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Phase II Environmental Site Assessment

Industrial Property
564 Industrial Avenue
Ottawa, Ontario

Prepared For

1252103 Ontario Inc.

May 7, 2013

Report: PE2979-2

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1.0 EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property at 564 Industrial Avenue, Ottawa, Ontario. The purpose of the Phase II ESA was to address areas of potential environmental concern identified during the Phase I ESA, in particular the presence of a former UST, current ASTs, floor drains and oil/water separators, an exterior drain associated with a parts drying rack, and various concerns associated with vehicle and equipment maintenance and repair at the subject site, as well as the former presence of a bulk fuel depot to the northeast of the subject site. The Phase II ESA consisted of the drilling of nine (9) boreholes and the installation of three (3) monitoring wells.

Soil samples were obtained from the boreholes and were screened using visual observations and organic vapour measurements. Based on the screening results, a total of three (3) soil samples were submitted for analysis of BTEX and PHCs. All sample results were in compliance with MOE Table 3 standards; however, samples BH1-SS3 and BH3-SS3 exceeded MOE Table 1 standards.

Groundwater samples were obtained from the monitoring wells at BH3, BH5, and BH7 and analyzed for BTEX, PHCs, and VOCs. All analytical results were in compliance with MOE Table 3 standards.

Recommendations

Based on the above results and on our observations, soils are present at the subject site which meet MOE Table 3 standards yet exceed MOE Table 1 (background) standards. Given the current use of the subject property, no immediate remedial action is required. It is our understanding that the subject site will eventually be redeveloped with commercial buildings, and that the existing building is to be demolished. If the redevelopment of the site requires soil to be hauled off-site, soils exceeding the Table 1 standards cannot be hauled as clean fill.

Furthermore, it is our opinion that additional impacted soils are likely present beneath the subject building, specifically beneath floor drains, the oil-water separator, and in the vicinity of the former underground storage tank. These soils could not be tested due to inability to access the interior of the building for borehole drilling purposes. As such, isolated pockets of contaminated soil may exist within the subject building footprint. If encountered, these soils may be remediated concurrently with building demolition and site redevelopment.

2.0 INTRODUCTION

At the request of 1252103 Ontario Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of the property addressed as 564 Industrial Avenue, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address concerns identified in the Phase I ESA, including equipment repair activities on the subject site, the historical presence of an underground storage tank at the subject site, and the historical presence of a bulk fuel depot to the northeast of the subject site.

2.1 Site Description

Address:	564 Industrial Avenue, Ontario.
Legal Description:	Lots 54, 55, and the west part of Lot 56, Plan 560, less Part 1, Registered Plan 5R-10344, in the City of Ottawa, Ontario.
Property Identification Number:	04256-0253.
Location:	The subject site is located on the south side of Industrial Avenue, immediately east of the intersection with Trainyards Drive. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 24' 40" N, 75° 38' 42" W.
Configuration:	Irregular.
Site Area:	0.61 hectares (approximate).

2.2 Property Ownership

The subject property is currently owned by 3686272 Canada Inc., operating as J.R. Brisson Equipment Limited. Paterson was retained to complete this Phase II ESA by Mr. Peter Dent of 1252103 Ontario Inc. Mr. Dent can be reached by telephone at (613) 723-7490.

2.3 Current and Proposed Future Uses

The subject site is currently occupied by the offices, repair shops, and equipment storage yard of J.R. Brisson Equipment Ltd., a dealer of construction equipment. The site building is present on the eastern portion of the subject site. The subject site was initially developed with the current building in 1956. The subject site may eventually be redeveloped with as a commercial/retail property.

2.4 Applicable Site Condition Standard

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

- Coarse-grained soil conditions
- Non-potable groundwater conditions
- Residential land use

Analytical results were also compared to the MOE Table 1 (background) standards for the purposes of classification of site soils for off-site disposal if required for construction/redevelopment purposes.

3.0 BACKGROUND INFORMATION

3.1 Physical Setting

The subject site is currently occupied by the offices, parts department, and repair shops of J.R. Brisson Equipment and associated paved and gravel vehicle and equipment parking areas. Site topography slopes gently downward towards the north. Drainage consists primarily of sheet flow to catch basins along Industrial Avenue, with minor infiltration in unpaved portions of the site.

Localized soil and pavement staining was observed throughout the subject site, particularly on the exterior of the subject building adjacent to a parts drying rack which apparently drains into a pile of gravel.

No areas of stressed vegetation were noted on the subject site (the site was not vegetated, aside from landscaped areas on the north side of the subject building). No water wells or private sewage systems were observed on the subject property at the time of the site visit. No rail lines or loading areas were observed at the subject site. No unidentified substances were observed on-site. No water bodies are present on the subject site. The nearest significant water body is the Rideau River, located approximately 1.6 km to the west of the site. No Areas of Natural or Scientific Interest (ANSIs) are present within 250 m of the subject site.

3.2 Past Investigations

Paterson has completed a Phase I ESA for the subject site, provided under separate cover. Paterson has not completed any other past investigations at the subject site. A previous Phase I ESA by St. Lawrence Testing and Inspection was available for review. This Phase I ESA did not meet the requirements of O.Reg. 153/04 as amended by O.Reg. 269/11.

As a component of the Phase I ESA, Paterson reviewed various reports for properties within the Phase I study area. The presence of a former bulk fuel depot to the north of the subject site (605 Industrial Avenue) was considered to represent an potential environmental concern with respect to the subject site. No other concerns with respect to the subject site were identified.

4.0 SCOPE OF INVESTIGATION

4.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II ESA consisted of the drilling of nine (9) boreholes at the subject site. Boreholes were drilled through overburden soils to a maximum depth of 3.96 m below ground surface. Groundwater monitoring wells were installed in three (3) of the boreholes.

4.2 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 are BTEX and PHCs. Contaminants of concern for groundwater are BTEX, PHCs and VOCs.

4.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada, drift thickness in the area of the subject site is estimated to be on the order of 2 to 3 m. Overburden soils are shown as glacial till.

Contaminants of Potential Concern

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

- BTEX – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with gasoline and diesel. These parameters were selected as CPCs for the Phase I study area based on equipment maintenance and repair activities at the subject site and the presence of the former fuel terminal at 605 Industrial Avenue. BTEX may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

- Petroleum Hydrocarbons Fractions 1 through 4 (PHCs F1-F4) – this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F1-F4 were selected as CPCs for the Phase I property based on equipment maintenance and repair activities at the subject site and the presence of the former fuel terminal at 605 Industrial Avenue. Gasoline and diesel are commonly used motor vehicle fuels, and diesel-fraction hydrocarbons were commonly used as heating oil. Heavy oils may be present in the form of lubricants and transmission or hydraulic fluids. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs – light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their lower density.

- Volatile Organic Compounds (VOCs) – this suite of parameters includes chlorinated solvents (Tetrachloroethylene, Trichloroethylene, Dichloroethylenes, and Vinyl Chloride) associated with de-greasing and dry cleaning. These parameters were selected as CPCs for the Phase I study area due to the potential historical use of non-hydrocarbon solvents at the subject site. VOCs may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

The mechanisms of contaminant transport within the site soils include physical transportation and leaching. Physical transportation includes any intentional or unintentional movement or distribution of soil by physical means. Contamination arising from localized spills or runoff from the washing area on-site may be physically transported by vehicle movement or site grading. Leaching may occur in areas where the ground surface consists of gravel or where asphalt quality is poor; precipitation infiltrating in these areas may transport surficial contaminants into lower strata. As such, this mechanism represents a potential pathway for soil contaminants to migrate into site groundwater.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion. Advection and dispersion will be the dominant mechanisms of contaminant transport in soils with higher hydraulic conductivities, such as sands, gravels, silts, and some glacial till soils, whereas diffusion will dominate in soils with lower hydraulic conductivity, such as clays.

Existing Buildings and Structures

The subject site is occupied by a two-storey steel-frame slab-on-grade building, housing the offices and shops of J.R. Brisson Equipment. The building is currently heated with gas. The building was constructed in the early 1950s with an addition added between 1985 and 1991.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is the Rideau River, located approximately 1.6 km to the west of the site.

Areas of Natural Significance

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

Drinking Water Wells

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

Neighbouring Land Use

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

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Potentially Contaminating Activities and Areas of Potential Environmental Concern identified include the presence of equipment repair activities, a potential former UST, two exterior ASTs, and a drain on the subject property, as well as the presence of a former bulk fuel depot at 605 Industrial Avenue. Additional Potentially Contaminating Activities were identified within the Phase I study area but were not considered to represent Areas of Potential Environmental Concern.

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 and neighbouring properties which have the potential to have impacted the subject site. The presence of potentially contaminating activities was confirmed by a variety of independent sources, including, in some cases, observations made during the Phase I site visit. As such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

4.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Field measurement of water quality parameters was not undertaken due to equipment malfunction in the field. No other deviations were noted.

4.5 Impediments

J.R. Brisson did not permit Paterson to drill boreholes on the interior of the subject building. No other physical impediments or denial of access were encountered during the Phase II Environmental Site Assessment.

5.0 INVESTIGATION METHOD

5.1 Subsurface Investigation

The subsurface investigation was conducted on April 18, 2013, and consisted of the placement of nine (9) boreholes on-site. The boreholes were placed to provide general coverage and to address the Areas of Potential Environmental Concern identified in the Phase I Conceptual Site Model. The boreholes were advanced using a track-mounted GeoProbe direct push drill rig. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Drilling occurred under full-time supervision of Paterson personnel. Borehole locations are shown on Drawing No. PE2979-3 – Test Hole Location Plan, appended to this report.

5.2 Soil Sampling

A total of 23 soil samples were obtained from the boreholes by means of direct push sampling tubes. Direct push samples were taken at approximate 1.22 m intervals. The depths at which direct push samples were obtained from the boreholes are shown as "**SS**" on the Soil Profile and Test Data Sheets, appended to this report. Boreholes were advanced to practical refusal to direct push sampling on inferred bedrock surface.

Site soils consist of fill material over silty sand and silty clay material underlain by glacial till in several boreholes. The fill material varied in thickness between 0.6 and 1.2 m and consisted of sand and gravel with trace silt and crushed stone. The silty sand layer varied between 0.3 and 2.0 m. The glacial till material, encountered in BH1, BH2, BH6, BH8, and BH9, varied in thickness between 0.5 and 2.3 m and consisted of a silty clay matrix with sand and gravel.

5.3 Field Screening Measurements

All soil samples collected underwent a preliminary screening procedure, which included visual screening for colour and evidence of deleterious fill, as well as screening with a RKI Eagle combustible gas detector. The detection limit is 5 ppm, with a precision of +/- 5 ppm.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. The combustible vapour readings ranged from 0 ppm to 410 ppm. Combustible vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

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

5.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed during the drilling program by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. The monitoring wells consisted of 32 mm (1¼") diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details is provided below in Table 1.

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

Table 1: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH3	101.33	2.84	1.32 - 2.84	1.01 - 2.84	0.00 - 1.01	Flushmount
BH5	101.05	2.21	0.99 - 2.21	0.69 - 2.21	0.00 - 0.69	Flushmount
BH7	100.07	2.69	1.17 - 2.69	0.91 - 2.69	0.00 - 0.91	Flushmount

5.5 Field Measurement of Water Quality Parameters

Field measurement of water quality parameters was not undertaken as a part of this assessment due to a battery failure in the field multi-parameter instrument during the sampling event.

5.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MOE 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.

5.7 Analytical Testing

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

Table 2: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed		Rationale
		PHCs F_1-F_4	BTEX	
BH1-SS3	2.44 - 2.49 m; weathered shale	X	X	Upper water table; high vapour readings; close to former UST plus general coverage of garage
BH3-SS3	2.44 - 2.84 m; silty sand	X	X	Upper water table; high vapour readings; close to equipment washing pad plus general coverage of garage.
BH4-SS2	1.22 - 1.62 m; silty sand	X	X	Upper water table; high vapour reading; close to garage and outdoor drain.

Table 3: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX, PHCs F_1-F_4	VOCs	
BH3-GW1	1.01 - 2.84 m; silty sand	X	X	Address concerns associated with garage, exterior drain, wash pad, and floor drains
BH5-GW1	0.69 - 2.21 m; silty sand	X	X	
BH7-GW1	0.91 - 2.69 m; silty sand	X		Address concerns associated with former fuel depot to the north

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.

5.8 Residue Management

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

5.9 Elevation Surveying

Monitoring well locations were surveyed using a laser level. Elevations were surveyed relative to the southeast corner of a catch basin on the south side of Industrial Avenue along the northern site boundary. The elevation of the catch basin was assumed to be 100.00 m ASL. The location of the benchmark is shown on Drawing PE2979-3 – Test Hole Location Plan.

5.10 Quality Assurance and Quality Control Measures

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

6.0 REVIEW AND EVALUATION

6.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets in Appendix 1. Site soils consist of fill overlying silty sand, underlain by an intermittent layer of glacial till. The fill material varied in thickness between 0.6 and 1.2 m and consisted of sand and gravel with trace silt and crushed stone. The silty sand layer varied between 0.3 and 2.0 m. The silty sand material varied from a silt matrix with fine sand to seams of medium to coarse sand with trace silt. Groundwater was generally encountered in the coarser strata within the silty sand layer. The glacial till material, encountered in BH1, BH2, BH6, BH8, and BH9, varied in thickness between 0.5 and 2.3 m and consisted of a silty clay matrix with sand and gravel. Practical refusal to direct push sampling was encountered at depths ranging from 1.6 m to 3.96 m.

Groundwater monitoring wells were installed in the silty sand layer (upper unconfined aquifer/water table) in BH3, BH5, and BH7. Site stratigraphy is shown on Drawing PE2979-5 - Cross-Section A-A'.

6.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on April 25, 2013 using an electronic water level meter. Groundwater levels are summarized below in Table 4. All measurements are relative to the site temporary benchmark.

Table 4: Groundwater Level Measurements - Upper Unit (Silty Clay)

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH3	101.33	1.21	100.12	April 25, 2013
BH5	101.05	1.37	99.68	April 25, 2013
BH7	100.07	1.21	98.86	April 25, 2013

These measurements represent the water levels in the silty sand layer (upper unconfined aquifer). Seasonal variations in groundwater levels may occur.

Based on the groundwater elevations from the April 2013 monitoring event, groundwater contour mapping was completed for the upper unconfined (silty sand) aquifer. Groundwater contours are shown on Drawing PE2979-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a northerly direction. A horizontal hydraulic gradient of approximately 0.02 m/m was calculated.

No free product was observed in the monitoring wells at the subject site.

6.3 Fine-Medium Soil Texture

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

6.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in organic vapour readings of 0 ppm to 410 ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

The organic vapour readings obtained from field screening of soil samples indicates that there is the potential for VOC, PHC F1, or PHC F2 hydrocarbon contamination in select soil samples with higher vapour readings.

6.5 Soil Quality

Three (3) soil samples were submitted for analysis of BTEX and PHCs. The results of the analytical testing are presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 5:
Analytical Test Results – Soil
BTEX/PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			Table 3 Commercial Coarse	Table 1 Commercial
		April 18, 2013				
		BH1-SS3	BH3-SS3	BH4-SS2		
Benzene	0.02	nd	**0.09**	nd	0.32	0.02
Ethylbenzene	0.05	**1.87**	**0.10**	nd	9.5	0.05
Toluene	0.05	0.17	nd	nd	68	0.2
Xylenes	0.05	**3.00**	**0.24**	nd	26	0.05
PHC F1	7	**42**	25	nd	55	25
PHC F2	4	**42**	nd	nd	230	10
PHC F3	8	40	nd	59	1,700	240
PHC F4	6	17	nd	12	3,300	120

Notes:
- MDL – Method Detection Limit
- Nd – not detected above the MDL
- N/V – no value provided by the MOE
- **Bold** – Value exceeds MOE Table 3 standards
- **Bold** - Value exceeds MOE Table 1 background standards

All test results are in compliance with MOE Table 3 standards. Concentrations of ethylbenzene, xylenes, PHC F1, and PHC F2 at BH1-SS3, and benzene, ethylbenzene, and xylenes at BH2-SS3 exceed MOE Table 1 (background) standards. As such, if this soil needs to be hauled off-site for the purpose of site redevelopment, it will not be considered clean fill.

Based on the analytical results, no contaminants were identified as being by-products of chemical or biological transformations which have or may have occurred.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 6.

Table 6: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Benzene	**0.09**	BH3-SS3	2.44 - 2.84 m; silty sand
Ethylbenzene	**1.87**	BH1-SS3	2.44 - 2.49 m; shale
Toluene	0.17	BH1-SS3	2.44 - 2.49 m; shale
Xylenes	**3.00**	BH1-SS3	2.44 - 2.49 m; shale
PHC F1	**42**	BH1-SS3	2.44 - 2.49 m; shale
PHC F2	**42**	BH1-SS3	2.44 - 2.49 m; shale
PHC F3	59	BH4-SS2	1.22 - 1.62 m; silty sand
PHC F4	17	BH1-SS3	2.44 - 2.49 m; shale

Notes:
- **Bold** – Value exceeds MOE Table 3 standards
- **Bold -** Value exceeds MOE Table 1 background standards.

All other parameter concentrations were below laboratory detection limits.

6.6 Groundwater Quality

Groundwater samples from the monitoring wells at BH3, BH5, and BH7 were submitted for laboratory analysis of BTEX, PHCs and VOCs. The groundwater samples were obtained from the screened intervals noted on Table 1, above. 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:
Analytical Test Results – Groundwater
BTEX and PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			Table 3 Commercial Coarse
		April 25, 2013			
		BH3-GW1	BH5-GW1	BH7-GW1	
Benzene	0.05	-	-	nd	44
Ethylbenzene	0.05	-	-	nd	2,300
Toluene	0.05	-	-	nd	18,000
Xylenes	0.05	-	-	nd	4,200
PHCs F1	25	nd	nd	nd	750
PHCs F2	100	nd	nd	nd	150
PHCs F3	100	nd	nd	nd	500
PHCs F4	100	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- Nd – not detected above the MDL
- N/V – no value provided by the MOE
- **Bold** – Value exceeds selected MOE Standard

No BTEX or PHC concentrations were detected above laboratory detection limits. The test results are in compliance with the selected MOE Table 3 standards.

Table 8:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		Table 3 Residential Fine
		April 25, 2013		
		BH3-GW1	BH5-GW1	
Acetone	5.0	nd	nd	130,000
Benzene	0.5	nd	nd	44
Bromodichloromethane	0.5	nd	nd	85,000
Bromoform	0.5	nd	nd	380
Bromomethane	0.5	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	630
Chloroform	0.5	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	2,300
Hexane	1.0	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	nd	140,000
Methyl tert-butyl Ether	2.0	nd	nd	190
Methylene Chloride	5.0	nd	nd	610
Styrene	0.5	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	1.6
Toluene	0.5	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes	0.5	nd	nd	4,200

Notes:
- MDL – Method Detection Limit nd – not detected above the MDL
- N/V – no value provided by the MOE
- **Bold** – Value exceeds applicable MOE Standard

No VOC concentrations were detected above laboratory detection limits. The test results are in compliance with the selected MOE Table 3 standards.

It is our interpretation that the analyzed parameter concentrations do not indicate the presence of dense non-aqueous phase liquids (DNAPLs) or light non-aqueous phase liquids (LNAPLs).

6.7 Quality Assurance and Quality Control Results

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

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

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

6.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

Potentially Contaminating Activities and Areas of Potential Environmental Concern identified include the presence of equipment repair activities, a former UST, two exterior ASTs, and a drain on the subject property, as well as the presence of a former bulk fuel depot at 605 Industrial Avenue. Additional Potentially Contaminating Activities were identified within the Phase I study area but were not considered to represent Areas of Potential Environmental Concern.

BTEX and PHCs in soil and BTEX, PHCs, and VOCs in groundwater are identified as the Contaminants of Concern with respect to the subject site potentially resulting from these AoPECs.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Gas, water, sewer, and telephone services to the site building are present along the north side of the subject building, running between the building and Industrial Avenue. Electrical services are overhead. A length of apparent buried on-site electrical service was observed in the vehicle/equipment storage yard. In general, service trenches may affect contaminant transport in that trench backfill (generally sand) may provide a preferential pathway; however, contamination was not observed in the vicinity of the service trenches, so their role in contaminant transport is considered to be limited.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawing PE2979-5 - Cross-Section A-A'. Stratigraphy consists of:

- Fill, consisting of sand and gravel with trace silt and crushed stone, varying in thickness from 0.6 to 1.2 m. Groundwater was not observed in this stratigraphic unit.
- Silty sand. This layer varied in thickness from 0.3 to 2.0 m. Groundwater was observed in this stratigraphic unit. All monitoring wells were installed in this stratigraphic unit.
- An intermittent layer of glacial till, consisting of a silty clay matrix with sand and gravel. This layer varied in thickness from 0.5 m to 2.3 m. Groundwater was not encountered in this unit.
- Weathered shale bedrock, encountered at practical refusal to direct push sampling. This is the deepest unit encountered.

Hydrogeological Characteristics

Groundwater was encountered in the silty sand unit at the subject site. The silty sand unit is interpreted to function as a local unconfined aquifer at the subject site.

Water levels were measured at the subject site on April 25, 2013. Water levels are summarized above in Section 6.2 of this report and are shown on Drawing PE2979-4 and PE2979-5.

Based on the groundwater elevations from the April 25, 2013 monitoring event, groundwater contour mapping was completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject site was in a northerly direction. A hydraulic gradient of approximately 0.02 m/m was calculated.

Approximate Depth to Bedrock

Practical refusal to direct push sampling (inferred bedrock surface) was encountered at depths ranging from 1.6 to 3.96 m below ground surface.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 1.21 and 1.37 m below existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site in that the subject site is not a Shallow Soil Property or within 30 m of a water body.

Fill Placement

Fill material was identified at the subject site. This fill material did not exhibit any visual or olfactory evidence of contamination, except in areas of localized surficial staining. This fill material was likely placed at the time of site development.

It is recommended that the fill material be tested if it is to be hauled off-site concurrently with site redevelopment.

Proposed Buildings and Other Structures

It is our understanding that the site is to be redeveloped at a later date with a commercial development. No further information is available regarding the proposed redevelopment.

Existing Buildings and Structures

The subject site is currently occupied by a two-storey steel-frame slab-on-grade building, containing the offices, parts department, and garages of J.R. Brisson Equipment.

Water Bodies

No creeks, rivers, streams, lakes or any other water body was identified on the subject site. The Rideau River is the closest significant water body and is present approximately 1.6 km west of the site.

Areas of Natural Significance

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

Environmental Condition

Areas Where Contaminants are Present

All analytical test results were in compliance with MOE Table 3 standards. Based on screening and analytical results, the area where contaminants are present in concentrations greater than the MOE Table 1 standards are shown on Drawing PE2979-3 and PE2979-5. Localized surficial staining was observed at various locations on the subject site, and given the presence of floor drains and oil-water separators in the subject building, it remains a possibility that soils exceeding Table 3 standards for BTEX and PHCs may be present beneath the building footprint.

Types of Contaminants

Based on the Areas of Potential Environmental Concern identified as part of the Phase I ESA and analytical testing, contaminants found at concentrations greater than the MOE Table 1 standards at the subject site consist of BTEX and PHCs in soil. All contaminant concentrations in groundwater were below laboratory detection limits.

Contaminated Media

Based on the results of the Phase II ESA, the contaminants of concern are present in the soil on the subject site, specifically in areas adjacent to the building. Analytical testing indicates that the groundwater at the monitoring well locations is not contaminated. However, the possibility remains that contaminated groundwater may be present in the footprint of the site building, particularly in the vicinity of the former UST, floor drains and the oil-water separator.

What Is Known About Areas Where Contaminants Are Present

The area of impacted soil exceeding Table 1 standards discussed in the previous sections is interpreted to be centered around the garage portion of the subject building. It is our interpretation that soil impacts likely extend beneath the footprint of the subject building, particularly in the vicinity of the former UST, floor drains, and the oil-water separator.

Distribution of Contaminants

The horizontal distribution of contaminants is considered to be centered around the garage portion of the subject building. The vertical distribution is considered to be confined to the fill and silty sand layer, given the comparatively lower permeability of the glacial till layer.

Discharge of Contaminants

It is our interpretation that the presence of contaminants on-site is a result of various leaks and spills over an extended period of time associated with vehicle maintenance, repair, and fuelling activities, and in the case of the exterior drain near BH4, the drip-drying of parts following cleaning.

Migration of Contaminants

Given the vapour survey results completed as part of the Phase II ESA, it is our interpretation that migration of contaminants within site soils is limited and areas of impacted soil are generally centered around the garage portion of the subject building. However, it is also noted that localized staining of the ground surface was noted throughout the subject site.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally. Based on the results of the subsurface investigation, the areas of impacted soil appear to be restricted to the overburden soils, and as such, the aforementioned climatic and meteorological conditions are not considered to have affected contaminant distribution at the subject site.

Potential for Vapour Intrusion

Although BTEX and PHC F1 were detected in site soils, concentrations were in compliance with Table 3 standards. The potential for vapour intrusion into the current site building is considered to be limited, given the site's current use as an equipment repair and maintenance garage, and its slab-on-grade construction with bay doors. It is our understanding that if the site is to be redeveloped, any impacted soils encountered during redevelopment will be removed, and as such the potential for vapour intrusion upon site redevelopment is considered negligible.

7.0 CONCLUSIONS

A Phase II ESA was conducted for the property at 564 Industrial Avenue, Ottawa, Ontario. The purpose of the Phase II ESA was to address areas of potential environmental concern identified during the Phase I ESA, in particular the presence of a former UST, current ASTs, floor drains and oil/water separators, an exterior drain associated with a parts drying rack, and various concerns associated with vehicle and equipment maintenance and repair at the subject site, as well as the former presence of a bulk fuel depot to the northeast of the subject site. The Phase II ESA consisted of the drilling of nine (9) boreholes and the installation of three (3) monitoring wells.

Soil samples were obtained from the boreholes and were screened using visual observations and organic vapour measurements. Based on the screening results, a total of three (3) soil samples were submitted for analysis of BTEX and PHCs. All sample results were in compliance with MOE Table 3 standards; however, samples BH1-SS3 and BH3-SS3 exceeded MOE Table 1 standards.

Groundwater samples were obtained from the monitoring wells at BH3, BH5, and BH7 and analyzed for BTEX, PHCs, and VOCs. All analytical results were in compliance with MOE Table 3 standards.

Recommendations

Based on the above results and on our observations, soils are present at the subject site which meet MOE Table 3 standards yet exceed MOE Table 1 (background) standards. Given the current use of the subject property, no immediate remedial action is required. It is our understanding that the subject site will eventually be redeveloped with commercial buildings, and that the existing building is to be demolished. If the redevelopment of the site requires soil to be hauled off-site, soils exceeding the Table 1 standards cannot be hauled as clean fill.

Furthermore, it is our opinion that additional impacted soils are likely present beneath the subject building, specifically beneath floor drains, the oil-water separator, and in the vicinity of the former underground storage tank. These soils could not be tested due to inability to access the interior of the building for borehole drilling purposes. As such, isolated pockets of contaminated soil may exist within the subject building footprint. If encountered, these soils may be remediated concurrently with building demolition and site redevelopment.

8.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with the agreed scope-of-work, in compliance 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 1252103 Ontario Inc. Permission and notification from 1252103 Ontario Inc. and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Daniel J. Arnott, P.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- 1252103 Ontario Inc. (2 cpoies + 1 PDF copy)
- Paterson Group (1 copy)

FIGURES

FIGURE 1 – KEY PLAN

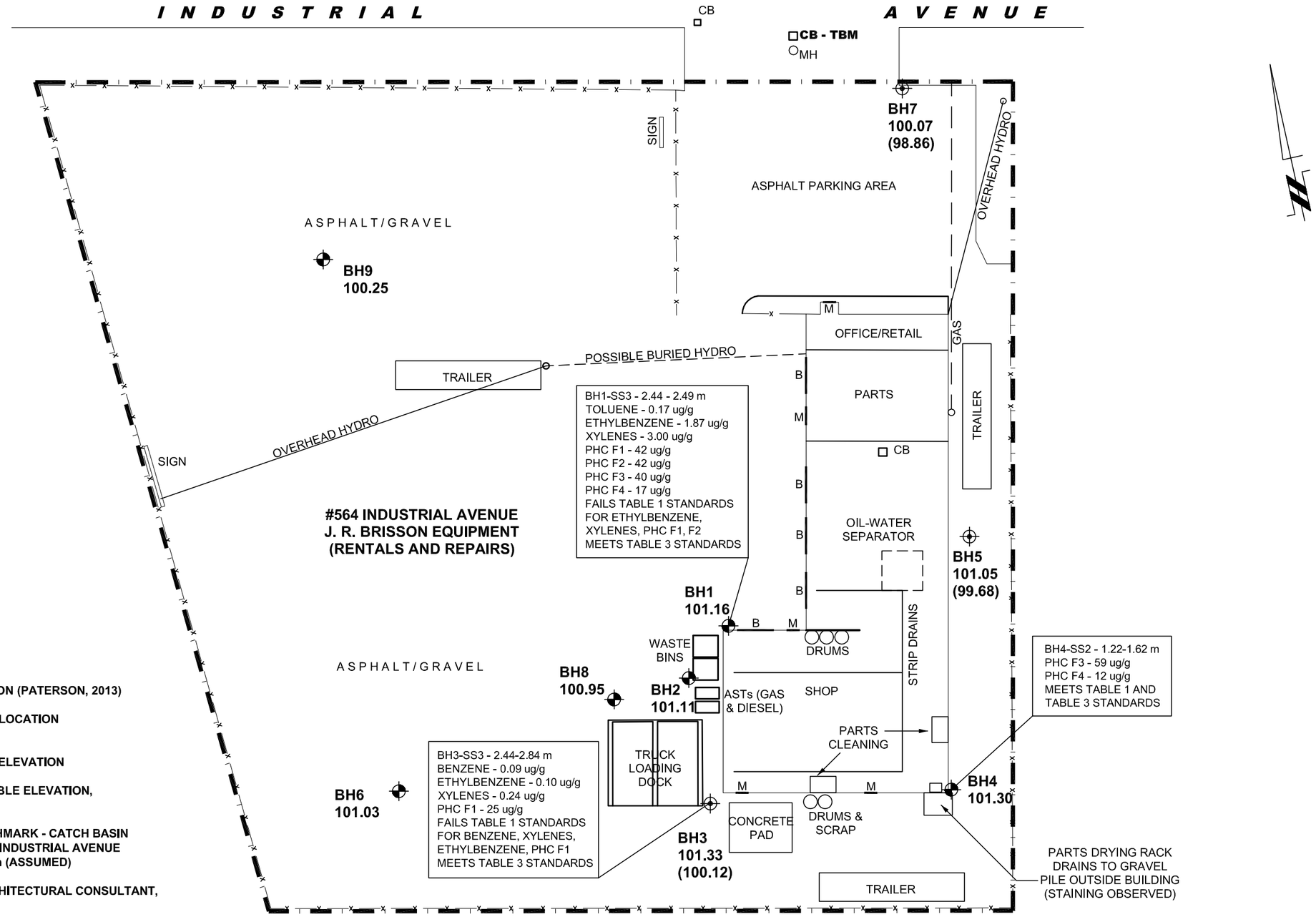
DRAWING PE2930-3 – TEST HOLE LOCATION PLAN

DRAWING PE2930-4 - GROUNDWATER CONTOUR PLAN

DRAWING PE2930-5 - CROSS-SECTIONS

FIGURE 1

KEY PLAN



LEGEND

- BOREHOLE LOCATION (PATERSON, 2013)
- MONITORING WELL LOCATION (PATERSON, 2013)
- 101.16 GROUND SURFACE ELEVATION
- (100.12) GROUNDWATER TABLE ELEVATION, APRIL 2013
- CB - TBM TEMPORARY BENCHMARK - CATCH BASIN ON SOUTH SIDE OF INDUSTRIAL AVENUE ELEVATION 100.00 m (ASSUMED)

BASE PLAN BY D.A. SMITH ARCHITECTURAL CONSULTANT, OCTOBER 1991.

paterson group
consulting engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Scale:	1:400
Des.:	DJA
Dwn:	DJA
Chkd:	MSD

1252103 ONTARIO INC.

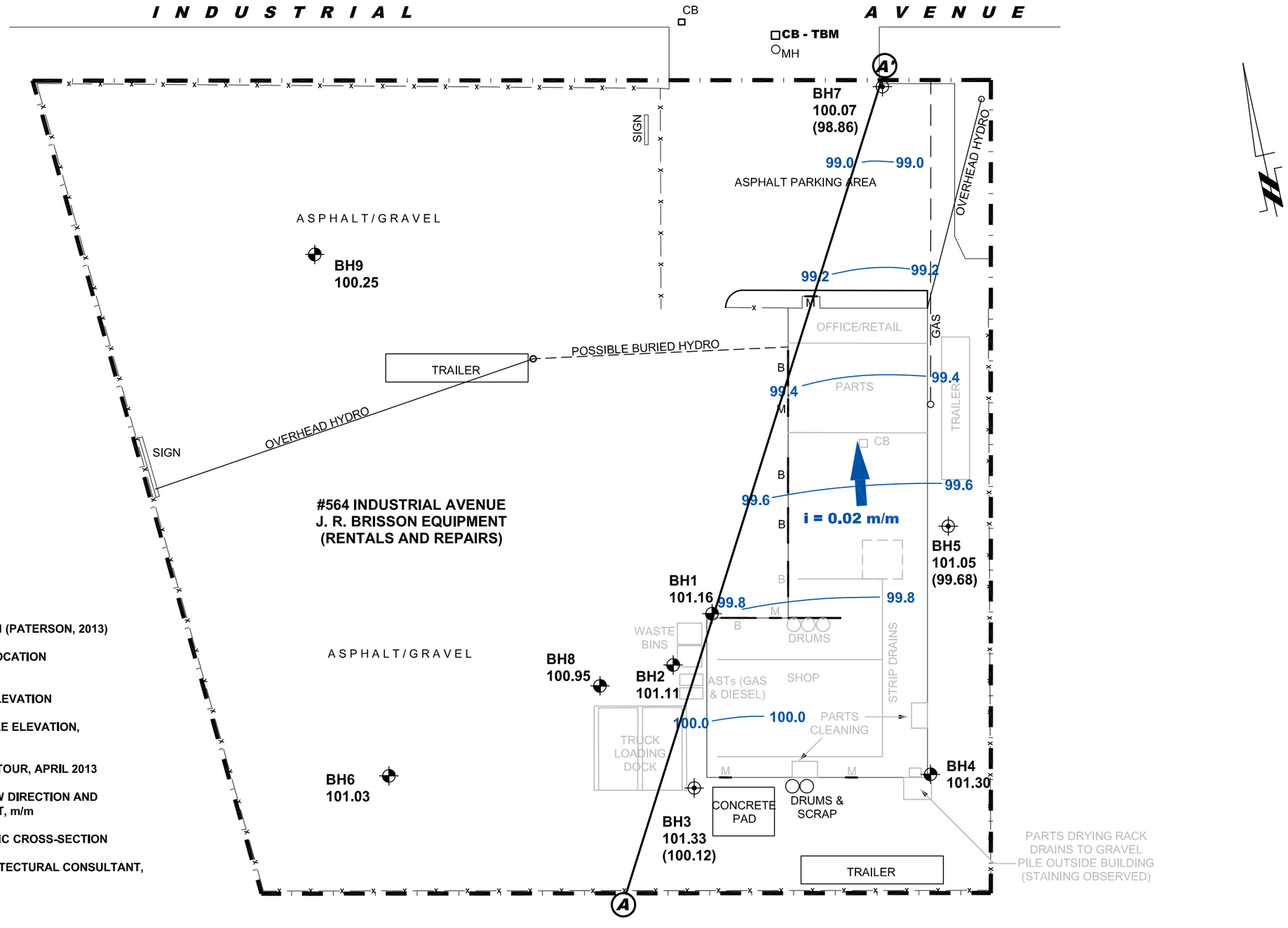
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
564 INDUSTRIAL AVENUE

OTTAWA, ONTARIO

TEST HOLE LOCATION PLAN

Dwg. No. PE2979-3
Report No.: PE2979-2
Date: 04/2013

11x17



LEGEND

- BOREHOLE LOCATION (PATERSON, 2013)
- MONITORING WELL LOCATION (PATERSON, 2013)
- 101.16 — GROUND SURFACE ELEVATION
- (100.12) — GROUNDWATER TABLE ELEVATION, APRIL 2013
- 99.0 — GROUNDWATER CONTOUR, APRIL 2013
- i = 0.02 m/m — GROUNDWATER FLOW DIRECTION AND HYDRAULIC GRADIENT, m/m
- HYDROSTRATIGRAPHIC CROSS-SECTION

BASE PLAN BY D.A. SMITH ARCHITECTURAL CONSULTANT, OCTOBER 1991.

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consulting engineers
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Scale:	1:400
Des.:	DJA
Dwn:	DJA
Chkd:	MSD

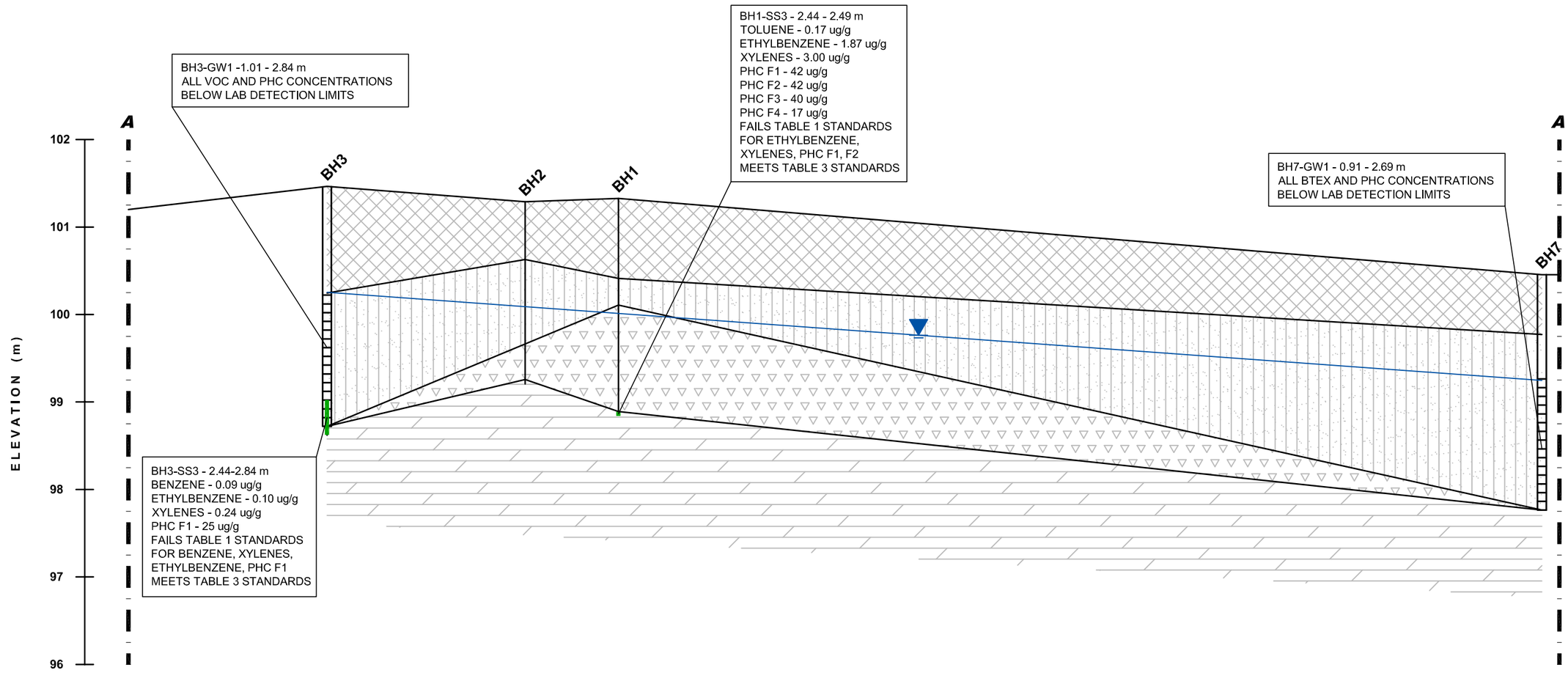
1252103 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
564 INDUSTRIAL AVENUE
OTTAWA, ONTARIO

GROUNDWATER CONTOUR PLAN

Dwg. No. PE2979-4
Report No.: PE2979-2
Date: 04/2013

11x17



LEGEND

- FILL: SAND AND GRAVEL
- SILTY SAND
- GLACIAL TILL: SILTY CLAY WITH SAND AND GRAVEL
- BEDROCK (SHALE)
- GROUNDWATER TABLE ELEVATION, APRIL 2013

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Scale:	1:250 H; 1:50 V
Des.:	DJA
Dwn:	DJA
Chkd:	MSD

1252103 ONTARIO INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
564 INDUSTRIAL AVENUE
OTTAWA, ONTARIO

CROSS-SECTION A-A'

Dwg. No. PE2979-5
Report No.: PE2979-2
Date: 05/2013

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

Prepared For

1252103 Ontario Inc.

April 2013

Report: PE2979-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by 1252103 Ontario Inc. to conduct a Phase II Environmental Site Assessment (ESA) for the property at 564 Industrial Avenue, Ottawa, Ontario. Based on the results of a Phase I ESA completed by Paterson for the subject property, the following subsurface investigation program was developed:

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Located adjacent to addition portion of site building to address floor drains and former UST	Terminated at practical refusal to direct-push sampling.
BH2	Located to address current ASTs, former UST, and floor drains	Terminated at practical refusal to direct-push sampling.
BH3	Located to address former UST, floor drains, and runoff from wash pad. Monitoring well installed.	Terminated at practical refusal to direct-push sampling. Monitoring well screened to straddle water table.
BH4	Located to address staining observed during Phase I ESA	Terminated at practical refusal to direct-push sampling.
BH5	Located to address floor drains and oil-water separator. Monitoring well installed.	Terminated at practical refusal to direct-push sampling. Monitoring well screened to straddle water table.
BH6	Located to address fill material	Terminated at practical refusal to direct-push sampling.
BH7	Located to address any potential impacts from off-site source, i.e. former bulk fuel depot to the northeast of the site. Monitoring well installed.	Terminated at practical refusal to direct-push sampling. Monitoring well screened to straddle water table.
BH8	Located in field to delineate western extent of any potential impacts encountered in BH1, BH2.	Terminated at practical refusal to direct-push sampling.
BH9	Located for general site coverage.	Terminated at practical refusal to direct-push sampling.

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

At each borehole, direct-push samples of overburden soils will be obtained at 1.2 m (4'0") intervals until practical refusal to direct push sampling. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

- Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).
- Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.
- At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.
- Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure (Direct-Push)

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
- 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 (Direct Push)

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:

- For direct-push sampling, samples are obtained using disposable plastic liners which fit within the casing and drive shoe assembly. Each sample run and liner are 1.2 m (4') in length. Plastic liners are discarded after every sample to minimize the potential for cross-contamination.
- If two or more stratigraphic units are present within a 1.2 m sampling run, these units should be measured, segregated, and retained in separate bags.
- If a single stratigraphic unit is present within a 1.2 m sampling run, the sampling run should be split into two 0.6 m sections and retained in separate bags to provide more accurate vertical resolution when delineating potential contamination.
- 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.
- 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.

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 or using direct-push rig)
- 5' x 2" threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" if installing in cored hole in bedrock or using direct-push rig)
- 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 or casing, 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.

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 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 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 the laboratory detection limit.

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. **PE2979**

REMARKS

HOLE NO. **BH 1**

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.16
FILL: List to medium brown sand with silt, clay and gravel		SS	1	79			
0.91						1	100.16
Brown **SILTY SAND**							
1.22							
GLACIAL TILL: silty clay with sand and gravel		SS	2	92		2	99.16
2.44							
BEDROCK: Weathered shale 2.49		SS	3	100			
End of Borehole							
Practical refusal to augering @ 2.49m 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

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 2

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	101.11		
FILL: Brown sand and gravel, trace silt and clay									
0.66		S	1	67					
Light brown **SILTY SAND** with trace organics to 0.8m depth						1	100.11		
1.63		SS	2	100					
GLACIAL TILL: Silty clay with sand and gravel									
-weathered shale @ 2.03m depth 2.09						2	99.11		
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.

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 3

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	101.33
ASPHALTIC CONCRETE 0.03							
FILL: Sand and gravel with silt and crushed stone		SS	1	35		1	100.33
1.22							
Coarse **SILTY SAND**		SS	2	0		2	99.33
		SS	3	100			
2.74							
BEDROCK: Weathered shale 2.84							
End of Borehole							
Practical refusal to augering @ 2.84m depth							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 4

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	101.30		
FILL: Sand and gravel with silty clay		SS	1	79					
						1	100.30		
1.22									
SILTY SAND with clay and gravel		SS	2	100					
1.52									
BEDROCK: Weathered shale 1.62									
End of Borehole									
Practical refusal to augering @ 1.62m 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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 5

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
ASPHALTIC CONCRETE	0.05						0	101.05
FILL: Gravel	0.30							
FILL: Sand with silt, clay and gravel	1.02		SS	1	75		1	100.05
SILTY SAND, trace clay			SS	2	100		2	99.05
End of Borehole	2.21							
Practical refusal to augering @ 2.21m depth								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 6

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	101.03		
FILL: sand and gravel, trace silt and clay									
0.61		SS	1	67					
SILTY SAND						1	100.03		
1.52									
GLACIAL TILL: Dark brown-grey silty clay with sand and gravel		SS	2	94		2	99.03		
2.13									
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.

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 7

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.07
ASPHALTIC CONCRETE 0.05							
FILL: Crushed stone 0.45							
FILL: Light brown sand and gravel, trace silt 0.68		SS	1	79		1	99.07
SILTY SAND, trace clay		SS	2	100		2	98.07
2.44							
Grey **SILT** 2.69		SS	3	100			
End of Borehole							
Practical refusal to augering @ 2.69m depth							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 8

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.95
FILL: Brown sand and travel, trace silty clay		SS	1	67			
0.69							
SILTY SAND						1	99.95
1.37							
GLACIAL TILL: Dark grey silty clay with sand and gravel		SS	2	100			
2.03						2	98.95
End of Borehole							
Practical refusal to augering @ 2.03m depth							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
564 Industrial Avenue
Ottawa, Ontario

DATUM TBM - Top of catch basin. Assumed elevation 100.00m.

FILE NO. PE2979

REMARKS

HOLE NO. BH 9

BORINGS BY Geo Probe **DATE** April 18, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	100.25		
FILL: Brown silty sand, trace clay and crushed stone		SS	1	71					
0.84						1	99.25		
Grey **SILTY CLAY**, trace organics									
1.67		SS	2	100		2	98.25		
GLACIAL TILL: Silty clay with sand and gravel									
		SS	3	100		3	97.25		
		SS	4	100					
3.96									
End of Borehole									

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

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

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

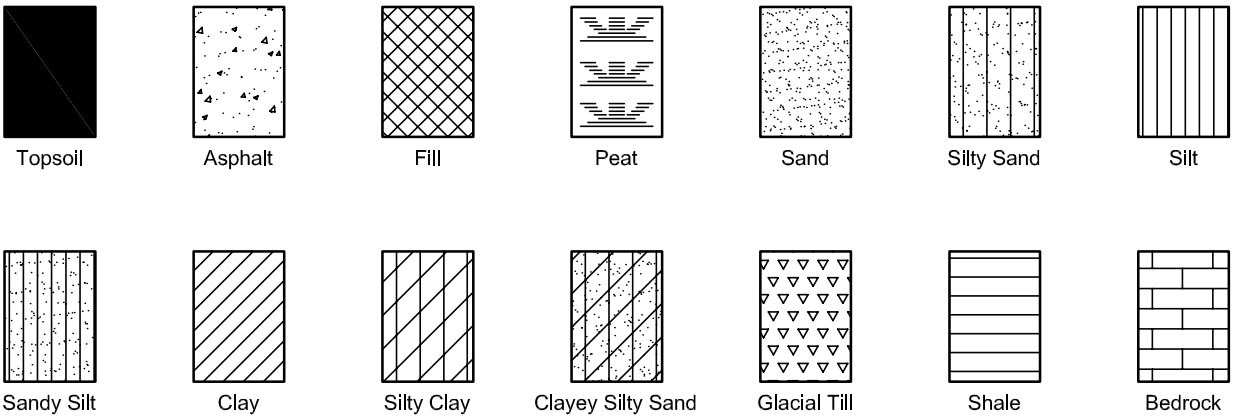
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

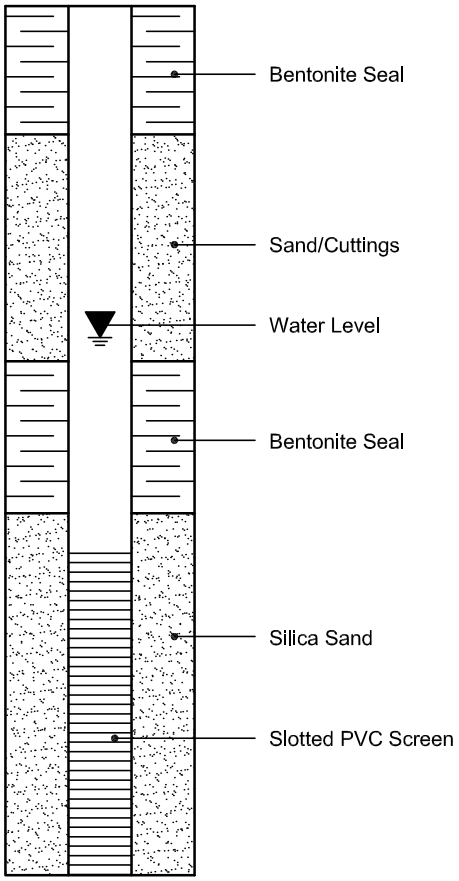
SYMBOLS AND TERMS (continued)

STRATA PLOT

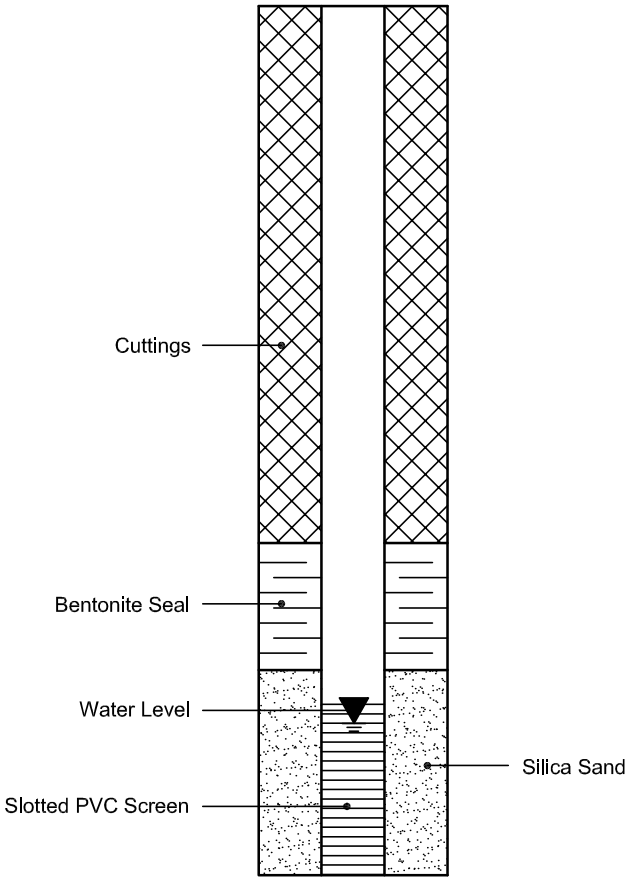


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers
154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Dan Arnott

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

Client PO: 14293
Project: PE2979
Custody: 8189

Report Date: 25-Apr-2013
Order Date: 19-Apr-2013
Order #: 1316253

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

Paracel ID	Client ID
1316253-01	BH1-SS3
1316253-02	BH3-SS3
1316253-03	BH4-SS2

Approved By:

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 25-Apr-2013
Order Date:19-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14293 Project Description: PE2979

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	22-Apr-13	23-Apr-13
PHC F1	CWS Tier 1 - P&T GC-FID	22-Apr-13	23-Apr-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	23-Apr-13	24-Apr-13
Solids, %	Gravimetric, calculation	20-Apr-13	20-Apr-13

Certificate of Analysis

Report Date: 25-Apr-2013
Order Date:19-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14293

Project Description: PE2979

	Client ID:	BH1-SS3	BH3-SS3	BH4-SS2	-
	Sample Date:	18-Apr-13	18-Apr-13	18-Apr-13	-
	Sample ID:	1316253-01	1316253-02	1316253-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	96.1	86.1	85.0	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	0.09	<0.02	-
Ethylbenzene	0.05 ug/g dry	1.87	0.10	<0.05	-
Toluene	0.05 ug/g dry	0.17	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	2.72	0.19	<0.05	-
o-Xylene	0.05 ug/g dry	0.28	0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	3.00	0.24	<0.05	-
Toluene-d8	Surrogate	108%	110%	109%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	42	25	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	42	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	40	<8	59	-
F4 PHCs (C34-C50)	6 ug/g dry	17	<6	12	-

Certificate of Analysis

Report Date: 25-Apr-2013
Order Date:19-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14293 Project Description: PE2979

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	*7.34*		*ug/g*		*91.7*	*50-140*			

Certificate of Analysis

Report Date: 25-Apr-2013
Order Date:19-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14293 Project Description: PE2979

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)	188	8	ug/g dry	188			0.0	30	
F4 PHCs (C34-C50)	137	6	ug/g dry	122			11.9	30	
Physical Characteristics									
% Solids	81.9	0.1	% by Wt.	81.4			0.7	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	*5.73*		*ug/g dry*	*ND*	*111*	*50-140*			

Certificate of Analysis

Report Date: 25-Apr-2013
Order Date:19-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14293 Project Description: PE2979

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	197	7	ug/g	ND	98.7	80-120			
F2 PHCs (C10-C16)	98	4	ug/g	ND	79.1	60-140			
F3 PHCs (C16-C34)	418	8	ug/g	188	89.7	60-140			
F4 PHCs (C34-C50)	306	6	ug/g	122	107	60-140			
Volatiles									
Benzene	3.11	0.02	ug/g	ND	77.8	60-130			
Ethylbenzene	3.46	0.05	ug/g	ND	86.4	60-130			
Toluene	2.97	0.05	ug/g	ND	74.3	60-130			
m,p-Xylenes	5.66	0.05	ug/g	ND	70.7	60-130			
o-Xylene	3.28	0.05	ug/g	ND	81.9	60-130			
Surrogate: Toluene-d8	*7.63*		*ug/g*		*95.4*	*50-140*			

Certificate of Analysis

Report Date: 25-Apr-2013
Order Date:19-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14293 Project Description: PE2979

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Page 1 of 1

Client Name: Paterson Group Inc.	Project Reference: PE 2979
Contact Name: Dan Arnott	Quote #
Address:	PO # 14293
Telephone:	Email Address: darnott@patersongroup.ca

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Date Required: _____

Criteria: [ ] O. Reg. 153/04 Table __ [X] O. Reg. 153/11 (Current) 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)

Paracel Order Number: 1316253

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	BTEX	PHCs F1-F4	Required Analyses
1	BH1-SS3	S		2	18-APR-13		X	X	60ml + Vial
2	BH3-SS3	S		2	18-APR-13		X	X	
3	BH4-SS2	S		2	18-APR-13		X	X	
4									
5									
6									
7									
8									
9									
10									

Comments:

Method of Delivery: Paracel

Relinquished By (Print & Sign): Dan Arnott DAN ARNOTT	Received by Driver/Depot: T. Decouse	Received at Lab:	Verified By:
Date/Time: 5:20pm 18-APR-2013	Date/Time: 19/04/13 11:52AM	Date/Time: Apr 19/13	Date/Time: Apr 19/13
	Temperature: ____ °C	Temperature: 15.0 °C 1:05pm	pH Verified [ ] By: N/A

1:21p

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Dan Arnott

Phone: (613) 226-7381
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Client PO: 13898
Project: PE2979
Custody: 96000

Report Date: 30-Apr-2013
Order Date: 25-Apr-2013
Order #: 1317230

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

Paracel ID	Client ID
1317230-01	BH3-GW1
1317230-02	BH5-GW1
1317230-03	BH7-GW1

Approved By:

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	26-Apr-13	27-Apr-13
PHC F1	CWS Tier 1 - P&T GC-FID	26-Apr-13	27-Apr-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	29-Apr-13	30-Apr-13
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	26-Apr-13	27-Apr-13

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898

Project Description: PE2979

	Client ID:	BH3-GW1	BH5-GW1	BH7-GW1	-
	Sample Date:	25-Apr-13	25-Apr-13	25-Apr-13	-
	Sample ID:	1317230-01	1317230-02	1317230-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroethane	1.0 ug/L	<1.0	<1.0	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Chloromethane	3.0 ug/L	<3.0	<3.0	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898

Project Description: PE2979

	Client ID:	BH3-GW1	BH5-GW1	BH7-GW1	-
	Sample Date:	25-Apr-13	25-Apr-13	25-Apr-13	-
	Sample ID:	1317230-01	1317230-02	1317230-03	-
	MDL/Units	Water	Water	Water	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Vinyl chloride	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	-	-
4-Bromofluorobenzene	Surrogate	114%	113%	-	-
Dibromofluoromethane	Surrogate	117%	120%	-	-
Toluene-d8	Surrogate	93.8%	90.9%	-	-
Benzene	0.5 ug/L	-	-	<0.5	-
Ethylbenzene	0.5 ug/L	-	-	<0.5	-
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	-	-	91.2%	-
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	-
F3 + F4 PHCs	200 ug/L	-	-	<200	-

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

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						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	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-Dichloroethylene, total	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						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	ND	0.5	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	*36.3*		*ug/L*		*114*	*50-140*			
Surrogate: Dibromofluoromethane	*34.3*		*ug/L*		*107*	*50-140*			
Surrogate: Toluene-d8	*31.4*		*ug/L*		*98.1*	*50-140*			

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*31.4*		*ug/L*		*98.1*	*50-140*			

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

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	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	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	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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	
1,2,4-Trichlorobenzene	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	
1,3,5-Trimethylbenzene	ND	0.5	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	*36.8*		*ug/L*	*ND*	*115*	*50-140*			
Surrogate: Dibromofluoromethane	*35.0*		*ug/L*	*ND*	*109*	*50-140*			
Surrogate: Toluene-d8	*30.5*		*ug/L*	*ND*	*95.4*	*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	

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*30.5*		*ug/L*	*ND*	*95.4*	*50-140*			

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1700	25	ug/L	ND	84.9	68-117			
F2 PHCs (C10-C16)	1660	100	ug/L	ND	92.5	60-140			
F3 PHCs (C16-C34)	3490	100	ug/L	ND	93.9	60-140			
F4 PHCs (C34-C50)	2100	100	ug/L	ND	84.6	60-140			
Volatiles									
Acetone	83.3	5.0	ug/L	ND	83.3	50-140			
Benzene	39.0	0.5	ug/L	ND	97.4	50-140			
Bromodichloromethane	43.3	0.5	ug/L	ND	108	50-140			
Bromoform	43.8	0.5	ug/L	ND	110	50-140			
Bromomethane	38.3	0.5	ug/L	ND	95.8	50-140			
Carbon Tetrachloride	40.8	0.2	ug/L	ND	102	50-140			
Chlorobenzene	37.4	0.5	ug/L	ND	93.5	50-140			
Chloroethane	33.5	1.0	ug/L	ND	83.8	50-140			
Chloroform	38.8	0.5	ug/L	ND	97.0	50-140			
Chloromethane	35.2	3.0	ug/L	ND	87.9	50-140			
Dibromochloromethane	45.1	0.5	ug/L	ND	113	50-140			
Dichlorodifluoromethane	30.2	1.0	ug/L	ND	75.6	50-140			
1,2-Dibromoethane	36.7	0.2	ug/L	ND	91.7	50-140			
1,2-Dichlorobenzene	34.9	0.5	ug/L	ND	87.3	50-140			
1,3-Dichlorobenzene	34.7	0.5	ug/L	ND	86.8	50-140			
1,4-Dichlorobenzene	35.4	0.5	ug/L	2.50	82.3	50-140			
1,1-Dichloroethane	41.5	0.5	ug/L	ND	104	50-140			
1,2-Dichloroethane	39.4	0.5	ug/L	ND	98.5	50-140			
1,1-Dichloroethylene	35.5	0.5	ug/L	ND	88.7	50-140			
cis-1,2-Dichloroethylene	36.6	0.5	ug/L	ND	91.6	50-140			
trans-1,2-Dichloroethylene	37.8	0.5	ug/L	ND	94.6	50-140			
1,2-Dichloropropane	35.8	0.5	ug/L	ND	89.5	50-140			
cis-1,3-Dichloropropylene	32.6	0.5	ug/L	ND	81.6	50-140			
trans-1,3-Dichloropropylene	35.3	0.5	ug/L	ND	88.2	50-140			
Ethylbenzene	35.4	0.5	ug/L	ND	88.5	50-140			
Hexane	30.6	1.0	ug/L	ND	76.5	50-140			
Methyl Ethyl Ketone (2-Butanone)	85.7	5.0	ug/L	ND	85.7	50-140			
Methyl Butyl Ketone (2-Hexanone)	89.5	10.0	ug/L	ND	89.5	50-140			
Methyl Isobutyl Ketone	93.9	5.0	ug/L	ND	93.9	50-140			
Methyl tert-butyl ether	105	2.0	ug/L	ND	105	50-140			
Methylene Chloride	33.4	5.0	ug/L	ND	83.6	50-140			
Styrene	36.0	0.5	ug/L	ND	90.0	50-140			
1,1,1,2-Tetrachloroethane	38.7	0.5	ug/L	ND	96.7	50-140			
1,1,2,2-Tetrachloroethane	38.9	0.5	ug/L	ND	97.4	50-140			
Tetrachloroethylene	33.6	0.5	ug/L	ND	84.0	50-140			
Toluene	36.4	0.5	ug/L	ND	91.0	50-140			
1,2,4-Trichlorobenzene	30.8	0.5	ug/L	ND	76.9	50-140			
1,1,1-Trichloroethane	32.9	0.5	ug/L	ND	82.2	50-140			
1,1,2-Trichloroethane	37.8	0.5	ug/L	ND	94.6	50-140			
Trichloroethylene	35.7	0.5	ug/L	ND	89.3	50-140			
Trichlorofluoromethane	37.7	1.0	ug/L	ND	94.2	50-140			
1,3,5-Trimethylbenzene	35.1	0.5	ug/L	ND	87.8	50-140			
Vinyl chloride	31.8	0.5	ug/L	ND	79.6	50-140			
m,p-Xylenes	79.5	0.5	ug/L	ND	99.4	50-140			

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	43.2	0.5	ug/L	1.98	103	50-140			
Surrogate: 4-Bromofluorobenzene	*27.0*		*ug/L*		*84.3*	*50-140*			
Benzene	39.0	0.5	ug/L	ND	97.4	50-140			
Ethylbenzene	35.4	0.5	ug/L	ND	88.5	50-140			
Toluene	36.4	0.5	ug/L	ND	91.0	50-140			
m,p-Xylenes	79.5	0.5	ug/L	ND	99.4	50-140			
o-Xylene	43.2	0.5	ug/L	1.98	103	50-140			

Certificate of Analysis

Report Date: 30-Apr-2013
Order Date:25-Apr-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 13898 Project Description: PE2979

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Chain of Custody
(Lab Use Only)
Nº 96000

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Client Name: Paterson Group	Project Reference: PE2979	TAT: [X] Regular [ ] 3 Day
Contact Name: Dan Arnott	Quote #	[ ] 2 Day [ ] 1 Day
Address: 154 Colonnade	PO # 13898	Date Required:
Telephone: 613 226-7381	Email Address: darnott@paterson group.ca	

Criteria: [ ] O. Reg. 153/04 Table __ [X] O. Reg. 153/11 (Current) 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: 1317230

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP/MS	Hg	CrVI	B (HWS)							
1	BH3-GW1	GW		3	Apr 25/13	11	X	X												
2	BH5-GW1	GW		3	↓	1130	X	X												
3	BH7-GW1	GW		3	↓	12	X													
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
	T. Decoste	M C	M C
Date/Time:	Date/Time: 25/04/13 3:45PM	Date/Time: Apr 25/13 5:25	Date/Time: Apr 25/13 5:49
	Temperature: ____ °C	Temperature: 14.5 °C	pH Verified [ ] By: N/A