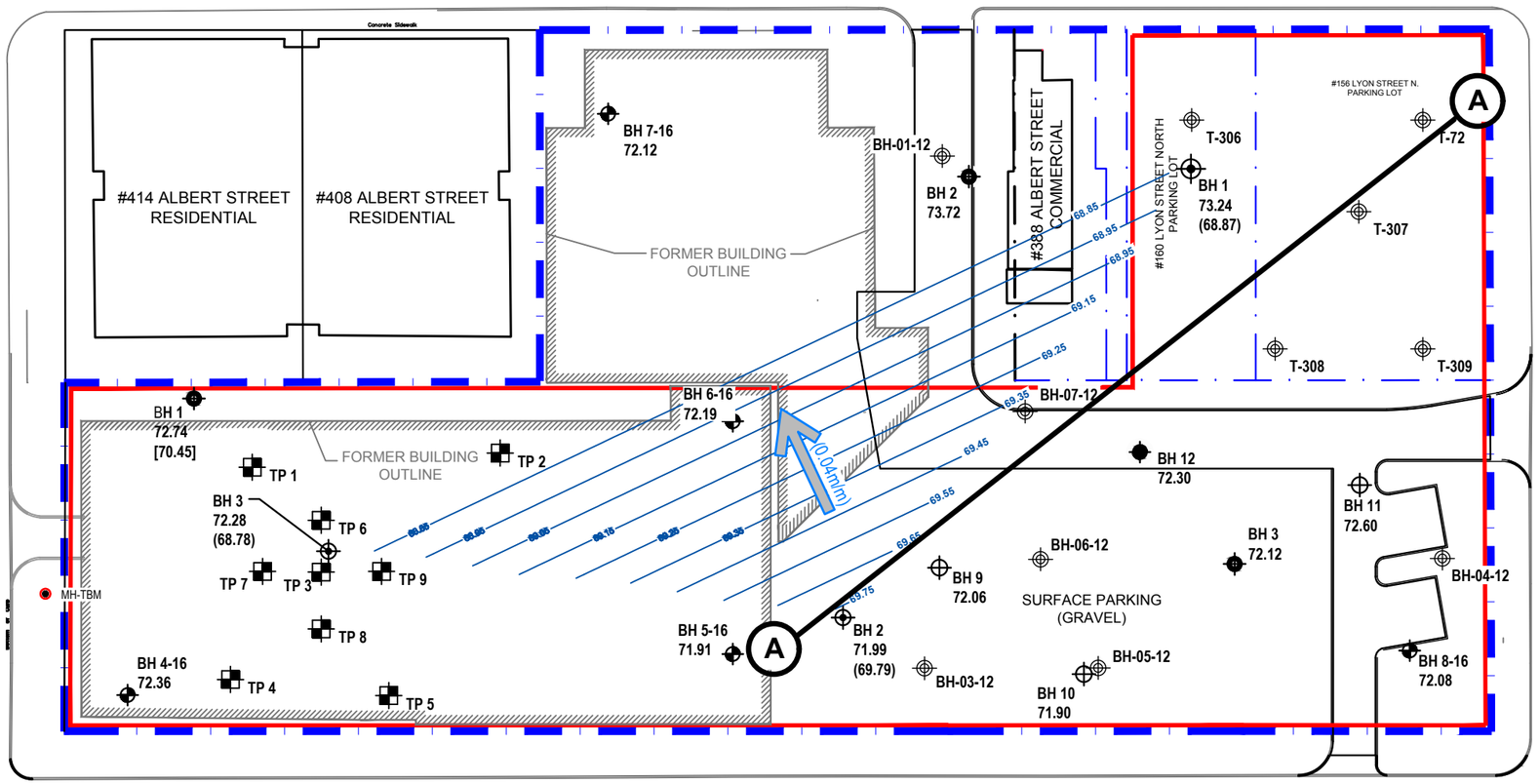
#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

ALBERT STREET



LYON STREET NORTH

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

SLATER STREET

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793/PE4581
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
- APPROX. BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION (GEOTECHNICAL INVESTIGATION PG4793/PE4581, 2019)
- 73.24 GROUND SURFCAE ELEVATION(m)
- (68.87) GROUNDWATER SURFACE ELEVATION (m)
- 68.95 GROUNDWATER CONTOUR (m)
- (0.06m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)
- A—A CROSS SECTION LOCATION

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

#400 SLATER STREET
RESIDENTIAL / UNDERGROUND PARKING

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-3
Approved by: MSD	Revision No.: 0

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#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

T-306-SA1 0.76-1.37m 1-NOV-11

Parameter	Result(µg/g)	Standard(µg/g)
Lead	438	120
Mercury	1.2	0.27

TP2-G1 1.2-0.2m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

TP3-G1 0.2-0.3m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium IV - complies with MECP Table 3 Standards

TP1-G1 0.2-0.3m 29-MARr-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

#440 ALBERT STREET
OTTAWA TECHNICAL
HIGH SCHOOL

ALBERT STREET

Concrete Sidewalk

#414 ALBERT STREET
RESIDENTIAL

#408 ALBERT STREET
RESIDENTIAL

BH 7-16
72.12

BH-01-12

BH 2
73.72

FORMER BUILDING OUTLINE

#388 ALBERT STREET
COMMERCIAL

#160 LYON STREET NORTH
PARKING LOT

#156 LYON STREET N.
PARKING LOT

T-306

BH 1
73.24
(68.87)

T-72

T-307

T-308

T-309

TP5-G1 0.2-0.3m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

BH 1
72.74
[70.45]

BH 6-16
72.19

FORMER BUILDING OUTLINE

TP 1

TP 2

BH 3
72.28
(68.78)

TP 6

TP 7

TP 3

TP 9

MH-TBM

TP 8

BH 4-16
72.36

TP 4

TP 5

BH 5-16
71.91

BH9-SS2 0.76-1.37m 29-MAR-19
Metals comply with MECP Table 3 Standards

BH 9
72.06

BH-06-12

BH 2
71.99
(69.79)

BH-03-12

SURFACE PARKING
(GRAVEL)

BH 3
72.12

BH-07-12

BH 12
72.30

BH 11
72.60

BH-04-12

BH-05-12

BH 10
71.90

BH 8-16
72.08

T-72-SA1 0.76-1.37m 1-NOV-11
Metals - comply with MECP Table 3 Standards

T-72-SA4 3.05-3.66m 1-NOV-11
Metals - comply with MECP Table 3 Standards

N.

T-307-SA1 0.76-1.37m 1-NOV-11

Parameter	Results(µg/g)	Standards(µg/g)
Lead	258	120
Mercury	0.7	0.29

T-309-SA1 0.91-1.52m 1-NOV-11
Metals comply with MECP Table 3 Standards

ST.

BH11-SS1B 0.25-0.91m 18-APR-17

Parameter	Results(µg/g)	Standards(µg/g)
Lead	129	120
Mercury	0.8	0.27

BH11-SS2A 0.91-1.37m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Mercury	0.6	0.27

Lead - complies with MECP Table 3 Standards

BH11-SS3 1.52-2.13m 18-APR-17
Mercury - complies with MECP Table 3 Standards

LYON

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

BH10-SS1B 0.31-0.76m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Mercury	0.5	0.27

Lead - complies with MECP Table 3 Standards

BH10-SS2 0.76-1.37m 18-APR-17
Metals comply with MECP Table 3 Standards

BH10-SS4 2.29-2.90m 18-APR-17
Mercury - complies with MECP Table 3 Standards

TP4-G1 0.2-0.3m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

SLATER STREET

BH12-SS1B 0.31-0.76m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Lead	126	120

BH12-SS2 0.76-1.37m 18-APR-17
Lead - complies with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
- APPROX. BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION GEOTECHNICAL INVESITGATION (PG4793, 2019)
- 73.24 GROUND SURFCAE ELEVATION(m)
- (68.87) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-4
Approved by: MSD	Revision No.: 0

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#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

ALBERT STREET

#440 ALBERT STREET
OTTAWA TECHNICAL
HIGH SCHOOL

#414 ALBERT STREET
RESIDENTIAL

#408 ALBERT STREET
RESIDENTIAL

#388 ALBERT STREET
COMMERCIAL

#156 LYON STREET N.
PARKING LOT

#60 LYON STREET NORTH
PARKING LOT

FORMER BUILDING
OUTLINE

FORMER BUILDING
OUTLINE

SURFACE PARKING
(GRAVEL)

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

SLATER STREET

LYON ST.

T-306-SA1 0.76-1.37m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-306-SA3 2.29-2.90m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72-SA1 0.76-1.37m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72-SA4 3.05-3.66m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-307-SA1 0.76-1.37m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-307-SA5 3.80-4.42m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-309-SA1 0.91-1.52m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-309-SA4 3.05-3.66m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-308-SA3 2.29-2.90m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - compy with MECP Table 3 Standards

T-308-SA6 3.80-4.27m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

BH9-SS2 0.76-1.37m 18-APR-17
PAHs - comply with MECP Table 3 Standards

BH12-SS5 3.04-3.66m 18-APR-17
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

BH11-SS6 3.81-4.22m 18-APR-17
VOCs - comply with MECP Table 3 Standards

BH10-SS2 0.76-1.37m 18-APR-17
BTEX - comply with MECP Table 3 Standards
PAHs - comply with MECP Table 3 Standards
PHCs (F1-F4) - comply with MECP Table 3 Standards

BH 7-16
72.12

BH-01-12

BH 2
73.72

T-306

T-72

BH 1
73.24
(68.87)

T-307

T-308

T-309

BH-07-12

BH 12
72.30

BH 11
72.60

BH-04-12

BH 8-16
72.08

BH 1
72.74
[70.45]

BH 6-16
72.19

TP 1

TP 2

BH 3
72.28
(68.78)

TP 6

TP 7

TP 3

TP 9

TP 8

TP 4

TP 5

BH 4-16
72.36

BH 5-16
71.91

BH 9
72.06

BH-06-12

BH 3
72.12

BH 2
71.99
(69.79)

BH-03-12

BH-05-12

BH 10
71.90

MH-TBM

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
- APPROX. BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION GEOTECHNICAL INVESITGATION (PG4793, 2019)
- 73.24 GROUND SURFCAE ELEVATION(m)
- (68.87) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

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NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (BTEX, PHC, VOC & PAH)

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-5
Approved by: MSD	Revision No.: 0

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#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

#440 ALBERT STREET
OTTAWA TECHNICAL
HIGH SCHOOL

ALBERT STREET

SLATER STREET

LYON

#414 ALBERT STREET
RESIDENTIAL

#408 ALBERT STREET
RESIDENTIAL

#388 ALBERT STREET
COMMERCIAL

#156 LYON STREET N.
PARKING LOT

#160 LYON STREET NORTH
PARKING LOT

SURFACE PARKING
(GRAVEL)

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

Concrete Sidewalk

FORMER BUILDING OUTLINE

FORMER BUILDING OUTLINE

MH-TBM

BH 7-16
72.12

BH-01-12

BH 2
73.72

T-306

BH 1
73.24
(68.87)

T-307

T-308

T-309

BH-07-12

BH 12
72.30

BH 6-16
72.19

BH 1
72.74
[70.45]

TP 1

TP 2

BH 3
72.28
(68.78)

TP 6

TP 7

TP 3

TP 9

TP 8

BH 4-16
72.36

TP 4

TP 5

BH 5-16
71.91

BH 2
71.99
(69.79)

BH 9
72.06

BH-06-12

BH 3
72.12

BH-03-12

BH-05-12

BH 10
71.90

BH 11
72.60

BH-04-12

BH 8-16
72.08

T-72

T-72A 33.3-39.3m 25-AUG-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72B 12.2-15.2m 25-AUG-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-307A 13.5-15.0m 10-NOV-11
VOCs - comply with MECP Table 3 Standards

T-309A 12.2-15.1m 10-NOV-11

Parameter	Result (µg/L)	Standard(µg/L)
Chloroform	5.4	2.4

VOCs - comply with MECP Table 3 Standards

T-309B 5.50-7.00m 10-NOV-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-306A 13.6-15.1m 10-NOV-11

Parameter	Result (µg/L)	Standard(µg/L)
Chloroform	13.5	2.4

VOCs - comply with MECP Table 3 Standards

T-306B 5.50-7.00m 10-NOV-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

BH1-GW1 15.0-18.0m 9-APR-19

Parameter	Results(µg/L)	Standards(µg/L)
Chloroform	27.1	2.4

VOCs - comply with MECP Table 3 Standards

BH3-GW1 16.4-19.4m 9-APR-19
VOCs - complies with MECP Table 3 Standards

BH11-GW1 4.89-6.81m 27-APR-17
Metals - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-308A 13.5-15.0m 10-NOV-11

Parameter	Result (µg/L)	Standard(µg/L)
Chloroform	18.2	2.4

VOCs - comply with MECP Table 3 Standards

T-308B 5.50-7.00m 10-NOV-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

BH2-GW1 14.9-17.9m 9-APR-19

Parameter	Results(µg/L)	Standards(µg/L)
Chloroform	25.7	2.4

VOCs - comply with MECP Table 3 Standards

BH9-GW1 3.81-7.14m 27-APR-17
PAHs - comply with MECP Table 3 Standards
PHCs - comply with MECP Table 3 Standards
Metals - comply with MECP Table 3 Standards

BH10-GW1 3.73-8.31m 27-APR-17
PAHs - comply with MECP Table 3 Standards
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
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TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
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MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-6
Approved by: MSD	Revision No.: 0

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BH9-SS2 0.76-1.37m 18-APR-17
Metals comply with MECP Table 3 Standards

BH12-SS1B 0.31-0.76m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Lead	126	120

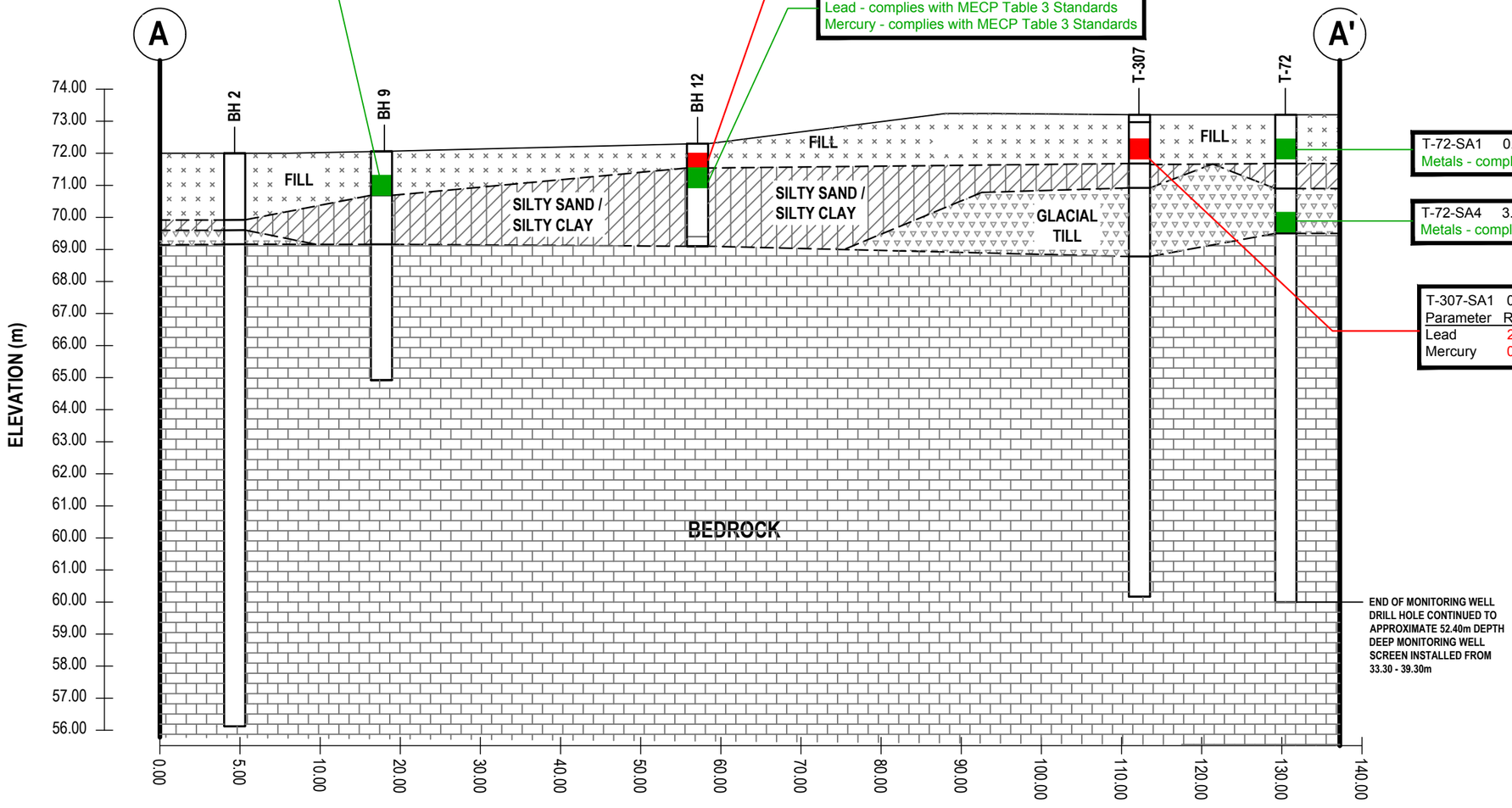
BH12-SS2 0.76-1.37m 18-APR-17
Lead - complies with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards

T-72-SA1 0.76-1.37m 1-NOV-11
Metals - comply with MECP Table 3 Standards

T-72-SA4 3.05-3.66m 1-NOV-11
Metals - comply with MECP Table 3 Standards

T-307-SA1 0.76-1.37m 1-NOV-11

Parameter	Results(µg/g)	Standards(µg/g)
Lead	258	120
Mercury	0.7	0.27



SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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MAIN AND MAIN DEVELOPMENTS
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

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

Scale: AS SHOWN	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-7
Approved by: MSD	Revision No.: 0

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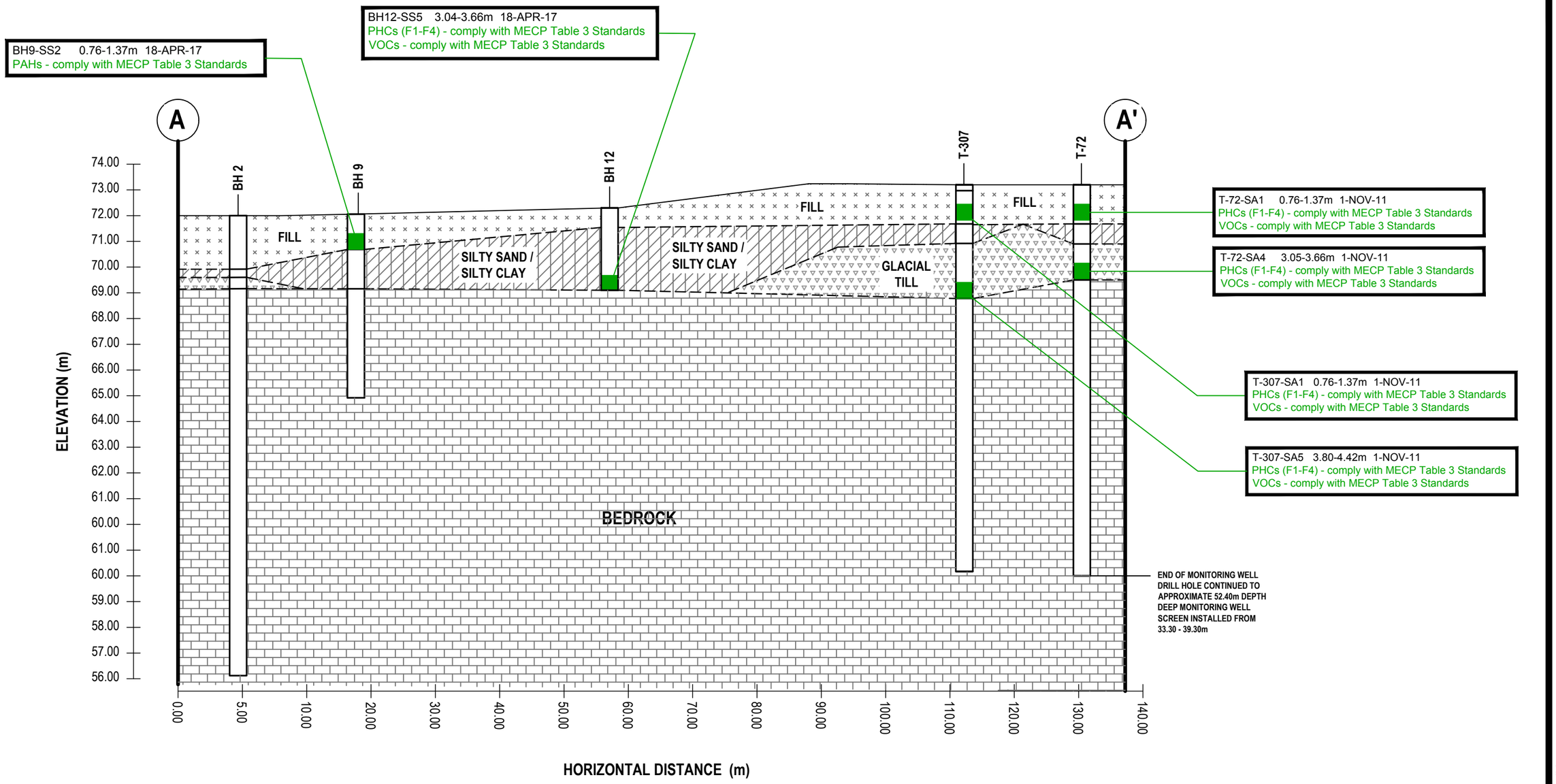

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

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MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - SOIL (BTEX, PHC, VOC & PAH)

Scale: AS SHOWN	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-8
Approved by: MSD	Revision No.: 0

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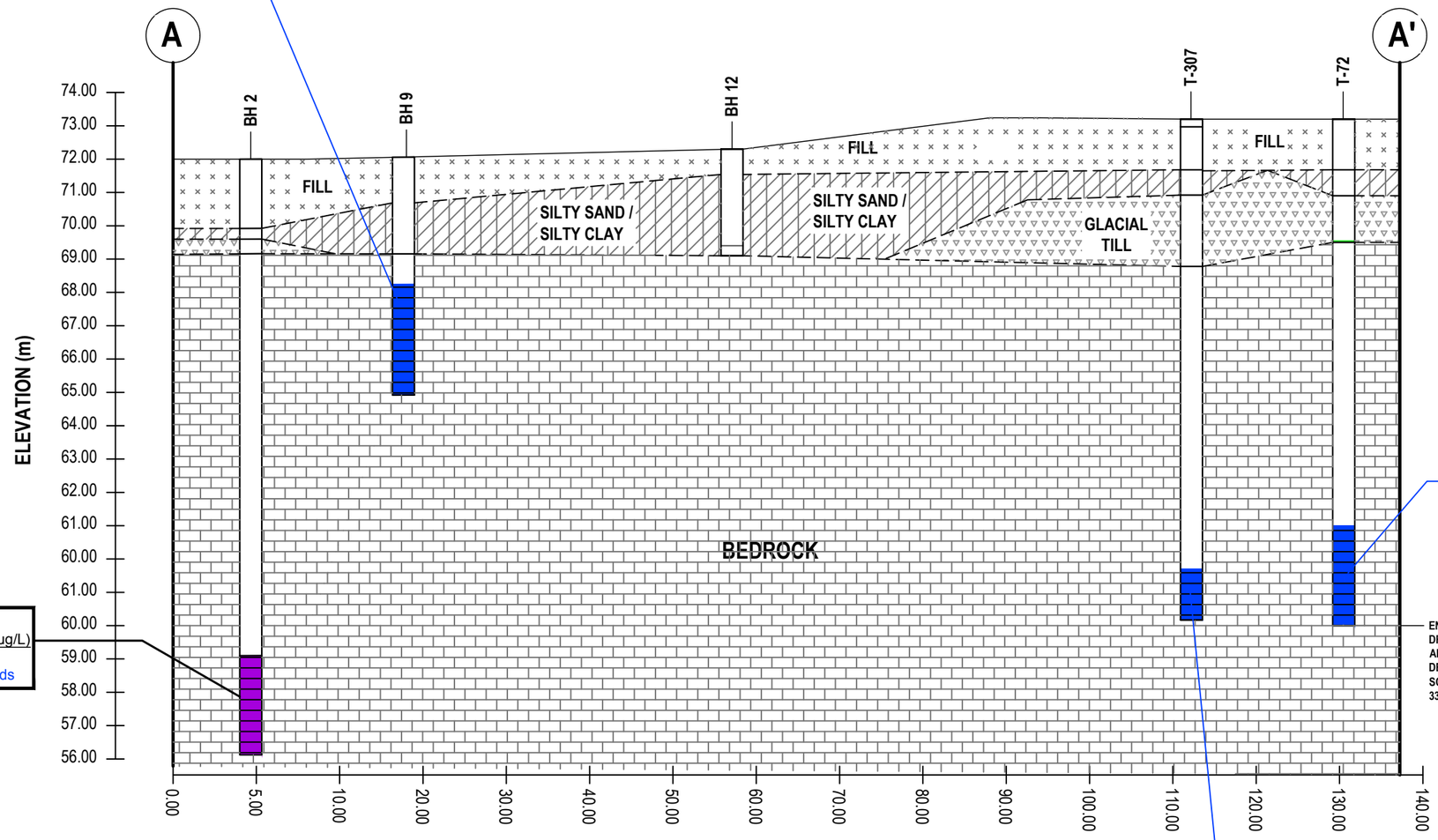
BH9-GW1 3.81-7.14m 27-APR-17
PAHs - complies with MECP Table 3 Standards
PHCs - complies with MECP Table 3 Standards



T-72B 12.2-15.2m 25-AUG-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72A 33.3-39.3m 25-AUG-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

END OF MONITORING WELL DRILL HOLE CONTINUED TO APPROXIMATE 52.40m DEPTH DEEP MONITORING WELL SCREEN INSTALLED FROM 33.30 - 39.30m

BH2-GW1 14.9-17.9m 9-APR-19

Parameter	Results(µg/L)	Standards(µg/L)
Chloroform	25.7	2.4

VOCs - comply with MECP Table 3 Standards

T-307A 13.5-15.0m 10-NOV-11
VOCs - comply with MECP Table 3 Standards

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

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MAIN AND MAIN DEVELOPMENTS
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-9
Approved by: MSD	Revision No.: 0

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

Consulting Engineers
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Sampling & Analysis Plan

Phase II Environmental Site Assessment
383 Slater Street, 388-400 Albert Street
and 156-160 Lyon Street
Ottawa, Ontario

Prepared For

Main & Main Developments

March 2019

Report: PE4581-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Mr. Rooie Ash of Main & Main Developments to conduct a Phase II Environmental Site Assessment (ESA) for the properties addressed 383 Slater, 388-400 Albert Street and 156-160 Lyon Street, in the City of Ottawa, Ontario

The Phase II ESA was carried out to address the APECs identified in the Paterson Phase I ESA. The following subsurface investigation program was developed to identify and delineate potential concerns. A geotechnical investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Confirm groundwater quality beneath the Phase II Property	Boreholes to be advanced to intercept water table to facilitate installation of groundwater monitoring wells.
BH2	Confirm groundwater quality beneath the Phase II Property	
BH3	Confirm groundwater quality beneath the Phase II Property	
TP1	Assess the quality of the fill material on the southwest portion of the subject site	Intercept the fill material on the southwest portion to obtain soil samples for analytical testing.
TP2	Assess the quality of the fill material on the southwest portion of the subject site	
TP3	Assess the quality of the fill material on the southwest portion of the subject site	
TP4	Assess the quality of the fill material on the southwest portion of the subject site	
TP5	Assess the quality of the fill material on the southwest portion of the subject site	
TP6	Assess the quality of the fill material on the southwest portion of the subject site	
TP7	Assess the quality of the fill material on the southwest portion of the subject site	
TP8	Assess the quality of the fill material on the southwest portion of the subject site	
TP9	Assess the quality of the fill material on the southwest portion of the subject site	

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained,

and samples will be selected for submission following a preliminary screening analysis.

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.
- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed a plan with the borehole locations must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Elevations were surveyed relative to a geodetic benchmark (manhole cover

located along east side of Bay Street, just north of Slater Street). The elevation of the benchmark was 72.77 metres above

Drilling Procedure

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

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

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.
- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).
- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.
- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples
- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** March 28, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.24
25mm Asphaltic concrete over		AU	1				
0.60 **FILL:** Brown clayey sand with sand and gravel		SS	2	79	12	1	72.24
0.86 Compact, brown **SILTY SAND**		SS	3	4	62	2	71.24
Very stiff, brown **SILTY CLAY,** some gravel		SS	4	88	10		
2.44 **GLACIAL TILL:** Brown clayey silt with sand and gravel		SS	5	62	10	3	70.24
		SS	6	47	50+	4	69.24
4.29		RC	1	100	0		
		RC	2	98	96	5	68.24
		RC	3	100	84	6	67.24
		RC	4	100	89	7	66.24
		RC	5	100	100	8	65.24
BEDROCK: Fair to excellent quality, grey limestone		RC	6	100	97	9	64.24
		RC	7	100	100	10	63.24
		RC	8	100	97	11	62.24
		RC	9	100	100	12	61.24
		RC	10	100	100	13	60.24
18.01						14	59.24
End of Borehole						15	58.24
(GWL @ 4.37m - April 9, 2019)						16	57.24
						17	56.24
						18	55.24

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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** March 29, 2019

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	71.99
Asphaltic concrete	0.06		AU	1				
FILL: Brown silty sand with gravel			SS	2	50	52	1	70.99
	2.08		SS	3	46	17	2	69.99
Compact, brown **SILTY SAND**	2.39		SS	4	33	2		
GLACIAL TILL: Brown clayey silt with sand and gravel	2.84		RC	1	100	87	3	68.99
			RC	2	100	93	4	67.99
			RC	3	100	95	5	66.99
			RC	4	100	95	6	65.99
BEDROCK: Good to excellent quality, grey limestone			RC	5	100	100	7	64.99
			RC	6	100	100	8	63.99
			RC	7	100	100	9	62.99
			RC	8	100	100	10	61.99
			RC	9	100	97	11	60.99
			RC	10	100	100	12	59.99
	17.88						13	58.99
End of Borehole							14	57.99
(GWL @ 2.20m - April 9, 2019)							15	56.99
							16	55.99
							17	54.99

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** April 1, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	72.28		
		AU	1						
FILL: Grey silty sand with gravel, some clay		SS	2	38	66	1	71.28		
		SS	3	46	21	2	70.28		
		SS	4	8	11				
3.28		SS	5	44	50+	3	69.28		
Concrete with rebar and ties 3.73									
		RC	1	17	0	4	68.28		
		RC	2	97	83	5	67.28		
		RC	3	100	61	6	66.28		
		RC	4	100	82				
						7	65.28		
		RC	5	100	93	8	64.28		
						9	63.28		
		RC	6	100	100	10	62.28		
		RC	7	100	100	11	61.28		
BEDROCK: Good to excellent quality, grey limestone						12	60.28		
		RC	8	100	100	13	59.28		
		RC	9	100	100	14	58.28		
						15	57.28		
		RC	10	100	95	16	56.28		
		RC	11	100	100	17	55.28		
						18	54.28		
		RC	12	100	10	19	53.28		
19.38									
End of Borehole									
(GWL @ 3.50m - April 9, 2019)									

Lower Explosive Limit % scale: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed Stone									
0.15									
FILL: Brown sitly sand		G	1						
0.35									
End of Test Pit									
TP terminated on concrete surface @ 0.35m depth									

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

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4581

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone		HAND	1						
0.20									
End of Test Pit TP terminated on concrete surface @ 0.2m depth									

Lower Explosive Limit %: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

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FILE NO. PE4581

REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.20									
FILL: Brown silty sand, some wood fragments and construction debris		G	1					●	
0.30									
End of Test Pit									
TP terminated on concrete surface @ 0.3m depth									

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

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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FILE NO. PE4581

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.15									
FILL: Brown silty sand, some gravel and construction debris		G	1						
0.30									
End of Test Pit									
TP terminated on concrete surface @ 0.3m depth									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

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DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone		G	1						
0.25									
End of Test Pit TP terminated on concrete surface @ 0.25m depth									

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.20									
FILL: Brown silty sand with gravel, some construction debris		G	1					●	
0.30									
End of Borehole									
TP terminated on concrete surface @ 0.3m depth									

Lower Explosive Limit %: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.20									
FILL: Brown silty sand, some gravel and construction debris		G	1					●	
0.30									
End of Test Pit									
TP terminated on concrete surface @ 0.3m depth									

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

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.10									
FILL: Brown silty sand, some gravel and construction debris		G	1					●	
0.20									
End of Test Pit									
TP terminated on concrete surface @ 0.2m depth									

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

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.10									
FILL: Brown silty sand, some gravel and construction debris		G	1					●	
0.20									
End of Test Pit									
TP terminated on concrete surface @ 0.2m depth									

Photo Ionization Detector: ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the 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 x D60)
Cu	-	Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

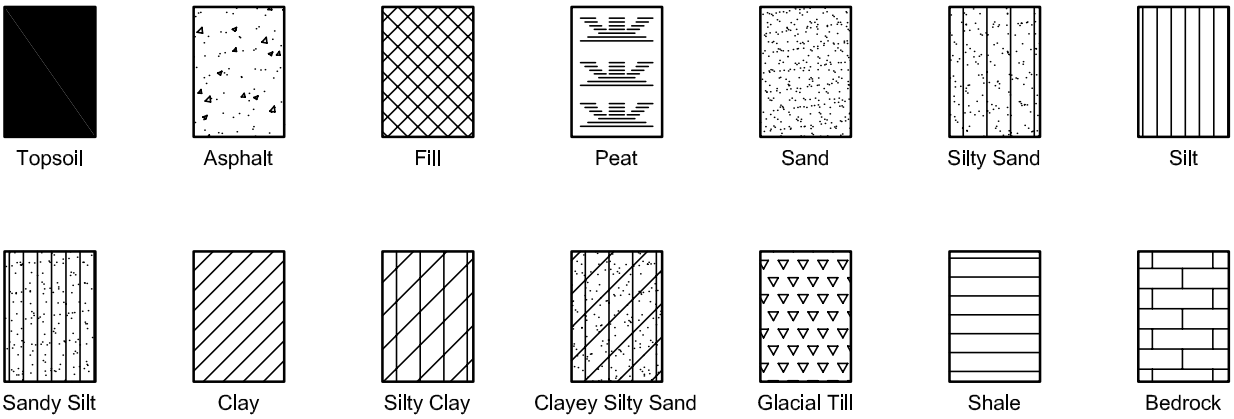
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

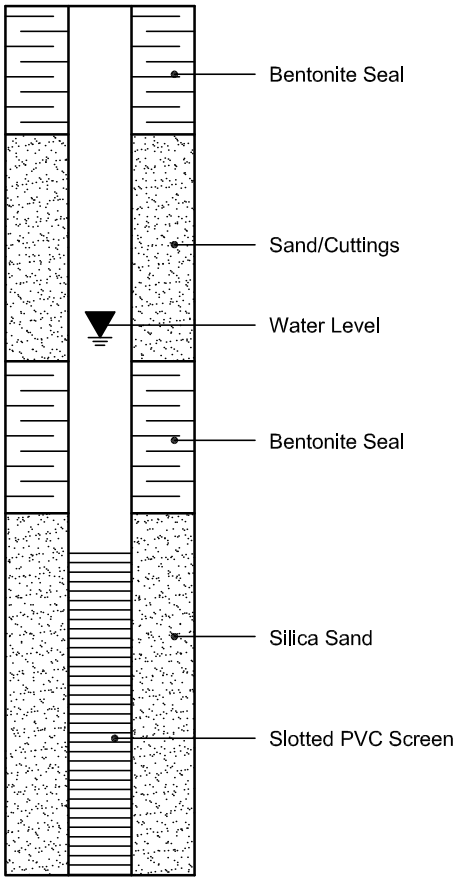
SYMBOLS AND TERMS (continued)

STRATA PLOT

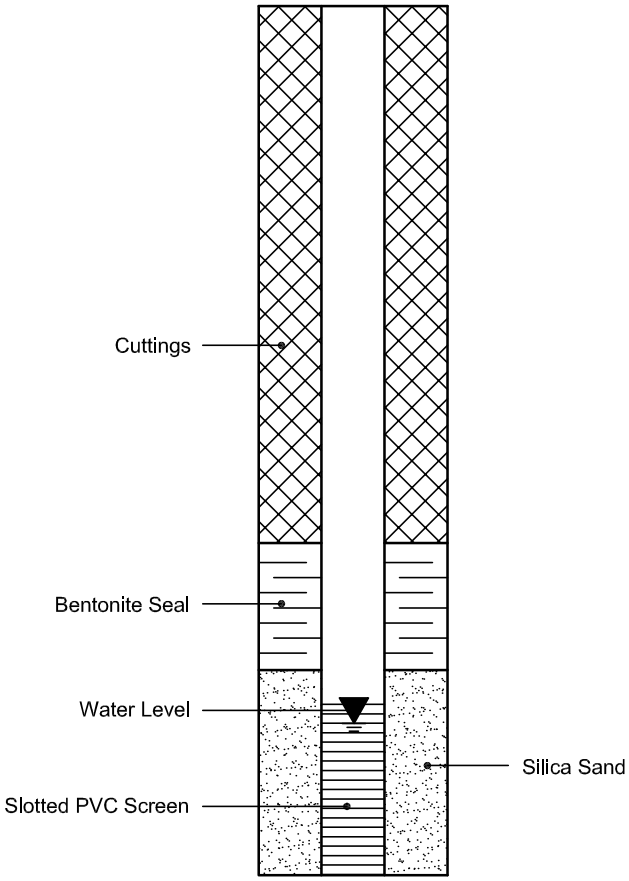


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mandy Witteman

Client PO:
Project: PE4581
Custody: 121626

Report Date: 3-Apr-2019
Order Date: 2-Apr-2019

Order #: 1914267

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

Paracel ID	Client ID
1914267-01	TP3-G1
1914267-02	TP5-G1
1914267-03	TP1-G1
1914267-04	TP2-G1
1914267-05	TP4-G1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

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

Report Date: 03-Apr-2019
Order Date: 2-Apr-2019
Project Description: PE4581

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	3-Apr-19	3-Apr-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	3-Apr-19	3-Apr-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	3-Apr-19	3-Apr-19
Solids, %	Gravimetric, calculation	3-Apr-19	3-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO:

Report Date: 03-Apr-2019

Order Date: 2-Apr-2019

Project Description: PE4581

	Client ID:	TP3-G1	TP5-G1	TP1-G1	TP2-G1
	Sample Date:	03/29/2019 09:00	03/29/2019 09:00	03/29/2019 09:00	03/29/2019 09:00
	Sample ID:	1914267-01	1914267-02	1914267-03	1914267-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	80.1	76.4	76.4	82.0
Metals					
Antimony	1.0 ug/g dry	1.1	1.2	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.8	4.2	1.8	3.3
Barium	1.0 ug/g dry	53.0	104	20.0	123
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	7.5	8.9	<5.0	26.1
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	11.5	16.3	8.8	10.3
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	4.4	5.7	3.5	4.1
Copper	5.0 ug/g dry	12.7	17.6	6.5	15.3
Lead	1.0 ug/g dry	10.3	29.8	3.9	16.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	3.0	4.2	<1.0	2.5
Nickel	5.0 ug/g dry	9.2	13.2	6.1	10.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	1.4	<1.0	<1.0
Vanadium	10.0 ug/g dry	17.4	21.9	18.7	13.6
Zinc	20.0 ug/g dry	25.3	48.7	<20.0	51.6

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO:

Report Date: 03-Apr-2019

Order Date: 2-Apr-2019

Project Description: PE4581

	Client ID:	TP4-G1	-	-	-
	Sample Date:	03/29/2019 09:00	-	-	-
	Sample ID:	1914267-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	79.6	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.9	-	-	-
Barium	1.0 ug/g dry	102	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	8.7	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	19.8	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	6.9	-	-	-
Copper	5.0 ug/g dry	17.0	-	-	-
Lead	1.0 ug/g dry	26.3	-	-	-
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1.0 ug/g dry	1.0	-	-	-
Nickel	5.0 ug/g dry	17.2	-	-	-
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	34.8	-	-	-
Zinc	20.0 ug/g dry	86.5	-	-	-

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

Report Date: 03-Apr-2019
Order Date: 2-Apr-2019
Project Description: PE4581

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1.0	ug/g dry	1.1			0.0	30	
Arsenic	3.6	1.0	ug/g dry	3.8			6.8	30	
Barium	60.6	1.0	ug/g dry	53.0			13.4	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	7.8	5.0	ug/g dry	7.5			4.2	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	10.5	5.0	ug/g dry	11.5			9.1	30	
Cobalt	4.3	1.0	ug/g dry	4.4			2.8	30	
Copper	12.9	5.0	ug/g dry	12.7			1.3	30	
Lead	9.8	1.0	ug/g dry	10.3			5.6	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	2.9	1.0	ug/g dry	3.0			4.9	30	
Nickel	8.8	5.0	ug/g dry	9.2			4.3	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	18.2	10.0	ug/g dry	17.4			4.4	30	
Zinc	35.7	20.0	ug/g dry	25.3			34.0	30	
Physical Characteristics									
% Solids	83.2	0.1	% by Wt.	83.1			0.2	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	42.0		ug/L	ND	83.2	70-130			
Arsenic	47.3		ug/L	1.5	91.6	70-130			
Barium	65.4		ug/L	21.2	88.3	70-130			
Beryllium	48.0		ug/L	ND	95.9	70-130			
Boron	43.8		ug/L	ND	81.7	70-130			
Cadmium	43.3		ug/L	ND	86.4	70-130			
Chromium	53.1		ug/L	ND	97.1	70-130			
Cobalt	48.9		ug/L	1.8	94.2	70-130			
Copper	51.7		ug/L	5.1	93.3	70-130			
Lead	52.9		ug/L	4.1	97.6	70-130			
Mercury	1.68	0.1	ug/g	ND	112	70-130			
Molybdenum	47.2		ug/L	1.2	92.0	70-130			
Nickel	50.1		ug/L	ND	92.7	70-130			
Selenium	45.2		ug/L	ND	90.2	70-130			
Silver	44.2		ug/L	ND	88.2	70-130			
Thallium	45.9		ug/L	ND	91.7	70-130			
Uranium	46.5		ug/L	ND	92.3	70-130			
Vanadium	56.1		ug/L	ND	98.2	70-130			
Zinc	53.5		ug/L	ND	86.7	70-130			

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.

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.

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Chain of Custody
(Lab Use Only)
№ 121626

Page ___ of ___

Client Name: Paterson Group.	Project Reference: PE4581
Contact Name: Mandy Witteman	Quote #
Address: 154 Colonnade Rd S	PO #
Telephone: (613) 226-7381	Email Address: mwitteman@patersongroup.ca

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

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

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

Required Analyses

Paracel Order Number: 19/4267

	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	TP3-G1	S		1	Mar 29/19					X	X	X	
2	TP5-G1	S		1	↓					X	X	X	
3	TP1-G1	S		1						X	X	X	
4	TP2-G1	S		1						X	X	X	
5	TP4-G1	S		1	↓					X	X	X	
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot: M Sloose	Received at Lab: [illegible]	Verified By: [illegible]
Relinquished By (Print): Nick Sullivan	Date/Time: 02/04/19 4:30 pm	Date/Time: 04/02/19 17:17	Date/Time:
Date/Time: April 2/2019	Temperature: °C	Temperature: 15.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mandy Witteman

Client PO: 26322
Project: PE4581
Custody: 121641

Report Date: 11-Apr-2019
Order Date: 9-Apr-2019

Order #: 1915241

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

Paracel ID	Client ID
1915241-01	BH1-GW1
1915241-02	BH2-GW1
1915241-03	BH3-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26322

Report Date: 11-Apr-2019
Order Date: 9-Apr-2019
Project Description: PE4581

Analysis Summary Table

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

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26322

Report Date: 11-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4581

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	04/09/2019 09:00	04/09/2019 09:00	04/09/2019 09:00	-
	Sample ID:	1915241-01	1915241-02	1915241-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	3.2	3.0	<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	27.1	25.7	<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	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26322

Report Date: 11-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4581

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	04/09/2019 09:00	04/09/2019 09:00	04/09/2019 09:00	-
	Sample ID:	1915241-01	1915241-02	1915241-03	-
	MDL/Units	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	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	102%	101%	102%	-
Dibromofluoromethane	Surrogate	107%	104%	110%	-
Toluene-d8	Surrogate	94.8%	92.6%	96.1%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*88.3*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*73.6*		*ug/L*		*92.1*	*50-140*			
Surrogate: Toluene-d8	*79.8*		*ug/L*		*99.8*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*81.8*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*84.8*		*ug/L*		*106*	*50-140*			
Surrogate: Toluene-d8	*76.3*		*ug/L*		*95.4*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26322

Report Date: 11-Apr-2019
Order Date: 9-Apr-2019
Project Description: PE4581

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	81.8	5.0	ug/L		81.8	50-140			
Benzene	33.5	0.5	ug/L		83.8	60-130			
Bromodichloromethane	31.5	0.5	ug/L		78.7	60-130			
Bromoform	30.8	0.5	ug/L		76.9	60-130			
Bromomethane	37.9	0.5	ug/L		94.8	50-140			
Carbon Tetrachloride	29.7	0.2	ug/L		74.2	60-130			
Chlorobenzene	38.7	0.5	ug/L		96.8	60-130			
Chloroform	37.2	0.5	ug/L		93.0	60-130			
Dibromochloromethane	32.6	0.5	ug/L		81.4	60-130			
Dichlorodifluoromethane	42.0	1.0	ug/L		105	50-140			
1,2-Dichlorobenzene	31.3	0.5	ug/L		78.2	60-130			
1,3-Dichlorobenzene	30.9	0.5	ug/L		77.2	60-130			
1,4-Dichlorobenzene	28.6	0.5	ug/L		71.5	60-130			
1,1-Dichloroethane	34.4	0.5	ug/L		86.0	60-130			
1,2-Dichloroethane	43.5	0.5	ug/L		109	60-130			
1,1-Dichloroethylene	34.3	0.5	ug/L		85.6	60-130			
cis-1,2-Dichloroethylene	33.3	0.5	ug/L		83.3	60-130			
trans-1,2-Dichloroethylene	34.8	0.5	ug/L		86.9	60-130			
1,2-Dichloropropane	31.8	0.5	ug/L		79.6	60-130			
cis-1,3-Dichloropropylene	35.7	0.5	ug/L		89.3	60-130			
trans-1,3-Dichloropropylene	34.3	0.5	ug/L		85.7	60-130			
Ethylbenzene	30.6	0.5	ug/L		76.5	60-130			
Ethylene dibromide (dibromoethane	35.6	0.2	ug/L		89.0	60-130			
Hexane	26.1	1.0	ug/L		65.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	75.2	5.0	ug/L		75.2	50-140			
Methyl Isobutyl Ketone	60.0	5.0	ug/L		60.0	50-140			
Methyl tert-butyl ether	67.5	2.0	ug/L		67.5	50-140			
Methylene Chloride	35.2	5.0	ug/L		88.1	60-130			
Styrene	32.4	0.5	ug/L		81.0	60-130			
1,1,1,2-Tetrachloroethane	32.9	0.5	ug/L		82.2	60-130			
1,1,2,2-Tetrachloroethane	45.5	0.5	ug/L		114	60-130			
Tetrachloroethylene	33.5	0.5	ug/L		83.8	60-130			
Toluene	38.9	0.5	ug/L		97.2	60-130			
1,1,1-Trichloroethane	29.6	0.5	ug/L		73.9	60-130			
1,1,2-Trichloroethane	32.3	0.5	ug/L		80.7	60-130			
Trichloroethylene	29.7	0.5	ug/L		74.3	60-130			
Trichlorofluoromethane	37.8	1.0	ug/L		94.4	60-130			
Vinyl chloride	39.5	0.5	ug/L		98.8	50-140			
m,p-Xylenes	66.7	0.5	ug/L		83.4	60-130			
o-Xylene	37.0	0.5	ug/L		92.4	60-130			
Surrogate: 4-Bromofluorobenzene	*75.6*		*ug/L*		*94.5*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

Paracel ID: 1915241

PARACEL LABORATORIES LTD.

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Chain of Custody
(Lab Use Only)
Nº 121641

Page ___ of ___

Client Name: Paterson Group
Contact Name: Mandy Witteman
Address: 154 Colonnade Rd. S.
Telephone: 613-226-7381

Project Reference: PE4581
Quote #
PO # 26322
Email Address: mwitteman@patersongroup.ca

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

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

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

Required Analyses

Paracel Order Number: 1915241

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-GW1	GW		2	Apr 9/19	AM		X					
2	BH2-GW1	↓		2	↓	↓		X					
3	BH3-GW1	↓		2	↓	↓		X					
4													
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:
Relinquished By (Print): Nick Sullivan	Date/Time: 09/04/19 3:30 PM	Date/Time: Apr 09, 2019 04:25
Date/Time: Apr 9, 2019	Temperature:	Temperature: 15.5°C
		Verified By:
		Date/Time: 04/09/19 16:25
		pH Verified [ ] By: