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Phase II Environmental Site Assessment

The Meadows – Phase 7 and 8
Part of 3640 Greenbank Road
Ottawa, Ontario

Prepared For

Tamarack (Nepean) Corporation

March 6, 2019

Report: PE0190-4

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the part of the property addressed 3640 Greenbank Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to assess potential areas of environmental concern (APECs) on the Phase II Property, resulting from the past and/or current industrial use of the subject land and adjacent properties for aggregate extraction purposes. The Phase II ESA consisted of drilling eight (8) boreholes across the Phase II Property, four (4) of which were constructed with groundwater monitoring well installations.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements. Based on the screening results, a total of nine (9) soil samples, including a duplicate sample, were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Based on the analytical test results, no BTEX parameters or PHC (F_1) were identified in the soil samples submitted for testing. Petroleum hydrocarbon F_3 and F_4 fractions were identified in samples recovered from BH2, BH3, BH5 and BH7. In addition to F_3 and F_4 fractions, F_2 was also detected in a sample recovered from BH8. The PHC parameters identified were in compliance with the MECP Table 3 standards.

Groundwater samples from monitoring wells installed in BH1, BH2, BH5 and BH6 were recovered and analysed for BTEX and PHC parameters. No free-phase product was observed on the groundwater at any of the monitoring well locations during the February 2019 sampling event. Based on analytical test results, no BTEX or PHC concentrations were identified above the laboratory method detection limits in the groundwater samples analysed. The test results are in compliance with the MECP Table 3 standards.

Conclusion

Based on the findings of the Phase II ESA, the soil and groundwater beneath the Phase II Property is in compliance with the MECP Table 3 standards and no further investigation is required at this time.

It is expected that the groundwater monitoring wells will be abandoned in accordance with Ontario Regulation 903 at the time of construction excavation.

1.0 INTRODUCTION

At the request of Tamarack (Nepean) Corporation (Tamarack), Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment (ESA) for part of the property addressed 3640 Greenbank Road in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address areas of potential environmental concern (APECs) associated with past or current aggregate extraction operations on the Phase II Property and adjacent lands.

1.1 Site Description

Address:	Part of 3640 Greenbank Road, Ottawa, Ontario.
Legal Description:	Part of Lot 9 and Lot 10, Concession 3 (Rideau Front), Geographic Township of Nepean, in the City of Ottawa, Ontario.
Property Identification Numbers:	04592-2486; 04592-2811
Location:	The Phase II Property is located approximately 350 east side of Borrisokane Road and approximately 275m south of Cambrian Road, in the City of Ottawa. The location of the Phase II Property is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 14' 39" N, 75° 44' 49" W
Configuration:	Rectangular
Site Area:	13.5 hectares (approximate)

1.2 Property Ownership

The subject property is currently owned by Tamarack (Nepean) Corporation. Paterson was retained to complete this Phase II ESA by Ms. Michelle Taggart of Tamarack. Ms. Taggart can be reached by telephone at (613) 739-2919.

1.3 Current and Proposed Future Uses

The Phase II Property is not developed with any buildings and currently exists as vacant, tree-covered land with some unmaintained, unpaved trails. It is our understanding that the Phase II Property will be developed with Phase 7 and 8 of a larger residential subdivision referred to as "The Meadows".

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

- ❒ Coarse-grained soil conditions;
- ❒ Non-potable groundwater conditions; and
- ❒ Residential land use.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is surrounded by unused, partially treed land to the west, treed land and/or residential subdivision under construction to the north and east, and an aggregate pit adjacent to the south.

As noted previously, the Phase II Property is not developed with any buildings and currently exists as vacant, partially tree-covered land with some unmaintained, unpaved access trails. The ground surface in the area of the former aggregate pit was observed to generally consist of topsoil, with bulrushes along the southern property boundary.

The western portion of the property slopes downward to the south, with elevations ranging from approximately 99.5 meters above sea level (m asl) to 97.4 m asl. However, the overall topography across the entire Phase II Property slopes downward to the north, with elevations ranging from approximately 97.4 to 93.4 m asl. The regional topography in the general area of the site also slopes downward to the north, towards the Jock River.

The residential subdivision further to the east of the Phase I Property is provided with municipal services. The Phase II Property and adjacent properties to the west and south are not currently provided with municipal services and do not have private wells or septic systems.

2.2 Past Investigations

Paterson conducted a Phase I ESA for the subject land in December of 2018. Based on a review of historical records, it was determined that part of the subject property and adjacent property to the west (which together form the larger parcel of land addressed 3640 Greenbank Road) was used as a sand pit in the 1960's/1970s, while the remainder of the property consisted of vacant, treed land or agricultural fields. The adjacent property to the south was also used for agricultural and mineral aggregate extraction purposes. While no specific on- or off-site potentially contaminating activities (PCAs) were identified, the industrial use of the subject and adjacent land was considered to result in APECs on the Phase I Property.

Past environmental and geotechnical investigations were conducted by Paterson Group in 2009 and 2018, and consisted of the excavation of numerous test holes across 3640 Greenbank Road, including the subject parcel of land. No indications of contamination or fill were observed during these field programs.

Following the historical review, a site visit was conducted. The Phase I Property was observed to exist as vacant, partially treed land with some unmaintained, unpaved access trails. No environmental concerns were identified on the Phase I Property at the time of the site visit. A subsequent site visit was completed in December 2018. At the time of the site visit, the light snow cover was brushed aside at multiple locations across the site; the ground surface in the area of the former aggregate pit was observed to consist of topsoil, with bulrushes along the southern edge of the property. The surrounding land use consisted of industrial (aggregate extraction) to the south, with residential development to the east, and vacant, partially treed land to the north and west. No specific PCAs were identified in the Phase I Study Area.

Situated outside of the Phase I Study Area, the Trail Road landfill was identified as a PCA due to the nature of the activity. However, the landfill site was not considered to represent an APEC on the Phase I Property given its separation distance of over 500m from the subject land and its cross-gradient orientation relative to the subject land, in combination with the information available with regard to its operations (2015 and 2016 monitoring and operating reports).

Based on the previous industrial use of the property as an aggregate pit, a record of site condition (RSC) will be required in order to change the land use to residential. As such, a Phase II ESA was recommended to support the filing of the RSC, although no specific on- or off-site PCAs were identified on the Phase II Property.

Table 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern with respect to Phase I Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1 (resulting from former industrial land use: on-site aggregate extraction operations)	Western and southern portions of the Phase I Property	PCA: Other (use of heavy equipment during aggregate extraction activities)	On-site	PHC F_1-F_4 BTEX	Soil and groundwater
APEC 2 (resulting from former off-site industrial land use: aggregate extraction operations, on adjacent land to the west)	Western portion of the Phase I Property	PCA: Other (use of heavy equipment during aggregate extraction activities)	Off-site	PHC F_1-F_4 BTEX	Soil and groundwater
APEC 3 (resulting from existing off-site industrial land use: aggregate extraction operations, on adjacent land to the south)	Southern portion of the Phase I Property	PCA: Other (use of heavy equipment during aggregate extraction activities)	Off-site	PHC F_1-F_4 BTEX	Soil and groundwater

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted during the interim of February 4 through February 5, 2019. The field program consisted of drilling 8 boreholes to depths ranging from approximately 4.6 to 5.9m below grade. Boreholes BH1, BH2, BH5 and BH6 were completed with monitoring well installations. Bedrock was not encountered at the borehole locations.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern (CPCs) identified in the Phase I ESA. As noted in Table 1 above, CPCs for soil and groundwater include petroleum hydrocarbons (PHCs, fractions F_1-F_4) and benzene, toluene, ethylbenzene and xylenes (BTEX), based on the former on- and off-site use of heavy equipment for aggregate extraction operations.

3.3 Phase I Conceptual Site Model

Existing Buildings and Structures

No buildings or permanent structures exist on the Phase I Property.

Geological and Hydrogeological Setting

The subject site is located in an area of dolomite bedrock with offshore and nearshore marine sediment, and areas of organic deposits, with overburden depths ranging from 10 to 25m below ground surface. Based on topographic information obtained from previous investigations, groundwater is considered to flow to the north, towards the Jock River.

Water Bodies

The closest major water body is the Jock River, located approximately 1.1km north of the Phase I Property. There are no water bodies on the Phase I Property. Areas of standing water have been present on the property in the past, however no ponded water was observed at the time of the current site visit.

Areas of Natural Significance

No areas of natural significance were identified on the Phase I Property or within the Phase I Study Area.

Water Wells

A search of the MECP's web site for all drilled well records within 250m of the Phase I Property was conducted in February 2019. Based on the search results, no wells are located on the Phase I Property. One well record, with no information, was identified within the Phase I Study Area, on the vacant land further northeast of the Phase I Property. The new residential subdivision situated to the east and northeast (approximately 250 to 450m) has been developed with full municipal services.

Neighbouring Land Use

Neighbouring land use within the Phase I Study Area currently consists of vacant, residential or industrial (aggregate extraction) land use.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 1 in Section 2.2 of this report, the previous industrial use of the Phase I Property and neighbouring lands to the west (occupied by the same aggregate extraction operation), specifically the use of heavy equipment, is considered to represent areas of potential environmental concern (APECs 1 and 2) on the subject land. The current industrial use of the adjacent property to the south for aggregate extraction is also considered to represent an APEC (APEC 3) on the Phase I Property based its proximity to the subject land. Similarly to APECs 1 and 2, the PCA is considered to be the use of heavy equipment related to the aggregate extraction activities.

Contaminants of Potential Concern

Contaminants of potential concern (CPCs) for the Phase I Property consist of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs).

Based on the findings of the previous geotechnical and environmental investigations on the Phase I Property (including the lands to the west which together form the larger piece of land addressed 3640 Greenbank Road), no evidence of infilling was observed. Metals were not considered to be CPCs for the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

There were no material deviations to the Phase I ESA requirements set out in O.Reg. 153/04 that would cause uncertainty or absence of information that would affect the validity of the findings of the Phase I ESA or this Phase I CSM.

It is the opinion of the qualified person (QP_{ESA}) that based on the information obtained and reviewed as part of this Phase I ESA, the previous and/or existing industrial land use for on- or off-site aggregate extraction purposes, has resulted in APECs on the Phase I Property. No other PCAs or APECs are considered to be associated with the Phase I Property.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. There were no deviations from the Sampling and Analysis Plan.

3.5 Impediments

Physical impediments encountered during the field portion of the Phase II ESA include surficial conditions, such as treed areas and marshy areas along the southern portion of the Phase II Property.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on February 4 and February 5, 2019 and consisted of drilling 8 boreholes across the Phase II Property. The boreholes were placed to address the aforementioned areas of potential environmental concern (APECs). Four (4) boreholes, BH1, BH2, BH5 and BH6, were completed with groundwater monitoring well installations.

All boreholes were drilled with a track-mounted CME 55 power auger drill rig, provided by George Downing Estate Drilling of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. Borehole locations are shown on Drawing PE0190-5 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of thirty-eight (38) soil samples were obtained from the boreholes by means of sampling directly from auger flights and split spoon sampling. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

Site soils at the borehole locations generally consist of native silty sand with gravel. A layer of topsoil was identified at BH6. Native silty clay, with traces of gravel, was identified beneath the silty sand layer at BH7 and BH8. Bedrock was not encountered in any of the boreholes.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour/staining and evidence of fill material/ metal impacts, as well as a soil vapour screening with an RKI Eagle gas detector with methane elimination and calibrated to hexane.

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

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

The combustible vapour readings were generally less than 25ppm and were not considered to be indicative of petroleum hydrocarbon compounds. A slightly higher reading of 50ppm was identified for sample BH1-SS6. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No visual or olfactory indications of potential hydrocarbons, or visual indications of fill material or metal impacts, were identified in the soil samples. Soil samples were selected based on a combination of the results of the vapour screening and sample depth.

4.4 Groundwater Monitoring Well Installation

Four (4) groundwater monitoring wells were installed on the Phase II Property, at boreholes BH1, BH2, BH5 and BH6. The monitoring wells consisted of 51mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Table 2: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	98.16	4.28	1.23-4.28	2.14-4.28	0.3-2.14	Stick-up
BH2	97.46	4.19	1.14-4.19	2.05-4.19	0.3-2.05	Stick-up
BH5	97.38	4.28	1.23-4.28	2.14-4.28	0.3-2.14	Stick-up
BH6	98.14	4.57	1.52-4.57	2.43-4.57	0.3-2.43	Stick-up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1, BH2, BH5 and BH6 on February 11, 2019. At this time, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, pH, and electrical conductivity.

Field parameters were measured after each well volume purged. Wells were purged prior to sampling until at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized in Table 3.

Table 3: Field Measurement of Water Quality Parameters – Feb.11, 2019

Parameter	BH1	BH2	BH5	BH6
Temperature (°C)	1.4	3.5	4.1	5.8
pH	8.20	7.62	8.00	7.38
Electrical Conductivity (µS/cm)	610	643	477	2,230

4.6 Groundwater Sampling

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

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the soil and groundwater samples submitted for analytical testing are outlined in Tables 4 and 5.

Table 4: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX	PHCs (F_1-F_4)	
BH1-SS6	3.81-4.42m; Native sand with gravel	X	X	Assessment of potential BTEX and PHC impacts associated with heavy equipment used for former aggregate extraction activities on-site and current activities on the adjacent property to the south.
BH2-SS3	1.52-2.13m; Native silty sand with gravel	X	X	
BH3-SS4	2.29-2.90m; Native silty sand to sandy silt with gravel	X	X	Assessment of potential BTEX and PHC impacts associated with former heavy equipment used for aggregate extraction activities on-site.
BH4-SS5	3.05-3.66m; Native silty sand, trace gravel	X	X	
BH5-SS4	2.29-2.90m; Native silty sand to sandy silt with gravel	X	X	Assessment of potential BTEX and PHC impacts associated with heavy equipment used for former aggregate extraction activities on-site and current activities on the adjacent property to the south.

Table 4 Continued: Soil Samples Submitted				
Sample ID	**Sample Depth/ Stratigraphic Unit**	**Parameters Analyzed**		**Rationale**
		BTEX	**PHCs (F_1-F_4)**	
BH6-SS4	2.29-2.90m; Native silty sand to sandy silt with gravel	X	X	Assessment of potential BTEX and PHC impacts associated with former heavy equipment used for aggregate extraction activities on-site.
BH7-SS4	2.29-2.90m; Native silty sand to sandy silt with gravel	X	X	
BH8-SS5	0.1-0.4m; Native silty sand	X	X	
DUP1	0.1-0.4m; Native silty sand		X	Quality Assurance/Quality Control; note that only PHC F_2-F_4 were analysed.

Table 5: Groundwater Samples Submitted				
Sample ID	**Sample Depth/ Stratigraphic Unit**	**Parameters Analyzed**		**Rationale**
		BTEX	**PHCs (F_1-F_4)**	
BH1-GW1	1.23-4.28m; Native sand with gravel	X	X	Assessment of potential BTEX and PHC impacts associated with heavy equipment used for former aggregate extraction activities on-site and current activities on the adjacent property to the south.
BH2-GW1	1.14-4.19m; Native silty sand with gravel	X	X	
BH5-GW1	1.23-4.28m; Native silty sand	X	X	Assessment of potential BTEX and PHC impacts associated with former heavy equipment used for aggregate extraction activities on-site.
BH6-GW1	1.52-4.57m; Native silty sand to sandy silt with gravel	X	X	
DUP2	1.23-4.28m; Native sand with gravel		X	Quality Assurance/Quality Control; note that only PHC F_2-F_4 were analysed.

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

4.8 Residue Management

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

4.9 Elevation Surveying

The monitoring well locations were selected by Paterson, and located and surveyed in the field by Stantec. The ground surface elevations at the monitoring well locations are referenced to a geodetic datum and are presented on Drawing PE0190-5 - Test Hole Location Plan appended to this report.

4.10 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, 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

Based on the information obtained during the current subsurface investigation, in combination with information obtained during previous Environmental and/or Geotechnical Investigations, site soils generally consist of topsoil, silty sand with gravel, silty clay with trace gravel and/or glacial till.

Groundwater was encountered within the overburden at depths ranging from approximately 1.58 and 2.05m below ground surface.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on February 11, 2019, using an electronic water level meter. Groundwater levels are summarized below in Table 6. Based on the groundwater elevations, contour mapping was completed. Groundwater contours as shown on Drawing PE0190-6 – Groundwater Contour Plan, indicate that the groundwater beneath the Phase II Property flows towards the southeast. A hydraulic gradient of 0.001m/m was calculated.

Table 6: Groundwater Level Measurements				
Borehole Location	**Ground Surface Elevation (m)**	**Water Level Depth (m below grade)**	**Water Level Elevation (m ASL)**	**Date of Measurement**
BH1	98.16	2.72	95.44	February 11, 2019
BH2	97.46	1.82	95.64	February 11, 2019
BH5	97.38	1.71	95.67	February 11, 2019
BH6	98.14	2.05	96.09	February 11, 2019

It should be noted the groundwater flow direction along the southern portion of the Phase II Property is considered to be influenced by the aggregate pit on the adjacent property to the south. Based on the regional topography, in combination with the proximity of the Jock River, and previous work conducted in the area, the regional groundwater flow is considered to be in a northerly direction.

5.3 Fine-Coarse Soil Texture

Based on field soil observations, fine-grained soil standards are not applicable to the Phase II Property.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in combustible vapour readings generally ranging from 0 to 25ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

A total of 8 soil samples were submitted for analysis of BTEX and PHCs (F_1-F_4). The results of the analytical testing are presented below in Table 7. The laboratory certificate of analysis is provided in Appendix 1.

Table 7: Analytical Test Results – Soil
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		Feb.4/19	Feb.5/19	Feb.4/19	
		BH1-SS6 (3.81-4.42m)	BH2-SS3 (1.52-2.13m)	BH3-SS4 (2.29-2.90m)	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes (Total)	0.05	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	55
PHC F2	4	nd	nd	nd	98
PHC F3	8	nd	14	10	300
PHC F4	6	nd	16	18	2,800

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

Table 7 Continued: Analytical Test Results – Soil
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		Feb.5/19	Feb.4/19		
		BH4-SS5 (3.05-3.66m)	BH5-SS4 (2.29-2.90m)	BH6-SS4 (2.29-2.90m)	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes (Total)	0.05	nd	nd	nd	3.1
PHC F1	7	nd	nd	nd	55
PHC F2	4	nd	nd	nd	98
PHC F3	8	nd	12	nd	300
PHC F4	6	nd	17	nd	2,800

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

Table 7 Continued: Analytical Test Results – Soil
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		Feb.5/19			
		BH7-SS4 (2.29-2.90m)	BH8-SS5 (3.05-3.66m)	DUP1 (3.05-3.66m)	
Benzene	0.02	nd	nd	na	0.21
Ethylbenzene	0.05	nd	nd	na	2
Toluene	0.05	nd	nd	na	2.3
Xylenes (Total)	0.05	nd	nd	na	3.1
PHC F1	7	nd	nd	na	55
PHC F2	4	nd	nd	6	98
PHC F3	8	22	nd	17	300
PHC F4	6	9	nd	6	2,800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- na – not analysed for this parameter

No concentrations of BTEX or PHC F_1 parameters were identified in any of the samples analysed. The petroleum hydrocarbon parameters identified in soil Samples BH2-SS3, BH3-SS4, BH5-SS4, BH7-SS4 and DUP1 are in compliance with MECP Table 3 standards.

Maximum soil concentrations identified on-site are presented in Table 8 below. All other parameters were below laboratory detection limits.

Table 8 : Maximum Soil Concentrations

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Petroleum Hydrocarbons			
PHC F_2	6	BH8-SS5	3.05-3.66
PHC F_3	22	BH7-SS4	2.29-2.90
PHC F_4	18	BH3-SS4	2.29-2.90

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1, BH2, BH5 and BH6 were submitted for laboratory analysis of BTEX and PHC (F_1-F_4) parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. No visual or olfactory evidence of petroleum hydrocarbons was noted on the groundwater at any of the borehole locations.

The results of the analytical testing are presented below in Table 9. The laboratory certificate of analysis is provided in Appendix 1.

Table 9: Analytical Test Results - Groundwater
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) February 11, 2019			MECP Table 3 Standards (µg/L)
		BH1-GW1 (4.62-7.62m)	BH2-GW1 (3.04-6.04m)	BH5-GW1 (4.21-7.21m)	
Benzene	0.5	nd	nd	nd	5
Ethylbenzene	0.5	nd	nd	nd	2.4
Toluene	0.5	nd	nd	nd	22
Xylenes (Total)	0.5	nd	nd	nd	300
PHC F1	25	nd	nd	nd	420
PHC F2	100	nd	nd	nd	150
PHC F3	100	nd	nd	nd	500
PHC F4	100	nd	nd	nd	500

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

Table 9 Continued: Analytical Test Results - Groundwater
BTEX and PHCs (F_1-F_4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) February 11, 2019		MECP Table 3 Standards (µg/L)
		BH6-GW1 (1.52-4.57m)	DUP2 (1.23-4.28m)	
Benzene	0.5	nd	na	5
Ethylbenzene	0.5	nd	na	2.4
Toluene	0.5	nd	na	22
Xylenes (Total)	0.5	nd	na	300
PHC F1	25	nd	na	420
PHC F2	100	nd	nd	150
PHC F3	100	nd	nd	500
PHC F4	100	nd	nd	500

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

No BTEX or PHC parameters were detected above the laboratory method detection limits in any of the groundwater samples submitted for analytical testing. The results are in compliance with the MECP Table 3 standards.

It is our interpretation that the analyzed parameter concentrations do not indicate the potential presence of light non-aqueous phase liquids (LNAPLs). As previously noted, no free phase hydrocarbons were noted in the wells at the time of groundwater sampling event.

5.7 Quality Assurance and Quality Control Results

As per the Sampling and Analysis Plan, a duplicate soil sample was obtained at BH8. The RPD calculations for the original and duplicate sample are provided below in Table 10.

Table 10
QA/QC Calculations – Soil

Parameter	MDL (µg/g)	BH8-SS5	DUP1	RPD (%)	QA/QC Result
PHC (F_2)	4	nd	6	40	Outside the acceptable range
PHC (F_3)	8	nd	17	72	Outside the acceptable range
PHC (F_4)	6	nd	6	0	Acceptable

Notes:
- As parameter concentrations were not detected for Sample BH8-SS5, the MDL was used to calculate the RPD.
- All other parameter concentrations were below laboratory detection limits for both BH8-SS5 and DUP1, and as such, are within acceptable QA/QC parameters.

Although the RPDs calculated are outside of the acceptable range of 20%, the parameter concentrations detected in the duplicate sample are similar to those detected in the other samples analysed. The findings of the Phase II ESA are not considered to have been affected by the difference between these two samples. For the purposes of filing a record of site condition (RSC) the higher results will be reported.

A duplicate groundwater sample (DUP2) was obtained from BH5 during the February 11, 2019 groundwater sampling event. Both the original and duplicate sample were analysed for BTEX and PHC parameters. No parameter concentrations were detected in either sample.

All soil and groundwater samples were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

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

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

5.8 Phase II Conceptual Site Model

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

Site Description

The Phase Phase II Property is located approximately 350 east side of Borrisokane Road and approximately 275m south of Cambrian Road, in the City of Ottawa, Ontario. The Phase II Property has an approximate area of 13.5 hectares. At the time of the Phase I Environmental Site Assessment (ESA), the subject land was partially treed, vacant and unused land. Some areas of the site had been cleared of vegetation as part of the geotechnical investigation. The ground surface in the area of the former aggregate pit was observed to consist of sand or topsoil on the west-central portion of the Phase II Property, while bulrushes were observed along the southern edge of the property.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Based on the findings of the Phase I ESA completed for the subject land, no specific potentially contaminating activities (PCAs) from Table 2 of O.Reg. 153/04, were identified on the Phase I Property or within the 250m study area, however, the former industrial use of the property for aggregate extraction purposes, specifically the use of heavy equipment, has been considered to have resulted in an APEC (APEC 1) on the Phase II Property.

Former aggregate extraction operations conducted on the adjacent lands to the west (part of the former operations on the subject land) and the existing aggregate extraction operations to the south (the Drummond Costello Pit), and more specifically the use of heavy equipment associated with these operations, was considered to result in APECs 2 and 3 on the western and southern portions of the Phase II Property, based on the proximity of the former and current industrial activity.

As shown on Drawing PE0190-4R, the following PCA is situated outside the 250m Phase I Study Area and is further discussed below:

- Item 58, Table 2, O.Reg.153/04 as amended ("Waste Disposal and Waste Management, including thermal treatment, landfilling and transfer of waste other than use of biosoils as soil conditioners"); this PCA refers to the Trail Road Landfill property situated approximately 500m southwest of the RSC Property.

As part of the Phase I ESA, Paterson obtained 2015 and 2016 Monitoring and Operating Reports prepared for the Trail Road Landfill Site, from the City of Ottawa. Based on a review of the reports, weak to moderate leachate effects were observed in the shallow sand aquifer in 2015, within the forested area north of the eastern portion of the landfill site and situated more than 250m west of the Phase II Property. Analytical testing of groundwater recovered from monitoring wells present along the northern landfill property boundary in 2016, indicated no leachate impacts. The reports also indicate that the presence of a stormwater management pond and drainage ditch directs surface flow (and shallow aquifer seepage) to the north, along Borrisokane Road, and not in the direction of the Phase II Property. Furthermore, according to our files, analytical testing of a groundwater sample recovered from BH3 (2004) on the adjacent lands to the west of the Phase II Property, along Borrisokane Road, did not indicate any potential impact from the Trail Road Landfill property.

Based on the information contained in our files, in combination with the aforementioned Trail Road Landfill Site Monitoring and Operating Reports, the distance of the landfill from the subject land and the geology and hydrogeology of the area, the landfill is not considered to represent an APEC on the Phase II Property.

The rationale for identifying the above PCAs is based on a review of aerial photographs as well as field observations and personal interviews.

Contaminants of Potential Concern and Impacted Media

The following Contaminants of Potential Concern (CPC) were identified with respect to the soil and groundwater beneath the Phase II Property:

- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX); and
- Petroleum Hydrocarbons fractions 1 through 4 (PHCs F_1-F_4).

As noted previously, BTEX and PHCs have been identified as CPCs associated with the former or current use of heavy equipment during aggregate extraction operations on the Phase II Property and adjacent lands.

Subsurface Structures and Utilities

There are no subsurface structures or utilities on the Phase II Property.

Physical Setting

Site Stratigraphy

The site stratigraphy, as presented on Drawings PE0190-8 and 9 – Cross-Sections A-A' and B-B', generally consists of the following:

- Topsoil was identified at TP1-09, TP8-09, BH6, TP4-18, TP5-18, TP6-18, and BH3 (2009) from ground surface to depths ranging from approximately 0.10 to 0.40m below grade.
- Native sand with gravel or glacial till (comprised of silty sand with gravel, cobbles and boulders) to depths up to 5.2m below grade. Native sand with gravel was encountered from ground surface at BH1, BH2, BH3, BH5 and TP7-18. With the exception of TP7-18, the test holes were completed in this layer. Groundwater was encountered within this stratigraphic unit.
- Native sandy clay was encountered below the sand layer at TP7-18, from 3.66 to 4.0m below grade, at which depth the test hole was completed.

Hydrogeological Characteristics

Groundwater was encountered in the sand layer beneath the Phase II Property. During the most recent groundwater monitoring event, groundwater flow was measured in a southeasterly direction, with a hydraulic gradient of 0.001 m/m. Groundwater contours are shown on Drawing PE0190-6 – Groundwater Contour Plan.

It should be noted the groundwater flow direction along the southern portion of the Phase II Property is considered to be influenced by the aggregate pit on the adjacent property to the south. Based on the regional topography, in combination with the proximity of the Jock River and previous work conducted in the area, the regional groundwater flow is considered to be in a northerly direction.

Approximate Depth to Bedrock

Bedrock was not encountered during the field drilling program. The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of dolomite of the Oxford Formation at depths ranging from approximately 10 to 25m across the Phase II Property.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 1.58m and 2.05m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the Phase II Property is not within 30m of an environmentally sensitive area, and the pH of surface soil is between 5 and 9, while the pH of subsurface soil is between 5 and 11. The results of the analytical testing for pH are shown on Drawing PE0190-7 – Analytical Testing Plan – Soil.

Section 43.1 of the Regulation does not apply to the subject site as bedrock is not located less than 2 m below ground surface.

Fill Placement

Fill material was not encountered on the Phase II Property. Paterson has conducted several previous environmental and/or geotechnical investigations for the larger parcel of land addressed 3640 Greenbank Road, during which numerous test holes were placed across the Phase II Property and adjacent lands to the west. No evidence of fill material was observed at any of the previous test hole locations, or at the borehole locations placed during the current Phase II ESA.

Several gravel paths are situated on the Phase II Property as shown on the attached drawings. The granular material is not considered to be fill material and is not considered to represent a concern on the Phase II Property.

Proposed Buildings and Other Structures

The Phase II Property will be developed with Phase 7 and Phase 8 of the residential subdivision referred to as The Meadows.

Existing Buildings and Structures

No buildings or permanent structures exist on the Phase II Property.

Water Bodies

No water bodies are situated on or within 30m of the Phase II Property. The closest major water body is the Jock River, located approximately 1.12 km to the north of the site.

Areas of Natural Significance

No areas of natural significance are present on or within 250m of the Phase II Property.

Environmental Condition

Areas Where Contaminants are Present

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

Types of Contaminants

Based on the findings of the Phase II ESA, no contaminants are present in the soil or groundwater on or beneath the Phase II Property.

Contaminated Media

Based on the findings of the Phase II ESA, contaminated media is not present on the Phase II Property.

What Is Known About Areas Where Contaminants Are Present

No contaminants exceeding MECP Table 3 standards are present in the soil or groundwater on or beneath the Phase II Property.

Distribution of Contaminants

No contaminants exceeding MECP Table 3 standards are present in the soil or groundwater on or beneath the Phase II Property. Therefore no distribution of contaminants has occurred on the Phase II Property.

Discharge of Contaminants

Based on the findings of the Phase II ESA, no contaminants are present on the Phase II Property and therefore no contaminants have been discharged to the Phase II Property.

Migration of Contaminants

No contaminants are present on the Phase II Property and therefore contaminant migration has not occurred on the Phase II Property.

Climatic and Meteorological Conditions

No contaminants are present in the soil or groundwater beneath the Phase II Property and therefore climatic and meteorological conditions are not considered to have affected contaminant transport.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the part of the property addressed 3640 Greenbank Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to assess potential areas of environmental concern (APECs) on the Phase II Property, resulting from the past and/or current industrial use of the subject land and adjacent properties for aggregate extraction purposes. The Phase II ESA consisted of drilling eight (8) boreholes across the Phase II Property, four (4) of which were constructed with groundwater monitoring well installations.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements. Based on the screening results, a total of nine (9) soil samples, including a duplicate sample, were submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F_1-F_4). Based on the analytical test results, no BTEX parameters or PHC (F_1) were identified in the soil samples submitted for testing. Petroleum hydrocarbon F_3 and F_4 fractions were identified in samples recovered from BH2, BH3, BH5 and BH7. In addition to F_3 and F_4 fractions, F_2 was also detected in a sample recovered from BH8. The PHC parameters identified were in compliance with the MECP Table 3 standards.

Groundwater samples from monitoring wells installed in BH1, BH2, BH5 and BH6 were recovered and analysed for BTEX and PHC parameters. No free-phase product was observed on the groundwater at any of the monitoring well locations during the February 2019 sampling event. Based on analytical test results, no BTEX or PHC concentrations were identified above the laboratory method detection limits in the groundwater samples analysed. The test results are in compliance with the MECP Table 3 standards.

Conclusion

Based on the findings of the Phase II ESA, the soil and groundwater beneath the Phase II Property is in compliance with the MECP Table 3 standards and no further investigation is required at this time.

It is expected that the groundwater monitoring wells will be abandoned in accordance with Ontario Regulation 903 at the time of construction excavation.

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 Tamarack (Nepean) Corporation. Notification from Tamarack and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Karyn Munch, P.Eng., QP$_{ESA}$

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

Report Distribution:

- ❒ Tamarack (Nepean) Corporation
- ❒ Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE0190-5 – TEST HOLE LOCATION PLAN

DRAWING PE0190-6 – GROUNDWATER CONTOUR PLAN

DRAWING PE0190-7 – ANALYTCIAL TESTING PLAN - SOIL

DRAWING PE0190-8 – ANALYTICAL TESTING PLAN - GROUNDWATER

DRAWING PE0190-9A – CROSS-SECTION A-A' – SOIL

DRAWING PE0190-9B – CROSS-SECTION A-A' – GROUNDWATER

DRAWING PE0190-10A – CROSS-SECTION B-B' – SOIL

DRAWING PE0190-10B – CROSS-SECTION B-B' - GROUNDWATER

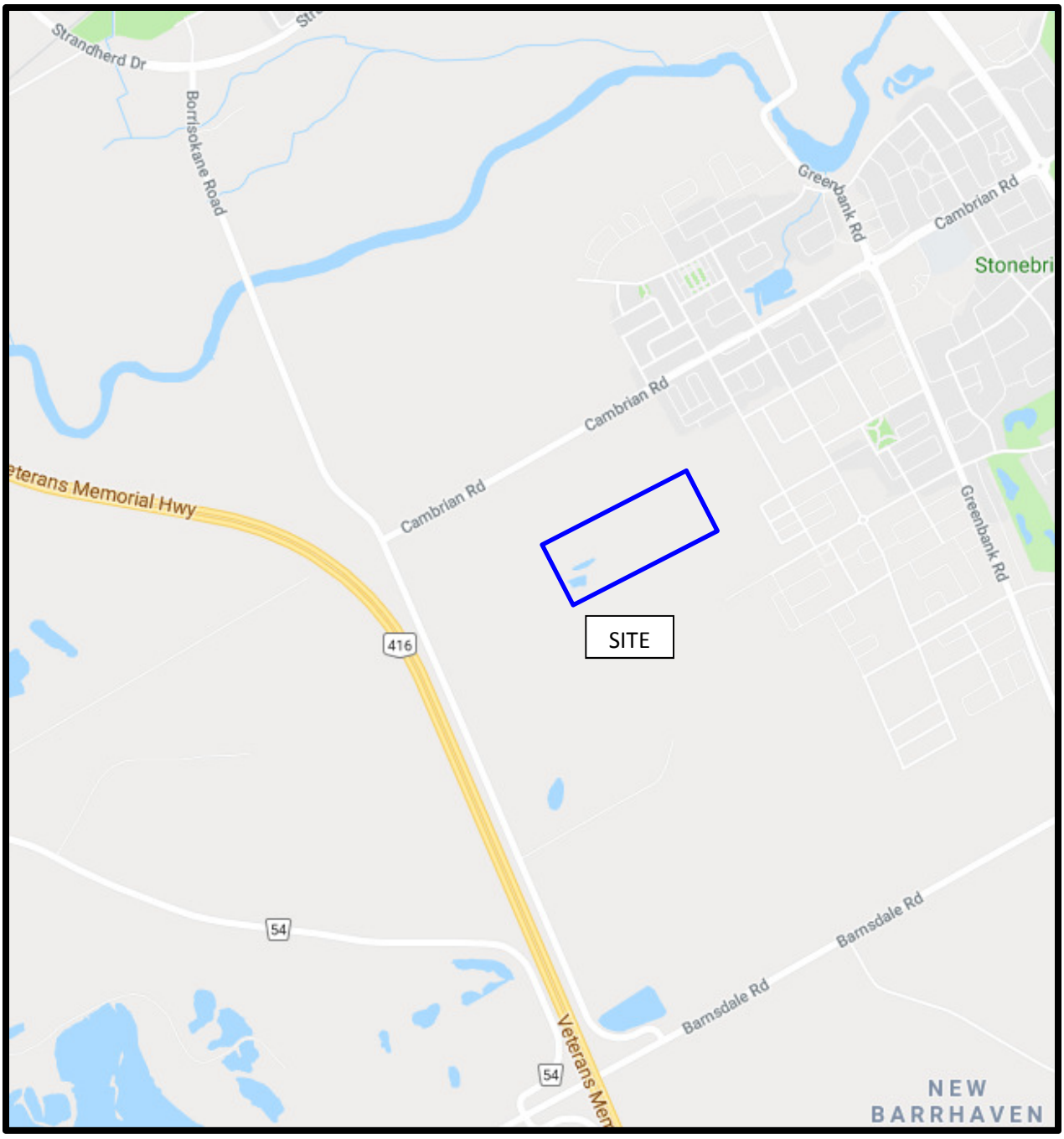
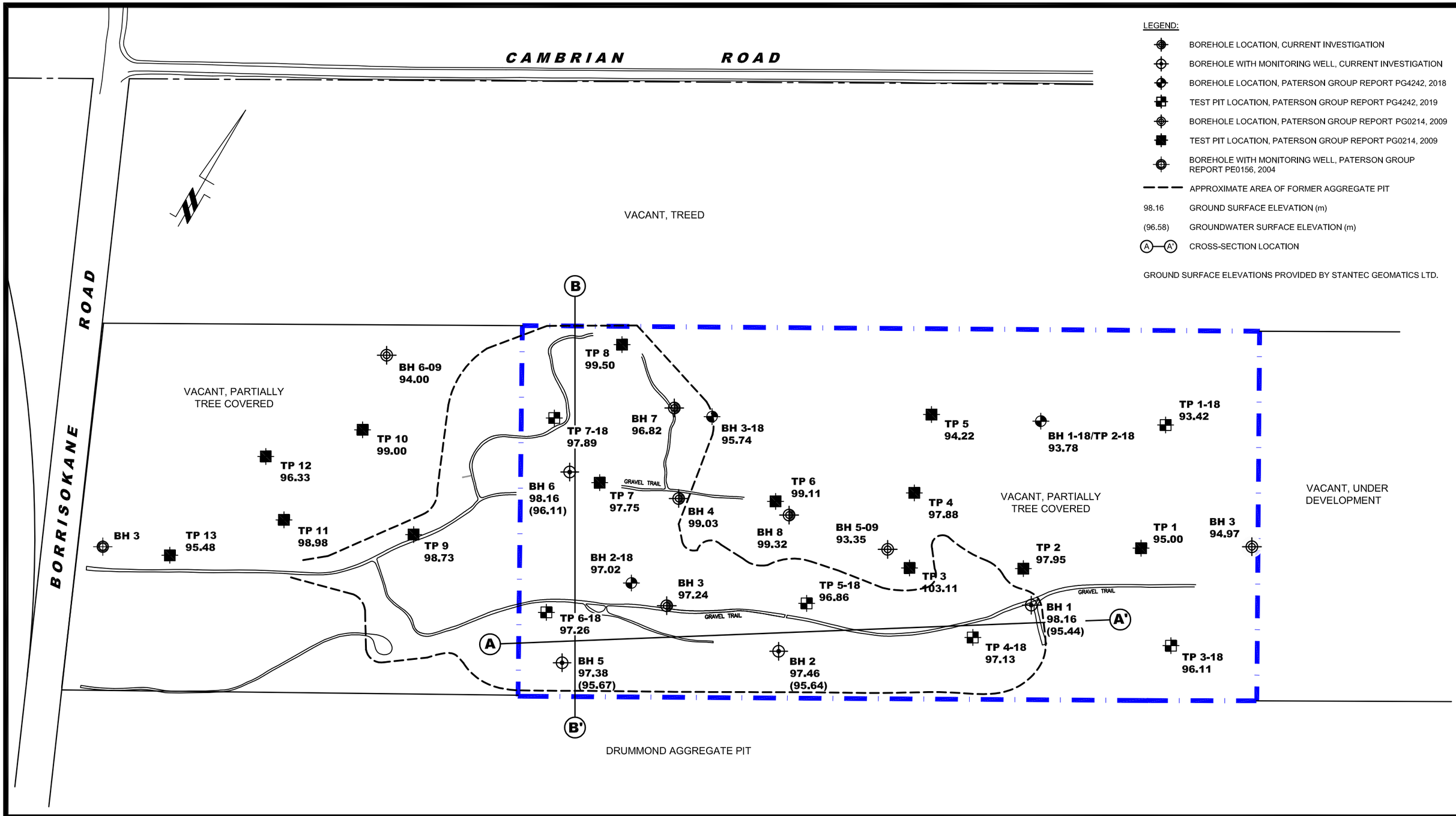


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG4242, 2018
- TEST PIT LOCATION, PATERSON GROUP REPORT PG4242, 2019
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG0214, 2009
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0214, 2009
- BOREHOLE WITH MONITORING WELL, PATERSON GROUP REPORT PE0156, 2004
- APPROXIMATE AREA OF FORMER AGGREGATE PIT
- 98.16 GROUND SURFACE ELEVATION (m)
- (96.58) GROUNDWATER SURFACE ELEVATION (m)
- A—A' CROSS-SECTION LOCATION

GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

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consulting engineers

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NO.	REVISIONS	DATE	INITIAL
0			

TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	Dwg. No.: PE0190-5
Approved by: MD	Revision No.: 0

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CAMBRIAN ROAD

BORRISOKANE ROAD

VACANT, TREED

VACANT, PARTIALLY TREE COVERED

VACANT, PARTIALLY TREE COVERED

VACANT, UNDER DEVELOPMENT

DRUMMOND AGGREGATE PIT

GRAVEL TRAIL

BH 6-09 94.00
TP 8 99.50
TP 10 99.00
TP 12 96.33
TP 7-18 97.89
BH 7 96.82
BH 3-18 95.74
TP 7 97.75
BH 4 99.03
BH 6 98.16 (96.11)
TP 6 99.11
TP 5 94.22
BH 1-18/TP 2-18 93.78
TP 1-18 93.42
TP 4 97.88
BH 5-09 93.35
BH 8 99.32
TP 3 103.11
TP 2 97.95
TP 1 95.00
BH 3 94.97
BH 3
TP 13 95.48
TP 11 98.98
TP 9 98.73
BH 2-18 97.02
BH 3 97.24
TP 5-18 96.86
BH 1 98.16 (95.44)
TP 3-18 96.11
TP 6-18 97.26
TP 4-18 97.13
BH 5 97.38 (95.67)
BH 2 97.46 (95.64)

96.0
95.9
95.8
95.7
95.6
95.5

(0.001m/m)

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG4242, 2018
- TEST PIT LOCATION, PATERSON GROUP REPORT PG4242, 2019
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG0214, 2009
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0214, 2009
- BOREHOLE WITH MONITORING WELL, PATERSON GROUP REPORT PE0156, 2004

98.16 GROUND SURFACE ELEVATION (m)

(96.58) GROUNDWATER SURFACE ELEVATION (m)

96.0 GROUNDWATER CONTOUR

(0.001m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

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consulting engineers

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TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:3000	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	Dwg. No.: PE0190-6
Approved by: MD	Revision No.: 0

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CAMBRIAN ROAD

BORRISOKANE ROAD

VACANT, TREED

VACANT, PARTIALLY TREE COVERED

VACANT, PARTIALLY TREE COVERED

VACANT, UNDER DEVELOPMENT

DRUMMOND AGGREGATE PIT

GRAVEL TRAIL

BH7-SS4 (2.29-2.90m) Feb. 5, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH6-SS4 (2.29-2.90m) Feb. 4, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH4-AU1 (0-0.61m) Feb. 5, 2019
pH = 8.30

BH4-SS5 (3.05-3.66m) Feb. 5, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH8-SS5 (3.05-3.66m) Feb. 5, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH5-SS4 (2.29-2.90m) Feb. 4, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH3-SS4 (2.29-2.90m) Feb. 4, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH2-SS3 (1.52-2.13m) Feb. 5, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3

BH1-SS6 (3.81-4.42m) Feb. 4, 2019
BTEX and PHCs (F1-F4) comply with MECP Table 3
pH = 9.01

BH 6-09 94.00
TP 8 99.50
TP 10 99.00
TP 7-18 97.89
BH 7 96.82
BH 3-18 95.74
TP 5 94.22
BH 1-18/TP 2-18 93.78
TP 1-18 93.42
TP 12 96.33
BH 6 98.16 (96.11)
TP 7 97.75
BH 4 99.03
TP 6 99.11
BH 8 99.32
TP 4 97.88
BH 5-09 93.35
TP 1 95.00
BH 3 94.97
BH 3
TP 13 95.48
TP 11 98.98
TP 9 98.73
BH 2-18 97.02
BH 3 97.24
TP 3 103.11
TP 2 97.95
TP 5-18 96.86
BH 1 98.16 (95.44)
TP 3-18 96.11
TP 6-18 97.26
TP 4-18 97.13
BH 5 97.38 (95.67)
BH 2 97.46 (95.64)

LEGEND:

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG4242, 2018
- TEST PIT LOCATION, PATERSON GROUP REPORT PG4242, 2019
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG0214, 2009
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0214, 2009
- BOREHOLE WITH MONITORING WELL, PATERSON GROUP REPORT PE0156, 2004

98.16 GROUND SURFACE ELEVATION (m)

(96.58) GROUNDWATER SURFACE ELEVATION (m)

GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

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NO.	REVISIONS	DATE	INITIAL
0			

TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:3000	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	Dwg. No.: PE0190-7
Approved by: MD	Revision No.: 0

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CAMBRIAN ROAD

BORRISOKANE ROAD

VACANT, TREED

VACANT, PARTIALLY TREE COVERED

VACANT, PARTIALLY TREE COVERED

VACANT, UNDER DEVELOPMENT

DRUMMOND AGGREGATE PIT

GRAVEL TRAIL

GRAVEL TRAIL

GRAVEL TRAIL

BH6-GW1 (1.52-4.57m) Feb. 11, 2019
BTEX and PHCs comply with MECP Table 3

BH5-GW1 (1.23-4.28m) Feb. 11, 2019
BTEX and PHCs comply with MECP Table 3

BH2-GW1 (1.14-4.19m) Feb. 11, 2019
BTEX and PHCs comply with MECP Table 3

BH1-GW1 (1.23-4.28m) Feb. 11, 2019
BTEX and PHCs comply with MECP Table 3

BH 6-09
94.00

TP 8
99.50

TP 10
99.00

TP 12
96.33

TP 7-18
97.89

BH 7
96.82

BH 3-18
95.74

BH 6
98.16
(96.11)

TP 7
97.75

BH 4
99.03

TP 6
99.11

BH 8
99.32

TP 5
94.22

BH 1-18/TP 2-18
93.78

TP 1-18
93.42

TP 4
97.88

BH 5-09
93.35

TP 1
95.00

BH 3
94.97

BH 3

TP 13
95.48

TP 11
98.98

TP 9
98.73

BH 2-18
97.02

BH 3
97.24

TP 5-18
96.86

TP 3
103.11

TP 2
97.95

TP 6-18
97.26

BH 1
98.16
(95.44)

TP 3-18
96.11

TP 4-18
97.13

BH 5
97.38
(95.67)

BH 2
97.46
(95.64)

LEGEND:

GROUNDWATER PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG4242, 2018
- TEST PIT LOCATION, PATERSON GROUP REPORT PG4242, 2019
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG0214, 2009
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0214, 2009
- BOREHOLE WITH MONITORING WELL, PATERSON GROUP REPORT PE0156, 2004

98.16 GROUND SURFACE ELEVATION (m)

(96.58) GROUNDWATER SURFACE ELEVATION (m)

GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

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TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:3000	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	Dwg. No.: PE0190-8
Approved by: MD	Revision No.: 0

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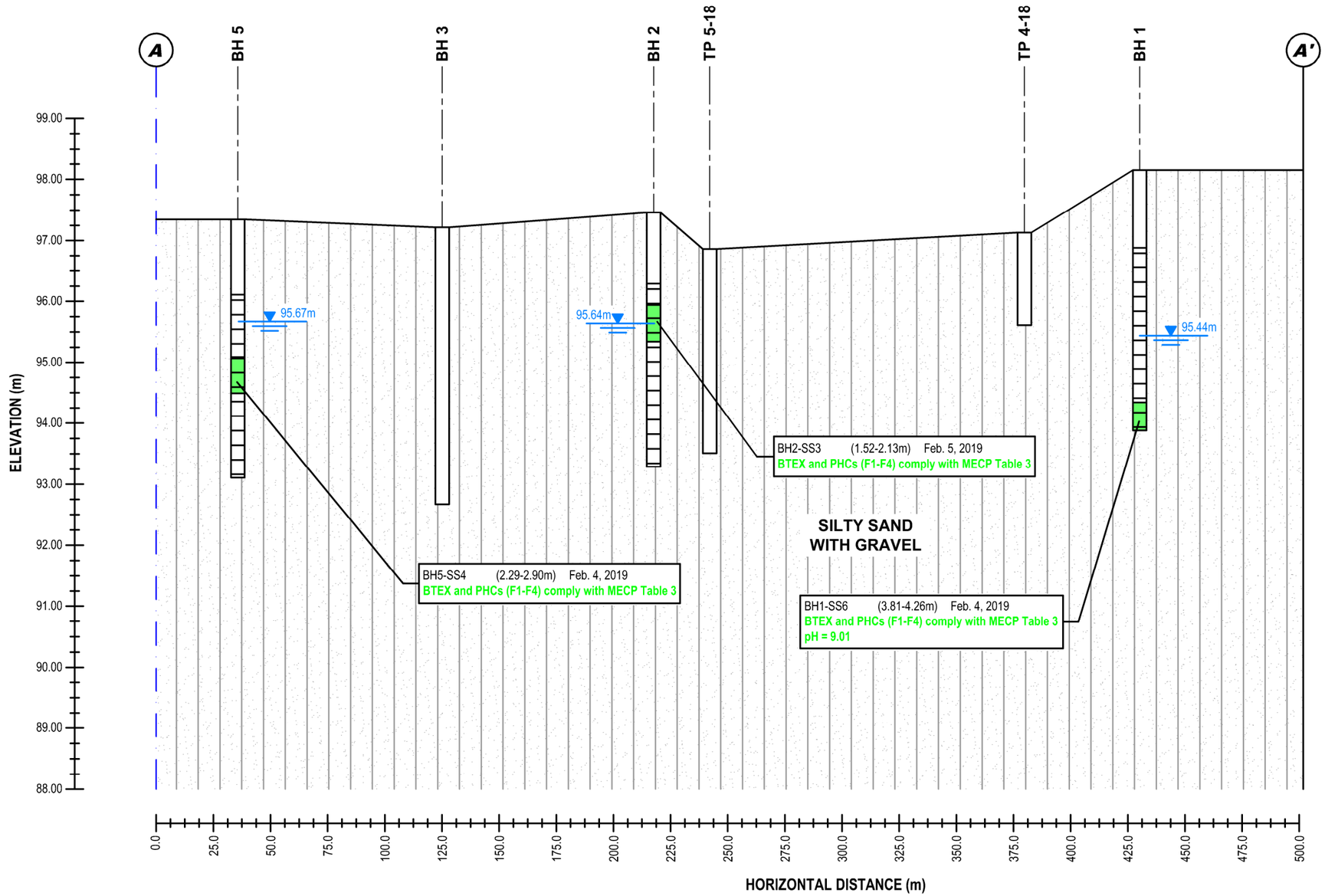

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

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TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL

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Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	PE0190-9A
Approved by: MSD	Revision No.:

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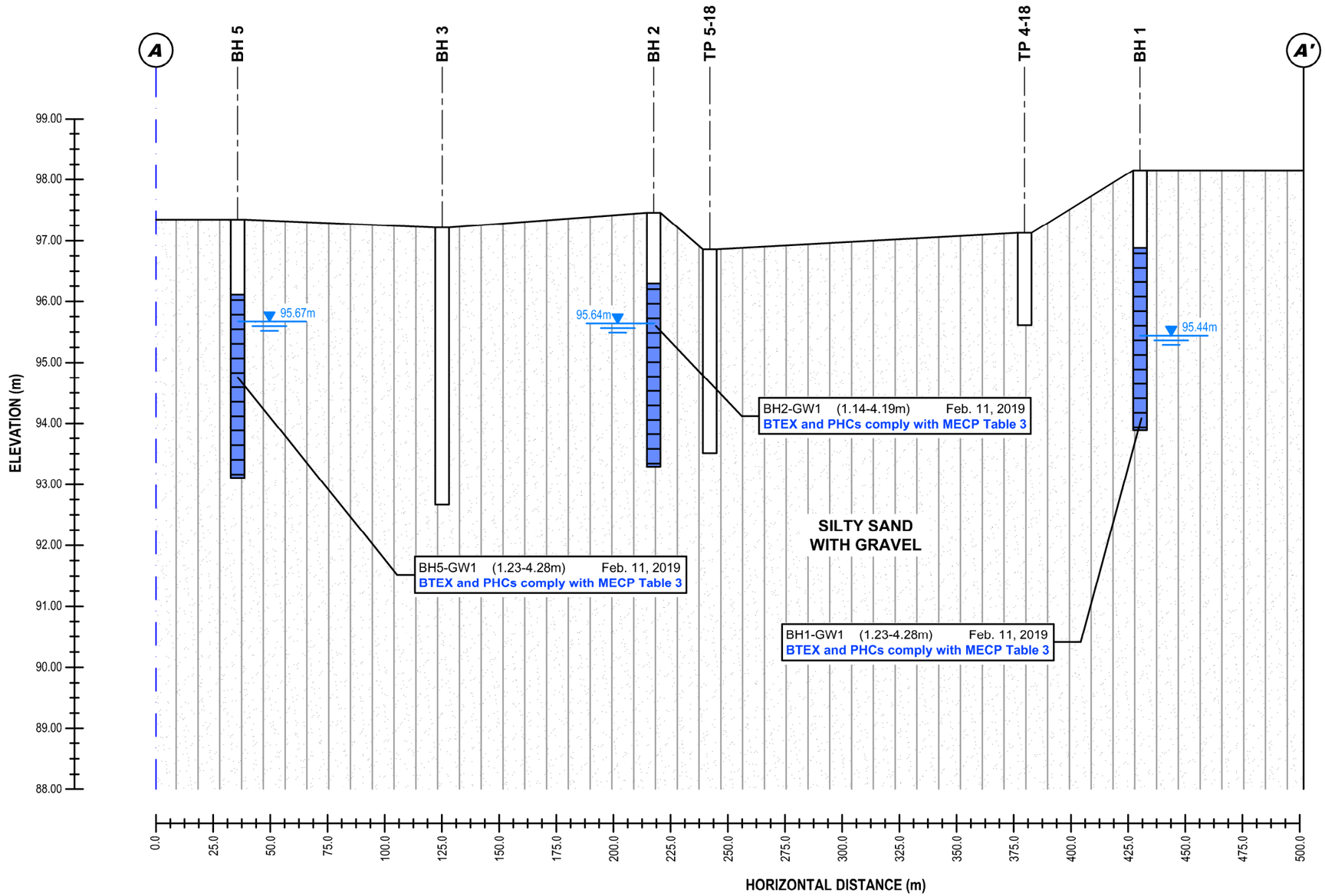

GROUNDWATER PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

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consulting engineers

154 Colonnade Road South
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NO.	REVISIONS	DATE	INITIAL

TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	PE0190-9B
Approved by: MSD	Revision No.:

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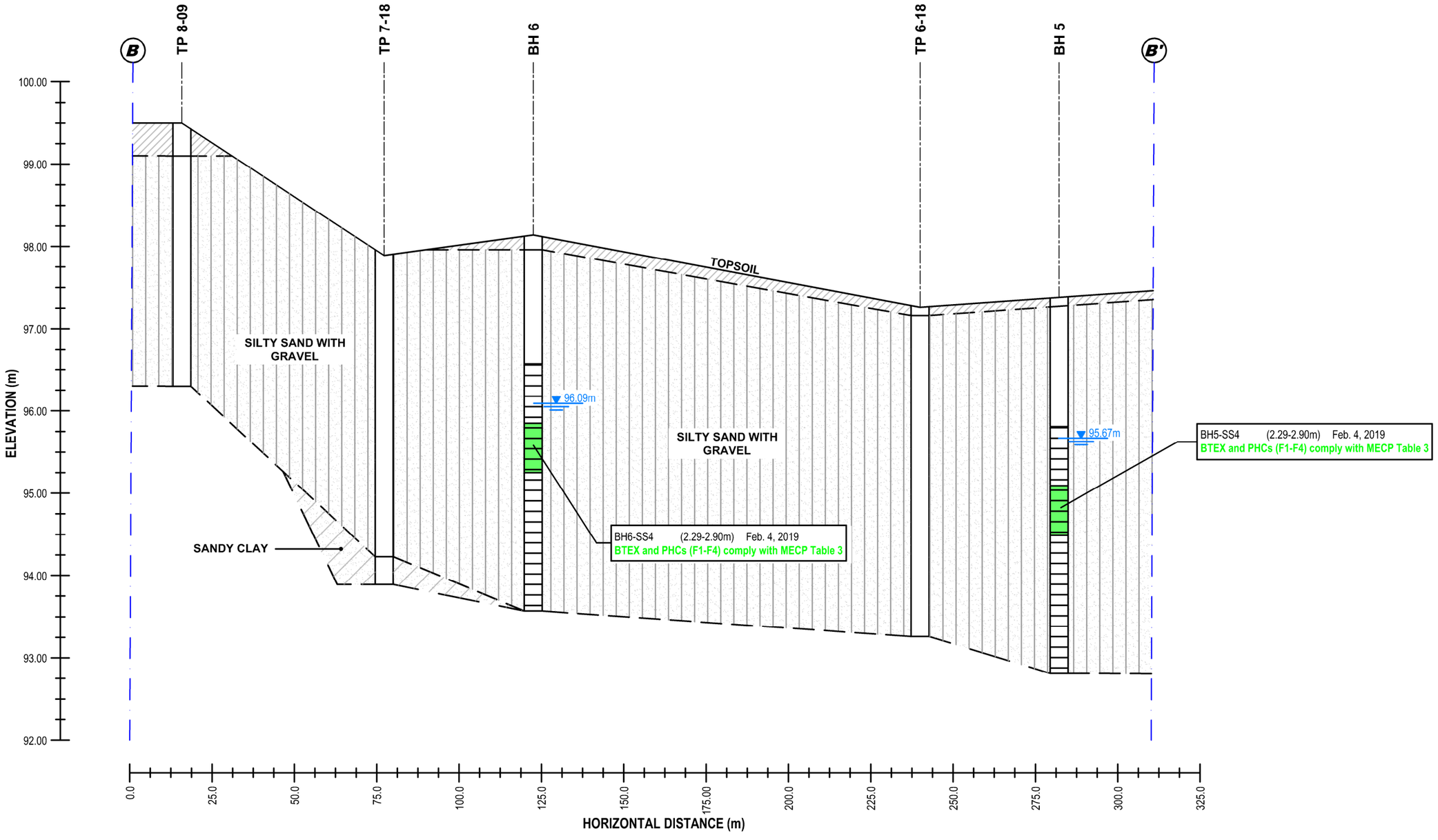

SOIL PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

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TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL

Scale: AS SHOWN	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
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Approved by: MSD	Revision No.:

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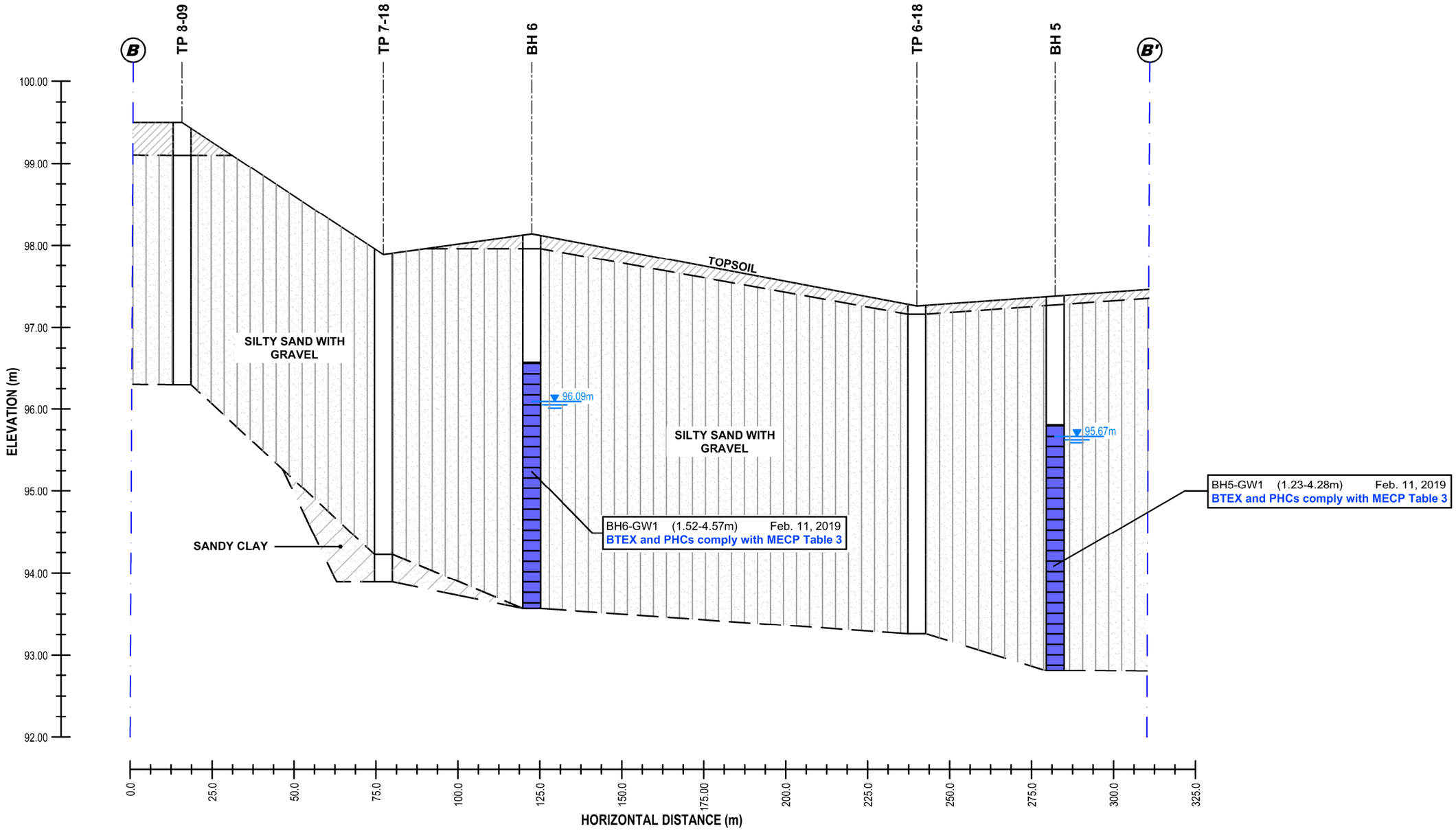

GROUNDWATER PARAMETERS COMPLY WITH MECP TABLE 3 STANDARDS

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TAMARACK (NEPEAN) CORPORATION

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 3640 GREENBANK ROAD

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - GROUNDWATER

Scale: AS SHOWN	Date: 02/2019
Drawn by: MPG	Report No.: PE0190-4
Checked by: KM	**PE0190-10B**
Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
The Meadows – Phase 7 and 8
Part of 3640 Greenbank Road
Ottawa, Ontario

Prepared For

Tamarack (Nepean) Corporation

January 2019

Report: PE0190-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Tamarack (Nepean) Corporation to conduct a Phase II Environmental Site Assessment (ESA) for part of 3640 Greenbank Road, in the City of Ottawa, Ontario. A subsurface investigation program consisting of borehole drilling, was developed for the property based on the findings of a Phase I ESA conducted by Paterson in December of 2018.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place borehole along southern portion of property to address potential concerns related to the former aggregate operations along the southern portion of the Phase I Property and on the adjacent land to the south.	Sample overburden to at least 1.5m below the water table for monitoring well installation.
BH2	Place borehole along southern portion of property to address potential concerns related to the former aggregate operations along the southern portion of the Phase I Property and on the adjacent land to the south.	
BH3	Place borehole within the approximate footprint of the former aggregate pit to address potential concerns associated with the former on-site operations.	Sample overburden to at least 1.5m below the water table.
BH4	Place borehole within the approximate footprint of the former aggregate pit to address potential concerns associated with the former on-site operations.	
BH5	Place borehole within the approximate footprint of the former aggregate pit to address potential concerns associated with the former on-site operations; also placed to address potential off-site concerns associated with the adjacent land to the south.	Sample overburden to at least 1.5m below the water table for monitoring well installation.
BH6	Place borehole within the approximate footprint of the former aggregate pit to address potential concerns associated with the former on-site operations.	
BH7	Place borehole within the approximate footprint of the former aggregate pit to address potential concerns associated with the former on-site operations.	Sample overburden to at least 1.5m below the water table.
BH8	Place borehole outside footprint of former aggregate pit for possible delineation purposes.	

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

Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

- ❒ glass soil sample jars
- ❒ two buckets
- ❒ trowel
- ❒ 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.

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 or hand held sampling equipment (shovel or trowel) 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 and more frequently if heavily used.

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

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

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

- ❒ Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).

- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (0.5 x) the laboratory detection limit.

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 3640 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** February 4, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.16
		AU	1				
		SS	2	67	39	1	97.16
		SS	3	42	29	2	96.16
Dense to compact, brown **SILTY SAND** with gravel		SS	4	79	20	3	95.16
		SS	5	25	26		
		SS	6	38	14	4	94.16
		SS	7	0	19	5	93.16
5.18							
End of Borehole							
(GWL @ 1.58m - Feb. 11, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 3640 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** February 5, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.46
		AU	1				
		SS	2	58	19	1	96.46
		SS	3	42	11		
Compact to loose, brown **SILTY SAND** with gravel						2	95.46
		SS	4	50	7		
		SS	5	58	15	3	94.46
		SS	6	0	7	4	93.46
4.57							
End of Borehole							
(GWL @ 1.82m - Feb. 11, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 3640 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** February 4, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	97.24		
		AU	1						
		SS	2	33	62	1	96.24		
		SS	3	54	25				
Very dense to dense, brown **SILTY SAND** with gravel						2	95.24		
		SS	4	75	35				
		SS	5	60	50+	3	94.24		
		SS	6	100	43	4	93.24		
4.57									
End of Borehole									

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

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

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** February 5, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	99.03		
		AU	1						
		SS	2	54	9	1	98.03		
		SS	3	79	10				
Brown **SILTY SAND** with gravel						2	97.03		
		SS	4	83	6				
		SS	5	75	12	3	96.03		
		SS	6	88	9	4	95.03		
		SS	7	29	15				
5.18						5	94.03		
End of Borehole									

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

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE0190

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** February 4, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.38
Brown **SILTY SAND**, some gravel, trace organics		AU	1				
0.76							
		SS	2	79	20	1	96.38
		SS	3	58	24		
Compact, brown **SILTY SAND** with gravel						2	95.38
		SS	4	71	12		
						3	94.38
		SS	5	100	21		
						4	93.38
		SS	6	100	19		
4.57							
End of Borehole							
(GWL @ 1.71m - Feb. 11, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 3640 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** February 4, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.14
TOPSOIL 0.18		AU	1				
Compact, brown **SILTY SAND**, trace organics		SS	2	0	20	1	97.14
- very loose and grey by 1.6m depth		SS	3	63	2	2	96.14
2.29		SS	4	54	6		
Loose to compact, brown **SILTY SAND**, trace gravel		SS	5	96	11	3	95.14
		SS	6	100	10	4	94.14
4.57							
End of Borehole							
(GWL @ 2.05m - Feb. 11, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 3640 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** February 5, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	96.82		
Dense, brown **SILTY SAND** with gravel		AU	1						
		SS	2	33	31	1	95.82		
1.57									
		SS	3	100	1	2	94.82		
		SS	4	100	1				
Grey **SILTY CLAY**						3	93.82		
		SS	5	17	W				
		SS	6	100	W	4	92.82		
5.18									
End of Borehole									

Lower Explosive Limit % scale: 20 40 60 80

RKI Eagle Rdg. (ppm) scale: 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 3640 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PE0190

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** February 5, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.32
		AU	1				
Loose to very loose, brown **SILTY SAND** with gravel		SS	2	63	10	1	98.32
		SS	3	50	2	2	97.32
2.31							
		SS	4	83	W	3	96.32
		SS	5	100	W		
Grey **SILTY CLAY**, trace gravel		SS	6	100	P	4	95.32
		SS	7	100	1	5	94.32
5.94							
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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 = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

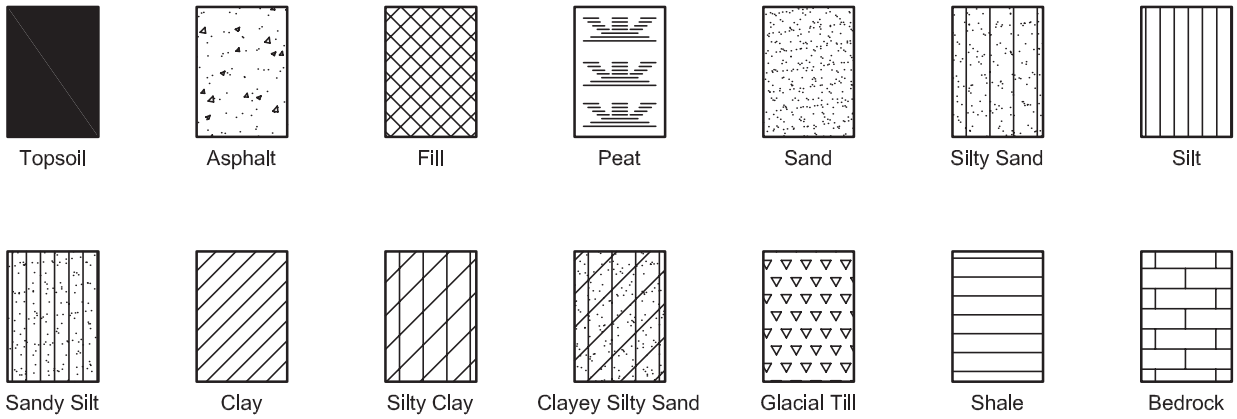
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

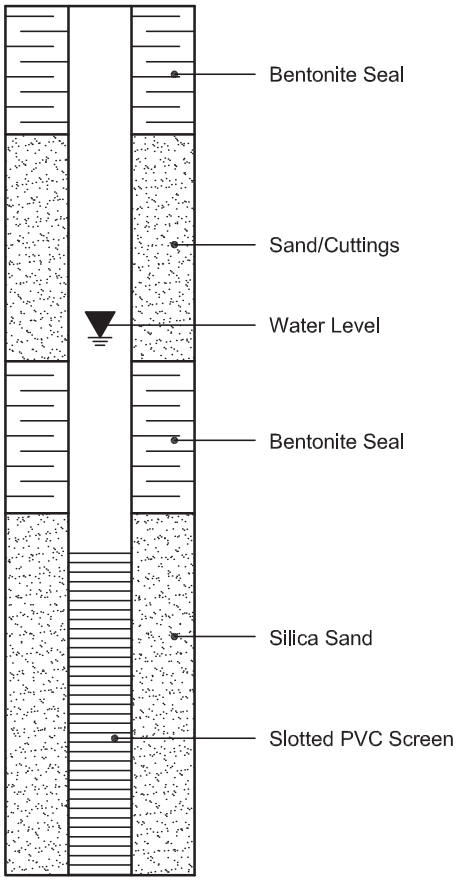
SYMBOLS AND TERMS (continued)

STRATA PLOT

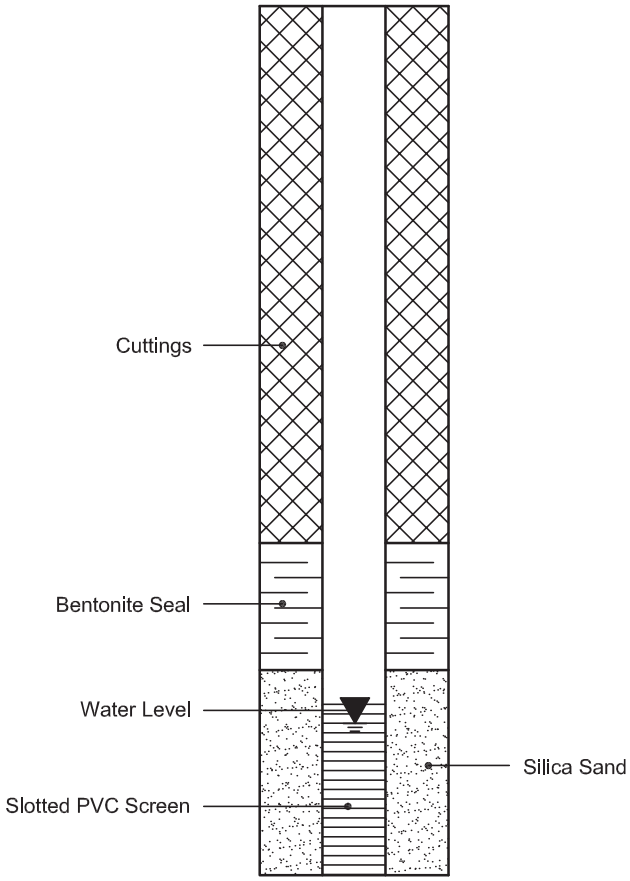


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 25841
Project: PE0190
Custody: 118600

Report Date: 12-Feb-2019
Order Date: 6-Feb-2019

Order #: 1906385

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

Paracel ID	Client ID
1906385-01	BH1-SS6
1906385-02	BH2-SS3
1906385-03	BH3-SS4
1906385-04	BH4-Gr1
1906385-05	BH5-SS4
1906385-06	BH6-SS4
1906385-07	BH7-SS4
1906385-08	BH8-SS5
1906385-09	Dup1
1906385-10	BH4-SS5

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25841

Report Date: 12-Feb-2019
Order Date: 6-Feb-2019
Project Description: PE0190

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Feb-19	9-Feb-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	7-Feb-19	8-Feb-19
PHC F1	CWS Tier 1 - P&T GC-FID	8-Feb-19	9-Feb-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Feb-19	8-Feb-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	8-Feb-19	9-Feb-19
Solids, %	Gravimetric, calculation	8-Feb-19	11-Feb-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25841

Report Date: 12-Feb-2019

Order Date: 6-Feb-2019

Project Description: PE0190

	Client ID:	BH1-SS6	BH2-SS3	BH3-SS4	BH4-Gr1
	Sample Date:	02/04/2019 09:00	02/05/2019 09:00	02/04/2019 09:00	02/05/2019 09:00
	Sample ID:	1906385-01	1906385-02	1906385-03	1906385-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	90.2	88.7	87.3	86.5
General Inorganics					
pH	0.05 pH Units	9.01	-	-	8.30
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25841

Report Date: 12-Feb-2019

Order Date: 6-Feb-2019

Project Description: PE0190

	Client ID:	BH1-SS6	BH2-SS3	BH3-SS4	BH4-Gr1
	Sample Date:	02/04/2019 09:00	02/05/2019 09:00	02/04/2019 09:00	02/05/2019 09:00
	Sample ID:	1906385-01	1906385-02	1906385-03	1906385-04
	MDL/Units	Soil	Soil	Soil	Soil
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	101%	-	-	-
Dibromofluoromethane	Surrogate	96.0%	-	-	-
Toluene-d8	Surrogate	94.4%	-	-	-
Benzene	0.02 ug/g dry	-	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	-
Toluene	0.05 ug/g dry	-	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	-	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	-	<0.05	<0.05	-
Toluene-d8	Surrogate	-	94.6%	93.0%	-
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	14	10	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	16	18	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25841

Report Date: 12-Feb-2019

Order Date: 6-Feb-2019

Project Description: PE0190

	Client ID:	BH5-SS4	BH6-SS4	BH7-SS4	BH8-SS5
	Sample Date:	02/04/2019 09:00	02/04/2019 09:00	02/05/2019 09:00	02/05/2019 09:00
	Sample ID:	1906385-05	1906385-06	1906385-07	1906385-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.1	83.1	69.3	72.9
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	<0.50	-
Benzene	0.02 ug/g dry	<0.02	-	<0.02	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	<0.05	-
Bromoform	0.05 ug/g dry	<0.05	-	<0.05	-
Bromomethane	0.05 ug/g dry	<0.05	-	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	<0.05	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
Chloroform	0.05 ug/g dry	<0.05	-	<0.05	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	<0.05	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	<0.05	-
Ethylene dibromide (dibromoethar	0.05 ug/g dry	<0.05	-	<0.05	-
Hexane	0.05 ug/g dry	<0.05	-	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	<0.50	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	<0.50	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	<0.05	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	<0.05	-
Styrene	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	<0.05	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25841

Report Date: 12-Feb-2019

Order Date: 6-Feb-2019

Project Description: PE0190

	Client ID:	BH5-SS4	BH6-SS4	BH7-SS4	BH8-SS5
	Sample Date:	02/04/2019 09:00	02/04/2019 09:00	02/05/2019 09:00	02/05/2019 09:00
	Sample ID:	1906385-05	1906385-06	1906385-07	1906385-08
	MDL/Units	Soil	Soil	Soil	Soil
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
Toluene	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	<0.05	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	<0.05	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	<0.02	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	-	<0.05	-
4-Bromofluorobenzene	Surrogate	99.7%	-	102%	-
Dibromofluoromethane	Surrogate	98.7%	-	103%	-
Toluene-d8	Surrogate	93.5%	-	93.5%	-
Benzene	0.02 ug/g dry	-	<0.02	-	<0.02
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	<0.05
Toluene	0.05 ug/g dry	-	<0.05	-	<0.05
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	<0.05
o-Xylene	0.05 ug/g dry	-	<0.05	-	<0.05
Xylenes, total	0.05 ug/g dry	-	<0.05	-	<0.05
Toluene-d8	Surrogate	-	93.0%	-	93.6%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	12	<8	22	<8
F4 PHCs (C34-C50)	6 ug/g dry	17	<6	9	<6

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25841

Report Date: 12-Feb-2019

Order Date: 6-Feb-2019

Project Description: PE0190

	Client ID:	Dup1	BH4-SS5	-	-
	Sample Date:	02/05/2019 09:00	02/05/2019 09:00	-	-
	Sample ID:	1906385-09	1906385-10	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	71.3	84.5	-	-
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	-	98.3%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	6	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	17	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	6	<6	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*8.96*		*ug/g*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*8.61*		*ug/g*		*108*	*50-140*			
Surrogate: Toluene-d8	*7.59*		*ug/g*		*94.9*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.59*		*ug/g*		*94.9*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25841

Report Date: 12-Feb-2019
Order Date: 6-Feb-2019
Project Description: PE0190

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	11.46	0.05	pH Units	11.40			0.5	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	244	4	ug/g dry	254			3.9	30	
F3 PHCs (C16-C34)	181	8	ug/g dry	192			6.0	30	
F4 PHCs (C34-C50)	25	6	ug/g dry	32			23.1	30	
Physical Characteristics									
% Solids	89.5	0.1	% by Wt.	90.3			0.9	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*10.2*		*ug/g dry*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*9.55*		*ug/g dry*		*95.5*	*50-140*			
Surrogate: Toluene-d8	*9.33*		*ug/g dry*		*93.4*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25841

Report Date: 12-Feb-2019
Order Date: 6-Feb-2019
Project Description: PE0190

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*9.33*		*ug/g dry*		*93.4*	*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)	199	7	ug/g		99.3	80-120			
F2 PHCs (C10-C16)	96	4	ug/g	ND	102	60-140			
F3 PHCs (C16-C34)	473	8	ug/g	192	130	60-140			
F4 PHCs (C34-C50)	192	6	ug/g	32	116	60-140			
Volatiles									
Acetone	10.1	0.50	ug/g		101	50-140			
Benzene	4.69	0.02	ug/g		117	60-130			
Bromodichloromethane	4.49	0.05	ug/g		112	60-130			
Bromoform	3.62	0.05	ug/g		90.6	60-130			
Bromomethane	3.21	0.05	ug/g		80.3	50-140			
Carbon Tetrachloride	4.10	0.05	ug/g		102	60-130			
Chlorobenzene	3.28	0.05	ug/g		81.9	60-130			
Chloroform	3.61	0.05	ug/g		90.4	60-130			
Dibromochloromethane	4.10	0.05	ug/g		103	60-130			
Dichlorodifluoromethane	5.20	0.05	ug/g		130	50-140			
1,2-Dichlorobenzene	2.63	0.05	ug/g		65.9	60-130			
1,3-Dichlorobenzene	2.86	0.05	ug/g		71.6	60-130			
1,4-Dichlorobenzene	2.73	0.05	ug/g		68.3	60-130			
1,1-Dichloroethane	5.00	0.05	ug/g		125	60-130			
1,2-Dichloroethane	4.39	0.05	ug/g		110	60-130			
1,1-Dichloroethylene	5.14	0.05	ug/g		128	60-130			
cis-1,2-Dichloroethylene	5.00	0.05	ug/g		125	60-130			
trans-1,2-Dichloroethylene	4.97	0.05	ug/g		124	60-130			
1,2-Dichloropropane	5.01	0.05	ug/g		125	60-130			
cis-1,3-Dichloropropylene	4.52	0.05	ug/g		113	60-130			
trans-1,3-Dichloropropylene	3.27	0.05	ug/g		81.9	60-130			
Ethylbenzene	3.43	0.05	ug/g		85.9	60-130			
Ethylene dibromide (dibromoethane	4.57	0.05	ug/g		114	60-130			
Hexane	3.33	0.05	ug/g		83.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	8.19	0.50	ug/g		81.9	50-140			
Methyl Isobutyl Ketone	10.8	0.50	ug/g		108	50-140			
Methyl tert-butyl ether	8.81	0.05	ug/g		88.1	50-140			
Methylene Chloride	4.27	0.05	ug/g		107	60-130			
Styrene	3.43	0.05	ug/g		85.7	60-130			
1,1,1,2-Tetrachloroethane	3.89	0.05	ug/g		97.3	60-130			
1,1,2,2-Tetrachloroethane	2.99	0.05	ug/g		74.7	60-130			
Tetrachloroethylene	4.02	0.05	ug/g		101	60-130			
Toluene	2.73	0.05	ug/g		68.4	60-130			
1,1,1-Trichloroethane	4.28	0.05	ug/g		107	60-130			
1,1,2-Trichloroethane	4.64	0.05	ug/g		116	60-130			
Trichloroethylene	4.86	0.05	ug/g		122	60-130			
Trichlorofluoromethane	4.06	0.05	ug/g		101	50-140			
Vinyl chloride	4.14	0.02	ug/g		104	50-140			
m,p-Xylenes	6.70	0.05	ug/g		83.7	60-130			
o-Xylene	3.51	0.05	ug/g		87.8	60-130			
Surrogate: 4-Bromofluorobenzene	*7.63*		*ug/g*		*95.4*	*50-140*			
Benzene	4.69	0.02	ug/g		117	60-130			
Ethylbenzene	3.43	0.05	ug/g		85.9	60-130			
Toluene	2.73	0.05	ug/g		68.4	60-130			
m,p-Xylenes	6.70	0.05	ug/g		83.7	60-130			
o-Xylene	3.51	0.05	ug/g		87.8	60-130			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH4-Gr1

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1906385

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Chain of Custody
(Lab Use Only)
№ 118600

Page 1 of 1

Client Name: Paterson	Project Reference: PE0190	**Turnaround Time:**
Contact Name: Karyn Munch	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 25841	☐ 2 Day ~~☐ Regular~~
Telephone: 613-226 7381	Email Address: kmunch@patersongroup.ca	Date Required:

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

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

Required Analyses

Paracel Order Number: 1906385

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	pH	PHC F2-F4				
1	BH1-S56	S		2	Feb 4/19		X	X						X				120mL vial	✓
2	BH2-S53	S		2	Feb 5/19		X											↓	✓
3	BH3-S54	S		2	Feb 4/19		X												✓
4	BH4-Gr1	S		1	Feb 5/19					X	X	X	X	X				120mL	✓
5	BH4-S55 HOLD	S		2	Feb 5/19		X											120mL vial	✓
6	BH5-S55	S		2	Feb 4/19		X	X											✓
7	BH6-S54	S		2	Feb 4/19		X												✓
8	BH7-S54	S		2	Feb 5/19		X	X											✓
9	BH8-S55	S		2	Feb 5/19		X											↓	✓
10	DUP1	S		1	Feb 5/19									X	X			120mL	✓

Comments: #5 jar reads as "BH5-S54". #8 date reads as Feb 5/19 on jar + vial. #4 jar reads as "BH4-Gr1". KW

Method of Delivery: Paracel

Relinquished By (Sign): Mike B.	Received by Driver/Depot: T. Scouse	Received at Lab:	Verified By:
Relinquished By (Print): MIKE B.	Date/Time: 06/02/19 4:40 PM	Date/Time: 02/06/19 8:15	Date/Time: 02/06/19 11:35
Date/Time:	Temperature: °C	Temperature: 11.4 °C	pH Verified [ ] By:

Extra samples: Jar "BH2-S52" Feb 5/19. Jar "BH8-S54" Feb 5/19. Vial "BH8-S5" Feb 5/19. KW } HOLD.

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Karyn Munch

Client PO: 25249
Project: PE0190
Custody: 120965

Report Date: 19-Feb-2019
Order Date: 12-Feb-2019

Order #: 1907208

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

Paracel ID	Client ID
1907208-01	BH1-GW1
1907208-02	BH2-GW1
1907208-03	BH5-GW1
1907208-04	BH6-GW1
1907208-05	Dup2

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25249

Report Date: 19-Feb-2019
Order Date: 12-Feb-2019
Project Description: PE0190

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	13-Feb-19	13-Feb-19
PHC F1	CWS Tier 1 - P&T GC-FID	12-Feb-19	13-Feb-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	15-Feb-19	17-Feb-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 25249

Report Date: 19-Feb-2019

Order Date: 12-Feb-2019

Project Description: PE0190

	Client ID:	BH1-GW1	BH2-GW1	BH5-GW1	BH6-GW1
	Sample Date:	02/11/2019 12:00	02/11/2019 12:00	02/11/2019 12:00	02/11/2019 12:00
	Sample ID:	1907208-01	1907208-02	1907208-03	1907208-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	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
Toluene	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
Toluene-d8	Surrogate	103%	101%	101%	102%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100

	Client ID:	Dup2	-	-	-
	Sample Date:	02/11/2019 12:00	-	-	-
	Sample ID:	1907208-05	-	-	-
	MDL/Units	Water	-	-	-
Hydrocarbons					
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25249

Report Date: 19-Feb-2019
Order Date: 12-Feb-2019
Project Description: PE0190

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									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*80.8*		*ug/L*		*101*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25249

Report Date: 19-Feb-2019
Order Date: 12-Feb-2019
Project Description: PE0190

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*78.8*		*ug/L*		*98.5*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1780	25	ug/L		89.2	68-117			
F2 PHCs (C10-C16)	1520	100	ug/L		95.0	60-140			
F3 PHCs (C16-C34)	3990	100	ug/L		102	60-140			
F4 PHCs (C34-C50)	2440	100	ug/L		98.4	60-140			
Volatiles									
Benzene	41.3	0.5	ug/L		103	60-130			
Ethylbenzene	40.0	0.5	ug/L		99.9	60-130			
Toluene	38.1	0.5	ug/L		95.2	60-130			
m,p-Xylenes	77.8	0.5	ug/L		97.2	60-130			
o-Xylene	41.0	0.5	ug/L		103	60-130			
Surrogate: Toluene-d8	*75.1*		*ug/L*		*93.8*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 25249

Report Date: 19-Feb-2019
Order Date: 12-Feb-2019
Project Description: PE0190

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH1-GW1, BH2-GW1, BH5-GW1, BH6-GW1

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

Paracel ID: 1907208

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e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 120965

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE0190
Contact Name: Kaitlyn Munch.	Quote #
Address: 154 Colonnade Rd S.	PO # 25249
Telephone: 613-226-7381	Email Address: kmunch@patersongroup.ca

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

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 2 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

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

Required Analyses

	Paracel Order Number: 1907208 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	PHCs F2-F4
1	BH1-GW1	GW		3	Feb.11/19	pm	✓							
2	BH2-GW1	GW		3	↓	↓	✓							
3	BH5-GW1	GW		3			✓							
4	BH6-GW1	GW		3			✓							
5	DUP2	GW		1	Feb 11/19	pm								✓
6														
7														
8														
9														
10														

Comments: please report as labelled on CoC
BH1-GW1 vs. BH1-19-GW1

Method of Delivery: Paracel

Relinquished By (Sign): KMunch	Received by Driver/Depot: M. DeLouse	Received at Lab:	Verified By:
Relinquished By (Print): KMunch	Date/Time: 12/02/19 4:30 PM	Date/Time: Feb 12/19 5:40 pm	Date/Time: 02/13/19 9:55 am
Date/Time: Feb.12.19	Temperature: °C	Temperature: 19.3 °C	pH Verified [ ] By: