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Phase II - Environmental Site Assessment

667 Bank Street
Ottawa, Ontario

Prepared For

Milito Investments

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Report: PE3865-2

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EXECUTIVE SUMMARY

ASSESSMENT

A Phase II - Environmental Site Assessment (ESA) was conducted for the commercial property located at 236 Richmond Road, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA was to address the APECs identified in the Phase I-ESA conducted for the site and to update the previous Phase II-ESA in general accordance with O.Reg. 153/04 as amended by O.Reg. 269/11.

Soil

Four (4) boreholes were advanced on the subject site in May 2016. No petroleum hydrocarbon odours were noted in BH1 or BH2, although some limited demolition debris was noted in BH1, which was located in the former garage building area. BH3 was located in the former tank remediation area, while BH4 was located in the southwest corner of the site. Several native clay soil samples did exhibit a faint petroleum hydrocarbon odour in these boreholes around the groundwater elevation level.

Groundwater

Groundwater samples were collected from monitoring wells installed in BH2, BH3 and BH4 in August 2016. Samples were submitted for PHC (F_1-F_4) and VOC analyses. None of the water exhibited any unusual odour or petroleum sheen. The analytical testing did not identify any contaminant concentrations above the laboratory detection limits. All groundwater results comply with the selected MOECC standards.

RECOMMENDATIONS

Based on the findings of the Phase I-ESA and taking into consideration the Phase II-ESA work that has been completed to date, further Phase II-ESA work will be required to fully assess the subsurface conditions beneath the subject property.

If the monitoring wells installed in BH2, BH3 and BH4 are not going to be used in the future, then they should be abandoned according to Ontario Regulation 903. The monitoring wells will be registered with the MOECC under this regulation. Further information can be provided upon request in this regard.

1.0 INTRODUCTION

At the request of Milito Investments, Paterson Group Inc. (Paterson) conducted a Phase II - Environmental Site Assessment (ESA) of the property located at 667 Bank Street, in the City of Ottawa, Ontario.

This report has been prepared specifically and solely for the above noted project which is described herein. It contains all of our findings and results of the environmental conditions at this site.

1.1 Site Description

Address:	667 Bank Street, Ottawa, Ontario.
Parcel Identification Number:	04133-0181
Legal Description:	Lot 2, of Plan 4M62, in the City of Ottawa.

Site Description:

Configuration/Area:	Irregular / 450 m^2 (approximate).
Zoning:	TM- Traditional Mainstreet Zone.
Current Use:	The site is currently unoccupied.
Services:	The site is located in a municipally serviced area.

1.2 Current and Proposed Future Uses

The site is currently undeveloped and used for vehicle parking for local businesses.

The proposed development will consist of a five-storey residential building with one level of underground parking. The proposed development will occupy the entire site. The existing property zoning, Traditional Main Street, will not change with redevelopment of the site.

1.3 Applicable Site Condition Standard

The soil and groundwater standards for the subject 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 Environment and Climate Change (MOECC), April 15, 2011. The MOECC Table 3 Standards are based on the following considerations:

- ❑ Coarse grained soil conditions.
- ❑ Surface soil and groundwater conditions.
- ❑ Non-potable groundwater situation.
- ❑ Residential land use.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is covered with gravel and patches of asphaltic concrete. The site is used for vehicle parking. The majority of the neighbouring properties are developed with low-rise buildings with Central Park situated to the north of the subject property.

Sheet drainage to catch basins located on Bank Street and Clemow Avenue is the primary method of removing surface water from the site. Some infiltration may be expected in the gravelled areas. No ponded water was observed at the time of the site assessment. No signs of surficial staining were noted at the time of the site assessment.

The site topography is relatively flat. The regional topography slopes down to the east. Regional groundwater is considered to flow in an northeasterly direction, towards the Central Park and Rideau Canal via Patterson Creek.

2.2 Past Investigations

Our review of the previous work indicates that a significant remediation program was completed in the area of the former pump island, underground storage tank nest and beneath the southern portion of the former garage building; however, given the lack of analytical data, these areas are still considered to represent APECs on the subject site.

A number of previous environmental reports for the subject site were provided to Paterson during the completion of the Phase I-ESA. The reports included a gasoline service station decommissioning report and a remediation prepared by Trow Ontario Ltd. (Trow) in 1990 followed by further investigation and remediation reports prepared by Arcturus Environmental (Arcturus) in 1991. The Trow reports indicated that three (3) underground fuel tanks and one (1) underground oil tank were removed from the property along with all fuel pumps and piping and a significant quantity of contaminated soil. Following further investigation, Arcturus removed an additional 520 mts in 1991. While no analytical testing was carried out at the time (due to a lack of regulatory criteria), the site was deemed to have been remediated in accordance with the MOECC requirements at the time.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

An investigation, conducted primarily for geotechnical purposes, was conducted on May 18, 2016. The investigation consisted of four (4) boreholes advanced to a maximum depth of 14.4 m below ground surface. Groundwater monitoring wells were installed in three of the boreholes to allow groundwater quality to be assessed. The test hole locations were selected in a manner as to provide general coverage of the proposed development site. The borehole locations are illustrated on Drawing No. PE3865-3 - Test Hole Locations Plan.

3.2 Media Investigated

Soil samples were recovered during the field drilling program for preliminary screening purposes.

Groundwater samples were obtained on August 3, 2016 and submitted for laboratory analysis. The rationale for sampling and analysing these media is based on the Contaminants of Potential Concern (CPCs) identified during the Phase I-ESA.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of shale of the Billings formation. Overburden soils are shown as offshore marine sediment with a drift thickness on the order of 10 to 15 m.

Contaminants of Potential Concern

The following CPCs were identified at the time of the Phase I-ESA:

- Petroleum Hydrocarbons, fractions 1 through 4 (PHCs F_1-F_4) - PHCs (F_1-F_4) were selected as CPCs for the Phase I-ESA property based the historical operation of the subject site as a retail fuel outlet and automotive service garage.

- Volatile Organic Compounds (VOCs) - this suite of parameters includes benzene, toluene, ethylbenzene and xylenes (BTEX) associated with gasoline, as well as

solvents associated that may have been used in the former service garage.

- Polycyclic Aromatic Hydrocarbons (PAHs) - this suite of parameters encompasses various complex hydrocarbons, commonly associated with coal and/or combustion of heavy-fraction hydrocarbons such as hydraulic or crankcase oil. PAHs were selected as a CPC for the site based on the presence of the automotive service garage on the subject site. PAHs may be present in the soil matrix or dissolved in site groundwater.

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

Existing Buildings and Structures

No buildings are present on the subject site. All former aboveground and below grade structures were reportedly removed in 1990 and 1991.

Water Bodies

There are no water bodies on the subject site. The Rideau Canal is located approximately 625 m to the east of the subject property. The groundwater flow direction in the general area of the subject site is considered to be in an northerly direction. No other bodies of water are present within the Phase I-ESA study area.

Areas of Natural and Scientific Interest (ANSI)

According to the Ministry of Natural Resources' (MNR) electronic mapping website, the subject property is not listed as an area of natural and scientific interest. Properties located within the 250 m Phase I-ESA study area are also not identified as ANSIs.

Drinking Water Wells

No drinking water well records for properties located within the Phase I-ESA study area were obtained from the MOECC website.

Groundwater Monitoring Wells

Two (2) groundwater monitoring well cluster records for properties located within the Phase I-ESA study area were obtained from the MOECC website. Each record is for three monitoring wells, located at the northwest corner of the intersection of Glebe Avenue and Bank Street. These wells were installed in 2009 at depths ranging from 1.2 m to 4.5 m below the ground surface.

The monitoring wells installed by Paterson in May 2016 were observed on the subject property at the time of the site assessment. There are currently no potable wells in use on the subject property.

Neighbouring Land Use

Neighbouring land use in the Phase I-ESA study area is predominantly residential and commercial, with several institutional properties. No potentially contaminating activities (PCAs) were identified within the Phase I-ESA study area at the time of the site assessment. Neighbouring land use within the Phase I-ESA study area is depicted on Drawing: PE3865-2 - Surrounding Land Use Plan, provided in the Phase I ESA (2016).

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Potentially contaminating activities identified on the subject property, as per Column A of Table 2, from O.Reg.153/04, amended by O.Reg. 296/11 include the following:

- ❏ Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems (Item 52)

- ❏ Gasoline and Associated Products Storage in Fixed Tanks (Item 28)

The former automotive service garage (Item 52) and the former waste oil tank and underground fuel storage tanks (Item 28) are considered to pose an environmental concern to the subject property.

Two (2) off-site retail fuel outlets were also considered to represent APECs on the subject site.

Assessment of Uncertainty and/or Absence of Information

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

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted in May 2016, and consisted of the placement of four (4) boreholes (BH1 to BH4) on the subject property. Groundwater monitoring wells were installed in BH2, BH3 and BH4. The borehole locations are illustrated on Drawing No. PE3865-3 - Test Hole Location Plan. The boreholes were advanced using a truck mounted drill rig under the full time supervision of Paterson personnel.

4.2 Soil Sampling

The boreholes were sampled to a maximum depth of 5.3 m below ground surface. Upon recovery, all samples were screened for visual and olfactory signs of contamination. The depths at which the split spoon samples were obtained from the boreholes are shown as "**AU**" (auger) and "**SS**" (split spoon), on the Soil Profile and Test Data sheet in the Appendix.

Soil sampling protocols were followed using the MOE document titled "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", dated May 1996.

4.3 Groundwater Monitoring Well Installations

As part of the investigation, three (3) groundwater monitoring wells were installed on the subject property by Marathon Drilling Co. Ltd., of Ottawa, Ontario, under the full-time supervision of Paterson personnel. The monitoring wells consisted of 51 mm diameter, Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided in the borehole logs in the Appendix. A summary of monitoring well construction details is provided below in Table 1.

Table 1 - Monitoring Well Construction Details						
Well ID	**Ground Surface Elevation**	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH2	99.09	5.8	2.8 - 5.8	2.4 - 5.8	0.3 - 2.4	Flushmount
BH3	99.06	7.6	4.6 - 7.6	4.0 - 7.6	0.3 - 4.0	Flushmount
BH4	99.12	7.6	4.6 - 7.6	4.0 - 7.6	0.3 - 4.0	Flushmount
Notes: m BGS - metres below ground surface						

4.4 Field Measurement of Water Quality Parameters

Water quality parameters were not measured in the field prior to sampling; however, the wells were purged prior to sampling until at least three well volumes had been removed or until the well was purged dry.

4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MOECC document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May, 1996. Groundwater samples were obtained from the monitoring wells installed in BH2, BH3 and BH4 on August 3, 2016 using dedicated sampling equipment. To ensure low sediment and non-stagnant water was sampled, approximately three (3) well volumes were purged prior to the collection of groundwater samples. Samples were stored in coolers to reduce analyte volatilization during transportation.

4.6 Analytical Testing

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 Environmental Analytical Laboratories (SCC/CAEL). Paracel is accredited and certified by SCC/CAEL for specific tests registered with the association. Groundwater samples submitted for analytical testing are presented in Table 2 below.

Table 2 - Groundwater Samples Submitted for Analytical Testing				
Sample ID	**Sample Depth/ Stratigraphic Unit or Screened Interval**	**Parameters Analyzed**		**Rationale**
		PHCs	**VOC**	
BH2-GW1	2.8-5.8m	**X**	**X**	To identify impacts associated with former off-site retail fuel outlet to the northwest and the former pump island.
BH3-GW1	4.6-7.6 m	**X**	**X**	To identify residual hydrocarbon impacts in the area of the former tank nest.
BH4-GW1	4.6-7.6 m	**X**	**X**	To identify impacts associated with the former off-site retail fuel outlet to the south.

4.7 Residue Management

Fluids from equipment cleaning and purge water were retained on site.

4.8 Elevation Surveying

Borehole locations were surveyed using a laser level. Elevations were surveyed relative to a fire hydrant on the corner of Bank Street and Clemow Avenue. The elevation of the top spindle of the fire hydrant was assumed to be 100.00 metres above sea level (m ASL).

5.0 REVIEW AND EVALUATION

5.1 Geology

The soil profile encountered at the borehole locations consisted of silty sand with crushed stone fill material at BH1, BH3, and BH4 (asphaltic concrete at the surface in BH2), followed by additional brown, silty sand fill material, with some limited demolition concrete and glass at BH1. The sand fill extended to varying depths as a result of the former remediation excavation work conducted on site. The fill was underlain by native silty clay. Specific details of the soil profile at the test hole location can be seen on the Soil Profile and Test Data sheet in the Appendix.

Site stratigraphy is shown on Drawing PE3865-5 - Cross Section A-A'.

5.2 Groundwater Elevations, Flow Direction and Hydraulic Gradient

Groundwater levels were measured on August 3, 2016 using an electronic water level meter. Elevations are relative to surveyed ground surface elevations at each monitoring well location. Groundwater elevations are summarized below in Table 3. All elevations are relative to the assumed fire hydrant spindle elevation (100.00 m ASL).

Table 3 - Groundwater Level Measurements

Monitoring Well	Water Level (m below grade)	Water Level Elevation (m ASL - assumed)	Screened Interval (m below grade)	Date of Measurement
BH2	3.89	95.2	2.8 - 5.8	August 3, 2016
BH3	3.89	95.17	4.6 - 7.6	August 3, 2016
BH4	4.51	94.62	4.6 - 7.6	August 3, 2016

Water level measurements from the most recent groundwater monitoring event collected in August 2016 were used to determine groundwater flow direction. Based on this information, the groundwater flow was determined to be in a southeasterly direction; however, it is suspected that the groundwater level in BH4 may be affected by services located in the adjacent roadways, since it is our expectation that the groundwater flows northward in this general area.

5.3 Soil Texture

Coarse grained soil conditions were selected for the subject site as a conservative approach, since grain size analyses were not carried out as part of this assignment.

5.4 Soil Field Screening

Soil samples recovered at the time of sampling were inspected for visual and olfactory signs of contamination. No deleterious substances were noted, although some limited building demolition debris was observed in BH1 located in the former garage building location. A faint petroleum hydrocarbon odour was noted in several native clay samples situated at the water table in BH3 and BH4.

5.5 Groundwater Quality

Groundwater samples were collected from the monitoring wells installed in BH2, BH3, and BH4 on August 3, 2016. Groundwater samples were submitted for a combination of PHC (F_1-F_4) and VOC parameters. The results of the analytical testing and the selected MOECC standards are presented in Tables 4 and 5. The laboratory reports are included in the Appendix.

Table 4 - Analytical Test Results - Groundwater
PHCs (Fractions 1 to 4)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MOECC Table 3 Standards (µg/L)
		BH2-GW1	BH3-GW1	BH4-GW1	
		August 3, 2016			
F_1 PHCs (C_6-C_{10})	25	nd	nd	nd	750
F_2 PHCs (C_{10}-C_{16})	100	nd	nd	nd	150
F_3 PHCs (C_{16}-C_{34})	100	nd	nd	nd	500
F_4 PHCs (C_{34}-C_{50})	100	nd	nd	nd	500

Notes: MDL - Method Detection Limit
nd - Not Detected (< MDL)
nv - No current MOECC standard
Bold & Underline values exceed selected MOECC Standards

No concentrations of PHC (F_1-F_4) parameters were detected in the groundwater samples. All PHC results comply with MOECC standards.

Table 5 - Analytical Test Results - Groundwater
Volatile Organic Compounds (VOCs)

Parameters	MDL (µg/L)	Groundwater Samples (µg/L)			MOECC Table 3 Standards (µg/L)
		BH2-GW1	BH3 - GW1	BH3 - GW1	
		August 3, 2016			
Acetone	5.0	nd	nd	nd	130,000
Benzene	0.5	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	630
Chloroethane	1.0	nd	nd	nd	nv
Chloroform	0.5	nd	nd	nd	2.4
Chloromethane	3.0	nd	nd	nd	nv
Dibromochloromethane	0.5	nd	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	nd	4,400
1,2 - Dibromoethane	0.2	nd	nd	nd	nv
m - Dichlorobenzene	0.5	nd	nd	nd	4,600
o - Dichlorobenzene	0.5	nd	nd	nd	9,600
p - Dichlorobenzene	0.5	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,3-Dichloropropene (total)	0.5	nd	nd	nd	5.2
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6
c-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
t-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	16
c-1,3-Dichloropropylene	0.5	nd	nd	nd	nv
t-1,3-Dichloropropylene	0.5	nd	nd	nd	nv
Ethylbenzene	0.5	nd	nd	nd	2,300
Methyl Ethyl Ketone	5.0	nd	nd	nd	470,000
Methyl Butyl Ketone	10.0	nd	nd	nd	nv
Methyl Isobutyl Ketone	5.0	nd	nd	nd	140,000
Methyl tert-Butyl Ether	2.0	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	1,300
1,1,1,2-tetrachloroethane	0.5	nd	nd	nd	3.3
1,1,2,2-tetrachloroethane	0.5	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	2,500

Table 5 - Analytical Test Results - Groundwater
Volatile Organic Compounds (VOCs)

Parameters	MDL (µg/L)	Groundwater Samples (µg/L)			MOECC Table 3 Standards (µg/L)
		BH2-GW1	BH3 - GW1	BH3 - GW1	
		August 3, 2016			
1,3,5-Trimethylbenzene	0.5	nd	nd	nd	nv
Vinyl Chloride	0.5	nd	nd	nd	0.5
Total Xylenes	0.5	nd	nd	nd	4,200
1,2,4-Trichlorobenzene	0.5	nd	nd	nd	180

Notes: MDL - Method Detection Limit
nd - Not Detected (< MDL)
nv - No current MOECC standard
Bold & Underline values exceed selected MOECC Standards

No VOC parameters were detected in the groundwater samples submitted. All VOC results comply with the selected MOECC standards.

5.6 Quality Assurance and Quality Control Measures

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

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

5.7 Phase II Conceptual Site Model

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

SITE DESCRIPTION

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Column A of Table 2 outlined in Ontario Regulation 153/04 and amended by O.Reg. 269/11, PCAs located on-site and off-site and resulting in APECs include the following:

- ❑ Gasoline and Associated Products Storage in Fixed Tanks (Item 28) and
- ❑ Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems (Item 52)

Four (4) APECs were identified on the subject site:

- ❑ APEC 1 : the former underground storage tanks, fuel distribution lines and pump island on-site
- ❑ APEC 2: the former automotive service garage on-site
- ❑ APEC 3: the northwest corner of the subject property, resulting from the former off-site retail fuel outlet to the northwest
- ❑ APEC 4: the south edge of the subject site, resulting from the former off-site retail fuel outlet to the south.

APECs identified are outlined in red on Drawing PE3865-1 - Site Plan, provided in the Phase I-ESA (2016).

Historical PCAs located off-site that were not considered to pose an APEC on the subject site and within the Phase I ESA study area include the following:

- ❑ Commercial Autobody Shops (Item 10),
- ❑ Gasoline and Associated Products Storage in Fixed Tanks (Item 28),
- ❑ Operation of Drycleaning Equipment (where chemcials are used) (Item 37)
- ❑ Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems (Item 52)

More specifically the aforementioned PCAs include:

- ❑ the former retail fuel outlet at 615 Bank Street;
- ❑ the former Imperial Oil retail fuel outlet at 690 Bank Street;
- ❑ the former Tony's Custom Tailors and Cleaners at 593 ½ Bank Street;
- ❑ the former Parker's Cleaners and Dyers / National Dry Cleaners and Dyers at 732 Bank Street;

- ❑ the former Morton Motors of Ottawa automotive dealership at 740 Bank Street;
- ❑ the former Volkswagen automotive dealership at 740 Bank Street;
- ❑ the former Capital Motors / Lewis Motors automotive dealership at 601 Bank Street;
- ❑ the former Myers Motors / Carleton Motors automotive dealership at 695 Bank Street;
- ❑ the former Sun Oil retail fuel outlet at 700 Bank Street;
- ❑ the former automotive service garage at 701 Bank Street;
- ❑ the former Morton Motors body shop at 117 Glebe Avenue.

The above-noted PCAs are not considered to pose a concern to the subject property based on their distances and orientations with regards to the subject site.

The aforementioned PCAs are outlined and numbered in green on Drawing PE3865-2 - Surrounding Land Use Plan, provided in the Phase I-ESA (2016).

Potential contaminants of concern associated with the aforementioned APECs include PAHs, VOCs and PHCs.

Subsurface Structures and Utilities

No subsurface structures or utilities are known to be present on site:

Potable Water Source

The subject property is located in an area serviced with municipal water.

PHYSICAL SETTING

Site Stratigraphy

The soil profile encountered at the borehole locations consisted of silty sand with crushed stone fill material at BH1, BH3, and BH4 (asphaltic concrete at the surface in BH2), followed by additional brown, silty sand fill material, with some limited demolition concrete and glass at BH1. The sand fill extended to varying depths as a result of the former remediation excavation work conducted on site. The fill was underlain by native silty clay. Specific details of the soil profile at the test hole location can be seen on the Soil Profile and Test Data sheet in the Appendix.

The site stratigraphy from ground surface to the deepest aquifer investigated, is illustrated on Drawing PE3865-5 - Cross Section A-A'. The stratigraphy consists of the following:

- **Asphaltic concrete** was encountered across part of the site, from ground surface to 0.05 m below ground surface. No asphaltic concrete was present at BH1, BH3 or BH4; crushed stone covered most of the site.

- **Fill material - brown silty sand with crushed stone**: noted beneath the asphaltic concrete at BH2 and from the surface of BH1, BH3 and BH4, extending to depths ranging from approximately 0.46 m to 1.60 m below the ground surface.

- **Fill material - brown silty sand with crushed stone, trace clay, concrete and glass**: identified at depths ranging from 1.47 m to 2.74 m below ground surface at BH1. This material was located within the former automotive service garage building excavation and is expected to result from the building demolition. Groundwater was not encountered within this fill layer.

- **Fill material - Brown coarse sand:** identified only at BH3, from 3.80 m to 4.78 m below ground surface.

- **Grey or brown silty clay:** identified in BH1 through BH 4 at depths ranging from 1.12 m to 4.78 m below ground surface and extending to depths ranging from 6.40 m to 7.77 m below ground surface.

- **Bedrock**: inferred bedrock (practical dynamic cone penetration test refusal) was encountered at 14.42 m below ground surface at BH3.

Hydrogeological Characteristics

Groundwater monitoring wells were installed in BH2, BH3 and BH4, to a depth of 5.8 m, 7.6 m, and 7.6 m below ground surface, respectively. Groundwater levels were measured at BH2, BH3 and BH4 in August of 2016. Groundwater was encountered at depths ranging from 3.88 to 4.50 m below ground surface in August 2016.

Approximate Depth to Bedrock

Inferred depth to bedrock at the subject site is 14.43 m below ground surface.

Approximate Depth to Water Table

The depth to water table at the subject site varies between approximately 3.9 m and 4.5 m below ground surface.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does not apply to the subject site, as the subject site is not a Shallow Soil property or within 30 m of a body of water.

Fill Placement

Fill placement has occurred at the subject site. Aside from the crushed stone pavement base, silty sand fill was identified at the subject property, the most of which would have been used to fill the remediation excavations.

Proposed Buildings and Other Structures

The proposed development consists of a 2 to 5 storey residential building with one storey of underground parking.

Existing Buildings and Structures

The subject property is currently undeveloped.

Water Bodies

There are no water bodies on the subject site. The Rideau Canal is located approximately 625 m east of the subject property. The groundwater flow direction in the general area of the subject site is considered to be in a northerly direction. No other bodies of water are present within the Phase I-ESA study area.

Areas of Natural Significance

No areas of natural significant were identified on or in the immediate vicinity of the property.

ENVIRONMENTAL CONDITION

Areas Where Contaminants are Present

Based on the results of the Phase I-ESA and Phase II-ESA, areas where contaminants may be present are the areas of the former underground storage tanks, fuel distribution equipment, as well as the former garage area. No contaminants were identified in the

groundwater at the locations tested.

Types of Contaminants

Based on the potentially contaminating activities identified at the subject site and on the results of the Phase II-ESA, the COCs at the subject property are considered to be VOCs and PHCs.

Contaminated Media

Based on the results of the Phase II-ESA, the groundwater has been contaminated in the southers and northwestern portions of the site. Further investigation is required to determine the presence or absence of contaminated soil, and the quality of the groundwater in the northeastern portion of the site.

What Is Known About The Area Where Contaminants Are Present

Some contaminated soil is expected to be present around the former fuel tanks / equipment and garage area, beyond the limits of the former remediation excavations.

No contaminants were identified in groundwater samples collected from BH2, BH3 or BH4.

Discharge of Contaminants

Discharge of contaminants to the environment in the area of the former pump island may be through surficial leaks from spillage during fuelling, and leaks in the piping associated with the pump island. Discharge to the environment in the area of the former UST tank nest may be through possible leaks from the USTs and associated piping.

Migration of Contaminants

Vertical migration of PHC concentrations in the soil is possible as a result of seasonal fluctuations in the groundwater table, although the groundwater tested was free from any contaminants. Since the source of petroleum hydrocarbon contamination was previously removed from the subject site, only residual levels of PHCs with no widespread groundwater contamination is expected, limiting any potential migration.

Climatic and Meteorological Conditions

Two (2) ways by which climatic and meteorological conditions may affect contaminant distribution include the following:

- ❏ downward leaching of contaminants by means of the infiltration of precipitation
- ❏ the migration of contaminants via temporal changes in groundwater levels and/or groundwater flow, both of which may fluctuate seasonally.

Neither of these mechanisms are considered to be currently affecting the property, given the previous remediation work conducted and the lack of contamination in the groundwater.

Potential for Vapour Intrusion

As part of the development of the proposed residential building, any remnant impacted soil will be excavated and disposed off-site at an approved waste disposal facility. As such, there is no anticipated potential for vapour intrusion into future subsurface structures and utilities at the subject site.

6.0 CONCLUSION

A Phase II - Environmental Site Assessment (ESA) was conducted for the property located at 667 Bank Street, in the City of Ottawa, Ontario. The purpose of the Phase II-ESA has been to provide an assessment of the property given its historical use.

Soil

Four (4) boreholes were placed on the subject site in May 2016. No petroleum hydrocarbon odours were noted in BH1 or BH2, although some limited demolition debris was noted in BH1, which was located in the former garage building area. BH3 was located in the former fuel tank remediation area, while BH4 was located in the southwest corner of the site. Several native clay soil samples did exhibit a faint petroleum hydrocarbon odour in these boreholes around the groundwater elevation level.

Groundwater

Groundwater samples were collected from monitoring wells installed in BH2, BH3 and BH4 in August 2016. Samples were submitted for PHC (F_1-F_4) and VOC analyses. None of the water exhibited any unusual odour or petroleum sheen. The analytical testing did not identify any contaminant concentrations above the laboratory detection limits. All groundwater results comply with the selected MOECC standards.

RECOMMENDATIONS

Based on the findings of the Phase I-ESA and taking into consideration the Phase II-ESA work that has been completed to date, further Phase II-ESA work will be required to fully assess the subsurface conditions beneath the subject property.

If the monitoring wells installed in BH2, BH3 and BH4 are not going to be used in the future, then they should be abandoned according to Ontario Regulation 903. The monitoring wells will be registered with the MOECC under this regulation. Further information can be provided upon request in this regard.

7.0 STATEMENT OF LIMITATIONS

This Phase II-ESA report has been prepared in accordance with the scope of work. 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 described by the test holes themselves.

Should any conditions be encountered at the subject site and/or historical information that differs 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 Milito Investments. Permission and notification from Milito Investments and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Mark D'Arcy, P.Eng.

Report Distribution

- ❑ Milito Investments
- ❑ Paterson Group

FIGURES

FIGURE 1 - KEY PLAN

DRAWING PE3865-3 - TEST HOLE LOCATION PLAN

DRAWING PE3865-4 - GROUNDWATER CONTOUR PLAN

DRAWING PE3865-5 - CROSS SECTION A-A'

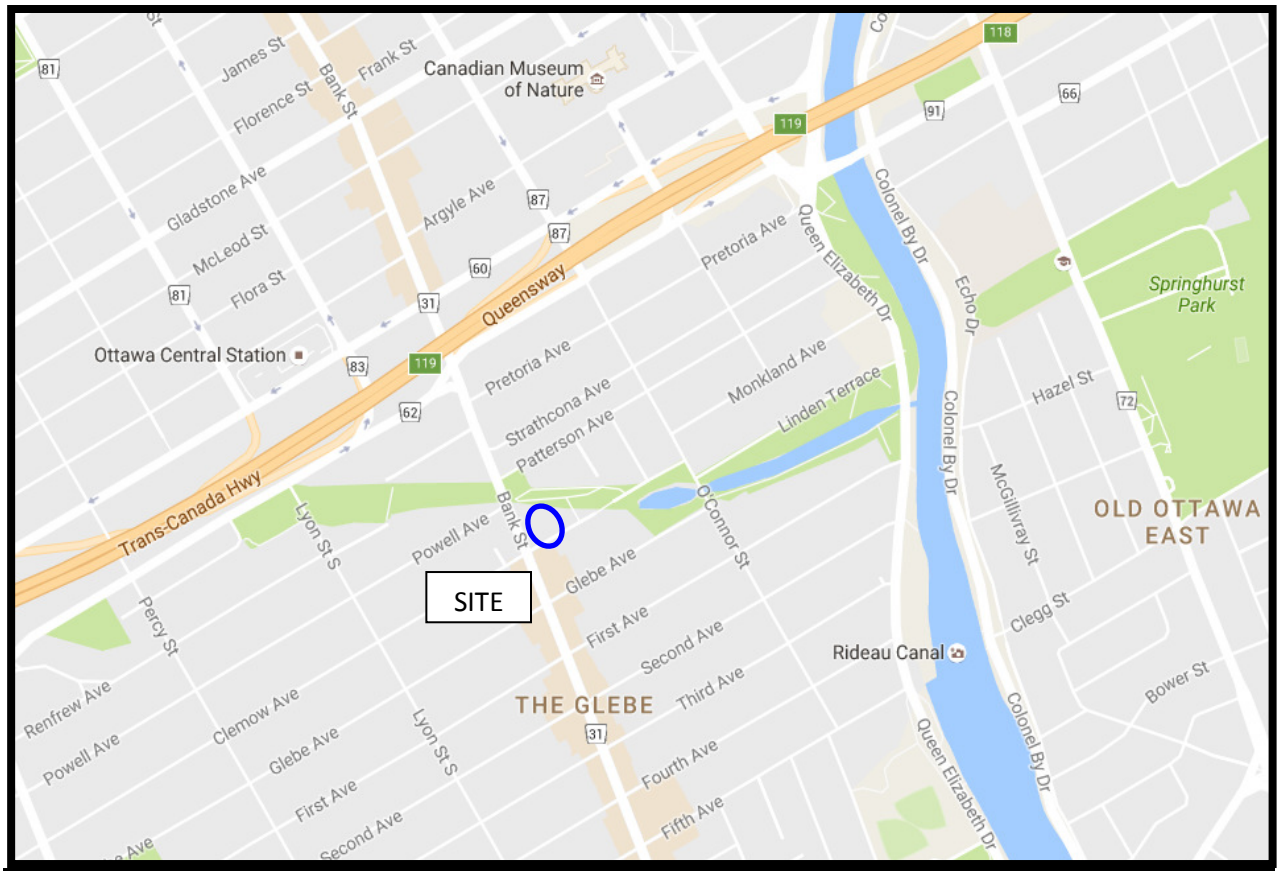
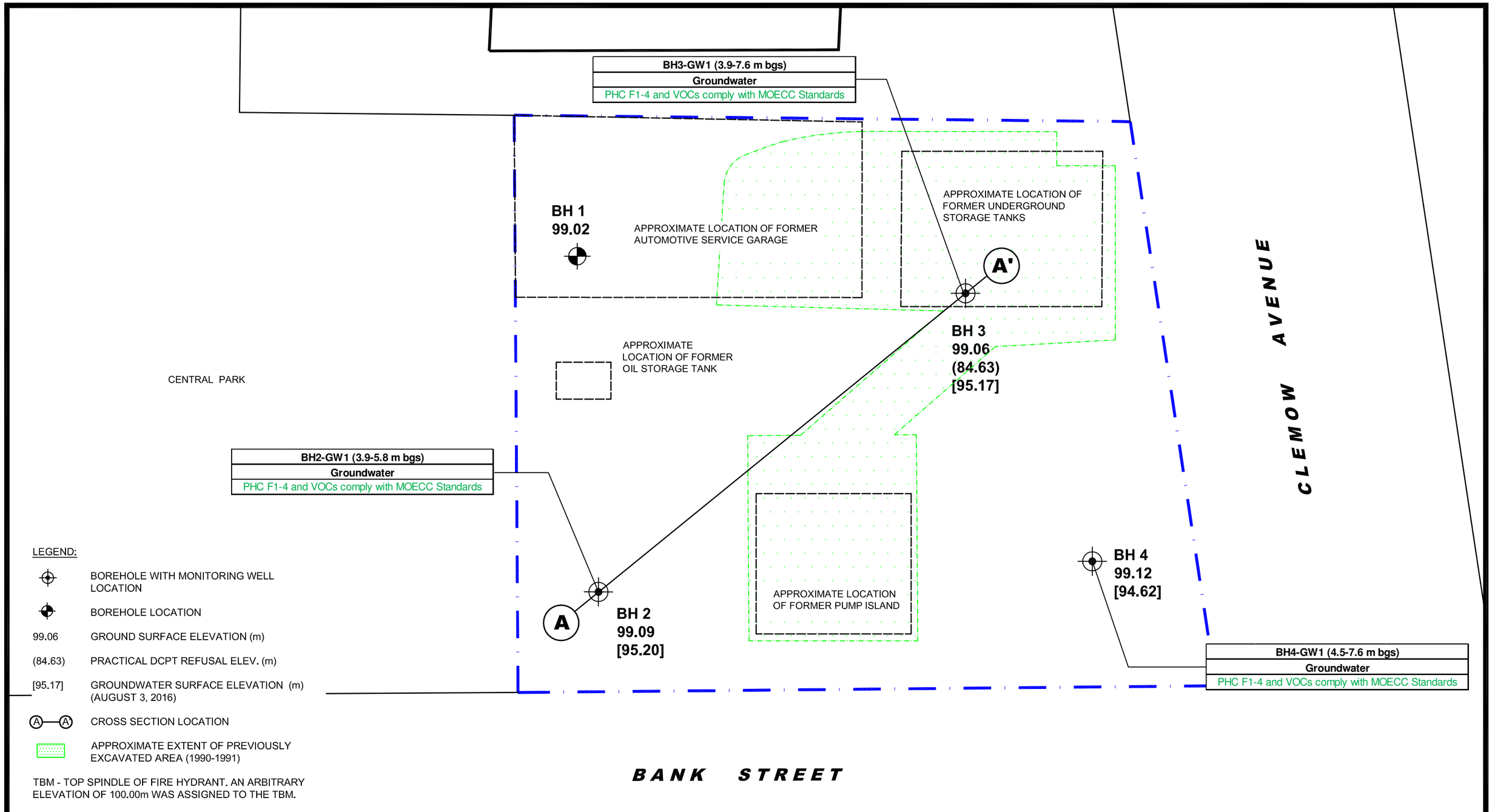


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL
0			

MILITO INVESTMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
667 BANK STREET
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:100	Date: 08/2016
Drawn by: AG	Report No.: PE3865
Checked by: MD	Dwg. No.: PE3865-3
Approved by: MD	Revision No.: 0

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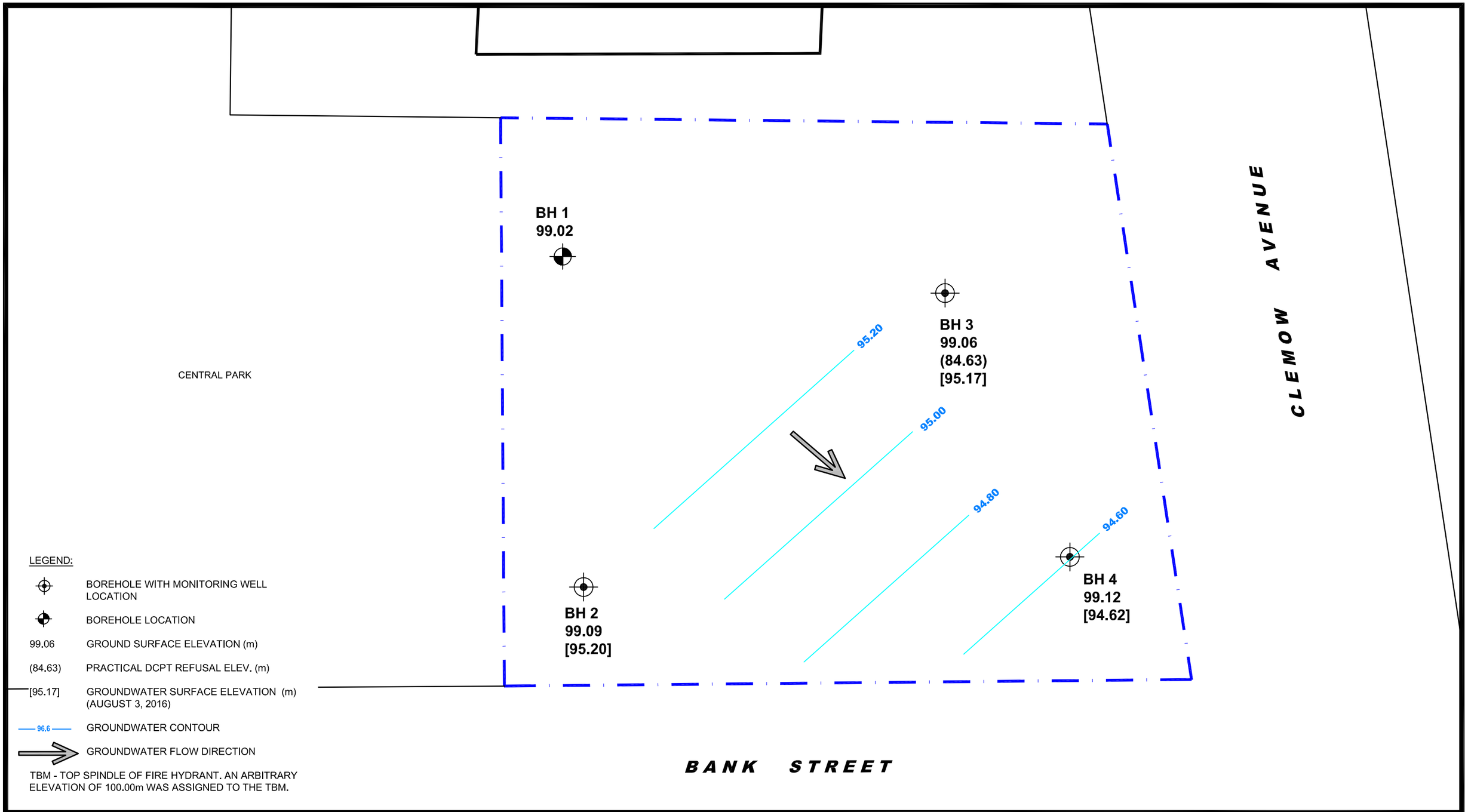

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- 99.06 GROUND SURFACE ELEVATION (m)
- (84.63) PRACTICAL DCPT REFUSAL ELEV. (m)
- [95.17] GROUNDWATER SURFACE ELEVATION (m) (AUGUST 3, 2016)
- 96.6 GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

TBM - TOP SPINDLE OF FIRE HYDRANT. AN ARBITRARY ELEVATION OF 100.00m WAS ASSIGNED TO THE TBM.

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MILITO INVESTMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
667 BANK STREET

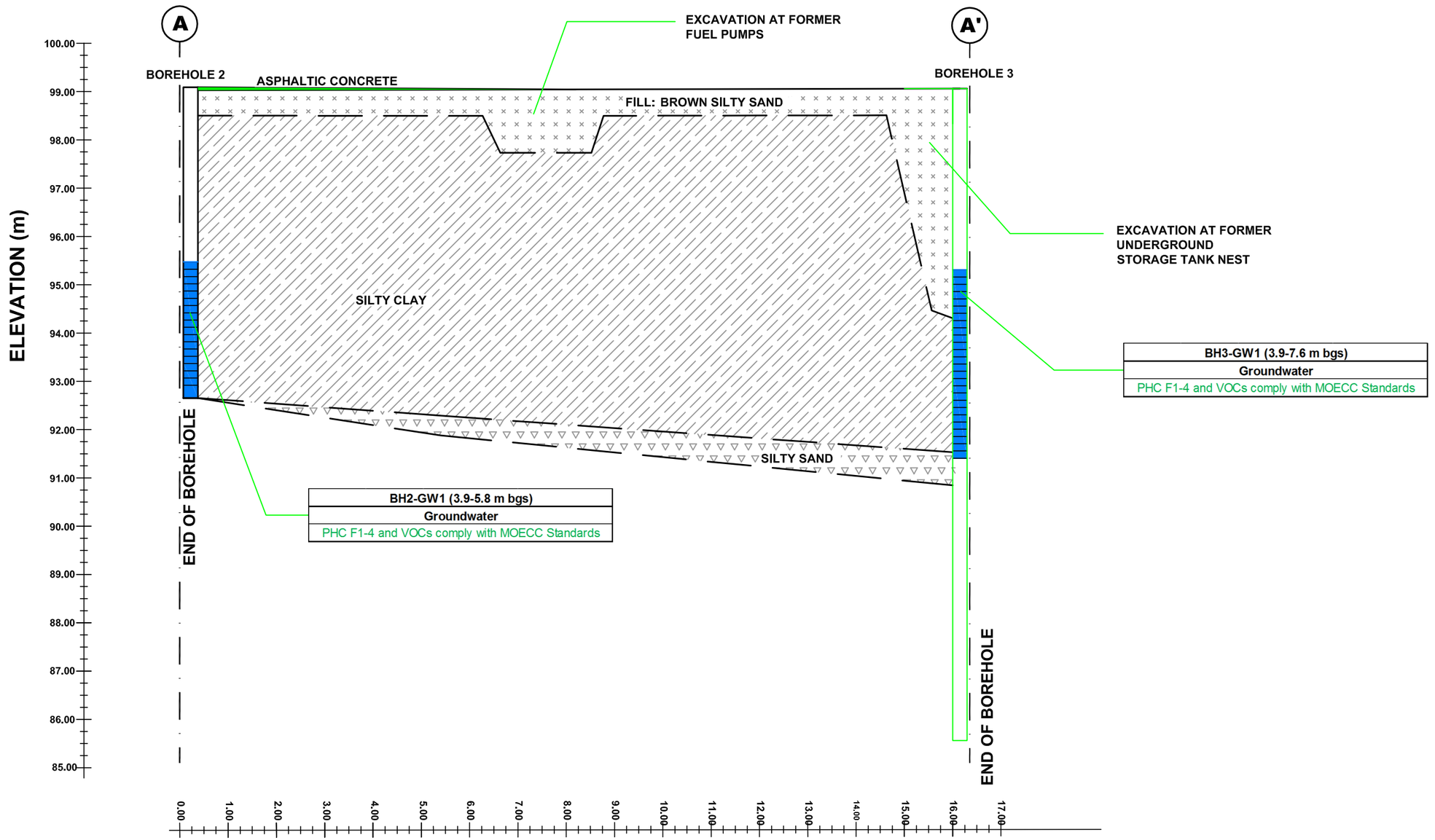
OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:100	Date: 08/2016
Drawn by: AG	Report No.: PE3865
Checked by: MD	Dwg. No.: PE3865-4
Approved by: MD	Revision No.: 0

p:\autocad drawings\environmental\pe38xx\pe3865-4 groundwater contour plan.dwg



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NO.	REVISIONS	DATE	INITIAL
0			

MILITO INVESTMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
667 BANK STREET

OTTAWA, ONTARIO

Title:

CROSS-SECTION A - A'

Scale: AS SHOWN	Date: 08/2016
Drawn by: AG	Report No.: PE3865
Checked by: MD	Dwg. No.: PE3865-5
Approved by: MSD	Revision No.: 0

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APPENDIX

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Prop. Residential Development - 667 Bank Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE3865

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** 18 May 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.02
FILL: Brown silty sand with crushed stone		AU	1				
		SS	2	33	7	1	98.02
1.47							
FILL: Brown silty sand, some crushed stone, trace clay, concrete and glass		SS	3	12	15	2	97.02
		SS	4	56	50+		
2.74						3	96.02
Stiff, brown **SILTY CLAY**		SS	5	100	W	4	95.02
- stiff to very stiff and grey by 4.6m depth						5	94.02
						6	93.02
6.40							
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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Prop. Residential Development - 667 Bank Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

FILE NO. PE3865

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 18 May 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.09
Asphaltic concrete 0.05							
FILL: Brown silty sand with crushed stone 0.66		AU	1				
Loose, brown **SILTY SAND**		SS	2	71	5	1	98.09
1.60							
		SS	3	88	7	2	97.09
		SS	4	100	3		
Very stiff to stiff, brown **SILTY CLAY**						3	96.09
						4	95.09
- stiff to very stiff and grey by 4.7m depth						5	94.09
						6	93.09
6.40							
End of Borehole							
(GWL @ 3.89m-Aug 3, 2016)							

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
Prop. Residential Development - 667 Bank Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** 18 May 2016

FILE NO. PE3865

HOLE NO. BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.06
FILL: Brown silty sand with crushed stone		AU	1				
0.46							
FILL: Brown silty clay, some sand and gravel		SS	2	33	4	1	98.06
1.52							
		SS	3	42	4	2	97.06
		SS	4	67	3		
FILL: Brown silty sand, some gravel		SS	5	54	3	3	96.06
3.80							
		SS	6	42	4	4	95.06
FILL: Brown coarse sand							
4.78		SS	7	67	2	5	94.06
Stiff to very stiff, grey **SILTY CLAY**						6	93.06
						7	92.06
7.77							
Compact, grey **SANDY SILT**		SS	8	83	13	8	91.06
8.23							
Dynamic Cone Penetration Test commenced at 8.23m depth.						9	90.06

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
Prop. Residential Development - 667 Bank Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE3865

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 18 May 2016

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
						9	90.06		
						10	89.06		
						11	88.06		
						12	87.06		
						13	86.06		
						14	85.06		
14.43									
End of Borehole Practical DCPT refusal at 14.43m depth (GWL @ 3.89m-Aug 3, 2016)									

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
Prop. Residential Development - 667 Bank Street
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

FILE NO. PE3865

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 18 May 2016

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.12
FILL: Brown silty sand with crushed stone		AU	1				
0.60							
Loose, brown **SILTY SAND**		SS	2	75	6	1	98.12
1.12							
		SS	3	100	7	2	97.12
Very stiff to stiff, brown **SILTY CLAY**		SS	45	100	3	3	96.12
						4	95.12
- stiff to very stiff and grey by 4.6m depth						5	94.12
						6	93.12
						7	92.12
7.62							
End of Borehole							
(GWL @ 4.51m-Aug 3, 2016)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

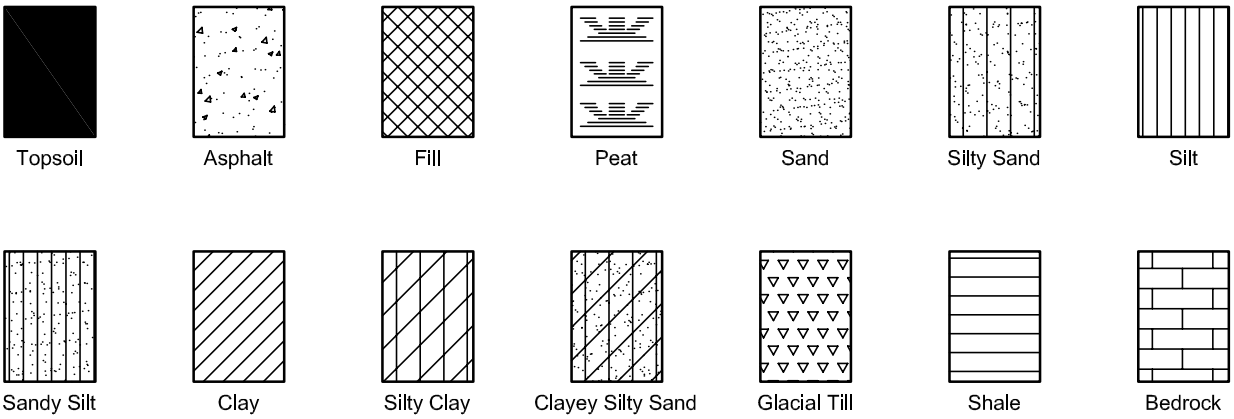
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

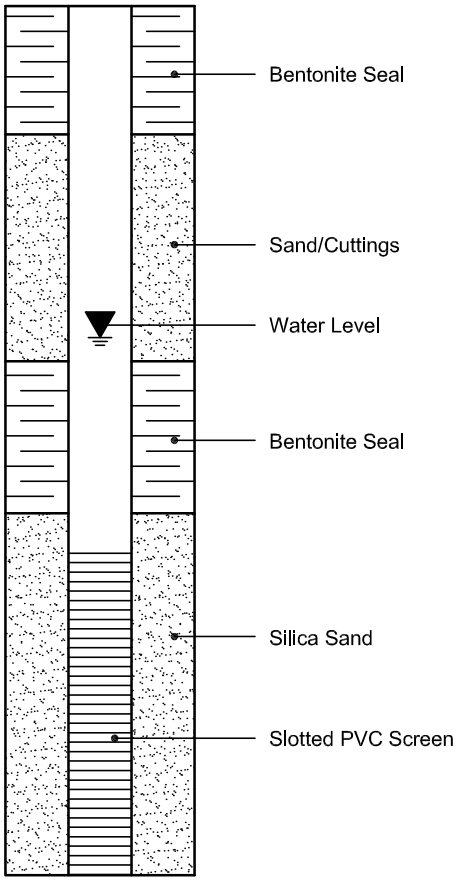
SYMBOLS AND TERMS (continued)

STRATA PLOT

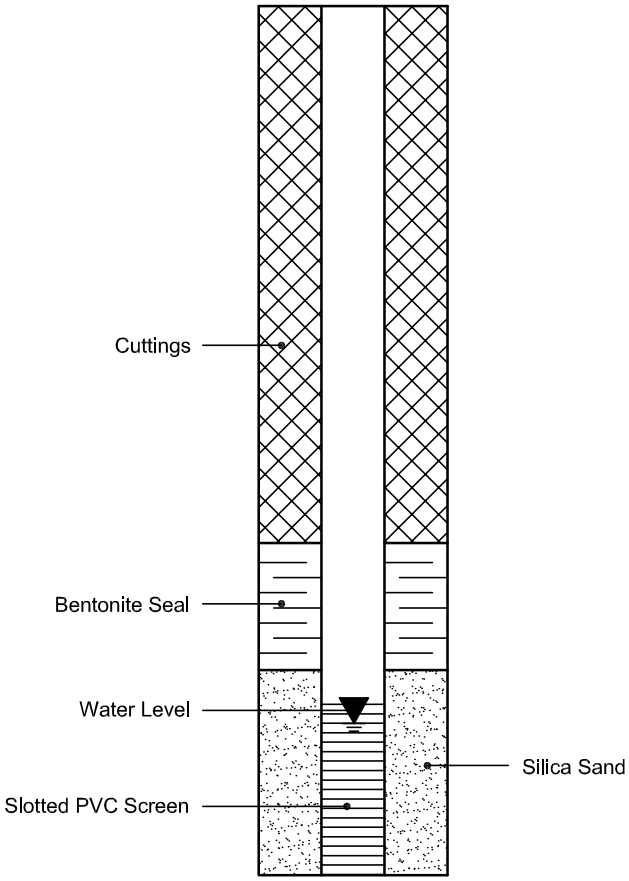


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 20198
Project: PE3865
Custody: 109347

Report Date: 9-Aug-2016
Order Date: 4-Aug-2016

Order #: 1632217

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

Paracel ID	Client ID
1632217-01	BH2-GW1
1632217-02	BH3-GW1
1632217-03	BH4-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 20198

Report Date: 09-Aug-2016
Order Date: 4-Aug-2016
Project Description: PE3865

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	5-Aug-16	7-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Aug-16	5-Aug-16
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	5-Aug-16	7-Aug-16

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 20198

Report Date: 09-Aug-2016

Order Date: 4-Aug-2016

Project Description: PE3865

	Client ID:	BH2-GW1	BH3-GW1	BH4-GW1	-
	Sample Date:	03-Aug-16	03-Aug-16	03-Aug-16	-
	Sample ID:	1632217-01	1632217-02	1632217-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 20198

Report Date: 09-Aug-2016

Order Date: 4-Aug-2016

Project Description: PE3865

	Client ID:	BH2-GW1	BH3-GW1	BH4-GW1	-
	Sample Date:	03-Aug-16	03-Aug-16	03-Aug-16	-
	Sample ID:	1632217-01	1632217-02	1632217-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	97.2%	98.0%	95.7%	-
Dibromofluoromethane	Surrogate	103%	105%	106%	-
Toluene-d8	Surrogate	89.3%	87.4%	84.2%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
F1 + F2 PHCs	125 ug/L	<125	<125	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	<200	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*77.7*		*ug/L*		*97.1*	*50-140*			
Surrogate: Dibromofluoromethane	*87.0*		*ug/L*		*109*	*50-140*			
Surrogate: Toluene-d8	*67.8*		*ug/L*		*84.7*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*79.2*		*ug/L*	*ND*	*99.0*	*50-140*			
Surrogate: Dibromofluoromethane	*80.4*		*ug/L*	*ND*	*101*	*50-140*			
Surrogate: Toluene-d8	*72.9*		*ug/L*	*ND*	*91.2*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 20198

Report Date: 09-Aug-2016
Order Date: 4-Aug-2016
Project Description: PE3865

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1910	25	ug/L	ND	95.7	68-117			
F2 PHCs (C10-C16)	1980	100	ug/L	ND	110	60-140			
F3 PHCs (C16-C34)	3970	100	ug/L	ND	107	60-140			
F4 PHCs (C34-C50)	2390	100	ug/L	ND	96.4	60-140			
Volatiles									
Acetone	119	5.0	ug/L	ND	119	50-140			
Benzene	34.4	0.5	ug/L	ND	86.1	50-140			
Bromodichloromethane	41.2	0.5	ug/L	ND	103	50-140			
Bromoform	41.4	0.5	ug/L	ND	104	50-140			
Bromomethane	24.8	0.5	ug/L	ND	62.0	50-140			
Carbon Tetrachloride	45.1	0.2	ug/L	ND	113	50-140			
Chlorobenzene	35.7	0.5	ug/L	ND	89.2	50-140			
Chloroform	38.0	0.5	ug/L	ND	95.0	50-140			
Dibromochloromethane	37.7	0.5	ug/L	ND	94.3	50-140			
Dichlorodifluoromethane	33.3	1.0	ug/L	ND	83.2	50-140			
1,2-Dichlorobenzene	37.1	0.5	ug/L	ND	92.8	50-140			
1,3-Dichlorobenzene	38.8	0.5	ug/L	ND	97.0	50-140			
1,4-Dichlorobenzene	39.6	0.5	ug/L	ND	99.0	50-140			
1,1-Dichloroethane	36.0	0.5	ug/L	ND	90.0	50-140			
1,2-Dichloroethane	42.4	0.5	ug/L	ND	106	50-140			
1,1-Dichloroethylene	36.0	0.5	ug/L	ND	90.0	50-140			
cis-1,2-Dichloroethylene	30.8	0.5	ug/L	ND	77.0	50-140			
trans-1,2-Dichloroethylene	30.5	0.5	ug/L	ND	76.2	50-140			
1,2-Dichloropropane	36.0	0.5	ug/L	ND	89.9	50-140			
cis-1,3-Dichloropropylene	30.3	0.5	ug/L	ND	75.8	50-140			
trans-1,3-Dichloropropylene	33.4	0.5	ug/L	ND	83.4	50-140			
Ethylbenzene	36.2	0.5	ug/L	ND	90.6	50-140			
Ethylene dibromide (dibromoethane	35.0	0.2	ug/L	ND	87.5	50-140			
Hexane	21.2	1.0	ug/L	ND	52.9	50-140			
Methyl Ethyl Ketone (2-Butanone)	85.3	5.0	ug/L	ND	85.3	50-140			
Methyl Isobutyl Ketone	103	5.0	ug/L	ND	103	50-140			
Methyl tert-butyl ether	97.5	2.0	ug/L	ND	97.5	50-140			
Methylene Chloride	32.5	5.0	ug/L	ND	81.3	50-140			
Styrene	33.8	0.5	ug/L	ND	84.5	50-140			
1,1,1,2-Tetrachloroethane	40.1	0.5	ug/L	ND	100	50-140			
1,1,2,2-Tetrachloroethane	37.3	0.5	ug/L	ND	93.2	50-140			
Tetrachloroethylene	34.4	0.5	ug/L	ND	85.9	50-140			
Toluene	33.4	0.5	ug/L	ND	83.6	50-140			
1,1,1-Trichloroethane	41.0	0.5	ug/L	ND	103	50-140			
1,1,2-Trichloroethane	35.2	0.5	ug/L	ND	88.0	50-140			
Trichloroethylene	27.8	0.5	ug/L	ND	69.4	50-140			
Trichlorofluoromethane	47.1	1.0	ug/L	ND	118	50-140			
Vinyl chloride	50.7	0.5	ug/L	ND	127	50-140			
m,p-Xylenes	68.9	0.5	ug/L	ND	86.2	50-140			
o-Xylene	38.0	0.5	ug/L	ND	95.0	50-140			
Surrogate: 4-Bromofluorobenzene	*71.9*		*ug/L*		*89.9*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Chain of Custody
(Lab Use Only)
№ 109347

Page 1 of 1

Client Name: PATERSON	Project Reference: PE3865	**Turnaround Time:**	
Contact Name: MARK DARCY	Quote #	☐ 1 Day	☑ 3 Day
Address: 154 COLONNADE RD. S. Ottawa, ON	PO # 20198	☐ 2 Day	☐ Regular
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca	Date Required:	

Criteria: ☑ O. Reg. 153/04 (As Amended) Table 3 ☐ 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: 163217

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH2-GW1	GW		3	Aug 3/16	2 pm	✓	✓												✓
2	BH3-GW1	GW		3	"	2:3 pm	✓	✓												✓
3	BH4-GW1	GW		3	"	3 pm	✓	✓												✓
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Louise	Received at Lab: SUNREPORT DOK MAH	Verified By:
Relinquished By (Print):	Date/Time: 04/08/16 10:25 AM	Date/Time: AUG 04 2016 11:05	Date/Time: 04/08/16 12:16
Date/Time:	Temperature: ____ °C	Temperature: 15.2 °C	pH Verified ☐ By: