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Phase II Environmental Site Assessment

144 Bentley Avenue
Ottawa, Ontario

Prepared For

Danviwill Holdings Inc.

August 3, 2020

Report: PE4998-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for 144 Bentley Avenue in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address the area of potential environmental concern (APEC) identified on the subject site during the Phase I ESA.

As part of this Phase II ESA, a subsurface investigation program was conducted on August 4, 2020. The field program consisted of advancing five (5) boreholes (BH1-BH5) throughout the subject site, of which three (3) were equipped with groundwater monitoring wells (BH1, BH2, and BH4). The boreholes drilled within the subject area were advanced to depths ranging from approximately 2.13 m to 10.24 m below the existing grade.

Six (6) soil samples were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), and/or metal parameters. Based on the analytical test results, all of the aforementioned parameter concentrations are in compliance with the selected MECP Table 3 standards.

Three (3) groundwater samples, obtained from the monitoring wells installed in boreholes BH1, BH2, and BH4, were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4) and VOC parameters. Based on the analytical test results, all of the aforementioned parameter concentrations are in compliance with the selected MECP Table 3 standards.

Based on the findings of this Phase II ESA and the previous Phase I ESA by Pinchin, it is our opinion that **no further work will be required.**

Recommendations

If the groundwater monitoring wells installed in boreholes BH1, BH2, and BH4 are not going to be used in the future, or will be destroyed during future redevelopment activities, then they must be decommissioned according to Ontario Regulation Reg. 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Mr. Frank Aiello with Danviwill Holdings Inc. Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for 144 Bentley Avenue, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the subject site during the Phase I ESA conducted by Paterson in August, 2020.

1.1 Site Description

Address:	144 Bentley Avenue, Ottawa, Ontario.
Legal Description:	Part of Lots 27 and 28, Concession A, Township of Nepean, in the City of Ottawa, Ontario.
Property Identification Number(s):	04628-0169; 04628-0173
Location:	The site is located on the south side of Bentley Avenue, approximately 0.5km east of Gifford Street, in the City of Ottawa, Ontario. Refer to Figure 1 – Key Plan for the site location
Latitude and Longitude:	45° 20’ 12” N, 75°42’ 35” W
Configuration:	Irregular
Site Area:	0.80 ha (approximate)
Zoning:	IH1 – Heavy Industrial Zone
Current Use:	The subject site is currently a vacant lot part of which is used for parking and storage of equipment and materials.
Services:	The subject site is located in a municipally serviced area.

1.2 Property Ownership

The current owner of the site is Danviwill Holdings Inc. Paterson was retained to complete this Phase II ESA by Mr. Frank Aiello of Danviwill Holdings Inc. Mr. Aiello can be contacted by telephone at 613-724-8518.

1.3 Current and Proposed Future Uses

The subject site is currently a vacant lot with gravel parking throughout and several storage sheds located in the southwest corner.

It is our understanding that the proposed development of the Phase II Property includes a 2-storey commercial building connected to an approximate 6,900 ft^2, 1-storey warehouse building via an enclosed structure, to be situated on the north portion of the site. Associated access lanes, parking areas and landscaped areas are also anticipated at the proposed development.

1.4 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 Ministry of the Environment, Conservation and Parks (MECP), April 2011. The MECP selected Table 3 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Non-potable groundwater conditions
- ❒ Commercial land use

These standards were selected based on the future land use of the subject site. Coarse-grained soil standards, which are considered conservative, were chosen to represent the current site conditions of the Phase II Property.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site occupies a total area of approximately 0.80 ha and consists of a vacant lot part of which is used for parking and storage of equipment and materials.

The site is bordered on the north by Bentley Avenue, on the south by the Smith Falls rail corridor, on the east by an asphaltic tar bulk storage facility, and on the west by a vacant lot and a salvage yard.

The site topography is relatively flat and at grade with the adjacent properties, whereas the regional topography slopes towards the southeast, in the general direction of the Rideau River. Site drainage consists primarily of surficial infiltration with some sheet drainage to the catch basins along the adjacent roadway.

2.2 Past Investigations

The following reports were reviewed prior to conducting this assessment:

- ❒ "Phase II - Environmental Site Assessment, 140-144 Bentley Avenue, Ottawa Ontario", prepared by Pinchin Environmental Ltd., dated June 2010.

- ❒ "Phase I - Environmental Site Assessment, 144 Bentley Avenue, Ottawa Ontario", prepared by Paterson Group Inc., dated August 2020.

The Phase II – ESA completed by Pinchin in June of 2010 highlighted that six (6) boreholes were advanced in April, 2010, all of which were fit with monitoring wells. Four (4) were located on the subject site. It was reported that the groundwater flow was calculated to be towards the north-northeast. Soil and groundwater samples were collected and submitted for chemical analysis of PHCs, volatile organic compounds (VOCs), PAHs and metals. All measured concentrations satisfied their respective Ontario Ministry of the Environment (MOE) Table 3 Standards.

According to the report completed by Paterson in August of 2020, one (1) potentially contaminating activity (PCA), resulting in an area of potential environmental concern (APEC) was identified as pertaining to the subject site. This APEC is described as a bulk storage of asphaltic tar facility, located immediately to the east of the subject site.

Other off-site PCAs were identified within the Phase I study area but were deemed not to be of concern based on their separation distances, down-gradient

or cross-gradient orientations, and the results from the previous Phase II Environmental Site Assessment by Pinchin.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

As part of this Phase II ESA, a subsurface investigation was conducted on August 4, 2020. The field program consisted of advancing five (5) boreholes (BH1-BH5) throughout the subject site, of which three (3) were equipped with groundwater monitoring wells (BH1, BH2, and BH4). The boreholes drilled within the subject area were advanced to depths ranging from approximately 2.13 m to 10.24 m below the existing grade. It should be noted that four (4) former boreholes (BH1-BH4) drilled in 2010 on the subject site for environmental purposes were utilized as part of this environmental investigation.

3.2 Media Investigated

During the subsurface investigation, soil and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these samples is based on the contaminants of potential concern identified in the Phase I ESA.

3.3 Updated Conceptual Site Model

Geological and Hydrogeological Setting

Based on a review of available mapping information and MECP Water Well Records, the bedrock within the area of the subject site consists of dolomite and sandstone of the Beekmantown Group, whereas the surficial geology consists of clay and silt with an overburden thickness ranging from 25 to 50 meters.

The groundwater beneath the subject site was generally encountered within the overburden at a depth of approximately 1 m below ground surface. Based on the local topography, the groundwater is interpreted to be moving in a southeasterly direction towards the Rideau River.

Existing Buildings and Structures

No permanent buildings or structures exist on the subject site aside from several storage sheds present in the southwest corner.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural significance are present on the subject site or within the Phase II study area. The nearest named water body with respect to the subject site is the Rideau River, located approximately 750 meters to the southeast.

Drinking Water Wells

Based on a search of available MECP water well records, no drinking water wells are expected to be present within the Phase II study area.

Neighbouring Land Use

Neighbouring land use within the Phase II study area consists of a asphaltic tar bulk storage facility (east), commercial businesses (north), a rail track (south) and a vacant lot (west). The asphaltic tar bulk storage facility does pose a potential environmental concern with respect to the subject site.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 2, O.Reg. 153/04, as amended, one potentially contaminating activity (PCA) is considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The PCA that is considered to represent an APEC is listed in Table 1, along with the respective location and contaminants of potential concern (CPCs).

TABLE 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1 (Resulting from an existing off-site asphaltic tar bulk storage facility)	Northeast portion of the Phase II Property	PCA 5 – Asphalt and Bitumen Manufacturing	Off-site	PHCs BTEX VOCs	Soil, Groundwater

Several off-site PCAs were identified within the Phase II Study Area, however, based on separation distances, down-gradient or cross-gradient orientation with respect to the subject land, and the results from the previous Phase II Environmental Site Assessment by Pinchin, other off-site PCAs are not considered to represent APECs on the Phase II Property.

Contaminants of Potential Concern

The contaminants of potential concern (CPCs) associated with the aforementioned APEC are considered to be:

- PHCs (petroleum hydrocarbons, fractions F_1-F_4);
- BTEX (benzene, toluene, ethylbenzene, and xylenes);
- VOCs (volatile organic compounds).

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are PCAs and APECs associated with the subject site. The presence of these PCAs were confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from the Sampling and Analysis Plan

The Sampling and Analysis Plan (SAP) for this project is included in Appendix 1 of this report. No deviations were made from the SAP.

3.5 Impediments

No physical impediments or denial of access was encountered during the course of this Phase II ESA Update.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

As part of this Phase II ESA, a subsurface investigation was conducted on August 4, 2020. The field program consisted of advancing five (5) boreholes (BH1-BH5) throughout the subject site, of which three (3) were equipped with groundwater monitoring wells (BH1, BH2, and BH4). It should be noted that four (4) former boreholes (BH1-BH4) drilled in 2010 on the subject site for environmental purposes were utilized as part of this environmental investigation.

The boreholes drilled within the subject area were advanced to depths ranging from approximately 2.13 m to 10.24 m below the existing grade under the full-time supervision of Paterson personnel. The boreholes were drilled using a track-mounted auger drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. The borehole locations are shown on Drawing PE4998-3 – Test Hole Location Plan, in the Figures section of this report.

4.2 Soil Sampling

A total of forty-two (42) soil samples were obtained from the boreholes placed within the subject site by means of auger and split spoon sampling, taken at approximately 0.76 m intervals. The depths at which the auger and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**", respectively, on the Soil Profile and Test Data Sheets, appended to this report.

Soil conditions encountered in the boreholes consisted of a fill layer, over a very stiff brown silty clay layer underlain by a deep deposit of stiff grey silty clay. The fill material consisted of either crushed stone (gravel) or reworked native soil. Bedrock was not encountered at any of the borehole locations at the time of the drilling program. A dynamic cone penetration test was conducted with refusal at 10.24 m on possible bedrock surface.

4.3 Field Screening Measurements

All soil samples obtained from the boreholes were subjected to a preliminary screening procedure, which included a visual screening for colour and evidence of metals, as well as soil vapour screening with a MiniRAE 2000 Portable VOC Monitor.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. The samples were then agitated/manipulated gently as the measurements were taken, and the peak reading registered within the first 15 seconds was recorded as the vapour measurement.

The soil vapour readings were measured to range from 0 to 1.6 parts per million (ppm). The measured vapour readings are depicted on the Soil Profile and Test Data Sheets in Appendix 1.

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the subject site as part of this Phase II ESA. The monitoring wells were constructed using 50 mm (2") 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. A summary of the monitoring well construction details are listed below in Table 2 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

Upon completion, the groundwater monitoring wells were developed using a dedicated inertial lift pump, with a minimum of three (3) well volumes being removed from the wells at the time of installation. The wells were developed until the appearance of the water was noted to be stabilized.

Table 2
Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m ASL)	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	88.52	6.70	3.65 - 6.70	2.74 - 6.70	0.13 - 2.74	Flushmount
BH2	88.27	6.40	3.35 - 6.40	2.74 - 6.40	0.13 - 2.74	Flushmount
BH4	89.22	6.40	3.35 - 6.40	2.74 - 6.40	0.13 - 2.74	Flushmount

4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996. Groundwater samples were obtained from the monitoring wells installed in boreholes BH1, BH2, and BH4, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.6 Residue Management

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

4.7 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis as part of this Phase II ESA Update:

Table 3
Soil Samples Submitted for Testing

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX	PHCs (F_1-F_4)	Metals	
August 4, 2020					
BH1-SS2	0.76 – 1.37 m (Silty Clay)			X	To assess for potential impacts resulting from the presence of the asphaltic tar bulk storage facility immediately adjacent to the east.
BH1-MTOV-15'-16'	4.57 – 4.87 m (Silty Clay)	X	X		
BH3-MTOV-15'-16'	4.57 – 4.87 m (Silty Clay)	X	X		
BH4-AU1	0.00 – 0.61 m (Fill Material)	X	X		To assess for potential impacts in the fill material.
BH4-SS2	0.76 – 1.37 m (Fill Material)			X	
BH4-MTOV-15'-16'	4.57 – 4.87 m (Silty Clay)	X	X		To assess for potential impacts resulting from the presence of the asphaltic tar bulk storage facility immediately adjacent to the east.

Table 4
Groundwater Samples Submitted for Testing

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX	PHCs (F_1-F_4)	VOCs	
August 10, 2020					
BH1-GW1	3.66 – 6.10 m (Silty Clay)	X	X	X	To assess for potential impacts resulting from the presence of the asphaltic tar bulk storage facility immediately adjacent to the east.
BH2-GW1	3.66 – 6.40 m (Silty Clay)	X	X	X	
BH4-GW1	3.36 – 6.40 m (Silty Clay)	X	X	X	
DUP(BH2-GW1)	3.66 – 6.40 m (Silty Clay)			X	Quality Analysis / Quality Control

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

4.8 Elevation Surveying

All borehole and groundwater monitoring well locations were surveyed using a GPS device and referenced to a known geodetic datum. The locations and elevations of the boreholes are depicted on Drawing PE4998-1 – Test Hole Location Plan, appended to this report.

4.9 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Overburden soils at the subject site generally consisted of a fill layer, underlain by a very stiff brown silty clay layer underlain by a deep deposit of stiff grey silty clay.

The fill layer ranged from approximately 0.5 m to 1.3 m below the existing ground surface. The fill material consisted of either crushed stone (gravel) or reworked native soil and no deleterious substances or any unusual visual observations were noted within the fill at the time of the drilling program.

Bedrock was not confirmed at any of the borehole locations at the time of the drilling program.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter at the monitoring wells installed in BH1, BH2, and BH4, on August 10, 2020. The measured groundwater levels are summarized below in Table 5.

Table 5
Groundwater Level Measurements

Well ID	Ground Surface Elevation (m ASL)	Water Level Depth (m BGS)	Water Level Elevation (m ASL)	Date of Measurement
BH1	88.52	0.86	87.66	August 10, 2020
BH2	88.27	1.07	87.20	August 10, 2020
BH4	89.22	1.51	87.71	August 10, 2020

The groundwater at BH1, BH2, and BH4, was encountered within the underlying silty clay, although this is considered likely to be a perched water condition. The groundwater level was measured at depths ranging from 0.86 m to 1.51 m below the existing ground surface. The previously completed Phase II Environmental Site Assessment by Pinchin reported groundwater levels measured at depths ranging from 0.41 m to 3.11 m. No unusual odours or visual observations were noted within the purged groundwater at the time of the sampling event.

Using the groundwater elevations recorded during the August 10, 2020 sampling event, a groundwater contour plan was completed. The groundwater contour mapping is shown Drawing PE4998-3 – Test Hole Location Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property is in a

westerly direction. A hydraulic gradient of approximately 0.0136 m/m was calculated.

It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

5.3 Fine-Coarse Soil Texture

Grain size analysis was not completed as part of this investigation. Coarse grained soil standards were chosen as a conservative approach.

5.4 Soil Quality

Six (6) soil samples were submitted for laboratory analysis of either: BTEX, PHCs, and/or metals parameters. The results of the analytical testing are presented below in Tables 6 and 7, as well as on the laboratory certificates of analysis in Appendix 1.

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

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 4, 2020				MECP Table 3 Standards (µg/g)
		BH1-MTOV-15'-16'	BH3-MTOV-15'-16'	BH4-AU1	BH4-MTOV-15'-16'	
Benzene	0.02	nd	nd	nd	nd	0.32
Ethylbenzene	0.05	nd	nd	nd	nd	9.5
Toluene	0.05	nd	nd	nd	nd	68
Xylenes	0.05	nd	nd	nd	nd	26
PHCs F_1	7	nd	nd	nd	nd	55
PHCs F_2	4	nd	nd	nd	nd	230
PHCs F_3	8	nd	nd	190	nd	1,700
PHCs F_4	6	nd	nd	72	nd	3,300

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

All BTEX and PHC concentrations are in compliance with the selected MECP Table 3 standards.

Table 7
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 4, 2020		MECP Table 3 Standards (µg/g)
		BH1-SS2	BH4-SS2	
Antimony	1	nd	nd	40
Arsenic	1	3.3	2.1	18
Barium	1	194	58.4	670
Beryllium	0.5	0.7	nd	8
Boron	5.0	nd	nd	120
Cadmium	0.5	nd	nd	1.9
Chromium	5	62.8	23.1	160
Cobalt	1	12.0	4.9	80
Copper	5	15.2	7.1	230
Lead	1	10.7	7.2	120
Molybdenum	1	nd	nd	40
Nickel	5	28.3	12.7	270
Selenium	1	nd	nd	5.5
Silver	0.3	nd	nd	40
Thallium	1	nd	nd	3.3
Uranium	1	1.5	nd	33
Vanadium	10	57.0	37.5	86
Zinc	20	78.6	47.6	340

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

All detected metal parameter concentrations are in compliance with the selected MECP Table 3 standards.

Table 8
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
PHCs F_3	190	BH4-AU1	0.00-0.61
PHCs F_4	72	BH4-AU1	0.00-0.61
Arsenic	3.3	BH1-SS2	0.76 – 1.37
Barium	194	BH1-SS2	0.76 – 1.37
Beryllium	0.7	BH1-SS2	0.76 – 1.37
Chromium	62.8	BH1-SS2	0.76 – 1.37
Cobalt	12.0	BH1-SS2	0.76 – 1.37
Copper	15.2	BH1-SS2	0.76 – 1.37
Lead	10.7	BH1-SS2	0.76 – 1.37
Nickel	28.3	BH1-SS2	0.76 – 1.37

Table 8
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
Uranium	1.5	BH1-SS2	0.76 – 1.37
Vanadium	57.0	BH1-SS2	0.76 – 1.37
Zinc	78.6	BH1-SS2	0.76 – 1.37

The maximum BTEX, PHC and metals concentrations in the soil samples analyzed are in compliance with the selected MECP Table 3 Standards. The remaining parameters were not detected above the laboratory detection limits.

5.5 Groundwater Quality

Three (3) groundwater samples, obtained from the monitoring wells installed in BH1, BH2, and BH4, were submitted for laboratory analysis of BTEX, PHC (F_1-F_4) and VOC parameters. The results of the analytical testing are presented below in Table 9 and Table 10, as well as on the laboratory certificates of analysis in Appendix 1.

Table 9
Analytical Test Results – Groundwater
BTEX & PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) August 10, 2020			MECP Table 3 Standards (µg/L)
		BH1-GW1	BH2-GW1	BH4-GW1	
Benzene	0.5	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	2,300
Toluene	0.5	nd	nd	nd	18,000
Xylenes	0.5	nd	nd	nd	4,200
PHCs F_1	25	nd	nd	nd	750
PHCs F_2	100	nd	nd	nd	150
PHCs F_3	100	nd	nd	nd	500
PHCs F_4	100	nd	nd	nd	500

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

All BTEX and PHC parameters were non-detect, and as a result, are considered to be in compliance with the selected MECP Table 3 standards.

TABLE 10: Analytical Test Results – Groundwater – VOC					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Standards (µg/L)
		August 10, 2020			
		BH1-GW1	BH2-GW1	BH4-GW1	
Acetone	5	nd	nd	nd	130,000
Bromodichloromethane	0.5	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	82000
Dichlorodifluoromethane	1	nd	nd	nd	4400
1,2-Dichlorobenzene	0.5	nd	nd	nd	4600
1,3-Dichlorobenzene	0.5	nd	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	16
cis-1,3-Dichloropropylene	0.5	nd	nd	nd	nv
trans-1,3-Dichloropropylene	0.5	nd	nd	nd	nv
1,3-Dichloropropene, total	0.2	nd	nd	nd	5.2
Ethylene dibromide (dibromoethane, 1,2-)	5	nd	nd	nd	0.25
Hexane	5	nd	nd	nd	51
Methyl Ethyl Ketone (2-Butanone)	2	nd	nd	nd	470000
Methyl Isobutyl Ketone	5	nd	nd	nd	140000
Methyl tert-butyl ether	0.5	nd	nd	nd	190
Methylene Chloride	0.5	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	1300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	1.6
1,1,1-Trichloroethane	0.5	nd	nd	nd	640

TABLE 10: Analytical Test Results – Groundwater – VOC					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Standards (µg/L)
		August 10, 2020			
		BH1-GW1	BH2-GW1	BH4-GW1	
1,1,2-Trichloroethane	1	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	nd	2500
Vinyl Chloride	0.5	nd	nd	nd	0.5

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- nv – no value

All VOC parameters were non-detect, and as a result, are considered to be in compliance with the selected MECP Table 3 standards.

5.6 Quality Assurance and Quality Control Results

As per the Sampling and Analysis Plan, a duplicate groundwater sample was obtained from sample BH2 and submitted for laboratory analysis of VOC parameters.

None of the aforementioned parameters were detected in either the original or the duplicate groundwater sample, and as such, the results are considered to be acceptable. As a result, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment

All samples submitted as part of the August 10, 2020 groundwater sampling event were handled in accordance with the aforementioned analytical protocols with respect to preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04, as amended by the Environmental Protection Act, a certificate of analysis has been received for each sample submitted for analysis, all of which are appended to this report.

5.7 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As described in the Phase I ESA report, as well as in Section 2.2 of this report, the following PCA, as described by Table 2 of O. Reg. 153/04, is considered to result in an APEC with respect to the subject site:

- APEC 1 – Resulting from the presence of the bulk storage of asphaltic tar facility adjacent ot the east *(Item 6: Asphalt and Bitumen Manufacturing).*

Ten (10) other off-site PCAs were identified within the Phase I study area, however, based on their separation distances, down-gradient or cross-gradient orientation with respect to the subject land, and the results from the previous Phase II Environmental Site Assessment by Pinchin they are not considered to be of concern to the subject site.

Contaminants of Concern

The contaminants of potential concern associated with the subject site are considered to be:

- BTEX (benzene, toluene, ethylbenzene, and xylenes);
- PHCs F_1-F_4 (petroleum hydrocarbons, fractions 1 through 4);
- VOCs (volatile organic compounds)

The PHC, BTEX and VOC contaminants have the potential to be present in the soil matrix and/or the groundwater situated beneath the subject site.

Subsurface Structures and Utilities

No underground utilities are currently present on the subject site that we are aware of.

Physical Setting

Site Stratigraphy

The stratigraphy of the subject site generally consists of:

- Fill material, consisting of either crushed stone (gravel) or reworked native soil, extending to depths ranging from approximately 0.5 m to 1.3 m below ground surface.
- Hard to very stiff brown/grey silty clay, extending to depths ranging from approximately 0.46 m to 6.70 m below ground surface.

Hydrogeological Characteristics

The groundwater at BH1, BH2, and BH4 was encountered within the overburden, at depths ranging from approximately 0.86 m to 1.51 m below the existing ground surface. The previously completed Phase II Environmental Site Assessment by Pinchin reported groundwater encountered withing the overburden, at depths ranging from 0.41 m to 3.11 m.

Based on the regional topography, in combination with the measured groundwater levels, the groundwater flow direction in the vicinity of the subject site is towards the west. It should be noted that groundwater levels are expected to change throughout the year with seasonal variations.

Approximate Depth to Water Table

During the August 10, 2020 groundwater sampling event, the groundwater level at BH1, BH2, and BH4, was measured at depths ranging from approximately 0.86 m to 1.51 m below the existing ground surface.

Approximate Depth to Bedrock

Bedrock was not encountered at any of the borehole locations at the time of the drilling program. A dynamic cone penetration test was conducted with refusal at 10.24 m on possible bedrock surface.

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, as there are no areas of natural significance or environmentally sensitive areas situated within 30 m of the property.

Section 43.1 of the Regulation (Site Condition Standards, Shallow Soil Property) does not apply to the subject site, since the underlying bedrock is situated at a depth greater than 2 m below the existing grounds surface.

Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural and scientific interest are known to exist within the Phase I study area. The nearest named water body with respect to the subject site is the Rideau River, located approximately 750 m to the southeast.

Fill Placement

Based on the available borehole information, the fill material encountered consisted of a mixture of either crushed stone (gravel) or reworked native soil and

ranged from 0.5 m to 1.3 m below the existing ground surface. No unusual visual or olfactory observations were noted regarding the soil or groundwater encountered at the time of the geotechnical investigation.

Existing Buildings and Structures

No buildings or structures are currently present on the subject site aside from several storage sheds present in the southwest corner.

Proposed Buildings and Other Structures

It is our understanding that the proposed development of the Phase II Property includes a 2-storey commercial building connected to an approximate 6,900 ft^2, 1-storey warehouse building via an enclosed structure, to be situated on the north portion of the site. Associated access lanes, parking areas and landscaped areas are also anticipated at the proposed development.

Environmental Condition

Areas Where Contaminants are Present

Based on the findings of this Phase II ESA, no contaminant concentrations exceeding the MECP Table 3 commercial standards were identified within the soil or groundwater on the subject site.

Types of Contaminants

Based on the findings of this Phase II ESA, no contaminant concentrations exceeding the MECP Table 3 commercial standards were identified within the soil or groundwater on the subject site.

Contaminated Media

Based on the findings of this Phase II ESA, the soil and groundwater conditions are in compliance with the selected MECP Table 3 commercial standards.

What Is Known Areas Where Contaminants Are Present

Based on the findings of this Phase II ESA, no contaminant concentrations exceeding the MECP Table 3 commercial standards were identified within the soil or groundwater on the subject site.

Distribution and Migration of Contaminants

Based on the findings of this Phase II ESA, no contaminant concentrations exceeding the MECP Table 3 commercial standards were identified within the soil or groundwater on the subject site.

Discharge of Contaminants

Based on the findings of this Phase II ESA, no contaminants have been discharged on the subject site.

Potential for Vapour Intrusion

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

Climatic and Meteorological Conditions

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

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

6.0 CONCLUSIONS

6.1 Assessment

A Phase II ESA was conducted for 144 Bentley Avenue in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address the area of potential environmental concern (APEC) identified on the subject site during the Phase I ESA.

As part of this Phase II ESA, a subsurface investigation program was conducted on August 4, 2020. The field program consisted of advancing five (5) boreholes (BH1-BH5) throughout the subject site, of which three (3) were equipped with groundwater monitoring wells (BH1, BH2, and BH4). The boreholes drilled within the subject area were advanced to depths ranging from approximately 2.13 m to 10.24 m below the existing grade.

Six (6) soil samples were submitted for laboratory analysis of either: BTEX, PHCs (F_1-F_4), and/or metal parameters. Based on the analytical test results, all of the aforementioned parameter concentrations are in compliance with the selected MECP Table 3 standards.

Three (3) groundwater samples, obtained from the monitoring wells installed in boreholes BH1, BH2, and BH4, were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4) and VOC parameters. Based on the analytical test results, all of the aforementioned parameter concentrations are in compliance with the selected MECP Table 3 standards.

Based on the findings of this Phase II ESA and the previous Phase I ESA by Pinchin, it is our opinion that **no further work will be required.**

6.2 Recommendations

If the groundwater monitoring wells installed in boreholes BH1, BH2, and BH4 are not going to be used in the future, or will be destroyed during future redevelopment activities, then they must be decommissioned according to Ontario Regulation Reg. 903 (Ontario Water Resources Act). The monitoring wells will be registered with the MECP under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

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

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

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

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

Paterson Group Inc.

Jeremy Camposarcone, B.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- Danviwill Holdings Inc.
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4998-3 – TEST HOLE LOCATION PLAN

DRAWING PE4998-4 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4998-5 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4998-6 – CROSS SECTION A-A' – SOIL

DRAWING PE4998-7 – CROSS SECTION A-A' – GROUNDWATER

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

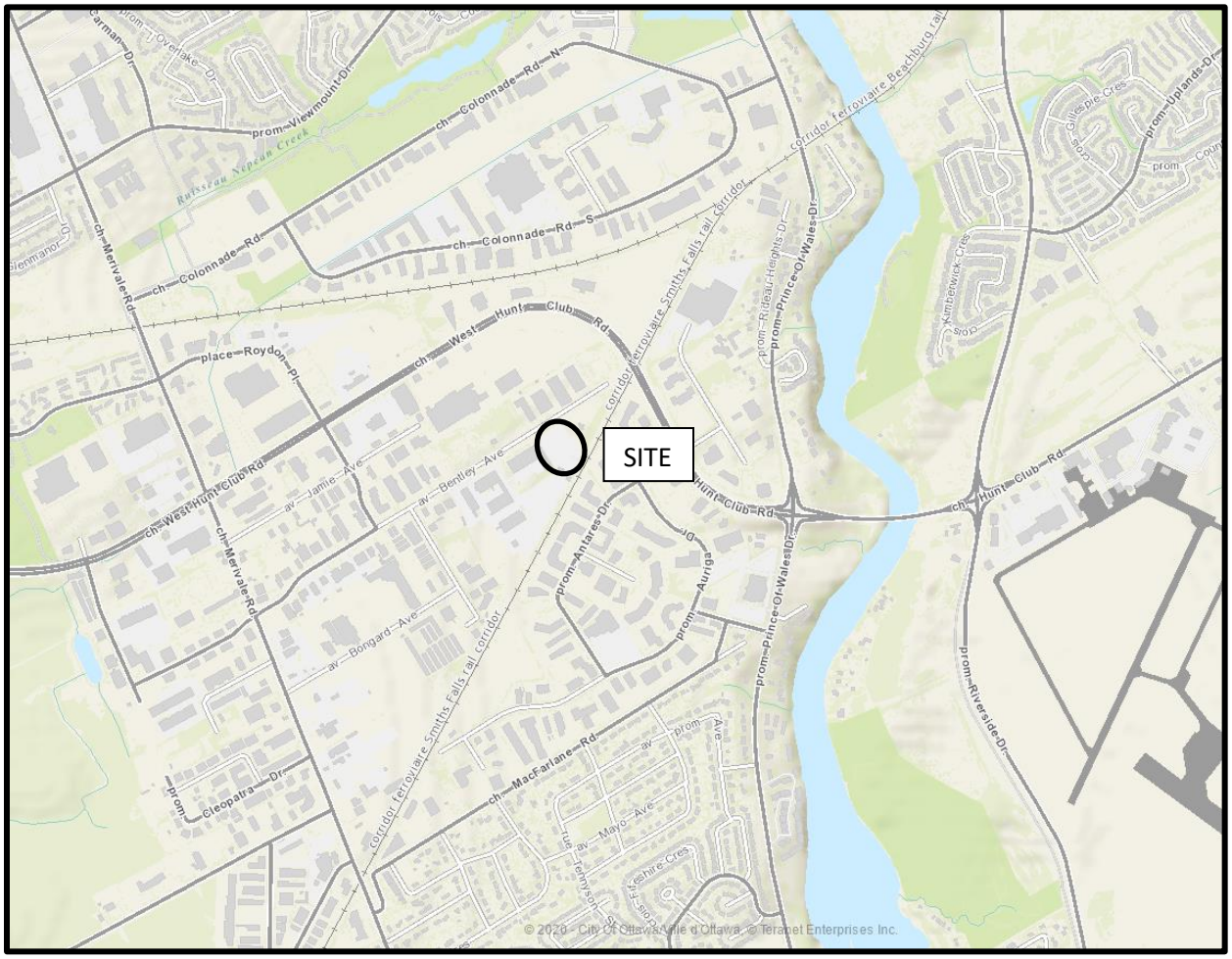
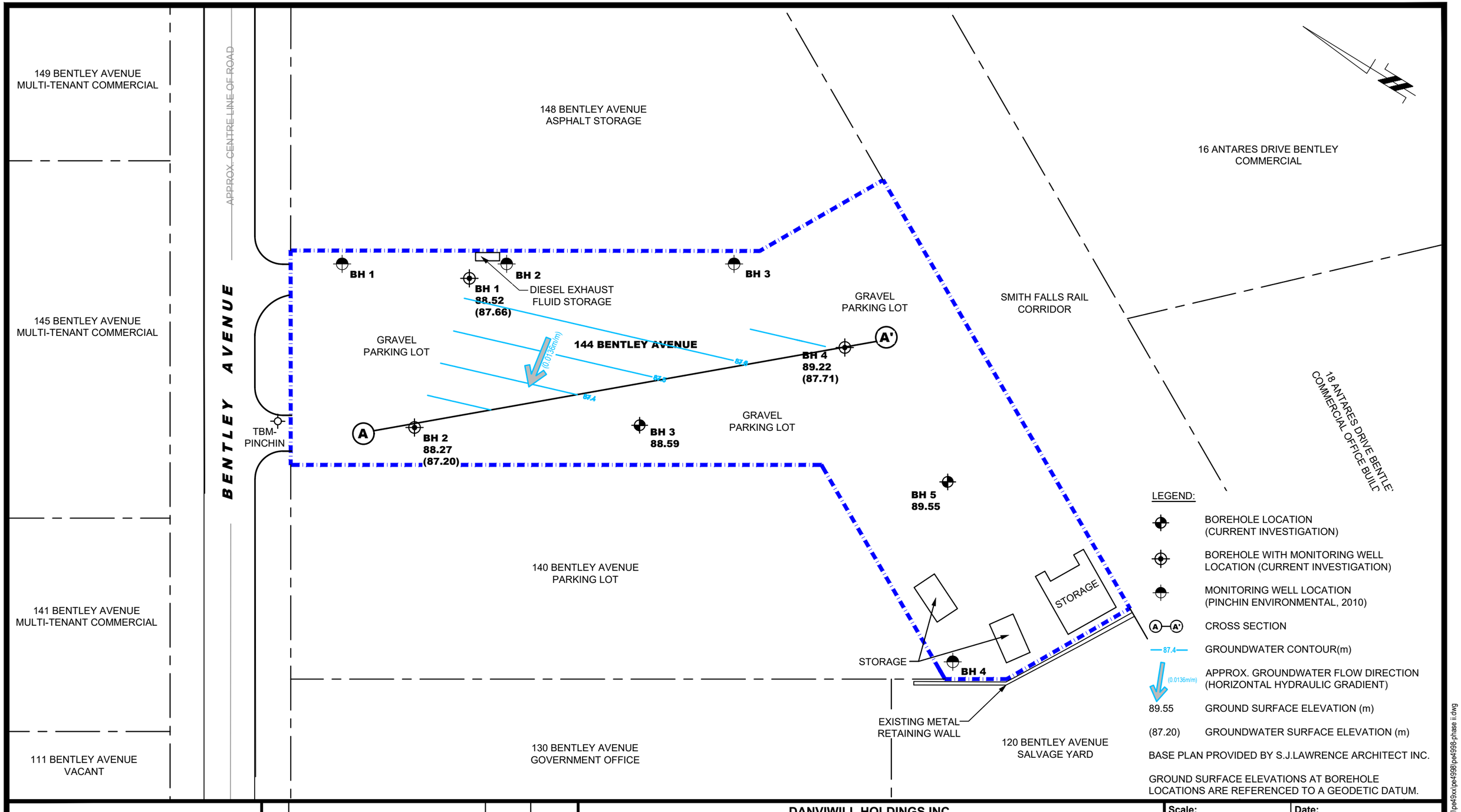


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL

DANVIWILL HOLDINGS INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:750	Date: 09/2020
Drawn by: YA	Report No.: PE4998-2
Checked by: JC	Dwg. No.: PE4998-3
Approved by: MSD	Revision No.:

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149 BENTLEY AVENUE
MULTI-TENANT COMMERCIAL

BH1-SS2 0.76-1.37m 4-Aug-20
METALS COMPLY WITH MECP TABLE 3 STANDARDS

BH1-MTOV-15-16' 4.57-4.87m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH1-SS8 4.30-4.90m 23-Apr-10
PHCs & VOCs COMPLY WITH MECP TABLE 3 STANDARDS

BH2-SS12 6.70-7.30m 23-Apr-10
PHCs, VOCs & PAHs COMPLY WITH MECP TABLE 3 STANDARDS

148 BENTLEY AVENUE
ASPHALT STORAGE

BH3-SS8 4.30-4.90m 23-Apr-10
PHCs & VOCs COMPLY WITH MECP TABLE 3 STANDARDS

16 ANTARES DRIVE BENTLEY
COMMERCIAL

BH4-AU1 0-0.61m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BH4-SS2 0.76-1.37m 4-Aug-20
METALS COMPLY WITH MECP TABLE 3 STANDARDS

BH4-MTOV-15-16' 4.57-4.87m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS

BENTLEY AVENUE

145 BENTLEY AVENUE
MULTI-TENANT COMMERCIAL

BH 1

BH 1
88.52
(87.66)

BH 2

DIESEL EXHAUST
FLUID STORAGE

BH 3

GRAVEL
PARKING LOT

SMITH FALLS RAIL
CORRIDOR

144 BENTLEY AVENUE

GRAVEL
PARKING LOT

BH 4
89.22
(87.71)

A

A'

TBM-
PINCHIN

BH 2
88.27
(87.20)

BH 3
88.59

18 ANTARES DRIVE BENTLEY
COMMERCIAL OFFICE BUILDING

BH 5
89.55

BH3-MTOV-15-16' 4.57-4.87m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS

140 BENTLEY AVENUE
PARKING LOT

141 BENTLEY AVENUE
MULTI-TENANT COMMERCIAL

BH4-SS12 6.70-7.30m 23-Apr-10
PHCs, VOCs & METALS COMPLY WITH MECP TABLE 3 STANDARDS

STORAGE

STORAGE

BH 4

EXISTING METAL
RETAINING WALL

130 BENTLEY AVENUE
GOVERNMENT OFFICE

120 BENTLEY AVENUE
SALVAGE YARD

SOIL RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEED MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- MONITORING WELL LOCATION (PINCHIN ENVIRONMENTAL, 2010)
- A–A' CROSS SECTION
- 89.55 GROUND SURFACE ELEVATION (m)
- (87.20) GROUNDWATER SURFACE ELEVATION (m)

BASE PLAN PROVIDED BY S.J.LAWRENCE ARCHITECT INC.

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

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DANVIWILL HOLDINGS INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:750	Date: 09/2020
Drawn by: YA	Report No.: PE4998-2
Checked by: JC	Dwg. No.: PE4998-4
Approved by: MSD	Revision No.:

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149 BENTLEY AVENUE
MULTI-TENANT COMMERCIAL

BH1-GW1 3.66-6.70m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS
VOCs COMPLY WITH MECP TABLE 3 STANDARDS

BH1-GW1 2.75-7.30m 5-May-10
PHCs & VOCs COMPLY WITH MECP TABLE 3 STANDARDS

148 BENTLEY AVENUE
ASPHALT STORAGE

BH2-GW1 2.60-7.30m 5-May-10
PHCs, VOCs & PAHs COMPLY WITH MECP TABLE 3 STANDARDS

16 ANTARES DRIVE BENTLEY
COMMERCIAL

BH3-GW1 0.41-7.30m 5-May-10
PHCs & VOCs COMPLY WITH MECP TABLE 3 STANDARDS

BH 1
BH 2
BH 3

BH 1
88.52
(87.66)

DIESEL EXHAUST
FLUID STORAGE

GRAVEL
PARKING LOT

SMITH FALLS RAIL
CORRIDOR

145 BENTLEY AVENUE
MULTI-TENANT COMMERCIAL

BENTLEY AVENUE

144 BENTLEY AVENUE

A'

BH 4
89.22
(87.71)

GRAVEL
PARKING LOT

BH4-GW1 3.36-6.40m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS
VOCs COMPLY WITH MECP TABLE 3 STANDARDS

18 CO... DRIVE BENTLEY OFFICE BUILDING

TBM-
PINCHIN

A

BH 2
88.27
(87.20)

BH 3
88.59

BH 5
89.55

BH2-GW1 3.66-6.40m 4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS
VOCs COMPLY WITH MECP TABLE 3 STANDARDS

141 BENTLEY AVENUE
MULTI-TENANT COMMERCIAL

140 BENTLEY AVENUE
PARKING LOT

STORAGE

STORAGE

BH 4

BH4-GW1 1.33-7.30m 5-May-10
PHCs, VOCs & METALS COMPLY WITH MECP TABLE 3 STANDARDS

EXISTING METAL
RETAINING WALL

130 BENTLEY AVENUE
GOVERNMENT OFFICE

120 BENTLEY AVENUE
SALVAGE YARD

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE LOCATION (CURRENT INVESTIGATION)
- BOREHOLE WITH MONITORING WELL LOCATION (CURRENT INVESTIGATION)
- MONITORING WELL LOCATION (PINCHIN ENVIRONMENTAL, 2010)
- A—A' CROSS SECTION
- 89.55 GROUND SURFACE ELEVATION (m)
- (87.20) GROUNDWATER SURFACE ELEVATION (m)

BASE PLAN PROVIDED BY S.J.LAWRENCE ARCHITECT INC.

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

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NO.	REVISIONS	DATE	INITIAL

DANVIWILL HOLDINGS INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:750	Date: 09/2020
Drawn by: YA	Report No.: PE4998-2
Checked by: JC	Dwg. No.: PE4998-5
Approved by: MSD	Revision No.:

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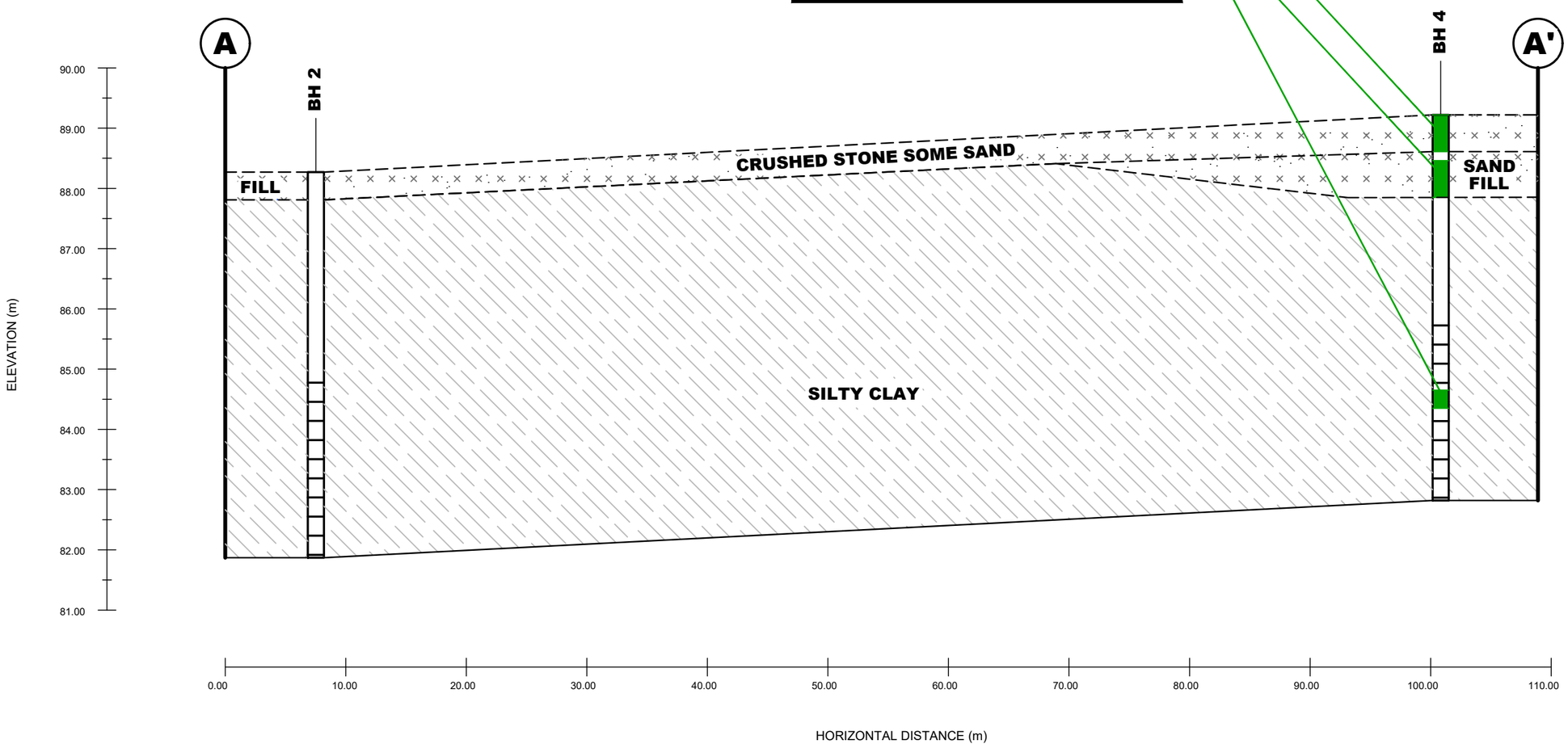
BH4-AU1	0-0.61m	4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS		
BH4-SS2	0.76-1.37m	4-Aug-20
METALS COMPLY WITH MECP TABLE 3 STANDARDS		
BH4-MTOV-15-16'	4.57-4.87m	4-Aug-20
BTEX & PHCs COMPLY WITH MECP TABLE 3 STANDARDS		



SOIL RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEED MECP TABLE 3 STANDARDS

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DANVIWILL HOLDINGS INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL

Scale: AS SHOWN	**Date:** 09/2020
Drawn by: YA	**Report No.:** PE4998-2
Checked by: JC	**Dwg. No.:** PE4998-6
Approved by: MSD	**Revision No.:**

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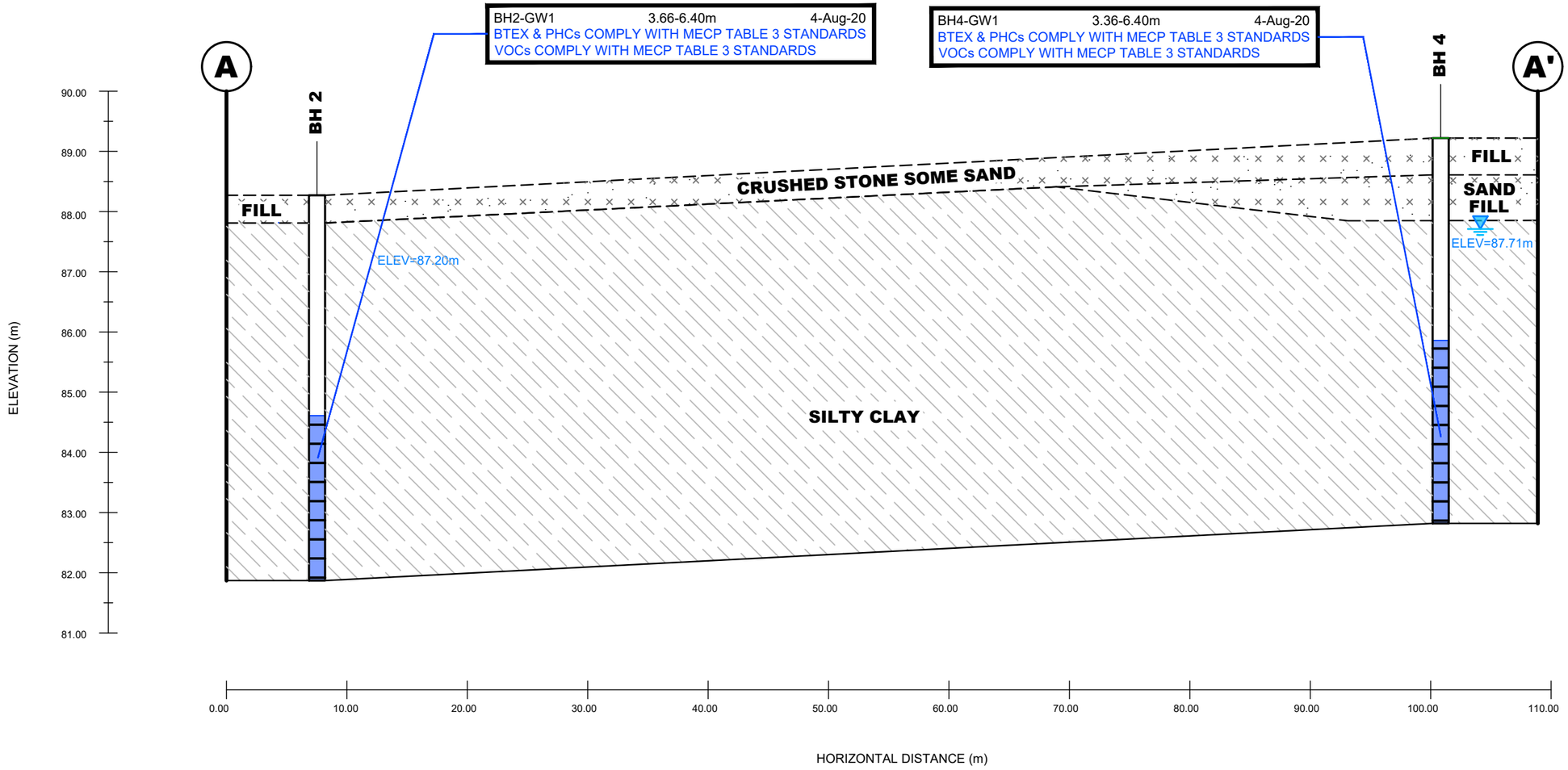

GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULTS EXCEED MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

DANVIWILL HOLDINGS INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
144 BENTLEY AVENUE

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 09/2020
Drawn by: YA	Report No.: PE4998-2
Checked by: JC	Dwg. No.: PE4998-7
Approved by: MSD	Revision No.:

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Geotechnical Engineering

Environmental Engineering

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Geological Engineering

Materials Testing

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Sampling & Analysis Plan

Phase II – Environmental Site Assessment
144 Bentley Avenue
Ottawa, Ontario

Prepared For

Danviwill Holdings Inc.

August 3, 2020

Report: PE4998-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Danviwill Holdings Inc. to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for the 144 Bentley Avenue, in the City of Ottawa, Ontario.

Based on the Phase I ESA, previously completed by Paterson Group Inc. for the subject property, the following subsurface investigation program, consisting of borehole drilling, was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Northeastern portion of the subject site; for general coverage and to assess potential impacts from the existing bulk storage of asphaltic tar facility.	Borehole advanced to approximately 7m; facilitate installation of groundwater monitoring wells.
BH2	northwestern portion of the subject site; for general coverage and geotechnical purposes.	Borehole advanced to approximately 7m; facilitate installation of groundwater monitoring wells.
BH3	West-central portion of the subject site; for general coverage and geotechnical purposes.	Borehole advance to approximately 7 m; for geotechnical purposes.
BH4	Southeastern portion of the subject site; for general coverage and geotechnical purposes.	Borehole advanced to approximately 7m; facilitate installation of groundwater monitoring wells.
BH5	Southwestern portion of the subject site; for general coverage and geotechnical purposes.	5-7 m; for geotechnical purposes.

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

It should be noted that four (4) former boreholes (BH1-BH4) drilled in 2010 on the subject site for geotechnical purposes were utilized as part of this environmental investigation.

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

Following the borehole drilling, groundwater monitoring wells will be installed in boreholes BH1, BH2, and BH4 for 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 MECP site condition standards.

- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.

- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

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

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

- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.

- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.

- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

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

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F_1, a soil core from each soil sample, which may be analyzed, must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS

Physical impediments to the Sampling and Analysis plan may include:

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

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Prop. Commercial Development - 144 Bentley Avenue
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4998

REMARKS

HOLE NO. BH 1

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.52
FILL: Brown silty sand with crushed stone		AU	1				
0.38							
FILL: Brown silty clay, trace gravel							
0.60		SS	2	46	7	1	87.52
						2	86.52
Hard to very stiff, brown **SILTY CLAY**						3	85.52
						4	84.52
- stiff and grey by 4.5m depth						5	83.52
						6	82.52
6.70							
End of Borehole							
(GWL @ 0.86m - Aug. 10, 2020)							

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
Prop. Commercial Development - 144 Bentley Avenue
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4998

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.27
FILL: Brown silty sand with crushed stone		AU	1				
0.46							
		SS	2	62	12	1	87.27
						2	86.27
Hard to very stiff, brown **SILTY CLAY**						3	85.27
- stiff and grey by 3.8m depth						4	84.27
						5	83.27
						6	82.27
6.40							
End of Borehole							
(GWL @ 1.07m - Aug. 10, 2020)							

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
Prop. Commercial Development - 144 Bentley Avenue
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4998

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.59
FILL: Brown silty sand with crushed stone		AU	1				
0.38							
FILL: Brown silty clay, trace gravel							
0.60		SS	2	46	10	1	87.59
						2	86.59
Hard to very stiff, brown **SILTY CLAY**						3	85.59
- stiff and grey by 3.8m depth						4	84.59
						5	83.59
						6	82.59
6.40							
Dynamic Cone Penetration Test commenced at 6.40m depth. Practical DCPT refusal at 10.24m depth.							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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
Prop. Commercial Development - 144 Bentley Avenue
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4998

REMARKS

HOLE NO. BH 4

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.22
FILL: Brown silty sand with crushed stone		AU	1				
0.46							
FILL: Brown silty sand		SS	2	71	8	1	88.22
1.32							
		SS	3	83	6	2	87.22
Very stiff to stiff, brown **SILTY CLAY**						3	86.22
						4	85.22
- grey by 4.6m depth						5	84.22
						6	83.22
6.40							
End of Borehole							
(GWL @ 1.51m - Aug. 10, 2020)							

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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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Prop. Commercial Development - 144 Bentley Avenue
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4998

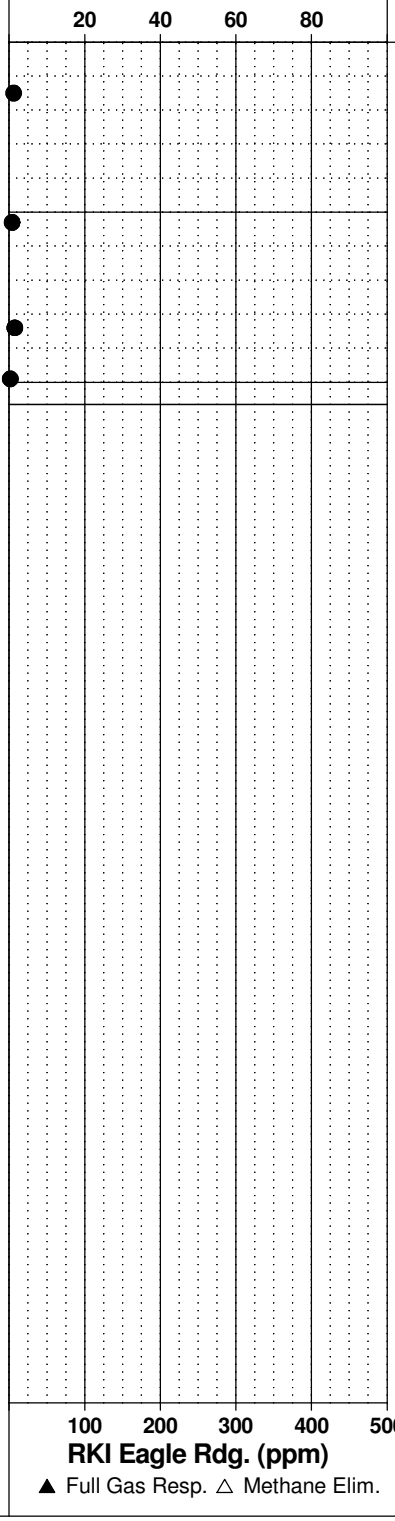
REMARKS

HOLE NO. BH 5

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
FILL: Brown silty sand with crushed stone 0.20		AU	1			0	89.55
FILL: Brown silty sand		SS	2	50	10	1	88.55
1.24							
Very stiff to hard, brown **SILTY CLAY**						2	87.55
2.13							
End of Borehole							
(BH dry upon completion)							

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



Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

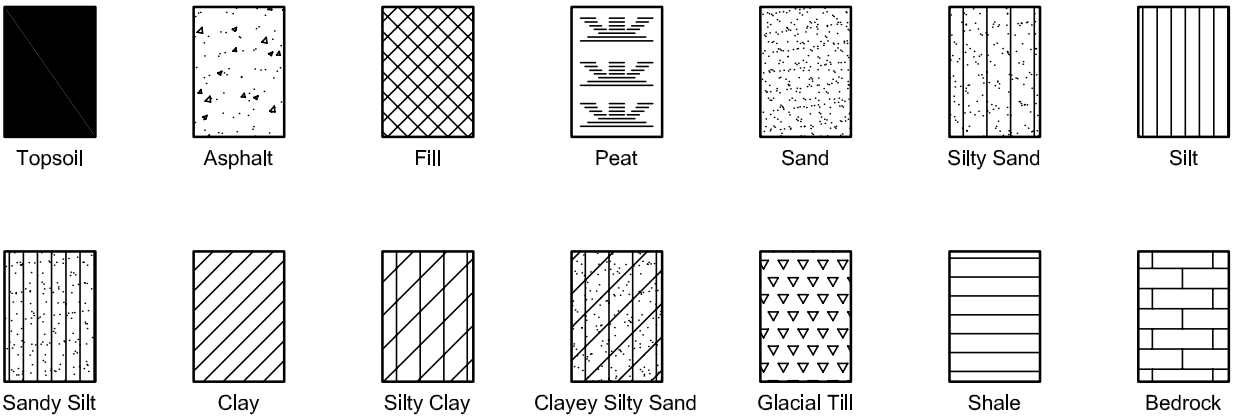
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

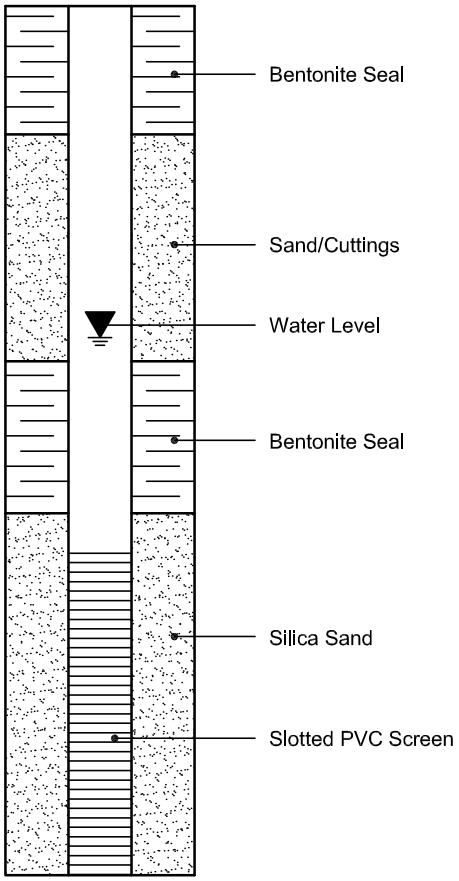
SYMBOLS AND TERMS (continued)

STRATA PLOT

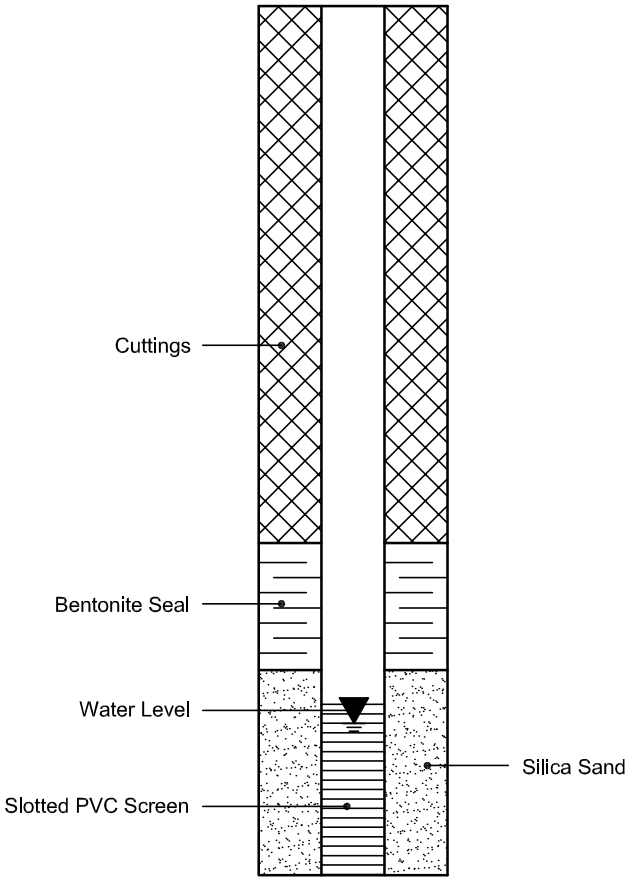


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30543
Project: PE4998
Custody: 128051

Report Date: 12-Aug-2020
Order Date: 7-Aug-2020

Order #: 2032523

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

Paracel ID	Client ID
2032523-01	BH1-SS2
2032523-02	BH1-MTOV-15-16'
2032523-03	BH3-MTOV-15-16'
2032523-04	BH4-AU1
2032523-05	BH4-SS2
2032523-06	BH4-MTOV-15-16'

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 12-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 7-Aug-2020

Client PO: 30543

Project Description: PE4998

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	10-Aug-20	11-Aug-20
PHC F1	CWS Tier 1 - P&T GC-FID	10-Aug-20	11-Aug-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	7-Aug-20	11-Aug-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	11-Aug-20	11-Aug-20
Solids, %	Gravimetric, calculation	10-Aug-20	10-Aug-20

Certificate of Analysis

Report Date: 12-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 7-Aug-2020

Client PO: 30543

Project Description: PE4998

	Client ID:	BH1-SS2	BH1-MTOV-15-16'	BH3-MTOV-15-16'	BH4-AU1
	Sample Date:	04-Aug-20 09:00	04-Aug-20 10:00	04-Aug-20 12:00	04-Aug-20 13:00
	Sample ID:	2032523-01	2032523-02	2032523-03	2032523-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	84.8	64.9	63.7	93.9
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	3.3	-	-	-
Barium	1.0 ug/g dry	194	-	-	-
Beryllium	0.5 ug/g dry	0.7	-	-	-
Boron	5.0 ug/g dry	<5.0	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	62.8	-	-	-
Cobalt	1.0 ug/g dry	12.0	-	-	-
Copper	5.0 ug/g dry	15.2	-	-	-
Lead	1.0 ug/g dry	10.7	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	28.3	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	1.5	-	-	-
Vanadium	10.0 ug/g dry	57.0	-	-	-
Zinc	20.0 ug/g dry	78.6	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	-	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	-	120%	117%	119%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	<8	190
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	<6	72

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 30543

Report Date: 12-Aug-2020

Order Date: 7-Aug-2020

Project Description: PE4998

	Client ID:	BH4-SS2	BH4-MTOV-15-16'	-	-
	Sample Date:	04-Aug-20 13:00	04-Aug-20 14:00	-	-
	Sample ID:	2032523-05	2032523-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	89.0	59.0	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.1	-	-	-
Barium	1.0 ug/g dry	58.4	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	<5.0	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	23.1	-	-	-
Cobalt	1.0 ug/g dry	4.9	-	-	-
Copper	5.0 ug/g dry	7.1	-	-	-
Lead	1.0 ug/g dry	7.2	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	12.7	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	37.5	-	-	-
Zinc	20.0 ug/g dry	47.6	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	124%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	-

Certificate of Analysis

Report Date: 12-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 7-Aug-2020

Client PO: 30543

Project Description: PE4998

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	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	*3.86*		*ug/g*		*121*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	3.4	1.0	ug/g dry	3.3			3.4	30	
Barium	96.7	1.0	ug/g dry	98.6			1.9	30	
Beryllium	ND	0.5	ug/g dry	ND			NC	30	
Boron	5.3	5.0	ug/g dry	ND			NC	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	18.0	5.0	ug/g dry	18.9			4.8	30	
Cobalt	5.7	1.0	ug/g dry	5.8			2.0	30	
Copper	11.0	5.0	ug/g dry	13.0			16.6	30	
Lead	5.5	1.0	ug/g dry	5.8			4.9	30	
Molybdenum	ND	1.0	ug/g dry	ND			NC	30	
Nickel	11.3	5.0	ug/g dry	11.8			3.8	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	26.2	10.0	ug/g dry	27.6			5.3	30	
Zinc	64.5	20.0	ug/g dry	29.7			NC	30	
Physical Characteristics									
% Solids	83.0	0.1	% by Wt.	83.9			1.1	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*4.04*		*ug/g dry*		*116*	*50-140*			

Certificate of Analysis

Report Date: 12-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 7-Aug-2020

Client PO: 30543

Project Description: PE4998

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	98.3	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	92.2	60-140			
F3 PHCs (C16-C34)	222	8	ug/g	ND	99.4	60-140			
F4 PHCs (C34-C50)	160	6	ug/g	ND	113	60-140			
Metals									
Antimony	43.2	1.0	ug/g	ND	86.3	70-130			
Arsenic	52.7	1.0	ug/g	1.3	103	70-130			
Barium	85.5	1.0	ug/g	39.4	92.1	70-130			
Beryllium	48.7	0.5	ug/g	ND	97.2	70-130			
Boron	45.8	5.0	ug/g	ND	87.6	70-130			
Cadmium	47.8	0.5	ug/g	ND	95.5	70-130			
Chromium	60.3	5.0	ug/g	7.5	105	70-130			
Cobalt	52.8	1.0	ug/g	2.3	101	70-130			
Copper	54.4	5.0	ug/g	5.2	98.4	70-130			
Lead	50.0	1.0	ug/g	2.3	95.3	70-130			
Molybdenum	51.0	1.0	ug/g	ND	102	70-130			
Nickel	54.6	5.0	ug/g	ND	99.7	70-130			
Selenium	50.5	1.0	ug/g	ND	101	70-130			
Silver	46.5	0.3	ug/g	ND	92.9	70-130			
Thallium	47.6	1.0	ug/g	ND	95.1	70-130			
Uranium	52.5	1.0	ug/g	ND	104	70-130			
Vanadium	63.3	10.0	ug/g	11.1	105	70-130			
Zinc	62.2	20.0	ug/g	ND	101	70-130			
Volatiles									
Benzene	2.65	0.02	ug/g	ND	66.4	60-130			
Ethylbenzene	4.04	0.05	ug/g	ND	101	60-130			
Toluene	3.90	0.05	ug/g	ND	97.5	60-130			
m,p-Xylenes	8.07	0.05	ug/g	ND	101	60-130			
o-Xylene	4.28	0.05	ug/g	ND	107	60-130			
Surrogate: Toluene-d8	*3.01*		*ug/g*		*94.2*	*50-140*			

Qualifier Notes:

QC Qualifiers :

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.
NC: Not Calculated

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2032523

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2032523	Nº 128051

Client Name: Paterson	Project Ref: PE4998	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address:	PO #: 30543	☐ 1 day ☐ 3 day
	E-mail:	☐ 2 day ☑ Regular
Telephone: 226-7381		Date Required:

Regulation 153/04: ☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☑ Table 3 ☐ Agri/Other ☐ Table — For RSC: ☐ Yes ☒ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm Mun: ☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-SS2	S	-	2	Aug 4/20	9am				✓			
2	BH1-MTOV-15-16'	S	-	2	"	10am	✓						
3	BH3-MTOV-15-16'	S	-	2		12am	✓						
4	BH4-AU1	S	-	2	"	1pm	✓						
5	BH4-SS2	S	-	2	"	"				✓			
6	BH4-MTOV-15-16'	S	-	2	"	2pm	✓						
7													
8													
9													
10													

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: M. LEDUC	Received at Lab:	Verified By:
Relinquished By (Print): Mark D'Arcy	Date/Time: 07/08/20 3:10	Date/Time: Aug 07, 2020 16:39	Date/Time: Aug 07, 2020 17:12
Date/Time: Aug. 7/20	Temperature: °C FH.	Temperature: 10.0 °C	pH Verified: ☐ By:

TABLE 1		CLIENT: Paterson Group Consulting Engineers							
PARACEL LABORATORIES LTD.		ATTENTION: Mark D'Arcy							
WORKORDER: 2032523		PROJECT: PE4998							
REPORT DATE: 08/12/2020		REFERENCE: Standing Offer							
Parameter	**Units**	**MDL**	**Regulation**	**Sample**					
				BH1-SS2 2032523-01	**BH1-MTOV-15-16' 2032523-02**	**BH3-MTOV-15-16' 2032523-03**	**BH4-AU1 2032523-04**	**BH4-SS2 2032523-05**	**BH4-MTOV-15-16' 2032523-06**
Sample Date (m/d/y)			**Reg 153/04 (2011)-Table 3 Industrial, coarse**	**08/04/2020 09:00 AM**	**08/04/2020 10:00 AM**	**08/04/2020 12:00 PM**	**08/04/2020 01:00 PM**	**08/04/2020 01:00 PM**	**08/04/2020 02:00 PM**
Physical Characteristics									
% Solids	% by Wt.	0.1		84.8	64.9	63.7	93.9	89.0	59.0
Metals									
Antimony	ug/g dry	1.0	40 ug/g dry	ND (1.0)	N/A	N/A	N/A	ND (1.0)	N/A
Arsenic	ug/g dry	1.0	18 ug/g dry	3.3	N/A	N/A	N/A	2.1	N/A
Barium	ug/g dry	1.0	670 ug/g dry	194	N/A	N/A	N/A	58.4	N/A
Beryllium	ug/g dry	0.5	8 ug/g dry	0.7	N/A	N/A	N/A	ND (0.5)	N/A
Boron	ug/g dry	5.0	120 ug/g dry	ND (5.0)	N/A	N/A	N/A	ND (5.0)	N/A
Cadmium	ug/g dry	0.5	1.9 ug/g dry	ND (0.5)	N/A	N/A	N/A	ND (0.5)	N/A
Chromium	ug/g dry	5.0	160 ug/g dry	62.8	N/A	N/A	N/A	23.1	N/A
Cobalt	ug/g dry	1.0	80 ug/g dry	12.0	N/A	N/A	N/A	4.9	N/A
Copper	ug/g dry	5.0	230 ug/g dry	15.2	N/A	N/A	N/A	7.1	N/A
Lead	ug/g dry	1.0	120 ug/g dry	10.7	N/A	N/A	N/A	7.2	N/A
Molybdenum	ug/g dry	1.0	40 ug/g dry	ND (1.0)	N/A	N/A	N/A	ND (1.0)	N/A
Nickel	ug/g dry	5.0	270 ug/g dry	28.3	N/A	N/A	N/A	12.7	N/A
Selenium	ug/g dry	1.0	5.5 ug/g dry	ND (1.0)	N/A	N/A	N/A	ND (1.0)	N/A
Silver	ug/g dry	0.3	40 ug/g dry	ND (0.3)	N/A	N/A	N/A	ND (0.3)	N/A
Thallium	ug/g dry	1.0	3.3 ug/g dry	ND (1.0)	N/A	N/A	N/A	ND (1.0)	N/A
Uranium	ug/g dry	1.0	33 ug/g dry	1.5	N/A	N/A	N/A	ND (1.0)	N/A
Vanadium	ug/g dry	10.0	86 ug/g dry	57.0	N/A	N/A	N/A	37.5	N/A
Zinc	ug/g dry	20.0	340 ug/g dry	78.6	N/A	N/A	N/A	47.6	N/A
Volatiles									
Benzene	ug/g dry	0.02	0.32 ug/g dry	N/A	ND (0.02)	ND (0.02)	ND (0.02)	N/A	ND (0.02)
Ethylbenzene	ug/g dry	0.05	9.5 ug/g dry	N/A	ND (0.05)	ND (0.05)	ND (0.05)	N/A	ND (0.05)
Toluene	ug/g dry	0.05	68 ug/g dry	N/A	ND (0.05)	ND (0.05)	ND (0.05)	N/A	ND (0.05)
m/p-Xylene	ug/g dry	0.05		N/A	ND (0.05)	ND (0.05)	ND (0.05)	N/A	ND (0.05)
o-Xylene	ug/g dry	0.05		N/A	ND (0.05)	ND (0.05)	ND (0.05)	N/A	ND (0.05)
Xylenes, total	ug/g dry	0.05	26 ug/g dry	N/A	ND (0.05)	ND (0.05)	ND (0.05)	N/A	ND (0.05)
Hydrocarbons									
F1 PHCs (C6-C10)	ug/g dry	7	55 ug/g dry	N/A	ND (7)	ND (7)	ND (7)	N/A	ND (7)
F2 PHCs (C10-C16)	ug/g dry	4	230 ug/g dry	N/A	ND (4)	ND (4)	ND (4)	N/A	ND (4)
F3 PHCs (C16-C34)	ug/g dry	8	1700 ug/g dry	N/A	ND (8)	ND (8)	190	N/A	ND (8)
F4 PHCs (C34-C50)	ug/g dry	6	3300 ug/g dry	N/A	ND (6)	ND (6)	72	N/A	ND (6)

PARACEL LABORATORIES LTD.

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30778
Project: PE4998
Custody: 128058

Report Date: 17-Aug-2020
Order Date: 12-Aug-2020

Order #: 2033362

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

Paracel ID	Client ID
2033362-01	BH1-GW1
2033362-02	BH2-GW1
2033362-03	BH4-GW1
2033362-04	Dup

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 17-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 12-Aug-2020

Client PO: 30778

Project Description: PE4998

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	13-Aug-20	13-Aug-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	13-Aug-20	14-Aug-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	13-Aug-20	13-Aug-20

Certificate of Analysis

Report Date: 17-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 12-Aug-2020

Client PO: 30778

Project Description: PE4998

	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	Dup
	Sample Date:	10-Aug-20 09:00	10-Aug-20 09:00	10-Aug-20 09:00	10-Aug-20 09:00
	Sample ID:	2033362-01	2033362-02	2033362-03	2033362-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 17-Aug-2020

Client: Paterson Group Consulting Engineers

Order Date: 12-Aug-2020

Client PO: 30778

Project Description: PE4998

	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	Dup
	Sample Date:	10-Aug-20 09:00	10-Aug-20 09:00	10-Aug-20 09:00	10-Aug-20 09:00
	Sample ID:	2033362-01	2033362-02	2033362-03	2033362-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	106%	108%	114%	105%
Dibromofluoromethane	Surrogate	96.7%	99.3%	97.6%	96.9%
Toluene-d8	Surrogate	123%	116%	116%	116%
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	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*86.1*		*ug/L*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*83.2*		*ug/L*		*104*	*50-140*			
Surrogate: Toluene-d8	*98.9*		*ug/L*		*124*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*87.5*		*ug/L*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*80.1*		*ug/L*		*100*	*50-140*			
Surrogate: Toluene-d8	*96.0*		*ug/L*		*120*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2120	25	ug/L	ND	106	68-117			
F2 PHCs (C10-C16)	1320	100	ug/L	ND	82.8	60-140			
F3 PHCs (C16-C34)	3470	100	ug/L	ND	88.5	60-140			
F4 PHCs (C34-C50)	2480	100	ug/L	ND	100	60-140			
Volatiles									
Acetone	128	5.0	ug/L	ND	128	50-140			
Benzene	24.3	0.5	ug/L	ND	60.7	60-130			
Bromodichloromethane	27.1	0.5	ug/L	ND	67.8	60-130			
Bromoform	31.2	0.5	ug/L	ND	78.0	60-130			
Bromomethane	24.4	0.5	ug/L	ND	60.9	50-140			
Carbon Tetrachloride	26.3	0.2	ug/L	ND	65.7	60-130			
Chlorobenzene	28.5	0.5	ug/L	ND	71.2	60-130			
Chloroform	27.3	0.5	ug/L	ND	68.2	60-130			
Dibromochloromethane	32.3	0.5	ug/L	ND	80.7	60-130			
Dichlorodifluoromethane	27.2	1.0	ug/L	ND	68.1	50-140			
1,2-Dichlorobenzene	27.4	0.5	ug/L	ND	68.4	60-130			
1,3-Dichlorobenzene	28.9	0.5	ug/L	ND	72.3	60-130			
1,4-Dichlorobenzene	24.5	0.5	ug/L	ND	61.2	60-130			
1,1-Dichloroethane	25.6	0.5	ug/L	ND	64.0	60-130			
1,2-Dichloroethane	28.1	0.5	ug/L	ND	70.2	60-130			
1,1-Dichloroethylene	24.6	0.5	ug/L	ND	61.5	60-130			
cis-1,2-Dichloroethylene	26.0	0.5	ug/L	ND	65.0	60-130			
trans-1,2-Dichloroethylene	26.5	0.5	ug/L	ND	66.3	60-130			
1,2-Dichloropropane	38.4	0.5	ug/L	ND	96.1	60-130			
cis-1,3-Dichloropropylene	25.4	0.5	ug/L	ND	63.6	60-130			
trans-1,3-Dichloropropylene	28.2	0.5	ug/L	ND	70.4	60-130			
Ethylbenzene	30.6	0.5	ug/L	ND	76.6	60-130			
Ethylene dibromide (dibromoethane, 1,2-	29.7	0.2	ug/L	ND	74.3	60-130			
Hexane	31.0	1.0	ug/L	ND	77.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	73.8	5.0	ug/L	ND	73.8	50-140			
Methyl Isobutyl Ketone	60.3	5.0	ug/L	ND	60.3	50-140			
Methyl tert-butyl ether	81.2	2.0	ug/L	ND	81.2	50-140			
Methylene Chloride	24.0	5.0	ug/L	ND	60.0	60-130			
Styrene	31.5	0.5	ug/L	ND	78.6	60-130			
1,1,1,2-Tetrachloroethane	29.7	0.5	ug/L	ND	74.3	60-130			
1,1,2,2-Tetrachloroethane	24.0	0.5	ug/L	ND	60.0	60-130			
Tetrachloroethylene	28.7	0.5	ug/L	ND	71.7	60-130			
Toluene	25.6	0.5	ug/L	ND	64.0	60-130			
1,1,1-Trichloroethane	25.2	0.5	ug/L	ND	63.1	60-130			
1,1,2-Trichloroethane	24.6	0.5	ug/L	ND	61.4	60-130			
Trichloroethylene	26.9	0.5	ug/L	ND	67.2	60-130			
Trichlorofluoromethane	32.2	1.0	ug/L	ND	80.6	60-130			
Vinyl chloride	28.6	0.5	ug/L	ND	71.5	50-140			
m,p-Xylenes	60.7	0.5	ug/L	ND	75.9	60-130			
o-Xylene	29.7	0.5	ug/L	ND	74.3	60-130			
Surrogate: 4-Bromofluorobenzene	*77.0*		*ug/L*		*96.3*	*50-140*			
Surrogate: Dibromofluoromethane	*81.1*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*82.4*		*ug/L*		*103*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2033362

www.paracellabs.com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2033362	Nº 128058

Client Name: Paterson	Project Ref: PE 4998	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time
Address: 154 Colonnade Road South	PO #: 30778	☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Telephone: 613 226-7381	E-mail: MDarcy@patersongroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☑ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun:
For RSC: ☐ Yes ☒ No	☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH1-GW1	GW		3	Aug 10 2020		✓	✓											✓
2	BH2-GW1						✓	✓											✓
3	BH4-GW1						✓	✓											✓
4	Dup			2			✓	✓											✓
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
GPat	A. Louise	Sunreporm Dolman	
Relinquished By (Print): Grant Paterson	Date/Time: 12/08/20 3:25	Date/Time: AUG 12, 2020 04:40	Date/Time: 8-12-20 16:40
Date/Time: Aug 12 2020	Temperature: °C	Temperature: 11.1 °C	pH Verified: ☐ By: