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Phase II - Environmental Site Assessment

Part of 265 Carling Avenue
Ottawa, Ontario

Prepared For

Taggart Group

June 13, 2018

Report: PE4252-2

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EXECUTIVE SUMMARY

Assessment

A Phase II-Environmental Site Assessment (ESA) was conducted on part of 265 Carling Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the Areas of Potential Environmental Concern identified during the Phase I ESA. The Phase II-ESA consisted of the drilling of four boreholes and installation of three groundwater monitoring wells to assess the soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations. Site soils consist of fill material consisting either of engineered fill or of sand, brick, gravel and cobbles. Based on the screening results, samples were selected for testing of metals parameters. Based on the analytical results, the fill material consisting of sand, brick, gravel, and cobbles identified in BH3-18 is impacted with metals. Two samples of engineered fill material were also analysed, based on the analysis, the engineered fill material is not considered to be impacted.

Groundwater samples were collected from the monitoring wells installed in BH1-18, BH2-18, BH3-18 and BH3, and analyzed for BTEX and PHCs. No detectable concentrations were identified in the groundwater. The groundwater is in compliance with the selected MOECC Standards.

Recommendations

Soil

At this time, the fill material consisting of sand, brick, gravel, and cobbles does not present a concern to the occupants of the subject site. This fill material should be disposed of at an appropriate waste facility during future development of the site. Prior to the disposal of this soil a TCLP analysis will be required.

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 MOECC under this regulation. It is recommended that the monitoring wells remain intact for future groundwater monitoring purposes and should be resampled prior to the start of the redevelopment of the property.

1.0 INTRODUCTION

At the request of Taggart Group (Taggart), Paterson Group (Paterson) conducted a Phase II-Environmental Site Assessment (ESA) of part of the property addressed as 265 Carling Avenue, Ottawa, Ontario. The purpose of this Phase II-ESA was to address concerns identified during the Phase I-ESA.

1.1 Site Description

Address:	Part of 265 Carling Avenue, Ottawa, Ontario
Legal Description:	Lots 11 and 12, Part Lots 6, 7, 9, 10, 13, 14, and 15, Plan 54, City of Ottawa.
Property Identification Numbers:	04104-0203
Location:	The subject site is located at the northeast corner of the intersection of Carling Avenue and Cambridge Street South. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 24' 03" N, 75° 42' 03" W
Configuration:	Irregular
Site Area:	1,800 m^2 (approximate)

1.2 Property Ownership

Paterson was engaged to conduct this Phase II ESA by Mr. Keith Taggart of Taggart Group (Taggart). Taggart's offices are located at 225 Metcalfe Street, Ottawa Ontario. Mr. Taggart can be reached at 613-234-7000.

1.3 Current and Proposed Future Uses

The property is currently used as a parking lot for an adjacent office tower. The site is being considered for redevelopment as a retirement residence.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 7 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under

Part XV.1 of the Environmental Protection Act", prepared by the Ontario Ministry of the Environment (MOECC), April 2011. The MOECC Table 7 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Surface soil and groundwater conditions
- Non-potable groundwater conditions
- Residential land use
- Shallow bedrock condition

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is part of the property municipally addressed as 265 Carling Avenue. The site is located to the northeast of the Carling Avenue and Cambridge Street South intersection. The property is currently used as a parking lot for the adjacent office tower. The site generally slopes towards the roadways and is similar to the regional topography (sloping southwest). Several catch basins were observed on the subject site.

No drinking water wells or private sewage systems were observed on the subject property, nor are any expected to be present, as the site is located in a fully municipally-serviced area. No water bodies or known areas of natural significance are present with the Phase I ESA Study Area.

2.2 Past Investigations

Based on a review of historical uses of the subject site and adjacent properties during the Phase I ESA, Paterson identified Areas of Potential Environmental Concern (APEC) for the subject property, as listed in Table 1.

Table 1
Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
Former retail fuel outlet and service station	15m East of the Phase I ESA property, at 748 Bronson Avenue	Item 52: Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems	Off-site	PHC F1-F4, BTEX	Groundwater
Former retail fuel outlet and service station	30m Southeast of the Phase I ESA property, at 770 Bronson Avenue	Item 52: Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems	Off-site	PHC F1-F4, BTEX	Groundwater
Former Ottawa Suburban Roads Commission Yard	15m West of the Phase I ESA property, at 279 Carling Avenue	Item 52: Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems	Off-site	PHC F1-F4, BTEX	Soil, Groundwater

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II ESA consisted of drilling four (4) boreholes at the subject site. Three of the boreholes were instrumented with a groundwater monitoring well. A fourth groundwater monitoring well, which was installed during a previous geotechnical investigation, was investigated as part of the groundwater sampling program. The boreholes were advanced to a maximum of 16.1m below the existing grade.

3.2 Media Investigated

During the subsurface investigation, soil and groundwater samples were recovered and submitted for laboratory analytical testing. There are no water bodies on the Phase II-ESA Property and as such, sediment sampling was not part of the Phase II-ESA. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern identified in the Phase I-ESA Conceptual Site Model, discussed in Subsection 3.3.

Soil

Soil samples were collected from four of the boreholes on subject property. Soil samples were collected from the boreholes by means of split spoon sampling or auger sampling. All boreholes extended from the existing ground surface to bedrock. No native soils were identified on the subject site, and all analytical testing of soil consisted of fill materials.

Groundwater

Groundwater monitoring wells were developed upon completion using a dedicated inertial lift pump. A minimum of three well volumes were removed from the monitoring wells during development. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each monitoring 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.

Sediment

There is no water body present on the Phase II-ESA property. As such, there is no sediment on, in or under the Phase II-ESA property. No sediment sampling was completed

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Phase I property is located in an area of limestone and shale of the Verulam formation. Overburden soils consist of glacial till, with a drift thickness on the order to 0 to 1m. Based on information from the previous geotechnical investigation, the overburden depth ranges from 1.1m to 1.9m below the existing ground surface.

Contaminants of Potential Concern

Contaminants of potential concern include metals in the fill material (soil) and PHCs and BTEX in the groundwater.

Existing Buildings and Structures

There are no buildings on the subject site, however the southeast portion of the subject site is occupied by an underground parking garage, shared by the adjacent building. Several short brick walls are present on the subject site, along the property lines. No other buildings or structures are present on the subject site.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area.

Areas of Natural Significance

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

Drinking Water Wells

No drinking water wells are located at the subject site or within the Phase I study area.

Neighbouring Land Use

Currently, neighbouring land use in the Phase I study area is commercial and residential.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Three of the potentially contaminating activities identified within the Phase I ESA Study Area are considered to represent an area of potential concern on the subject site. The former retail fuel outlets and automotive service stations at 748 and 770 Bronson Avenue, and the former Ottawa Suburban Roads Commission Yard at 279 Carling Avneue. Other potentially contaminating activities in the area are not considered to have created areas of potential environmental concern on the subject site, based on their separation distances, downgradient location with respect to groundwater flow direction, and/or available documentation regarding those concerns.

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. The presence of potentially contaminating activities was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Two deviations from the sampling and analysis plan were noted and are as follows:

- Duplicate soil and groundwater samples were not submitted for analytical testing.
- Trip Blank samples were not collected.

Based on the analytical test results the absence of duplicate and trip blank samples are not considered to significantly impact the results and conclusions of the Phase II ESA.

3.5 Impediments

No physical impediments or denial of access were encountered during the Phase II ESA.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on April 17, 2018 and consisted four boreholes (BH1 to BH4). The boreholes were placed to address the APECs identified in the Phase I ESA. The boreholes were advanced using a truck-mounted CME 55 power auger drill rig or a portable drilling crew. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario (for the truck mount work) and CCC Geotechnical and Environmental Drilling (for the portable drilling work). Drilling occurred under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4252-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 6 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. Upon bedrock refusal rock coring was undertaken. The depths at which split spoon, and grab samples were obtained from the boreholes are shown as "**SS**", "**AU**", and "**RC**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist of a pavement structure (including asphaltic concrete and crushed stone/engineered fill) followed by a silty sand fill. Shallow bedrock was encountered in all boreholes between 0.59m and 0.94m ground surface.

4.3 Field Screening Measurements

All soil samples collected were submitted to a preliminary screening procedure, which included visual screening for colour, evidence of metals and other deleterious fill materials.

4.4 Groundwater Monitoring Well Installation

Four (4) groundwater monitoring wells were installed by George Downing Estate Drilling of Hawkesbury, Ontario or CCC Geotechnical and Environmental Drilling of Ottawa, Ontario, under the full-time supervision of Paterson personnel. Monitoring wells in BH1-18 – BH3-18 consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. George Downing Estate Drilling completed the

installation of the monitoring well in BH3 during the 2012 geotechnical investigation. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to the ground surface to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details is provided below in Table 2.

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
BH1-18	76.94	7.14	4.14-7.14	3.75-7.14	0.61 – 7.14	Flushmount
BH2-18	73.56	4.57	1.57-4.57	1.22-4.57	0.61 – 4.57	Flushmount
BH3-18	77.23	7.03	4.03-7.03	3.66-7.03	0.61 – 7.03	Flushmount
BH3	76.48	15.39	12.39-15.39	11.60-15.39	0.61 -11.60	Flushmount

4.5 Field Measurement of Water Quality Parameters

Field water quality parameters were considered consistent throughout the sampling program and in each monitoring well. The results of the field measurement of water quality parameters are considered to represent the groundwater at each sampling location.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MOECC 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 groundwater and soil samples were submitted for analysis:

Table 3:
Soil Samples Submitted

Sample ID	Sample Depth/Stratigraphic Unit	Parameters Analyzed	Rationale
		Metals	
June 20, 2017			
BH1-18-AU1	0.05 – 0.61m bgs; engineered fill	X	Assess quality of fill/soil above bedrock surface
BH3-18-SS3	0.51 – 0.94m bgs, fill	X	Assess quality of fill/soil above bedrock surface
BH4-18-G1	0.15 – 0.61m bgs; engineered fill	X	Assess quality of fill/soil above bedrock surface

Table 4:
Groundwater Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed		Rationale
		PHC (F_1-F_4)	BTEX	
June 28, 2017				
BH1-18-GW1	4.14-7.14m – Limestone bedrock	X	X	Assess the groundwater quality on the subject site.
BH2-18-GW1	1.57-4.57m – Limestone bedrock	X	X	
BH3-18-GW1	4.03-7.03m – Limestone bedrock	X	X	
BH3-GW1	12.39-15.39m – Limestone bedrock	X	X	Vertical delineation of the groundwater quality.

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

Monitoring well/borehole locations were surveyed using a laser level. Elevations were surveyed relative to a geodetic benchmark (manhole in Cambridge Street South, near Carling Avenue). The elevation of the benchmark was provided by Annis, O'Sullivan, and VollebeKk to be 76.23m. The location of the site benchmark is shown on Drawing PE4252-3 – 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, chain of custody, equipment cleaning procedures, and field quality control measurements are provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils consist of a layer of fill material, which is underlain by limestone bedrock. The bedrock was cored in three of the borehole locations to facilitate the installation of groundwater monitoring wells. The fill material consisted primarily of engineered fill mixed with sand. A small layer of sand, brick, gravel and cobbles was noted in BH3-18. Groundwater was encountered in the limestone bedrock at depths ranging from 0.35 to 2.83 m below existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter. Groundwater levels are summarized below in Table 5. All elevations are relative to the geodetic benchmark. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

Table 5:
Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m)	Date of Measurement
BH1-18	76.94	2.83	74.11	April 25, 2018
BH2-18	73.56	0.35	73.21	April 25, 2018
BH3-18	77.23	2.35	74.88	April 25, 2018
BH3	76.48	4.70	71.78	April 27, 2018

Based on the groundwater elevations from the April 25, 2018 monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4252-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in an easterly direction. A horizontal hydraulic gradient of approximately 0.044 m/m was calculated. It is expected that the underground parking garage will affect the groundwater flow direction. The groundwater level measured in BH3 on April 27, 2018 was excluded due to the difference in screen intervals.

5.3 Fine-Medium Soil Texture

Coarse-grained soil standards have been used for the subject site. Grain size analysis was not completed.

5.4 Soil: Field Screening

Visual screening was completed for the limited soil samples collected from the subject site.

5.5 Soil Quality

Three soil samples were submitted to Paracel Laboratories for analysis of a combination of metal parameters. A copy of the analytical test results are attached to this report. The results of the soil analysis are presented 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) April 17, 2018			MOECC Table 7 Residential Coarse (µg/g)
		BH1-18-AU1	BH3-18-SS3	BH4-18-G1	
Antimony	1.0	nd	1	nd	7.5
Arsenic	1.0	2	nd	2	18
Barium	1.0	272	**690**	174	390
Beryllium	1.0	nd	nd	nd	4
Boron	1.0	15.1	5.7	12	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	1.0	14	19	9	160
Chromium (VI)	0.2	nd	nd	nd	9
Cobalt	1.0	6	5	6	22
Copper	1.0	13	15	9	140
Lead	1.0	21	**152**	17	120
Mercury	0.1	nd	**0.4**	nd	0.27
Molybdenum	1.0	nd	nd	1	6.9
Nickel	1.0	13	11	14	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.5	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	1.0	18	22	11	86
Zinc	1.0	nd	322	nd	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MOECC Standard

Barium, Lead and mercury exceed the MOECC Table 7 Residential Standards in sample BH3-18-SS1. All other samples are in compliance with the MOECC Standard.

Table 7:
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole/ Test Pit	Depth Interval (m BGS)
Arsenic	1	BH3-18-SS3	0.51 – 0.94m
Barium	**690**	BH1-18-AU1	0.05 – 0.61m
Boron	15.1	BH1-18-AU1	0.05 – 0.61m
Chromium	19	BH3-18-SS3	0.51 – 0.94m
Cobalt	6	BH1-18-AU1	0.05 – 0.61m
Cobalt	6	BH4-18-G1	0.15 – 0.61m
Copper	15	BH3-18-SS3	0.51 – 0.94m
Lead	**152**	BH3-18-SS3	0.51 – 0.94m
Mercury	**0.4**	BH3-18-SS3	0.51 – 0.94m
Molybdenum	1	BH4-18-G1	0.15 – 0.61m
Nickel	14	BH4-18-G1	0.15 – 0.61m
Vanadium	22	BH3-18-SS3	0.51 – 0.94m
Zinc	322	BH3-18-SS3	0.51 – 0.94m

Notes:
- **Bold** – Value exceeds MOECC Table 7 Standard

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells installed in BH1-18, BH2-18, BH3-18, and BH3 were submitted for laboratory analysis of BTEX and PHC (F_1-F_4) parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented below in Table 8. The laboratory certificates of analysis are provided in Appendix 1.

Table 8:
Analytical Test Results – Groundwater
BTEX and PHC (F_1 – F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MOECC Table 7 Standards Non-Potable Coarse (µg/L)
		BH1-18 GW1	BH2-18 GW1	BH3-18 GW1	BH3-GW	
		April 25, 2018			April 27, 2018	
Benzene	0.5	nd	nd	nd	nd	0.5
Ethylbenzne	0.5	nd	nd	nd	nd	54
Toluene	0.5	nd	nd	nd	nd	320
Xylene	0.5	nd	nd	nd	nd	72
PHC F_1	25	nd	nd	88	nd	750
PHC F_2	100	nd	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	nd	500

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

There were no detected concentrations of BTEX and PHCs (F_1-F_4) above the method detection limits in the groundwater samples. All of the groundwater results were in compliance with the select MOECC Table 7 Standards.

5.7 Quality Assurance and Quality Control Results

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

As per Subsection 47(3) of O.Reg. 153/04 as amended by O.Reg. 269/11, a Certificate of Analysis has been received for each sample submitted for analysis, and all Certificates of Analysis are appended to this report.

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 O.Reg. 269/11 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities

Three PCA's representing APECs on the subject site were identified during the historical research.

- Former retail fuel outlet at 748 Bronson Avenue.
- Former Mechanic and Retail Fuel Outlet at 770 Bronson Avenue
- Former Ottawa Suburban Roads Commission Yard at 279 Carling Avenue

One PCA representing an APEC on the subject site was identified during the field program.

- Fill material of unknown quality in BH3-18

Other PCAs within the Phase I study area are not considered to pose an environmental concern to the subject site due to their separation distance and/or location downgradient or cross-gradient of the subject site.

Contaminants of Potential Concern

The Phase I ESA identified Metals as contaminants of concern in the soil and BTEX and PHCs as contaminants of concern in the groundwater.

Subsurface Structures and Utilities

The subject site is located in a municipally serviced area. Several underground services, including municipal water and sewer, natural gas, and hydro, were located as part of the field program for the Phase II ESA.

Physical Setting

Site Stratigraphy

Site stratigraphy is provided in the Soil Profile and Test Data Sheets provided in Appendix 1 and illustrated on Drawings PE4252-7 - Cross-Section A-A' and PE4252-8 – Cross-Section B-B'. Stratigraphy consists of:

- Asphaltic concrete varying in thickness between 0.02m and 0.08m.
- Crushed stone beneath the asphalt surfaces.
- Fill material consisting of sand, brick, gravel and cobbles identified in BH3-18.
- Limestone bedrock with occasional shale seams.

The limestone bedrock is the deepest unit investigated as part of this Phase II ESA.

Hydrogeological Characteristics

The water table at the subject site was encountered in the limestone bedrock at the subject site. Groundwater levels were measured at the subject site on April 25, 2018 and April 27, 2018. Groundwater was encountered at depths between 0.35 m and 4.70 m below existing grade. It is noted that water levels fluctuate with seasonal variations.

Based on the groundwater elevations from the April 25, 2018 monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4252-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a eastern direction. A horizontal hydraulic gradient of approximately 0.044 m/m was calculated.

Approximate Depth to Bedrock

Bedrock was encountered in the boreholes at depths varying from 0.66m to 1.7m below the existing ground surface.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 0.35m and 4.70m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the subject site.

Section 43.1 of the Regulation applies to the property since the property is considered to be a shallow soil property. The property does not include all or part of a water body and is not within 30m of a water body.

Fill Placement

Fill placement has occurred at the subject site. The majority of the fill material consists of crushed stone extending to the bedrock surface in the paved areas. Fill material in BH3-18 was identified to be crushed stone underlain by a mixture

of sand, brick, gravel and cobbles. The fill material extends to the bedrock surface in all boreholes.

Proposed Buildings and Other Structures

It is our understanding that the site is under consideration for redevelopment with a retirement residence.

Existing Buildings and Structures

An underground parking structure for the adjacent property is located on the southeastern portion of the subject site. No concerns were identified within the parking structure.

Water Bodies

There are no water bodies on the subject site or within the Phase I ESA Study Area.

Areas of Natural Significance

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

Environmental Condition

Areas Where Contaminants are Present

Based on analytical results, impacted fill material is present in BH3018 above the bedrock throughout the subject site. The soils are impacted with metals. The remaining fill material (predominantly crushed stone) is not impacted.

Based on analytical results, the groundwater is in compliance with the selected MOECC Standards.

Sample locations are illustrated with analytical results in the Analytical Testing Plans (Drawings PE4252-5 and PE4252-6) appended to this report.

Types of Contaminants

The fill material in the northwest corner of the subject site is impacted with metals, specifically Barium, Lead, and Mercury.

Contaminated Media

Based on the analytical testing results from the Phase II-ESA, the fill material (excluding the engineered fill) in the northwest corner of the Phase II ESA property exceeds the MOECC Table 7 Standards.

What Is Known About Areas where Contaminants are Present

The Phase II ESA property was originally developed with residential buildings prior to 1912. The site southeast corner was redeveloped in conjunction with the adjacent property in the 1980s when the parking lot was constructed.

Distribution and Migration of Contaminants

The fill material in the northwest corner the subject site is considered to be impacted. The impacted fill is not considered to have the potential to migrate unless disturbed by anthropogenic causes since the fill material is sealed beneath the asphalt surface of the parking areas.

The distribution of the soil impacts are identified on Drawing PE4252-5.

Discharge of Contaminants

The discharge of contaminants at the Phase II-ESA Property is considered to have been associated with the demolition of the residential buildings during the redevelopment phase of the property in the 1980s. No ongoing discharge of contaminants is expected on the Phase II-ESA Property.

Migration of Contaminants

Contaminant migration due to anthropogenic causes is expected to be limited on the Phase II-ESA Property. The majority of the property is currently covered in asphaltic concrete.

Climatic and Meteorological Conditions

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

Potential for Vapour Intrusion

The only structure on the subject site is an underground parking structure located at the southeastern corner of the property. Based on the use of the underground structure (parking), the lack of volatility of the contaminants, and the lack of regular occupancy of the parking structure there is no potential for vapour intrusion.

6.0 CONCLUSIONS

Assessment

A Phase II-Environmental Site Assessment (ESA) was conducted on part of 265 Carling Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the Areas of Potential Environmental Concern identified during the Phase I ESA. The Phase II-ESA consisted of the drilling of four boreholes and installation of three groundwater monitoring wells to assess the soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations. Site soils consist of fill material consisting either of engineered fill or of sand, brick, gravel and cobbles. Based on the screening results, samples were selected for testing of metals parameters. Based on the analytical results, the fill material consisting of sand, brick, gravel, and cobbles identified in BH3-18 is impacted with metals. Two samples of engineered fill material were also analysed, based on the analysis, the engineered fill material is not considered to be impacted.

Groundwater samples were collected from the monitoring wells installed in BH1-18, BH2-18, BH3-18 and BH3, and analyzed for BTEX and PHCs. No detectable concentrations were identified in the groundwater. The groundwater is in compliance with the selected MOECC Standards.

Recommendations

Soil

At this time, the fill material consisting of sand, brick, gravel, and cobbles does not present a concern to the occupants of the subject site. This fill material should be disposed of at an appropriate waste facility during future development of the site. Prior to the disposal of this soil a TCLP analysis will be required.

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 MOECC under this regulation. It is recommended that the monitoring wells remain intact for future groundwater monitoring purposes and should be resampled prior to the start of the redevelopment of the property.

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 by O.Reg. 269/11, 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 the Taggart Group. Permission and notification from the Taggart Group and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Michael Beaudoin, P.Eng.

Mark D'Arcy, P.Eng.

Report Distribution:

- ❑ Taggart Group
- ❑ Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4252-3 – TEST HOLE LOCATION PLAN

DRAWING PE4252-4 - GROUNDWATER CONTOUR PLAN

DRAWING PE4252-5 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4252 – 6 – ANALYTICAL TESTING PLAN - GROUNDWATER

DRAWING PE4252-7 – CROSS-SECTION A-A`

DRAWING PE4252-8 – CROSS-SECTION B-B'

FIGURE 1

KEY PLAN

#300 POWELL AVENUE
RESIDENTIAL APARTMENTS

#341-351 CLEMOW AVENUE
RESIDENTIAL

#696 BRONSON AVENUE
COMMERCIAL
(LAUNDROMAT COIN WASH, RESTAURANT)

#528 CAMBRIDGE STREET SOUTH
RESIDENTIAL

CLEMOW AVENUE

CLEMOW AVENUE

CAMBRIDGE STREET SOUTH

BRONSON AVENUE

#540 CAMBRIDGE STREET SOUTH
RESIDENTIAL APARTMENTS

MH-S (TBM)
T/G=76.63m

BH 3-18
77.23
[76.29]
(74.88)

BH 2
77.09

BH 3
76.48
[75.31]

BH 4-18
76.87

BH 1
76.74
[74.84]

BH 1-18
76.94
[76.28]
(74.11)

BH 2-18
73.56
[72.97]
(73.21)

PART OF #265
CARLING AVENUE
ASPHALTIC CONCRETE
PARKING LOT

APPROX. EXTENT
OF UNDERGROUND
PARKING

#265 CARLING AVENUE
EXISTING 8-STOREY
COMMERCIAL OFFICE
BUILDING

No. 350
2 1/2 Storey
Brick Building

No. 342 2 Storey Brick Building No. 340

No. 746
2 Storey
Dwelling

Parking at Grade Under 2nd Floor

Approximate Location of Underground Parking

Frame Garage

North Face CRW

Flower Bed

Landscaped Area

Landscaped Sign

Concrete Sidewalk

Concrete Curb

CRW

Guard Rail

Wooden Deck

Concrete Wall

Well

BUS SHELTER

VENT

UPLS

LS

PT

A

A'

B

B'

CARLING AVENUE

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- GEOTECHNICAL BOREHOLE LOCATION, PATERSON GROUP REPORT PG2682, 2012
- GEOTECHNICAL BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP PG2682, 2012
- 76.94 GROUND SURFACE ELEVATION (m)
- [76.28] BEDROCK SURFACE ELEVATION (m)
- (76.00) GROUNDWATER SURFACE ELEVATION (m)
- A—A' CROSS-SECTION LOCATION

BM - TOP OF GRATE OF SANITARY MANHOLE COVER. GEODETIC ELEVATION = 76.63m.

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consulting engineers

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Ottawa, Ontario K2E 7J5
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NO.	REVISIONS	DATE	INITIAL
0			

TAGGART GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 265 CARLING AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 04/2018
Drawn by: MPG	Report No.: PE4252-2
Checked by: MB	Dwg. No.: PE4252-3
Approved by: MSD	Revision No.: 0

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#300 POWELL AVENUE
RESIDENTIAL APARTMENTS

#341-351 CLEMOW AVENUE
RESIDENTIAL

#696 BRONSON AVENUE
COMMERCIAL
(LAUNDROMAT COIN WASH, RESTAURANT)

#528 CAMBRIDGE STREET SOUTH
RESIDENTIAL

#540 CAMBRIDGE STREET SOUTH
RESIDENTIAL APARTMENTS

CLEMOW AVENUE

CAMBRIDGE STREET SOUTH

BRONSON AVENUE

CARLING AVENUE

BH 3-18
77.23
[76.29]
(74.88)

BH 2
77.09

BH 3
76.48
[75.31]

BH 4-18
76.87

BH 1
76.74
[74.84]

BH 1-18
76.94
[76.28]
(74.11)

BH 2-18
73.56
[72.97]
(73.21)

PART OF #265
CARLING AVENUE
ASPHALTIC CONCRETE
PARKING LOT

74.6
74.4
74.2
74.0
73.8
73.6
(0.044m/m)

APPROX. EXTENT OF UNDERGROUND PARKING

Parking at Grade Under 2nd Floor

#265 CARLING AVENUE
EXISTING 8-STOREY
COMMERCIAL OFFICE
BUILDING

Approximate Location of Underground Parking

No. 350
2 1/2 Storey
Brick Building

No. 342 2 Storey Brick Building No. 340

No. 746
2 Storey
Dwelling

Frame Garage

Wooden Deck

Guard Rail

North Face CRW

Concrete Walk

Flower Bed

Area

Landscaped SIGN

BUS SHELTER

VENT

UPLS

LS

PT

BRW

CRW

Concrete Curb

Concrete Sidewalk

MH-S (TBM)
T/G=76.63m

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- GEOTECHNICAL BOREHOLE LOCATION, PATERSON GROUP REPORT PG2682, 2012
- GEOTECHNICAL BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP PG2682, 2012
- 76.94 GROUND SURFACE ELEVATION (m)
- [76.28] BEDROCK SURFACE ELEVATION (m)
- (76.0) GROUNDWATER SURFACE ELEVATION (m)
- 73.8 GROUNDWATER CONTOUR
- (0.044m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

BM - TOP OF GRATE OF SANITARY MANHOLE COVER. GEODETIC ELEVATION = 76.63m.

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consulting engineers

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Ottawa, Ontario K2E 7J5
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NO.	REVISIONS	DATE	INITIAL
0			

TAGGART GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 265 CARLING AVENUE

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:500	Date: 04/2018
Drawn by: MPG	Report No.: PE4252-2
Checked by: MB	Dwg. No.: PE4252-4
Approved by: MSD	Revision No.: 0

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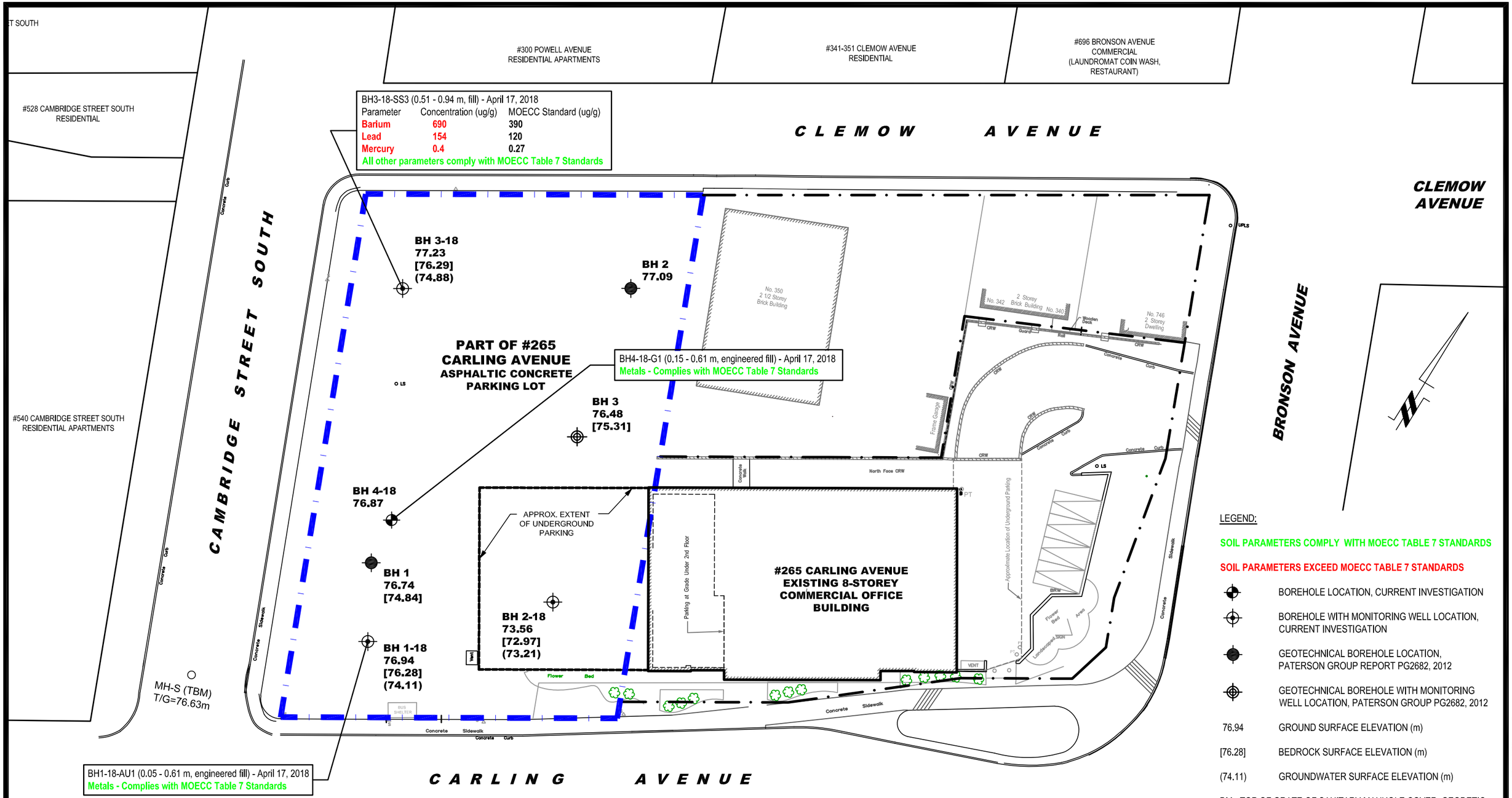

LEGEND:

SOIL PARAMETERS COMPLY WITH MOECC TABLE 7 STANDARDS

SOIL PARAMETERS EXCEED MOECC TABLE 7 STANDARDS

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- GEOTECHNICAL BOREHOLE LOCATION, PATERSON GROUP REPORT PG2682, 2012
- GEOTECHNICAL BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP PG2682, 2012
- 76.94 GROUND SURFACE ELEVATION (m)
- [76.28] BEDROCK SURFACE ELEVATION (m)
- (74.11) GROUNDWATER SURFACE ELEVATION (m)

BM - TOP OF GRATE OF SANITARY MANHOLE COVER, GEODETIC ELEVATION = 76.63m.

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NO.	REVISIONS	DATE	INITIAL
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TAGGART GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 265 CARLING AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:500	Date: 04/2018
Drawn by: MPG	Report No.: PE4252-2
Checked by: MB	Dwg. No.: PE4252-5
Approved by: MSD	Revision No.: 0

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#522 CAMBRIDGE STREET SOUTH
RESIDENTIAL

#528 CAMBRIDGE STREET SOUTH
RESIDENTIAL

#540 CAMBRIDGE STREET SOUTH
RESIDENTIAL APARTMENTS

#300 POWELL AVENUE
RESIDENTIAL APARTMENTS

#341-351 CLEMOW AVENUE
RESIDENTIAL

#696 BRONSON AVENUE
COMMERCIAL
(LAUNDROMAT COIN WASH,
RESTAURANT)

CLEMOW AVENUE

CAMBRIDGE STREET SOUTH

BRONSON AVENUE

CARLING AVENUE

BH3-18-GW1 (4.03 - 7.03 m, limestone bedrock) - April 25, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards
BTEX - Complies with MOECC Table 7 Standards

BH2-18-GW1 (1.57 - 4.57 m, limestone bedrock) - April 25, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards
BTEX - Complies with MOECC Table 7 Standards

BH3-GW (12.39 - 15.39 m, limestone bedrock) - April 27, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards
BTEX - Complies with MOECC Table 7 Standards

BH1-18-GW1 (4.14 - 7.14 m, limestone bedrock) - April 25, 2018
PHC F1-F4 - Complies with MOECC Table 7 Standards
BTEX - Complies with MOECC Table 7 Standards

BH 3-18
77.23
[76.29]
(74.88)

BH 2
77.09

BH 3
76.48
[75.31]

BH 4-18
76.87

BH 1
76.74
[74.84]

BH 1-18
76.94
[76.28]
(74.11)

BH 2-18
73.56
[72.97]
(73.21)

PART OF #265
CARLING AVENUE
ASPHALTIC CONCRETE
PARKING LOT

#265 CARLING AVENUE
EXISTING 8-STOREY
COMMERCIAL OFFICE
BUILDING

APPROX. EXTENT
OF UNDERGROUND
PARKING

Parking at Grade Under 2nd Floor

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Brick Building

No. 342
2 Storey
Brick Building

No. 340

No. 746
2 Storey
Dwelling

Wooden Deck

Frame Garage

Flower Bed

Landscaped Area

Concrete Curb

Concrete Sidewalk

Concrete Curb

Concrete Sidewalk

BUS SHELTER

MH-S (TBM)
T/G=76.63m

LEGEND:

GROUNDWATER PARAMETERS COMPLY WITH MOECC TABLE 7 STANDARDS

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- GEOTECHNICAL BOREHOLE LOCATION, PATERSON GROUP REPORT PG2682, 2012
- GEOTECHNICAL BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP PG2682, 2012

76.94 GROUND SURFACE ELEVATION (m)

[76.28] BEDROCK SURFACE ELEVATION (m)

(74.11) GROUNDWATER SURFACE ELEVATION (m)

BM - TOP OF GRATE OF SANITARY MANHOLE COVER. GEODETIC ELEVATION = 76.63m.

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TAGGART GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 265 CARLING AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:500	Date: 04/2018
Drawn by: MPG	Report No.: PE4252-2
Checked by: MB	Dwg. No.: PE4252-6
Approved by: MSD	Revision No.: 0

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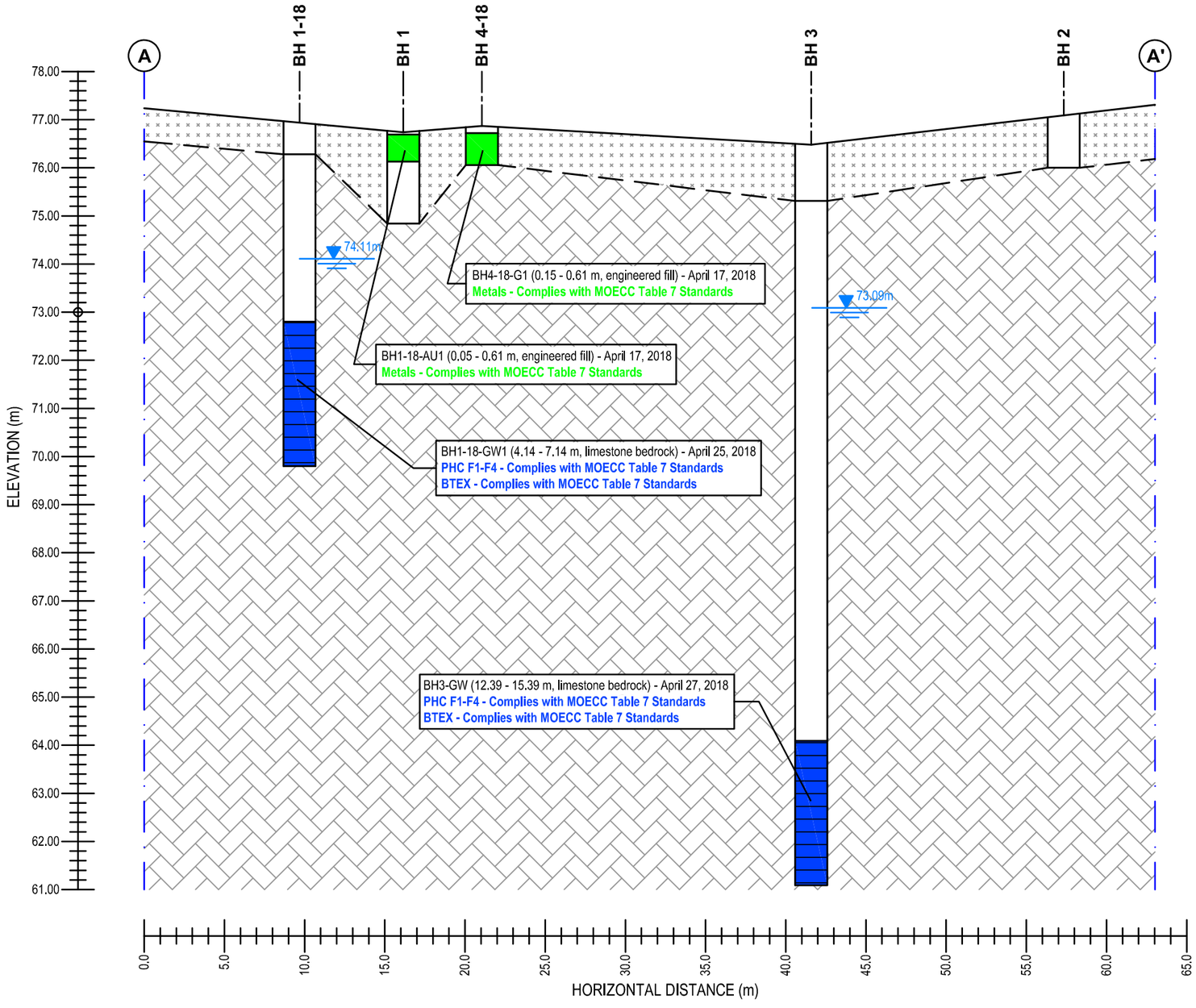

SOIL PARAMETERS COMPLY WITH MOECC TABLE 3 STANDARDS

GROUNDWATER PARAMETERS COMPLY WITH MOECC TABLE 3 STANDARDS

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TAGGART GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 265 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A'

Scale: AS SHOWN	Date: 05/2018
Drawn by: MPG	Report No.: PE4252-2
Checked by: MB	Dwg. No.: PE4252-7
Approved by: MSD	Revision No.: 0

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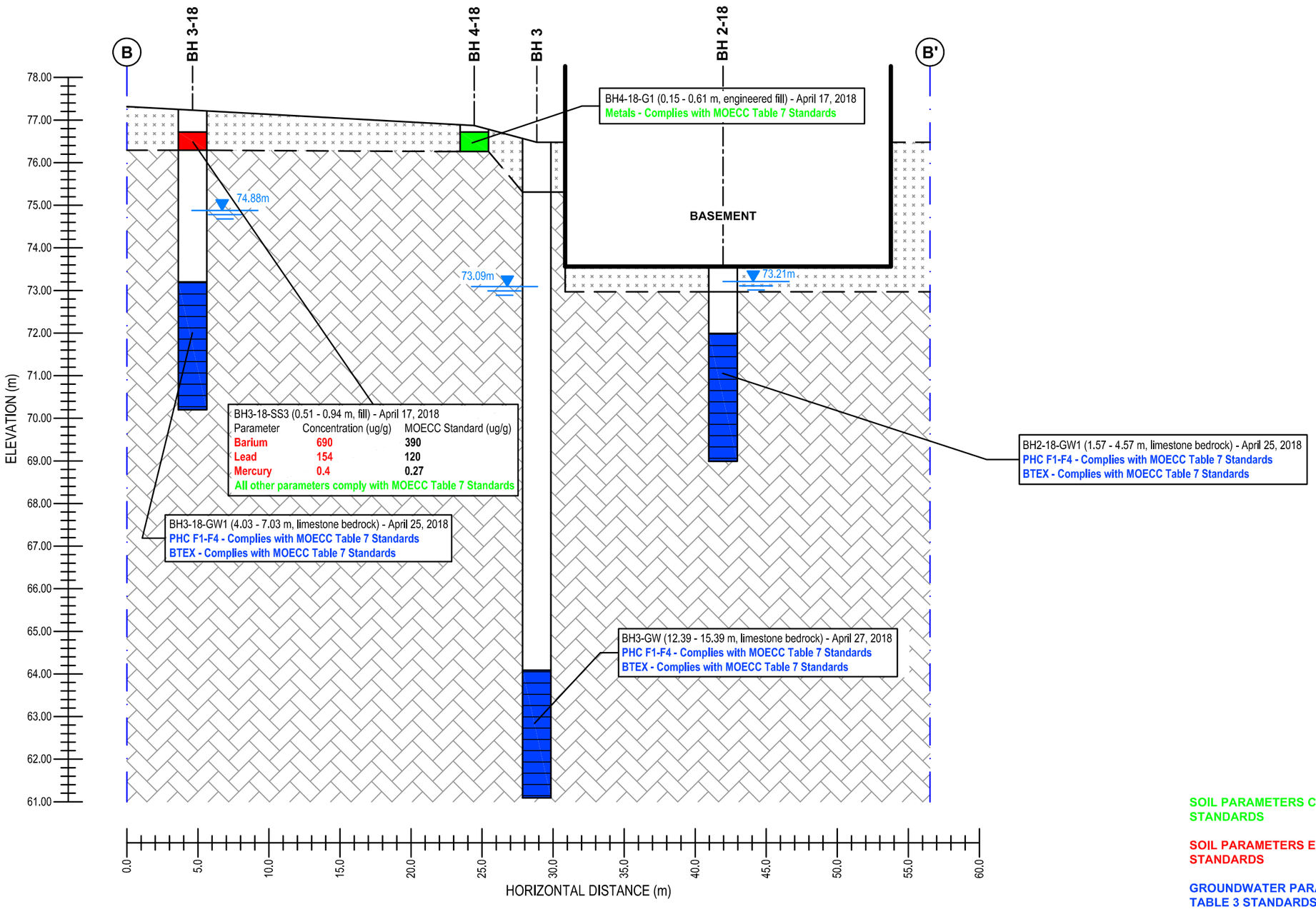

SOIL PARAMETERS COMPLY WITH MOECC TABLE 3 STANDARDS

SOIL PARAMETERS EXCEED MOECC TABLE 3 STANDARDS

GROUNDWATER PARAMETERS COMPLY WITH MOECC TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
0			

TAGGART GROUP

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 265 CARLING AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B'

Scale: AS SHOWN	Date: 05/2018
Drawn by: MPG	Report No.: PE4252-2
Checked by: MB	Dwg. No.: PE4252-8
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 Studies

Paterson Group Inc.

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

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patersongroup

Sampling and Analysis Plan

Part of 265 Carling Avenue
Ottawa, Ontario

Prepared For

Taggart Group

April, 2018

Report: PE4252-SAP.01

Table of Contents

1.0 Sampling Program

Paterson Group (Paterson) was commissioned by Taggart Group to conduct a Phase II ESA for a portion of the property addressed as 265 Carling Avenue, 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 the suspected contamination:

Borehole	Location and Rationale	Proposed Depth and Rationale
BH1-18	Address the APEC located to the west of the subject site.	Boreholes to be advanced to intercept water table to facilitate installation of groundwater monitoring wells.
BH2-18	Address the APEC located to the east and southeast of the subject site.	
BH3-18	Address the APEC located to the west of the subject site	
BH4-18	Provide general coverage of the property	Advance to bedrock surface and collect soil samples, if present.
BH3	Provide vertical delineation of the groundwater	Drilled as part of the 2012 Geotechnical investigation, groundwater sampled as part of the current investigation.

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

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

If it is considered necessary to drill into bedrock to intercept the groundwater table, boreholes will be advanced into bedrock as required using diamond coring equipment. Rock core samples will be retained for review.

Following borehole drilling, monitoring wells will be installed in selected boreholes for the measurement of water levels and the collection of groundwater samples.

2.0 Analytical Testing Program

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

- In borehole where there is visual or olfactory evidence of contamination, or where gas detector readings indicate the presence of contamination, the 'worst-case' sample from each test pit 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 vertically downward.
- At least one sample from each borehole should be submitted to delineate the horizontal extent of contamination across the site.
- Parameters analyzed should be consistent with the contaminants of potential concern identified in the Phase II-ESA.
- Samples will be submitted for analysis of PHC, PAH, and metals parameters.

3.0 Standard Operating Procedures

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to assess the soil condition and facilitate the installation of groundwater monitoring wells to delineate the petroleum hydrocarbon impacted groundwater.

Equipment

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

- Glass soil sample jars
- Plastic sample bags 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 and Test Pit Locations

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

After drilling/excavation is completed a plan with the borehole/test pit locations must be provided. Distances and orientations of test pits with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a geodetic benchmark, if one is available, or a temporary site benchmark which can be tied in at a later date if necessary.

Drilling Procedure

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

- Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required. Sleeve samples are to be collected when utilizing GeoProbe direct push drill.
- 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. Sleeves are disposable and will not require washing.
- 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, visual observations, 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.

The spoon-washing procedure may be bypassed if a GeoProbe direct-push drill rig with disposable plastic sampling tubes is used.

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3.2 cm 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
- Portable pH/Temperature/Conductivity analyzer
- 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.

Instrument Washing Procedure

All sampling equipment (shovels, trowels, spatulas, 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 instrument with brush in soapy water, inside and out, including tip
- Rinse in clean water
- Apply a small amount of methyl hydrate to the exposed faces of the instrument. (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 equipment, 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.

4.0 Quality Assurance/Quality Control (QA/QC)

The QA/QC program for this subsurface investigation is as follows:

- All non-dedicated sampling equipment (shovels, split spoons, etc.) will be decontaminated according to the SOPs listed above.
- Approximately one field duplicate will be submitted for every ten samples submitted for laboratory analysis. A minimum of one field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples where possible.
- Where multi-parameter analyzers are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 Physical Impediments to Sampling and Analysis Plan

Physical impediments to the Sampling and Analysis plan may include:

- The location of underground utilities
- Shallow bedrock or limited presence of fill
- Insufficient groundwater volume for groundwater samples (if encountered)
- 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
- Mechanical Equipment breakdowns
- Winter conditions
- Other site-specific impediments

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phsae II - Environmental Site Assessment
265 Carling Avenue
Ottawa, Ontario

DATUM BM - Top of manhole located on the corner of Cambridge Street South and Carling Avenue. Geodetic elevation = 76.63m.

FILE NO. PE4252

REMARKS

HOLE NO. BH 1-18

BORINGS BY CME 55 Power Auger **DATE** April 17, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.06						0	76.94
FILL: Crushed stone with silt and sand 0.66		AU	1			1	75.94
		RC	1	100	84	2	74.94
		RC	2	100	93	3	73.94
BEDROCK: Grey limestone						4	72.94
		RC	3	100	97	5	71.94
						6	70.94
		RC	4	100	92	7	69.94
7.14 End of Borehole							
(GWL @ 2.83m - April 25, 2018)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phsae II - Environmental Site Assessment
265 Carling Avenue
Ottawa, Ontario

DATUM BM - Top of manhole located on the corner of Cambridge Street South and Carling Avenue. Geodetic elevation = 76.63m.

FILE NO. PE4252

REMARKS

HOLE NO. BH 2-18

BORINGS BY CME 55 Power Auger **DATE** April 17, 2018

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									
Concrete 0.13									
FILL: Crushed stone with silt and sand 0.59		AU	1						
		RC	1	92	77	1	72.56		
		RC	2	98	82	2	71.56		
BEDROCK: Grey limestone		RC	3	100	91	3	70.56		
		RC	4	100	86	4	69.56		
4.57									
End of Borehole									
(GWL @ 0.35m - April 25, 2018)									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phsae II - Environmental Site Assessment
265 Carling Avenue
Ottawa, Ontario

DATUM BM - Top of manhole located on the corner of Cambridge Street South and Carling Avenue. Geodetic elevation = 76.63m.

FILE NO. PE4252

REMARKS

HOLE NO. BH 3-18

BORINGS BY CME 55 Power Auger **DATE** April 17, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.06		AU	1			0	77.23		
FILL: Crushed stone with silt and sand 0.51		AU	2						
FILL: Brown silty sand, trace gravel 0.94		SS	3	50	50+	1	76.23		
FILL: Brown silty sand, trace gravel, cobbles, concrete and brick		RC	1	100	77	2	75.23		
		RC	2	100	100	3	74.23		
BEDROCK: Grey limestone		RC	3	100	94	4	73.23		
		RC	4	100	100	5	72.23		
						6	71.23		
7.03						7	70.23		
End of Borehole									
(GWL @ 2.35m - April 25, 2018)									

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phsae II - Environmental Site Assessment
265 Carling Avenue
Ottawa, Ontario

DATUM BM - Top of manhole located on the corner of Cambridge Street South and Carling Avenue. Geodetic elevation = 76.63m.

FILE NO. PE4252

REMARKS

HOLE NO. BH 4-18

BORINGS BY CME 55 Power Auger **DATE** April 17, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: ● Volatile Organic Rdg. (ppm) / ○ Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.05						0	76.87		
FILL: Crushed stone with silt and sand 0.61		AU	1						
End of Borehole									
Practical refusal to augering at 0.61m 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.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

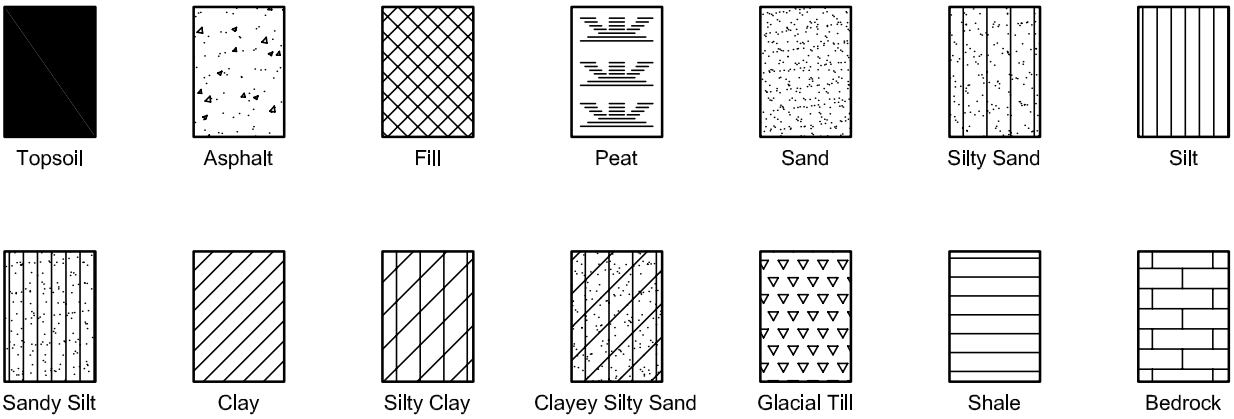
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

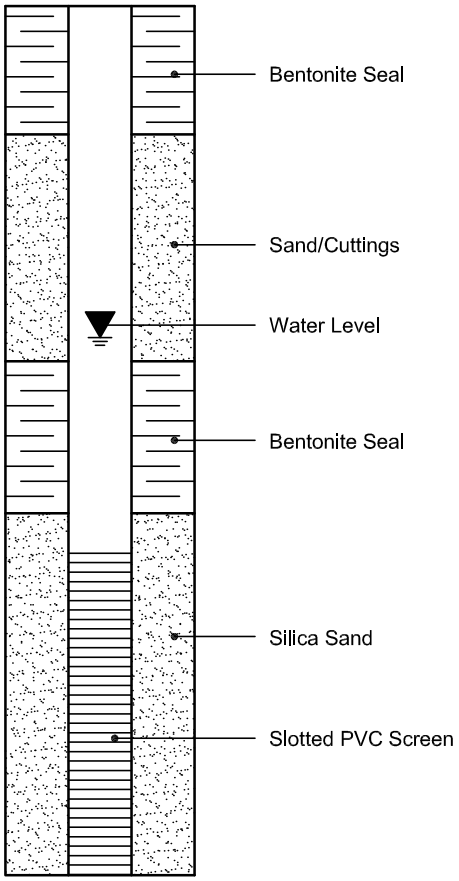
SYMBOLS AND TERMS (continued)

STRATA PLOT

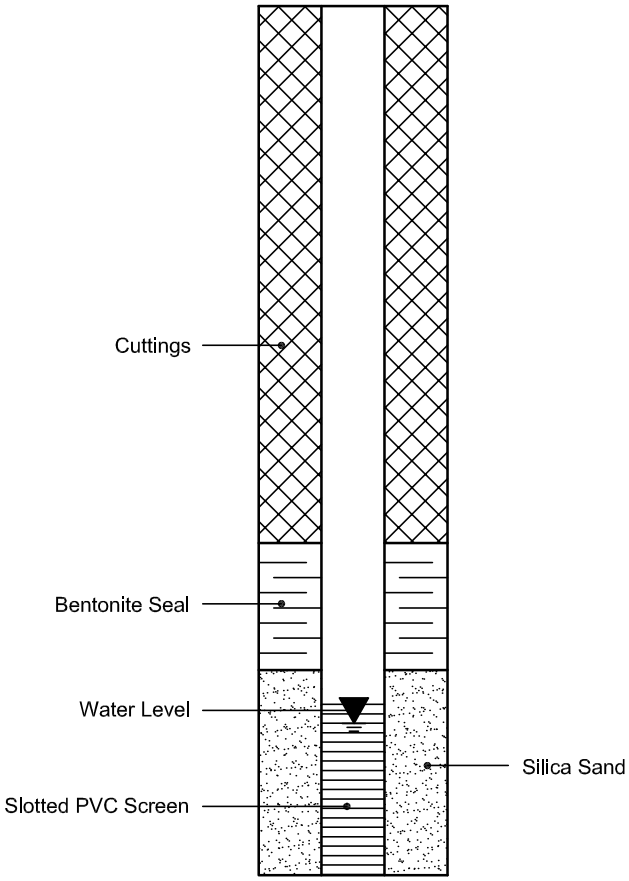


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23775
Project: PE4252
Custody: 116662

Report Date: 24-Apr-2018
Order Date: 18-Apr-2018

Order #: 1816317

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

Paracel ID	Client ID
1816317-01	BH1-18-AU1
1816317-02	BH3-18-SS3
1816317-03	BH4-18-G1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23775

Report Date: 24-Apr-2018
Order Date: 18-Apr-2018
Project Description: PE4252

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	20-Apr-18	21-Apr-18
Mercury by CVAA	EPA 7471B - CVAA, digestion	23-Apr-18	23-Apr-18
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	23-Apr-18	23-Apr-18
Solids, %	Gravimetric, calculation	20-Apr-18	20-Apr-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23775

Report Date: 24-Apr-2018

Order Date: 18-Apr-2018

Project Description: PE4252

	Client ID:	BH1-18-AU1	BH3-18-SS3	BH4-18-G1	-
	Sample Date:	04/17/2018 09:00	04/17/2018 09:00	04/17/2018 09:00	-
	Sample ID:	1816317-01	1816317-02	1816317-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	90.4	83.5	93.7	-
Metals					
Antimony	1 ug/g dry	<1	1	<1	-
Arsenic	1 ug/g dry	2	<1	2	-
Barium	1 ug/g dry	272	690	174	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Boron	5.0 ug/g dry	15.1	5.7	12.0	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5 ug/g dry	14	19	9	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1 ug/g dry	6	5	6	-
Copper	5 ug/g dry	13	15	9	-
Lead	1 ug/g dry	21	152	17	-
Mercury	0.1 ug/g dry	<0.1	0.4	<0.1	-
Molybdenum	1 ug/g dry	<1	<1	1	-
Nickel	5 ug/g dry	13	11	14	-
Selenium	1 ug/g dry	<1	<1	<1	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1 ug/g dry	<1	<1	<1	-
Uranium	1 ug/g dry	<1	<1	<1	-
Vanadium	10 ug/g dry	18	22	11	-
Zinc	20 ug/g dry	<20	322	<20	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23775

Report Date: 24-Apr-2018
Order Date: 18-Apr-2018
Project Description: PE4252

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	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	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23775

Report Date: 24-Apr-2018
Order Date: 18-Apr-2018
Project Description: PE4252

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1	ug/g dry	ND			0.0	30	
Arsenic	1.3	1	ug/g dry	1.6			17.5	30	
Barium	68.7	1	ug/g dry	64.5			6.3	30	
Beryllium	ND	0.5	ug/g dry	0.56			0.0	30	
Boron	26.1	5.0	ug/g dry	22.0			17.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	14.8	5	ug/g dry	15.3			3.2	30	
Cobalt	5.2	1	ug/g dry	5.2			0.0	30	
Copper	8.7	5	ug/g dry	9.0			3.2	30	
Lead	17.3	1	ug/g dry	16.9			2.7	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1	ug/g dry	ND			0.0	30	
Nickel	15.8	5	ug/g dry	16.1			2.4	30	
Selenium	ND	1	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1	ug/g dry	ND			0.0	30	
Uranium	ND	1	ug/g dry	ND			0.0	30	
Vanadium	ND	10	ug/g dry	10.2			0.0	30	
Zinc	24.4	20	ug/g dry	27.0			10.1	30	
Physical Characteristics									
% Solids	74.5	0.1	% by Wt.	74.3			0.3	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	47.3		ug/L	ND	94.5	70-130			
Arsenic	50.8		ug/L	ND	100	70-130			
Barium	80.6		ug/L	25.8	110	70-130			
Beryllium	51.9		ug/L	ND	103	70-130			
Boron	54.8		ug/L	8.8	91.9	70-130			
Cadmium	48.3		ug/L	ND	96.6	70-130			
Chromium (VI)	4.0	0.2	ug/g	ND	70.5	70-130			
Chromium	58.3		ug/L	6.1	104	70-130			
Cobalt	53.8		ug/L	2.1	104	70-130			
Copper	54.8		ug/L	ND	102	70-130			
Lead	60.3		ug/L	6.7	107	70-130			
Mercury	1.49	0.1	ug/g	ND	99.6	70-130			
Molybdenum	47.7		ug/L	ND	94.9	70-130			
Nickel	58.5		ug/L	6.5	104	70-130			
Selenium	48.6		ug/L	ND	97.2	70-130			
Silver	43.8		ug/L	ND	87.6	70-130			
Thallium	53.3		ug/L	ND	106	70-130			
Uranium	48.8		ug/L	ND	97.2	70-130			
Vanadium	57.2		ug/L	ND	106	70-130			
Zinc	57.2		ug/L	ND	92.9	70-130			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match - Sample date April 17,2018
Applies to samples: BH1-18-AU1, BH3-18-SS3, BH4-18-G1

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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Page 1 of 1

Client Name: PATERSON	Project Reference: PE4252	**Turnaround Time:**
Contact Name: MIKE BEAUDOIN	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 COLONNADE RD	PO # 23775	☐ 2 Day ☒ Regular
Telephone: 613-~~836~~-226-7381	Email Address: mbeaudoin@patersongroup.ca	Date Required:

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

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

Required Analyses

	Paracel Order Number: 1816317 / 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-~~Art~~18-AU1	S		1	APR 16/18					X	X	X					- 85 mL -			
2	BH3-18-SS3	S		1	↓					X	X	X					↓			
3	~~BH~~4-18-61	S		1						X	X	X								
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: D's No. 1, 2, 3 = Sample date on 3 Jars read = APR 17, 2018.

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Seguin	Received at Lab: SUNEETA RANI DHAMI	Verified By:
Relinquished By (Print):	Date/Time: 18/04/18 3:20 PM	Date/Time: APR 18, 2018 04:45	Date/Time: APR 18, 18 5:09
Date/Time:	Temperature: °C	Temperature: 17.2 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23012
Project: PE4252
Custody: 116666

Report Date: 4-May-2018
Order Date: 30-Apr-2018

Order #: 1818137

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

Paracel ID	Client ID
1818137-01	BH1-18-GW1
1818137-02	BH2-18-GW1
1818137-03	BH3-18-GW1
1818137-04	BH3-GW

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23012

Report Date: 04-May-2018
Order Date: 30-Apr-2018
Project Description: PE4252

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	2-May-18	2-May-18
PHC F1	CWS Tier 1 - P&T GC-FID	1-May-18	2-May-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	1-May-18	1-May-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 23012

Report Date: 04-May-2018

Order Date: 30-Apr-2018

Project Description: PE4252

	Client ID:	BH1-18-GW1	BH2-18-GW1	BH3-18-GW1	BH3-GW
	Sample Date:	04/25/2018 09:00	04/25/2018 09:00	04/25/2018 09:00	04/27/2018 09:00
	Sample ID:	1818137-01	1818137-02	1818137-03	1818137-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene-d8	Surrogate	103%	104%	104%	104%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23012

Report Date: 04-May-2018
Order Date: 30-Apr-2018
Project Description: PE4252

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*90.4*		*ug/L*		*113*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23012

Report Date: 04-May-2018
Order Date: 30-Apr-2018
Project Description: PE4252

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*85.8*		*ug/L*		*107*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23012

Report Date: 04-May-2018
Order Date: 30-Apr-2018
Project Description: PE4252

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1990	25	ug/L		99.3	68-117			
F2 PHCs (C10-C16)	2120	100	ug/L		118	60-140			
F3 PHCs (C16-C34)	4120	100	ug/L		111	60-140			
F4 PHCs (C34-C50)	2910	100	ug/L		117	60-140			
Volatiles									
Benzene	37.6	0.5	ug/L		94.0	60-130			
Ethylbenzene	38.6	0.5	ug/L		96.5	60-130			
Toluene	33.5	0.5	ug/L		83.7	60-130			
m,p-Xylenes	74.7	0.5	ug/L		93.3	60-130			
o-Xylene	38.6	0.5	ug/L		96.4	60-130			
Surrogate: Toluene-d8	*81.2*		*ug/L*		*102*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

TRUS
RESP
RELI/

Paracel ID: 1818137

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Ontario K1G 4J8
749-1947
l@paracellabs.com

Chain of Custody (Lab Use Only)
№ 116666

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4252
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 Colonnade Rd S.	PO # 23012
	Email Address: mbeaudoin@patersongroup.ca
Telephone: 613-226-7381	

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

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

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

Paracel Order Number: 1818137

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-18-GW1	GW		3	APR 25/18		X						
2	BH2-18-GW1	GW		3	↓		X						
3	BH3-18-GW1	GW		3	↓		X						
4	BH3-GW	GW		3	APR 27/18		X						
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: H. Jlouse	Received at Lab: Suneeporn Dokmai	Verified By: [signature]
Relinquished By (Print): MIKE B.	Date/Time: 30/04/18 4:30 PM.	Date/Time: APR 30, 2018 05.10	Date/Time: 30/4/18 6:04
Date/Time:	Temperature: °C	Temperature: 20.6 °C	pH Verified [ ] By: