Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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

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

patersongroup

Phase II Environmental Site Assessment

4139 Moodie Drive
Ottawa, Ontario

Prepared For

8589119 Canada Inc.
c/o ProSlide Technology Inc.

March 24, 2017

Report: PE3982-2

TABLE OF CONTENTS

EXECUTIVE SUMMARY iii
1.0 INTRODUCTION 1
1.1 Site Description 1
1.2 Property Ownership 1
1.3 Current and Proposed Future Uses 1
1.4 Applicable Site Condition Standard 2
2.0 BACKGROUND INFORMATION 2
2.1 Physical Setting 2
2.2 Past Investigations 2
3.0 SCOPE OF INVESTIGATION 2
3.1 Overview of Site Investigation 2
3.2 Media Investigated 3
3.3 Phase I Conceptual Site Model 3
3.4 Deviations from Sampling and Analysis Plan 5
3.5 Impediments 5
4.0 INVESTIGATION METHOD 6
4.1 Subsurface Investigation 6
4.2 Soil Sampling 6
4.3 Field Screening Measurements 7
4.4 Groundwater Monitoring Well Installation 7
4.5 Groundwater Sampling 8
4.6 Analytical Testing 8
4.7 Residue Management 9
4.8 Quality Assurance and Quality Control Measures 9
5.0 REVIEW AND EVALUATION 9
5.1 Geology 9
5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient 10
5.3 Fine-Medium Soil Texture 10
5.4 Soil: Field Screening 10
5.5 Soil Quality 10
5.6 Groundwater Quality 11
5.7 Quality Assurance and Quality Control Results 14
5.8 Phase II Conceptual Site Model 14
6.0 CONCLUSIONS 18
7.0 STATEMENT OF LIMITATIONS 20

List of Figures

Figure 1 - Key Plan
Drawing PE3982-3– Test Hole Location Plan
Drawing PE3982-4 – Analytical Testing Plan

List of Appendices

Appendix 1 Sampling and Analysis Plan
Soil Profile and Test Data Sheets
Symbols and Terms
Laboratory Certificates of Analysis

EXECUTIVE SUMMARY

Assessment

Paterson Group was retained by ProSlide Technology Inc., on behalf of 8589119 Canada Inc., to prepare a Phase II Environmental Site Assessment for the property addressed 4139 Moodie Drive, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the Areas of Potential Environmental Concern (APECs) for the subject site identified during the Phase I ESA conducted in March 2017. The Phase II ESA was carried out in conjunction with a geotechnical investigation and consisted of drilling a total of 5 boreholes, 3 of which were installed with groundwater monitoring wells, to assess the soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Soils within the building footprints generally consist of fill material, underlain by native silty clay. Soils outside of the building footprints generally consisted of a topsoil material, followed by a native silty sand, underlain by a native silty clay. The fill material within the building footprints consisted of silty clay with sand and a trace of demolition debris.

The results of the combustible vapour screening survey were all 0 ppm, which are not indicative potential volatile contamination.

Based on the screening results in combination with field observations, soil samples from BHs 1, 2, and, 5 were submitted for analytical testing of benzene, ethylbenzene, toluene and xylene (BTEX) and petroleum hydrocarbons (PCHs, F_1-F_4). No BTEX or PHC F_1 and F_2 parameters were identified in any of the soil samples submitted for analysis. Petroleum hydrocarbon fractions F_3 and F_4 were identified in Sample BH1-SS3 and PHC F_3 in BH2-SS2/SS3 at concentrations below the MOECC Table 2 standards. No PHC parameters were identified in BH5-SS2.

Groundwater samples were collected from the monitoring wells installed in BH1, BH2, and BH5 on March 17, 2017 and submitted for analysis of BTEX or VOC and PHC (F_1-F_4) parameters.

No parameter concentrations were identified above the method detection limits in any of the groundwater samples submitted for analysis. The groundwater is therefore considered to be in compliance with the MOECC Table 2 standards.

Recommendations

Monitoring Wells

If the monitoring wells installed onsite are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. The monitoring wells installed in BH1, BH2, and BH5 will be registered with the MOECC under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of ProSlide Technology Inc. (ProSlide) acting on behalf of 8589119 Canada Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment (ESA) for the property addressed 4139 Moodie Drive, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address potential environmental concerns identified in a Phase I ESA conducted by Paterson in March of 2017.

1.1 Site Description

Address:	4139 Moodie Drive, Ottawa, Ontario.
Legal Description:	Part of Lot 4, Concession 4, Rideau Front, Geographic Township of Nepean, City of Ottawa.
Property Identification Number:	04592-0020
Location:	The subject site is located on the east side of Moodie Drive, approximately 640m south of Barnsdale Road. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 12’ 47" N, 75° 48' 47" W.
Configuration:	Rectangular (approximately)
Site Area:	0.93 hectares (approximate)

1.2 Property Ownership

The subject property is currently owned by 8589119 Canada Inc. Paterson was engaged to complete the Phase II ESA at the subject site by Mr. David Alexander of ProSlide whose office is located at 150-2650 Queensview Drive, Ottawa, Ontario. Mr. Alexander can be reached by telephone at (613) 526-5522.

1.3 Current and Proposed Future Uses

The Phase II Property is currently vacant and unused. It is our understanding that the property will be redeveloped as a research and development facility for ProSlide.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 2 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ontario Ministry of the Environment and Climate Change (MOECC), April 2011. The MOECC Table 2 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions.
- ❒ Surface soil and groundwater conditions.
- ❒ Potable groundwater conditions.
- ❒ Commercial land use.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is currently vacant. The former residence and garage building were demolished in the fall of 2016. Several small structures remain, however none are occupied. The majority of the property is treed with pathways and clearings located throughout. Several drainage ditches were identified during the Phase I-ESA site visit and the Phase II-ESA field program.

The Phase II Property is at grade with the adjacent roadway and is generally flat.

2.2 Past Investigations

A Phase I ESA, in general accordance with Ontario Regulation (O.Reg.) 153/04, amended by O.Reg. 269/11, was conducted by Paterson in March 2017. Based on the findings of the Phase I-ESA, one (1) area of potential environmental concern (APEC) was identified on the subject property. The APEC is discussed further in Section 3.3 Phase I Conceptual Site Model.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The Phase II-ESA was carried out on March 9, 2017, in conjunction with a Geotechnical Investigation for the subject site. The field program consisted of drilling a total of 5 boreholes across the Phase II Property. As per the Sampling

and Analysis Plan appended to this report, the boreholes were placed to address the former garage operations and several other former onsite activities.

Further details of the subsurface investigation are provided in Section 4.0.

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 (CPCs) identified in the Phase I-ESA, in conjunction with the findings of the field program.

The CPCs within the APEC identified on the Phase II Property, include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons, fractions 1 through 4 (PHCs F_1-F_4) in soil and volatile organic compounds (VOCs), BTEX, and PHCs in groundwater.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on the Geological Survey of Canada website, bedrock in the area of the site consists of dolomite of the Oxford Formation. Overburden is reported to consist of sand and offshore marine sediments (clay and silt) of depths ranging from 15-25m throughout the Phase II-ESA property.

The regional topography is generally considered to be flat. The local groundwater flow beneath the Phase I Property was inferred to be in a easterly direction.

Contaminants of Potential Concern

As noted above, the CPCs identified in this Phase I ESA included BTEX/VOCs and PHCs. CPCs may be encountered in the soil or groundwater in the vicinity of the historical on-site garage. Potential mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion.

Existing Buildings and Structures

There were several unused chicken coops on the subject site, along with a modified school bus which appeared to be used as a recreational vehicle.

Water Bodies

No proper water bodies are known to exist within the Phase I study area.

Areas of Natural Significance

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

Drinking Water Wells

A search of MOECC's online water well records database was completed on February 16, 2017, for all drilled wells within 250 m of the subject site. Multiple groundwater wells were identified in the surrounding area. One groundwater well is shown to be on the subject site.

One suspected groundwater well was identified during the site visit. The well appeared to be a dug well and is not currently in use. This well is not expected to be the well identified during a review of the MOECC online water well records database. No other drinking water wells were encountered during the site visit.

Groundwater Monitoring Wells

No groundwater monitoring wells were observed on the Phase I Property or within the Phase I study area at the time of the site visit.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is mainly agricultural, vacant land, or residential.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Potentially contaminating activities (PCAs) that are considered to represent areas of potential environmental concern (APECs) on the Phase I Property are presented in Table 1 below.

No additional PCAs were identified within the Phase I ESA study area during the historical research or site visit.

Table 1
Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
Former Garage	Western portion of the subject site	Item 52 – Storage, maintenance, fuelling, and repair of equipment, vehicles, and material used to maintain transportation systems	On-site	BTEX, PHCs, and VOCs (in groundwater),	Soil and/or groundwater

Assessment of Uncertainty and/or Absence of Information

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

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Duplicate samples were not submitted for analysis as part of this assessment. A trip blank was not conducted during the groundwater sampling event; no VOC concentrations were detected in any of the groundwater samples submitted for analysis and therefore the lack of trip blank and duplicate samples are not considered to affect QA/QC for this project. Otherwise, there were no deviations from the Sampling and Analysis Plan.

3.5 Impediments

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

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on March 9, 2017 and consisted of drilling 5 boreholes (BH1 to BH5) for both environmental and geotechnical purposes. The boreholes were placed to address the aforementioned APEC as well as to provide data for the concurrent Geotechnical Investigation. The drilling contractors were George Downing Estate Drilling (Downing) of Hawkesbury, Ontario. The boreholes were advanced using a track-mounted drill rig under the full-time supervision of Paterson personnel. The borehole locations are identified on the attached Drawing PE3982-3 - Test Hole Location Plan.

The boreholes were drilled to depths ranging from approximately 5.3 to 6.4 m below the existing surface grade. A dynamic cone penetration test (DCPT) was conducted at BH5, where inferred bedrock was encountered at approximately 19.4 m below grade. Boreholes BH1, BH2, and BH5 were instrumented with groundwater monitoring wells upon their completion.

4.2 Soil Sampling

A total of 36 soil samples were obtained from the boreholes by means of split spoon sampling with the sampling of shallow soils directly from auger flights. Split spoon samples from the boreholes were taken at approximate 0.76 to 1.52 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of a fill material with trace building debris in the building footprints followed by silty clay. Outside of the building footprints soils generally consist of a topsoil, followed by a silt with sand, then a silty clay.

No apparent odours, staining or deleterious substances were observed in any of the soil samples.

Specific details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets appended to this report.

4.3 Field Screening Measurements

All soil samples collected were submitted to a preliminary screening procedure, which included visual screening for colour and evidence of metals. Soil samples from BH1, BH2, and BH5 were subjected to soil vapour screening with a MiniRae photoionization detector with detection limit of 0.1 ppm and a precision of +/- 0.1 ppm

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 parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale. The explosive point, 100% LEL, represents the leanest mixture which will burn (or explode) if ignited.

The vapour readings reported by the PID were all identified as 0 ppm. The readings are not indicative of volatile substances. It should be noted however that combustible vapours cannot be used to identify heavier products such as waste oil.

Please refer to the Soil Profile and Test Data sheets provided in Appendix 1, for soil sample headspace results.

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

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed by Downing, under full-time supervision by Paterson personnel. The monitoring wells consisted of 50 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details is provided below in Table 2.

Table 2: Monitoring Well Construction Details					
Well ID	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH1	5.8	2.8-5.8	2.4-5.8	0.0-2.4	PVC riser
BH2	5.3	2.3-5.3	2.0-5.3	0.0-2.0	PVC riser
BH5	5.3	2.3-5.3	1.9-5.3	0.0-1.9	PVC riser

4.5 Groundwater Sampling

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

4.6 Analytical Testing

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

Table 3: Soil Samples Submitted				
Sample ID	**Sample Depth/ Stratigraphic Unit**	**Parameters Analyzed**		**Rationale**
		BTEX	**PHCs (F_1-F4)**	
BH1-SS3	1.22-1.83m bgs; fill material	X	X	To address potential PHC impacts in the former house location backfill.
BH2-SS2/SS3	0.8-2.1m bgs; fill material	X	X	To address the former garage building
BH5-SS2	0.8-1.4m bgs; native silty sand	X	X	Address the area surrounding the modified bus structure, and background purposes.

Table 4: Groundwater Samples Submitted					
Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX	PHC (F_1-F_4)	VOCs	
BH1-GW1	2.8-5.8m silty clay with sand	X	X		Assessment of groundwater quality at the subject site based on potential contaminants of concern.
BH2-GW1	2.3-5.3m silt with clay		X	X	
BH5-GW1	2.3-5.3m silty clay, some sand	X	X		

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

4.7 Residue Management

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

4.8 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils generally consist of a fill material with trace building debris in the building footprints followed by silty clay. Outside of the building footprints soils generally consist of a topsoil, followed by a silt with sand, then a silty clay. According to geological mapping of the area, the underlying bedrock consists of dolomite of the Oxford Formation.

Fill material generally consisted of brown silty sand with some topsoil and clay, and trace demolition debris. The trace demolition debris is not considered to be a concern.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

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

Table 5: Groundwater Level Measurements

Borehole Location	Water Level Depth (m below grade)	Date of Measurement
BH1	1.57	March 17, 2017
BH2	0.88	
BH5	0.84	

5.3 Fine-Medium Soil Texture

Coarse-grained soil standards have been used for the subject site.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in soil vapour readings of 0 ppm. Field screening results for the soil samples are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Three soil samples were submitted to Paracel Laboratories for analysis of BTEX, and PHC (F_1-F_4). The results of the soil testing are presented in Table 6. The laboratory certificates of analysis are provided in Appendix 1.

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

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MOECC Table 2 Standards Commercial Coarse (µg/g)
		BH1-SS3	BH2-SS2/SS3	BH5-SS2	
		March 9, 2017			
Benzene	0.02	nd	nd	nd	0.32
Ethylbenzene	0.05	nd	nd	nd	1.1
Toluene	0.05	nd	nd	nd	6.4
Xylenes	0.05	nd	nd	nd	26
PHC F_1	7	nd	nd	nd	55
PHC F_2	4	nd	nd	nd	230
PHC F_3	8	33	21	nd	1700
PHC F_4	6	10	nd	nd	3300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL;
- **bold** – concentration exceeds selected MOECC standards

No BTEX, PHC F_1 or PHC F_2 parameters were identified in any of the soil samples submitted for analysis. Petroleum hydrocarbon fractions F_3 and F_4 were identified in Sample BH1-SS3 and PHC F_3 in BH2-SS2/SS3 at concentrations below the MOECC Table 2 standards. No PHC fractions were identified in BH5-SS2.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells installed in BH1, BH2 and BH5 were submitted for laboratory analysis of a combination of VOC or BTEX, and PHC (F_1-F_4) parameters. The groundwater samples were obtained from the screened intervals noted on Table 4. The results of the analytical testing are presented below in Tables 7 and 8. The laboratory certificates of analysis are provided in Appendix 1.

Table 7: Groundwater Analytical Test Results - BTEX/PHC (F_1 – F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MOECC Table 2 Standards (µg/L)
		BH1-GW1	BH2-GW1	BH5-GW1	
		March 17, 2017			
Benzene	0.5	nd	nd	nd	5
Ethylbenzene	0.5	nd	nd	nd	2.4
Toluene	0.5	nd	nd	nd	24
Xylenes (total)	0.5	nd	nd	nd	300
PHC F_1	25	nd	nd	nd	750
PHC F_2	100	nd	nd	nd	150
PHC F_3	100	nd	nd	nd	500
PHC F_4	100	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **bold** – concentration exceeds selected MOECC standards

No BTEX or PHC parameters were identified above the method detection limits in any of the samples submitted for analytical testing. The results are in compliance with MOECC Table 2 standards.

Table 8:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) March 17, 2017	MOECC Table 2 Residential Standards (µg/L)
		BH2-GW1	
Acetone	5.0	nd	2700
Benzene	0.5	nd	5
Bromodichloromethane	0.5	nd	16
Bromoform	0.5	nd	25
Bromomethane	0.5	nd	0.89
Carbon Tetrachloride	0.2	nd	0.79
Chlorobenzene	0.5	nd	30
Chloroform	0.5	nd	2.4
Dibromochloromethane	0.5	nd	25
Dichlorodifluoromethane	1.0	nd	590
1,2-Dichlorobenzene	0.5	nd	3
1,3-Dichlorobenzene	0.5	nd	59
1,4-Dichlorobenzene	0.5	nd	1
1,1-Dichlroethane	0.5	nd	5
1,2-dichlorethane	0.5	nd	1.6
1,1-Dichlroethylene	0.5	nd	1.6
Cis-1,2-Dichloroethylene	0.5	nd	1.6
Trans-1,2-dichloroethylene	0.5	nd	1.6
1,2-dichloropropane	0.5	nd	5
1,3-Dichloropropene, total	0.5	nd	0.5
Ethylbenzene	0.5	nd	2.4
Ethylene dibromide	0.2	nd	0.2
Hexane	1.0	nd	51
Methyl Ethyl ketone	5.0	nd	1800
Methyl Isobutyl ketone	5.0	nd	640
Methyl tert-butyl ether	2.0	nd	15
Methylene Chloride	5.0	nd	50
Styrene	0.5	nd	5.4
Toluene	0.5	nd	24
1,1,1,2-Tetrachloroethane	0.5	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	1
Trichloroethylene	0.5	nd	1.6
Tetrachloroethylene	0.5	nd	1.6
Trichlorofluoromethane	1.0	nd	150
Vinyl Chloride	0.5	nd	0.5
Xylenes	0.5	nd	300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- N/V – no value provided by the MOECC

No VOC parameters were identified above the method detection limits in the groundwater sample submitted for analytical testing. The results are in compliance with the MOECC Table 2 standards.

5.7 Quality Assurance and Quality Control Results

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

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

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

5.8 Phase II Conceptual Site Model

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

Site Description

The Phase II Property is located on the east side of Moodie Drive approximately 640m south of Barnsdale Road, in the City of Ottawa, Ontario. The Phase II Property has an area of approximately 20 hectares. At the time of the Phase II Environmental Site Assessment (ESA) the only structures on the Phase II Property were a modified school bus used as a recreational vehicle and several chicken coops.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Column A of Table 2 outlined in Ontario Regulation 153/04 and amended by O.Reg. 269/11, potentially contaminating activities (PCAs) identified on the subject property that were considered to result in an APEC on the subject land are summarized in Table 1 presented in Section 3.3.

No offsite PCAs were identified during the Phase I-ESA research.

Contaminants of Concern

The Phase I ESA identified BTEX, PHCs, and/or VOCs as contaminants of concern in soil and/or groundwater. Detailed descriptions of these contaminants are provided in Section 3.3 of this report.

Subsurface Structures and Utilities

A septic bed is reportedly located to the east of the former building. No other utilities are reported to be on site.

Physical Setting

Site Stratigraphy

Site stratigraphy is provided in the Soil Profile and Test Data Sheets provided in Appendix 1. A general description of the site stratigraphy consists of the following:

- **Fill Material** was encountered within the two building footprints. The fill material generally consisted of silty sand with trace clay and the occasional building debris (pieces of brick, concrete, etc.).
- **Native Silt –** A native silty material with sand was encountered near the ground surface or beneath the fill material.
- **Native Silty Clay** - Native silty clay (or native silt with clay) was encountered in all boreholes. This was the deepest unit investigated at the time of the Phase II ESA.

Hydrogeological Characteristics

Groundwater levels were measured at the subject site on March 17, 2017. The water table at the subject site was encountered in the overburden material.

The groundwater levels were measured at depths between approximately 0.84 and 1.57 m below the existing grade. It is noted that water levels fluctuate with seasonal variations.

Approximate Depth to Bedrock

At the time of the Phase II ESA, a dynamic cone penetration test (DCPT) was completed in BH5. The DCPT was terminated on the suspected bedrock surface at a depth of 19.41 m below ground surface.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 0.84 and 1.57 m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) and Section 43.1 do not apply to the subject site as the Phase II Property is not a shallow soil property and the Phase II Property is not within 30 m of a body of water.

Fill Placement

As noted above, fill material was within the former building footprints. The fill material extended to depths ranging from approximately 2.7 to 2.9 m below grade within the building footprint. The fill generally consisted of brown silty sand with gravel and occasional fragments of building/demolition materials. Fill material was not identified outside of the building footprints, with the exception of a crushed stone layer in BH5.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property will be redeveloped as a research and development facility for ProSlide.

Existing Buildings and Structures

There were several unused chicken coops on the subject site, along with a modified school bus which appeared to be used as a recreational vehicle.

Water Bodies

No bodies of water are present on the subject property or within the Phase I study area.

Areas of Natural Significance

No areas of natural significance were observed on the Phase I Property or within the Phase I study area.

Environmental Condition

Areas Where Contaminants are Present

Based on screening and analytical results, the soil and groundwater on the subject site is considered to be in compliance with the MOECC Table 2 Standards.

6.0 CONCLUSIONS

Assessment

Paterson Group was retained by ProSlide Technology Inc., on behalf of 8589119 Canada Inc., to prepare a Phase II Environmental Site Assessment for the property addressed 4139 Moodie Drive, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the Areas of Potential Environmental Concern (APECs) for the subject site identified during the Phase I ESA conducted in March 2017. The Phase II ESA was carried out in conjunction with a geotechnical investigation and consisted of drilling a total of 5 boreholes, 3 of which were installed with groundwater monitoring wells, to assess the soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Soils within the building footprints generally consist of fill material, underlain by native silty clay. Soils outside of the building footprints generally consisted of a topsoil material, followed by a native silty sand, underlain by a native silty clay. The fill material within the building footprints consisted of silty clay with sand and a trace of demolition debris.

The results of the combustible vapour screening survey were all 0 ppm, which are not indicative potential volatile contamination.

Based on the screening results in combination with field observations, soil samples from BHs 1, 2, and, 5 were submitted for analytical testing of benzene, ethylbenzene, toluene and xylene (BTEX) and petroleum hydrocarbons (PCHs, F_1-F_4). No BTEX or PHC F_1 and F_2 parameters were identified in any of the soil samples submitted for analysis. Petroleum hydrocarbon fractions F_3 and F_4 were identified in Sample BH1-SS3 and PHC F_3 in BH2-SS2/SS3 at concentrations below the MOECC Table 2 standards. No PHC parameters were identified in BH5-SS2.

Groundwater samples were collected from the monitoring wells installed in BH1, BH2, and BH5 on March 17, 2017 and submitted for analysis of BTEX or VOC and PHC (F_1-F_4) parameters.

No parameter concentrations were identified above the method detection limits in any of the groundwater samples submitted for analysis. The groundwater is therefore considered to be in compliance with the MOECC Table 2 standards.

Recommendations

Monitoring Wells

If the monitoring wells installed onsite are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. The monitoring wells installed in BH1, BH2, and BH5 will be registered with the MOECC 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 by O.Reg. 269/11, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of 8589119 Canada Inc. Permission and notification from 8589119 Canada Inc. and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Michael Beaudoin, P.Eng.,

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

Report Distribution:

- 8589119 Canada Inc. c/o ProSlide Technologies Inc. (6 copies)
- Paterson Group (1 copy)

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3982-3 – TEST HOLE LOCATION PLAN

DRAWING PE3982-4 – ANALYTICAL TESTING PLAN

FIGURE 1

KEY PLAN

#4041 MOODIE DRIVE
VACANT / AGRICULTURAL

#4071 MOODIE DRIVE
RESIDENTIAL

#4077 MOODIE DRIVE
RESIDENTIAL

#4095 MOODIE DRIVE
VACANT / AGRICULTURAL

VACANT/AGRICULTURAL

HYDRO

MOODIE DRIVE

VACANT/AGRICULTURAL

WOODED

BH 3

WATER WELL

FORMER GARAGE

BH 5

BH 2

CAMPER STRUCTURE

BH 4

#4139 MOODIE DRIVE

WOODED

#4134 MOODIE DRIVE
RESIDENTIAL

#4134
WILLIAM MCEWEN DRIVE
VACANT /
AGRICULTURAL

BH 1

FORMER HOUSE

WOODED

FORMER SEPTIC LOCATION

VACANT / AGRICULTURAL

#4221 MOODIE DRIVE
PROPOSED WATER PARK
(ALOTTAWATA)

#4184 MOODIE DRIVE
RESIDENTIAL / FARM

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

8589119 CANADA INC. c/o PRO-SLIDE TECHNOLOGY INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
4139 MOODIE DRIVE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 03/2017
Drawn by: MPG	Report No.: PE3982-2
Checked by: MB	Dwg. No.: PE3982-3
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe39xx\pe3982\pe3982-3 thlp.dwg

#4041 MOODIE DRIVE
VACANT / AGRICULTURAL

#4071 MOODIE DRIVE
RESIDENTIAL

#4077 MOODIE DRIVE
RESIDENTIAL

#4095 MOODIE DRIVE
VACANT / AGRICULTURAL

VACANT/AGRICULTURAL

BH 5 - SS2 (0.76-1.37m) - March 9, 2017
BTEX & PHC results in compliance with MOECC Standards

BH 5 - GW1 (2.3-53m) - March 17, 2017
BTEX & PHC results in compliance with MOECC Standards

HYDRO

BH 2 - SS2/SS3 (0.76-2.90m) - March 9, 2017
BTEX & PHC results in compliance with MOECC Standards

BH 2 - GW1 (2.8-5.8m) - March 17, 2017
VOC & PHC results in compliance with MOECC Standards

VACANT/AGRICULTURAL

MOODIE DRIVE

BH 3

WATER WELL

FORMER GARAGE

BH 5

BH 2

CAMPER STRUCTURE

BH 4

#4139 MOODIE DRIVE

WOODED

#4134 WILLIAM MCEWEN DRIVE
VACANT / AGRICULTURAL

#4134 MOODIE DRIVE
RESIDENTIAL

BH 1

WOODED

FORMER HOUSE

FORMER SEPTIC LOCATION

VACANT / AGRICULTURAL

BH 1 - SS3 (1.22-1.83m) - March 9, 2017
BTEX & PHC results in compliance with MOECC Standards

BH 1 - GW1 (2.3-5.3) - March 17, 2017
BTEX & PHC results in compliance with MOECC Standards

#4221 MOODIE DRIVE
PROPOSED WATER PARK
(ALOTTAWATA)

#4184 MOODIE DRIVE
RESIDENTIAL / FARM

LEGEND:

SOIL RESULTS ARE IN COMPLIANCE WITH MOECC STANDARDS

SOIL RESULTS EXCEED MOECC STANDARDS

GROUNDWATER RESULTS IN COMPLIANCE WITH MOECC STANDARDS

GROUNDWATER RESULTS EXCEED MOECC STANDARDS

BOREHOLE WITH MONITORING WELL LOCATION

BOREHOLE LOCATION

patersongroup
consulting engineers

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

NO.	REVISIONS	DATE	INITIAL
0			

8589119 CANADA INC. c/o PRO-SLIDE TECHNOLOGY INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
4139 MOODIE DRIVE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN

Scale: 1:3000	Date: 03/2017
Drawn by: MPG	Report No.: PE3982-2
Checked by: MB	Dwg. No.: PE3982-4
Approved by: MSD	Revision No.: 0

p:\autocad drawings\environmental\pe39xx\pe3982\pe3982-3 thlp.dwg

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Studies

Paterson Group Inc.

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

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

patersongroup

Sampling and Analysis Plan

4139 Moodie Drive
Ottawa, Ontario

Prepared For

8589119 Canada Inc.
c/o Proslide Technologies Inc.

February, 2017

Report: PE3982-SAP.01

Table of Contents

1.0 Sampling Program 1
2.0 Analytical Testing Program 1
3.0 Standard Operating Procedures 2
3.1 Environmental Drilling Procedure 2
3.2 Monitoring Well Installation Procedure 4
3.3 Monitoring Well Sampling Procedure 5
4.0 Quality Assurance/Quality Control (QA/QC) 8
5.0 Physical Impediments to Sampling and Analysis Plan 8

1.0 Sampling Program

Paterson Group (Paterson) was commissioned by 8589119 Canada Inc. to conduct a Phase II ESA for the vacant property located at 4139 Moodie Drive, in the City of Ottawa, Ontario.

The Phase II ESA was carried out to address the APECs identified in the Paterson Phase I ESA. The following subsurface investigation program was developed to identify and delineate the suspected contamination:

Borehole	Location and Rationale	Proposed Depth and Rationale
BH1	Borehole placed to address the former house.	Boreholes to be advanced to intercept water table to facilitate installation of groundwater monitoring wells in BH1, BH2, and BH5.
BH2	Placed to address former garage.	
BH3	General coverage, geotechnical purposes	
BH4	General coverage, geotechnical purposes.	
BH5	Address the recreational vehicle and general coverage.	

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

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

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

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

2.0 Analytical Testing Program

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

- In borehole where there is visual or olfactory evidence of contamination, or where gas detector readings indicate the presence of contamination, the 'worst-case' sample from each test pit should be submitted for comparison with MOECC site condition standards.
- In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated vertically downward.
- At least one sample from each borehole should be submitted to delineate the horizontal extent of contamination across the site.
- Parameters analyzed should be consistent with the contaminants of potential concern identified in the Phase II-ESA.
- Samples will be submitted for analysis of PHC, PAH, and metals parameters.

3.0 Standard Operating Procedures

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

- Glass soil sample jars
- Plastic sample bags two buckets
- Cleaning brush (toilet brush works well)
- Dish detergent
- Methyl hydrate
- Water (if not available on site - water jugs available in trailer)
- Latex or nitrile gloves (depending on suspected contaminant)
- RKI Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)
-

Determining Borehole and Test Pit Locations

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

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

Drilling Procedure

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

- Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required. Sleeve samples are to be collected when utilizing GeoProbe direct push drill.
- Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- Note all and any odours or discolouration of samples.
- Split spoon samplers must be washed between samples. Sleeves are disposable and will not require washing.
- If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).

- If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, visual observations, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- Threaded end-cap
- Slip-cap or J-plug
- Asphalt cold patch or concrete
- Silica Sand
- Bentonite chips (Holeplug)
- Steel flushmount casing

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

- Portable pH/Temperature/Conductivity analyzer
- Laboratory-supplied sample bottles

Sampling Procedure

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

Instrument Washing Procedure

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

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

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

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

Screening Procedure

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

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

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

4.0 Quality Assurance/Quality Control (QA/QC)

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

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

5.0 Physical Impediments to Sampling and Analysis Plan

Physical impediments to the Sampling and Analysis plan may include:

- The location of underground utilities
- Shallow bedrock or limited presence of fill
- Insufficient groundwater volume for groundwater samples (if encountered)
- Breakage of sampling containers following sampling or while in transit to the laboratory
- Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)
- Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in laboratory
- Mechanical Equipment breakdowns
- Winter conditions
- Other site-specific impediments

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
4139 Moodie Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** March 9, 2017

FILE NO. PE3982

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
		AU	1				
FILL: Brown silty clay with sand, gravel, cobbles, boulders, trace brick, asphalt and concrete		SS	2	50	8	1	
		SS	3	42	50		
2.00						2	
FILL: Brown silty sand with gravel and cobbles		SS	4	29	21		
2.74							
		SS	5	100	5	3	
Firm, brown **SILTY CLAY** with sand		SS	6	100	P	4	
4.27							
		SS	7	75	12	5	
Compact to loose, grey **SILT,** trace clay		SS	8	58	8		
		SS	9	42	6	6	
6.40							
End of Borehole							
(GWL @ 1.57m-March 17, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
4139 Moodie Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** March 9, 2017

FILE NO. PE3982

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
FILL: Brown silty sand with crushed stone and styrofoam		AU	1				
		SS	2	12	2	1	
1.40							
FILL: Brown silty sand with gravel and cobbles, trace clay		SS	3	17	5	2	
		SS	4	4	2		
2.90						3	
Very loose to compact, grey **SILT** with clay		SS	5	100	3		
		SS	6	58	12	4	
		SS	7	50	10		
5.33						5	
End of Borehole							
(GWL @ 0.88m-March 17, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
4139 Moodie Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** March 9, 2017

FILE NO. PE3982

HOLE NO. BH 3

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 0.25		AU	1			0			
Loose, grey-brown **SAND**		SS	2	54	7	1			
1.52		SS	3	83	2	2			
		SS	4	50	23				
Compact to very loose, grey **SILT**		SS	5	58	12	3			
		SS	6	71	29	4			
		SS	7	54	16	5			
		SS	8	42	3				
5.94 End of Borehole									

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

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
4139 Moodie Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** March 9, 2017

FILE NO. PE3982

HOLE NO. BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL with organics		AU	1			0	
0.23							
Loose, brown **SILT** with sand, trace clay		SS	2	58	7	1	
1.37							
		SS	3	100	3	2	
Soft to stiff, grey **SILTY CLAY**						3	
4.42						4	
		SS	4	100	51		
Very dense to compact, grey **SILT**						5	
		SS	5	71	16		
5.94							
End of Borehole							

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
4139 Moodie Drive
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY CME 55 Power Auger **DATE** March 9, 2017

FILE NO. PE3982

HOLE NO. BH 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL 0.04							
FILL: Crushed stone with silt 0.28		AU	1				
Loose, brown **SILT** with sand		SS	2	71	6	1	
1.37							
		SS	3	100	5	2	
Firm to stiff, grey **SILTY CLAY,** some sand		SS	4	100	P	3	
		SS	5	100	P	4	
4.57							
		SS	6	1006	34	5	
Dense to compact, grey **SILT**		SS	7	67	23		
5.94							
Dynamic Cone Penetration Test (DCPT) commenced at 5.94m depth. Practical DCPT refusal at 19.41m depth.							
(GWL @ 0.84m-March 17, 2017)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

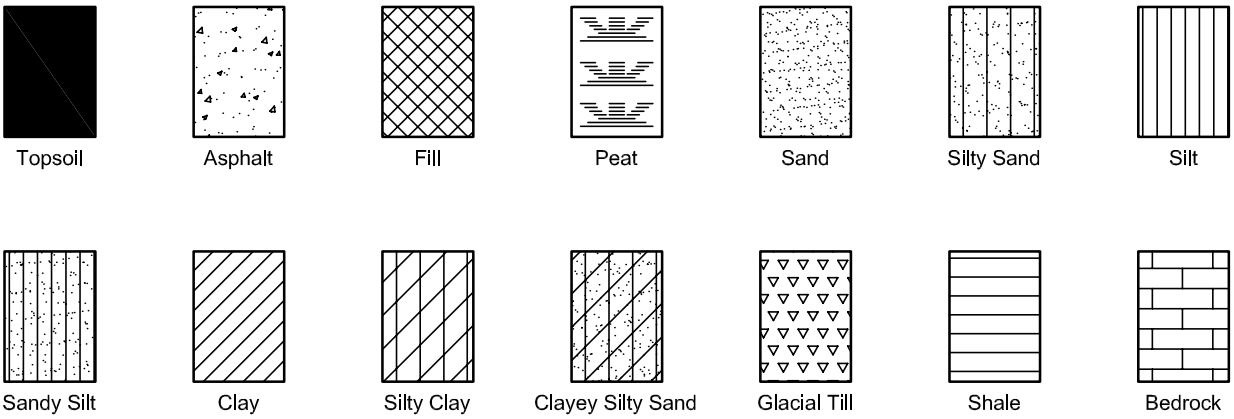
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

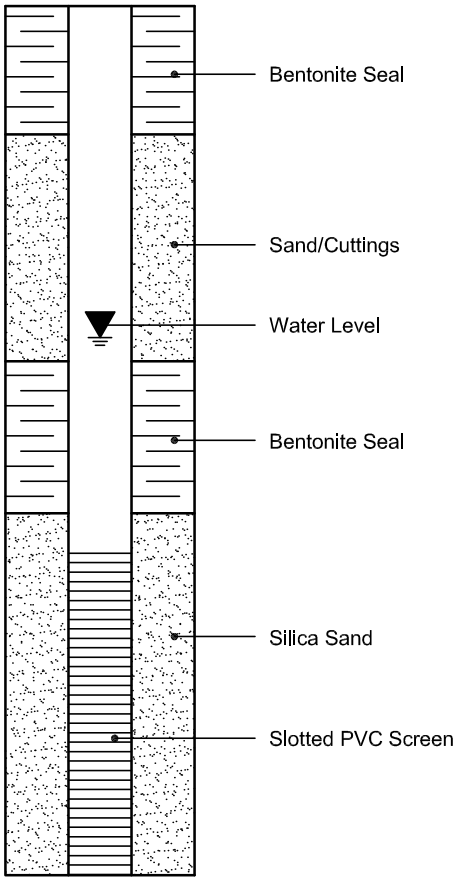
SYMBOLS AND TERMS (continued)

STRATA PLOT

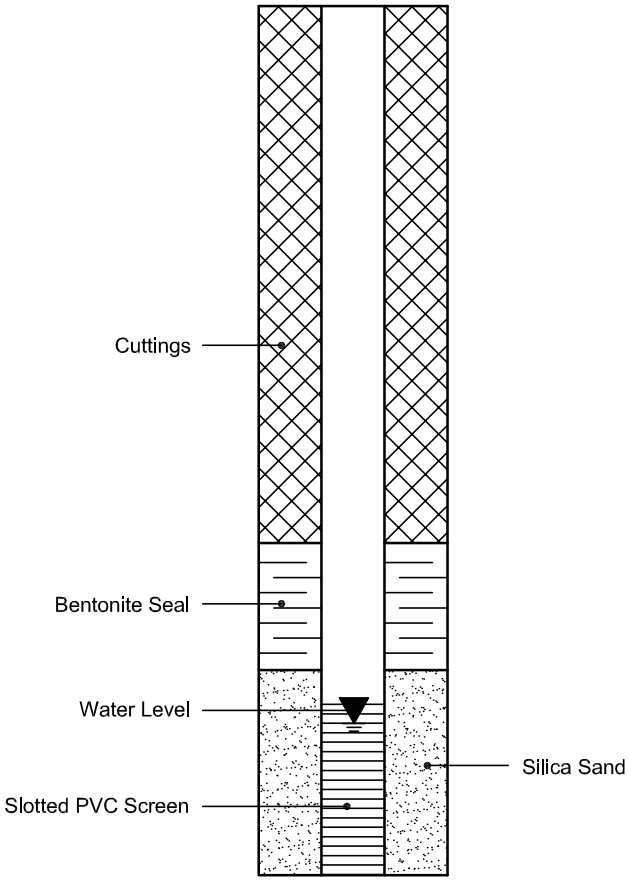


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 21743
Project: PE3982
Custody: 111559

Report Date: 15-Mar-2017
Order Date: 10-Mar-2017

Order #: 1710505

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

Paracel ID	Client ID
1710505-01	BH1-SS3
1710505-02	BH2-SS2/SS3
1710505-03	BH5-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21743

Report Date: 15-Mar-2017
Order Date: 10-Mar-2017
Project Description: PE3982

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	13-Mar-17	15-Mar-17
PHC F1	CWS Tier 1 - P&T GC-FID	13-Mar-17	15-Mar-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Mar-17	13-Mar-17
Solids, %	Gravimetric, calculation	11-Mar-17	11-Mar-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21743

Report Date: 15-Mar-2017

Order Date: 10-Mar-2017

Project Description: PE3982

	Client ID:	BH1-SS3	BH2-SS2/SS3	BH5-SS2	-
	Sample Date:	09-Mar-17	09-Mar-17	09-Mar-17	-
	Sample ID:	1710505-01	1710505-02	1710505-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	87.8	86.7	82.1	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	110%	111%	111%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	33	21	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	10	<6	<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	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*9.13*		*ug/g*		*114*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	85.2	0.1	% by Wt.	83.8			1.7	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*7.07*		*ug/g dry*		*112*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	194	7	ug/g		97.2	80-120			
F2 PHCs (C10-C16)	97	4	ug/g	ND	88.5	60-140			
F3 PHCs (C16-C34)	198	8	ug/g	ND	87.5	60-140			
F4 PHCs (C34-C50)	125	6	ug/g	ND	83.0	60-140			
Volatiles									
Benzene	3.46	0.02	ug/g		86.5	60-130			
Ethylbenzene	3.72	0.05	ug/g		92.9	60-130			
Toluene	3.52	0.05	ug/g		88.1	60-130			
m,p-Xylenes	7.71	0.05	ug/g		96.4	60-130			
o-Xylene	3.78	0.05	ug/g		94.4	60-130			
Surrogate: Toluene-d8	*8.10*		*ug/g*		*101*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1710505

PARACEL LABORATORIES LTD.

TRUSTED
RESPONS
RELIABLE

...urent Blvd.
K1G 4J8
...47
...paracellabs.com

Chain of Custody
(Lab Use Only)
№ 111559

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE3988	**Turnaround Time:**	
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day	☐ 3 Day
Address: 154 Colonnade Rd. S.	PO # 21743	☐ 2 Day	☒ Regular
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca	Date Required:	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 7 ☐ 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: 1710505 / 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)	120ml + vial					
1	BH1 - SS3	S		2	9.3.17	~	X												
2	BH2 - SS2/SS3	S		2	"	~	X												
3	BH5 - SS2	S		2	"	~	X												
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel.

Relinquished By (Sign): Ryan Matheson	Received by Driver/Depot: T. Louise	Received at Lab: Rachel Subject	Verified By:
Relinquished By (Print): Ryan Matheson	Date/Time: 10/03/17 3:05	Date/Time: Mar 10 17.	Date/Time: March 13, 17
Date/Time: March 10, 17 / 1:40 pm.	Temperature: ____ °C FT.	Temperature: 9.8 °C 4.48.	pH Verified [ ] By:

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

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

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 21686
Project: PE3982
Custody: 111808

Report Date: 23-Mar-2017
Order Date: 17-Mar-2017

Revised Report

Order #: 1711505

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

Paracel ID	Client ID
1711505-01	BH1-GW1
1711505-02	BH2-GW1
1711505-03	BH5-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 21686

Report Date: 23-Mar-2017
Order Date: 17-Mar-2017
Project Description: PE3982

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	21-Mar-17	21-Mar-17
PHC F1	CWS Tier 1 - P&T GC-FID	21-Mar-17	21-Mar-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	20-Mar-17	20-Mar-17
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	21-Mar-17	21-Mar-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21686

Report Date: 23-Mar-2017

Order Date: 17-Mar-2017

Project Description: PE3982

	Client ID:	BH1-GW1	BH2-GW1	BH5-GW1	-
	Sample Date:	17-Mar-17	17-Mar-17	17-Mar-17	-
	Sample ID:	1711505-01	1711505-02	1711505-03	-
	MDL/Units	Ground Water	Ground Water	Ground Water	-
Volatiles					
Acetone	5.0 ug/L	-	<5.0	-	-
Benzene	0.5 ug/L	-	<0.5	-	-
Bromodichloromethane	0.5 ug/L	-	<0.5	-	-
Bromoform	0.5 ug/L	-	<0.5	-	-
Bromomethane	0.5 ug/L	-	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	-	<0.2	-	-
Chlorobenzene	0.5 ug/L	-	<0.5	-	-
Chloroform	0.5 ug/L	-	<0.5	-	-
Dibromochloromethane	0.5 ug/L	-	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	-	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	-	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	-	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	-	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	-	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	-	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	-	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	-	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	-	<0.5	-	-
Ethylbenzene	0.5 ug/L	-	<0.5	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	-	<0.2	-	-
Hexane	1.0 ug/L	-	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	-	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	-	<2.0	-	-
Methylene Chloride	5.0 ug/L	-	<5.0	-	-
Styrene	0.5 ug/L	-	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	-	<0.5	-	-
Toluene	0.5 ug/L	-	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	-	<0.5	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21686

Report Date: 23-Mar-2017

Order Date: 17-Mar-2017

Project Description: PE3982

	Client ID:	BH1-GW1	BH2-GW1	BH5-GW1	-
	Sample Date:	17-Mar-17	17-Mar-17	17-Mar-17	-
	Sample ID:	1711505-01	1711505-02	1711505-03	-
	MDL/Units	Ground Water	Ground Water	Ground Water	-
1,1,2-Trichloroethane	0.5 ug/L	-	<0.5	-	-
Trichloroethylene	0.5 ug/L	-	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	-	<1.0	-	-
Vinyl chloride	0.5 ug/L	-	<0.5	-	-
m,p-Xylenes	0.5 ug/L	-	<0.5	-	-
o-Xylene	0.5 ug/L	-	<0.5	-	-
Xylenes, total	0.5 ug/L	-	<0.5	-	-
4-Bromofluorobenzene	Surrogate	-	94.2%	-	-
Dibromofluoromethane	Surrogate	-	93.4%	-	-
Toluene-d8	Surrogate	-	115%	-	-
Benzene	0.5 ug/L	<0.5	-	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	-
Toluene	0.5 ug/L	<0.5	-	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	-
o-Xylene	0.5 ug/L	<0.5	-	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	-
Toluene-d8	Surrogate	116%	-	115%	-
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	-
F1 + F2 PHCs	125 ug/L	<125	<125	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	<200	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*78.0*		*ug/L*		*97.5*	*50-140*			
Surrogate: Dibromofluoromethane	*76.7*		*ug/L*		*95.9*	*50-140*			
Surrogate: Toluene-d8	*92.1*		*ug/L*		*115*	*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	*92.1*		*ug/L*		*115*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*76.0*		*ug/L*		*95.0*	*50-140*			
Surrogate: Dibromofluoromethane	*74.2*		*ug/L*		*92.8*	*50-140*			
Surrogate: Toluene-d8	*92.3*		*ug/L*		*115*	*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			0.0	30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*92.3*		*ug/L*		*115*	*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)	2080	25	ug/L		104	68-117			
F2 PHCs (C10-C16)	1260	100	ug/L		70.2	60-140			
F3 PHCs (C16-C34)	3360	100	ug/L		90.2	60-140			
F4 PHCs (C34-C50)	2350	100	ug/L		94.7	60-140			
Volatiles									
Acetone	94.9	5.0	ug/L		94.9	50-140			
Benzene	43.9	0.5	ug/L		110	60-130			
Bromodichloromethane	37.8	0.5	ug/L		94.5	60-130			
Bromoform	37.4	0.5	ug/L		93.4	60-130			
Bromomethane	24.1	0.5	ug/L		60.2	50-140			
Carbon Tetrachloride	43.4	0.2	ug/L		109	60-130			
Chlorobenzene	38.0	0.5	ug/L		95.0	60-130			
Chloroform	43.6	0.5	ug/L		109	60-130			
Dibromochloromethane	35.1	0.5	ug/L		87.7	60-130			
Dichlorodifluoromethane	32.7	1.0	ug/L		81.8	50-140			
1,2-Dichlorobenzene	31.9	0.5	ug/L		79.7	60-130			
1,3-Dichlorobenzene	34.9	0.5	ug/L		87.2	60-130			
1,4-Dichlorobenzene	30.3	0.5	ug/L		75.7	60-130			
1,1-Dichloroethane	44.6	0.5	ug/L		112	60-130			
1,2-Dichloroethane	39.6	0.5	ug/L		99.1	60-130			
1,1-Dichloroethylene	42.6	0.5	ug/L		107	60-130			
cis-1,2-Dichloroethylene	48.9	0.5	ug/L		122	60-130			
trans-1,2-Dichloroethylene	47.0	0.5	ug/L		118	60-130			
1,2-Dichloropropane	47.6	0.5	ug/L		119	60-130			
cis-1,3-Dichloropropylene	41.9	0.5	ug/L		105	60-130			
trans-1,3-Dichloropropylene	42.8	0.5	ug/L		107	60-130			
Ethylbenzene	40.1	0.5	ug/L		100	60-130			
Ethylene dibromide (dibromoethane	38.7	0.2	ug/L		96.8	60-130			
Hexane	46.1	1.0	ug/L		115	60-130			
Methyl Ethyl Ketone (2-Butanone)	139	5.0	ug/L		139	50-140			
Methyl Isobutyl Ketone	134	5.0	ug/L		134	50-140			
Methyl tert-butyl ether	105	2.0	ug/L		105	50-140			
Methylene Chloride	42.1	5.0	ug/L		105	60-130			
Styrene	40.8	0.5	ug/L		102	60-130			
1,1,1,2-Tetrachloroethane	34.3	0.5	ug/L		85.7	60-130			
1,1,2,2-Tetrachloroethane	40.6	0.5	ug/L		102	60-130			
Tetrachloroethylene	37.7	0.5	ug/L		94.4	60-130			
Toluene	39.9	0.5	ug/L		99.8	60-130			
1,1,1-Trichloroethane	39.5	0.5	ug/L		98.8	60-130			
1,1,2-Trichloroethane	47.4	0.5	ug/L		118	60-130			
Trichloroethylene	45.1	0.5	ug/L		113	60-130			
Trichlorofluoromethane	39.6	1.0	ug/L		99.1	60-130			
Vinyl chloride	43.6	0.5	ug/L		109	50-140			
m,p-Xylenes	77.5	0.5	ug/L		96.9	60-130			
o-Xylene	38.2	0.5	ug/L		95.6	60-130			
Surrogate: 4-Bromofluorobenzene	*69.8*		*ug/L*		*87.2*	*50-140*			
Benzene	43.9	0.5	ug/L		110	60-130			
Ethylbenzene	40.1	0.5	ug/L		100	60-130			
Toluene	39.9	0.5	ug/L		99.8	60-130			
m,p-Xylenes	77.5	0.5	ug/L		96.9	60-130			
o-Xylene	38.2	0.5	ug/L		95.6	60-130			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH1-GW1

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1 - This report includes additional VOC data.

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1711505

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

e: paracel@paracellabs.com

Chain of Custody (Lab Use Only)

№ 111808

Page 1 of 1

Client Name: PATERSON	Project Reference: PE 3982
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 COLONNADE RD.	PO # 21686
Telephone: 613-226-7381	Email Address: mbeaudoin@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)

Paracel Order Number: 1711505

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-GW1	GW		3	Mar 17/17	PM	X						
2	BH2-GW1	GW		3	↓	↓	X						
3	BH5-GW1	GW		3	↓	↓	X						
4													
5													
6													
7													
8													
9													
10													

Comments: 1 VOC. 2 Sample read = BH1-GW2. - report as BH1-GW1.

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): GREG VL	Date/Time: 17/03/17 4:20 PM	Date/Time: MAR 17 2017 05:00	Date/Time: Mar 17/17.
Date/Time: MAR 17, 2017	Temperature: °C	Temperature: 21.6 °C	pH Verified ☒ By: N/A 5:08