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Phase II Environmental Site Assessment

383 Albert Street and 340 Queen Street
Ottawa, Ontario

Prepared For

Claridge Homes

August 3, 2018

Report: PE4011-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed 383 Albert Street and 340 Queen Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase I and Phase II Property.

The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling six (6) boreholes, all of which were constructed with groundwater monitoring well installations. Monitoring wells installed in BH2, BH5 and BH6 were installed at a depth of approximately 8m below grade while the remaining monitoring wells were installed at depths up to 25m below grade for geotechnical purposes.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements. A total of five (5) soil samples were submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs) and/or metals. All identified concentrations were in compliance with the MOECP Table 3 standards selected for the site.

Groundwater samples from monitoring wells installed in BH2, BH5 and BH6 were recovered and analysed for a combination of VOC, PHC and/or metal parameters. With the exception of various metal parameters and chloroform, no contaminant concentrations were identified above the laboratory method detection limits. Metal parameters identified Sample BH5-GW1 were in compliance with the MOECP Table 3 standards. Chloroform identified in Sample BH6-GW1 was marginally above the MOECP Table 3 standard and considered to have resulted from the use of municipal groundwater during the bedrock coring process. The chloroform concentration is expected to dissipate over time and is not considered to be a contaminant of concern on the Phase II Property.

Conclusion

Based on the findings of the Phase II ESA, soil and groundwater at the Phase II Property is in compliance with MOECC Table 3 standards.

It is recommended that groundwater from BH2 and BH6 be resampled to confirm chloroform concentrations.

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of the proposed development. In the meantime, it is recommended that an effort be made to maintain the integrity of the monitoring wells for future groundwater sampling events.

1.0 INTRODUCTION

At the request of Claridge Homes, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of the property addressed 383 Albert Street and 340 Queen Street, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in July of 2018.

1.1 Site Description

Address:	383 Albert Street and 340 Queen Street, Ottawa, Ontario.
Legal Description:	Part of Lots 12, 13, 14 South Queen and Lots 12, 13, 14, 15 North Albert, Plan 3992, City of Ottawa.
Property Identification Numbers:	04114-0004, 04114-0006, and 04114-0403
Location:	The Phase I Property is situated between Queen Street and Albert Street, west of Lyon Street, in the City of Ottawa.
Latitude and Longitude:	45° 25' 06" N, 75° 42' 30" W
Configuration:	Irregular
Site Area:	1,900 m^2 (approximate)

1.2 Property Ownership

The registered property owners include 1823071 Ontario Limited and Claridge Homes (Centretown) Inc. Paterson was engaged to conduct this Phase II ESA by Mr. Neil Malhotra of Claridge Homes. Mr. Malhotra can be reached by telephone at (613) 233-6030.

1.3 Current and Proposed Future Uses

The Phase II Property is currently occupied by a commercial building (two restaurants and an entertainment establishment) and an Ottawa Light Rail Transit (OLRT) station, fronting onto Queen Street. A commercial parking lot, accessed via Albert Street, is present on the southern portion of the site.

It is our understanding that the Phase II Property will be developed with three (3) multi-storey mixed-use buildings. Towers A and B will each have 28 storeys, while Tower C will have 22 storeys. All of the proposed buildings will share eight (8) levels of underground parking, which will occupy the majority of the site.

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 (MOECC), April 2011. The selected MOECC Table 3 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Full depth generic site conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is located in an urban area surrounded by various sized commercial and residential structures. Site topography is relatively flat and at grade with the surrounding roadways. The regional topography generally slopes downward to the north and west and regional groundwater is anticipated to flow to the northwest, toward the Ottawa River. Water drainage for the subject site occurs primarily by sheet-flow to catch basins on the Phase I Property and along adjacent streets. The Phase II Property is situated within a municipally serviced area.

2.2 Past Investigations

Exp conducted a preliminary geotechnical investigation at the Phase I Property in December of 2013. Six (6) boreholes were placed across the property, four (4) of which were completed with groundwater monitoring well installations. According to the Exp report, fill material was identified across the site. The fill material generally consists of brown silty sand with gravel, with fragments of construction debris noted at several borehole locations. It should be noted that two of the monitoring wells were dry at the time groundwater levels were recorded.

A Phase I ESA was conducted by Paterson in July of 2018. Based on the findings of the Phase I ESA, several historical on- or off-site potentially contaminating activities (PCAs) were considered to result in areas of potential environmental concern (APECs) on the Phase I and Phase II Property, as presented in Table 1.

Table 1
Areas of Potential Environmental Concern (APEC)

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: Former on-site automotive service garage	Northwestern portion of the Phase I Property.	Item 52 - Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems	On-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 2: Fill material of unknown quality associated with infilling of former building foundations	Across the southern portion of the Phase I Property	Item 30 - Importation of Fill Material of Unknown Quality	On-site	Metals PAHs	Soil and Groundwater
APEC 3: Former automotive service garage adjacent to the west of the Phase I Property	Northwestern portion of the Phase I Property	Item 52 - Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater

Table 1 (Continued)
Areas of Potential Environmental Concern (APEC)

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 4: Former photo lab adjacent to the north of the western portion of the Phase I Property	Northwestern portion of the Phase I Property	Item: Other	Off-site	VOCs Metals	Soil and Groundwater
APEC 5: Former automotive service garage adjacent to the northwest of the Phase I Property	Northwestern portion of the Phase I Property	Item 52 - Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems")	Off-Site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 6: Former chrome plating industry	Northwestern portion of the Phase I Property	Item 33 – Metal Treatment, Coating, Plating and Finishing	Off-site	VOCs Metals	Groundwater

A Phase II ESA was recommended to address the aforementioned APECs.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted during the interim of July 3 through July 6, 2018, in conjunction with a Geotechnical Investigation. The field program consisted of drilling six (6) boreholes, all of which were completed with groundwater monitoring wells. Environmental boreholes BH2, BH5 and BH6 were drilled to depths ranging from approximately 8.4 to 8.7m below grade, while BH1, BH3 and BH4 were drilled to depths of approximately 23.8 to 25m below grade for geotechnical purposes.

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 identified in the Phase I ESA.

Contaminants of concern for soil and/or groundwater include a combination of petroleum hydrocarbons (PHCs, fractions F_1-F_4), benzene, toluene, ethylbenzene and xylenes (BTEX), volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and/or metals.

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 interbedded limestone and dolomite of the Gull River Formation. Overburden is reported to consist of plain till of depths ranging from 0 to 5 m. Based on the findings of the previous geotechnical investigation conducted by Exp, overburden generally consists of fill over native silty sand glacial till, followed by limestone bedrock, encountered at depths ranging from approximately 3.3 to 5m below ground surface.

The regional topography slopes down to the north and west, however the topography in the immediate vicinity of the Phase I Property slopes down to the south. The regional groundwater flow is inferred to be in a northwesterly direction toward the Ottawa River.

Existing Buildings and Structures

The northwestern portion of the Phase I Property is occupied by a 2-storey commercial building fronting onto Queen Street. A public transit station associated with the OLRT, is situated on the northeastern portion of the Phase I Property, fronting onto Queen Street. A kiosk associated with the commercial parking lot is present on the south-central portion of the Phase I Property.

Water Bodies

There are no water bodies on the Phase I Property or within the Phase I Study Area. The closest water body is the Ottawa River, located approximately 300 m to the northwest of the Phase I Property.

Areas of Natural Significance

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

Drinking Water Wells

No drinking water wells are located on the Phase I Property or within the Phase I Study Area.

Groundwater Monitoring Wells

Three (3) monitoring wells were observed on the Phase I Property at the time of the site visit and were installed during a previous geotechnical investigation conducted by others.

Well records for all drilled wells within the Phase I Study Area were obtained from the MOECC website. Based on the results of the well records search, there are no well records for the Phase I Property, however, three (3) monitoring wells were noted on the Phase I Property at the time of the site visit. A total of 12 monitoring well and well abandonment records were obtained for the following properties within the Phase I Study Area: 280 Queen Street (4 abandoned wells); Lyon Street and Queen Street (4 abandoned wells – exact location unknown), 154 O'Connor Street (1 monitoring well), 384 Wellington Street (1 monitoring well) and 387 Wellington Street (1 monitoring well).

Fill Material

No evidence of fill material was observed at the time of the site visit. However, based on the previous geotechnical investigation conducted by Exp, fill is present across the subject property beneath the pavement structure, to depths ranging from approximately 0.6 to 2m below ground surface. The fill material generally consists of silty sand with gravel with fragments of construction debris at several borehole locations.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is primarily commercial and residential with occasional community or institutional uses. Land use is shown on Drawing PE4011-2 - Surrounding Land Use Plan in the Phase I ESA.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Existing or historical on- or off-site PCAs that are considered to have resulted in six (6) APECs on the Phase I Property, are presented in Table 1 above.

Additional historical PCAs were identified within the Phase I Study Area, however these activities were not considered to represent APECs on the Phase I Property based on their respective separation distances and/or orientations with respect to the Phase I Property, in combination with the extensive development of the neighbouring properties and information contained in our files. All PCAs are presenting on Drawing PE4011-2 – Surrounding Land Use Plan in the Phase I ESA.

Contaminants of Potential Concern (CPCs)

As noted above, the CPCs identified for the soil and/or groundwater beneath the Phase I Property include a combination of BTEX, VOCs, PHCs, PAHs, and/or metals.

Assessment of Uncertainty and/or Absence of Information

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

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. 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 included the following:

- the use of the Phase II Property as a commercial parking lot;
- the subject structure;
- construction on the eastern portion of the site (OLRT station and Claridge Sales Center);
- proximity of the buildings on the adjacent properties to the west; and
- private services and parking kiosk on the western and central portions of the site.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted July 3 through July 6, 2018, in conjunction with a Geotechnical Investigation, and consisted of drilling six (6) boreholes on the Phase II Property. All of the boreholes were completed with groundwater monitoring well installations. Boreholes BH2, BH5 and BH6 were placed to address the aforementioned areas of potential environmental concern (APECs), while BH1, BH3 and BH4 were placed primarily to provide coverage of the site for geotechnical purposes.

All boreholes were cored into the bedrock to access the groundwater tables. The environmental boreholes were cored to depths ranging from 8.4 to 8.7m to intercept the top of the water table, while the remaining boreholes were cored into the bedrock to the approximate founding elevation at depths ranging from 23.8 to 25m below grade, for geotechnical purposes. The boreholes were drilled with a truck mounted CME 55 power auger drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. Borehole locations are shown on Drawing PE4011-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of thirty-six (36) soil samples and fifty (50) rock core samples were obtained from the boreholes by means of sampling from shallow auger flights, split spoon sampling and rock coring. The depths at which split spoon samples and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**" and "**RC**" on the Soil Profile and Test Data Sheets, appended to this report.

The soil profile consists of asphaltic concrete underlain by fill material, native glacial till, and limestone bedrock. The fill material generally consisted of brown silty sand with gravel, organics and/or crushed stone and extended to depths ranging from approximately 1.5 to 3.0m below grade. Occasional brick fragments were observed at BH2, BH3, BH4 and BH6, while occasional possible coal fragments were identified at BH2 and BH4. Native glacial till consisting of brown silty sand with gravel and cobbles was identified beneath the fill to depths ranging from approximately 4.4 to 4.8m below grade. The underlying limestone bedrock was cored to the depths ranging from approximately 8.4 to 25m below grade.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, 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 found to range from less than 5 to 10ppm and were not considered to be indicative of volatile hydrocarbon compounds. No visual or olfactory indications of potential hydrocarbons were identified in the soil samples. Based on the vapour screening and visual or olfactory observations, soil samples were selected based on their location relative to the inferred depth of groundwater.

Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

4.4 Groundwater Monitoring Well Installation

Six (6) groundwater monitoring wells were installed on the Phase II Property. The monitoring wells consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details for the environmental boreholes are listed below in Table 2, while construction details for all monitoring wells are 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
BH2	73.79	8.53	5.53-8.53	5.03-8.53	0.30-5.03	Flushmount
BH5	74.09	8.36	5.36-8.36	4.86-8.36	0.30-4.86	Flushmount
BH6	74.02	8.66	5.66-8.66	5.16-8.66	0.30-5.16	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH2, BH4 and BH5 on July 19, 2018. 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 – July 19, 2018

Parameter	BH2	BH5	BH6
Temperature (°C)	13.4	16.9	19.1
pH	8.02	7.53	7.65
Electrical Conductivity (µS/cm)	307	303	335

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MOECP 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 following soil and groundwater samples were submitted for analysis:

Table 4: Soil Samples Submitted

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		BTEX	PHCs (F_1-F_4)	PAHs	Metals	
BH2-AU1	0.08-0.6m; Fill			X	X	Assessment of possible impacted fill material.
BH3-SS4	2.29-2.89m; Fill				X	Assessment of possible impacted fill material.
BH4-SS2	0.76-1.37m; Native Glacial Till				X	Assessment of possible impacted fill material.
BH5-SS4	2.29-2.89m; Native Glacial Till	X	X			To assess potential soil impacts associated with off-site historical automotive service garage; based on vapour screening and depth with respect to water table.
BH6-SS4	2.29-2.89m; Native Glacial Till	X	X	.		To assess potential soil impacts associated with on-site historical automotive service garage; based on vapour screening and depth with respect to water table.

The possible coal fragments identified in BH2 and BH4 may have consisted of asphalt from the auger flights. No apparent coal was noted in any of the remaining boreholes. Therefore only one sample, Sample BH2-AU1, was analysed for PAHs.

Table 5: Groundwater Samples Submitted					
Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed			Rationale
		PHCs (F_1-F_4)	VOCs	Metals	
BH2-GW1	5.53-8.53m; Bedrock		X		Delineation of potential impacts identified in BH5 or BH6.
BH5-GW1	5.36-8.36m; Bedrock	X	X	X	Assessment of potential groundwater impacts from former on-site garage and historical off-site PCAs.
BH6-GW1	5.13-8.13 m; Bedrock	X	X		Assessment of potential groundwater impacts from historical off-site PCAs.

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

An elevation survey of all borehole locations was completed by Paterson at the time of the subsurface investigation. All borehole elevations are relative to the top of grate of a catch basin located near the exit of the existing parking lot on the south-central portion of the Phase II Property, with geodetic elevation 73.5m above sea level (m asl), as provided by Annis, O'Sullivan, Vollebekk.

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, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils generally consist of asphaltic concrete over fill material, underlain by a layer of native glacial till, followed by limestone bedrock. Site stratigraphy is shown on Drawing PE4011-7 – Cross-Section A-A' and Drawing PE4011-8 – Cross-Section B-B'.

Groundwater was encountered within the bedrock at depths ranging from approximately 4.5 to 6.1m below existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on July 19, 2018, using an electronic water level meter. Groundwater levels are summarized below in Table 6. All measurements are relative to the top of grate of a catch basin located near the exit of the existing parking lot on the south-central portion of the Phase II Property.

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	74.13	5.16	68.97	July 19, 2018
BH2	73.79	4.46	69.33	July 19, 2018
BH3	73.76	5.06	68.70	July 19, 2018
BH4	73.68	6.07	67.61	July 19, 2018
BH5	74.09	5.19	68.90	July 19, 2018
BH6	74.02	5.07	68.95	July 19, 2018

Based on the groundwater elevations measured at BH2, BH5 and BH6 (all screened at a similar depth at a shallower elevation than the remaining wells) during the July 2018 sampling event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4011-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property appears to flow towards the northwest. A horizontal hydraulic gradient of approximately 0.011 m/m was calculated.

No free product was observed in the monitoring wells at the Phase II Property.

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 up to 10ppm. 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

Five (5) soil samples were submitted for analysis of a combination of PHCs (F1-F4), BTEX, PAHs and/or metals. The results of the analytical testing are presented below in Tables 7, 8, 9 and 10. The laboratory certificates of analysis are provided in Appendix 1.

Table 7
Analytical Test Results – Soil (BTEX and PHCs (F1-F4))

Parameter	MDL (µg/g)	Soil Samples (µg/g) July 6, 2018		MOECP Table 3 Residential Standards (µg/g)
		BH5-SS4 (2.29-2.89m)	BH6-SS4 (2.29-2.89m)	
Benzene	0.02	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	2.3
Toluene	0.05	nd	nd	2
Xylenes (Total)	0.05	nd	nd	3.1
PHC F1	7	nd	nd	55
PHC F2	4	nd	nd	98
PHC F3	8	nd	nd	300
PHC F4	6	nd	nd	2,800

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

No BTEX or PHC concentrations were identified in the samples above the laboratory method detection limits. The results are in compliance with MOECP Table 3 standards.

Table 8
Analytical Test Results – Soil (PAHs)

Parameter	MDL (µg/g)	Soil Samples (µg/g) July 4, 2018	MOECP Table 3 Residential Standards (µg/g)
		BH2-AU1 (0.08-0.6m)	
Acenaphthene	0.02	nd	7.9
Acenaphthylene	0.02	nd	0.15
Anthracene	0.02	0.04	0.67
Benzo[a]anthracene	0.02	0.13	0.5
Benzo[a]pyrene	0.02	0.13	0.3
Benzo[b]fluoranthene	0.02	0.15	0.78
Benzo[g,h,i]perylene	0.02	0.09	6.6
Benzo[k]fluoranthene	0.02	0.08	0.78
Chrysene	0.02	0.12	7
Dibenzo[a,h]anthracene	0.02	0.02	0.1
Flouranthene	0.02	0.28	0.69
Fluorene	0.02	nd	62
Indeno[1,2,3-cd]pyrene	0.02	0.07	0.38
1-Methylnaphthalene	0.02	nd	0.99
2-Methylnaphthalene	0.02	nd	0.99
Methylnaphthalene (1&2)	0.04	nd	0.99
Naphthalene	0.01	nd	0.6
Phenanthrene	0.02	0.12	6.2
Pyrene	0.02	0.25	78

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

All PAH parameters identified in soil Sample BH2-AU1 are in compliance with MOECP Table 3 standards. It should be noted that all PAH parameters also meet MOECP Table 1 standards, which are typically used for off-site disposal purposes.

Table 9
Analytical Test Results – Soil (Metals, As, Sb, Se)

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MOECP Table 3 Residential Standards (µg/g)
		July 4, 2018		July 5, 2018	
		BH2-AU1 (0.08-0.60m)	BH3-SS4 (2.29-2.89m)	BH4-SS2 (0.76-1.37m)	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	1.5	2.1	1.0	18
Barium	1.0	84.4	53.0	59.9	390
Beryllium	0.5	nd	nd	nd	4
Boron	5.0	6.8	nd	nd	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	5.0	15.6	9.5	10.9	160
Cobalt	1.0	3.4	2.5	3.7	22
Copper	5.0	9.9	14.4	13.1	140
Lead	1.0	68.4	98.4	101	120
Molybdenum	1.0	nd	nd	nd	6.9
Nickel	5.0	10.1	9.0	8.2	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	10.0	17.0	nd	19.8	86
Zinc	20.0	30.9	55.4	35.4	340

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

Metal parameters were identified in each of the soil samples submitted for analytical testing. All parameters are in compliance with the MOECP Table 3 standards. All metal parameters also meet MOECP Table 1 standards.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 10.

Table 10
Maximum Soil Concentrations

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Anthracene	0.04	BH2	0.08-0.60
Benzo[a]anthracene	0.13	BH2	0.08-0.60
Benzo[a]pyrene	0.13	BH2	0.08-0.60
Benzo[b]fluoranthene	0.15	BH2	0.08-0.60
Benzo[g,h,i]perylene	0.09	BH2	0.08-0.60
Benzo[k]fluoranthene	0.08	BH2	0.08-0.60
Chrysene	0.12	BH2	0.08-0.60
Dibenzo[a,h]anthracene	0.02	BH2	0.08-0.60
Flouranthene	0.28	BH2	0.08-0.60
Indeno[1,2,3-cd]pyrene	0.07	BH2	0.08-0.60
Phenanthrene	0.12	BH2	0.08-0.60
Pyrene	0.25	BH2	0.08-0.60
Arsenic	2.1	BH3	2.29-2.89
Barium	84	BH2	0.08-0.60
Boron	6.8	BH2	0.08-0.60
Chromium	15.6	BH2	0.08-0.60
Cobalt	3.7	BH4	0.76-1.37
Copper	14.4	BH3	2.29-2.89
Lead	101	BH4	0.76-1.37
Nickel	10.1	BH2	0.08-0.60
Vanadium	19.8	BH3	2.29-2.89
Zinc	55.4	BH4	0.76-1.37

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH2, BH5 and BH6 were submitted for laboratory analysis of VOC, PHC and/or metal parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented below in Tables 11, 12 and 13. The laboratory certificates of analysis are provided in Appendix 1.

Table 11
Analytical Test Results – Groundwater (PHCs (F1-F4))

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 19, 2018		MOECP Table 3 Standards (µg/L)
		BH5-GW1	BH6-GW1	
PHC F1	25	nd	nd	750
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 PHC parameters were detected above the laboratory method detection limits in any of the groundwater samples submitted for analytical testing. The results are considered to be in compliance with the MOECP 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). No free phase hydrocarbons were noted in the wells at the time of sampling.

Table 12
Analytical Test Results - Groundwater (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 19, 2018			MOECP Table 3 Standards (µg/L)
		BH2-GW1	BH-5GW1	BH6-GW1	
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	1.5	nd	**3.1**	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	0.25
1,2-Dichlorobenzene	0.5	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6

Table 12 Continued
Analytical Test Results - Groundwater (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 19, 2018			MOECP Table 3 Standards (µg/L)
		BH2-GW1	BH-5GW1	BH6-GW1	
1,2-Dichloropropane	0.5	nd	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	2,300
Hexane	1.0	nd	nd	nd	51
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	1900
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	3.4
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
1,3,5-Trimethylbenzene	0.5	nd	nd	nd	nv
Vinyl Chloride	0.5	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	4,200

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **bold** – exceeds the MOECP Table 3 standard

With the exception of chloroform identified in Samples BH2-GW1 and BH6-GW1, VOC parameters were not detected above the laboratory method detection limits in any of the groundwater samples analysed. The chloroform concentration identified in Sample BH2-GW1 is in compliance with the MOECP Table 3 standard while the concentration (3.1µg/L) identified in Sample BH6-GW1 exceeds the standard of 2.4µg/L. The presence of chloroform in the groundwater is considered to be the result of the use of municipal water during the bedrock coring process. The chloroform concentration is anticipated to dissipate in the near future; chloroform is not considered to be a contaminant of concern on the Phase II Property.

Table 13
Analytical Test Results – Groundwater (Metals)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) July 19, 2018	MOECP Table 3 Standards (µg/L)
		BH5-GW1	
Antimony	0.5	nd	20,000
Arsenic	1	nd	1,900
Barium	1	68	29,000
Beryllium	0.5	nd	67
Boron	10	153	45,000
Cadmium	0.1	nd	2.7
Chromium	1	8	810
Chromium (VI)	10	nd	140
Cobalt	0.5	0.9	66
Copper	0.5	5.8	87
Lead	0.1	nd	25
Mercury	0.1	nd	0.29
Molybdenum	0.5	14.7	9,200
Nickel	1	5	490
Selenium	1	7	63
Sodium	200	528,000	2,300,000
Silver	0.1	nd	1.5
Thallium	200	nd	510
Uranium	0.1	3.0	420
Vanadium	0.5	7.5	250
Zinc	5	nd	1,100

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

All of the detected parameters were in compliance with the MOECP Table 3 standards.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the July 2018 sampling event 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 O.Reg. 269/11 amending O.Reg. 153/04 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report and Section 2.2 of this report, the following PCAs are considered to result in APECs on the Phase I and Phase II Property:

- Item 30 – Importation of Fill Material of Unknown Quality – based on a previous subsurface investigation, fill material was identified across the southern portion of the Phase II Property. The potential for impacted fill material across the Phase II Property was considered to represent an APEC on the subject land (APEC 2).
- Item 33 - Metal Treatment, Coating, Plating and Finishing – based on a former chrome plating industry adjacent to the northwest of the Phase II Property (APEC 6).
- Item 52 – Storage, maintenance, fuelling and repair of equipment, vehicles and material used to maintain transportation systems – based on a former on-site automotive service garage and two (2) former off-site automotive service garages adjacent to the northwest of the Phase II Property (APECs 1, 3 and 5).
- Although not specified under Column A of Table 2 in O.Reg. 347/558 as amended, a historical off-site photo lab situated adjacent to the northwest of the Phase II Property was also considered to represent an APEC on the subject land (APEC 4).

Contaminants of potential environmental concern associated with the aforementioned PCAs include a combination of PHCs (F1-F4), BTEX, VOCs, PAHs and/or metals in the soil and/or groundwater.

Subsurface Structures and Utilities

Underground utilities present on the Phase I Property include natural gas (enters property from Queen Street on the western portion of the site and private storm sewers are present on the southern portion of the site. A below grade chamber was observed near the southeast corner of the commercial building. The chamber was not accessible at the time of the site visit, however it is considered to be associated with the former building structures.

The property is municipally serviced; water and sewer enter the subject commercial building from Queen Street and are not present beneath the Phase I Property. The OLRT building under construction on the northeastern portion of the site is not currently serviced.

No private wells or septic systems are present on or within the immediate vicinity of the Phase II Property.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE4011-7 and 8 - Cross-Section A-A' and B-B'. Stratigraphy consists of:

- Asphaltic concrete from ground surface to depths ranging from 0.08 to 0.14m below grade.
- Fill material generally consisting of crushed stone with sand (BH1) and/or brown silty sand with gravel and crushed stone. Trace fragments of brick, possible coal and organics were identified at BH1, BH3, BH4 and/or BH6. Fill extended to depths ranging from 1.5 to 3.0m below grade.
- Native glacial till material consisting of silty sand with gravel and cobbles, was identified at each borehole beneath the fill material. Glacial till extended to depths ranging from approximately 4.4 to 4.8m below grade.
- Limestone bedrock was present beneath the glacial till. Bedrock was cored to depths ranging from approximately 8.4 to 25m below grade. Groundwater was identified in this stratigraphic unit.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered within the bedrock. This unit is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on July 19, 2018, at depths ranging from approximately 4.5 to 6.1m below grade. Based on the groundwater elevations measured during this monitoring event, groundwater contour mapping was completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject site was in a northwesterly direction, with a hydraulic gradient of approximately 0.011 m/m.

Approximate Depth to Bedrock

Bedrock was encountered at depths ranging from approximately 4.4 to 4.8m below grade.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 4.5 to 6.1m below existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the subject site, in that no bodies of water or areas of natural or scientific interest (ANSIs) are present on or within 30m of the subject land.

Section 43.1 of the Regulation does not apply to the subject site in that the Phase II Property is not a Shallow Soil Property.

Fill Placement

Fill material was identified across the Phase II Property beneath the asphaltic concrete, to depths of ranging from approximately 1.5 to 3.0m below grade. The fill generally consisted of crushed stone (BH1) and/or brown silty sand with gravel, and occasional organics, crushed stone, brick fragments and/or possible coal or asphalt fragments at BH1, BH3, BH4 and/or BH6.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property will be developed with three (3) multi-storey mixed-use buildings. Towers A and B will each have 28 storeys, while Tower C will have 22 storeys. All of the proposed buildings will share eight (8) levels of underground parking, which will occupy the majority of the site.

Existing Buildings and Structures

The northwestern portion of the Phase I Property is occupied by a 2-storey commercial building fronting onto Queen Street. A public transit station associated with the OLRT, is situated on the northeastern portion of the Phase I Property, fronting onto Queen Street. A kiosk associated with the commercial parking lot is present on the south-central portion of the Phase I Property.

Water Bodies

There are no water bodies on or within the immediate vicinity of the Phase II Property.

Areas of Natural Significance

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

Environmental Condition

Areas Where Contaminants are Present

Based on the results of the Phase II ESA, there are no contaminants present in the soil or groundwater beneath the Phase II Property. Although a chloroform concentration in the groundwater exceeding the MOECP Table 3 standard was identified at BH6, it is considered to have resulted from the use of municipal water during bedrock coring and is expected to dissipate over time. Chloroform is not considered to be a contaminant of concern on the Phase II Property.

Analytical test results are shown on Drawings PE4011-5 and PE4011-6 – Analytical Testing Plans.

Types of Contaminants

Based on the findings of the Phase II ESA, there are no contaminants on the Phase II Property.

Contaminated Media

Soil and groundwater samples obtained from the Phase II Property were in compliance with the selected MOECP standards.

What Is Known About Areas Where Contaminants Are Present

As previously noted, based on the findings of the Phase II ESA, contaminants are not present on the Phase II Property.

Distribution and Migration of Contaminants

As soil and groundwater at the borehole locations was determined to be in compliance with MOECP Table 3 standards, no distribution or migration of contaminants is considered to have occurred on the Phase II Property.

Discharge of Contaminants

Contaminants are not considered to have been discharged on the Phase II Property.

Climatic and Meteorological Conditions

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

No contaminants were identified on the Phase II Property and therefore leaching and groundwater flow/fluctuation are not considered to have affected contaminant distribution.

Potential for Vapour Intrusion

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

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 383 Albert Street and 340 Queen Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase I and Phase II Property.

The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling six (6) boreholes, all of which were constructed with groundwater monitoring well installations. Monitoring wells installed in BH2, BH5 and BH6 were installed at a depth of approximately 8m below grade while the remaining monitoring wells were installed at depths up to 25m below grade for geotechnical purposes.

Soil samples were obtained from the boreholes and screened using visual observations and combustible vapour measurements. A total of five (5) soil samples were submitted for laboratory analysis of a combination of benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs) and/or metals. All identified concentrations were in compliance with the MOECP Table 3 standards selected for the site.

Groundwater samples from monitoring wells installed in BH2, BH5 and BH6 were recovered and analysed for a combination of VOC, PHC and/or metal parameters. With the exception of various metal parameters and chloroform, no contaminant concentrations were identified above the laboratory method detection limits. Metal parameters identified Sample BH5-GW1 were in compliance with the MOECP Table 3 standards. Chloroform identified in Sample BH6-GW1 was marginally above the MOECP Table 3 standard and considered to have resulted from the use of municipal groundwater during the bedrock coring process. The chloroform concentration is expected to dissipate over time and is not considered to be a contaminant of concern on the Phase II Property.

Conclusion

Based on the findings of the Phase II ESA, soil and groundwater at the Phase II Property is in compliance with MOECC Table 3 standards.

It is recommended that groundwater from BH2 and BH6 be resampled to confirm chloroform concentrations.

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of the proposed development. In the meantime, it is recommended that an effort be made to maintain the integrity of the monitoring wells for future groundwater sampling events.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended by O.Reg. 269/11, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

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

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

This report was prepared for the sole use of Claridge Homes. Notification from Claridge Homes and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Karyn Munch, P.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- Claridge Homes
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4011-3 – TEST HOLE LOCATION PLAN

DRAWING PE4011-4 - GROUNDWATER CONTOUR PLAN

DRAWING PE4011-5 – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4011-6 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4011-7A – CROSS-SECTION A-A' – SOIL

DRAWING PE4011-7B – CROSS-SECTION A-A' – GROUNDWATER

DRAWING PE4011-8A – CROSS-SECTION B-B' – SOIL

DRAWING PE4011-8B – CROSS-SECTION B-B' - GROUNDWATER

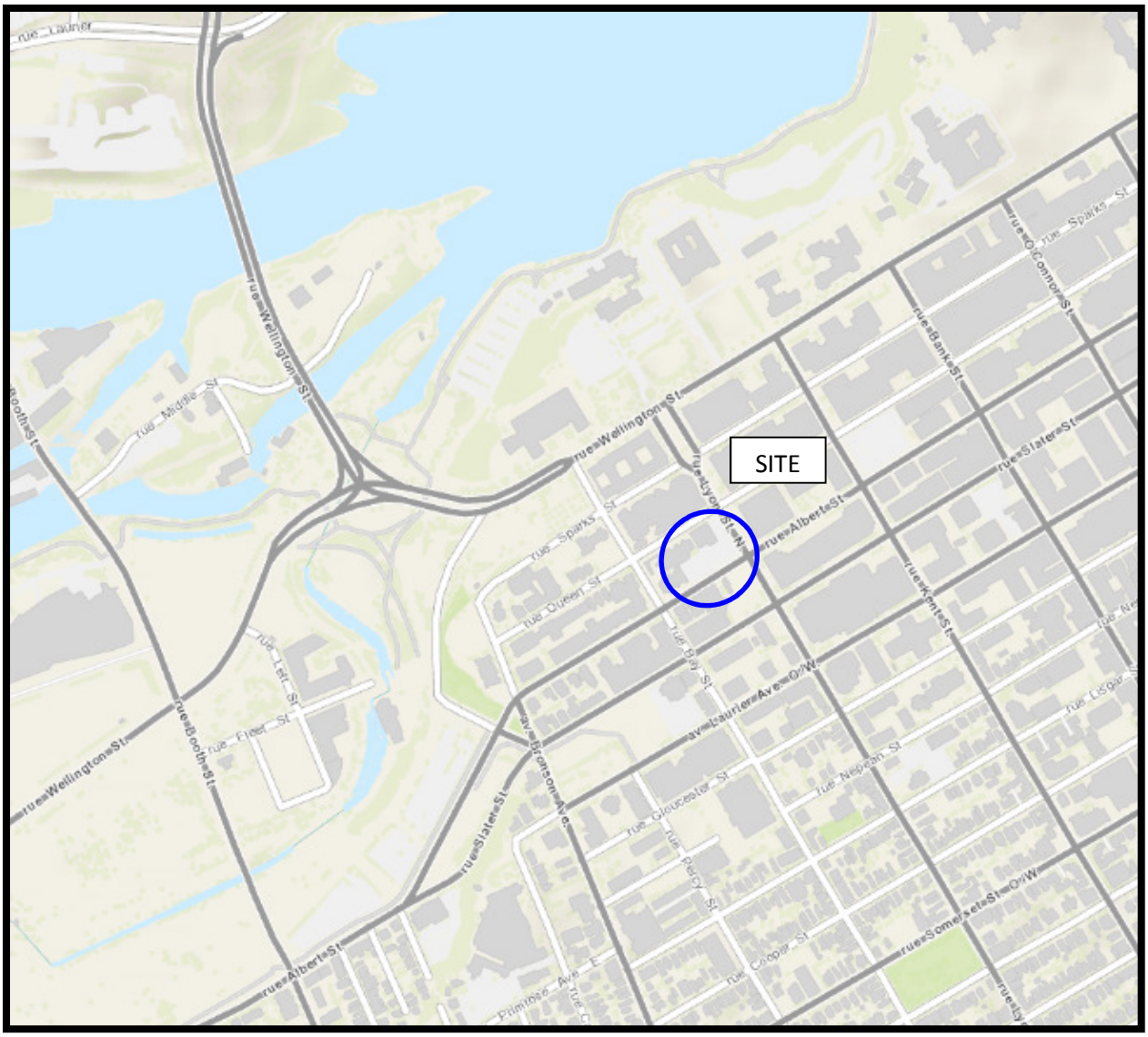
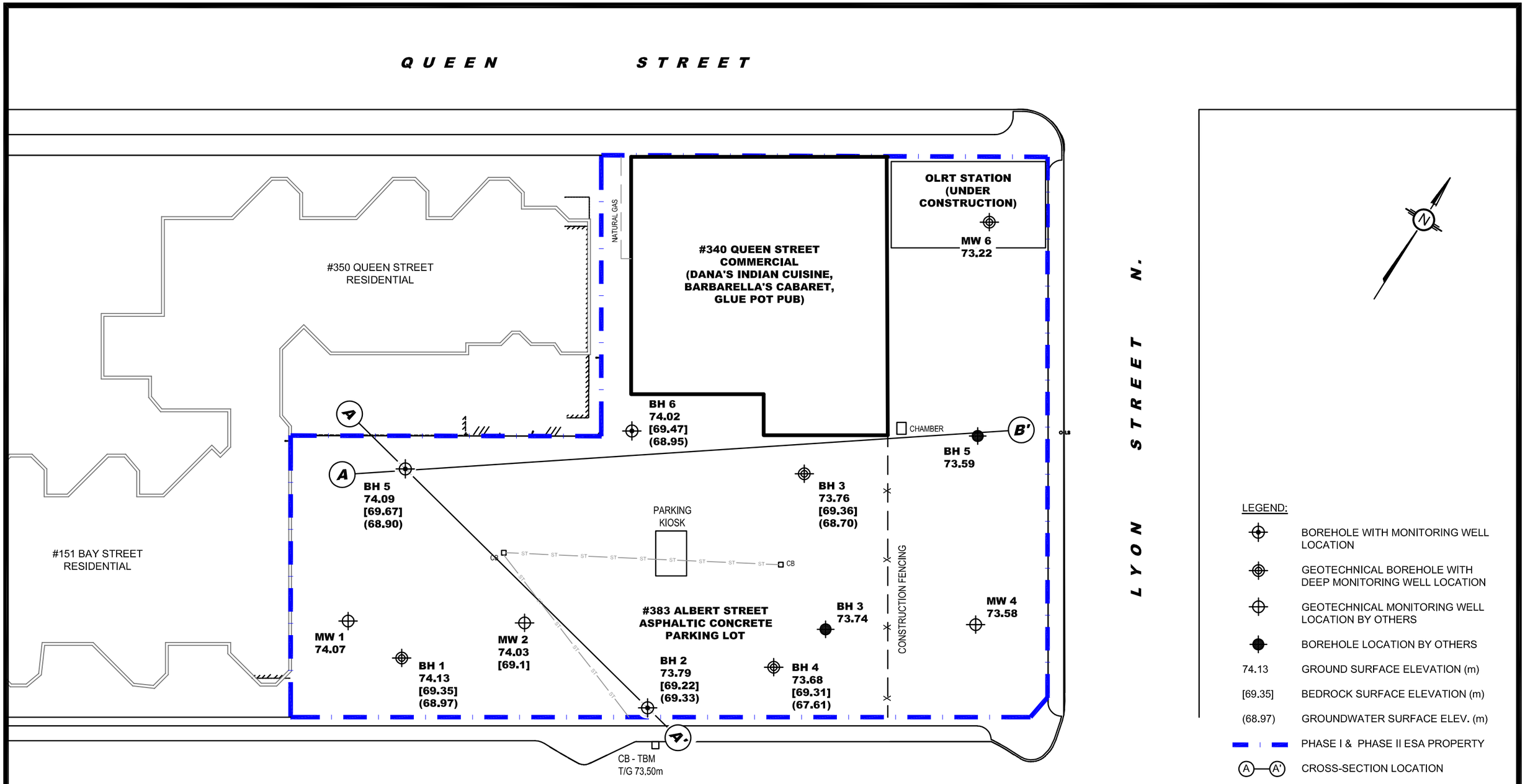


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- GEOTECHNICAL BOREHOLE WITH DEEP MONITORING WELL LOCATION
- GEOTECHNICAL MONITORING WELL LOCATION BY OTHERS
- BOREHOLE LOCATION BY OTHERS
- 74.13 GROUND SURFACE ELEVATION (m)
- [69.35] BEDROCK SURFACE ELEVATION (m)
- (68.97) GROUNDWATER SURFACE ELEV. (m)
- PHASE I & PHASE II ESA PROPERTY
- A — A' CROSS-SECTION LOCATION

BENCHMARK (BM) - TOP OF GRATE OF CATCH BASIN LOCATED NEAR EXIT OF SUBJECT SITE. GEODETIC ELEVATION = 73.50m.

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Ottawa, Ontario K2E 7J5
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NO.	REVISIONS	DATE	INITIAL
0			

CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-3
Approved by: MSD	Revision No.: 0

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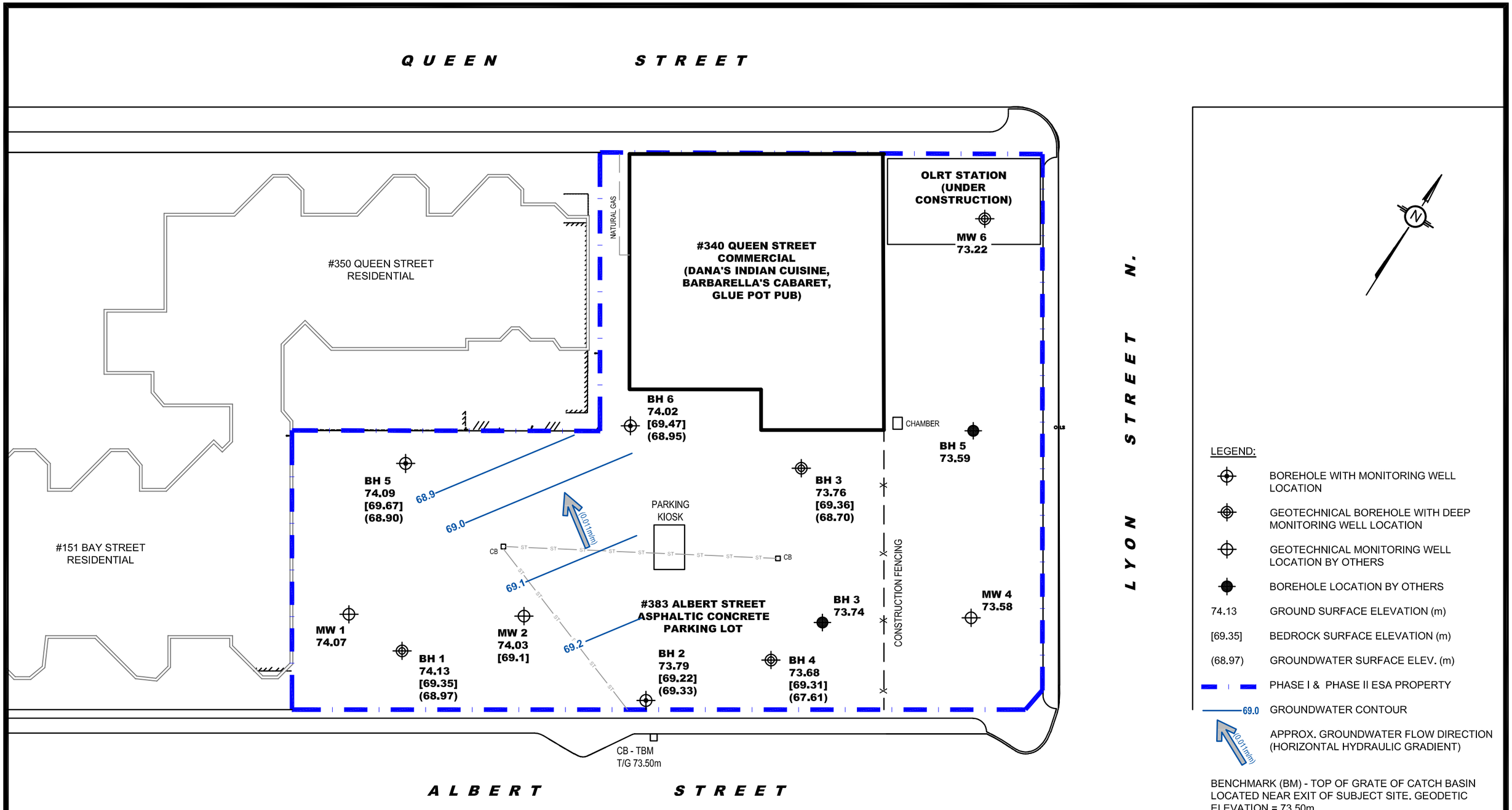

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- GEOTECHNICAL BOREHOLE WITH DEEP MONITORING WELL LOCATION
- GEOTECHNICAL MONITORING WELL LOCATION BY OTHERS
- BOREHOLE LOCATION BY OTHERS
- 74.13 GROUND SURFACE ELEVATION (m)
- [69.35] BEDROCK SURFACE ELEVATION (m)
- (68.97) GROUNDWATER SURFACE ELEV. (m)
- PHASE I & PHASE II ESA PROPERTY
- 69.0 GROUNDWATER CONTOUR
- (0.011m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

BENCHMARK (BM) - TOP OF GRATE OF CATCH BASIN LOCATED NEAR EXIT OF SUBJECT SITE. GEODETIC ELEVATION = 73.50m.

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET

OTTAWA, ONTARIO

Title:

GROUNDWATER CONTOUR PLAN

Scale: 1:400	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-4
Approved by: MSD	Revision No.: 0

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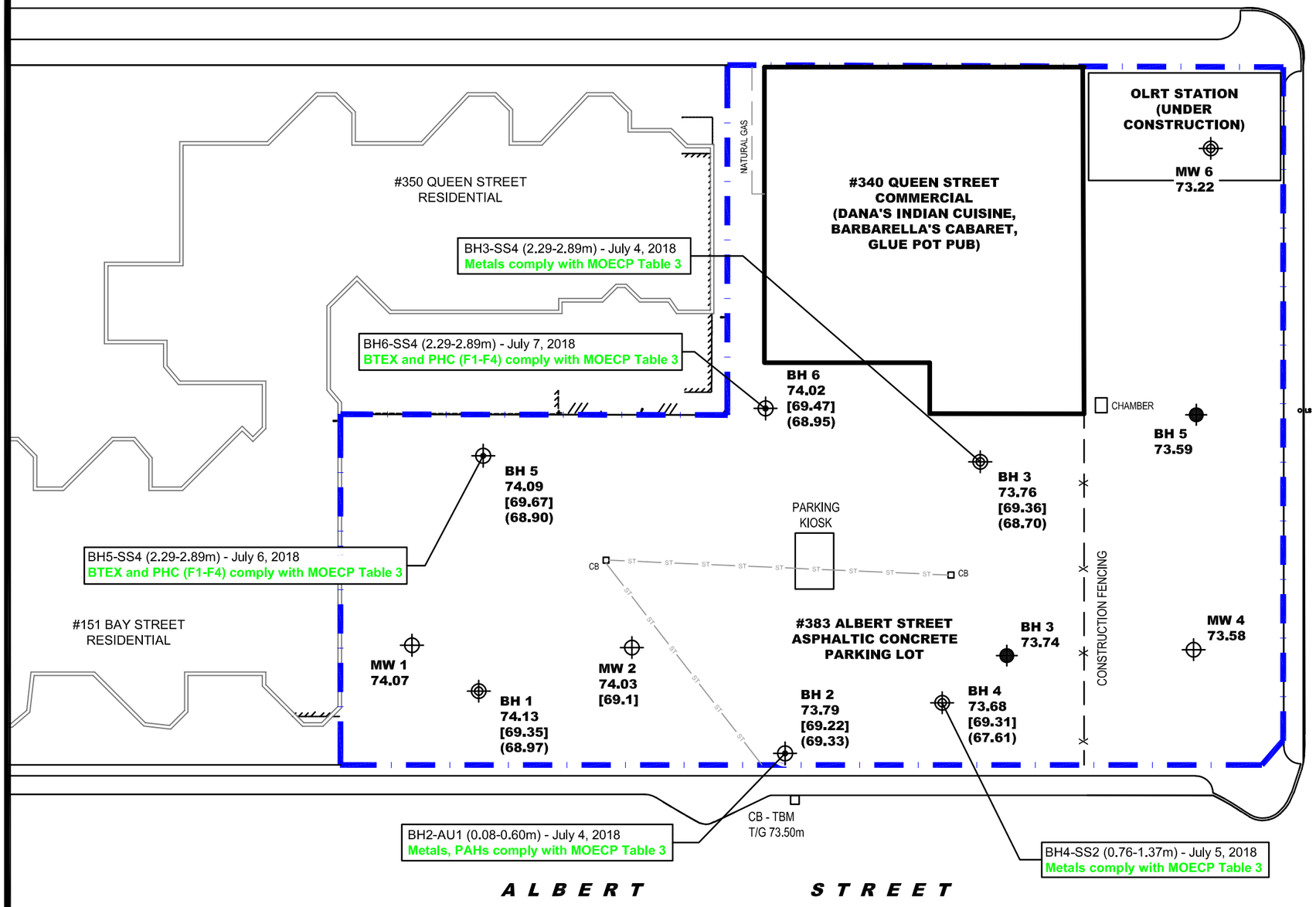

LEGEND:

SOIL PARAMETERS COMPLY WITH MOECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION
- GEOTECHNICAL BOREHOLE WITH DEEP MONITORING WELL LOCATION
- GEOTECHNICAL MONITORING WELL LOCATION BY OTHERS
- BOREHOLE LOCATION BY OTHERS
- 74.13 GROUND SURFACE ELEVATION (m)
- [69.35] BEDROCK SURFACE ELEVATION (m)
- (68.97) GROUNDWATER SURFACE ELEV. (m)
- PHASE I & PHASE II ESA PROPERTY

BENCHMARK (BM) - TOP OF GRATE OF CATCH BASIN LOCATED NEAR EXIT OF SUBJECT SITE. GEODETIC ELEVATION = 73.50m.

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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:400	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-5
Approved by: MSD	Revision No.: 0

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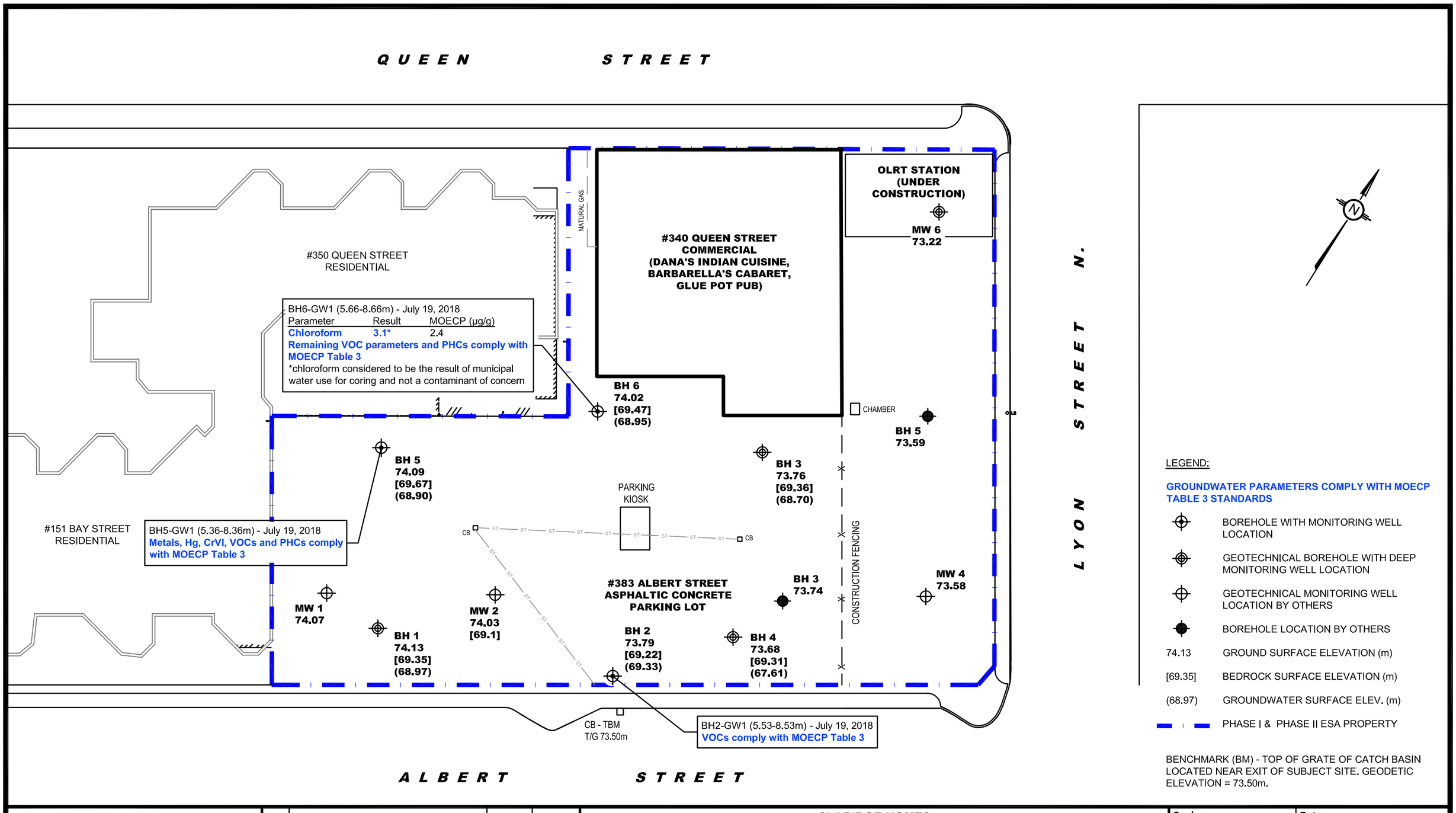

LEGEND:

GROUNDWATER PARAMETERS COMPLY WITH MOECP TABLE 3 STANDARDS

- BOREHOLE WITH MONITORING WELL LOCATION
- GEOTECHNICAL BOREHOLE WITH DEEP MONITORING WELL LOCATION
- GEOTECHNICAL MONITORING WELL LOCATION BY OTHERS
- BOREHOLE LOCATION BY OTHERS
- 74.13 GROUND SURFACE ELEVATION (m)
- [69.35] BEDROCK SURFACE ELEVATION (m)
- (68.97) GROUNDWATER SURFACE ELEV. (m)
- PHASE I & PHASE II ESA PROPERTY

BENCHMARK (BM) - TOP OF GRATE OF CATCH BASIN LOCATED NEAR EXIT OF SUBJECT SITE. GEODETIC ELEVATION = 73.50m.

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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:400	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-6
Approved by: MSD	Revision No.: 0

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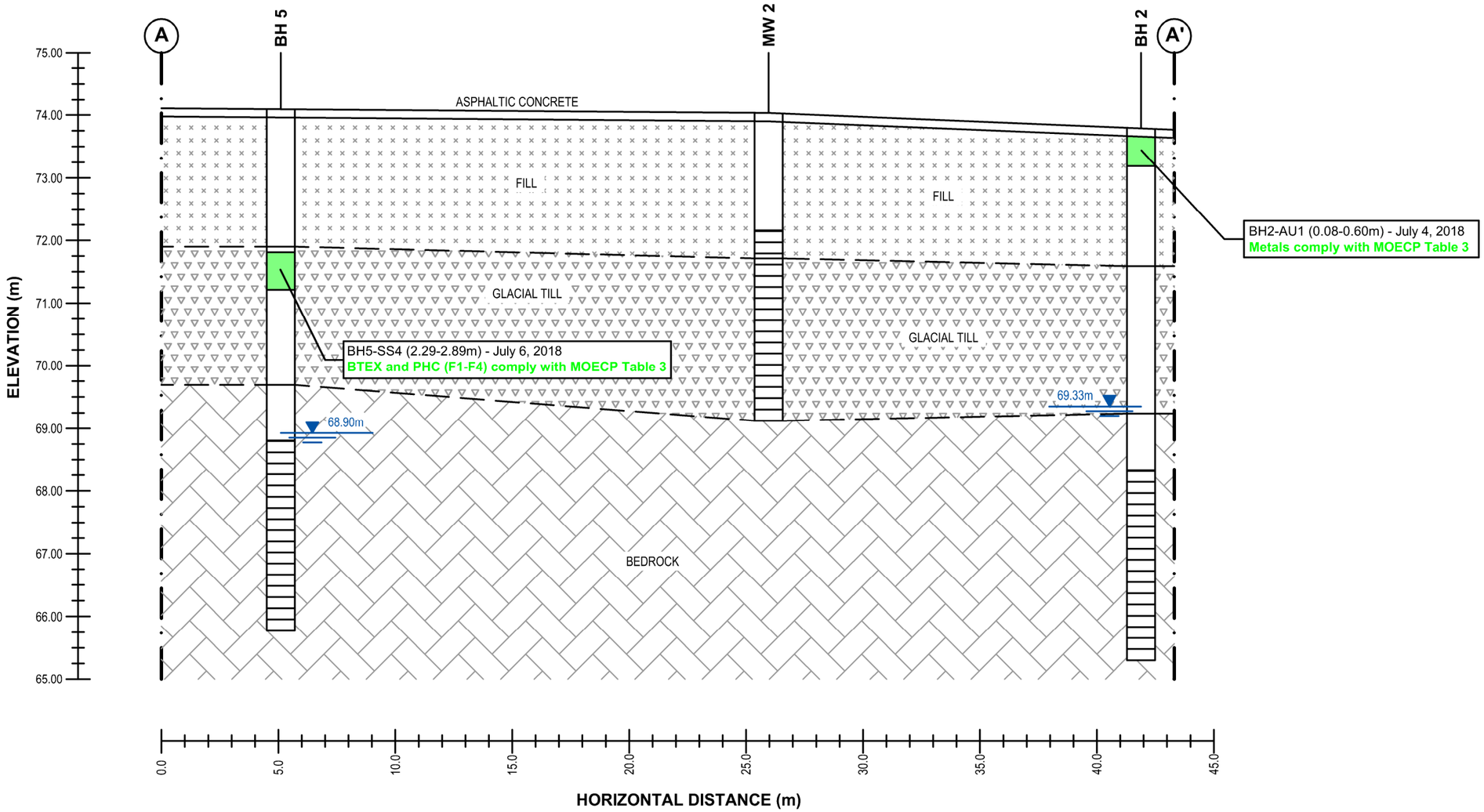

SOIL PARAMETERS COMPLY WITH MOECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET

OTTAWA, ONTARIO

Title:

CROSS-SECTION A-A' - SOIL

Scale: AS SHOWN	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-7A
Approved by: MSD	Revision No.: 0

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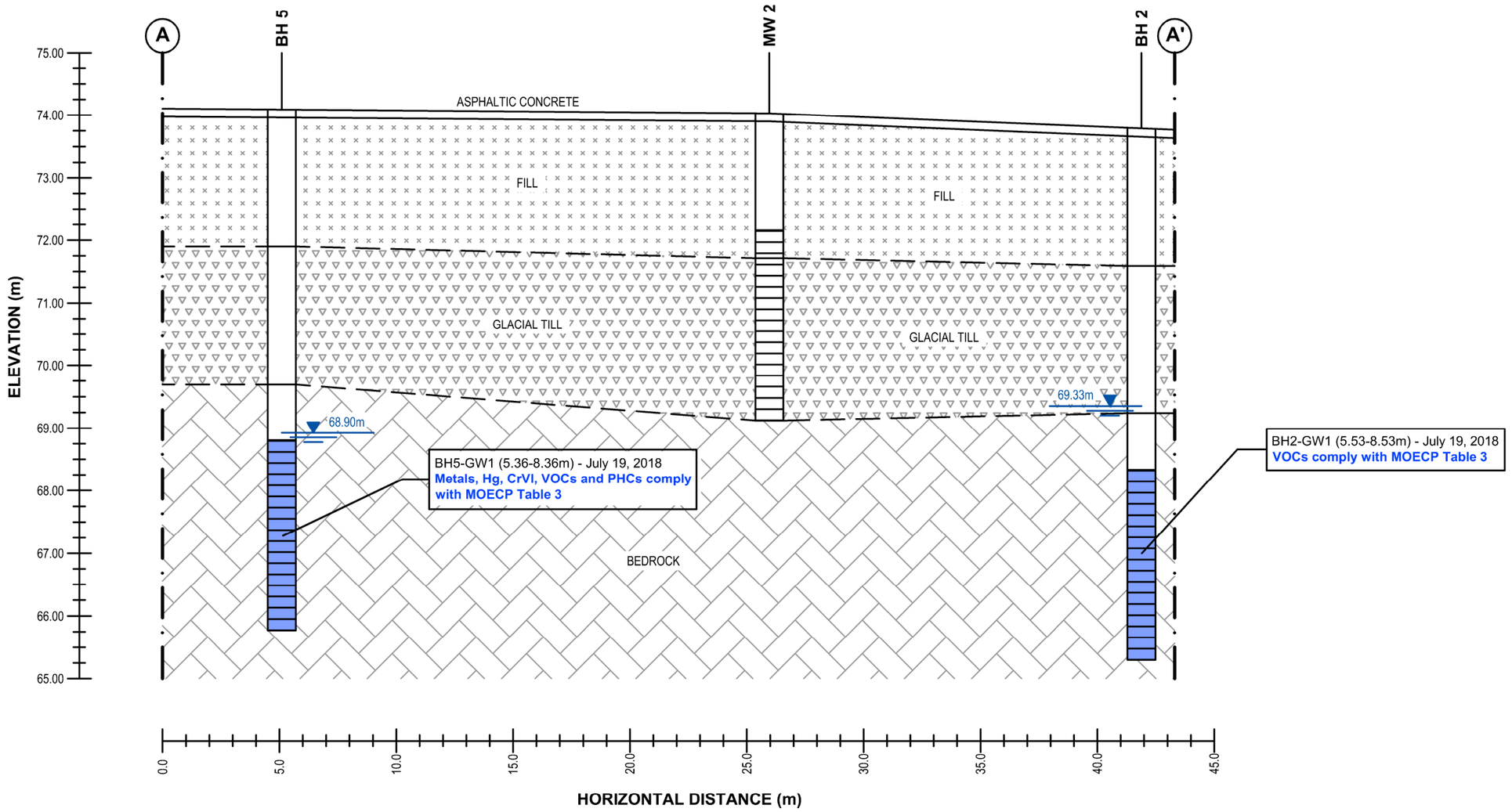

GROUNDWATER PARAMETERS COMPLY WITH MOECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
0			

CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET

OTTAWA, ONTARIO

Title: CROSS-SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-7B
Approved by: MSD	Revision No.: 0

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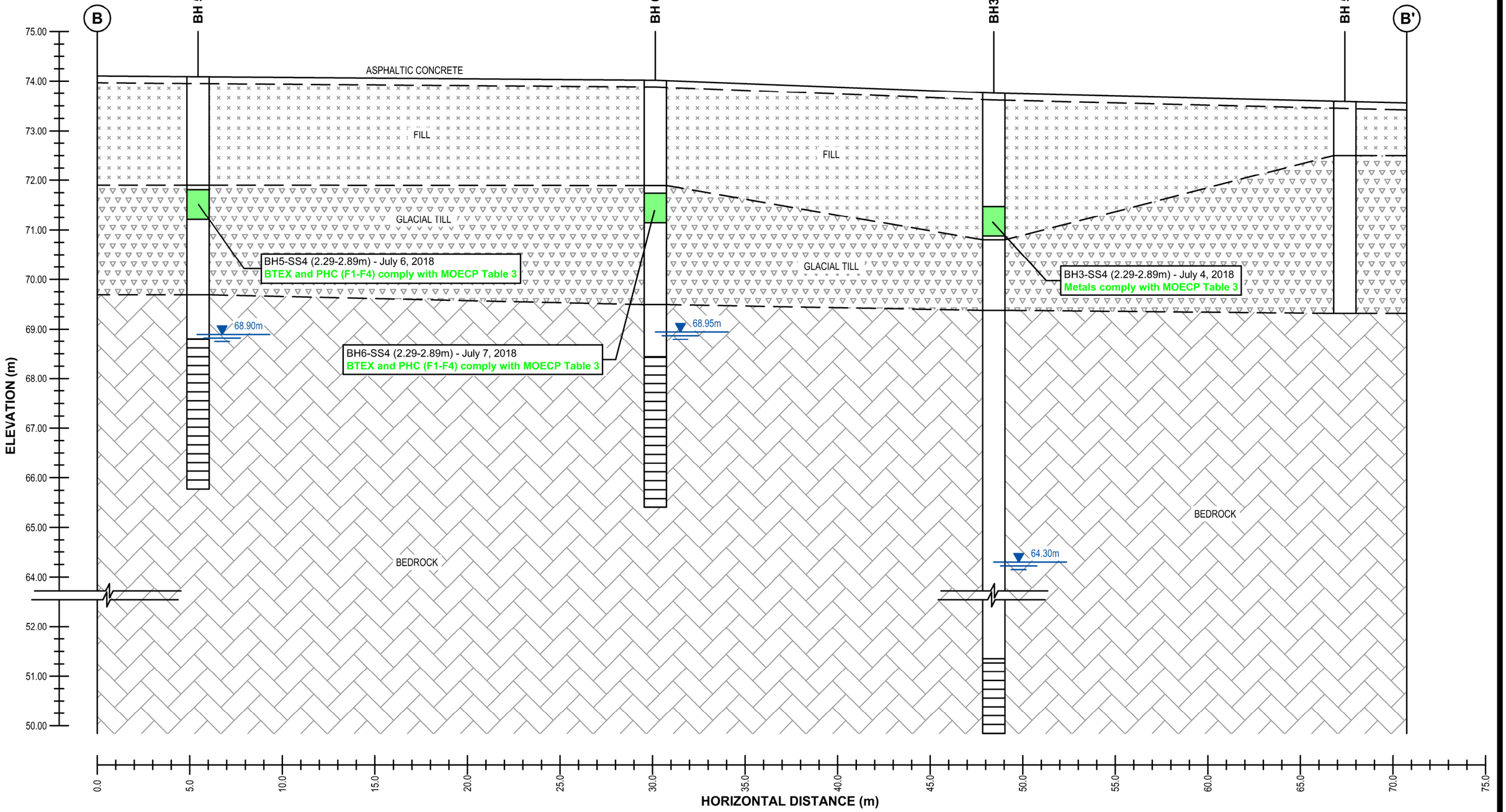

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CLARIDGE HOMES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 ALBERT STREET AND 340 QUEEN STREET

OTTAWA, ONTARIO

Title:

CROSS-SECTION B-B' - SOIL

Scale: AS SHOWN	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-8A
Approved by: MSD	Revision No.: 0

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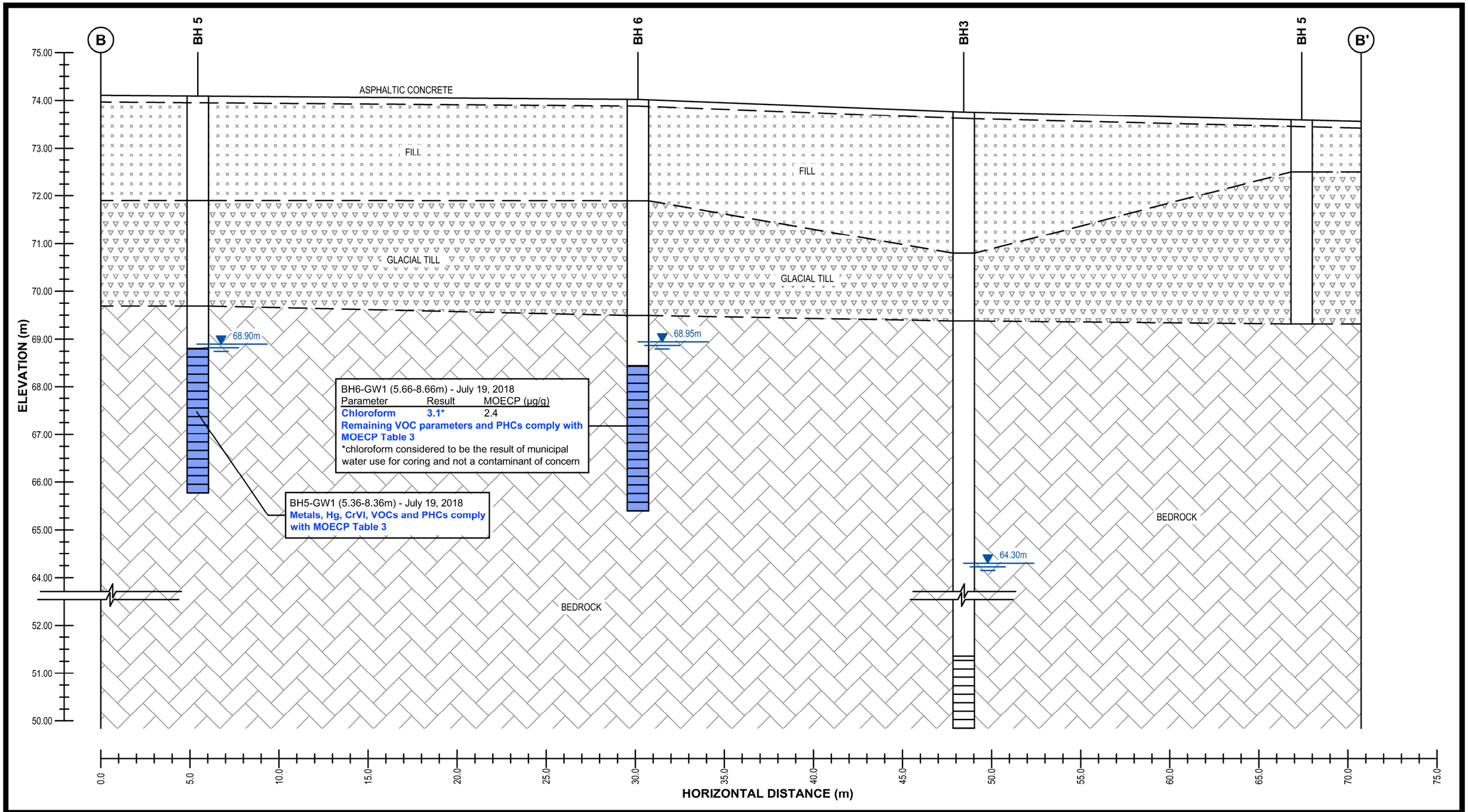

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383 ALBERT STREET AND 340 QUEEN STREET

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Title:

CROSS-SECTION B-B' - GROUNDWATER

Scale: AS SHOWN	Date: 08/2018
Drawn by: MPG	Report No.: PE4011-2
Checked by: KM	Dwg. No.: PE4011-8B
Approved by: MSD	Revision No.: 0

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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

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
383 Albert Street and 340 Queen Street
Ottawa, Ontario

Prepared For

Claridge Homes

June 2018

Report: PE4011-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Claridge Homes to conduct a Phase II Environmental Site Assessment (ESA) for part of the property addressed 383 Albert Street and 340 Queen Street, in the City of Ottawa, Ontario. Based on the Phase I ESA conducted by Paterson in July of 2018, a subsurface investigation program consisting of borehole drilling was developed. A geotechnical investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place to provide general coverage for geotechnical purposes/assessment of fill material.	Sample overburden to bedrock surface and core into bedrock to approximate depth of 25m below grade, for geotechnical purposes.
BH2	Place borehole to provide general coverage of site/assessment of fill material.	Sample overburden to bedrock surface and core into bedrock to approximate depth of 8m below grade to intercept water table.
BH3	Place to provide general coverage for geotechnical purposes/assessment of fill material.	Sample overburden to bedrock surface and core into bedrock to approximate depth of 25m below grade, for geotechnical purposes.
BH4	Place to provide general coverage for geotechnical purposes/assessment of fill material.	Sample overburden to bedrock surface and core into bedrock to approximate depth of 25m below grade, for geotechnical purposes.
BH5	Place borehole to assess potential for soil and groundwater impacts from historical off-site sources of contamination adjacent to the northwest of the Phase II Property.	Sample overburden to bedrock surface and core into bedrock to approximate depth of 8m below grade to intercept water table.
BH6	Place borehole to assess potential for soil and groundwater impacts from historical on-site automotive service garage and historical off-site sources adjacent to the northwest.	Sample overburden to bedrock surface and core into bedrock to approximate depth of 8m below grade to intercept water table.

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 MOECC site condition standards.
- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed a plan with the borehole locations must be provided. Distances and orientations of boreholes with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a fire hydrant located on south side of Lisgar Street (300 Lisgar Street), with geodetic elevation of 72.57m above sea level (asl).

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 F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [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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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** July 3, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	74.13
Asphaltic concrete	0.08		AU	1				
FILL: Crushed stone with sand	0.69							
FILL: Brown silty sand, gravel, trace organics	1.50		SS	2	42	9	1	73.13
			SS	3	79	27	2	72.13
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles, boulders, trace clay			SS	4	67	21		
			SS	5	83	11	3	71.13
			SS	6	79	24	4	70.13
	4.78		SS	7	67	50+		
			RC	1	71	100	5	69.13
			RC	2	100	96	6	68.13
							7	67.13
			RC	3	100	88	8	66.13
BEDROCK: Grey limestone							9	65.13
			RC	4	100	80	10	64.13
			RC	5	100	93	11	63.13
			RC	6	98	98	12	62.13
							13	61.13

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
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** July 3, 2018

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									
		RC	7	100	98	13	61.13		
						14	60.13		
		RC	8	100	100	15	59.13		
						16	58.13		
		RC	9	100	100	17	57.13		
						18	56.13		
BEDROCK: Grey limestone		RC	10	95	95	19	55.13		
		RC	11	100	98	20	54.13		
						21	53.13		
		RC	12	100	100	22	52.13		
		RC	13	96	88	23	51.13		
		RC	14	100	100	24	50.13		
24.41									
End of Borehole									
(GWL @ 5.16m - July 19, 2018)									

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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** July 4, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.79
Asphaltic concrete 0.08		AU	1				
FILL: Brown silty sand with gravel, cobbles, occasional fragments of possible coal		SS	2	75	35	1	72.79
2.21		SS	3	58	39	2	71.79
		SS	4	67	15		
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles, boulders, trace clay		SS	5	33	16	3	70.79
4.57		SS	6	75	13	4	69.79
		RC	1	95	80	5	68.79
BEDROCK: Grey limestone		RC	2	100	97	6	67.79
		RC	3	98	88	7	66.79
8.53						8	65.79
End of Borehole							
(GWL @ 4.46m - July 19, 2018)							

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
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** July 4, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.76
Asphaltic concrete 0.14		AU	1				
FILL: Crushed stone, some sand, gravel, trace brick		SS	2	25	53	1	72.76
		SS	3	0	50+	2	71.76
2.97		SS	4	33	24		
GLACIAL TILL: Compact to dense, brown silty sand, some gravel, cobble, boulders		SS	5	46	16	3	70.76
4.40		SS	6	73	50+	4	69.76
		RC	1	100	84	5	68.76
		RC	2	95	86	6	67.76
		RC	3	100	88	7	66.76
BEDROCK: Grey limestone						8	65.76
		RC	4	100	85	9	64.76
		RC	5	100	100	10	63.76
		RC	6	100	98	11	62.76
						12	61.76
						13	60.76

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

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FILE NO. PE4011

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** July 4, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						13	60.76
		RC	7	100	98	14	59.76
						15	58.76
		RC	8	100	96		
						16	57.76
		RC	9	100	88	17	56.76
						18	55.76
BEDROCK: Grey limestone		RC	10	100	90		
						19	54.76
		RC	11	100	100	20	53.76
						21	52.76
		RC	12	100	100		
						22	51.76
		RC	13	100	100	23	50.76
23.77							
End of Borehole							
(GWL @ 5.06m - July 19, 2018)							

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
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Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** July 4, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.68
Asphaltic concrete 0.10		AU	1				
FILL: Brown silty sand with crushed stone, trace brick, occasional fragments of possible coal 1.45		SS	2	42	13	1	72.68
		SS	3	75	30	2	71.68
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles, boulders		SS	4	71	16	3	70.68
		SS	5	83	12		
4.37		SS	6	33	16	4	69.68
		RC	1	95	82	5	68.68
		RC	2	98	98	6	67.68
		RC	3	100	93	7	66.68
BEDROCK: Grey limestone		RC	4	98	95	8	65.68
		RC	5	100	98	9	64.68
		RC	6	100	100	10	63.68
						11	62.68
						12	61.68
						13	60.68

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
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** July 4, 2018

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 % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE									
		RC	7	100	100	13	60.68		
						14	59.68		
		RC	8	100	100	15	58.68		
						16	57.68		
		RC	9	100	91	17	56.68		
						18	55.68		
BEDROCK: Grey limestone		RC	10	100	100	19	54.68		
		RC	11	100	100	20	53.68		
						21	52.68		
		RC	12	100	100	22	51.68		
		RC	13	100	92	23	50.68		
						24	49.68		
		RC	14	98	94	25	48.68		
25.02									
End of Borehole									
(GWL @ 6.07m - July 19, 2018)									

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** July 5, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	74.09
Asphaltic concrete 0.13		AU	1				
FILL: Brown silty sand, some gravel		SS	2	33	15	1	73.09
2.20		SS	3	67	8	2	72.09
GLACIAL TILL: Compact to dense, brown silty sand with gravel, cobbles, boulders		SS	4	62	32	3	71.09
		SS	5	50	20		
4.42		SS	6	12	47	4	70.09
		RC	1	98	98	5	69.09
BEDROCK: Grey limestone		RC	2	100	95	6	68.09
		RC	3	83	83	7	67.09
8.36						8	66.09
End of Borehole							
(GWL @ 5.19m - July 19, 2018)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Albert Street
Ottawa, Ontario

DATUM BM - Top of grate of catch basin located near exit of subject site. Geodetic elevation = 73.50m.

FILE NO. PE4011

REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** July 6, 2018

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
Asphaltic concrete	0.10		AU	1			0	74.02
FILL: Brown silty sand with crushed stone, trace brick			SS	2	38	24	1	73.02
			SS	3	25	22	2	72.02
	2.13							
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles, boulders			SS	4	71	25	3	71.02
			SS	5	12	15	4	70.02
	4.55							
BEDROCK: Grey limestone			RC	1	100	60	5	69.02
			RC	2	98	95	6	68.02
							7	67.02
			RC	3	100	95	8	66.02
	8.66							
End of Borehole								
(GWL @ 5.07m - July 19, 2018)								

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

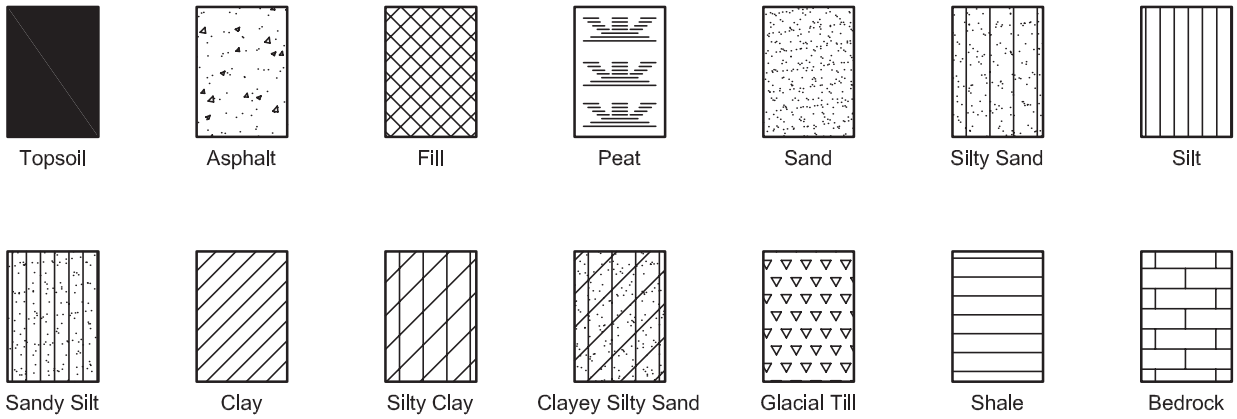
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

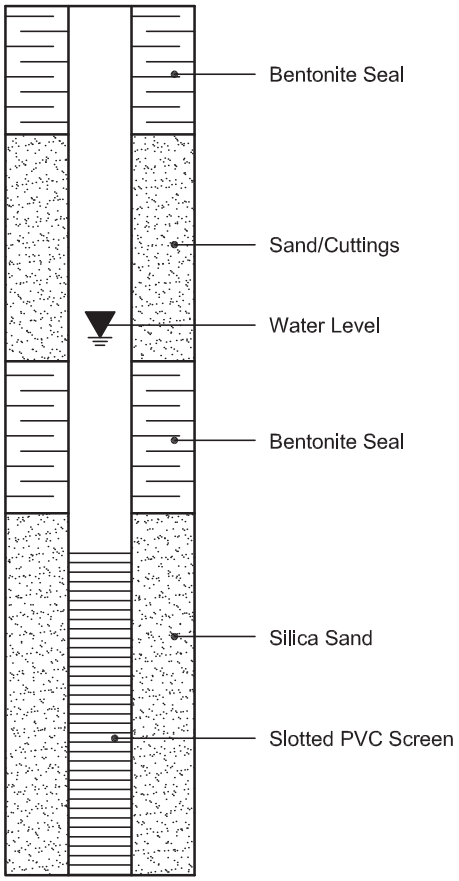
SYMBOLS AND TERMS (continued)

STRATA PLOT

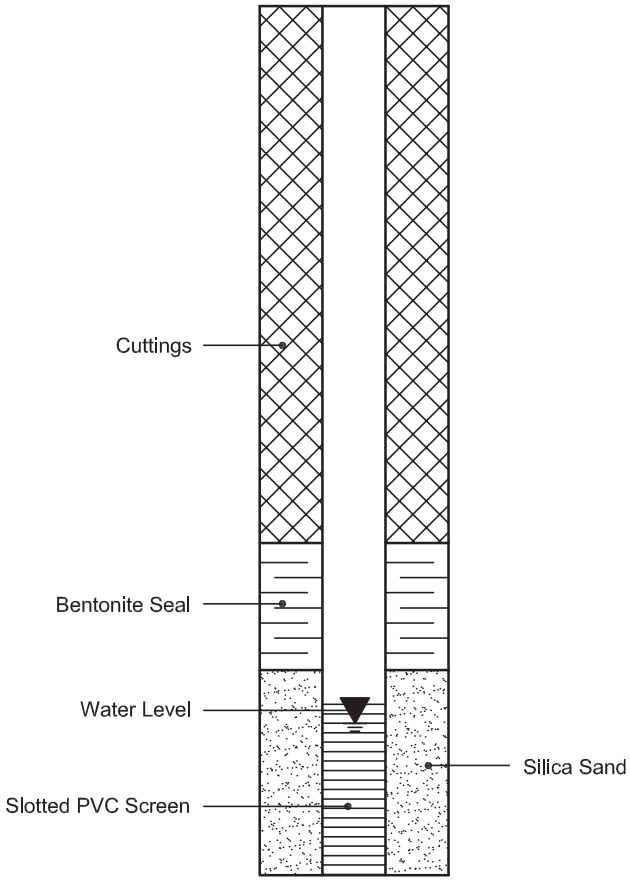


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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: 24121
Project: PE4011
Custody: 118655

Report Date: 16-Jul-2018
Order Date: 10-Jul-2018

Order #: 1828250

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

Paracel ID	Client ID
1828250-01	BH2-AU1
1828250-02	BH3-SS4
1828250-03	BH4-SS2
1828250-04	BH5-SS4
1828250-05	BH6-SS4

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24121

Report Date: 16-Jul-2018
Order Date: 10-Jul-2018
Project Description: PE4011

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	12-Jul-18	13-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	12-Jul-18	13-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Jul-18	12-Jul-18
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	12-Jul-18	12-Jul-18
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	11-Jul-18	11-Jul-18
Solids, %	Gravimetric, calculation	11-Jul-18	11-Jul-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 24121

Report Date: 16-Jul-2018

Order Date: 10-Jul-2018

Project Description: PE4011

	Client ID:	BH2-AU1	BH3-SS4	BH4-SS2	BH5-SS4
	Sample Date:	07/04/2018 09:00	07/04/2018 09:00	07/05/2018 09:00	07/06/2018 09:00
	Sample ID:	1828250-01	1828250-02	1828250-03	1828250-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.7	93.4	93.7	91.8
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	1.5	2.1	1.0	-
Barium	1.0 ug/g dry	84.4	53.0	59.9	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Boron	5.0 ug/g dry	6.8	<5.0	<5.0	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	15.6	9.5	10.9	-
Cobalt	1.0 ug/g dry	3.4	2.5	3.7	-
Copper	5.0 ug/g dry	9.9	14.4	13.1	-
Lead	1.0 ug/g dry	68.4	98.4	101	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Nickel	5.0 ug/g dry	10.1	9.0	8.2	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Vanadium	10.0 ug/g dry	17.0	<10.0	19.8	-
Zinc	20.0 ug/g dry	30.9	55.4	35.4	-
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	-	-	-	107%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	-	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	-	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	-	-	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	-	-	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 24121

Report Date: 16-Jul-2018

Order Date: 10-Jul-2018

Project Description: PE4011

	Client ID:	BH2-AU1	BH3-SS4	BH4-SS2	BH5-SS4
	Sample Date:	07/04/2018 09:00	07/04/2018 09:00	07/05/2018 09:00	07/06/2018 09:00
	Sample ID:	1828250-01	1828250-02	1828250-03	1828250-04
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthylene	0.02 ug/g dry	<0.02	-	-	-
Anthracene	0.02 ug/g dry	0.04	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.13	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.13	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.15	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.09	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.08	-	-	-
Chrysene	0.02 ug/g dry	0.12	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	0.02	-	-	-
Fluoranthene	0.02 ug/g dry	0.28	-	-	-
Fluorene	0.02 ug/g dry	<0.02	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.07	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	-	-	-
Naphthalene	0.01 ug/g dry	<0.01	-	-	-
Phenanthrene	0.02 ug/g dry	0.12	-	-	-
Pyrene	0.02 ug/g dry	0.25	-	-	-
2-Fluorobiphenyl	Surrogate	82.4%	-	-	-
Terphenyl-d14	Surrogate	103%	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 24121

Report Date: 16-Jul-2018

Order Date: 10-Jul-2018

Project Description: PE4011

	Client ID:	BH6-SS4	-	-	-
	Sample Date:	07/06/2018 09:00	-	-	-
	Sample ID:	1828250-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	90.4	-	-	-
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	105%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24121

Report Date: 16-Jul-2018
Order Date: 10-Jul-2018
Project Description: PE4011

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.38*		*ug/g*		*103*	*50-140*			
Surrogate: Terphenyl-d14	*1.66*		*ug/g*		*124*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.85*		*ug/g*		*111*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	1.8	1.0	ug/g dry	ND			0.0	30	
Arsenic	1.5	1.0	ug/g dry	1.3			12.1	30	
Barium	170	1.0	ug/g dry	169			0.8	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	13.7	5.0	ug/g dry	12.5			9.1	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	25.1	5.0	ug/g dry	24.9			0.7	30	
Cobalt	9.1	1.0	ug/g dry	8.9			2.4	30	
Copper	15.6	5.0	ug/g dry	15.7			0.1	30	
Lead	6.2	1.0	ug/g dry	6.3			0.8	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	18.7	5.0	ug/g dry	18.5			0.9	30	
Selenium	ND	1.0	ug/g dry	1.2			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	35.5	10.0	ug/g dry	35.2			0.8	30	
Zinc	38.9	20.0	ug/g dry	38.3			1.5	30	
Physical Characteristics									
% Solids	82.8	0.1	% by Wt.	86.0			3.8	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*8.88*		*ug/g dry*		*52.9*	*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)	174	7	ug/g		86.9	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	93.7	60-140			
F3 PHCs (C16-C34)	265	8	ug/g	ND	121	60-140			
F4 PHCs (C34-C50)	127	6	ug/g	ND	91.5	60-140			
Metals									
Antimony	39.0		ug/L	ND	77.4	70-130			
Arsenic	41.0		ug/L	ND	80.9	70-130			
Barium	118		ug/L	67.6	100	70-130			
Beryllium	42.1		ug/L	ND	83.8	70-130			
Boron	47.4		ug/L	5.0	84.8	70-130			
Cadmium	41.4		ug/L	ND	82.7	70-130			
Chromium	55.9		ug/L	10.0	91.9	70-130			
Cobalt	49.1		ug/L	3.6	91.1	70-130			
Copper	49.8		ug/L	6.3	87.0	70-130			
Lead	48.6		ug/L	2.5	92.1	70-130			
Molybdenum	39.4		ug/L	ND	78.7	70-130			
Nickel	51.9		ug/L	7.4	89.1	70-130			
Selenium	40.3		ug/L	ND	79.6	70-130			
Silver	40.0		ug/L	ND	80.0	70-130			
Thallium	46.1		ug/L	ND	92.1	70-130			
Uranium	46.3		ug/L	ND	92.3	70-130			
Vanadium	60.1		ug/L	14.1	92.0	70-130			
Zinc	55.7		ug/L	ND	80.8	70-130			
Semi-Volatiles									
Acenaphthene	0.152	0.02	ug/g		91.2	50-140			
Acenaphthylene	0.136	0.02	ug/g		81.5	50-140			
Anthracene	0.126	0.02	ug/g		75.7	50-140			
Benzo [a] anthracene	0.106	0.02	ug/g		63.4	50-140			
Benzo [a] pyrene	0.136	0.02	ug/g		81.7	50-140			
Benzo [b] fluoranthene	0.135	0.02	ug/g		81.3	50-140			
Benzo [g,h,i] perylene	0.120	0.02	ug/g		71.9	50-140			
Benzo [k] fluoranthene	0.129	0.02	ug/g		77.3	50-140			
Chrysene	0.134	0.02	ug/g		80.4	50-140			
Dibenzo [a,h] anthracene	0.113	0.02	ug/g		68.0	50-140			
Fluoranthene	0.130	0.02	ug/g		78.2	50-140			
Fluorene	0.143	0.02	ug/g		85.5	50-140			
Indeno [1,2,3-cd] pyrene	0.127	0.02	ug/g		76.5	50-140			
1-Methylnaphthalene	0.121	0.02	ug/g		72.3	50-140			
2-Methylnaphthalene	0.133	0.02	ug/g		79.7	50-140			
Naphthalene	0.134	0.01	ug/g		80.4	50-140			
Phenanthrene	0.133	0.02	ug/g		80.0	50-140			
Pyrene	0.134	0.02	ug/g		80.2	50-140			
Surrogate: 2-Fluorobiphenyl	*1.18*		*ug/g*		*88.4*	*50-140*			
Volatiles									
Benzene	4.69	0.02	ug/g		117	60-130			
Ethylbenzene	4.13	0.05	ug/g		103	60-130			
Toluene	4.05	0.05	ug/g		101	60-130			
m,p-Xylenes	8.25	0.05	ug/g		103	60-130			
o-Xylene	4.24	0.05	ug/g		106	60-130			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match - Bottle ID reads July 04, 2018
Applies to samples: BH3-SS4

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 LABORATORIES LTD.

Paracel ID: 1828250

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 118655

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE4011	**Turnaround Time:**
Contact Name: Kaya Munch	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd. S.	PO # 24121	☐ 2 Day ☒ Regular
Telephone: 613-226-7381	Email Address: Kmunch@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: 1828250 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH2-AU1	S		1	July 4/18				✓	✓						120ml			✓
2	BH3-SS4 ✓	S		1	July 5/18 ✓					✓						↓			✓
3	BH4-SS2	S		1	July 5/18					✓						↓			✓
4	BH5-SS4	S		2	July 6/18		✓									120ml + 1 vial			✓
5	BH6-SS4	S		2	July 6/18		✓									↓			✓
6																			
7																			
8																			
9																			
10																			

Comments: 2:- No. 2 - Sample ID on soil jar read = July 04, 2018. Report as July 4th per Kaya. DSL

Method of Delivery: Paracel

Relinquished By (Sign): KMunch	Received by Driver/Depot: T. Fouse	Received at Lab: SUNNEYGRN DOKMNI	Verified By:
Relinquished By (Print): K Munch	Date/Time: 10/07/18 4:10 PM	Date/Time: JUL 10 2018 09:00	Date/Time: July 10/18 7:09a
Date/Time:	Temperature: °C	Temperature: 20.3 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 24150
Project: PE4011
Custody: 118660

Report Date: 30-Jul-2018
Order Date: 23-Jul-2018

Order #: 1830122

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

Paracel ID	Client ID
1830122-01	BH2-GW1
1830122-02	BH5-GW1
1830122-03	BH6-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24150

Report Date: 30-Jul-2018
Order Date: 23-Jul-2018
Project Description: PE4011

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	25-Jul-18	25-Jul-18
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	24-Jul-18	24-Jul-18
Metals, ICP-MS	EPA 200.8 - ICP-MS	27-Jul-18	27-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	24-Jul-18	25-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	24-Jul-18	24-Jul-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	24-Jul-18	25-Jul-18

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 24150

Report Date: 30-Jul-2018

Order Date: 23-Jul-2018

Project Description: PE4011

	Client ID:	BH2-GW1	BH5-GW1	BH6-GW1	-
	Sample Date:	07/19/2018 09:00	07/19/2018 09:00	07/19/2018 09:00	-
	Sample ID:	1830122-01	1830122-02	1830122-03	-
	MDL/Units	Water	Water	Water	-
Metals					
Mercury	0.1 ug/L	-	<0.1	-	-
Antimony	0.5 ug/L	-	<0.5	-	-
Arsenic	1 ug/L	-	<1	-	-
Barium	1 ug/L	-	68	-	-
Beryllium	0.5 ug/L	-	<0.5	-	-
Boron	10 ug/L	-	153	-	-
Cadmium	0.1 ug/L	-	<0.1	-	-
Chromium	1 ug/L	-	8	-	-
Chromium (VI)	10 ug/L	-	<10	-	-
Cobalt	0.5 ug/L	-	0.9	-	-
Copper	0.5 ug/L	-	5.8	-	-
Lead	0.1 ug/L	-	<0.1	-	-
Molybdenum	0.5 ug/L	-	14.7	-	-
Nickel	1 ug/L	-	5	-	-
Selenium	1 ug/L	-	7	-	-
Silver	0.1 ug/L	-	<0.1	-	-
Sodium	200 ug/L	-	528000	-	-
Thallium	0.1 ug/L	-	<0.1	-	-
Uranium	0.1 ug/L	-	3.0	-	-
Vanadium	0.5 ug/L	-	7.5	-	-
Zinc	5 ug/L	-	<5	-	-
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	1.5	<0.5	3.1	-
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	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24150

Report Date: 30-Jul-2018
Order Date: 23-Jul-2018
Project Description: PE4011

	Client ID:	BH2-GW1	BH5-GW1	BH6-GW1	-
	Sample Date:	07/19/2018 09:00	07/19/2018 09:00	07/19/2018 09:00	-
	Sample ID:	1830122-01	1830122-02	1830122-03	-
	MDL/Units	Water	Water	Water	-
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	-
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	104%	102%	105%	-
Dibromofluoromethane	Surrogate	108%	106%	106%	-
Toluene-d8	Surrogate	99.2%	99.6%	101%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	-	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	-	<100	<100	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24150

Report Date: 30-Jul-2018
Order Date: 23-Jul-2018
Project Description: PE4011

	Client ID:	BH2-GW1	BH5-GW1	BH6-GW1	-
	Sample Date:	07/19/2018 09:00	07/19/2018 09:00	07/19/2018 09:00	-
	Sample ID:	1830122-01	1830122-02	1830122-03	-
	MDL/Units	Water	Water	Water	-
F4 PHCs (C34-C50)	100 ug/L	-	<100	<100	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	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						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*84.6*		*ug/L*		*106*	*50-140*			
Surrogate: Dibromofluoromethane	*86.2*		*ug/L*		*108*	*50-140*			
Surrogate: Toluene-d8	*83.5*		*ug/L*		*104*	*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	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	64.4	1	ug/L	64.4			0.0	20	
Beryllium	0.76	0.5	ug/L	0.73			3.5	20	
Boron	21	10	ug/L	21			1.5	20	
Cadmium	0.16	0.1	ug/L	0.17			7.8	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	1.2	1	ug/L	ND			0.0	20	
Cobalt	0.59	0.5	ug/L	0.57			1.9	20	
Copper	11.2	0.5	ug/L	11.2			0.1	20	
Lead	144	0.1	ug/L	145			0.7	20	
Molybdenum	ND	0.5	ug/L	ND			0.0	20	
Nickel	1.5	1	ug/L	1.5			0.6	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	2610	200	ug/L	2540			2.9	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	0.3	0.1	ug/L	0.3			0.6	20	
Vanadium	3.04	0.5	ug/L	3.05			0.2	20	
Zinc	60	5	ug/L	59			1.9	20	
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	1.00	0.5	ug/L	1.04			3.9	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	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	*84.5*		*ug/L*		*106*	*50-140*			
Surrogate: Dibromofluoromethane	*81.8*		*ug/L*		*102*	*50-140*			
Surrogate: Toluene-d8	*80.2*		*ug/L*		*100*	*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)	1890	25	ug/L		94.6	68-117			
F2 PHCs (C10-C16)	1640	100	ug/L		103	60-140			
F3 PHCs (C16-C34)	3830	100	ug/L		97.8	60-140			
F4 PHCs (C34-C50)	2660	100	ug/L		107	60-140			
Metals									
Mercury	3.18	0.1	ug/L	ND	106	70-130			
Antimony	41.7		ug/L	ND	82.4	80-120			
Arsenic	42.6		ug/L	ND	84.5	80-120			
Barium	107		ug/L	64.4	85.2	80-120			
Beryllium	53.6		ug/L	0.73	106	80-120			
Boron	72		ug/L	21	101	80-120			
Cadmium	42.7		ug/L	0.17	85.0	80-120			
Chromium (VI)	147	10	ug/L	ND	73.5	70-130			
Chromium	48.7		ug/L	ND	97.4	80-120			
Cobalt	48.8		ug/L	0.57	96.5	80-120			
Copper	58.5		ug/L	11.2	94.6	80-120			
Lead	50.9		ug/L		102	80-120			
Molybdenum	41.6		ug/L	ND	82.7	80-120			
Nickel	50.0		ug/L	1.5	96.9	80-120			
Selenium	42.5		ug/L	ND	84.3	80-120			
Silver	41.8		ug/L	ND	83.7	80-120			
Sodium	3400		ug/L	2540	86.7	80-120			
Thallium	49.3		ug/L	ND	98.6	80-120			
Uranium	50.1		ug/L	0.3	99.7	80-120			
Vanadium	51.0		ug/L	3.05	95.9	80-120			
Zinc	100		ug/L	59	81.6	80-120			
Volatiles									
Acetone	77.3	5.0	ug/L		77.3	50-140			
Benzene	35.4	0.5	ug/L		88.4	60-130			
Bromodichloromethane	38.6	0.5	ug/L		96.5	60-130			
Bromoform	51.3	0.5	ug/L		128	60-130			
Bromomethane	35.1	0.5	ug/L		87.8	50-140			
Carbon Tetrachloride	43.5	0.2	ug/L		109	60-130			
Chlorobenzene	37.4	0.5	ug/L		93.4	60-130			
Chloroform	34.6	0.5	ug/L		86.6	60-130			
Dibromochloromethane	45.3	0.5	ug/L		113	60-130			
Dichlorodifluoromethane	36.7	1.0	ug/L		91.7	50-140			
1,2-Dichlorobenzene	36.3	0.5	ug/L		90.8	60-130			
1,3-Dichlorobenzene	36.2	0.5	ug/L		90.6	60-130			
1,4-Dichlorobenzene	36.5	0.5	ug/L		91.2	60-130			
1,1-Dichloroethane	33.1	0.5	ug/L		82.7	60-130			
1,2-Dichloroethane	33.6	0.5	ug/L		84.0	60-130			
1,1-Dichloroethylene	35.5	0.5	ug/L		88.8	60-130			
cis-1,2-Dichloroethylene	35.0	0.5	ug/L		87.6	60-130			
trans-1,2-Dichloroethylene	36.4	0.5	ug/L		91.0	60-130			
1,2-Dichloropropane	32.1	0.5	ug/L		80.3	60-130			
cis-1,3-Dichloropropylene	34.6	0.5	ug/L		86.6	60-130			
trans-1,3-Dichloropropylene	33.2	0.5	ug/L		82.9	60-130			
Ethylbenzene	35.1	0.5	ug/L		87.8	60-130			
Ethylene dibromide (dibromoethane	36.3	0.2	ug/L		90.8	60-130			
Hexane	46.9	1.0	ug/L		117	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Ethyl Ketone (2-Butanone)	86.1	5.0	ug/L		86.1	50-140			
Methyl Isobutyl Ketone	99.8	5.0	ug/L		99.8	50-140			
Methyl tert-butyl ether	75.7	2.0	ug/L		75.7	50-140			
Methylene Chloride	37.6	5.0	ug/L		94.0	60-130			
Styrene	33.8	0.5	ug/L		84.6	60-130			
1,1,1,2-Tetrachloroethane	42.1	0.5	ug/L		105	60-130			
1,1,2,2-Tetrachloroethane	39.0	0.5	ug/L		97.6	60-130			
Tetrachloroethylene	37.6	0.5	ug/L		93.9	60-130			
Toluene	35.6	0.5	ug/L		89.0	60-130			
1,1,1-Trichloroethane	36.1	0.5	ug/L		90.4	60-130			
1,1,2-Trichloroethane	34.6	0.5	ug/L		86.4	60-130			
Trichloroethylene	33.2	0.5	ug/L		83.1	60-130			
Trichlorofluoromethane	38.3	1.0	ug/L		95.8	60-130			
Vinyl chloride	38.6	0.5	ug/L		96.6	50-140			
m,p-Xylenes	78.0	0.5	ug/L		97.6	60-130			
o-Xylene	37.5	0.5	ug/L		93.7	60-130			
Surrogate: 4-Bromofluorobenzene	*80.2*		*ug/L*		*100*	*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.

PARACEL LABORATORIES LTD

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Chain of Custody
(Lab Use Only)
№ 118660

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE4011	**Turnaround Time:**
Contact Name: Kaiyn Munch	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S.	PO # 24152	☐ 2 Day ☒ Regular
Telephone: 613-226-7381	Email Address: kmunch@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)

Paracel Order Number: 1830122

	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)	Required Analyses
* 1	~~BH2-GW1~~ BH2-GW1	~~GW~~ GW		~~3~~ 8	~~July 19/18~~			✓						
2	BH5-GW1	GW		6	July 19/18		✓	✓		✓	✓	✓		
3	BH6-GW1	GW		3	"		✓	✓						
4														
5														
6														
7														
8														
9														
10														

Comments: * An extra ~~CrVI~~ CrVI - NOID
- missing VOC vial - Subsample for VOCs (VIA email)

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T Louie	Received at Lab: Sunreport DOUMA	Verified By:
Relinquished By (Print):	Date/Time: 23/07/18 10 20	Date/Time: July 23 2018 01-50	Date/Time: 23/7/18 4:13
Date/Time:	Temperature: °C AM.	Temperature: 15.2 °C	pH Verified ☐ By: