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Phase II - Environmental Site Assessment

Commercial and Residential Properties
320 McRae Avenue, 1976 Scott Street,
311 and 315 Tweedsmuir Avenue
Ottawa, Ontario

Prepared For

The Estate of Carson Unsworth

April 21, 2017

Report: PE3391-3

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the commercial and residential properties addressed 320 McRae Avenue, 1976 Scott Street, 311 and 315 Tweedsmuir Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern (APECs) identified during the Phase I ESA. The APECs included the former landfill in the area of the subject site, the former and continued use of the eastern portion of the subject site as various automotive service garages and autobody shops, as well as, the former use of the northern portion of the subject site as a retail fuel outlet.

During a previous investigation in 2008, petroleum hydrocarbon (PHC) fraction F3, barium, cadmium, lead, mercury and zinc impacted fill was identified on the east side of the commercial building and impacted groundwater (benzene, chloroform, toluene, xylenes and PHC (F1)) was identified in BH6, on the north side of the commercial building. Field observations indicated the presence of impacted groundwater in BH4, in the former pump island area. This well was not found at the time of the current assessment and could not be assessed.

A 2014 subsurface investigation at the subject site was conducted on October 8 and 9, 2014 and consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells.

An arsenic concentration in BH1 and a petroleum hydrocarbon (PHC) fraction 1 (F1) concentration in BH3 were identified in excess of the selected MOECC Table 7 standards. Metals impacted fill in BH1 was visually identified at depths of 0.91 and 2.44 m, while in BH3 a thin layer of PHC impacted fill was identified between 3.28 and 3.38 m below ground surface, immediately on top of bedrock surface.

Groundwater samples were obtained from the monitoring wells at BH1 and BH2, and submitted for analysis of PHCs and volatile organic compounds (VOCs). None of the analytical parameters were found to exceed the selected MOECC Table 7 standards.

The current investigation included the placement of eight (8) boreholes, three (3) of which were instrumented with groundwater monitoring wells. Metals in excess of the MOECC Table 7 standards were identified in the fill material at BH15 and BH16. One PAH parameter was also identified in excess of the MOECC Table 7 standard in borehole BH16.

All groundwater was found to be in compliance with the MOECC Table 7 standards with the exception of the groundwater from BH9, where the F1 fraction petroleum hydrocarbon, benzene, ethylbenzene, and xylenes were identified above the MOECC Table 7 standard. The groundwater from BH6 was analysed again and all hydrocarbon and BTEX parameters were in compliance with the site standards.

Recommendations

Soil

Metal, PAH, and PHC concentrations in some soils are present at the subject site in concentrations in excess of the selected MOECC Table 7 standards. The presence of metals impacted fill beneath the commercial building and petroleum impacts in the former tank nest area are not considered to represent an immediate risk to the current use of the subject site. It is understood that, the site is being considered for redevelopment.

Any impacted soil removed from the site during redevelopment will require disposal at an approved waste disposal facility. Prior to disposal, a toxicity characteristic leaching procedure analysis will be required on a representative soil sample. It is recommended that Paterson personnel be present onsite during the soil excavation program to direct excavation activities in the areas where impacted material has been identified or is expected to exist. Additional testing may be required to effectively identify and delineate the impacted fill on the subject site.

If any soil is to remain on-site, it is recommended that confirmatory soil samples be collected upon completion of the soil remediation program to ensure that the site is in compliance with the MOECC Table 7 Standards.

Groundwater

Groundwater in the vicinity of the former pump island, located at the northern end of the property, appears to have been impacted with the F1 PHC fraction, as well as benzene, ethylbenzene, and xylenes.

Depending upon the volume of impacted groundwater encountered during future site development, and the depth of the future site works, several options may be available to treat the groundwater. The removal of impacted groundwater from the site by a licensed pumping contractor would be a feasible option for smaller volumes, while an on-site treatment system would likely be more economical for larger volumes over a longer period of time. An on-site treatment system would discharge to the City of Ottawa sewer system.

Prior to discharging treated groundwater to the municipal sewer system, a Sanitary Sewer Agreement will be required from the City of Ottawa's Sewer Use Program. Additional groundwater monitoring wells may be required following the completion of the site remediation program to ensure that the site meets the MOECC Table 7 Standards.

If site development does not occur in the near future, it is recommended that the groundwater from BH9 be retested to confirm the quality of the groundwater and the need for any remediation.

1.0 INTRODUCTION

At the request of the Estate of Carson Unsworth, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of the properties addressed 320 McRae Avenue, 1976 Scott Street, 311 and 315 Tweedsmuir Avenue, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address concerns identified in the Phase I ESA and to delineate previously identified contamination.

1.1 Site Description

Address:	1976 Scott Street, 320 McRae Avenue, 311 and 315 Tweedsmuir Avenue, Ottawa, Ontario, hereafter referred to as 320 McRae Avenue.
Legal Description:	Lots 12 to 19, Registered Plan 273 and Lots 23, 24 and 25, Registered Plan 263. Part of Lot 31 and 32, Concession 1, Nepean Township, Ottawa Front.
Property Identification Numbers:	04021-0013, 04021-0014, 04021-0015, 04021-0021, 04021-0022, 04021-0023, 04021-0024, 04021-0025, 04021-0026.
Location:	The subject site is located west of McRae Avenue, south of Scott Street and east of Tweedsmuir Avenue, in the City of Ottawa, Ontario. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 23' 45" N, 75° 45' 02" W.
Configuration:	Irregular.
Site Area:	0.51 hectares (approximate).

1.2 Property Ownership

The subject property is currently owned by the Estate of Carson Unsworth. Paterson was retained to complete this Phase II ESA by Ms. Carol Morris-Unsworth.

1.3 Current and Proposed Future Uses

The southeast portion of the subject site is occupied by a commercial complex with two (2) garages, two (2) units used for office space, two (2) garage bays used for storage of landscaping equipment and self-storage space. The northwest portion of the subject site (311 and 315 Tweedsmuir Avenue) is occupied by two 2 storey residential dwellings. The northern portion of the subject site is utilized as a parking lot.

It is our understanding that the redevelopment of the property into a residential condominium complex is being considered.

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
- Shallow bedrock conditions
- Non-potable groundwater conditions
- Residential land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located south of Scott Street, between McRae Avenue and Tweedsmuir Avenue, in the City of Ottawa. The site is occupied by two, 2 storey residential buildings on the west side of the subject site, a commercial building with a partial second storey on the east side of the subject site and a vacant kiosk on the north side of the subject site. The commercial building is currently being utilized as two (2) automotive service garages, a landscaper's storage garage, a self storage complex and two (2) units are being used for office space. The ground cover in the area of the residences and to the north of the residences towards Scott Street, consists of grass and trees. The remainder of the subject site is asphaltic concrete parking, with two gravel patches from former retail fuel outlet decommissioning work.

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 municipally-serviced area. No evidence of current or former railway or spur lines on the subject property was observed, at the time of the site inspection. There were no unidentified substances observed on the subject site.

2.2 Past Investigations

The following reports were available for review:

- "Soil Testing During Retail Gas Station Decommissioning, 1976 Scott Street, Ottawa, ON", prepared by SEACOR Environmental Inc. (SEACOR), dated September 2003.
- "Phase I-II - Environmental Site Assessment, 319 & 320 McRae Avenue, Ottawa, Ontario", prepared by Paterson, dated November 2008.
- Phase I – Environmental Site Assessment, Commercial and Residential Properties, 320 McRae Avenue, 1976 Scott Street and 311 Tweedsmuir Avenue, Ottawa, Ontario", prepared by Paterson, dated November 3, 2014.
- Phase II – Environmental Site Assessment, Commercial and Residential Properties, 320 McRae Avenue, 1976 Scott Street, 311 and 315 Tweedsmuir Avenue, Ottawa, Ontario", prepared by Paterson, dated January 28, 2016.

The 2014 Phase I-ESA report, incorporated information from the previous two (2) reports and identified three (3) on-site potentially contaminating activities (PCAs) that are considered to represent areas of potential environmental concern (APECs) for the subject site. These on-site PCAs are as follows:

- The former use of the northern portion of the subject site (1976 Scott Street) as a retail fuel outlet, between 1971 and 2002.
- The former and continued use of various units within the commercial building on the southeast portion of the subject site, as various automotive service garages and autobody shops, since the 1940's.
- Possible importation of fill of unknown quality during the former landfilling activities in the area of the subject site, prior to 1928.

Soil and groundwater analyses from previous subsurface investigations, including data from boreholes and groundwater monitoring wells, will be used to supplement the current Phase II-ESA.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The current subsurface investigation conducted as a component of this Phase II ESA consisted of drilling eight (8) boreholes, three of which were instrumented with groundwater monitoring wells. Boreholes were advanced to a maximum depth of 6.96 m below grade, some boreholes terminating within bedrock.

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 observations made in the field.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada mapping and the current and previous subsurface investigations, drift thickness in the area of the subject site is between 1.01 and 3.10 m. Overburden soils consist primarily of fill and silty sand. Bedrock in the area of the subject site is considered to be interbedded limestone and dolostone of the Gull River Formation.

Groundwater in the monitoring wells onsite was encountered within the bedrock. Groundwater levels ranged from 2.02 to 2.54 m below grade.

Contaminants of Potential Concern

The following CPCs were identified with respect to the subject site:

- Petroleum Hydrocarbons Fractions 1 through 4 (PHCs F1-F4) – this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F1-F4 were selected as CPCs for the Phase I property based on the historical use of three (3) underground storage tanks at the former retail fuel outlet, and the historical and present use of new and waste oil ASTs, as well as, various mechanical activities at the automotive service garages. Heavy oils may be present in the form of lubricants and transmission or hydraulic fluids. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs – light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their lower density.

- Metals – this suite of parameters encompasses various metals for which MOECC standards exist. Metals may be present in the soil matrix or dissolved in site groundwater. Metals were selected as CPCs for the Phase I property based on the reported historical presence of a landfill in the area of the subject site and the former and current use of the subject site as various automotive service garages.

- Volatile Organic Compounds (VOCs) – this suite of parameters includes chlorinated solvents (Tetrachloroethylene, Trichloroethylene, Dichloroethylenes, and Vinyl Chloride) associated with de-greasing and dry cleaning, as well as benzene, toluene, ethylbenzene, and xylenes (BTEX), associated with gasoline. These parameters were selected as CPCs for the Phase I study area based on the use of the eastern portion of the subject site as various automotive service garages and commercial autobody shops, as well as, the former use of the northern portion of the subject site as a retail fuel outlet. VOCs may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

- Polycyclic Aromatic Hydrocarbons (PAHs) - this suite of parameters encompasses various complex hydrocarbons, commonly associated with coal, combustion, and/or heavy-fraction hydrocarbons such as hydraulic, transmission or crankcase oil.

PAHs may be present in the soil matrix or dissolved in site groundwater. PAHs were selected as CPCs for the RSC Property based on the use of the property as an automotive garage, as well as the historical presence of nearby landfilling activities.

The mechanisms of contaminant transport within the site soils include physical transportation and leaching. Physical transport is not anticipated to be an issue at the subject site, given the developed nature of the site. Leaching is anticipated to play a lesser role in the contaminant transportation, given the presence of an asphaltic concrete parking lot surface.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion. Diffusion and advection will likely dominate in the fill where lower hydraulic conductivity is likely to be present.

Existing Buildings and Structures

The site is occupied by residential dwellings at 311 and 315 Tweedsmuir Avenue, by a vacant kiosk at 1976 Scott Street and the commercial building (occupied two (2) automotive service garages, Westboro Self-storage, a landscaper for equipment storage and two (2) office units.) at 320 McRae Avenue.

Water Bodies

No water bodies are present within the Phase I study area. The closest body of water is the Ottawa River, located to the north and west of the subject site.

Areas of Natural Significance

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

Drinking Water Wells

Based on the availability of municipal water within the Phase I ESA study area, drinking water wells are not expected to be located on the subject property or neighbouring properties within the study area.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is a mixture of residential, commercial and industrial properties.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Various PCAs were identified with regard to the current and former use of properties within the Phase I study area, however, only the PCAs identified on the subject site were considered to represent APECs on the subject site. As discussed in detail in the Phase I-ESA report and in Section 2.2 of this report, these PCAs are associated with the potential former landfilling activities in the area of the subject site, the former use of the northern portion of the subject site as a retail fuel outlet and the previous and continued use of the commercial structure on the southeast portion of the property as various automotive service garages and autobody shops.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are areas of potential environmental concern on the subject site which have the potential to have impacted the subject site. The exact footprint of the reported former landfill site in the area of the subject site could not be confirmed. 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. No significant deviations from the sampling and analysis plan were noted.

3.5 Impediments

The presence of various utilities on the east and north sides of the property restricted borehole placement in these areas. General use of the subject site (automotive service garage; shuffling of vehicles and equipment) resulted in restricted locations for drilling, with several delays and interruptions.

No other physical impediments or denial of access were encountered during the Phase II Environmental Site Assessment.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The recent subsurface investigation was conducted on March 29 and 30, 2017 and consisted of the drilling of eight (8) boreholes, three (3) of which were instrumented with groundwater monitoring wells. The boreholes were drilled by George Downing Estate Drilling Ltd. under full-time supervision of Paterson staff. Boreholes were also drilled on the property in 2014, and 2008. Three (3) previous groundwater monitoring wells remain on site from those investigations. Borehole locations are shown on Drawing No. PE3391-4 and PE3391-5, appended to this report.

4.2 Soil Sampling

A total of 22 soil samples were obtained from the boreholes by means of auger flight sampling and split spoon sampling. Split spoon samples were taken at approximate 0.6 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets, appended to this report. A total of 3 rock core samples were also collected from each BH9, BH10 and BH11 during the coring. These are shown as "**RC**" on the Soil Profile and Test Data Sheets.

Soil samples and rock core samples were also collected during previous investigations in 2014 and 2008.

Site soils consist primarily of fill material (crushed stone over sandy material), with some silty sand, underlain by limestone bedrock. Glacial till was identified below fill material at the south end of the property. A concrete floor is present in the building. Gravel ground surface is present in the area of the former underground tank nest in the north-east side of the property.

Concrete encountered in BH1 and BH2 was 0.15 m thick, asphalt in other areas was approximately 0.05 m thick. Fill was present in all boreholes in thicknesses varying between 0.96 to 3.38 m. Fill material with traces of glass, plastic, slag and metal pieces), was identified in the upper fill layer at BH1, BH8 and BH16.

A hydrocarbon odour was noted in the rock core collected from BH9. During the previous investigation in 2014, a hydrocarbon odour was noted in a soil sample collected from BH3, however no such odours were noted in BH10, placed adjacent to BH3. Bedrock was confirmed at depths of 1.19 m to 3.30 m, and limestone bedrock (with calcite seams) was cored to a maximum depth of 7.87 m below grade.

4.3 Field Screening Measurements

Samples collected from site underwent a preliminary screening procedure which included visual screening for colour and evidence of deleterious substances. A MiniRae 2000 photoionization detector (PID) was used to determine the selection of samples to be submitted for analytical testing.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. The vapour readings ranged from 0.2 to 242 ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Soil samples were selected for analysis based on visual appearance, location, and vapour readings.

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells installed in 2014 (BH1, BH2 and BH3) by CoreTech Drilling Inc. of Ottawa, under full-time supervision by Paterson personnel. Two (2) groundwater monitoring wells (BH4 and BH6) were installed in 2008 by George Downing Estate Drilling Inc., and three (3) more in 2017 by the same contractor. The monitoring wells consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. 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 1.

The groundwater monitoring wells were developed upon completion using a dedicated inertial lift pump. A minimum of three (3) well volumes were removed from the wells.

It should be noted that the monitoring wells installed at BH3 and BH4 have been destroyed.

Table 1: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH4 (2008) *Destroyed*	63.42	7.75	4.70 – 7.75	3.05 – 7.75	0.60 – 3.05	Flushmount
BH6 (2008)	63.16	7.87	4.82 – 7.87	3.05 – 7.87	0.60 – 3.05	Flushmount
BH1 (2014)	64.76	7.09	4.04 – 7.09	3.58 – 7.09	0.60 – 3.58	Flushmount
BH2 (2014)	63.04	7.01	3.96 – 7.01	3.35 – 7.01	0.60 – 3.35	Flushmount
BH3 (2014) *Destroyed*	63.17	3.38	1.86 – 3.38	1.55- 3.38	0.60 - 1.55	Flushmount
BH9 (2017)	63.44	5.48	2.30 – 5.48	2.21 – 5.48	0.3 – 2.21	Flushmount
BH10 (2017)	63.12	6.96	3.80 – 6.96	3.61 – 6.96	0.3 – 3.61	Flushmount
BH11 (2017)	63.42	5.77	2.65 – 5.77	2.44 – 5.77	0.3 – 2.44	Flushmount

4.5 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.

4.6 Analytical Testing

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

Table 2: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed					Rationale
		Metals	PAH	VOC	BTEX	PHCs (F1-F4)	
Phase II-ESA Investigation, 2008							
BH8-SS2	0.76-1.01 m; Fill	X				X	Assessment of suspect fill material on the east side of the commercial building.
Phase II-ESA Investigation, 2014							
BH1-SS3	1.37-1.83 m; Fill	X					Assessment of suspect fill material.
BH1-SS4	1.83-2.44 m; Fill			X	X	X	Assess of potential BTEX and PHC impacts in the soil beneath the automotive service garage.
BH3-SS6	3.05-3.38 m; Fill				X	X	To assess potential BTEX and PHC impacts in the former underground storage tank nest on 1976 Scott Street.
Phase II-ESA Investigation, Current							
BH9-SS2	0.73–1.34 m; Fill	X			X	X	Assessment of the former pump island
BH10-SS3	1.43–2.04 m; Fill	X	X				Assessment of fill material
BH10-SS5	2.91–3.20 m; Fill			X	X	X	To assess potential BTEX and PHC impacts in the former underground storage tank nest on 1976 Scott Street.
BH13-SS2	0.73–1.34 m; Fill				X	X	Assessment of fill material
BH14-AU1	0.13–0.43 m; Fill	X					Assessment of fill material, and soils in vicinity of garage
BH14-SS3	1.47-1.69 m; Fill				X	X	Assessment of fill material, and soils in vicinity of garage
BH15-AU1	0.17–0.43 m; Fill	X	X				Assessment of fill material
BH15-SS2	0.77-1.35 m; Glacial till	Barium					To vertically delineate barium at this location
BH16-SS2	0.76–1.37 m; Fill	X	X				Assessment of fill material, and soils in vicinity of garage

Table 3: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed					Rationale
		PHCs (F1-F4)	BTEX	VOC	PAH	Metals	
BH1-GW1	4.04 – 7.09 m; Bedrock	X	X	X			Assessment of the groundwater in the vicinity of the automotive service garages.
BH1-GW2	4.04 – 7.09 m; Bedrock					X	
BH2-GW1	3.96 – 7.01 m; Bedrock	X	X	X			Assessment of the groundwater in the vicinity of the automotive service garages.
BH2-GW1	3.96 – 7.01 m; Bedrock					X	
BH6-GW2	3.05 – 7.87 m; Bedrock	X	X	X			Assessment of the groundwater downgradient of the commercial building utilized as various automotive service garages and autobody shops. Placed on the north side of the building nearby the former in-ground hoist location.
BH6-GW1	3.05 – 7.87 m; Bedrock				X		
BH9-GW1	2.30 – 5.39 m, Bedrock	X	X				Assessment of the groundwater within the former pump island location
BH10-GW1	3.80 – 6.82 m, Bedrock	X	X		X		Assessment of the groundwater within the former underground storage tank nest
BH11-GW1	2.65 – 5.65 m, Bedrock	X	X	X			Assessment of the groundwater in the vicinity of the former underground storage tank nest and pump island

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.

4.7 Residue Management

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

4.8 Elevation Surveying

Ground surface elevations at the borehole locations were determined by Paterson personnel based on the geodetic elevation of the top of spindle of a fire hydrant (64.44 m), which is no longer present, located on the west side of McRae Street, immediately south of Scott Street, and a municipal catch basin (63.13 m), located on the east side of Tweedsmuir Avenue, immediately south of Scott Street. The geodetic elevations are based on a Topographic Site Plan prepared by Stantec Geomatics Ltd. in 2008. The accuracy of the benchmark was not verified by Paterson.

4.9 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 primarily consist of sandy fill material, with some silty sand (and gravel at BH14 and BH15), atop predominantly limestone bedrock. The fill material consists of silty sand with gravel and some cobbles. Traces of plastic, slag and metal pieces were observed in BH1 at depths of 0.91 m and 2.44 m, BH8 between 0.30 and 1.10 m, and BH16 from below the asphalt surface and 1.37 m. Bedrock was cored in BH1, BH2, BH4, BH6, BH9, BH10 and BH11 to depths ranging from 7.09 and 7.87 m below grade.

Groundwater monitoring wells were installed at BH1, BH2, BH3, BH4, BH6, BH9, BH10 and BH11. In recent years, the groundwater monitoring wells at BH3 and BH4 have been destroyed and are no longer present. Site stratigraphy is shown on Drawings PE3391-6A - Cross-Section A-A' – Soil and PE3391-6B - Cross-Section A-A' - Groundwater.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on April 5, 2017, using an electronic water level meter. Groundwater levels are summarized below in Table 4. All measurements are geodetic based on the topographic site plan prepared by Stantec Geomatics Ltd.

Table 4: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	64.76	2.50	62.26	April 5, 2017
BH2	63.04	2.25	60.79	April 5, 2017
BH6	63.16	2.08	61.08	April 5, 2017
BH9	63.44	2.35	61.09	April 5, 2017
BH10	63.12	2.05	61.07	April 5, 2017
BH11	63.42	2.54	60.88	April 5, 2017

Based on the groundwater levels collected during the April 5, 2017 groundwater sampling event, the groundwater flow at the subject property is considered to be in a northward direction, consistent with the anticipated regional groundwater flow direction towards the Ottawa River.

No free product was observed in the monitoring wells sampled at the subject site, however a hydrocarbon odour was noted within the groundwater samples collected from BH9.

5.3 Fine-Medium Soil Texture

Based on field soil observations, fine-grained soil standards are not applicable to the subject site.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in organic vapour readings of 0.2 ppm to 242 ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

The organic vapour readings obtained from field screening of soil samples identified the potential for PHC contamination in BH3-SS6 (242 ppm).

Higher-fraction hydrocarbons may not be as readily detectable by combustible gas or PID detectors.

Visually, pieces of slag were observed in some of the fill samples from BH1, and traces of plastic and glass were noted in fill samples from BH16.

5.5 Soil Quality

Five (5) soil samples from the current investigation were submitted for analysis of a combination of metals, PHCs, BTEX, VOCs and PAH. The results of the testing are presented below. Also provided are the previous analytical results from the 2008 and 2014 investigations. Laboratory certificates for the recent analytical testing are presented in Appendix A.

Table 5:
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) – March 29/30, 2017					MOECC Table 7 Residential Coarse Standards (µg/g)
		BH9-SS2	BH10-SS3	BH14-AU1	BH15-AU1	BH16-SS2	
Antimony	1.0	nd	nd	nd	nd	nd	7.5
Arsenic	1.0	nd	nd	3.4	nd	10.5	18
Barium	1.0	61.1	42.9	82.8	**432**	**757**	390
Beryllium	1.0	nd	nd	nd	nd	nd	4
Boron (total)	1.0	4.3	3.7	8.2	15.9	21.7	120
Cadmium	0.5	nd	nd	nd	nd	1.1	1.2
Chromium (total)	1.0	8.3	7.4	16.1	17.0	95.4	160
Chromium VI	0.4	nd	nd	nd	nd	nd	8
Cobalt	1.0	4.4	3.9	6.3	6.4	8.3	22
Copper	1.0	12.4	9.6	10.9	14.3	126	140
Lead	1.0	12.4	5.8	13.5	38.7	**308**	120
Mercury	0.1	nd	nd	nd	nd	**0.6**	0.27
Molybdenum	1.0	nd	nd	nd	nd	1.3	6.9
Nickel	1.0	8.8	6.9	10.6	14.0	26.0	100
Selenium	1.0	nd	nd	nd	nd	nd	2.4
Silver	0.5	nd	nd	nd	nd	0.9	20
Thallium	1.0	nd	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	nd	23
Vanadium	1.0	16.5	15.4	25.3	23.9	29.5	86
Zinc	1.0	23.0	25.2	25.0	32.5	**683**	340

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- **Bold and underlined** – Value exceeds selected MOECC Standard

All metals parameter concentrations were found to be in compliance with the MOECC Table 7 standards with the exception of samples collected from BH15 and BH16.

Soil Sample BH15-SS2 was later submitted for barium analysis to confirm that the barium exceedance noted in Sample BH15-AU1 was limited to the upper fill material. Barium in that sample (Sample BH15-SS2) was in compliance with the MOECC Table 7 standard.

Table 6:
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MOECC Table 7 Residential Coarse Standards (µg/g)
		October 27, 2008	October 8, 2014	
		BH8-SS2	BH1-SS3	
Antimony	1.0	nd	nd	7.5
Arsenic	1.0	18	**113**	18
Barium	1.0	**720**	309	390
Beryllium	1.0	0.6	nd	4
Boron (total)	1.0	1.5	38.7	120
Cadmium	0.5	**4.8**	nd	1.2
Chromium (total)	1.0	89	22.1	160
Chromium VI	0.4	nd	na	8
Cobalt	1.0	13	8.7	22
Copper	1.0	90	55.7	140
Iron	200	41,900	nv	nv
Lead	1.0	**515**	67.4	120
Mercury	0.1	**0.3**	na	0.27
Molybdenum	1.0	2	4.3	6.9
Nickel	1.0	34	24.4	100
Selenium	1.0	1	nd	2.4
Silver	0.5	0.5	nd	20
Thallium	1.0	nd	nd	1
Uranium	1.0	na	nd	23
Vanadium	1.0	38	39.0	86
Zinc	1.0	**2720**	82.7	340

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOE value reported
- **Bold and underlined** – Value exceeds selected MOECC Standard

Barium, cadmium, lead, mercury and zinc were identified in Sample BH8-SS2 (from October, 2008) in excess of the selected MOECC Table 7 standards. Arsenic was indentified in Sample BH1-SS3 in excess of the MOECC Table 7 standard. All other metals parameters were in compliance with the selected MOECC standards.

Table 7:
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) March 29, 2017 BH10-SS5	MOECC Table 7 Residential Coarse Standards (µg/g)
Acetone	0.5	nd	16
Benzene	0.02	nd	0.21
Bromodichloromethane	0.05	nd	13
Bromoform	0.05	nd	0.27
Bromomethane	0.05	nd	0.05
Carbon Tetrachloride	0.05	nd	0.05
Chlorobenzene	0.05	nd	2.4
Choroform	0.05	nd	0.05
Dibromochloromethane	0.05	nd	9.4
Dichlorodifluoromethane	0.05	nd	16
1,2-Dichlorobenzene	0.05	nd	3.4
1,3-Dichlorobenzene	0.05	nd	4.8
1,4-Dichlorobenzene	0.05	nd	0.083
1,1-Dichloroethane	0.05	nd	3.5
1,2-Dichloroethane	0.05	nd	0.05
1,1-Dichloroethylene	0.05	nd	0.05
Cis-1,2-Dichloeothylene	0.05	nd	3.4
Trans-1,2-Dichloroethylene	0.05	nd	0.084
1,2-Dichloropropane	0.05	nd	0.05
1,3-Dichloropropene	0.05	nd	0.05
Ethylbenzene	0.05	nd	2
Ethylene Dibromide	0.05	nd	0.05
Hexane	0.05	nd	2.8
Methyl Ethyl Ketone	0.5	nd	16
Methyl Isobutyl Ketone	0.5	nd	1.7
Methyl tert-butyl ketone	0.05	nd	0.75
Methylene Chloride	0.05	nd	0.1
Styrene	0.05	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	0.05
Tetrachloroethylene	0.05	nd	0.28
Toluene	0.05	nd	2.3
1,1,1-Trichloroethane	0.05	nd	0.38
1,1,2-Trichloroethane	0.05	nd	0.05
Trichloroethylene	0.05	nd	0.061
Trichlorofluoromethane	0.05	nd	4
Vinyl Chloride	0.02	nd	0.02
Xylenes	0.05	nd	3.1

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC standards

No VOC parameters were detected above the laboratory detection limits. All VOC concentrations are in compliance with the MOECC Table 7 standards.

A soil sample (BH1-SS4) was later analysed for the full VOC suite, based on the earlier BTEX results. All VOC parameters from Sample BH1-SS4 were non-detect, and in compliance with the MOECC Table 7 standards.

Table 8:
Analytical Test Results – Soil
BTEX and PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) March 29/30, 2017				MOECC Table 7 Residential Coarse Standards (µg/g)
		BH9-SS2	BH10-SS5	BH13-SS2	BH14-SS3	
Benzene	0.02	nd	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	nd	55
PHC F2	4	nd	nd	nd	nd	98
PHC F3	8	nd	nd	27	24	300
PHC F4	6	nd	nd	41	27	2,800

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC standards

No BTEX parameters were detected in any of the samples, and no PHC parameters were detected in Samples BH9-SS2 and BH10-SS5. The PHC parameters detected in Samples BH13-SS2 and BH14-SS3 are in compliance with MOECC Table 7 standards.

Table 9:
Analytical Test Results – Soil
BTEX and PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MOECC Table 7 Residential Coarse Standards (µg/g)
		October 27, 2008	October 8, 2014	October 9, 2014	
		BH8-SS2	BH1-SS4	BH3-SS6	
Benzene	0.02	na	nd	nd	0.21
Ethylbenzene	0.05	na	nd	nd	2
Toluene	0.05	na	nd	nd	2.3
Xylenes	0.05	na	nd	nd	3.1
PHC F1	7	nd	nd	**73**	55
PHC F2	4	33	nd	23	98
PHC F3	8	**409**	nd	nd	300
PHC F4	6	1,130	nd	nd	2,800

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC standards

Petroleum hydrocarbon (PHC) fraction F3 was identified in Soil Sample BH8-SS2 at a concentration that exceeds the MOECC Table 7 standard. PHC F1 was identified in Sample BH3-SS6 in excess of the selected MOECC Table 7 standard. All other BTEX and PHC parameters are in compliance with MOECC Table 7 standards.

Table 10:
Analytical Test Results – Soil
PAH

Parameter	MDL (µg/g)	Soil Samples (µg/g) March 29/30, 2017			MOECC Table 7 Residential Coarse Standards (µg/g)
		BH10-SS3	BH15-AU1	BH16-SS2	
Acenaphthene	0.02	nd	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	0.06	0.15
Anthracene	0.02	nd	nd	0.11	0.67
Benzo[a]anthracene	0.02	nd	0.03	0.27	0.5
Benzo[a]pyrene	0.02	nd	0.05	**0.35**	0.3
Benzo[b]fluoranthene	0.02	nd	0.06	0.37	0.78
Benzo[g,h,i]perylene	0.02	nd	0.04	0.24	6.6
Benzo[k]fluoranthene	0.02	nd	0.02	0.19	0.78
Chrysene	0.02	nd	0.04	0.27	7
Dibenzo[a,h]anthracene	0.02	nd	nd	0.06	0.1
Fluoranthene	0.02	nd	0.07	0.48	0.69
Fluorene	0.02	nd	nd	0.04	62
Indeno[1,2,3-cd]pyrene	0.02	nd	0.03	0.22	0.38
Methylnaphthalene (1&2)	0.04	nd	nd	0.06	0.99
Naphthalene	0.01	nd	nd	0.05	0.6
Phenanthrene	0.02	nd	0.06	0.19	6.2
Pyrene	0.02	nd	0.06	0.42	78

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC standards

No PAH parameters were detected above laboratory detection limits in Sample BH10-SS3 and all PAH parameters detected in Sample BH15-AU1 were in compliance with MOECC standards. Benzo[a]pyrene was detected in Sample BH16-SS2 above the MOECC Standard; all other parameters were in compliance with the site standards.

The maximum concentrations of the analyzed parameters in the soil at the site are summarized below in Table 11.

Table 11:
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample	Depth Interval (m BGS) / Stratigraphic Unit
Arsenic	**113**	BH1-SS3	1.37-1.83 m; Fill
Barium	**757**	BH16-SS2	0.76–1.37 m; Fill
Beryllium	0.6	BH8-SS2	0.76-1.01 m; Fill
Boron (total)	38.7	BH1-SS3	1.37-1.83 m; Fill
Cadmium	**4.8**	BH8-SS2	0.76-1.01 m; Fill
Chromium (total)	95.4	BH16-SS2	0.76–1.37 m; Fill
Cobalt	13	BH8-SS2	0.76-1.01 m; Fill
Copper	126	BH16-SS2	0.76–1.37 m; Fill
Iron	41900	BH8-SS2	0.76-1.01 m; Fill
Lead	**515**	BH8-SS2	0.76-1.01 m; Fill
Mercury	**0.6**	BH16-SS2	0.76–1.37 m; Fill
Molybdenum	4.3	BH1-SS3	1.37-1.83 m; Fill
Nickel	34	BH8-SS2	0.76-1.01 m; Fill
Selenium	1	BH8-SS2	0.76-1.01 m; Fill
Silver	0.9	BH16-SS2	0.76–1.37 m; Fill
Vanadium	39	BH1-SS3	1.37-1.83 m; Fill
Zinc	**2720**	BH8-SS2	0.76-1.01 m; Fill
PHC F1	**73**	BH3-SS6	3.05-3.38 m; Fill
PHC F2	33	BH8-SS2	0.76-1.01 m; Fill
PHC F3	**409**	BH8-SS2	0.76-1.01 m; Fill
PHC F4	1,130	BH8-SS2	0.76-1.01 m; Fill
Acenaphthylene	0.06	BH16-SS2	0.76–1.37 m; Fill
Anthracene	0.11	BH16-SS2	0.76–1.37 m; Fill
Benzo[a]anthracene	0.27	BH16-SS2	0.76–1.37 m; Fill
Benzo[a]pyrene	**0.35**	BH16-SS2	0.76–1.37 m; Fill
Benzo[b]fluoranthene	0.37	BH16-SS2	0.76–1.37 m; Fill
Benzo[g,h,i]perylene	0.24	BH16-SS2	0.76–1.37 m; Fill
Benzo[k]fluoranthene	0.19	BH16-SS2	0.76–1.37 m; Fill
Chrysene	0.27	BH16-SS2	0.76–1.37 m; Fill
Dibenzo[a,h]anthracene	0.06	BH16-SS2	0.76–1.37 m; Fill
Fluoranthene	0.48	BH16-SS2	0.76–1.37 m; Fill
Fluorene	0.04	BH16-SS2	0.76–1.37 m; Fill
Indeno[1,2,3-cd]pyrene	0.22	BH16-SS2	0.76–1.37 m; Fill
Methylnaphthalene (1&2)	0.06	BH16-SS2	0.76–1.37 m; Fill
Naphthalene	0.05	BH16-SS2	0.76–1.37 m; Fill
Phenanthrene	0.19	BH16-SS2	0.76–1.37 m; Fill
Pyrene	0.42	BH16-SS2	0.76–1.37 m; Fill

Notes:
- **Bold and underlined** – Value exceeds MOECC Table 7 standards

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples were collected from the recent groundwater monitoring wells installed at BH9, BH10 and BH11. Samples were also collected from older wells installed at BH1, BH2 and BH6 during previous work and the current study.

The results of the analytical testing are presented below in Tables 12 - 17. The laboratory certificates of analysis are provided in Appendix 1.

Table 12:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L)		MOECC Table 7 Coarse Standards (µg/L)
		March 14, 2017	April 5, 2017	
		BH6-GW2	BH11-GW1	
Acetone	5.0	nd	nd	100,000
Benzene	0.5	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	67,000
Bromoform	0.5	nd	nd	5
Bromomethane	0.5	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	140
Chloroform	0.5	nd	nd	2
Dibromochloromethane	0.5	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	54
Ethylene Dibromide	0.2	nd	nd	0.2
Hexane	1.0	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	5,200
Methyl tert-butyl Ether	2.0	nd	nd	15
Methylene Chloride	5.0	nd	nd	26
Styrene	0.5	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	1.1

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold** – Value exceeds selected MOECC Standard

Table 12 (continued):
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L)		MOECC Table 7 Coarse Standards (µg/L)
		March 14, 2017	April 5, 2017	
		BH6-GW2	BH11-GW1	
1,1,2,2-Tetrachloroethane	0.5	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	0.5
Toluene	0.5	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	2,000
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes	0.5	1.6	nd	72

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold** – Value exceeds selected MOECC Standard

All VOC parameters were found to be in compliance with the MOECC Table 7 standards.

Table 13:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L)		MOECC Table 7 Coarse Standards (µg/L)
		October 15, 2014		
		BH1-GW1	BH2-GW1	
Acetone	5.0	219	22.2	100,000
Benzene	0.5	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	67,000
Bromoform	0.5	nd	nd	5
Bromomethane	0.5	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	140
Chloroethane	1.0	na	na	nv
Chloroform	0.5	nd	1.3	2
Chloromethane	3.0	na	na	nv
Dibromochloromethane	0.5	nd	nd	65,000
Dichlorodifluoromethane	1.0	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	0.5

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold** – Value exceeds selected MOECC Standard

Table 13 (continued):
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) October 15, 2014		MOECC Table 7 Coarse Standards (µg/L)
		BH1-GW1	BH2-GW1	
1,1-Dichloroethane	0.5	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	54
Ethylene Dibromide	0.2	nd	nd	0.2
Hexane	1.0	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	5,200
Methyl tert-butyl Ether	2.0	nd	nd	15
Methylene Chloride	5.0	nd	nd	26
Styrene	0.5	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	0.5
Toluene	0.5	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	2,000
1,3,5-Trimethylbenzene	0.5	na	na	nv
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes	0.5	nd	nd	72

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold** – Value exceeds selected MOECC Standard

All VOC parameters from the 2014 Sampling event were in compliance with the MOECC table 7 standards.

Table 14:
Analytical Test Results – Groundwater
PHC and BTEX

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MOECC Table 7 Coarse Standards (µg/L)
		March 14, 2017	April 5, 2017			
		BH6-GW2	BH9-GW1	BH10-GW1	BH11-GW1	
Benzene	0.5	nd	**109**	nd	nd	0.5
Ethylbenzene	0.5	nd	**628**	nd	nd	54
Toluene	0.5	nd	72.0	nd	nd	320
Xylenes	0.5	1.6	**1400**	nd	nd	72
PHCs F1	25	nd	**4820**	nd	nd	420
PHCs F2	100	nd	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	nd	500

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

All parameter concentrations were found to be in compliance with the MOECC Table 7 standards with the exception of benzene, ethylbenzne, xylene and the F1 PHC fraction in Sample BH9-GW1.

Table 15:
Analytical Test Results – Groundwater
PHC and BTEX

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MOECC Table 7 Coarse Standards (µg/L)
		October 15, 2014		
		BH2-GW1	BH3-GW1	
Benzene	0.5	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	54
Toluene	0.5	nd	nd	320
Xylenes	0.5	nd	nd	72
PHCs F1	25	107	nd	420
PHCs F2	100	nd	nd	150
PHCs F3	100	nd	nd	500
PHCs F4	100	nd	nd	500

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

Petroleum hydrocarbon faction 1 was identified in BH2-GW1, below the MOECC Table 7 standard. All PHC and BTEX parameters comply with MOECC Table 7 standards.

Table 16:
Analytical Test Results – Groundwater
PAH

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) April 5, 2017		MOECC Table 7 Residential Coarse Standards (µg/L)
		BH10-GW1	BH6-GW1	
Acenaphthene	0.05	nd	nd	17
Acenaphthylene	0.05	nd	nd	1
Anthracene	0.01	nd	nd	1
Benzo[a]anthracene	0.01	nd	nd	1.8
Benzo[a]pyrene	0.01	nd	nd	0.81
Benzo[b]fluoranthene	0.05	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	nd	02
Benzo[k]fluoranthene	0.05	nd	nd	0.4
Chrysene	0.05	nd	nd	0.7
Dibenzo[a,h]anthracene	0.05	nd	nd	0.4
Fluoranthene	0.01	nd	nd	44
Fluorene	0.05	nd	nd	290
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	0.2
Methylnaphthalene (1&2)	0.10	nd	nd	1500
Naphthalene	0.05	nd	nd	7
Phenanthrene	0.05	nd	nd	380
Pyrene	0.01	nd	nd	5.7

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC standards

No PAH parameters were detected in the submitted samples. All parameters are in compliance with the MOECC Table 7 standards.

Table 17:
Analytical Test Results – Groundwater
Metals

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) March 14, 2017		MOECC Table 7 Residential Coarse Standards (µg/L)
		BH1-GW2	BH2-GW2	
Antimony	0.5	nd	nd	16,000
Arsenic	1	nd	nd	1,500
Barium	1	193	270	23,000

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC Standard

Table 17 (continued):
Analytical Test Results – Groundwater
Metals

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) March 14, 2017		MOECC Table 7 Residential Coarse Standards (µg/L)
		BH1-GW2	BH2-GW2	
Beryllium	0.5	nd	nd	53
Boron (total)	10	259	230	36,000
Cadmium	0.1	nd	nd	2.1
Chromium (total)	1	nd	nd	640
Chromium VI	10	nd	nd	110
Cobalt	0.5	2.7	nd	52
Copper	0.5	nd	nd	69
Lead	0.1	0.4	nd	20
Mercury	0.1	0.8	nd	0.1
Molybdenum	0.5	11	nd	7,300
Nickel	1	nd	nd	390
Selenium	1	nd	nd	50
Silver	0.1	nd	nd	1.2
Sodium	200	165000	116000	1,800,000
Thallium	0.1	nd	nd	400
Uranium	0.1	1.0	0.3	330
Vanadium	0.5	nd	nd	200
Zinc	5	22	nd	890

Notes:
- MDL – Method Detection Limit
- na – Not analyzed
- nd – Not detected above the MDL
- nv – No MOECC value reported
- **Bold and underlined** – Value exceeds selected MOECC Standard

All metals parameters are in compliance with the MOECC Table 7 standards.

Table 18: Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole-Sample	Screened Interval (m BGS)
Acetone	219	BH1-GW1	4.04 – 7.09 m; Bedrock
Chloroform	1.3	BH2-GW1	3.96 – 7.01 m; Bedrock
Xylenes	1.6	BH6-GW2	3.05 – 7.87 m; Bedrock
Benzene	**109**	BH9-GW1	2.30 – 5.39 m, Bedrock
Ethylbenzene	**628**	BH9-GW1	2.30 – 5.39 m, Bedrock
Toluene	72	BH9-GW1	2.30 – 5.39 m, Bedrock
Xylenes	**1400**	BH9-GW1	2.30 – 5.39 m, Bedrock
PHC F1	**4820**	BH9-GW1	2.30 – 5.39 m, Bedrock
PHC F4	1.6	BH6-GW2	3.05 – 7.87 m; Bedrock

Table 18: Maximum Concentrations – Groundwater (continued)			
Parameter	**Maximum Concentration (µg/L)**	**Borehole-Sample**	**Screened Interval (m BGS)**
Barium	270	BH2-GW2	3.96 – 7.01 m; Bedrock
Boron (total)	259	BH1-GW2	4.04 – 7.09 m; Bedrock
Cobalt	2.7	BH1-GW2	4.04 – 7.09 m; Bedrock
Lead	0.4	BH1-GW2	4.04 – 7.09 m; Bedrock
Mercury	0.8	BH1-GW2	4.04 – 7.09 m; Bedrock
Molybdenum	11	BH1-GW2	4.04 – 7.09 m; Bedrock
Sodium	165000	BH1-GW2	4.04 – 7.09 m; Bedrock
Uranium	1	BH1-GW2	4.04 – 7.09 m; Bedrock
Zinc	22	BH1-GW2	4.04 – 7.09 m; Bedrock
Notes: ▪ **Bold** – Value exceeds MOECC Table 7 standards			

All other parameter concentrations were below laboratory detection limits.

5.7 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report, potentially contaminating activities (PCAs) that are considered to represent areas of potential environmental concern (APECs) on the subject site consist of:

- The former use of the northern portion of the subject site (1976 Scott Street) as a retail fuel outlet, between 1971 and 2002.
- The former and continued use of various units within the commercial building on the southeast portion of the subject site as various automotive service garages and autobody shops, since the 1940's.
- Possible importation of fill of unknown quality during the former landfilling activities in the area of the subject site, prior to 1928.

These activities are all considered to have had the potential to have introduced contamination to the soil and/or groundwater under the subject site.

Subsurface Structures and Utilities

Public and private underground service locates were completed for a 5 m radius around each borehole location, prior to the subsurface investigation. Various underground utilities including sewers and private drainage lines were identified in the vicinity of the boreholes. No private potable water wells or septic systems are present on the subject site.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE3391-6A and PE3391-6B. Stratigraphy consists of:

- Concrete in BH1 and BH2 with a thickness of 0.15 m (interior of building). Asphalt in BH6, BH7 and BH8 with a thickness of 0.05 to 0.06 m.
- Fill, generally consisting of silty sand with gravel (with pieces of slag in BH1, metal pieces in BH8 and some glass in BH16), varying in thickness from 1.04 to 2.29 m, with deeper fill in the former underground storage tank nest location at BH3 (3.38 m). Groundwater was not observed in this stratigraphic unit.
- Silty sand with gravel, and cobbles was identified in BH7 with a thickness of 1.58 m. Gravel was also encountered in Boreholes BH14 and BH15.
- Limestone bedrock - this unit was confirmed in BH1, BH2, BH4, BH6, BH9. BH1- and BH11, where bedrock was cored to depths between 1.19 to 7.87 m below grade. Groundwater was observed in this stratigraphic unit. This is the deepest unit investigated.

Hydrogeological Characteristics

Groundwater was encountered in the limestone bedrock at the subject site. The upper bedrock unit is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on April 5, 2017. Water levels are summarized above in Section 6.2 of this report and are shown on the attached drawings.

Based on measured groundwater levels, the groundwater flow direction at the subject property is in a northward direction, heading towards the Ottawa River.

Approximate Depth to Bedrock

Bedrock was confirmed in Boreholes BH1, BH2, BH4, BH6, BH9, BH10, and BH11 at depths of 1.19 to 3.30 m below grade.

Approximate Depth to Water Table

The depth to water table at the subject site varies between approximately 2.05 and 2.54 m below existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does apply to the subject site in that the subject site is a Shallow Soil Property; bedrock is estimated at depths less than 2 m below grade across more than two thirds (2/3) of the entire site. It is not located within 30 m of a water body.

Fill Placement

Fill material was identified at the subject site. As addressed in the Phase I-ESA, potentially impacted fill deposition was considered to be a potentially contaminating activity, associated with the reported former landfilling activities in the area the subject site.

Proposed Buildings and Other Structures

It is Paterson's understanding that the subject site will be developed with three (3) mixed use (commercial/residential) buildings.

Existing Buildings and Structures

The subject site is currently occupied by two, 2-storey residential dwellings (311 and 315 Tweedsmuir Avenue), a small vacant kiosk (1976 Scott Street) and a commercial building with a partial second storey (320 McRae Avenue). No other buildings or structures are present on the subject site.

Water Bodies

The Ottawa River is the closest body of water to the subject site, located generally to the north of the subject site, with the closest point approximately 800 m west.

Areas of Natural Significance

No areas of natural significance are present on the subject site.

Environmental Condition

Areas Where Contaminants are Present

Areas where contaminants are present (identified as part of the current Phase II-ESA) include the parking area to the north of the building along McRae Avenue (metals, PAH), and a portion of the parking area to the south of the building (barium).

During previous investigations; contaminants were identified below the southern portion of the building (metals), within the former tank test (PHC), and in the space between the building and McRae Avenue (metals, PHC).

Groundwater impacts (PHC, BTEX) were identified in the monitoring well located within the former pump island area.

The areas where contaminants are present in concentrations greater than the MOECC Table 7 standards are shown on Drawing PE3391-4 and PE3391-5.

Types of Contaminants

Based on the recent analytical testing, contaminants found at concentrations greater than the MOECC Table 7 standards at the subject site consist of various metals, the F1 and F3 petroleum hydrocarbon fractions, and benzo[a]pyrene in soil. In groundwater, identified contaminants include the F1 petroleum hydrocarbon fraction, benzene, ethylbenzene, and xylenes.

Contaminated Media

Based on the results of the Phase II ESA, the contaminants of concern are present in the fill at various locations on the subject site, in the southeast part of he site around the commercial building.

Hydrocarbon and BTEX impacts were also detected in the groundwater at one groundwater well location, BH9.

What Is Known About Areas Where Contaminants Are Present

Contaminants are located in the vicinity of the commercial structure on the subject site, in the area of the former underground storage tank nest and pump island associated with the former retail fuel outlet. Based on the nature of the contaminants and their locations, the contaminants are suspected to be from imported poor quality fill, the operation of automotive services garages, autobody shops on the eastern portion of the property and the former operation of the retail fuel outlet on northeastern portion of the subject site.

Distribution of Contaminants

The horizontal distribution of contaminants is shown on Drawing PE3391-4 and PE3391-5.

Vertically, the soil contaminants were observed in the fill strata in BH1, BH3, BH8, BH15 and BH16. Suspect fill (traces of slag and metal pieces) was identified in BH1 and BH8, and trace amounts of glass and plastic were identified in BH16.

Groundwater contamination was identified in the monitoring well at BH9, and is considered to be localised to the area around the former pump island.

Discharge of Contaminants

The source of metal and PAH contaminants may be associated with the importation of poor quality fill material or activities associated with the past use of the commercial building on site. The presence of PHC and BTEX contamination in the soil and groundwater is considered to be associated with the use of the subject site as various automotive service garages and autobody shops, as well as, the former use of the northern portion of the property as a retail fuel outlet.

Migration of Contaminants

The migration of metals and PAH contaminants within the soil, or from the soil to groundwater, is expected to be limited due to the fact that the groundwater table was encountered primarily within the bedrock, and not within the fill above it. Furthermore, metals and PAHs were tested in the groundwater and all parameters were in compliance with the site standards.

PHC and BTEX impacts have a greater potential to migrate through the bedrock to the groundwater table and migrate with the groundwater flow. PHC and BTEX contaminants are typically light non-aqueous phase liquids (LNAPLs), which have a specific density less than water, which would mean they would sit atop the groundwater table.

The migration of contaminants within site groundwater is interpreted to be controlled primarily by groundwater flow at the subject site as well as seasonal fluctuations.

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.

Based on analytical test results, downward leaching through the fill layer into the water table has not occurred, primarily due to the layer of asphalt covering most of the parking lot and the buildings covering the remainder of the property. Furthermore, metals are not known to readily dissolve in groundwater.

Potential for Vapour Intrusion

The potential for vapour intrusion into the existing buildings is considered to be negligible, and insignificant with respect to the vapours already present in the garage spaces due to the products typically used in auto garages. Furthermore, only metals were identified exceedance in the soil from the boreholes drilled inside the commercial building, and metals do not easily enter the vapour state.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the commercial and residential properties addressed 320 McRae Avenue, 1976 Scott Street, 311 and 315 Tweedsmuir Avenue, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern (APECs) identified during the Phase I ESA. The APECs included the former landfill in the area of the subject site, the former and continued use of the eastern portion of the subject site as various automotive service garages and autobody shops, as well as, the former use of the northern portion of the subject site as a retail fuel outlet.

During a previous investigation in 2008, petroleum hydrocarbon (PHC) fraction F3, barium, cadmium, lead, mercury and zinc impacted fill was identified on the east side of the commercial building and impacted groundwater (benzene, chloroform, toluene, xylenes and PHC (F1)) was identified in BH6, on the north side of the commercial building. Field observations indicated the presence of impacted groundwater in BH4, in the former pump island area. This well was not found at the time of the current assessment and could not be assessed.

A 2014 subsurface investigation at the subject site was conducted on October 8 and 9, 2014 and consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells.

An arsenic concentration in BH1 and a petroleum hydrocarbon (PHC) fraction 1 (F1) concentration in BH3 were identified in excess of the selected MOECC Table 7 standards.

Metals impacted fill in BH1 was visually identified at depths of 0.91 and 2.44 m, while in BH3 a thin layer of PHC impacted fill was identified between 3.28 and 3.38 m below ground surface, immediately on top of bedrock surface.

Groundwater samples were obtained from the monitoring wells at BH1 and BH2, and submitted for analysis of PHCs and volatile organic compounds (VOCs). None of the analytical parameters were found to exceed the selected MOECC Table 7 standards.

The current investigation included the placement of eight (8) boreholes, three (3) of which were instrumented with groundwater monitoring wells.

Metals in excess of the MOECC Table 7 standards were identified in the fill material at BH15 and BH16. One PAH parameter was also identified in excess of the MOECC Table 7 standard in borehole BH16.

All groundwater was found to be in compliance with the MOECC Table 7 standards with the exception of the groundwater from BH9, where the F1 fraction petroleum hydrocarbon, benzene, ethylbenzene, and xylenes were identified above the MOECC Table 7 standard. The groundwater from BH6 was analysed again and all hydrocarbon and BTEX parameters were in compliance with the site standards.

Recommendations

Soil

Metal, PAH, and PHC concentrations in some soils are present at the subject site in concentrations in excess of the selected MOECC Table 7 standards. The presence of metals impacted fill beneath the commercial building and petroleum impacts in the former tank nest area are not considered to represent an immediate risk to the current use of the subject site. It is understood that, the site is being considered for redevelopment.

Any impacted soil removed from the site during redevelopment will require disposal at an approved waste disposal facility. Prior to disposal, a toxicity characteristic leaching procedure analysis will be required on a representative soil sample. It is recommended that Paterson personnel be present onsite during the soil excavation program to direct excavation activities in the areas where impacted material has been identified or is expected to exist. Additional testing may be required to effectively identify and delineate the impacted fill on the subject site.

If any soil is to remain on-site, it is recommended that confirmatory soil samples be collected upon completion of the soil remediation program to ensure that the site is in compliance with the MOECC Table 7 Standards.

Groundwater

Groundwater in the vicinity of the former pump island, located at the northern end of the property, appears to have been impacted with the F1 PHC fraction, as well as benzene, ethylbenzene, and xylenes.

Depending upon the volume of impacted groundwater encountered during future site development, and the depth of the future site works, several options may be available to treat the groundwater. The removal of impacted groundwater from the site by a licensed pumping contractor would be a feasible option for smaller volumes, while an on-site treatment system would likely be more economical for larger volumes over a longer period of time. An on-site treatment system would discharge to the City of Ottawa sewer system. Prior to discharging treated groundwater to the municipal sewer system, a Sanitary Sewer Agreement will be required from the City of Ottawa's Sewer Use Program. Additional groundwater monitoring wells may be required following the completion of the site remediation program to ensure that the site meets the MOECC Table 7 Standards.

If site development does not occur in the near future, it is recommended that the groundwater from BH9 be retested to confirm the quality of the groundwater and the need for any remediation.

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 Estate of Carson Unsworth. Permission and notification from the Estate of Carson Unsworth and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Adrian Menyhart, P.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- The Estate of Carson Unsworth
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3391-3R – TEST HOLE LOCATION PLAN

DRAWING PE3391-4 – ANALYTICAL TESTING PLAN - SOIL

DRAWING PE3391-5 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE3391-6A – CROSS-SECTION A-A' – SOIL

DRAWING PE3391-6B – CROSS-SECTION A-A' – GROUNDWATER

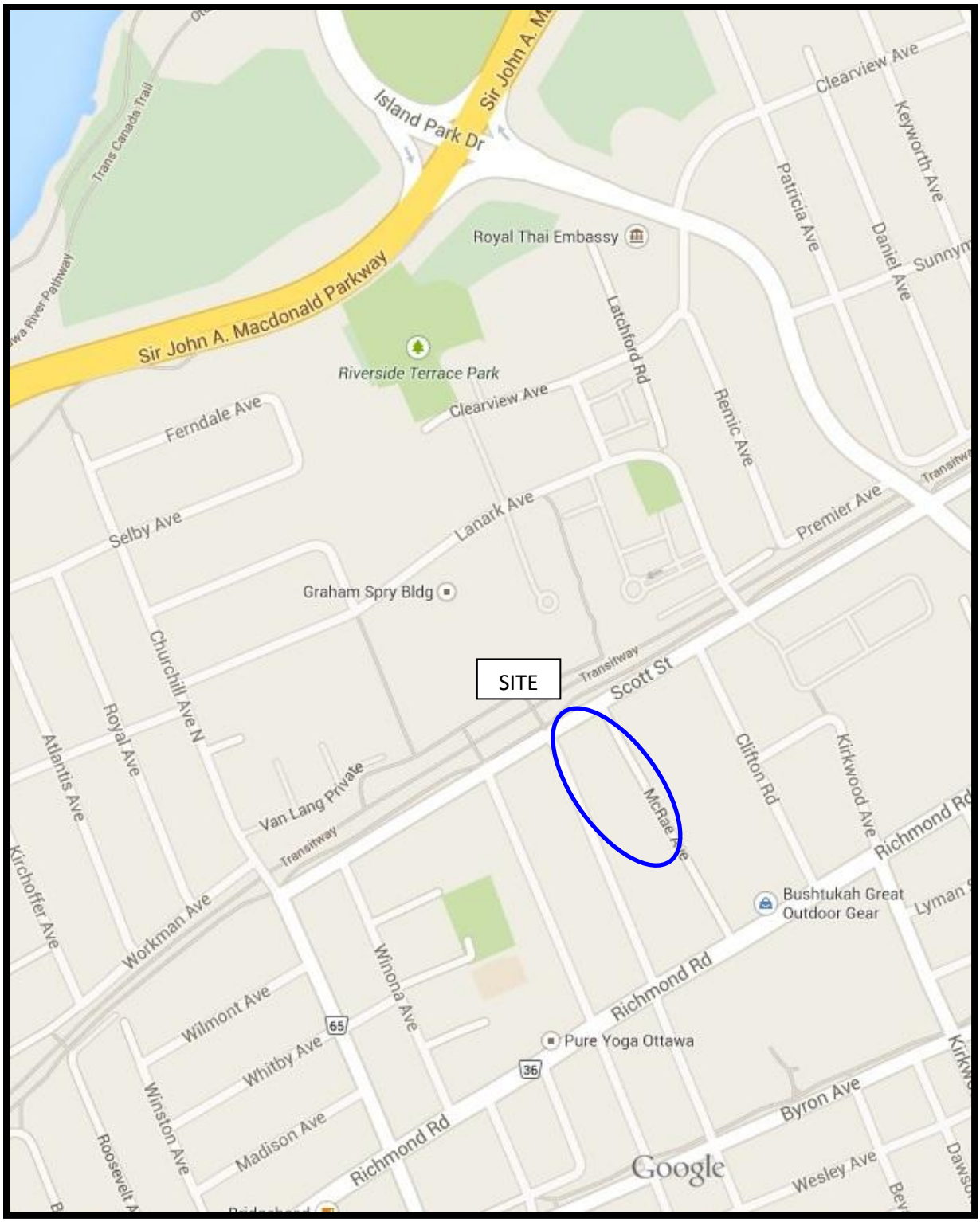
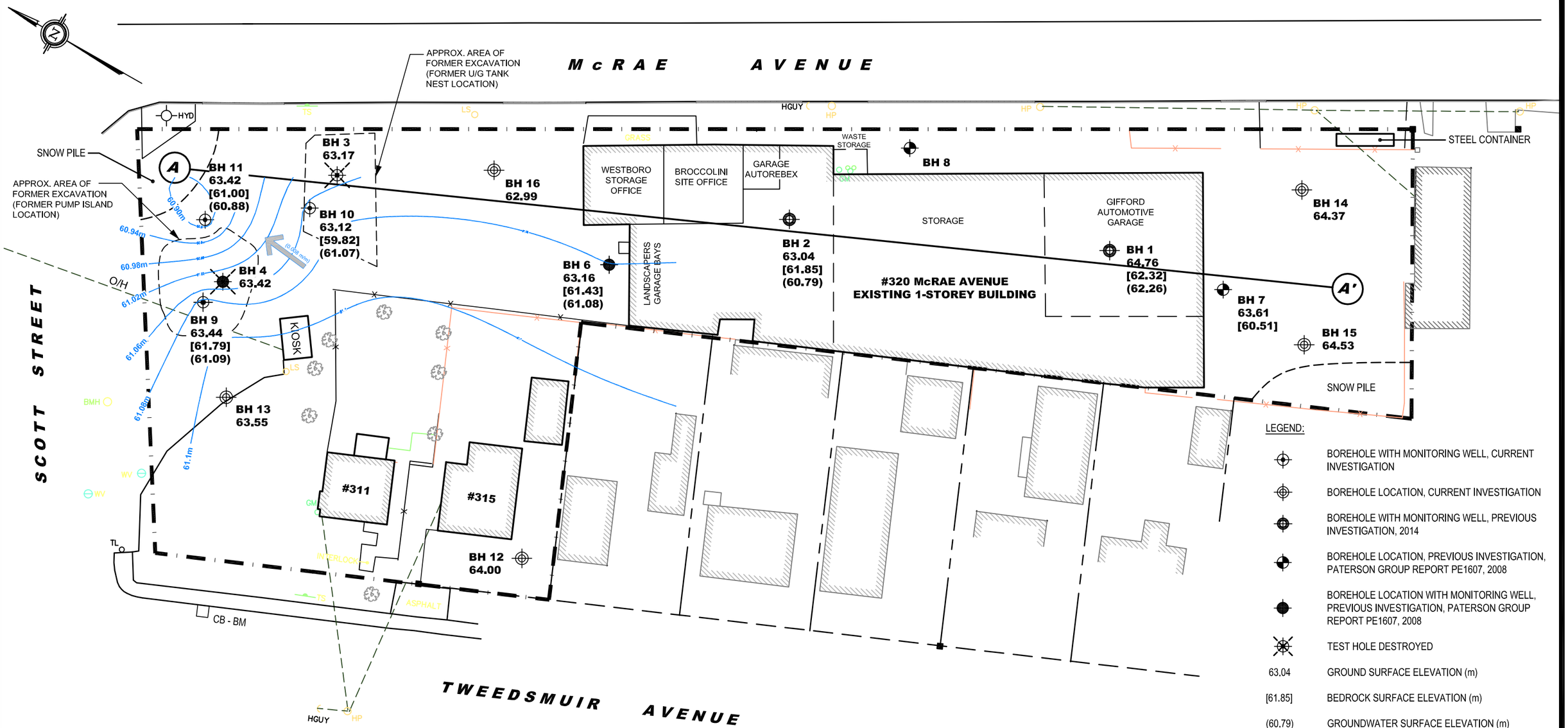


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE WITH MONITORING WELL, CURRENT INVESTIGATION
- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL, PREVIOUS INVESTIGATION, 2014
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE1607, 2008
- BOREHOLE LOCATION WITH MONITORING WELL, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE1607, 2008
- TEST HOLE DESTROYED
- 63.04 — GROUND SURFACE ELEVATION (m)
- [61.85] — BEDROCK SURFACE ELEVATION (m)
- (60.79) — GROUNDWATER SURFACE ELEVATION (m) (APRIL 5, 2017)
- A — A' — CROSS-SECTION LOCATION
- 61.1m — GROUNDWATER CONTOUR
- 10.08 mm/yr — APPROXIMATE GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

BENCHMARK (BM) - TOP OF CATCH BASIN. GEODETIC ELEVATION = 63.13m.

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NO.	REVISIONS	DATE	INITIAL

THE ESTATE OF CARSON UNSWORTH

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
320 McRAE AVE., 1976 SCOTT ST., 311 AND 315 TWEEDSMUIR AVE.

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:600	Date: 04/2017
Checked by: AM	Report No.: PE3391-2R
Approved by: MSD	Drawing No.: PE3391-3R
Drawn by: MPG	

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BH10-SS3 (1.43-2.04 m) - March 29, 2017
Metals - Complies with MOECC
PAH - Complies with MOECC

BH10-SS5 (2.91-3.20 m) - March 29, 2017
PHC/BTEX - Complies with MOECC
VOC - Complies With MOECC

BH3-SS6 - 3.05-3.38 m - October 9, 2014
BTEX/PHCs (F1-F4)

	Result (µg/g)	MOECC (µg/g)
PHC F1	73	55

All other parameters comply with MOECC

BH16-SS2 (0.73-1.30 m) - March 29, 2017

Metals	Result (ug/g)	MOECC (ug/g)
Barium	757	390
Lead	308	120
Mercury	0.6	0.27
Zinc	683	340

All other metals comply with MOECC

PAH	Result (ug/g)	MOECC (ug/g)
Benzo[a]pyrene	0.35	0.3

All other PAH comply with MOECC

BH8-SS2 (0.76-1.01 m) - Semptember 28,2008

Metals	Result (ug/g)	MOECC (ug/g)
Barium	720	390
Cadmium	4.8	1.2
Lead	515	120
Mercury	0.3	0.27
Zinc	2720	340

All other metals comply with MOECC

PHC	Result (ug/g)	MOECC (ug/g)
F3	409	300

All other PHCs comply with MOECC
BTEX - Complies with MOECC

BH14-AU1 (0.13-0.43 m) - March 29, 2017
Metals - Complies with MOECC

BH14-SS3 (1.47-1.69 m) - March 29, 2017
PHC/BTEX - Complies with MOECC

BH15-AU1 (0.17-0.43 m) - March 29, 2017

Metals	Result (ug/g)	MOECC (ug/g)
Barium	432	390

All other metals comply with MOECC
PAH - Complies with MOECC

BH15-SS2 (0.77-1.35 m) - March 29, 2017
Barium - Complies with MOECC

BH1-SS3 - 1.37-1.83 m - October 8, 2014
Metals

	Result (µg/g)	MOECC (µg/g)
Arsenic	113	18

All other parameters comply with MOECC

BH1-SS4 - 1.83-2.44 m - October 8, 2014
BTEX/PHCs (F1-F4)
All other parameters comply with MOECC

BH9-SS2 (0.73-1.34 m) - March 29, 2017
Metals - Complies with MOECC
PHC/BTEX - Complies with MOECC

BH13-SS2 (0.73-1.34 m) - March 29, 2017
PHC/BTEX - Complies with MOECC

McRAE

SCOTT STREET

TWEEDSMUIR AVENUE

#320 McRAE AVENUE
EXISTING 1-STOREY BUILDING

#311

#315

WESTBORO STORAGE OFFICE

BROCCOLINI SITE OFFICE

GARAGE AUTOREBEX

WASTE STORAGE

STORAGE

GIFFORD AUTOMOTIVE GARAGE

LANDSCAPERS GARAGE BAYS

KIOSK

STEEL CONTAINER

SNOW PILE

APPROX. AREA OF FORMER EXCAVATION (FORMER PUMP ISLAND LOCATION)

APPROX. AREA OF FORMER EXCAVATION (FORMER U/G TANK NEST LOCATION)

BH 1 64.76 [62.32] (62.26)
BH 2 63.04 [61.85] (60.79)
BH 3 63.17
BH 4 63.42
BH 6 63.16 [61.43] (61.08)
BH 7 63.61 [60.51]
BH 8
BH 9 63.44 [61.79] (61.09)
BH 10 63.12 [59.82] (61.07)
BH 11 63.42 [61.00] (60.88)
BH 12 64.00
BH 13 63.55
BH 14 64.37
BH 15 64.53
BH 16 62.99

BENCHMARK (BM) - TOP OF CATCH BASIN. GEODETIC ELEVATION = 63.13m.

LEGEND:

SOIL RESULTS IN COMPLIANCE WITH MOEE STANDARDS

SOIL RESULTS EXCEED MOECC STANDARDS

- BOREHOLE WITH MONITORING WELL, CURRENT INVESTIGATION
- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL, PREVIOUS INVESTIGATION, 2014
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE1607, 2008
- BOREHOLE LOCATION WITH MONITORING WELL, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PE1607, 2008
- TEST HOLE DESTROYED
- 63.04 GROUND SURFACE ELEVATION (m)
- [61.85] BEDROCK SURFACE ELEVATION (m)
- (60.79) GROUNDWATER SURFACE ELEVATION (m) (APRIL 5, 2017)

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OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:600	Date: 04/2017
Checked by: AM	Report No.: PE3391-2R
Approved by: MSD	Drawing No.: PE3391-4
Drawn by: MPG	

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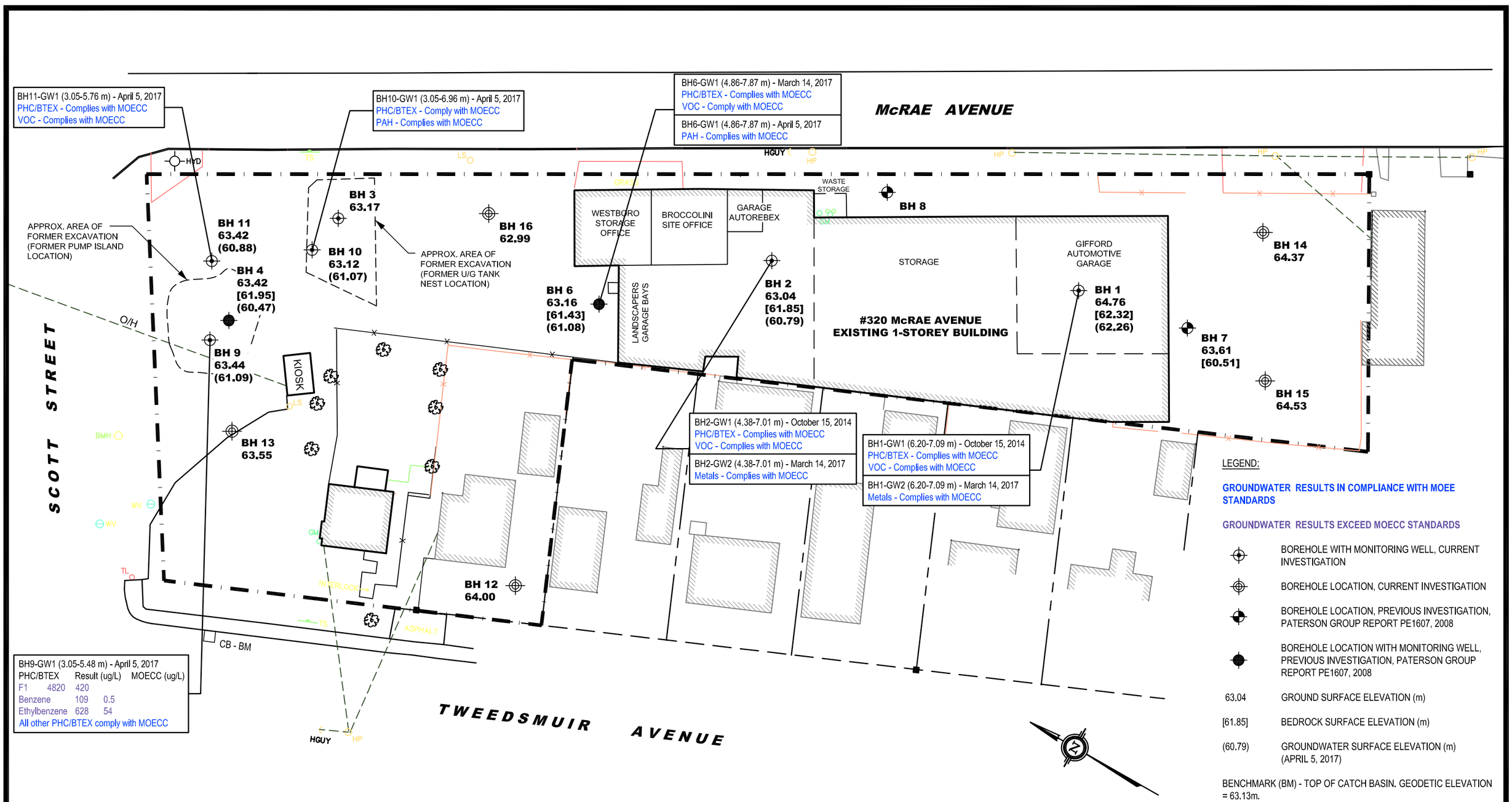

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
320 McRAE AVE., 1976 SCOTT ST., 311 AND 315 TWEEDSMUIR AVE.

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:600	Date: 04/2017
Checked by: AM	Report No.: PE3391-2R
Approved by: MSD	Drawing No.: PE3391-5
Drawn by: MPG	

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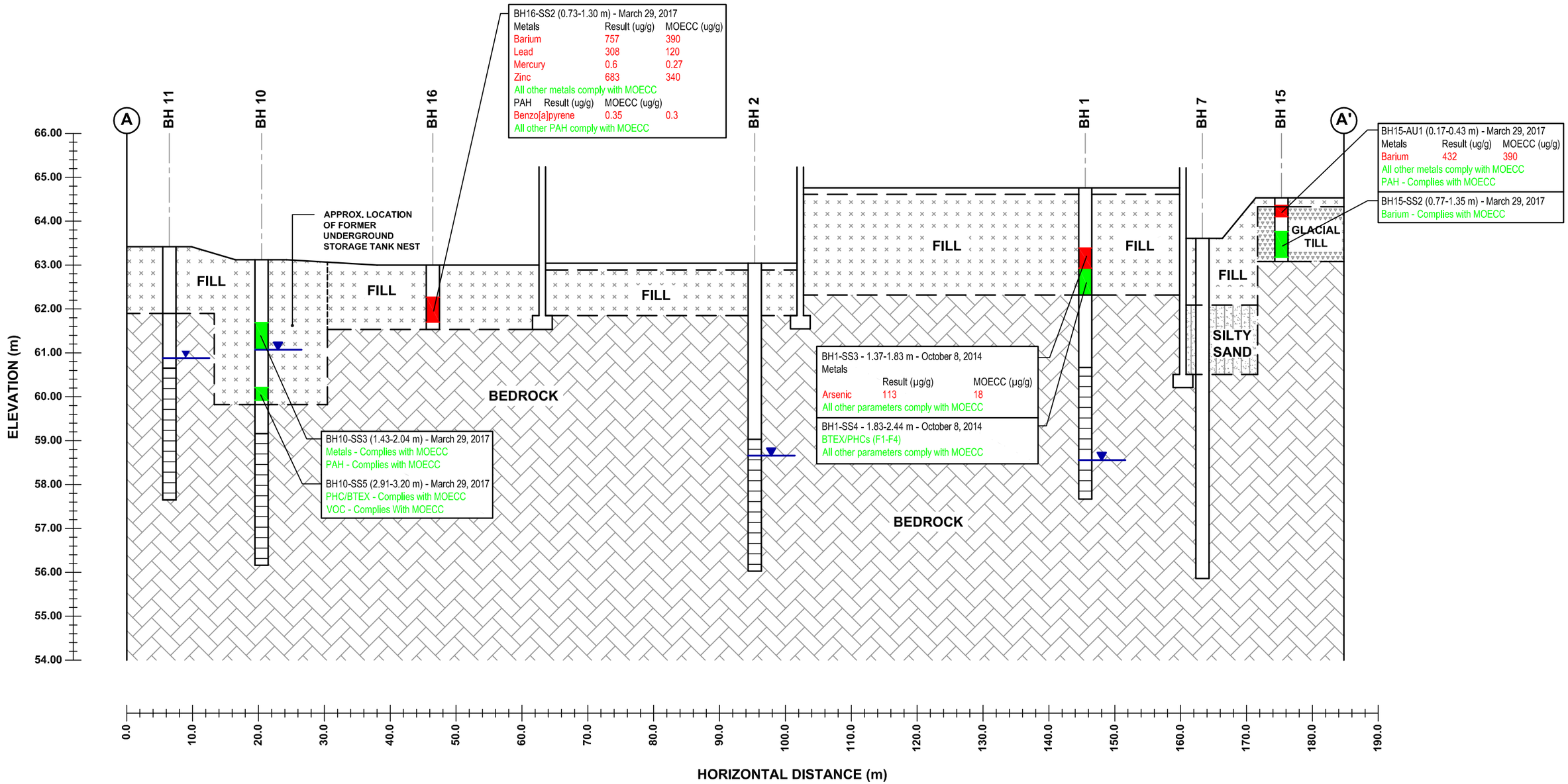

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THE ESTATE OF CARSON UNSWORTH

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
320 McRAE AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL

Scale: AS SHOWN	Date: 04/2017
Checked by: SM	Report No.: PE3391-2
Approved by: MSD	Drawing No.: PE3391-6A
Drawn by: MPG	

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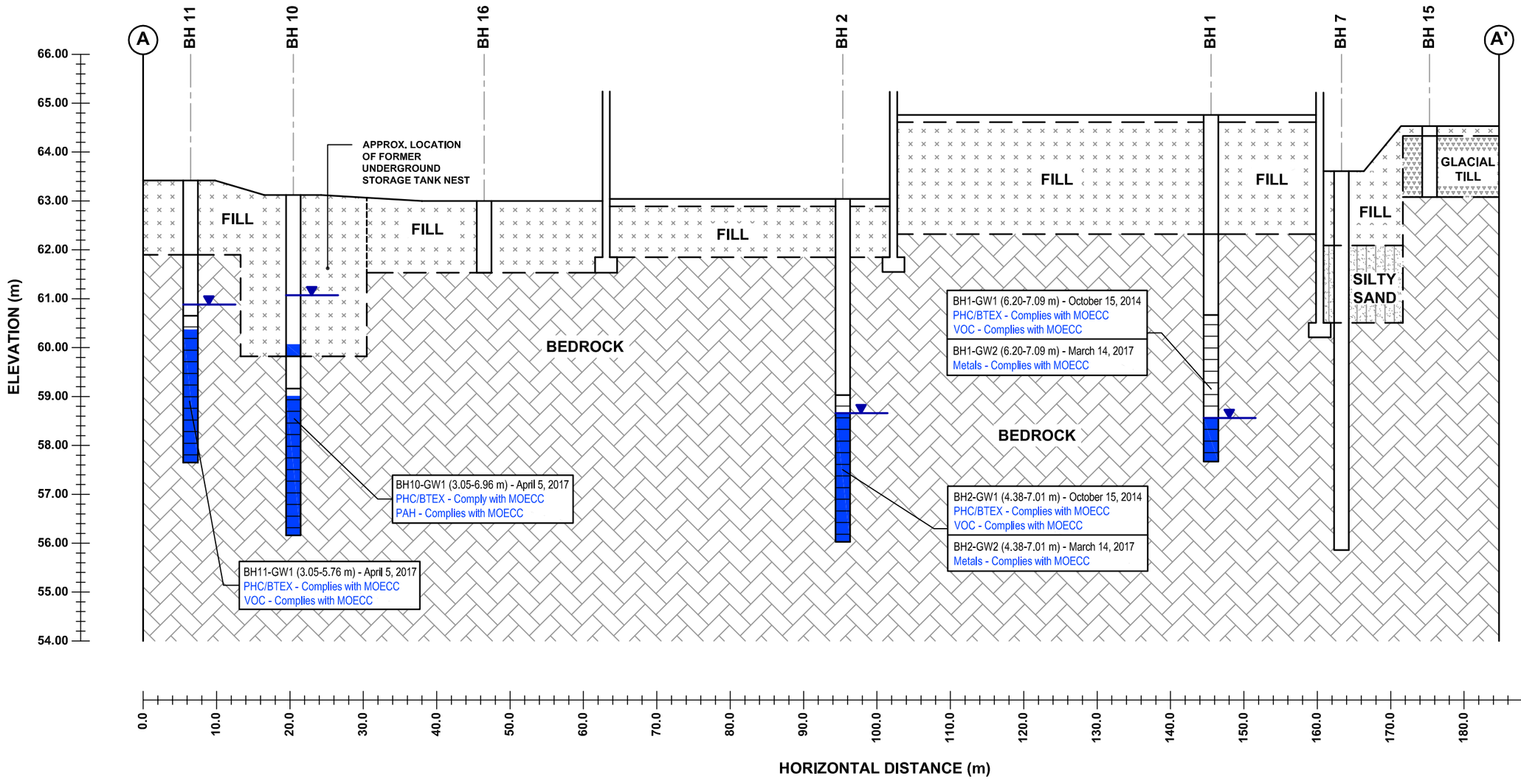

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NO.	REVISIONS	DATE	INITIAL

THE ESTATE OF CARSON UNSWORTH

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
320 McRAE AVENUE

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 04/2017
Checked by: SM	Report No.: PE3391-2
Approved by: MSD	Drawing No.: PE3391-6B
Drawn by: MPG	

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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

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Sampling & Analysis Plan

Phase II ESA
Commercial and Residential Properties
320 McRae Avenue, 1976 Scott Street,
311 and 315 Tweedsmuir Avenue
Ottawa, Ontario

Prepared For

The Estate of Carson Unsworth

March 2017

Report: PE3391-SAP-2

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by the Estate of Carson Unsworth to conduct a Phase II Environmental Site Assessment (ESA) for the property located at 320 McRae Avenue, 1976 Scott Street and 311 Tweedsmuir Avenue, in the City of Ottawa, Ontario. Based on the results of a 2008 Phase II ESA and the 2014 Phase II ESA completed by Paterson for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed. The summary of the sampling program is provided below in Table 1.

Table 1: Sampling Program Summary

Borehole	Location & Rationale	Proposed Depth & Rationale
BH9	Drill to assess the former pump island	Drilled to intercept water table for monitoring well installation. Coring bedrock will likely be necessary.
BH10	Drill to assess potential BTEX and PHC impacts in the former underground storage tank nest on 1976 Scott Street.	Drilled to intercept water table for monitoring well installation. Coring bedrock will likely be necessary.
BH11	Drill to assess the groundwater in the vicinity of the former underground storage tank nest and pump island	Drilled to intercept water table for monitoring well installation. Coring bedrock will likely be necessary.
BH12	Drill to assess potential placement of fill and for general coverage.	Drill to bedrock. Well installation not anticipated.
BH13	Drill to assess potential placement of fill and the former retail fuel outlet.	Drill to bedrock. Well installation not anticipated.
BH14	Drill to assess fill material, and soils in vicinity of garage	Drill to bedrock. Well installation not anticipated.
BH15	Drill to assess fill material, and soils in vicinity of garage	Drill to bedrock. Well installation not anticipated.
BH16	Drill to assess fill material, and soils in vicinity of garage	Drill to bedrock. Well installation not anticipated.

All boreholes are considered to be assessing the subject site for the potential presence of deleterious fill, to address the area of potential environmental concern associated with the reported former land-filling activities in the area of the subject site. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

At each borehole, auger and split-spoon samples of overburden soils will be obtained at 0.6 m (2') intervals until approximately 2.0 m below the groundwater

level, to intercept groundwater with monitoring wells. 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.

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 MOE site condition standards.
- In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

- Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- If sampling for VOCs, BTEX, or PHCs 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 1¼" [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 1¼" [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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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the northwest corner of subject site. Geodetic elevation = 64.445m.

FILE NO. PE3391

REMARKS

HOLE NO. BH 1

BORINGS BY Portable Drill **DATE** October 8, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	64.76
Concrete slab 0.15		AU	1				
FILL: Crushed stone 0.36		SS	2	82			
		RC	1	10		1	63.76
FILL: Brown silty sand with gravel, some cobbles and boulders		SS	3	17			
		SS	4	50		2	62.76
2.44		RC	2	100	100		
		RC	3	67	33		
		RC	4	90	40	3	61.76
		RC	5	96	21		
						4	60.76
BEDROCK: Grey limestone		RC	6	100	58		
		RC	7	100	90	5	59.76
		RC	8	33	0		
						6	58.76
		RC	9	100	94		
7.09						7	57.76
End of Borehole							
(GWL @ 6.20m-October 15, 2014)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the northwest corner of subject site. Geodetic elevation = 64.445m.

REMARKS

FILE NO. PE3391

HOLE NO. BH 2

BORINGS BY Portable Drill **DATE** October 8, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.04
Concrete slab 0.15		AU	1				
FILL: Crushed stone		RC	1	11	0	1	62.04
1.19		RC	2	60	0		
		RC	3	69	44		
		RC	4	100	0	2	61.04
		RC	5	100	56		
		RC	6	90	87	3	60.04
BEDROCK: Grey limestone		RC	8	100	75	4	59.04
		RC	9	100	89	5	58.04
						6	57.04
7.01						7	56.04
End of Borehole							
(GWL @ 4.38m-October 15, 2014)							

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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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the northwest corner of subject site. Geodetic elevation = 64.445m.

REMARKS

FILE NO. PE3391

HOLE NO. BH 3

BORINGS BY Portable Drill **DATE** October 8, 2014

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	63.17		
		AU	1						
		SS	2	50		1	62.17		
FILL: Brown silty sand with gravel		SS	3	50					
		SS	4	100		2	61.17		
		SS	5	100					
		SS	6	92		3	60.17	242	
3.38									
End of Borehole									
(BH dry - October 15, 2014)									

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

Phase I-II Environmental Site Assessment
319 and 320 McRae Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant at the intersection of McRae Avenue and Scott Street, elevation = 64.445m.

FILE NO. PE1607

REMARKS

HOLE NO. BH 4

BORINGS BY CME 75 Power Auger **DATE** October 27, 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.42
FILL: Sand and gravel		AU	1				
		SS	2	42	41	1	62.42
1.47							
		RC	1	89	77	2	61.42
		RC	2	97	83	3	60.42
BEDROCK: Grey limestone						4	59.42
		RC	3	93	87	5	58.42
		RC	4	98	83	6	57.42
		RC	5	78	78	7	56.42
7.75							
End of Borehole							
(GWL @ 2.95m-Nov. 3/08)							

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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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I-II Environmental Site Assessment
319 and 320 McRae Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant at the intersection of McRae Avenue and Scott Street, elevation = 64.445m.

FILE NO. PE1607

REMARKS

HOLE NO. BH 6

BORINGS BY CME 75 Power Auger **DATE** October 27, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.16
Asphaltic concrete 0.05							
FILL: Brown silty sand with gravel and crushed stone 0.46		AU	1				
FILL: Brown silty sand with cobbles and boulders		SS	2	12	50+	1	62.16
1.73		SS	3	17	50+		
		RC	1	78	42	2	61.16
		RC	2	100	85	3	60.16
BEDROCK: Grey limestone						4	59.16
		RC	3	100	95	5	58.16
						6	57.16
		RC	4	100	95		
						7	56.16
		RC	5	100	100		
7.87							
End of Borehole							
(GWL @ 4.85m-Nov. 3/08)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase I-II Environmental Site Assessment
319 and 320 McRae Avenue
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant at the intersection of McRae Avenue and Scott Street, elevation = 64.445m.

FILE NO. PE1607

REMARKS

HOLE NO. BH 8

BORINGS BY CME 75 Power Auger **DATE** October 28, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
Asphaltic concrete 0.05							
FILL: Crushed stone 0.30		AU	1				
FILL: Brown sand and gravel with pieces of metal							
1.01		SS	2	21	50+	1	
End of Borehole							
Practical refusal to augering @ 1.01m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** March 29, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
FILL: Crushed stone						0	63.44
0.20							
		AU	1				
FILL: Brown sand		SS	2	42	6	1	62.44
1.65							
		RC	1	98	90	2	61.44
						3	60.44
BEDROCK: Grey limestone interbedded with shale		RC	2	100	98	4	59.44
		RC	3	100	98	5	58.44
5.82							
End of Borehole							
(GWL @ 2.35m-April 5, 2017)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** March 29, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.12
FILL: Crushed stone							
0.25							
		AU	1				
FILL: Brown sand, some gravel		SS	2	67	26	1	62.12
		SS	3	58	11	2	61.12
2.13							
FILL: Brown sand		SS	4	67	4	3	60.12
		SS	5	80	50+		
3.30							
		RC	1	78	78	4	59.12
BEDROCK: Grey limestone		RC	2	100	87	5	58.12
		RC	3	100	90	6	57.12
6.96							
End of Borehole							
(GWL @ 2.05m-April 5, 2017)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH11

BORINGS BY CME 55 Power Auger **DATE** March 29, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.05						0	63.42
FILL: Brown sand and gravel with silt and clay 0.76		AU	1				
FILL: Black organics 1.52		SS	2	25	19	1	62.42
		RC	1	87	66	2	61.42
BEDROCK: Grey limestone		RC	2	98	97	3	60.42
						4	59.42
		RC	3	97	75	5	58.42
5.77 End of Borehole							
(GWL @ 2.54m-April 5, 2017)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH12

BORINGS BY CME 55 Power Auger **DATE** March 29, 2017

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	64.00		
FILL: Brown silty sand with clay and gravel		AU	1						
		SS	2	58	18	1	63.00		
1.42									
End of Borehole									
Practical refusal to augering at 1.42m depth									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH13

BORINGS BY CME 55 Power Auger **DATE** March 30, 2017

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	63.55		
FILL: Brown silty sand, some clay and gravel		AU	1						
		SS	2	50	50	1	62.55		
1.50									
End of Borehole									
Practical refusal to augering at 1.50m depth									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH14

BORINGS BY CME 55 Power Auger **DATE** March 30, 2017

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	64.37		
FILL: Crushed stone 0.15		AU	1						
FILL: Brown silty sand with clay and gravel 0.60									
		SS	2	100	13	1	63.37		
GLACIAL TILL: Brown silty sand with gravel, trace clay		SS	3	67	50+				
2.29						2	62.37		
End of Borehole									
Practical refusal to augering at 2.29m 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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

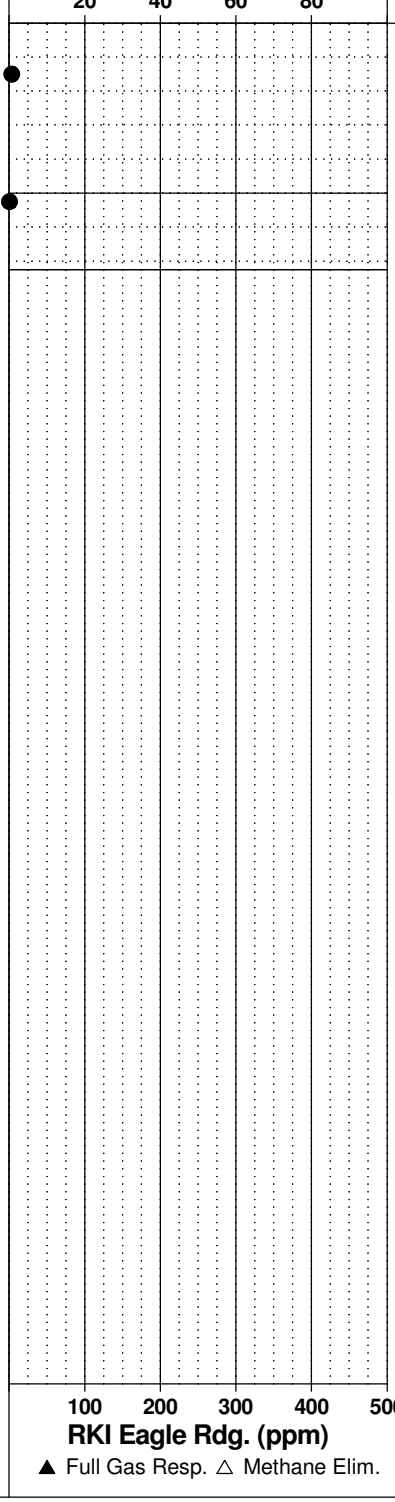
FILE NO. PE3391

REMARKS

HOLE NO. BH15

BORINGS BY CME 55 Power Auger **DATE** March 30, 2017

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	64.53		
FILL: Crushed stone 0.20		AU	1						
GLACIAL TILL: Brown silty sand with clay and gravel		SS	2	91	48	1	63.53		
1.45									
End of Borehole									
Practical refusal to augering at 1.45m depth									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
320 McRae Avenue
Ottawa, Ontario

DATUM Benchmark (BM) - Top of grate of catch basin on Tweedsmuir Avenue, south of Scott Stree. Geodetic elevation = 63.13m.

FILE NO. PE3391

REMARKS

HOLE NO. BH16

BORINGS BY CME 55 Power Auger **DATE** March 30, 2017

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	62.99		
FILL: Crushed stone, trace brick 0.60		AU	1						
FILL: Mixtured of organics, sand, glass, crushed stone, plastic, piece of plastic 1.47		SS	2	42	22	1	61.99		
End of Borehole									
Practical refusal to augering at 1.47m 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

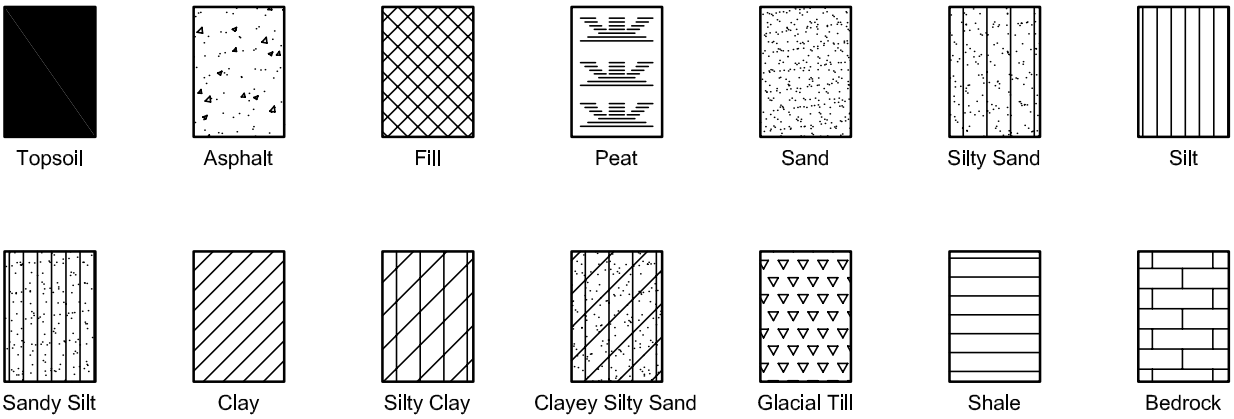
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

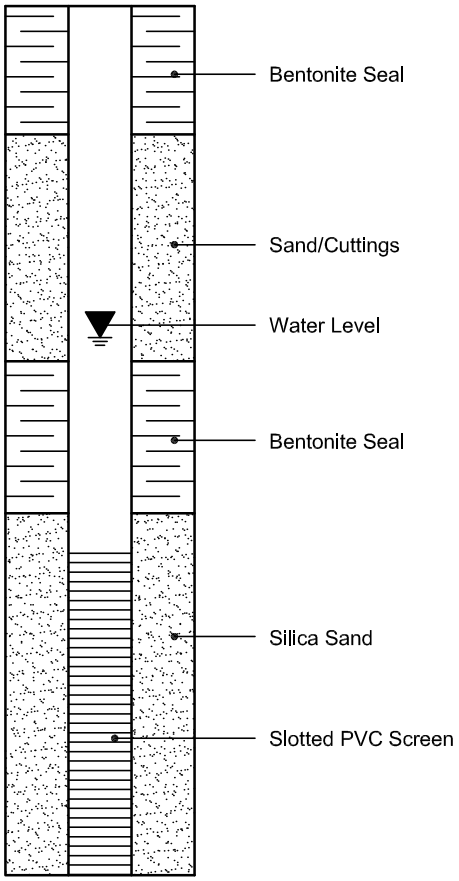
SYMBOLS AND TERMS (continued)

STRATA PLOT

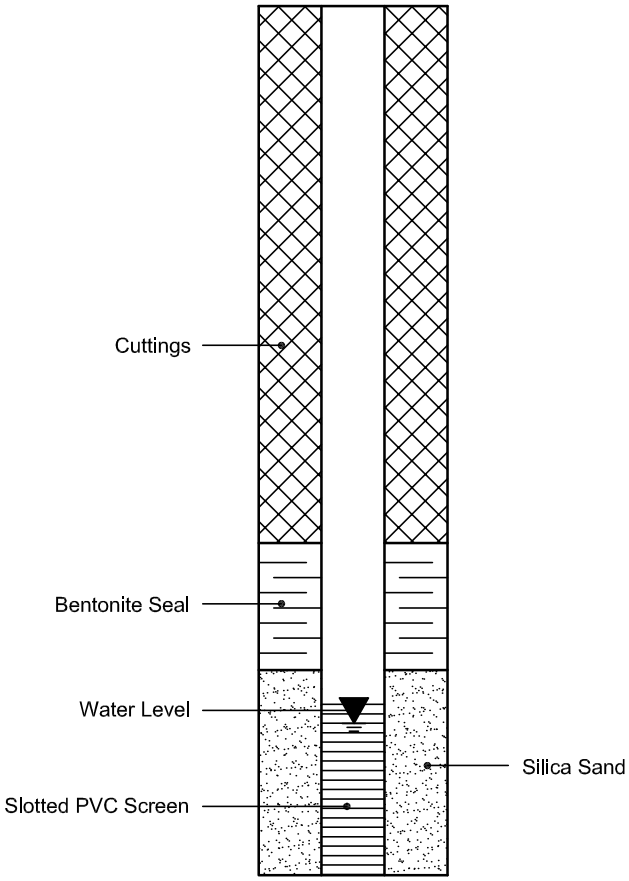


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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: Mark D'Arcy

Client PO: 21672
Project: PE3391
Custody: 110632

Report Date: 5-Apr-2017
Order Date: 30-Mar-2017

Order #: 1713409

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

Paracel ID	Client ID
1713409-01	BH9-SS2
1713409-02	BH10-SS3
1713409-03	BH10-SS5
1713409-04	BH13-SS2
1713409-05	BH14-AU1
1713409-06	BH14-SS3
1713409-07	BH15-AU1
1713409-08	BH16-SS2

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21672

Report Date: 05-Apr-2017
Order Date: 30-Mar-2017
Project Description: PE3391

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	31-Mar-17	5-Apr-17
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	30-Mar-17	4-Apr-17
Mercury by CVAA	EPA 7471B - CVAA, digestion	1-Apr-17	1-Apr-17
PHC F1	CWS Tier 1 - P&T GC-FID	31-Mar-17	5-Apr-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	31-Mar-17	2-Apr-17
REG 153: Metals by ICP/OES, soil	based on MOE E3470, ICP-OES	3-Apr-17	3-Apr-17
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	31-Mar-17	4-Apr-17
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	31-Mar-17	5-Apr-17
Solids, %	Gravimetric, calculation	1-Apr-17	1-Apr-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21672

Report Date: 05-Apr-2017

Order Date: 30-Mar-2017

Project Description: PE3391

	Client ID:	BH9-SS2	BH10-SS3	BH10-SS5	BH13-SS2
	Sample Date:	29-Mar-17	29-Mar-17	29-Mar-17	30-Mar-17
	Sample ID:	1713409-01	1713409-02	1713409-03	1713409-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	92.1	93.9	82.2	92.4
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	<1.0	<1.0	-	-
Barium	1.0 ug/g dry	61.1	42.9	-	-
Beryllium	1.0 ug/g dry	<1.0	<1.0	-	-
Boron	1.0 ug/g dry	4.3	3.7	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	1.0 ug/g dry	8.3	7.4	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1.0 ug/g dry	4.4	3.9	-	-
Copper	1.0 ug/g dry	12.4	9.6	-	-
Lead	1.0 ug/g dry	12.4	5.8	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	-	-
Nickel	1.0 ug/g dry	8.8	6.9	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.5 ug/g dry	<0.5	<0.5	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	1.0 ug/g dry	16.5	15.4	-	-
Zinc	1.0 ug/g dry	23.0	25.2	-	-
Volatiles					
Acetone	0.50 ug/g dry	-	-	<0.50	-
Benzene	0.02 ug/g dry	-	-	<0.02	-
Bromodichloromethane	0.05 ug/g dry	-	-	<0.05	-
Bromoform	0.05 ug/g dry	-	-	<0.05	-
Bromomethane	0.05 ug/g dry	-	-	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	-	-	<0.05	-
Chlorobenzene	0.05 ug/g dry	-	-	<0.05	-
Chloroform	0.05 ug/g dry	-	-	<0.05	-
Dibromochloromethane	0.05 ug/g dry	-	-	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	-	-	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21672

Report Date: 05-Apr-2017
Order Date: 30-Mar-2017
Project Description: PE3391

	Client ID:	BH9-SS2	BH10-SS3	BH10-SS5	BH13-SS2
	Sample Date:	29-Mar-17	29-Mar-17	29-Mar-17	30-Mar-17
	Sample ID:	1713409-01	1713409-02	1713409-03	1713409-04
	MDL/Units	Soil	Soil	Soil	Soil
1,4-Dichlorobenzene	0.05 ug/g dry	-	-	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	-	-	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	-	-	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	-	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	-	-	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	-	-	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	-	-	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	-	-	<0.05	-
Ethylbenzene	0.05 ug/g dry	-	-	<0.05	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	-	-	<0.05	-
Hexane	0.05 ug/g dry	-	-	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	-	<0.50	-
Methyl Isobutyl Ketone	0.50 ug/g dry	-	-	<0.50	-
Methyl tert-butyl ether	0.05 ug/g dry	-	-	<0.05	-
Methylene Chloride	0.05 ug/g dry	-	-	<0.05	-
Styrene	0.05 ug/g dry	-	-	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	-	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	-	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	-	-	<0.05	-
Toluene	0.05 ug/g dry	-	-	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	-	-	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	-	-	<0.05	-
Trichloroethylene	0.05 ug/g dry	-	-	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	-	-	<0.05	-
Vinyl chloride	0.02 ug/g dry	-	-	<0.02	-
m,p-Xylenes	0.05 ug/g dry	-	-	<0.05	-
o-Xylene	0.05 ug/g dry	-	-	<0.05	-
Xylenes, total	0.05 ug/g dry	-	-	<0.05	-
4-Bromofluorobenzene	Surrogate	-	-	96.7%	-
Dibromofluoromethane	Surrogate	-	-	75.2%	-
Toluene-d8	Surrogate	-	-	102%	-
Benzene	0.02 ug/g dry	<0.02	-	-	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	<0.05
Toluene	0.05 ug/g dry	<0.05	-	-	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21672

Report Date: 05-Apr-2017

Order Date: 30-Mar-2017

Project Description: PE3391

	Client ID:	BH9-SS2	BH10-SS3	BH10-SS5	BH13-SS2
	Sample Date:	29-Mar-17	29-Mar-17	29-Mar-17	30-Mar-17
	Sample ID:	1713409-01	1713409-02	1713409-03	1713409-04
	MDL/Units	Soil	Soil	Soil	Soil
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	-	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	-	-	<0.05
Toluene-d8	Surrogate	104%	-	-	103%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	<8	27
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	<6	41

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21672

Report Date: 05-Apr-2017
Order Date: 30-Mar-2017
Project Description: PE3391

	Client ID:	BH14-AU1	BH14-SS3	BH15-AU1	BH16-SS2
	Sample Date:	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17
	Sample ID:	1713409-05	1713409-06	1713409-07	1713409-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	86.0	91.6	91.0	72.0
Metals					
Antimony	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.4	-	<1.0	10.5
Barium	1.0 ug/g dry	82.8	-	432	757
Beryllium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Boron	1.0 ug/g dry	8.2	-	15.9	21.7
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	1.1
Chromium	1.0 ug/g dry	16.1	-	17.0	95.4
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	<0.2
Cobalt	1.0 ug/g dry	6.3	-	6.4	8.3
Copper	1.0 ug/g dry	10.9	-	14.3	126
Lead	1.0 ug/g dry	13.5	-	38.7	308
Mercury	0.1 ug/g dry	<0.1	-	<0.1	0.6
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	1.3
Nickel	1.0 ug/g dry	10.6	-	14.0	26.0
Selenium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	-	<0.5	0.9
Thallium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Vanadium	1.0 ug/g dry	25.3	-	23.9	29.5
Zinc	1.0 ug/g dry	25.0	-	32.5	683
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	103%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	24	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	27	-	-
Semi-Volatiles					

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21672

Report Date: 05-Apr-2017

Order Date: 30-Mar-2017

Project Description: PE3391

	Client ID:	BH14-AU1	BH14-SS3	BH15-AU1	BH16-SS2
	Sample Date:	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17
	Sample ID:	1713409-05	1713409-06	1713409-07	1713409-08
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthene	0.02 ug/g dry	-	-	-	<0.02
Acenaphthylene	0.02 ug/g dry	-	-	-	0.06
Anthracene	0.02 ug/g dry	-	-	-	0.11
Benzo [a] anthracene	0.02 ug/g dry	-	-	-	0.27
Benzo [a] pyrene	0.02 ug/g dry	-	-	-	0.35
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	-	0.37
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	-	0.24
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	-	0.19
Chrysene	0.02 ug/g dry	-	-	-	0.27
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	-	0.06
Fluoranthene	0.02 ug/g dry	-	-	-	0.48
Fluorene	0.02 ug/g dry	-	-	-	0.04
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	-	0.22
1-Methylnaphthalene	0.02 ug/g dry	-	-	-	0.02
2-Methylnaphthalene	0.02 ug/g dry	-	-	-	0.04
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	-	0.06
Naphthalene	0.01 ug/g dry	-	-	-	0.05
Phenanthrene	0.02 ug/g dry	-	-	-	0.19
Pyrene	0.02 ug/g dry	-	-	-	0.42
2-Fluorobiphenyl	Surrogate	-	-	-	93.7%
Terphenyl-d14	Surrogate	-	-	-	89.8%

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	1.0	ug/g						
Boron	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.5	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	1.0	ug/g						
Zinc	ND	1.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.24*		*ug/g*		*93.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.23*		*ug/g*		*92.3*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*7.83*		*ug/g*		*97.9*	*50-140*			
Surrogate: Dibromofluoromethane	*7.76*		*ug/g*		*97.0*	*50-140*			
Surrogate: Toluene-d8	*8.13*		*ug/g*		*102*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.13*		*ug/g*		*102*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
Metals									
Antimony	ND	1.0	ug/g dry	ND				30	
Arsenic	5.04	1.0	ug/g dry	5.41			7.2	30	
Barium	57.4	1.0	ug/g dry	61.4			6.8	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron	11.8	1.0	ug/g dry	12.0			1.7	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	19.6	1.0	ug/g dry	20.0			1.9	30	
Cobalt	11.4	1.0	ug/g dry	11.6			1.4	30	
Copper	73.8	1.0	ug/g dry	82.5			11.1	30	
Lead	18.7	1.0	ug/g dry	19.6			4.5	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	23.5	1.0	ug/g dry	24.4			4.0	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.5	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				30	
Vanadium	29.2	1.0	ug/g dry	29.7			2.0	30	
Zinc	107	1.0	ug/g dry	87.4			20.6	30	
Physical Characteristics									
% Solids	69.1	0.1	% by Wt.	68.7			0.6	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND				40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND				40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND				40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND				40	
Surrogate: 2-Fluorobiphenyl	*1.08*		*ug/g dry*		*67.3*	*50-140*			
Surrogate: Terphenyl-d14	*1.36*		*ug/g dry*		*85.2*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*5.01*		*ug/g dry*		*93.6*	*50-140*			
Surrogate: Dibromofluoromethane	*5.21*		*ug/g dry*		*97.4*	*50-140*			
Surrogate: Toluene-d8	*5.59*		*ug/g dry*		*104*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*5.59*		*ug/g dry*		*104*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	194	7	ug/g		96.8	80-120			
F2 PHCs (C10-C16)	83	4	ug/g		92.3	80-120			
F3 PHCs (C16-C34)	165	8	ug/g		88.7	80-120			
F4 PHCs (C34-C50)	106	6	ug/g		85.4	80-120			
Metals									
Antimony	276		ug/L	ND	110	70-130			
Arsenic	366		ug/L	108	103	70-130			
Barium	1440		ug/L	1230	82.6	70-130			
Beryllium	258		ug/L	4.71	101	70-130			
Boron	484		ug/L	240	97.6	70-130			
Cadmium	258		ug/L	1.38	103	70-130			
Chromium (VI)	4.6	0.2	ug/g		93.0	70-130			
Chromium	618		ug/L	400	87.0	70-130			
Cobalt	446		ug/L	232	85.7	70-130			
Copper	1870		ug/L	1650	87.8	70-130			
Lead	609		ug/L	392	87.0	70-130			
Mercury	1.51	0.1	ug/g	ND	100	70-130			
Molybdenum	231		ug/L	4.34	90.5	70-130			
Nickel	685		ug/L	489	78.5	70-130			
Selenium	210		ug/L	ND	83.9	70-130			
Silver	235		ug/L	ND	94.0	70-130			
Thallium	205		ug/L	16.0	75.7	70-130			
Uranium	253		ug/L	ND	101	70-130			
Vanadium	823		ug/L	595	91.3	70-130			
Zinc	235		ug/L		94.2	70-130			
Semi-Volatiles									
Acenaphthene	0.200	0.02	ug/g	ND	100	50-140			
Acenaphthylene	0.179	0.02	ug/g	ND	89.5	50-140			
Anthracene	0.199	0.02	ug/g	ND	99.8	50-140			
Benzo [a] anthracene	0.201	0.02	ug/g	ND	101	50-140			
Benzo [a] pyrene	0.229	0.02	ug/g	ND	115	50-140			
Benzo [b] fluoranthene	0.248	0.02	ug/g	ND	124	50-140			
Benzo [g,h,i] perylene	0.213	0.02	ug/g	ND	107	50-140			
Benzo [k] fluoranthene	0.236	0.02	ug/g	ND	118	50-140			
Chrysene	0.226	0.02	ug/g	ND	113	50-140			
Dibenzo [a,h] anthracene	0.217	0.02	ug/g	ND	109	50-140			
Fluoranthene	0.190	0.02	ug/g	ND	95.3	50-140			
Fluorene	0.201	0.02	ug/g	ND	101	50-140			
Indeno [1,2,3-cd] pyrene	0.231	0.02	ug/g	ND	115	50-140			
1-Methylnaphthalene	0.189	0.02	ug/g		114	50-140			
2-Methylnaphthalene	0.202	0.02	ug/g		121	50-140			
Naphthalene	0.242	0.01	ug/g	ND	121	50-140			
Phenanthrene	0.191	0.02	ug/g	ND	95.6	50-140			
Pyrene	0.196	0.02	ug/g	ND	97.9	50-140			
Surrogate: 2-Fluorobiphenyl	*1.61*		*ug/g*		*101*	*50-140*			
Volatiles									
Acetone	6.84	0.50	ug/g		68.4	50-140			
Benzene	4.24	0.02	ug/g		106	60-130			
Bromodichloromethane	4.12	0.05	ug/g		103	60-130			
Bromoform	3.66	0.05	ug/g		91.5	60-130			
Bromomethane	2.72	0.05	ug/g		67.9	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Carbon Tetrachloride	3.94	0.05	ug/g		98.6	60-130			
Chlorobenzene	3.98	0.05	ug/g		99.6	60-130			
Chloroform	3.80	0.05	ug/g		94.9	60-130			
Dibromochloromethane	3.72	0.05	ug/g		93.0	60-130			
Dichlorodifluoromethane	2.55	0.05	ug/g		63.8	50-140			
1,2-Dichlorobenzene	3.76	0.05	ug/g		94.0	60-130			
1,3-Dichlorobenzene	4.06	0.05	ug/g		101	60-130			
1,4-Dichlorobenzene	4.10	0.05	ug/g		102	60-130			
1,1-Dichloroethane	3.80	0.05	ug/g		94.9	60-130			
1,2-Dichloroethane	3.62	0.05	ug/g		90.6	60-130			
1,1-Dichloroethylene	2.95	0.05	ug/g		73.7	60-130			
cis-1,2-Dichloroethylene	4.02	0.05	ug/g		100	60-130			
trans-1,2-Dichloroethylene	3.67	0.05	ug/g		91.6	60-130			
1,2-Dichloropropane	4.22	0.05	ug/g		106	60-130			
cis-1,3-Dichloropropylene	4.23	0.05	ug/g		106	60-130			
trans-1,3-Dichloropropylene	3.69	0.05	ug/g		92.2	60-130			
Ethylbenzene	3.81	0.05	ug/g		95.2	60-130			
Ethylene dibromide (dibromoethane	3.65	0.05	ug/g		91.2	60-130			
Hexane	4.01	0.05	ug/g		100	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.31	0.50	ug/g		73.1	50-140			
Methyl Isobutyl Ketone	7.74	0.50	ug/g		77.4	50-140			
Methyl tert-butyl ether	8.75	0.05	ug/g		87.5	50-140			
Methylene Chloride	3.15	0.05	ug/g		78.9	60-130			
Styrene	3.68	0.05	ug/g		92.0	60-130			
1,1,1,2-Tetrachloroethane	3.91	0.05	ug/g		97.7	60-130			
1,1,2,2-Tetrachloroethane	4.30	0.05	ug/g		107	60-130			
Tetrachloroethylene	3.73	0.05	ug/g		93.4	60-130			
Toluene	3.74	0.05	ug/g		93.5	60-130			
1,1,1-Trichloroethane	3.87	0.05	ug/g		96.8	60-130			
1,1,2-Trichloroethane	4.31	0.05	ug/g		108	60-130			
Trichloroethylene	3.92	0.05	ug/g		98.0	60-130			
Trichlorofluoromethane	3.98	0.05	ug/g		99.6	50-140			
Vinyl chloride	3.14	0.02	ug/g		78.4	50-140			
m,p-Xylenes	7.97	0.05	ug/g		99.6	60-130			
o-Xylene	3.97	0.05	ug/g		99.4	60-130			
Benzene	4.24	0.02	ug/g		106	60-130			
Ethylbenzene	3.81	0.05	ug/g		95.2	60-130			
Toluene	3.74	0.05	ug/g		93.5	60-130			
m,p-Xylenes	7.97	0.05	ug/g		99.6	60-130			
o-Xylene	3.97	0.05	ug/g		99.4	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Paracel ID: 1713409

Chain of Custody
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№ 110632

Page 1 of 1

Client Name: PATERSON	Project Reference: PE3391	**Turnaround Time:**
Contact Name: MARK D'ARCY	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd	PO # 21672	☐ 2 Day ☑ Regular
Telephone: 613-226-7381	Email Address: mdarcy@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: 1713409

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	
1	BH9-SS2	S		2	Mar 29/17		X			X	X	X		250mL+1vial
2	BH10-SS3	S		1	Mar 29/17					X	X	X		250mL
3	BH10-SS5	S		2	Mar 29/17		X	X						120mL+1vial
4	BH11-SS2	S		3	Mar 29/17									HOLD for now.
5	BH13-SS2	S		2	Mar 30/17		X							250mL+1vial
6	BH14-AU1	S		1	Mar 30/17					X	X	X		250mL
7	BH14-SS3	S		2	" "		X							250mL+1vial
8	BH15-AU1	S		1	" "					X	X	X		250mL
9	BH16-SS2	S		1	" "				X	X	X	X		↓
10														

120mL+250mL+1vial

Comments: Received Extra soil re: BH12-SS2.

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: SUNNYCORN DOR MYE	Verified By:
Relinquished By (Print):	Date/Time: 30/03/17 2:45 PM	Date/Time: MAR 31, 2017 04:35	Date/Time: mar 31/17 7:48a
Date/Time:	Temperature: °C	Temperature: 18.7 °C	pH Verified [ ] By: N/A

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 21672
Project: PE3391
Custody: 110632

Report Date: 12-Apr-2017
Order Date: 6-Apr-2017

Order #: 1714425

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

Paracel ID	Client ID
1714425-01	BH10-SS3
1714425-02	BH15-AU1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: **21672**

Report Date: 12-Apr-2017

Order Date: 6-Apr-2017

Project Description: PE3391

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	8-Apr-17	12-Apr-17
Solids, %	Gravimetric, calculation	8-Apr-17	8-Apr-17

Certificate of Analysis

Report Date: 12-Apr-2017

Client: **Paterson Group Consulting Engineers**

Order Date: 6-Apr-2017

Client PO: 21672

Project Description: PE3391

	Client ID:	BH10-SS3	BH15-AU1	-	-
	Sample Date:	29-Mar-17	30-Mar-17	-	-
	Sample ID:	1714425-01	1714425-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	93.9	91.0	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	-	-
Anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	0.03	-	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	0.05	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	0.06	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	0.04	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	0.02	-	-
Chrysene	0.02 ug/g dry	<0.02	0.04	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluoranthene	0.02 ug/g dry	<0.02	0.07	-	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	0.03	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	-	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	-	-
Phenanthrene	0.02 ug/g dry	<0.02	0.06	-	-
Pyrene	0.02 ug/g dry	<0.02	0.06	-	-
2-Fluorobiphenyl	Surrogate	81.5%	97.2%	-	-
Terphenyl-d14	Surrogate	99.8%	115%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.17*		*ug/g*		*88.0*	*50-140*			
Surrogate: Terphenyl-d14	*1.54*		*ug/g*		*116*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: **21672**

Report Date: 12-Apr-2017

Order Date: 6-Apr-2017

Project Description: PE3391

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	87.5	0.1	% by Wt.	87.1			0.4	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND			0.0	40	
Anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND			0.0	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND			0.0	40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
Naphthalene	ND	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	ND	0.02	ug/g dry	ND			0.0	40	
Pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Surrogate: 2-Fluorobiphenyl	*1.09*		*ug/g dry*		*76.8*	*50-140*			
Surrogate: Terphenyl-d14	*1.47*		*ug/g dry*		*103*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Semi-Volatiles									
Acenaphthene	0.212	0.02	ug/g	ND	120	50-140			
Acenaphthylene	0.187	0.02	ug/g	ND	106	50-140			
Anthracene	0.193	0.02	ug/g	ND	109	50-140			
Benzo [a] anthracene	0.153	0.02	ug/g	ND	86.3	50-140			
Benzo [a] pyrene	0.196	0.02	ug/g	ND	110	50-140			
Benzo [b] fluoranthene	0.212	0.02	ug/g	ND	119	50-140			
Benzo [g,h,i] perylene	0.218	0.02	ug/g	ND	123	50-140			
Benzo [k] fluoranthene	0.196	0.02	ug/g	ND	110	50-140			
Chrysene	0.201	0.02	ug/g	ND	113	50-140			
Dibenzo [a,h] anthracene	0.209	0.02	ug/g	ND	118	50-140			
Fluoranthene	0.180	0.02	ug/g	ND	101	50-140			
Fluorene	0.217	0.02	ug/g	ND	122	50-140			
Indeno [1,2,3-cd] pyrene	0.209	0.02	ug/g	ND	118	50-140			
1-Methylnaphthalene	0.248	0.02	ug/g	ND	140	50-140			
2-Methylnaphthalene	0.246	0.02	ug/g	ND	139	50-140			
Naphthalene	0.223	0.01	ug/g	ND	126	50-140			
Phenanthrene	0.203	0.02	ug/g	ND	114	50-140			
Pyrene	0.189	0.02	ug/g	ND	106	50-140			
Surrogate: 2-Fluorobiphenyl	*1.41*		*ug/g*		*99.5*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: **21672**

Report Date: 12-Apr-2017

Order Date: 6-Apr-2017

Project Description: PE3391

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.

Revised April 6/17-KS.

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Paracel ID: 1714425

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Use Only)
110632

Page 1 of 1

Client Name: PATERSON	Project Reference: PE3391	**Turnaround Time:**
Contact Name: MARK D'ARCY	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd	PO # 21672	☐ 2 Day ☑ Regular
Telephone: 613-226-7381	Email Address: mdarcy@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: ~~171340~~ 1714425

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH9-SS2	S		2	Mar 24/17		X			X	X	X				250ml+1vial			
2	BH10-SS3	S		1	Mar 23/17				X	X	X	X				250ml			
3	BH10-SS5	S		2	Mar 23/17		X	X								125ml+1vial			
4	BH11-SS2	S		3	Mar 23/17											HOLD for now.			
5	BH13-SS2	S		2	March 29/17		X									250ml+1vial			
6	BH14-AU1	S		1	Mar 29/17					X	X	X				250ml			
7	BH14-SS3	S		2	" "		X		X							250ml+1vial			
8	BH15-AU1	S		1	" "				X	X	X	X				250ml			
9	BH16-SS2	S		1	" "				X	X	X	X				↓			
10																			

180ml + 250ml + 1vial

Comments: Received Extra soil : BH12-SS2.

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: SUSSEXCRN DOR MW	Verified By:
Relinquished By (Print):	Date/Time: 30/03/17 2:45	Date/Time: Mar 31, 2017 04:35	Date/Time: mar 31/17
Date/Time:	Temperature: °C	Temperature: 18.7 °C	pH Verified [ ] By: N/A

7:48a

Rachel Subject
April 6/17. 3:38pm

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 21366
Project: PE3391
Custody: 110623

Report Date: 13-Apr-2017
Order Date: 7-Apr-2017

Order #: 1714552

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

Paracel ID	Client ID
1714552-01	BH15-SS2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21366

Report Date: 13-Apr-2017
Order Date: 7-Apr-2017
Project Description: PE3391

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	11-Apr-17	13-Apr-17
Solids, %	Gravimetric, calculation	8-Apr-17	8-Apr-17

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21366

Report Date: 13-Apr-2017
Order Date: 7-Apr-2017
Project Description: PE3391

	Client ID:	BH15-SS2	-	-	-
	Sample Date:	30-Mar-17	-	-	-
	Sample ID:	1714552-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	90.2	-	-	-
Metals					
Barium	1 ug/g dry	65	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21366

Report Date: 13-Apr-2017
Order Date: 7-Apr-2017
Project Description: PE3391

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Barium	ND	1	ug/g						

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21366

Report Date: 13-Apr-2017
Order Date: 7-Apr-2017
Project Description: PE3391

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Barium	2060	1	ug/g dry	2210			6.9	30	
Physical Characteristics									
% Solids	83.9	0.1	% by Wt.	81.6			2.7	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Barium	925		ug/L	884	82.6	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.

Paracel ID: 1714552

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№ 110623

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE3391	**Turnaround Time:**	
Contact Name: ADRIAN MENYHART	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 COLONNADE RD. S.	PO # 21366.	☐ 2 Day	☑ Regular
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca	Date Required:	

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 1 ☐ 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: 1714552

	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)	BARIUM			250ml.		
1	BH15-552	S		1	MAR 30									/					
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel.

Relinquished By (Sign):	Received by Driver/Depot: T. Krouse	Received at Lab: L. Sawatt	Verified By: Rachel Subject
Relinquished By (Print): ADRIAN MENYHART	Date/Time: 07/04/17 4:10 PM	Date/Time: Apr 7/17 4:55pm	Date/Time: Apr 7/17
Date/Time:	Temperature: °C	Temperature: 16.7 °C	pH Verified ☒ By: N/A 5:21.

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Sean Moggridge

Client PO: 16609
Project: PE3391
Custody: 16365

Report Date: 18-Apr-2017
Order Date: 17-Apr-2017

Order #: 1716018

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

Paracel ID	Client ID
1716018-01	BH1-SS4

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 16609

Report Date: 18-Apr-2017
Order Date: 17-Apr-2017
Project Description: PE3391

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
VOCs by P&T GC-MS	EPA 8260 - P&T GC-MS	11-Oct-14	12-Oct-14

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 16609

Report Date: 18-Apr-2017

Order Date: 17-Apr-2017

Project Description: PE3391

	Client ID:	BH1-SS4	-	-	-
	Sample Date:	08-Oct-14	-	-	-
	Sample ID:	1716018-01	-	-	-
	MDL/Units	Soil	-	-	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroethane	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Chloromethane	0.20 ug/g dry	<0.20	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dibromoethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethylene, total	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Butyl Ketone (2-Hexanone)	2.00 ug/g dry	<2.00	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 16609

Report Date: 18-Apr-2017

Order Date: 17-Apr-2017

Project Description: PE3391

	Client ID:	BH1-SS4	-	-	-
	Sample Date:	08-Oct-14	-	-	-
	Sample ID:	1716018-01	-	-	-
	MDL/Units	Soil	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	103%	-	-	-
Dibromofluoromethane	Surrogate	96.7%	-	-	-
Toluene-d8	Surrogate	99.0%	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 16609

Report Date: 18-Apr-2017
Order Date: 17-Apr-2017
Project Description: PE3391

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroethane	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Chloromethane	ND	0.20	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dibromoethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloroethylene, total	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
1,3,5-Trimethylbenzene	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*9.01*		*ug/g*		*113*	*50-140*			
Surrogate: Dibromofluoromethane	*8.34*		*ug/g*		*104*	*50-140*			
Surrogate: Toluene-d8	*8.57*		*ug/g*		*107*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 16609

Report Date: 18-Apr-2017
Order Date: 17-Apr-2017
Project Description: PE3391

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	46.0	0.1	% by Wt.	45.7			0.6	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroethane	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Chloromethane	ND	0.20	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dibromoethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
1,3,5-Trimethylbenzene	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*6.10*		*ug/g dry*		*97.6*	*50-140*			
Surrogate: Dibromofluoromethane	*4.81*		*ug/g dry*		*77.0*	*50-140*			
Surrogate: Toluene-d8	*6.64*		*ug/g dry*		*106*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	11.0	0.50	ug/g		110	50-140			
Benzene	3.97	0.02	ug/g		99.2	60-130			
Bromodichloromethane	3.89	0.05	ug/g		97.2	60-130			
Bromoform	3.90	0.05	ug/g		97.5	60-130			
Bromomethane	4.95	0.05	ug/g		124	50-140			
Carbon Tetrachloride	3.96	0.05	ug/g		98.9	60-130			
Chlorobenzene	4.03	0.05	ug/g		101	60-130			
Chloroethane	4.76	0.05	ug/g		119	50-140			
Chloroform	3.80	0.05	ug/g		94.9	60-130			
Chloromethane	4.47	0.20	ug/g		112	50-140			
Dibromochloromethane	3.93	0.05	ug/g		98.2	60-130			
Dichlorodifluoromethane	3.47	0.05	ug/g		86.8	50-140			
1,2-Dibromoethane	3.69	0.05	ug/g		92.2	60-130			
1,2-Dichlorobenzene	3.76	0.05	ug/g		94.0	60-130			
1,3-Dichlorobenzene	3.92	0.05	ug/g		98.0	60-130			
1,4-Dichlorobenzene	3.84	0.05	ug/g		96.0	60-130			
1,1-Dichloroethane	3.77	0.05	ug/g		94.2	60-130			
1,2-Dichloroethane	3.99	0.05	ug/g		99.6	60-130			
1,1-Dichloroethylene	3.66	0.05	ug/g		91.5	60-130			
cis-1,2-Dichloroethylene	3.70	0.05	ug/g		92.5	60-130			
trans-1,2-Dichloroethylene	3.67	0.05	ug/g		91.8	60-130			
1,2-Dichloropropane	3.62	0.05	ug/g		90.5	60-130			
cis-1,3-Dichloropropylene	4.05	0.05	ug/g		101	60-130			
trans-1,3-Dichloropropylene	3.85	0.05	ug/g		96.3	60-130			
Ethylbenzene	4.79	0.05	ug/g		120	60-130			
Hexane	3.06	0.05	ug/g		76.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	7.35	0.50	ug/g		73.5	50-140			
Methyl Butyl Ketone (2-Hexanone)	7.48	2.00	ug/g		74.8	50-140			
Methyl Isobutyl Ketone	7.57	0.50	ug/g		75.7	50-140			
Methyl tert-butyl ether	10.4	0.05	ug/g		104	50-140			
Methylene Chloride	3.57	0.05	ug/g		89.4	60-130			
Styrene	3.88	0.05	ug/g		97.0	60-130			
1,1,1,2-Tetrachloroethane	4.04	0.05	ug/g		101	60-130			
1,1,2,2-Tetrachloroethane	4.00	0.05	ug/g		100	60-130			
Tetrachloroethylene	3.74	0.05	ug/g		93.6	60-130			
Toluene	4.65	0.05	ug/g		116	60-130			
1,1,1-Trichloroethane	3.94	0.05	ug/g		98.5	60-130			
1,1,2-Trichloroethane	3.67	0.05	ug/g		91.8	60-130			
Trichloroethylene	3.66	0.05	ug/g		91.4	60-130			
Trichlorofluoromethane	3.78	0.05	ug/g		94.4	50-140			
1,3,5-Trimethylbenzene	4.10	0.05	ug/g		102	60-130			
Vinyl chloride	4.88	0.02	ug/g		122	50-140			
m,p-Xylenes	7.89	0.05	ug/g		98.6	60-130			
o-Xylene	4.35	0.05	ug/g		109	60-130			
Surrogate: 4-Bromofluorobenzene	*7.85*		*ug/g*		*98.2*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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)
Nº 16365

Page 1 of 1

Client Name: PATERSON GROUP INC.	Project Reference: PE3391	TAT: (Regular) [ ] 3 Day	
Contact Name: SEAN MCGGRIDGE	Quote #	[ ] 2 Day	[ ] 1 Day
Address: 154 COLONNADE ROAD SOUTH	PO # 16609	Date Required:	
Telephone: 613 226 7381	Email Address: SMCGGRIDGE@PATERSONGROUP.CA		

Criteria: [X] O. Reg. 153/04 (As Amended) Table 3 [ ] 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: 1441220

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: Metals ICP-Scan	BTEX/PHC(F1-F4)								
1	BH1-SS3	S		1	Oct 8, 2014		X							120 mL		
2	BH1-SS4	S		2	"	"		X						120 mL	1 Vial	
3																
4																
5																
6																
7																
8																
9																
10																

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received by Driver/Depot: T. LOUSE	Received at Lab: SUMEEPORN DOKMAI	Verified By:
Relinquished By (Print): SEAN MCGGRIDGE	Date/Time: 09/10/14 10:25AM	Date/Time: OCT 09 2014 11:55	Date/Time: Oct 9/14
Date/Time: OCT 8, 2014 ~5:30pm	Temperature: °C	Temperature: °C	pH Verified [ ] By: N/A

12:22p

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 21365
Project: PE3391
Custody: 110622

Report Date: 11-Apr-2017
Order Date: 5-Apr-2017

Order #: 1714323

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

Paracel ID	Client ID
1714323-01	BH9-GW1
1714323-02	BH10-GW1
1714323-03	BH11-GW1
1714323-04	BH6-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21365

Report Date: 11-Apr-2017
Order Date: 5-Apr-2017
Project Description: PE3391

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	8-Apr-17	8-Apr-17
PHC F1	CWS Tier 1 - P&T GC-FID	7-Apr-17	8-Apr-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Apr-17	10-Apr-17
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	10-Apr-17	11-Apr-17
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Apr-17	8-Apr-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21365

Report Date: 11-Apr-2017

Order Date: 5-Apr-2017

Project Description: PE3391

	Client ID:	BH9-GW1	BH10-GW1	BH11-GW1	BH6-GW1
	Sample Date:	05-Apr-17	05-Apr-17	05-Apr-17	05-Apr-17
	Sample ID:	1714323-01	1714323-02	1714323-03	1714323-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
Volatiles					
Acetone	5.0 ug/L	-	-	<5.0	-
Benzene	0.5 ug/L	-	-	<0.5	-
Bromodichloromethane	0.5 ug/L	-	-	<0.5	-
Bromoform	0.5 ug/L	-	-	<0.5	-
Bromomethane	0.5 ug/L	-	-	<0.5	-
Carbon Tetrachloride	0.2 ug/L	-	-	<0.2	-
Chlorobenzene	0.5 ug/L	-	-	<0.5	-
Chloroform	0.5 ug/L	-	-	<0.5	-
Dibromochloromethane	0.5 ug/L	-	-	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	-	-	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,1-Dichloroethane	0.5 ug/L	-	-	<0.5	-
1,2-Dichloroethane	0.5 ug/L	-	-	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
1,2-Dichloropropane	0.5 ug/L	-	-	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	-	-	<0.5	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	-	-	<0.2	-
Hexane	1.0 ug/L	-	-	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	-	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	-	-	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	-	-	<2.0	-
Methylene Chloride	5.0 ug/L	-	-	<5.0	-
Styrene	0.5 ug/L	-	-	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-
Tetrachloroethylene	0.5 ug/L	-	-	<0.5	-
Toluene	0.5 ug/L	-	-	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	-	-	<0.5	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21365

Report Date: 11-Apr-2017
Order Date: 5-Apr-2017
Project Description: PE3391

	Client ID:	BH9-GW1	BH10-GW1	BH11-GW1	BH6-GW1
	Sample Date:	05-Apr-17	05-Apr-17	05-Apr-17	05-Apr-17
	Sample ID:	1714323-01	1714323-02	1714323-03	1714323-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
1,1,2-Trichloroethane	0.5 ug/L	-	-	<0.5	-
Trichloroethylene	0.5 ug/L	-	-	<0.5	-
Trichlorofluoromethane	1.0 ug/L	-	-	<1.0	-
Vinyl chloride	0.5 ug/L	-	-	<0.5	-
m,p-Xylenes	0.5 ug/L	-	-	<0.5	-
o-Xylene	0.5 ug/L	-	-	<0.5	-
Xylenes, total	0.5 ug/L	-	-	<0.5	-
4-Bromofluorobenzene	Surrogate	-	-	120%	-
Dibromofluoromethane	Surrogate	-	-	90.4%	-
Toluene-d8	Surrogate	-	-	89.7%	-
Benzene	0.5 ug/L	109	<0.5	-	-
Ethylbenzene	0.5 ug/L	628 [1]	<0.5	-	-
Toluene	0.5 ug/L	72.0	<0.5	-	-
m,p-Xylenes	0.5 ug/L	1360 [1]	<0.5	-	-
o-Xylene	0.5 ug/L	40.0	<0.5	-	-
Xylenes, total	0.5 ug/L	1400 [1]	<0.5	-	-
Toluene-d8	Surrogate	85.0%	91.9%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	4820	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
F1 + F2 PHCs	125 ug/L	4820	<125	-	-
F1 + F2 PHCs	125 ug/L	-	-	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	-	-
F3 + F4 PHCs	200 ug/L	-	-	<200	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	<0.05	-	<0.05
Acenaphthylene	0.05 ug/L	-	<0.05	-	<0.05
Anthracene	0.01 ug/L	-	<0.01	-	<0.01
Benzo [a] anthracene	0.01 ug/L	-	<0.01	-	<0.01
Benzo [a] pyrene	0.01 ug/L	-	<0.01	-	<0.01
Benzo [b] fluoranthene	0.05 ug/L	-	<0.05	-	<0.05
Benzo [g,h,i] perylene	0.05 ug/L	-	<0.05	-	<0.05
Benzo [k] fluoranthene	0.05 ug/L	-	<0.05	-	<0.05
Chrysene	0.05 ug/L	-	<0.05	-	<0.05
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	-	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21365

Report Date: 11-Apr-2017

Order Date: 5-Apr-2017

Project Description: PE3391

	Client ID:	BH9-GW1	BH10-GW1	BH11-GW1	BH6-GW1
	Sample Date:	05-Apr-17	05-Apr-17	05-Apr-17	05-Apr-17
	Sample ID:	1714323-01	1714323-02	1714323-03	1714323-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
Fluoranthene	0.01 ug/L	-	<0.01	-	<0.01
Fluorene	0.05 ug/L	-	<0.05	-	<0.05
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	<0.05	-	<0.05
1-Methylnaphthalene	0.05 ug/L	-	<0.05	-	<0.05
2-Methylnaphthalene	0.05 ug/L	-	<0.05	-	<0.05
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	-	<0.10
Naphthalene	0.05 ug/L	-	<0.05	-	<0.05
Phenanthrene	0.05 ug/L	-	<0.05	-	<0.05
Pyrene	0.01 ug/L	-	<0.01	-	<0.01
2-Fluorobiphenyl	Surrogate	-	114%	-	101%
Terphenyl-d14	Surrogate	-	105%	-	108%

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*24.0*		*ug/L*		*120*	*50-140*			
Surrogate: Terphenyl-d14	*20.4*		*ug/L*		*102*	*50-140*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
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						

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21365

Report Date: 11-Apr-2017
Order Date: 5-Apr-2017
Project Description: PE3391

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*93.8*		*ug/L*		*117*	*50-140*			
Surrogate: Dibromofluoromethane	*81.0*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*76.2*		*ug/L*		*95.2*	*50-140*			
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*76.2*		*ug/L*		*95.2*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	7.27	5.0	ug/L	ND			0.0	30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	2.52	0.5	ug/L	3.24			25.0	30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	5.20	0.5	ug/L	6.74			25.8	30	
Dibromochloromethane	1.56	0.5	ug/L	2.09			29.0	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	*98.8*		*ug/L*		*123*	*50-140*			
Surrogate: Dibromofluoromethane	*79.5*		*ug/L*		*99.4*	*50-140*			
Surrogate: Toluene-d8	*73.6*		*ug/L*		*92.0*	*50-140*			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*73.6*		*ug/L*		*92.0*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2170	25	ug/L		108	68-117			
F2 PHCs (C10-C16)	1540	100	ug/L		85.5	60-140			
F3 PHCs (C16-C34)	3530	100	ug/L		94.9	60-140			
F4 PHCs (C34-C50)	2440	100	ug/L		98.3	60-140			
Semi-Volatiles									
Acenaphthene	4.76	0.05	ug/L		95.2	50-140			
Acenaphthylene	4.26	0.05	ug/L		85.2	50-140			
Anthracene	4.63	0.01	ug/L		92.6	50-140			
Benzo [a] anthracene	4.16	0.01	ug/L		83.1	50-140			
Benzo [a] pyrene	5.20	0.01	ug/L		104	50-140			
Benzo [b] fluoranthene	5.62	0.05	ug/L		112	50-140			
Benzo [g,h,i] perylene	5.64	0.05	ug/L		113	50-140			
Benzo [k] fluoranthene	5.68	0.05	ug/L		114	50-140			
Chrysene	4.63	0.05	ug/L		92.5	50-140			
Dibenzo [a,h] anthracene	6.03	0.05	ug/L		121	50-140			
Fluoranthene	4.72	0.01	ug/L		94.5	50-140			
Fluorene	4.85	0.05	ug/L		96.9	50-140			
Indeno [1,2,3-cd] pyrene	5.99	0.05	ug/L		120	50-140			
1-Methylnaphthalene	5.31	0.05	ug/L		106	50-140			
2-Methylnaphthalene	5.43	0.05	ug/L		109	50-140			
Naphthalene	4.75	0.05	ug/L		95.1	50-140			
Phenanthrene	4.26	0.05	ug/L		85.2	50-140			
Pyrene	4.93	0.01	ug/L		98.5	50-140			
Surrogate: 2-Fluorobiphenyl	*19.6*		*ug/L*		*98.1*	*50-140*			
Volatiles									
Acetone	85.6	5.0	ug/L		85.6	50-140			
Benzene	32.9	0.5	ug/L		82.2	60-130			
Bromodichloromethane	29.6	0.5	ug/L		74.1	60-130			
Bromoform	39.8	0.5	ug/L		99.5	60-130			
Bromomethane	21.7	0.5	ug/L		54.4	50-140			
Carbon Tetrachloride	32.3	0.2	ug/L		80.8	60-130			
Chlorobenzene	36.4	0.5	ug/L		91.0	60-130			
Chloroform	34.3	0.5	ug/L		85.8	60-130			
Dibromochloromethane	34.4	0.5	ug/L		86.1	60-130			
Dichlorodifluoromethane	25.8	1.0	ug/L		64.4	50-140			
1,2-Dichlorobenzene	29.3	0.5	ug/L		73.2	60-130			
1,3-Dichlorobenzene	31.3	0.5	ug/L		78.3	60-130			
1,4-Dichlorobenzene	29.2	0.5	ug/L		73.0	60-130			
1,1-Dichloroethane	33.9	0.5	ug/L		84.6	60-130			
1,2-Dichloroethane	33.0	0.5	ug/L		82.4	60-130			
1,1-Dichloroethylene	35.8	0.5	ug/L		89.4	60-130			
cis-1,2-Dichloroethylene	35.0	0.5	ug/L		87.6	60-130			
trans-1,2-Dichloroethylene	36.0	0.5	ug/L		89.9	60-130			
1,2-Dichloropropane	34.6	0.5	ug/L		86.4	60-130			
cis-1,3-Dichloropropylene	29.4	0.5	ug/L		73.6	60-130			
trans-1,3-Dichloropropylene	31.8	0.5	ug/L		79.4	60-130			
Ethylbenzene	34.0	0.5	ug/L		85.0	60-130			
Ethylene dibromide (dibromoethane	38.4	0.2	ug/L		95.9	60-130			
Hexane	38.9	1.0	ug/L		97.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	104	5.0	ug/L		104	50-140			
Methyl Isobutyl Ketone	107	5.0	ug/L		107	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl tert-butyl ether	79.5	2.0	ug/L		79.5	50-140			
Methylene Chloride	35.7	5.0	ug/L		89.2	60-130			
Styrene	33.8	0.5	ug/L		84.6	60-130			
1,1,1,2-Tetrachloroethane	33.4	0.5	ug/L		83.5	60-130			
1,1,2,2-Tetrachloroethane	42.3	0.5	ug/L		106	60-130			
Tetrachloroethylene	30.2	0.5	ug/L		75.4	60-130			
Toluene	33.4	0.5	ug/L		83.6	60-130			
1,1,1-Trichloroethane	30.7	0.5	ug/L		76.8	60-130			
1,1,2-Trichloroethane	35.5	0.5	ug/L		88.8	60-130			
Trichloroethylene	32.3	0.5	ug/L		80.8	60-130			
Trichlorofluoromethane	36.9	1.0	ug/L		92.2	60-130			
Vinyl chloride	30.6	0.5	ug/L		76.4	50-140			
m,p-Xylenes	68.7	0.5	ug/L		85.9	60-130			
o-Xylene	35.4	0.5	ug/L		88.4	60-130			
Benzene	32.9	0.5	ug/L		82.2	60-130			
Ethylbenzene	34.0	0.5	ug/L		85.0	60-130			
Toluene	33.4	0.5	ug/L		83.6	60-130			
m,p-Xylenes	68.7	0.5	ug/L		85.9	60-130			
o-Xylene	35.4	0.5	ug/L		88.4	60-130			

Qualifier Notes:

Sample Qualifiers :

1 : This result exceeds the calibration range of the instrument. The result may be biased.

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.

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Paracel ID: 1714323

Chain of Custody (Lab Use Only) № 110622

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE3391	**Turnaround Time:**	
Contact Name: ADRIAN MENYHART	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 COLONNADE RD S.	PO # 21365	☐ 2 Day	☒ Regular
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca	Date Required:	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 1 ☐ 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: 1714323

	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	BH9-GW1	GW		3	APR 5 2017	AM	/													/
2	BH10-GW1	|		4	|	|	/		/					HOLD PAH					/
3	BH11-GW1	|		7 6 /	|	|	/	/		/	/	/		HOLD METALS/Hg/CrVI					/
4	BH6-GW1	|		1	|	|			/					HOLD PAH.					/
5																				
6																				
7																				
8																				
9	Received PAH bottle for sample BH11-GW1. -RS																			
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: TEDOUSE	Received at Lab: SUMEDHA DEKMAJ
Relinquished By (Print): ADRIAN MENYHART	Date/Time: 05/04/17 4:15	Date/Time: APR 05 2017 05:00
Date/Time:	Temperature: °C	Temperature: 20.9 °C

Verified By: Rachel Subject

Date/Time: Apr 5/17.

pH Verified (✓) By: N/A 5:21

Paracel ID: 1714323

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Chain of Custody (Lab Use Only) № 110622

Page 1 of 1

Client Name: PATERSON GROUP	Project Reference: PE3391	**Turnaround Time:**	
Contact Name: ADRIAN MENYHART	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 COLONNADE RD S.	PO # 21365	☐ 2 Day	☒ Regular
Telephone: 613-226-7381	Email Address: amenyhart@patersongroup.ca	Date Required:	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 1 ☐ 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: 1714323 / 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	BH9-GW1	GW		3	Apr 5 2017	AM	/													/
2	BH10-GW1	|		4	|	|	/		/					HOLD PAH					/
3	BH11-GW1	|		3 ~~6~~ /	|	|	/	/		/	/	/		HOLD METALS/Hg/CrVI					/
4	BH6-GW1	|		1	|	|			/					HOLD PAH.					
5																				
6																				
7																				
8																				
9	Received PAH bottle for sample BH11-GW1. -BS																			
10	↳ PAH on hold as per Adrian. BC.																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: JEDUSE	Received at Lab: SUMEDHA DEKHAJ	Verified By: Rached Subject
Relinquished By (Print): ADRIAN MENYHART	Date/Time: 05/04/17 4:15 PM	Date/Time: APR 05 2017 09:00	Date/Time: Apr 5/17.
Date/Time:	Temperature: ___ °C	Temperature: 20.0 °C	pH Verified [X] By: N/A 5:21

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 21764
Project: PE3391
Custody: 31152

Report Date: 20-Mar-2017
Order Date: 14-Mar-2017

Order #: 1711191

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

Paracel ID	Client ID
1711191-01	BH1-GW2
1711191-02	BH2-GW2
1711191-03	BH6-GW2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21764

Report Date: 20-Mar-2017
Order Date: 14-Mar-2017
Project Description: PE3391

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	16-Mar-17	16-Mar-17
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	16-Mar-17	16-Mar-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	15-Mar-17	15-Mar-17
PHC F1	CWS Tier 1 - P&T GC-FID	16-Mar-17	16-Mar-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	16-Mar-17	17-Mar-17
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	16-Mar-17	16-Mar-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21764

Report Date: 20-Mar-2017

Order Date: 14-Mar-2017

Project Description: PE3391

	Client ID:	BH1-GW2	BH2-GW2	BH6-GW2	-
	Sample Date:	14-Mar-17	14-Mar-17	14-Mar-17	-
	Sample ID:	1711191-01	1711191-02	1711191-03	-
	MDL/Units	Water	Water	Water	-
Metals					
Mercury	0.1 ug/L	<0.1	<0.1	-	-
Antimony	0.5 ug/L	<0.5	<0.5	-	-
Arsenic	1 ug/L	<1	<1	-	-
Barium	1 ug/L	193	270	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	-	-
Boron	10 ug/L	259	230	-	-
Cadmium	0.1 ug/L	<0.1	<0.1	-	-
Chromium	1 ug/L	<1	<1	-	-
Chromium (VI)	10 ug/L	<10	<10	-	-
Cobalt	0.5 ug/L	2.7	<0.5	-	-
Copper	0.5 ug/L	<0.5	<0.5	-	-
Lead	0.1 ug/L	0.4	<0.1	-	-
Molybdenum	0.5 ug/L	0.8	<0.5	-	-
Nickel	1 ug/L	11	<1	-	-
Selenium	1 ug/L	<1	<1	-	-
Silver	0.1 ug/L	<0.1	<0.1	-	-
Sodium	200 ug/L	165000	116000	-	-
Thallium	0.1 ug/L	<0.1	<0.1	-	-
Uranium	0.1 ug/L	1.0	0.3	-	-
Vanadium	0.5 ug/L	<0.5	<0.5	-	-
Zinc	5 ug/L	22	<5	-	-
Volatiles					
Acetone	5.0 ug/L	-	-	<5.0	-
Benzene	0.5 ug/L	-	-	<0.5	-
Bromodichloromethane	0.5 ug/L	-	-	<0.5	-
Bromoform	0.5 ug/L	-	-	<0.5	-
Bromomethane	0.5 ug/L	-	-	<0.5	-
Carbon Tetrachloride	0.2 ug/L	-	-	<0.2	-
Chlorobenzene	0.5 ug/L	-	-	<0.5	-
Chloroform	0.5 ug/L	-	-	<0.5	-
Dibromochloromethane	0.5 ug/L	-	-	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	-	-	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	-	-	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21764

Report Date: 20-Mar-2017

Order Date: 14-Mar-2017

Project Description: PE3391

	Client ID:	BH1-GW2	BH2-GW2	BH6-GW2	-
	Sample Date:	14-Mar-17	14-Mar-17	14-Mar-17	-
	Sample ID:	1711191-01	1711191-02	1711191-03	-
	MDL/Units	Water	Water	Water	-
1,1-Dichloroethane	0.5 ug/L	-	-	<0.5	-
1,2-Dichloroethane	0.5 ug/L	-	-	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	-	<0.5	-
1,2-Dichloropropane	0.5 ug/L	-	-	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	-	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	-	-	<0.5	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	-	-	<0.2	-
Hexane	1.0 ug/L	-	-	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	-	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	-	-	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	-	-	<2.0	-
Methylene Chloride	5.0 ug/L	-	-	<5.0	-
Styrene	0.5 ug/L	-	-	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	-	<0.5	-
Tetrachloroethylene	0.5 ug/L	-	-	<0.5	-
Toluene	0.5 ug/L	-	-	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	-	-	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	-	-	<0.5	-
Trichloroethylene	0.5 ug/L	-	-	<0.5	-
Trichlorofluoromethane	1.0 ug/L	-	-	<1.0	-
Vinyl chloride	0.5 ug/L	-	-	<0.5	-
m,p-Xylenes	0.5 ug/L	-	-	1.6	-
o-Xylene	0.5 ug/L	-	-	<0.5	-
Xylenes, total	0.5 ug/L	-	-	1.6	-
4-Bromofluorobenzene	Surrogate	-	-	91.3%	-
Dibromofluoromethane	Surrogate	-	-	101%	-
Toluene-d8	Surrogate	-	-	117%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	<25	-
F2 PHCs (C10-C16)	100 ug/L	-	-	<100	-
F3 PHCs (C16-C34)	100 ug/L	-	-	<100	-
F4 PHCs (C34-C50)	100 ug/L	-	-	<100	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21764

Report Date: 20-Mar-2017

Order Date: 14-Mar-2017

Project Description: PE3391

	Client ID:	BH1-GW2	BH2-GW2	BH6-GW2	-
	Sample Date:	14-Mar-17	14-Mar-17	14-Mar-17	-
	Sample ID:	1711191-01	1711191-02	1711191-03	-
	MDL/Units	Water	Water	Water	-
F1 + F2 PHCs	125 ug/L	-	-	<125	-
F3 + F4 PHCs	200 ug/L	-	-	<200	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
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						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*77.8*		*ug/L*		*97.2*	*50-140*			
Surrogate: Dibromofluoromethane	*76.4*		*ug/L*		*95.5*	*50-140*			
Surrogate: Toluene-d8	*91.6*		*ug/L*		*115*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	ND	1	ug/L	ND			0.0	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	ND	10	ug/L	ND			0.0	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	ND	1	ug/L	ND				20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	ND	0.5	ug/L	ND				20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	ND	0.5	ug/L	ND			0.0	20	
Nickel	ND	1	ug/L	ND				20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	ND	200	ug/L	ND			0.0	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND				20	
Zinc	ND	5	ug/L	ND				20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	2.61	0.5	ug/L	2.57			1.5	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	4.39	0.5	ug/L	5.22			17.3	30	
Dibromochloromethane	2.00	0.5	ug/L	1.91			4.6	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	7.76	0.5	ug/L	4.24			58.7	30	QR-05
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*76.2*		*ug/L*		*95.3*	*50-140*			
Surrogate: Dibromofluoromethane	*76.8*		*ug/L*		*96.0*	*50-140*			
Surrogate: Toluene-d8	*93.8*		*ug/L*		*117*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2000	25	ug/L		100	68-117			
F2 PHCs (C10-C16)	1600	100	ug/L		89.0	60-140			
F3 PHCs (C16-C34)	3260	100	ug/L		87.7	60-140			
F4 PHCs (C34-C50)	2270	100	ug/L		91.7	60-140			
Metals									
Mercury	2.91	0.1	ug/L	ND	97.2	70-130			
Antimony	41.2		ug/L	ND	82.3	80-120			
Arsenic	49.3		ug/L	ND	98.7	80-120			
Barium	47.7		ug/L	ND	95.3	80-120			
Beryllium	49.1		ug/L	ND	98.2	80-120			
Boron	48		ug/L	ND	84.0	80-120			
Cadmium	43.9		ug/L	ND	87.7	80-120			
Chromium (VI)	193	10	ug/L	ND	96.5	70-130			
Chromium	44.5		ug/L	ND	89.1	80-120			
Cobalt	43.2		ug/L	ND	86.4	80-120			
Copper	39.7		ug/L	ND	79.5	80-120			QM-07
Lead	46.5		ug/L	ND	93.0	80-120			
Molybdenum	41.1		ug/L	ND	82.1	80-120			
Nickel	44.7		ug/L	ND	89.4	80-120			
Selenium	48.8		ug/L	ND	97.4	80-120			
Silver	42.3		ug/L	ND	84.6	80-120			
Sodium	797		ug/L	ND	74.5	80-120			QM-07
Thallium	47.3		ug/L	ND	94.7	80-120			
Uranium	43.5		ug/L	ND	86.9	80-120			
Vanadium	45.0		ug/L	ND	90.0	80-120			
Zinc	46		ug/L	ND	91.9	80-120			
Volatiles									
Acetone	87.0	5.0	ug/L		87.0	50-140			
Benzene	32.0	0.5	ug/L		80.1	60-130			
Bromodichloromethane	28.7	0.5	ug/L		71.7	60-130			
Bromoform	32.9	0.5	ug/L		82.2	60-130			
Bromomethane	27.7	0.5	ug/L		69.2	50-140			
Carbon Tetrachloride	31.8	0.2	ug/L		79.6	60-130			
Chlorobenzene	30.1	0.5	ug/L		75.3	60-130			
Chloroform	33.6	0.5	ug/L		84.0	60-130			
Dibromochloromethane	27.9	0.5	ug/L		69.7	60-130			
Dichlorodifluoromethane	27.1	1.0	ug/L		67.6	50-140			
1,2-Dichlorobenzene	32.0	0.5	ug/L		80.1	60-130			
1,3-Dichlorobenzene	35.0	0.5	ug/L		87.4	60-130			
1,4-Dichlorobenzene	30.5	0.5	ug/L		76.3	60-130			
1,1-Dichloroethane	32.9	0.5	ug/L		82.2	60-130			
1,2-Dichloroethane	30.9	0.5	ug/L		77.2	60-130			
1,1-Dichloroethylene	31.1	0.5	ug/L		77.8	60-130			
cis-1,2-Dichloroethylene	33.6	0.5	ug/L		84.1	60-130			
trans-1,2-Dichloroethylene	31.5	0.5	ug/L		78.8	60-130			
1,2-Dichloropropane	34.3	0.5	ug/L		85.8	60-130			
cis-1,3-Dichloropropylene	31.8	0.5	ug/L		79.6	60-130			
trans-1,3-Dichloropropylene	32.9	0.5	ug/L		82.2	60-130			
Ethylbenzene	31.4	0.5	ug/L		78.6	60-130			
Ethylene dibromide (dibromoethane	32.6	0.2	ug/L		81.6	60-130			
Hexane	35.0	1.0	ug/L		87.6	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	118	5.0	ug/L		118	50-140			
Methyl Isobutyl Ketone	126	5.0	ug/L		126	50-140			
Methyl tert-butyl ether	81.9	2.0	ug/L		81.9	50-140			
Methylene Chloride	36.7	5.0	ug/L		91.8	60-130			
Styrene	33.9	0.5	ug/L		84.8	60-130			
1,1,1,2-Tetrachloroethane	30.1	0.5	ug/L		75.2	60-130			
1,1,2,2-Tetrachloroethane	33.1	0.5	ug/L		82.6	60-130			
Tetrachloroethylene	26.9	0.5	ug/L		67.3	60-130			
Toluene	29.0	0.5	ug/L		72.4	60-130			
1,1,1-Trichloroethane	30.0	0.5	ug/L		74.9	60-130			
1,1,2-Trichloroethane	38.3	0.5	ug/L		95.8	60-130			
Trichloroethylene	33.6	0.5	ug/L		84.0	60-130			
Trichlorofluoromethane	33.8	1.0	ug/L		84.4	60-130			
Vinyl chloride	27.6	0.5	ug/L		68.9	50-140			
m,p-Xylenes	61.1	0.5	ug/L		76.4	60-130			
o-Xylene	31.2	0.5	ug/L		78.0	60-130			
Surrogate: 4-Bromofluorobenzene	*88.4*		*ug/L*		*110*	*50-140*			

Qualifier Notes:

QC Qualifiers :

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

QR-05 : Duplicate RPDs higher than normally accepted. Remaing batch QA\QC was acceptable. May be sample effect.

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 ID: 1711191

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Chain of Custody
(Lab Use Only)
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Page 1 of 1

Client Name: Paterson Group	Project Reference: PE3391	**Turnaround Time:**	
Contact Name: MARK D'ARCY	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 COLONNADE RD. S. Ottawa, ON	PO # 21764	☐ 2 Day	☑ Regular
Telephone: 613-226-7381	Email Address: mdarcy@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: 1711191 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Metals	HS	Cr VI	VOCs	F1 - F4						
1	BH1 - GW2	GW		3	MAR 14/17	10:30	✓	✓	✓								
2	BH2 - GW2	↓		3	↓	9:30	✓	✓	✓								
3	BH6 - GW2	↓		3	↓	8:30				✓	✓						
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Louie	Received at Lab: D. Saroff	Verified By: Rachel Subject
Relinquished By (Print): Greg van Loenen	Date/Time: 14/03/17 3:40 PM	Date/Time: Mar 14/17 4:30pm	Date/Time: MAR 15/17.
Date/Time: MAR 14, 2017.	Temperature: °C	Temperature: 10.1 °C	pH Verified ☑ By: RS 7:55