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Phase II Environmental Site Assessment

4055 & 4120 Russell Road
Ottawa, Ontario

Prepared For

Avenue 31 Capital Inc.

October 10, 2019

Report: PE4690-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 4055 and 4120 Russell Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the subject properties. The subsurface investigation consisted of drilling sixteen (16) boreholes, of which seven (7) were installed with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Eleven (11) soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs F_1-F_4), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), metals, and/or organo-chlorine (OC) pesticides and the atrazine package.

The concentration of barium in BH1 exceeded the selected MECP Table 9 standard yet complied with the federal CCME commercial standard. Based on the native origins of the soil sample, as well as the analytical results of previous subsurface investigations, this exceedance is considered to be a naturally occurring elevated level, and thus does not present a contaminant issue to the subject property. All remaining parameters analyzed were in compliance with the selected MECP and CCME standards.

Groundwater samples recovered from monitoring wells installed in BH1, BH3, BH6, BH9, BH13, BH14, and BH15 were submitted for analysis of BTEX, PHCs (F1-F4), VOCs, PAHs, and/or metals parameters. All of the analytical test results were in compliance with the selected MECP and CCME standards.

Recommendations

While in compliance with the selected MECP Table 3 and CCME standards, it should be noted that the concentration of molybdenum and PHC F4 in the soil sample (fill material) recovered from BH15, located in the north portion of 4120 Russell Road, exceeded the MECP Table 1 Full Depth Background Site Conditions. If this fill material is to be removed from the property, it should be classified as contaminated soil for off-site disposal.

The full extent of the fill material was not delineated as part of this Phase II ESA, however, based on our field observations it is anticipated that the volume of this fill material ranges from approximately 50 to 150 m^3.

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

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

While our Phase II ESA did not identify any significant/gross contamination, it is a limited investigation on properties of this size. Based on the history/previous activities on-site, it is considered likely that some pockets of impacted soil will be encountered during future site development. In lieu of further investigation to attempt to find such pockets, which would likely be impractical, an allowance should be carried to cover any such related costs.

If the groundwater monitoring wells installed in BH1, BH3, BH6, BH9, BH13, BH14, and BH15 are not going to be used in the future, then they must be decommissioned according to Ontario Regulation Reg. 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Mr. Michel Pilon of Avenue 31 Capital Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of 4055 and 4120 Russell Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in September 2019.

1.1 Site Description

Addresses:	4055 Russell Road, Ottawa, Ontario. 4120 Russell Road, Ottawa, Ontario.
Legal Descriptions:	(4055 Russell Road) Part of Lots 3 to 5, Concession 6, Rideau Front, Part of Registered Plan 5R-5635; Formerly the Township of Gloucester, in the City of Ottawa. (4120 Russell Road) Part of Lot 5, Concession 6, Rideau Front; Part of Registered Plan 4R-24959; Formerly the Township of Gloucester, in the City of Ottawa.
Property Identification Numbers (PINs):	(4055 Russell Road) 04351-0393 (4120 Russell Road) 04161-0168, 04161-0166, 04161-0166, 04161-0158
Location:	The subject properties are located on the north (4055 Russell Road) and south (4120 Russell Road) side of Russell Road, approximately 50 m west of Hunt Club Road, in the City of Ottawa, Ontario.
Latitude and Longitude:	(4055 Russell Road) 45° 23' 09" N, 75° 35' 30" W (4120 Russell Road) 45° 22' 50" N, 75° 35' 27" W

Site Description:

Configurations:	(4055 Russell Road) Irregular (4120 Russell Road) Irregular

Site Areas:	(4055 Russell Road) 28.2 ha (approximate) (4120 Russell Road) 12.2 ha (approximate)
Zoning:	(4055 Russell Road) IH – Heavy Industrial Zone
	(4120 Russell Road) IH – Heavy Industrial Zone (4120 Russell Road) AG – Agricultural Zone
Current Uses	(4055 Russell Road) The property is currently occupied by a residential dwelling and an abandoned farmhouse and associated barns.
	(4120 Russell Road) The property is currently vacant.
Services:	Both properties are located in a municipally serviced area. It should be noted that the occupied residential dwelling situated on 4055 Russell Road (addressed 3995 Russell Road) is supplied with municipal services but has a private septic system.

1.2 Property Ownership

The current registered property owner of 4055 and 4120 Russell Road is the National Capital Commission (NCC). Paterson was retained to complete this Phase II ESA by Mr. Michel Pilon of Avenue 31 Capital Inc. Avenue 31 Capital Inc.'s office is located at 222 Somerset Street West, Unit 402, in Ottawa, Ontario. Mr. Pilon can be contacted by telephone at 613-903-7331.

1.3 Current and Proposed Future Uses

4055 Russell Road is currently occupied by a residential dwelling and an abandoned farmhouse and associated barns. 4120 Russell Road is currently vacant. It is our understanding that the subject properties will be leased to future commercial and industrial tenants, as per the existing Heavy Industrial (HI) zoning on the subject properties.

1.4 Applicable Site Condition Standard

The site condition standards for the subject properties were obtained from the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ministry of the Environment, Conservation and Parks (MECP), April 2011.

4055 Russell Road:

For this property, the selected MECP Table 9 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Non-potable groundwater conditions
- ❒ Proximity to a waterbody
- ❒ Commercial and/or industrial land use

4120 Russell Road:

For this property, the selected MECP Table 3 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Non-potable groundwater conditions
- ❒ Commercial and/or industrial land use

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

The MECP Table 1 Standards for Full Depth Background Site Conditions were also selected for additional consideration, with respect to both properties, in order to assess the on-site soil conditions prior to future off-site disposal.

In addition to the aforementioned provincial site condition standards, the federal standards based on the Council of Canadian Ministers of the Environment (CCME) Environmental Quality Guidelines for commercial land use have been used to assess the soil and groundwater conditions on the subject properties.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The property addressed 4055 Russell Road is currently occupied by a residential dwelling as well as an abandoned farmhouse with associated barns. The majority of the subject property is covered with dense grass, light brush, and mature trees. The site topography is relatively flat, while the regional topography slopes gently down to the east. The site is at grade with respect to Russell Road and Highway 417.

The property addressed 4120 Russell Road is currently vacant and covered with dense grass, light brush, and immature trees. The site topography slopes down to the south and gently down to the east, while the regional topography slopes down to the east. The site is at grade with Russell Road as well as the adjacent properties to the north, and below grade with respect to Hunt Club Road. Water drainage on the subject sites consists primarily of infiltration throughout the properties.

2.2 Past Investigations

4055 Russell Road

- "Phase I Environmental Assessment, 4055/3995 Russell Road, Gloucester, Ontario", prepared by Oliver, Mangione, McCalla & Associates and dated February 12, 1999.

A 1999 Phase I ESA report identified eight (8) APECs on the subject property and, as a result, a Phase II ESA was recommended.

- "Phase II Environmental Site Assessment, 4055 and 3995 Russell Road, Ottawa, Ontario", prepared by Trow Associates Inc. and dated October 2005.

The Phase II ESA, conducted in 2005, involved the advancement of eleven (11) test pits and five (5) boreholes, within the areas of environmental concern, to a maximum depth of 7.3 meters below ground surface. Eleven (11) soil samples were submitted for analysis of petroleum hydrocarbons (PHCs), pesticides, nitrate, metals, as well as benzene, toluene, ethylbenzene, and xylenes (BTEX) analysis. Five (5) groundwater samples, recovered from monitoring wells installed in each borehole, were submitted for analysis of PHCs, BTEX, metals, and volatile organic compounds (VOCs).

According to the analytical test results, the concentration of BTEX, pesticides, and metal parameters in the soil samples analysed were in compliance with the selected MOE and CCME soil quality criteria. One (1) soil sample, collected at ground surface in the vicinity of staining observed around an aboveground diesel fuel tank (AST), located adjacent to a large storage shed in the vicinity of the on-site farmhouse, had concentration of PHC F_3 which exceeded the applicable federal and provincial soil quality criteria. Based on visual and olfactory observations made at the time of the sampling program, the lateral extent of PHC impact to soil in this area was suspected to be limited to a 1.0 m radius from the AST and extend to a depth of approximately 0.5 m below ground surface.

The concentration of PHCs in all other soil samples were compliant with the selected CCME and MOE soil quality criteria. In addition, all groundwater parameter concentrations analysed were in compliance with the selected MOE criteria. The concentration of PHCs in the soil and groundwater samples analysed also comply with the current MECP Table 9 standards. The presence of the former AST spill is considered to be an APEC on the subject property.

4120 Russell Road

- "Limited Phase II Environmental Site Assessment, NCC Property Asset Numbers 243780 and 185, 4120 & 4224 Russell Road, Ottawa, Ontario", prepared by Aqua Terre Solutions Inc. and dated December 16, 2002.

A limited Phase II ESA was conducted for 4120 Russell Road in 2002 in order to assess potential impacts resulting from a closed landfill located west of the subject site, as well as for potential impacts resulting from the former on-site farmhouse. Five (5) boreholes were advanced on the property to a maximum depth of 9.85 meters below ground surface. A total of eight (8) soil samples were submitted for analysis of BTEX, TPH, PHCs, VOCs, and metals parameters.

According to the analytical test results, three (3) soil samples, recovered from BH1, BH2, and BH3, contained a concentration of chromium and which marginally exceeded the CCME criteria. One (1) of these samples, recovered from BH2, also contained a concentration of zinc which marginally exceeded the CCME criteria. Based on the depths of the recovered soil samples, the excess concentrations of chromium and zinc are considered to be naturally occurring, and do not pose a contaminant issue to the subject property. All remaining BTEX, TPH, PHCs, and VOC parameters in the soil samples analysed were in compliance with the MOE and CCME criteria. The results are also in compliance with the current MECP Table 3 standards.

A total of five (5) groundwater samples, recovered from monitoring wells installed in each borehole, were submitted for analysis of BTEX, TPH, VOCs, metals, pH levels, and general chemistry parameters. According to the analytical results, one (1) groundwater sample, recovered from BH1, contained a concentration of sodium which marginally exceeded the MOE Table A potable groundwater criteria and the CCME criteria. Two (2) groundwater samples, recovered from BH1 and BH2, contained a concentration of benzene which marginally exceeded the MOE Table A and CCME criteria. Three (3) groundwater samples, recovered from BH1, BH2, and BH5, contained a concentration of ethylbenzene which marginally exceeded the MOE Table A and CCME criteria.

All remaining parameters analysed were in compliance with the MOE and CCME criteria. As a result of the limited 2002 Phase II ESA, a screening level risk assessment was recommended.

It should be noted that at the time, the aforementioned analytical test results for the recovered soil samples were compared to the more stringent MOE Table A agricultural land use, generic soil remediation criteria in a potable groundwater situation. Furthermore, the analytical test results for the recovered groundwater samples were also compared to the more stringent MOE Table A potable groundwater criteria. Since the subject land is to be used for future commercial purposes in a non-potable groundwater situation, these test results have been compared to the now contemporary MECP Table 3 commercial standards. The analytical test results for all soil and groundwater samples recovered as part of the limited 2002 Phase II ESA are in compliance with the current MECP Table 3 commercial standards.

When testing wells for the first time and encountering marginal concentrations of BTEX parameters when there is no supplemental evidence of petroleum impact, it has been our experience that during resampling of the wells no detectable concentrations of the originally identified parameters were detected. It is our opinion that this is a result of the drilling activity and occurs when wells have not been fully established. It is suspected that this may explain the previously noted BTEX concentrations.

- "Screening Level Risk Assessment, 4120 & 4224 Russell Road, NCC Property Asset Numbers 243780 and 185, Ottawa, Ontario", prepared by Trow Consulting Engineers Ltd. and dated March 2003.

A screening level risk assessment was completed for the subject property in 2003. As part of the assessment, a limited Phase II ESA was conducted to confirm the findings from the previous 2002 Phase II ESA. One (1) groundwater sample, recovered from BH5, was obtained and submitted for BTEX analysis. This borehole was chosen due to the benzene and ethylbenzene exceedances identified in the previous groundwater sample recovered from this well, as part of the 2002 Phase II ESA.

According to the analytical test results, all BTEX parameters complied with the MOE and CCME criteria.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted between August 28 and September 4, 2019. The field program consisted of drilling sixteen (16) boreholes (BH1-BH16), of which seven (7) were equipped with groundwater monitoring wells (BH1, BH3, BH6, BH9, BH13, BH14, and BH15). The boreholes were drilled to depths ranging from 2.29 m to 10.24 m below the existing grade.

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.

Contaminants of concern for soil and groundwater include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs F_1 - F_4), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and metals. Confirmatory analysis of organo-chlorine (OC) pesticides and the atrazine package was also conducted as part of this investigation.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on available mapping information, the bedrock in the area of the subject sites consists of shale of the Carlsbad Formation, with an overburden consisting of offshore marine sediments (erosional terraces) and ranging from 3 to 10 m in thickness.

The site topography slopes down to the east, while the regional topography in the general area of the site slopes down to the east in the direction of Mer Bleue Bog. The regional groundwater flow is anticipated to flow to the northeast, towards Mer Bleue Bog.

Contaminants of Potential Concern

As per Section 6.1 of the Phase I ESA report, benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs F_1 - F_4), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and metals were identified as contaminants of potential concern (CPCs) on the subject sites.

Existing Buildings and Structures

The property addressed 4055 Russell Road is currently occupied by a residential dwelling as well as an abandoned farmhouse with associated barns, silos, and storage sheds.

No buildings or structures are currently present on the property addressed 4120 Russell Road.

Water Bodies and Areas of Natural Significance

A small watercourse (The Mather Award Drainage Ditch) is present in the south portion of 4055 Russell Road and transects the property in an east-west direction. This watercourse generally flows towards the northeast and feeds into Ramsay Creek, located approximately 650 m east of 4055 Russell Road.

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

Drinking Water Wells

The subject sites are located within a municipally supplied area. Based on the available MECP Water Well Records, no drinking water wells are expected to be present within the Phase I study area.

Neighbouring Land Use

Neighbouring land use within the Phase I study area consists of residential, commercial, and light industrial properties. Land use is shown on Drawing PE4690-2 – Surrounding Land Use Plan.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 6.1 of the Phase I ESA report, five (5) Potentially Contaminating Activities (PCAs) identified on the subject properties are considered to represent Areas of Potential Environmental Concern (APECs):

- A former on-site auto service garage, located on the southeast portion of 4055 Russell Road.
- A diesel fuel spill originating from a former above ground fuel storage tank, located adjacent to a storage shed on 4055 Russell Road.
- The potential for deleterious fill material as a result of the demolition of a former farmhouse in the northwest portion of 4055 Russell Road.
- The potential for deleterious fill material as a result of the demolition of a former farmhouse in the west-central portion of 4120 Russell Road.
- The presence of fill material of unknown quality in the north portion of 4120 Russell Road.

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 properties which have the potential to have impacted the subject sites. 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.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted between August 28 and September 4, 2019. The field program consisted of drilling sixteen (16) boreholes (BH1-BH16), of which seven (7) were equipped with groundwater monitoring wells (BH1, BH3, BH6, BH9, BH13, BH14, and BH15). The boreholes were drilled to depths ranging from 2.29 m to 10.24 m below the existing grade. Under the full-time supervision of Paterson personnel, the boreholes were drilled using a truck-mounted drill rig and a track-mounted drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario and Capital Cutting and Coring Ltd. of Ottawa, Ontario. Borehole locations are shown on Drawing PE4690-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of one hundred twenty-one (121) soil samples were obtained from the boreholes by means of auger and split spoon sampling. The depths at which the auger and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of brown silty sand, underlain by grey silty clay and gravel till. Bedrock was not confirmed by coring during the current subsurface investigation, however, based on the measured depths of practical refusal to auguring, the bedrock is interpreted to be at depths ranging from approximately 2.29 m to 10.24 m in the vicinity of 4055 Russell Road and approximately 3.91 m to 8.23 m in the vicinity of 4120 Russell Road.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a Photo Ionization Detector. The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated/manipulated gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The organic vapour readings were found to range from 0 ppm to 2.3 ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

4.4 Groundwater Monitoring Well Installation

Seven (7) groundwater monitoring wells were installed on the subject sites as part of the current Phase II ESA investigation. The monitoring wells consisted of 50 mm diameter Schedule 40 threaded PVC risers and screens. A summary of the monitoring well construction details are listed below in Table 1 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Upon completion, the ground elevation of each borehole were subsequently surveyed with respect to a known geodetic elevation.

Table 1
Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m ASL)	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	69.48	6.88	3.83 - 6.88	3.30 - 6.88	0.15 - 3.30	Stick-Up
BH3	71.57	4.88	1.83 - 4.88	1.52 - 4.88	0.13 - 1.52	Stick-Up
BH6	70.60	2.29	0.77 - 2.29	0.31 - 2.29	0.08 - 0.31	Stick-Up
BH9	70.95	4.57	1.52 - 4.57	1.19 - 4.57	0.15 - 1.19	Stick-Up
BH13	70.20	4.57	3.05 - 4.57	2.79 - 4.57	0.03 - 2.79	Stick-Up
BH14	79.45	7.62	4.57 - 7.62	4.32 - 7.62	3.71 - 4.32	Stick-Up
BH15	79.23	6.10	3.05 - 6.10	2.74 - 6.10	2.13 - 2.74	Stick-Up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1, BH3, BH6, BH9, BH14, and BH15 on September 18, 2019, and at BH13 on September 19, 2019. No water quality parameters were measured in the field at that time.

4.6 Groundwater Sampling

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

4.7 Analytical Testing

The following soil and groundwater samples were submitted for analysis:

Table 2
Soil Samples Submitted

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed								Rationale
		PHCs (F_1-F_4)	VOCs	PAHs	Metals[1]	PHCs (F_2-F_4)	BTEX & PHCs (F_1-F_4)	Atrazine Package	OC Pesticides	
4055 Russell Road										
BH1-SS6	3.81 – 4.42 m Silty Clay	X	X	X	X					Assess for potential impacts resulting from the former on-site auto service garage.
BH3-AU1	0.00 – 0.61 m Silty Sand				X		X			Assess for potential impacts resulting from the former aboveground diesel tank spill.
BH3-SS2	0.76 – 1.37 m Silty Sand						X			Assess for potential impacts resulting from the former aboveground diesel tank spill.
BH4-AU1	0.00 – 0.61 m Topsoil							X	X	For additional coverage purposes.
BH6-SS2	0.76 – 1.37 m Silty Sand						X			For additional coverage purposes.
BH9-SS2	0.76 – 1.37 m Silty Sand				X		X			Assess for potential impacts resulting from on-site fill material.
4120 Russell Road										
BH13-AU1	0.00 – 0.61 m Topsoil				X			X	X	For additional coverage purposes.
BH13-SS6	3.81 – 4.42 m Till	X	X							For additional coverage purposes.
BH14-AU1-SS2	0.00 – 1.37 m Fill Material				X	X				Assess for potential impacts resulting from on-site fill material.
BH15-SS1	0.00 – 0.61 m Fill Material			X	X	X				Assess for potential impacts resulting from on-site fill material.
BH16-AU1	0.00 – 0.61 m Topsoil							X	X	For additional coverage purposes.

1 – Including Chromium VI and Mercury

Table 3
Groundwater Samples Submitted

Sample ID	Screened Interval & Stratigraphic Unit	Parameters Analyzed					Rationale
		BTEX	PHCs ($F_1 - F_4$)	VOCs	PAHs	Metals[1]	
4055 Russell Road							
BH1-GW1	3.83 – 6.88 m Silty Clay		X	X			Assess for potential impacts resulting from the former on-site auto service garage.
BH3-GW1	1.83 – 4.88 m Silty Sand	X	X				Assess for potential impacts resulting from the former aboveground diesel tank spill.
BH6-GW1	0.77 – 2.29 m Silty Sand	X	X				For additional coverage purposes.
BH9-GW1	1.52 – 4.57 m Silty Clay	X	X		X		Assess for potential impacts resulting from on-site fill material.
4120 Russell Road							
BH13-GW1	3.05 – 4.57 m Till		X	X			For additional coverage purposes.
BH14-GW1	4.57 – 7.62 m Silty Clay	X	X				Assess for potential impacts resulting from on-site fill material.
BH15-GW1	3.05 – 6.10 m Till		X	X	X	X	Assess for potential impacts resulting from on-site fill material.

1 – Including Chromium VI and Mercury

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

4.8 Residue Management

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

4.9 Elevation Surveying

Borehole elevations were surveyed with respect to a known geodetic elevation by Annis, O'Sullivan, Vollebekk Ltd. on September 17, 2019.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

The overburden soils on the subject sites consist of brown silty sand, underlain by grey silty clay and gravel till. Based on available mapping information, the bedrock in the area of the subject sites consists of shale of the Carlsbad Formation.

Based on the measured depths of practical refusal to auguring, the bedrock is interpreted to lie at a depth of approximately 2.29 m to 10.24 m in the vicinity of 4055 Russell Road and approximately 3.91 m to 8.23 m in the vicinity of 4120 Russell Road.

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

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on September 18, 2019 and September 19, 2019 using an electronic water level meter. Groundwater levels are summarized below in Table 4.

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	69.48	2.48	67.00	September 18, 2019
BH3	71.57	3.87	67.70	September 18, 2019
BH6	70.60	1.75	68.85	September 18, 2019
BH9	70.95	1.97	68.98	September 18, 2019
BH13	70.20	1.61	68.58	September 19, 2019
BH14	79.45	5.47	73.98	September 18, 2019
BH15	79.23	2.37	76.86	September 18, 2019

The groundwater was typically encountered within the upper silty sand and silty clay units at depths ranging from approximately 1.61 m to 5.47 m below the existing grade. Based on the measured water levels and the configuration of the borehole locations on the subject sites, the groundwater appears to be flowing in an easterly direction towards Mer Bleue Bog.

5.3 Fine/Coarse Soil Texture

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

5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0 ppm to 2.3 ppm. The organic vapour readings obtained from the field screening indicate that there is a negligible potential for the presence of volatile substances.

Heavier substances, such as heavy oil, may not be detected by the above field screening method, however, visual observations did not suggest the presence of hydrocarbon contamination.

Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Eleven (11) soil samples were submitted for analysis of BTEX and PHCs (F_1-F_4), PAHs, metals, VOCs, and/or OC pesticides and the atrazine package. The results of the analytical testing are presented below in Tables 5 to 14.

Analytical Results for 4055 Russell Road

Table 5
Analytical Test Results – Soil – 4055 Russell Road
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)					MECP Table 9 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 28, 2019			August 29, 2019			
		BH1-SS6	BH3-AU1	BH3-SS2	BH6-SS2	BH9-SS2		
Benzene	0.002	0.007	<0.02	nd	nd	<0.02	0.02	0.03
Ethylbenzene	0.002	0.003	<0.05	nd	nd	<0.05	0.05	0.082
Toluene	0.002	0.014	<0.05	nd	nd	<0.05	0.2	0.37
Xylenes, total	0.005	0.023	<0.05	nd	nd	<0.05	0.05	11
PHC F_1	7	nd	nd	nd	nd	nd	25	240
PHC F_2	4	nd	nd	nd	nd	nd	10	260
PHC F_3	8	nd	42	nd	nd	28	240	1,700
PHC F_4	6	nd	36	nd	nd	15	120	3,300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All BTEX and PHC concentrations in the soil samples analysed are in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 6
Analytical Test Results – Soil – 4055 Russell Road
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MECP Table 9 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 28, 2019		
		BH1-SS6		
Acenaphthene	0.02	nd	0.072	0.28
Acenaphthylene	0.02	nd	0.093	320
Anthracene	0.02	nd	0.22	32
Benzo[a]anthracene	0.02	nd	0.36	10
Benzo[a]pyrene	0.02	nd	0.3	72
Benzo[b]fluoranthene	0.02	nd	0.47	10
Benzo[g,h,i]perylene	0.02	nd	0.68	nv
Benzo[k]fluoranthene	0.02	nd	0.48	10
1,1-Biphenyl	0.02	nd	0.05	nv
Chrysene	0.02	nd	2.8	nv
Dibenzo[a,h]anthracene	0.02	nd	0.1	10
Fluoranthene	0.02	nd	0.69	180
Fluorene	0.02	nd	0.19	0.25
Indeno[1,2,3-cd]pyrene	0.02	nd	0.23	10
Methylnaphthalene(1,2)	0.04	nd	0.59	nv
Naphthalene	0.01	nd	0.09	0.013
Phenanthrene	0.02	nd	0.69	0.046
Pyrene	0.02	nd	1	100
Quinoline	0.10	nd	nv	nv

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All PAH concentrations in the soil sample analysed are in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 7
Analytical Test Results – Soil – 4055 Russell Road
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 9 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 28, 2019		August 29, 2019		
		BH1-SS6	BH3-AU1	BH9-SS2		
Antimony	1.0	nd	nd	nd	1.3	40
Arsenic	1.0	3	3	1	18	12
Barium	1.0	**364**	60	31	220	2,000
Beryllium	0.5	0.8	nd	nd	2.5	8
Boron	5.0	8.3	6.3	nd	36	nv
Cadmium	0.5	nd	nd	nd	1.2	22
Chromium	5.0	52	14	15	70	87
Chromium (VI)	0.2	nd	nd	nd	0.66	1.4
Cobalt	1.0	14	4	4	22	300
Copper	5.0	30	12	7	92	91
Lead	1.0	7	18	2	120	260
Mercury	0.1	nd	nd	nd	0.27	24
Molybdenum	1.0	nd	1	nd	2	40
Nickel	5.0	30	9	9	82	89
Selenium	1.0	nd	nd	nd	1.5	2.9
Silver	0.3	nd	nd	nd	0.5	40
Thallium	1.0	nd	nd	nd	1	1
Tin	5.0	nd	nd	nd	nv	300
Uranium	1.0	nd	nd	nd	2.5	33
Vanadium	10.0	71	14	23	86	130
Zinc	20.0	80	46	nd	290	410

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

The concentration of Barium in soil sample BH1-SS6 was in excess of the selected MECP Table 9 standards. Based on the native origins of the soil sample, as well as the analytical results of previous subsurface investigations, this exceedance is considered to be a naturally occurring elevated level and does not present a contaminant issue to the subject property.

All remaining metals concentrations in the soil samples analysed were in compliance with the selected MECP Table 9 standards and CCME commercial standards. The remaining metals concentrations are also in compliance with the MECP Table 1 standards.

Table 8
Analytical Test Results – Soil – 4055 Russell Road
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MECP Table 9 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 28, 2019		
		BH1-SS6		
Acetone	0.100	nd	0.5	nv
Benzene	0.002	0.007	0.02	0.03
Bromodichloromethane	0.005	nd	0.05	nv
Bromoform	0.005	nd	0.05	nv
Bromomethane	0.005	nd	0.05	nv
Carbon Tetrachloride	0.002	nd	0.05	50
Chlorobenzene	0.002	nd	0.05	10
Chloroethane	0.050	nd	nv	50
Chloroform	0.002	nd	0.05	50
Chloromethane	0.050	nd	nv	50
Dibromochloromethane	0.002	nd	0.05	nv
Ethylene dibromide (dibromoethane, 1,2-)	0.005	nd	0.05	nv
1,2-Dichlorobenzene	0.002	nd	0.05	10
1,3-Dichlorobenzene	0.002	nd	0.05	10
1,4-Dichlorobenzene	0.002	nd	0.05	10
1,1-Dichloroethane	0.002	nd	0.05	50
1,2-Dichloroethane	0.002	nd	0.05	50
1,1-Dichloroethylene	0.002	nd	0.05	50
Dichlorodifluoromethane	0.002	nd	0.05	nv
cis-1,2-Dichloroethylene	0.002	nd	0.05	50
trans-1,2-Dichloroethylene	0.002	nd	0.05	50
1,2-Dichloroethylene, total	0.003	nd	nv	nv
1,2-Dichloropropane	0.002	nd	0.05	50
cis-1,3-Dichloropropylene	0.002	nd	nv	50
trans-1,3-Dichloropropylene	0.002	nd	nv	50
1,3-Dichloropropene, total	0.003	nd	0.05	nv
Ethylbenzene	0.002	0.003	0.05	0.082
Hexane	0.002	nd	0.05	6.5
Methyl Ethyl Ketone (2-Butanone)	0.050	nd	0.5	nv
Methyl Butyl Ketone (2-Hexanone)	0.010	nd	nv	nv
Methyl Isobutyl Ketone	0.050	nd	0.5	nv
Methyl tert-butyl ether	0.010	nd	0.05	nv
Methylene Chloride	0.005	nd	0.05	50
Styrene	0.005	nd	0.05	50
1,1,1,2-Tetrachloroethane	0.002	nd	0.05	50
1,1,2,2-Tetrachloroethane	0.002	nd	0.05	50
Tetrachloroethylene	0.002	nd	0.05	0.5
Toluene	0.002	0.014	0.2	0.37
1,2,4-Trichlorobenzene	0.002	nd	0.05	10
1,1,1-Trichloroethane	0.002	nd	0.05	50
1,1,2-Trichloroethane	0.002	nd	0.05	50
Trichloroethylene	0.002	nd	0.05	0.01
Trichlorofluoromethane	0.005	nd	0.25	nv
1,3,5-Trimethylbenzene	0.005	nd	nv	nv
Vinyl Chloride	0.005	nd	0.02	nv
Xylenes, Total	0.005	0.023	0.05	11

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All VOC concentrations in the soil sample analysed were in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 9
Analytical Test Results – Soil – 4055 Russell Road
OC Pesticides & Atrazine Package

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MECP Table 9 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 29, 2019		
		BH4-AU1		
2-4'-DDD	0.01	nd	nv	nv
2-4'-DDE	0.01	nd	nv	nv
2-4'-DDT	0.01	nd	nv	nv
4,4'-DDE	0.01	nd	nv	nv
4,4'-DDT	0.01	nd	nv	nv
Aldrin	0.01	nd	nv	nv
Atrazine	1.0	nd	nv	nv
Cyanazine	1.0	nd	nv	nv
DDD (total)	0.01	nd	0.05	nv
DDE (total)	0.01	nd	0.05	nv
DDT (total)	0.01	nd	0.05	12
Dieldrin	0.01	nd	1.4	nv
Endosulfan I	0.01	nd	0.05	nv
Endosulfan I + II	0.01	nd	nv	nv
Endosulfan II	0.01	nd	0.04	nv
Endosulfan sulfate	0.01	nd	nv	nv
Endrin	0.01	nd	nv	nv
Endrin aldehyde	0.01	nd	0.04	nv
Heptachlor	0.01	nd	nv	nv
Heptachlor epoxide	0.01	nd	0.05	nv
Hexachlorobenzene	0.01	nd	0.05	10
Hexachlorobutadiene	0.01	nd	0.02	nv
Hexachloroethane	0.01	nd	0.01	nv
Methoxychlor	0.01	nd	0.01	nv
Metolachlor	1.0	nd	nv	nv
Mirex	0.01	nd	0.05	nv
Oxychlordane	0.01	nd	nv	nv
Prometryne	0.25	nd	nv	nv
Simazine	1.0	nd	nv	nv
β-BHC	0.01	nd	nv	nv
α-Chlordane	0.01	nd	nv	nv
α + γ-Chlordane	0.01	nd	nv	nv
α-BHC	0.01	nd	0.05	nv
γ-Chlordane	0.01	nd	nv	nv
γ-BHC (Lindane)	0.01	nd	nv	nv
δ-BHC	0.01	nd	0.01	nv
2-4'-DDD	0.01	nd	nv	nv

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All OC pesticide and atrazine package concentrations in the soil sample analysed were in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Analytical Results for 4120 Russell Road

Table 10
Analytical Test Results – Soil – 4120 Russell Road
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 30, 2019	September 4, 2019			
		BH13-SS6	BH14-AU1-SS2	BH15-SS1		
Benzene	0.002	nd	-	-	0.32	0.03
Ethylbenzene	0.002	nd	-	-	9.5	0.082
Toluene	0.002	0.003	-	-	68	0.37
Xylenes, total	0.005	0.012	-	-	26	11
PHC F_1	7	nd	-	-	55	240
PHC F_2	4	nd	nd	nd	230	260
PHC F_3	8	nd	24	238	1,700	1,700
PHC F_4	6	nd	21	186	3,300	3,300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All BTEX and PHC concentrations in the soil samples analysed are in compliance with the selected MECP Table 3 standards and CCME commercial standards.

It should be noted that while all BTEX and PHC concentrations are in compliance with the aforementioned site-specific standards, the concentration of PHC F_4 in the soil sample recovered from BH15 (fill material) exceeds the MECP Table 1 Full Depth Background Site Conditions. This exceedance is not considered to pose an environmental concern to the subject property, however, if the fill material is to be removed from the property, it should be classified as a contaminant.

Table 11
Analytical Test Results – Soil – 4120 Russell Road
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MECP Table 3 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		September 4, 2019		
		BH15-SS1		
Acenaphthene	0.02	nd	96	0.28
Acenaphthylene	0.02	nd	0.15	320
Anthracene	0.02	nd	0.67	32
Benzo[a]anthracene	0.02	0.04	0.96	10
Benzo[a]pyrene	0.02	0.04	0.3	72
Benzo[b]fluoranthene	0.02	0.08	0.96	10
Benzo[g,h,i]perylene	0.02	0.05	9.6	nv
Benzo[k]fluoranthene	0.02	0.06	0.96	10
1,1-Biphenyl	0.02	nd	52	nv
Chrysene	0.02	0.04	9.6	nv
Dibenzo[a,h]anthracene	0.02	nd	0.1	10
Fluoranthene	0.02	0.09	9.6	180
Fluorene	0.02	nd	62	0.25
Indeno[1,2,3-cd]pyrene	0.02	0.04	0.76	10
Methylnaphthalene(1,2)	0.04	nd	76	nv
Naphthalene	0.01	nd	9.6	0.013
Phenanthrene	0.02	0.03	12	0.046
Pyrene	0.02	0.08	96	100
Quinoline	0.10	nd	nv	nv

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All PAH concentrations in the soil sample analysed are in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 12
Analytical Test Results – Soil – 4120 Russell Road
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 30, 2019	September 4, 2019			
		BH13-AU1	BH14-AU1-SS2	BH15-SS1		
Antimony	1.0	nd	nd	nd	40	40
Arsenic	1.0	2	4	3	18	12
Barium	1.0	190	193	159	670	2,000
Beryllium	0.5	0.7	0.7	0.7	8	8
Boron	5.0	5.8	7.5	8.5	120	nv
Cadmium	0.5	nd	nd	nd	1.9	22
Chromium	5.0	46	67	61	160	87
Chromium (VI)	0.2	nd	nd	nd	8	1.4
Cobalt	1.0	10	15	13	80	300
Copper	5.0	17	30	29	230	91
Lead	1.0	12	14	18	120	260
Mercury	0.1	nd	nd	nd	3.9	24
Molybdenum	1.0	nd	2	3	40	40
Nickel	5.0	22	40	32	270	89
Selenium	1.0	nd	nd	nd	5.5	2.9
Silver	0.3	nd	nd	nd	40	40
Thallium	1.0	nd	nd	nd	3.3	1
Tin	5.0	nd	nd	nd	nv	300
Uranium	1.0	nd	nd	nd	33	33
Vanadium	10.0	57	61	57	86	130
Zinc	20.0	88	71	107	340	410

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All metals concentrations in the soil samples analysed were in compliance with the selected MECP Table 3 standards and CCME commercial standards.

It should be noted that while all metals concentrations are in compliance with the aforementioned site-specific standards, the concentration of molybdenum in the soil sample recovered from BH15 (fill material) exceeds the MECP Table 1 Full Depth Background Site Conditions. This exceedance is not considered to pose and environmental concern to the subject property, however, if the fill material is to be removed from the property, it should be classified as a contaminant.

Table 13
Analytical Test Results – Soil – 4120 Russell Road
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)	MECP Table 3 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 30, 2019		
		BH13-SS6		
Acetone	0.100	nd	16	nv
Benzene	0.002	nd	0.32	0.03
Bromodichloromethane	0.005	nd	18	nv
Bromoform	0.005	nd	0.61	nv
Bromomethane	0.005	nd	0.05	nv
Carbon Tetrachloride	0.002	nd	0.21	50
Chlorobenzene	0.002	nd	2.4	10
Chloroethane	0.050	nd	nv	50
Chloroform	0.002	nd	0.47	50
Chloromethane	0.050	nd	nv	50
Dibromochloromethane	0.002	nd	13	nv
Ethylene dibromide (dibromoethane, 1,2-)	0.005	nd	0.05	nv
1,2-Dichlorobenzene	0.002	nd	6.8	10
1,3-Dichlorobenzene	0.002	nd	9.6	10
1,4-Dichlorobenzene	0.002	nd	0.2	10
1,1-Dichloroethane	0.002	nd	17	50
1,2-Dichloroethane	0.002	nd	0.05	50
1,1-Dichloroethylene	0.002	nd	0.064	50
Dichlorodifluoromethane	0.002	nd	16	nv
cis-1,2-Dichloroethylene	0.002	nd	55	50
trans-1,2-Dichloroethylene	0.002	nd	1.3	50
1,2-Dichloroethylene, total	0.003	nd	nv	nv
1,2-Dichloropropane	0.002	nd	0.16	50
cis-1,3-Dichloropropylene	0.002	nd	nv	50
trans-1,3-Dichloropropylene	0.002	nd	nv	50
1,3-Dichloropropene, total	0.003	nd	0.18	nv
Ethylbenzene	0.002	nd	9.5	0.082
Hexane	0.002	nd	46	6.5
Methyl Ethyl Ketone (2-Butanone)	0.050	nd	70	nv
Methyl Butyl Ketone (2-Hexanone)	0.010	nd	nv	nv
Methyl Isobutyl Ketone	0.050	nd	31	nv
Methyl tert-butyl ether	0.010	nd	11	nv
Methylene Chloride	0.005	nd	1.6	50
Styrene	0.005	nd	34	50
1,1,1,2-Tetrachloroethane	0.002	nd	0.087	50
1,1,2,2-Tetrachloroethane	0.002	nd	0.05	50
Tetrachloroethylene	0.002	nd	4.5	0.5
Toluene	0.002	0.003	68	0.37
1,2,4-Trichlorobenzene	0.002	nd	3.2	10
1,1,1-Trichloroethane	0.002	nd	6.1	50
1,1,2-Trichloroethane	0.002	nd	0.05	50
Trichloroethylene	0.002	nd	0.91	0.01
Trichlorofluoromethane	0.005	nd	4	nv
1,3,5-Trimethylbenzene	0.005	nd	nv	nv
Vinyl Chloride	0.005	nd	0.032	nv
Xylenes, Total	0.005	0.012	26	11

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All VOC concentrations in the soil sample analysed were in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 14
Analytical Test Results – Soil – 4120 Russell Road
OC Pesticides & Atrazine Package

Parameter	MDL (µg/g)	Soil Samples (µg/g)		MECP Table 3 Commercial Standards (µg/g)	CCME SQG Commercial Standards (µg/g)
		August 29, 2019	September 4, 2019		
		BH13-AU1	BH16-AU1		
2-4'-DDD	0.01	nd	<0.008	nv	nv
2-4'-DDE	0.01	nd	<0.008	nv	nv
2-4'-DDT	0.01	nd	<0.008	nv	nv
4,4'-DDE	0.01	nd	<0.008	nv	nv
4,4'-DDT	0.01	nd	<0.008	nv	nv
Aldrin	0.01	nd	<0.008	0.088	nv
Atrazine	1.0	nd	nd	nv	nv
Cyanazine	1.0	nd	nd	nv	nv
DDD (total)	0.01	nd	<0.008	4.6	nv
DDE (total)	0.01	nd	<0.008	0.52	nv
DDT (total)	0.01	nd	<0.008	1.4	12
Dieldrin	0.01	nd	<0.008	0.088	nv
Endosulfan I	0.01	nd	<0.008	nv	nv
Endosulfan I + II	0.01	nd	<0.008	0.3	nv
Endosulfan II	0.01	nd	<0.008	nv	nv
Endosulfan sulfate	0.01	nd	<0.008	nv	nv
Endrin	0.01	nd	<0.008	0.04	nv
Endrin aldehyde	0.01	nd	<0.008	nv	nv
Heptachlor	0.01	nd	<0.008	0.19	nv
Heptachlor epoxide	0.01	nd	<0.008	0.05	nv
Hexachlorobenzene	0.01	nd	<0.008	0.66	10
Hexachlorobutadiene	0.01	nd	<0.008	0.031	nv
Hexachloroethane	0.01	nd	<0.008	0.21	nv
Methoxychlor	0.01	nd	<0.008	1.6	nv
Metolachlor	1.0	nd	nd	nv	nv
Mirex	0.01	nd	<0.008	nv	nv
Oxychlordane	0.01	nd	<0.008	nv	nv
Prometryne	0.25	nd	nd	nv	nv
Simazine	1.0	nd	nd	nv	nv
β-BHC	0.01	nd	<0.008	nv	nv
α-Chlordane	0.01	nd	<0.008	nv	nv
α + γ-Chlordane	0.01	nd	<0.008	0.05	nv
α-BHC	0.01	nd	<0.008	nv	nv
γ-Chlordane	0.01	nd	<0.008	nv	nv
γ-BHC (Lindane)	0.01	nd	<0.008	0.056	nv
δ-BHC	0.01	nd	<0.008	nv	nv

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All OC pesticide and atrazine package concentrations in the soil samples analysed were in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 15
Maximum Concentrations - Soil

Parameter	Maximum Concentration	Sample ID	Depth Interval (m BGS)
Benzene	0.007	BH1-SS6	3.81 – 4.42
Ethylbenzene	0.003	BH1-SS6	3.81 – 4.42
Toluene	0.014	BH1-SS6	3.81 – 4.42
Xylenes, total	0.023	BH1-SS6	3.81 – 4.42
PHC F_3	238	BH15-SS1	0.00 – 0.61
PHC F_4	186	BH15-SS1	0.00 – 0.61
Benzo[a]anthracene	0.04	BH15-SS1	0.00 – 0.61
Benzo[a]pyrene	0.04	BH15-SS1	0.00 – 0.61
Benzo[b]fluoranthene	0.08	BH15-SS1	0.00 – 0.61
Benzo[g,h,i]perylene	0.05	BH15-SS1	0.00 – 0.61
Benzo[k]fluoranthene	0.06	BH15-SS1	0.00 – 0.61
Chrysene	0.04	BH15-SS1	0.00 – 0.61
Fluoranthene	0.09	BH15-SS1	0.00 – 0.61
Indeno[1,2,3-cd]pyrene	0.04	BH15-SS1	0.00 – 0.61
Phenanthrene	0.03	BH15-SS1	0.00 – 0.61
Pyrene	0.08	BH15-SS1	0.00 – 0.61
Arsenic	4	BH14-AU1-SS2	0.00 – 1.37
Barium	**364**	BH1-SS6	3.81 – 4.42
Beryllium	0.8	BH1-SS6	3.81 – 4.42
Boron	8.5	BH15-SS1	0.00 – 0.61
Chromium	6.7	BH14-AU1-SS2	0.00 – 1.37
Cobalt	15	BH14-AU1-SS2	0.00 – 1.37
Copper	30	BH1-SS6 / BH14-AU1-SS2	3.81 – 4.42 / 0.00 – 1.37
Lead	18	BH3-AU1 / BH15-SS1	0.00 – 0.61 / 0.00 – 0.61
Molybdenum	3	BH15-SS1	0.00 – 0.61
Nickel	40	BH14-AU1-SS2	0.00 – 1.37
Vanadium	71	BH1-SS6	3.81 – 4.42
Zinc	107	BH14-AU1-SS2	0.00 – 1.37

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

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

5.6 Groundwater Quality

Groundwater samples from the monitoring wells were submitted for laboratory analysis of BTEX and PHCs (F_1-F_4), VOCs, PAHs, and/or metals. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented below in Tables 16 to 22. The laboratory certificates of analysis are provided in Appendix 1.

Analytical Results for 4055 Russell Road

Table 16
Analytical Test Results – Groundwater – 4055 Russell Road
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 9 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 18, 2019					
		BH1-GW1	BH3-GW1	BH6-GW1	BH9-GW1		
Benzene	0.5	nd	nd	nd	nd	44	88
Ethylbenzene	0.5	nd	nd	nd	nd	1,800	3,200
Toluene	0.5	nd	nd	nd	nd	14,000	83
Xylenes, total	0.5	nd	nd	nd	nd	3,300	3,900
PHC F_1	25	nd	nd	nd	nd	420	810
PHC F_2	100	nd	nd	nd	nd	150	1,300
PHC F_3	100	nd	nd	nd	nd	500	nv
PHC F_4	100	nd	nd	nd	nd	500	nv

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All BTEX and PHC concentrations in the groundwater samples analysed are in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 17
Analytical Test Results – Groundwater – 4055 Russell Road
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)	MECP Table 9 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 18, 2019		
		BH1-GW1		
Acetone	5.0	nd	100,000	13,000
Benzene	0.5	nd	44	88
Bromodichloromethane	0.5	nd	67000	8,500
Bromoform	0.5	nd	380	380
Bromomethane	0.5	nd	5.6	56
Carbon Tetrachloride	0.2	nd	0.79	0.56
Chlorobenzene	0.5	nd	500	1.3
Chloroform	0.5	nd	2.4	1.8
Dibromochloromethane	0.5	nd	65,000	100
Dichlorodifluoromethane	1.0	nd	3,500	nv
1,2-Dichlorobenzene	0.5	nd	4,600	0.7
1,3-Dichlorobenzene	0.5	nd	7,600	42
1,4-Dichlorobenzene	0.5	nd	8	26
1,1-Dichloroethane	0.5	nd	320	320
1,2-Dichloroethane	0.5	nd	1.6	5
1,1-Dichloroethylene	0.5	nd	1.6	39
cis-1,2-Dichloroethylene	0.5	nd	1.6	1.6
trans-1,2-Dichloroethylene	0.5	nd	1.6	1.6
1,2-Dichloropropane	0.5	nd	16	16
cis-1,3-Dichloropropylene	0.5	nd	nv	nv
trans-1,3-Dichloropropylene	0.5	nd	nv	nv
1,3-Dichloropropene, total	0.5	nd	5.2	5.2
Ethylbenzene	0.5	nd	1,800	3,200
Ethylene dibromide (dibromoethane, 1,2-)	0.2	nd	0.25	0.25
Hexane	1.0	nd	51	nv
Methyl Ethyl Ketone (2-Butanone)	5.0	nd	470,000	150,000
Methyl Isobutyl Ketone	5.0	nd	140,000	58,000
Methyl tert-butyl ether	2.0	nd	190	4,300
Methylene Chloride	5.0	nd	610	50
Styrene	0.5	nd	1,300	72
1,1,1,2-Tetrachloroethane	0.5	nd	3.3	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	3.2	3.2
Tetrachloroethylene	0.5	nd	1.6	110
Toluene	0.5	nd	14,000	83
1,1,1-Trichloroethane	0.5	nd	640	640
1,1,2-Trichloroethane	0.5	nd	4.7	4.7
Trichloroethylene	0.5	nd	1.6	20
Trichlorofluoromethane	1.0	nd	2,000	nv
Vinyl Chloride	0.5	nd	0.5	1.1
Xylenes, Total	0.5	nd	3,300	3.9

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All VOC concentrations in the groundwater samples analysed are in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 18
Analytical Test Results – Groundwater – 4055 Russell Road
PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)	MECP Table 9 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 18, 2019		
		BH9-GW1		
Acenaphthene	0.05	nd	600	5.8
Acenaphthylene	0.05	nd	1.4	46
Anthracene	0.01	nd	1	0.012
Benzo[a]anthracene	0.01	nd	1.8	0.018
Benzo[a]pyrene	0.01	nd	0.81	0.015
Benzo[b]fluoranthene	0.05	nd	0.75	nv
Benzo[g,h,i]perylene	0.05	nd	0.2	0.17
Benzo[k]fluoranthene	0.05	nd	0.4	0.48
Chrysene	0.05	nd	0.7	0.1
Dibenzo[a,h]anthracene	0.05	nd	0.4	0.26
Fluoranthene	0.01	nd	73	0.04
Fluorene	0.05	nd	290	3
Indeno[1,2,3-cd]pyrene	0.05	nd	0.2	0.21
1-Methylnaphthalene	0.05	nd	1,500	1,500
2-Methylnaphthalene	0.05	nd	1,500	1,500
Methylnaphthalene (1&2)	0.10	nd	1,500	180
Naphthalene	0.05	nd	1,400	1.1
Phenanthrene	0.05	nd	380	0.4
Pyrene	0.01	nd	5.7	0.025

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All PAH concentrations in the groundwater samples analysed are in compliance with the selected MECP Table 9 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Analytical Results for 4120 Russell Road

Table 19
Analytical Test Results – Groundwater – 4120 Russell Road
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 19, 2019	September 18, 2019			
		BH13-GW1	BH14-GW1	BH15-GW1		
Benzene	0.5	nd	nd	nd	44	88
Ethylbenzene	0.5	nd	nd	nd	2,300	3,200
Toluene	0.5	nd	nd	nd	18,000	83
Xylenes, total	0.5	nd	nd	nd	4,200	3,900
PHC F_1	25	nd	nd	nd	750	810
PHC F_2	100	nd	nd	nd	150	1,300
PHC F_3	100	nd	nd	nd	500	nv
PHC F_4	100	nd	nd	nd	500	nv

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All BTEX and PHC concentrations in the groundwater samples analysed are in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 20
Analytical Test Results – Groundwater – 4120 Russell Road
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 3 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 19, 2019	September 18, 2019		
		BH13-GW1	BH15-GW1		
Acetone	5.0	nd	nd	130,000	13,000
Benzene	0.5	nd	nd	44	88
Bromodichloromethane	0.5	nd	nd	85,000	8,500
Bromoform	0.5	nd	nd	380	380
Bromomethane	0.5	nd	nd	5.6	56
Carbon Tetrachloride	0.2	nd	nd	0.79	0.56
Chlorobenzene	0.5	nd	nd	630	1.3
Chloroform	0.5	nd	nd	2.4	1.8
Dibromochloromethane	0.5	nd	nd	82,000	100
Dichlorodifluoromethane	1.0	nd	nd	4400	nv
1,2-Dichlorobenzene	0.5	nd	nd	4600	0.7
1,3-Dichlorobenzene	0.5	nd	nd	9600	42
1,4-Dichlorobenzene	0.5	nd	nd	8	26
1,1-Dichloroethane	0.5	nd	nd	320	320
1,2-Dichloroethane	0.5	nd	nd	1.6	5
1,1-Dichloroethylene	0.5	nd	nd	1.6	39
cis-1,2-Dichloroethylene	0.5	nd	nd	1.6	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6	1.6
1,2-Dichloropropane	0.5	nd	nd	16	16
cis-1,3-Dichloropropylene	0.5	nd	nd	nv	nv
trans-1,3-Dichloropropylene	0.5	nd	nd	nv	nv
1,3-Dichloropropene, total	0.5	nd	nd	5.2	5.2
Ethylbenzene	0.5	nd	nd	2300	3,200
Ethylene dibromide (dibromoethane, 1,2-)	0.2	nd	nd	0.25	0.25
Hexane	1.0	nd	nd	51	nv
Methyl Ethyl Ketone (2-Butanone)	5.0	nd	nd	470000	150,000
Methyl Isobutyl Ketone	5.0	nd	nd	140000	58,000
Methyl tert-butyl ether	2.0	nd	nd	190	4,300
Methylene Chloride	5.0	nd	nd	610	50
Styrene	0.5	nd	nd	1300	72
1,1,1,2-Tetrachloroethane	0.5	nd	nd	3.3	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	3.2	3.2
Tetrachloroethylene	0.5	nd	nd	1.6	110
Toluene	0.5	nd	nd	18000	83
1,1,1-Trichloroethane	0.5	nd	nd	640	640
1,1,2-Trichloroethane	0.5	nd	nd	4.7	4.7
Trichloroethylene	0.5	nd	nd	1.6	20
Trichlorofluoromethane	1.0	nd	nd	2500	nv
Vinyl Chloride	0.5	nd	nd	0.5	1.1
Xylenes, Total	0.5	nd	nd	4,200	3.9

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All VOC concentrations in the groundwater samples analysed are in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 21
Analytical Test Results – Groundwater – 4120 Russell Road
PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)	MECP Table 3 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 18, 2019		
		BH15-GW1		
Acenaphthene	0.05	nd	600	5.8
Acenaphthylene	0.05	nd	1.8	46
Anthracene	0.01	nd	2.4	0.012
Benzo[a]anthracene	0.01	nd	4.7	0.018
Benzo[a]pyrene	0.01	nd	0.81	0.015
Benzo[b]fluoranthene	0.05	nd	0.75	nv
Benzo[g,h,i]perylene	0.05	nd	0.2	0.17
Benzo[k]fluoranthene	0.05	nd	0.4	0.48
Chrysene	0.05	nd	1	0.1
Dibenzo[a,h]anthracene	0.05	nd	0.52	0.26
Fluoranthene	0.01	nd	130	0.04
Fluorene	0.05	nd	400	3
Indeno[1,2,3-cd]pyrene	0.05	nd	0.2	0.21
1-Methylnaphthalene	0.05	nd	1,800	1,500
2-Methylnaphthalene	0.05	nd	1,800	1,500
Methylnaphthalene (1&2)	0.10	nd	1,800	180
Naphthalene	0.05	nd	1,400	1.1
Phenanthrene	0.05	nd	580	0.4
Pyrene	0.01	nd	68	0.025

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All PAH concentrations in the groundwater sample analysed are in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 22
Analytical Test Results – Groundwater – 4120 Russell Road
Metals

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)	MECP Table 3 Commercial Standards (µg/L)	CCME WQG Commercial Standards (µg/L)
		September 18, 2019		
		BH15-GW1		
Antimony	0.5	nd	20,000	2,000
Arsenic	1	1	1,900	5
Barium	1	150	29,000	500
Beryllium	0.5	nd	67	5.3
Boron	10	32	45,000	500
Cadmium	0.1	nd	2.7	0.017
Chromium	1	nd	810	8.9
Chromium (VI)	10	nd	140	nv
Cobalt	0.5	nd	66	nv
Copper	0.5	2.8	87	50
Lead	0.1	nd	25	1
Mercury	0.1	nd	0.29	0.016
Molybdenum	0.5	11.8	9,200	73
Nickel	1	1	490	25
Selenium	1	nd	63	1
Silver	0.1	nd	1.5	0.1
Sodium	200	51,000	2,300,000	nv
Thallium	0.1	nd	510	0.8
Uranium	0.1	2.4	420	10
Vanadium	0.5	1.6	250	100
Zinc	5	nd	1,100	10

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

All metals concentrations in the groundwater sample analysed are in compliance with the selected MECP Table 3 standards and CCME commercial standards. The results are also in compliance with the MECP Table 1 standards.

Table 23
Maximum Concentrations - Groundwater

Parameter	Maximum Concentration	Sample ID	Depth Interval (m BGS)
Arsenic	1	BH15-GW1	3.05 – 6.10
Barium	150	BH15-GW1	3.05 – 6.10
Boron	32	BH15-GW1	3.05 – 6.10
Copper	2.8	BH15-GW1	3.05 – 6.10
Molybdenum	11.8	BH15-GW1	3.05 – 6.10
Nickel	1	BH15-GW1	3.05 – 6.10
Sodium	51,000	BH15-GW1	3.05 – 6.10
Uranium	2.4	BH15-GW1	3.05 – 6.10
Vanadium	1.6	BH15-GW1	3.05 – 6.10

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no standard value for this parameter
- **Bold and Underlined** – Value exceeds selected MECP Standards
- **(Bold and Bracketed)** – Value exceeds selected CCME Standards

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

5.7 Quality Assurance and Quality Control Results

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

As per the Sampling an Analysis Plan, a duplicate soil sample was obtained at BH15 during the September 4, 2019 drilling program and analyzed for metals. The relative percent different (RPD) calculations for the original and duplicate samples are provided below in Table 24.

Table 24
QA/QC Calculations – Soil – Metals

Parameter	MDL (µg/g)	BH15-SS1	DUP 1	RPD (%)	QA/QC Result
Antimony	1.0	nd	nd	0	Meets Target
Arsenic	1.0	3	3	0	Meets Target
Barium	1.0	159	148	7.2	Meets Target
Beryllium	0.5	0.7	0.6	15.4	Meets Target
Boron	5.0	8.5	7.7	9.8	Meets Target
Cadmium	0.5	nd	nd	0	Meets Target
Chromium	5.0	61	54	12.2	Meets Target
Chromium (VI)	0.2	nd	-	0	Meets Target
Cobalt	1.0	13	11	16.6	Meets Target
Copper	5.0	29	28	3.5	Meets Target
Lead	1.0	18	17	5.7	Meets Target
Mercury	0.1	nd	-	0	Meets Target
Molybdenum	1.0	3	2	40	Does Not Meet Target
Nickel	5.0	32	29	9.8	Meets Target
Selenium	1.0	nd	nd	0	Meets Target
Silver	0.3	nd	nd	0	Meets Target
Thallium	1.0	nd	nd	0	Meets Target
Tin	5.0	nd	nd	0	Meets Target
Uranium	1.0	nd	nd	0	Meets Target
Vanadium	10.0	57	50	13.1	Meets Target
Zinc	20.0	107	101	5.8	Meets Target

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

Although the RPD calculated for one (1) parameter fell outside the acceptable range of 20% or less, the remaining RPDs (95%) fall within the acceptable range. As a result, the findings of the Phase II ESA are not considered to have been affected by the difference between these two samples.

A duplicate groundwater sample was also obtained at BH15 during the September 18, 2019 sampling event and analyzed for VOCs. No parameter concentrations were detected for both the original and duplicate sample, and as such, are considered to be acceptable. As a result, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 269/11 amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I ESA report and Section 2.2 of this report, the following PCAs, as per Table 2, O.Reg. 153/04 as amended by Environmental Protection Act, are considered to result in APECs on the subject properties:

- *Item 28: "Gasoline and Associated Products Storage in Fixed Tanks"*
  - This PCA was identified on 4055 Russell Road as a result of a previous spill associated with a former aboveground diesel fuel storage tank, located adjacent to a storage shed in the south-central portion of the property;
- *Item 30: "Importation of Fill Material of Unknown Quality"*
  - This PCA was identified on both subject sites as a result of the demolition of former farmhouses on each property, as well as the identification of fill material in the north portion of 4120 Russell Road;
- *Item 52: "Storage, maintenance, fuelling and repair of equipment, vehicles, and materials used to maintain transportation systems"*
  - this PCA was identified on 4055 Russell Road as a result of the former auto service garage on the southeastern portion of the property.

Other PCAs identified within the vicinity of the subject sites are not considered to result in APECs, based on their separation distances as well as their down-gradient or cross-gradient locations with respect to the subject sites.

Contaminants of Potential Concern

Contaminants of potential concern associated with the aforementioned PCAs include BTEX and PHCs (F_1-F_4), PAHs, VOCs, and/or metals in the soil and/or groundwater.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the subject properties include a municipal water service and a private sewage system.

Physical Setting

Site Stratigraphy

The stratigraphy of the subject sites generally consists of:

- Sandy topsoil, ranging from approximately 0.00 m to 0.25 m below grade;
- Brown silty sand, ranging from approximately 0.13 m to 2.84 m below grade;
- Grey silty clay, ranging from approximately 0.23 m to 10.24 m below grade;
- Glacial till (gravel), ranging from approximately 1.52 m to 9.14 m below grade;
- Shale bedrock (inferred), at depths ranging from approximately 2.29 m to 10.24 m below grade.

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

Hydrogeological Characteristics

Groundwater levels were measured at the subject sites on September 18, 2019 and September 19, 2019, with depths ranging from 1.75 m to 3.87 m below grade at 4055 Russell Road and 1.61 m to 5.47 m at 4120 Russell Road. The groundwater on the subject properties was typically encountered within the native silty sand or silty clay overburden. This stratigraphic unit is interpreted to function as a local aquifer.

Based on the measured water levels and the regional topography, in combination with information contained within our files, the groundwater is interpreted to flow towards the east in the direction of Mer Bleue Bog.

Approximate Depth to Bedrock

Based on the measured depths of practical refusal to auguring, the bedrock is interpreted to be at depths ranging from approximately 2.29 m to 10.24 m in the vicinity of 4055 Russell Road and approximately 3.91 m to 8.23 m in the vicinity of 4120 Russell Road.

Approximate Depth to Water Table

The depth to the water table is approximately 1.75 m to 3.87 m below the existing grade at 4055 Russell Road and approximately 1.61 m to 5.47 m below the existing grade at 4120 Russell Road.

Sections 41 and 43.1 of Ontario Regulation 153/04

Section 41 of the Regulation does not apply to either of the subject properties, as there are no areas of natural significance located on or within 30 m of the subject sites. The subject properties are not considered to be environmentally sensitive.

Section 43.1 of the Regulation only applies to 4055 Russell Road, as there is a waterbody which transects the southeast portion of the property, however, it does not apply to 4120 Russell Road, as there are no waterbodies within 30 m of the subject property.

Existing Buildings and Structures

The property addressed 4055 Russell Road is currently occupied by a residential dwelling as well as an abandoned farmhouse with associated barns, silos, and storage sheds. No buildings or structures are currently present on the property addressed 4120 Russell Road.

Fill Placement

Fill material identified during the subsurface investigation consisted of brown silty sand and gravel. The fill material was identified on-site in the vicinity of the former farmhouses on the north portion of 4055 Russell Road as well as the west-central portion of 4120 Russell Road.

Additional fill material was observed on the north property boundary of 4120 Russell Road, which is suspected to have been placed on-site by the neighbouring contractor storage yard.

Proposed Buildings and Other Structures

It is our understanding that the subject properties are to be leased to future commercial and industrial tenants.

Areas of Natural Significance and Water Bodies

No areas of natural significance are present on or within the vicinity of the subject properties. The subject properties are not considered to be environmentally sensitive.

A small watercourse (The Mather Award Drainage Ditch) is present in the south portion of 4055 Russell Road and transects the property in an east-west direction. This watercourse generally flows towards the northeast and feeds into Ramsay Creek, located approximately 650 m east of 4055 Russell Road.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical test results, the native silty clay soil in the area of BH1, located in the southeast portion of 4055 Russell Road, contains an elevated concentration of barium which exceeds the selected MECP Table 9 standards. Based on the native origins of the soil sample, as well as the analytical results of previous subsurface investigations, this exceedance is considered to be a naturally occurring elevated level and does not present a contaminant issue to the subject property.

While in compliance with the selected MECP Table 3 and CCME standards, it should be noted that the concentration of molybdenum and PHC F_4 in the soil sample (fill material) recovered from BH15, located in the north portion of 4120 Russell Road, exceeded the MECP Table 1 Full Depth Background Site Conditions. These exceedances are not considered to pose an environmental concern to the subject property as is, however, if the fill material is to be removed from the property, it should be classified as contaminated soil.

Analytical test results for soil and groundwater are shown on Drawings PE4690-4 and PE4690-5 – Analytical Testing Plans in the figures section of this report.

Types of Contaminants

Based on the PCAs resulting in APECs on the subject properties, as well as the results of the analytical testing, no contaminants of concern were identified on the subject properties.

Contaminated Media

Based on the analytical test results, no contaminated media was identified. The fill material in the vicinity of BH15, located on the north portion of 4120 Russell Road, contains concentrations of molybdenum and PHC F_4 which exceed the MECP Table 1 Background Standards.

These exceedances are not considered to pose an environmental concern to the subject property as is, however, if the fill material is to be removed from the property, it should be classified as contaminated soil for off-site disposal.

What Is Known About Areas Where Contaminants Are Present

Based on the analytical test results, no contaminants of concern are present on or beneath the subject properties. As previously mentioned, the elevated concentration of barium in the vicinity of BH1 is considered to be naturally occurring, and as a result, is not considered to be a contaminant issue.

The fill material in the vicinity of BH15 may have likely been placed on-site by neighbouring commercial activities.

Distribution and Migration of Contaminants

No contamination was identified on the subject properties.

Potential for Vapour Intrusion

Based on the findings of the Phase II ESA, there is no potential for vapour intrusion on the subject property.

Discharge of Contaminants

As previously mentioned, the elevated concentration of barium in the vicinity of BH1 is considered to be naturally occurring, and as a result, is not considered to be a contaminant issue. The fill material in the vicinity of BH15 may have been placed on-site by neighbouring commercial activities.

Climatic and Meteorological Conditions

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

Based on the findings of the Phase II ESA, there are no contaminants of concern present on the subject property, and thus no contaminant distribution has occurred.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the properties addressed 4055 and 4120 Russell Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the subject properties. The subsurface investigation consisted of drilling sixteen (16) boreholes, of which seven (7) were installed with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Eleven (11) soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs F_1-F_4), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), metals, and/or organo-chlorine (OC) pesticides and the atrazine package.

The concentration of barium in BH1 exceeded the selected MECP Table 9 standard yet complied with the federal CCME commercial standard. Based on the native origins of the soil sample, as well as the analytical results of previous subsurface investigations, this exceedance is considered to be a naturally occurring elevated level, and thus does not present a contaminant issue to the subject property. All remaining parameters analyzed were in compliance with the selected MECP and CCME standards.

Groundwater samples recovered from monitoring wells installed in BH1, BH3, BH6, BH9, BH13, BH14, and BH15 were submitted for analysis of BTEX, PHCs (F_1-F_4), VOCs, PAHs, and/or metals parameters. All of the analytical test results were in compliance with the selected MECP and CCME standards.

Recommendations

While in compliance with the selected MECP Table 3 and CCME standards, it should be noted that the concentration of molybdenum and PHC F4 in the soil sample (fill material) recovered from BH15, located in the north portion of 4120 Russell Road, exceeded the MECP Table 1 Full Depth Background Site Conditions. If this fill material is to be removed from the property, it should be classified as contaminated soil for off-site disposal.

The full extent of the fill material was not delineated as part of this Phase II ESA, however, based on our field observations it is anticipated that the volume of this fill material ranges from approximately 50 to 150 m^3.

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

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

While our Phase II ESA did not identify any significant/gross contamination, it is a limited investigation on properties of this size. Based on the history/previous activities on-site, it is considered likely that some pockets of impacted soil will be encountered during future site development. In lieu of further investigation to attempt to find such pockets, which would likely be impractical, an allowance should be carried to cover any such related costs.

If the groundwater monitoring wells installed in BH1, BH3, BH6, BH9, BH13, BH14, and BH15 are not going to be used in the future, then they must be decommissioned according to Ontario Regulation Reg. 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

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

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

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

This report was prepared for the sole use of Avenue 31 Capital Inc. Notification from Avenue 31 Capital Inc. and Paterson Group will be required prior to the release of this report to any other party.

Paterson Group Inc.

Nick Sullivan, B.Sc.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- Avenue 31 Capital Inc.
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4690-3 – TEST HOLE LOCATION PLAN

DRAWING PE4690-4 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4690-5 – ANALYTICAL TESTING PLAN – GROUNDWATER

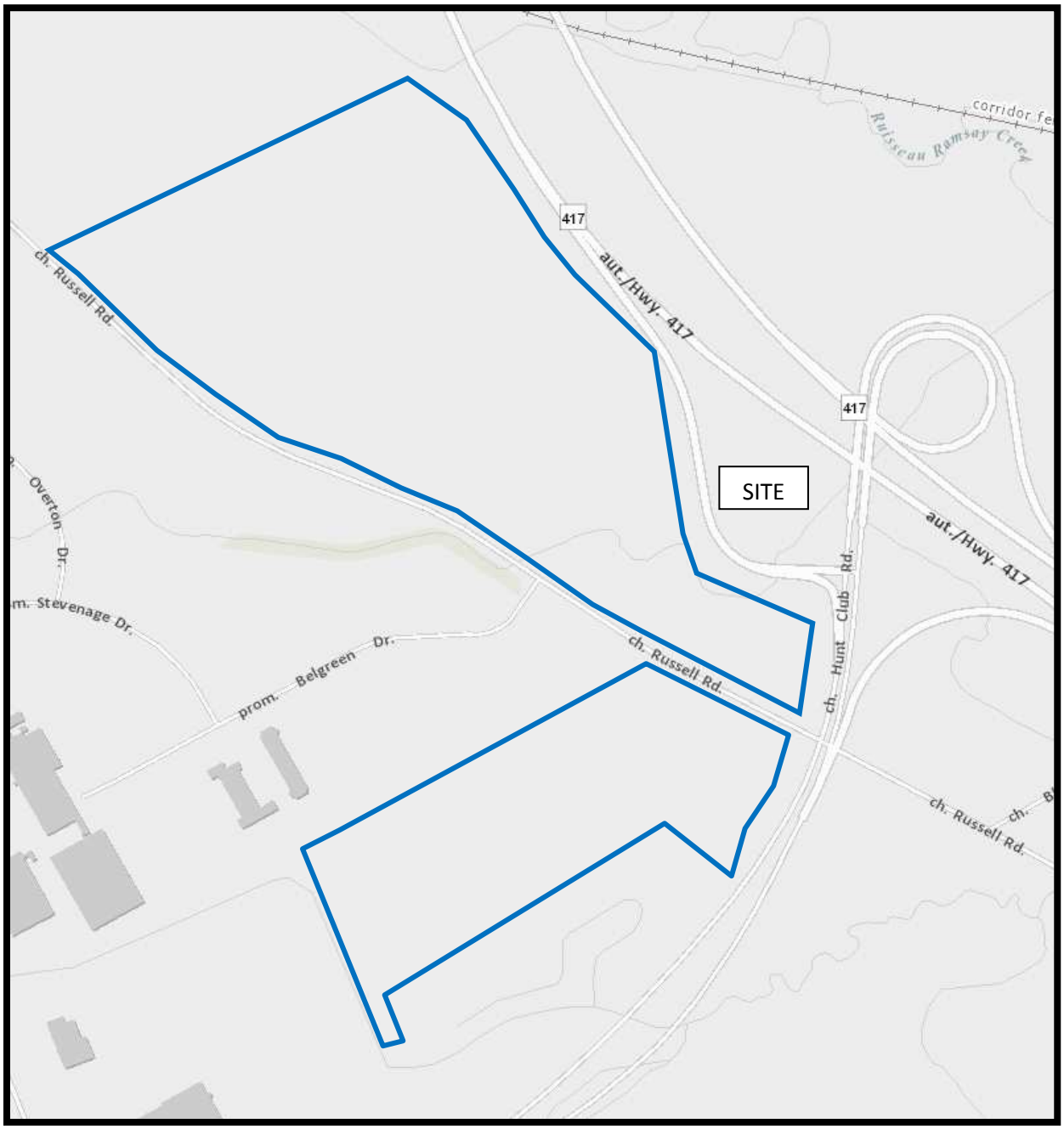
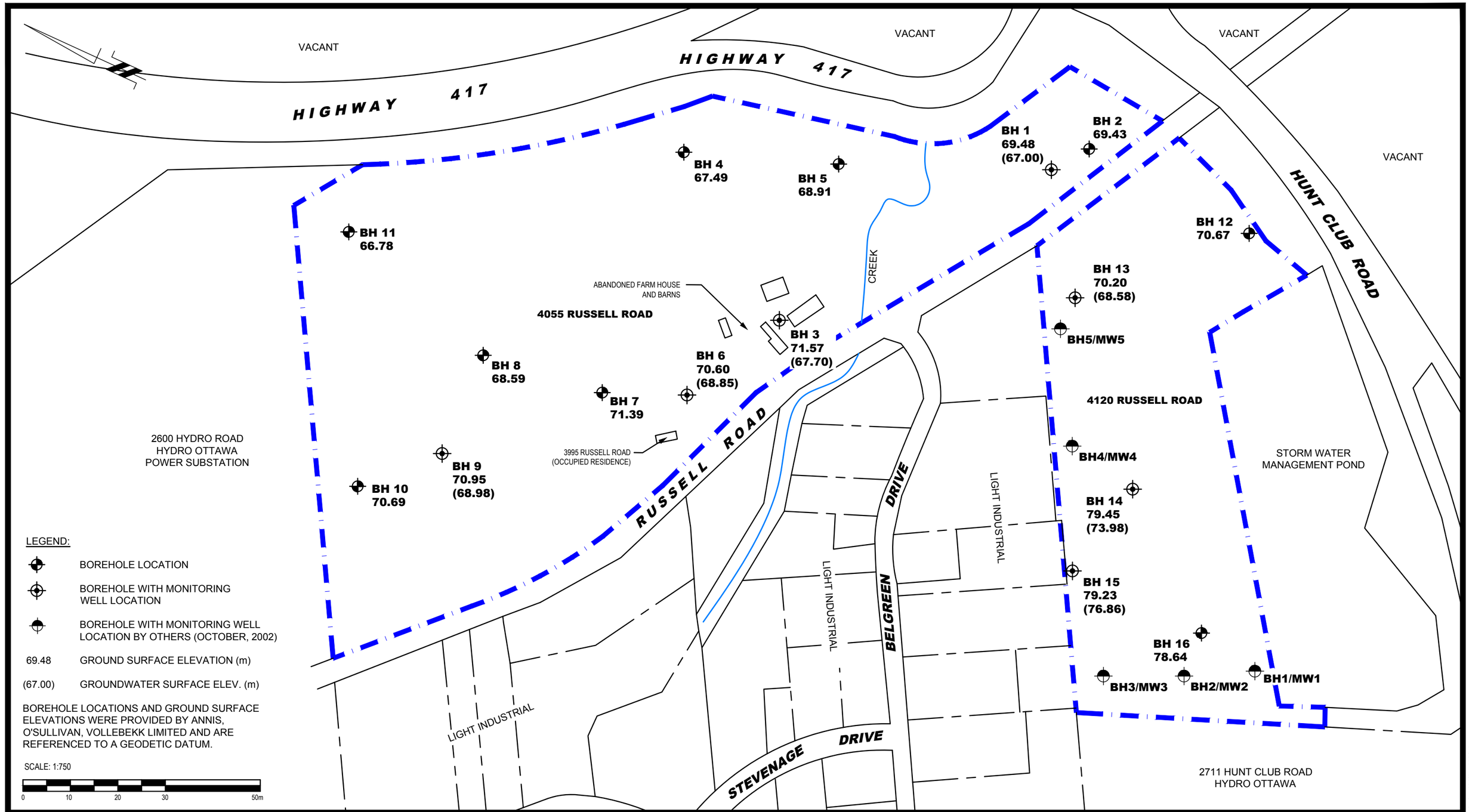


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION BY OTHERS (OCTOBER, 2002)
- 69.48 GROUND SURFACE ELEVATION (m)
- (67.00) GROUNDWATER SURFACE ELEV. (m)

BOREHOLE LOCATIONS AND GROUND SURFACE ELEVATIONS WERE PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED AND ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:750

0 10 20 30 50m

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NO.	REVISIONS	DATE	INITIAL

AVENUE 31 CAPITAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
4055 AND 4120 RUSSELL ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:750	Date: 10/2019
Drawn by: YA	Report No.: PE4690-2
Checked by: NS	Dwg. No.: PE4690-3
Approved by: MSD	Revision No.:

11x17

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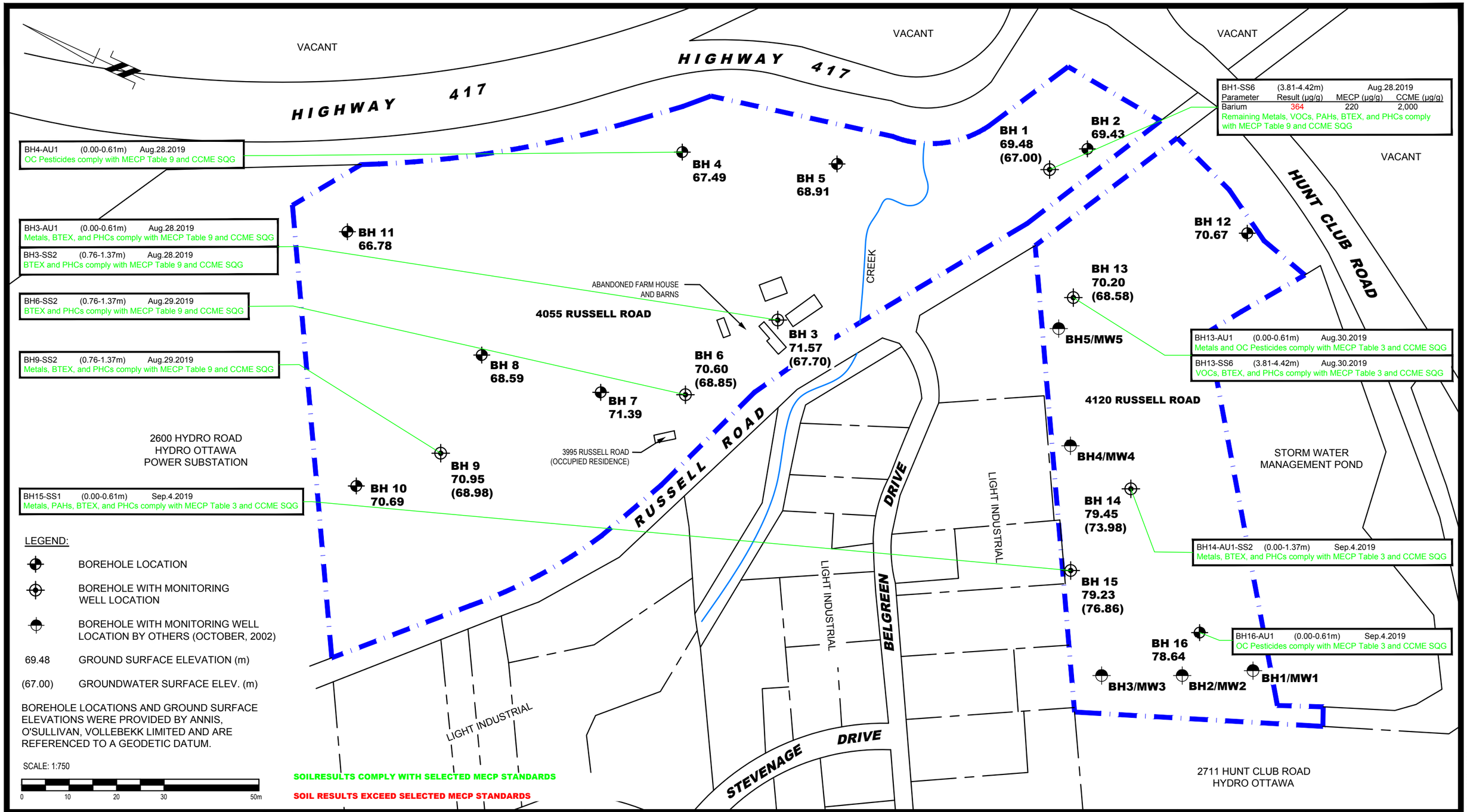

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NO.	REVISIONS	DATE	INITIAL

AVENUE 31 CAPITAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
4055 AND 4120 RUSSELL ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN-SOIL

Scale: 1:750	Date: 10/2019
Drawn by: YA	Report No.: PE4690-2
Checked by: NS	Dwg. No.: PE4690-4
Approved by: MSD	Revision No.:

11x17

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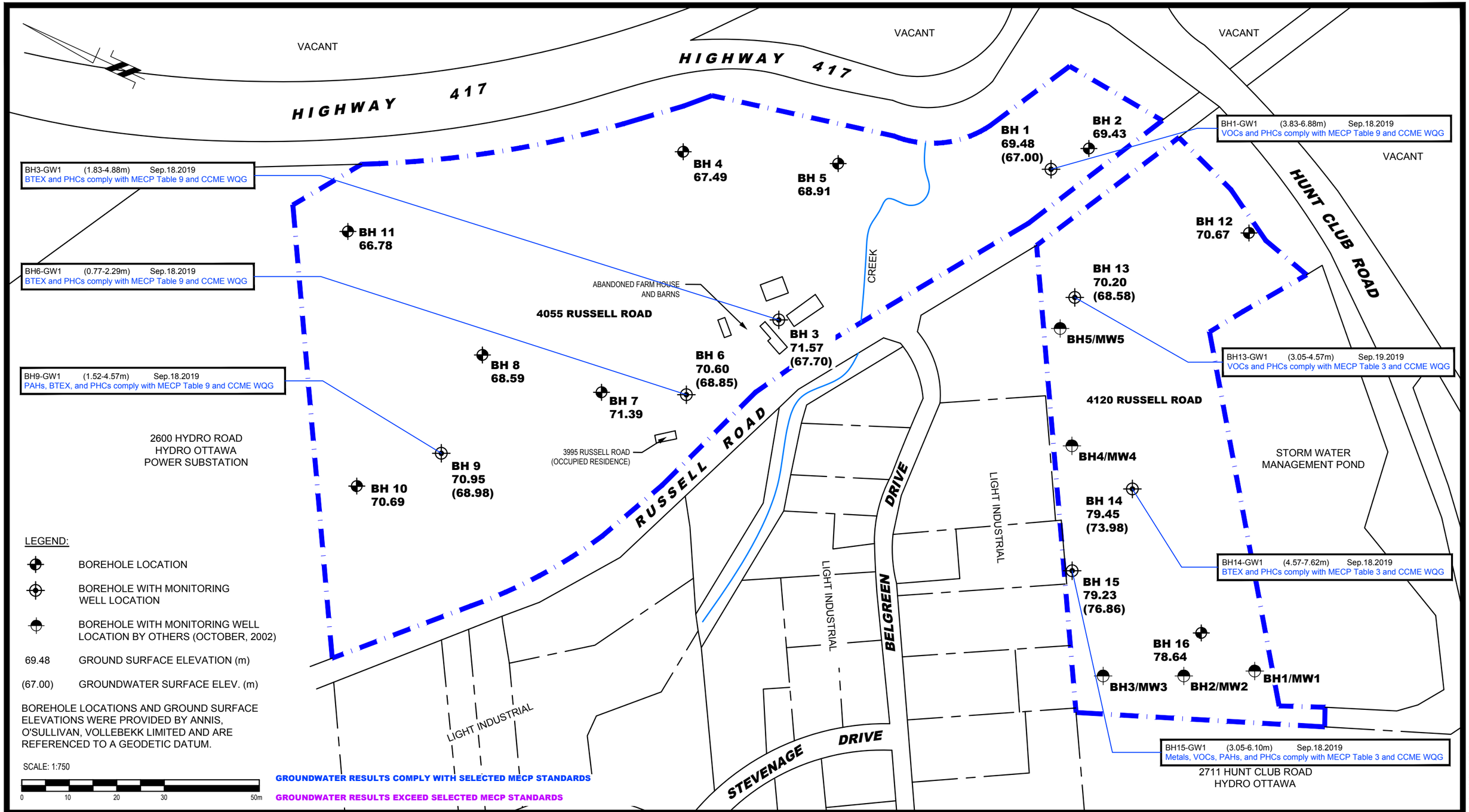

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SCALE: 1:750

0 10 20 30 50m

GROUNDWATER RESULTS COMPLY WITH SELECTED MECP STANDARDS

GROUNDWATER RESULTS EXCEED SELECTED MECP STANDARDS

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NO.	REVISIONS	DATE	INITIAL

AVENUE 31 CAPITAL INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
4055 AND 4120 RUSSELL ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN-GROUNDWATER

Scale: 1:750	Date: 10/2019
Drawn by: YA	Report No.: PE4690-2
Checked by: NS	Dwg. No.: PE4690-5
Approved by: MSD	Revision No.:

11x17

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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

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
4055 & 4120 Russell Road
Ottawa, Ontario

Prepared For

Avenue 31 Capital Inc.

August 26, 2019

Report: PE4690-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Avenue 31 Capital Inc. to conduct a Phase II Environmental Site Assessment (Phase II ESA) for the properties addressed 4055 and 4120 Russell Road, Ottawa, Ontario. Based on a Phase I ESA previously completed by Paterson for the subject property, the following subsurface investigation program, consisting of borehole drilling, was developed:

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Southeast portion of 4055 Russell Road; to address potential concerns associated with the former on-site automotive service garage.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH2	Southeast portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH3	South-central portion of 4055 Russell Road; to address potential concerns associated with the former aboveground diesel tank spill.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH4	East portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH5	East portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH6	South-central portion of 4055 Russell Road; to provide additional coverage.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH7	West portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH8	North portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH9	Northwest portion of 4055 Russell Road; to address potential concerns associated with on-site fill material as a result of the demolition of the former on-site farmhouse.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH10	Northwest portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH11	North portion of 4055 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH12	Southeast portion of 4120 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.
BH13	Northeast portion of 4120 Russell Road; to provide additional coverage.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH14	Central portion of 4120 Russell Road; to address potential concerns associated with on-site fill material as a result of the demolition of the former on-site farmhouse.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH15	Northwest portion of 4120 Russell Road; to address potential concerns associated with the on-site fill material.	6-10 m; to intercept the groundwater table for the purpose of installing a groundwater monitoring well.
BH16	Southwest portion of 4120 Russell Road; for geotechnical purposes and to provide additional coverage.	6-10 m; geotechnical purposes.

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

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

Following borehole drilling, monitoring wells will be installed in BH1, BH3, BH6, BH9, BH13, BH14, and BH15 for the collection of groundwater samples. Seven (7) groundwater samples will be collected from the monitoring wells, and one (1) duplicate sample will be collected from BH15 for a total of eight (8) groundwater samples.

2.0 ANALYTICAL TESTING PROGRAM

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

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

The analytical testing program for 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 F_1, a soil core from each soil sample, which may be analyzed, must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

- ❒ Obtain two buckets of water (preferably hot if available)
- ❒ Add a small amount of dish soap to one bucket
- ❒ Scrub spoons with brush in soapy water, inside and out, including tip
- ❒ Rinse in clean water

- ❒ Apply a small amount of methyl hydrate to the inside of the spoon. (A spray bottle or water bottle with a small hole in the cap works well)
- ❒ Allow to dry (takes seconds)
- ❒ Rinse with distilled water, a spray bottle works well.

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS

Physical impediments to the Sampling and Analysis plan may include:

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

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4690

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** 2019 August 28

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
TOPSOIL	0.20							
Brown **SILTY SAND**	0.30		AU	1				
			SS	2	38	5	1	68.48
			SS	3	100	5	2	67.48
Brown **SILTY CLAY**			SS	4	100	4		
- grey by 3.0m depth			SS	5	100	3	3	66.48
			SS	6	100	3	4	65.48
			SS	7	62	6	5	64.48
	5.18							
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders			SS	8	43	8	6	63.48
	6.88		SS	9	100	50+		
End of Borehole								
Practical refusal to augering at 6.88m depth								
(GWL @ 2.48m - Sept. 18, 2019)								

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
Proposed Commercial / Industrial Complex
4055 and 4120 Russell Road, Ottawa, Ontario

DATUM Ground surface elevations provided Annis, O'Sullivan, Vollebekk Ltd.

FILE NO. PE4690

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 2019 August 28

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	69.43
TOPSOIL 0.15		AU	1				
Loose, brown **SILTY SAND**							
1.01		SS	2	83	5	1	68.43
		SS	3	100	4	2	67.43
Very stiff to stiff, brown **SILTY CLAY**		SS	4	100	2		
						3	66.43
		SS	5	100	2		
- grey by 3.8m depth		SS	6	100	2	4	65.43
5.20						5	64.43
		SS	7	17	15		
GLACIAL TILL: Grey silty clay with gravel, cobbles and boulders						6	63.43
		SS	8	100	55		
6.91		SS	9	100	50+		
End of Borehole							
Practical refusal to augering at 6.91m 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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SOIL PROFILE AND TEST DATA

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FILE NO. PE4690

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 2019 August 28

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.57
Brown **SILTY SAND** with gravel		AU	1				
0.28							
		SS	2	50	8	1	70.57
Loose, brown **SILTY SAND**		SS	3	58	10	2	69.57
		SS	4	54	2		
2.90						3	68.57
		SS	5	42	12		
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders, trace clay		SS	6	54	24	4	67.57
4.88		SS	7	67	50+		
End of Borehole							
Practical refusal to augering at 4.88m depth							
(GWL @ 3.87m - Sept. 18, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4690

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.49
TOPSOIL 0.18		AU	1				
Loose to compact, brown **SILTY SAND**		SS	2	96	8	1	66.49
		SS	3	100	21	2	65.49
2.13							
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		SS	4	83	17		
3.12		SS	5	100	50+	3	64.49
End of Borehole							
Practical refusal to augering at 3.12m 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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SOIL PROFILE AND TEST DATA

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FILE NO. PE4690

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

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									
TOPSOIL 0.13		AU	1			0	68.91		
Compact, brown **SILTY SAND**		SS	2	62	11	1	67.91		
1.37									
Very stiff to hard, brown **SILTY CLAY**		SS	3	100	7	2	66.91		
3.66						3	65.91		
GLACIAL TILL: Brown silty clay with gravel, some cobbles, boulders 4.06		SS	4	60	50+	4	64.91		
End of Borehole									
Practical refusal to augering at 4.06m depth									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.60
TOPSOIL 0.20		AU	1				
Compact, brown **SILTY SAND**		SS	2	75	10	1	69.60
1.37							
Grey **SILTY CLAY**		SS	3	92	5	2	68.60
2.13							
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders 2.29							
End of Borehole							
Practical refusal to augering at 2.29m depth							
(GWL @ 1.75m - Sept. 18, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.39
TOPSOIL 0.20		AU	1				
Loose, brown **SILTY SAND**		SS	2	67	6	1	70.39
		SS	3	79	8	2	69.39
2.29							
Stiff, grey **SILTY CLAY**		SS	4	96	1	3	68.39
3.53							
End of Borehole							
Practical refusal to augering at 3.53m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	68.59
TOPSOIL 0.23		AU	1				
Very stiff, brown **SILTY CLAY**		SS	2	75	8	1	67.59
- grey by 1.5m depth		SS	3	100	4	2	66.59
2.90							
GLACIAL TILL: Grey silty clay, trace gravel, cobbles and boulders		SS	4	75	3	3	65.59
3.76							
End of Borehole							
Practical refusal to augering at 3.76m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4690

REMARKS

HOLE NO. BH 9

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.95
TOPSOIL 0.25		AU	1				
Loose, brown **SILTY SAND**		SS	2	46	9	1	69.95
1.52		SS	3	75	3	2	68.95
		SS	4	100	1		
Very stiff to stiff, grey **SILTY CLAY**		SS	5	100	1	3	67.95
		SS	6	100	1	4	66.95
4.57							
End of Borehole							
(GWL @ 1.97m - Sept. 18, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** 2019 August 29

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.69
TOPSOIL 0.15		AU	1				
Compact, brown **SILTY SAND**		SS	2	54	10	1	69.69
1.52		SS	3	83	6	2	68.69
		SS	4	100	2	3	67.69
						4	66.69
Very stiff to stiff, grey **SILTY CLAY**		SS	5	100	1	5	65.69
						6	64.69
						7	63.69
- firm by 8.4m depth						8	62.69
8.99							
Dynamic Cone Penetration Test commenced at 8.99m depth. Practical refusal to DCPT at 10.24m depth.							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH11

BORINGS BY CME 55 Power Auger **DATE** 2019 August 30

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									
TOPSOIL 0.15		AU	1			0	66.78		
Very stiff to stiff, brown **SILTY CLAY**		SS	2	88	8	1	65.78		
- grey by 1.5m depth		SS	3	92	4	2	64.78		
3.05						3	63.78		
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	4	100	12				
3.91		SS	5	0	50+				
End of Borehole									
Practical refusal to augering at 3.91m depth									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH12

BORINGS BY CME 55 Power Auger **DATE** 2019 August 30

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.67
TOPSOIL 0.10		AU	1				
Very stiff to stiff, brown **SILTY CLAY**		SS	2	79	8	1	69.67
- grey by 1.5m depth		SS	3	100	5	2	68.67
		SS	4	100	5		
		SS	5	100	4	3	67.67
3.81							
GLACIAL TILL: Brown silty clay with gravel, cobbles and boulders		SS	6	50	6	4	66.67
		SS	7	54	18	5	65.67
		SS	8	100	12	6	64.67
7.32						7	63.67
End of Borehole							
Practical refusal to augering at 7.32m depth							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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Phase II - Environmental Site Assessment
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FILE NO. PE4690

REMARKS

HOLE NO. BH13

BORINGS BY CME 55 Power Auger **DATE** 2019 August 30

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	70.20
TOPSOIL 0.08		AU	1				
Very stiff, brown **SILTY CLAY**		SS	2	100	8	1	69.20
1.52		SS	3	100	5	2	68.20
GLACIAL TILL: Brown silty clay with gravel, cobbles and boulders		SS	4	62	7	3	67.20
		SS	5	38	7		
		SS	6	33	15	4	66.20
4.57							
End of Borehole							
Practical refusal to augering at 4.57m depth							
(GWL @ 1.61m - Sept. 18, 2019)							

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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FILE NO. PE4690

REMARKS

HOLE NO. BH14

BORINGS BY CME 55 Power Auger **DATE** 2019 September 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.20		AU	1			0	79.45
FILL: Brown silty clay with sand, some gravel		SS	2	12	17	1	78.45
1.52		SS	3	96	15	2	77.45
		SS	4	100	9		
		SS	5	100	7	3	76.45
Hard to very stiff, brown **SILTY CLAY**		SS	6	100	4	4	75.45
		SS	7	100	1		
- stiff to firm and grey by 5.3m depth		SS	8	100	W	5	74.45
		SS	9	100	W	6	73.45
		SS	10	100	1	7	72.45
7.92		SS	11	10	2	8	71.45
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders 8.23							
End of Borehole							
(GWL @ 5.47m - Sept. 18, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4690

REMARKS

HOLE NO. BH15

BORINGS BY CME 55 Power Auger **DATE** 2019 September 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	79.23
TOPSOIL 0.10							
FILL: Brown silty sand, trace gravel		SS	1	67	7		
0.76							
		SS	2	75	13	1	78.23
		SS	3	92	11	2	77.23
Very stiff, brown **SILTY CLAY**		SS	4	100	9		
		SS	5	100	5	3	76.23
		SS	6	100	4	4	75.23
- grey by 4.8m depth		SS	7	100	2	5	74.23
5.64		SS	8	67	50		
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders							
6.25		SS	9	60	50+	6	73.23
End of Borehole							
Practical refusal to augering at 6.25m depth							
(GWL @ 2.37m - Sept. 18, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4690

REMARKS

HOLE NO. BH16

BORINGS BY CME 55 Power Auger **DATE** 2019 September 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.20		AU	1			0	78.64
		SS	2	88	19	1	77.64
Hard, brown **SILTY CLAY,** trace sand		SS	3	100	15	2	76.64
		SS	4	100	9	3	75.64
3.81							
GLACIAL TILL: Brown silty sand with ground rock 3.91		SS	5	100	50+		
End of Borehole							
Practical refusal to augering at 3.91m 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

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

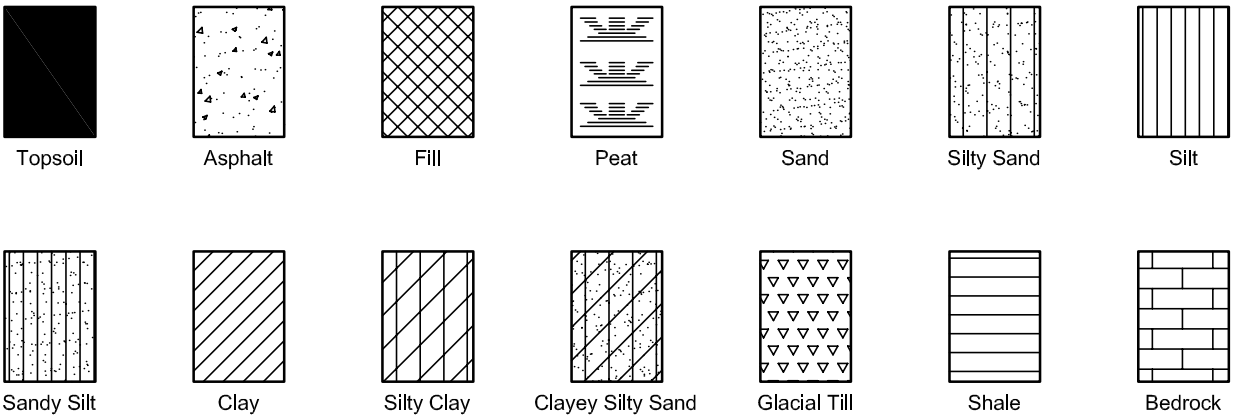
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

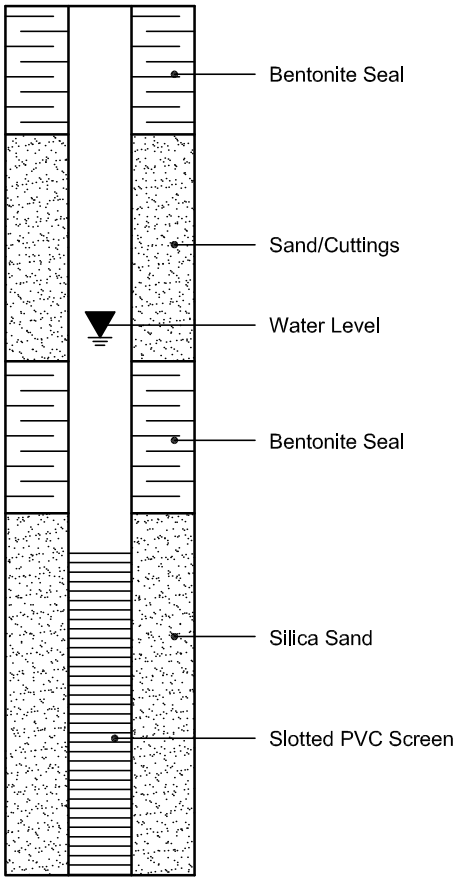
SYMBOLS AND TERMS (continued)

STRATA PLOT

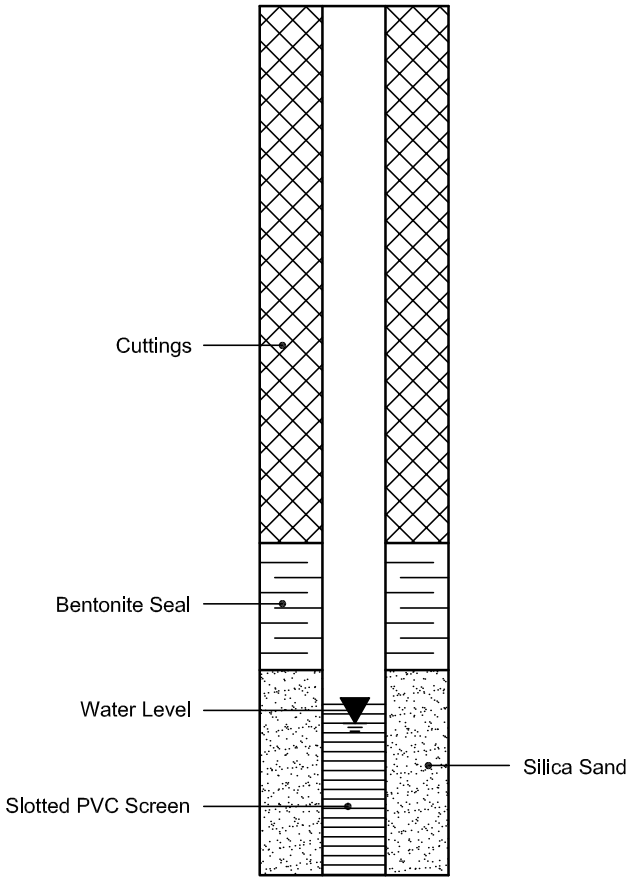


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Subcontracted Analysis

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

Tel: (613) 226-7381
Fax: (613) 226-6344

Paracel Report No **1936115**
Client Project(s): **PE4690**
Client PO: **27109**
Reference: **Standing Offer**
CoC Number: **123171**

Order Date: 04-Sep-19
Report Date: 13-Sep-19

Sample(s) from this project were subcontracted for the listed parameters. A copy of the subcontractor's report is attached

Paracel ID	Client ID	Analysis
1936115-04	BH4-AU1	Herbicides - triazine Pesticides - Organochlorine in soil
1936115-07	BH13-AU1	Herbicides - triazine Pesticides - Organochlorine in soil

Certificate of Analysis

Client: Paracel Laboratories Ltd.
300-2319 St. Laurent Blvd.
Ottawa, ON
K1G 4J8
Attention: Ms. Donna Bloom
PO#:
Invoice to: Paracel Laboratories Ltd.

Report Number: 1916150
Date Submitted: 2019-09-05
Date Reported: 2019-09-12
Project: 1936115
COC #: 848422

Dear Donna Bloom:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: _____
Long Qu, Organics Supervisor

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Certificate of Analysis

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Client: Paracel Laboratories Ltd.
300-2319 St. Laurent Blvd.
Ottawa, ON
K1G 4J8
Attention: Ms. Donna Bloom
PO#:
Invoice to: Paracel Laboratories Ltd.

Report Number: 1916150
Date Submitted: 2019-09-05
Date Reported: 2019-09-12
Project: 1936115
COC #: 848422

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1451902 Soil 2019-08-29 BH4-AU1	1451903 Soil 2019-08-30 BH13-AU1
NP Pestcides	Atrazine	1.0	ug/g			<1.0	<1.0
	Cyanazine	1.0	ug/g			<1.0	<1.0
	Metolachlor	1.0	ug/g			<1.0	<1.0
	Prometryne	0.25	ug/g			<0.25	<0.25
	Simazine	1.0	ug/g			<1.0	<1.0

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

eurofins | Environment Testing

Client: Paracel Laboratories Ltd.
300-2319 St. Laurent Blvd.
Ottawa, ON
K1G 4J8
Attention: Ms. Donna Bloom
PO#:
Invoice to: Paracel Laboratories Ltd.

Report Number: 1916150
Date Submitted: 2019-09-05
Date Reported: 2019-09-12
Project: 1936115
COC #: 848422

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 372031 **Analysis/Extraction Date** 2019-09-06 **Analyst** C M **Method** EPA 8141/8270			
Metolachlor	<1.0 ug/g	128	20-140
Run No 372032 **Analysis/Extraction Date** 2019-09-06 **Analyst** C M **Method** EPA 8141/8270			
Atrazine	<1.0 ug/g	110	20-140
Cyanazine	<1.0 ug/g	106	
Prometryne	<0.25 ug/g	128	20-140
Simazine	<1.0 ug/g	100	20-140

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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CERTIFICATE OF ANALYSIS

Client:	Dale Robertson	Work Order Number:	382115
Company:	Paracel Laboratories Ltd.- Ottawa	PO #:	
Address:	300-2319 St. Laurent Blvd. Ottawa, ON, K1G 4J8	Regulation: Project #:	CCME Freshwater Sediment Quality Guidelines 1936115
Phone/Fax:	(613) 731-9577 / (613) 731-9064	DWS #:	
Email:	drobertson@paracellabs.com	Sampled By:	
Date Order Received:	9/6/2019	Analysis Started:	9/11/2019
Arrival Temperature:	17 °C	Analysis Completed:	9/11/2019

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
BH4-AU1	1473703	Soil	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	8/29/2019	10:00 AM
BH13-AU1	1473704	Soil	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	8/30/2019	3:30 PM

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Moisture (A99)	Garson	Determination of Percent Moisture	In House
OCPs Soil (A19)	Garson	Determination of Organochlorine Pesticides in Soil by GC/ECD	Modified from SW846-8081B

This report has been approved by:

Brad Halvorson, B.Sc.
Laboratory Director

7 Margaret Street, Garson, ON, P3L 1E1
Phone: (705) 693-1121 Fax: (705) 693-1124 Web: www.testmark.ca

CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd.- Ottawa

Work Order Number: 382115

WORK ORDER RESULTS

Sample Description	BH4 - AU1		BH13 - AU1			
Sample Date	08/29/2019		08/30/2019			
Lab ID	1473703		1473704			
General Chemistry	Result	MDL	Result	MDL	Units	Criteria: CCME Freshwater Sediment Quality Guidelines
% Moisture	14.8	0.1	15.6	0.1	%	~

Sample Description	BH4 - AU1		BH13 - AU1			
Sample Date	08/29/2019		08/30/2019			
Lab ID	1473703		1473704			
OC Pesticides	Result	MDL	Result	MDL	Units	Criteria: CCME Freshwater Sediment Quality Guidelines
2,4'-DDD	<0.01	0.01	<0.01	0.01	µg/g	~
2,4'-DDE	<0.01	0.01	<0.01	0.01	µg/g	~
2,4'-DDT	<0.01	0.01	<0.01	0.01	µg/g	~
4,4'-DDD	<0.01	0.01	<0.01	0.01	µg/g	~
4,4'-DDE	<0.01	0.01	<0.01	0.01	µg/g	~
4,4'-DDT	<0.01	0.01	<0.01	0.01	µg/g	~
Aldrin	<0.01	0.01	<0.01	0.01	µg/g	~
DDD (Total) (Calc.)	<0.01	0.01	<0.01	0.01	µg/g	0.00354
DDE (Total) (Calc.)	<0.01	0.01	<0.01	0.01	µg/g	0.00142
DDT (Total) (Calc.)	<0.01	0.01	<0.01	0.01	µg/g	0.00119
Decachlorobiphenyl (Surr.)	102	N/A	111	N/A	% Rec	~
Dieldrin	<0.01	0.01	<0.01	0.01	µg/g	0.00285
Endosulfan I	<0.01	0.01	<0.01	0.01	µg/g	~
Endosulfan I + II (Calc.)	<0.01	0.01	<0.01	0.01	µg/g	~

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CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd.- Ottawa

Work Order Number: 382115

Sample Description	BH4 - AU1		BH13 - AU1			
Sample Date	08/29/2019		08/30/2019			
Lab ID	1473703		1473704			
OC Pesticides	Result	MDL	Result	MDL	Units	Criteria: CCME Freshwater Sediment Quality Guidelines
Endosulfan II	<0.01	0.01	<0.01	0.01	µg/g	~
Endosulfan sulfate	<0.01	0.01	<0.01	0.01	µg/g	~
Endrin	<0.01	0.01	<0.01	0.01	µg/g	0.00267
Endrin aldehyde	<0.01	0.01	<0.01	0.01	µg/g	~
Heptachlor	<0.01	0.01	<0.01	0.01	µg/g	0.0006
Heptachlor epoxide	<0.01	0.01	<0.01	0.01	µg/g	0.0006
Hexachlorobenzene	<0.01	0.01	<0.01	0.01	µg/g	~
Hexachlorobutadiene	<0.01	0.01	<0.01	0.01	µg/g	~
Hexachloroethane	<0.01	0.01	<0.01	0.01	µg/g	~
Methoxychlor	<0.01	0.01	<0.01	0.01	µg/g	~
Mirex	<0.01	0.01	<0.01	0.01	µg/g	~
Oxychlordane	<0.01	0.01	<0.01	0.01	µg/g	0.0045
ß-BHC	<0.01	0.01	<0.01	0.01	µg/g	0.00094
α - Chlordane	<0.01	0.01	<0.01	0.01	µg/g	0.0045
α + γ -Chlordane (Calc.)	<0.01	0.01	<0.01	0.01	µg/g	~
α-BHC	<0.01	0.01	<0.01	0.01	µg/g	0.00094
γ - Chlordane	<0.01	0.01	<0.01	0.01	µg/g	0.0045
γ-BHC (Lindane)	<0.01	0.01	<0.01	0.01	µg/g	0.00094
δ-BHC	<0.01	0.01	<0.01	0.01	µg/g	0.00094

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CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd.- Ottawa

Work Order Number: 382115

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result.

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Subcontracted Analysis

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

Tel: (613) 226-7381
Fax: (613) 226-6344

Paracel Report No	**1936431**
Client Project(s):	**PE4690**
Client PO:	**27111**
Reference:	**Standing Offer**
CoC Number:	**123181**

Order Date:	05-Sep-19
Report Date:	16-Sep-19

Sample(s) from this project were subcontracted for the listed parameters. A copy of the subcontractor's report is attached

Paracel ID	Client ID	Analysis
1936431-03	BH16-AU1	Herbicides - triazine Pesticides - Organochlorine in soil

TESTMARK Laboratories Ltd.
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CERTIFICATE OF ANALYSIS

Client:	Dale Robertson	Work Order Number:	382364
Company:	Paracel Laboratories Ltd.- Ottawa	PO #:	
Address:	300-2319 St. Laurent Blvd. Ottawa, ON, K1G 4J8	Regulation: Project #:	CCME Freshwater Sediment Quality Guidelines 1936431
Phone/Fax:	(613) 731-9577 / (613) 731-9064	DWS #:	
Email:	drobertson@paracellabs.com	Sampled By:	
Date Order Received:	9/10/2019	Analysis Started:	9/12/2019
Arrival Temperature:	14 °C	Analysis Completed:	9/12/2019

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
BH16-AU1	1474539	Soil	None	SAMPLE CONTAINED RESULT EXCEEDENCES.	9/4/2019	4:00 PM

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Moisture (A99)	Garson	Determination of Percent Moisture	In House
OCPs Soil (A19)	Garson	Determination of Organochlorine Pesticides in Soil by GC/ECD	Modified from SW846-8081B

This report has been approved by:

Brad Halvorson, B.Sc.
Laboratory Director

7 Margaret Street, Garson, ON, P3L 1E1
Phone: (705) 693-1121 Fax: (705) 693-1124 Web: www.testmark.ca

CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd.- Ottawa

Work Order Number: 382364

WORK ORDER RESULTS

Sample Description	BH16 - AU1
Sample Date	09/04/2019
Lab ID	1474539

General Chemistry	Result	MDL	Units	Criteria: CCME Freshwater Sediment Quality Guidelines
% Moisture	20.1	0.1	%	~

Sample Description	BH16 - AU1
Sample Date	09/04/2019
Lab ID	1474539

OC Pesticides	Result	MDL	Units	Criteria: CCME Freshwater Sediment Quality Guidelines
2,4'-DDD	<0.008	0.008	µg/g	~
2,4'-DDE	<0.008	0.008	µg/g	~
2,4'-DDT	<0.008	0.008	µg/g	~
4,4'-DDD	<0.008	0.008	µg/g	~
4,4'-DDE	<0.008	0.008	µg/g	~
4,4'-DDT	<0.008	0.008	µg/g	~
Aldrin	<0.008	0.008	µg/g	~
DDD (Total) (Calc.)	<0.008	0.008	µg/g	0.00354
DDE (Total) (Calc.)	<0.008	0.008	µg/g	0.00142
DDT (Total) (Calc.)	<0.008	0.008	µg/g	0.00119
Decachlorobiphenyl (Surr.)	91.5	N/A	% Rec	~
Dieldrin	<0.008	0.008	µg/g	0.00285
Endosulfan I	<0.008	0.008	µg/g	~
Endosulfan I + II (Calc.)	<0.008	0.008	µg/g	~

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Phone: (705) 693-1121 Fax: (705) 693-1124 Web: www.testmark.ca

CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd.- Ottawa

Work Order Number: 382364

Sample Description	BH16 - AU1
Sample Date	09/04/2019
Lab ID	1474539

OC Pesticides	Result	MDL	Units	Criteria: CCME Freshwater Sediment Quality Guidelines
Endosulfan II	<0.008	0.008	µg/g	~
Endosulfan sulfate	<0.008	0.008	µg/g	~
Endrin	<0.008	0.008	µg/g	0.00267
Endrin aldehyde	<0.008	0.008	µg/g	~
Heptachlor	<0.008	0.008	µg/g	0.0006
Heptachlor epoxide	<0.008	0.008	µg/g	0.0006
Hexachlorobenzene	<0.008	0.008	µg/g	~
Hexachlorobutadiene	<0.008	0.008	µg/g	~
Hexachloroethane	<0.008	0.008	µg/g	~
Methoxychlor	<0.008	0.008	µg/g	~
Mirex	<0.008	0.008	µg/g	~
Oxychlordane	<0.008	0.008	µg/g	0.0045
ß-BHC	<0.008	0.008	µg/g	0.00094
α - Chlordane	<0.008	0.008	µg/g	0.0045
α + γ -Chlordane (Calc.)	<0.008	0.008	µg/g	~
α-BHC	<0.008	0.008	µg/g	0.00094
γ - Chlordane	<0.008	0.008	µg/g	0.0045
γ-BHC (Lindane)	<0.008	0.008	µg/g	0.00094
δ-BHC	<0.008	0.008	µg/g	0.00094

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CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd.- Ottawa

Work Order Number: 382364

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result.

7 Margaret Street, Garson, ON, P3L 1E1
Phone: (705) 693-1121 Fax: (705) 693-1124 Web: www.testmark.ca

Certificate of Analysis

Client: Paracel Laboratories Ltd.
300-2319 St. Laurent Blvd.
Ottawa, ON
K1G 4J8
Attention: Ms. Donna Bloom
PO#:
Invoice to: Paracel Laboratories Ltd.

Report Number: 1916328
Date Submitted: 2019-09-09
Date Reported: 2019-09-16
Project: 1936431
COC #: 848509

Dear Donna Bloom:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: _____
Long Qu, Organics Supervisor

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

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Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Certificate of Analysis

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Client: Paracel Laboratories Ltd.
300-2319 St. Laurent Blvd.
Ottawa, ON
K1G 4J8
Attention: Ms. Donna Bloom
PO#:
Invoice to: Paracel Laboratories Ltd.

Report Number: 1916328
Date Submitted: 2019-09-09
Date Reported: 2019-09-16
Project: 1936431
COC #: 848509

				Lab I.D.	1452369
				Sample Matrix	Soil
				Sample Type	
				Sampling Date	2019-09-04
				Sample I.D.	BH16-AU1
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
NP Pestcides	Atrazine	1.0	ug/g		<1.0
	Cyanazine	1.0	ug/g		<1.0
	Metolachlor	1.0	ug/g		<1.0
	Prometryne	0.25	ug/g		<0.25
	Simazine	1.0	ug/g		<1.0

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

eurofins | Environment Testing

Client: Paracel Laboratories Ltd.
300-2319 St. Laurent Blvd.
Ottawa, ON
K1G 4J8
Attention: Ms. Donna Bloom
PO#:
Invoice to: Paracel Laboratories Ltd.

Report Number: 1916328
Date Submitted: 2019-09-09
Date Reported: 2019-09-16
Project: 1936431
COC #: 848509

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 372032 **Analysis/Extraction Date** 2019-09-16 **Analyst** C M **Method** EPA 8141/8270			
Atrazine	<1.0 ug/g	110	20-140
Cyanazine	<1.0 ug/g	106	
Metolachlor			20-140
Prometryne	<0.25 ug/g	128	20-140
Simazine	<1.0 ug/g	100	20-140

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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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: 27109
Project: PE4690
Custody: 123171

Report Date: 17-Sep-2019
Order Date: 4-Sep-2019

Revised Report

Order #: 1936115

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

Paracel ID	Client ID
1936115-01	BH1-SS6
1936115-02	BH3-AU1
1936115-03	BH3-SS2
1936115-05	BH6-SS2
1936115-06	BH9-SS2
1936115-07	BH13-AU1
1936115-08	BH13-SS6

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27109

Report Date: 17-Sep-2019
Order Date: 4-Sep-2019
Project Description: PE4690

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	6-Sep-19	7-Sep-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	4-Sep-19	6-Sep-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	9-Sep-19	10-Sep-19
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	10-Sep-19	10-Sep-19
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	3-Sep-19	6-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	6-Sep-19	7-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Sep-19	7-Sep-19
Solids, %	Gravimetric, calculation	4-Sep-19	4-Sep-19
VOCs by P&T GC-MS, Soil Direct Purge	EPA 8260 - P&T GC-MS	10-Sep-19	11-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27109

Report Date: 17-Sep-2019

Order Date: 4-Sep-2019

Project Description: PE4690

	Client ID:	BH1-SS6	BH3-AU1	BH3-SS2	BH6-SS2
	Sample Date:	28-Aug-19 10:00	28-Aug-19 12:00	28-Aug-19 12:00	29-Aug-19 13:30
	Sample ID:	1936115-01	1936115-02	1936115-03	1936115-05
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	69.4	86.3	90.4	84.0
Metals					
Antimony	1 ug/g dry	<1	<1	-	-
Arsenic	1 ug/g dry	3	3	-	-
Barium	1 ug/g dry	364	60	-	-
Beryllium	0.5 ug/g dry	0.8	<0.5	-	-
Boron	5.0 ug/g dry	8.3	6.3	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5 ug/g dry	52	14	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1 ug/g dry	14	4	-	-
Copper	5 ug/g dry	30	12	-	-
Lead	1 ug/g dry	7	18	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1 ug/g dry	<1	1	-	-
Nickel	5 ug/g dry	30	9	-	-
Selenium	1 ug/g dry	<1	<1	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1 ug/g dry	<1	<1	-	-
Tin	5 ug/g dry	<5	<5	-	-
Uranium	1 ug/g dry	<1	<1	-	-
Vanadium	10 ug/g dry	71	14	-	-
Zinc	20 ug/g dry	80	46	-	-
Volatiles					
Benzene	0.002 ug/g dry	-	-	<0.002	<0.002
Ethylbenzene	0.002 ug/g dry	-	-	<0.002	<0.002
Toluene	0.002 ug/g dry	-	-	<0.002	<0.002
m,p-Xylenes	0.002 ug/g dry	-	-	<0.002	<0.002
o-Xylene	0.002 ug/g dry	-	-	<0.002	<0.002
Xylenes, total	0.002 ug/g dry	-	-	<0.002	<0.002
Toluene-d8	Surrogate	-	-	99.1%	103%
Acetone	0.100 ug/g dry	<0.100	-	-	-
Benzene	0.002 ug/g dry	0.007	-	-	-
Bromodichloromethane	0.005 ug/g dry	<0.005	-	-	-
Bromoform	0.005 ug/g dry	<0.005	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27109

Report Date: 17-Sep-2019

Order Date: 4-Sep-2019

Project Description: PE4690

	Client ID:	BH1-SS6	BH3-AU1	BH3-SS2	BH6-SS2
	Sample Date:	28-Aug-19 10:00	28-Aug-19 12:00	28-Aug-19 12:00	29-Aug-19 13:30
	Sample ID:	1936115-01	1936115-02	1936115-03	1936115-05
	MDL/Units	Soil	Soil	Soil	Soil
Bromomethane	0.005 ug/g dry	<0.005	-	-	-
Carbon Tetrachloride	0.002 ug/g dry	<0.002	-	-	-
Chlorobenzene	0.002 ug/g dry	<0.002	-	-	-
Chloroethane	0.050 ug/g dry	<0.050	-	-	-
Chloroform	0.002 ug/g dry	<0.002	-	-	-
Chloromethane	0.050 ug/g dry	<0.050	-	-	-
Dibromochloromethane	0.002 ug/g dry	<0.002	-	-	-
Ethylene dibromide (dibromoethan	0.005 ug/g dry	<0.005	-	-	-
1,2-Dichlorobenzene	0.002 ug/g dry	<0.002	-	-	-
1,3-Dichlorobenzene	0.002 ug/g dry	<0.002	-	-	-
1,4-Dichlorobenzene	0.002 ug/g dry	<0.002	-	-	-
1,1-Dichloroethane	0.002 ug/g dry	<0.002	-	-	-
1,2-Dichloroethane	0.002 ug/g dry	<0.002	-	-	-
1,1-Dichloroethylene	0.002 ug/g dry	<0.002	-	-	-
Dichlorodifluoromethane	0.002 ug/g dry	<0.002	-	-	-
cis-1,2-Dichloroethylene	0.002 ug/g dry	<0.002	-	-	-
trans-1,2-Dichloroethylene	0.002 ug/g dry	<0.002	-	-	-
1,2-Dichloroethylene, total	0.003 ug/g dry	<0.003	-	-	-
1,2-Dichloropropane	0.002 ug/g dry	<0.002	-	-	-
cis-1,3-Dichloropropylene	0.002 ug/g dry	<0.002	-	-	-
trans-1,3-Dichloropropylene	0.002 ug/g dry	<0.002	-	-	-
1,3-Dichloropropene, total	0.003 ug/g dry	<0.003	-	-	-
Ethylbenzene	0.002 ug/g dry	0.003	-	-	-
Hexane	0.050 ug/g dry	<0.050	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.050 ug/g dry	<0.050	-	-	-
Methyl Butyl Ketone (2-Hexanone)	0.010 ug/g dry	<0.010	-	-	-
Methyl Isobutyl Ketone	0.050 ug/g dry	<0.050	-	-	-
Methyl tert-butyl ether	0.010 ug/g dry	<0.010	-	-	-
Methylene Chloride	0.005 ug/g dry	<0.005	-	-	-
Styrene	0.005 ug/g dry	<0.005	-	-	-
1,1,1,2-Tetrachloroethane	0.002 ug/g dry	<0.002	-	-	-
1,1,2,2-Tetrachloroethane	0.002 ug/g dry	<0.002	-	-	-
Tetrachloroethylene	0.002 ug/g dry	<0.002	-	-	-
Toluene	0.002 ug/g dry	0.014	-	-	-
1,2,4-Trichlorobenzene	0.002 ug/g dry	<0.002	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27109

Report Date: 17-Sep-2019

Order Date: 4-Sep-2019

Project Description: PE4690

	Client ID:	BH1-SS6	BH3-AU1	BH3-SS2	BH6-SS2
	Sample Date:	28-Aug-19 10:00	28-Aug-19 12:00	28-Aug-19 12:00	29-Aug-19 13:30
	Sample ID:	1936115-01	1936115-02	1936115-03	1936115-05
	MDL/Units	Soil	Soil	Soil	Soil
1,1,1-Trichloroethane	0.002 ug/g dry	<0.002	-	-	-
1,1,2-Trichloroethane	0.002 ug/g dry	<0.002	-	-	-
Trichloroethylene	0.002 ug/g dry	<0.002	-	-	-
Trichlorofluoromethane	0.005 ug/g dry	<0.005	-	-	-
1,3,5-Trimethylbenzene	0.005 ug/g dry	<0.005	-	-	-
Vinyl chloride	0.005 ug/g dry	<0.005	-	-	-
m,p-Xylenes	0.005 ug/g dry	0.017	-	-	-
o-Xylene	0.002 ug/g dry	0.006	-	-	-
Xylenes, total	0.005 ug/g dry	0.023	-	-	-
4-Bromofluorobenzene	Surrogate	95.3%	-	-	-
Dibromofluoromethane	Surrogate	79.1%	-	-	-
Toluene-d8	Surrogate	96.3%	-	-	-
Benzene	0.02 mg/kg dry	-	<0.02 [4]	-	-
Ethylbenzene	0.05 mg/kg dry	-	<0.05 [4]	-	-
Toluene	0.05 mg/kg dry	-	<0.05 [4]	-	-
m,p-Xylenes	0.05 mg/kg dry	-	<0.05 [4]	-	-
o-Xylene	0.05 mg/kg dry	-	<0.05 [4]	-	-
Xylenes, total	0.05 mg/kg dry	-	<0.05 [4]	-	-
Toluene-d8	Surrogate	-	93.8% [4]	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	42	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	36	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 mg/kg dry	<0.02	-	-	-
Acenaphthylene	0.02 mg/kg dry	<0.02	-	-	-
Anthracene	0.02 mg/kg dry	<0.02	-	-	-
Benzo [a] anthracene	0.02 mg/kg dry	<0.02	-	-	-
Benzo [a] pyrene	0.02 mg/kg dry	<0.02	-	-	-
Benzo [b] fluoranthene	0.02 mg/kg dry	<0.02	-	-	-
Benzo [g,h,i] perylene	0.02 mg/kg dry	<0.02	-	-	-
Benzo [k] fluoranthene	0.02 mg/kg dry	<0.02	-	-	-
Biphenyl	0.02 mg/kg dry	<0.02	-	-	-
Chrysene	0.02 mg/kg dry	<0.02	-	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg dry	<0.02	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27109

Report Date: 17-Sep-2019

Order Date: 4-Sep-2019

Project Description: PE4690

	Client ID:	BH1-SS6	BH3-AU1	BH3-SS2	BH6-SS2
	Sample Date:	28-Aug-19 10:00	28-Aug-19 12:00	28-Aug-19 12:00	29-Aug-19 13:30
	Sample ID:	1936115-01	1936115-02	1936115-03	1936115-05
	MDL/Units	Soil	Soil	Soil	Soil
Fluoranthene	0.02 mg/kg dry	<0.02	-	-	-
Fluorene	0.02 mg/kg dry	<0.02	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg dry	<0.02	-	-	-
1-Methylnaphthalene	0.02 mg/kg dry	<0.02	-	-	-
2-Methylnaphthalene	0.02 mg/kg dry	<0.02	-	-	-
Methylnaphthalene (1&2)	0.04 mg/kg dry	<0.04	-	-	-
Naphthalene	0.01 mg/kg dry	<0.01	-	-	-
Phenanthrene	0.02 mg/kg dry	<0.02	-	-	-
Pyrene	0.02 mg/kg dry	<0.02	-	-	-
Quinoline	0.10 mg/kg dry	<0.10	-	-	-
2-Fluorobiphenyl	Surrogate	84.8%	-	-	-
Terphenyl-d14	Surrogate	136%	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27109

Report Date: 17-Sep-2019

Order Date: 4-Sep-2019

Project Description: PE4690

	Client ID:	BH9-SS2	BH13-AU1	BH13-SS6	-
	Sample Date:	29-Aug-19 16:00	30-Aug-19 15:30	30-Aug-19 16:00	-
	Sample ID:	1936115-06	1936115-07	1936115-08	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	92.3	85.5	90.8	-
Metals					
Antimony	1 ug/g dry	<1	<1	-	-
Arsenic	1 ug/g dry	1	2	-	-
Barium	1 ug/g dry	31	190	-	-
Beryllium	0.5 ug/g dry	<0.5	0.7	-	-
Boron	5.0 ug/g dry	<5.0	5.8	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5 ug/g dry	15	46	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1 ug/g dry	4	10	-	-
Copper	5 ug/g dry	7	17	-	-
Lead	1 ug/g dry	2	12	-	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1 ug/g dry	<1	<1	-	-
Nickel	5 ug/g dry	9	22	-	-
Selenium	1 ug/g dry	<1	<1	-	-
Silver	0.3 ug/g dry	<0.3	<0.3	-	-
Thallium	1 ug/g dry	<1	<1	-	-
Tin	5 ug/g dry	<5	<5	-	-
Uranium	1 ug/g dry	<1	<1	-	-
Vanadium	10 ug/g dry	23	57	-	-
Zinc	20 ug/g dry	<20	88	-	-
Volatiles					
Acetone	0.100 ug/g dry	-	-	<0.100	-
Benzene	0.002 ug/g dry	-	-	<0.002	-
Bromodichloromethane	0.005 ug/g dry	-	-	<0.005	-
Bromoform	0.005 ug/g dry	-	-	<0.005	-
Bromomethane	0.005 ug/g dry	-	-	<0.005	-
Carbon Tetrachloride	0.002 ug/g dry	-	-	<0.002	-
Chlorobenzene	0.002 ug/g dry	-	-	<0.002	-
Chloroethane	0.050 ug/g dry	-	-	<0.050	-
Chloroform	0.002 ug/g dry	-	-	<0.002	-
Chloromethane	0.050 ug/g dry	-	-	<0.050	-
Dibromochloromethane	0.002 ug/g dry	-	-	<0.002	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27109

Report Date: 17-Sep-2019

Order Date: 4-Sep-2019

Project Description: PE4690

	Client ID:	BH9-SS2	BH13-AU1	BH13-SS6	-
	Sample Date:	29-Aug-19 16:00	30-Aug-19 15:30	30-Aug-19 16:00	-
	Sample ID:	1936115-06	1936115-07	1936115-08	-
	MDL/Units	Soil	Soil	Soil	-
Ethylene dibromide (dibromoethar	0.005 ug/g dry	-	-	<0.005	-
1,2-Dichlorobenzene	0.002 ug/g dry	-	-	<0.002	-
1,3-Dichlorobenzene	0.002 ug/g dry	-	-	<0.002	-
1,4-Dichlorobenzene	0.002 ug/g dry	-	-	<0.002	-
1,1-Dichloroethane	0.002 ug/g dry	-	-	<0.002	-
1,2-Dichloroethane	0.002 ug/g dry	-	-	<0.002	-
1,1-Dichloroethylene	0.002 ug/g dry	-	-	<0.002	-
Dichlorodifluoromethane	0.002 ug/g dry	-	-	<0.002	-
cis-1,2-Dichloroethylene	0.002 ug/g dry	-	-	<0.002	-
trans-1,2-Dichloroethylene	0.002 ug/g dry	-	-	<0.002	-
1,2-Dichloroethylene, total	0.003 ug/g dry	-	-	<0.003	-
1,2-Dichloropropane	0.002 ug/g dry	-	-	<0.002	-
cis-1,3-Dichloropropylene	0.002 ug/g dry	-	-	<0.002	-
trans-1,3-Dichloropropylene	0.002 ug/g dry	-	-	<0.002	-
1,3-Dichloropropene, total	0.003 ug/g dry	-	-	<0.003	-
Ethylbenzene	0.002 ug/g dry	-	-	<0.002	-
Hexane	0.050 ug/g dry	-	-	<0.050	-
Methyl Ethyl Ketone (2-Butanone)	0.050 ug/g dry	-	-	<0.050	-
Methyl Butyl Ketone (2-Hexanone)	0.010 ug/g dry	-	-	<0.010	-
Methyl Isobutyl Ketone	0.050 ug/g dry	-	-	<0.050	-
Methyl tert-butyl ether	0.010 ug/g dry	-	-	<0.010	-
Methylene Chloride	0.005 ug/g dry	-	-	<0.005	-
Styrene	0.005 ug/g dry	-	-	<0.005	-
1,1,1,2-Tetrachloroethane	0.002 ug/g dry	-	-	<0.002	-
1,1,2,2-Tetrachloroethane	0.002 ug/g dry	-	-	<0.002	-
Tetrachloroethylene	0.002 ug/g dry	-	-	<0.002	-
Toluene	0.002 ug/g dry	-	-	0.003	-
1,2,4-Trichlorobenzene	0.002 ug/g dry	-	-	<0.002	-
1,1,1-Trichloroethane	0.002 ug/g dry	-	-	<0.002	-
1,1,2-Trichloroethane	0.002 ug/g dry	-	-	<0.002	-
Trichloroethylene	0.002 ug/g dry	-	-	<0.002	-
Trichlorofluoromethane	0.005 ug/g dry	-	-	<0.005	-
1,3,5-Trimethylbenzene	0.005 ug/g dry	-	-	<0.005	-
Vinyl chloride	0.005 ug/g dry	-	-	<0.005	-
m,p-Xylenes	0.005 ug/g dry	-	-	0.010	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27109

Report Date: 17-Sep-2019
Order Date: 4-Sep-2019
Project Description: PE4690

	Client ID:	BH9-SS2	BH13-AU1	BH13-SS6	-
	Sample Date:	29-Aug-19 16:00	30-Aug-19 15:30	30-Aug-19 16:00	-
	Sample ID:	1936115-06	1936115-07	1936115-08	-
	MDL/Units	Soil	Soil	Soil	-
o-Xylene	0.002 ug/g dry	-	-	0.002	-
Xylenes, total	0.005 ug/g dry	-	-	0.012	-
4-Bromofluorobenzene	Surrogate	-	-	109%	-
Dibromofluoromethane	Surrogate	-	-	78.4%	-
Toluene-d8	Surrogate	-	-	104%	-
Benzene	0.02 mg/kg dry	<0.02 [4]	-	-	-
Ethylbenzene	0.05 mg/kg dry	<0.05 [4]	-	-	-
Toluene	0.05 mg/kg dry	<0.05 [4]	-	-	-
m,p-Xylenes	0.05 mg/kg dry	<0.05 [4]	-	-	-
o-Xylene	0.05 mg/kg dry	<0.05 [4]	-	-	-
Xylenes, total	0.05 mg/kg dry	<0.05 [4]	-	-	-
Toluene-d8	Surrogate	93.5% [4]	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	-	<7	-
F2 PHCs (C10-C16)	4 mg/kg dry	<4	-	<4	-
F3 PHCs (C16-C34)	8 mg/kg dry	28 [2]	-	<8	-
F4 PHCs (C34-C50)	6 mg/kg dry	15	-	<6	-

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	mg/kg						
F2 PHCs (C10-C16)	ND	4	mg/kg						
F3 PHCs (C16-C34)	ND	8	mg/kg						
F4 PHCs (C34-C50)	ND	6	mg/kg						
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Tin	ND	5	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	mg/kg						
Acenaphthylene	ND	0.02	mg/kg						
Anthracene	ND	0.02	mg/kg						
Benzo [a] anthracene	ND	0.02	mg/kg						
Benzo [a] pyrene	ND	0.02	mg/kg						
Benzo [b] fluoranthene	ND	0.02	mg/kg						
Benzo [g,h,i] perylene	ND	0.02	mg/kg						
Benzo [k] fluoranthene	ND	0.02	mg/kg						
Biphenyl	ND	0.02	mg/kg						
Chrysene	ND	0.02	mg/kg						
Dibenzo [a,h] anthracene	ND	0.02	mg/kg						
Fluoranthene	ND	0.02	mg/kg						
Fluorene	ND	0.02	mg/kg						
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg						
1-Methylnaphthalene	ND	0.02	mg/kg						
2-Methylnaphthalene	ND	0.02	mg/kg						
Methylnaphthalene (1&2)	ND	0.04	mg/kg						
Naphthalene	ND	0.01	mg/kg						
Phenanthrene	ND	0.02	mg/kg						
Pyrene	ND	0.02	mg/kg						
Quinoline	ND	0.10	mg/kg						
Surrogate: 2-Fluorobiphenyl	*1.29*		*mg/kg*		*96.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.75*		*mg/kg*		*131*	*50-140*			
Volatiles									
Benzene	ND	0.002	ug/g						
Ethylbenzene	ND	0.002	ug/g						
Toluene	ND	0.002	ug/g						
m,p-Xylenes	ND	0.002	ug/g						
o-Xylene	ND	0.002	ug/g						
Xylenes, total	ND	0.002	ug/g						
Surrogate: Toluene-d8	*0.356*		*ug/g*		*89.1*	*60-140*			

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acetone	ND	0.100	ug/g						
Benzene	ND	0.002	ug/g						
Bromodichloromethane	ND	0.005	ug/g						
Bromoform	ND	0.005	ug/g						
Bromomethane	ND	0.005	ug/g						
Carbon Tetrachloride	ND	0.002	ug/g						
Chlorobenzene	ND	0.002	ug/g						
Chloroethane	ND	0.050	ug/g						
Chloroform	ND	0.002	ug/g						
Chloromethane	ND	0.050	ug/g						
Dibromochloromethane	ND	0.002	ug/g						
Ethylene dibromide (dibromoethane	ND	0.005	ug/g						
1,2-Dichlorobenzene	ND	0.002	ug/g						
1,3-Dichlorobenzene	ND	0.002	ug/g						
1,4-Dichlorobenzene	ND	0.002	ug/g						
1,1-Dichloroethane	ND	0.002	ug/g						
1,2-Dichloroethane	ND	0.002	ug/g						
1,1-Dichloroethylene	ND	0.002	ug/g						
Dichlorodifluoromethane	ND	0.002	ug/g						
cis-1,2-Dichloroethylene	ND	0.002	ug/g						
trans-1,2-Dichloroethylene	ND	0.002	ug/g						
1,2-Dichloroethylene, total	ND	0.003	ug/g						
1,2-Dichloropropane	ND	0.002	ug/g						
cis-1,3-Dichloropropylene	ND	0.002	ug/g						
trans-1,3-Dichloropropylene	ND	0.002	ug/g						
1,3-Dichloropropene, total	ND	0.003	ug/g						
Ethylbenzene	ND	0.002	ug/g						
Hexane	ND	0.050	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.050	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	0.010	ug/g						
Methyl Isobutyl Ketone	ND	0.050	ug/g						
Methyl tert-butyl ether	ND	0.010	ug/g						
Methylene Chloride	ND	0.005	ug/g						
Styrene	ND	0.005	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.002	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.002	ug/g						
Tetrachloroethylene	ND	0.002	ug/g						
Toluene	ND	0.002	ug/g						
1,2,4-Trichlorobenzene	ND	0.002	ug/g						
1,1,1-Trichloroethane	ND	0.002	ug/g						
1,1,2-Trichloroethane	ND	0.002	ug/g						
Trichloroethylene	ND	0.002	ug/g						
Trichlorofluoromethane	ND	0.005	ug/g						
1,3,5-Trimethylbenzene	ND	0.005	ug/g						
Vinyl chloride	ND	0.005	ug/g						
m,p-Xylenes	ND	0.005	ug/g						
o-Xylene	ND	0.002	ug/g						
Xylenes, total	ND	0.005	ug/g						
Surrogate: 4-Bromofluorobenzene	*0.351*		*ug/g*		*87.7*	*60-140*			
Surrogate: Dibromofluoromethane	*0.332*		*ug/g*		*83.1*	*60-140*			
Surrogate: Toluene-d8	*0.356*		*ug/g*		*89.1*	*60-140*			
Benzene	ND	0.02	mg/kg						
Ethylbenzene	ND	0.05	mg/kg						
Toluene	ND	0.05	mg/kg						
m,p-Xylenes	ND	0.05	mg/kg						
o-Xylene	ND	0.05	mg/kg						
Xylenes, total	ND	0.05	mg/kg						
Surrogate: Toluene-d8	*7.17*		*mg/kg*		*89.6*	*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	mg/kg dry	ND				40	
F2 PHCs (C10-C16)	ND	4	mg/kg dry	ND				30	
F3 PHCs (C16-C34)	ND	8	mg/kg dry	ND				30	
F4 PHCs (C34-C50)	ND	6	mg/kg dry	ND				30	
Metals									
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Mercury	ND	0.1	ug/g dry	ND				30	
Physical Characteristics									
% Solids	96.6	0.1	% by Wt.	98.2			1.6	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	mg/kg dry	ND				40	
Acenaphthylene	ND	0.02	mg/kg dry	ND			0.0	40	
Anthracene	ND	0.02	mg/kg dry	ND			0.0	40	
Benzo [a] anthracene	ND	0.02	mg/kg dry	ND			0.0	40	
Benzo [a] pyrene	ND	0.02	mg/kg dry	ND			0.0	40	
Benzo [b] fluoranthene	ND	0.02	mg/kg dry	ND				40	
Benzo [g,h,i] perylene	0.041	0.02	mg/kg dry	0.038			6.5	40	
Benzo [k] fluoranthene	ND	0.02	mg/kg dry	ND				40	
Biphenyl	ND	0.02	mg/kg dry	ND				40	
Chrysene	0.025	0.02	mg/kg dry	0.024			2.9	40	
Dibenzo [a,h] anthracene	ND	0.02	mg/kg dry	ND			0.0	40	
Fluoranthene	ND	0.02	mg/kg dry	0.021			0.0	40	
Fluorene	ND	0.02	mg/kg dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg dry	ND			0.0	40	
1-Methylnaphthalene	ND	0.02	mg/kg dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	mg/kg dry	ND			0.0	40	
Naphthalene	ND	0.01	mg/kg dry	ND			0.0	40	
Phenanthrene	ND	0.02	mg/kg dry	ND			0.0	40	
Pyrene	ND	0.02	mg/kg dry	0.029			0.0	40	
Quinoline	ND	0.10	mg/kg dry	ND				40	
Surrogate: 2-Fluorobiphenyl	*1.06*		*mg/kg dry*		*71.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.65*		*mg/kg dry*		*111*	*50-140*			
Volatiles									
Benzene	ND	0.02	mg/kg dry	ND				50	
Ethylbenzene	ND	0.05	mg/kg dry	ND				50	
Toluene	ND	0.05	mg/kg dry	ND				50	
m,p-Xylenes	ND	0.05	mg/kg dry	ND				50	
o-Xylene	ND	0.05	mg/kg dry	ND				50	
Surrogate: Toluene-d8	*8.52*		*mg/kg dry*		*93.5*	*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)	198	7	mg/kg		98.8	80-120			
F2 PHCs (C10-C16)	107	4	mg/kg	ND	103	60-140			
F3 PHCs (C16-C34)	294	8	mg/kg	ND	115	60-140			
F4 PHCs (C34-C50)	161	6	mg/kg	ND	100	60-140			
Metals									
Antimony	43.1		ug/L		86.2	70-130			
Arsenic	45.7		ug/L		91.5	70-130			
Barium	46.4		ug/L		92.8	70-130			
Beryllium	49.9		ug/L		99.8	70-130			
Boron	43.2		ug/L		86.5	70-130			
Cadmium	41.2		ug/L		82.4	70-130			
Chromium (VI)	4.6	0.2	ug/g	ND	64.5	70-130			QM-05
Chromium	46.5		ug/L		92.9	70-130			
Cobalt	47.3		ug/L		94.5	70-130			
Copper	47.0		ug/L		94.0	70-130			
Lead	44.9		ug/L		89.7	70-130			
Mercury	1.59	0.1	ug/g	ND	106	70-130			
Molybdenum	42.7		ug/L		85.5	70-130			
Nickel	46.6		ug/L		93.1	70-130			
Selenium	43.7		ug/L		87.4	70-130			
Silver	38.5		ug/L		76.9	70-130			
Thallium	45.8		ug/L		91.7	70-130			
Tin	42.9		ug/L		85.8	70-130			
Uranium	47.2		ug/L		94.4	70-130			
Vanadium	46.9		ug/L		93.8	70-130			
Zinc	44.3		ug/L		88.5	70-130			
Semi-Volatiles									
Acenaphthene	0.209	0.02	mg/kg	ND	113	50-140			
Acenaphthylene	0.184	0.02	mg/kg	ND	99.2	50-140			
Anthracene	0.185	0.02	mg/kg	ND	99.9	50-140			
Benzo [a] anthracene	0.218	0.02	mg/kg	ND	118	50-140			
Benzo [a] pyrene	0.170	0.02	mg/kg	ND	91.6	50-140			
Benzo [b] fluoranthene	0.188	0.02	mg/kg	ND	101	50-140			
Benzo [g,h,i] perylene	0.212	0.02	mg/kg	0.038	93.6	50-140			
Benzo [k] fluoranthene	0.205	0.02	mg/kg	ND	110	50-140			
Biphenyl	0.168	0.02	mg/kg	ND	90.7	50-140			
Chrysene	0.260	0.02	mg/kg	0.024	127	50-140			
Dibenzo [a,h] anthracene	0.205	0.02	mg/kg	ND	111	50-140			
Fluoranthene	0.244	0.02	mg/kg	0.021	120	50-140			
Fluorene	0.194	0.02	mg/kg	ND	104	50-140			
Indeno [1,2,3-cd] pyrene	0.180	0.02	mg/kg	ND	97.0	50-140			
1-Methylnaphthalene	0.130	0.02	mg/kg	ND	70.1	50-140			
2-Methylnaphthalene	0.154	0.02	mg/kg	ND	82.9	50-140			
Naphthalene	0.186	0.01	mg/kg	ND	100	50-140			
Phenanthrene	0.184	0.02	mg/kg	ND	99.2	50-140			
Pyrene	0.255	0.02	mg/kg	0.029	122	50-140			
Surrogate: 2-Fluorobiphenyl	*1.15*		*mg/kg*		*77.7*	*50-140*			
Volatiles									
Benzene	0.184	0.002	ug/g		92.2	60-140			
Ethylbenzene	0.215	0.002	ug/g		107	60-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	0.185	0.002	ug/g		92.7	60-140			
m,p-Xylenes	0.436	0.002	ug/g		109	60-140			
o-Xylene	0.221	0.002	ug/g		110	60-140			
Acetone	0.553	0.100	ug/g		111	60-140			
Benzene	0.184	0.002	ug/g		92.2	60-140			
Bromodichloromethane	0.177	0.005	ug/g		88.7	60-140			
Bromoform	0.223	0.005	ug/g		112	60-140			
Carbon Tetrachloride	0.244	0.002	ug/g		122	60-140			
Chlorobenzene	0.203	0.002	ug/g		101	60-140			
Chloroform	0.222	0.002	ug/g		111	60-140			
Chloromethane	0.203	0.050	ug/g		102	60-140			
Dibromochloromethane	0.218	0.002	ug/g		109	60-140			
Ethylene dibromide (dibromoethane	0.220	0.005	ug/g		110	60-130			
1,2-Dichlorobenzene	0.257	0.002	ug/g		128	60-140			
1,3-Dichlorobenzene	0.247	0.002	ug/g		124	60-140			
1,4-Dichlorobenzene	0.279	0.002	ug/g		140	60-140			
1,1-Dichloroethane	0.171	0.002	ug/g		85.4	60-140			
1,2-Dichloroethane	0.181	0.002	ug/g		90.6	60-140			
1,1-Dichloroethylene	0.162	0.002	ug/g		81.1	60-140			
cis-1,2-Dichloroethylene	0.177	0.002	ug/g		88.3	60-140			
trans-1,2-Dichloroethylene	0.182	0.002	ug/g		91.0	60-140			
1,2-Dichloropropane	0.158	0.002	ug/g		78.8	60-140			
cis-1,3-Dichloropropylene	0.165	0.002	ug/g		82.7	60-140			
trans-1,3-Dichloropropylene	0.192	0.002	ug/g		95.9	60-140			
Ethylbenzene	0.215	0.002	ug/g		107	60-140			
Methyl Ethyl Ketone (2-Butanone)	0.503	0.050	ug/g		101	60-140			
Methyl Butyl Ketone (2-Hexanone)	0.525	0.010	ug/g		105	60-140			
Methyl Isobutyl Ketone	0.527	0.050	ug/g		105	60-140			
Methyl tert-butyl ether	0.504	0.010	ug/g		101	60-140			
Methylene Chloride	0.175	0.005	ug/g		87.5	60-140			
Styrene	0.234	0.005	ug/g		117	60-140			
1,1,1,2-Tetrachloroethane	0.234	0.002	ug/g		117	60-140			
1,1,2,2-Tetrachloroethane	0.179	0.002	ug/g		89.4	60-140			
Tetrachloroethylene	0.236	0.002	ug/g		118	60-140			
Toluene	0.185	0.002	ug/g		92.7	60-140			
1,2,4-Trichlorobenzene	0.253	0.002	ug/g		127	60-140			
1,1,1-Trichloroethane	0.241	0.002	ug/g		121	60-140			
1,1,2-Trichloroethane	0.180	0.002	ug/g		89.9	60-140			
Trichloroethylene	0.197	0.002	ug/g		98.7	60-140			
Trichlorofluoromethane	0.262	0.005	ug/g		131	60-140			
1,3,5-Trimethylbenzene	0.237	0.005	ug/g		119	60-140			
Vinyl chloride	0.185	0.005	ug/g		92.7	60-140			
m,p-Xylenes	0.436	0.005	ug/g		109	60-140			
o-Xylene	0.221	0.002	ug/g		110	60-140			
Benzene	3.30	0.02	mg/kg		82.4	60-130			
Ethylbenzene	3.15	0.05	mg/kg		78.7	60-130			
Toluene	3.24	0.05	mg/kg		81.0	60-130			
m,p-Xylenes	6.34	0.05	mg/kg		79.2	60-130			
o-Xylene	3.27	0.05	mg/kg		81.7	60-130			

Qualifier Notes:

Login Qualifiers :

Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
Applies to samples: BH1-SS6, BH3-AU1, BH3-SS2, BH6-SS2, BH9-SS2, BH13-SS6

Sample Qualifiers :

2 : Peak(s) in the GC-FID Chromatogram are not typical of petroleum hydrocarbon distillates. May be the result of high concentrations of non-mineral based compounds not completely removed by the method cleanup.

4 : Not able to complete VOC-low level analysis due to a matrix interference. VOC-high level analysis completed in its place.

QC Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 This report includes an updated parameter list,

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 1936115

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Chain of Custody
(Lab Use Only)
№ 123171

Page 1 of 1

Client Name: Paterson Group
Contact Name: Mark D'Arcy
Address:
Telephone: 226-7381

Project Reference: PE4690
Quote #
PO # 27109
Email Address:

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

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

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

Paracel Order Number: 1936115

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	BTEX + PHCs	Arsenic	O-C trial	
1	BH1-SS6	S	-	3	Aug 28/19	10 am	✓	✓	✓	✓	✓	✓					- 2x 250mL + 1 vial
2	BH3-AU1	S	-	3	" "	12 pm				✓	✓	✓		✓			↓
3	BH3-SS2	S	-	2	" "	" "								✓			- 250mL + 1 vial
4	BH4-AU1	S	-	1	Aug 29/19	10 am				✓	✓	✓			✓	✓	- 125mL -
5	BH6-SS2	S	-	3	Aug 29/19	1:30 pm								✓	-		2x 125mL + 1 vial
6	BH9-SS2	S	-	3	Aug 29/19	4 pm				✓	✓	✓		✓			↓
7	BH13-AU1	S	-	1	Aug 30/19	3:30 pm				✓	✓	✓			✓	✓	- 125mL -
8	BH13-SS1	S	-	2	" "	4 pm	✓	✓									- 250mL + 1 vial
9																	
10																	

Comments: O-C cancelled per MK 3/9/19

Method of Delivery: walk in

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot:	Received at Lab: Tim Stewart	Verified By: D Barnes
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: 3 Sept 19 16:22	Date/Time: 4/Sep/19/4:30
Date/Time: Sep 4/19 @ 4:20 PM	Temperature: °C	Temperature: 17.8 °C	pH Verified [ ] By:

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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: 27111
Project: PE4690
Custody: 123181

Report Date: 17-Sep-2019
Order Date: 5-Sep-2019

Order #: 1936431

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

Paracel ID	Client ID
1936431-01	BH14-AU1-SS2
1936431-02	BH15-SS1
1936431-04	DUP

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27111

Report Date: 17-Sep-2019
Order Date: 5-Sep-2019
Project Description: PE4690

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	9-Sep-19	10-Sep-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	10-Sep-19	10-Sep-19
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	11-Sep-19	11-Sep-19
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	9-Sep-19	11-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	9-Sep-19	10-Sep-19
Solids, %	Gravimetric, calculation	9-Sep-19	9-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27111

Report Date: 17-Sep-2019

Order Date: 5-Sep-2019

Project Description: PE4690

	Client ID:	BH14-AU1-SS2	BH15-SS1	DUP	-
	Sample Date:	04-Sep-19 10:30	04-Sep-19 12:45	04-Sep-19 09:00	-
	Sample ID:	1936431-01	1936431-02	1936431-04	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	93.2	86.0	80.0	-
Metals					
Antimony	1 ug/g dry	<1	<1	<1	-
Arsenic	1 ug/g dry	4	3	3	-
Barium	1 ug/g dry	193	159	148	-
Beryllium	0.5 ug/g dry	0.7	0.7	0.6	-
Boron	5.0 ug/g dry	7.5	8.5	7.7	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5 ug/g dry	67	61	54	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	-	-
Cobalt	1 ug/g dry	15	13	11	-
Copper	5 ug/g dry	30	29	28	-
Lead	1 ug/g dry	14	18	17	-
Mercury	0.1 ug/g dry	<0.1	<0.1	-	-
Molybdenum	1 ug/g dry	2	3	2	-
Nickel	5 ug/g dry	40	32	29	-
Selenium	1 ug/g dry	<1	<1	<1	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1 ug/g dry	<1	<1	<1	-
Tin	5 ug/g dry	<5	<5	<5	-
Uranium	1 ug/g dry	<1	<1	<1	-
Vanadium	10 ug/g dry	61	57	50	-
Zinc	20 ug/g dry	71	107	101	-
Hydrocarbons					
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 mg/kg dry	24	238	-	-
F4 PHCs (C34-C50)	6 mg/kg dry	21	186	-	-
Semi-Volatiles					
Acenaphthene	0.02 mg/kg dry	-	<0.02	-	-
Acenaphthylene	0.02 mg/kg dry	-	<0.02	-	-
Anthracene	0.02 mg/kg dry	-	<0.02	-	-
Benzo [a] anthracene	0.02 mg/kg dry	-	0.04	-	-
Benzo [a] pyrene	0.02 mg/kg dry	-	0.04	-	-
Benzo [b] fluoranthene	0.02 mg/kg dry	-	0.08	-	-
Benzo [g,h,i] perylene	0.02 mg/kg dry	-	0.05	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27111

Report Date: 17-Sep-2019

Order Date: 5-Sep-2019

Project Description: PE4690

	Client ID:	BH14-AU1-SS2	BH15-SS1	DUP	-
	Sample Date:	04-Sep-19 10:30	04-Sep-19 12:45	04-Sep-19 09:00	-
	Sample ID:	1936431-01	1936431-02	1936431-04	-
	MDL/Units	Soil	Soil	Soil	-
Benzo [k] fluoranthene	0.02 mg/kg dry	-	0.06	-	-
Biphenyl	0.02 mg/kg dry	-	<0.02	-	-
Chrysene	0.02 mg/kg dry	-	0.04	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg dry	-	<0.02	-	-
Fluoranthene	0.02 mg/kg dry	-	0.09	-	-
Fluorene	0.02 mg/kg dry	-	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg dry	-	0.04	-	-
1-Methylnaphthalene	0.02 mg/kg dry	-	<0.02	-	-
2-Methylnaphthalene	0.02 mg/kg dry	-	<0.02	-	-
Methylnaphthalene (1&2)	0.04 mg/kg dry	-	<0.04	-	-
Naphthalene	0.01 mg/kg dry	-	<0.01	-	-
Phenanthrene	0.02 mg/kg dry	-	0.03	-	-
Pyrene	0.02 mg/kg dry	-	0.08	-	-
Quinoline	0.10 mg/kg dry	-	<0.10	-	-
2-Fluorobiphenyl	Surrogate	-	58.4%	-	-
Terphenyl-d14	Surrogate	-	93.1%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	mg/kg						
F3 PHCs (C16-C34)	ND	8	mg/kg						
F4 PHCs (C34-C50)	ND	6	mg/kg						
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Tin	ND	5	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	mg/kg						
Acenaphthylene	ND	0.02	mg/kg						
Anthracene	ND	0.02	mg/kg						
Benzo [a] anthracene	ND	0.02	mg/kg						
Benzo [a] pyrene	ND	0.02	mg/kg						
Benzo [b] fluoranthene	ND	0.02	mg/kg						
Benzo [g,h,i] perylene	ND	0.02	mg/kg						
Benzo [k] fluoranthene	ND	0.02	mg/kg						
Biphenyl	ND	0.02	mg/kg						
Chrysene	ND	0.02	mg/kg						
Dibenzo [a,h] anthracene	ND	0.02	mg/kg						
Fluoranthene	ND	0.02	mg/kg						
Fluorene	ND	0.02	mg/kg						
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg						
1-Methylnaphthalene	ND	0.02	mg/kg						
2-Methylnaphthalene	ND	0.02	mg/kg						
Methylnaphthalene (1&2)	ND	0.04	mg/kg						
Naphthalene	ND	0.01	mg/kg						
Phenanthrene	ND	0.02	mg/kg						
Pyrene	ND	0.02	mg/kg						
Quinoline	ND	0.10	mg/kg						
Surrogate: 2-Fluorobiphenyl	*0.862*		*mg/kg*		*64.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.45*		*mg/kg*		*109*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	mg/kg dry	ND				30	
F3 PHCs (C16-C34)	25	8	mg/kg dry	24			4.4	30	
F4 PHCs (C34-C50)	18	6	mg/kg dry	21			16.2	30	
Metals									
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Physical Characteristics									
% Solids	92.7	0.1	% by Wt.	93.2			0.6	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	mg/kg dry	ND				40	
Acenaphthylene	ND	0.02	mg/kg dry	ND			0.0	40	
Anthracene	ND	0.02	mg/kg dry	ND			0.0	40	
Benzo [a] anthracene	0.058	0.02	mg/kg dry	0.044			26.7	40	
Benzo [a] pyrene	0.061	0.02	mg/kg dry	0.044			31.3	40	
Benzo [b] fluoranthene	0.112	0.02	mg/kg dry	0.082			30.4	40	
Benzo [g,h,i] perylene	0.073	0.02	mg/kg dry	0.055			28.4	40	
Benzo [k] fluoranthene	0.045	0.02	mg/kg dry	0.060			27.5	40	
Biphenyl	ND	0.02	mg/kg dry	ND			0.0	40	
Chrysene	0.061	0.02	mg/kg dry	0.044			31.7	40	
Dibenzo [a,h] anthracene	ND	0.02	mg/kg dry	ND			0.0	40	
Fluoranthene	0.126	0.02	mg/kg dry	0.092			31.4	40	
Fluorene	ND	0.02	mg/kg dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.051	0.02	mg/kg dry	0.042			20.2	40	
1-Methylnaphthalene	ND	0.02	mg/kg dry	ND				40	
2-Methylnaphthalene	ND	0.02	mg/kg dry	ND				40	
Naphthalene	ND	0.01	mg/kg dry	ND			0.0	40	
Phenanthrene	0.044	0.02	mg/kg dry	0.029			40.6	40	QR-01
Pyrene	0.109	0.02	mg/kg dry	0.083			27.8	40	
Quinoline	ND	0.10	mg/kg dry	ND				40	
Surrogate: 2-Fluorobiphenyl	*0.942*		*mg/kg dry*		*60.8*	*50-140*			
Surrogate: Terphenyl-d14	*1.38*		*mg/kg dry*		*89.0*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	92	4	mg/kg	ND	108	60-140			
F3 PHCs (C16-C34)	284	8	mg/kg	24	124	60-140			
F4 PHCs (C34-C50)	193	6	mg/kg	21	129	60-140			
Metals									
Antimony	41.8		ug/L		83.7	70-130			
Arsenic	52.6		ug/L		105	70-130			
Barium	49.4		ug/L		98.8	70-130			
Beryllium	54.2		ug/L		108	70-130			
Boron	49.4		ug/L		98.8	70-130			
Cadmium	49.4		ug/L		98.8	70-130			
Chromium (VI)	0.1		mg/L	ND	54.0	70-130			QM-05
Chromium	53.8		ug/L		108	70-130			
Cobalt	51.5		ug/L		103	70-130			
Copper	53.0		ug/L		106	70-130			
Lead	43.7		ug/L		87.4	70-130			
Mercury	1.64	0.1	ug/g	ND	109	70-130			
Molybdenum	49.4		ug/L		98.8	70-130			
Nickel	51.4		ug/L		103	70-130			
Selenium	44.5		ug/L		89.1	70-130			
Silver	41.4		ug/L		82.7	70-130			
Thallium	42.3		ug/L		84.5	70-130			
Tin	55.4		ug/L		111	70-130			
Uranium	45.4		ug/L		90.8	70-130			
Vanadium	53.0		ug/L		106	70-130			
Zinc	51.1		ug/L		102	70-130			
Semi-Volatiles									
Acenaphthene	0.168	0.02	mg/kg	ND	86.8	50-140			
Acenaphthylene	0.155	0.02	mg/kg	ND	80.1	50-140			
Anthracene	0.193	0.02	mg/kg	ND	99.7	50-140			
Benzo [a] anthracene	0.237	0.02	mg/kg	0.044	99.3	50-140			
Benzo [a] pyrene	0.198	0.02	mg/kg	0.044	79.3	50-140			
Benzo [b] fluoranthene	0.330	0.02	mg/kg	0.082	128	50-140			
Benzo [g,h,i] perylene	0.235	0.02	mg/kg	0.055	92.9	50-140			
Benzo [k] fluoranthene	0.310	0.02	mg/kg	0.060	129	50-140			
Biphenyl	0.136	0.02	mg/kg	ND	70.4	50-140			
Chrysene	0.270	0.02	mg/kg	0.044	117	50-140			
Dibenzo [a,h] anthracene	0.190	0.02	mg/kg	ND	98.0	50-140			
Fluoranthene	0.308	0.02	mg/kg	0.092	112	50-140			
Fluorene	0.152	0.02	mg/kg	ND	78.2	50-140			
Indeno [1,2,3-cd] pyrene	0.228	0.02	mg/kg	0.042	95.9	50-140			
1-Methylnaphthalene	0.125	0.02	mg/kg	ND	64.8	50-140			
2-Methylnaphthalene	0.146	0.02	mg/kg	ND	75.3	50-140			
Naphthalene	0.158	0.01	mg/kg	ND	81.3	50-140			
Phenanthrene	0.175	0.02	mg/kg	0.029	75.3	50-140			
Pyrene	0.290	0.02	mg/kg	0.083	107	50-140			
Surrogate: 2-Fluorobiphenyl	*0.990*		*mg/kg*		*63.9*	*50-140*			

Qualifier Notes:

QC Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 1936431

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
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Chain of Custody
(Lab Use Only)
№ 123181

Page 1 of 1

Client Name: Paterson	Project Reference: PE 4690
Contact Name: Mark D'Arcy	Quote #
Address:	PO # 27111
Telephone: 226-7381	Email Address:

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

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

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

Required Analyses

Paracel Order Number: 1936431

	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)	F_2 - F_4	O-Cpesticides	Atrazine pesticides				
1	BH14-AU1-SS2	S	-	1	Sept 4/19	10:30am	✓			✓	✓	✓		✓				250mL		
2	BH15-SS1	S	-	2	"	12:45pm			✓	✓	✓	✓		✓				250+120		
3	BH16-AU1	S	-	2	"	4pm									✓	✓		"		
4	DUP	S	-	1	"					✓								120mL		
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Louie	Received at Lab:	Verified By:
Relinquished By (Print): Nicholas Doucette	Date/Time: 05/09/19 4:20 PM	Date/Time: 09/09/19 16:35	Date/Time: 09/06/19 14:19
Date/Time:	Temperature:	Temperature: 26.2 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 28272
Project: PE4690
Custody: 123247

Report Date: 30-Sep-2019
Order Date: 20-Sep-2019

Revised Report

Order #: 1938688

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

Paracel ID	Client ID
1938688-01	BH1-GW1
1938688-02	BH3-GW1
1938688-03	BH6-GW1
1938688-04	BH9-GW1
1938688-05	BH13-GW1
1938688-06	BH14-GW1
1938688-07	BH15-GW1
1938688-08	DUP 1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 28272

Report Date: 30-Sep-2019
Order Date: 20-Sep-2019
Project Description: PE4690

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	27-Sep-19	27-Sep-19
Chromium, hexavalent - water	MOE E3056 - colourimetric	24-Sep-19	24-Sep-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	23-Sep-19	24-Sep-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	25-Sep-19	27-Sep-19
PHC F1	CWS Tier 1 - P&T GC-FID	26-Sep-19	27-Sep-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-Sep-19	25-Sep-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	23-Sep-19	25-Sep-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	26-Sep-19	27-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28272

Report Date: 30-Sep-2019

Order Date: 20-Sep-2019

Project Description: PE4690

	Client ID:	BH1-GW1	BH3-GW1	BH6-GW1	BH9-GW1
	Sample Date:	18-Sep-19 12:00	18-Sep-19 09:00	18-Sep-19 09:00	18-Sep-19 09:00
	Sample ID:	1938688-01	1938688-02	1938688-03	1938688-04
	MDL/Units	Water	Water	Water	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: 28272

Report Date: 30-Sep-2019

Order Date: 20-Sep-2019

Project Description: PE4690

	Client ID:	BH1-GW1	BH3-GW1	BH6-GW1	BH9-GW1
	Sample Date:	18-Sep-19 12:00	18-Sep-19 09:00	18-Sep-19 09:00	18-Sep-19 09:00
	Sample ID:	1938688-01	1938688-02	1938688-03	1938688-04
	MDL/Units	Water	Water	Water	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	115%	-	-	-
Dibromofluoromethane	Surrogate	87.5%	-	-	-
Toluene-d8	Surrogate	78.6%	-	-	-
Benzene	0.5 ug/L	-	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	-	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	-	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	-	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	-	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	-	<0.5	<0.5	<0.5
Toluene-d8	Surrogate	-	78.5%	79.0%	79.4%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	-	-	<0.05
Acenaphthylene	0.05 ug/L	-	-	-	<0.05
Anthracene	0.01 ug/L	-	-	-	<0.01
Benzo [a] anthracene	0.01 ug/L	-	-	-	<0.01
Benzo [a] pyrene	0.01 ug/L	-	-	-	<0.01
Benzo [b] fluoranthene	0.05 ug/L	-	-	-	<0.05
Benzo [g,h,i] perylene	0.05 ug/L	-	-	-	<0.05
Benzo [k] fluoranthene	0.05 ug/L	-	-	-	<0.05
Chrysene	0.05 ug/L	-	-	-	<0.05
Dibenzo [a,h] anthracene	0.05 ug/L	-	-	-	<0.05
Fluoranthene	0.01 ug/L	-	-	-	<0.01
Fluorene	0.05 ug/L	-	-	-	<0.05
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	-	-	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28272

Report Date: 30-Sep-2019

Order Date: 20-Sep-2019

Project Description: PE4690

	Client ID:	BH1-GW1	BH3-GW1	BH6-GW1	BH9-GW1
	Sample Date:	18-Sep-19 12:00	18-Sep-19 09:00	18-Sep-19 09:00	18-Sep-19 09:00
	Sample ID:	1938688-01	1938688-02	1938688-03	1938688-04
	MDL/Units	Water	Water	Water	Water
1-Methylnaphthalene	0.05 ug/L	-	-	-	<0.05
2-Methylnaphthalene	0.05 ug/L	-	-	-	<0.05
Methylnaphthalene (1&2)	0.10 ug/L	-	-	-	<0.10
Naphthalene	0.05 ug/L	-	-	-	<0.05
Phenanthrene	0.05 ug/L	-	-	-	<0.05
Pyrene	0.01 ug/L	-	-	-	<0.01
2-Fluorobiphenyl	Surrogate	-	-	-	92.2%
Terphenyl-d14	Surrogate	-	-	-	109%

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28272

Report Date: 30-Sep-2019

Order Date: 20-Sep-2019

Project Description: PE4690

	Client ID:	BH13-GW1	BH14-GW1	BH15-GW1	DUP 1
	Sample Date:	19-Sep-19 09:00	18-Sep-19 09:00	18-Sep-19 12:00	18-Sep-19 09:00
	Sample ID:	1938688-05	1938688-06	1938688-07	1938688-08
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	-	-	<0.1	-
Antimony	0.5 ug/L	-	-	<0.5	-
Arsenic	1 ug/L	-	-	1	-
Barium	1 ug/L	-	-	150	-
Beryllium	0.5 ug/L	-	-	<0.5	-
Boron	10 ug/L	-	-	32	-
Cadmium	0.1 ug/L	-	-	<0.1	-
Chromium	1 ug/L	-	-	<1	-
Chromium (VI)	10 ug/L	-	-	<10	-
Cobalt	0.5 ug/L	-	-	<0.5	-
Copper	0.5 ug/L	-	-	2.8	-
Lead	0.1 ug/L	-	-	<0.1	-
Molybdenum	0.5 ug/L	-	-	11.8	-
Nickel	1 ug/L	-	-	1	-
Selenium	1 ug/L	-	-	<1	-
Silver	0.1 ug/L	-	-	<0.1	-
Sodium	200 ug/L	-	-	51000	-
Thallium	0.1 ug/L	-	-	<0.1	-
Uranium	0.1 ug/L	-	-	2.4	-
Vanadium	0.5 ug/L	-	-	1.6	-
Zinc	5 ug/L	-	-	<5	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	-	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	-	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28272

Report Date: 30-Sep-2019

Order Date: 20-Sep-2019

Project Description: PE4690

	Client ID:	BH13-GW1	BH14-GW1	BH15-GW1	DUP 1
	Sample Date:	19-Sep-19 09:00	18-Sep-19 09:00	18-Sep-19 12:00	18-Sep-19 09:00
	Sample ID:	1938688-05	1938688-06	1938688-07	1938688-08
	MDL/Units	Water	Water	Water	Water
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	-	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	-	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	-	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	117%	-	117%	118%
Dibromofluoromethane	Surrogate	88.7%	-	86.9%	87.1%
Toluene-d8	Surrogate	78.9%	-	79.2%	77.0%
Benzene	0.5 ug/L	-	<0.5	-	-
Ethylbenzene	0.5 ug/L	-	<0.5	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 28272

Report Date: 30-Sep-2019

Order Date: 20-Sep-2019

Project Description: PE4690

	Client ID:	BH13-GW1	BH14-GW1	BH15-GW1	DUP 1
	Sample Date:	19-Sep-19 09:00	18-Sep-19 09:00	18-Sep-19 12:00	18-Sep-19 09:00
	Sample ID:	1938688-05	1938688-06	1938688-07	1938688-08
	MDL/Units	Water	Water	Water	Water
Toluene	0.5 ug/L	-	<0.5	-	-
m,p-Xylenes	0.5 ug/L	-	<0.5	-	-
o-Xylene	0.5 ug/L	-	<0.5	-	-
Xylenes, total	0.5 ug/L	-	<0.5	-	-
Toluene-d8	Surrogate	-	76.9%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	-	<0.05	-
Acenaphthylene	0.05 ug/L	-	-	<0.05	-
Anthracene	0.01 ug/L	-	-	<0.01	-
Benzo [a] anthracene	0.01 ug/L	-	-	<0.01	-
Benzo [a] pyrene	0.01 ug/L	-	-	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	-	-	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	-	-	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	-	-	<0.05	-
Chrysene	0.05 ug/L	-	-	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	-	-	<0.05	-
Fluoranthene	0.01 ug/L	-	-	<0.01	-
Fluorene	0.05 ug/L	-	-	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	-	<0.05	-
1-Methylnaphthalene	0.05 ug/L	-	-	<0.05	-
2-Methylnaphthalene	0.05 ug/L	-	-	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	-	-	<0.10	-
Naphthalene	0.05 ug/L	-	-	<0.05	-
Phenanthrene	0.05 ug/L	-	-	<0.05	-
Pyrene	0.01 ug/L	-	-	<0.01	-
2-Fluorobiphenyl	Surrogate	-	-	118%	-
Terphenyl-d14	Surrogate	-	-	113%	-

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						
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	*24.1*		*ug/L*		*121*	*50-140*			
Surrogate: Terphenyl-d14	*20.6*		*ug/L*		*103*	*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						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*87.9*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*60.4*		*ug/L*		*75.5*	*50-140*			
Surrogate: Toluene-d8	*70.8*		*ug/L*		*88.4*	*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	*70.8*		*ug/L*		*88.4*	*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	1.0			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			0.0	20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	ND	0.5	ug/L	ND			0.0	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			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	349	200	ug/L	305			13.5	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			0.0	20	
Zinc	ND	5	ug/L	ND			0.0	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*86.6*		*ug/L*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*60.9*		*ug/L*		*76.1*	*50-140*			
Surrogate: Toluene-d8	*70.4*		*ug/L*		*88.0*	*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	*70.4*		*ug/L*		*88.0*	*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)	1900	25	ug/L		95.1	68-117			
F2 PHCs (C10-C16)	1820	100	ug/L		114	60-140			
F3 PHCs (C16-C34)	4760	100	ug/L		121	60-140			
F4 PHCs (C34-C50)	2680	100	ug/L		108	60-140			
Metals									
Mercury	3.85	0.1	ug/L	ND	128	70-130			
Antimony	43.1		ug/L	ND	86.2	80-120			
Arsenic	52.7		ug/L	ND	105	80-120			
Barium	48.4		ug/L	1.0	94.8	80-120			
Beryllium	50.1		ug/L	ND	100	80-120			
Boron	40		ug/L	ND	76.7	80-120			QM-07
Cadmium	49.7		ug/L	ND	99.4	80-120			
Chromium (VI)	164	10	ug/L	ND	82.0	70-130			
Chromium	52.0		ug/L	ND	104	80-120			
Cobalt	48.1		ug/L	ND	96.3	80-120			
Copper	51.0		ug/L	ND	102	80-120			
Lead	45.4		ug/L	ND	90.8	80-120			
Molybdenum	43.5		ug/L	ND	86.6	80-120			
Nickel	50.1		ug/L	ND	100	80-120			
Selenium	53.8		ug/L	ND	108	80-120			
Silver	44.1		ug/L	ND	88.2	80-120			
Sodium	10300		ug/L	305	100	80-120			
Thallium	43.2		ug/L	ND	86.3	80-120			
Uranium	47.2		ug/L	ND	94.4	80-120			
Vanadium	51.1		ug/L	ND	102	80-120			
Zinc	54		ug/L	ND	108	80-120			
Semi-Volatiles									
Acenaphthene	4.28	0.05	ug/L		85.6	50-140			
Acenaphthylene	4.18	0.05	ug/L		83.7	50-140			
Anthracene	4.32	0.01	ug/L		86.4	50-140			
Benzo [a] anthracene	4.62	0.01	ug/L		92.3	50-140			
Benzo [a] pyrene	4.45	0.01	ug/L		88.9	50-140			
Benzo [b] fluoranthene	5.88	0.05	ug/L		118	50-140			
Benzo [g,h,i] perylene	4.67	0.05	ug/L		93.4	50-140			
Benzo [k] fluoranthene	5.52	0.05	ug/L		110	50-140			
Chrysene	5.83	0.05	ug/L		117	50-140			
Dibenzo [a,h] anthracene	3.25	0.05	ug/L		65.0	50-140			
Fluoranthene	4.24	0.01	ug/L		84.8	50-140			
Fluorene	4.14	0.05	ug/L		82.8	50-140			
Indeno [1,2,3-cd] pyrene	4.25	0.05	ug/L		85.1	50-140			
1-Methylnaphthalene	5.50	0.05	ug/L		110	50-140			
2-Methylnaphthalene	5.70	0.05	ug/L		114	50-140			
Naphthalene	5.72	0.05	ug/L		114	50-140			
Phenanthrene	4.34	0.05	ug/L		86.9	50-140			
Pyrene	4.28	0.01	ug/L		85.6	50-140			
Surrogate: 2-Fluorobiphenyl	*18.8*		*ug/L*		*94.2*	*50-140*			
Volatiles									
Acetone	76.0	5.0	ug/L		76.0	50-140			
Benzene	30.4	0.5	ug/L		76.0	60-130			
Bromodichloromethane	36.8	0.5	ug/L		91.9	60-130			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 28272

Report Date: 30-Sep-2019
Order Date: 20-Sep-2019
Project Description: PE4690

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	44.2	0.5	ug/L		110	60-130			
Bromomethane	42.4	0.5	ug/L		106	50-140			
Carbon Tetrachloride	36.5	0.2	ug/L		91.3	60-130			
Chlorobenzene	33.2	0.5	ug/L		83.0	60-130			
Chloroform	30.7	0.5	ug/L		76.6	60-130			
Dibromochloromethane	35.3	0.5	ug/L		88.3	60-130			
Dichlorodifluoromethane	40.4	1.0	ug/L		101	50-140			
1,2-Dichlorobenzene	29.6	0.5	ug/L		74.1	60-130			
1,3-Dichlorobenzene	30.2	0.5	ug/L		75.5	60-130			
1,4-Dichlorobenzene	30.0	0.5	ug/L		75.0	60-130			
1,1-Dichloroethane	32.2	0.5	ug/L		80.4	60-130			
1,2-Dichloroethane	31.4	0.5	ug/L		78.6	60-130			
1,1-Dichloroethylene	38.8	0.5	ug/L		97.1	60-130			
cis-1,2-Dichloroethylene	30.7	0.5	ug/L		76.8	60-130			
trans-1,2-Dichloroethylene	29.3	0.5	ug/L		73.3	60-130			
1,2-Dichloropropane	29.0	0.5	ug/L		72.4	60-130			
cis-1,3-Dichloropropylene	42.5	0.5	ug/L		106	60-130			
trans-1,3-Dichloropropylene	41.0	0.5	ug/L		103	60-130			
Ethylbenzene	32.2	0.5	ug/L		80.4	60-130			
Ethylene dibromide (dibromoethane	31.4	0.2	ug/L		78.5	60-130			
Hexane	29.4	1.0	ug/L		73.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	92.3	5.0	ug/L		92.3	50-140			
Methyl Isobutyl Ketone	69.2	5.0	ug/L		69.2	50-140			
Methyl tert-butyl ether	74.7	2.0	ug/L		74.7	50-140			
Methylene Chloride	27.0	5.0	ug/L		67.5	60-130			
Styrene	33.6	0.5	ug/L		84.0	60-130			
1,1,1,2-Tetrachloroethane	37.3	0.5	ug/L		93.2	60-130			
1,1,2,2-Tetrachloroethane	33.5	0.5	ug/L		83.7	60-130			
Tetrachloroethylene	31.4	0.5	ug/L		78.5	60-130			
Toluene	32.6	0.5	ug/L		81.6	60-130			
1,1,1-Trichloroethane	32.3	0.5	ug/L		80.7	60-130			
1,1,2-Trichloroethane	27.1	0.5	ug/L		67.8	60-130			
Trichloroethylene	34.5	0.5	ug/L		86.3	60-130			
Trichlorofluoromethane	32.1	1.0	ug/L		80.3	60-130			
Vinyl chloride	38.7	0.5	ug/L		96.6	50-140			
m,p-Xylenes	69.6	0.5	ug/L		87.0	60-130			
o-Xylene	32.8	0.5	ug/L		82.0	60-130			
Benzene	30.4	0.5	ug/L		76.0	60-130			
Ethylbenzene	32.2	0.5	ug/L		80.4	60-130			
Toluene	32.6	0.5	ug/L		81.6	60-130			
m,p-Xylenes	69.6	0.5	ug/L		87.0	60-130			
o-Xylene	32.8	0.5	ug/L		82.0	60-130			

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.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 This report includes an updated parameter list.

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

TRU
RES
REI

Paracel ID: 1938688

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300-749-1947
racel@paracellabs.com

Chain of Custody
(Lab Use Only)
Nº 123247

Page ___ of ___

Client Name: Paterson Group	Project Reference: PE4690
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd. S.	PO # 28272
Telephone: 613-226-7381	Email Address: nsullivan@patersongroup.ca, mdarcy@patersongroup.ca

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

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

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

Required Analyses

Paracel Order Number: 1938688

	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)	PHCs F1-F4						
1	BH1-GW1	GW		3	Sep. 18.19	PM		X						X						
2	BH3-GW1			3		AM	X													
3	BH6-GW1			3		AM	X													
4	BH9-GW1			4		AM	X		X											
5	BH13-GW1			3	Sep. 19.19	AM		X						X						
6	BH14-GW1			3	Sep. 18.19	PM	X													
7	BH15-GW1			7		PM		X	X	X	X	X		X						
8	DUP1			2		[redacted]		X												
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot: M. Faure	Received at Lab: Jaspreet Dhami
Relinquished By (Print): Nick Sullivan	Date/Time: 20/09/19 2:00 PM	Date/Time: SEP 20, 2019 04:20
Date/Time: Sep. 20. 19	Temperature:	Temperature: 14.4 °C

Verified By: BGM
Date/Time: 09/20/19 16:50
pH Verified ☐ By: BS