APPENDIX

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GEOTECHNICAL INVESTIGATION REPORT

Geotechnical Investigation Report

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47), City of Brampton, Ontario

Wood Reference: TP115086

Prepared for:

City of Brampton
1975 Williams Parkway, Brampton, ON, L6S 6E5

August 15, 2022

Geotechnical Investigation Report

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47), City of Brampton, Ontario
Halton Region, Ontario

Wood Reference: TP115086

Prepared for:

City of Brampton
1975 Williams Parkway, Brampton, ON, L6S 6E5

Prepared by:

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15 August 2022

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August 15, 2022

City of Brampton
1975 Williams Parkway,
Brampton, ON, L6S 6E5

Via E-mail: Soheil.Nejatian@brampton.ca

Attention: **Mr. Soheil Nejatian, P. Eng., Senior Project Engineer**
Capital Works, City of Brampton

RE: **Submission of Final Geotechnical Investigation**
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
City of Brampton – RFP No. RFP2015-016

Dear Mr. Goolsarran:

Wood Environment & Infrastructure Solutions Canada Limited take pleasure in enclosing the final Geotechnical Investigation Report carried out for the abovementioned project and we will be glad to discuss any questions arising from this work.

We thank you for giving us this opportunity to be of service to you.

Yours truly,
Wood Environment & Infrastructure Solutions Canada Limited

Hoda Seddik

Hoda Seddik., M. A. Sc., P. Eng.,
Consulting Engineer
Principal Pavement Engineer/Group Lead

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GENERAL

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions Canada Limited ("Wood"), was retained by City of Brampton ("the City") to conduct an Environmental Assessment Study (EA Study) for Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) in the City. As part of the EA Study, a geotechnical investigation was required for the approximately 16 km of new and/or widened arterial roadways in northeast Brampton. This report presents the findings of the geotechnical investigation. A hydrogeological investigation was also carried out for the project, the associated findings of which are presented in a separate cover. The project site location is shown in Figure Site Plan.

The purpose of the geotechnical investigation was to assess the existing pavement condition and obtain subsurface and groundwater information by means of a limited number of boreholes within the investigated areas. This information was used to provide recommendations for pavement design alternatives for the new roads/road widening, foundation design for culverts, slope stability analysis for embankments (where required), roadway cut and fill operations, dewatering requirements, and chemical analyses and disposal requirements of surplus materials in conformance to the MOE Clean-up guidelines for this project.

The work request and authorization to proceed with this investigation was received via email after approval of the boreholes plan from Mr. Mario Goolsarran, P. Eng, Senior Project Engineer, City of Brampton. The investigation was carried out in accordance with Wood's proposal TP02200, dated May 5, 2015, and the requirements set out the City's RFP2015-16.

This report contains the factual results of the geotechnical / pavement investigation. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. Sub-surface soil and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation.

The anticipated construction conditions are also discussed, but only to the extent that they will likely influence design decisions. Construction methods discussed, however, express Wood's opinion only and are not intended to direct Contractors on how to carry out the construction. Contractors should be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect upon the construction.

The report is prepared with the conditions that the design and construction will be in accordance with all applicable standards, codes, regulations of authorities having jurisdiction, and carried out using good engineering practices. Further, the recommendations and opinions in this report are applicable only to the proposed project as described herein.

Once the details of the proposed works are finalized, on-going liaison with Wood is recommended during both the design and construction phases of the project to confirm that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project should be directed to Wood for further elaboration and/or clarification.

The enclosed *Limitations to Geotechnical Reports* are an integral part of this report.

2.0. REPORT FORMAT

Section ID	Content
General (This Section)	Overall General Project Information
Section A	Investigation results and recommendations for project components along Coleraine Drive, from proposed East-West Arterial to Mayfield Road (~ 3.0 km)
Section B	Investigation results and recommendations for project components along proposed Arterial A2, from Mayfield Road to Major Mackenzie Drive / Highway 50 (~3.4 km)
Section C	Investigation results and recommendations for project components along Countryside Drive, from St. Johns Road to Highway 50 (~ 2.7 km)
Section D	Investigation results and recommendations for project components along Clarkway Drive, from Castlemore Road to Mayfield Road (~ 3.0 km)
Section E	Investigation results and recommendations for project components along proposed East-West Arterial, from The Gore Road to Colerain Drive (~2.4 km)

3.0 SCOPE OF WORK

The scope of work for the geotechnical pavement investigation included: (i) pavement investigation for new construction / rehabilitation / widening / reconstruction; (ii) foundation investigation for structure (culverts - new and widening) and installation of underground utility; (iii) limited soil chemical analysis for soil disposal; and (iv) hydrogeological investigation (submitted in a separate report). The proposed arterial road network included five road corridors, two of which are new road alignments, as summarized in Table 3.1 based on the information provided in the RFP and as per Wood's review of site. As per the information provided, the road corridors are divided into two parts (Part A and Part B) based on the planned design and construction work.

Table 3.1: Summarized Data of the Arterial Road Network Under the EA Study

Part	Corridor	Planned Work	Road Type	From	To	Current Lanes	Planned Lanes	Appx. Length (km)
A	Arterial A2 (Section A)	New Road	Major Arterial	Mayfield Rd	Major Mackenzie Drive / RR 50	none	6	3.4
	Coleraine Drive (Section B)	Widening	Minor Arterial	E-W Arterial	Mayfield Drive	2	4	3.0
							Sub-Total for Part A	6.4

Part	Corridor	Planned Work	Road Type	From	To	Current Lanes	Planned Lanes	Appx. Length (km)
B	Countryside Drive (Section C)	Widening	Minor Arterial	Clarkway Drive	RR 50	2	4	2.7
	Clarkway Drive (Section D)	Widening	Minor Arterial	Castlemore Rd	E-W Arterial	2	4	1.3
				E-W Arterial	Mayfield Drive		2 to 3	3.0
	East – West (E-W) Arterial (Section E)	New Road	Minor Arterial	The Gore Rd	Coleraine drive	none	4	2.4
							Sub-Total for Part B	9.4
							TOTAL (Part A & Part B)	15.8

3.1 Pavement Investigation

Pavement investigation included, but not limited to, the following:

- Visual pavement condition survey of existing road;
- Boreholes along the existing and new road alignments;
- Provision of pavement recommendations for new alignments and widening / rehabilitation / resurfacing of existing roads; and
- Pavement analysis and design, including reuse /recycling / removal options, will be conducted based on a 20-year service life.

3.2 Foundation Investigation

Foundation investigation included, but not limited to, the following:

- Boreholes for underground utility services (boreholes for pavement investigation were deepened as necessary);
- Boreholes for ten (10) structures (culverts - new or widening). A monitoring well was to be installed at each structure location to monitor groundwater and for hydrogeological investigation (see Section 3.4);
- Slope stability analyses, where required. One analysis per structure (i.e. total up to ten) will be carried, if and where required;
- Provision of foundation recommendation for installation of underground utilities and structure foundations, including discussions on construction considerations, dewatering, etc.;
- Laboratory tests for soil classification.

3.3 Limited Soil Chemical Analysis

A limited soil chemical analyses was carried out for potential contaminants and assessment of the environmental quality of soils to be excavated. Discussion with regard to contamination and disposal requirements of surplus materials are provided in conformance to the MECP clean-up guidelines.

3.4 Hydrogeological Investigation

A hydrogeological investigation was carried out along each road alignment to assess the existing groundwater conditions, determine impacts to water bearing formation / water well, provision of mitigation measures (if applicable), evaluation of construction methods, determination of possible requirement for dewatering / depressurization and / or sumping for construction etc. The report is to address applicable TRCA requirements. The findings of the hydrogeological study are presented in a separate report prepared by Wood.

3.5 Report

This Geotechnical Report includes factual conditions (field and laboratory test results), recommendations for pavement design and foundation design, and soil chemical analysis results, including corrosivity tests results, and discussion with regard to disposal options.

A separate Hydrogeological Investigation Report for the project has been prepared by Wood.

4.0 SITE PHYSIOGRAPHY

The project study area at the Highway 427 Industrial Secondary Plan Area (Area 47), located within the City of Brampton, Ontario, is within the physiographic region identified as the Peel Plain. The Peel Plain covers an area of about 300 square miles and extends towards the northeast from the Niagara Escarpment through the central portions of the York, Peel, and Halton municipalities. The Peel Plain consists of a till, containing shale and limestone fragments, that was originally deposited within a glacial lake basin (Lake Peel). The study area is the northern part of the Peel Plain that contains a bevelled till plain, that consists of fine-medium sand, and laminated silt and clay.

Based on Quaternary Geology, Bolton, Southern Ontario (Ministry of Natural Resources, Map 2275), the project area consists of Lacustrine-Wildfield Till Complex of stratified or non-stratified silt loam, silty clay loam or clay deposits, which may contain grits, silt balls or pebbles or may be interbedded with layers of till-like material.

The Peel Plain is underlain by Middle to Upper Ordovician sediments of the Georgian Bay Formation, Blue Mountain Formation, Billings Formation, Collingwood Member, and Eastview Member. The Georgian Bay Formation is characterized by interbedded grey-green to dark grey shale and fossiliferous calcareous siltstone to limestone. The Blue Mountain and Billings formations consist of dark blue-grey to brown to black shales with thin interbeds of limestone or calcareous siltstone. The Collingwood and Eastview members are characterized by black, organic-rich, fissile, very fine-grained limestones.

Based on Ontario Department of Mines, Preliminary Map No. P.470, Bolton Sheet, Southern, Bedrock Topography Series, bedrock in the project area could be about 8 m to 40 m below existing ground level.

References:

Armstrong, D.K., and Dodge, J.E.P. 2007. Paleozoic Geology of Southern Ontario, Ontario Geological Survey, pp. 5-5.

Armstrong, D.K. and Dodge, J.E.P. 2007. Paleozoic Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 219.

Chapman L.J., and Putnam D.F. 1984. The Physiography of Southern Ontario, Third Edition. Ontario Geological Survey, Special Volume 2.

Chapman, L.J. and Putnam, D.F. 2007. Physiography of Southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 228.

Ontario Geological Survey, 2010, Surficial Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 128 – Revised.

5.0 PROJECT METHODOLOGY

5.1 Overall Investigation Approach

Prior to start of fieldwork, proposed borehole location plans were submitted to the City for review and approval. Upon approval of the plan, the borehole locations were staked out on site by Wood. The final locations of the boreholes were adjusted, where necessary, based on existing underground utilities and site conditions.

Prior to drilling, permits for field work and utility locate clearances for existing underground utilities were obtained. The fieldwork was carried out between 20 January and 1 April 2020. At the time of this report, a total of 156 boreholes had been completed along Coleraine Drive, Arterial A2, Countryside Drive, and Clarkway Drive. The borehole details are provided in Table 5.1 to 5.5, and as-drilled borehole locations are shown in Figure Nos. 1A and 1B, 2A and 2B, 3A and 3B, 4A to 4C, 5A and 5B. The following boreholes have not been drilled and have been deferred to detail design stage, if required:

- Four (4) boreholes along Clarkway Drive (i.e. BH D14, BH D24, BH D30 and BH D42) were in conflict with existing underground utilities.
- Two (2) boreholes for Countryside Drive (i.e. BH C36 and C38).
- Five (5) boreholes along Arterial A2 located north of Countryside Drive (i.e. BH B29 to B33).
- Seventeen (17) boreholes for East-West Arterial (i.e. BH E8 to E22, S19 and S20).

Thirty-three (33) boreholes were drilled along Coleraine Drive as listed in Table 5.1.

Table 5.1: Borehole Details – Coleraine Drive

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH A1	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 0+000	605646	4853212	5.0	215.5	210.5	1A
BH A2	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 0+000	605648	4853213	1.8	215.4	213.5	1A
BH A3	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 0+150	605516	4853330	3.0	216.3	213.3	1A
BH A4	Pavement (topsoil measurement)	Coleraine Dr., SBL, Sta. 0+150	605511	485326	250 mm			1A
BH A5	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 0+300	605408	4853441	1.5	216.5	215.0	1A
BH A6	Pavement (topsoil measurement)	Coleraine Dr., NBL, Sta. 0+300	605412	4853445	230 mm			1A
BH A7	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 0+450	605353	4853491	1.5	218.2	216.6	1A
BH A8	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 0+450	605353	4853490	1.8	217.9	216.1	1A
BH A9	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 0+600	605252	4853597	5.0	219.1	214.1	1A
BH A10	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 0+600	605253	4853600	1.8	219.0	217.2	1A
BH A11	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 0+750	605117	4853720	3.0	219.9	216.8	1A
BH A12	Pavement (topsoil measurement)	Coleraine Dr., SBL, Sta. 0+750	605116	4853716	216 mm			1A
BH A13	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 0+900	605006	4853836	2.9	220.2	217.3	1A
BH A14	Pavement (topsoil measurement)	Coleraine Dr., NBL, Sta. 0+900	605008	4853841	200 mm			1A
BH A15	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 1+050	604898	4853934	1.5	221.5	220.0	1A
BH A16	Pavement (topsoil measurement)	Coleraine Dr., SBL, Sta. 1+050	604900	4853931	150 mm			1A
BH A17	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 1+200	604785	4854053	5.0	222.5	217.5	1A
BH A18	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 1+200	604785	4854054	1.8	222.9	221.1	1A
BH A19	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 1+350	604701	4854134	3.0	222.6	219.6	1A
BH A20	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 1+350	604693	4854133	1.2	222.4	221.2	1A

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH A21	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 1+500	604576	4854257	1.5	223.2	221.7	1A
BH A22	Pavement (topsoil measurement)	Coleraine Dr., NBL, Sta. 1+500	604578	4854261	216 mm			1A
BH A23 / BH S1	Culvert, Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 1+650	604481	4854343	9.4	222.8	213.4	1A
BH A24	Pavement (topsoil measurement)	Coleraine Dr., SBL, Sta. 1+650	604473	4854351	250 mm			1A
BH A25	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 1+800	604381	4854447	5.0	225.0	220.0	1A
BH A26	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 1+800	604384	4854450	1.8	224.4	222.6	1A
BH A27	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 1+950	604250	4854566	3.0	226.8	223.8	1A
BH A28	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 1+950	604250	4854566	1.2	226.8	225.6	1A
BH A29	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 2+100	604157	4854675	1.5	228.6	227.1	1B
BH A30	Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 2+100	604159	4854679	1.8	228.7	226.9	1B
BH A31	Pavement & Underground utilities	Coleraine Dr., SBL, Sta. 2+250	604075	4854743	5.0	230.7	225.7	1B
BH A32	Pavement (topsoil measurement)	Coleraine Dr., SBL, Sta. 2+250	604046	4854755	240 mm			
CULVERT BOREHOLES								
BH S1 / BH A23 **	Culvert, Pavement & Underground utilities	Same as BH A23 / S2	604481	4854343	9.4	222.8	213.4	1A
BH S2	Culvert, Pavement & Underground utilities	Coleraine Dr., NBL, Sta. 1+650	604486	4854343	9.4	222.5	213.1	1A

* Assuming Sta. 0+000 at BH A1 (in the vicinity of proposed intersection of Coleraine Drive and proposed E-W Arterial)
** Monitoring well installed

Thirty-one (31) boreholes were drilled along the alignment of new Arterial A2 as listed in Table 5.2.

Table 5.2: Borehole Details – Proposed Arterial A2

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH B1	Pavement & Underground utilities	Arterial A2, Sta. 0+000	606238	4852654	1.5	211.5	210.0	2A
BH B2	Pavement & Underground utilities	Arterial A2, Sta. 0+100	606151	4852615	5.0	210.2	205.2	2A
BH B3	Pavement & Underground utilities	Arterial A2, Sta. 0+200	606056	4852586	3.0	211.8	208.8	2A
BH B4	Pavement (topsoil measurement)	Arterial A2, Sta. 0+300	605958	4852563	1.8	211.7	209.9	2A
BH B5	Pavement & Underground utilities	Arterial A2, Sta. 0+400	605861	4852545	5.0	211.3	206.2	2A
BH B6	Pavement & Underground utilities	Arterial A2, Sta. 0+500	605759	4852529	2.1	210.9	208.8	2A
BH B7 / BH S5	Culvert, Pavement & Underground utilities	Arterial A2, Sta. 0+600	605633	4852520	9.8	209.3	199.6	2A
BH B8	Pavement & Underground utilities	Arterial A2, Sta. 0+700	605564	4852529	1.7	211.1	209.4	2A
BH B9	Pavement & Underground utilities	Arterial A2, Sta. 0+800	605461	4852548	5.0	212.5	207.4	2A
BH B10	Pavement & Underground utilities	Arterial A2, Sta. 0+900	605365	4852580	1.7	212.7	211.1	2A
BH B11	Pavement & Underground utilities	Arterial A2, Sta. 1+000	605279	4852627	3.0	212.3	209.3	2A
BH B12	Pavement & Underground utilities	Arterial A2, Sta. 1+100	605192	4852676	1.7	214.3	212.6	2A
BH B13	Pavement & Underground utilities	Arterial A2, Sta. 1+200	605111	4852740	5.0	215.7	210.7	2A
BH B14	Pavement & Underground utilities	Arterial A2, Sta. 1+300	605038	4852807	1.8	217.1	215.2	2B
BH B15	Pavement & Underground utilities	Arterial A2, Sta. 1+400	604966	4852877	3.0	217.3	214.3	2B
BH B16	Pavement & Underground utilities	Arterial A2, Sta. 1+500	604893	4852946	1.8	217.9	216.1	2B
BH B17	Pavement & Underground utilities	Arterial A2, Sta. 1+600	604822	4853017	5.0	218.5	213.5	2B
BH B18	Pavement & Underground utilities	Arterial A2, Sta. 1+700	604752	4853086	1.8	219.2	217.4	2B
BH B19	Pavement & Underground utilities	Arterial A2, Sta. 1+800	604680	4853157	3.0	219.5	216.5	2B
BH B20	Pavement & Underground utilities	Arterial A2, Sta. 1+900	604609	4853227	1.8	219.9	218.1	2B

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH B21	Pavement & Underground utilities	Arterial A2, Sta. 2+000	604537	4853296	5.0	220.8	215.8	2B
BH B22	Pavement & Underground utilities	Arterial A2, Sta. 2+100 (Countryside Dr.)	604484	4853360	1.5	220.5	219.0	2B
BH B23	Pavement & Underground utilities	Arterial A2, Sta. 2+200 (Countryside Dr.)	604392	4853436	3.0	221.1	218.1	2B
BH B24	Pavement & Underground utilities	Arterial A2, Sta. 2+300 (Countryside Dr.)	604321	4853507	2.1	221.9	219.7	2B
BH B25	Pavement & Underground utilities	Arterial A2, Sta. 2+400 (Countryside Dr.)	604250	4853574	5.2	222.5	217.3	2B
BH B26	Pavement & Underground utilities	Arterial A2, Sta. 2+500 (Countryside Dr.)	604179	4853643	2.1	222.9	220.8	2B
BH B27	Pavement & Underground utilities	Arterial A2, Sta. 2+600 (Countryside Dr.)	604107	4853714	3.0	223.4	220.4	2B
BH B28	Pavement & Underground utilities	Arterial A2, Sta. 2+700 (Countryside Dr.)	604034	4853786	2.1	223.4	221.3	2B
BH B29 to B33	Pavement & Underground utilities	**Boreholes deferred to detail design phase, if required.**						
CULVERT BOREHOLES								
BH S3	Culvert, Pavement & Underground utilities	Arterial A2 at Hwy 50	606278	4852633	9.4	210.7	201.2	2A
BH S4 **	Culvert, Pavement & Underground utilities	Arterial A2 at Hwy 50	606254	4852631	9.8	210.6	200.8	2A
BH S5 / BH B7 **	Culvert, Pavement & Underground utilities	Arterial A2, Sta. 0+650	605633	4852520	9.8	209.3	199.6	2A
BH S6	Culvert, Pavement & Underground utilities	Arterial A2, Sta. 0+650	605620	4852529	9.8	209.0	199.3	2A

* Assuming Sta. 0+000 at BH B1 (at the intersection of Coleraine Drive and Highway 50)
** Monitoring well installed

Forty (40) boreholes were drilled along Countryside Drive as listed in Table 5.3.

Table 5.3: Borehole Details – Countryside Drive

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH C1	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+000	603645	4852294	3.0	215.8	212.8	3A
BH C2	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+000	603646	4852295	1.8	215.1	213.2	3A
BH C3	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+150	603738	4852420	1.5	216.5	215.0	3A
BH C4	Pavement (topsoil measurement)	Countryside Dr., WBL, Sta. 0+150	603731	4852419	150 mm			3A
BH C5	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+300	603831	4852531	4.9	214.6	209.7	3A
BH C6	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+300	603832	4852529	1.7	214.6	213.0	3A
BH C7	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+450	603917	4852640	3.0	216.5	213.5	3A
BH C8	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+450	603915	4852650	1.8	216.6	214.8	3A
BH C9	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+600	604016	4852761	1.5	218.3	216.8	3A
BH C10	Pavement (topsoil measurement)	Countryside Dr., EBL, Sta. 0+600	604017	4852760	200 mm			3A
BH C11	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+750	604113	4852893	5.2	215.2	210.0	3A
BH C12	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+750	604113	4852900	1.2	213.6	212.4	3A
BH C13	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+900	604197	4852992	3.0	219.0	215.9	3A
BH C14	Pavement (topsoil measurement)	Countryside Dr., EBL, Sta. 0+900	604201	4852990	250 mm			3A
BH C15	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+050	604285	4853111	1.5	219.7	218.2	3A
BH C16	Pavement (topsoil measurement)	Countryside Dr., WBL, Sta. 1+050	604286	4853116	200 mm			3A
BH C17	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 1+200	604386	4853230	5.0	219.9	214.9	3A
BH C18	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 1+200	604388	4853229	1.8	219.9	218.1	3A
BH C19 / BH B22	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+350 (same as BH B22)	604484	4853360	1.5	220.5	219.0	3A
BH C20	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+350	604492	4853362	1.2	220.2	219.0	3A

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH C21	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 1+500	604570	4853458	1.5	221.3	219.7	3A
BH C22	Pavement (topsoil measurement)	Countryside Dr., EBL, Sta. 1+500	504575	4853454	150 mm			3A
BH C23	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+650	604645	4853563	5.2	221.3	216.1	3A
BH C24	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+650	604647	4853568	1.8	220.9	219.1	3A
BH C25	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 1+800	604747	4853682	3.0	220.9	217.8	3A
BH C26	Pavement (topsoil measurement)	Countryside Dr., EBL, Sta. 1+800	604751	4853681	200 mm			3A
BH C27 / BH S7	Culvert, Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+950	604850	4853816	9.8	217.8	208.0	3A
BH C28	Pavement (topsoil measurement)	Countryside Dr., WBL, Sta. 1+950	604854	4853830	270 mm			3A
BH C29	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 2+100	604945	4853935	4.9	221.4	216.5	3B
BH C30	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 2+100	604944	4853931	1.8	221.1	219.2	3B
BH C31	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 2+250	605023	4854046	3.0	221.7	218.7	3B
BH C32	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 2+250	605023	4854047	1.8	221.7	219.8	3B
BH C33	Pavement & Underground utilities	Countryside Dr., EBL, Sta. 2+400	605131	4854170	1.5	221.8	220.2	3B
BH C34	Pavement (topsoil measurement)	Countryside Dr., EBL, Sta. 2+400	605125	4854169	300 mm			3B
BH C35	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 2+550	605211	4854296	1.5	220.6	219.1	3B
BH C36	Pavement & Underground utilities	Property N. of Countryside Dr., Sta. 2+550	**Boreholes deferred to detail design phase, if required.**					3B
BH C37	Pavement & Underground utilities	Countryside Dr., WBL, Sta. 2+700	605295	4854406	1.5	220.0	218.5	3B
BH C38	Pavement & Underground utilities	Property N. of Countryside Dr., Sta. 2+700	**. Boreholes deferred to detail design phase, if required.**					3B
CULVERT BOREHOLES								
BH S7 / BH C27 **	Culvert, Pavement & Underground utilities	Countryside Dr., WBL, Sta. 1+950	604850	4853816	9.8	217.8	208.0	3A

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH S8	Culvert, Pavement & Underground utilities	Countryside Dr., EBL, Sta. 1+950	604854	4853824	9.7	219.5	209.9	3A
BH S9	Culvert, Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+700	604080	4852848	9.4	214.4	219.7	3A
BH S10 **	Culvert, Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+700	604082	4852848	9.4	213.8	204.4	3A
BH S11	Culvert, Pavement & Underground utilities	Countryside Dr., WBL, Sta. 0+350	603849	4852560	9.2	213.2	216.1	3A
BH S12 **	Culvert, Pavement & Underground utilities	Countryside Dr., EBL, Sta. 0+350	603857	4852567	5.8	213.5	207.7	3A

* Assuming Sta. 0+000 at BH C1 (about 200 m east of St. Johns Road)
** Monitoring well installed

Fifty-eight (58) boreholes were drilled along Clarkway Drive as listed in Table 5.4.

Table 5.4: Borehole Details – Clarkway Drive

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH D1	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 0+000	606251	4850676	3.0	205.6	202.6	4A
BH D2	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 0+000	606254	4850680	1.8	206.0	204.2	4A
BH D3	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 0+150	606138	4850776	1.5	206.0	204.4	4A
BH D4	Pavement (topsoil measurement)	Clarkway Dr., SBL, Sta. 0+150	606134	4850770	190 mm			4A
BH D5	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 0+300	606039	4850884	5.0	205.7	200.7	4A
BH D6	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 0+300	606040	4850886	1.8	206.1	204.3	4A
BH D7	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 0+450	605935	4850986	3.0	206.0	202.9	4A
BH D8	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 0+450	605935	4850984	0.9	205.6	204.7	4A
BH D9	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 0+600	605832	4851092	1.5	207.1	205.5	4A
BH D10	Pavement (topsoil measurement)	Clarkway Dr., NBL, Sta. 0+600	605831	4851102	230 mm			4A

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH D11	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 0+750	605720	4851194	5.0	207.9	202.9	4A
BH D12	Pavement (topsoil measurement)	Clarkway Dr., SBL, Sta. 0+750	605712	4851196	200 mm			4A
BH D13	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 0+900	605607	4851398	3.0	209.3	206.2	4A
BH D14	Pavement & Underground utilities	Not drilled due to conflict with existing underground utilities.						4A
BH D15	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 1+050	605513	4851403	1.5	209.5	208.0	4A
BH D16	Pavement (topsoil measurement)	Clarkway Dr., SBL, Sta. 1+050	605497	4851406	240 mm			4A
BH D17	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 1+200	605385	4851532	5.2	210.5	205.3	4A
BH D18	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 1+200	605387	4851534	1.8	210.1	208.2	4A
BH D19	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 1+350	605297	4851614	3.0	210.6	207.6	4A
BH D20	Pavement (topsoil measurement)	Clarkway Dr., SBL, Sta. 1+350	605283	4851615	190 mm			4A
BH D21	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 1+500	605194	4851719	1.5	209.1	207.5	4A
BH D22	Pavement (topsoil measurement)	Clarkway Dr., NBL, Sta. 1+500	605189	4851734	180 mm			4A
BH D23	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 1+650	605071	4851839	5.0	209.2	204.2	4A
BH D24	Pavement & Underground utilities	Not drilled due to conflict with existing underground utilities.						4A
BH D25	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 1+800	604975	4851935	3.0	209.1	206.0	4A
BH D26	Pavement (topsoil measurement)	Clarkway Dr., NBL, Sta. 1+800	604976	4851946	200 mm			4A
BH D27	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 1+950	604867	4852040	1.5	208.6	207.1	4A
BH D28	Pavement (topsoil measurement)	Clarkway Dr., SBL, Sta. 1+950	604859	4852040	200 mm			4A
BH D29	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 2+100	604765	4852155	1.8	211.7	209.9	4B
BH D30	Pavement & Underground utilities	Not drilled due to conflict with existing underground utilities.						4B
BH D31	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+250	604668	4852236	3.5	210.0	206.5	4B

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH D32	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+250	604666	4852234	1.8	208.3	206.4	4B
BH D33	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 2+400	604548	4852361	2.0	214.0	212.0	4B
BH D34	Pavement (topsoil measurement)	Clarkway Dr., NBL, Sta. 2+400	604548	4852368	190 mm			4B
BH D35	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+550	604458	4852462	5.0	212.9	207.9	4B
BH D36	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+550	604437	4852462	1.8	211.9	210.1	4B
BH D37	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 2+700	604335	4852470	3.5	214.5	211.0	4B
BH D38	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 2+700	604336	4852567	1.8	215.3	213.4	4B
BH D39	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+850	604234	4852659	2.0	213.0	211.0	4B
BH D40	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+850	604138	4852764	5.0	212.9	207.9	4B
BH D41	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+000	604141	4852766	2.1	213.9	211.7	4B
BH D42	Pavement (topsoil measurement)	Not drilled due to conflict with existing underground utilities.						4B
BH D43	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 3+150	604009	4852887	3.5	217.5	214.0	4B
BH D44	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 3+150	604007	4852886	1.8	216.8	215.0	4B
BH D45	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+300	603917	4852984	1.8	218.8	217.0	4B
BH D46	Pavement (topsoil measurement)	Clarkway Dr., NBL, Sta. 3+300	603909	4853000	230 mm			4B
BH D47	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 3+450	603816	4853079	5.0	219.9	214.9	4B
BH D48	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 3+450	603814	4853078	1.8	219.9	218.0	4B
BH D49	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+600	603698	4853200	3.5	220.8	217.3	4B
BH D50	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+600	603700	4853201	1.8	220.8	219.0	4B
BH D51	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 3+750	603599	4853290	2.0	221.5	219.5	4B
BH D52	Pavement (topsoil measurement)	Clarkway Dr., SBL, Sta. 3+750	603578	4853305	200 mm			4B

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH D53	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+900	603497	4853398	5.0	222.0	217.0	4B
BH D54	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+900	603499	4853399	1.8	221.7	219.9	4B
BH D55	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 4+050	603388	4853502	3.5	222.5	219.0	4B
BH D56	Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 4+050	603380	4853532	1.8	222.0	220.2	4B
BH D57	Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 4+200	603286	4853614	2.0	223.6	221.6	4C
BH D58	Pavement (topsoil measurement)	Clarkway Dr., NBL, Sta. 4+200	603271	4853634	200 mm			4C
CULVERT BOREHOLES								
BH S13 **	Culvert, Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 2+275	604621	4852286	9.3	210.2	207.5	4B
BH S14	Culvert, Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 2+275	604618	4852293	9.3	210.0	200.7	4B
BH S15	Culvert, Pavement & Underground utilities	Clarkway Dr., SBL, Sta. 3+325	604169	4852729	9.4	212.7	204.2	4B
BH S16 **	Culvert, Pavement & Underground utilities	Clarkway Dr., NBL, Sta. 3+325	604158	4852745	9.8	213.1	203.3	4B

* Assuming Sta. 0+000 at BH D1 (about 50 m north of Castlemore Drive)
** Monitoring well installed

Eighteen (18) boreholes were drilled along proposed East-West Arterial Road as listed in Table 5.5.

Table 5.5: Borehole Details – East – West Arterial Road

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH E1	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+000	604583	4850435	2.1	203.0	200.9	5A
BH E2	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+100	604641	4850507	5.2	204.6	199.4	5A
BH E3	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+200	604703	4850585	2.1	205.9	203.7	5A
BH E4	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+300	604766	4850663	3.0	205.1	202.0	5A

Borehole No.	Purpose of Borehole	Location / Approximate Station*	Approximate GPS Coordinates (UTM/NAD 83)		Depth Below Ground Surface	Ground Surface Elevation (1)	Bottom Elevation	Figure No.
			Easting	Northing	(m)			
BH E5	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+400	604828	4850742	2.1	203.2	201.1	5A
BH E6 / S18	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+500	604885	4850810	9.3	204.8	195.4	5A
BH E7	Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+600	604955	4850896	2.1	204.9	202.8	5A
BH E8 to BH E22	Pavement & Underground utilities	**Boreholes deferred to detail design phase, if required.**						
BH E23	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+200	605606	4852284	2.1	210.7	208.5	5B
BH E24	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+300	605614	4852383	3.0	210.7	207.7	5B
BH E25	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+400	605628	4852476	2.1	209.3	207.2	5B
BH E26	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+500	605650	4852571	5.2	210.0	204.8	5B
BH E27	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+600	605680	4852668	2.1	211.1	208.9	5B
BH E28	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+700	605714	4852764	3.0	212.4	209.4	5B
BH E29	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+800	605743	4852863	2.1	213.5	211.3	5B
BH E30	Pavement & Underground utilities	East – West Arterial Rd., Sta. 2+900	605749	4852965	5.2	214.3	209.2	5B
BH E31	Pavement & Underground utilities	East – West Arterial Rd., Sta. 3+000	605728	4853064	2.1	214.9	212.7	5B
BH E32	Pavement & Underground utilities	East – West Arterial Rd., Sta. 3+100	605683	4853156	3.0	215.0	211.9	5B
CULVERT BOREHOLES								
BH S17*	Culvert, Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+490	604874	4850797	7.0	202.6	195.6	5A
BH E6 / S18	Culvert, Pavement & Underground utilities	East – West Arterial Rd., Sta. 0+500	604885	4850810	9.3	204.8	195.4	5A
BH S19 and BH S20	Culvert, Pavement & Underground utilities	**Boreholes deferred to detail design phase, if required.**						

* Monitoring well installed

The as-drilled borehole locations were obtained as northing and easting co-ordinates (UTM Coordinates, NAD 83) using a hand-held GPS unit with accuracy of ±3 m. Ground elevations at the borehole locations were estimated from the topographic survey drawing prepared by Wood for the project.

Traffic control during the investigation was provided by TCI Field Services (Brooklyn, Ontario) in accordance with the Ontario Traffic Manual – Temporary Conditions (Book 7).

All boreholes were drilled using truck- or track-mounted drill rigs, fitted with an automatic hammer, supplied and operated by Drilltech Drilling Ltd. of Newmarket, Ontario. The drilling activities were conducted under full-time oversight of Wood personnel, who also logged the soil types encountered during borehole advancement and collected soil samples.

Soil samples were generally obtained via the Standard Penetration Test (SPT) method, as per ASTM D1586, using an automatic hammer. The SPT tests consisted of freely dropping a 63.5 kg (140 lbs.) hammer a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inch) diameter O.D. split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m (12 inches) was recorded as SPT 'N' values of the soil, which indicated the compactness of non-cohesive soils and / or implied (indirectly determined) the consistency of cohesive soils. The results of SPT are shown in the Record of Boreholes.

A monitoring well was installed in nine (9) of the borehole locations (Boreholes BH S1, BH S4, BH S5, BH S7, BH S10, BH S12, BH S13, BH S16, and BH S17) for groundwater monitoring hydrogeological investigation.

Groundwater depths in the boreholes, where encountered, were measured during drilling and upon completion of drilling, and subsequently in the monitoring well (where installed). The measured groundwater depths, where applicable, are shown on the Record of Boreholes.

Upon completion of drilling, all boreholes not installed with a monitoring well were backfilled in accordance with the general requirements of Ministry of Environment (MOE) Ontario Regulation 903. The surficial asphaltic concrete at the borehole locations were reinstated by cold patch asphalt.

A visual pavement condition survey of the existing road surface was carried out to evaluate the existing condition. Selected photographs showing the existing road condition are included in Appendix A of each Section.

Soil samples were transported to Wood's Laboratory for further review and laboratory testing (i.e., water content determination, grain size distribution analysis and Atterberg Limit test, where applicable). The soil conditions, groundwater levels, and the results of the in-situ and laboratory tests are presented on the corresponding Record of Boreholes. The laboratory test results are attached in Appendix B of each section.

Selected soil samples from each road section were analyzed for corrosive potential of soil with respect to concrete and steel.

Upon recovery, all soil samples were screened to assess for evidence of potential contamination, which included visual inspection as well as vapour screening for combustible organic vapours, using a portable hand-held hydrocarbon surveyor (RKI Eagle 2). The results are presented on the Record of Boreholes.

Soil chemical analyses were carried out on selected soil samples from the boreholes for assessment of potential contamination and soil disposal options. The soil chemical analyses and corrosive tests were performed by AGAT Laboratories, an accredited CAEL laboratory located in Mississauga, Ontario. Results of the analysis are summarized in Appendix C of each section. The Certificates of Analyses for the soil chemical analyses and corrosivity analysis are included in Appendix D.

5.2 Pavement Investigation

5.2.1 Visual Condition Survey

Wood carried out a visual pavement condition survey of the existing road surface within the project area in August 2020 to identify any distresses. The identification and classification of the pavement distresses were carried out in accordance with MTO's "Flexible Pavement Condition Rating Manual – Guidelines for Municipalities", SP-022.

5.2.2 Borehole Investigation for Pavement Investigation

A total of 166 boreholes (as listed in Tables 5.1 to 5.5) have been drilled within the project limits at the existing pavement structure at the driving lanes / shoulders / boulevard for pavement investigation. The remaining 14 boreholes drilled at structure locations can also be used for pavement investigation. Topsoil thickness at the existing ditches were also obtained at selected locations during the field investigation. The details of the boreholes drilled at the project site are presented in Tables 5.1 to 5.5 and shown on Figure Nos. 1 to 5.

5.3 Geotechnical Investigation

5.3.1 Underground Utilities

All of the 166 boreholes drilled for the pavement investigation and 14 boreholes drilled for structures (Section 2.3.2) will be used for underground utility installations. Along all road alignments, alternating pavement investigation boreholes were drilled deeper (3 m to 5 m) to obtain sub-surface information for installation of underground utilities.

5.3.2 Structures

A total of 20 structures (culverts) are planned to be rehabilitated and / or extended and / or newly constructed along the five road alignments under the planned Area 47 road network, out of which 3 new structures are located in the two new road alignments and 7 structures are existing structures as listed in Tables 5.1 to 5.5. At the time of this report, boreholes for 2 structures located along the new East-West Arterial road alignment have not been drilled. Two boreholes were drilled at each of the remaining 8 structure locations. One monitoring well was installed at each of the structure locations for groundwater monitoring and hydrogeological investigation.

5.4 Laboratory Tests

Laboratory testing was performed on selected samples from boreholes where tested for soil characterization, soil contamination and disposal options and soil corrosivity tests as follows:

- Water content determinations;
- Grain size distribution analyses;
- Atterberg Limit tests;
- Soil corrosivity analyses; and
- Soil chemical analyses.

5.5 Groundwater Measurements

Groundwater depths were measured in the boreholes (where groundwater was encountered) at the time of drilling or upon completion of drilling. Groundwater was also measured subsequently in the monitoring wells.

SECTION A: COLERAINE DRIVE (FROM EAST-WEST ARTERIAL TO MAYFIELD DRIVE, ~ 3.0 KM)

A1.0 OVERALL SUBSURFACE CONDITION

A total of thirty-one (31) boreholes (BH A1 to BH A22 and BH A24 to BH A32) were drilled to depths varying from 0.2 m to 5.0 m, for the proposed road reconstruction/widening and underground service installation within project limits of Coleraine Drive (as shown in Figure Nos. 1A and 1B), which included boreholes in the driving lanes, shoulders and auger holes in the ditches. Two (2) boreholes (BH A23/S1 and S2) were drilled to a depth of about 9.4 m, for the proposed culvert rehabilitation / extension. Due to their proximity, BH A23 and BH S1 were combined into one borehole (BH A23 / S1). The boreholes in the driving lanes and pavement shoulders were sampled via Standard Penetration Test (SPT), while recording 'N' Values. Eight (8) auger holes (without SPT) were carried out in the ditches to measure the topsoil thicknesses.

The stratigraphic units and groundwater conditions are discussed in the following sections. Additional information is provided in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the possible soil conditions at the investigated road section. The soil and groundwater conditions might vary between and beyond the borehole locations.

A1.1 Topsoil

Topsoil thicknesses were measured in the ditches beside the road at eight (8) locations, which varied from about 150 mm to 250 mm, with an average thickness of about 219 mm, as listed in Table A1.1.

Table A1.1: Topsoil Thickness Measurements (Coleraine Drive)

Borehole No.	Coordinates (UTM, Zone 17T)		Topsoil Thickness (mm)
	Easting	Northing	
BH A4	605511	4853326	250
BH A6	605412	4853445	230
BH A12	605116	4853716	216
BH A14	605008	4853841	200
BH A16	604900	4853931	150
BH A22	604578	4854261	216
BH A24	604473	4854351	250
BH A32	604046	4854755	240

A1.2 Asphaltic Concrete and Concrete

At the location of Boreholes BH A1, A3, A5, A7, A9, A11, A13, A15, A17, A19, A21, A23/S1, A25, A27, A29, A31 and S2, approximately 180 mm to 250 mm of asphaltic concrete was encountered at the pavement surface. An approximately 110 mm thick of concrete layer was encountered below the asphalt at BH A15.

A1.3 Granular Fill

Granular fill (sand and gravel and gravelly sand fill) was encountered at the surface in Boreholes BH A2, A8, A10, A18, A20, A26, A28, A30 and A31. Underlying the asphalt or concrete surfacing were layers of granular fill, which likely comprises the road base materials. The granular fill in these boreholes ranged in thickness from approximately 50 to 700 mm. The granular fills extended to depths varying from about 0.2 m to 0.9 m (Elevations 218.8 m to 229.8 m) below the existing ground surface.

Two (2) gradation tests were carried out on the selected samples of granular fill, the results of which are presented in Table A1.2 and are also shown in the Record of Boreholes.

Table A1.2: Results of Grain Size Distribution Analysis (Granular Fill)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Soil Classification
				Gravel	Sand	Fines		
						Silt	Clay	
BH A10	SS1A	0 - 0.2	219.0 - 218.8	27	60	13		GRAVELLY SAND, some fines. Sample does not meet OPSS1010 Granular A or B due to excessive fines content
BH A30	SS1A	0 - 0.5	228.7 - 228.2	30	57	13		

The grain size distribution curves are presented in Figures B-A1 in Appendix B-A.

A1.4 Silty Clay / Clayey Silt Fill

Silty clay / clayey silt fill was encountered beneath the concrete in Borehole A15 and below the granular fill soils, where present. The silty clay / clayey silt fill was generally brown to dark grey in colour and contained traces of gravel and organics. Cobbles were noted in the cohesive fill in Boreholes BH A11, A20, A25 to A27 and A29. Where fully penetrated, the silty clay / clayey silt fill thickness ranged from 0.6 to 2.0 m, and extended to depths varying from about 0.9 m to of 2.3 m (Elevations 214.0 m to 229.2 m) below the existing ground surface. The silty clay / clayey silt fill was present up to the termination depths of Boreholes BH A28 and A29 at about 1.2 m and 1.5 m below ground surface, respectively.

The SPT 'N' values measured in the silty clay / clayey silt fill ranged from 5 blows to 29 blows per 0.3 m of penetration, indicating firm to very stiff consistency. The measured water contents in the silty clay / clayey silt fill samples varied from about 13 % to 32 %.

A1.5 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered below the fill soils at depths of about 0.9 m to 2.3 m (Elevations 214.0 m to 229.2 m) and extended to the termination depths of all boreholes except Boreholes BH A28 and A29, which terminated within silty clay / clayey silt fill). The silty clay / clayey silt till was confirmed to a depth of a maximum depth of 9.4 m (Elevations 214.1 to 214.4 m) below existing ground surface at Boreholes BH S2 and A23/S1, respectively.

The clayey silt / silty clay till was brown to grey in color, and contained trace to some sand, or was sandy, and had trace gravel. Cobbles/boulders were encountered in Boreholes BH A1, A9, A11, A13, A17, A23/S1, A25, A27, A30, A31 and S2. Due to the depositional history of glacial tills, the presence of cobbles and boulders should be anticipated throughout the till deposit. Generally, the SPT 'N' values of the silty clay / clayey silt till ranged from 8 blows to greater than 50 blows per 0.3 m but were generally above 17 blows implying a firm to hard consistency overall.

The measured water contents of the silty clay / clayey silt till samples ranged from about 10 % to 26 %.

Gradation and Atterberg Limits tests were carried out on three (3) samples of the silty clay / clayey silt till, the results of which are presented in Table A1.3, and shown in the Records of Boreholes.

Table A1.3: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Clay / Clayey Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH A1	SS 6	3.8	211.7	3	30	45	22	21	12	9	CL
BH A3	SS 4	2.4	213.9	3	18	52	27	28	15	13	CL
BH A23/S1	SS 5	3.1	219.7	1	18	48	33	30	14	16	CL/CI

The grain size distribution curves and plasticity chart are presented Figure Nos. B-A2 and B-A3 in Appendix B-A.

A1.6 Groundwater

Upon completion, groundwater was encountered in Boreholes BH A3, A13, and A23/S1 at depths of 2.7 m (Elevation 213.6 m), 2.4 m (Elevation 217.8 m), and 8.2 m (Elevation 214.6 m) below the existing ground surface, respectively. Groundwater was not encountered in the remaining boreholes.

One monitoring well was installed in BH A23/S1 at the location of the culvert crossing. The groundwater depth measured in the boreholes (where groundwater was encountered) at the time of drilling or upon completion of drilling, and in subsequent measurements in the monitoring well are summarized in Table A1.4 and shown on the Record of Boreholes.

Table A1.4: Results of Groundwater Depth Measurements

Borehole No.	Groundwater Measurements					
	During or Upon Completion of Drilling			In Monitoring Well (m)		
	Date	Depth	Elevation (m)	Date	Depth	Elevation
BH A3	21 Jan 2020	2.7	213.6	Not installed		
BH A13	21 Jan 2020	2.4	217.8	Not installed		
BH A23/S1	20 Jan 2020	8.2	214.6	24 Apr 2020	1.8	221.0
				4 May 2020	0.9	221.9
				12 May 2020	0.9	221.9

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months, and in response to major weather events.

A1.7 Soil Corrosivity

Two (2) soil samples were submitted for corrosion analysis to determine the corrosive potential of the soils with respect to buried metallic structures. The results of the analyses are presented Table A1.5, and the laboratory test certificate is included in Appendix D.

Table A1.5: Soil Corrosivity Test Results

Parameter	Units	BH A3 – SS2	BH S1/BH A23-SS4
Chloride	ug/g or (ppm)	127	276
Sulphate	ug/g or (ppm)	21	46
pH	pH Units	8.20	7.74
Electrical Conductivity	mS/cm	0.334	0.682
Resistivity	Ohm-cm	2990	1470

As per ASTM STP 1013 (Effects of Soil Characteristics on Corrosion – "*chloride appears to be the main factor in increased soil corrosivity with levels in excess of 0.01 % (100 (µg/g) considered indicative of accelerated corrosion*". The chloride content measured in both samples were more than 100 µg/g. In accordance with Table 1 of CSA A23.1-14 and based on "structurally reinforced concrete exposed to chloride, with or without freezing and thawing" and based on project location, exposure class "C-1" can be used. Class should be based on structure location and/or durability requirement.

In accordance with Table 3 of CSA A23.1-14, no additional requirement is specified for sulphate content below 0.10 % (i.e. 1,000 ppm or µg/g) below the "moderate degree of exposure" with respect to concrete.

Therefore, in accordance with Table 6 of the Canadian Standards Association (CSA) Series A23.1-14, Type GU Portland cement can be used based on the water-soluble sulphate contents measured in soils.

As noted in ASTM -STP 1013 (*Effects of Soil Characteristics on Corrosion*), pH values between 4.0 and 8.5 have very little effect on corrosion (American Water Works Association (AWWA) Standard C 105-72 (Table 1 – Soil-Test Evaluation AWWA Rating).

The measured soil resistivity values can be considered as “high” between 1000 ohm-cm and 2000 ohm-cm, and “moderate” between 2000 ohm-cm to 5000 ohm-cm for exposed metallic structures, based on ASTM STP 1000, Corrosion Testing and Evaluation - Table 3 (Corrosivity for Uncoated Steel).

Protection against steel corrosion, where required, could include one or a combination of: adequate concrete cover, low-permeability concrete, corrosion inhibitors; coated reinforcing steel; clad reinforcing steel; and corrosion-resistant alloy reinforcement.

A corrosion specialist should be retained, if necessary, to review the analysis results and provide relevant recommendation.

A2.0 PAVEMENT INVESTIGATIONS AND DESIGN

The purpose of the pavement investigation was to obtain subsurface information and to provide geotechnical recommendations for widening of Coleraine Drive which is north / south oriented, and as per the City’s road classification, it is designated as a minor arterial road. The total length of the investigated road section is about 3.0 km.

At the time of the investigation, the investigated road section was a 2-lanes rural road that would be widened to 4-lanes, from Arterial A2 to Mayfield Road, including realignment at Arterial A2 west of RR50. The discussions and recommendations in the following sections are general in nature, as the details of the widening were not available at the time of this report.

The subsurface soil profile at the site consisted of surficial asphaltic concrete underlain by non-cohesive soil sand and gravel fill overlying silty clay fill, silty clay /clayey silt till which extended to the termination depths of the boreholes that ranged from 1.2 to 9.4 m.

All boreholes were open and dry upon completion to their respective vertical limits of investigation except 3 boreholes: (A3, A13, A23/S1), where groundwater was encountered at depths of 2.7 m, 2.4 m, 8.2 m below ground surface, respectively.

The discussions and recommendations in the following sections are based on the subsurface information obtained from the boreholes and are intended for use by Design Engineers.

A2.1 Visual Pavement Condition Survey

On 10 August 2020, Wood carried out a visual pavement condition survey of the existing road surface within the project area to identify any distresses. A summary of the pavement condition survey, including predominant surface defects, surface deformation and cracking, is tabulated in Table A2.1 and copies of the Pavement Condition Survey Forms are included in Appendix A-A. Based on the pavement condition survey, the existing asphaltic concrete surface condition was rated from Poor to Very Poor Condition.

Table A2.1: Existing Pavement Condition

Predominant Distress	2020 Condition Ra0ting
Coleraine Drive from Major MacKenzie Drive to Countryside Drive ~1.8 km (2 lanes)	
280 m South of Mayfield and was rated Good Condition.	
• Ravelling & coarse aggregate loss – Moderate / Frequent. • Wheel Track Rutting/Distortion – Severe / Frequent. • Longitudinal Cracking (single, multiple and alligator) – Very Severe/ Extensive. • Centreline Cracking (single, multiple and alligator) – Moderate to Severe/Extensive. • Pavement Edge Cracking - Moderate to Severe/Extensive. • Transverse Cracking (single, multiple and alligator) – Moderate to Very Severe / Frequent to Extensive.	Poor to Very Poor Condition
Coleraine Dr-Countryside Dr to Mayfield Rd ~1.3 km (2 lanes)	
• Ravelling & coarse aggregate loss – Severe / Intermittent. • Wheel Track Rutting/Distortion – Moderate to Severe / Intermittent. • Longitudinal Cracking (single, multiple and alligator) – Moderate / Frequent. • Centreline Cracking (single, multiple and alligator) – Moderate / Frequent. • Pavement Edge Cracking - Moderate to Severe/Frequent. • Transverse Cracking (single, multiple and alligator) – Moderate to Severe / Extensive.	Poor to Very Poor Condition

A2.2 Subsurface Conditions

A total of 33 boreholes were drilled along Coleraine Drive from its intersection with the proposed E-W Arterial A2 Mayfield Drive (approximately 2.3 km). The subsurface soil profile at the site consisted of surficial asphaltic concrete underlain by sand and gravel fill overlying silty clay fill, silty clay /clayey silt till which extended to the termination depths of the boreholes that different in depths that ranged from 1.2 to 9.4 m as detailed in the Record of Boreholes.

The driving lanes boreholes revealed that the asphaltic concrete thickness ranged from 180 mm to 250 mm with an average of 199 mm. Non-cohesive soil (sand and gravel fill) was encountered in all the boreholes underlying the existing asphaltic concrete that ranged in thickness from 50 mm to 700 mm, with an average of 138 mm. The shoulder boreholes revealed sand and gravel fill was encountered in all the boreholes that ranged in thickness from 100 mm to 600 mm, with an average of 389 mm.

Additional subsurface information is provided in Section A1.0 and in the Record of Boreholes.

A2.3 Groundwater Conditions

Groundwater was encountered only in three boreholes during and on completion of drilling in the open boreholes at depth varying from 2.7 m to 8.2 below ground, as listed in Table A1.4. It should be pointed out that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

A2.4 Pavement Design

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations for road rehabilitation/re-surfacing and widening along Coleraine Drive.

The discussions and recommendations in the following sections are based on the available information and the subsurface information obtained from the boreholes and is intended for use by Design Engineers.

A2.4.1 Pavement Structure Adequacy

A total of 24 boreholes were drilled through the pavement along Coleraine Drive, between proposed Arterial A2 and Mayfield Drive (approximately 2.3 km).

Two methods were used to assess the existing pavement structure. In-situ structure number ("SN") and in-situ Granular Base Equivalency ("GBE") were estimated from the borehole data using the equivalency factors for various material types, as shown in Table A2.2.

Table A2.2: Summary of Typical Structural Layer Coefficient

Material Type	Typical AASHTO-Ontario Structural Layer Coefficient (SLC), ai (mm) (1)		Granular base Equivalency Factors
Rehabilitation	**Drainage**	**Structural**	
Existing HL Existing Gran Base Existing Gran Sub-base Existing Gran Base/Sub-base	Acceptable 1.0 Questionable 0.9 Inadequate 0.8 to 0.5	0.14 to 0.28 0.10 to 0.14 0.05 to 0.09	1.25 0.75 0.50 0.625
Pulverization	1.0	0.10 to 0.14	1.0
CIR	1.0	0.28 to 0.38	1.6 – 1.8
RAP/Gran A blended stabilized with EAM	1.0	0.20 to 0.25	1.0

Notes:

(1) MTO Report MI-183 -. MTO Report MI-183 "Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions" - Table 4-5.

Table A2.3 summarises the total average pavement structural thickness of the existing asphaltic concrete pavement, granular base and sub-base, as well as the average existing Structure Number 'SN' and 'GBE' before rehabilitation.

Table A2.3: Summary of Existing Pavement Structure

Boreholes	Average Thickness (mm)		SN(1)	GBE	Predominant Subgrade
	HMA	Base/Subbase	(mm)		
No. of BHs @ MDL/EP=16 (A1, A3, A5, A7, A9, A11, A13, A15, A17, A19, A21, A23/S1, A25, A27, A29, A31)	Range (180-250) mm Av. 199 mm	Range (50-700) mm Av.138 mm	Range (38-104) mm Av. 43 mm	Range (300-688) mm Av. 336 mm	Si(y) Cl Fill Si(y) Cl/Cl(y) Si Till
No. of BHs @ SHR/TOR=9 (A2, A8, A10, A18, A20 A26, A28, A30, A32/S1)	-	Range (100-600) mm Av. 389 mm	-	-	

Notes:

MDL= Mid driving Lane EP = Edge of Pavement SHR = Shoulder Rounding TOS = Toe of Slope.

1. Existing SN calculation s the following parameters were used:
    - Existing HMA coefficient, = 0.14;
    - Existing granular base/subbase coefficient, and concrete = 0.12/0.9

A2.4.2 Existing and Forecasted Traffic Data

The traffic data represented as Average Annual Daily Traffic ($AADT_{2020}$) in both directions was estimated by Wood Traffic Group as presented in Table A2.4. This traffic data was used to projected traffic data for 20 years design life. Equivalent single axle loads (ESALs) were calculated cumulatively over 20 years as described in the Ministry of Transportation Report "Procedures for Estimating Traffic Loads for Pavement Design, 1995".

Table A2.4: Traffic Data - Minor Arterial (Rural)

AADT in Both Directions 2020(1)	Growth Rate (%)	Comm. Vehicles (%)	Design ESALs @ 20 Years	Traffic Category
7,400	2.0%	6.0%	2,994,018 ~ 3.0×10^6	**Category** C

(1) 2020 is the anticipated construction year.

A2.4.3 Flexible Structural Pavement Design for Widening

After reviewing the field data and laboratory test results, the minimum pavement structural design for the widening of Coleraine Drive is presented in Table A2.5, which was determined in accordance with the 1993 American Association of State Highway and Transportation Officials ('AASHTO') Guide for the Design of Pavement Structures using the Darwin Software Program.

The AASHTO Pavement Design is considered to be a function of estimated future traffic in both directions (ESALs), reliability (R), which is a function of road classification, overall standard deviation (S_o), resilient modulus (M_r), as well as initial and terminal serviceability (P_o, P_t). From these parameters, the structure number (SN) is calculated. The SN is defined in the AASHTO Guide as a number, which provides a measure of the pavement strength and thickness needed to avoid overstressing the subgrade.

The following design parameters were chosen to calculate the required structure number for the design of flexible pavement using the AASHTO method, as described in the Ministry of Transportation Materials Information Report MI-183 "*Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions*".

- Initial serviceability, $P_i = 4.5$;
- Terminal serviceability, $P_t = 2.5$;
- Reliability level, R = 90 percent;
- Overall standard of deviation, $S_o = 0.49$;
- Subgrade Resilient Modulus, M_r (kPa) $M_r = 30{,}000$

Table A2.5: Recommended Minimum Structural Pavement Design

ESALs	AASHTO Design for 20 Years					Recommended HMA & PGAC		Traffic Category
						Marshall		
	HMA	Granular	Required Design SN	Selected SN	Total Pavement Thickness	HI 3 (HS) / HL 1 Surface Course	HL 8 (HS) / HDBC Binder Course	
	Thickness (mm)							
3.0 X 10^6	150	Gran A = 450 mm or Gran A = 150 mm Gran B Type II = 300 mm	123	126	600	SP 50 mm PGAC 64-28	50+50 mm PGAC 58-28	C
The Regional Minimum Pavement Structure Design for Arterial Roads								
3.0 X 10^6	160	Gran A = 150 mm Gran Type II = 450 min (subgrade base slopes at	-	151.2	760	40-50 HL1	100-110 mm HL8 (HS)/ HDBC	C

ESALs	**AASHTO Design for 20 Years**					**Recommended HMA & PGAC**		***Traffic Category***
						Marshall		
	HMA	Granular	Required Design SN	Selected SN	Total Pavement Thickness	HI 3 (HS) / HL 1 Surface Course	HL 8 (HS) / HDBC Binder Course	
	Thickness (mm)							
		3% and top of subgrade at 2, so depth varies).				No rap. No engine oils, min PGAC of 64-28)		

Notes:
- Pavement shall be placed over approved subgrade.
- Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

The Regional minimum design was selected for the road widening since it is intended to be Regional road.

A2.4.4 Widening Coleraine Drive from E-W Arterial to Mayfield Drive

Pavement recommendations for widening of Coleraine Drive are presented in Table A2.6, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS.MUNI 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Table A2.6: Widening of Coleraine Drive

HMA		**PGAC**	**Traffic Category**
Type	**Thickness (mm)**		
HL 1 / DFC – Surface Course	50 mm	64-28	C
HL 8 (HS) / HDBC – Binder Course	50 mm 60 mm	64-28	
Granular Base 'A'	150 mm	-	-
Granular Subbase 'B' Type II	**450 mm**	-	-
Total Pavement Structure	**760 mm**	-	-

Full depth excavation, as required and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness.

The excavated granular materials from the shoulder can be re-used as fill material for subgrade for the widening/embankment, provided it is not contaminated. New Granular B subbase should be added and compacted, followed by new Granular A base material. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted and overlain with 2 lifts of HL 8 (HS) or HDBC binder course, and 1 lift of HL 1 or DFC surface course, as per Table A2.6. Installation of subdrain is recommended, if lateral drainage of the existing subgrade is not possible.

A2.5 Rehabilitation Strategies

The selected rehabilitation strategy was based on Wood's geotechnical / pavement investigation and analysis, including a visual pavement condition assessment, subgrade condition, and calculated ESALs. Consideration was also given to user delay, cost and/or disruption of traffic and an anticipated construction year of 2020. Two (2) proposed rehabilitation strategies for Coleraine Drive are as follows:

Option 1: In-Place Pulverization, Remixing & Resurfacing with 200 mm HMA

Prior to pulverization, mill the entire road section to a depth of 50 mm. Then pulverize the existing asphalt concrete thickness into an equivalent depth of granular base material to a total depth of 300 mm. The resulting mixture of asphalt concrete and granular is then graded to cross fall, compacted and used as a base. The advantages of this option include the elimination of surface defects and reflection cracking and the reuse of the existing material efficiently. Typically, the GBE for bituminous crushed recovered material is in the order of 1.0. In-place pulverization should be graded and compacted and resurfaced with 200 mm of HMA. This option will raise the vertical profile by 200 mm and will provide 15 to 17 years of service life and average SN of 126 mm after resurfacing.

Option 2: Full Depth Reconstruction and Resurface

This option involves excavation to a depth of 760 mm to accommodate the design in Table A2.5. Proof-roll, re-grade and compact, add 600 mm of new granular A and compact, and resurfacing with 160 mm of hot mix. This option will improve drainage and the structural capacity of the pavement and will have lower maintenance cost over the pavement service life than the existing pavement. This option will not raise the vertical profile and will provide 20 years of service life and SN of 151.2 mm after reconstruction.

A2.6 Recommendations and Construction Features for Pavement

A2.6.1 Rehabilitation Strategies

Option 1 - In-Place Pulverization, Remixing & Resurfacing with 200 mm HMA. Prior to pulverization mill 50 mm and pulverize is cost cost-effective option. This option will raise the existing vertical profiles by 200 mm and will provide service life of 15 to 17 years.

A2.6.2 Widening of Coleraine Drive

Pavement recommendations for widening of Coleraine Drive are presented in Table A2.6 for new pavement structure, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Full depth excavation, as necessary, and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness. The excavated granular materials from the shoulder can be re-used as fill material for subgrade for the widening/embankment, provided it is not contaminated. New Granular B Type II subbase should be added and compacted, followed by new Granular A base material. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted and overlaid with 2 lifts of HL 8 (HS) /HDBC Binder course, and 1 lift of HL 1 or DFC surface course, as per Table A2.6. Installation of subdrain is recommended if lateral drainage of the existing subgrade is not possible.

A2.6.3 Subgrade / Road Base Preparation and Compaction

The pavement structural design recommended for roads is applicable, provided the subgrade is prepared under dry weather conditions, proof-rolled with a heavy rubber-tired vehicle (such as a grader or loaded dump truck) in the presence of the geotechnical consultant. Any loose, soft or unstable areas, if detected during proof-rolling, must be sub-excavated, replaced with approved granular materials and compacted. Any additional engineered fill, if required, should be placed in thin layers not exceeding 200 mm and compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD). Granular materials should be placed in thin layers not exceeding approximately 200 mm, within ± 2 % of its optimum moisture content, and thoroughly compacted to a minimum of 100 % of SPMDD.

The subgrade should be provided with adequate drainage. If wet weather conditions prevail at the time of construction, adjustments to this design may be required, i.e. if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional sub-base material is best determined during construction.

All granular base and sub-base materials must be compacted to at least 100% of SPMDD.

A2.6.4 Stripping and Sub-Excavation

No additional sub-excavation, other than removal of organics and topsoil are anticipated within the widening limits, as presented in Table A1.1 that ranged from 150 mm to 250 mm. However, any unsuitable soft or saturated material should be removed. Deeper stripping depths may be required, depending on the actual site conditions between borehole locations.

A2.6.5 Drainage

Prior to completing the rehabilitation, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project.

To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times. This can be accomplished by ensuring proper grading of the subgrade and positive lateral drainage of the granular base daylighting at the ditch. Alternatively, full-length perforated subdrain pipes of 150 mm diameter should be installed along both sides of the road, below the roadbed level, to ensure effective drainage, in accordance with OPSD 216.021. The sub-drainpipes should be wrapped in suitable non-woven geotextile surrounded by a minimum drainage zone of 19 mm size clear stone of minimum 150 mm thickness. A minimum slope of 2 % should be maintained across the paved sections (finished road surface) to ensure proper surface drainage. New pavement should slope towards the gutter/ditch.

A2.6.6 Hot Mixes and PGAC Type

The following Marshall hot mixes should be used on Coleraine Drive:

- DFC / HL 1 surface course mix and HL 8 (HS) /HDBC binder course should be used to provide the roadway with high durability.

Material Specification should be as per OPSS.MUNI 1150 Material Specification for Hot Mix Asphalt. For aggregates, the material specification should be as per OPSS.MUNI 1003.

Performance Graded Asphalt Cement (“PGAC”) 64-28 should be used for both surface course and binder course. This PGAC should satisfy the requirements of MP1 of SHRP Specifications for Superpave.

Recycled Materials: The use of reclaimed asphalt pavement (RAP) is not permitted as per the Regional minimum requirements for Marshall mixes for the Regional Arterial Roads.

Steel slag aggregates should not be allowed.

Transition Treatments at Limits of Paving: At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered at a distance of not less than 5 m, in accordance with OPSS.PROV 313. It should be ensured that no joint location corresponds with a joint location in any other layer.

The transition treatment from earth cut to earth fill should be in accordance with OPSD 205.010.

Tack Coat: It is recommended that all milled surfaces, and binder course surfaces will be tack coated prior to top course asphalt, if exposed to extended traffic. Construction Specification should be as per OPSS.PROV 308, April 2012.

A2.6.7 In-Situ Compaction for Hot Mix

In all areas, asphaltic concrete should be compacted as per OPSS.MUNI 310, Table 10 (April 2011). It should be noted that the granular base and sub-base materials should be compacted to the City's standards or to minimum 100 % SPMDD.

Field Quality Assurance: Plate samples of loose hot mix should be obtained for each paving day, and extraction/gradation and full Marshall compliance testing should be carried out on these samples. The finished surface shall be true to required profile and cross-section within 6 mm from required elevations and thickness. The surface shall show no depressions or bumps exceeding 3 mm under a 3.0 m long straight edge, placed parallel to the road centreline.

A2.6.8 Frost Depth

A minimum depth of 1.4 m should be used for frost protection as per OPSD 3090.101.

A2.6.8 Detouring

No long-term detouring is planned. Therefore, no special treatment will be required.

A3.0 UNDERGROUND UTILITIES

The geotechnical investigation scope of work included obtaining subsurface conditions and providing recommendations for installation of proposed underground utility services. Accordingly, selected boreholes (i.e. alternating pavement boreholes) were deepened to a depth of 3 m to 5 m, as listed in Table 5.1. Information obtained from all relevant boreholes drilled along Coleraine Drive have been considered in this section, as applicable.

A3.1 Subsurface Conditions

A total of twenty-five (25) boreholes (not including the eight augered boreholes for topsoil measurements) were drilled in driving lanes and shoulder areas of Coleraine Drive to depths varying from about 1.2 m to 9.4 m, for pavement investigation, underground utility installation and one structure.

Overall, the project site along Coleraine Drive consisted of surficial cover (topsoil, asphaltic concrete, concrete and / or exposed granular fill) underlain by fill soils (granular and / or silty clay / clayey silt) overlying native silty clay / clayey silt till. The fill soils extended to depths varying from about 0.9 m to 2.3 m (Elevations 214.0 m to 229.2 m) below the existing ground surface. The silty clay / clayey silt till was confirmed to a depth of about 9.4 m (up to Elevation 213.1 m) below existing ground surface in the deeper boreholes at the structure location.

Groundwater depths measured in the boreholes and monitoring wells varied from 0.9 m to 8.2 m (Elevations 221.9 m to 213.6 m) below ground surface.

Detailed subsurface and groundwater conditions are provided in Section A1.0.

A3.2 Discussions and Recommendations for Underground Utilities

As per information available, the planned Coleraine Drive rehabilitation / widening within the project limits will include installation of underground utilities and associated manholes and catch basins. Details of the installation were not available at the time of this report. Existing utilities, if any, should be protected and taken into consideration for design and construction of the proposed underground utilities and road widening.

The ground (road) elevations within the project limits (based on borehole location) varied from about 215.5 m (at BH A1) to 230.7 m (at BH A31), with the overall the ground surface was sloping up from south (RR 50) to north (Mayfield Road, RR14).

The recommendations and discussions for excavation and installation of underground utility services, and associated manholes / catch basins, are provided in the following sections.

A3.2.1 Founding Subgrade Conditions

From the investigation result, fill soils (granular, silty clay) were present to depths varying from 0.9 m to 2.3 m below existing ground / road level, which included granular fill to depths varying from 0.2 m to 0.9 m in some of the boreholes. The SPT values in the silty clay / clayey silt fill below the granular fill indicated a firm to hard but generally stiff consistency.

The native silty clay / clayey silt till below the fill soils were of firm to hard consistency overall, with the majority indicating very stiff to hard consistency, and should be generally competent to support underground utility services.

It is recommended that the inverts of underground utilities be founded on native soils, or competent fill soil subgrade. Existing fills or soft soil encountered at the founding level should be compacted, if possible, or otherwise, should be sub-excavated and backfilled with compacted soil as recommended in Section A5.3 (Engineered Fill).

For manholes and catch basins founded on competent subgrade (i.e., approved existing fill, imported engineered fill, silty clay / clayey till), a Geotechnical Reaction at Serviceability Limit State (SLS) of 100 to 150 kPa and a factored Geotechnical Resistance at Ultimate Limit State (factored ULS) of 150 to 225 kPa, depending on the subgrade conditions, may be used, which should be verified by a geotechnical engineer during construction. Under the SLS bearing values, settlements of up to 25 mm may take place.

The frost penetration depth for the project area should be considered as 1.4 m.

The highest groundwater elevation measured during the investigation within the project limits of Coleraine Drive was 0.9 m (Elevation 221.9 m) below ground surface in the monitoring well installed at the culvert location. As such, groundwater may be present within the excavation depths for the underground utilities. Also, perched water in sandy / silty pockets and / or water from surface runoff will require dewatering during excavation. As the excavation will generally be in clayey soils, groundwater seepage, if any, into the excavation is likely to be slow and a properly filtered sump and pump system, or gravity drainage, may be used for dewatering excavation.

General discussions regarding excavation and dewatering are provided in Section A5.4. Detailed dewatering consideration for the project is included Wood's hydrogeological investigation report, which is submitted under a separate cover.

Trench excavation, pipe bedding and anti-seepage collar considerations are discussed in following sections.

General discussions provided in Section A5.0 should also be considered for design and construction.

A3.2.2 Trench Excavation

Trench excavation should be carried out as per the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects. The soils classifications are shown in Section A5.4. Based on the soils encountered in the boreholes, the sides of excavations are expected to be temporarily stable at 1H:1V for Type 2 and Type 3 soils, provided excavations are properly dewatered and underground utilities are installed and backfilled within a reasonable short period of time. Provisions should be made for dewatering, as noted in Section A5.4. Trenching should be in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

It is important for frost heave compatibility that the trench backfill within the frost zone of 1.4 m depth matches the soil exposed on the trench walls.

A3.2.3 Bedding

Bedding for underground pipes should be placed in accordance with the design requirements and current Ontario Provincial Standards (OPS) specifications (Ontario Provincial Standard Drawing (OPSD) 802.10 for flexible pipes and OPSD 802.30, 802.31 and 802.32 for rigid pipes). It is recommended that a minimum of 150 mm thick bedding material (Class 'B' Type or better) be placed below the pipe invert. The thickness of the bedding may, however, need to be increased depending on the pipe diameter, or if wet or weak subgrade conditions are encountered. If the subgrade is weak, it should be sub-excavated and replaced with engineered fill to support the pipes and allow the use of Class 'B' Type bedding. If weak subgrade is encountered and cannot totally be removed, Class 'A' Type bedding (e.g. minimum 100 mm thick lean concrete) should be used to provide a workable surface and support the proposed pipes.

For the areas to be filled, the fill soils should first be placed approximately to final grade and subsequently excavated to install the underground pipes in order to prevent pipe settlement due to overburden loads.

Should the pipes be installed in soft clay soils, the joints should be restrained from movements and the backfill around the pipes should be properly compacted in order to prevent long-term movements. A layer of geotextile (Terrafix 270R or equivalent) should be placed between the soft clayey soils and the granular bedding/backfill in order to prevent soil migration.

The possibility of pipe movements in soft clayey soils, after installation, should be considered in the design and construction of the underground pipes.

Construction of underground pipes should be carried out in accordance with the relevant OPSS.MUNI 410 (Construction Specification for Pipe Sewer Installation in Open Cut), or other relevant applicable municipal / regional standards.

A3.2.4 Backfill

Based on the visual and tactile examination of the soil samples, the on-site excavated granular / silty clay fill and silty clay / clayey silt till may be re-used as backfill in sewer trenches provided their moisture contents at the time of construction are at or near the optimum. Moisture conditioning of the sub-excavation soils may be required prior to reuse. It should be noted that samples of silty clay / clayey silt that contained organics typically had water contents that were higher than the range optimum for compaction. The excavated cohesive fill should be carefully examined for organic content and moisture condition by qualified geotechnical personnel in order to confirm the need for moisture conditioning or its acceptability for use as backfill.

The backfill should be placed in maximum 200 mm thick layers at or near (± 2 %) optimum moisture content, and each layer should be compacted to at least 95 % Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the manhole / catch basins should be brought up simultaneously on all sides and operation of heavy equipment near the walls should be restricted to minimize potential movement and/or damage.

Unsuitable material such as organic soils, boulders, cobbles, frozen soils, etc., should not be used for backfilling.

A3.2.5 Anti-Seepage Collars

From the borehole information, the underground utilities will be installed in clayey soil (silty clay fill, silty clay / clayey silt till). As such, anti-seepage collars should not be required.

A4.0 CULVERT NO. 1 (STATION 1+650)

One existing culvert (approximate Station 1+650), located within the project limits on Coleraine Drive, is planned to be rehabilitated / extended to accommodate the proposed road widening. Based on available information, the existing culvert is a concrete structure with a span of about 2.4 m, and is about 10 m long and 0.6 m high. Other information of the existing culvert and details of the proposed rehabilitation / extension were not available at the time of preparation of this report.

The geotechnical investigation consisted of drilling two (2) boreholes (BH A23/S1 and S2) at the existing culvert location to obtain subsurface and groundwater condition at the culvert location. Both boreholes were drilled to a depth of about 9.4 m (Elevations 213.4 m and 213.1 m) below the existing ground surface. The culvert and borehole locations are shown on Figure Nos. 1A and 1B.

A4.1 Subsurface Conditions

Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location generally consisted of fill soils (sand and gravel, and silty clay / clayey silt fill), which were underlying the asphaltic concrete. Native silty clay / clayey silt till was encountered underlying the fill soils in both boreholes to the termination depth.

The stratigraphic units and groundwater conditions for each culvert are discussed in the following sections and presented in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the soil conditions encountered at the proposed culvert location. The soil and groundwater conditions might vary between and beyond the borehole locations.

A4.1.1 Surficial Cover – Asphaltic Concrete

At both borehole locations, 200 mm thick asphaltic concrete was encountered at the ground surface.

A4.1.2 Fill Soils

Fill soils encountered below the asphaltic concrete consisted of sand and gravel fill overlying silty clay / clayey silt fill, which extended to a depth of 2.2 m (Elevations 220.2 m and 220.6 m) below the existing ground surface. The granular fill was approximately 100 mm thick and is likely granular road base material.

The sand and gravel fill was brown and contained trace to some silt. The silty clay fill, which was encountered below the sand and gravel fill, was dark grey to brown in colour and contained traces of gravel and organics. SPT 'N' values measured within the silty clay / clayey silt fill ranged from 5 to 8 blows per 0.3 m. Water contents measured in the fill samples ranged from 23 % to 31 %.

A4.1.3 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the fill soils and extended to the termination depth of 9.4 m (Elevations 213.4 m and 213.1 m) below the existing ground surface) in both boreholes.

The silty clay / clayey silt till was brown to grey in colour, and contained some sand and traces of gravel. Cobbles/boulders were encountered in both boreholes. SPT 'N' values measured within the silty clay / clayey silt till ranged between 19 blows and more than 50 blows per 0.3 m, implying very stiff to hard consistency. Water contents measured in the silty clay / clayey silt till varied from 10 % to 22 %.

Gradation and Atterberg Limits tests were carried out in one (1) sample from BH A23/S1 (SS5), the results of which are presented in Table A1.3, and are also shown in the Records of Boreholes.

A4.1.4 Groundwater Conditions

Upon completion, groundwater was encountered in Borehole BH A23/S1 at a depth of 8.2 m (Elevation 214.6 m) below the existing ground surface. Groundwater was not encountered in Borehole BH S2.

Groundwater measured subsequently in the monitoring well installed in BH A23/S1 ranged between 0.9 m and 1.8 m below the existing ground surface (Elevations 221.9 m to 221.0 m). Measured groundwater depths are listed in Table A1.4 and shown on the Record of Boreholes.

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months, and in response to major weather events.

A4.2 DISCUSSIONS AND RECOMMENDATIONS FOR CULVERT

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations with respect to proposed culvert rehabilitation / extension.

Within the depths of the two boreholes drilled adjacent to the existing culvert location, fill soils (sand and gravel, silty clay / clayey silt) were encountered to a depth of about 2.2 m (Elevations 220.2 m and 220.6 m) below ground surface, overlying very stiff to hard silty clay / clayey silt till

The foundation type of existing culvert and details of the proposed rehabilitation / extension were not available at the time of preparation of this report. Accordingly, general considerations for the culverts are presented the following sections.

A4.2.1 Foundation

Based on the boreholes drilled at or in the vicinity of the culvert locations, values of geotechnical reaction at Serviceability Limit State (SLS) and the factored geotechnical resistance at Ultimate Limit State (ULS) are provided in Table A4.1 which may be used for design.

Table A4.1: Recommended ULS / SLS Bearing Values for Culvert Foundations

Borehole No.	Founding Stratum	Depth Below Existing Grade (m)	Elevation (m)	Geotechnical Reaction at SLS (kPa)	Factored Geotechnical Resistance at ULS$^{(1)}$ (kPa)
BH A23 / S1	Fill	above 2.2 (±)	above 220.6 (±)	not recommended	not recommended
	Very stiff to hard silty clay till	below 2.2 (±)	below 220.6 (±)	200	300
BH S2	Fill	above 2.2 (±)	above 220.2 (±)	not recommended	not recommended
	Very stiff to hard silty clay till	below 2.2 (±)	below 220.2 (±)	200	300
Engineered fill per OPSS.MUNI 1010 (if used), as per Section A5.3				150	225

Notes: (1) A resistance factor of Φ = 0.5 has been applied to the ULS values provided.

The geotechnical bearing values provided in Table A4.1 are intended to assess the feasibility and sizes of footings and are for vertical loads (no inclination) without load eccentricity. Under the SLS pressures, foundation settlements could be up to 25 mm (total) and 20 mm (differential). Detail foundation analysis should be carried out, if necessary, to confirm SLS/ULS and corresponding settlements.

The design frost depth penetration is 1.4 m. All foundations should be covered by at least 1.4 m deep soil or equivalent synthetic thermal insulation.

Highest groundwater level measured during geotechnical investigation period was at about Elevation 221.9 m. As such, a minimum groundwater level at Elevation 222 m or the creek water level, whichever is higher, should be considered for design. If required, the regional high flood level of the creek may be used.

During construction, groundwater control and / or creek diversion (e.g., cofferdam, sheetpiles) to control the ingress of creek water may be required. General recommendations related to excavation and groundwater control are presented in Section A5.4.

A4.2.2 Soil Parameters for Design

The unfactored soil parameters listed in Table A4.2A may be used for design of earth structures. It should be noted that these parameters are based on published information and/or semi-empirical/theoretical relationships, and are conservative and should be verified by field/laboratory testing, if more representative parameters are required.

Table A4.2: Unfactored Static Soil Parameters for Design

Material	Total Stress Analysis		Effective Stress Analysis		Earth Pressure Coefficients(1)			Bulk Unit Weight (kN/m^3)	Coefficient of Friction between Concrete and Soil
	C (kPa)	Φ (deg)	c′ (kPa)	Φ′ (deg)	Active K_a	At-Rest K_o	Passive K_p		
Very stiff to hard silty clay / clayey silt till	100	0	0	30(2)	0.33	0.50	3.0	19	0.35
Engineered Fill (3)									
Granular A (OPSS.MUNI 1010)	0	35	0	35	0.27	0.43	3.7	24(4)	0.4
Granular B Type I or Type II (OPSS.MUNI 1010)	0	32	0	32	0.31	0.47	3.3	23(4)	

Notes: (1) Values based on semi-empirical relationships. For SLS, K_p values should be reduced to 1/3 of indicated value to limit lateral movement.

(2) Normally-consolidated range.

(3) All engineered fill should be compacted to at least 100 % SPMDD for supporting foundations.

(4) Unit weight values for engineered fill compacted to 100 % SPMDD. For backfill of retaining walls, unit weights for Granular A and Granular B compacted to 95 % SPMDD may be taken as 22 kN/m3 and 21 kN/m3, respectively.

A4.2.3 Earthquake Considerations

Based on the soil conditions observed in the boreholes (maximum drill depth of 9.4 m below ground) and the possible bedrock depth at the culvert location (~30 m), and in conformance with the criteria in Table 4.1 (Section 4.4.3.2 – Seismic Properties) of the Canadian Highway Bridge Design Code CSA S6-19 ("CHBDC"), the project site may be classified as Site Class D ("stiff soil").

The design values of site coefficients F(T), F(PGA) and F(PGV) can be obtained from Geological Survey of Canada on Natural resources Canada website: 'www.earthquakecanada.ca" or Tables 4.2 to 4.9 (Section 4.4.3.3 – Site Coefficients) of CHBDC, and the design spectral acceleration, S (T), should be determined as per Section 4.4.3.4 (Design Spectral Acceleration and Displacement Values) and Tables 4.2 to 4.9 in Section 4.4.3.3 of CHBDC.

A4.2.4 Scour Protection

Culvert and headwall footings should be protected against scour and erosion in the form of cut-off walls, rip-rap or equivalent. Scour protection should be designed based on the hydrology requirement by an experienced engineer. Alternatively, the foundations could be placed below the depth of scour and frost penetration. If rip-rap protection is used, it should be separated from the native soils with a geotextile filter fabric (e.g. Terrafix 600R or equivalent) or a filter zone of granular material. The embankment slope surface should be covered with topsoil and seeded/sodded as soon as possible after completion of construction.

A4.2.5 Backfill for Culvert

Backfill materials around culvert should consist of non-frost susceptible, free-draining granular materials in accordance with OPSS.MUNI 1010 (i.e., Granular 'A' or Granular 'B'). Such granular backfill should be compacted to at least 95 % SPMDD (Standard Proctor Maximum Dry Density). Free-draining backfill materials and the drain pipes and weep holes, etc., should be used provided to prevent hydrostatic pressure build-up.

Backfill, backfill transition and cover for the culvert should conform to Ontario Provincial Standard Drawing (OPSD) 3101.150 (*Walls, Abutment, Backfill, Minimum Granular Requirement*) or applicable City Standard.

Engineered fill is discussed in Section A5.3, and excavation and dewatering during construction are discussed in Section A5.4.

To increase sliding resistance, a shear key may be used, if required. The shear key can be designed using the unfactored K_p values for the soils provided in Table A4.2. The movement of the retaining structure to mobilize the passive resistance should be considered in the design.

A4.2.6 Retaining Wall

If retaining walls are constructed at the ends of the culvert (inlet and outlet), they may be founded on the very stiff to hard native silty clay till. If required, the wall may also be founded on the engineered fill per OPSS.MUNI 1010. The frost and scour protection recommendations provided in Sections A4.2.1 and A4.2.4, respectively should also be adhered to in designing retaining wall foundations.

Soft fill areas should be recompacted (if possible) or replaced with the engineered fill described in Section A5.3. The founding subgrade should be verified by a geotechnical engineer. The SLS/ULS values and soil parameters provided in Tables A4.1 and A4.2 may be used for design of wall foundations, as required. Slope stability analyses should be carried for the retaining wall, once the detailed design is completed.

A4.2.7 Permanent Slopes

A slope of 2H:1V (2 Horizontal : 1 Vertical) or flatter should be constructed for the permanent fill embankment. The embankment should be constructed using engineered fill (Section A5.3). The global slope stability should be analyzed during detailed design, if the new embankment height is higher than 2 m high, once the detailed design is finalized. All permanent slope surfaces should be protected against erosion by surface water and creek water.

Construction of the embankment should follow the requirements of OPSS.MUNI 206 (*Construction Specification for Grading*), or applicable City Standard.

A5.0 General Considerations for Design and Construction

A5.1 Site Preparation

Site preparation will likely generally include stripping of topsoil / asphalt / concrete, excavation to subgrade, proof-rolling, sub-excavating soft spots, if encountered, and backfilling, if necessary, with engineered fill.

All topsoil and loose soil or soil mixed with organic matter should be stripped from pavement areas, manhole / catch basin founding areas, and base of underground utility services. Subgrade preparation of pavement is discussed in Section A2.6.3. Any loose, soft or unstable areas in the exposed subgrade should be sub-excavated and replaced with approved fill and compacted (Section A5.3). Lean concrete may be used to backfill sub-excavated areas.

Excavation should be carried out with a temporary slope of 1H:1V or flatter above the groundwater level (Section A5.4). Roadway shoring protection systems may be required during construction of the culverts. Temporary shoring is discussed in Section A5.5.

A5.2 Embankment Widening

Based on site condition, the proposed road widening will generally involve fill sections along the investigation limits. The embankment required for road widening should be constructed with compacted engineered fill at 2H:1V (or flatter) side slopes. If a side slope steeper than 2H:1V slope is required or if the height of the embankment / cut slope is greater than 2 m, slope stability analysis should be carried out to assess stability of the planned slope, depending on the subsurface conditions. Where existing embankments are to be widened, the side slopes should be benched in accordance with OPSD 208.010 prior to placement of the widening fills. Final (permanent) embankment side slopes in granular fills should be established to match the existing slopes or as per OPSD 200.010. Final slopes should be treated with a seed and mulch to prevent ravelling.

Widening of the road will require, as a minimum, stripping the existing ground surface cover (topsoil, asphaltic concrete, vegetation cover, surficial fill soils, etc.) from the area required for road widening. The planned widening will generally be constructed to the same elevation as the existing road surface. Grading, backfilling and compacting should follow OPSS.MUNI 206 (Construction Specification for Grading), OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting), OPSS 501.MUNI (Construction Specification for Compacting), and / or the City's requirements.

Backfilling, if required, for site grading (e.g., for subgrade raise, replacement of soft soil) should be placed as engineered fill. Engineered fill per OPSS.MUNI 1010 should be used to replace soft / incompetent soils and/or raising grade. Engineered fill should be prepared according to the City's standards / contract specifications. Engineered fill is discussed in Section A5.3.

The fill soils used for embankment widening should consist of approved clean fill (e.g., Select Subgrade Materials - OPSS 1010).

A5.3 Engineered Fill

Engineered fill per OPSS.MUNI 1010, where required, may be used to backfill excavated areas, backfill around manholes, replace soft/incompetent soils, and / or raise grades. Engineered fill for backfill of excavated areas should be placed after stripping existing fill soils, any soils containing excessive organic matters and otherwise unsuitable soils.

Engineered fill can be prepared by placing fill soil and compacted as per OPSS.MUNI 501 (*Construction Specification for Compacting*) and/or applicable City Standard. Alternatively, engineered fill should be placed in loose layers not exceeding 200 mm. The water content of the fill should be within ± 2 % of its optimum moisture content (OMC) at the time of its placement, and it should be thoroughly compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD) in general.

The fill soils should consist of inorganic soils and should not be frozen during backfilling and compaction. Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. The compaction procedures and quality control should be overseen by a geotechnical engineer.

A5.4 Excavation and Dewatering

All excavations should be carried out in accordance with the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects (O. Reg. 213/91). The soils to be excavated can be classified as follows:

Existing fill soils	Type 3
Firm to hard silty clay / clayey silt till	Type 1 to 3 (varies by consistency)
Very dense silty sand (above groundwater level / fully dewatered)	Type 1
Very dense silty sand (below groundwater level)	Type 3

In accordance with the OHSA, a maximum short-term slope of 1H:1V is required to within 1.2 m of the trench bottom for temporary excavations in Type 1 and 2 cohesive till and native silty sand that is above the groundwater level, or properly dewatered. For Type 1 and 2 soils, a maximum depth of 1.2 m high vertical cut at the bottom of excavation may generally be constructed. However, under the groundwater table a 1.2 m high vertical cut may not be stable and flatter slopes may be required. Type 3 soils above the groundwater level may be inclined at 1H:1V or flatter from the bottom. In the case of saturated Type 3 fills or native granular deposits below the prevailing groundwater, if adequate dewatering is not implemented, slopes of open excavations will have to be reduced to 2H: 1V or flatter. In the absence of proper dewatering or groundwater control of Type 3 soils, slope flattening may be insufficient to prevent particularly saturated granular soils from becoming unstable and devolving to Type 4 materials. Near the ground surface, occasional 3H:1V or flatter slopes may be required due to loose/soft surficial soils. If open cut cannot be carried out, a temporary shoring system may be used to limit the extent of excavation. General consideration for temporary shoring is provided in Section A5.5.

Trenching should be carried out in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

Stockpiles, materials or any heavy equipment should be kept at least the same horizontal distance as the depth of the excavation from the upper edge of the excavation to prevent slope instability. All surface drainage should be directed away from any open excavations and trenches.

Based on observations at the borehole locations and planned excavation depth, normal excavation equipment should be suitable for excavation. Hard till soils may require additional effort for excavation (e.g., heavy excavator, rippers, impact hammer, etc.). The terms describing the compactness (very loose, loose, compact, dense, very dense) or consistency (very soft, soft, firm, stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation. It should be noted that cobbles / boulders can be encountered in the till and in fill soils. Therefore, removal of the cobbles / boulders should be considered and planned for.

During the construction, temporary runoff controls such as sediment trap, interceptor drain, dyke and / or silt fence should be installed to prevent uncontrolled water / sediment flow into existing water courses. The effluent from dewatering operations should also be filtered or passed through sediment traps to prevent turbidity.

Based on the soil and groundwater conditions at the borehole locations, groundwater control within the excavated area should not be significant. In the clayey soils, groundwater seepage into the excavation, if encountered, is likely to be slow and a properly filtered sump and pump system or gravity drainage may be used for dewatering the excavation. High water flow rates (e.g. from perched water in fills or granular layers with the cohesive tills) may be encountered during construction and the dewatering effort could require an increased number of sumps and pumps.

Use of lean concrete mud mat or granular layer may be warranted where founding surfaces are to be exposed for extended period, especially if the work is carried out during wet weather. Care should also be exercised to minimize disturbance to the final subgrade during excavation.

It is recommended that qualified geotechnical personnel be present during the foundation excavation to review the conditions of the foundation subgrade.

A5.5 Temporary shoring

Temporary shoring may be required for vertical excavation during construction of culverts, installation of underground utilities or roadway protection. This can be accomplished using soldier piles with lagging (or similar) in order to support the sides of the excavation. Temporary shoring design and construction should comply with OPSS.MUNI 539 (*Construction Specification for Temporary Protection Systems*), or applicable City Standard. The temporary shoring system should be designed to resist the lateral earth, surcharge and hydrostatic pressures which could occur during construction. Bracings should be installed within the shoring system to minimize movements of the soils. The temporary shoring system should be designed in accordance with the latest editions of Canadian Foundation Engineering Manual's (CFEM) and Canadian Highway Bridge Design Code (CHBDC), together with the requirements of the Ontario Health and Safety Regulations, as applicable.

The shoring system should be designed and approved by a professional engineer. Geotechnical parameters provided in Section A4.2.2 may be considered for design of shoring.

A5.6 Suitability of Existing Soils for Backfilling

Most of the excavated soils (i.e. granular fills, clayey fill and silty clay till) can be suitable for being reused for backfill, provided they can be separately stored, properly compacted and are environmentally acceptable. Fill soils containing construction debris (or similar) and organic matter should not be reused. Soils that are too wet to compact will require additional processing (e.g., drying). Cobbles and boulders (larger than 100 mm in size), if any, should be discarded by mechanical means (e.g., sieving) or manual removal.

A6.0 PRELIMINARY SOIL CHEMICAL ANALYSES

Environmental soil chemical analyses were carried out to provide preliminary discussions for soil disposal options as part of the Geotechnical Investigation Preliminary Design for the Site, the results of which are discussed in the following section.

No Phase I or Phase II Environmental Site Assessment (ESA) reports have been conducted or provided to Wood for review.

It is assumed that a Record of Site Condition, (RSC) as per Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the *Environmental Protection Act* (EPA), as amended ("O.Reg.153/04, as amended") is not required at this time.

A6.1 Methodology

The environmental soil screening and laboratory analyses program was carried out in general accordance with the current *Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the Environmental Protection Act (EPA)*, as amended (O. Reg. 153/04) in order to characterize the soil at the Site and to provide an initial discussion on disposal options for surplus material during future construction. It should be noted that the scope of work does not meet the analytical or administrative requirements of Ontario Regulation 406/19 On Site and Excess Soil Management (O. Reg. 406/19) in the event that the soil is to be considered for beneficial offsite reuse.

A Record of Site Condition (RSC) was not part of the scope of work. Due to the limited scope of work, further environmental assessment would be required in the event that an RSC is required.

A6.2 Sample Selection for Analyses

The environmental component of the subsurface investigation included the following activities:

- Conducting the soil sampling activities in accordance with the Ministry of the Environment (MOE) document entitled *"Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04"* dated June 2011, the Ministry of the Environment and Energy (MOEE) document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated December 1996; and MOE document entitled *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act"* issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol);
- Based on City of Brampton instruction, submission of seven (7) soil samples for laboratory analysis of metals & inorganics to assist in determining appropriate soil disposal options, if required, during construction;
- Submission of one (1) soil sample for Ontario Regulation 347 (*O. Reg. 347*) as amended by Ontario Regulation 558/00 (*O. Reg. 558/00*) Toxicity Characteristic Leaching Procedure (TCLP) for volatile organic compounds (VOCs), Organochlorine (OC) pesticides, polychlorinated biphenyls (PCBs) and metals and inorganics to determine landfill acceptability of soil/granular fill originating from the Site; and
- Comparison of the laboratory analytical results to soil standards presented in the Ministry of the Environment, Conservation and Parks (MECP) document entitled "*Soil, Ground Water and Sediment*

Standards for Use Under Part XV.1 of the Environmental Protection Act," (the "MECP SCS") dated April 15, 2011 and *O. Reg. 347*, as amended by *O. Reg. 558/00*, Schedule 4 Leachate Quality Criteria provided in the MECP document entitled "*Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste*," October 2000 (the "Schedule 4 Criteria").

A6.2.1 Site Condition Standards

Analytical soil results were compared to the MECP Table 1 (background) SCS for all types of Property Use (except Agricultural) (Table 1 SCS) and MECP Table 3 (generic) SCS for Industrial/Commercial/Community Property Use for Medium/Fine Textured Soils (Table 3 SCS).

The chemical analyses results were also evaluated against the following tables of Appendix 1 (Generic Excess Soil Quality Standards) of the new MECP O.Reg.406/19 "On-Site and Excess Soil Management," additional elements which are expected to come into force in January 2023:

- Table 1 Full Depth Background Site Condition Standards for all types of property use (except agricultural) (Table 1 Excess Soil Quality Standards); and
- Table 3.1 Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent, for industrial/commercial/community property use (Table 3.1 Excess Soil Quality Standards).

Furthermore, TCLP analyses results were also compared with Table 3.1 Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial / Commercial / Community Property Use, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse – of O.Reg.406/19.

A6.2.2 Soil Sampling, Inspection & Preservation Procedures

Soil samples were obtained for laboratory analysis and field screening, where applicable, using a drill rig equipped with split spoon sampling capabilities. The drillers cleaned the split spoon by removing loose dirt from the split spoon using a wire brush, washing the split spoon using a brush in a dilute mix of potable water and Alconox soap, rinsing the split spoon with distilled water and rinsing the split spoon with methanol and allowing the split spoon to air dry.

The drillers obtained the split spoon sample by auguring to the specified depth, hammering the spoon about 0.6 m into the soil and removing the spoon. The split spoon sample was inspected for visual and/or olfactory evidence of environmental impacts. Disposable nitrile gloves were used and replaced between the handling of successive samples.

The soil samples retrieved from the borehole investigations were examined, classified and logged according to soil type, moisture content, colour, consistency, and presence of visible indicators of environmental impact. Soil samples requiring vapour analysis were split into duplicate fractions upon recovery at the surface. The primary sample fractions were placed in 120 and/or 250 millilitre (mL) sample jars with Teflon-lined lids and methanol preserved (cored) samples were placed in 40 mL vials and subsequently stored in coolers on ice for potential future laboratory analysis. The volatile sample fractions were placed in resealable plastic sample bags and stored at ambient temperature for subsequent field vapour screening. The samples were selected on the basis of visual/olfactory evidence of impacts, field screening results, or from the vicinity of the apparent water table.

Representative soil samples collected during the investigation were submitted to AGAT Laboratories (AGAT) of Mississauga, Ontario, for metals & inorganics. AGAT is accredited by the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) in accordance with ISO/IEC 17025:2005 – *"General Requirements for the Competence of Testing and Calibration Laboratories"* for the tested parameters set out in the Soil, Ground Water and Sediment Standards.

A6.3 Environmental Test Results and Considerations

Wood completed a preliminary Environmental Soil Quality Testing Program (the Investigation) as part of the Geotechnical Investigation. The details of the drilling program, including borehole locations and drilling methodology are presented in the geotechnical investigation sections of this report. Soil samples submitted for chemical analysis were collected from depths between 0.3 m and 3.0 m below ground surface (mbgs) based on presence of fill material and depth of construction works, as detailed in Table A6.1.

Table A6.1: Environmental Tests

Sample ID	Depth (m)	Parameters Tested
A3 SS4	2.4 – 3.0	Metals and Inorganics
A9 SS1	0.3 – 0.9	Metals and Inorganics
A13 SS1	0.3 – 0.9	Metals and Inorganics
BH A17 SS3	1.5 -2.1	Metals and Inorganics
BH A20 SS2	0.6 – 1.3	Metals and Inorganics
BH A28 SS2	0.6 – 1.2	Metals and Inorganics
BH A31 SS2	0.9 – 1.5	Metals and Inorganics

Wood observed fill material in all of the boreholes.

Headspace combustible organic vapour (COV) concentration measurements recorded in the soil samples were all non-detectable. Total organic vapour (TOV) concentration measurements recorded in the soil samples were all non-detectable. No other evidence (i.e., visual/olfactory) of potential environmental impacts were observed in any of the soil samples collected from this project area.

The soil samples collected as part of this preliminary assessment that had Table 1 SCS exceedances are as follows:

- A9 SS1 and its field duplicate (DUP1) for electrical conductivity (EC) and sodium adsorption ratio (SAR);
- A13 SS1 for EC;
- BH A20 SS2 for EC and SAR;
- BH A28 SS2 for EC and SAR; and
- BH A31 SS2 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 1 SCS for metals and inorganics.

The soil samples collected as part of this assessment that exceeded the Table 3 SCS are as follows:

- DUP1 of soil sample A9 SS1 for EC;
- A13 SS1 for EC;
- BH A20 SS2 for EC;
- BH A28 SS2 for EC and SAR; and
- BH A31 SS2 for EC.

The other analyzed soil samples had concentrations that met the Table 3 SCS for metals and inorganics.

When compared to the O. Reg. 406/19 Excess Soil Quality Standards Exceedances, the soil samples collected as part of this assessment that had Table 1 Excess Soil Quality Standards exceedances are as follows:

- A9 SS1 and its field duplicate (DUP1) for electrical conductivity (EC) and sodium adsorption ratio (SAR);
- A13 SS1 for EC;
- BH A20 SS2 for EC and SAR;
- BH A28 SS2 for EC and SAR; and
- BH A31 SS2 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 1 Excess Soil Quality Standards for metals and inorganics.

The soil samples collected as part of this assessment that had Table 3.1 Excess Soil Quality Standards exceedances are as follows:

- DUP1 of soil sample A9 SS1 for EC;
- A13 SS1 for EC;
- BH A20 SS2 for EC;
- BH A28 SS2 for EC and SAR; and
- BH A31 SS2 for EC.

The other analyzed soil samples had concentrations that met the Table 3.1 Excess Soil Quality Standards for metals and inorganics, the contaminant of concern indicated by the City of Brampton.

The TCLP analyses for the parameters tested indicated that dry soils (soils that would pass a slump test) would meet the Schedule 4 Leachate Quality Criteria.

Soil analytical results are shown in Tables 1A to 4A in Appendix C-A. The laboratory certificates of analysis for the bulk analysis and the certificates of analysis for the O. Reg. 347 TCLP analysis are included Appendix D.

A6.4 Quality Assurance / Quality Control

Field Quality Control: Field quality control was not performed for this segment and is discussed in separate reports being written as part of the Geotechnical Investigation.

Laboratory Quality Control: The 2011 Analytical Protocol provides requirements for sample handling and storage requirements, reporting requirements, analytical methods and QA/QC procedures for analytical parameters.

As per the 2011 Analytical Protocol, all samples/sample extracts were analyzed within their applicable hold times using approved analytical methods. The report limits were met for all samples and tested parameters. No tested parameter was present in a detectable concentration in any laboratory Method Blank and all laboratory surrogates, reference materials and replicate samples are considered acceptable.

SECTION B: ARTERIAL A2 (FROM MAYFIELD ROAD TO REGIONAL ROAD 50, ~3.4 KM)

B1.0 OVERALL SUBSURFACE CONDITION

The new road (Arterial A2) is proposed between Highway 50 and Mayfield Road, as shown Figure Nos. 2A and 2B. A total of 33 boreholes (BH B1 to B33) along the road alignment and 4 boreholes (BH S3 to S6) at two culvert locations were planned to be drilled. Seven (7) boreholes (i.e. BH B29 to B33) located north of Countryside have been deferred to the detail design stage, if needed, as discussed with and approved by the City.

A total of twenty-seven (27) boreholes (BH B1 to B28, not including B7) were drilled to depths varying from 1.5 m to 5.2 m, along the alignment proposed new road (Arterial A2). Additionally, four (4) boreholes (BH S3, S4, B7/S5 and S6) were drilled to depths ranging between 9.4 m and 9.8 m, for the one proposed new culvert and one culverts rehabilitations / extensions. Due to their proximity, BH B7 and BH S5 were combined into one borehole (BH B7 / S5). The boreholes were drilled along the proposed alignment. Boreholes BH S3 and BH S4 were located at the two sides of an existing culvert on Highway 50, at its proposed intersection with the new Arterial A2. Boreholes BH S5 and BH B7/S5 were located at the two sides of a proposed culvert at the intersection of the proposed Arterial A2 with the proposed E-W Arterial.

The stratigraphic units and groundwater conditions are discussed in the following sections. Additional information is provided in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the possible soil conditions at the investigated road section. The soil and groundwater conditions might vary between and beyond the borehole locations.

B1.1 Topsoil

Topsoil was encountered at the surface of all boreholes except Boreholes BH B1, BH B22, BH B23 to BH28, inclusive, BH S3 and BH S4. The thickness of the topsoil varied between 100 and 300 mm.

B1.2 Asphaltic Concrete

In Boreholes BH B1 and BH B22, approximately 140 and 200 mm of asphalt was encountered, respectively.

B1.3 Granular Fill

Granular fill (gravelly sand and sand and gravel fill), likely comprising granular road base in whole or part, was encountered underlying the asphalt layer in Boreholes BH B1 and BH B22 or was exposed at the surface at Boreholes BH B24, BH S3 and BH S4. Borehole BH B24 was drilled next to a vegetated area and Boreholes BH S3 and BH S4 were drilled on the driving lane / shoulder of existing roads. The thickness was 700 mm in BH B1 and BH S3, 400 mm in BH B22, 600 mm in BH B24, and 900 mm in BH S4. The SPT ‘N’ values of the granular fill ranged from 9 to more than 50 blows per 0.3 m. Water contents measured in granular fill samples varied from about 6 % to 7 %.

Two (2) sieve analyses were carried out on the selected samples of granular fill zone from Boreholes BH B1 and BH B22. The test results are presented in Table B1.1 and are also shown in the Record of Boreholes.

Table B1.1: Results of Grain Size Distribution Analysis (Granular Fill)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Soil Classification
				Gravel	Sand	Fines		
						Silt	Clay	
BH B1	SS1A	0.3 - 0.8	211.2 - 210.7	32	56	12		GRAVELLY SAND, some fines. Sample does not meet OPSS1010 Granular A or B due to excessive fines content
BH B22	SS1A	0.3 - 0.6	220.2 - 219.9	33	58	9		GRAVELLY SAND, trace fines. Sample meets OPSS1010 Granular B Type I

The grain size distribution curves are presented in Figure B-B1 in Appendix B-B.

B1.4 Silty Clay Fill

Silty clay fill was encountered at the ground surface or below the topsoil / granular fill soils at all borehole locations. The silty clay fill was generally brown, dark grey, or black in colour and contained some sand and trace to some gravel, with trace of organics noted in several boreholes. The silty clay fill extended to a minimum depth of about 0.6 m below the existing ground surface to a maximum depth of 3.7 m (Elevations 206.8 m to 222.7 m). In Boreholes BH B1, BH B22, and BH B24, the silty clay fill was encountered to the termination depths of the boreholes at 1.5 m to 2.1 m below ground surface. The SPT ‘N’ values of the silty clay fill ranged from 4 to 36 blows per 0.3 m. The measured water contents of the silty clay fill samples ranged from about 13 % to 47 %.

B1.5 Silty Clay / Clayey Silt Till

Natural silty clay / clayey silt till was generally encountered below the fill soils in all boreholes except Boreholes BH B1, BH B22, and BH B24, which were terminated within the silty clay fill. Where encountered, the silty clay / clayey silt till extended to the termination depths of all boreholes except in Borehole BH S4. The silty clay / clayey silt till was brown, grey, or black in color, and contained trace to some gravel, cobbles/boulders, and oxidation. Layers of silty sand and sand and silt were encountered at Elevation 207.2 m in Borehole BH B2 and Elevation 205.6 m in Borehole BH B7/S5, respectively. The SPT ‘N’ values of the silty clay / clayey silt till ranged from 5 blows to greater than 50 blows per 0.3 m, implying a firm to hard consistency, but were generally over 15 blows per 0.3 m, i.e. generally very stiff to hard. The measured water contents of the silty clay / clayey silt till samples ranged from about 9 % to 28 %.

Gradation and Atterberg Limits tests were carried out on five (5) samples from the till deposit, the results of which are presented in Table B1.2, and shown in the Records of Boreholes.

Table B1.2: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Clayey Silt / Silty Clay Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH B11	SS 3	1.6	210.7	2	24	49	25	26	16	10	CL
BH B17	SS 3	1.6	216.9	5	21	47	27	28	17	11	CL
BH B25	SS 6	4.1	218.4	1	10	49	40	35	19	16	CI
BH B27	SS 3	1.8	221.6	1	18	53	28	31	18	13	CI
BH S3	SS 6	3.8	206.9	3	33	46	18	22	12	10	CL

The grain size distribution curves and plasticity chart are presented in Figure Nos. B-B2 and B-B3 in Appendix B-B.

B1.6 Silty Sand / Sand and Silt Till

A layer of silty sand to sand and silt till was encountered within the silty clay / clayey silt till in Boreholes BH B2 and BH B7/S5 and extended to about 3.7 m to 4.5 m depth below the existing ground surface (Elevation 206.5 m to 204.8 m). The silty sand to sand and silt till was brown to grey in color and contained trace to some gravel and traces of clay. The SPT 'N' values of the till were 65 and 58 blows per 0.3 m of penetration, indicating a very dense state of compactness. Two water contents measured in the silty sand to sand and silt till were 11 % and 12 %.

Two (2) gradation tests were carried out on samples of the silty sand to sand and silt till, the results of which are presented in Table B1.3, and shown in the Records of Boreholes.

Table B1.3: Results of Grain Size Distribution Analysis (Silty Sand / Sand and Silt)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Soil Classification
				Gravel	Sand	Fines		
						Silt	Clay	
BH B2	SS 5	3.1	207.1	14	49	33	4	SILTY SAND, some gravel, trace clay
BH B7/S5	SS 6	3.8	205.5	4	43	50	3	SAND AND SILT, trace gravel, trace clay

The grain size distribution curves are presented in Figure B-B4 in Appendix B-B.

B1.7 Silty Sand / Sandy Silt Till

Natural silty sand / sandy silt till were encountered in Boreholes BH S3 and BH S4 below the silty clay / clayey silt till, and extended to the termination depth of the boreholes at 9.4 to 9.8 m (Elevation 201.2 to 200.8 m), respectively. The silty sand / sandy silt till was grey in colour and contained traces clay and gravel. SPT 'N' values measured in the silty sand / sandy silt till ranged between 35 blows to more than 50 blows per 0.3 m indicating dense to very dense compactness. Cobbles and boulders were encountered in the silty sand / sandy silt till.

Water contents measured in silty sand / sandy silt till samples varied from 15 % to 17 %.

One (1) gradation test was carried out on one sample of the till, the results of which are presented in Table B1.4, and also shown in the Record of Borehole.

Table B1.4: Results of Grain Size Distribution Analysis Tests
(Silty Sand / Sandy Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Soil Classification
				Gravel	Sand	Fines		
						Silt	Clay	
BH S3	SS 9	7.7	203.0	1	35	56	8	SANDY SILT TILL, trace clay, trace gravel

The grain size distribution curve is presented in Figure B-B5 in Appendix B-B.

B1.8 Groundwater

Upon completion, groundwater was encountered in Boreholes BH B2, B7/S5, BH B9, BH B20, BH B21, BH S6, BH S3, BH S4 and BH S6 at depths of 1.2 to 7.6 m below the existing ground surface. Groundwater was not encountered in the remaining boreholes.

Two (2) monitoring wells were installed, one each in Boreholes BH B7/S5 and BH S4, at the location of the culverts crossing. The groundwater depths measured in the boreholes at the time of drilling or upon completion of drilling, where encountered, and in subsequent measurements in the monitoring wells are summarized in Table B1.5 and shown on the Record of Boreholes.

Table B1.5: Results of Groundwater Level Measurements

Borehole No.	Groundwater Measurements					
	During or Upon Completion of Drilling (m)			In Monitoring Well (m)		
	Date	Depth	Elevation	Date	Depth	Elevation
BH S3	10-Jan-20	7.0	203.7	Not installed		
BH S4	10-Jan-20	7.6	203.0	Well damaged by others (road construction)		
BH B2	23 Jan 2020	3.7	206.5	Not installed		

Borehole No.	Groundwater Measurements					
	During or Upon Completion of Drilling (m)			In Monitoring Well (m)		
	Date	Depth	Elevation	Date	Depth	Elevation
BH B7/S5	26 Feb 2020	5.8	203.5	4 May 2020	-0.7	210.0
				12 May 2020	-0.5	209.8
BH S6	26 Feb 2020	5.5	203.5	Not installed		
BH B9	20 Feb 2020	4.3	208.2	Not installed		
BH B20	24 Jan 2020	1.2	218.7	Not installed		
BH B21	24 Jan 2020	2.7	218.1	Not installed		

Note: Negative (-ve) values indicate that the groundwater level is above the ground surface (artesian).

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months, and in response to major weather events.

B1.9 Soil Corrosivity

Two (2) soil samples were submitted for corrosion analysis to determine the corrosive potential of the soils with respect to buried metallic structures. The results of the analyses are presented Table B1.6, and the laboratory test certificate is included in Appendix D.

Table B1.6: Soil Corrosivity Test Results

Parameter	Units	BH S6-SS5	BH 24- SS1
Chloride	ug/g or (ppm)	13	54
Sulphate	ug/g or (ppm)	24	68
pH	pH Units	8.20	8.15
Electrical Conductivity	mS/cm	0.145	0.335
Resistivity	Ohm-cm	6900	2990

As per ASTM STP 1013 (Effects of Soil Characteristics on Corrosion – "*chloride appears to be the main factor in increased soil corrosivity with levels in excess of 0.01 % (100 µg/g) considered indicative of accelerated corrosion*". The chloride content measured in the sample was less than 100 µg/g. In accordance with Table 1 of CSA A23.1-14 and based on "structurally reinforced concrete exposed to chloride, with or without freezing and thawing" and based on project location, exposure class "C-1" can be used. Class should be based on structure location and/or durability requirement.

In accordance with Table 3 of CSA A23.1-14, no additional requirement is specified for sulphate content below 0.10 % (i.e. 1,000 ppm or µg/g) below the "moderate degree of exposure" with respect to concrete. Therefore, in accordance with Table 6 of the Canadian Standards Association (CSA) Series A23.1-14, Type GU Portland cement can be used based on the water-soluble sulphate content measured in soil.

As noted in ASTM -STP 1013 (*Effects of Soil Characteristics on Corrosion*), pH values between 4.0 and 8.5 have very little effect on corrosion (American Water Works Association (AWWA) Standard C 105-72 (Table 1 – Soil-Test Evaluation AWWA Rating).

The measured soil resistivity value of 6900 ohm-cm from Borehole BH S6-SS5 and 2990 ohm-cm for Borehole BH 24-SS1 can be considered as "low" and "moderate", respectively, for exposed metallic structures, based on ASTM STP 1000, Corrosion Testing and Evaluation - Table 3 (Corrosivity for Uncoated Steel).

Protection against steel corrosion, where required, could include one or a combination of: adequate concrete cover, low-permeability concrete, corrosion inhibitors; coated reinforcing steel; clad reinforcing steel; and corrosion-resistant alloy reinforcement.

A corrosion specialist should be retained, if necessary, to review the analysis results and provide relevant recommendation.

B2.0 PAVEMENT INVESTIGATIONS AND DESIGN

The purpose of the pavement investigation was to obtain subsurface information and to provide geotechnical recommendations for new construction of Arterial A2 which will be north / south oriented, and as the City's road classification, it is a Major Arterial road. The length of the investigation of the new road is about 3.3 km.

The proposed Arterial A2 is a new alignment designated as rural road with 6-lanes from Mayfield Road to Major MacKenzie Drive / RR 50. The discussions and recommendations in the following sections are general in nature as the details of the new alignment were not available at the time of this report. At the time of this report, seven (7) boreholes (BH B29 to BH B33), located in the private lands north of Countryside Drive, could not be drilled and have been deferred to detailed design stage, if required. Therefore, the subsurface profile and the discussions and recommendations in the following sections are applicable only to the planned road section up to Borehole BH B28 (Sta. 2+700). Additional investigation should be carried out for the section from Borehole BH B28 (Sta.2+700) to Mayfield Road (Sta. 3+300) during detailed design.

The subsurface soil profile at the site consisted of granular and cohesive silty clay fills, and native soils (silty clay /clayey silt till, silty sand / sandy and silt, silty sand / sandy silt till) which extended to the termination depths of the boreholes that ranged from 1.5 m to 9.8 m below ground surface.

All boreholes were open and dry upon completion to their respective vertical limits of investigation except eight (8) boreholes (BH B2, BH B7/S5, BH B9, BH B20, BH B21, BH S3, BH S4, BH S6). The termination depths of the open and dry boreholes ranged from 1.5 m to 5.2 m below ground surface.

The discussions and recommendations in the following sections are based on the subsurface information obtained from the boreholes and are intended for use by Design Engineers.

B2.1 Visual Pavement Condition Survey

Not applicable, as this is a new construction.

B2.2 Subsurface Conditions

At the time of this report, a total of thirty-one (31) boreholes had been drilled along the proposed central line of the Arterial A2 and at two culvert locations, between Mayfield Road and Major Mackenzie Drive / RR 50 (approximately 3.3 km). As noted above, five (5) boreholes have not been drilled and are to be drilled at a later date.

The subsurface soil profile at the site consisted of surface covering materials (topsoil, asphalt, and/or fill) overlying native soils. The thickness of topsoil ranged from 100 mm to 300 mm, asphaltic concrete ranged from 140 mm to 200 mm were encountered at Boreholes BH B2 (at intersection of Highway 50 and Coleraine Drive) and BH B22 (drilled at Countryside Drive), granular fill material (gravelly sand and sand and gravel) ranged from 400 mm to 660 mm, and silty clay fill material was encountered to the maximum depth of to 3.7 m. The native soils (silty clay /clayey silt till, silty sand / sand and silt, silty sand / sandy silt till) extended to the termination depths of the boreholes which ranged from 1.7 m to 9.8 m as detailed in the Record of Boreholes.

Additional subsurface information is provided in Section B1.0 and in the Record of Boreholes.

B2.3 Groundwater Conditions

Groundwater was encountered in a number of boreholes during and on completion of drilling in the open boreholes at depths varying from 7.6 m below ground to 0.7 m above ground (artesian condition), as listed in Table B1.5. It should be pointed out that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

B2.4 Pavement Design

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations for new construction of new 6-lane north-south major arterial road (Arterial A2).

The discussions and recommendations in the following sections are based on the available information and the subsurface information obtained from the boreholes and is intended for use by Design Engineers.

B2.4.1 Forecasted Traffic Data

The traffic data represented as Average Annual Daily Traffic ($AADT_{2016}$) in both directions was estimated by Wood Traffic Group as presented in Table B2.1. This traffic data was used to projected traffic data for 20 years design life. Equivalent single axle loads (ESALs) were calculated cumulatively over 20 years as described in the Ministry of Transportation Report "Procedures for Estimating Traffic Loads for Pavement Design, 1995".

Table B2.1: Traffic Data along Coleraine Drive from Arterial A2 to Mayfield Dr, Ontario

AADT in Both Directions 2020(1)	Growth Rate (%)	Comm. Vehicles (%)	Design ESALs @ 20 Years	Traffic Category
9,780	2.0%	6.0%	5,058,663 ~ 5.1×10^6	**Category** C

(1) 2020 is the anticipated construction year.

B2.4.2 Flexible Structural Pavement Design

After reviewing the field data and laboratory test results, the minimum pavement structural design for the new construction of the Arterial A2 is presented in Table B2.2 and was determined in accordance with the 1993 American Association of State Highway and Transportation Officials ('AASHTO') Guide for the Design of Pavement Structures using the Darwin Software Program.

The AASHTO Pavement Design is considered to be a function of estimated future traffic in both directions (ESALs), reliability (R), which is a function of road classification, overall standard deviation (S_o), resilient modulus (M_r), as well as initial and terminal serviceability (P_o, P_t). From these parameters, the structure number (SN) is calculated. The SN is defined in the AASHTO Guide as a number, which provides a measure of the pavement strength and thickness needed to avoid overstressing the subgrade.

The following design parameters were chosen to calculate the required structure number for the design of flexible pavement using the AASHTO method, as described in the Ministry of Transportation Materials Information Report MI-183 "*Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions*".

- Initial serviceability,	$P_i = 4.5$;
- Terminal serviceability,	$P_t = 2.5$;
- Reliability level,	R = 90 percent;
- Overall standard of deviation,	$S_o = 0.49$;
- Subgrade Resilient Modulus, M_r (kPa)	$M_r = 30,000$

Table B2.2: Recommended Minimum Structural Pavement Design

ESALs	AASHTO Design for 20 Years					Recommended HMA & PGAC		Traffic Category
						Marshall		
	HMA	Gran A	Required Design SN	Selected SN	Total Pavement Thickness	HL 3 (HS) /HL 1 Surface Course	HL8 Binder Course	
	Thickness (mm)							
5.1 X 10^6	170	Gran A = 450 mm or Gran A = 150 mm Gran B Type II = 300 mm	133	134	620	SP 50 mm PGAC 64-28	60+60 mm PGAC 58-28	C
The Regional Minimum Pavement Structure Design for Arterial Roads								
3.0 X 10^6	160	Gran A = 150 mm Gran Type II = 450 min (subgrade base slopes at 3% and top of subgrade at 2, so depth varies).	-	151.2	760	40-50 HL1	100-110 mm HL8 (HS)/HDBC	C
						No rap. No engine oils, min PGAC of 64-28)		

Notes:

- Pavement shall be placed over approved subgrade.
- Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

The Regional minimum design was selected for the road widening since it is intended to be Regional road.

B2.5 Recommendations and Construction Features for Pavement

B2.5.1 New Construction

Pavement recommendations for new alignment is presented in Table B2.3, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS.MUNI 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Table B2.3: New Construction of Arterial Widening of Arterial A2

HMA		PGAC	Traffic Category
Type	Thickness (mm)		
HL 1 / DFC – Surface Course	50 mm	64-28	C
HL 8 (HS) / HDBC – Binder Course	50 mm 60 mm	64-28	
Granular Base 'A'	150 mm	-	-
Granular Subbase 'B' Type II	**450 mm**	-	-
Total Pavement Structure	**760 mm**		

B2.5.2 Subgrade / Road Base Preparation and Compaction

The pavement structural design recommended for roads is applicable, provided the subgrade is prepared under dry weather conditions, proof-rolled with a heavy rubber-tired vehicle (such as a grader or loaded dump truck) in the presence of the geotechnical consultant. Any loose, soft or unstable areas, if detected during proof-rolling, must be sub-excavated, replaced with approved granular materials and compacted. Any additional engineered fill, if required, should be placed in thin layers not exceeding 200 mm and compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD). Granular materials should be placed in thin layers not exceeding approximately 200 mm, within ± 2 % of its optimum moisture content, and thoroughly compacted to a minimum of 100 % of SPMDD.

The subgrade should be provided with adequate drainage. If wet weather conditions prevail at the time of construction, adjustments to this design may be required, i.e. if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional sub-base material is best determined during construction.

All granular base and sub-base materials must be compacted to at least 100% of SPMDD.

B2.5.3 Stripping and Sub-Excavation

No additional sub-excavation, other than removal of organics and topsoil (ranging in thickness from 100 mm to 300 mm), are anticipated within the widening limits. However, any unsuitable soft or saturated material should be removed. Deeper stripping depths may be required, depending on the actual site conditions between borehole locations.

B2.5.4 Drainage

Prior to completing the rehabilitation, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project.

To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times. This can be accomplished by ensuring proper grading of the subgrade and positive lateral drainage of the granular base daylighting at the ditch. Alternatively, full-length perforated subdrain pipes of 150 mm diameter should be installed along both sides of the road, below the roadbed level, to ensure effective drainage, in accordance with OPSD 216.021. The sub-drain pipes should be wrapped in suitable non-woven geotextile surrounded by a minimum drainage zone of 19 mm size clear stone of minimum 150 mm thickness. A minimum slope of 2 % should be maintained across the paved sections (finished road surface) to ensure proper surface drainage. New pavement should slope towards the gutter/ditch.

B2.5.5 Hot Mixes and PGAC Type

The following Marshall hot mixes should be used on Arterial A2:

- DFC / HL 1 surface course mix and HL 8 (HS) /HDBC binder course should be used to provide the roadway with high durability.

Material Specification should be as per OPSS 1150 Material Specification for Hot Mix Asphalt. For aggregates, the material specification should be as per OPSS.MUNI 1003.

Performance Graded Asphalt Cement ("PGAC") 64-28 should be used only for surface course and PGAC 58-28 for binder course. This PGAC should satisfy the requirements of MP1 of SHRP Specifications for Superpave.

Recycled Materials: The use of reclaimed asphalt pavement (RAP) is not permitted as per the Regional minimum requirements for Marshall mixes for the Regional Arterial Roads.

Steel slag aggregates should not be allowed.

Transition Treatments at Limits of Paving: At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered at a distance of not less than 5 m, in accordance with OPSS.PROV 313. It should be ensured that no joint location corresponds with a joint location in any other layer.

The transition treatment from earth cut to earth fill should be in accordance with OPSD 205.010.

Tack Coat: It is recommended that all milled surfaces, and binder course surfaces will be tack coated prior to top course asphalt, if exposed to extended traffic. Construction Specification should be as per OPSS Prov. 308, April 2007.

B2.5.6 In-Situ Compaction for Hot Mix

In all areas, asphaltic concrete should be compacted as per OPSS.MUNI 310, Table 10 (April 2011). It should be noted that the granular base and sub-base materials should be compacted to the City's standards or to minimum 100 % SPMDD.

Field Quality Assurance: Plate samples of loose hot mix should be obtained for each paving day, and extraction/gradation and full Marshall compliance testing should be carried out on these samples. The finished surface shall be true to required profile and cross-section within 6 mm from required elevations and thickness. The surface shall show no depressions or bumps exceeding 3 mm under a 3.0 m long straight edge, placed parallel to the road centreline.

B2.6.7 Frost Depth

A minimum depth of 1.4 m should be used for frost protection as per OPSD 3090.101.

B2.6.7 Detouring

No long-term detouring is planned. Therefore, no special treatment will be required.

B3.0 UNDERGROUND UTILITIES

The geotechnical investigation scope of work included obtaining subsurface conditions and providing recommendations for installation of proposed underground utility services. Accordingly, selected boreholes (i.e. alternating pavement boreholes) were deepened to a depth of 3 m to 5 m, as listed in Table 5.2. Information obtained from all relevant boreholes drilled along proposed alignment of Arterial A2 have been considered in this section, as applicable.

B3.1 Subsurface Conditions

At the time of this report, a total of thirty-one (31) boreholes had been drilled in along the alignment of the proposed road (at and south of Countryside Drive) and at culvert locations (one existing and one proposed) to depths varying from about 1.5 m to 9.8 m, for pavement investigation, underground utility installation and two culverts. Five (5) boreholes (i.e. BH B29 to B33), located north of Countryside Drive, have been deferred to detail design stage, if required.

Overall, the project site along Arterial A2 (from Sta. 0+000 to Sta. 2+700) consisted of surficial cover (topsoil, asphaltic concrete, and / or exposed fills) underlain by fill soils (granular and / or silty clay) overlying native soils (silty clay / clayey silt till, silty sand to sand and silt and / or silty sand / sandy silt till). Within the drilled depth, the fill soils extended to depths varying from about 0.6 m to 3.7 m (Elevations 206.8 m to 222.7 m) below the existing ground surface. Generally, till soils (silty clay / clayey silt and / or silty sand / sandy silt) were confirmed to a depth of about 9.8 m (up to Elevation 199.3 m) below existing ground surface in the deeper boreholes at the structure locations.

Groundwater levels measured in the boreholes (upon completion of drilling) and subsequently monitoring wells varied from 0.7 m above ground to 7.6 m (Elevations 210.0 m to 203.0 m) below ground surface.

Detailed subsurface and groundwater conditions are provided in Section B1.0.

B3.2 Discussions and Recommendations for Underground Utilities

As per information available, the proposed Arterial A2 will include installation of underground utilities and associated manholes and catch basins. Details of the installation were not available at the time of this report. Existing utilities, if any, should be protected and taken into consideration for design and construction of the proposed underground utilities and road.

The ground (road) elevations along the alignment (based on borehole locations up to the investigated limits) varied from about 209.0 m (at BH S6) to 223.4 m (at BH 28), with the overall the ground surface was sloping up from south (Highway 50) to north (towards Mayfield Road).

The recommendations and discussions for excavation and installation of underground utility services, and associated manholes / catch basins, are provided in the following sections.

B3.2.1 Founding Subgrade Conditions

From the investigation result, fill soils (granular, silty clay) were present to depths varying from 0.6 m to 3.7 m below existing ground / road level. The granular fill was encountered to depths varying from 0.4 m to 1.2 m in four boreholes that were drilled on the road / shoulder and one borehole (BH B24) drilled next to a vegetated area. The SPT values in the silty clay fill implied a firm to hard consistency. The granular fill, where encountered, was loose to very dense.

The native soils below the fill soils were of generally very stiff to hard consistency (with occasional firm to stiff areas) and / or of dense to very dense compactness overall, and should be generally competent to support underground utility services.

It is recommended that the inverts of underground utilities be founded on native soils, or competent fill soil subgrade. Soft / loose soils encountered at the founding level should be compacted, if possible, or otherwise, should be sub-excavated and backfilled with compacted soil as recommended in Section B5.3 (Engineered Fill).

For manholes and catch basins founded on competent subgrade (i.e., approved existing fill, imported engineered fill, native soils), a Geotechnical Reaction at Serviceability Limit State (SLS) of 100 to 150 kPa and a factored Geotechnical Resistance at Ultimate Limit State (factored ULS) of 150 to 225 kPa, depending on the subgrade conditions, may be used, which should be verified by a geotechnical engineer during construction. Under the SLS bearing values, settlements of up to 25 mm may take place.

The frost penetration depth for the project area should be considered as 1.4 m.

The highest groundwater elevation measured during the investigation within the investigated project limits of the proposed Arterial A2 was at Elevation 218.1 m (2.7 m below ground surface). It should be noted that groundwater level measured in the monitoring well installed at Borehole BH B7/S5 location (drilled for proposed culvert) was up to 0.7 m above existing ground surface (up to Elevation 210.0 m). As such, groundwater may be present within the excavation depths for the underground utilities. Also, perched water in sandy / silty pockets and / or water from surface runoff will require dewatering during excavation. As the excavation will generally be in clayey soils, groundwater seepage, if any, into the excavation is likely to be slow and a properly filtered sump and pump system, or gravity drainage, may be used for dewatering excavation.

General discussions regarding excavation and dewatering are provided in Section B5.4. Detailed dewatering consideration for the project is included Wood's hydrogeological investigation report, which is submitted under a separate cover.

Trench excavation, pipe bedding, backfill, and anti-seepage collar considerations are discussed in following sections.

General discussions provided in Section B5.0 should also be considered for design and construction.

B3.2.2 Trench Excavation

Trench excavation should be carried out as per the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects. The soils classifications are shown in Section B5.4. Based on the soils encountered in the boreholes, the sides of excavations are expected to be temporarily stable at 1H:1V for Type 2 and Type 3 soils, provided excavations are properly dewatered and underground utilities are installed and backfilled within a reasonable short period of time. Provisions should be made for dewatering, as noted in Section B5.4. Trenching should be in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

It is important for frost heave compatibility that the trench backfill within the frost zone of 1.4 m depth matches the soil exposed on the trench walls.

B3.2.3 Bedding

Bedding for underground pipes should be placed in accordance with the design requirements and current Ontario Provincial Standards (OPS) specifications (Ontario Provincial Standard Drawing (OPSD) 802.10 for flexible pipes and OPSD 802.30, 802.31 and 802.32 for rigid pipes). It is recommended that a minimum of

150 mm thick bedding material (Class ‘B’ Type or better) be placed below the pipe invert. The thickness of the bedding may, however, need to be increased depending on the pipe diameter, or if wet or weak subgrade conditions (soft or loose) are encountered. If the subgrade is weak and cannot be completed, it should be sub-excavated and replaced with engineered fill to support the pipes and allow the use of Class 'B' Type bedding. If weak subgrade is encountered and cannot totally be removed, Class ‘A’ Type bedding (e.g. minimum 100 mm thick lean concrete) should be used to provide a workable surface and support the proposed pipes.

For the areas to be filled, the fill soils should first be placed approximately to final grade and subsequently excavated to install the underground pipes in order to prevent pipe settlement due to overburden loads.

Should the pipes be installed in soft clay soils, the joints should be restrained from movements and the backfill around the pipes should be properly compacted in order to prevent long-term movements. A layer of geotextile (Terrafix 270R or equivalent) should be placed between the soft clayey soils and the granular bedding/backfill in order to prevent soil migration.

The possibility of pipe movements in soft clayey soils, after installation, should be considered in the design and construction of the underground pipes.

Construction of underground pipes should be carried out in accordance with the relevant OPSS.MUNI 410 (Construction Specification for Pipe Sewer Installation in Open Cut), or other relevant applicable municipal / regional standards.

B3.2.4 Backfill

Based on the visual and tactile examination of the soil samples, the on-site excavated granular / silty clay fill and native soils may be re-used as backfill in sewer trenches provided their moisture contents at the time of construction are at or near the optimum. Moisture conditioning of the sub-excavation soils may be required prior to reuse. The excavated cohesive fill should be carefully examined for organic content and moisture condition by qualified geotechnical personnel in order to confirm the need for moisture conditioning or its acceptability for use as backfill.

The backfill should be placed in maximum 200 mm thick layers at or near (± 2 %) optimum moisture content, and each layer should be compacted to at least 95 % Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the manhole / catch basins should be brought up simultaneously on all sides and operation of heavy equipment near the walls should be restricted to minimize potential movement and/or damage.

Unsuitable material such as organic soils, boulders, cobbles, frozen soils, etc., should not be used for backfilling.

B3.2.5 Anti-Seepage Collars

From the borehole information, the underground utilities will most likely be installed in clayey soil (silty clay fill, silty clay / clayey silt till). As such, anti-seepage collars should not be required.

B4.0 CULVERTS ON ARTERIAL A2 (STATIONS 0+000 and 0+650)

Two (2) culverts (one existing and one proposed) are located within the project limits of the proposed Arterial A2, as listed in Table 5.2.

The existing culvert is located under Highway 50 just south of its intersection with Coleraine Drive, where the proposed Arterial A2 will connect to Highway 50 (approximate at assumed Sta. 0+000 for Arterial A2). The geotechnical investigation program consisted of drilling two (2) boreholes (BH S3 and BH S4) at the existing culvert location to obtain subsurface condition at the culvert locations and to provide geotechnical recommendations.

A new culvert is proposed at the planned intersection of Arterial A2 and E-W Arterial, at approximate Sta. 0+650 of Arterial A2. The geotechnical investigation program consisted of drilling two (2) boreholes (BH B7/S5 and BH S6) at the proposed culvert location to obtain subsurface conditions at the culvert location and to provide geotechnical recommendations.

Details of the existing culvert, rehabilitation / extension and proposed culvert were not available at the time of preparation of this report.

The stratigraphic units and groundwater conditions for each culvert are discussed in the following sections and presented in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the soil conditions encountered at the proposed culvert location. The soil and groundwater conditions might vary between and beyond the borehole locations.

B4.1 Subsurface Conditions - Culvert on Arterial A2 (Station 0+000)

Two (2) boreholes (BH S3 and BH S4) were drilled at the vicinity of two ends of the existing culvert on Highway 50 (approximate Sta. 0+000), just south of Colerain Drive. The boreholes were drilled to depths of 9.4 m and 9.8 m below the existing ground surface, respectively. The existing culvert is a concrete culvert. Other detail of the existing culvert was not available at the time of this report. The culvert and borehole locations are shown on Figure No. 2A.

Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location generally consisted of fill soils (sand and gravel and silty clay / clayey silt fill), which were exposed at the ground surface. Native silty clay / clayey silt till and silty sand / sandy silt till were encountered underlying the fill soils in both boreholes. Groundwater was encountered in the drilled Boreholes BH S3 and BH S4 at depths of 7.0 m (Elevation 203.7 m) and 7.6 m (Elevation 203.0 m) below the existing ground surface, respectively.

B4.1.1 Fill Soils

Fill soils were encountered at the surface of both boreholes and consisted of sand and gravel fill and silty clay fill, which extended to a depth of 3.0 m and 3.7 m below the existing ground surface in Boreholes BH S3 and S4, respectively.

The sand and gravel fill was dark grey to brown and contained trace to some silt. The silty clay fill, which was encountered below the sand and gravel fill, was dark grey to black in colour and contained trace to some sand, some gravel and traces of organics. SPT 'N' values measured within the fill soils ranged from 9 to 45 blows per 0.3 m. Water contents measured in the fill samples ranged from 5 % to 29 %.

B4.1.2 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the fill soils and extended to depths of 7.2 m at Borehole BH S3 and 9.4 m at Borehole BH S4.

The silty clay / clayey silt till was brown to grey in colour, with some sand to sandy and traces of gravel. SPT 'N' values measured within the silty clay / clayey silt till ranged from 15 blows to more than 50 blows per 0.3 m, implying stiff to hard consistency. Water contents measured in the silty clay /clayey silt till ranged between 9 % and 15 %.

Gradation and Atterberg Limits tests were carried out in one (1) sample (SS 6) from Borehole BH S3, the results of which are presented in Table B1.2 above and shown on the Record of Borehole.

B4.1.3 Silty Sand / Sandy Silt Till

Native silty sand / sandy silt till were encountered in Boreholes BH S3 and BH S4 below the clayey silt / silty clay till, and confirmed to the termination depth of the boreholes at 9.4 and 9.8 m (Elevation 201.2 and 200.8 m), respectively. The silty sand / sandy silt till was grey in colour and contained traces of clay and gravel. SPT 'N' values measured in the silty sand / sandy silt till ranged between 35 blows to more than 50 blows per 0.3 m indicating dense to very dense compactness. Water contents measured in silty sand / sandy silt till samples varied from 15 % to 17 %.

One (1) gradation test was carried out in one sample (SS 9) from Borehole BH S3, the results of which are presented in Table B2.4 above, and also shown on the Record of Borehole.

B4.1.4 Groundwater Conditions

Upon completion, groundwater was encountered in Boreholes BH S3 and BH S4 at depths of 7.0 m (Elevation 203.7 m) and 7.6 m (Elevation 203.0 m) below the existing ground surface, respectively.

One (1) monitoring well was installed in Borehole BH S4. Groundwater depth measured in the boreholes during drilling, and subsequent measurements in the monitoring well are summarized in Table B1.5 above and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

B4.2 Subsurface Conditions - Culvert on Arterial A2 (Station 0+650)

Two (2) boreholes (BH B7/S5 and BH S6) were drilled at the vicinity of the proposed culvert at Sta. 0+650. Both boreholes were drilled to depths of about 9.8 m below the existing ground surface. Details of the proposed culvert was not available at the time of this report. The culvert and borehole locations are shown on Figure No. 2A.

Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location generally consisted of fill soils (silty clay / clayey silt fill), which were below the surficial cover of topsoil. Native silty clay / clayey silt till was encountered underlying the fill soils in both boreholes. Groundwater level measured upon completion of drilling in both boreholes (BH B7/S5 and BH S6) was at Elevation 203.5 m, corresponding to depths of 5.8 m and 5.5 m below the existing ground surface, respectively. Groundwater level above ground surface was measured subsequently in the monitoring well installed in Borehole BH B7/S5.

B4.2.1 Topsoil

In Boreholes BH B7/S5 and BH S6, 150 mm and 100 mm of topsoil was encountered at the ground surface, respectively.

B4.2.2 Fill Soils

Fill soils were encountered below the surficial cover of topsoil in both boreholes and consisted of silty clay fill, which extended to a depth of 0.7 m below the existing ground surface in Boreholes BH S3 and BH S4.

The silty clay fill was dark brown in colour and contained trace to some gravel and traces of organics. SPT ‘N’ values measured within the fill soils were 4 and6 blows per 0.3 m. Two water contents measured in the fill samples were 40 % and 47 %.

B4.2.3 Sand and Silt

A layer of natural sand and silt was encountered within the silty clay/clayey silt till in Borehole BH B7/S5. The 0.8 m thick sand and silt extended to about 4.5 m depth below the existing ground surface (Elevation 204.8 m). The sand and silt was grey in color and contained trace gravel and clay. One (1) SPT 'N' value measured in the layer was 58 blows per 0.3 m of penetration, indicating a very dense state of compactness. Measured water content in the silty sand to sandy silt was 12 %.

One (1) gradation test was carried out in sample (SS6) from Borehole BH B7/S5, the results of which are presented in Table B1.3, and shown in the Records of Boreholes.

B4.2.4 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the fill soils and extended to the termination depth of both boreholes.

The silty clay / clayey silt till was brown to grey in colour, with some sand to sandy and traces of gravel. SPT 'N' values measured within the silty clay / clayey silt till ranged from 5 to more than 50 blows per 0.3 m, implying a firm to hard consistency. The cohesive till is generally hard except for within 2 m of the ground surface at both boreholes, where the cohesive till is firm to very stiff with the SPT 'N' values of 5 to 27 blows per 0.3 m of. Water contents measured in the silty clay /clayey silt till ranged between 9 % and 28 %.

B4.2.5 Groundwater Conditions

Upon completion, groundwater was encountered in Boreholes BH B7/S5 and S6 at elevation 203.5 m or depths of 5.8 m and 5.5 m below the existing ground surface, respectively.

One (1) monitoring well was installed in Borehole BH B7/S5. Groundwater level measured subsequently in the well was above ground level (artesian, up to 0.7 m above existing ground). The groundwater depths measured in subsequent measurements in the monitoring well are summarized in Table B1.5 above and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

B4.3 DISCUSSIONS AND RECOMMENDATIONS FOR CULVERT

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations with respect to proposed culvert construction and existing culvert rehabilitation / extension.

Within the depths of the four boreholes drilled adjacent to the existing culvert location, fill soils (sand and gravel and silty clay) were encountered to a depth of about 0.7 m to 3.7 m (Elevations 208.3 m and 205.6 m) below ground surface, overlying firm to hard and / or dense to very dense native soil deposits and/or till. The firm native soils were encountered immediately below the fill soils.

The foundation type of existing culvert and details of the proposed rehabilitation / extension were not available at the time of preparation of this report. Accordingly, general considerations for the culverts are presented the following sections.

B4.3.1 Foundation

Based on the boreholes drilled at or in the vicinity of the culvert locations, values of geotechnical reaction at Serviceability Limit State (SLS) and the factored geotechnical resistance at Ultimate Limit State (ULS) are provided in Table B4.1 which may be used for design.

Table B4.1: Recommended ULS / SLS Bearing Values for Culvert Foundations

Borehole No.	Founding Stratum	Depth Below Existing Grade (m)	Elevation (m)	Geotechnical Reaction at SLS (kPa)	Factored Geotechnical Resistance at ULS[1] (kPa)
BH S3	Fill	above 3.0 (±)	above 207.7 (±)	not recommended	not recommended
	Stiff to hard silty clay till / very dense silty sand / sandy silt till	below 2.2 (±)	below 207.7 (±)	200	300
BH S4	Fill	above 3.7 (±)	above 206.8 (±)	not recommended	not recommended
	Stiff to hard silty clay till / very dense silty sand / sandy silt till	below 2.2 (±)	below 206.8 (±)	200	300
BH B7/S5	Fill / firm silty clay / clayey silt till	above 0.7 (±)	above 207.9 (±)	not recommended	not recommended
	Very stiff to hard silty clay till	below 2.2 (±)	below 207.9 (±)	200	300
BH S6	Fill / firm silty clay / clayey silt till	above 1.4 (±)	above 207.6 (±)	not recommended	not recommended
	Stiff to hard silty clay till	below 2.2 (±)	below 207.6 (±)	200	300
Engineered fill per OPSS.MUNI 1010 (if used), as per Section B5.3				150	225

Notes: (1) A resistance factor of Φ = 0.5 has been applied to the ULS values provided.

The geotechnical bearing values provided in Table B4.1 are intended to assess the feasibility and sizes of footings and are for vertical loads (no inclination) without load eccentricity. Under the SLS pressures, foundation settlements could be up to 25 mm (total) and 20 mm (differential). Detail foundation analysis should be carried out, if necessary, to confirm SLS/ULS and corresponding settlements.

The design frost depth penetration is 1.4 m. All foundations should be covered by at least 1.4 m deep soil or equivalent synthetic thermal insulation.

Highest groundwater level measured during geotechnical investigation in the boreholes / monitoring well at the culvert location (Sta. 0+000) was at about Elevation 203.7 m. As such, a minimum groundwater level at Elevation 204 m or the creek water level, whichever is higher, should be considered for design.

At the culvert location (Sta. 0+650), groundwater was measured up to 0.7 m above ground (up to Elevation 210.0 m). Therefore, a minimum groundwater level at Elevation 209 m, i.e. the ground surface elevation at the location, should be considered for design. Additional investigation may be necessary to assess the artesian water, especially if a large excavation in anticipated at this location.

If required, the regional high flood level of the creek may be used.

During construction, considerable dewatering efforts and / or creek diversion (e.g., cofferdam, sheetpiles) to control the ingress of creek water may be required. General recommendations related to excavation and dewatering are presented in Section B5.4.

B4.3.2 Soil Parameters for Design

The unfactored soil parameters listed in Table B4.2 may be used for design of earth structures. It should be noted that these parameters are based on published information and/or semi-empirical/theoretical relationships, and are conservative and should be verified by field/laboratory testing, if more representative parameters are required.

Table B4.2: Unfactored Static Soil Parameters for Design

Material	Total Stress Analysis		Effective Stress Analysis		Earth Pressure Coefficients[1]			Bulk Unit Weight (kN/m^3)	Coefficient of Friction between Concrete and Soil
	C (kPa)	Φ (deg)	c′ (kPa)	Φ′ (deg)	Active K_a	At-Rest K_o	Passive K_p		
Stiff to hard silty clay / clayey silt till	100	0	0	30[2]	0.33	0.50	3.0	19	0.35
Very dense silty sand / sandy silt till	0	35	0	35	0.27	0.43	3.7	20	0.4

Material	Total Stress Analysis		Effective Stress Analysis		Earth Pressure Coefficients[1]			Bulk Unit Weight (kN/m^3)	Coefficient of Friction between Concrete and Soil
	C (kPa)	Φ (deg)	c′ (kPa)	Φ′ (deg)	Active K_a	At-Rest K_o	Passive K_p		
Engineered Fill [3]									
Granular A (OPSS.MUNI 1010)	0	35	0	35	0.27	0.43	3.7	24[4]	0.4
Granular B Type I or Type II (OPSS.MUNI 1010)	0	32	0	32	0.31	0.47	3.3	23[4]	

Notes: [1] Values based on semi-empirical relationships. For SLS, K_p values should be reduced to 1/3 of indicated value to limit lateral movement.
[2] Normally-consolidated range.
[3] All engineered fill should be compacted to at least 100 % SPMDD for supporting foundations.
[4] Unit weight values for engineered fill compacted to 100 % SPMDD. For backfill of retaining walls, unit weights for Granular A and Granular B compacted to 95 % SPMDD may be taken as 22 kN/m3 and 21 kN/m3, respectively.

B4.3.3 Earthquake Considerations

Based on the soil conditions observed in the boreholes (maximum drill depth of 9.4 m below ground) and the possible bedrock depth at the culvert location (~30 m), and in conformance with the criteria in Table 4.1 (Section 4.4.3.2 – Seismic Properties) of the Canadian Highway Bridge Design Code CSA S6-19 (“CHBDC”), the project site may be classified as Site Class D (“stiff soil”).

The design values of site coefficients F(T), F(PGA) and F(PGV) can be obtained from Geological Survey of Canada on Natural resources Canada website: ‘www.earthquakecanada.ca” or Tables 4.2 to 4.9 (Section 4.4.3.3 – Site Coefficients) of CHBDC, and the design spectral acceleration, S (T), should be determined as per Section 4.4.3.4 (Design Spectral Acceleration and Displacement Values) and Tables 4.2 to 4.9 in Section 4.4.3.3 of CHBDC.

B4.3.4 Scour Protection

Culvert and headwall footings should be protected against scour and erosion in the form of cut-off walls, rip-rap or equivalent. Scour protection should be designed based on the hydrology requirement by an experienced engineer. Alternatively, the foundations could be placed below the depth of scour and frost penetration. If rip-rap protection is used, it should be separated from the native soils with a geotextile filter fabric (e.g. Terrafix 600R or equivalent) or a filter zone of granular material. The embankment slope surface should be covered with topsoil and seeded/sodded as soon as possible after completion of construction.

B4.3.5 Backfill for Culvert

Backfill materials around culvert should consist of non-frost susceptible, free-draining granular materials in accordance with OPSS.MUNI 1010 (i.e., Granular 'A' or Granular 'B'). Such granular backfill should be compacted to at least 95 % SPMDD (Standard Proctor Maximum Dry Density). Free-draining backfill materials and the drain pipes and weep holes, etc., should be used provided to prevent hydrostatic pressure build-up.

Backfill, backfill transition and cover for the culvert should conform to Ontario Provincial Standard Drawing (OPSD) 3101.150 (*Walls, Abutment, Backfill, Minimum Granular Requirement*) or applicable City Standard.

Engineered fill is discussed in Section B5.3, and excavation and dewatering during construction are discussed in Section B5.4.

To increase sliding resistance, a shear key may be used, if required. The shear key can be designed using the unfactored K_p values for the soils provided in Table B4.2. The movement of the retaining structure to mobilize the passive resistance should be considered in the design.

B4.3.6 Retaining Wall

If retaining walls are constructed at the ends of the culvert (inlet and outlet), they may be founded on the stiff to hard native silty clay till. If required, the wall may also be founded on the engineered fill per OPSS.MUNI 1010. The frost and scour protection recommendations provided in Sections B4.3.1 and B4.3.4, respectively should also be adhered to in designing retaining wall foundations.

Soft fill areas should be recompacted (if possible) or replaced with the engineered fill described in Section B5.3. The founding subgrade should be verified by a geotechnical engineer. The SLS/ULS values and soil parameters provided in Tables B4.1 and B4.2 may be used for design of wall foundations, as required. Slope stability analyses should be carried for the retaining wall, once the detailed design is completed.

B4.3.7 Permanent Slopes

A slope of 2H:1V (2 Horizontal : 1 Vertical) or flatter should be constructed for permanent fill embankment. The embankment should be constructed using engineered fill (Section B5.3). Global slope stability should be analyzed during detailed design, if the new embankment height is higher than 2 m high, once the detailed design is finalized. All permanent slope surfaces should be protected against erosion by surface water and creek water.

Construction of the embankment should follow the requirements of OPSS.MUNI 206 (*Construction Specification for Grading*), or applicable City Standard.

B5.0 General Considerations for Design and Construction

B5.1 Site Preparation

Site preparation will likely generally include stripping of topsoil / asphalt / concrete, excavation to subgrade, proof-rolling, sub-excavating soft spots, if encountered, and backfilling, if necessary, with engineered fill.

All topsoil and loose soil or soil mixed with organic matter should be stripped from pavement areas, manhole / catch basin founding areas, and base of underground utility services. Subgrade preparation of pavement is discussed in Section B2.6.3. Any loose, soft or unstable areas in the exposed subgrade should be sub-excavated and replaced with approved fill and compacted (Section B5.3). Lean concrete may be used to backfill sub-excavated areas.

Excavation should be carried out with a temporary slope of 1H:1V or flatter above the groundwater level (Section B5.4). Roadway shoring protection systems may be required during construction of the culverts. Temporary shoring is discussed in Section B5.5.

B5.2 Embankment Widening

Based on site condition, the proposed road widening will generally involve fill sections along the investigation limits. The embankment required for road widening should be constructed with compacted engineered fill at 2H:1V (or flatter) side slopes. If a side slope steeper than 2H:1V slope is required or if the height of the embankment / cut slope is greater than 2 m, slope stability analysis should be carried out to assess stability of the planned slope, depending on the subsurface conditions. Where existing embankments are to be widened, the side slopes should be benched in accordance with OPSD 208.010 prior to placement of the widening fills. Final (permanent) embankment side slopes in granular fills should be established to match the existing slopes or as per OPSD 200.010. Final slopes should be treated with a seed and mulch to prevent ravelling.

Widening of the road will require, as a minimum, stripping the existing ground surface cover (topsoil, asphaltic concrete, vegetation cover, surficial fill soils, etc.) from the area required for road widening. The planned widening will generally be constructed to the same elevation as the existing road surface. Grading, backfilling and compacting should follow OPSS.MUNI 206 (Construction Specification for Grading), OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting), OPSS 501.MUNI (Construction Specification for Compacting), and / or the City’s requirements.

Backfilling, if required, for site grading (e.g., for subgrade raise, replacement of soft soil) should be placed as engineered fill. Engineered fill per OPSS.MUNI 1010 should be used to replace soft / incompetent soils and/or raising grade. Engineered fill should be prepared according to the City’s standards / contract specifications. Engineered fill is discussed in Section B5.3.

The fill soils used for embankment widening should consist of approved clean fill (e.g., Select Subgrade Materials - OPSS 1010).

B5.3 Engineered Fill

Engineered fill per OPSS.MUNI 1010, where required, may be used to backfill excavated areas, backfill around manholes, replace soft / incompetent soils, and / or raise grades. Engineered fill for backfill of excavated areas should be placed after stripping existing fill soils, any soils containing excessive organic matters and otherwise unsuitable soils.

Engineered fill can be prepared by placing fill soil and compacted as per OPSS.MUNI 501 (*Construction Specification for Compacting*) and/or applicable City Standard. Alternatively, engineered fill should be placed in loose layers not exceeding 200 mm. The water content of the fill should be within ± 2 % of its optimum moisture content (OMC) at the time of its placement, and it should be thoroughly compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD) in general.

The fill soils should consist of inorganic soils and should not be frozen during backfilling and compaction. Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. The compaction procedures and quality control should be overseen by a geotechnical engineer.

B5.4 Excavation and Dewatering

All excavations should be carried out in accordance with the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects (O. Reg. 213/91). The soils to be excavated can be classified as follows:

Existing fill soils	Type 3
Firm to hard silty clay / clayey silt till	Type 1 to 3 (varies by consistency)
Very dense silty sand / sandy silt till (above groundwater level / fully dewatered)	Type 1
Very dense silty sand / sandy silt till (below groundwater level)	Type 3

In accordance with the OHSA, a maximum short-term slope of 1H:1V is required to within 1.2 m of the trench bottom for temporary excavations in Type 1 and 2 cohesive till and native silty sand that is above the groundwater level, or properly dewatered. For Type 1 and 2 soils, a maximum depth of 1.2 m high vertical cut at the bottom of excavation may generally be constructed. However, under the groundwater table a 1.2 m high vertical cut may not be stable and flatter slopes may be required. Type 3 soils above the groundwater level may be inclined at 1H:1V or flatter from the bottom. In the case of saturated Type 3 fills or native granular deposits below the prevailing groundwater, if adequate dewatering is not implemented, slopes of open excavations will have to be reduced to 2H: 1V or flatter. In the absence of proper dewatering or groundwater control of Type 3 soils, slope flattening may be insufficient to prevent particularly saturated granular soils from becoming unstable and devolving to Type 4 materials. Near the ground surface, occasional 3H:1V or flatter slopes may be required due to loose/soft surficial soils. If open cut cannot be carried out, a temporary shoring system may be used to limit the extent of excavation. General consideration for temporary shoring is provided in Section B5.5.

Trenching should be carried out in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

Stockpiles, materials or any heavy equipment should be kept at least the same horizontal distance as the depth of the excavation from the upper edge of the excavation to prevent slope instability. All surface drainage should be directed away from any open excavations and trenches.

Based on observations at the borehole locations and planned excavation depth, normal excavation equipment should be suitable for excavation. Hard till soils may require additional effort for excavation (e.g., heavy excavator, rippers, impact hammer, etc.). The terms describing the compactness (very loose, loose, compact, dense, very dense) or consistency (very soft, soft, firm, stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation. It should be noted that cobbles / boulders can be encountered in the till and in fill soils. Therefore, removal of the cobbles / boulders should be considered and planned for.

During the construction, temporary runoff controls such as sediment trap, interceptor drain, dyke and / or silt fence should be installed to prevent uncontrolled water / sediment flow into existing water courses. The effluent from dewatering operations should also be filtered or passed through sediment traps to prevent turbidity.

Based on the soil and groundwater conditions at the borehole locations, groundwater control within the excavated area should not be significant. It should be noted at the location of culvert (Station 0+650), artesian condition (i.e., groundwater higher than ground level was measured. Additional investigation (such as test pitting) may be required at this location to confirm the artesian condition and / or to plan for groundwater control / dewatering. In the clayey soils, groundwater seepage into the excavation, if encountered, is likely to be slow and a properly filtered sump and pump system or gravity drainage may be used for dewatering the excavation. High water flow rates (e.g. from perched water in fills or granular layers with the cohesive tills) may be encountered during construction and the dewatering effort could require an increased number of sumps and pumps.

Use of a lean concrete mud mat or granular layer may be warranted where founding surfaces are to be exposed for extended period, especially if the work is carried out during wet weather. Care should also be exercised to minimize disturbance to the final subgrade during excavation.

It is recommended that qualified geotechnical personnel be present during the foundation excavation to review the conditions of the foundation subgrade.

B5.5 Temporary shoring

Temporary shoring may be required for vertical excavation during construction of culvert, installation of underground utilities or roadway protection. This can be accomplished using soldier piles with lagging (or similar) in order to support the sides of the excavation. Temporary shoring design and construction should comply with OPSS.MUNI 539 (*Construction Specification for Temporary Protection Systems*), or applicable City Standard. The temporary shoring system should be designed to resist the lateral earth, surcharge and hydrostatic pressures which could occur during construction. Bracings should be installed within the shoring system to minimize movements of the soils. The temporary shoring system should be designed in accordance with the latest editions of Canadian Foundation Engineering Manual's (CFEM) and Canadian Highway Bridge Design Code (CHBDC), together with the requirements of the Ontario Health and Safety Regulations, as applicable.

The shoring system should be designed and approved by a professional engineer. Geotechnical parameters provided in Section B4.3.2 may be considered for design of shoring.

B5.6 Suitability of Existing Soils for Backfilling

Most of the excavated soils (i.e. granular fills, clayey fill and till soils) can be suitable for being reused for backfill, provided they can be separately stored, properly compacted and are environmentally acceptable. Fill soils containing construction debris (or similar) and organic matter should not be reused. Soils that are too wet to compact will require additional processing (e.g., drying). Cobbles and boulders (larger than 100 mm in size), if any, should be discarded by mechanical means (e.g., sieving) or manual removal.

B6.0 PRELIMINARY SOIL CHEMICAL ANALYSES

Environmental soil chemical analyses were carried out to provide preliminary discussions for soil disposal options as part of the Geotechnical Investigation Preliminary Design for the Site, the results of which are discussed in the following section.

No Phase I or Phase II Environmental Site Assessment (ESA) reports have been conducted or provided to Wood for review.

It is assumed that a Record of Site Condition, (RSC) as per Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the *Environmental Protection Act* (EPA), as amended ("O.Reg.153/04, as amended") is not required at this time.

B6.1 Methodology

The environmental soil screening and laboratory analyses program was carried out in general accordance with the current *Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the Environmental Protection Act (EPA)*, as amended (O. Reg. 153/04) in order to characterize the soil at the Site and to provide an initial discussion on disposal options for surplus material during future construction. It should be noted that the scope of work does not meet the analytical or administrative requirements of Ontario Regulation 406/19 On Site and Excess Soil Management (O. Reg. 406/19) in the event that the soil is to be considered for beneficial reuse.

A Record of Site Condition (RSC) was not part of the scope of work. Due to the limited scope of work, further environmental assessment would be required in the event that an RSC is required.

B6.2 Sample Selection for Analyses

The environmental component of the preliminary subsurface investigation included the following activities:

- Conducting the soil sampling activities in accordance with the Ministry of the Environment (MOE) document entitled *"Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04"* dated June 2011, the Ministry of the Environment and Energy (MOEE) document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated December 1996; and MOE document entitled *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act"* issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol);
- Based on City of Brampton instruction, submission of eight (8) soil samples for laboratory analysis of metals & inorganics and organochlorine (OC) pesticides, and two (2) soil samples for analysis of volatile organic compounds (VOCs) and petroleum hydrocarbons (PHC) F1 to F4 to assist in determining appropriate soil disposal options, if required, during construction;
- Based on City of Brampton instruction, submission of two (2) soil samples for Ontario Regulation 347 (*O. Reg. 347*) as amended by Ontario Regulation 558/00 (*O. Reg. 558/00*) Toxicity Characteristic Leaching Procedure (TCLP) for four (4) or more of volatile organic compounds (VOCs), Organochlorine (OC) pesticides, polychlorinated biphenyls (PCBs), benzo(a)pyrene and metals and inorganics to determine landfill acceptability of soil/granular fill originating from the Site; and
- Comparison of the laboratory analytical results to soil standards presented in the Ministry of the Environment, Conservation and Parks (MECP) document entitled "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*," (the "MECP SCS") dated April 15, 2011 and *O. Reg. 347*, as amended by *O. Reg. 558/00*, Schedule 4 Leachate Quality Criteria provided in the MECP document entitled "*Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste*," October 2000 (the "Schedule 4 Criteria").

B6.2.1 Site Condition Standards

The analytical soil results were compared to the MECP Table 1 (background) SCS for all types of Property Use (except Agricultural) (Table 1 SCS) and MECP Table 3 (generic) SCS for Industrial/Commercial/Community Property Use for Medium/Fine Textured Soils (Table 3 SCS).

The chemical analyses results were also evaluated against the following tables of Appendix 1 (Generic Excess Soil Quality Standards) of the new MECP O.Reg.406/19 "On-Site and Excess Soil Management," additional elements which are expected to come into force in January 2023:

- Table 1 Full Depth Background ESQS for all types of property use (except agricultural) (Table 1 ESQS); and
- Table 3.1 Full Depth ESQS in a Non-Potable Ground Water Condition, Volume Independent, for industrial/commercial/community property use (Table 3.1 ESQS).

Furthermore, TCLP analyses results were also compared with Table 3.1 Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial / Commercial / Community Property Use, Appendix 2 – Generic Leachate Screening Levels for Excess Soil Reuse – of O.Reg.406/19.

B6.2.2 Soil Sampling, Inspection & Preservation Procedures

Soil samples were obtained for laboratory analysis and field screening, where applicable, using a drill rig equipped with split spoon sampling capabilities. The drillers cleaned the split spoon by removing loose dirt from the split spoon using a wire brush, washing the split spoon using a brush in a dilute mix of potable water and Alconox soap, rinsing the split spoon with distilled water and rinsing the split spoon with methanol and allowing the split spoon to air dry.

The drillers obtained the split spoon sample by auguring to the specified depth, hammering the spoon about 0.6 m into the soil and removing the spoon. The split spoon sample was inspected for visual and/or olfactory evidence of environmental impacts. Disposable nitrile gloves were used and replaced between the handling of successive samples.

The soil samples retrieved from the borehole investigations were examined, classified and logged according to soil type, moisture content, colour, consistency, and presence of visible indicators of environmental impact. Soil samples requiring vapour analysis were split into duplicate fractions upon recovery at the surface. The primary sample fractions were placed in 120 and/or 250 millilitre (mL) sample jars with Teflon-lined lids and methanol preserved (cored) samples were placed in 40 mL vials and subsequently stored in coolers on ice for potential future laboratory analysis. The volatile sample fractions were placed in resealable plastic sample bags and stored at ambient temperature for subsequent field vapour screening. The samples were selected on the basis of visual/olfactory evidence of impacts, field screening results, or from the vicinity of the apparent water table.

Representative soil samples collected during the investigation were submitted to AGAT Laboratories (AGAT) of Mississauga, Ontario, for metals & inorganics, VOCs and PHCs. AGAT is accredited by the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) in accordance with ISO/IEC 17025:2005 – *"General Requirements for the Competence of Testing and Calibration Laboratories"* for the tested parameters set out in the Soil, Ground Water and Sediment Standards.

B6.3 Environmental Test Results & Considerations

Wood conducted a preliminary Environmental Soil Quality Testing Program (the Investigation) as part of the Geotechnical Investigation. The details of the drilling program, including borehole locations and drilling methodology are presented in the geotechnical investigation sections of this report. Soil samples submitted for chemical analysis were collected from depths between surface and 5.0 m below ground surface (mbgs) based on presence of fill material and depth of construction works, as detailed Table B6.1.

Table B6.1: Environmental Tests

Sample ID	Depth (m)	Parameters Tested
BH B2 SS1	0.3 – 0.6	PHCs, VOCs, OC pesticides
BH B2 SS5	3.05 – 3.6	Metals and Inorganics
BH B5 SS1	0.3 – 0.6	OC pesticides
BH B5 SS4	2.3 – 2.9	Metals and Inorganics
BH B8 SS1	Surface – 0.6	OC pesticides
BH B9 SS5	4.6 – 5.0	Metals and Inorganics
BH BH11 SS2	0.8 – 1.4	Metals and Inorganics
BH B12 SS1	Surface – 0.6	OC pesticides
BH B15 SS1	Surface – 0.6	OC pesticides
BH B17 SS1	Surface – 0.6	OC pesticides
BH B17 SS3	1.5 – 2.1	Metals and Inorganics
BH B21 SS1	Surface – 0.6	OC pesticides
BH B22 SS1	0.3 – 0.9	Metals and Inorganics
BH B23 SS1	Surface – 0.6	Metals and Inorganics
BH B25 SS1	Surface – 0.6	OC pesticides
BH B28 SS2	0.7-1.4	PHCs and VOCs
BH S3 SS3	1.5 – 2.1	Metals and Inorganics

PHC = Petroleum Hydrocarbons
VOC = Volatile Organic Compounds
OC = Organochlorine

Wood observed fill material in all the boreholes. Headspace combustible organic vapour (COV) concentration measurements recorded in the soil samples were ranging from non-detectable to 20 parts per million (ppm).

Total organic vapour (TOV) concentration measurements recorded in the soil samples were ranging from non-detectable to 1 ppm.

No other evidence (i.e., visual/olfactory) of potential environmental impacts were observed in any of the soil samples collected from this project area.

The soil samples collected as part of this assessment that had Table 1 SCS exceedances are as follows:

- BHB22 SS1 for EC and SAR; and
- BHS3 SS3 for EC and SAR.

The other analyzed soils samples met the Table 1 SCS for metals and inorganics, PHCs, VOCs, and OC pesticides.

The soil sample collected as part of this assessment that exceeded the Table 3 SCS is as follows:

- BHS3 SS3 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 3 SCS for metals and inorganics, PHCs, VOCs, and OC pesticides.

When compared to the O. Reg. 406/19 ESQS, the soil samples collected as part of this assessment that had Table 1 ESQS exceedances are as follows:

- BHB22 SS1 for EC and SAR; and
- BHS3 SS3 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 1 ESQS for metals and inorganics, PHCs, VOCs, and OC pesticides.

The soil sample collected as part of this assessment that had Table 3.1 ESQSexceedances is as follows:

- BHS3 SS3 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 3.1 ESQS for metals and inorganics, PHCs, VOCs, and OC pesticides.

The TCLP analyses for the parameters tested indicated that dry soils (soils that would pass a slump test) would meet the Schedule 4 Leachate Quality Criteria.

Soil analytical results are shown in Tables 1B to 10B in Appendix C-B. The laboratory certificates of analysis for the bulk analysis and the certificates of analysis for the O. Reg. 347 TCLP analysis are included in Appendix D.

B6.4 Quality Assurance / Quality Control

Field Quality Control: Field quality control was not performed for this segment and is discussed in separate reports being written as part of the Geotechnical Investigation.

Laboratory Quality Control: The 2011 Analytical Protocol provides requirements for sample handling and storage requirements, reporting requirements, analytical methods and QA/QC procedures for analytical parameters.

As per the 2011 Analytical Protocol, all samples/sample extracts were analyzed within their applicable hold times using approved analytical methods. The report limits were met for all samples and tested parameters. No tested parameter was present in a detectable concentration in any laboratory Method Blank and all laboratory surrogates, reference materials and replicate samples are considered acceptable.

SECTION C: COUNTRYSIDE DRIVE (FROM ST. JOHNS ROAD TO HIGHWAY 50, ~ 2.7 KM)

C1.0 OVERALL SUBSURFACE CONDITION

A total of forty (40) boreholes (BH C1 to BH C35, BH C37 and Borehole BH S7 to BH S12) were drilled to depths varying from 0.2 m to 9.8 m, for the proposed road reconstruction/widening, underground service installation and culvert rehabilitation / extension, which included boreholes in the driving lanes, shoulders and auger holes in the ditches. Due to their proximity, BH C19 was combined with BH B22 (drilled for Arterial A2) as "BH C19/B22". Similarly, BH C27 was combined with BH S7 as "BH C27/S7". Boreholes BH C36 and C38 have been deferred to the detail design stage, if needed, as discussed with and approved by the City.

The boreholes in the driving lanes and pavement shoulders were sampled via Standard Penetration Test (SPT), while recording 'N' Values. SPT was not carried out in the auger holes in the ditches, where only the topsoil thicknesses were measured.

The stratigraphic units and groundwater conditions are discussed in the following sections. Additional information is provided in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the possible soil conditions at the investigated road section. The soil and groundwater conditions might vary between and beyond the borehole locations.

C1.1 Topsoil

In Borehole BH C12, approximately 100 mm of topsoil was encountered at the surface. Topsoil thicknesses were also measured in the ditches beside the road at eight (8) locations, which varied from about 150 mm to 300 mm, with an average thickness of about 215 mm, as listed in Table C1.1.

Table C1.1: Topsoil Thickness Measurements

Borehole No.	Coordinates (UTM, Zone 17T)		Topsoil Thickness (mm)
	Easting	Northing	
BH C4	603731	4852419	150
BH C10	604017	4852760	200
BH C14	604201	4852990	250
BH C16	604286	4853116	200
BH C22	604575	4853454	150
BH C26	604751	4853681	200
BH C28	604854	4853830	270
BH C34	605125	4854169	300

C1.2 Asphaltic Concrete

In the boreholes drilled through the asphalt pavement (BH C1, C3, C5, C7, C9, C11, C13, C15, C17, C19/B22, C21, C23, C25, C27/S7, C29, C31, C33, C35 and C37), approximately 90 mm to 200 mm of asphaltic concrete was encountered.

C1.3 Granular Fill

Granular fill soils underlying the asphalt and surficial topsoil ranged from 150 mm to 800 mm in thickness.

Granular fill soils (sand and gravel fill) were also encountered at the surface in Boreholes BH C2, C6, C8, C18, C20, C24, C30 and C32. The granular fill in these boreholes extended to a minimum depth of 0.3 m to a maximum depth of 0.6 m below the existing ground surface (Elevations 214.0 m to 221.1). The SPT 'N' values of the granular fil ranged from 5 to 30 blows per 0.3 m. Water contents measured in granular fill samples varied from about 3 % to 5 %.

A gradation test was carried out in one sample (SS 1A) from Borehole BH C19/B22, the results of which are presented in Table C1.2, and shown in the Records of Boreholes.

Table C1.2: Results of Grain Size Distribution Analysis (Granular Fill)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Soil Classification
				Gravel	Sand	Fines		
						Silt	Clay	
BH C19/BH B22*	SS1A	0.2 - 0.6	220.3 - 219.9	33	58	9		GRAVELLY SAND, trace fines. Sample meets OPSS1010 Granular B Type I

* Due to proximity, Boreholes C19 and BH B22 (Arterial A2) were combined.

The grain size distribution curves are presented in Figure B-C1 in Appendix B-C.

C1.4 Silty Clay / Clayey Silt Fill

Silty clay / clayey silt fill was encountered below the granular fill soils in all borehole locations except Boreholes BH C8 and C18. The silty clay / clayey silt fill was generally brown/dark brown to grey/dark grey in colour and contained some sand, trace to some gravel and traces of organics. The silty clay silty clay / clayey silt fill extended to depths varying from 0.9 m to 2.2 m (Elevations 211.0 m to 220.9 m) below the existing ground surface. Boreholes BH C2, C12, C19/B22 and C20 were terminated in the silty clay/clayey silt fill at depths ranging from 1.2 to 1.8 m the existing ground surface. The SPT 'N' values of the silty clay / clayey silt fill ranged from 5 to 38 blows per 0.3 m. The measured water contents of the silty clay fill samples ranged from about 9 % to 37 %.

The measured water contents in the silty clay silty clay / clayey silt fill varied from about 9 % to 28 %.

Gradation and Atterberg Limits tests were carried out in one sample (SS 3) from Borehole BH C1, the results of which are presented in Table C1.3, and shown on the Records of Boreholes.

Table C1.3: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Clay / Clayey Silt Fill)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines		Liquid Limit	Plastic Limit	Plasticity Index	
						Silt	Clay				
BH C1	SS 3	1.5	214.3	0	14	48	38	49	22	27	CI

The grain size distribution curve and plasticity chart are presented in Figure Nos. B-C2 and B-C3 in Appendix B-C.

C1.5 Silty Sand / Sandy Silt / Sand and Silt Till

Native silty sand / sandy silt / sand and silt till was encountered below the fill soils in Boreholes BH C5, C6, C31, C32, S8, S11 and S12. A seam of gravelly silty sand till was encountered within the silty clay/clayey silt till near Elevation 210 in Borehole S10. The silty sand / sandy silt / sand and silt till was encountered at depths ranging from about 1.2 m to 2.2 m (Elevations 211.0 m to 220.5 m) below the existing ground surface. With the exception of Boreholes BH S8 and S11, the remaining boreholes were terminated within the silty sand / sandy silt / sand silt till. Auger refusal was encountered in BH S12. Where fully penetrated, the granular till in Boreholes BH S8 and S11 was 0.8 and 5.6 m thick, respectively.

The silty sand / sandy silt / sand silt till was brown to grey in color and contained trace to some clay, trace gravel. Cobbles and boulders were observed in several boreholes. The SPT 'N' values measured in the silty sand / sandy silt / sand silt till ranged between 20 blows and greater than 50 blows per 0.3 m but generally above 33 blows, indicating compact to very dense condition overall and dense to very dense typically. The measured water contents in the till ranged between 9 % and 21 %.

Gradation and Atterberg Limits tests were carried out in four (4) selected samples of silty sand / sandy silt / sand silt till, the results of which are presented in Table C1.4, and shown on the Records of Boreholes.

Table C1.4: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Sand / Sandy Silt / Sand and Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH C27/S7	SS 4	2.3	215.5	1	40	52	7	17	14	3	ML
BH C31	SS 3	1.5	220.2	0	67	31	2	-	-	-	-
BH S10	SS 6	3.8	210.0	31	29	33	7	-	-	-	-
BH S11	SS 6	3.8	209.4	1	42	55	2	-	-	-	-

The grain size distribution curve and plasticity chart are presented in Figure Nos. B-C4 and B-C5 in Appendix B-C.

C1.6 Silty Clay / Clayey Silt Till

In all boreholes that was extended beyond the fill soils, except Boreholes BH C2, C5, C6, C19/B22, C20, C27/S7, C31, C32 and S12, native silty clay / clayey silt till was encountered below the fill soils or the silty sand / sandy silt / silt and sand till, and extended to the termination depths of the boreholes at depths varying from about 1.5 m to 9.8 m (Elevations 220.2 m to 204.0 m). Cobbles and/or boulders were reported in the cohesive till in Boreholes BH C1, C23, C24, and S8 to S11 and their presence should be expected throughout this material based on the depositional history of glacial tills.

The silty clay / clayey silt till was brown to grey in colour, and contained trace to some sand and trace gravel and cobbles/boulders. The SPT 'N' values of the clayey silt / silty clay till generally ranged from 7 blows to more than 50 blows per 0.3 m implying firm to hard consistency. The lower values were generally immediately below the fill soils. In majority of the boreholes, the 'N' value was more than 12 blows (stiff). The measured water contents of the silty clay / clayey silt till samples ranged from about 8 % to 28 %.

Gradation and Atterberg Limits tests were carried out in two samples of the silty clay / clayey silt till, the results of which are presented in Table C1.5, and shown on the Records of Boreholes.

Table C1.5: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Clay / Clayey Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines		Liquid Limit	Plastic Limit	Plasticity Index	
						Silt	Clay				
BH S9	SS 7	4.6	209.8	12	32	47	9	17	12	5	CL-ML
BH C17	SS 7	4.6	215.3	1	11	50	38	31	16	15	CI

The grain size distribution curve and plasticity chart are presented in Figure Nos. B-C6 and B-C7 in Appendix B-C.

C1.7 Groundwater

Upon completion, groundwater was encountered in Boreholes BH C5, C11, C27/S7, C31, S8, S10 and S11 at depths varying from about 1.5 m to 8.2 m (Elevations 220.2 m to 205.6 m) below the existing ground surface. Groundwater was not encountered in the remaining boreholes during or upon completion of boreholes.

A monitoring well was installed in each of Boreholes BH C27/S7, S10 and S12 at the locations of the culvert crossings. Groundwater depths measured in the boreholes (where encountered) at the time of drilling or upon completion of drilling, and in subsequent measurements in the monitoring well are summarized in Table C1.6 and shown on the Record of Boreholes.

Table C1.6: Results of Groundwater Depth Measurements

Borehole No.	Groundwater Measurements					
	During or Upon Completion of Drilling (m)			In Monitoring Well (m)		
	Date	Depth	Elevation	Date	Depth	Elevation
BH C5	25 Mar 2020	3.0	211.6	Not installed		
BH C11	27 Mar 2020	4.9	210.3	Not installed		
BH C27/S7	26 Mar 2020	2.7	215.1	24 Apr 2020	1.7	216.1
				4 May 2020	1.7	216.1
				12 May 2020	1.9	215.9
BH C31	19 Mar 2020	1.5	220.2	Not installed		
BH S8	26 Mar 2020	2.4	217.1	Not installed		
BH S10	18 Mar 2020	8.2	205.6	4 May 2020	0.9	212.9
				12 May 2020	1.0	212.8
BH S11	24 Mar 2020	2.1	211.1	Not installed		
BH S12	24 Mar 2020	Dry	-	4 May 2020	1.4	212.1
				12 May 2020	1.5	212.0

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months, and in response to major weather events.

C1.8 Soil Corrosivity

One (1) soil sample was submitted for corrosion analysis to determine the corrosive potential of the soils with respect to buried metallic structures. The results of the analyses are presented Table C1.7, and the laboratory test certificate is included in Appendix D.

Table C1.7: Summary of Analytical Testing

Soil Characteristic	Units	BH C17-SS3	BH C31-SS3	BH S10-SS5	BH S12-SS5
Chloride (2:1)	ug/g or (ppm)	141	69	363	546
Sulphate (2:1)	ug/g or (ppm)	21	18	65	35
pH	pH	8.17	8.54	8.12	8.09
Electrical Conductivity	mS/cm	0.392	0.224	0.798	1.08
Resistivity	Ohm-cm	2550	4460	1250	926

As per ASTM STP 1013 (Effects of Soil Characteristics on Corrosion – "*chloride appears to be the main factor in increased soil corrosivity with levels in excess of 0.01 % (100 (µg/g) considered indicative of accelerated corrosion*". The chloride content measured in the samples varied from 69 to 546 µg/g. In accordance with Table 1 of CSA A23.1-14 and based on "structurally reinforced concrete exposed to chloride, with or without freezing and thawing" and based on project location, exposure class "C-1" can be used. Class should be based on structure location and/or durability requirement.

In accordance with Table 3 of CSA A23.1-14, no additional requirement is specified for sulphate content below 0.10 % (i.e. 1,000 ppm or µg/g) below the "moderate degree of exposure" with respect to concrete. Therefore, in accordance with Table 6 of the Canadian Standards Association (CSA) Series A23.1-14, Type GU Portland cement can be used based on the water-soluble sulphate content measured in soil.

As noted in ASTM -STP 1013 (*Effects of Soil Characteristics on Corrosion*), pH values between 4.0 and 8.5 have very little effect on corrosion (American Water Works Association (AWWA) Standard C 105-72 (Table 1 – Soil-Test Evaluation AWWA Rating).

The measured soil resistivity values can be considered as "very high" for values below 1000 ohm-cm, "high" between 1000 ohm-cm and 2000 ohm-cm and "moderate" between 2000 ohm-cm to 5000 ohm-cm for exposed metallic structures, based on ASTM STP 1000, Corrosion Testing and Evaluation - Table 3 (Corrosivity for Uncoated Steel).

Protection against steel corrosion, where required, could include one or a combination of: adequate concrete cover, low-permeability concrete, corrosion inhibitors; coated reinforcing steel; clad reinforcing steel; and corrosion-resistant alloy reinforcement.

A corrosion specialist should be retained, if necessary, to review the analysis results and provide relevant recommendation.

C2.0 PAVEMENT INVESTIGATIONS AND DESIGN

The purpose of the pavement investigation was to obtain subsurface information and to provide geotechnical recommendations for widening along Countryside Drive which is east / west oriented, and as per the City's road classification, it is designated as a minor arterial road. The total length of the investigated road section is about 2.7 km.

At the time of the investigation, the investigated road section was a 2-lanes rural road that would be widened to 4-lanes, from Clarkway Drive to RR 50 including realignment at RR50, Ontario. The discussions and recommendations in the following sections are general in nature as the details of the widening were not available at the time of this report. At the time of this report, two (2) boreholes (BH C36 and C38), located in the private lands north of Countryside Drive, have been deferred to detailed design stage, if required.

The subsurface soil profile at the site consisted of surficial asphaltic concrete underlain by non-cohesive soil sand and gravel fill overlying silty clay fill, silty clay /clayey silt till which extended to the termination depths of the boreholes that ranged from 1.2 to 9.8 m.

All boreholes were open and dry upon completion to their respective vertical limits of investigation except in seven boreholes (BHs C5, C11, C27/S7, C31, S8, S10 and S11), where groundwater was encountered at depths ranging from 2.1 m to 8.2 m below ground surface.

The discussions and recommendations in the following sections are based on the subsurface information obtained from the boreholes and are intended for use by Design Engineers.

C2.1 Visual Pavement Condition Survey

On 10 August 2020, Wood carried out a visual pavement condition survey of the existing road surface within the project area to identify any distresses. A summary of the pavement condition survey, including predominant surface defects, surface deformation and cracking, is tabulated in Table C2.1 and copies of the Pavement Condition Survey Forms are included in Appendix A-C. Based on the pavement condition survey, the existing asphaltic concrete surface condition ranged from Good to Fairly Good to Fair for with some locations in Fairly Poor to Poor from Clarkway Drive to Coleraine Drive. The existing asphaltic concrete surface condition ranged from Good to Fairly Good with some locations in Fair and Poor Condition from Coleraine Dr to Hwy 50.

Table C2.1: Existing Pavement Condition

Predominant Distress	2020 Condition Ra0ting
Clarkway Dr to Coleraine Dr ~ 1.4 km (2 lanes)	
• Ravelling & coarse aggregate loss – Slight / Intermittent. • Wheel Track Rutting/Distortion – Very Severe /Few. • Longitudinal Cracking (single, multiple and alligator) – Slight to Moderate / Intermittent. • Centreline Cracking (single, multiple and alligator) – Moderate / Intermittent. • Transverse Cracking (single, multiple and alligator) – Moderate /Frequent.	Ranged from Good to Fairly Good to Fair with some locations in Fairly Poor to Poor Condition.
Coleraine Dr to Hwy 50 ~ 0.8 km (2 lanes)	
• Ravelling & coarse aggregate loss – Severe /Extensive. • Wheel Track Rutting/Distortion – Slight /Few. • Longitudinal Cracking (single, multiple and alligator) – Moderate / Intermittent. • Centreline Cracking (single, multiple and alligator) – Slight / Intermittent. • Transverse Cracking (single, multiple and alligator) – Moderate /Few.	Ranged from Good to Fairly Good with some locations in Fair and Poor Condition.

C2.2 Subsurface Conditions

A total of 42 boreholes have been drilled along Countryside Drive from St. Johns Road to Highway 50 including realignment at RR50, Ontario (approx. 2.7 km), including boreholes at three culvert locations. Due to proximity to BH B22, Borehole C19 was not drilled and combined as BH C19/B22. Similarly, BH C27 and S7 were combined as BH C27/S7. As noted above, two (2) boreholes have not been drilled and are to be drilled at a later date.

The subsurface soil profile at the site consisted of surficial asphaltic concrete underlain by sand and gravel fill overlying silty clay fill, silty clay /clayey silt till which extended to the termination depths of the boreholes that different in depths that ranged from 1.2 to 9.8 m as detailed in the Record of Boreholes.

The driving lanes boreholes revealed that the asphaltic concrete thickness ranged from 90 mm to 200 mm with an average of 123 mm. Non-cohesive soil (sand and gravel fill) was encountered in all the boreholes underlying the existing asphaltic concrete that ranged in thickness from 150 mm to 800 mm, with an average of 442 mm. The shoulder boreholes revealed sand and gravel fill was encountered in all the boreholes that ranged in thickness from 300 mm to 600 mm, with an average of 535 mm. Two boreholes C12 and C22 encountered 100 mm of topsoil and the other 150 mm of asphaltic concrete overlying fill material.

Additional subsurface information is provided in Section C1.0 and in the Record of Boreholes.

C2.3 Groundwater Conditions

Groundwater was encountered in a number of boreholes during and on completion of drilling in the open boreholes at depths varying from 1.5 m to 8.2 m below ground, as listed in Table C1.6. It should be pointed out that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

C2.4 Pavement Design

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations for road rehabilitation/re-surfacing and widening along Countryside Drive.

The discussions and recommendations in the following sections are based on the available information and the subsurface information obtained from the boreholes and is intended for use by Design Engineers.

C2.4.1 Pavement Structure Adequacy

Two methods were used to assess the existing pavement structure. In-situ structure number ("SN") and in-situ Granular Base Equivalency ("GBE") were estimated from the borehole data using the equivalency factors for various material types, as shown in Table C2.2.

Table C2.2: Summary of Typical Structural Layer Coefficient

Material Type	Typical AASHTO-Ontario Structural Layer Coefficient (SLC), ai (mm) (1)		Granular base Equivalency Factors
Rehabilitation	**Drainage**	**Structural**	
Existing HL Existing Gran Base Existing Gran Sub-base Existing Gran Base/Sub-base	Acceptable 1.0 Questionable 0.9 Inadequate 0.8 to 0.5	0.14 to 0.28 0.10 to 0.14 0.05 to 0.09	1.25 0.75 0.50 0.625
Pulverization CIR RAP/Gran A blended stabilized with EAM	1.0 1.0 1.0	0.10 to 0.14 0.28 to 0.38 0.20 to 0.25	1.0 1.6 – 1.8 1.0

(1) MTO Report MI-183 -. MTO Report MI-183 "Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions" - Table 4-5.

Table C2.3 summarises the total average pavement structural thickness of the existing asphaltic concrete pavement, granular base and sub-base, as well as the average existing Structure Number 'SN' and 'GBE' before rehabilitation.

Table C2.3: Summary of Existing Pavement Structure

# of BHs	Average Thickness (mm)		SN(1)	GBE	Predominant Subgrade
	HMA	Base/Subbase	(mm)		
# of BHs @ MDL /EP=17 (C1, C3, C5, C7, C9, C11, C13, C15, C17, C21, C25, C27 / S7, C29, C31, C33, C35, C37)	Range (90-200) mm Av. 123 mm	Range (150-800) mm Av.442 mm	Range (48-120) mm Av. 82 mm	Range (244-644) mm Av. 430 mm	Si(y) Cl Fill Si(y) Cl/Cl(y) Si Till
# of BHs @ SHR/TOR=10 (C2, C6, C8, C12, C18, C20, C22, C24, C30, C32)	100 mm Tps @ BH C12 150 mm HMA @BHC22	Range (300-600) mm Av. 535 mm	-	-	

Notes:

MDL= Mid driving Lane EP = Edge of Pavement SHR = Shoulder Rounding TOS = Toe of Slope.

(1) Existing SN calculations the following parameters were used:

- Existing HMA coefficient, = 0.28
- Existing granular base/subbase coefficient, and concrete = 0.12/0.9

C2.4.2 Existing and Forecasted Traffic Data

The traffic data represented as Average Annual Daily Traffic (AADT$_{2020}$) in both directions was estimated by Wood Traffic Group as presented in Table C2.4. This traffic data was used to projected traffic data for 20 years design life. Equivalent single axle loads (ESALs) were calculated cumulatively over 20 years as described in the Ministry of Transportation Report "Procedures for Estimating Traffic Loads for Pavement Design, 1995".

Table C2.4: Traffic Data - Minor Arterial (Rural)

AADT in Both Directions 2020(1)	Growth Rate (%)	Comm. Vehicles (%)	Design ESALs @ 20 Years	Traffic Category
5,888	2.0%	6.0%	2,379,031 ~ 2.4 x 10^6	**Category** B

(1) 2020 is the anticipated construction year.

C2.4.3 Flexible Structural Pavement Design for Widening

After reviewing the field data and laboratory test results, the minimum pavement structural design for widening of Countryside Drive is presented in Table C2.5 and was determined in accordance with the 1993 American Association of State Highway and Transportation Officials ('AASHTO') Guide for the Design of Pavement Structures using the Darwin Software Program.

The AASHTO Pavement Design is considered to be a function of estimated future traffic in both directions (ESALs), reliability (R), which is a function of road classification, overall standard deviation (S_o), resilient modulus (M_r), as well as initial and terminal serviceability (P_o, P_t). From these parameters, the structure number (SN) is calculated. The SN is defined in the AASHTO Guide as a number, which provides a measure of the pavement strength and thickness needed to avoid overstressing the subgrade.

The following design parameters were chosen to calculate the required structure number for the design of flexible pavement using the AASHTO method, as described in the Ministry of Transportation Materials Information Report MI-183 "*Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions*".

- Initial serviceability,	P_i = 4.5;
- Terminal serviceability,	P_t = 2.5;
- Reliability level,	R = 90 percent;
- Overall standard of deviation,	S_o = 0.49;
- Subgrade Resilient Modulus, M_r (kPa)	M_r = 30,000

Table C2.5: Recommended Minimum Structural Pavement Design

ESALs	AASHTO Design for 20 Years					Recommended HMA & PGAC		Traffic Category
						Marshall		
	HMA	Gran A	Required Design SN	Selected SN	Total Pavement Thickness	HL 3 (HS) /HL 1 Surface Course	HL8 Binder Course	
	Thickness (mm)							
2.4 X 10^6	150	Gran A = 400 mm or Gran A = 150 mm Gran B Type II = 250 mm	119	119	550	SP 50 mm PGAC 64-28	50+50 mm PGAC 58-28	B
		Gran A = 480 mm or Gran A = 130 mm Gran B Type II = 350 mm	119	130.2	630			

Notes:

- Pavement shall be placed over approved subgrade.
- Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

The City of Brampton minimum Pavement Structure is as follows (Arterial Road STD#208 - 2019):

- 50 mm HL3 Asphalt (High Stability or HL1)
- 85 mm HL8 Asphalt (100 mm for All New Subdivision Roads)

- 150 mm Granular "A" or 130 mm of 20 mm Crusher Run Limestone
- 450 mm Granular "B" or 350 mm of 50 mm Crusher Run Limestone

The structure number (SN) of the City of Brampton design is 118.2 mm or by using Crusher Run Limestone SN = 123.9 mm.

The AASHTO pavement design was selected for the road widening since it is tailored on soil field investigation, traffic data and traffic loading of 20 years period, with the granular thickness increased to match the City's minimum requirements. However, the granular B Type II thickness shall be increased to 450 mm to match the City's Standards (Table C2.6).

C2.4.4 Widening Countryside Drive from St. Johns Road to Highway 50

Pavement recommendations for widening of Countryside Drive are presented in Table C2.6, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS.MUNI 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Table C2.6: Widening of Countryside Drive

HMA		PGAC	Traffic Category
Type	Thickness (mm)		
HL 3 (HS) / HL 1	50 mm	64-28	B
HL 8 (HS) /HDBC	50 mm 50 mm	58-28 58-28	
Granular Base 'A' 20m Crusher Run	130 mm	-	-
Granular Subbase 'B' Modified or 50m Crusher Run or Limestone	**450 mm**	-	-
Total Pavement Structure	**730 mm**	-	-
The granular thicknesses of the widening given in the table is a minimum thickness and should be increased, as required, to match the adjacent existing pavement granular thickness to promote positive lateral drainage (refer to the Borehole Log Data). Also, the thicknesses can be increased depending on grading requirements.			

Full depth excavation, as required and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness.

The excavated granular materials from the shoulder can be re-used as fill material for subgrade for the widening/embankment, provided it is not contaminated. New Granular B subbase should be added and compacted, followed by new Granular A base material. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted and overlain with 2 lifts of HL 8 (HS) / HDBC binder course, and 1 lift of HL 3 (HS) or HL 1 surface course, as per Table C2.6. Installation of subdrain is recommended, if lateral drainage of the existing subgrade is not possible.

C2.5 Rehabilitation Strategies

The selected rehabilitation strategy was based on Wood's geotechnical/pavement investigation and analysis, including a visual pavement condition assessment, subgrade condition, and calculated ESALs. Consideration was also given to user delay, cost and/or disruption of traffic and an anticipated construction year of 2020. The proposed rehabilitation strategy is as follows:

In-Place Pulverization, Remixing & Resurfacing with 120 mm of HMA: This strategy involves pulverizing the existing asphalt concrete thickness into an equivalent depth of granular base material to a total depth of 240 mm. The resulting mixture of asphalt concrete and granular is then graded to cross fall, compacted and used as a base. The advantages of this option include the elimination of surface defects and reflection cracking and the reuse of the existing material efficiently. Typically, the GBE for bituminous crushed recovered material is in the order of 1.0. In-place pulverization should be graded and compacted and resurfaced with 120 mm of HMA. This option will raise the vertical profile by 120 mm and will provide 16 to 18 years of service life and average SN of 115 mm after resurfacing.

C2.6 Recommendations and Construction Features for Pavement

C2.6.1 Rehabilitation Strategies

In-Place Pulverization, Remixing & Resurfacing with 120 mm of HMA. This option will raise the existing vertical profile by 120 mm and will provide service life of 16-18 years.

C2.6.2 Widening of Countryside Drive

Pavement recommendations for widening of Countryside Drive are presented in Table C2.6 for new pavement structure, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Full depth excavation, as necessary, and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness. The excavated granular materials from the shoulder can be re-used as fill material for subgrade for the widening/embankment, provided it is not contaminated. New Granular B Type II subbase should be added and compacted, followed by new Granular A base material. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted and overlaid with 2 lifts of HL 8 (HS) /HDBC binder course, and 1 lift of HL 3 (HS) / HL 1 surface course, as per Table C2.6. Installation of subdrain is recommended, if lateral drainage of the existing subgrade is not possible.

C2.6.3 Subgrade / Road Base Preparation and Compaction

The pavement structural design recommended for roads is applicable, provided the subgrade is prepared under dry weather conditions, proof-rolled with a heavy rubber-tired vehicle (such as a grader or loaded dump truck) in the presence of the geotechnical consultant. Any loose, soft or unstable areas, if detected during proof-rolling, must be sub-excavated, replaced with approved granular materials and compacted. Any additional engineered fill, if required, should be placed in thin layers not exceeding 200 mm and compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD). Granular materials should be placed in thin layers not exceeding approximately 200 mm, within ± 2 % of its optimum moisture content, and thoroughly compacted to a minimum of 100 % of SPMDD.

The subgrade should be provided with adequate drainage. If wet weather conditions prevail at the time of construction, adjustments to this design may be required, i.e. if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional sub-base material is best determined during construction.

All granular base and sub-base materials must be compacted to at least 100% of SPMDD.

C2.7.4 Stripping and Sub-Excavation

No additional sub-excavation, other than removal of organics and topsoil are anticipated within the widening limits, as presented in Table C1.1 that ranged from 150 mm to 300 mm. However, any unsuitable soft or saturated material should be removed. Deeper stripping depths may be required, depending on the actual site conditions between borehole locations.

C2.6.5 Drainage

Prior to completing the rehabilitation, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project.

To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times. This can be accomplished by ensuring proper grading of the subgrade and positive lateral drainage of the granular base daylighting at the ditch. Alternatively, full-length perforated subdrain pipes of 150 mm diameter should be installed along both sides of the road, below the roadbed level, to ensure effective drainage, in accordance with OPSD 216.021. The sub-drainpipes should be wrapped in suitable non-woven geotextile surrounded by a minimum drainage zone of 19 mm size clear stone of minimum 150 mm thickness. A minimum slope of 2 % should be maintained across the paved sections (finished road surface) to ensure proper surface drainage. New pavement should slope towards the gutter/ditch.

C2.6.6 Hot Mixes and PGAC Type

The following Marshall hot mixes should be used on Countryside Drive:

- HL 3 (HS) / HL 1 surface course mix and HL 8 (HS) /HDBC binder course should be used to provide the roadway with high durability.

Material Specification should be as per OPSS.MUNI 1150 Material Specification for Hot Mix Asphalt. For aggregates, the material specification should be as per OPSS MUNI 1003.

Performance Graded Asphalt Cement ("PGAC") 64-28 should be used only for surface course and PG 58-28 for binder course. This PGAC should satisfy the requirements of MP1 of SHRP Specifications for Superpave. Recycled Materials: The use of reclaimed asphalt pavement (RAP) is permitted in Marshall mixes. The percent of RAP for HL 8 and HL 3 should be as per OPSS.MUNI 1150.

RAP containing steel slag aggregates should not be allowed.

Transition Treatments at Limits of Paving: At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered at a distance of not less than 5 m, in accordance with OPSS.PROV 313. It should be ensured that no joint location corresponds with a joint location in any other layer.

The transition treatment from earth cut to earth fill should be in accordance with OPSD 205.010.

Tack Coat: It is recommended that all milled surfaces, and binder course surfaces will be tack coated prior to top course asphalt, if exposed to extended traffic. Construction Specification should be as per OPSS Prov. 308, April 2007.

C2.6.7 In-Situ Compaction for Hot Mix

In all areas, asphaltic concrete should be compacted as per OPSS.MUNI 310, Table 10 (April 2011). It should be noted that the granular base and sub-base materials should be compacted to the City's standards or to minimum 100 % SPMDD.

Field Quality Assurance: Plate samples of loose hot mix should be obtained for each paving day, and extraction/gradation and full Marshall compliance testing should be carried out on these samples. The finished surface shall be true to required profile and cross-section within 6 mm from required elevations and thickness. The surface shall show no depressions or bumps exceeding 3 mm under a 3.0 m long straight edge, placed parallel to the road centreline.

C2.6.8 Frost Depth

A minimum depth of 1.4 m should be used for frost protection as per OPSD 3090.101.

C2.6.9 Detouring

No long-term detouring is planned. Therefore, no special treatment will be required.

C3.0 UNDERGROUND UTILITIES

The geotechnical investigation scope of work included obtaining subsurface conditions and providing recommendations for installation of proposed underground utility services. Accordingly, selected boreholes (i.e. alternating pavement boreholes) were deepened to a depth of 3 m to 5 m, as listed in Table 5.3. Information obtained from all relevant boreholes drilled along Countryside Drive have been considered in this section, as applicable.

C3.1 Subsurface Conditions

A total of thirty-two (32) boreholes (not including the eight augered boreholes for topsoil measurements) were drilled in driving lanes and shoulder areas of Coleraine Drive to depths varying from about 1.2 m to 9.8 m, for pavement investigation, underground utility installation and three culverts. *Two boreholes (BH C36 and C38) had not been drilled at the time of this report and will be drilled at a later date.*

Overall, the project site along Countryside Drive consisted of surficial cover (topsoil, asphaltic concrete, and/or exposed granular fill) underlain fill soils (granular and / or silty clay / clayey silt) overlying native till soils (silty sand / sandy silt / sand and silt and/or silty clay / clayey silt). The fill soils extended to depths varying from about 0.9 m to 2.2 m (Elevations 211.0 m to 220.9 m) below the existing ground surface. The silty sand / sandy silt / sand and silt till was encountered up to a maximum depth of 7.8 m (Elevation 205.4 m) below the existing ground surface in BH S11. The silty clay / clayey silt till was confirmed to a depth of about 9.8 m (Elevation 208.0 m) below existing ground surface BH C23 / S7.

Groundwater depths measured in the boreholes and monitoring wells varied from 0.9 m to 8.2 m (Elevations 216.1 m to 205.6 m) below ground surface.

Detailed subsurface and groundwater conditions are provided in Section C1.0.

C3.2 Discussions and Recommendations for Underground Utilities

As per information available, the planned Countryside Drive rehabilitation / widening within the project limits will include installation of underground utilities and associated manholes and catch basins. Details of the installation were not available at the time of this report. Existing utilities, if any, should be protected and taken into consideration for design and construction of the proposed underground utilities and road widening.

The ground (road) elevations within the project limits (based on borehole location) varied from about 213.2 m (at BH S11) to 221.8 m (at BH C33), with the overall the ground surface was sloping up from west (St. Johns Road) to east (Highway 50).

The recommendations and discussions for excavation and installation of underground utility services, and associated manholes / catch basins, are provided in the following sections.

C3.2.1 Founding Subgrade Conditions

From the investigation result, fill soils (granular, silty clay) were present to depths varying from 0.9 m to 2.2 m below existing ground / road level, which included granular fill to depths varying from 0.3 m to 0.6 m in some of the boreholes. The SPT values in the silty clay / clayey silt fill below the granular fill indicated a firm to hard but generally stiff consistency. The granular fill was in loose to compact condition.

The native tills soils (silty clay / clayey silt and silty sand / sandy silt / sand and silt) below the fill soils were of firm to hard consistency and / or compact to very dense overall, with the majority indicating very stiff to hard consistency and dense to very dense compactness, and should be generally competent to support underground utility services.

It is recommended that the inverts of underground utilities be founded on native soils, or competent fill soil subgrade. Existing fills or soft soil encountered at the founding level should be compacted, if possible, or otherwise, should be sub-excavated and backfilled with compacted soil as recommended in Section C5.3 (Engineered Fill).

For manholes and catch basins founded on competent subgrade (i.e., approved existing fill, imported engineered fill, till soils), a Geotechnical Reaction at Serviceability Limit State (SLS) of 100 to 150 kPa and a factored Geotechnical Resistance at Ultimate Limit State (factored ULS) of 150 to 225 kPa, depending on the subgrade conditions, may be used, which should be verified by a geotechnical engineer during construction. Under the SLS bearing values, settlements of up to 25 mm may take place.

The frost penetration depth for the project area should be considered as 1.4 m.

The highest groundwater elevation measured during the investigation within the project limits of Countryside Drive was 0.9 m (Elevation 212.9 m) below ground surface in the monitoring well installed at the culvert location (BH S10). As such, groundwater may be present within the excavation depths for the underground utilities. Also, perched water in sandy / silty pockets and / or water from surface runoff will require dewatering during excavation. As the excavation will generally be in clayey soils, groundwater seepage, if any, into the excavation is likely to be slow and a properly filtered sump and pump system, or gravity drainage, may be used for dewatering excavation.

General discussions regarding excavation and dewatering are provided in Section C5.4. Detailed dewatering consideration for the project is included Wood's hydrogeological investigation report, which is submitted under a separate cover.

Trench excavation, pipe bedding and anti-seepage collar considerations are discussed in following sections.

General discussions provided in Section C5.0 should also be considered for design and construction.

C3.2.2 Trench Excavation

Trench excavation should be carried out as per the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects. The soils classifications are shown in Section C5.4. Based on the soils encountered in the boreholes, the sides of excavations are expected to be temporarily stable at 1H:1V for Type 2 and Type 3 soils, provided excavations are properly dewatered and underground utilities are installed and backfilled within a reasonable short period of time. Provisions should be made for dewatering, as noted in Section C5.4. Trenching should be in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

It is important for frost heave compatibility that the trench backfill within the frost zone of 1.4 m depth matches the soil exposed on the trench walls.

C3.2.3 Bedding

Bedding for underground pipes should be placed in accordance with the design requirements and current Ontario Provincial Standards (OPS) specifications (Ontario Provincial Standard Drawing (OPSD) 802.10 for flexible pipes and OPSD 802.30, 802.31 and 802.32 for rigid pipes). It is recommended that a minimum of 150 mm thick bedding material (Class 'B' Type or better) be placed below the pipe invert. The thickness of the bedding may, however, need to be increased depending on the pipe diameter, or if wet or weak subgrade conditions are encountered. If the subgrade is weak, it should be sub-excavated and replaced with engineered fill to support the pipes and allow the use of Class 'B' Type bedding. If weak subgrade is encountered and cannot totally be removed, Class 'A' Type bedding (e.g. minimum 100 mm thick lean concrete) should be used to provide a workable surface and support the proposed pipes.

For the areas to be filled, the fill soils should first be placed approximately to final grade and subsequently excavated to install the underground pipes in order to prevent pipe settlement due to overburden loads.

Should the pipes be installed in soft clay soils, the joints should be restrained from movements and the backfill around the pipes should be properly compacted in order to prevent long-term movements. A layer of geotextile (Terrafix 270R or equivalent) should be placed between the soft clayey soils and the granular bedding/backfill in order to prevent soil migration.

The possibility of pipe movements in soft clayey soils, after installation, should be considered in the design and construction of the underground pipes.

Construction of underground pipes should be carried out in accordance with the relevant OPSS.MUNI 410 (Construction Specification for Pipe Sewer Installation in Open Cut), or other relevant applicable municipal / regional standards.

C3.2.4 Backfill

Based on the visual and tactile examination of the soil samples, the on-site excavated granular / silty clay fill and till soils may be re-used as backfill in sewer trenches provided their moisture contents at the time of construction are at or near the optimum. Moisture conditioning of the sub-excavation soils may be required prior to reuse. The excavated cohesive fill should be carefully examined for organic content and moisture condition by qualified geotechnical personnel in order to confirm the need for moisture conditioning or its acceptability for use as backfill.

The backfill should be placed in maximum 200 mm thick layers at or near (± 2 %) optimum moisture content, and each layer should be compacted to at least 95 % Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the manhole / catch basins should be brought up simultaneously on all sides and operation of heavy equipment near the walls should be restricted to minimize potential movement and/or damage.

Unsuitable material such as organic soils, boulders, cobbles, frozen soils, etc., should not be used for backfilling.

C3.2.5 Anti-Seepage Collars

From the borehole information, the underground utilities will be installed in clayey soil (silty clay fill, silty clay / clayey silt till). As such, anti-seepage collars should not be required.

C4.0 CULVERTS ON COUNTRYSIDE DRIVE (STATIONS 0+350, 0+700 AND 1+950)

Three (3) existing culvert (approximate Station 0+300, 0+700 and 1+950), located within the project limits on Countryside Drive, are planned to be rehabilitated / extended to accommodate the proposed road widening. The geotechnical investigation consisted of drilling six (6) boreholes (BH C27/S7 and S8 to S12) at the existing culvert locations to obtain subsurface and groundwater condition. The boreholes were drilled to depth of about 5.8 m to 9.8 m (Elevations 204.4 m and 219.5 m) below the existing ground surface. One boreholes was terminated at the depth of 5.8 m due to auger refusal on likely boulder. The remaining boreholes were drilled to depth varying from 9.2 m to 9.8 m. Based on available information:

- the existing culvert over Rainbow Creek Tributary at Station 0+350 is a concrete box culvert with a span of about 3.5 m and is about 12 m long;
- the existing culvert over West Humber Tributary (Clarkway Tributary) at Station 0+700 is a concrete culvert with a span of about 7.1 m and is about 9.2 m long; and
- the existing culvert over West Humber Tributary (Gore Road Tributary) at Station 1+950 is a concrete culvert with a span of about 5.5 m and is about 7.5 m long.

Other information of the existing culverts and details of the proposed rehabilitations / extensions were not available at the time of preparation of this report. The culvert and borehole locations are shown in Figure Nos. 3A and 3B.

The stratigraphic units and groundwater conditions for each culvert are discussed in the following sections and presented on the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the soil conditions encountered at the proposed culvert location. The soil and groundwater conditions might vary between and beyond the borehole locations.

C4.1 Subsurface Condition - Culvert on Countryside Drive (Station 0+350)

Two (2) boreholes (BH S11 and S12) were drilled in the vicinity the existing culvert over Rainbow Creek Tributary at Station 0+350. Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile consisted of fill soils (sand and gravel and silty clay / clayey silt fill) underlying the asphaltic concrete. Native silty sand / sandy silt / sand and silt and/or silty clay / clayey silt till were encountered underlying the fill soils in both boreholes.

C4.1.1 Asphaltic Concrete

At Boreholes BH S11 and S12 locations, about 200 mm and 140 mm thick asphaltic concrete, respectively, was encountered at the ground surface.

C4.1.2 Fill Soils

Fill soils were encountered in both boreholes below the asphaltic concrete and consisted of sand and gravel fill and silty clay / clayey silt fill, which extended to a depth of about 2.2 m (Elevations 211.0 m and 211.3 m) below the existing ground surface in both boreholes.

The sand and gravel fill was brown in colour and contained trace to some silt. The silty clay / clayey silt fill, which was encountered below the sand and gravel fill, was dark brown / grey in colour and contained trace to some gravel and trace of organics. SPT 'N' values measured within the fill soils ranged from 6 blows to 16 blows per 0.3 m. Water contents measured in the fill samples ranged from 5 % to 21 %.

C4.1.3 Silty Sand / Sandy Silt / Sand and Silt Till

Native silty sand / sandy silt / sand and silt till was encountered below the fill soils in both boreholes and extended to a depth of about 7.8 m (Elevation 205.4 m) below the existing ground surface in Borehole BH S11, and to the termination depth of BH S12 5.8 m (Elevation 207.7 m). Borehole BH S12 was terminated due to auger refusal on possible cobbles/boulders or bedrock. The presence of cobbles and boulders should be anticipated throughout this granular till deposit based on the depositional history of this material.

The silty sand / sandy silt / sand and silt till was brown to grey in colour, and contained trace clay and trace gravel. The SPT 'N' values measured within the silty sand / sandy silt / sand and silt till ranged from 20 blows to more than 50 blows per 0.3 m, implying compact to very dense condition. Water contents measured in the till samples varied from 12 % to 16 %.

Gradation testing was carried out in one sample (BH S11 / SS6), the results of which are presented in Table C1.4 and shown on the Record of Borehole sheet.

C4.1.4 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the silty sand / sandy silt / sand and silt till and confirmed to the termination depth of Borehole BH S11 at 9.2 m (Elevation 204.0) below the existing ground surface.

The silty clay / clayey silt till was brown to grey in colour, and contained trace sand to some sand or was sandy, trace to some gravel, and cobbles / boulders. One (1) SPT 'N' value measured within the silty clay / clayey silt till was more than 50 blows per 0.3 m, implying hard consistency. A single water content measured in the silty clay / clayey silt till was 10 %.

C4.1.5 Groundwater Conditions

Upon completion, groundwater was encountered in Borehole BH S11 at a depth of 2.1 m (Elevation 211.1 m) below the existing ground surface. Groundwater was not encountered in Borehole BH S12 during and upon completion of the drilling.

The highest groundwater depth measured in monitoring well installed in BH S12 was about 1.4 m (Elevation 212.1 m) below ground surface. Groundwater measurements during drilling and in the monitoring well are summarized in Table C1.5 and shown on the Record of Borehole.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

C4.2 Subsurface Condition – Culvert on Countryside Drive (Station 0+700)

Two (2) boreholes (BH S9 and S10) were drilled in the vicinity of existing culvert over the West Humber Tributary (Clarkway Tributary) at Station 0+700. Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location consisted of fill soils (sand and gravel and silty clay / clayey silt fill) underlying the asphaltic concrete. Native silty clay / clayey silt till was encountered underlying the fill soils to the termination depths of both boreholes.

C4.2.1 Asphaltic Concrete

At Boreholes BH S9 and S10 locations, 150 mm thick asphaltic concrete was encountered at the ground surface in both boreholes.

C4.2.2 Fill Soils

Fill soils were encountered below the asphaltic concrete and consisted of sand and gravel fill and silty clay / clayey silt fill, which extended to depths of about 1.8 m and 1.5 m (Elevations 212.6 m and 212.3 m) below the existing ground surface in Boreholes BH S9 and S10, respectively.

The sand and gravel fill was brown to grey in colour and contained trace to some silt. The silty clay / clayey silt fill, which was encountered below the sand and gravel fill, was brown and dark brown in colour, and contained trace to some sand and gravel. SPT 'N' values measured within the fill soils ranged from 7 to 9 blows per 0.3 m. Water contents measured in the fill samples ranged from 16 % to 23 %.

C4.2.4 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the fill soils and extended to the termination depth of both boreholes at 9.4 m (Elevations 205.0 m and 204.4 m) below the existing ground surface.

The silty clay / clayey silt till was brown to grey in colour, and contained trace to some sand or was sandy, and trace gravel and cobbles / boulders. The SPT 'N' values measured within the silty clay / clayey silt till ranged between 7 blows and more than 50 blows per 0.3 m, implying firm to hard consistency. Water contents measured in the silty clay / clayey silt till ranged from 8 % to 19 %.

Gradation and Atterberg Limits tests were carried out in one sample (BH S9 / SS7), the results of which are presented in Table C1.5 above and shown on the Record of Borehole sheets.

C4.2.5 Groundwater Conditions

Upon completion, groundwater was encountered in Borehole BH S10 at a depth of 8.2 m (Elevation 205.6 m) below the existing ground surface. Groundwater was not encountered during and upon completion of the drilling of Borehole BH S9.

The highest groundwater depth measured in monitoring well installed in BH S10 was about 0.9 m (Elevation 212.9 m) below ground surface. Groundwater measurements during drilling and in the monitoring well are summarized in Table C1.6 and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

C4.3 Subsurface Conditions - Culvert on Countryside Drive (Station 1+950)

Two (2) boreholes (BH C27 / S7 and S8) were drilled in the vicinity of the existing culvert over West Humber Tributary (Gore Road Tributary) at Station 1+950. Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile consisted of fill soils (sand and gravel and silty clay / clayey silt fill) underlying the asphaltic concrete. Native silty sand / sandy silt till and/or silty clay / clayey silt till was encountered underlying the fill soils.

C4.3.1 Asphaltic Concrete

At Boreholes BH C27 / S7 and S8 locations, 130 mm and 140 mm thick asphaltic concrete, respectively, was encountered at the ground surface.

C4.3.2 Fill Soils

Fill soils were encountered below the asphaltic concrete and consisted of sand and gravel fill and silty clay / clayey silt fill, which extended to a depth of 2.2 m (Elevations 215.6 m and 217.3 m) below the existing ground surface.

The sand and gravel fill was brown in colour and contained trace to some silt. The silty clay / clayey silt fill, which was encountered below the sand and gravel fill, was dark grey and dark brown in colour and contained some sand, trace to some gravel and trace organics. SPT 'N' values measured within the fill soils ranged from 6 blows to 17 blows per 0.3 m. Water contents measured in the fill samples ranged from 4 % to 28 %.

C4.3.3 Silty Sand / Sandy Silt / Sand and Silt Till

An 0.8 m thick layer of native silty sand / sandy silt till was encountered underlying the fill soils up to a depth of 3.0 m (Elevation 216.6 m) below the existing ground surface in Borehole BH S8. The fill in borehole BH C27/S7 was underlain by sand and silt till with cobbles and boulders. Borehole BH C27/S7 was terminated in the granular till.

The silty sand / sandy silt / sand and silt till was brown in colour changing to grey with depth, and contained trace to some clay and trace gravel. Measured SPT 'N' values the granular till varied from 40 to over 50 blows per 0.3 m, indicating a dense to very dense condition. The water contents measured in the silty sand / sandy silt till sample were 9 to 26 %.

Gradation and Atterberg Limits tests were carried out in one (1) sample (BH C27 / S7 - SS4), the results of which are presented in Table C1.4 above and shown in the Records of Boreholes.

C4.3.4 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the sand and silt till in Borehole BH S8. The cohesive till was confirmed to the termination depth of 9.7 m (Elevations 209.9 m) below the existing ground surface.

The silty clay / clayey silt till was brown to grey in colour, and contained trace to some sand, trace gravel and cobbles / boulders. The SPT 'N' values measured within the silty clay / clayey silt till ranged between 31 blows and more than 50 blows per 0.3 m, implying hard consistency. Water contents measured in the silty clay / clayey silt till ranged from 9 % to 28 %.

C4.3.5 Groundwater Conditions

Upon completion, groundwater was encountered in Boreholes BH C27 / S7 and S8 at depths of 2.7 m and 2.4 m (Elevations 215.1 m and 217.1 m) below the existing ground surface, respectively.

Highest groundwater depth measured in monitoring well installed in BH C27 / S7 was about 1.7 m (Elevation 216.1 m) below ground surface. Groundwater measurements during drilling and in the monitoring well are summarized in Table C1.6 and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

C4.4 DISCUSSIONS AND RECOMMENDATIONS FOR CULVERTS

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations with respect to proposed culvert rehabilitation / extension.

Within the depths of the six boreholes drilled adjacent to the existing culvert locations, fill soils (sand and gravel and silty clay / clayey silt) were encountered to a depth of about 1.8 m to 2.2 m (Elevations 217.3 m and 211.0 m) below ground surface, overlying generally very stiff to hard and / or compact to very dense native till. The firm till soil were encountered only immediately below the fill soils.

The foundation type of existing culvert and details of the proposed rehabilitation / extension were not available at the time of preparation of this report. Accordingly, general considerations for the culverts are presented the following sections.

C4.4.1 Foundation

Based on the boreholes drilled at or in the vicinity of the culvert locations, values of geotechnical reaction at Serviceability Limit State (SLS) and the factored geotechnical resistance at Ultimate Limit State (ULS) are provided in Table C4.1 which may be used for design.

Table C4.1: Recommended ULS / SLS Bearing Values for Culvert Foundations

Borehole No.	Founding Stratum	Depth Below Existing Grade (m)	Elevation (m)	Geotechnical Reaction at SLS (kPa)	Factored Geotechnical Resistance at ULS(1) (kPa)
BH C27/S7	Fill	above 2.2 (±)	above 215.6 (±)	not recommended	not recommended
	Dense sand and silt till / hard silty clay / clayey silt till	below 2.2 (±)	below 215.6 (±)	200	300
BH S8	Fill	above 2.2 (±)	above 217.3 (±)	not recommended	not recommended
	Very dense silty sand / sandy silt till / hard silty clay / clayey silt till	below 2.2 (±)	below 217.3 (±)	200	300
BH S9	Fill	above 2.1 (±)	above 212.2 (±)	not recommended	not recommended
	Hard silty clay / clayey silt till	below 2.1 (±)	below 212.2 (±)	200	300
BH S10	Fill	above 1.5 (±)	above 212.3 (±)	not recommended	not recommended
	Very stiff to hard silty clay / clayey silt till	below 1.5 (±)	below 212.3 (±)	200	300
BH S11	Fill	above 2.2 (±)	above 211.0 (±)	not recommended	not recommended

Borehole No.	Founding Stratum	Depth Below Existing Grade (m)	Elevation (m)	Geotechnical Reaction at SLS (kPa)	Factored Geotechnical Resistance at ULS$^{(1)}$ (kPa)
	Dense to very dense silty sand / sandy silt / sand and silt till / hard silty clay / clayey silt till	below 2.2 (±)	below 211.0 (±)	200	300
BH S12	Fill	above 2.2 (±)	above 211.0 (±)	not recommended	not recommended
	Compact to very dense silty sand / sandy silt / sand and silt till	below 2.2 (±)	below 211.0 (±)	200	300
Engineered fill per OPSS.MUNI 1010 (if used), as per Section B5.3				150	225

Notes: $^{(1)}$ A resistance factor of $\Phi = 0.5$ has been applied to the ULS values provided.

The geotechnical bearing values provided in Table C4.1 are intended to assess the feasibility and sizes of footings and are for vertical loads (no inclination) without load eccentricity. Under the SLS pressures, foundation settlements could be up to 25 mm (total) and 20 mm (differential). Detail foundation analysis should be carried out, if necessary, to confirm SLS/ULS and corresponding settlements.

The design frost depth penetration is 1.4 m. All foundations should be covered by at least 1.4 m deep soil or equivalent synthetic thermal insulation.

Highest groundwater level measured during geotechnical investigation in the boreholes / monitoring well at the culvert location (Sta. 0+350) was at about Elevation 212.1 m (1.4 m below ground), at culvert location (Sta. 0+700) was at about Elevation 212.9 m (0.9 m below ground) and at culvert location (Sta. 1+950) was at about Elevation 216.1 m (1.7 m below ground). As such, a minimum groundwater level at Elevations of 212 m, 213 m and 216 m, respectively, or the creek water levels, whichever is higher, should be considered for design.

If required, the regional high flood level of the creek may be used.

During construction, considerable dewatering efforts and / or creek diversion (e.g., cofferdam, sheetpiles) to control the ingress of creek water may be required. General recommendations related to excavation and dewatering are presented in Section C5.4.

C4.4.2 Soil Parameters for Design

The unfactored soil parameters listed in Table C4.2 may be used for design of earth structures. It should be noted that these parameters are based on published information and/or semi-empirical/theoretical relationships, and are conservative and should be verified by field/laboratory testing, if more representative parameters are required.

Table C4.2: Unfactored Static Soil Parameters for Design

Material	Total Stress Analysis		Effective Stress Analysis		Earth Pressure Coefficients(1)			Bulk Unit Weight (kN/m^3)	Coefficient of Friction between Concrete and Soil
	C (kPa)	Φ (deg)	c′ (kPa)	Φ′ (deg)	Active K_a	At-Rest K_o	Passive K_p		
Dense to very dense silty sand / sandy silt till	0	35	0	35	0.27	0.43	3.7	20	0.4
Very stiff to hard silty clay / clayey silt till	100	0	0	30(2)	0.33	0.50	3.0	19	0.35
Engineered Fill (3)									
Granular A (OPSS.MUNI 1010)	0	35	0	35	0.27	0.43	3.7	24(4)	0.4
Granular B Type I or Type II (OPSS.MUNI 1010)	0	32	0	32	0.31	0.47	3.3	23(4)	

Notes: (1) Values based on semi-empirical relationships. For SLS, K_p values should be reduced to 1/3 of indicated value to limit lateral movement.

(2) Normally-consolidated range.

(3) All engineered fill should be compacted to at least 100 % SPMDD for supporting foundations.

(4) Unit weight values for engineered fill compacted to 100 % SPMDD. For backfill of retaining walls, unit weights for Granular A and Granular B compacted to 95 % SPMDD may be taken as 22 kN/m3 and 21 kN/m3, respectively.

C4.4.3 Earthquake Considerations

Based on the soil conditions observed in the boreholes (maximum drill depth of 9.4 m below ground) and the possible bedrock depth at the culvert location (~30 m), and in conformance with the criteria in Table 4.1 (Section 4.4.3.2 – Seismic Properties) of the Canadian Highway Bridge Design Code CSA S6-19 ("CHBDC"), the project site may be classified as Site Class D ("stiff soil").

The design values of site coefficients F(T), F(PGA) and F(PGV) can be obtained from Geological Survey of Canada on Natural resources Canada website: 'www.earthquakecanada.ca" or Tables 4.2 to 4.9 (Section 4.4.3.3 – Site Coefficients) of CHBDC, and the design spectral acceleration, S (T), should be determined as per Section 4.4.3.4 (Design Spectral Acceleration and Displacement Values) and Tables 4.2 to 4.9 in Section 4.4.3.3 of CHBDC.

C4.4.4 Scour Protection

Culvert and headwall footings should be protected against scour and erosion in the form of cut-off walls, rip-rap or equivalent. Scour protection should be designed based on the hydrology requirement by an experienced engineer. Alternatively, the foundations could be placed below the depth of scour and frost penetration. If rip-rap protection is used, it should be separated from the native soils with a geotextile filter fabric (e.g. Terrafix 600R or equivalent) or a filter zone of granular material. The embankment slope surface should be covered with topsoil and seeded/sodded as soon as possible after completion of construction.

C4.4.5 Backfill for Culvert

Backfill materials around culverts should consist of non-frost susceptible, free-draining granular materials in accordance with OPSS.MUNI 1010 (i.e., Granular 'A' or Granular 'B'). Such granular backfill should be compacted to at least 95 % SPMDD (Standard Proctor Maximum Dry Density). Free-draining backfill materials and the drain pipes and weep holes, etc., should be used provided to prevent hydrostatic pressure build-up.

Backfill, backfill transition and cover for the culvert should conform to Ontario Provincial Standard Drawing (OPSD) 3101.150 (*Walls, Abutment, Backfill, Minimum Granular Requirement*) or applicable City Standard.

Engineered fill is discussed in Section C5.3, and excavation and dewatering during construction are discussed in Section C5.4.

To increase sliding resistance, a shear key may be used, if required. The shear key can be designed using the unfactored K_p values for the soils provided in Table C4.2. The movement of the retaining structure to mobilize the passive resistance should be considered in the design.

C4.4.6 Retaining Wall

If retaining walls are constructed at the ends of the culvert (inlet and outlet), they may be founded on the dense to very dense or the very stiff to hard till. If required, the wall may also be founded on the engineered fill per OPSS.MUNI 1010. The frost and scour protection recommendations provided in Sections C4.4.1 and C4.4.4, respectively should also be adhered to in designing retaining wall foundations.

Soft fill areas should be recompacted (if possible) or replaced with the engineered fill described in Section C5.3. The founding subgrade should be verified by a geotechnical engineer. The SLS/ULS values and soil parameters provided in Tables C4.1 and C4.2 may be used for design of wall foundations, as required. Slope stability analyses should be carried for the retaining wall, once the detailed design is completed.

C4.4.7 Permanent Slopes

A slope of 2H:1V (2 Horizontal : 1 Vertical) or flatter should be constructed for a permanent fill embankment. The embankment should be constructed using engineered fill (Section C5.3). Global slope stability should be analyzed during detailed design, if the new embankment height is higher than 2 m high, once the detailed design is finalized. All permanent slope surfaces should be protected against erosion by surface water and creek water.

Construction of the embankment should follow the requirements of OPSS.MUNI 206 (*Construction Specification for Grading*), or applicable City Standard.

C5.0 General Considerations for Design and Construction

C5.1 Site Preparation

Site preparation will likely generally include stripping of topsoil / asphalt / concrete, excavation to subgrade, proof-rolling, sub-excavating soft spots, if encountered, and backfilling, if necessary, with engineered fill.

All topsoil and loose soil or soil mixed with organic matter should be stripped from pavement areas, manhole / catch basin founding areas, and base of underground utility services. Subgrade preparation of pavement is discussed in Section C2.6.3. Any loose, soft or unstable areas in the exposed subgrade should be sub-excavated and replaced with approved fill and compacted (Section C5.3). Lean concrete may be used to backfill sub-excavated areas.

Excavation should be carried out with a temporary slope of 1H:1V or flatter above the groundwater level (Section C5.4). Roadway shoring protection systems may be required during construction of the culverts. Temporary shoring is discussed in Section C5.5.

C5.2 Embankment Widening

Based on site condition, the proposed road widening will generally involve fill sections along the investigation limits. The embankment required for road widening should be constructed with compacted engineered fill at 2H:1V (or flatter) side slopes. If a side slope steeper than 2H:1V slope is required or if the height of the embankment / cut slope is greater than 2 m, slope stability analysis should be carried out to assess stability of the planned slope, depending on the subsurface conditions. Where existing embankments are to be widened, the side slopes should be benched in accordance with OPSD 208.010 prior to placement of the widening fills. Final (permanent) embankment side slopes in granular fills should be established to match the existing slopes or as per OPSD 200.010. Final slopes should be treated with a seed and mulch to prevent ravelling.

Widening of the road will require, as a minimum, stripping the existing ground surface cover (topsoil, asphaltic concrete, vegetation cover, surficial fill soils, etc.) from the area required for road widening. The planned widening will generally be constructed to the same elevation as the existing road surface. Grading, backfilling and compacting should follow OPSS.MUNI 206 (Construction Specification for Grading), OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting), OPSS 501.MUNI (Construction Specification for Compacting), and / or the City's requirements.

Backfilling, if required, for site grading (e.g., for subgrade raise, replacement of soft soil) should be placed as engineered fill. Engineered fill per OPSS.MUNI 1010 should be used to replace soft / incompetent soils and/or raising grade. Engineered fill should be prepared according to the City's standards / contract specifications. Engineered fill is discussed in Section C5.3.

The fill soils used for embankment widening should consist of approved clean fill (e.g., Select Subgrade Materials - OPSS 1010).

C5.3 Engineered Fill

Engineered fill per OPSS.MUNI 1010, where required, may be used to backfill excavated areas, backfill around manholes, replace soft/ incompetent soils, and / or raise grades. Engineered fill for backfill of excavated areas should be placed after stripping existing fill soils, any soils containing excessive organic matters and otherwise unsuitable soils.

Engineered fill can be prepared by placing fill soil and compacted as per OPSS.MUNI 501 (*Construction Specification for Compacting*) and/or applicable City Standard. Alternatively, engineered fill should be placed in loose layers not exceeding 200 mm. The water content of the fill should be within ± 2 % of its optimum moisture content (OMC) at the time of its placement, and it should be thoroughly compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD) in general.

The fill soils should consist of inorganic soils and should not be frozen during backfilling and compaction. Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. The compaction procedures and quality control should be overseen by a geotechnical engineer.

C5.4 Excavation and Dewatering

All excavations should be carried out in accordance with the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects (O. Reg. 213/91). The soils to be excavated can be classified as follows:

Existing fill soils	Type 3
Firm to hard silty clay / clayey silt till	Type 1 to 3 (varies by consistency)

Dense to very dense silty sand / sandy silt till (above groundwater level / fully dewatered)	Type 1
Dense to very dense silty sand / sandy silt till (below groundwater level)	Type 3

In accordance with the OHSA, a maximum short-term slope of 1H:1V is required to within 1.2 m of the trench bottom for temporary excavations in Type 1 and 2 cohesive till and native silty sand that is above the groundwater level, or properly dewatered. For Type 1 and 2 soils, a maximum depth of 1.2 m high vertical cut at the bottom of excavation may generally be constructed. However, under the groundwater table a 1.2 m high vertical cut may not be stable and flatter slopes may be required. Type 3 soils above the groundwater level may be inclined at 1H:1V or flatter from the bottom. In the case of saturated Type 3 fills or native granular deposits below the prevailing groundwater, if adequate dewatering is not implemented, slopes of open excavations will have to be reduced to 2H: 1V or flatter. In the absence of proper dewatering or groundwater control of Type 3 soils, slope flattening may be insufficient to prevent particularly saturated granular soils from becoming unstable and devolving to Type 4 materials. Near the ground surface, occasional 3H:1V or flatter slopes may be required due to loose/soft surficial soils. If open cut cannot be carried out, a temporary shoring system may be used to limit the extent of excavation. General consideration for temporary shoring is provided in Section C5.5.

Trenching should be carried out in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

Stockpiles, materials or any heavy equipment should be kept at least the same horizontal distance as the depth of the excavation from the upper edge of the excavation to prevent slope instability. All surface drainage should be directed away from any open excavations and trenches.

Based on observations at the borehole locations and planned excavation depth, normal excavation equipment should be suitable for excavation. Hard till soils may require additional effort for excavation (e.g., heavy excavator, rippers, impact hammer, etc.). The terms describing the compactness (very loose, loose, compact, dense, very dense) or consistency (very soft, soft, firm, stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation. It should be noted that cobbles / boulders can be encountered in the till and in fill soils. Therefore, removal of the cobbles / boulders should be considered and planned for.

During the construction, temporary runoff controls such as sediment trap, interceptor drain, dyke and / or silt fence should be installed to prevent uncontrolled water / sediment flow into existing water courses. The effluent from dewatering operations should also be filtered or passed through sediment traps to prevent turbidity.

Based on the soil and groundwater conditions at the borehole locations, groundwater control within the excavated area should not be significant. In the clayey soils, groundwater seepage into the excavation, if encountered, is likely to be slow and a properly filtered sump and pump system or gravity drainage may be used for dewatering the excavation. High water flow rates (e.g. from perched water in fills or granular layers with the cohesive tills) may be encountered during construction and the dewatering effort could require an increased number of sumps and pumps.

Use of lean concrete mud mat or granular layer may be warranted where founding surfaces are to be exposed for extended period, especially if the work is carried out during wet weather. Care should also be exercised to minimize disturbance to the final subgrade during excavation.

It is recommended that qualified geotechnical personnel be present during the foundation excavation to review the conditions of the foundation subgrade.

C5.5 Temporary shoring

Temporary shoring may be required for vertical excavation during construction of culvert, installation of underground utilities or roadway protection. This can be accomplished using soldier piles with lagging (or similar) in order to support the sides of the excavation. Temporary shoring design and construction should comply with OPSS.MUNI 539 (*Construction Specification for Temporary Protection Systems*), or applicable City Standard. The temporary shoring system should be designed to resist the lateral earth, surcharge and hydrostatic pressures which could occur during construction. Bracings should be installed within the shoring system to minimize movements of the soils. The temporary shoring system should be designed in accordance with the latest editions of Canadian Foundation Engineering Manual's (CFEM) and Canadian Highway Bridge Design Code (CHBDC), together with the requirements of the Ontario Health and Safety Regulations, as applicable.

The shoring system should be designed and approved by a professional engineer. Geotechnical parameters provided in Section C4.4.2 may be considered for design of shoring.

C5.6 Suitability of Existing Soils for Backfilling

Most of the excavated soils (i.e. granular fills, clayey fill and till soils) can be suitable for being reused for backfill, provided they can be separately stored, properly compacted and are environmentally acceptable. Fill soils containing construction debris (or similar) and organic matter should not be reused. Soils that are too wet to compact will require additional processing (e.g., drying). Cobbles and boulders (larger than 100 mm in size), if any, should be discarded by mechanical means (e.g., sieving) or manual removal.

C6.0 PRELIMINARY SOIL CHEMICAL ANALYSES

Environmental soil chemical analyses were carried out to provide preliminary discussions for soil disposal options as part of the Geotechnical Investigation Preliminary Design for the Site, the results of which are discussed in the following section.

No Phase I or Phase II Environmental Site Assessment (ESA) reports have been conducted or provided to Wood for review.

It is assumed that a Record of Site Condition, (RSC) as per Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the *Environmental Protection Act* (EPA), as amended ("O.Reg.153/04, as amended") is not required at this time.

C6.1 Methodology

The environmental soil screening and laboratory analyses program was carried out in general accordance with the current *Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the Environmental Protection Act (EPA)*, as amended (O. Reg. 153/04) in order to characterize the soil at the Site and to provide an initial discussion on disposal options for surplus material during future construction. It should be noted that the scope of work does not meet the analytical or administrative requirements of Ontario Regulation 406/19 On Site and Excess Soil Management (O. Reg. 406/19) in the event that the soil is to be considered for beneficial offsite reuse.

A Record of Site Condition (RSC) was not part of the scope of work. Due to the limited scope of work, further environmental assessment would be required in the event that an RSC is required.

C6.2 Sample Selection for Analyses

The environmental component of the preliminary subsurface investigation included the following activities:

- Conducting the soil sampling activities in accordance with the Ministry of the Environment (MOE) document entitled *"Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04"* dated June 2011, the Ministry of the Environment and Energy (MOEE) document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated December 1996; and MOE document entitled *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act"* issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol);
- Based on City of Brampton instruction, submission of nine (9) soil samples for laboratory analysis of metals & inorganics, three (3) soil sample for analysis of petroleum hydrocarbons (PHC) F1 to F4, two (2) soil samples for analysis of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs), and one (1) soil sample for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), to assist in determining appropriate soil disposal options, if required, during construction;
- Based on City of Brampton instruction, submission of one (1) soil sample for Ontario Regulation 347 (*O. Reg. 347*) as amended by Ontario Regulation 558/00 (*O. Reg. 558/00*) Toxicity Characteristic Leaching Procedure (TCLP) for volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) and metals and inorganics to determine landfill acceptability of soil/granular fill originating from the Site; and
- Comparison of the laboratory analytical results to soil standards presented in the Ministry of the Environment, Conservation and Parks (MECP) document entitled "*Soil, Ground Water and Sediment*

Standards for Use Under Part XV.1 of the Environmental Protection Act," (the "MECP SCS") dated April 15, 2011 and *O. Reg. 347*, as amended by *O. Reg. 558/00*, Schedule 4 Leachate Quality Criteria provided in the MECP document entitled "*Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste*," October 2000 (the "Schedule 4 Criteria").

C6.2.1 Site Condition Standards

All analytical soil results were compared to the MECP Table 1 (background) SCS for all types of Property Use (except Agricultural) (Table 1 SCS) and MECP Table 3 (generic) SCS for Industrial/Commercial/Community Property Use for Medium/Fine Textured Soils (Table 3 SCS).

The chemical analyses results were also evaluated against the following tables of Appendix 1 (Generic Excess Soil Quality Standards) of the new MECP O.Reg.406/19 "On-Site and Excess Soil Management," additional elements which are expected to come into force in January 2023:

- Table 1 Full Depth Background Site Condition Standards for all types of property use (except agricultural) (Table 1 Excess Soil Quality Standards); and
- Table 3.1 Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent, for industrial/commercial/community property use (Table 3.1 Excess Soil Quality Standards).

Furthermore, TCLP analyses results were also compared with Table 3.1 Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse – of O.Reg.406/19.

C6.2.2 Soil Sampling, Inspection & Preservation Procedures

Soil samples were obtained for laboratory analysis and field screening, where applicable, using a drill rig equipped with split spoon sampling capabilities. The drillers cleaned the split spoon by removing loose dirt from the split spoon using a wire brush, washing the split spoon using a brush in a dilute mix of potable water and Alconox soap, rinsing the split spoon with distilled water and rinsing the split spoon with methanol and allowing the split spoon to air dry.

The drillers obtained the split spoon sample by auguring to the specified depth, hammering the spoon about 0.6 m into the soil and removing the spoon. The split spoon sample was inspected for visual and/or olfactory evidence of environmental impacts. Disposable nitrile gloves were used and replaced between the handling of successive samples.

The soil samples retrieved from the borehole investigations were examined, classified and logged according to soil type, moisture content, colour, consistency, and presence of visible indicators of environmental impact. Soil samples requiring vapour analysis were split into duplicate fractions upon recovery at the surface. The primary sample fractions were placed in 120 and/or 250 millilitre (mL) sample jars with Teflon-lined lids and methanol preserved (cored) samples were placed in 40 mL vials and subsequently stored in coolers on ice for potential future laboratory analysis. The volatile sample fractions were placed in resealable plastic sample bags and stored at ambient temperature for subsequent field vapour screening. The samples were selected on the basis of visual/olfactory evidence of impacts, field screening results, or from the vicinity of the apparent water table.

Representative soil samples collected during the investigation were submitted to AGAT Laboratories (AGAT) of Mississauga, Ontario, for metals & inorganics, VOCs and PHC. AGAT is accredited by the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) in accordance with ISO/IEC 17025:2005 – *"General Requirements for the Competence of Testing and Calibration Laboratories"* for the tested parameters set out in the Soil, Ground Water and Sediment Standards.

C6.3 Environmental Test Results & Considerations

Wood conducted a preliminary Environmental Soil Quality Testing Program (the Investigation) as part of the Geotechnical Investigation. The details of the drilling program, including borehole locations and drilling methodology are presented in the geotechnical investigation sections of this report. Soil samples submitted for chemical analysis were collected from depths between 0.3 m and 3.9 m below ground surface (mbgs) based on presence of fill material and depth of construction works, as detailed in Table C6.1.

Table C6.1: Environmental Tests

Sample ID	Depth (m)	Parameters Tested
BH C1 SS4	2.3 – 3.9	Metals and Inorganics
BH C6 SS2	0.6 – 1.2	Metals and Inorganics
BH C12 SS2	0.6 – 1.2	Metals and Inorganics
BH C13 SS3	1.5 – 2.1	Metals and Inorganics
BH C17 SS1	0.3 – 0.9	Metals and Inorganics
BH C24 SS2	0.6 – 1.2	Metals and Inorganics
BH C25 SS3	1.5 – 2.1	Metals and Inorganics
BH C29 SS1	0.3 – 0.9	Metals and Inorganics, PHCs, VOCs, PAHs
BH C33 SS1	0.3 – 0.9	PHCs, VOCs, PAHs
BH C37 SS1	0.3 – 0.9	Metals and Inorganics
BH S11 SS5	3.05 – 3.7	PHCs, BTEX

PHC = Petroleum Hydrocarbons
VOC = Volatile Organic Compounds
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
PAH = Polycyclic Aromatic Hydrocarbons

Wood observed fill material in all the boreholes. Headspace combustible organic vapour (COV) concentration measurements recorded in the soil samples were all non-detectable. Total organic vapour (TOV) concentration measurements recorded in the soil samples were all non-detectable.

No other evidence (i.e., visual/olfactory) of potential environmental impacts were observed in any of the soil samples collected from this project area.

The soil samples collected as part of this assessment that had Table 1 SCS exceedances are as follows:

- BH C6 SS2 for EC and SAR;
- BH C12 SS2 for EC and SAR;
- BH C13 SS3 for EC and SAR;
- BH C24 SS2 for EC and SAR;
- BH C25 SS3 and its field duplicate DUP for EC and SAR;
- BH C29 SS1 for EC and SAR; and
- BH C37 SS1 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 1 SCS for metals and inorganics, PHCs, VOCs, including BTEX, and PAHs.

The soil samples collected as part of this assessment that had Table 3 SCS exceedances are as follows:

- BH C6 SS2 for SAR;
- BH C12 SS2 for EC and SAR;
- BH C13 SS3 for EC;
- BH C25 SS3 and its field duplicate DUP for EC; and
- BH C29 SS1 for EC.

The other analyzed soil samples met had concentrations that met the Table 3 SCS for metals and inorganics, PHCs, VOCs, including BTEX, and PAHs.

When compared to the O. Reg. 406/19 Excess Soil Quality Standards Exceedances, the soil samples collected as part of this assessment that had Table 1 Excess Soil Quality Standards exceedances are as follows:

- BH C6 SS2 for EC and SAR;
- BH C12 SS2 for EC and SAR;
- BH C13 SS3 for EC and SAR;
- BH C24 SS2 for EC and SAR;
- BH C25 SS3 and its field duplicate DUP for EC and SAR;

- BH C29 SS1 for EC and SAR; and
- BH C37 SS1 for EC and SAR.

The other analyzed soil samples had concentrations that met the Table 1 Excess Soil Quality Standards for metals and inorganics, PHCs, VOCs, including BTEX, and PAHs.

The soil samples collected as part of this assessment that had Table 3.1 Excess Soil Quality Standards exceedances are as follows:

- BH C6 SS2 for SAR;
- BH C12 SS2 for EC and SAR;
- BH C13 SS3 for EC;
- BH C25 SS3 and its field duplicate DUP for EC; and
- BH C29 SS1 for EC.

The other analyzed soil samples had concentrations that met the Table 3.1 Excess Soil Quality Standards for metals and inorganics, PHCs, VOCs, including BTEX, and PAHs.

The TCLP analyses for the parameters tested indicated that dry soils (soils that would pass a slump test) would meet the Schedule 4 Leachate Quality Criteria.

Soil analytical results are shown in Tables 1C to 10C in Appendix C-C. The laboratory certificates of analysis for the bulk analysis and the certificates of analysis for the O. Reg. 347 TCLP analysis are included Appendix D.

C6.4 Quality Assurance / Quality Control

Field Quality Control: Field quality control was not performed for this segment and is discussed in separate reports being written as part of the Geotechnical Investigation.

Laboratory Quality Control: The 2011 Analytical Protocol provides requirements for sample handling and storage requirements, reporting requirements, analytical methods and QA/QC procedures for analytical parameters.

As per the 2011 Analytical Protocol, all samples/sample extracts were analyzed within their applicable hold times using approved analytical methods. The report limits were met for all samples and tested parameters. No tested parameter was present in a detectable concentration in any laboratory Method Blank and all laboratory surrogates, reference materials and replicate samples are considered acceptable.

SECTION D: CLARKWAY DRIVE (FROM CASTLEMORE ROAD TO MAYFIELD DRIVE, ~ 4.3 KM)

D1.0 OVERALL SUBSURFACE CONDITION

A total of fifty-four (54) boreholes (BH D1 to D58, excluding BH D14, D24, D30 and D42) were drilled to depths varying from 0.2 m to 5.2 m, for the proposed road reconstruction/widening and underground service installation, which included boreholes in the driving lanes, shoulders and auger holes in the ditches. Boreholes BH D14, D24, D30 and D42 could not be drilled due to presence of utilities in the shoulder/ditch areas. Four (4) boreholes (BH S13, S14, S15 and S16) were drilled to depths ranging between 9.3 m and 9.8 m at two culverts, which are planned to be rehabilitated / extended. The boreholes in the driving lanes and pavement shoulders were sampled via Standard Penetration Test (SPT), while recording 'N' Values. Thirteen (13) auger holes (without SPT) were carried out in the ditches to measure the topsoil thicknesses.

The stratigraphic units and groundwater conditions are discussed in the following sections. Additional information is provided in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the possible soil conditions at the investigated road section. The soil and groundwater conditions might vary between and beyond the borehole locations.

D1.1 Topsoil

Topsoil thicknesses were also measured in the ditches beside the road at thirteen (13) locations, which varied from about 180 mm to 240 mm, with an average thickness of about 205 mm, as listed in Table D1.1.

Table D1.1: Topsoil Thickness Measurements

Borehole No.	Coordinates (UTM, Zone 17T)		Topsoil Thickness (mm)
	Easting	Northing	
BH D4	606134	4850770	190
BH D10	605831	4851102	230
BH D12	605712	4851196	200
BH D16	605497	4851406	240
BH D20	605283	4851615	190
BH D22	605189	4851734	180
BH D26	604976	4851946	200
BH D28	604859	4852040	200
BH D34	604548	4852368	190
BH D40	604216	4852671	220

Borehole No.	Coordinates (UTM, Zone 17T)		Topsoil Thickness (mm)
	Easting	Northing	
BH D46	603909	4853000	230
BH D52	603578	4853305	200
BH D58	603271	4853634	200

At Boreholes BH D2 and D29 locations, approximately 50 mm and 150 mm of topsoil was encountered at the surface, respectively.

D1.2 Asphaltic Concrete

At the location of Boreholes BH D1, D3, D5, D7, D9, D11, D13, D15, D17, D19, D21, D23, D25, D27, D31, D32, D33, D35, D37, D39, D40, D41, D43, D45, D47, D49, D51, D53, D55, D57 and S13 to S16, approximately 80 to 160 mm of asphaltic concrete was encountered at the pavement surface. A layer of 180 mm of concrete was encountered below the asphalt in Borehole BH D57.

D1.3 Granular Fill

Granular fill, ranging from 100 mm to 1290 mm in thickness, where fully penetrated, was encountered below the asphaltic concrete in all boreholes drilled through the pavement, except in Borehole BH D57. Borehole BH D21 was terminated in the granular fill. A 100 mm thick layer of granular fill was intercepted within the cohesive fill layer in Borehole D2 at a depth of 0.5 m.

Granular fill (sand and gravel) was also encountered at the surface in Boreholes BH D6, D8, D18, D36, D38, D44, D48, D50, D54 and D56, which extended to depths varying from of 0.1 m to 1.1 m (Elevations 205.5 m to 221.6 m) below the existing ground surface. Borehole D8, which was terminated in the granular fill.

The SPT 'N' values measured in the granular fill ranged from 9 blows to more the 50 blows per 0.3 m of penetration. The measured water contents in the granular fill samples varied from about 3 % to 11 %.

Two (2) gradation tests were carried out on the selected samples of granular fill, the results of which are presented in Table D1.2 and are also shown on the Record of Boreholes. Cobbles were enountered in the granular fill in Boreholes BH D8 and D21.

Table D1.2: Results of Grain Size Distribution Analysis (Granular Fill)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Soil Classification
				Gravel	Sand	Fines		
						Silt	Clay	
BH D6	SS1A	0.0 - 0.6	206.1 - 205.5	36	49	15		SAND AND GRAVEL, some fines. Sample does not meet OPSS1010 Granular A or B due to excessive fines content
BH D41	SS1A	0.1 - 0.2	213.8 - 213.7	35	50	13	2	

The grain size distribution curves are presented on Figure B-D1 in Appendix B-D.

D1.4 Silty Clay / Clayey Silt Fill

Silty clay / clayey silt fill was encountered below the granular fill / topsoil / asphaltic concrete at all borehole locations, except at Boreholes BH D6, D8, D21, D31 and D39. Boreholes BH D8 and D21 were terminated within the granular fill. Where fully penetrated, the silty clay / clayey silt fill thickness ranged from about 0.3 to 3.1 m, and extended to depths varying from about 0.6 m to 4.1m (Elevations 203.7 m to 222.9 m) below the existing ground. Eleven boreholes (BH D9, D15, D18, D27, D29, D32, D33, D36, D38, D39 and D41) terminated within the silty clay / clayey silt fill at depths varying from about 1.5 m and 2.1 m below ground surface.

The silty clay / clayey silt fill was generally brown to dark grey in colour and contained trace to some sand, trace of gravel and organics. Cobbles were noted in the cohesive fill in Boreholes BH D9 and D13.

The SPT 'N' values measured in the silty clay / clayey silt fill ranged from 0 blows to 38 blows per 0.3 m of penetration. One zero blow count (i.e. penetration with spoon self-weight) was measured in BH D37. In the rest of the test, a minimum 'N' value of 5 blow per 0.3 m was observed. The measured water contents in the silty clay / clayey silt fill samples varied from about 6 % to 28 %.

D1.5 Sandy Silt Fill

Sandy silt fill was encountered below the granular fill at borehole locations BH D31 and D39. The sandy fill extended to a depth of 2.2 m (Elevation 207.8 m) below ground surface in Borehole BH D31. Borehole BH 39 was terminated within the sandy silt fill.

The sandy silt fill was generally dark brown / dark grey in colour and contained trace to some clay and trace of gravel. The SPT 'N' values measured in the sandy silt fill were all 9 blows per 0.3 m of penetration. Two water contents measured in the sandy silt fill samples were about 14 % and 23 %.

D1.6 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered below the fill soils in all boreholes that did not terminate within the fill soils, and were encountered at depths of about 0.6 m to 4.1 m (Elevations 203.7 m to 222.9 m) and extended to the termination depths of all boreholes, except Boreholes BH S13 and S14, where it was underlain by silty sand / sandy silt till (Section D1.7). The silty clay / clayey silt till was confirmed to a maximum termination depth at about 9.8 m (Elevation 203.3 m) below existing ground surface in BH S16. In the rest of the boreholes the silty clay / clayey silt till extended up to depths (including termination depths) of about 1.5 m to 9.4 m (Elevations 200.7 m to 221.6 m) below existing ground surface.

The clayey silt / silty clay till was brown to grey in color, and contained trace to some sand and trace amount of gravel. Cobbles/boulders were encountered in some of the boreholes at various depths. Due to the depositional history of glacial tills, the presence of cobbles and boulders should be anticipated throughout the till deposit. Generally, the SPT 'N' values of the silty clay / clayey silt till ranged from 3 blows to greater than 50 blows per 0.3 m blows implying a soft to hard consistency overall. Generally, 'N' values were above 10 blows per 0.3 m, (stiff consistency).

The measured water contents of the silty clay / clayey silt till samples ranged from about 8 % to 22 %.

Gradation and Atterberg Limits tests were carried out on four (4) samples of the silty clay / clayey silt till, the results of which are presented in Table D1.3, and shown in the Records of Boreholes.

Table D1.3: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Clay / Clayey Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH D19	SS 3	1.8	208.8	2	22	49	27	27	16	11	CL
BH D49	SS 5	3.3	217.5	2	19	48	31	29	17	12	CL
BH S13	SS 6	4.9	205.3	3	16	50	31	26	17	9	CL
BH S15	SS 7	4.8	207.9	6	31	46	17	18	13	5	CL-ML

The grain size distribution curves and plasticity chart are presented Figure Nos. B-D2 and B-D3 in Appendix B-D.

D1.7 Silty Sand / Sand and Silt Till

Native silty sand / sand and silt till were encountered in Borehole BH S13 and S14 below the silty clay / clayey silt till, and extended to the termination depth of the boreholes at about 9.3 m (Elevations 200.9 m and 200.7 m, respectively). The silty sand / sand and silt till was grey in color, contained trace clay and trace gravel and cobbles / boulders. SPT 'N' values measured in the silty sand / sand and silt till varied from 9 blows to 50 blows per 0.3 m indicating loose to very dense compactness. Water contents measured in silty sand / sand and silt till samples varied from 13 % to 21 %.

Gradation and Atterberg Limit tests were carried out in one sample (SS 8) from Borehole BH S14, the results of which are presented in Table D1.4, and also shown in the Records of Boreholes.

Table D1.4: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Sand and Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
				(%)							
BH S14	SS 8	7.9	202.0	-	51	47	2	Non-plastic			SM

The grain size distribution curve is presented in Figure No. B-D4 in Appendix B-D.

D1.8 Groundwater

Upon completion, groundwater was encountered in Boreholes BH D3, D6 to D8, D15, D17 to D19, D21, D23, D25, D40 and S13 and S14 at depths of 0.6 to 4.6 m (Elevation 204.1 to 210.2.9 m) below the existing ground surface. Groundwater was not encountered in the remaining boreholes.

A monitoring well was installed at the locations of BH S13 and S16 at the culvert crossings. The groundwater depth measured in the boreholes (where groundwater was encountered) at the time of drilling or upon completion of drilling, and in subsequent measurements in the monitoring well are summarized in Table D1.5 and shown on the Record of Boreholes.

Table D1.5: Results of Groundwater Depth Measurements

Borehole No.	Groundwater Measurements					
	During or Upon Completion of Drilling (m)			In Monitoring Well (m)		
	Date	Depth	Elevation	Date	Depth	Elevation
D3	18 Feb 2020	0.6	205.4	Not installed		
D6	18 Feb 2020	0.6	205.5	Not installed		
D7	18 Feb 2020	1.8	204.1	Not installed		
D8	18 Feb 2020	0.6	205.0	Not installed		
D15	19 Feb 2020	0.9	208.6	Not installed		
D17	1 Apr 2020	4.6	205.9	Not installed		
D18	1 Apr 2020	1.2	208.9	Not installed		
D19	19 Feb 2020	1.2	209.4	Not installed		
D21	19 Feb 2020	1.2	207.8	Not installed		
D23	19 Feb 2020	1.2	208.0	Not installed		
D25	24 Feb 2020	1.2	207.9	Not installed		
D40	13 Feb 2020	2.7	210.2	Not installed		
BH S13	25 Feb 2020	4.3	205.9	12 May 2020	1.4	208.8
BH S14	25 Feb 2020	4.1	205.9	Not installed		
BH S16	24 Feb 2020	Not encountered		12 May 2020	3.2	209.9

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months, and in response to major weather events.

D1.9 Soil Corrosivity

Three (2) soil samples were submitted for corrosion analysis to determine the corrosive potential of the soils with respect to buried metallic structures. The results of the analyses are presented Table D2.6, and the laboratory test certificate is included in Appendix D.

Table D2.6: Soil Corrosivity Test Results

Parameter	Units	BH D53 – SS4	BH S14 – SS5	BH S16 – SS5
Chloride	ug/g or (ppm)	660	107	242
Sulphate	ug/g or (ppm)	31	208	26
pH	pH Units	7.97	8.00	8.12
Electrical Conductivity	mS/cm	1.4	0.554	0.575
Resistivity	Ohm-cm	763	1810	1740

As per ASTM STP 1013 (Effects of Soil Characteristics on Corrosion – "*chloride appears to be the main factor in increased soil corrosivity with levels in excess of 0.01 % (100 (µg/g) considered indicative of accelerated corrosion*". The chloride content measured in all three samples were more than 100 µg/g. In accordance with Table 1 of CSA A23.1-14 and based on "structurally reinforced concrete exposed to chloride, with or without freezing and thawing" and based on project location, exposure class "C-1" can be used. Class should be based on structure location and/or durability requirement.

In accordance with Table 3 of CSA A23.1-14, no additional requirement is specified for sulphate content below 0.10 % (i.e. 1,000 ppm or µg/g) below the "moderate degree of exposure" with respect to concrete. Therefore, in accordance with Table 6 of the Canadian Standards Association (CSA) Series A23.1-14, Type GU Portland cement can be used based on the water-soluble sulphate contents measured in soils.

As noted in ASTM -STP 1013 (*Effects of Soil Characteristics on Corrosion*), pH values between 4.0 and 8.5 has very little effect on corrosion (American Water Works Association (AWWA) Standard C 105-72 (Table 1 – Soil-Test Evaluation AWWA Rating).

The measured soil resistivity values below 1000 ohm-cm can be considered as "very high" and between 1000 ohm-cm and 2000 ohm-cm as "high" for exposed metallic structures, based on ASTM STP 1000, Corrosion Testing and Evaluation - Table 3 (Corrosivity for Uncoated Steel).

Protection against steel corrosion, where required, could include one or a combination of: adequate concrete cover, low-permeability concrete, corrosion inhibitors; coated reinforcing steel; clad reinforcing steel; and corrosion-resistant alloy reinforcement.

A corrosion specialist should be retained, if necessary, to review the analysis results and provide relevant recommendation.

D2.0 PAVEMENT INVESTIGATIONS AND DESIGN

The purpose of the pavement investigation was to obtain subsurface information and to provide geotechnical recommendations for widening of Clarkway Drive which is north / south oriented, and as per the City's road classification, it is designated as a minor arterial road. The total length of the investigated road section is about 4.3 km.

At the time of the investigation, the investigated Castlemore Road was a 2-lanes rural road that would be widened to 4-lanes; from Castlemore Road to E-W Arterial as rural for about 1.3 km, and urbanizing 3.0 km from E-W arterial and Mayfield Road with potential continuous centre turn lane. The discussions and recommendations in the following sections are general in nature as the details of the widening were not available at the time of this report.

The subsurface soil profile at the site consisted of surficial asphaltic concrete underlain by non-cohesive soil sand and gravel fill overlying silty clay fill, silty clay /clayey silt till which extended to the termination depths of the boreholes that ranged from 0.9 to 9.4 m.

All boreholes were open and dry upon completion to their respective vertical limits of investigation except in two boreholes (BH S13 and S14), where groundwater was encountered at depths of 4.3 m and 4.1 m, respectively, below ground surface.

The discussions and recommendations in the following sections are based on the subsurface information obtained from the boreholes and are intended for use by Design Engineers.

D2.1 Visual Pavement Condition Survey

On 10 August 2020, Wood carried out a visual pavement condition survey of the existing road surface within the project area to identify any distresses. A summary of the pavement condition survey, including predominant surface defects, surface deformation and cracking, is tabulated in Table D2.1 and copies of the Pavement Condition Survey Forms are included in Appendix A-D. Based on the pavement condition survey, the existing asphaltic concrete surface condition was rated Poor Condition from Castlemore Rd to Countryside Dr with some locations ranged from Fairly Good, Fair, Fairly Poor to Very Poor. The existing asphaltic concrete surface condition from Castlemore Rd to Countryside Dr ranged from Fair to Poor to Very Poor condition. The existing asphaltic concrete surface condition from Clarkway Drive from Countryside Dr to Mayfield Rd ranged from Very Poor to Poor condition with some locations ranged from Fair to Good.

Table D2.1: Existing Pavement Condition

Predominant Distress	2020 Condition Ra0ting
Clarkway Drive from Castlemore Rd to Countryside Dr ~3.1 km (2 lanes)	
300 m North of Castlemore Rd recently paved and rated Good Condition.	
• Ravelling & coarse aggregate loss – Moderate / Frequent. • Wheel Track Rutting/Distortion – Slight / Intermittent. • Longitudinal Cracking (single, multiple and alligator) – Moderate to Severe/ Frequent to Extensive. • Centreline Cracking (single, multiple and alligator) – Moderate to Severe/ Frequent to Extensive. • Pavement Edge Cracking – Moderate to Severe/ Frequent to Extensive. • Transverse Cracking (single, multiple and alligator) – Moderate to Severe / Frequent to Extensive.	Ranged from Fair to Poor to Very Poor Condition with some locations ranged from Fairly Poor to Good
Clarkway Drive from Countryside Dr to Mayfield Rd. ~ 1.2 km (2 lanes)	
Patched NBL North of Countryside from 50 – 100 m and from 125 – 150 m. Patched South of Mayfield Rd from 10 to 100 m.	
• Ravelling & coarse aggregate loss – Moderate / Intermittent. • Wheel Track Rutting/Distortion – Moderate / Frew. • Longitudinal Cracking (single, multiple and alligator) – Severe / Frequent. • Centreline Cracking (single, multiple and alligator) – Moderate / Frequent. • Pavement Edge Cracking - Severe/ Frequent. • Transverse Cracking (single, multiple and alligator) – Moderate / Frequent.	Ranged from Very Poor to Poor Condition with some locations ranged from Fair to Good

D2.2 Subsurface Conditions

A total of 58 boreholes were drilled along Clarkway Drive from Castlemore Road to Mayfield Road (approx. 4.3 km). Four (4) boreholes could not be drilled due to presence of underground utility along shoulder/ditch. The subsurface soil profile at the site consisted of surficial asphaltic concrete underlain by sand and gravel fill overlying silty clay fill, silty clay /clayey silt till which extended to the termination depths of the boreholes that different in depths that ranged from 0.9 to 9.4 m as detailed in the Record of Boreholes.

The driving lanes boreholes revealed that the asphaltic concrete thickness ranged from 85 mm to 160 mm with an average of 114 mm. Non-cohesive soil (sand and gravel fill) was encountered in all the boreholes underlying the existing asphaltic concrete that ranged in thickness from 100 mm to 1,410 mm, with an average of 544 mm. The shoulder boreholes revealed sand and gravel fill was encountered in all the boreholes that ranged in thickness from 100 mm to 1,250 mm, with an average of 512 mm. Two boreholes (BH D2 and D29) encountered topsoil ranged in depth from 50 mm - 150 mm. Another 2 boreholes (BH D32 and D40) encountered asphaltic concrete ranged in thickness from 110 mm – 150 mm.

Additional subsurface information is provided in Section D1.0 and in the Record of Boreholes.

D2.3 Groundwater Conditions

Groundwater was encountered in a number of boreholes during and on completion of drilling in the open boreholes at depths varying from 0.6 m to 4.6 m below ground, as listed in Table D1.4. It should be pointed out that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

D2.4 Pavement Design

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations for road rehabilitation/re-surfacing and widening along Clarkway Drive.

The discussions and recommendations in the following sections are based on the available information and the subsurface information obtained from the boreholes and is intended for use by Design Engineers.

D2.4.1 Pavement Structure Adequacy

Two methods were used to assess the existing pavement structure. In-situ structure number ("SN") and in-situ Granular Base Equivalency ("GBE") were estimated from the borehole data using the equivalency factors for various material types, as shown in Table D2.2.

Table D2.2: Summary of Typical Structural Layer Coefficient

Material Type	Typical AASHTO-Ontario Structural Layer Coefficient (SLC), ai (mm) [1]		Granular base Equivalency Factors
Rehabilitation	**Drainage**	**Structural**	
Existing HL Existing Gran Base Existing Gran Sub-base Existing Gran Base/Sub-base	Acceptable 1.0 Questionable 0.9 Inadequate 0.8 to 0.5	0.14 to 0.28 0.10 to 0.14 0.05 to 0.09	1.25 0.75 0.50 0.625
Pulverization	1.0	0.10 to 0.14	1.0
CIR	1.0	0.28 to 0.38	1.6 – 1.8
RAP/Gran A blended stabilized with EAM	1.0	0.20 to 0.25	1.0

(1) MTO Report MI-183 -. MTO Report MI-183 "Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions" - Table 4-5.

Table D2.3 summarises the total average pavement structural thickness of the existing asphaltic concrete pavement, granular base and sub-base, as well as the average existing Structure Number 'SN' and 'GBE' before rehabilitation.

Table D2.3: Summary of Existing Pavement Structure

No of Boreholes	Average Thickness (mm)		SN(1)	GBE	Predominant Subgrade
	HMA	Base/Subbase	(mm)		
# of BHs @ MDL/EP= 28 (D1, D3, D5, D7, D9, D11, D13, D15, D17, D19, D21, D23, D25, D27, D31, D33, D35, D37, D39, D41, D43, D45, D47, D49, D51, D53, D55, D57)	Range (85-160) mm Av. 114 mm	Range (100-1,410) mm Av. 544 mm	Range (25-165) mm Av. 75 mm	Range (188-994) mm Av. 482 mm	Si(y) Cl Fill Si(y) Cl/Cl(y) Si Till
# of BHs @ SHR/TOR= 14 (D2, D6, D8, D18, D29, D32, D36, D38, D40, D44, D48, D50, D54, D56)	HMA@ BHs (D32, D40) (110-150) mm Tps @ BHs (D2, D29) (50-150) mm	Range (100-1,250) mm Av. 512 mm	-	-	

Notes:

MDL= Mid driving Lane EP = Edge of Pavement SHR = Shoulder Rounding TOS = Toe of Slope.

(1) Existing SN calculation s the following parameters were used:

- Existing HMA coefficient, = 0.14
- Existing granular base/subbase coefficient, and concrete = 0.12/0.9

D2.4.2 Existing and Forecasted Traffic Data

The traffic data represented as Average Annual Daily Traffic (AADT$_{2020}$) in both directions was estimated by Wood Traffic Group as presented in Table D2.4. This traffic data was used to projected traffic data for 20 years design life. Equivalent single axle loads (ESALs) were calculated cumulatively over 20 years as described in the Ministry of Transportation Report "Procedures for Estimating Traffic Loads for Pavement Design, 1995".

Table D2.4: Traffic Data along Clarkway Drive

AADT in Both Directions 2020(1)	Growth Rate (%)	Comm. Vehicles (%)	Design ESALs @ 20 Years	Traffic Category
Clarkway Drive from Castlemore Rd to E-W Arterial ~1.3 km (Rural)				
3,620	2.0%	6.0%	1,464,641 ~ 1.5 x 10^6	**Category B**
Clarkway Drive from E-W Arterial to Mayfield Road. ~ 3.0 km (Urban)				
2,360	2.0%	6.0%	725,132 ~ 0.75 x 10^6	**Category B**

(1) 2020 is the anticipated construction year.

D2.4.3 Flexible Structural Pavement Design for Widening

After reviewing the field data and laboratory test results, the minimum pavement structural design for the widening of Clarkway Drive is presented in Table D2.5 and was determined in accordance with the 1993 American Association of State Highway and Transportation Officials ('AASHTO') Guide for the Design of Pavement Structures using the Darwin Software Program.

The AASHTO Pavement Design is considered to be a function of estimated future traffic in both directions (ESALs), reliability (R), which is a function of road classification, overall standard deviation (S_o), resilient modulus (M_r), as well as initial and terminal serviceability (P_o, P_t). From these parameters, the structure number (SN) is calculated. The SN is defined in the AASHTO Guide as a number, which provides a measure of the pavement strength and thickness needed to avoid overstressing the subgrade.

The following design parameters were chosen to calculate the required structure number for the design of flexible pavement using the AASHTO method, as described in the Ministry of Transportation Materials Information Report MI-183 "*Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions*".

- Initial serviceability,	$P_i = 4.5$;
- Terminal serviceability,	$P_t = 2.5$;
- Reliability level,	R = 90 percent;
- Overall standard of deviation,	$S_o = 0.49$;
- Subgrade Resilient Modulus, M_r (kPa)	$M_r = 30,000$

Table D2.5: Recommended Minimum Structural Pavement Design

ESALs	AASHTO Design for 20 Years					Recommended HMA & PGAC		*Traffic Category*
	HMA	Gran A	Design SN Requirement	Selected SN	Total Pavement Thickness	Marshall		
						HI 3 (HS) / HL 1 Surface Course	HL 8 (HS) / HDBC Binder Course	
	Thickness (mm)							
Clarkway Drive from Castlemore Rd to E-W Arterial ~1.3 km (Rural) ESALs = 1.5 X 10^6 Clarkway Drive from E-W Arterial to Mayfield Road ~ 3.0 km (Urban) ESALs = 0.75 X 10^6								
1.5 X 10^6 0.75 X 10^6	135	Gran A = 400 mm or Gran A = 150 mm Gran B Type II = 250 mm	112	112.7	535	SP 50 mm PGAC 64-28	85 mm PGAC 58-28	B
		Gran A = 480 mm or Gran A = 130 mm Gran B Type II = 350 mm	112	123.9	615			

Notes:
- Pavement shall be placed over approved subgrade.
- Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

The City of Brampton minimum Pavement Structure is as follows (Arterial Road STD#208 - 2019):

- 50 mm HL3 Asphalt (High Stability or HL1)
- 85 mm HL8 Asphalt (100 mm for All New Subdivision Roads)
- 150 mm Granular "A" or 130 mm of 20 mm Crusher Run Limestone
- 450 mm Granular "B" or 350 mm of 50 mm Crusher Run Limestone

The structure number (SN) of the City of Brampton design is 118.2 mm or by using Crusher Run Limestone SN = 123.9 mm

The City of Brampton pavement design standard was selected for the roadway widening since it provides better granular thickness in comparison to the AASHTO pavement structure design.

D2.4.4 Widening Clarkway Drive from Castlemore Drive to Mayfield Drive

Pavement recommendations for widening of Clarkway Drive are presented in Table D2.6, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Table D2.6: Widening of Clarkway Drive

HMA		PGAC	Traffic Category
Type	Thickness (mm)		
HL 3 (HS) / HL 1	50 mm	64-28	B
HL 8 (HS) /HDBC	85 mm	58-28	
Granular Base 'A' or 20m Crusher Run	150 mm	-	-
Granular Subbase 'B' Modified or 50m Crusher Run or Limestone	450 mm	-	-
Total Pavement Structure	**735 mm**	-	-
The granular thicknesses of the widening given in the table is a minimum thickness and should be increased, as required, to match the adjacent existing pavement granular thickness to promote positive lateral drainage (refer to the Borehole Log Data). Also, the thicknesses can be increased depending on grading requirements.			

Full depth excavation, as required and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness.

The excavated granular materials from the shoulder can be re-used as fill material for subgrade for the widening/embankment, provided it is not contaminated. New Granular B subbase should be added and compacted, followed by new Granular A base material. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted and overlain with 1 lift of HL 8 (HS) / HDBC binder course, and 1 lift of HL 3 (HS) or HL 1 surface course, as per Table D2.6. Installation of subdrain is recommended, if lateral drainage of the existing subgrade is not possible.

D2.5 Rehabilitation Strategies

The selected rehabilitation strategy was based on Wood's geotechnical/pavement investigation and analysis, including a visual pavement condition assessment, subgrade condition, and calculated ESALs. Consideration was also given to user delay, cost and/or disruption of traffic and an anticipated construction year of 2020. The proposed rehabilitation strategy is as follows:

In-Place Pulverization, Remixing & Resurfacing with 135 mm of HMA: This strategy involves pulverizing the existing asphalt concrete thickness into an equivalent depth of granular base material to a total depth of 240 mm. The resulting mixture of asphalt concrete and granular is then graded to cross fall, compacted and used as a base. The advantages of this option include the elimination of surface defects and reflection cracking and the reuse of the existing material efficiently. Typically, the GBE for bituminous crushed recovered material is in the order of 1.0. In-place pulverization should be graded and compacted and resurfaced with 135 mm of HMA. This option will raise the vertical profile by 135 mm and will provide 14 to 18 years of service life and average SN of 135 mm after resurfacing.

D2.6 Recommendations and Construction Features for Pavement

D2.6.1 Rehabilitation Strategies

In-Place Pulverization, Remixing & Resurfacing with 135 mm of HMA. This option will raise the existing vertical profile by 135 mm and will provide service life of 14-18 years.

D2.6.2 Widening of Coleraine Drive

Pavement recommendations for widening of Clarkway Drive are presented in Table D2.6 for new pavement structure, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Full depth excavation, as necessary, and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness. The excavated granular materials from the shoulder can be re-used as fill material for subgrade for the widening/embankment, provided it is not contaminated. New Granular B Type II subbase should be added and compacted, followed by new Granular A base material. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted and overlaid with 1 lift of HL 8 (HS) /HDBC binder course, and 1 lift of HL 3 (HS) / HL 1 surface course, as per Table D2.6 Installation of subdrain is recommended, if lateral drainage of the existing subgrade is not possible.

D2.6.3 Subgrade / Road Base Preparation and Compaction

The pavement structural design recommended for roads is applicable, provided the subgrade is prepared under dry weather conditions, proof-rolled with a heavy rubber-tired vehicle (such as a grader or loaded dump truck) in the presence of the geotechnical consultant. Any loose, soft or unstable areas, if detected during proof-rolling, must be sub-excavated, replaced with approved granular materials and compacted. Any additional engineered fill, if required, should be placed in thin layers not exceeding 200 mm and compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD). Granular materials should be placed in thin layers not exceeding approximately 200 mm, within ± 2 % of its optimum moisture content, and thoroughly compacted to a minimum of 100 % of SPMDD.

The subgrade should be provided with adequate drainage. If wet weather conditions prevail at the time of construction, adjustments to this design may be required, i.e. if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional sub-base material is best determined during construction.

All granular base and sub-base materials must be compacted to at least 100% of SPMDD.

D2.6.4 Stripping and Sub-Excavation

No additional sub-excavation, other than removal of organics and topsoil (ranging in thickness from 50 mm to 240 mm), are anticipated within the widening limits. However, any unsuitable soft or saturated material should be removed. Deeper stripping depths may be required, depending on the actual site conditions between borehole locations.

D2.6.5 Drainage

Prior to completing the rehabilitation, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project.

To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times. This can be accomplished by ensuring proper grading of the subgrade and positive lateral drainage of the granular base daylighting at the ditch. Alternatively, full-length perforated subdrain pipes of 150 mm diameter should be installed along both sides of the road, below the roadbed level, to ensure effective drainage, in accordance with OPSD 216.021. The sub-drainpipes should be wrapped in suitable non-woven geotextile surrounded by a minimum drainage zone of 19 mm size clear stone of minimum 150 mm thickness. A minimum slope of 2 % should be maintained across the paved sections (finished road surface) to ensure proper surface drainage. New pavement should slope towards the gutter/ditch.

D2.6.6 Hot Mixes and PGAC Type

The following Marshall hot mixes should be used on Clarkway Drive:

- HL 3 (HS) / HL 1 surface course mix and HL 8 (HS) /HDBC binder course should be used to provide the roadway with high durability.

Material Specification should be as per OPSS 1150 Material Specification for Hot Mix Asphalt. For aggregates, the material specification should be as per OPSS.MUNI 1003.

Performance Graded Asphalt Cement ("PGAC") 64-28 should be used only for surface course and PG 58-28 for binder course. This PGAC should satisfy the requirements of MP1 of SHRP Specifications for Superpave.

Recycled Materials: The use of reclaimed asphalt pavement (RAP) is permitted in Marshall mixes. The percent of RAP for HL 8 and HL 3 should be as per OPSS.MUNI 1150.

RAP containing steel slag aggregates should not be allowed.

Transition Treatments at Limits of Paving: At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered at a distance of not less than 5 m, in accordance with OPSS.PROV 313. It should be ensured that no joint location corresponds with a joint location in any other layer.

The transition treatment from earth cut to earth fill should be in accordance with OPSD 205.010.

Tack Coat: It is recommended that all milled surfaces, and binder course surfaces will be tack coated prior to top course asphalt, if exposed to extended traffic. Construction Specification should be as per OPSS Prov. 308, April 2007.

D2.6.7 In-Situ Compaction for Hot Mix

In all areas, asphaltic concrete should be compacted as per OPSS.MUNI 310, Table 10 (April 2011). It should be noted that the granular base and sub-base materials should be compacted to the City's standards or to minimum 100 % SPMDD.

Field Quality Assurance: Plate samples of loose hot mix should be obtained for each paving day, and extraction/gradation and full Marshall compliance testing should be carried out on these samples. The finished surface shall be true to required profile and cross-section within 6 mm from required elevations and thickness. The surface shall show no depressions or bumps exceeding 3 mm under a 3.0 m long straight edge, placed parallel to the road centre line.

D2.6.8 Frost Depth

A minimum depth of 1.4 m should be used for frost protection as per OPSD 3090.101.

D2.6.9 Detouring

No long-term detouring is planned. Therefore, no special treatment will be required.

D3.0 UNDERGROUND UTILITIES

The geotechnical investigation scope of work included obtaining subsurface conditions and providing recommendations for installation of proposed underground utility services. Accordingly, selected boreholes (i.e. alternating pavement boreholes) were deepened to a depth of 3 m to 5 m, as listed in Table 5.4. Information obtained from all relevant boreholes drilled along Clarkway Drive have been considered in this section, as applicable.

D3.1 Subsurface Conditions

A total of forty-one (41) boreholes (not including the thirteen augered boreholes for topsoil measurements) were drilled in driving lanes and shoulder areas of Clarkway Drive to depths varying from about 0.9 m to 9.8 m, for pavement investigation, underground utility installation and two structures (culverts). Borehole BH D8 was stopped at a depth of 0.9 m due to existing underground utility. The remaining boreholes were drilled to a minimum depth of about 1.5 m below ground level.

Overall, the project site along Clarkway Drive consisted of surficial cover (topsoil, asphaltic concrete, concrete and / or exposed granular fill) underlain by fill soils (granular and/or silty clay / clayey silt and/or sandy silt) overlying native silty clay / clayey silt till. Silty sand / sand and silt till was encountered at two borehole locations (BH S13 and S14), below the silty clay / clayey silt till. The fill soils extended to depths varying from about 0.6 m to 4.1 m (Elevations 203.7 m to 222.9 m) below the existing ground surface. The native till soils (silty clay / clayey silt till and/or silty sand / sand and silt) were confirmed to a depth of up to 9.8 m (up to Elevation 200.7 m) below existing ground surface in the deeper boreholes at the structure locations.

Groundwater depths measured in the boreholes and monitoring wells varied from 0.6 m to 4.6 m (Elevations 204.1 m to 209.9 m) below ground surface.

Detailed subsurface and groundwater conditions are provided in Section D1.0.

D3.2 Discussions and Recommendations for Underground Utilities

As per information available, the planned Countryside Drive rehabilitation / widening within the project limits will include installation of underground utilities and associated manholes and catch basins. Details of the installation were not available at the time of this report. Existing utilities, if any, should be protected and taken into consideration for design and construction of the proposed underground utilities and road widening.

The ground (road) elevations within the project limits (based on borehole location) varied from about 205.6 m (at BH D1) to 223.6 m (at BH D57), with the overall the ground surface was sloping up from south (Castlemore Road) to north (Mayfield Road).

The recommendations and discussions for excavation and installation of underground utility services, and associated manholes / catch basins, are provided in the following sections.

D3.2.1 Founding Subgrade Conditions

From the investigation result, fill soils (granular and/or silty clay / clayey silt and/or sandy silt) were present to depths varying from 0.6 m to 4.1 m below existing ground / road level, which included granular fill to depths varying from 0.1 m to 1.3 m in some of the boreholes. The SPT values in the silty clay / clayey silt fill below the granular fill indicated a firm to hard. The granular fill was in loose to very dense condition overall, and was compact to compact to very dense generally.

The native tills soils (silty clay / clayey silt and silty sand / sand and silt) below the fill soils were of soft to hard consistency and / or loose to very dense overall, with the majority indicating stiff to hard consistency and compact to very dense compactness, and should be generally competent to support underground utility services.

It is recommended that the inverts of underground utilities be founded on native soils, or competent fill soil subgrade. Existing fills or soft soil encountered at the founding level should be compacted, if possible, or otherwise, should be sub-excavated and backfilled with compacted soil as recommended in Section D5.3 (Engineered Fill).

For manholes and catch basins founded on competent subgrade (i.e., approved existing fill, imported engineered fill, till soils), a Geotechnical Reaction at Serviceability Limit State (SLS) of 100 to 150 kPa and a factored Geotechnical Resistance at Ultimate Limit State (factored ULS) of 150 to 225 kPa, depending on the subgrade conditions, may be used, which should be verified by a geotechnical engineer during construction. Under the SLS bearing values, settlements of up to 25 mm may take place.

The frost penetration depth for the project area should be considered as 1.4 m.

The highest groundwater elevation measured during the investigation within the project limits of Clarkway Drive was about 1.2 m (Elevation 209.4 m) below ground surface in the monitoring well installed at the culvert location (BH D19). As such, groundwater may be present within the excavation depths for the underground utilities. Also, perched water in sandy / silty pockets and / or water from surface runoff will require dewatering during excavation. As the excavation will generally be in clayey soils, groundwater seepage, if any, into the excavation is likely to be slow and a properly filtered sump and pump system, or gravity drainage, may be used for dewatering excavation.

General discussions regarding excavation and dewatering are provided in Section D5.4. Detailed dewatering consideration for the project is included Wood's hydrogeological investigation report, which is submitted under a separate cover.

Trench excavation, pipe bedding and anti-seepage collar considerations are discussed in following sections.

General discussions provided in Section D5.0 should also be considered for design and construction.

D3.2.2 Trench Excavation

Trench excavation should be carried out as per the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects. The soils classifications are shown in Section D5.4. Based on the soils encountered in the boreholes, the sides of excavations are expected to be temporarily stable at 1H:1V for Type 2 and Type 3 soils, provided excavations are properly dewatered and underground utilities are installed and backfilled within a reasonable short period of time. Provisions should be made for dewatering, as noted in Section D5.4. Trenching should be in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

It is important for frost heave compatibility that the trench backfill within the frost zone of 1.4 m depth matches the soil exposed on the trench walls.

D3.2.3 Bedding

Bedding for underground pipes should be placed in accordance with the design requirements and current Ontario Provincial Standards (OPS) specifications (Ontario Provincial Standard Drawing (OPSD) 802.10 for flexible pipes and OPSD 802.30, 802.31 and 802.32 for rigid pipes). It is recommended that a minimum of

150 mm thick bedding material (Class 'B' Type or better) be placed below the pipe invert. The thickness of the bedding may, however, have to be increased depending on the pipe diameter, or if wet or weak subgrade conditions are encountered. If the subgrade is weak, it should be sub-excavated and replaced with engineered fill to support the pipes and allow the use of Class 'B' Type bedding. If weak subgrade is encountered and cannot totally be removed, Class 'A' Type bedding (e.g. minimum 100 mm thick lean concrete) should be used to provide a workable surface and support the proposed pipes.

For the areas to be filled, the fill soils should first be placed approximately to final grade and subsequently excavated to install the underground pipes in order to prevent pipe settlement due to overburden loads.

Should the pipes be installed in soft clay soils, the joints should be restrained from movements and the backfill around the pipes should be properly compacted in order to prevent long-term movements. A layer of geotextile (Terrafix 270R or equivalent) should be placed between the soft clayey soils and the granular bedding/backfill in order to prevent soil migration.

The possibility of pipe movements in soft clayey soils, after installation, should be considered in the design and construction of the underground pipes.

Construction of underground pipes should be carried out in accordance with the relevant OPSS.MUNI 410 (Construction Specification for Pipe Sewer Installation in Open Cut), or other relevant applicable municipal / regional standards.

D3.2.4 Backfill

Based on the visual and tactile examination of the soil samples, the on-site excavated granular / silty clay fill and till soils may be re-used as backfill in sewer trenches provided their moisture contents at the time of construction are at or near the optimum. Moisture conditioning of the sub-excavation soils may be required prior to reuse. The excavated cohesive fill should be carefully examined for organic content and moisture condition by qualified geotechnical personnel in order to confirm the need for moisture conditioning or its acceptability for use as backfill.

The backfill should be placed in maximum 200 mm thick layers at or near (± 2 %) optimum moisture content, and each layer should be compacted to at least 95 % Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the manhole / catch basins should be brought up simultaneously on all sides and operation of heavy equipment near the walls should be restricted to minimize potential movement and/or damage.

Unsuitable material such as organic soils, boulders, cobbles, frozen soils, etc., should not be used for backfilling.

D3.2.5 Anti-Seepage Collars

From the borehole information underground utilities will likely be installed in clayey soil (silty clay fill, silty clay / clayey silt). As such, anti-seepage collars should not be required.

D4.0 CULVERTS ON CLARKWAY DRIVE (STATION 2+275 AND 3+325)

Two existing culverts (approximate Stations 2+275 and 3+325), located within the project limits on Clarkway Drive, are planned to be rehabilitated / extended to accommodate the proposed road widening. The geotechnical investigation consisted of drilling four (4) boreholes (BH S13 to S16) at the existing culvert locations (two boreholes at each culvert) to obtain subsurface and groundwater condition at the culvert locations. The boreholes were drilled to depths varying from about 9.3 m to 9.8 m (Elevations 207.5 m to 200.7 m) below the existing ground surface. The culvert and borehole locations are shown in Figure Nos. 4A to 4C.

Based on available information, the existing culvert at Station 3+325 is a concrete structure with a clear span of about 6.5 m, and is about 12 m long. Other information on the existing culverts and details of the proposed rehabilitations / extensions were not available at the time of preparation of this report.

The stratigraphic units and groundwater conditions for each culvert are discussed in the following sections and presented in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the soil conditions encountered at the proposed culvert location. The soil and groundwater conditions might vary between and beyond the borehole locations.

D4.1 Subsurface Conditions - Culvert on Clarkway Drive (Station 2+275)

Two (2) boreholes (BH S13 and S14) were drilled at the vicinity of Culvert at Sta. 2+275. Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location consisted of fill soils (sand and gravel, and silty clay / clayey silt), which were underlying the asphaltic concrete. Native silty clay / clayey silt till was encountered underlying the fill soils, and overlying silty sand / sand and silt till in both boreholes. The silty sand / sand and silt till was present to the termination depths of the boreholes.

D4.1.1 Asphaltic Concrete

Asphaltic concrete layers 80 mm and 90 mm thick were encountered at the surface of Boreholes BH S13 and S14, respectively.

D4.1.2 Fill Soils

Fill soils were encountered in both boreholes below the asphaltic concrete and consisted of sand and gravel fill and silty clay / clayey silt fill, which extended to a depth of 4.1 m (Elevations 206.1 m and 205.9 m) below the existing ground surface in Boreholes BH S13 and S14, respectively.

The sand and gravel fill was generally brown and contained trace to some silt. The silty clay / clayey silt fill, which was encountered below the sand and gravel fill, was brown to grey in colour and contained trace to some sand, trace to some gravel and traces of organics.

SPT 'N' values measured within the fill soils ranged from 6 to 67 blows per 0.3 m. Water contents measured in the fill samples ranged from 4 % to 15 % with the granular fill having an average water content of 4 %.

D4.1.3 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the fill soils and extended to depths of 5.6 m (Elevation 204.6 m) below ground surface at BH S13 and 7.2 m (Elevation 202.8 m) at BH S14.

The silty clay / clayey silt till was grey in colour, and contained trace to some sand and trace gravel. SPT 'N' values measured within the silty clay / clayey silt till ranged from 3 blows to 27 blows per 0.3 m, implying soft to very stiff consistency. Water contents measured in the silty clay /clayey silt till ranged between 12 % and 22 %.

Results of gradation and Atterberg Limit tests carried out a silty clay / clayey silt till sample are presented in Table D1.3, and shown on the Record of Borehole BH S13.

D4.1.4 Silty Sand / Sandy Silt Till

Native silty sand / sand and silt till was encountered underlying the silty clay / clayey silt till and extended to terminations depths of the boreholes at 9.3 m (Elevations 200.9 m and 200.7 m) below ground surface at BH S13 and BH S14, respectively.

The silty sand / sand and silt till was grey in colour, and contained trace clay and trace gravel. Cobbles and boulders were encountered in BH S13. SPT 'N' values measured within the silty sand / sand and silt till ranged from 9 blows to more than 50 blows per 0.3 m, implying loose to very dense condition. Water contents measured in the silty sand / sand and silt till ranged between 13 % and 21 %.

Results of gradation and Atterberg Limit tests carried out on one silty sand / sandy silt till samples are presented in Table D1.4, and shown on the Record of Borehole BH S14.

D4.1.5 Groundwater Conditions

Upon completion, groundwater was encountered in Boreholes BH S13 and S14 at depths of 4.3 m and 4.1 m (Elevation 205.9 m) below the existing ground surface, respectively.

One (1) monitoring well was installed in BH S13. Groundwater was measured at a depth of about 1.4 m (Elevation 208.8 m) in one subsequent measurement in the monitoring well. The groundwater measurements are summarized in Table D1.5 and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

D4.2 Subsurface Conditions - Culvert on Clarkway Drive (Station 3+325)

Two (2) boreholes (BH S15 and S16) were drilled at the vicinity of Culvert at Sta. 3+325. Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location consisted of fill soils (sand and gravel, and silty clay / clayey silt), which were underlying the asphaltic concrete. Native silty clay / clayey silt till was encountered underlying the fill soils, and extended to the termination depth of both boreholes.

D4.2.1 Asphaltic Concrete

Asphaltic concrete layers 100 mm and 90 mm thick were encountered at the surface of Boreholes BH S15 and S16, respectively.

D4.2.2 Fill Soils

Fill soils were encountered in both boreholes below the asphaltic concrete and consisted of sand and gravel fill and silty clay / clayey silt fill, which extended to a depth of 2.2 m (Elevations 210.5 m and 210.8 m) below the existing ground surface in Boreholes BH S15 and S16, respectively.

The sand and gravel fill was generally grey and contained trace to some silt. The silty clay / clayey silt fill, which was encountered below the sand and gravel fill, was brown to dark grey in colour and contained trace to some sand and trace to some gravel.

SPT ‘N’ values measured within the fill soils ranged from 8 to 37 blows per 0.3 m. Water contents measured in the fill samples ranged from 3 % to 24 %.

D4.2.2 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered underlying the fill soils and extended to the termination depths of the boreholes at 9.4 m (Elevation 203.2 m) below ground surface at BH S15 and 9.8 m (Elevation 203.3 m) at BH S14.

The silty clay / clayey silt till was brown to grey in colour, and contained trace to some sand, or was sandy, and trace gravel. Cobbles / boulders were encountered within the cohesive till in both boreholes. SPT 'N' values measured within the silty clay / clayey silt till ranged from 20 blows to more than 50 blows per 0.3 m, implying a very stiff to hard consistency. Water contents measured in the silty clay /clayey silt till ranged between 9 % and 22 %.

Results of gradation and Atterberg Limit tests carried out on one silty clay / clayey silt till samples are presented in Table D1.3, and shown on the Record of Borehole BH S15.

D4.2.3 Groundwater Conditions

Groundwater was not encountered upon completion of both Boreholes BH S15 and S16. One (1) monitoring well was installed in BH S16, at the location of the culvert crossing. Groundwater was measured at a depth of about 3.2 m (Elevation 209.9 m) in one subsequent measurement in the monitoring well. The groundwater measurements are summarized in Table D1.5 and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

D4.3 DISCUSSIONS AND RECOMMENDATIONS FOR CULVERTS

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations with respect to proposed culvert rehabilitation / extension.

Within the depths of the four boreholes drilled adjacent to the existing culvert location, fill soils (sand and gravel and silty clay / clayey silt) were encountered to a depth of about 2.2 m to 4.1 m (Elevations 210.8 m and 205.9 m) below ground surface, overlying soft to hard and / or loose to very dense till.

The foundation type of existing culvert and details of the proposed rehabilitation / extension were not available at the time of preparation of this report. Accordingly, general considerations for the culverts are presented the following sections.

D4.3.1 Foundation

Based on the boreholes drilled at or in the vicinity of the culvert locations, values of geotechnical reaction at Serviceability Limit State (SLS) and the factored geotechnical resistance at Ultimate Limit State (ULS) are provided in Table D4.1 which may be used for design.

Table D4.1: Recommended ULS / SLS Bearing Values for Culvert Foundations

Borehole No.	Founding Stratum	Depth Below Existing Grade (m)	Elevation (m)	Geotechnical Reaction at SLS (kPa)	Factored Geotechnical Resistance at ULS[1] (kPa)
BH S13	Fill	above 4.1 (±)	above 206.1 (±)	not recommended	not recommended
	Very stiff silty clay till	4.1 to 5.6 (±)	206.1 to 204.6 (±)	100	150
	Very dense silty sand / sand and silt till	below 5.6 (±)	below 204.6 (±)	200	300
BH S14	Fill / soft silty clay / clayey silt till	above 6.1 (±)	above 204.0 (±)	not recommended	not recommended
	Stiff silty clay/clayey silt till / dense to very dense silty sand/sand and silt till	below 6.1 (±)	below 204.0 (±)	200	300
BH S15	Fill	above 2.2 (±)	above 210.5 (±)	not recommended	not recommended
	Very stiff to hard silty clay/clayey silt till	below 2.2 (±)	below 210.5 (±)	200	300
BH S16	Fill	above 2.2 (±)	above 210.8 (±)	not recommended	not recommended
	Very stiff to hard silty clay/clayey silt till	below 2.2 (±)	below 210.8 (±)	200	300
Engineered fill per OPSS.MUNI 1010 (if used), as per Section B5.3				150	225

Notes: [1] A resistance factor of $\Phi = 0.5$ has been applied to the ULS values provided.

The geotechnical bearing values provided in Table D4.1 are intended to assess the feasibility and sizes of footings and are for vertical loads (no inclination) without load eccentricity. Under the SLS pressures, foundation settlements could be up to 25 mm (total) and 20 mm (differential). Detail foundation analysis should be carried out, if necessary, to confirm SLS/ULS and corresponding settlements.

The design frost depth penetration is 1.4 m. All foundations should be covered by at least 1.4 m deep soil or equivalent synthetic thermal insulation.

Highest groundwater level measured during geotechnical investigation in the boreholes / monitoring well at the culvert location (Sta. 2+275) was at about Elevation 208.8 m (1.4 m below ground) and at culvert location (Sta. 3+325) was at about Elevation 209.9 m (3.2 m below ground). As such, a minimum groundwater level at Elevations of 209 m and 210 m, respectively, or the creek water levels, whichever is higher, should be considered for design. If required, the regional high flood level of the creek may be used.

During construction, considerable dewatering efforts and / or creek diversion (e.g., cofferdam, sheetpiles) to control the ingress of creek water may be required. General recommendations related to excavation and dewatering are presented in Section D5.4.

D4.3.2 Soil Parameters for Design

The unfactored soil parameters listed in Table D4.2 may be used for design of earth structures. It should be noted that these parameters are based on published information and/or semi-empirical/theoretical relationships, and are conservative and should be verified by field/laboratory testing, if more representative parameters are required.

Table D4.2: Unfactored Static Soil Parameters for Design

Material	Total Stress Analysis		Effective Stress Analysis		Earth Pressure Coefficients(1)			Bulk Unit Weight (kN/m^3)	Coefficient of Friction between Concrete and Soil
	C (kPa)	Φ (deg)	c′ (kPa)	Φ′ (deg)	Active K_a	At-Rest K_o	Passive K_p		
stiff to hard silty clay / clayey silt till	100	0	0	30(2)	0.33	0.50	3.0	19	0.35
Compact silty sand / sand and silt till	0	32	0	32	0.31	0.47	3.3	20	0.4
Dense to very dense silty sand / sand and silt till	0	35	0	35	0.27	0.43	3.7	20	0.4
Engineered Fill (3)									
Granular A (OPSS.MUNI 1010)	0	35	0	35	0.27	0.43	3.7	24(4)	0.4
Granular B Type I or Type II (OPSS.MUNI 1010)	0	32	0	32	0.31	0.47	3.3	23(4)	

Notes: (1) Values based on semi-empirical relationships. For SLS, K_p values should be reduced to 1/3 of indicated value to limit lateral movement.

[2] Normally-consolidated range.

[3] All engineered fill should be compacted to at least 100 % SPMDD for supporting foundations.

[4] Unit weight values for engineered fill compacted to 100 % SPMDD. For backfill of retaining walls, unit weights for Granular A and Granular B compacted to 95 % SPMDD may be taken as 22 kN/m^3 and 21 kN/m^3, respectively.

D4.3.3 Earthquake Considerations

Based on the soil conditions observed in the boreholes (maximum drill depth of 9.4 m below ground) and the possible bedrock depth at the culvert location (~30 m), and in conformance with the criteria in Table 4.1 (Section 4.4.3.2 – Seismic Properties) of the Canadian Highway Bridge Design Code CSA S6-19 ("CHBDC"), the project site may be classified as Site Class D ("stiff soil").

The design values of site coefficients F(T), F(PGA) and F(PGV) can be obtained from Geological Survey of Canada on Natural resources Canada website: 'www.earthquakecanada.ca" or Tables 4.2 to 4.9 (Section 4.4.3.3 – Site Coefficients) of CHBDC, and the design spectral acceleration, S (T), should be determined as per Section 4.4.3.4 (Design Spectral Acceleration and Displacement Values) and Tables 4.2 to 4.9 in Section 4.4.3.3 of CHBDC.

D4.3.4 Scour Protection

Culvert and headwall footings should be protected against scour and erosion in the form of cut-off walls, rip-rap or equivalent. Scour protection should be designed based on the hydrology requirement by an experienced engineer. Alternatively, the foundations could be placed below the depth of scour and frost penetration. If rip-rap protection is used, it should be separated from the native soils with a geotextile filter fabric (e.g. Terrafix 600R or equivalent) or a filter zone of granular material. The embankment slope surface should be covered with topsoil and seeded/sodded as soon as possible after completion of construction.

D4.3.5 Backfill for Culvert

Backfill materials around culvert should consist of non-frost susceptible, free-draining granular materials in accordance with OPSS.MUNI 1010 (i.e., Granular 'A' or Granular 'B'). Such granular backfill should be compacted to at least 95 % SPMDD (Standard Proctor Maximum Dry Density). Free-draining backfill materials and the drain pipes and weep holes, etc., should be used provided to prevent hydrostatic pressure build-up.

Backfill, backfill transition and cover for the culvert should conform to Ontario Provincial Standard Drawing (OPSD) 3101.150 (*Walls, Abutment, Backfill, Minimum Granular Requirement*) or applicable City Standard.

Engineered fill is discussed in Section D5.3, and excavation and dewatering during construction are discussed in Section D5.4.

To increase sliding resistance, a shear key may be used, if required. The shear key can be designed using the unfactored K_p values for the soils provided in Table D4.2. The movement of the retaining structure to mobilize the passive resistance should be considered in the design.

D4.3.6 Retaining Walls

If retaining walls are constructed at the ends of the culvert (inlet and outlet), they may be founded on the stiff to hard native silty clay till. If required, the wall may also be founded on the engineered fill per OPSS.MUNI 1010. The frost and scour protection recommendations provided in Sections D4.3.1 and D4.3.4, respectively should also be adhered to in designing retaining wall foundations.

Soft fill areas should be recompacted (if possible) or replaced with the engineered fill described in Section D5.3. The founding subgrade should be verified by a geotechnical engineer. The SLS/ULS values and soil parameters provided in Tables D4.1 and D4.2 may be used for design of wall foundations, as required. Slope stability analyses should be carried for the retaining wall, once the detailed design is completed.

D4.3.7 Permanent Slopes

A slope of 2H:1V (2 Horizontal : 1 Vertical) or flatter should be constructed for permanent fill embankment. The embankment should be constructed using engineered fill (Section D5.3). Global slope stability should be analyzed during detailed design, if the new embankment height is higher than 2 m high, once the detailed design is finalized. All permanent slope surfaces should be protected against erosion by surface water and creek water.

Construction of the embankment should follow the requirements of OPSS.MUNI 206 (*Construction Specification for Grading*), or applicable City Standard.

D5.0 General Considerations for Design and Construction

D5.1 Site Preparation

Site preparation will likely generally include stripping of topsoil / asphalt / concrete, excavation to subgrade, proof-rolling, sub-excavating soft spots, if encountered, and backfilling, if necessary, with engineered fill.

All topsoil and loose soil or soil mixed with organic matter should be stripped from pavement areas, manhole / catch basin founding areas, and base of underground utility services. Subgrade preparation of pavement is discussed in Section D2.6.3. Any loose, soft or unstable areas in the exposed subgrade should be sub-excavated and replaced with approved fill and compacted (Section D5.3). Lean concrete may be used to backfill sub-excavated areas.

Excavation should be carried out with a temporary slope of 1H:1V or flatter above the groundwater level (Section D5.4). Roadway shoring protection systems may be required during construction of the culverts. Temporary shoring is discussed in Section D5.5.

D5.2 Embankment Widening

Based on site condition, the proposed road widening will generally involve fill sections along the investigation limits. The embankment required for road widening should be constructed with compacted engineered fill at 2H:1V (or flatter) side slopes. If a side slope steeper than 2H:1V slope is required or if the height of the embankment / cut slope is greater than 2 m, slope stability analysis should be carried out to assess stability of the planned slope, depending on the subsurface conditions. Where existing embankments are to be widened, the side slopes should be benched in accordance with OPSD 208.010 prior to placement of the widening fills. Final (permanent) embankment side slopes in granular fills should be established to match the existing slopes or as per OPSD 200.010. Final slopes should be treated with a seed and mulch to prevent ravelling.

Widening of the road will require, as a minimum, stripping the existing ground surface cover (topsoil, asphaltic concrete, vegetation cover, surficial fill soils, etc.) from the area required for road widening. The planned widening will generally be constructed to the same elevation as the existing road surface. Grading, backfilling and compacting should follow OPSS.MUNI 206 (Construction Specification for Grading), OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting), OPSS 501.MUNI (Construction Specification for Compacting), and / or the City's requirements.

Backfilling, if required, for site grading (e.g., for subgrade raise, replacement of soft soil) should be placed as engineered fill. Engineered fill per OPSS.MUNI 1010 should be used to replace soft / incompetent soils and/or raising grade. Engineered fill should be prepared according to the City's standards / contract specifications. Engineered fill is discussed in Section D5.3.

The fill soils used for embankment widening should consist of approved clean fill (e.g., Select Subgrade Materials - OPSS 1010).

D5.3 Engineered Fill

Engineered fill per OPSS.MUNI 1010, where required, may be used to backfill excavated areas, backfill around manholes, replace soft/incompetent soils, and / or raise grades. Engineered fill for backfill of excavated areas should be placed after stripping existing fill soils, any soils containing excessive organic matters and otherwise unsuitable soils.

Engineered fill can be prepared by placing fill soil and compacted as per OPSS.MUNI 501 (*Construction Specification for Compacting*) and/or applicable City Standard. Alternatively, engineered fill should be placed in loose layers not exceeding 200 mm. The water content of the fill should be within ± 2 % of its optimum moisture content (OMC) at the time of its placement, and it should be thoroughly compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD) in general.

The fill soils should consist of inorganic soils and should not be frozen during backfilling and compaction. Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. The compaction procedures and quality control should be overseen by a geotechnical engineer.

D5.4 Excavation and Dewatering

All excavations should be carried out in accordance with the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects (O. Reg. 213/91). The soils to be excavated can be classified as follows:

Existing fill soils,	Type 3
Loose silty sand / sand and silty (below groundwater level), soft silty clay / clayey silt till	Type 4
Firm to hard silty clay / clayey silt till	Type 1 to 3 (varies by consistency)
Dense to very dense silty sand / sand and silt till (above groundwater level / fully dewatered)	Type 1
Dense to very dense silty sand / sand and silt till (below groundwater level)	Type 3

In accordance with the OHSA, a maximum short-term slope of 1H:1V is required to within 1.2 m of the trench bottom for temporary excavations in Type 1 and 2 cohesive till and native silty sand that is above the groundwater level, or properly dewatered. For Type 1 and 2 soils, a maximum depth of 1.2 m high vertical cut at the bottom of excavation may generally be constructed. However, under the groundwater table a 1.2 m high vertical cut may not be stable and flatter slopes may be required. Type 3 soils above the groundwater level may be inclined at 1H:1V or flatter from the bottom. In the case of saturated Type 3 fills or native granular deposits below the prevailing groundwater, if adequate dewatering is not implemented, slopes of open excavations will have to be reduced to 2H: 1V or flatter. In the absence of proper dewatering or groundwater control of Type 3 soils, slope flattening may be insufficient to prevent particularly saturated granular soils from becoming unstable and devolving to Type 4 materials, which requires 3H:1V or flatter slopes. Near the ground surface, occasional 3H:1V or flatter slopes may be required due to loose/soft surficial soils. If open cut cannot be carried out, a temporary shoring system may be used to limit the extent of excavation. General consideration for temporary shoring is provided in Section D5.5.

Trenching should be carried out in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

Stockpiles, materials or any heavy equipment should be kept at least the same horizontal distance as the depth of the excavation from the upper edge of the excavation to prevent slope instability. All surface drainage should be directed away from any open excavations and trenches.

Based on observations at the borehole locations and planned excavation depth, normal excavation equipment should be suitable for excavation. Hard till soils may require additional effort for excavation (e.g., heavy excavator, rippers, impact hammer, etc.). The terms describing the compactness (very loose, loose, compact, dense, very dense) or consistency (very soft, soft, firm, stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation. It should be noted that cobbles / boulders can be encountered in the till and in fill soils. Therefore, removal of the cobbles / boulders should be considered and planned for.

During the construction, temporary runoff controls such as sediment trap, interceptor drain, dyke and / or silt fence should be installed to prevent uncontrolled water / sediment flow into existing water courses. The effluent from dewatering operations should also be filtered or passed through sediment traps to prevent turbidity.

Based on the soil and groundwater conditions at the borehole locations, groundwater control within the excavated area should not be significant. In the clayey soils, groundwater seepage into the excavation, if encountered, is likely to be slow and a properly filtered sump and pump system or gravity drainage may be used for dewatering the excavation. High water flow rates (e.g. from perched water in fills or granular layers with the cohesive tills) may be encountered during construction and the dewatering effort could require an increased number of sumps and pumps.

Use of lean concrete mud mat or granular layer may be warranted where founding surfaces are to be exposed for extended period, especially if the work is carried out during wet weather. Care should also be exercised to minimize disturbance to the final subgrade during excavation.

It is recommended that qualified geotechnical personnel be present during the foundation excavation to review the conditions of the foundation subgrade.

D5.5 Temporary shoring

Temporary shoring may be required for vertical excavation during construction of culvert, installation of underground utilities or roadway protection. This can be accomplished using soldier piles with lagging (or similar) in order to support the sides of the excavation. Temporary shoring design and construction should comply with OPSS.MUNI 539 (*Construction Specification for Temporary Protection Systems*), or applicable City Standard. The temporary shoring system should be designed to resist the lateral earth, surcharge and hydrostatic pressures which could occur during construction. Bracings should be installed within the shoring system to minimize movements of the soils. The temporary shoring system should be designed in accordance with the latest editions of Canadian Foundation Engineering Manual's (CFEM) and Canadian Highway Bridge

Design Code (CHBDC), together with the requirements of the Ontario Health and Safety Regulations, as applicable.

The shoring system should be designed and approved by a professional engineer. Geotechnical parameters provided in Section D4.3.2 may be considered for design of shoring.

D5.6 Suitability of Existing Soils for Backfilling

Most of the excavated soils (i.e. granular fills, clayey fill and till soils) can be suitable for being reused for backfill, provided they can be separately stored, properly compacted and are environmentally acceptable. Fill soils containing construction debris (or similar) and organic matter should not be reused. Soils that are too wet to compact will require additional processing (e.g., drying). Cobbles and boulders (larger than 100 mm in size), if any, should be discarded by mechanical means (e.g., sieving) or manual removal.

D6.0 PRELIMINARY SOIL CHEMICAL ANALYSES

Environmental soil chemical analyses were carried out to provide preliminary discussions for soil disposal options as part of the Geotechnical Investigation Preliminary Design for the Site, the results of which are discussed in the following section.

No Phase I or Phase II Environmental Site Assessment (ESA) reports have been conducted or provided to Wood for review.

It is assumed that a Record of Site Condition, (RSC) as per Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the *Environmental Protection Act* (EPA), as amended (“O.Reg.153/04, as amended”) is not required at this time.

D6.1 Methodology

The environmental soil screening and laboratory analyses program was carried out in general accordance with the current *Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the Environmental Protection Act (EPA)*, as amended (O. Reg. 153/04) in order to characterize the soil at the Site and to provide an initial discussion on disposal options for surplus material during future construction. It should be noted that the scope of work does not meet the analytical or administrative requirements of Ontario Regulation 406/19 On Site and Excess Soil Management (O. Reg. 406/19) in the event that the soil is to be considered for beneficial reuse.

A Record of Site Condition (RSC) was not part of the scope of work. Due to the limited scope of work, further environmental assessment would be required in the event that an RSC is required.

D6.2 Sample Selection for Analyses

The environmental component of the subsurface investigation included the following activities:

- Conducting the soil sampling activities in accordance with the Ministry of the Environment (MOE) document entitled *"Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04"* dated June 2011, the Ministry of the Environment and Energy (MOEE) document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated December 1996; and MOE document entitled *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act"* issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol);
- Based on City of Brampton instruction, submission of fourteen (14) soil samples for laboratory analysis of metals & inorganics, and one (1) soil sample for analysis of volatile organic compounds (VOCs), petroleum hydrocarbons (PHC) F1 to F4, and organochlorine (OC) pesticides to assist in determining appropriate soil disposal options, if required, during construction;
- Submission of one (1) soil sample for Ontario Regulation 347 (*O. Reg. 347*) as amended by Ontario Regulation 558/00 (*O. Reg. 558/00*) Toxicity Characteristic Leaching Procedure (TCLP) for VOCs, polychlorinated biphenyls (PCBs), OC pesticides and metals and inorganics to determine landfill acceptability of soil/granular fill originating from the Site; and
- Comparison of the laboratory analytical results to soil standards presented in the Ministry of the Environment, Conservation and Parks (MECP) document entitled "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*," (the "MECP SCS") dated April 15, 2011 and *O. Reg. 347*, as amended by *O. Reg. 558/00*, Schedule 4 Leachate Quality Criteria provided in the MECP document entitled "*Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste*," October 2000 (the "Schedule 4 Criteria").

D6.2.1 Site Condition Standards

All analytical soil results were compared to the MECP Table 1 (background) SCS for all types of Property Use (except Agricultural) Residential/ Parkland /Institutional/Industrial/Commercial/Community Property Use (Table 1 SCS) and MECP Table 3 (generic) SCS for Industrial/Commercial/Community Property Use for Medium/Fine Textured Soils (Table 3 SCS).

The chemical analyses results were also evaluated against the following tables of Appendix 1 (Generic Excess Soil Quality Standards) of the new MECP O.Reg.406/19 "On-Site and Excess Soil Management," additional elements which are expected to come into force in January 2023:

- Table 1 Full Depth Background Site Condition Standards for all types of property use (except agricultural) (Table 1 Excess Soil Quality Standards); and

- Table 3.1 Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent, for industrial/commercial/community property use (Table 3.1 Excess Soil Quality Standards).

Furthermore, TCLP analyses results were also compared with Table 3.1 Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse – of O.Reg.406/19.

D6.2.2 Soil Sampling, Inspection & Preservation Procedures

Soil samples were obtained for laboratory analysis and field screening, where applicable, using a drill rig equipped with split spoon sampling capabilities. The drillers cleaned the split spoon by removing loose dirt from the split spoon using a wire brush, washing the split spoon using a brush in a dilute mix of potable water and Alconox soap, rinsing the split spoon with distilled water and rinsing the split spoon with methanol and allowing the split spoon to air dry.

The drillers obtained the split spoon sample by auguring to the specified depth, hammering the spoon about 0.6 m into the soil and removing the spoon. The split spoon sample was inspected for visual and/or olfactory evidence of environmental impacts. Disposable nitrile gloves were used and replaced between the handling of successive samples.

The soil samples retrieved from the borehole investigations were examined, classified and logged according to soil type, moisture content, colour, consistency, and presence of visible indicators of environmental impact. Soil samples requiring vapour analysis were split into duplicate fractions upon recovery at the surface. The primary sample fractions were placed in 120 and/or 250 millilitre (mL) sample jars with Teflon-lined lids and methanol preserved (cored) samples were placed in 40 mL vials and subsequently stored in coolers on ice for potential future laboratory analysis. The volatile sample fractions were placed in resealable plastic sample bags and stored at ambient temperature for subsequent field vapour screening. The samples were selected on the basis of visual/olfactory evidence of impacts, field screening results, or from the vicinity of the apparent water table.

Representative soil samples collected during the investigation were submitted to AGAT Laboratories (AGAT) of Mississauga, Ontario, for metals & inorganics, VOCs and PHC. AGAT is accredited by the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) in accordance with ISO/IEC 17025:2005 – *"General Requirements for the Competence of Testing and Calibration Laboratories"* for the tested parameters set out in the Soil, Ground Water and Sediment Standards.

D6.3 Environmental Test Results & Considerations

Wood completed a preliminary Environmental Soil Quality Testing Program (the Investigation) as part of the Geotechnical Investigation. The details of the drilling program, including borehole locations and drilling methodology are presented in the geotechnical investigation sections of this report. Soil samples submitted for chemical analysis were collected from depths between surface and 4.4 m below ground surface (mbgs) based on presence of fill material and depth of construction works, as detailed Table D6.1.

Table D6.1: Environmental Tests

Sample ID	Depth (m)	Parameters Tested
BH D5 SS6	3.8 – 4.4	Metals and Inorganics
BH D17 SS2	0.9 – 1.5	Metals and Inorganics, PHC, VOC, OC pesticides
BH D18 SS3	1.2 – 1.8	Metals and Inorganics
BH D25 SS3	1.5 – 2.1	Metals and Inorganics
BH D27 SS2	0.9 – 1.5	Metals and Inorganics
BH D31 SS3	1.6 – 2.0	Metals and Inorganics
BH D35 SS2	0.8 – 1.2	Metals and Inorganics
BH D37 SS4	2.3 – 2.7	Metals and Inorganics
BH D41 SS3	1.5 – 2.1	Metals and Inorganics
BH D44 SS1	Surface – 0.6	Metals and Inorganics
BH D47 SS4	2.3 – 2.7	Metals and Inorganics
BH D50 SS3	1.2 – 1.8	Metals and Inorganics
BH D55 SS2	0.8 – 1.2	Metals and Inorganics
BH D57 SS1	Surface – 0.5	Metals and Inorganics

PHC = Petroleum Hydrocarbons
VOC = Volatile Organic Compounds
OC = Organochlorine

Wood observed fill material in all the boreholes. Headspace combustible organic vapour (COV) concentration measurements recorded in the soil samples were ranging from non-detectable to 10 parts per million (ppm). Total organic vapour (TOV) concentration measurements recorded in the soil samples were ranging from non-detectable to 1 ppm.

No other evidence (i.e., visual/olfactory) of potential environmental impacts were observed in any of the soil samples collected from this project area.

The soil samples collected as part of this assessment that exceeded the Table 1 SCS are as follows:

- BH D5 SS6 for EC and SAR;
- BH D17 SS2 for EC and SAR;
- BH D18 SS3 for EC and SAR;
- BH D25 SS3 for EC and SAR;

- BH D27 SS2 for EC and SAR;
- BH D31 SS3 for EC and SAR;
- BH D35 SS2 for EC and SAR;
- BH D37 SS4 for EC and SAR;
- BH D41 SS3 for EC and SAR;
- BH D44 SS1 for EC and SAR;
- BH D47 SS4 for EC and SAR;
- BH D50 SS3 for EC and SAR;
- BH D55 SS2 for EC and SAR; and
- BH D57 SS1 for EC and SAR.

The remaining samples were below the Table 1 SCS for metals and inorganics, PHCs, VOCs, and OC pesticides.

The soil samples collected as part of this assessment that exceeded the Table 3 SCS are as follows:

- BH D5 SS6 for EC;
- BH D17 SS2 for EC;
- BH D25 SS3 for EC;
- BH D27 SS2 for EC;
- BH D35 SS2 for EC;
- BH D44 SS1 for EC and SAR;
- BH D47 SS4 for EC and SAR; and
- BH D50 SS3 for SAR.

The remaining samples were below the Table 3 SCS for metals and inorganics, PHCs, VOCs, and OC pesticides. When compared to the O. Reg. 406/19 Excess Soil Quality Standards Exceedances, the soil samples collected as part of this assessment that exceeded the Table 1 Excess Soil Quality Standards are as follows:

- BH D5 SS6 for EC and SAR;
- BH D17 SS2 for EC and SAR;
- BH D18 SS3 for EC and SAR;
- BH D25 SS3 for EC and SAR;
- BH D27 SS2 for EC and SAR;
- BH D31 SS3 for EC and SAR;
- BH D35 SS2 for EC and SAR;
- BH D37 SS4 for EC and SAR;
- BH D41 SS3 for EC and SAR;

- BH D44 SS1 for EC and SAR;
- BH D47 SS4 for EC and SAR;
- BH D50 SS3 for EC and SAR;
- BH D55 SS2 for EC and SAR; and
- BH D57 SS1 for EC and SAR.

The other analyzed soil samples were below the Table 1 Excess Soil Quality Standards for metals and inorganics, PHCs, VOCs, and OC pesticides.

The soil samples collected as part of this assessment that exceeded the Table 3.1 Excess Soil Quality Standards are as follows:

- BH D5 SS6 for EC;
- BH D17 SS2 for EC;
- BH D25 SS3 for EC;
- BH D27 SS2 for EC;
- BH D35 SS2 for EC;
- BH D44 SS1 for EC and SAR;
- BH D47 SS4 for EC and SAR; and
- BH D50 SS3 for SAR.

The other analyzed soil samples were below the Table 3.1 Excess Soil Quality Standards for metals and inorganics, PHCs, VOCs, and OC pesticides.

It should be noted that EC and SAR are commonly associated with road salt used for de-icing activities along roads and highways.

The QP has determined that the EC and SAR exceedances in soil are likely attributed to the de-icing salt which has been applied to surfaces at the Site for the safety of vehicular and pedestrian traffic under conditions of snow or ice or both and, therefore, the exceedances are exempt in accordance with Section 49.1(1) of O.Reg.153/04. However, the presence of EC/SAR exceedances in soils would still provide an excess soils management concern, since any excess soil generated at the Site will require disposal at an appropriate disposal or soil treatment facility that can accept soils with concentrations of the contaminants, including EC/SAR, above the Table 1 SCS.

The TCLP analyses for the parameters tested indicated that dry soils (soils that would pass a slump test) would meet the Schedule 4 Leachate Quality Criteria.

Soil analytical results are shown in Tables 1D to 10D in Appendix C-D. The laboratory certificates of analysis for the bulk analysis and the certificates of analysis for the O. Reg. 347 TCLP analysis are included in Appendix D.

D6.4 Quality Assurance / Quality Control

Field Quality Control: Field quality control was not performed for this segment and is discussed in separate reports being written as part of the Geotechnical Investigation.

Laboratory Quality Control: The 2011 Analytical Protocol provides requirements for sample handling and storage requirements, reporting requirements, analytical methods and QA/QC procedures for analytical parameters.

As per the 2011 Analytical Protocol, all samples/sample extracts were analyzed within their applicable hold times using approved analytical methods. The report limits were met for all samples and tested parameters. No tested parameter was present in a detectable concentration in any laboratory Method Blank and all laboratory surrogates, reference materials and replicate samples are considered acceptable.

SECTION E: EAST-WEST ARTERIAL (FROM THE GORE ROAD TO COLERAINE DRIVE, ~ 2.4 KM)

A total of eighteen (18) boreholes (BH E1 to BH E6/S18, BH E7, BH E23 to BH E32, and BH S17)) were drilled in vacant lands to depths varying from 2.1 m to 9.3 m for the proposed new road, underground service installation and culvert construction. Planned Boreholes BH E8 to BH E22 have been deferred to the detail design stage, if needed, as discussed with and approved by the City. Boreholes BH E6 and BH S18 were combined to a single Borehole "BH E6 / S18" because of their close proximity. Two (2) boreholes (BH S17 and BHE6 / S18) were drilled to depths of7.0 m and 9.3 m, respectively at one new proposed culvert location. The boreholes were sampled via Standard Penetration Test (SPT), while recording 'N' Values.

The stratigraphic units and groundwater conditions are discussed in the following sections. Additional information is provided in the Record of Boreholes. The following summary is to assist the designers of the project with an understanding of the possible soil conditions at the investigated road section. The soil and groundwater conditions might vary between and beyond the borehole locations.

E1.1 Topsoil

Topsoil was encountered at the ground surface at all eighteen (18) borehole locations. Topsoil thicknesses varied from about 76 mm to 100 mm, with an average thickness of about 83 mm, as listed in Table E1.1.

Table E1.1: Topsoil Thickness Measurements

Borehole No.	Coordinates (UTM, Zone 17T)		Topsoil Thickness (mm)
	Easting	Northing	
BH E1	604583	4850435	100
BH E2	604641	4850507	76
BH E3	604703	4850585	76
BH E4	604766	4850663	76
BH E5	604828	4850742	100
BH S17	604874	4850797	100
BH E6 / S18	604885	4850810	76
BH E7	604955	4850896	76
BH E23	605606	4852284	76
BH E24	605614	4852383	76
BH E25	605628	4852476	76
BH E26	605650	4852571	76
BH E27	605680	4852668	100
BH E28	605714	4852764	100
BH E29	605743	4852863	76
BH E30	605749	4852965	76
BH E31	605728	4853064	76
BH E32	605683	4853156	76
Average			**83**

E1.2 Silty Clay / Clayey Silt Fill

Silty clay / clayey silt fill was encountered below the topsoil at all the borehole locations except Borehole BH S17. The silty clay / clayey silt fill is likely reworked native soil and extended to a depth of about 0.7 m (Elevations 202.4 m to 214.3 m) below the existing ground.

The silty clay / clayey silt fill was generally brown to dark brown in colour and contained trace to some sand, trace gravel, trace rootlets and organics. Cobbles were noted in the fill in Boreholes BH E2, BH E6 / S18, BH E28 and BH E32.

The SPT 'N' values measured in the silty clay fill ranged from 3 blows to 12 blows per 0.3 m of penetration. The measured water contents in the silty clay fill samples varied from about 3 % to 36 %.

E1.3 Sandy Silt Fill

The sandy silt fill encountered below the topsoil at Borehole BH S17 extended to a depth of about 0.7 m (Elevation 201.9 m) below ground surface.

The sandy silt fill was generally dark brown / brown in colour and contained trace clay, trace gravel, trace cobbles, and trace organics. One SPT 'N' value measured in the sandy silt fill was 9 blows per 0.3 m of penetration, and one water content measured in the sandy silt fill sample was about 17 %.

E1.4 Silty Clay / Clayey Silt Till

Native silty clay / clayey silt till was encountered below the silty clay / clayey silt fills in all boreholes except Borehole BH E5 and BH S17, and extended to the termination of depths of all boreholes at about 2.1 m to 5.2 m (Elevations 199.4 m to 212.7 m) below existing ground surface, except BH E6 / S18 and BH E26. T

The silty clay / clayey silt till was brown to brownish grey to grey in color, and contained trace sand to sandy, trace gravel and oxidation stains. Cobbles/boulders were encountered in some boreholes at various depths. Approximately 100 mm of sandy seam with gravel was observed within the till at depth 4.6 m (Elevation 200.0 m) below grade in Borehole BH E2. Sandy / silty seams were also observed at a depth of 1.8 m below grade in BH E25 (Elevations 207.5 m).

SPT 'N' values within the silty clay / clayey silt till ranged from 7 blows to 49 blows per 0.3 m blows implying firm to hard consistency. Majority of the measured 'N' values implied stiff to very stiff consistency (10 blows to 29 blows per 0.3 m. The measured water contents of the silty clay / clayey silt till samples ranged from about 4 % to 25 %.

Gradation and Atterberg Limits tests were carried out on four (4) silty clay / clayey silt till samples, the results of which are presented in Table E1.2, and shown in the Records of Boreholes.

Table E1.2: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Clay / Clayey Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH E3	SS 3	1.8	204.1	1	22	50	27	29	18	11	CL
BH E7	SS 3	1.8	203.1	5	17	46	32	32	17	15	CI
BH E23	SS 3	1.8	208.9	1	28	51	20	25	15	10	CL
BH E30	SS 6	4.1	210.3	1	24	52	23	24	13	11	CL

The grain size distribution curves and the plasticity chart are presented Figure Nos. B-E1 and B-E2 in Appendix B-E.

E1.5 Silty Sand / Sandy Silt Till

Native silty sand / sandy silt till was encountered below the fill soils in Boreholes BH E5 and BH S17, and below the silty clay / clayey silt till in Boreholes BH E6 / S18 and BH E26, and extended to the depth varying from 2.1 m to 8.5 m (Elevations 201.1 m and 196.3 m, respectively). Boreholes BH E5 and BH E26 were terminated within the silty sand / sandy silt till deposit at depths 2.1 m and 5.2 m below grade, respectively.

The silty sand / sandy silt till was brown to grey in color, and contained trace clay, trace gravel, and oxidation stains. Cobbles / boulders were observed at various depths within the silty sand / sandy silt till. Clay seams were observed within the till in Boreholes BH E5 and BH E26.

SPT ‘N’ values measured in the silty sand / sandy silt till varied from 6 blows to more than 50 blows per 0.3 m indicating loose to very dense compactness. The ‘N’ values were all above 37 blows (dense to very dense), except immediately below fill soil in Borehole BH E5. Water contents measured in the silty sand / sandy silt till samples varied from 7 % to 21 %.

Gradation and Atterberg Limit tests were carried out in two silty sand / sandy silt till samples, the results of which are presented in Table E1.3, and also shown on the Records of Boreholes.

Table E1.3: Results of Grain Size Distribution Analysis and Atterberg Limit Tests (Silty Sand / Sandy Silt Till)

Borehole No.	Sample No.	Depth (m)	Elevation (m)	Grain Size Distribution (%)				Atterberg Limit			USCS Modified Group Symbol
				Gravel	Sand	Fines					
						Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	
BH E6 / S18	SS 9	7.7	197.1	6	34	59	1	non-plastic			ML
BH S17	SS 5	3.1	199.5	7	41	49	3	non-plastic			ML

The grain size distribution curve is presented in Figure No. B-E3 in Appendix B-E.

E1.6 Weathered Shale

Weathered shale (that could be augered through) was encountered below the silty sand / sandy silt till deposit in Boreholes BH E6 / S18 and BH S17, which were terminated within the weathered shale at depths of 9.3 m and 7.0 m (Elevation 195.4 m and 195.6 m) below ground surface, respectively. Clayey soils were observed within the weathered shale in Borehole BH S17.

The weathered shale was grey in colour. SPT 'N' values measured in weather shale deposit were all more than 50 blows per 0.3 m of penetration. Water content measured in the weathered shale sample varied between 6 % and 7 %.

E1.7 Groundwater

Upon completion, free groundwater (seepage) was not observed in any of the boreholes. A monitoring well was installed at the location of Borehole BH S17. Groundwater depth measured in the monitoring well is listed in Table E1.4 and shown on the Record of Boreholes.

Table E1.4: Results of Groundwater Depth Measurements

Borehole No.	Groundwater Measurements					
	During or Upon Completion of Drilling (m)			In Monitoring Well (m)		
	Date	Depth	Elevation	Date	Depth	Elevation
BH S17	12 Jan 2022	Not encountered		26 Jan 2022	3.3	199.3
				1 Apr 2022	0.0	202.6

It should be noted that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months, and in response to major weather events.

E1.8 Soil Corrosivity

Three (3) soil samples were submitted for corrosion analysis to determine the corrosive potential of the soils with respect to buried metallic structures. The results of the analyses are presented Table E1.5, and the laboratory test certificate is included in Appendix E.

Table E1.5: Soil Corrosivity Test Results

Parameter	Units	BH E16 – SS4	BH E31 – SS5	BH S17 – SS3
Chloride	ug/g or (ppm)	32	20	7
Sulphate	ug/g or (ppm)	13	40	16
pH	pH Units	8.12	7.58	8.36
Electrical Conductivity	mS/cm	0.195	0.235	0.119
Resistivity	Ohm-cm	5130	4260	8400

As per ASTM STP 1013 (Effects of Soil Characteristics on Corrosion – "*chloride appears to be the main factor in increased soil corrosivity with levels in excess of 0.01 % (100 (µg/g) considered indicative of accelerated corrosion*". The chloride content measured in all three samples were less than 100 µg/g. In accordance with Table 1 of CSA A23.1-14 and based on "structurally reinforced concrete exposed to chloride, with or without freezing and thawing" and based on project location, exposure class "C-1" can be used. Class should be based on structure location and/or durability requirement.

In accordance with Table 3 of CSA A23.1-14, no additional requirement is specified for sulphate content below 0.10 % (i.e. 1,000 ppm or µg/g) below the "moderate degree of exposure" with respect to concrete. Therefore, in accordance with Table 6 of the Canadian Standards Association (CSA) Series A23.1-14, Type GU Portland cement can be used based on the water-soluble sulphate contents measured in soils.

As noted in ASTM -STP 1013 (*Effects of Soil Characteristics on Corrosion*), pH values between 4.0 and 8.5 have very little effect on corrosion (American Water Works Association (AWWA) Standard C 105-72 (Table 1 – Soil-Test Evaluation AWWA Rating).

The measured soil resistivity value of 4260 ohm-cm can be considered as a "Moderate" corrosive environment, and other two measured values between 5000 ohm-cm and 10000 ohm-cm as an environment of "Low" corrosivity for exposed metallic structures, based on ASTM STP 1000, Corrosion Testing and Evaluation - Table 3 (Corrosivity for Uncoated Steel).

Protection against steel corrosion, where required, could include one or a combination of: adequate concrete cover, low-permeability concrete, corrosion inhibitors; coated reinforcing steel; clad reinforcing steel; and corrosion-resistant alloy reinforcement.

A corrosion specialist should be retained, if necessary, to review the analysis results and provide relevant recommendation.

E2.0 PAVEMENT INVESTIGATIONS AND DESIGN

The purpose of the pavement investigation was to obtain subsurface information and to provide geotechnical recommendations for new construction East-West (E-W) Arterial, and as per the City's road classification, it is designated as a minor arterial road. The total length of the investigated road section is about 2.4 km.

The proposed E-W Arterial is a new alignment designated as rural road with 4-lanes from The Gore Road to Coleraine Drive. The discussions and recommendations in the following sections are general in nature as the details of the new alignment were not available at the time of this report. At the time of this report, eighteen (18) boreholes from E1 to E7 (including E6/S17), S18 and E23 to E32 had been drilled. The remaining boreholes have been deferred to detail design phase, if needed. Therefore, the subsurface profile and the discussions and recommendations in the following sections are applicable only to the planned road section for the above boreholes.

Additional investigation should be carried out for the section from Borehole BH E8 to BH E22 for pavement and Underground utilities and BH S19 and BH S20 for Culvert, Pavement & Underground utilities during detailed design.

The discussions and recommendations in the following sections are based on the subsurface information obtained from the boreholes and are intended for use by Design Engineers.

E2.1 Visual Pavement Condition Survey

Not applicable, as this is a new construction.

E2.2 Subsurface Conditions

At the time of this report, a total of eighteen (18) boreholes had been drilled along the proposed central line of the E-W Arterial and at two culvert locations Sta. (0+500) where monitoring well was installed.

The subsurface soil profile at the site consisted of surface covering materials (topsoil, asphalt, and/or fill) overlying native soils. The thickness of topsoil ranged from 76 mm to 100 mm, followed silty clay / clayey silt fill was encountered below the topsoil at all the borehole locations except Boreholes BH S17. Where sandy silt fill was encountered below the topsoil at borehole location BH S17. The native soils underlying the fill soils consisted of silty clay /clayey silt till and / or silty sand / sandy silt till, as detailed in the Record of Boreholes.

Additional subsurface information is provided in Section E1.0 and in the Record of Boreholes.

E2.3 Groundwater Conditions

All boreholes were open and dry upon completion of drilling to their respective vertical limits of investigation, except 2 boreholes BH E6/ / S18 and BH S17 where Groundwater level was inferred from soil conditions during drilling. Two groundwater measurements made in the monitoring well (BH S17) were 0.0 (at ground surface) and 3.3 m below ground surface. It should be pointed out that the groundwater at the site would fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

E2.4 Pavement Design

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations for new construction of new 4-lane east-west minor arterial road (East-West Arterial).

The discussions and recommendations in the following sections are based on the available information and the subsurface information obtained from the boreholes and is intended for use by Design Engineers.

E2.4.1 Forecasted Traffic Data

The traffic data represented as Average Annual Daily Traffic (AADT$_{2016}$) in both directions was estimated by Wood Traffic Group as presented in Table E2.1. This traffic data was used to projected traffic data for 20 years design life. Equivalent single axle loads (ESALs) were calculated cumulatively over 20 years as described in the Ministry of Transportation Report "Procedures for Estimating Traffic Loads for Pavement Design, 1995".

Table E2.1: Traffic Data along E-W Arterial from the Gore Road to Coleraine Drive, Ontario

AADT in Both Directions	Growth Rate (%)	Comm. Vehicles (%)	Design ESALs @ 20 Years	Traffic Category
2020$^{(1)}$				
11,020	2.0%	6.0%	4,458,659 (~ 4.5 x 10^6)	**Category** C

(1) 2020 is the anticipated construction year.

E2.4.2 Flexible Structural Pavement Design

After reviewing the field data and laboratory test results, the minimum pavement structural design for the new construction of the East-West Arterial is presented in Table E2.2 and was determined in accordance with the 1993 American Association of State Highway and Transportation Officials ('AASHTO') Guide for the Design of Pavement Structures using the Darwin Software Program.

The AASHTO Pavement Design is considered to be a function of estimated future traffic in both directions (ESALs), reliability (R), which is a function of road classification, overall standard deviation (S_o), resilient modulus (M_r), as well as initial and terminal serviceability (P_o, P_t). From these parameters, the structure number (SN) is calculated. The SN is defined in the AASHTO Guide as a number, which provides a measure of the pavement strength and thickness needed to avoid overstressing the subgrade.

The following design parameters were chosen to calculate the required structure number for the design of flexible pavement using the AASHTO method, as described in the Ministry of Transportation Materials Information Report MI-183 "*Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions*".

- Initial serviceability, P_i = 4.5;
- Terminal serviceability, P_t = 2.5;
- Reliability level, R = 90 percent;
- Overall standard of deviation, S_o = 0.49;
- Subgrade Resilient Modulus, M_r (kPa) M_r = 30,000

Table E2.2: Recommended Minimum Structural Pavement Design

ESALs	AASHTO Design for 20 Years					Recommended HMA & PGAC		Traffic Category
	HMA	Gran A	Required Design SN	Selected SN	Total Pavement Thickness	Marshall		
						HL 3 (HS) /HL 1 Surface Course	HL8 Binder Course	
	Thickness (mm)							
4.5 X 10^6	165	Gran A = 450 mm or Gran A = 150 mm Gran B Type II = 300 mm	130	132	615	SP 50 mm PGAC 64-28	55+60 mm PGAC 58-28	C

Notes:

- Pavement shall be placed over approved subgrade.
- Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

The City of Brampton minimum Pavement Structure is as follows (Arterial Road STD#208 - 2019):

- 50 mm HL3 Asphalt (High Stability or HL1)
- 85 mm HL8 Asphalt (100 mm for All New Subdivision Roads)
- 150 mm Granular "A" or 130 mm of 20 mm Crusher Run Limestone
- 450 mm Granular "B" or 350 mm of 50 mm Crusher Run Limestone

The structure number (SN) of the City of Brampton design is 118.2 mm or by using Crusher Run Limestone SN = 123.9 mm

The AASHTO pavement design was selected for the road widening since it is tailored on traffic data, design period of 20 years and soil field investigation and provides higher selected SN of 130 mm in comparison to the City of Brampton pavement design standards. However, the granular B Type II thickness shall be increased to 450 mm to match the City's Standards (Table E2.3).

E2.5 Recommendations and Construction Features for Pavement

B2.5.1 New Construction

Pavement recommendations for new alignment is presented in Table E2.3, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS.MUNI 1151. Also, the granular thicknesses can be increased depending on grading requirements.

Table E2.3: New Construction of Arterial Widening of Arterial A2

HMA		PGAC	Traffic Category
Type	Thickness (mm)		
HL 3 (HS) / HL 1	50 mm	64-28	C
HL 8 (HS) /HDBC HL 8 (HS) /HDBC	55 mm 60 mm	58-28 58-28	
Granular Base ‘A’ or 20m Crusher Run	150 mm	-	-
Granular Subbase ‘B’ Modified or 50m Crusher Run or Limestone	**450 mm**	-	-
Total Pavement Structure	**765 mm**	-	-

E2.5.2 Subgrade / Road Base Preparation and Compaction

The pavement structural design recommended for roads is applicable, provided the subgrade is prepared under dry weather conditions, proof-rolled with a heavy rubber-tired vehicle (such as a grader or loaded dump truck) in the presence of the geotechnical consultant. Any loose, soft or unstable areas, if detected during proof-rolling, must be sub-excavated, replaced with approved granular materials and compacted. Any additional engineered fill, if required, should be placed in thin layers not exceeding 200 mm and compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD). Granular materials should be placed in thin layers not exceeding approximately 200 mm, within ± 2 % of its optimum moisture content, and thoroughly compacted to a minimum of 100 % of SPMDD.

The subgrade should be provided with adequate drainage. If wet weather conditions prevail at the time of construction, adjustments to this design may be required, i.e. if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional sub-base material is best determined during construction.

All granular base and sub-base materials must be compacted to at least 100% of SPMDD.

E2.5.3 Stripping and Sub-Excavation

No additional sub-excavation, other than removal of organics and topsoil (ranging in thickness from 76 mm to 100 mm), are anticipated within the widening limits. However, any unsuitable soft or saturated material should be removed. Deeper stripping depths may be required, depending on the actual site conditions between borehole locations.

E2.5.4 Drainage

Prior to completing the new construction, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project.

To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times. This can be accomplished by ensuring proper grading of the subgrade and positive lateral drainage of the granular base daylighting at the ditch. Alternatively, full-length perforated subdrain pipes of 150 mm diameter should be installed along both sides of the road, below the roadbed level, to ensure effective drainage, in accordance with OPSD 216.021. The sub-drainpipes should be wrapped in suitable non-woven geotextile surrounded by a minimum drainage zone of 19 mm size clear stone of minimum 150 mm thickness. A minimum slope of 2 % should be maintained across the paved sections (finished road surface) to ensure proper surface drainage. New pavement should slope towards the gutter/ditch.

E2.5.5 Hot Mixes and PGAC Type

The following Marshall hot mixes should be used on E-W Arterial:

- HL 3 (HS) / HL 1 surface course mix and HL 8 (HS) /HDBC binder course should be used to provide the roadway with high durability.

Material Specification should be as per OPSS 1150 Material Specification for Hot Mix Asphalt. For aggregates, the material specification should be as per OPSS.MUNI 1003.

Performance Graded Asphalt Cement ("PGAC") 64-28 should be used only for surface course and PG 58-28 for binder course. This PGAC should satisfy the requirements of MP1 of SHRP Specifications for Superpave.

Recycled Materials: The use of reclaimed asphalt pavement (RAP) is permitted in Marshall mixes. The percent of RAP for HL 8 and HL 3 should be as per OPSS.MUNI 1150.

RAP containing steel slag aggregates should not be allowed.

Transition Treatments at Limits of Paving: At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered at a distance of not less than 5 m, in accordance with OPSS.PROV 313. It should be ensured that no joint location corresponds with a joint location in any other layer.

The transition treatment from earth cut to earth fill should be in accordance with OPSD 205.010.

Tack Coat: It is recommended that all milled surfaces, and binder course surfaces will be tack coated prior to top course asphalt, if exposed to extended traffic. Construction Specification should be as per OPSS Prov. 308, April 2007.

E2.5.6 In-Situ Compaction for Hot Mix

In all areas, asphaltic concrete should be compacted as per OPSS.MUNI 310, Table 10 (April 2011). It should be noted that the granular base and sub-base materials should be compacted to the City's standards or to minimum 100 % SPMDD.

Field Quality Assurance: Plate samples of loose hot mix should be obtained for each paving day, and extraction/gradation and full Marshall compliance testing should be carried out on these samples. The finished surface shall be true to required profile and cross-section within 6 mm from required elevations and thickness. The surface shall show no depressions or bumps exceeding 3 mm under a 3.0 m long straight edge, placed parallel to the road centre line.

E2.5.7 Frost Depth

A minimum depth of 1.4 m should be used for frost protection as per OPSD 3090.101.

E2.5.8 Detouring

No long-term detouring is planned. Therefore, no special treatment will be required.

E3.0 UNDERGROUND UTILITIES

The geotechnical investigation scope of work included obtaining subsurface conditions and providing recommendations for installation of proposed underground utility services. Accordingly, selected boreholes (i.e., alternating pavement boreholes) were deepened to a depth of 3 m to 5 m, as listed in Table 5.4. Information obtained from all relevant boreholes drilled along the proposed East-West arterial road have been considered in this section, as applicable.

E3.1 Subsurface Conditions

A total of eighteen (18) boreholes were drilled in vacant land along the proposed East-West arterial road to depths varying from about 2.1 m to 9.3 m, for pavement investigation, underground utility installation and one culvert. Proposed Boreholes BH E8 – E22 and BH S15-16 were not drilled and have been deferred to design stage, if required. The recommendations and discussions provided in this section is based on the drilled boreholes. Additional investigation should be carried out in the areas between Boreholes BH E7 and BH 23 to confirm the soil condition.

Overall, based the drilled boreholes (BH E1 to BH E7 and BH E23 to BH E32), the project site along proposed East-West arterial road consisted of surficial cover (topsoil) underlain by fill soils (silty clay / clayey silt or sandy silt) overlying native till (silty clay / clayey silt and / or silty sand / sandy silt). The fill soils extended to a depth of 0.7 m (Elevations 201.9 m to 214.3 m) below the existing ground surface. The native till soils (silty clay / clayey silt till and/or silty sand / sandy silt) were confirmed to a depth of up to 8.5 m (up to Elevation 196.3 m) below existing ground surface in the deeper boreholes at the structure location. Weathered shale was encountered below the till the two deep Boreholes E6 / S17 and S18.

Highest groundwater level measured in the monitoring well was at 0 m (i.e., at the ground level, Elevation 202.6 m) below ground surface.

Detailed subsurface and groundwater conditions are provided in Section E1.0.

E3.2 Discussions and Recommendations for Underground Utilities

As per information available, the planned East-West arterial road within the project limits will include installation of underground utilities and associated manholes and catch basins. Details of the installation were not available at the time of this report. Existing utilities, if any, should be protected and taken into consideration for design and construction of the proposed underground utilities and road widening.

The ground (road) elevations within the project limits (based on borehole location) varied from about 202.6 m (at BH S17) to 215.0 m (at BH E32), with the overall the ground surface generally sloping up from west (The Gore Road) to east (Coleraine Drive).

The recommendations and discussions for excavation and installation of underground utility services, and associated manholes / catch basins, are provided in the following sections, based the drilled boreholes (BH E1 to BH E7 and BH E23 to BH E32). Additional investigation should be carried out in the areas between Boreholes BH E7 and BH 23 to confirm the soil condition.

E3.2.1 Founding Subgrade Conditions

From the investigation result, fill soils (silty clay / clayey silt or sandy silt) were present to a depth of 0.7 m below existing ground. The fill soils were generally in soft to stiff / loose condition.

The native till soils (silty clay / clayey silt and silty sand / sandy silt) below the fill soils were in generally of stiff to hard and / or dense to very dense overall. Some firm or loose / compact areas in the upper portions of the strata. Therefore, the existing ground should be generally competent to support underground utility services. It is recommended that the inverts of underground utilities be founded on native soils, or competent fill soil subgrade. Existing fills or soft / loose soil encountered at the founding level should be compacted, if possible, or otherwise, should be sub-excavated and backfilled with compacted soil as recommended in Section E5.3 (Engineered Fill).

For manholes and catch basins founded on competent subgrade (i.e., approved existing fill, imported engineered fill, till soils), a Geotechnical Reaction at Serviceability Limit State (SLS) of 100 to 150 kPa and a factored Geotechnical Resistance at Ultimate Limit State (factored ULS) of 150 to 225 kPa, depending on the subgrade conditions, may be used, which should be verified by a geotechnical engineer during construction. Under the SLS bearing values, settlements of up to 25 mm may take place.

The frost penetration depth for the project area should be considered as 1.4 m.

The highest groundwater depth measured during the investigation within the project limits of planned East-West arterial road was about 0 m (at ground level, Elevation 206.9 m) below ground surface in the monitoring well installed at the culvert location (BH S17). Groundwater level fluctuates over times, and may be present within the excavation depths for the underground utilities. In addition, dewatering during excavation may be required due to perched water in sandy / silty pockets and / or from surface runoff. As the excavation will generally be in clayey / silty soils, groundwater seepage, if any, into the excavation is likely to be slow and a properly filtered sump and pump system, or gravity drainage, may be used for dewatering excavation.

General discussions regarding excavation and dewatering are provided in Section E5.4. Detailed dewatering consideration for the project is included in Wood's hydrogeological investigation report, which is submitted under a separate cover.

Trench excavation, pipe bedding and anti-seepage collar considerations are discussed in following sections.

General discussions provided in Section E5.0 should also be considered for design and construction.

E3.2.2 Trench Excavation

Trench excavation should be carried out as per the latest Ontario's Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects. The soils classifications are shown in Section E5.4. Based on the soils encountered in the boreholes, the sides of excavations are expected to be temporarily stable at 1H:1V for Type 2 and Type 3 soils, provided excavations are properly dewatered and underground utilities are installed and backfilled within a reasonable short period of time. Provisions should be made for dewatering, as noted in Section E5.4. Trenching should be in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

It is important for frost heave compatibility that the trench backfill within the frost zone of 1.4 m depth matches the soil exposed on the trench walls.

E3.2.3 Bedding

Bedding for underground pipes should be placed in accordance with the design requirements and current Ontario Provincial Standards (OPS) specifications (Ontario Provincial Standard Drawing (OPSD) 802.10 for flexible pipes and OPSD 802.30, 802.31 and 802.32 for rigid pipes). It is recommended that a minimum of 150 mm thick bedding material (Class 'B' Type or better) be placed below the pipe invert. The thickness of the bedding may, however, have to be increased depending on the pipe diameter, or if wet or weak subgrade conditions are encountered. If the subgrade is weak, it should be compacted, if possible, or otherwise, sub-excavated and replaced with engineered fill to support the pipes and allow the use of Class 'B' Type bedding. If weak subgrade is encountered and cannot totally be removed, Class 'A' Type bedding (e.g., minimum 100 mm thick lean concrete) should be used to provide a workable surface and support the proposed pipes.

For the areas to be filled, the fill soils should first be placed approximately to final grade and subsequently excavated to install the underground pipes in order to prevent pipe settlement due to overburden loads.

Should the pipes be installed in soft clay soils, the joints should be restrained from movements and the backfill around the pipes should be properly compacted in order to prevent long-term movements. A layer of geotextile (Terrafix 270R or equivalent) should be placed between the soft clayey soils and the granular bedding/backfill in order to prevent soil migration.

The possibility of pipe movements in soft clayey soils, after installation, should be considered in the design and construction of the underground pipes.

Construction of underground pipes should be carried out in accordance with the relevant OPSS.MUNI 410 (Construction Specification for Pipe Sewer Installation in Open Cut), or other relevant applicable municipal / regional standards.

E3.2.4 Backfill

Based on the visual and tactile examination of the soil samples, the on-site excavated silty clay / clayey silt / sandy silt fill and native till soils may be re-used as backfill in sewer trenches provided their moisture contents at the time of construction are at or near the optimum. Moisture conditioning (e.g., drying) of the sub-excavation soils may be required prior to reuse. The excavated cohesive fill should be carefully examined for organic content and moisture condition by qualified geotechnical personnel in order to confirm the need for moisture conditioning or its acceptability for use as backfill.

The backfill should be placed in maximum 200 mm thick layers at or near (± 2 %) optimum moisture content, and each layer should be compacted to at least 95 % Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the manhole / catch basins should be brought up simultaneously on all sides and operation of heavy equipment near the walls should be restricted to minimize potential movement and/or damage.

Unsuitable material such as organic soils, boulders, cobbles, frozen soils, etc., should not be used for backfilling.

E3.2.5 Anti-Seepage Collars

From the borehole information underground utilities will likely be installed in clayey soil (silty clay fill, silty clay / clayey silt). As such, anti-seepage collars should not be required. If installed in silty soil (e.g., silty sand / sandy silt till or fill, anti-seepage collars should be used.

E4.0 CULVERTS ON PLANNED EAST-WEST ARTERIAL ROAD (STATION 0+500, 1+100 and 2+450)

Three culverts are planned along the East-West Arterial Road alignment as approximate Stations 0+500, 1+100 and 2+450, with two boreholes to be drilled at each culvert locations. The culvert at Station 2+450 is located at the intersection East-West Arterial Road and Arterial A2, and is discussed in Section B4.0 (Station 0+650 of Arterial A2). An access permit could not be obtained for advancement of the boreholes (BH S19 and BH S20) planned for the culvert at Station 1+100. These boreholes have been deferred to a later date (detail design stage), as discussed with and approved by the City. Therefore, this section includes subsurface conditions, recommendations and discussion for the Culvert at Station 0+500 only

The geotechnical investigation for the culvert at Station 0+500 consisted of drilling two (2) boreholes (BH E6 / S18 and BH S17) to obtain subsurface and groundwater conditions and were drilled to depths of 7.0 m and 9.3 m (Elevations 195.6 m and 195.4 m) below the existing ground surface, respectively. The culvert and borehole locations are shown in Figure Nos. 5A and 5B.

Details of the proposed culvert were not available at the time of preparation of this report.

The stratigraphic units and groundwater conditions are discussed in the following sections and presented in the Record of Boreholes. he following summary is to assist the designers of the project with an understanding of the soil conditions encountered at the proposed culvert location. The soil and groundwater conditions might vary between and beyond the borehole locations.

E4.1 Subsurface Conditions - Culvert on Planned East-West Arterial Road (Station 0+500)

Two (2) boreholes (BH E6 / S18 and BH S17) were drilled at the vicinity of Culvert at Sta. 0+500. Based on the soil conditions observed in the boreholes drilled for culvert, the subsurface profile at the culvert location consisted of fill soils (silty clay / sandy silt) underlying the surficial topsoil. Native silty clay till was encountered below the fill soils in BH E6 / S18. Native silty sand / sandy silt till was encountered underneath the fill soil and the silty clay till in BH S17. Weathered shale was encountered below the till soils and extended to the termination depths in both boreholes.

E4.1.1 Topsoil

Topsoil 76 mm and 100 mm thick was encountered at the surface of Boreholes BH E6 / S18 and BH S17, respectively.

E4.1.2 Fill Soils

Silty clay / sandy silt fill soils were encountered below the topsoil and extended to a depth of 0.7 m (Elevations 201.9 m and 204.1 m) below the existing ground surface in Boreholes BH S17 and BH E6 / S18, respectively.

The silty clay fill was dark brown / brown in colour and contained trace gravel, trace organics, and trace cobbles. The sandy silt fill was dark brown / brown in colour and contained trace clay, trace gravel, trace cobbles and organics.

Two SPT ‘N’ values measured within the fill soils ranged were 6 and 9 blows per 0.3 m penetration. Water contents measured in one silty clay fill sample was 29 %, and in one sandy silt sample was 17 %.

E4.1.3 Silty Clay Till

Native silty clay till was encountered underlying the fill soils in Borehole BH E6 / S18 and extended to a depth of about 2.2 m (Elevation 202.6 m) below ground surface.

The silty clay till was brown in colour and contained trace gravel, trace cobbles, and oxidation stains. Two SPT ‘N’ values measured within the silty clay till were 30 and 36 blows per 0.3 m penetration, implying hard consistency. Water contents measured in two silty clay till samples were 12 % and 14 %.

E4.1.4 Silty Sand / Sandy Silt Till

Native silty sand / sandy silt till was encountered underlying the sandy silt fill in Borehole BH S17 and below silty clay till in Borehole BH E6 / S18, and extended to depths of about 5.5 m to 8.5 m (Elevations 197.1 m and 196.3 m) below ground surface at BH S17 and BH E6 / S18, respectively.

The silty sand / sandy silt till was brown to grey in colour, and contained trace clay, trace gravel, and oxidation stains. Cobbles and boulders were encountered at various depth within the till. SPT ‘N’ values measured within the silty sand / sandy silt till were all more than 50 blows per 0.3 m, indicating very dense condition. Water contents measured in the silty sand / sandy silt till samples ranged between 7 % and 14 %.

Results of gradation and Atterberg Limit tests carried out on two silty sand / sandy silt till samples are presented in Table E1.3, and shown on the Record of Boreholes.

E4.1.5 Weathered Shale

Weathered shale was encountered below the silty sand / sandy silt till in both boreholes and extended to the termination depths of the Boreholes BH E6 / S18 and BH S17 at about 9.3 m and 7.0 m (Elevation 195.4 m and 195.6 m) below ground surface, respectively. Clayey soils were observed within the weathered shale in BH S17.

The weathered shale was grey in colour. The SPT ‘N’ values measured in weather shale deposit were more than 50 blows per 0.3 m of penetration. Two water contents measured in the weathered shale samples were 6 % and 7 %.

E4.1.6 Groundwater Conditions

Groundwater was not encountered in both Boreholes upon completion. Groundwater levels measured in a monitoring well installed in BH S17 were at depths of about 0.0 m (i.e., at ground surface) and 3.3 m (Elevations 202.6 m and 199.3 m). The groundwater measurements are summarized in Table E1.4 and shown on the Record of Boreholes.

It should be noted that the groundwater could fluctuate seasonally and can be expected to be somewhat higher during the spring months and in response to major weather events.

E4.3 DISCUSSIONS AND RECOMMENDATIONS FOR CULVERT (STATION 0+500)

The purpose of the geotechnical investigation was to obtain subsurface information and to provide geotechnical recommendations with respect to proposed culvert construction.

Within the depths of the two boreholes drilled adjacent to the planned culvert location, fill soils (silty clay / sandy silt) were encountered to a depth of about 0.7 m (Elevations 201.9 m and 204.1 m) below ground surface, overlying hard / very dense till followed by hard weathered shale.

The foundation types of planned culvert were not available at the time of preparation of this report. Accordingly, general considerations for the culverts are presented in the following sections.

E4.3.1 Foundation

Based on the boreholes drilled at or in the vicinity of the planned culvert location, values of geotechnical reaction at Serviceability Limit State (SLS) and the factored geotechnical resistance at Ultimate Limit State (ULS) are provided in Table E4.1 which may be used for design.

Table E4.1: Recommended ULS / SLS Bearing Values for Culvert Foundations

Borehole No.	Founding Stratum	Depth Below Existing Grade (m)	Elevation (m)	Geotechnical Reaction at SLS (kPa)	Factored Geotechnical Resistance at ULS[1] (kPa)
BH E6 / S18	Fill / frost depth hard silty clay / very dense silty sand / sandy silt till	above 1.4 (±) below 1.4 (±)	above 203.4 (±) below 203.4 (±)	not recommended 200	not recommended 300
BH S17	Fill / frost depth very dense silty sand/sandy silt till	above 1.4 (±) below 1.4 (±)	above 201.2 (±) below 201.2 (±)	not recommended 200	not recommended 300
Engineered fill per OPSS.MUNI 1010 (if used), as per Section B5.3				150	225

(1) A resistance factor of Φ = 0.5 has been applied to the ULS values provided.

The geotechnical bearing values provided in Table E4.1 are intended to assess the feasibility and sizes of footings and are for vertical loads (no inclination) without load eccentricity. Under the SLS pressures, foundation settlements could be up to 25 mm (total) and 20 mm (differential). Detail foundation analysis should be carried out, if necessary, to confirm SLS/ULS and corresponding settlements.

The design frost depth penetration is 1.4 m. All foundations should be covered by at least 1.4 m deep soil or equivalent synthetic thermal insulation.

Based on the groundwater levels measured in the monitoring well, a minimum groundwater level at Elevation of 202.6 m should be considered for design. If required, the regional high flood level of the creek may be used.

During construction, considerable dewatering efforts and / or creek diversion (e.g., cofferdam, sheetpiles) to control the ingress of creek water may be required. General recommendations related to excavation and dewatering are presented in Section E5.4.

E4.3.2 Soil Parameters for Design

The unfactored soil parameters listed in Table E4.2 may be used for design of earth structures. It should be noted that these parameters are based on published information and/or semi-empirical/theoretical relationships, and are conservative and should be verified by field/laboratory testing, if more representative parameters are required.

Table E4.2: Unfactored Static Soil Parameters for Design

Material	Total Stress Analysis		Effective Stress Analysis		Earth Pressure Coefficients(1)			Bulk Unit Weight (kN/m^3)	Coefficient of Friction between Concrete and Soil
	C (kPa)	Φ (deg)	c′ (kPa)	Φ′ (deg)	Active K_a	At-Rest K_o	Passive K_p		
Hard silty clay till	150	0	0	32(2)	0.31	0.47	3.25	20	0.35
Very dense silty sand / sandy silt till	0	35	0	35	0.27	0.43	3.7	21	0.4
Engineered Fill (3)									
Granular A (OPSS.MUNI 1010)	0	35	0	35	0.27	0.43	3.7	24(4)	0.4
Granular B Type I or Type II (OPSS.MUNI 1010)	0	32	0	32	0.31	0.47	3.3	23(4)	

Notes: (1) Values based on semi-empirical relationships. For SLS, K_p values should be reduced to 1/3 of indicated value to limit lateral movement.

(2) Normally-consolidated range.

(3) All engineered fill should be compacted to at least 100 % SPMDD for supporting foundations.

(4) Unit weight values for engineered fill compacted to 100 % SPMDD. For backfill of retaining walls, unit weights for Granular A and Granular B compacted to 95 % SPMDD may be taken as 22 kN/m^3 and 21 kN/m^3, respectively.

E4.3.3 Earthquake Considerations

Based on the soil conditions observed in the boreholes (maximum drill depth of 9.3 m below ground) and the possible bedrock depth at the culvert location (~10 m), and in conformance with the criteria in Table 4.1 (Section 4.4.3.2 – Seismic Properties) of the Canadian Highway Bridge Design Code CSA S6-19 ("CHBDC"), the project site may be classified as Site Class C ("very dense soil and soft rock").

The design values of site coefficients F(T), F(PGA) and F(PGV) can be obtained from Geological Survey of Canada on Natural resources Canada website: 'www.earthquakecanada.ca" or Tables 4.2 to 4.9 (Section 4.4.3.3 – Site Coefficients) of CHBDC, and the design spectral acceleration, S (T), should be determined as per Section 4.4.3.4 (Design Spectral Acceleration and Displacement Values) and Tables 4.2 to 4.9 in Section 4.4.3.3 of CHBDC.

E4.3.4 Scour Protection

Culvert and headwall footings should be protected against scour and erosion in the form of cut-off walls, rip-rap or equivalent. Scour protection should be designed based on the hydrology requirement by an experienced engineer. Alternatively, the foundations could be placed below the depth of scour and frost penetration. If rip-rap protection is used, it should be separated from the native soils with a geotextile filter fabric (e.g. Terrafix 600R or equivalent) or a filter zone of granular material. The embankment slope surface should be covered with topsoil and seeded/sodded as soon as possible after completion of construction.

E4.3.5 Backfill for Culvert

Backfill materials around culvert should consist of non-frost susceptible, free-draining granular materials in accordance with OPSS.MUNI 1010 (i.e., Granular 'A' or Granular 'B'). Such granular backfill should be compacted to at least 95 % SPMDD (Standard Proctor Maximum Dry Density). Free-draining backfill materials and the drain pipes and weep holes, etc., should be used provided to prevent hydrostatic pressure build-up.

Backfill, backfill transition and cover for the culvert should conform to Ontario Provincial Standard Drawing (OPSD) 3101.150 (*Walls, Abutment, Backfill, Minimum Granular Requirement*) or applicable City Standard.

Engineered fill is discussed in Section E5.3, and excavation and dewatering during construction are discussed in Section E5.4.

To increase sliding resistance, a shear key may be used, if required. The shear key can be designed using the unfactored K_p values for the soils provided in Table E4.2. The movement of the retaining structure to mobilize the passive resistance should be considered in the design.

E4.3.6 Retaining Walls

If retaining walls are constructed at the ends of the culvert (inlet and outlet), they may be founded on the hard native silty clay till or very dense sandy silt / silty sand till. If required, the wall may also be founded on the engineered fill per OPSS.MUNI 1010. The frost and scour protection recommendations provided in Sections E.3.1 and E4.3.4, respectively should also be adhered to in designing retaining wall foundations.

Soft fill areas should be recompacted (if possible) or replaced with the engineered fill described in Section E5.3. The founding subgrade should be verified by a geotechnical engineer. The SLS/ULS values and soil parameters provided in Tables E4.1 and E4.2 may be used for design of wall foundations, as required. Slope stability analyses should be carried for the retaining wall, once the detailed design is completed.

E4.3.7 Permanent Slopes

A slope of 2H:1V (2 Horizontal : 1 Vertical) or flatter should be constructed for permanent fill embankment. The embankment should be constructed using engineered fill (Section E5.3). The global slope stability should be analyzed during detailed design, if the new embankment height is higher than 2 m high, once the detailed design is finalized. All permanent slope surfaces should be protected against erosion by surface water and creek water.

Construction of the embankment should follow the requirements of OPSS.MUNI 206 (*Construction Specification for Grading*), or applicable City Standard.

E5.0 General Considerations for Design and Construction

E5.1 Site Preparation

Site preparation will likely generally include stripping of topsoil, excavation to subgrade, proof-rolling, sub-excavating soft spots, if encountered, and backfilling, if necessary, with engineered fill.

All topsoil and loose soil or soil mixed with organic matter should be stripped from pavement areas, manhole / catch basin founding areas, and base of underground utility services. Subgrade preparation of pavement is discussed in Section E2.6.3. Any loose, soft or unstable areas in the exposed subgrade should be sub-excavated and replaced with approved fill and compacted (Section E5.3). Lean concrete may be used to backfill sub-excavated areas.

Excavation should be carried out with a temporary slope of 1H:1V or flatter above the groundwater level (Section E5.4). Roadway shoring protection systems may be required during construction of the culverts. Temporary shoring is discussed in Section E5.5.

E5.2 Embankment Construction

Based on site condition, the proposed road construction will generally involve fill sections along the investigation limits. The embankment requires for road construction should be constructed with compacted engineered fill at 2H:1V (or flatter) side slopes. If a side slope steeper than 2H:1V slope is required or if the height of the embankment / cut slope is greater than 2 m, slope stability analysis should be carried out to assess stability of the planned slope, depending on the subsurface conditions. Final (permanent) embankment side slopes in granular fills should be established to match the existing slopes or as per OPSD 200.010. Final slopes should be treated with a seed and mulch to prevent ravelling.

Construction of the road will require, as a minimum, stripping the existing ground surface cover (topsoil, vegetation cover, surficial fill soils, etc.) from the area required for road construction. Grading, backfilling and compacting should follow OPSS.MUNI 206 (Construction Specification for Grading), OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting), OPSS 501.MUNI (Construction Specification for Compacting), and / or the City’s requirements.

Backfilling, if required, for site grading (e.g., for subgrade raise, replacement of soft soil) should be placed as engineered fill. Engineered fill per OPSS.MUNI 1010 should be used to replace soft / incompetent soils and/or raising grade. Engineered fill should be prepared according to the City’s standards / contract specifications. Engineered fill is discussed in Section E5.3.

The fill soils used for embankment widening should consist of approved clean fill (e.g., Select Subgrade Materials - OPSS 1010).

E5.3 Engineered Fill

Engineered fill per OPSS.MUNI 1010, where required, may be used to backfill excavated areas, backfill around manholes, replace soft/incompetent soils, and / or raise grades. Engineered fill for backfill of excavated areas should be placed after stripping existing fill soils, any soils containing excessive organic matters and otherwise unsuitable soils.

Engineered fill can be prepared by placing fill soil and compacted as per OPSS.MUNI 501 (*Construction Specification for Compacting*) and/or applicable City Standard. Alternatively, engineered fill should be placed in loose layers not exceeding 200 mm. The water content of the fill should be within ± 2 % of its OMC at the time of its placement, and it should be thoroughly compacted to a minimum of 98 % of SPMDD in general.

The fill soils should consist of inorganic soils and should not be frozen during backfilling and compaction. Full-time geotechnical inspection and quality control (by means of frequent field density and laboratory testing) are necessary for the construction of a certifiable engineered fill. The compaction procedures and quality control should be overseen by a geotechnical engineer.

E5.4 Excavation and Dewatering

All excavations should be carried out in accordance with the latest OHSA and Regulations for Construction Projects (O. Reg. 213/91). The soils to be excavated can be classified as follows:

Existing fill soils	Type 4
Hard silty clay till	Type 1
Very dense silty sand / sandy silt till (above groundwater level / fully dewatered)	Type 1
Very dense silty sand / sandy silt till (below groundwater level)	Type 3

In accordance with the OHSA, a maximum short-term slope of 1H:1V is required to within 1.2 m of the trench bottom for temporary excavations in Type 1 and 2 cohesive till and native silty sand / sandy silt till that is above the groundwater level, or properly dewatered. For Type 1 and 2 soils, a maximum depth of 1.2 m high vertical cut at the bottom of excavation may generally be constructed. However, under the groundwater table a 1.2 m high vertical cut may not be stable and flatter slopes may be required. Type 3 soils above the groundwater level may be inclined at 1H:1V or flatter from the bottom. In the case of saturated Type 3 fills or native granular deposits below the prevailing groundwater, if adequate dewatering is not implemented, slopes of open excavations will have to be reduced to 2H: 1V or flatter. In the absence of proper dewatering or groundwater control of Type 3 soils, slope flattening may be insufficient to prevent particularly saturated granular soils from becoming unstable and devolving to Type 4 materials, which requires 3H:1V or flatter slopes. Near the ground surface, occasional 3H:1V or flatter slopes may be required due to loose/soft surficial soils. If open cut cannot be carried out, a temporary shoring system may be used to limit the extent of excavation. General consideration for temporary shoring is provided in Section E5.5.

Trenching should be carried out in accordance with OPSS.MUNI 401 (Construction Specification for Trenching, Backfilling and Compacting).

Stockpiles, materials or any heavy equipment should be kept at least the same horizontal distance as the depth of the excavation from the upper edge of the excavation to prevent slope instability. All surface drainage should be directed away from any open excavations and trenches.

Based on observations at the borehole locations and planned excavation depth, normal excavation equipment should be suitable for excavation. Hard till soils may require additional effort for excavation (e.g., heavy excavator, rippers, impact hammer, etc.). The terms describing the compactness (very loose, loose, compact, dense, very dense) or consistency (very soft, soft, firm, stiff, very stiff, hard) of soil strata give an indication of the effort needed for excavation. It should be noted that cobbles / boulders can be encountered in the till and in fill soils. Therefore, removal of the cobbles / boulders should be considered and planned for.

During the construction, temporary runoff controls such as sediment trap, interceptor drain, dyke and / or silt fence should be installed to prevent uncontrolled water / sediment flow into existing water courses. The effluent from dewatering operations should also be filtered or passed through sediment traps to prevent turbidity.

Based on the soil and groundwater conditions at the borehole locations, groundwater control within the excavated area should not be significant. In the clayey / silty glacial till soils, groundwater seepage into the excavation, if encountered, is likely to be slow and a properly filtered sump and pump system or gravity drainage may be used for dewatering the excavation. High water flow rates (e.g., from perched water in fills or granular layers with the tills) may be encountered during construction and the dewatering effort could require an increased number of sumps and pumps.

Use of lean concrete mud mat or granular layer may be warranted where founding surfaces are to be exposed for extended period, especially if the work is carried out during wet weather. Care should also be exercised to minimize disturbance to the final subgrade during excavation.

It is recommended that qualified geotechnical personnel be present during the foundation excavation to review the conditions of the foundation subgrade.

E5.5 Temporary shoring

Temporary shoring may be required for vertical excavation during construction of culvert, installation of underground utilities or roadway protection. This can be accomplished using soldier piles with lagging (or similar) in order to support the sides of the excavation. Temporary shoring design and construction should comply with OPSS.MUNI 539 (*Construction Specification for Temporary Protection Systems*), or applicable City

Standard. The temporary shoring system should be designed to resist the lateral earth, surcharge and hydrostatic pressures which could occur during construction. Bracings should be installed within the shoring system to minimize movements of the soils. The temporary shoring system should be designed in accordance with the latest editions of Canadian Foundation Engineering Manual's (CFEM) and Canadian Highway Bridge Design Code (CHBDC), together with the requirements of the Ontario Health and Safety Regulations, as applicable.

The shoring system should be designed and approved by a professional engineer. Geotechnical parameters provided in Section E4.3.2 may be considered for design of shoring.

E5.6 Suitability of Existing Soils for Backfilling

Most of the excavated soils (i.e., clayey and silty fills and till soils) can be suitable for being reused for backfill, provided they can be separately stored, properly compacted and are environmentally acceptable. Fill soils containing construction debris (or similar) and organic matter should not be reused. Soils that are too wet to compact will require additional processing (e.g., drying). Cobbles and boulders (larger than 100 mm in size), if any, should be discarded by mechanical means (e.g., sieving) or manual removal.

E6.0 PRELIMINARY SOIL CHEMICAL ANALYSES

Environmental soil chemical analyses were carried out to provide preliminary discussions for soil disposal options as part of the Geotechnical Investigation Preliminary Design for the site, the results of which are discussed in the following section.

No Phase I or Phase II Environmental Site Assessment (ESA) reports have been conducted or provided to Wood for review.

It is assumed that a Record of Site Condition, (RSC) as per Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the *Environmental Protection Act* (EPA), as amended ("O.Reg.153/04, as amended") is not required at this time.

E6.1 Methodology

The environmental soil screening and laboratory analyses program was carried out in general accordance with the current *Ontario Regulation 153/04 Records of Site Condition, Part XV.1 of the Environmental Protection Act (EPA)*, as amended (O. Reg. 153/04) in order to characterize the soil at the Site and to provide an initial discussion on disposal options for surplus material during future construction. It should be noted that the scope of work does not meet the analytical or administrative requirements of Ontario Regulation 406/19 On Site and Excess Soil Management (O. Reg. 406/19) in the event that the soil is to be considered for beneficial reuse.

A Record of Site Condition (RSC) was not part of the scope of work. Due to the limited scope of work, further environmental assessment would be required in the event that an RSC is required.

E6.2 Sample Selection for Analyses

The environmental component of the subsurface investigation included the following activities:

- Conducting the soil sampling activities in accordance with the Ministry of the Environment (MOE) document entitled *"Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04"* dated June 2011, the Ministry of the Environment and Energy (MOEE) document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated December 1996; and MOE document entitled *"Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act"* issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol);
- Based on City of Brampton instruction, submission of eleven (11) soil samples for laboratory analysis of metals & inorganics, three (3) soil samples for analysis of volatile organic compounds (VOCs) and petroleum hydrocarbons (PHC) F1 to F4, and six (6) soil samples for organochlorine (OC) pesticides to assist in determining appropriate soil disposal options, if required, during construction;
- Submission of one (1) soil sample for Ontario Regulation 347 (*O. Reg. 347*) as amended by Ontario Regulation 558/00 (*O. Reg. 558/00*) Toxicity Characteristic Leaching Procedure (TCLP) for VOCs, polychlorinated biphenyls (PCBs), benzo(a)pyrene and metals and inorganics to determine landfill acceptability of soil/granular fill originating from the Site; and
- Comparison of the laboratory analytical results to soil standards presented in the Ministry of the Environment, Conservation and Parks (MECP) document entitled "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*," (the "MECP SCS") dated April 15, 2011 and *O. Reg. 347*, as amended by *O. Reg. 558/00*, Schedule 4 Leachate Quality Criteria provided in the MECP document entitled "*Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste*," October 2000 (the "Schedule 4 Criteria").

E6.2.1 Site Condition Standards

All analytical soil results were compared to the MECP Table 1 (background) SCS for all types of Property Use (except Agricultural) Residential/ Parkland /Institutional/Industrial/Commercial/Community Property Use (Table 1 SCS) and MECP Table 3 (generic) SCS for Industrial/Commercial/Community Property Use for Medium/Fine Textured Soils (Table 3 SCS).

The chemical analyses results were also evaluated against the following tables of Appendix 1 (Generic Excess Soil Quality Standards) of the new MECP O.Reg.406/19 "On-Site and Excess Soil Management," additional elements which are expected to come into force in January 2023:

- Table 1 Full Depth Background Site Condition Standards for all types of property use (except agricultural) (Table 1 Excess Soil Quality Standards); and

- Table 3.1 Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent, for industrial/commercial/community property use (Table 3.1 Excess Soil Quality Standards).

TCLP analyses results were compared with O. Reg. 347, as amended by O. Reg. 558/00, Schedule 4 Leachate Quality Criteria provided in the MECP document entitled "Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste," October 2000 (the "Schedule 4 Criteria").

TCLP analyses results were also compared with Table 3.1 Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse – of O.Reg.406/19.

E6.2.2 Soil Sampling, Inspection & Preservation Procedures

Soil samples were obtained for laboratory analysis and field screening, where applicable, using a drill rig equipped with split spoon sampling capabilities. The drillers cleaned the split spoon by removing loose dirt from the split spoon using a wire brush, washing the split spoon using a brush in a dilute mix of potable water and Alconox soap, rinsing the split spoon with distilled water and rinsing the split spoon with methanol and allowing the split spoon to air dry.

The drillers obtained the split spoon sample by auguring to the specified depth, hammering the spoon about 0.6 m into the soil and removing the spoon. The split spoon sample was inspected for visual and/or olfactory evidence of environmental impacts. Disposable nitrile gloves were used and replaced between the handling of successive samples.

The soil samples retrieved from the borehole investigations were examined, classified and logged according to soil type, moisture content, colour, consistency, and presence of visible indicators of environmental impact. Soil samples requiring vapour analysis were split into duplicate fractions upon recovery at the surface. The primary sample fractions were placed in 120 and/or 250 millilitre (mL) sample jars with Teflon-lined lids and methanol preserved (cored) samples were placed in 40 mL vials and subsequently stored in coolers on ice for potential future laboratory analysis. The volatile sample fractions were placed in resealable plastic sample bags and stored at ambient temperature for subsequent field vapour screening. The samples were selected on the basis of visual/olfactory evidence of impacts, field screening results, or from the vicinity of the apparent water table.

Representative soil samples collected during the investigation were submitted to AGAT Laboratories (AGAT) of Mississauga, Ontario, for metals & inorganics, VOCs ,PHCs, and OC pesticides. AGAT is accredited by the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) in accordance with ISO/IEC 17025:2005 – *"General Requirements for the Competence of Testing and Calibration Laboratories"* for the tested parameters set out in the Soil, Ground Water and Sediment Standards.

E6.3 Environmental Test Results & Considerations

Wood completed a preliminary Environmental Soil Quality Testing Program (the Investigation) as part of the Geotechnical Investigation. The details of the drilling program, including borehole locations and drilling methodology are presented in the geotechnical investigation sections of this report. Soil samples submitted for chemical analysis were collected from depths between surface and 1.4 m below ground surface (mbgs) based on presence of fill material and depth of construction works, as detailed Table D6.1.

Table D6.1: Environmental Tests

Sample ID	Depth (m)	Parameters Tested
E1 SS1	Surface – 0.6	Metals and Inorganics
E2 SS1	Surface – 0.6	Metals and Inorganics and OC Pesticides
E2 SS2	0.8 – 1.4	PHCs and VOCs
E3 SS1	Surface – 0.6	Metals and Inorganics
E3 SS2	0.8 – 1.4	OC Pesticides
E5 SS2	0.8 – 1.4	Metals and Inorganics
E7 SS1	Surface – 0.6	Metals and Inorganics
E23 SS1	Surface – 0.6	Metals and Inorganics
E24 SS1	Surface – 0.6	OC Pesticides
E25 SS1	Surface – 0.6	Metals and Inorganics
E26 SS1	Surface – 0.6	OC Pesticides
E27 SS1	Surface – 0.6	Metals and Inorganics
E27 SS2 + DUP3	0.8 – 1.4	PHCs and VOCs
E28 SS2 + DUP2	0.8 – 1.4	OC Pesticides
E29 SS1	Surface – 0.6	Metals and Inorganics
E30 SS1	Surface – 0.6	Metals and Inorganics
E32 SS1	Surface – 0.6	Metals and Inorganics
E32 SS2	0.8 – 1.4	OC Pesticides

PHC = Petroleum Hydrocarbons
VOC = Volatile Organic Compounds
OC = Organochlorine

Wood observed evidence of fill material in the boreholes.

Headspace combustible organic vapour (COV) and total organic vapour (TOV) concentration measurements recorded in the soil samples were non-detectable.

No evidence (i.e., visual/olfactory) of potential environmental impacts were observed in any of the soil samples.

Where present, detected concentrations of metals and inorganics, PHCs, VOCs, and OC pesticides were below the Table 1 and Table 3 SCS, and Table 1 and Table 3.1 Excess Soil Quality Standards.

The TCLP analyses for the parameters tested indicated that dry soils (soils that would pass a slump test) would meet the Schedule 4 Leachate Quality Criteria and the Table 3.1 Appendix 2 criteria

Soil analytical results are shown in Tables 1E to 10E in Appendix C-E. The laboratory certificates of analysis for the bulk analysis and the certificates of analysis for the O. Reg. 347 TCLP analysis are included in Appendix E.

E6.4 Quality Assurance / Quality Control

Field Quality Control: Field quality control was not performed for this segment and is discussed in separate reports being written as part of the Geotechnical Investigation.

Laboratory Quality Control: The 2011 Analytical Protocol provides requirements for sample handling and storage requirements, reporting requirements, analytical methods and QA/QC procedures for analytical parameters.

As per the 2011 Analytical Protocol, all samples/sample extracts were analyzed within their applicable hold times using approved analytical methods. The report limits were met for all samples and tested parameters. No tested parameter was present in a detectable concentration in any laboratory Method Blank and all laboratory surrogates, reference materials and replicate samples are considered acceptable.

CLOSURE

The subsoil information and recommendations contained in this report should be used solely for the purpose of geotechnical assessment of the project as described in this report.

The Limitations to Geotechnical Reports are an integral part of this report.

Sincerely,

Wood Environment & Infrastructure Solutions Canada Limited

Hoda Seddik

LICENSED PROFESSIONAL ENGINEER
H. M. K. SEDDIK
PROVINCE OF ONTARIO

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Principal Pavement Engineer

Shami Malla

Shami Malla, M.Civ. Eng., P.Eng.
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Environmental Scientist

I. Powell

Ian A. Powell, B.E.S., P.Geo., QP_{ESA}
Senior Environmental Geoscientist

LIMITATIONS TO GEOTECHNICAL REPORTS

1. The work performed in the preparation of this report and the conclusions presented herein are subject to the following:

   a) The contract between Wood and the Client, including any subsequent written amendment or Change Order dully signed by the parties (hereinafter together referred as the "Contract");

   b) Any and all time, budgetary, access and/or site disturbance, risk management preferences, constraints or restrictions as described in the contract, in this report, or in any subsequent communication sent by Wood to the Client in connection to the Contract; and

   c) The limitations stated herein.

2. **Standard of care:** Wood has prepared this report in a manner consistent with the level of skill and are ordinarily exercised by reputable members of Wood's profession, practicing in the same or similar locality at the time of performance, and subject to the time limits and physical constraints applicable to the scope of work, and terms and conditions for this assignment. No other warranty, guaranty, or representation, expressed or implied, is made or intended in this report, or in any other communication (oral or written) related to this project. The same are specifically disclaimed, including the implied warranties of merchantability and fitness for a particular purpose.

3. **Limited locations:** The information contained in this report is restricted to the site and structures evaluated by Wood and to the topics specifically discussed in it, and is not applicable to any other aspects, areas or locations.

4. **Information utilized:** The information, conclusions and estimates contained in this report are based exclusively on: i) information available at the time of preparation, ii) the accuracy and completeness of data supplied by the Client or by third parties as instructed by the Client, and iii) the assumptions, conditions and qualifications/limitations set forth in this report.

5. **Accuracy of information:** No attempt has been made to verify the accuracy of any information provided by the Client or third parties, except as specifically stated in this report (hereinafter "Supplied Data"). Wood cannot be held responsible for any loss or damage, of either contractual or extra-contractual nature, resulting from conclusions that are based upon reliance on the Supplied Data.

6. **Report interpretation:** This report must be read and interpreted in its entirety, as some sections could be inaccurately interpreted when taken individually or out-of-context. The contents of this report are based upon the conditions known and information provided as of the date of preparation. The text of the final version of this report supersedes any other previous versions produced by Wood.

7. **No legal representations:** Wood makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

8. **Decrease in property value:** Wood shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.

9. **No third party reliance:** This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or Contract. Any use or reproduction which any third party makes of the report, in whole or in part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Wood does not represent or warrant the accuracy, completeness, merchantability, fitness for purpose or usefulness of this document, or any information contained in this document, for use or consideration by any third party. Wood accepts no responsibility whatsoever for damages or loss of any nature or

kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on this report or anything set out therein. including without limitation, any indirect, special, incidental, punitive or consequential loss, liability or damage of any kind.

10. **Assumptions**: Where design recommendations are given in this report, they apply only if the project contemplated by the Client is constructed substantially in accordance with the details stated in this report. It is the sole responsibility of the Client to provide to Wood changes made in the project, including but not limited to, details in the design, conditions, engineering or construction that could in any manner whatsoever impact the validity of the recommendations made in the report. Wood shall be entitled to additional compensation from Client to review and assess the effect of such changes to the project.

11. **Time dependence**: If the project contemplated by the Client is not undertaken within a period of 18 months following the submission of this report, or within the time frame understood by Wood to be contemplated by the Client at the commencement of Wood's assignment, and/or, if any changes are made, for example, to the elevation, design or nature of any development on the site, its size and configuration, the location of any development on the site and its orientation, the use of the site, performance criteria and the location of any physical infrastructure, the conclusions and recommendations presented herein should not be considered valid unless the impact of the said changes is evaluated by Wood, and the conclusions of the report are amended or are validated in writing accordingly.

    Advancements in the practice of geotechnical engineering, engineering geology and hydrogeology and changes in applicable regulations, standards, codes or criteria could impact the contents of the report, in which case, a supplementary report may be required. The requirements for such a review remain the sole responsibility of the Client or their agents.

    Wood will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

12. **Limitations of visual inspections:** Where conclusions and recommendations are given based on a visual inspection conducted by Wood, they relate only to the natural or man-made structures, slopes, etc. inspected at the time the site visit was performed. These conclusions cannot and are not extended to include those portions of the site or structures, which were not reasonably available, in Wood's opinion, for direct observation.

13. **Limitations of site investigations**: Site exploration identifies specific subsurface conditions only at those points from which samples have been taken and only at the time of the site investigation. Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions.

    The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite this investigation, conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

    Final sub-surface/bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports.

    Bedrock, soil properties and groundwater conditions can be significantly altered by environmental remediation and/or construction activities such as the use of heavy equipment or machinery, excavation, blasting, pile-driving or draining or other activities conducted either directly on site or on adjacent terrain. These properties can also be indirectly affected by exposure to unfavorable natural events or weather conditions, including freezing, drought, precipitation and snowmelt.

During construction, excavation is frequently undertaken which exposes the actual subsurface and groundwater conditions between and beyond the test locations, which may differ from those encountered at the test locations. It is recommended practice that Wood be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations, that construction work has no negative impact on the geotechnical aspects of the design, to adjust recommendations in accordance with conditions as additional site information is gained and to deal quickly with geotechnical considerations if they arise.

Interpretations and recommendations presented herein may not be valid if an adequate level of review or inspection by Wood is not provided during construction.

14. **Factors that may affect construction methods, costs and scheduling**: The performance of rock and soil materials during construction is greatly influenced by the means and methods of construction. Where comments are made relating to possible methods of construction, construction costs, construction techniques, sequencing, equipment or scheduling, they are intended only for the guidance of the project design professionals, and those responsible for construction monitoring. The number of test holes may not be sufficient to determine the local underground conditions between test locations that may affect construction costs, construction techniques, sequencing, equipment, scheduling, operational planning, etc.

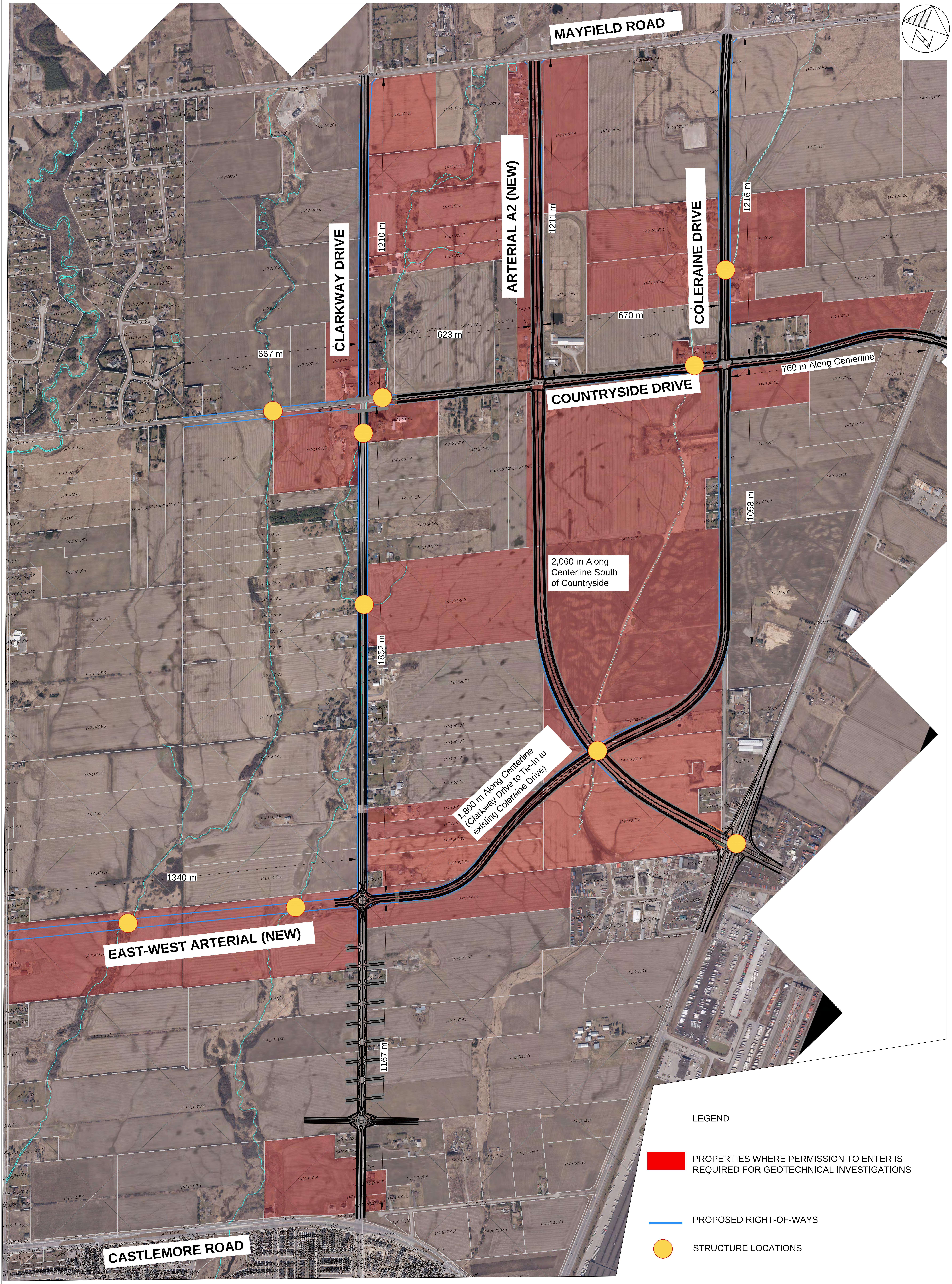
    Any contractors bidding on or undertaking the works should draw their own conclusions as to how the subsurface and groundwater conditions may affect their work, based on their own investigations and interpretations of the factual soil data, groundwater observations, and other factual information.

15. **Groundwater and Dewatering**: Wood will accept no responsibility for the effects of drainage and/or dewatering measures if Wood has not been specifically consulted and involved in the design and monitoring of the drainage and/or dewatering system.

16. **Environmental and Hazardous Materials Aspects**: Unless otherwise stated, the information contained in this report in no way reflects on the environmental aspects of this project, since this aspect is beyond the Scope of Work and the Contract. Unless expressly included in the Scope of Work, this report specifically excludes the identification or interpretation of environmental conditions such as contamination, hazardous materials, wild life conditions, rare plants or archeology conditions that may affect use or design at the site. This report specifically excludes the investigation, detection, prevention or assessment of conditions that can contribute to moisture, mould or other microbial contaminant growth and/or other moisture related deterioration, such as corrosion, decay, rot in buildings or their surroundings. Any statements in this report or on the boring logs regarding odours, colours, and unusual or suspicious items or conditions are strictly for informational purposes

17. **Sample Disposal**: Wood will dispose of all uncontaminated soil and rock samples after 30 days following the release of the final geotechnical report. Should the Client request that the samples be retained for a longer time, the Client will be billed for such storage at an agreed upon rate. Contaminated samples of soil, rock or groundwater are the property of the Client, and the Client will be responsible for the proper disposal of these samples, unless previously arranged for with Wood or a third party.

FIGURES



LEGEND

🟥 PROPERTIES WHERE PERMISSION TO ENTER IS REQUIRED FOR GEOTECHNICAL INVESTIGATIONS

— PROPOSED RIGHT-OF-WAYS

● STRUCTURE LOCATIONS

BRAMPTON
brampton.ca Flower City

GEOTECHNICAL INVESTIGATIONS
A OA S I
I L OLICY AREA 47
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO
GEOTECHNICAL PERMISSION TO ENTER

wood.

Project No.	TP115086
Date	JUNE 3, 2019
Scale	0 100 200 300 400 500
Drawing No.	1

SECTION A
COLERAINE DRIVE
(FROM ARTERIAL A2 TO MAYFIELD DRIVE, ~3 KM)

FIGURES

LEGEND

⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
⊕ BOREHOLE LOCATION (depth 10m)
(w) MONITORING WELL LOCATIONS

CLIENT LOGO

BRAMPTON Flower City
brampton.ca

CLIENT:

THE CORPORATION OF THE CITY OF BRAMPTON

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited
50 Vogell Road, Units 3 & 4, Richmond Hill, Ontario, L4B 3K6

wood.

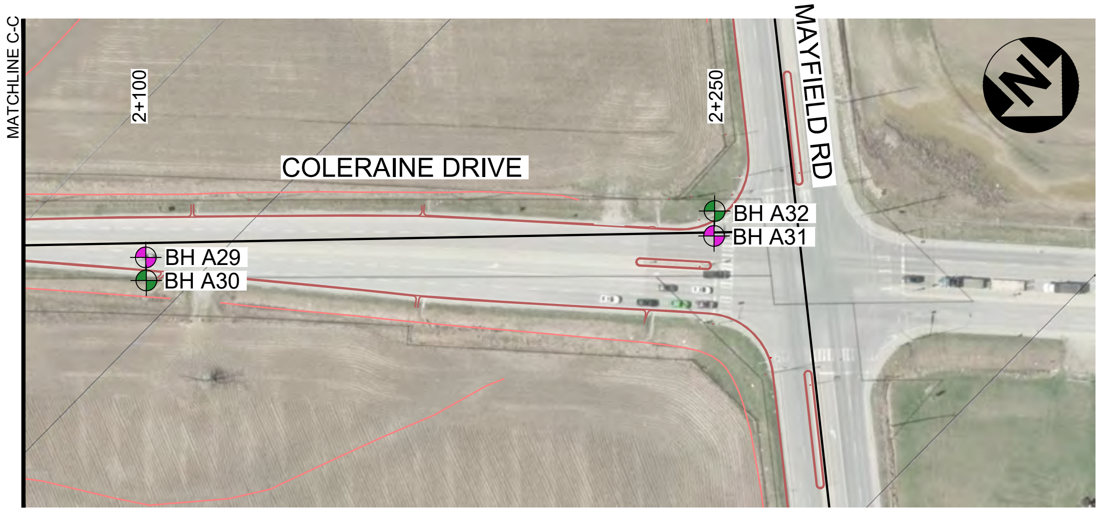
KW
CHK'D BY: SM
DATUM: NAD83
PROJECTION: UTM Zone 17T
SCALE: AS SHOWN

TITLE
SITE AND BOREHOLE LOCATION PLAN
(COLERAINE DRIVE)

PROJECT
GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE: DECEMBER 2020
PROJECT NO: TP115086
RFQ NO: 2015-016
FIGURE No. 1A

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_NOV20_BHPLAN_COLERAINE.dwg – COLERAINE 1A – Dec. 07, 2020 10:50am – kent.wong



0 30 60 90 120m
APPROXIMATE SCALE

LEGEND

- ⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- ⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- ⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- ⊕ BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

CLIENT LOGO

BRAMPTON Flower City
brampton.ca

CLIENT:
THE CORPORATION OF THE CITY OF BRAMPTON

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wood.

KW
CHK'D BY:
SM
DATUM:
NAD83
PROJECTION:
UTM Zone 17T
SCALE:
AS SHOWN

TITLE
SITE AND BOREHOLE LOCATION PLAN
(COLERAINE DRIVE)

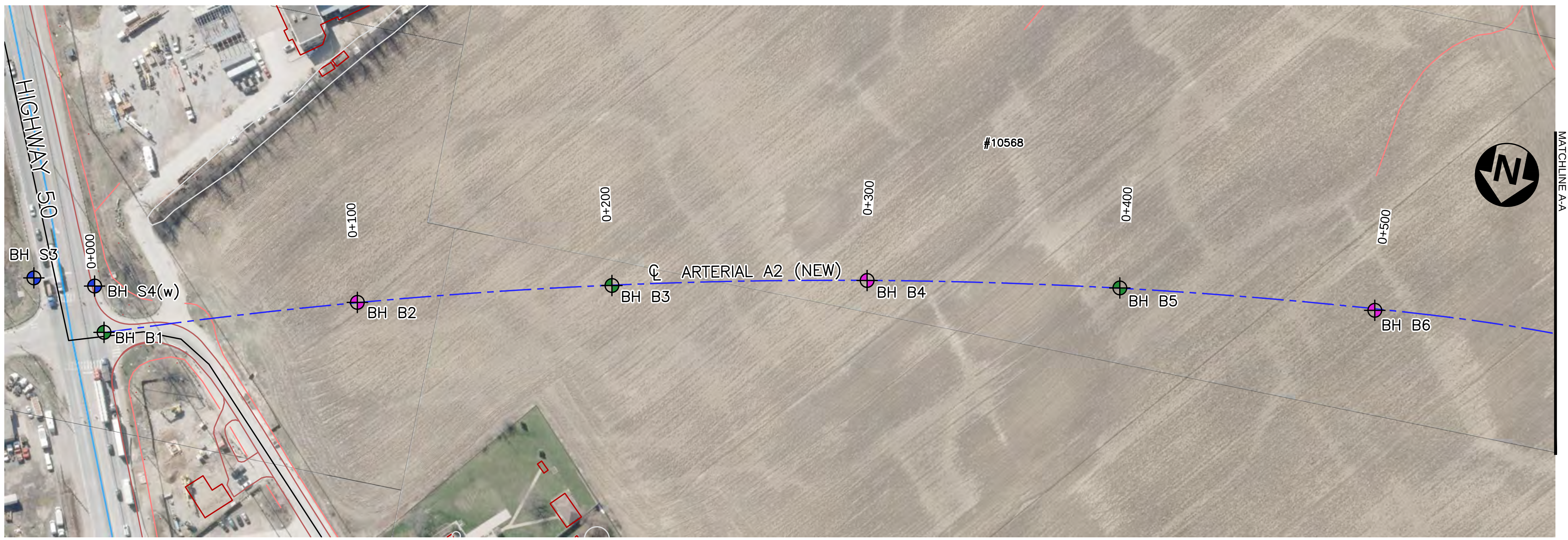
PROJECT
GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

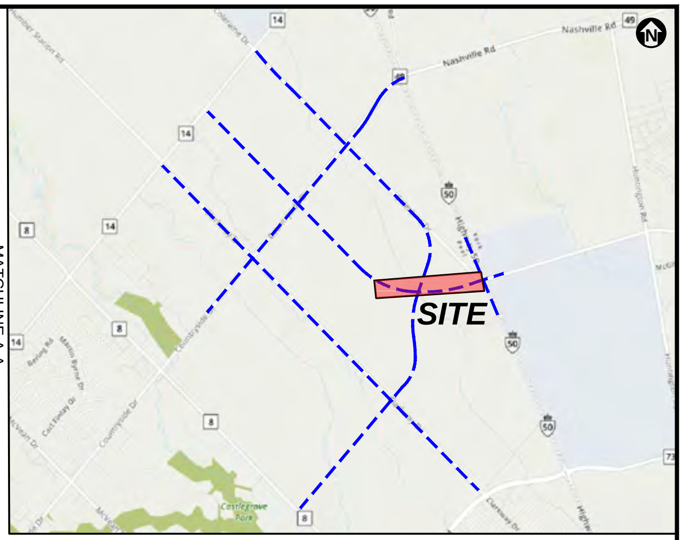
DATE:
DECEMBER 2020
PROJECT NO:
TP115086
RFQ NO:
2015-016
FIGURE No.
1B

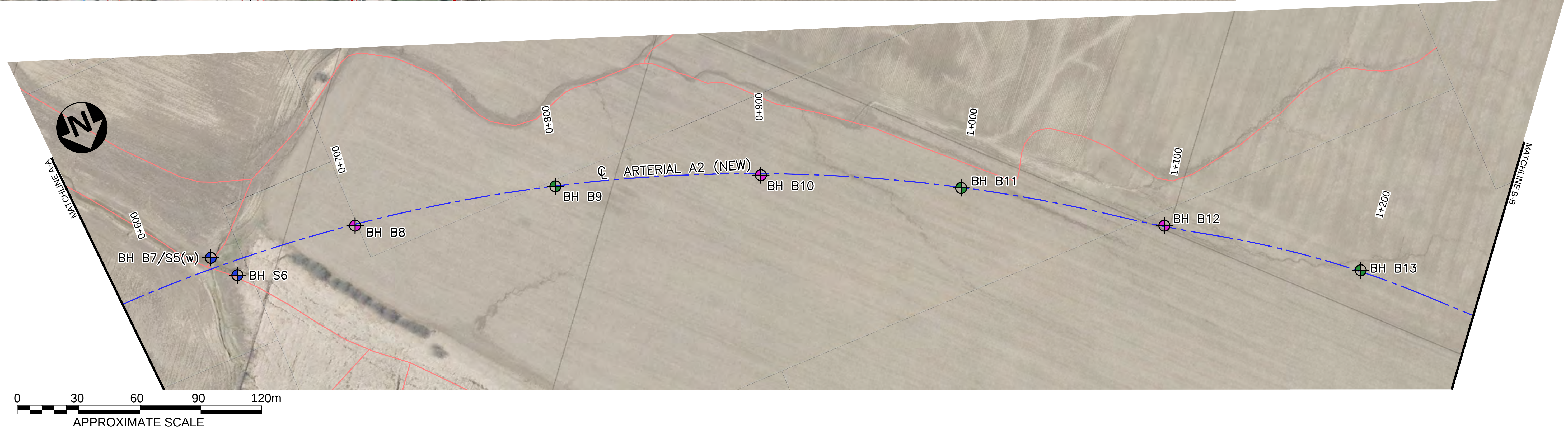
H:\2011 to 2019\2019\# - TPB - Burlington Projects\# (2015) TP115086 - SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_NOV20_BHPLAN_COLERAINE.dwg - COLERAINE 1B - Dec. 07, 2020 10:55am - kent.wong

SECTION B
ARTERIAL A2
(FROM MAYFIELD ROAD TO MAJOR MACKENZIE DRIVE / RR 50, ~3.4 KM)

FIGURES







LEGEND

⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
⊕ BOREHOLE LOCATION (depth 10m)
(w) MONITORING WELL LOCATIONS

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wood.

KW
CHK'D BY: SM
DATUM: NAD83
PROJECTION: UTM Zone 17T
SCALE: AS SHOWN

TITLE
SITE AND BOREHOLE LOCATION PLAN
(ARTERIAL A2)

PROJECT
GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE: MARCH 2021
PROJECT NO: TP115086
RFQ NO: 2015-016
FIGURE No. 2A

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_7DEC20_BHPLAN_A2.dwg – A2 1A – Apr. 01, 2021 3:58pm – kent.wong

LEGEND

⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
⊕ BOREHOLE LOCATION (depth 10m)
(w) MONITORING WELL LOCATIONS

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SM
DATUM:
NAD83
PROJECTION:
UTM Zone 17T
SCALE:
AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN
(ARTERIAL A2)

PROJECT

GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE:
DECEMBER 2020
PROJECT NO:
TP115086
RFQ NO:
2015-016
FIGURE No.
2B

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_7DEC20_BHPLAN_A2.dwg – A2 1B – Dec. 07, 2020 12:12pm – kent.wong

SECTION C
COUNTRYSIDE DRIVE
(FROM CLARKWAY DRIVE TO RR 50, ~3 KM)

FIGURES

LEGEND

- ⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- ⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- ⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- ⊕ BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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CHK'D BY: SM

DATUM: NAD83

PROJECTION: UTM Zone 17T

SCALE: AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN (COUNTRYSIDE DRIVE)

PROJECT

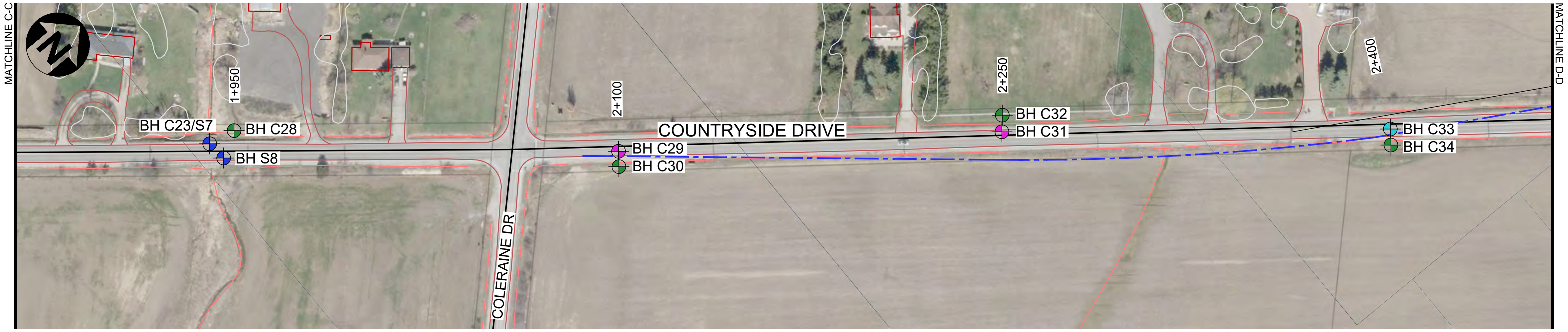
GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

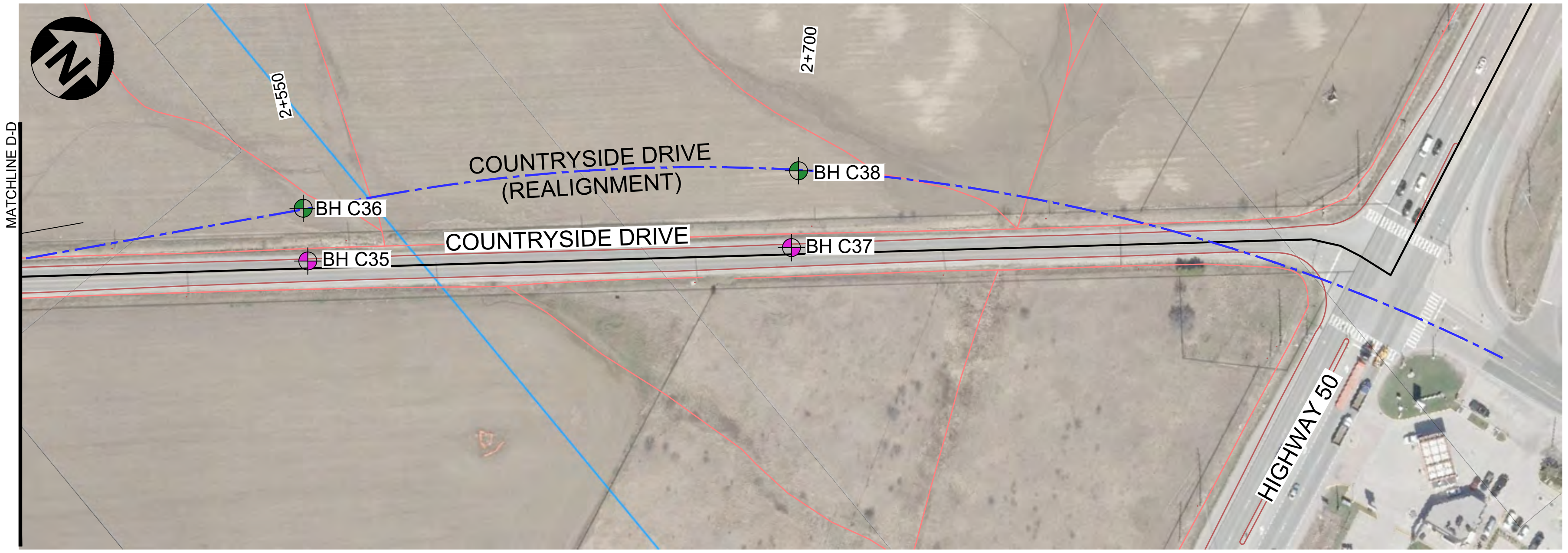
DATE: DECEMBER 2020

PROJECT NO: TP115086

RFQ NO: 2015-016

FIGURE No. 3A





0 30 60 90 120m

APPROXIMATE SCALE

LEGEND

⊕	BOREHOLE LOCATION (MDL/EP - depth 1.5m)
⊕	BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
⊕	BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
⊕	BOREHOLE LOCATION (depth 10m)
(w)	MONITORING WELL LOCATIONS

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DATUM: NAD83
PROJECTION: UTM Zone 17T
SCALE: AS SHOWN

TITLE
SITE AND BOREHOLE LOCATION PLAN
(COUNTRYSIDE DRIVE)

PROJECT
GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE: DECEMBER 2020
PROJECT NO: TP115086
RFQ NO: 2015-016
FIGURE No. 3B

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_DEC12_BHPLAN_COUNTRYSIDE.dwg – COUNTRYSIDE 1B – Dec. 07, 2020 12:45pm – kent.wong

SECTION D
CLARKWAY DRIVE
(FROM CASTLEMORE ROAD TO MAYFIELD DRIVE, ~3 KM)

FIGURES

LEGEND

- ⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- ⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- ⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- ⊕ BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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CHK'D BY:
SM
DATUM:
NAD83
PROJECTION:
UTM Zone 17T
SCALE:
AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN

PROJECT

GEOTECHNICAL INVESTIGATIONS

ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE:
DECEMBER 2019
PROJECT NO:
TPB115086
RFQ NO:
2015-016
FIGURE No.
4A

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_DEC13_BHPLAN_CLARKWAY.dwg – CLARKWAY 1A – Dec. 07, 2020 1:19pm – kent.wong

LEGEND

⊕	BOREHOLE LOCATION (MDL/EP - depth 1.5m)
⊕	BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
⊕	BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
⊕	BOREHOLE LOCATION (depth 10m)
(w)	MONITORING WELL LOCATIONS

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CHK'D BY:
SM

DATUM:
NAD83

PROJECTION:
UTM Zone 17T

SCALE:
AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN

PROJECT

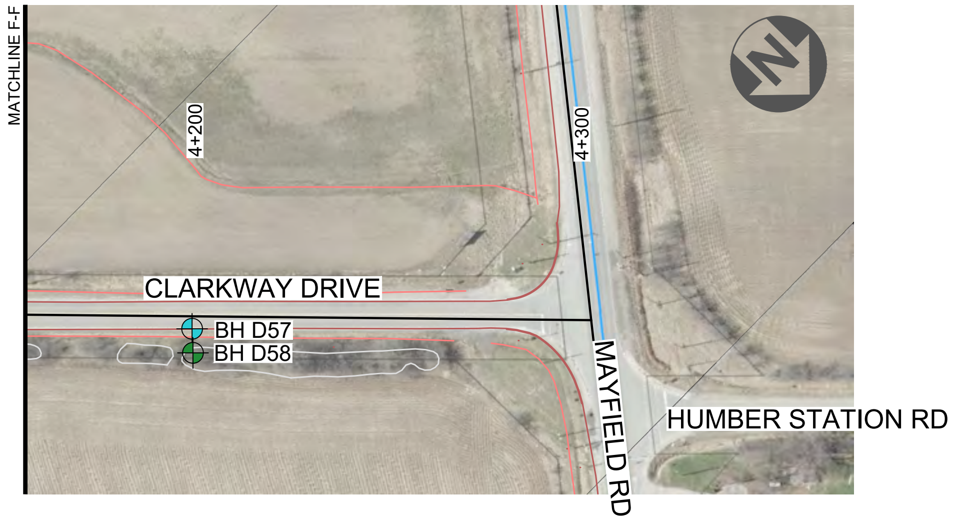
GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE:
DECEMBER 2020

PROJECT NO:
TPB115086

RFQ NO:
2015-016

FIGURE No.
4B



0 30 60 90 120m

APPROXIMATE SCALE

LEGEND

- ⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- ⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- ⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- ⊕ BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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DATUM:
NAD83

PROJECTION:
UTM Zone 17T

SCALE:
AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN

PROJECT

GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROAD NETWORK WITHIN HIGHWAY 427 INDUSTRIAL
SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE:
DECEMBER 2020

PROJECT NO:
TPB115086

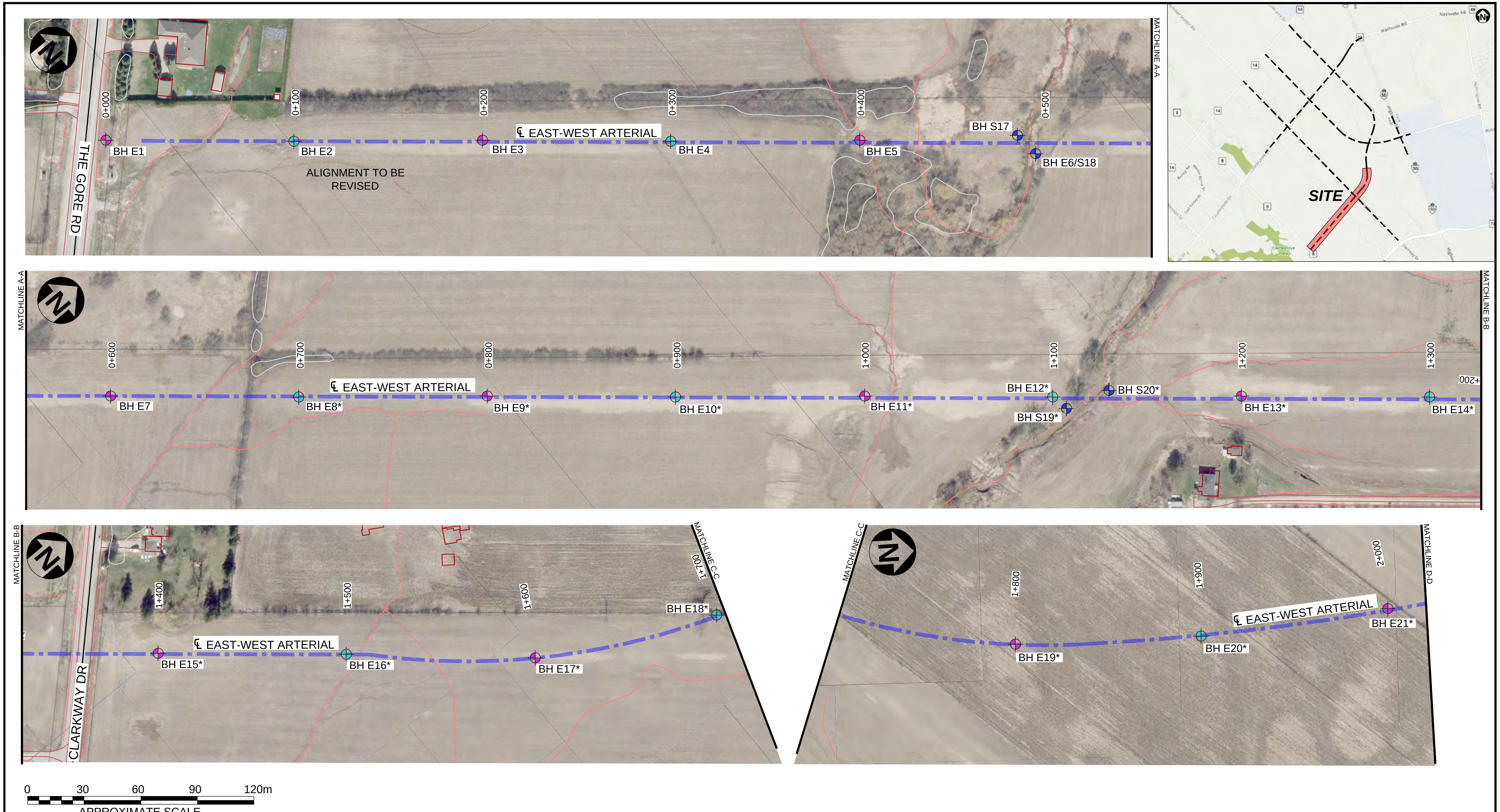
RFQ NO:
2015-016

FIGURE No.
4C

H:\2011 to 2019\2019\# - TPB - Burlington Projects\# (2015) TP115086 - SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_DEC13_BHPLAN_CLARKWAY.dwg - CLARKWAY 1C - Dec. 07, 2020 1:12pm - kent.wong

SECTION E
EAST – WEST ARTERIAL ROAD
(FROM THE GORE ROAD TO COLERAINE DRIVE, ~2.4 KM)

FIGURES



* BOREHOLE NOT DRILLED AS ACCESS PERMIT COULD NOT BE OBTAINED.

LEGEND

- ⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- ⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- ⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- ⊕ BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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KW

CHK'D BY: SM

DATUM: NAD83

PROJECTION: UTM Zone 17T

SCALE: AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN (EAST-WEST ARTERIAL)

PROJECT

GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROADS WITHIN HIGHWAY 427 INDUSTRIAL SECONDARY PLAN AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE: APRIL 2022

PROJECT NO: TP115086

RFQ NO: 2015-016

FIGURE No. 5A

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_BHPLAN_EAST-WEST ARTERIAL.dwg – EAST-WEST Arterial 1A – Apr. 07, 2022 10:05am – kent.wong

* BOREHOLE NOT DRILLED AS ACCESS PERMIT COULD NOT BE OBTAINED.

LEGEND

- ⊕ BOREHOLE LOCATION (MDL/EP - depth 1.5m)
- ⊕ BOREHOLE LOCATION (SHR/TOS - depth 1.5m)
- ⊕ BOREHOLE LOCATION (MDL/EP - depth 3m to 5m)
- ⊕ BOREHOLE LOCATION (depth 10m)
- (w) MONITORING WELL LOCATIONS

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	KW
CHK'D BY:	SM
DATUM:	NAD83
PROJECTION:	UTM Zone 17T
SCALE:	AS SHOWN

TITLE

SITE AND BOREHOLE LOCATION PLAN
(EAST-WEST ARTERIAL)

PROJECT

GEOTECHNICAL INVESTIGATIONS
ARTERIAL ROADS WITHIN HIGHWAY 427 INDUSTRIAL SECONDARY PLAN
AREA (AREA 47)
CITY OF BRAMPTON, ONTARIO

DATE:	APRIL 2022
PROJECT NO:	TP115086
RFQ NO:	2015-016
FIGURE No.	5B

H:\2011 to 2019\2019\# – TPB – Burlington Projects\# (2015) TP115086 – SP47 Arterial Roads EA\Drawings\Aerial\TPB115086_BHPLAN_EAST-WEST ARTERIAL.dwg – EAST-WEST Arterial 1B – Apr. 07, 2022 10:13am – kent.wong

EXPLANATION OF BOREHOLE LOGS
AND
RECORD OF BOREHOLES

EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION

Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and Depth

This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot

This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description

This column gives a description of the soil stratums, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the *Modified Unified Soil Classification System*.

The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows *(Ref. Canadian Foundation Engineering Manual)*:

Compactness of	
Cohesionless Soils	**SPT N-Value**
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

Consistency of	Undrained Shear Strength	
Cohesive Soils	**kPa**	**psf**
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very stiff	100 to 200	2000 to 4000
Hard	Over 200	Over 4000

Soil Sampling

Sample types are abbreviated as follows:

SS	Split Spoon	TW	Thin Wall Open (Pushed)	RC	Rock Core
AS	Auger Sample	TP	Thin Wall Piston (Pushed)	WS	Washed Sample

Additional information provided in this section includes sample numbering, sample recovery and numerical testing results.

Field and Laboratory Testing

Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Instrumentation Installation

Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section. Water levels, if measured during fieldwork, are also plotted. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors.

Comments

This column is used to describe non-standard situations or notes of interest.

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MODIFIED * UNIFIED CLASSIFICATION SYSTEM FOR SOILS

*The soil of each stratum is described using the Unified Soil Classification System (Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S Army. Vol. 1 March 1953.) modified slightly so that an inorganic clay of "medium plasticity" is recognized.

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u= \frac{D_{60}}{D_{10}}>4$; $C_C= \frac{(D_{30})^2}{D_{10} X D_{60}} = 1$ to 3
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM	SILTY GRAVELS, GRAVEL-SAND- SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR P.I MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (TRACE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u= \frac{D_{60}}{D_{10}}>6$; $C_C= \frac{(D_{30})^2}{D_{10} X D_{60}} = 1$ to 3
			SP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR P.I MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 50$	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
		$W_L > 50$	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	$W_L < 30$	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS	
		$30 < W_L < 50$	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		$W_L > 50$	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SILTS & CLAYS BELOW "A" LINE	$W_L < 50$	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", E.G SF IS A MIXTURE OF SAND WITH SILT OR CLAY
		$W_L > 50$	OH	ORGANIC CLAYS OF HIGH PLASTICITY	
HIGH ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE

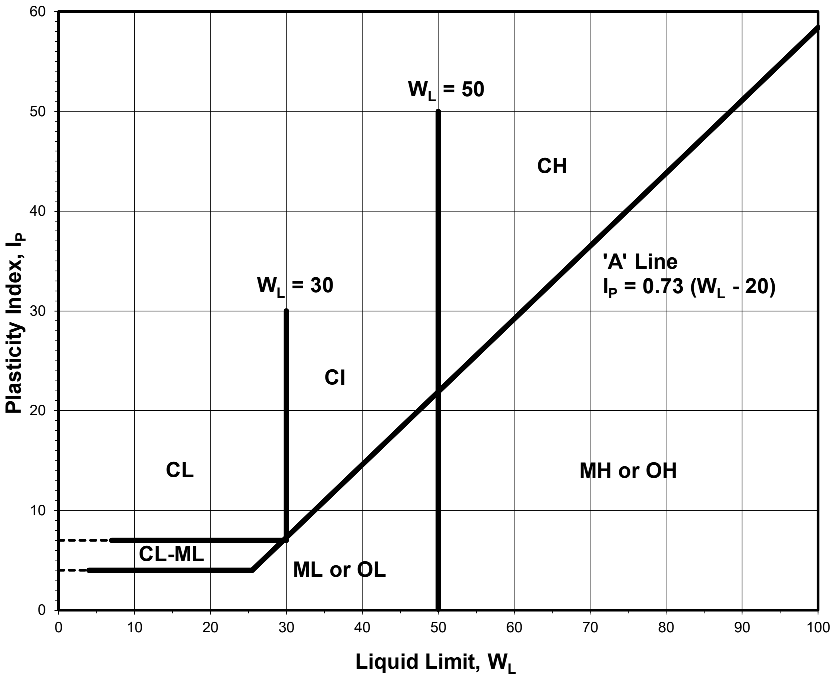
SOIL COMPONENTS

FRACTION	U.S STANDARD SIEVE SIZE		
		PASSING	RETAINED
GRAVEL	COARSE	76 mm	19 mm
	FINE	19 mm	4.75 mm
SAND	COARSE	4.75 mm	2.00 mm
	MEDIUM	2.00 mm	425 µm
	FINE	425 µm	75 µm
FINES (SILT OR CLAY BASED ON PLASTICITY)		75 µm	

DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
PERCENT	DESCRIPTOR
35-50	AND
20-35	Y/EY
10-20	SOME
1-10	TRACE

OVERSIZED MATERIAL	
ROUNDED OR SUBROUNDED: COBBLES 76 mm TO 200 mm BOULDERS > 200 mm	NOT ROUNDED: ROCK FRAGMENTS > 76 mm ROCKS > 0.76 CUBIC METRE IN VOLUME

Plasticity Chart for Soil Passing 425 Micron Sieve



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Note 1: Soils are classified and described according to their engineering properties and behaviour.

Note 2: The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual.

SECTION A
COLERAINE DRIVE
(FROM ARTERIAL A2 TO MAYFIELD DRIVE ~3 KM)

RECORD OF BOREHOLES

RECORD OF BOREHOLE No. BH A1

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., NBL, Sta. 0+000 E:605646 N:4853212**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 215.5 m

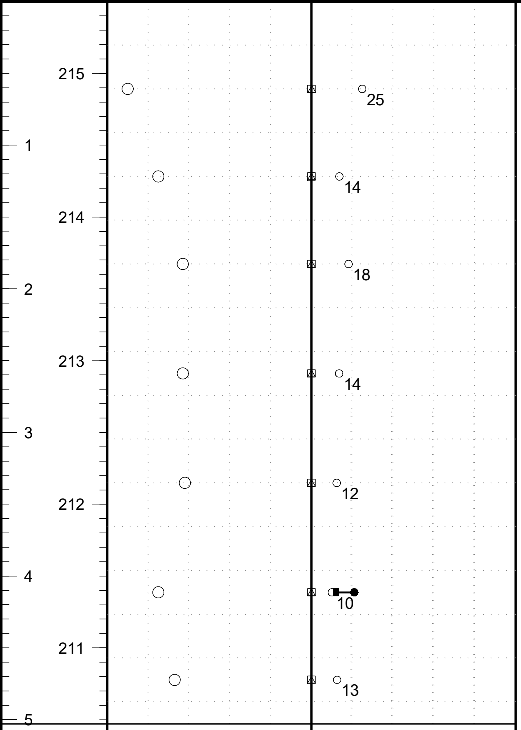
DESCRIPTION	Elevation / Depth
about 180 mm ASPHALT	215.3 0.2
Sand and Gravel FILL moist	215.2 0.3
dark grey/brown **Silty Clay FILL** trace gravel, trace organics	214.0 1.5
brown/grey **SILTY CLAY TILL** trace sand, trace gravel very stiff to hard ---------- cobbles/boulders -------- grey	210.5 5.0
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	10
SS	2	83	25
SS	3	100	37
SS	4	83	37
SS	5	100	38
SS	6	100	25
SS	7	100	33

FIELD TESTING

LAB TESTING



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
3	30	45	22

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$\underline{\nabla}$ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A2

wood.

Project Number:	TP115086	Drilling Location:	Coleraine Dr., NBL, Sta. 0+000 E:605648 N:4853213
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Truck Mounted Drill
Project Location:	Brampton, Ontario	Date Started:	Jan 21, 2020
		Date Completed:	Jan 21, 2020

Logged by: MS
Compiled by: PR
Reviewed by: SM/DP
Revision No.: 0, 12/1/20

Geodetic Ground Surface Elevation: 215.4 m

LITHOLOGY PROFILE			SOIL SAMPLING						COMMENTS & GRAIN SIZE DISTRIBUTION (%)
DESCRIPTION	Elevation (m)	Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	GR SA SI CL
Sand and Gravel FILL moist	214.9	0.5	SS	1	100	61		215	Ground frozen to about 300 mm below surface..
dark grey/brown **Silty Clay FILL** trace sand, trace gravel, with oxidation	214.1	1.2	SS	2	100	10	1		
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, tarce gravel very stiff	213.5	1.8	SS	3	100	29		214	
END OF BOREHOLE		1.8							

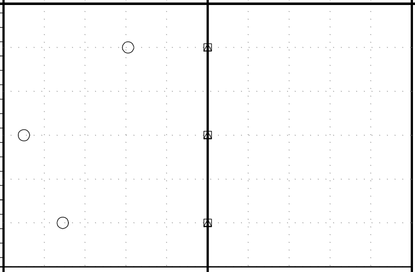
FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A3

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**
Drilling Location: **Coleraine Dr., SBL, Sta. 0+150 E:605516 N:4853330**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020**
Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Geodetic Ground Surface Elevation: 216.3 m

Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L Plastic Liquid 20 40 60 80

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W	GR	SA	SI	CL
about 200 mm ASPHALT	216.1 0.2									
Sand and Gravel FILL moist	216.0 0.3									
dark grey/brown **Silty Clay FILL** trace gravel, trace organics		SS	1	50	9	29				
		SS	2	100	12	26				
	214.0 2.3	SS	3	100	7	22				
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand. trace gravel very stiff	213.3 3.0	SS	4	100	21	14	3	18	52	27
END OF BOREHOLE										

DEPTH (m): 1, 2, 3
ELEVATION (m): 216, 215, 214

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∇ Groundwater encountered on completion of drilling on 1/21/2020 at a depth of: 2.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A5

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

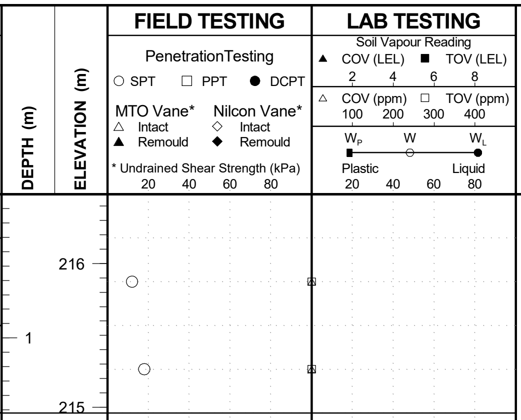
Drilling Location: **Coleraine Dr., NBL, Sta. 0+300 E:605408 N:4853441**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 216.5 m

Lithology Plot	DESCRIPTION	Elevation (m) Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
■	**about 200 mm ASPHALT**	216.3 0.2				
▨	**Sand and Gravel FILL** moist	216.2 0.3				
▨	brown **Silty Clay FILL** trace gravel, trace organics	215.3 1.2	SS	1	79	12
▨	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff	215.0 1.5	SS	2	100	18
	END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A7

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., SBL, Sta. 0+450 E:605353 N:4853491**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020**

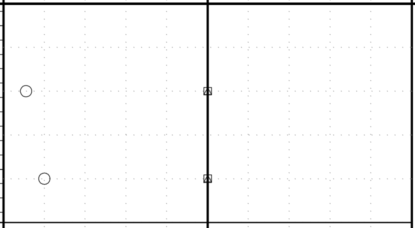
Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

Geodetic Ground Surface Elevation: 218.2 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	SOIL SAMPLING: Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 180 mm ASPHALT	218.0 0.2						218
Sand and Gravel FILL moist	217.9 0.3						
dark grey **Silty Clay FILL** trace gravel	217.2 0.9	SS	1	75	11		
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff	216.6 1.5	SS	2	100	20	1	217
END OF BOREHOLE							

FIELD TESTING
Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING
Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A8

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., SBL, Sta. 0+450 E:605353 N:4853490**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 23, 2020** Date Completed: **Jan 23, 2020**	Revision No.:	**0, 12/1/20**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	**DESCRIPTION** Geodetic Ground Surface Elevation: 217.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	**DEPTH (m)**	**ELEVATION (m)**	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Sand and Gravel FILL trace organics moist 217.5	SS	1	100	14						
	0.5 brown **Silty Clay FILL** trace gravel 216.7	SS	2	83	8	1	217				
	1.2 brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff 216.1	SS	3	25	20						
	END OF BOREHOLE 1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A9

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., NBL, Sta. 0+600 E:605252 N:4853597**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Truck Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 21, 2020** Date Completed: **Jan 21, 2020**	Revision No.:	**0, 12/1/20**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 219.1 m

DESCRIPTION	Elevation / Depth
about 190 mm ASPHALT	218.9
Sand and Gravel FILL moist	218.8 0.2 0.3
dark grey/dark brown **Silty Clay FILL** trace gravel	218.2
brown/grey **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, trace cobbles very stiff to hard ------- grey	0.9 214.1
END OF BOREHOLE	5.0

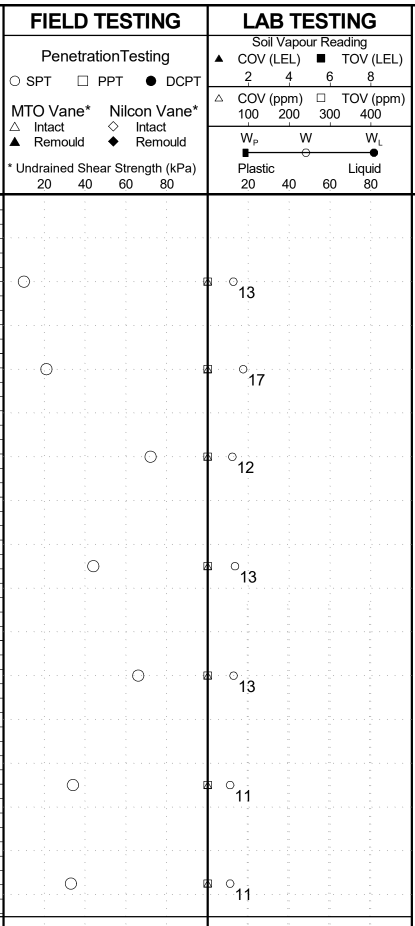
SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	75	10
SS	2	63	21
SS	3	100	72
SS	4	100	44
SS	5	100	66
SS	6	100	34
SS	7	100	33

DEPTH (m)	ELEVATION (m)
	219
1	218
2	217
3	216
4	215
5	

FIELD TESTING

LAB TESTING



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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⊻ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A10

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., NBL, Sta. 0+600 E:605253 N:4853600**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Field Testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 219.0 m

Lithology Plot	DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	Sand and Gravel FILL some topsoil moist	218.8 0.2	SS	1	100	8				27	60	(13)	
	brown/grey **Silty Clay FILL** trace gravel	217.8 1.2	SS	2	83	12	1	218					
	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff	217.2	SS	3	83	24							
	END OF BOREHOLE	1.8											

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A11

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., SBL, Sta. 0+750 E:605117 N:4853720**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

Geodetic Ground Surface Elevation: 219.9 m

DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 200 mm ASPHALT	219.7 0.2				
Sand and Gravel FILL moist	219.6 0.3				
dark grey **Silty Clay FILL** trace gravel, trace organics, trace cobbles	219.0 0.9	SS	1	25	12
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders stiff to hard		SS	2	58	14
		SS	3	83	28
	216.8 3.0	SS	4	100	38
END OF BOREHOLE					

DEPTH (m): 1, 2, 3
ELEVATION (m): 219, 218, 217

FIELD TESTING

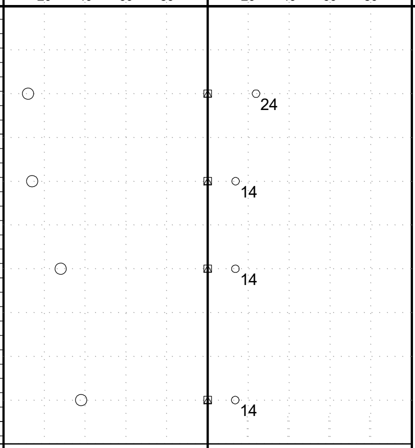
Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A13

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., NBL, Sta. 0+900 E:605006 N:4853836**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 21, 2020** Date Completed: **Jan 21, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 220.2 m

DESCRIPTION	Elevation / Depth (m)
about 200 mm ASPHALT	220.0
Sand and Gravel FILL moist	219.9 / 0.2 0.3
dark grey/grey **Silty Clay FILL** trace sand, trace gravel, trace organics	218.6
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace gravel, cobbles/boulders hard	1.5 217.9
brown **SILTY SAND** trace clay, trace gravel very dense wet	2.3 217.3
END OF BOREHOLE	2.9

SOIL SAMPLING

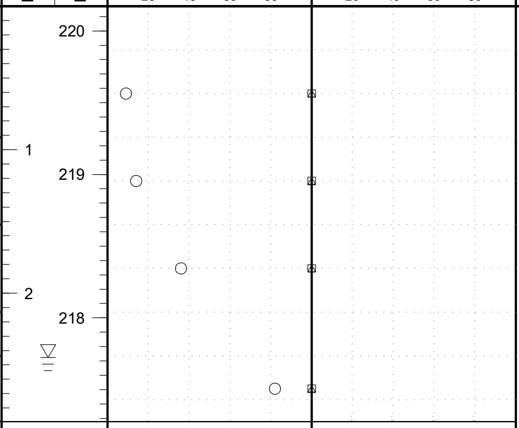
Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	67	9
SS	2	83	14
SS	3	100	36
SS	4	100	82

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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∇ Groundwater encountered on completion of drilling on 1/21/2020 at a depth of: 2.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A15

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., SBL, Sta. 1+050 E:604898 N:4853934**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Truck Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 22, 2020** Date Completed: **Jan 22, 2020**	Revision No.:	**0, 12/1/20**

LITHOLOGY PROFILE		SOIL SAMPLING					
DESCRIPTION Geodetic Ground Surface Elevation: 221.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	**DEPTH (m)**	**ELEVATION (m)**
about 190 mm ASPHALT	221.3						
About 110 mm CONCRETE	221.2 0.2						
dark grey **Silty Clay FILL** trace gravel, trace organics	0.3 220.6	SS	1	46	10		221
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel firm to stiff	0.9 220.0	SS	2	100	8	1	220
END OF BOREHOLE	1.5						

FIELD TESTING

Penetration Testing: ○ SPT ☐ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8

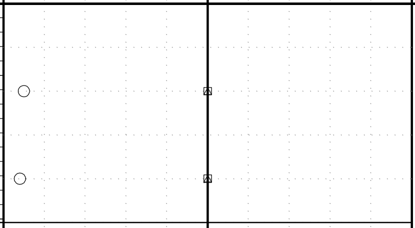
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

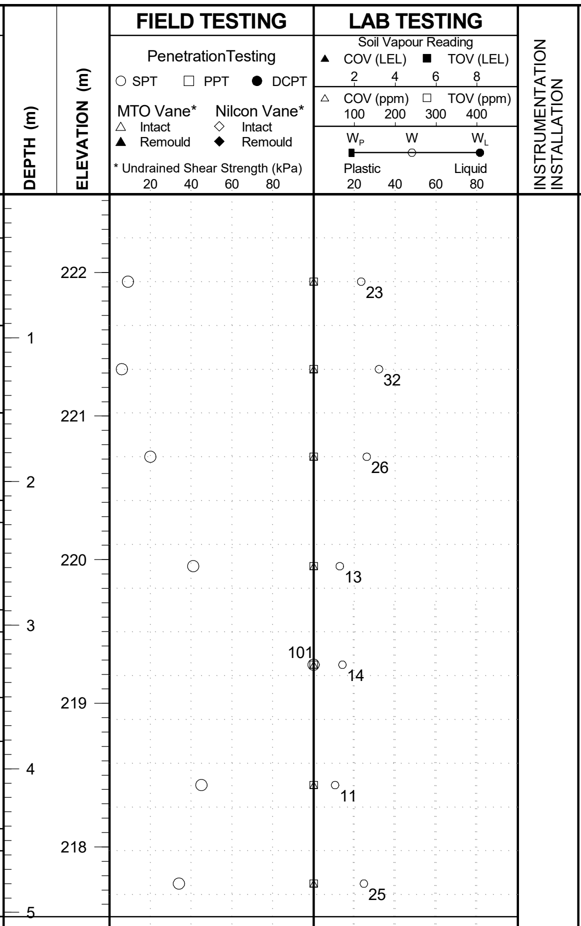
Page: 1 of 1

RECORD OF BOREHOLE No. BH A17

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., NBL, Sta. 1+200 E:604785 N:4854053**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Truck Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 22, 2020** Date Completed: **Jan 22, 2020**	Revision No.:	**0, 12/1/20**

LITHOLOGY PROFILE		SOIL SAMPLING			
DESCRIPTION Geodetic Ground Surface Elevation: 222.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 200 mm ASPHALT	222.3				
Sand and Gravel FILL moist	222.2 0.2 0.3				
grey/brown **Silty Clay FILL** trace sand and gravel		SS	1	83	9
	221.0 1.5	SS	2	83	6
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	3	100	20
cobbles /boulders		SS	4	100	41
		SS	5	100	101
---------- greyish brown		SS	6	100	45
	217.5 5.0	SS	7	100	34
END OF BOREHOLE					



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

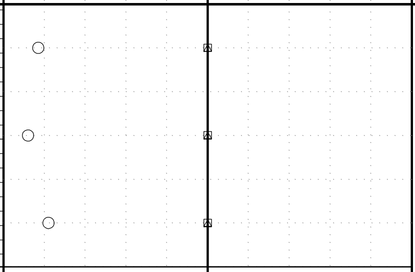
Page: 1 of 1

RECORD OF BOREHOLE No. BH A18

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., NBL, Sta. 1+200 E:604785 N:4854054**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Truck Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 22, 2020** Date Completed: **Jan 22, 2020**	Revision No.:	**0, 12/1/20**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 222.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Sand and Gravel FILL trace organics moist 222.5 0.4	SS	1	100	17						
	brown/dark brown **Silty Clay FILL** trace gravel, with oxidation 221.7 1.2	SS	2	83	12	1	222				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff 221.1 1.8	SS	3	100	22						
	END OF BOREHOLE										



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A19

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., SBL, Sta. 1+350 E:604701 N:4854134**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 222.6 m

DESCRIPTION	Elevation (m) Depth (m)
about 200 mm ASPHALT	
Sand and Gravel FILL moist	222.4 0.2
dark grey/brown **Silty Clay FILL** trace sand, trace organics	222.3 0.3
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel hard	221.1 1.5
END OF BOREHOLE	219.6 3.0

SOIL SAMPLING

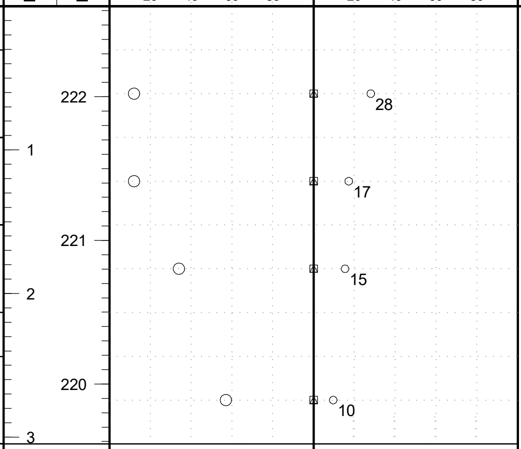
Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	12
SS	2	67	12
SS	3	100	34
SS	4	100	57

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W_P W W_L
Plastic Liquid
20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A20

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., SBL, Sta. 1+350 E:604693 N:4854133**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 222.4 m

Lithology Plot	DESCRIPTION	Elevation (m) / Depth (m)
▩	**Sand and Gravel FILL** moist	222.1 0.3
▩	dark grey/brown **Silty Clay FILL** trace gravel, trace organics, trace cobbles	221.3 1.1
▨	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel stiff	221.2 1.2
	END OF BOREHOLE	

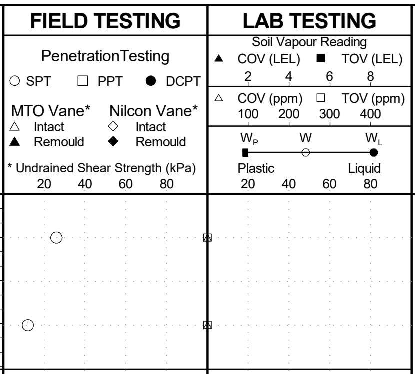
SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	26
SS	2	100	12

DEPTH (m): 1
ELEVATION (m): 222

FIELD TESTING

LAB TESTING



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A21

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., NBL, Sta. 1+500 E:604576 N:4854257**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 223.2 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
■	**about 200 mm ASPHALT** 223.0										
▨	**Sand and Gravel FILL** moist 222.9 0.2 0.3						223				
▨	dark grey **Silty Clay FILL** trace sand, trace organics	SS	1	50	10			○			
	221.9	SS	2	58	9	1	222	○			
▨	greyish brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel stiff 221.7 1.4 1.5										
	END OF BOREHOLE										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A23 / BH S1

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Coleraine Drive, Brampton, Ontario**
Drilling Location: **Coleraine Dr., SBL, Sta. 1+650 E:604481 N:4854343**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 20, 2020** Date Completed: **Jan 20, 2020**
Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 3/30/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 222.8 m

DESCRIPTION	Elevation (m) / Depth (m)
about 200 mm ASPHALT	222.6 0.2
brown **Sand and Gravel FILL** trace to some silt moist	222.5 0.3
dark grey/brown **Silty Clay / Clayey Silt FILL** trace gravel, trace organics	220.6 2.2
brown **SILTY CLAY TILL** trace to some sand, trace gravel, cobbles/boulders very stiff to hard -------- grey	213.4 9.4
END OF BOREHOLE	

SOIL SAMPLING / FIELD TESTING / LAB TESTING / COMMENTS & GRAIN SIZE DISTRIBUTION (%)

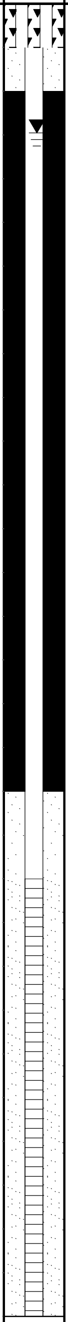
Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)	GR	SA	SI	CL
SS	1	100	7	24				
SS	2	100	5	23				
SS	3	100	8	31				
SS	4	100	30	16				
SS	5	83	53	16	1	18	48	33
SS	6	100	28	21				
SS	7	100	71	13				
SS	8	100	33	22				
SS	9	100	86 / 280mm	13				
SS	10	80	50 / 100mm	17				

DEPTH (m): 1, 2, 3, 4, 5, 6, 7, 8, 9
ELEVATION (m): 222, 221, 220, 219, 218, 217, 216, 215, 214

FIELD TESTING
PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

LAB TESTING
Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W_P W W_L
Plastic Liquid
20 40 60 80

INSTRUMENTATION INSTALLATION



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▽ Groundwater encountered on completion of drilling on 1/20/2020 at a depth of: 8.2 m. ▩ Cave in depth after removal of augers: 9.1 m.
▼ Groundwater depth observed on 5/12/2020 at a depth of: 0.9 m.

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Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH A23 / BH S1

wood.

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Coleraine Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 24 Apr 2020: 1.8 m 4 May 2020: 0.9 m 12 May 2020: 0.9 m													

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

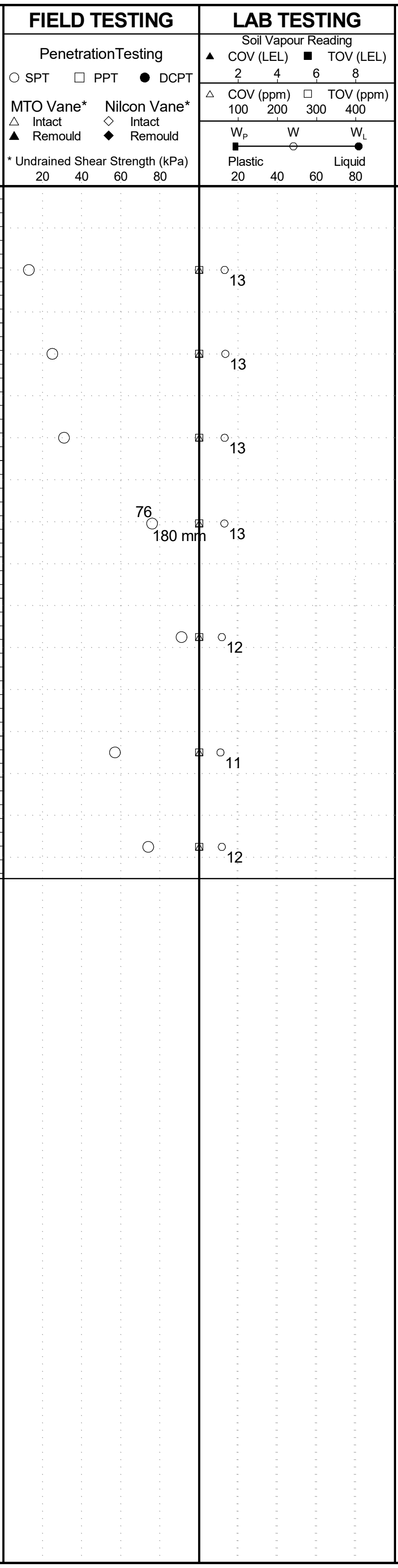
RECORD OF BOREHOLE No. BH A25

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., NBL, Sta. 1+800 E:604381 N:4854447**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Truck Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 22, 2020** Date Completed: **Jan 22, 2020**	Revision No.:	**0, 12/1/20**

Geodetic Ground Surface Elevation: 225.0 m

LITHOLOGY PROFILE DESCRIPTION	Elev. / Depth	SOIL SAMPLING Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 200 mm ASPHALT	224.8 0.2						
Sand and Gravel FILL moist	224.7 0.3						
grey/brown **Silty Clay FILL** trace gravel, trace cobbles	224.1 0.9	SS	1	100	13		
brown/grey **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders very stiff to hard		SS	2	100	25	1	224
		SS	3	75	31	2	223
		SS	4	100	76 / 180mm		
		SS	5	100	91	3	222
--------- grey		SS	6	92	57	4	221
	220.0	SS	7	100	74	5	220
END OF BOREHOLE	5.0						



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A26

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

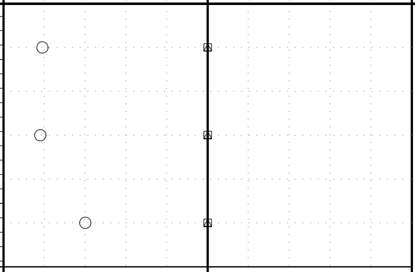
Drilling Location: **Coleraine Dr., NBL, Sta. 1+800 E:604384 N:4854450**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

Geodetic Ground Surface Elevation: 224.4 m

LITHOLOGY PROFILE: DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
Sand and Gravel FILL trace organics moist	224.0 0.4	SS	1	100	19
dark grey/brown **Silty Clay FILL** trace gravel, trace cobbles	223.2 1.2	SS	2	100	18
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel hard	222.6 1.8	SS	3	100	40
END OF BOREHOLE					

DEPTH (m): 1
ELEVATION (m): 224, 223



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

No freestanding groundwater measured in open borehole on completion of drilling.

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A27

wood.

Project Number:	**TP115086**	Drilling Location:	**Coleraine Dr., SBL, Sta. 1+950 E:604250 N:4854566**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Truck Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 22, 2020** Date Completed: **Jan 22, 2020**	Revision No.:	**0, 12/1/20**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | INSTRUMENTATION INSTALLATION | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

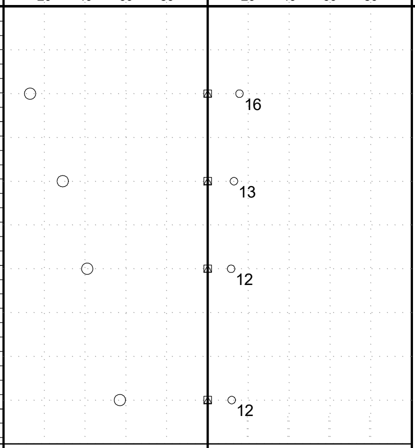
Geodetic Ground Surface Elevation: 226.8 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
■	**about 250 mm ASPHALT** 226.6						
▨	**Sand and Gravel FILL** moist 226.5 0.2 0.3						
▨	brown **Silty Clay FILL** trace gravel, trace cobbles	SS	1	100	13		226
		SS	2	100	29	1	
	225.3 1.5						
▨	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders hard	SS	3	100	41	2	225
		SS	4	100	57		224
	223.8 3.0					3	
	END OF BOREHOLE						

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A28

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., SBL, Sta. 1+950 E:604250 N:4854566**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 226.8 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
▨	**Sand and Gravel FILL** moist 226.2 0.6	SS	1	100	46						
▨	brown **Silty Clay FILL** trace gravel 225.6 1.2	SS	2	100	12	1	226				
	END OF BOREHOLE										

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A29

wood.

Project Number:	TP115086	Drilling Location:	Coleraine Dr., NBL, Sta. 2+100 E:604157 N:4854675	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	PR
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Truck Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Jan 22, 2020 Date Completed: Jan 22, 2020	Revision No.:	0, 12/1/20

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

Geodetic Ground Surface Elevation: 228.6 m

Lithology Plot	DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	INSTRUMENTATION INSTALLATION
■	**about 200 mm ASPHALT**	228.4 0.2							
▨	**Sand and Gravel FILL** moist	227.7 0.9	SS	1	100	44		228	
▨	brown **Silty Clay FILL** trace gravel, trace cobbles	227.1 1.5	SS	2	100	18	1		
	END OF BOREHOLE								

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A30

wood.

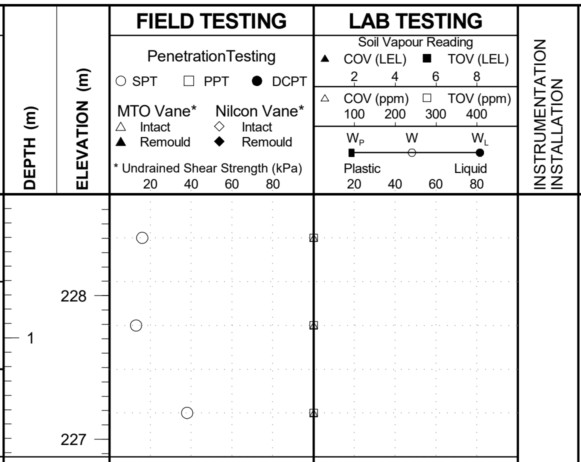
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., NBL, Sta. 2+100 E:604159 N:4854679**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

Geodetic Ground Surface Elevation: 228.7 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
Sand and Gravel FILL some topsoil moist	228.2 0.5	SS	1	100	16	30	57	(13)	
dark grey/brown **Silty Clay FILL** trace gravel, with oxidation	227.5 1.2	SS	2	100	13				
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders hard	226.9 1.8	SS	3	100	38				
END OF BOREHOLE									



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH A31

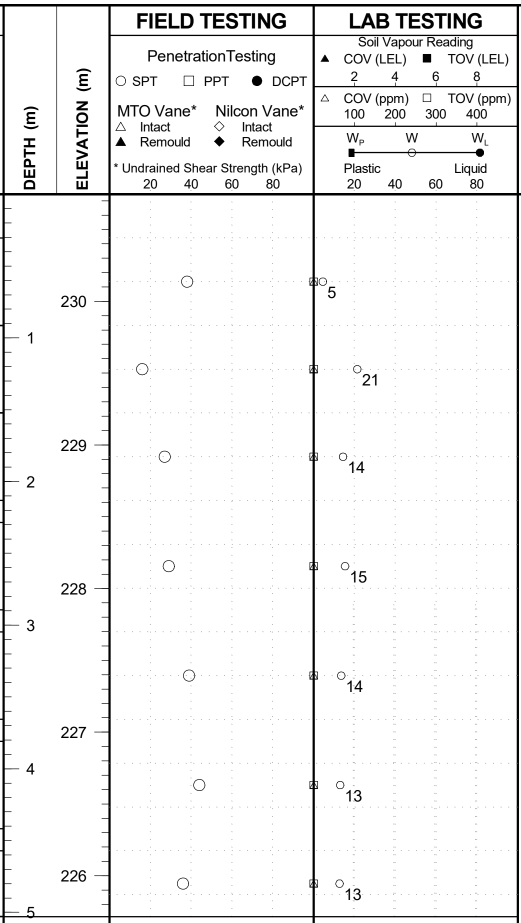
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., SBL, Sta. 2+250 E:604075 N:4854743**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 22, 2020** Date Completed: **Jan 22, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

Geodetic Ground Surface Elevation: 230.7 m

Lithology Plot	DESCRIPTION	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
■	**about 200 mm ASPHALT**	230.5				
▨	**Sand and Gravel FILL** moist	0.2	SS	1	100	38
▨	grey/brown **Silty Clay FILL** trace gravel	229.8 0.9	SS	2	100	16
	brown/brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders very stiff to hard	229.2 1.5	SS	3	100	27
			SS	4	100	29
			SS	5	100	39
			SS	6	92	44
			SS	7	100	36
	END OF BOREHOLE	225.7 5.0				



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S2

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Coleraine Dr., NBL, Sta. 1+650 E:604486 N:4854343**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 20, 2020** Date Completed: **Jan 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 12/1/20**

LITHOLOGY PROFILE

DESCRIPTION

Geodetic Ground Surface Elevation: 222.4 m

about 200 mm ASPHALT 222.3

222.1 0.2

brown
Sand and Gravel FILL
trace to some silt
moist
0.3

dark grey/brown
Silty Clay / Clayey Silt FILL
trace gravel, trace organics

----
brown

220.2 2.2

brown
SILTY CLAY / CLAYEY SILT TILL
trace sand, trace gravel, cobbles/boulders
very stiff to hard

----
grey

213.1 9.4

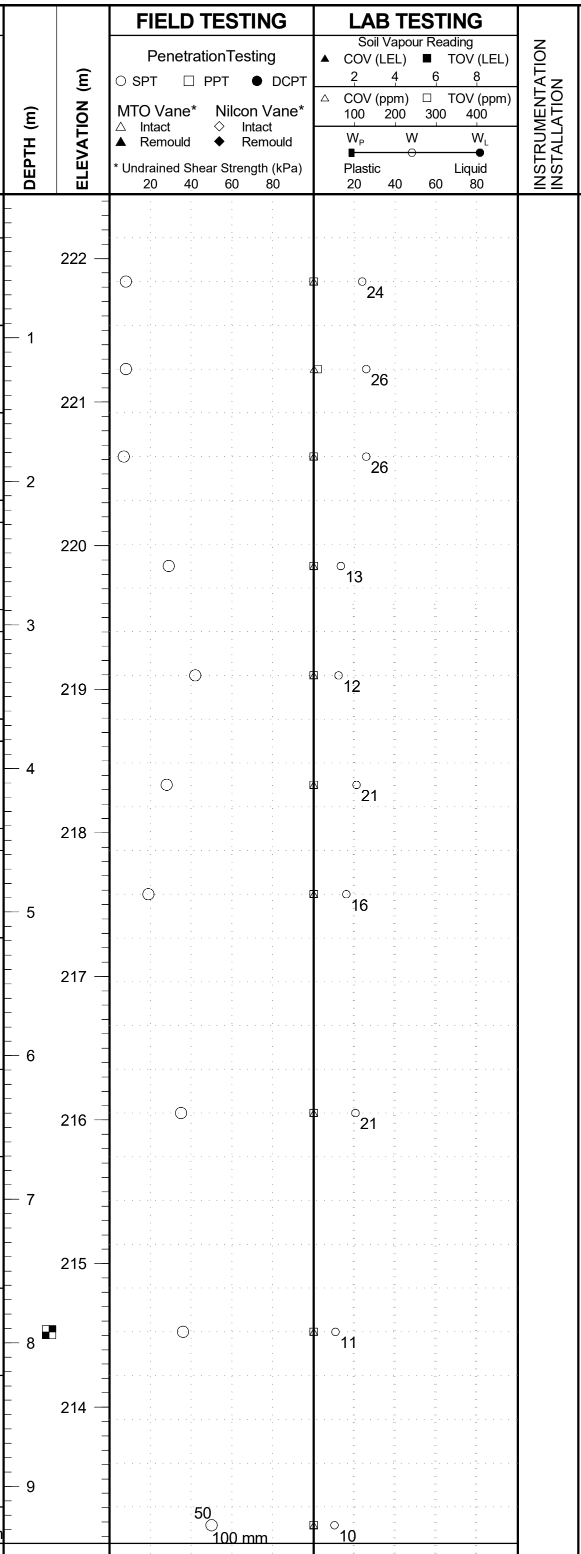
END OF BOREHOLE

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	8
SS	2	42	8
SS	3	75	7
SS	4	100	29
SS	5	46	42
SS	6	100	28
SS	7	100	19
SS	8	100	35
SS	9	100	36
SS	10	100	50 / 100mm

FIELD TESTING

LAB TESTING



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▞ Cave in depth after removal of augers: 7.9 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

SECTION B
ARTERIAL A2
(FROM MAYFIELD ROAD TO MAJOR MACKENZIE DRIVE / RR 50, ~3.4 KM)

RECORD OF BOREHOLES

RECORD OF BOREHOLE No. BH B1

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 0+000 E:606238 N:4852654**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 10, 2020** Date Completed: **Jan 10, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING						COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
DESCRIPTION Geodetic Ground Surface Elevation: 211.5 m	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	GR	SA	SI	CL
about 140 mm ASPHALT	211.4 0.1										
brown **Sand and Gravel FILL** moist	210.7 0.8	SS	1	100	27		211	32	56	(12)	
brown/dark grey **Silty Clay FILL** some sand, trace to some gravel, trace organics	210.0 1.5	SS	2	100	12	1	210				
END OF BOREHOLE											

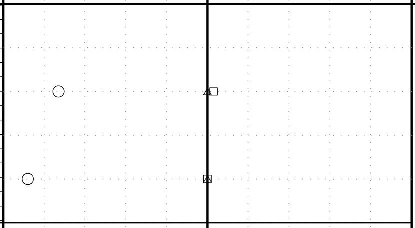
FIELD TESTING

Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B2

wood.

Project Number:	**TP115086**	Drilling Location:	**Arterial A2, Sta. 0+100 E:606151 N:4852615**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan. 23, 2020** Date Completed: **Jan. 23, 2020**	Revision No.:	**0, 5/2/22**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 210.2 m

DESCRIPTION	Elevation / Depth (m)
about 300 mm TOPSOIL	209.9 0.3
brown **Silty Clay FILL** (reworked soil)	209.5 0.7
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard ------- cobbles/boulders	207.2 3.0
brown **SILTY SAND TILL** some gravel very dense wet	206.5 3.7
brown/grey **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel hard to very stiff grey	205.2 5.0
END OF BOREHOLE	

SOIL SAMPLING

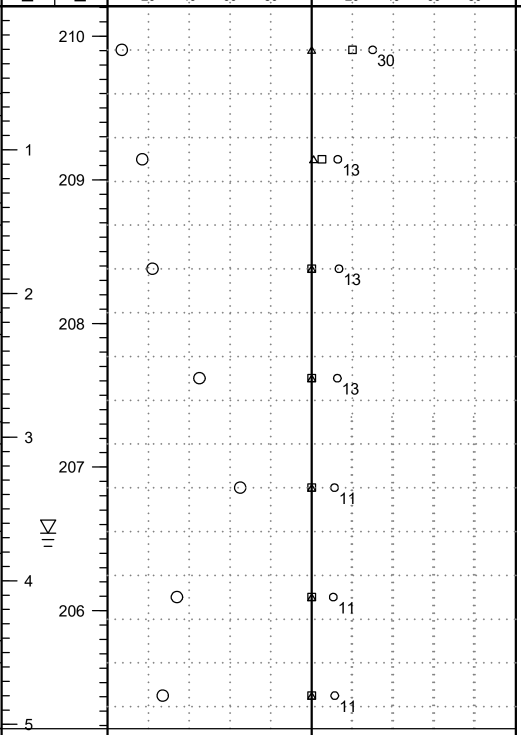
Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
SS	1	75	7				
SS	2	100	17				
SS	3	100	22				
SS	4	100	45				
SS	5	75	65	14	49	33	4
SS	6	83	34				
SS	7	100	27				

FIELD TESTING — PenetrationTesting: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING — Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)



∇ Groundwater encountered on completion of drilling on 1/23/2020 at a depth of: 3.7 m.

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B3

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

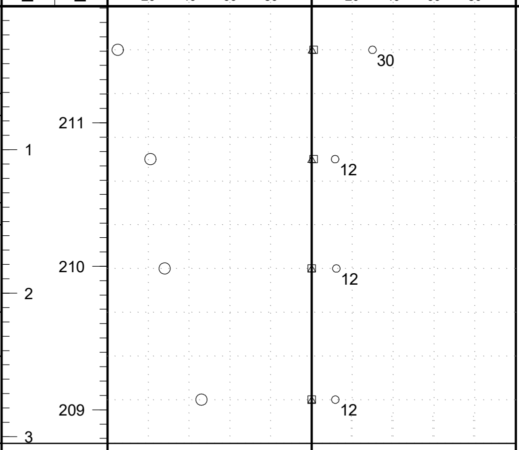
Drilling Location: **Arterial A2, Sta. 0+200 E:606056 N:4852586**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **INSTRUMENTATION INSTALLATION** | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Geodetic Ground Surface Elevation: 211.8 m

Lithology Plot	DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
	about 200 mm TOPSOIL	211.6 0.2					
	dark grey/brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	211.1 0.7	SS	1	58	5	30
	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders very stiff to hard		SS	2	100	21	12
			SS	3	100	28	12
	brownish grey	208.8 3.0	SS	4	100	46	12
	END OF BOREHOLE						



Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa): 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL): 2 4 6 8
△ COV (ppm) ☐ TOV (ppm): 100 200 300 400
W_P W W_L — Plastic Liquid: 20 40 60 80

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B4

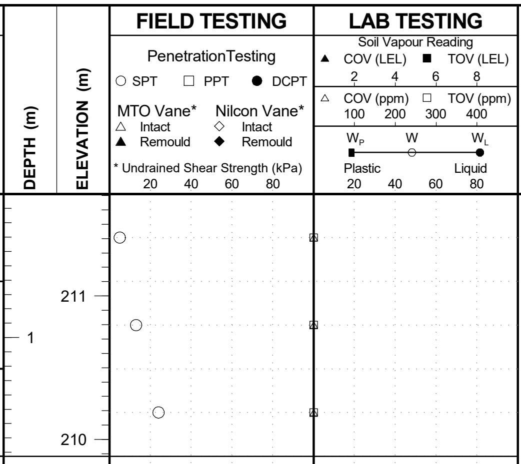
Project Number:	**TP115086**	Drilling Location:	**Arterial A2, Sta. 0+300 E:605958 N:4852563**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 23, 2020** Date Completed: **Jan 23, 2020**	Revision No.:	**0, 1/5/21**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 211.7 m

DESCRIPTION	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 200 mm TOPSOIL	211.5 0.2				
dark brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	211.1 0.6	SS	1	83	5
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel stiff to very stiff		SS	2	100	13
	209.9	SS	3	100	24
END OF BOREHOLE	1.8				

FIELD TESTING / LAB TESTING



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B5

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 0+400 E:605861 N:4852545**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 211.3 m

Elevation (m)	Depth (m)	DESCRIPTION
		about 300 mm TOPSOIL
211.0	0.3	dark grey/brown **Silty Clay FILL** trace gravel (reworked soil)
210.6	0.7	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders stiff to hard -------- grey
206.2	5.0	**END OF BOREHOLE**

SOIL SAMPLING / FIELD TESTING / LAB TESTING

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water Content W (%)
SS	1	83	6	17
SS	2	100	10	14
SS	3	100	18	13
SS	4	100	35	13
SS	5	100	28	11
SS	6	100	20	11
SS	7	100	17	14

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B6

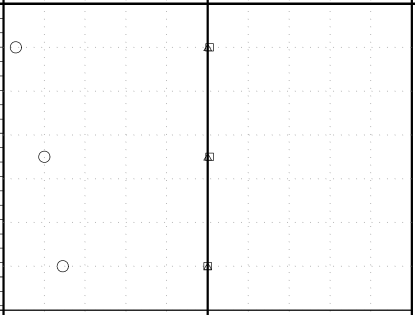
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 0+500 E:605759 N:4852529**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 7, 2020** Date Completed: **Feb 7, 2020**

Logged by: **MM**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 210.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 150 mm TOPSOIL 210.8										
	brown **Silty Clay / Clayey Silt FILL** trace sand, trace rootlets (reworked soil) 0.2 / 210.2	SS	1	83	6						
	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace gravel very stiff 0.7	SS	2	100	20	1	210				
	208.8	SS	3	100	29	2	209				
	END OF BOREHOLE 2.1										



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B7 / BH S5

wood.

Project Number:	**TP115086**	Drilling Location:	**Arterial A2, Sta. 0+600 E:605633 N:4852520**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Feb 26, 2020** Date Completed: **Feb 26, 2020**	Revision No.:	**0, 3/30/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 209.3 m

DESCRIPTION	Elevation (m) / Depth (m)
about 150 mm TOPSOIL	209.2 0.2
dark brown **Silty Clay / Clayey Silt FILL** trace to some gravel, trace organics	208.7 0.7
brown to grey **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace to some gravel firm to hard -------- grey	205.6 3.7
grey **SAND AND SILT TILL** trace clay, trace gravel firm to hard	204.8 4.5
grey **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace to some gravel, cobbles/boulders hard	199.6 9.8
END OF BOREHOLE	

SOIL SAMPLING / FIELD TESTING / LAB TESTING

Penetration Testing: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W_P W W_L Plastic Liquid 20 40 60 80

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W	GR	SA	SI	CL
SS	1	100	6	40				
SS	2	100	8	25				
SS	3	100	27	12				
SS	4	100	50	13				
SS	5	100	69	11				
SS	6	83	58	12	4	43	50	3
SS	7	100	64 / 150mm	10				
SS	8	100	62 / 150mm	13				
SS	9	100	66	24				
SS	10	100	39	23				

DEPTH (m): 1 2 3 4 5 6 7 8 9

ELEVATION (m): 209 208 207 206 205 204 203 202 201 200

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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▽ Groundwater encountered on completion of drilling on 2/26/2020 at a depth of: 5.8 m. ▞ Cave in depth after removal of augers: 9.1 m.

▼ Groundwater depth observed on 5/4/2020 at a depth of: - 0.7 m.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH B7 / BH S5

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)			Penetration Testing ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80		GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 9.1 m Screen: 6.1 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 4 May 2020: -0.7 m (above ground) 12 May 2020: -0.5 m (above ground)										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B8

wood.

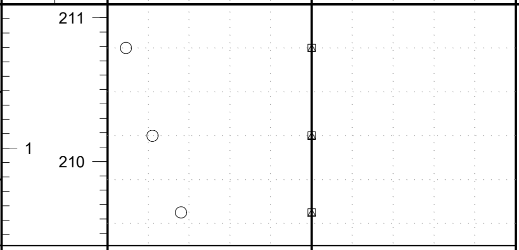
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 0+700 E:605564 N:4852529**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

Geodetic Ground Surface Elevation: 211.1 m

LITHOLOGY PROFILE DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm TOPSOIL	211.0 0.1				
dark brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	210.5 0.6	SS	1	100	9
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	2	100	22
	209.4 1.7	SS	3	44	36
END OF BOREHOLE					



FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B9

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 0+800 E:605461 N:4852548**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 212.5 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	FIELD TESTING (SPT)	LAB TESTING (W)	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
about 100 mm TOPSOIL	212.3 0.1								
dark brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	211.8 0.7	SS	1	100	15	○	36		
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand and sandy, trace gravel, cobbles/boulders stiff to hard		SS	2	100	13	○	19		
		SS	3	100	34	○	18		
-------- grey		SS	4	100	68	○	11		
		SS	5	100	48	○	11		
		SS	6	100	72	○	11		
		SS	7	100	49	○	13		
END OF BOREHOLE	207.4 5.0								

DEPTH (m): 1, 2, 3, 4, 5
ELEVATION (m): 212, 211, 210, 209, 208

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∇ Groundwater encountered on completion of drilling on 2/20/2020 at a depth of: 4.3 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B10

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 0+900 E:605365 N:4852580**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 212.7 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 150 mm TOPSOIL 212.6 / 0.2										
	dark brown **Silty Clay FILL** trace gravel, trace organics (reworked soil) 212.1 / 0.6	SS	1	79	8			○			
	brown/brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard	SS	2	100	18	1	212	○			
	211.0 / 1.7	SS	3	100	54			○			
	END OF BOREHOLE 1.7										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Page: 1 of 1

RECORD OF BOREHOLE No. BH B11

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 1+000 E:605279 N:4852627**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 212.3 m

LITHOLOGY PROFILE – DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	LAB TESTING (W)	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
about 100 mm TOPSOIL	212.2 0.1												
dark brown/brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	211.6 0.7	SS	1	100	16		212	25					
brown **SILTY CLAY TILL** trace sand to sandy, trace gravel very stiff to hard		SS	2	100	25	1	211	13					
		SS	3	100	43	2		13		2	24	49	25
brownish grey	209.3 3.0	SS	4	100	56	3	210	13					
END OF BOREHOLE													

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B12

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 1+100 E:605192 N:4852676**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | INSTRUMENTATION INSTALLATION | COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Geodetic Ground Surface Elevation: 214.3 m

Lithology Plot	DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
	about 150 mm TOPSOIL	214.1 0.2				
	dark brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	213.6 0.6	SS	1	83	17
	greyish brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	2	100	24
		212.6 1.7	SS	3	100	69
	END OF BOREHOLE					

DEPTH (m): 1
ELEVATION (m): 214, 213

Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa): 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL): 2 4 6 8
△ COV (ppm) ☐ TOV (ppm): 100 200 300 400
W_P W W_L Plastic Liquid: 20 40 60 80

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B13

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

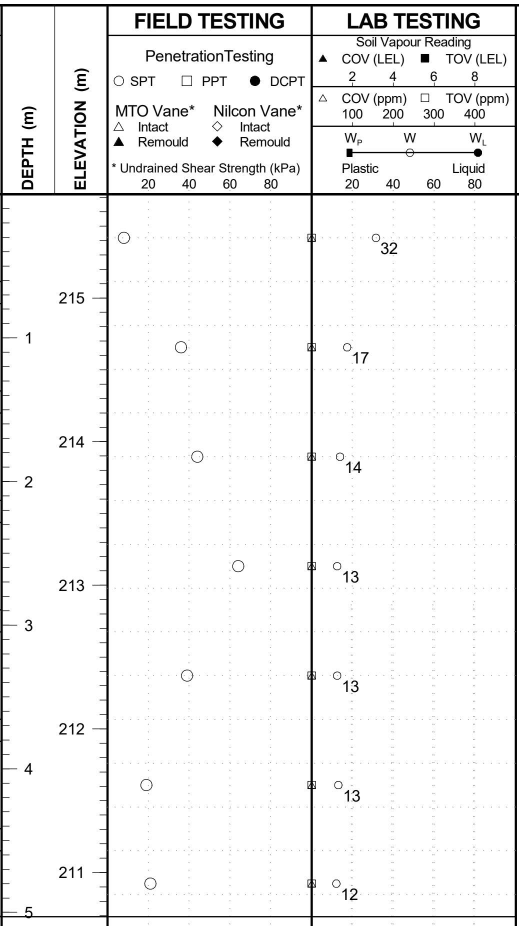
Drilling Location: **Arterial A2, Sta. 1+200 E:605111 N:4852740**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 20, 2020** Date Completed: **Feb 20, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 215.7 m

DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm TOPSOIL	215.6 0.1				
dark brown/brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	215.0 0.7	SS	1	75	8
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel, cobbles/boulders hard to very stiff		SS	2	54	36
		SS	3	100	44
		SS	4	100	64
		SS	5	100	39
---------- grey		SS	6	100	19
	210.7 5.0	SS	7	100	21
END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B14

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 1+300 E:605038 N:4852807**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
DESCRIPTION Geodetic Ground Surface Elevation: 217.1 m	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
about 200 mm TOPSOIL	216.9 0.2										
drak brown / brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	216.5 0.6	SS	1	100	7						
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	2	100	25	1	216				
	215.2	SS	3	100	56						
END OF BOREHOLE	1.8										

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$\underline{\nabla}$ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B15

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

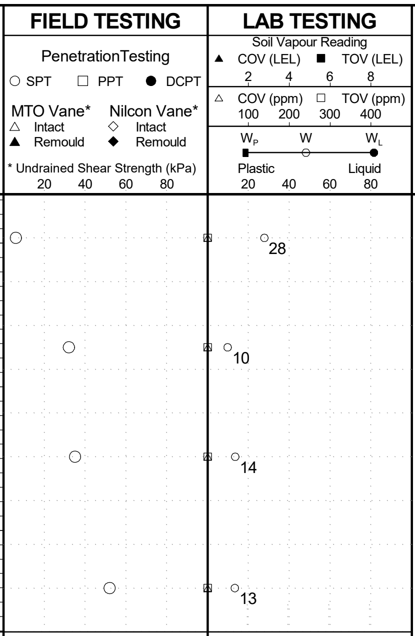
Drilling Location: **Arterial A2, Sta. 1+400 E:604966 N:4852877**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

Geodetic Ground Surface Elevation: 217.3 m

LITHOLOGY PROFILE DESCRIPTION		SOIL SAMPLING Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 150 mm TOPSOIL	217.2				
dark brown / brown **Silty Clay FILL** trace gravel (reworked soil)	0.2	SS	1	100	6
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel hard	216.8 0.6	SS	2	100	32
		SS	3	100	35
	214.3	SS	4	100	52
END OF BOREHOLE	3.0				

DEPTH (m): 1, 2, 3
ELEVATION (m): 217, 216, 215



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B16

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 1+500 E:604893 N:4852946**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
DESCRIPTION Geodetic Ground Surface Elevation: 217.9 m	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
about 150 mm TOPSOIL	217.8 0.2										
drak brown / brown **Silty Clay FILL** trace gravel (reworked soil)	217.4 0.6	SS	1	100	8						
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	2	100	21	1	217				
	216.1	SS	3	100	56						
END OF BOREHOLE	1.8										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

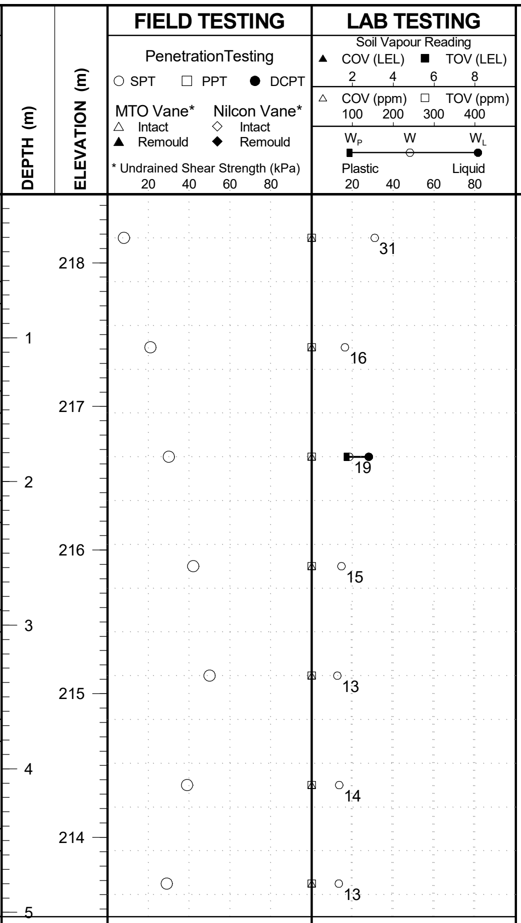
Scale: 1 : 53

RECORD OF BOREHOLE No. BH B17

Project Number:	**TP115086**	Drilling Location:	**Arterial A2, Sta. 1+600 E:604822 N:4853017**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 24, 2020** Date Completed: **Jan 24, 2020**	Revision No.:	**0, 1/5/21**

Geodetic Ground Surface Elevation: 218.5 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water content W (%)	GR	SA	SI	CL
about 150 mm TOPSOIL	218.3 0.2									
dark brown / brown **Silty Clay FILL** (reworked soil)	217.9 0.6	SS	1	100	8	31				
brown **SILTY CLAY TILL** trace sand to sandy, trace gravel, cobbles/boulders very stiff to hard		SS	2	100	21	16				
		SS	3	100	30	19	5	21	47	27
		SS	4	100	42	15				
		SS	5	100	50	13				
------------ grey		SS	6	100	39	14				
	213.4 5.0	SS	7	100	29	13				
END OF BOREHOLE										



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B18

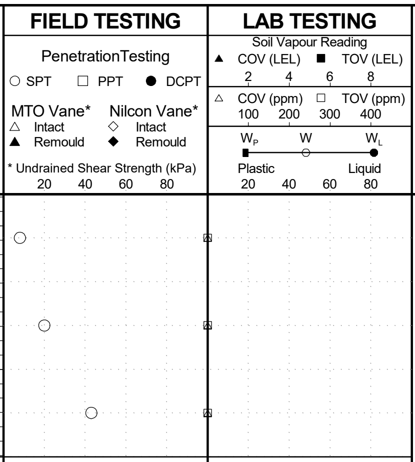
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 1+700 E:604752 N:4853086**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING						
DESCRIPTION **Geodetic Ground Surface Elevation: 219.2 m**	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
about 150 mm TOPSOIL	219.1							
drak brown / brown **Silty Clay FILL** trace gravel (reworked soil)	0.2 218.6	SS	1	100	8		219	
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, tarce gravel, cobbles/boulders very stiff to hard	0.6	SS	2	100	20	1		
	217.4	SS	3	100	43		218	
END OF BOREHOLE	1.8							



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B19

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 1+800 E:604680 N:4853157**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE		SOIL SAMPLING				LAB TESTING
DESCRIPTION Geodetic Ground Surface Elevation: 219.5 m	Elevation Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W
about 200 mm TOPSOIL	219.3 0.2					
dark brown/brown **Silty Clay FILL** trace gravel (reworked soil)	218.9 0.6	SS	1	100	7	17
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	2	100	29	15
		SS	3	83	37	16
greyish brown	216.5 3.0	SS	4	100	40	14
END OF BOREHOLE						

FIELD TESTING

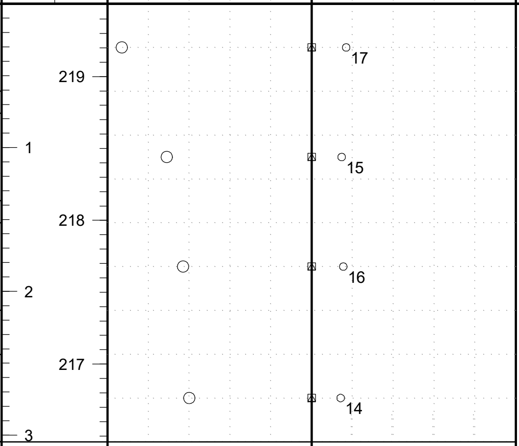
PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W_P W W_L
Plastic Liquid
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B20

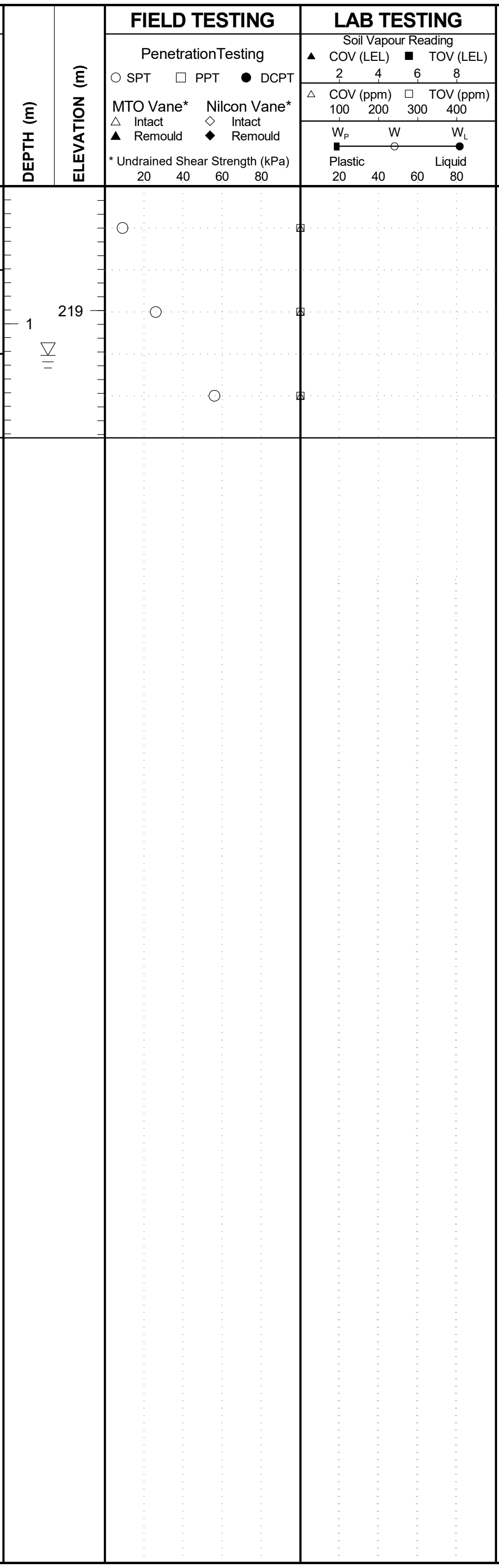
wood.

Project Number:	**TP115086**	Drilling Location:	**Arterial A2, Sta. 1+900 E:604609 N:4853227**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan 24, 2020**
		Date Completed:	**Jan 24, 2020**
Logged by:	**MS**	Compiled by:	**PR**
Reviewed by:	**SM/DP**	Revision No.:	**0, 1/5/21**

LITHOLOGY PROFILE — **SOIL SAMPLING** — **FIELD TESTING** — **LAB TESTING** — INSTRUMENTATION INSTALLATION — **COMMENTS & GRAIN SIZE DISTRIBUTION (%)** GR SA SI CL

Geodetic Ground Surface Elevation: 219.9 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm TOPSOIL	219.8 0.1				
drak grey / brown **Silty Clay FILL** trace gravel (reworked soil)	219.3 0.6	SS	1	75	9
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel very stiff to hard		SS	2	100	26
	218.1	SS	3	100	56
END OF BOREHOLE	1.8				



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▽ Groundwater encountered on completion of drilling on 1/24/2020 at a depth of: 1.2 m.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH B21

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 2+000 E:604537 N:4853296**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 24, 2020** Date Completed: **Jan 24, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE

DESCRIPTION Geodetic Ground Surface Elevation: 220.8 m	
about 200 mm TOPSOIL	220.6 0.2
dark grey / dark brown / brown **Silty Clay FILL** trace gravel, trace organics (reworked soil)	218.6 2.2
brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel stiff to hard ---------- grey	215.8 5.0
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	LAB TESTING W
SS	1	100	12	14
SS	2	100	9	22
SS	3	100	9	39
SS	4	100	13	17
SS	5	100	27	16
SS	6	100	22	17
SS	7	22	30	20

DEPTH (m): 1, 2, 3, 4, 5
ELEVATION (m): 220, 219, 218, 217, 216

FIELD TESTING

Penetration Testing
○ SPT □ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) □ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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∇ Groundwater encountered on completion of drilling on 1/24/2020 at a depth of: 2.7 m. ▞ Cave in depth after removal of augers: 4.3 m.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH B22

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Arterial A2, Sta. 2+100 (Countryside Dr.) E:604484 N:4853360**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **PR**
Reviewed by: **SM/DP**
Revision No.: **0, 1/5/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Field testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 220.5 m

Lithology Plot	DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
■	**about 200 mm ASPHALT**	220.3 0.2									
▨	**Sand and Gravel FILL** moist	219.9 0.6						33	58	(9)	
▨	brown/dark grey **Silty Clay FILL** trace gravel		SS	1	75	9					
		219.0 1.5	SS	2	100	18					
	END OF BOREHOLE										

DEPTH (m): 1
ELEVATION (m): 220, 219

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No freestanding groundwater measured in open borehole on completion of drilling.

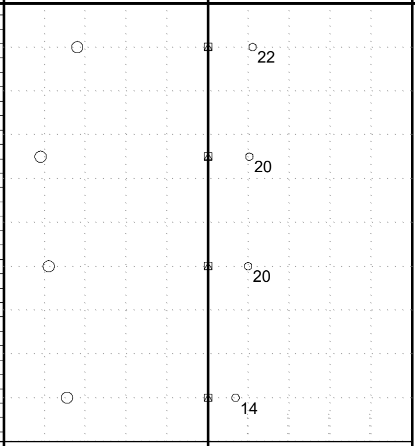
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B23

Project Number:	TP115086	Drilling Location:	Arterial A2, Sta. 2+200 E:604392 N:4853436	Logged by:	AS
Project Client:	City of Brampton	Drilling Method:	Solid Stem Augers	Compiled by:	KC/ZF
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	MST Bomb	Reviewed by:	SM/DP
Project Location:	Proposed East-West Arterial Road, Brampton	Date Started:	Jan 26, 2022 Date Completed: Jan 26, 2022	Revision No.:	0, 3/10/22

LITHOLOGY PROFILE DESCRIPTION Geodetic Ground Surface Elevation: 221.1 m	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water content W (%)
brown **Silty Clay FILL** some sand, trace gravel, trace organics, oxidation		SS	1	100	36	22
		SS	2	38	18	20
		SS	3	100	22	20
brown **SILTY CLAY TILL** trace to some sand, trace to some gravel, oxidation hard	218.8 2.3	SS	4	100	31	14
END OF BOREHOLE	218.0 3.0					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

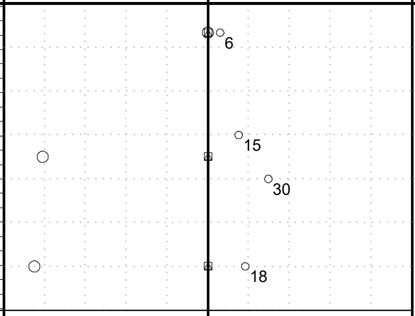
Scale: 1 : 53

Page: 1 of 1

RECORD OF BOREHOLE No. BH B24

Project Number:	TP115086	Drilling Location:	Arterial A2, Sta. 2+300 E:604321 N:4853507	Logged by:	AS
Project Client:	City of Brampton	Drilling Method:	Solid Stem Augers	Compiled by:	KC/ZF
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	MST Bomb	Reviewed by:	SM/DP
Project Location:	Proposed East-West Arterial Road, Brampton	Date Started:	Jan 26, 2022 Date Completed: Jan 26, 2022	Revision No.:	0, 3/10/22

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 221.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT □ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) □ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80		GR SA SI CL
▨	dark brown **Gravelly Sand FILL** trace clay, organics moist	SS	1	100	100						
▨	221.3 0.6 brown **Silty Clay FILL** some sand, trace gravel, trace organics, oxidation	SS	2	54	19	1	221				
▨	trace cobbles 219.8 2.1	SS	3	83	15	2	220				
	END OF BOREHOLE 2.1										



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH B25

Project Number:	TP115086	Drilling Location:	Arterial A2, Sta. 2+400 E:604250 N:4853574	Logged by:	AS
Project Client:	City of Brampton	Drilling Method:	Solid Stem Augers	Compiled by:	KC/ZF
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	MST Bomb	Reviewed by:	SM/DP
Project Location:	Proposed East-West Arterial Road, Brampton	Date Started:	Jan 26, 2022 Date Completed: Jan 26, 2022	Revision No.:	0, 3/10/22

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **INSTRUMENTATION INSTALLATION** | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Field Testing: PenetrationTesting ○ SPT □ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 222.5 m

DESCRIPTION	Elevation / Depth (m)
black to light brown **Silty Clay FILL** some sand, trace gravel, trace organics, oxidation	221.8 0.7
brown **SILTY CLAY / CLAYEY SILT TILL** some sand, trace to some gravel, trace cobbles, trace organics, oxidation very stiff to hard -------- grey	217.3 5.2
END OF BOREHOLE	

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water Content (%)	GR	SA	SI	CL
SS	1	92	15	22				
SS	2	100	16					
SS	3	100	26	17				
SS	4	100	38	16				
SS	5	100	36	16				
SS	6	100	19	19 35 20	1	10	49	40
SS	7	75	16	18				

DEPTH (m): 1 2 3 4 5

ELEVATION (m): 222 221 220 219 218

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. **BH B26**

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Proposed East-West Arterial Road, Brampton**
Drilling Location: **Arterial A2, Sta. 2+500 E:604179 N:4853643**
Drilling Method: **Solid Stem Augers**
Drilling Machine: **MST Bomb**
Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022**
Logged by: **AS**
Compiled by: **KC/ZF**
Reviewed by: **SM/DP**
Revision No.: **0, 3/10/22**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 222.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
▩	brown **Silty Clay FILL** some sand, trace gravel, trace organics, oxidation	SS	1	100	17			○	15		
▩		SS	2	100	13	1	222	○	30		
	221.5 1.4										
▨	brown **SILTY CLAY / CLAYEY SILT TILL** some sand, trace gravel, oxidation very stiff	SS	3	100	28	2	221	○	15		
	220.8 2.1										
	END OF BOREHOLE										

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH B27

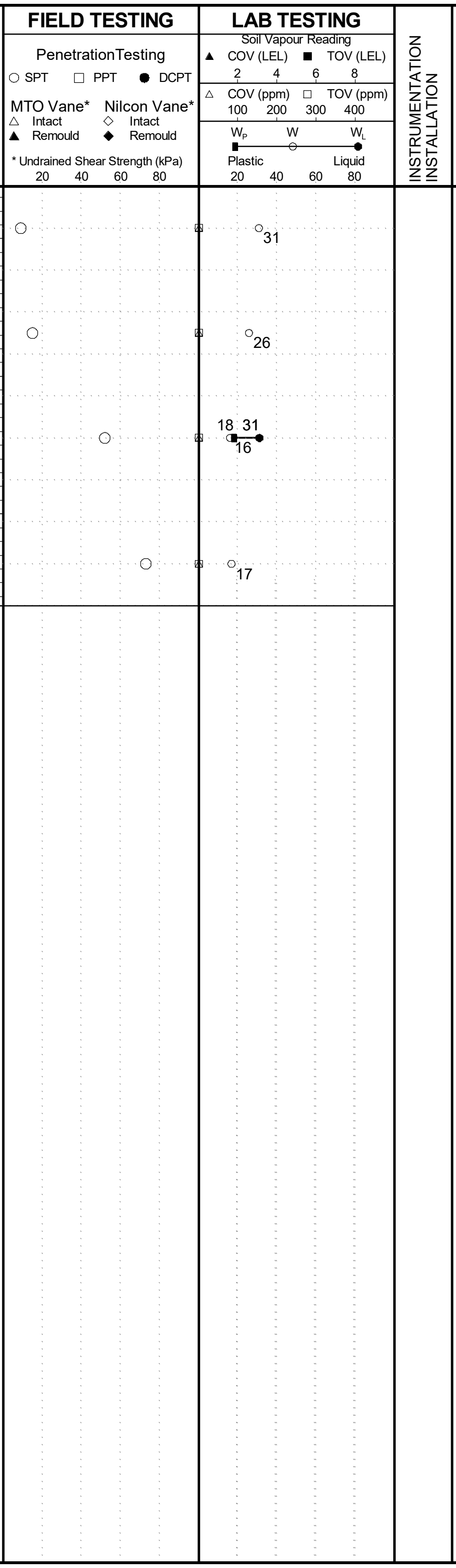
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Proposed East-West Arterial Road, Brampton**

Drilling Location: **Arterial A2, Sta. 2+600 E:604107 N:4853714**
Drilling Method: **Solid Stem Augers**
Drilling Machine: **MST Bomb**
Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022**

Logged by: **AS**
Compiled by: **KC/ZF**
Reviewed by: **SM/DP**
Revision No.: **0, 3/10/22**

LITHOLOGY PROFILE		SOIL SAMPLING						COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
DESCRIPTION Geodetic Ground Surface Elevation: 223.4 m	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	GR	SA	SI	CL
brown **Silty Clay FILL** some sand, trace gravel, trace organics, oxidation		SS	1	71	9		223				
		SS	2	100	15	1	222				
brown **SILTY CLAY / CLAYEY SILT TILL** some sand, trace gravel, oxidation hard	221.9 1.4	SS	3	100	52	2		1	18	53	28
		SS	4	100	73		221				
END OF BOREHOLE	220.3 3.0					3					



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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH B28

wood.

Project Number: **TP115086**
Drilling Location: **Arterial A2, Sta. 2+700 E:604034 N:4853786**
Logged by: **AS**
Project Client: **City of Brampton**
Drilling Method: **Solid Stem Augers**
Compiled by: **KC/ZF**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Drilling Machine: **MST Bomb**
Reviewed by: **SM/DP**
Project Location: **Proposed East-West Arterial Road, Brampton**
Date Started: **Jan 26, 2022** Date Completed: **Jan 26, 2022**
Revision No.: **0, 3/10/22**

FIELD TESTING – Penetration Testing: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING – Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%) – GR SA SI CL

Geodetic Ground Surface Elevation: 223.4 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	dark brown and black **Silty Clay FILL** some sand, trace gravel	SS	1	83	22		223	○	28		
	222.7 0.7										
	brown **SILTY CLAY / CLAYEY SILT TILL** some sand, trace gravel, trace organics, oxidation very stiff	SS	2	100	23	1		○	15		
							222				
		SS	3	100	27			○	16		
	221.2 2.1					2					
	END OF BOREHOLE										

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

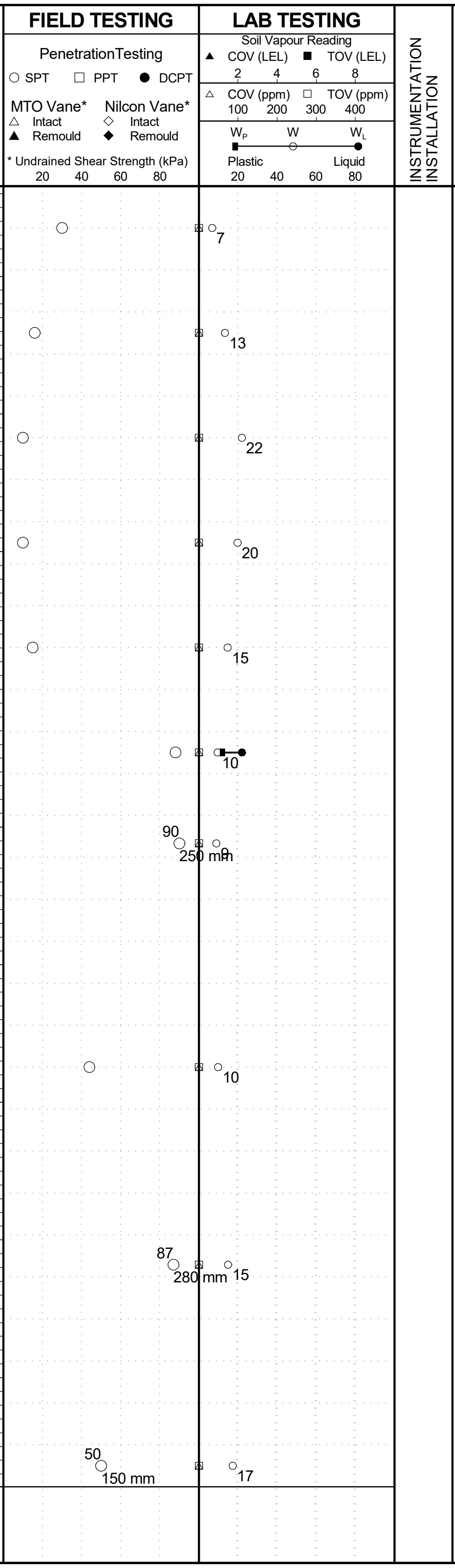
RECORD OF BOREHOLE No. BH S3

wood.

Project Number:	TP115086	Drilling Location:	Arterial A2 at Hwy 50 E:606278 N:4852633	Logged by:	MS / RM
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	PR
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Jan 10, 0202 Date Completed: Jan 10, 0202	Revision No.:	0, 3/31/21

Geodetic Ground Surface Elevation: 210.7 m

LITHOLOGY PROFILE		SOIL SAMPLING						COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Elevation / Depth (m)	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	GR	SA	SI	CL
	dark grey / brown **Sand and Gravel FILL** moist	SS	1	100	30						
210.0 0.7	dark grey / grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel, trace organics	SS	2	75	16	1	210				
		SS	3	83	10	2	209				
		SS	4	100	10		208				
207.7 3.0	brown **SILTY CLAY TILL** some sand to sandy, trace gravel, cobbles/boulders stiff to hard	SS	5	100	15	3	207				
		SS	6	100	88	4		3	33	46	18
		SS	7	100	90 / 250mm	5	206				
	-------- grey					6	205				
		SS	8	100	44		204				
203.5 7.2	grey **SANDY SILT TILL** trace clay, trace gravel, cobbles/boulders very dense moist to wet					7 ▽					
		SS	9	100	87 / 280mm	8	203	1 Non-plastic	35	56	8
	-------- wet					9	202				
201.2 9.4		SS	10	100	50 / 150mm						
	END OF BOREHOLE										



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▽ Groundwater encountered on completion of drilling on 1/10/202 at a depth of: 7.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S4

wood.

Project Number:	TP115086	Drilling Location:	Arterial A2 at Hwy 50 E:606254 N:4852631	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	PR
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Jan 10, 0202 Date Completed: Jan 10, 0202	Revision No.:	0, 3/31/21

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | INSTRUMENTATION INSTALLATION | COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Penetration Testing: ○ SPT ☐ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W_P W W_L Plastic Liquid 20 40 60 80

GR SA SI CL

Geodetic Ground Surface Elevation: 210.6 m

Elevation (m) / Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
	brown **Sand and Gravel FILL** moist	SS	1	42	45	7
209.7 0.9	dark brown / black **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel, trace organics	SS	2	83	11	22
		SS	3	75	9	29
		SS	4	100	9	25
		SS	5	67	11	29
206.8 3.7	brown **SILTY CLAY TILL** some sand to sandy, trace gravel, cobbles/boulders stiff to hard	SS	6	100	59	11
		SS	7	100	101	9
	-------- grey					
		SS	8	100	46	10
		SS	9	100	45	14
201.9 8.7	grey **SANDY SILT / SILTY SAND TILL** trace clay, trace gravel, cobbles/boulders very dense wet	SS	10	100	55	16
200.8 9.8						

Depth (m): 1 2 3 4 5 6 7 8 9

Elevation (m): 210 209 208 207 206 205 204 203 202 201

101

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∇ Groundwater encountered on completion of drilling on 1/10/202 at a depth of: 7.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH S4

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	END OF BOREHOLE 50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 5.8 m Sand Filter: 5.5 - 9.1 m Screen: 6.1 - 9.1 m										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S6

wood.

Project Number:	TP115086	Drilling Location:	Arterial A2, Sta. 0+600 E:605620 N:4852529	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	PR
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Feb 26, 2020 Date Completed: Feb 26, 2020	Revision No.:	0, 1/5/21

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 209.0 m

DESCRIPTION	Elevation (m) / Depth (m)
about 100 mm TOPSOIL	208.9 0.1
dark brown **Silty Clay / Clayey Silt FILL** some sand, trace to some gravel, trace organics	208.3 0.7
brown to grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders firm to hard -------- grey	199.3 9.8
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	4
SS	2	100	5
SS	3	100	10
SS	4	100	35
SS	5	100	57
SS	6	100	62
SS	7	100	108
SS	8	100	69 / 150mm
SS	9	100	83
SS	10	100	43

DEPTH (m)	ELEVATION (m)
1	208
2	207
3	206
4	205
5	204
6	203
7	202
8	201
9	200

FIELD TESTING

PenetrationTesting

○ SPT ☐ PPT ● DCPT

MTO Vane* △ Intact ▲ Remould

Nilcon Vane* ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading

▲ COV (LEL) ■ TOV (LEL) 2 4 6 8

△ COV (ppm) ☐ TOV (ppm) 100 200 300 400

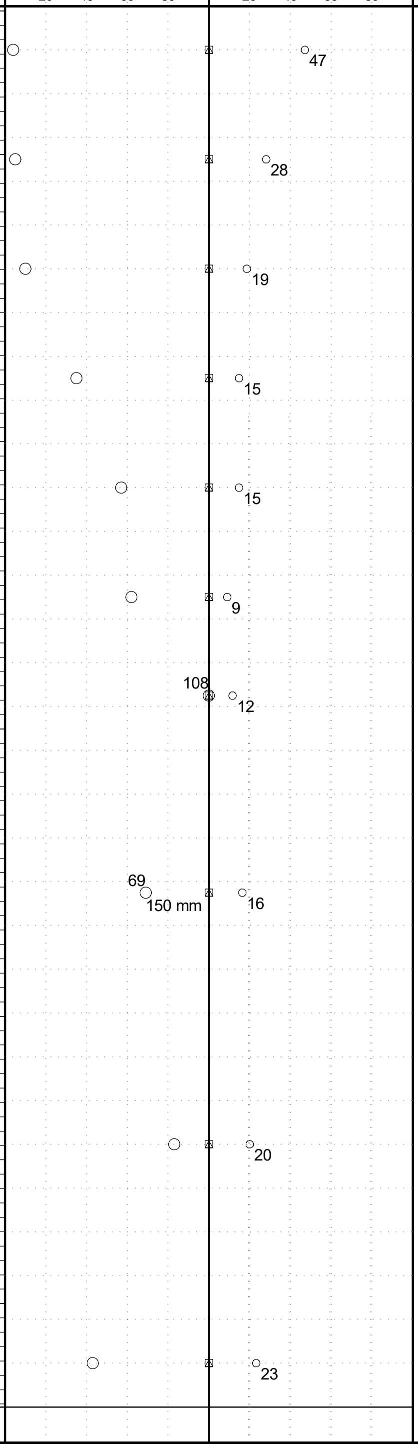
W_P W W_L

Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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▽ Groundwater encountered on completion of drilling on 2/26/2020 at a depth of: 5.5 m. ▚ Cave in depth after removal of augers: 6.1 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

SECTION C
COUNTRYSIDE DRIVE
(FROM CLARKWAY DRIVE TO RR 50, ~3 KM)

RECORD OF BOREHOLES

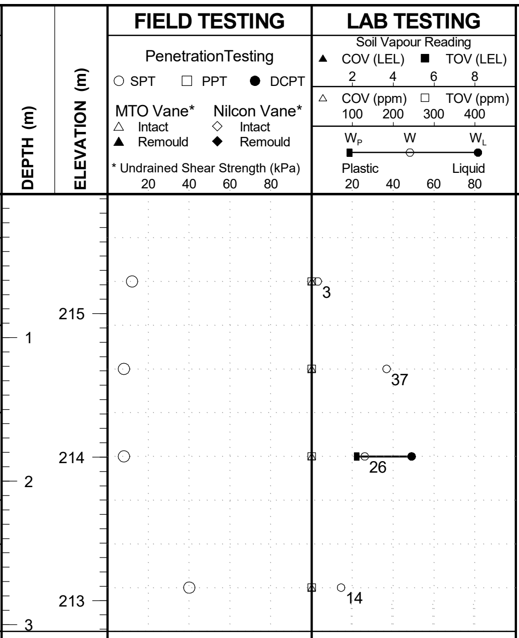
RECORD OF BOREHOLE No. BH C1

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**
Drilling Location: **Countryside Dr., EBL, Sta. 0+000 E:603645 N:4852294**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**
Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

Geodetic Ground Surface Elevation: 215.8 m

LITHOLOGY PROFILE: DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
about 100 mm ASPHALT	215.7 0.1								
brown **Sand and Gravel FILL** moist	214.9 0.9	SS	1	83	12				
grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel, trace organics		SS	2	92	8				
	213.6 2.2	SS	3	100	8	0	14	48	38
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders hard	212.8 3.0	SS	4	100	40				
END OF BOREHOLE	3.0								



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C2

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 0+000 E:603646 N:4852295**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
DESCRIPTION Geodetic Ground Surface Elevation: 215.1 m	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ☐ PPT ● DCPT MTO Vane*: △ Intact ▲ Remould Nilcon Vane*: ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80		GR SA SI CL
brown **Sand and Gravel FILL** moist	214.5	SS	1	75	6			○			
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.6	SS	2	100	7	1	214	○			
	213.2	SS	3	100	19			○			
END OF BOREHOLE	1.8										

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C3

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 0+150 E:603738 N:4852420**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE			SOIL SAMPLING					
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 216.5 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
	about 90 mm ASPHALT	216.4 0.1						
	brown **Sand and Gravel FILL** moist	216.2 0.3						216
	dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	215.6 0.9	SS	1	83	5		
	brown **SILTY CLAY / CLAYEY SILT TILL** trace sand, trace gravel stiff	215.0 1.5	SS	2	100	9	1	215
	END OF BOREHOLE							

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT

MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa)
20 40 60 80

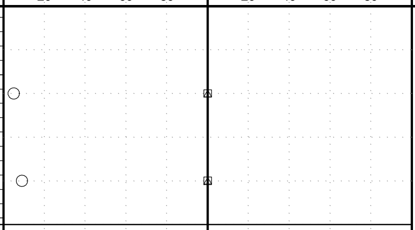
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400

W_P W W_L
Plastic Liquid
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C5

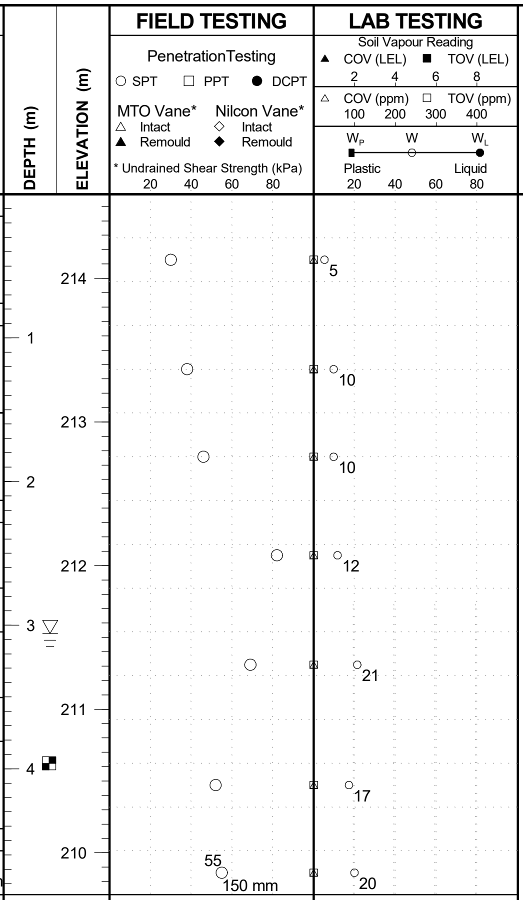
wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 0+300 E:603831 N:4852531**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 25, 2020** Date Completed: **Mar 25, 2020**	Revision No.:	**0, 2/8/21**

Geodetic Ground Surface Elevation: 214.6 m

DESCRIPTION	Elevation (m) / Depth (m)
about 100 mm ASPHALT	214.5 0.1
brown **Sand and Gravel FILL** moist	213.8 0.8
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	213.1 1.5
brown **SILTY SAND / SANDY SILT TILL** trace to some clay, trace gravel dense to very dense moist to wet --------- grey	209.7 4.9
END OF BOREHOLE	

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
SS	1	83	30	5
SS	2	100	38	10
SS	3	83	46	10
SS	4	100	82	12
SS	5	100	69	21
SS	6	79	52	17
SS	7	100	55 / 150mm	20



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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∇ Groundwater encountered on completion of drilling on 3/25/2020 at a depth of: 3.0 m. ▚ Cave in depth after removal of augers: 4.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C6

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 0+300 E:603832 N:4852529**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

FIELD TESTING – PenetrationTesting: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING – Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

LITHOLOGY PROFILE – DESCRIPTION (Geodetic Ground Surface Elevation: 214.6 m)	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
brown **Sand and Gravel FILL** moist	214.0 0.6	SS	1	83	11
brown **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel	213.4 1.2	SS	2	88	34
brown **SILTY SAND / SANDY SILT TILL** trace to some clay, trace gravel very dense moist	213.0 1.7	SS	3	100	75
END OF BOREHOLE					

DEPTH (m): 1 — ELEVATION (m): 214, 213

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C7

wood.

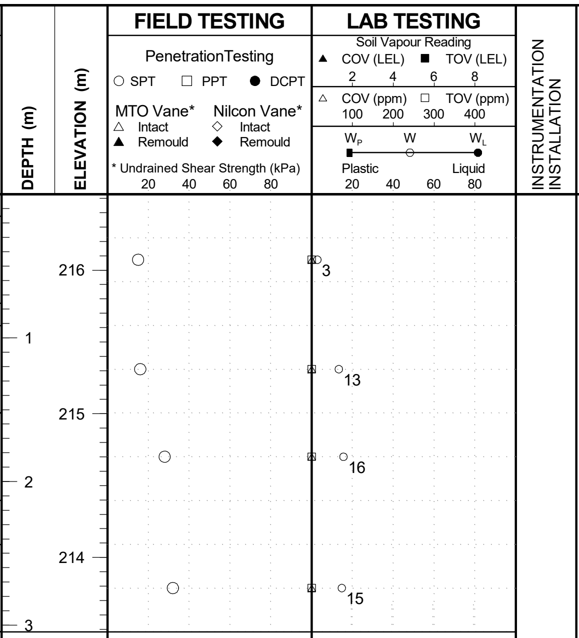
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 0+450 E:603917 N:4852640**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE — Geodetic Ground Surface Elevation: 216.5 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm ASPHALT	216.4 0.1				
brown **Sand and Gravel FILL** moist	215.9 0.6	SS	1	50	15
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	215.5 1.1				
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard		SS	2	100	16
		SS	3	100	28
--------- grey	213.5 3.0	SS	4	100	32
END OF BOREHOLE	3.0				



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

∇ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH C8

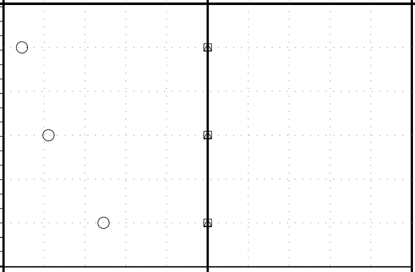
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 0+450 E:603915 N:4852650**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 216.6 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
▨	brown **Sand and Gravel FILL** moist 216.0	SS	1	42	9						
▨	0.6 brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard	SS	2	100	22	1	216				
		SS	3	58	49		215				
	214.8 **END OF BOREHOLE** 1.8										



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C9

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 0+600 E:604016 N:4852761**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | INSTRUMENTATION INSTALLATION | COMMENTS & GRAIN SIZE DISTRIBUTION (%) (GR SA SI CL)

Field Testing: Penetration Testing ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 218.3 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 110 mm ASPHALT	218.2 0.1				
brown **Sand and Gravel FILL** moist	217.9 0.5				
dark grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	217.4 0.9	SS	1	83	10
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	216.8 1.5	SS	2	100	20
END OF BOREHOLE					

DEPTH (m): 1
ELEVATION (m): 218, 217

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C11

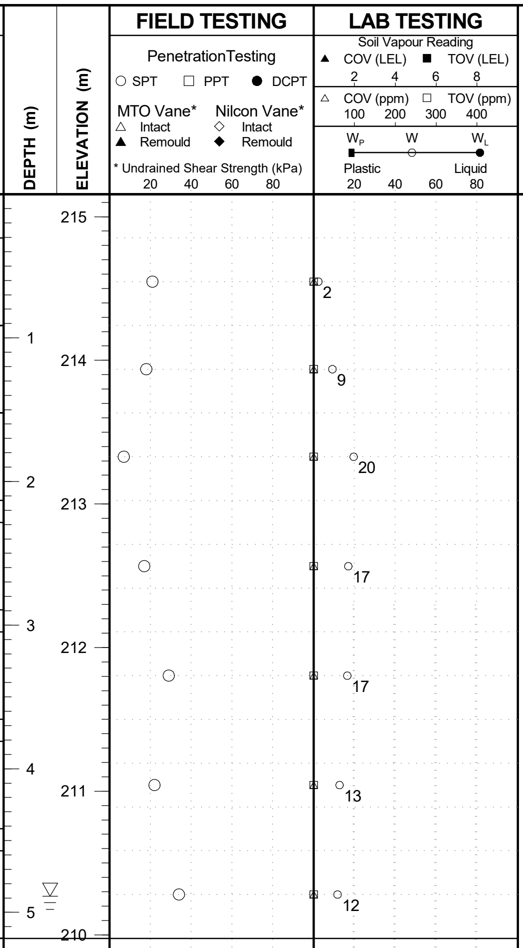
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 0+750 E:604113 N:4852893**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

Geodetic Ground Surface Elevation: 215.2 m

LITHOLOGY PROFILE DESCRIPTION	Elevation Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 120 mm ASPHALT	215.0 0.1				
brown **Sand and Gravel FILL** moist	214.4 0.8	SS	1	83	21
dark grey / grey **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel, trace organics		SS	2	100	18
	212.9 2.2	SS	3	92	7
brown / brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard		SS	4	100	17
		SS	5	100	29
--------- grey		SS	6	83	22
	210.0 5.2	SS	7	83	34
END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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Groundwater encountered on completion of drilling on 3/27/2020 at a depth of: 4.9 m.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH C12

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 0+750 E:604113 N:4852900**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 25, 2020** Date Completed: **Mar 25, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

Geodetic Ground Surface Elevation: 213.6 m

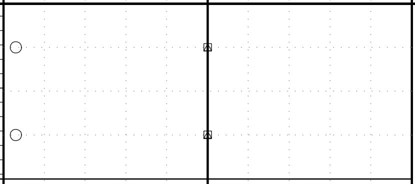
DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 100 mm TOPSOIL	213.5 0.1						
brown **Sand and Gravel FILL** moist	213.0 0.6	SS	1	75	6		213
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	212.4 1.2	SS	2	100	6	1	
END OF BOREHOLE							

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH C13

wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 0+900 E:604197 N:4852992**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 27, 2020** Date Completed: **Mar 27, 2020**	Revision No.:	**0, 2/8/21**

LITHOLOGY PROFILE · **SOIL SAMPLING** · **FIELD TESTING** · **LAB TESTING** · **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Geodetic Ground Surface Elevation: 219.0 m

Field Testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

DESCRIPTION	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Lab Testing (W)	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
about 140 mm ASPHALT	218.9 0.1												
brown **Sand and Gravel FILL** moist	218.5 0.5												
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	218.1 0.9	SS	1	83	11			16					
brown/grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard						1	218						
		SS	2	100	17			17					
		SS	3	100	23			15					
						2	217						
		SS	4	100	30			17					
	215.9					3	216						
END OF BOREHOLE	3.0												

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C15

wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., WBL, Sta. 1+050 E:604285 N:4853111**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 27, 2020** Date Completed: **Mar 27, 2020**	Revision No.:	**0, 2/8/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING**

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Geodetic Ground Surface Elevation: 219.7 m

Lithology Plot	DESCRIPTION	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
■	**about 130 mm ASPHALT**	219.6 0.1						
▨	brown **Sand and Gravel FILL** moist	219.2 0.5						
▨	dark grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel, trace organics	218.8 0.9	SS	1	100	16		219
▨	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to stiff	218.2 1.5	SS	2	100	10	1	
	END OF BOREHOLE							

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C17

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 1+200 E:604386 N:4853230**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 219.9 m

DESCRIPTION	Elevation / Depth (m)
about 130 mm ASPHALT	219.8 0.1
brown **Sand and Gravel FILL** moist	219.5 0.4
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	219.0 0.9
brown / brownish grey **SILTY CLAY TILL** trace to some sand, trace gravel stiff to hard --------- grey	214.9
END OF BOREHOLE	5.0

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	11
SS	2	88	14
SS	3	100	24
SS	4	100	41
SS	5	100	30
SS	6	50	14
SS	7	100	20

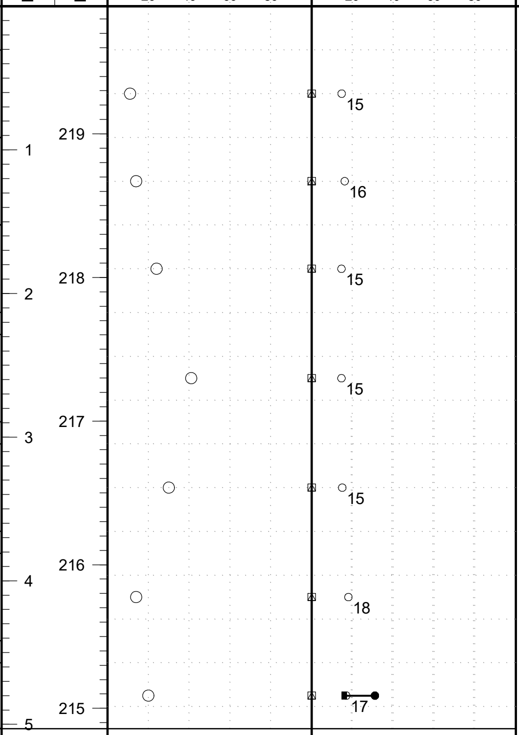
DEPTH (m) / ELEVATION (m)

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W_P W W_L
Plastic Liquid
20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
1	11	50	38

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH C18

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 1+200 E:604388 N:4853229**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Apr 1, 2020** Date Completed: **Apr 1, 2020**	Revision No.:	**0, 2/8/21**

Geodetic Ground Surface Elevation: 219.9 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
brown **Sand and Gravel FILL** moist	219.3 0.6	SS	1	88	5		
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to very stiff		SS	2	100	12	1	219
	218.1 1.8	SS	3	100	19		
END OF BOREHOLE							

FIELD TESTING

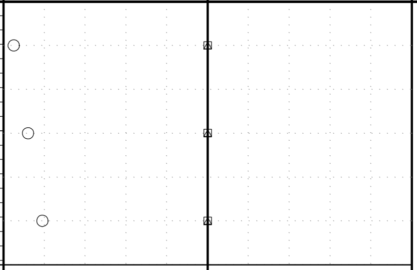
PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
WP W WL
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C19 / BH B22

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 1+350 E:604448 N:4853360**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan 23, 2020** Date Completed: **Jan 23, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

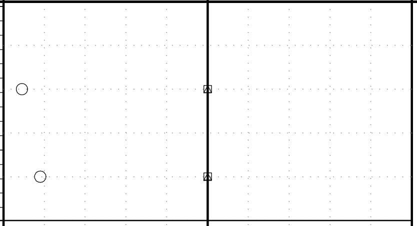
Geodetic Ground Surface Elevation: 209.0 m

Lithology Plot	DESCRIPTION	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	GR	SA	SI	CL
■	**about 200 mm ASPHALT**	208.8 0.2										
▨	**Sand and Gravel FILL** moist	208.4 0.6							33	58	(9)	
▨	brown/dark grey **Silty Clay FILL** trace gravel		SS	1	75	9						
							1	208				
		207.5 1.5	SS	2	100	18						
	END OF BOREHOLE											

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) □ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C20

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 1+350 E:604492 N:4853362**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Apr 1, 2020** Date Completed: **Apr 1, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

Geodetic Ground Surface Elevation: 220.2 m

Lithology Plot	Description	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Field Testing	Lab Testing
▨	brown **Sand and Gravel FILL** moist	219.8 0.5	SS	1	100	16	○	⊠
▨	dark grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace to some gravel, trace organics	219.0 1.2	SS	2	67	11	○	⊠
	END OF BOREHOLE Borehole was terminated due to the close proximity of existing watermain							

Depth scale: 1 m. Elevation scale: 220 m.

Field Testing legend: Penetration Testing ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing legend: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Instrumentation Installation

Comments & Grain Size Distribution (%): GR SA SI CL

▽ No freestanding groundwater measured in open borehole on completion of drilling.

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Page: 1 of 1

RECORD OF BOREHOLE No. BH C21

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 1+500 E:604570 N:4853458**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING**

Field Testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W$_P$ W W$_L$ Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Geodetic Ground Surface Elevation: 221.3 m

Lithology Plot	DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
■	**about 200 mm ASPHALT**	221.1 0.2						221
▨	brown **Sand and Gravel FILL** moist	220.8 0.5						
▨	dark grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	220.4 0.9	SS	1	100	9		
▥	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff	219.7 1.5	SS	2	100	14	1	220
	END OF BOREHOLE							

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C23

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 1+650 E:604645 N:4853563**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

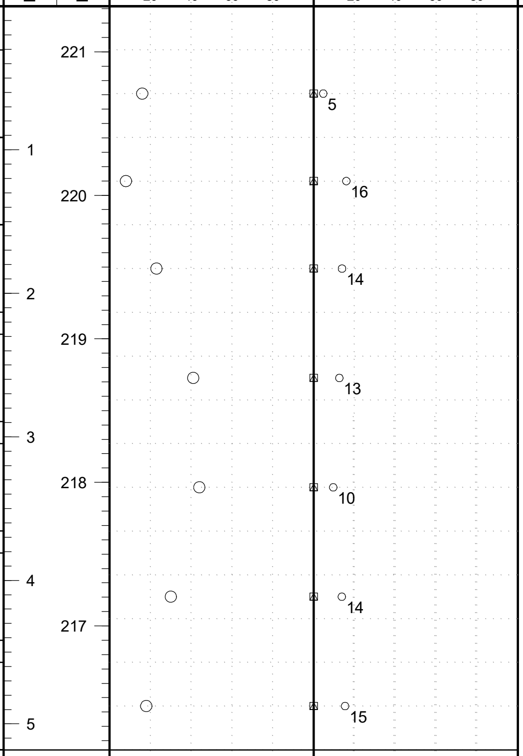
LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 221.3 m

DESCRIPTION	Elevation (m) / Depth (m)
about 150 mm ASPHALT	221.2 0.1
brown **Sand and Gravel FILL** moist	220.7 0.6
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	220.4 0.9
brown / brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders firm to hard --------- grey	216.1 5.2
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W
SS	1	100	16	5
SS	2	100	8	16
SS	3	100	23	14
SS	4	100	41	13
SS	5	100	44	10
SS	6	100	30	14
SS	7	100	18	15



FIELD TESTING

Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C24

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 1+650 E:604647 N:4853568**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Apr 1, 2020** Date Completed: **Apr 1, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
▨	brown **Sand and Gravel FILL** moist 220.3	SS	1	67	5			○			
▨	dark grey 0.6 **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics 219.7	SS	2	100	15	1	220	○			
▥	brown 1.2 **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders very stiff 219.1	SS	3	58	22			○			
	END OF BOREHOLE 1.8										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C25

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 1+800 E:604747 N:4853682**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 27, 2020** Date Completed: **Mar 27, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 220.9 m

DESCRIPTION	Elevation / Depth
about 150 mm ASPHALT	220.7 0.1
brown **Sand and Gravel FILL** moist	220.3 0.6
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	219.9 0.9
brown /brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to hard	217.8 3.0
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W
SS	1	100	11	4
SS	2	100	14	12
SS	3	100	25	13
SS	4	100	46	12

DEPTH (m): 1, 2, 3
ELEVATION (m): 220, 219, 218

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

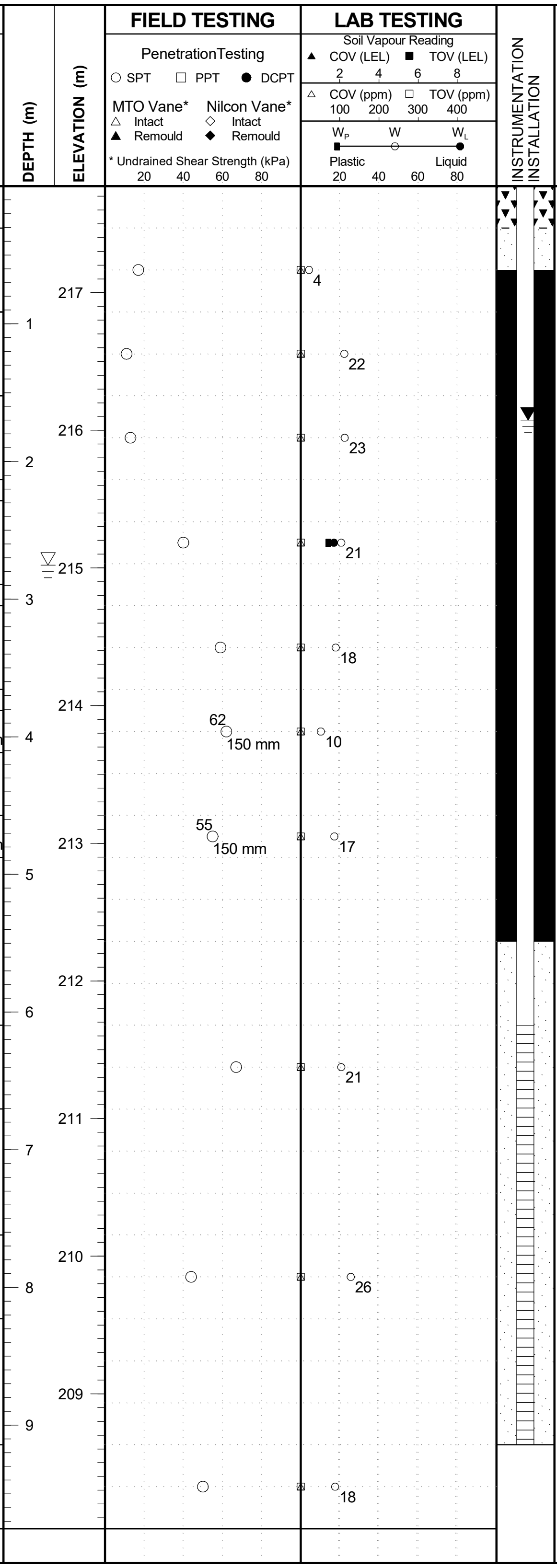
Scale: 1 : 53

RECORD OF BOREHOLE No. BH C27 / BH S7

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., WBL, Sta. 1+950 E:604850 N:4853816**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 26, 2020** Date Completed: **Mar 26, 2020**	Revision No.:	**0, 4/1/21**

Geodetic Ground Surface Elevation: 217.8 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)	GR	SA	SI	CL
about 130 mm ASPHALT	217.6 0.1									
brown **Sand and Gravel FILL** trace to some silt moist		SS	1	83	17	4				
	216.9 0.9									
dark brown / dark grey **Silty Clay / Clayey Silt FILL** some sand, trace to some gravel, trace organics		SS	2	100	11	22				
		SS	3	100	13	23				
	215.6 2.2									
brown **SAND AND SILT TILL** trace clay, trace gravel dense		SS	4	21	40	21	1	40	52	7
	214.8 3.0									
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders hard		SS	5	100	59	18				
		SS	6	100	62 / 150mm	10				
		SS	7	100	55 / 150mm	17				
-------- grey		SS	8	25	67	21				
		SS	9	100	44	26				
		SS	10	67	50	18				
	208.0 9.8									
END OF BOREHOLE										



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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▽ Groundwater encountered on completion of drilling on 3/26/2020 at a depth of: 2.7 m.

▼ Groundwater depth observed on 5/4/2020 at a depth of: 1.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH C27 / BH S7

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurement in the monitoring well (depth below ground): 24 Apr 2020: 1.7 m 4 May 2020: 1.7 m 12 May 2020: 1.9 m										

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C29

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., EBL, Sta. 2+100 E:604945 N:4853935**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 19, 2020** Date Completed: **Mar 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 221.4 m

DESCRIPTION	Elevation (m) / Depth (m)
about 150 mm ASPHALT	221.2
brown **Sand and Gravel FILL** moist	221.1 0.1
dark grey /grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	0.3
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard --------- grey	219.9 1.5
END OF BOREHOLE	216.5 4.9

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	18
SS	2	83	11
SS	3	100	36
SS	4	100	55 / 150mm
SS	5	100	50 / 100mm
SS	6	100	50 / 100mm
SS	7	100	74 / 150mm

FIELD TESTING

Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa)

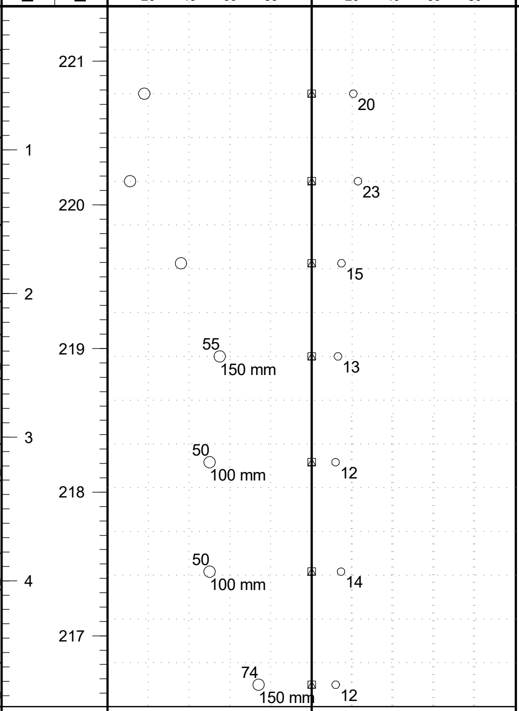
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
△ COV (ppm) ☐ TOV (ppm)
W_P W W_L
Plastic Liquid

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C30

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 2+100 E:604944 N:4853931**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 19, 2020** Date Completed: **Mar 19, 2020**	Revision No.:	**0, 2/8/21**

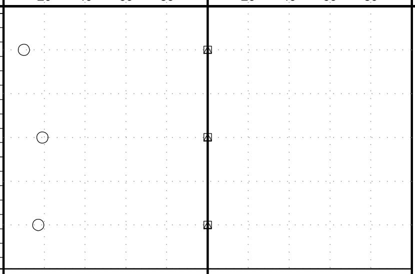
LITHOLOGY PROFILE — Geodetic Ground Surface Elevation: 221.0 m

DESCRIPTION	Elevation / Depth (m)
brown **Sand and Gravel FILL** moist	220.7 0.3
dark grey /brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	219.8 1.2
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	219.2 1.8
END OF BOREHOLE	1.8

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	83	10
SS	2	100	19
SS	3	25	17

DEPTH (m): 1 — **ELEVATION (m)**: 220



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C31

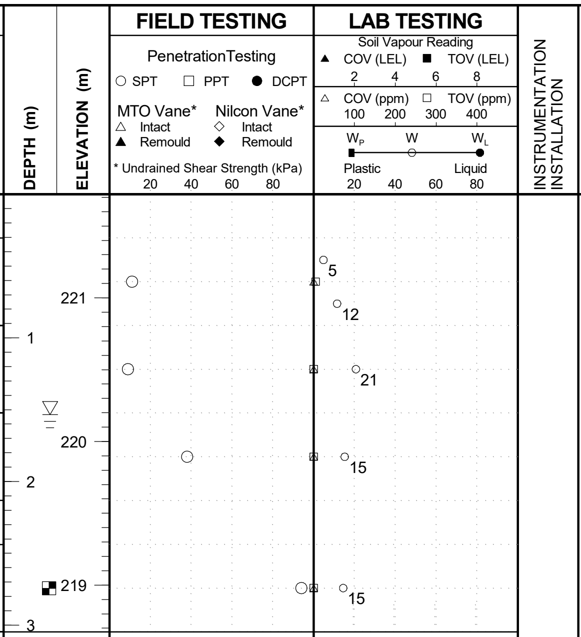
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 2+250 E:605023 N:4854046**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 19, 2020** Date Completed: **Mar 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE		SOIL SAMPLING				COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
DESCRIPTION Geodetic Ground Surface Elevation: 221.7 m	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
about 150 mm ASPHALT	221.6 0.1								
brown **Sand and Gravel FILL** moist	221.1 0.6	SS	1	83	11				
dark grey /brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	220.2 1.5	SS	2	100	9				
brown **SILTY SAND TILL** trace to some clay, trace gravel dense to very dense wet to moist		SS	3	100	38	-	67	31	2
	218.7 3.0	SS	4	100	94				
END OF BOREHOLE									



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▽ Groundwater encountered on completion of drilling on 3/19/2020 at a depth of: 1.5 m. ▞ Cave in depth after removal of augers: 2.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Page: 1 of 1

RECORD OF BOREHOLE No. BH C32

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 2+250 E:605023 N:4854047**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 19, 2020** Date Completed: **Mar 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

Geodetic Ground Surface Elevation: 221.7 m

LITHOLOGY PROFILE DESCRIPTION	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
brown **Sand and Gravel FILL** moist	221.1 0.6	SS	1	50	8
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	220.5 1.2	SS	2	100	13
brown **SILTY SAND / SANDY SILT TILL** trace to some clay, trace gravel dense wet	219.8 1.8	SS	3	100	33
END OF BOREHOLE	1.8				

DEPTH (m): 1
ELEVATION (m): 221, 220

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

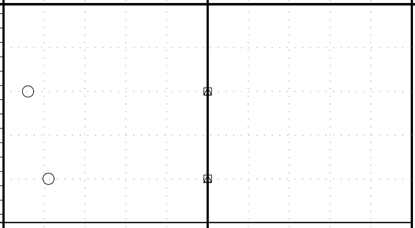
RECORD OF BOREHOLE No. BH C33

wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 2+400 E:605131 N:4854170**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 19, 2020** Date Completed: **Mar 19, 2020**	Revision No.:	**0, 2/8/21**

Geodetic Ground Surface Elevation: 221.8 m

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm ASPHALT 221.7 0.1										
	brown **Sand and Gravel FILL** moist 221.3 0.5										
	dark grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics 220.9 0.9	SS	1	83	12		221				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff 220.2 1.5	SS	2	100	22	1					
	END OF BOREHOLE										



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$\underline{\nabla}$ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C35

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 2+550 E:605211 N:4854296**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 19, 2020** Date Completed: **Mar 19, 2020**

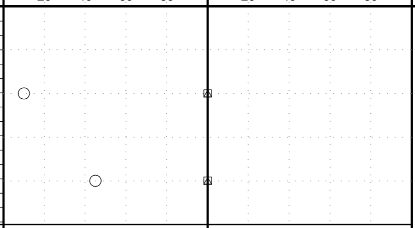
Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

FIELD TESTING — PenetrationTesting: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING — Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 220.6 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	about 100 mm ASPHALT	220.5 0.1											
	brown **Sand and Gravel FILL** moist	220.2 0.5											
	dark grey /brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	219.7 0.9	SS	1	100	10		220					
	brownish grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard	219.1 1.5	SS	2	100	45	1						
	END OF BOREHOLE												



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH C37

wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., WBL, Sta. 2+700 E:605295 N:4854406**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 19, 2020** Date Completed: **Mar 19, 2020**	Revision No.:	**0, 2/8/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Geodetic Ground Surface Elevation: 220.0 m

Field Testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Lithology Plot	DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	INSTRUMENTATION INSTALLATION	GR	SA	SI	CL
	about 90 mm ASPHALT	220.0 0.1											
	brown **Sand and Gravel FILL** moist	219.6 0.4											
	brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	219.1 0.9	SS	1	100	16							
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard	218.5 1.5	SS	2	83	47	1	219					
	END OF BOREHOLE												

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S8

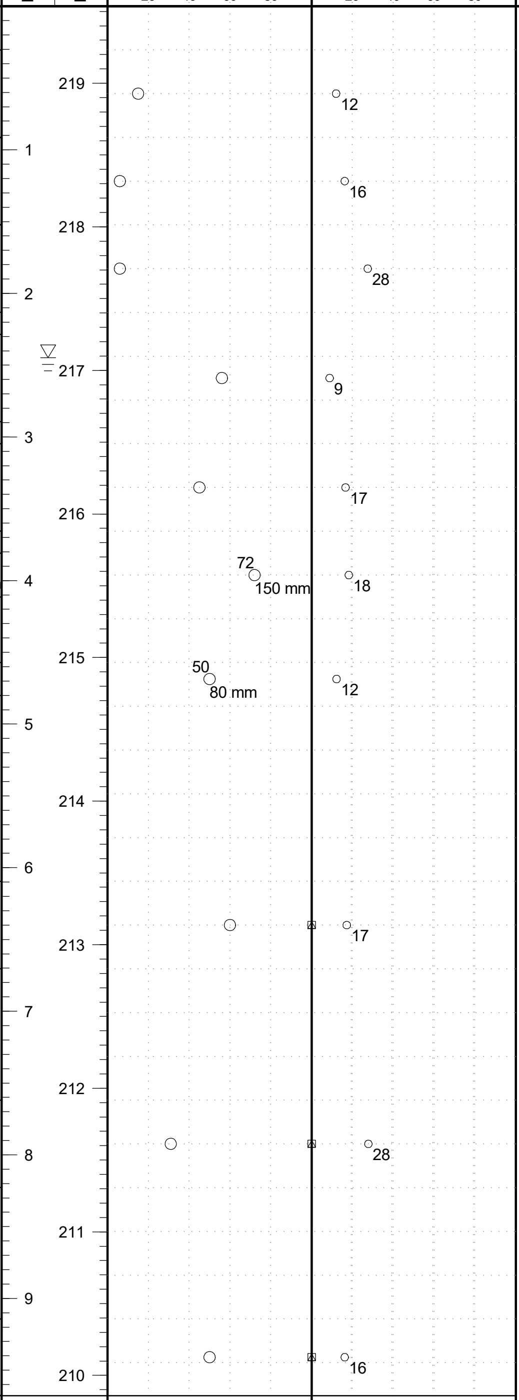
Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 1+950 E:604854 N:4853824**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 26, 2020** Date Completed: **Mar 26, 2020**	Revision No.:	**0, 2/8/21**

LITHOLOGY PROFILE – **DESCRIPTION** – Geodetic Ground Surface Elevation: 219.5 m

Elevation (m)	Depth (m)	Description
219.4	0.1	**about 140 mm ASPHALT**
219.4 to 218.6	0.1 to 0.9	brown **Sand and Gravel FILL** trace to some silt moist
218.6 to 217.3	0.9 to 2.2	dark brown **Silty Clay / Clayey Silt FILL** some sand, trace to some gravel, trace organics
217.3 to 216.6	2.2 to 3.0	brown **SILTY SAND / SANDY SILT TILL** trace to some clay, trace gravel very dense moist
216.6 to 209.9	3.0 to 9.7	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders hard --------- trace to some shale fragments -------- grey
209.9	9.7	**END OF BOREHOLE**

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water content W (%)
SS	1	42	15	12
SS	2	92	6	16
SS	3	83	6	28
SS	4	100	56	9
SS	5	33	45	17
SS	6	100	72 / 150mm	18
SS	7	100	50 / 80mm	12
SS	8	100	60	17
SS	9	100	31	28
SS	10	100	50	16



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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Groundwater encountered on completion of drilling on 3/26/2020 at a depth of: 2.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S9

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **Countryside Dr., WBL, Sta. 0+700 E:604080 N:4852848**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Mar 18, 2020** Date Completed: **Mar 18, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM / DP**
Revision No.: **0, 2/8/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 214.4 m

DESCRIPTION	Elevation (m) / Depth (m)
about 150 mm ASPHALT	214.3
grey **Sand and Gravel FILL** trace to some silt moist	214.1 0.2 0.3
dark brown **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel	212.6 1.8
brown to grey **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace to some gravel, cobbles/boulders firm to hard -------- grey sandy	205.0 9.4
END OF BOREHOLE	

SOIL SAMPLING / FIELD TESTING / LAB TESTING

Penetration Testing: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W_P W W_L Plastic Liquid 20 40 60 80

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Penetration Testing	W (%)	GR	SA	SI	CL
SS	1	100	9	○	19				
SS	2	83	8	○	23				
SS	3	100	7	○	19 15				
SS	4	100	53	○	18				
SS	5	100	19	○	14				
SS	6	0	50 / 30mm	50 30 mm					
SS	7	100	50 / 80mm	50 80 mm	9	12	32	47	9
SS	8	100	50 / 100mm	50 100 mm	11				
SS	9	100	65 / 150mm	65 150 mm	14				
SS	10	100	65 / 150mm	65 150 mm	15				

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

∇ No freestanding groundwater measured in open borehole on completion of drilling.

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S10

wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., EBL, Sta. 0+700 E:604082 N:4852848**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 18, 2020** Date Completed: **Mar 18, 2020**	Revision No.:	**0, 3/30/21**

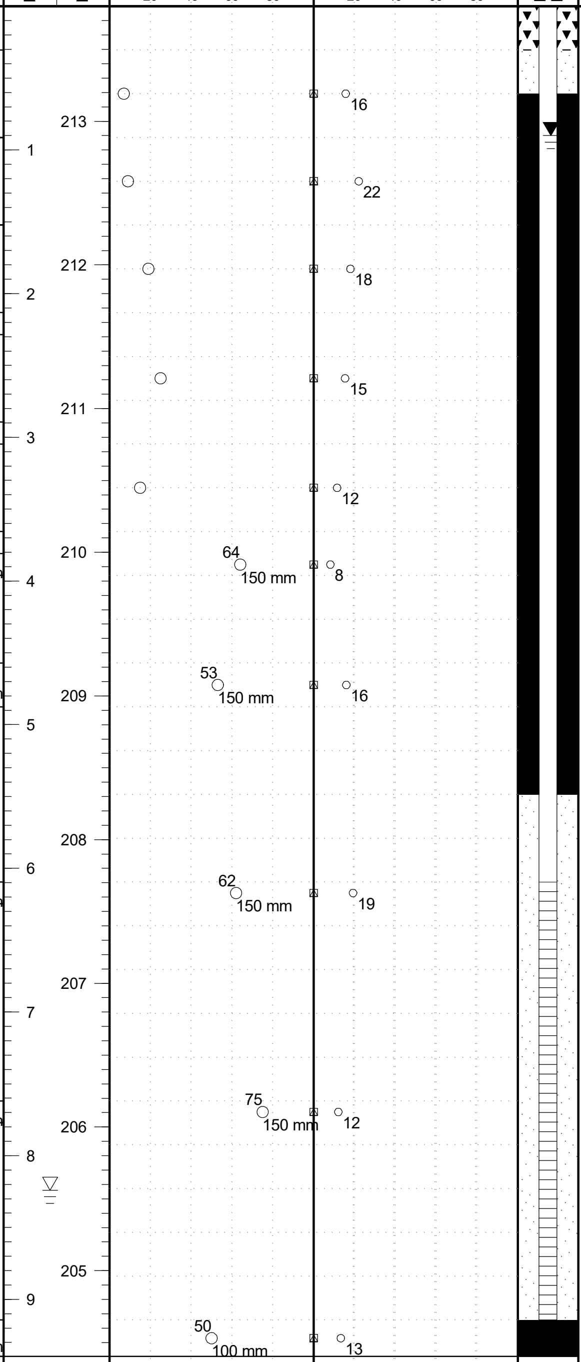
LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 213.8 m

DESCRIPTION	Elevation (m) / Depth (m)
about 150 mm ASPHALT	213.6 0.2
brown **Sand and Gravel FILL** trace to some silt moist	213.5 0.3
brown **Silty Clay / Clayey Silt FILL** trace to some gravel	212.3 1.5
brown to grey **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace to some gravel, cobbles/boulders very stiff to hard -------- grey sandy, cobbles / boulders	204.4 9.4
END OF BOREHOLE	

SOIL SAMPLING / FIELD TESTING / LAB TESTING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)	GR	SA	SI	CL
SS	1	100	7	16				
SS	2	100	9	22				
SS	3	83	19	18				
SS	4	75	25	15				
SS	5	100	15	12				
SS	6	100	64 / 150mm	8	31	29	33	7
SS	7	100	53 / 150mm	16				
SS	8	100	62 / 150mm	19				
SS	9	100	75 / 150mm	12				
SS	10	100	50 / 100mm	13				



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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▽ Groundwater encountered on completion of drilling on 3/18/2020 at a depth of: 8.2 m.

▼ Groundwater depth observed on 5/4/2020 at a depth of: 0.9 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH S10

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 -9.1 m Groundwater measurement in the monitoring well (depth below ground): 4 May 2020: 0.9 m 12 May 2020: 1.0 m										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S11

wood.

Project Number:	**TP115086**	Drilling Location:	**Countryside Dr., WBL, Sta. 0+350 E:603849 N:4852560**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM / DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Mar 24, 2020** Date Completed: **Mar 24, 2020**	Revision No.:	**0, 2/8/21**

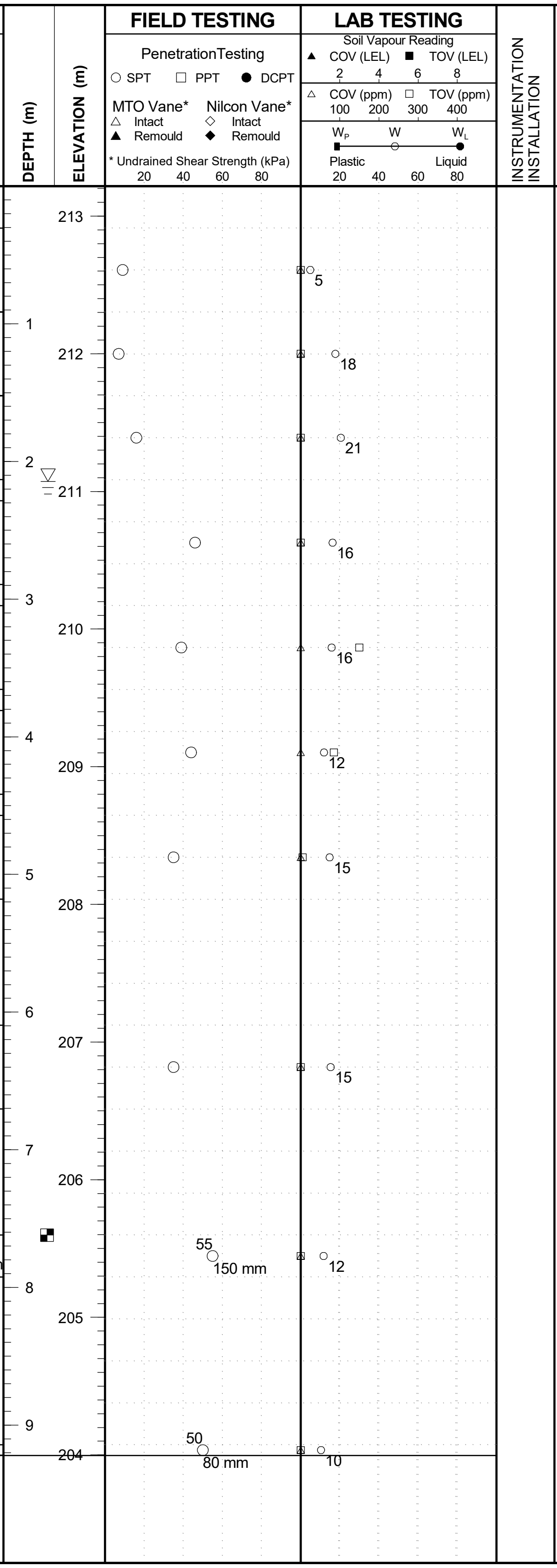
LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 213.2 m

Elevation (m) / Depth (m)	DESCRIPTION
213.0 0.2	**about 200 mm ASPHALT**
212.6 0.6	brown **Sand and Gravel FILL** trace to some silt moist
211.0 2.2	dark grey/brown **Silty Clay / Clayey Silt FILL** trace to some gravel, trace organics
205.4 7.8	brown to grey **SILTY SAND / SANDY SILT / SAND AND SILT TILL** trace clay, trace gravel dense to very dense moist to wet -------- grey
204.0 9.2	grey **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace to some gravel, cobbles/boulders, shale fragments hard
	END OF BOREHOLE

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
SS	1	100	9				
SS	2	83	7				
SS	3	100	16				
SS	4	100	46				
SS	5	83	39				
SS	6	83	44	1	42	55	2
SS	7	83	35				
SS	8	88	35				
SS	9	100	55 / 150mm				
SS	10	100	50 / 80mm				



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ Groundwater encountered on completion of drilling on 3/24/2020 at a depth of: 2.1 m. ▚ Cave in depth after removal of augers: 7.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S12

wood.

Project Number:	TP115086	Drilling Location:	Countryside Dr., EBL, Sta. 0+350 E:603857 N:4852567	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM / DP
Project Location:	Brampton, Ontario	Date Started:	Mar 24, 2020 Date Completed: Mar 24, 2020	Revision No.:	0, 3/30/21

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 213.5 m

Elevation / Depth (m)	DESCRIPTION
213.3 0.1	**about 140 mm ASPHALT**
212.9 0.6	brown **Sand and Gravel FILL** trace to some silt moist
211.3 2.2	dark grey/ brown **Silty Clay / Clayey Silt FILL** trace to some gravel, trace organics
207.7 5.8	brown to grey **SILTY SAND / SANDY SILT TILL** trace gravel compact to very dense moist to wet -------- grey

END OF BOREHOLE

(Borehole terminated due to Auger refusal at 5.8 m depth.)

50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface):

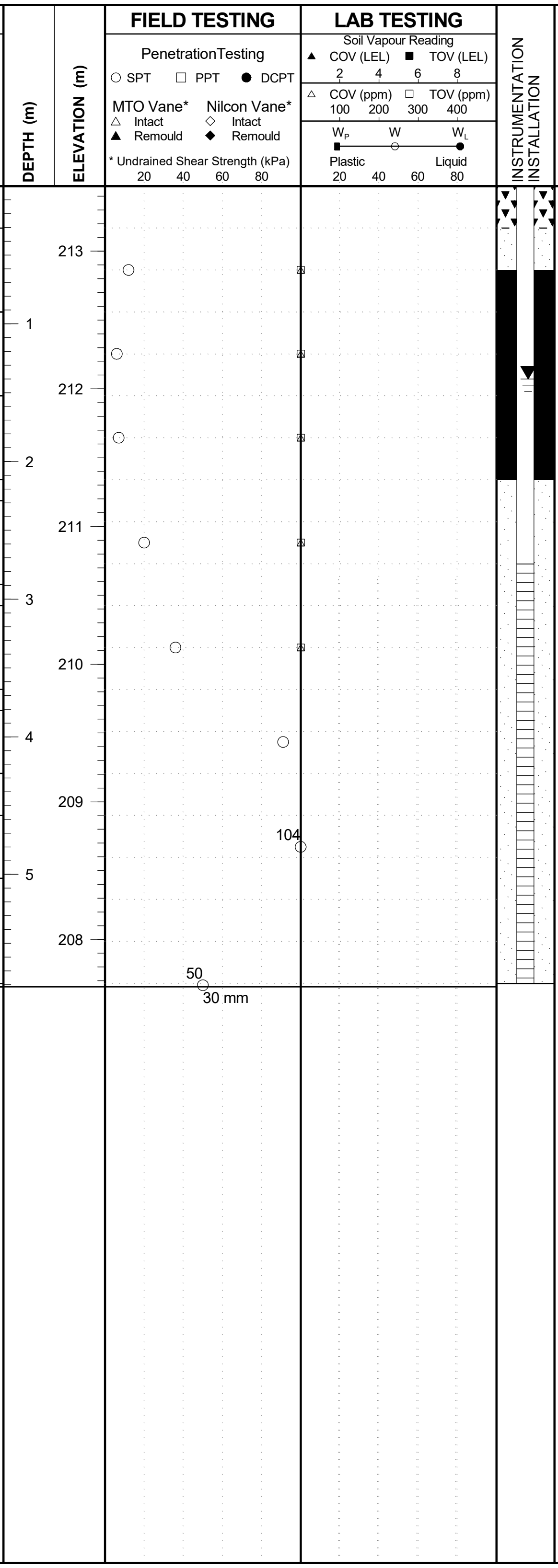
Concrete: 0.0 - 0.3 m
Sand: 0.3 - 0.6 m
Bentonite: 0.6 - 2.1 m
Sand Filter: 2.1 - 2.7 m
Screen: 2.7 - 5.8 m

Groundwater measurement in the monitoring well (depth below ground):

4 May 2020: 1.4 m
12 May 2020: 1.5 m

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	12
SS	2	67	6
SS	3	83	7
SS	4	75	20
SS	5	83	36
SS	6	100	91
SS	7	100	104
~~SS~~	~~8~~	~~100~~	~~50 /~~ 30mm



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 5/4/2020 at a depth of: 1.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

SECTION D
CLARKWAY DRIVE
(FROM CASTLEMORE ROAD TO MAYFIELD DRIVE, ~3 KM)

RECORD OF BOREHOLES

RECORD OF BOREHOLE No. BH D1

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., NBL, Sta. 0+000 E:606251 N:4850676**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 18, 2020** Date Completed: **Feb 18, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 205.6 m

DESCRIPTION	Elevation / Depth (m)
about 150 mm ASPHALT	205.5 0.1
brown **Sand and Gravel FILL** moist	204.8 0.8
brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	204.1 1.5
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard	202.6 3.0
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	94
SS	2	100	29
SS	3	100	27
SS	4	100	36

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

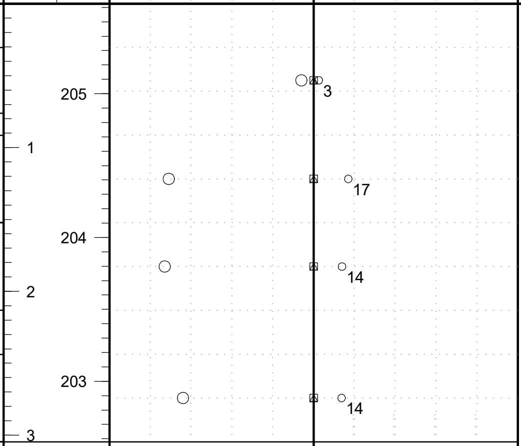
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D2

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., NBL, Sta. 0+000 E:606254 N:4850680**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 18, 2020** Date Completed: **Feb 18, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 206.0 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 50 mm TOPSOIL	205.9 0.0										
	brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	205.5	SS	1	75	6						
	brown **Sand and Gravel FILL**	205.4 0.5 0.6										
	brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	204.8	SS	2	100	15	1	205				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders hard	1.2 204.1	SS	3	100	36						
	END OF BOREHOLE	1.8										

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D3

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 0+150 E:606138 N:4850776**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 18, 2020**
		Date Completed:	**Feb 18, 2020**
Logged by:	**MS**	Compiled by:	**SN**
Reviewed by:	**SM**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING					
DESCRIPTION Geodetic Ground Surface Elevation: 206.0 m	Elevation (m) Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 130 mm ASPHALT	205.8 0.1						
brown **Sand and Gravel FILL** moist	205.4 0.6	SS	1	79	12		
brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	204.6 1.4					1	205
		SS	2	100	16		
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	204.4 1.5						
END OF BOREHOLE							

FIELD TESTING

PenetrationTesting: ○ SPT ☐ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8

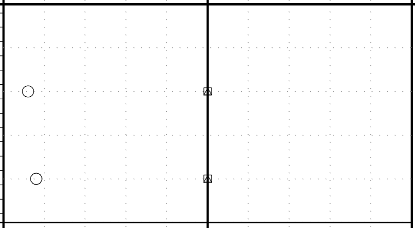
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W$_P$ W W$_L$ Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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∇ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 0.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D5

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 0+300 E:606039 N:4850884**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 205.7 m

DESCRIPTION	
about 110 mm ASPHALT	205.6 0.1
brown **Sand and Gravel FILL** moist	205.1 0.6
brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	204.5 1.2
brown/grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders stiff	200.7 5.0
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	20
SS	2	100	9
SS	3	58	11
SS	4	0	9
SS	5	17	14
SS	6	75	10
SS	7	100	11

DEPTH (m)
ELEVATION (m)

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

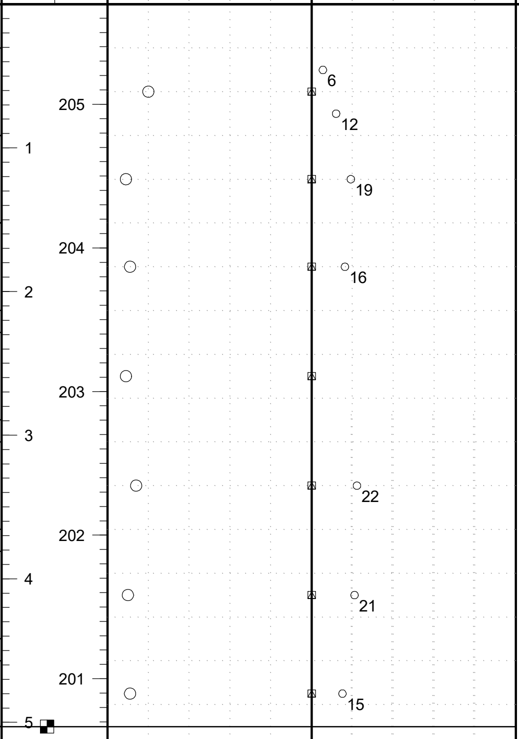
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W_P W W_L
Plastic Liquid
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

▚ Cave in depth after removal of augers: 5.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D6

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 0+300 E:606040 N:4850886**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | INSTRUMENTATION INSTALLATION | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Field Testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 206.1 m

DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	W	GR	SA	SI	CL
brown **Sand and Gravel FILL** moist 205.5	SS	1	100	17		206	8	36	49	(15)	
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to stiff 0.6	SS	2	33	8	1	205	14				
204.3	SS	3	25	8			13				
END OF BOREHOLE 1.8											

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∇ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 0.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D7

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 0+450 E:605935 N:4850986**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 18, 2020** Date Completed: **Feb 18, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
DESCRIPTION Geodetic Ground Surface Elevation: 205.9 m	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
about 100 mm ASPHALT	205.8 0.1										
brown **Sand and Gravel FILL** moist	205.3 0.6	SS	1	100	36				11		
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics		SS	2	100	10	1	205		23		
	203.7 2.3	SS	3	100	6	▽ 2	204		28		
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	202.9 3.0	SS	4	100	20	3	203		15		
END OF BOREHOLE											

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▽ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 1.8 m.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D8

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 0+450 E:605935 N:4850984**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 18, 2020** Date Completed: **Feb 18, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	**DESCRIPTION** Geodetic Ground Surface Elevation: 205.6 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	**DEPTH (m)**	**ELEVATION (m)**	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
▨	brown **Sand and Gravel FILL** trace cobbles moist	SS	1	83	22						
▨		SS	2	0	NA		▽ 205				
	204.7 **END OF BOREHOLE** 0.9 Borehole was terminated due to the exisitng Bell cable.										Borehole was terminated due to the existing utility cables.

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▽ Groundwater encountered on completion of drilling on 2/18/2020 at a depth of: 0.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D9

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 0+600 E:605832 N:4851092**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | INSTRUMENTATION INSTALLATION | COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Field Testing: Penetration Testing ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Comments: GR SA SI CL

Geodetic Ground Surface Elevation: 207.0 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm ASPHALT	206.9 0.1				
brown **Sand and Gravel FILL** moist	206.1 0.9	SS	1	75	27
grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, cobbles	205.5 1.5	SS	2	83	12
END OF BOREHOLE					

DEPTH (m): 1 — ELEVATION (m): 206

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D11

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 0+750 E:605720 N:4851199**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 207.9 m

LITHOLOGY PROFILE DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 90 mm ASPHALT	207.9 0.1				
brown **Sand and Gravel FILL** moist	207.6 0.3				
brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	1	75	38
		SS	2	100	14
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to very stiff	206.4 1.5	SS	3	83	11
		SS	4	100	11
		SS	5	100	22
--------- grey		SS	6	92	19
		SS	7	100	16
END OF BOREHOLE	202.9 5.0				

DEPTH (m): 1, 2, 3, 4, 5
ELEVATION (m): 207, 206, 205, 204, 203

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

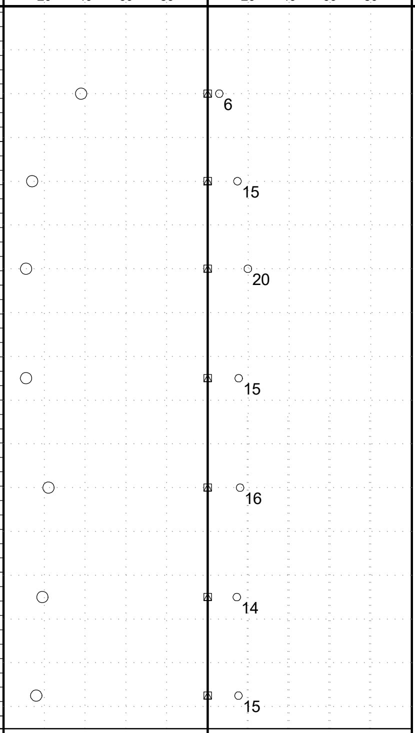
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W_P W W_L
Plastic Liquid
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D13

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., NBL, Sta. 0+900 E:605607 N:4851318**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 19, 2020** Date Completed: **Feb 19, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 209.3 m

Lithology Plot	DESCRIPTION	Elevation / Depth (m)
	about 100 mm ASPHALT	209.2 0.1
	brown **Sand and Gravel FILL** moist	208.6 0.7
	brown / grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, cobbles/boulders	207.9 1.4
	brown / grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders stiff to very stiff	206.2 3.0
	END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	100	50 / 150mm
SS	2	83	10
SS	3	54	18
SS	4	100	19

DEPTH (m) 1 2 3

ELEVATION (m) 209 208 207

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT

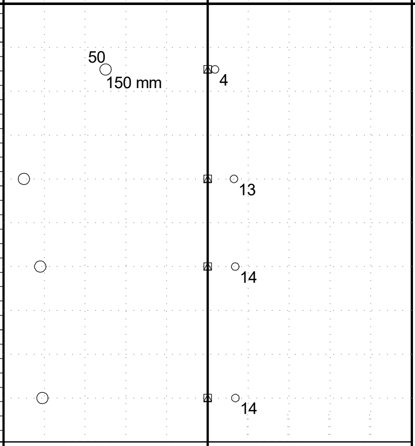
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W_P W W_L
Plastic Liquid
20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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$\underline{\nabla}$ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D15

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 1+050 E:605513 N:4851403**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 209.5 m	Elevation (m) Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	about 100 mm ASPHALT	209.4 0.1										
	brown **Sand and Gravel FILL** moist	208.6 0.9	SS	1	100	44		209	○			
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	208.0 1.5	SS	2	67	15	1	208	○			
	END OF BOREHOLE											

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∇ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 0.9 m.

▞ Cave in depth after removal of augers: 1.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Page: 1 of 1

RECORD OF BOREHOLE No. BH D17

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 1+200 E:605385 N:4851532**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Apr 1, 2020** Date Completed: **Apr 1, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE

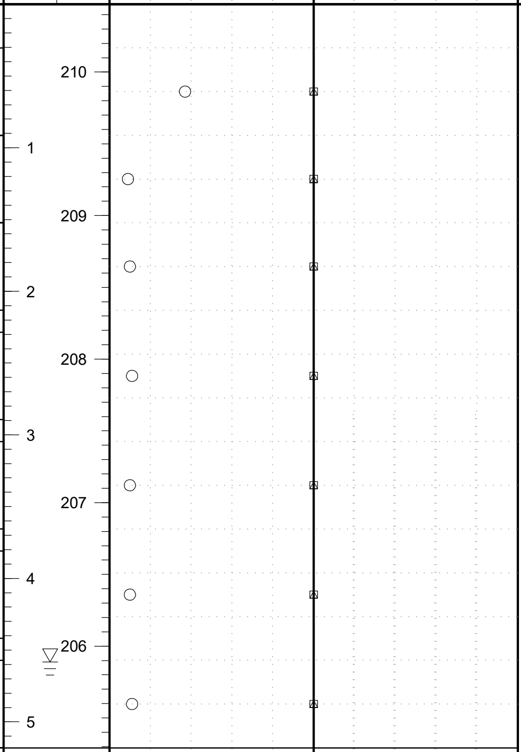
Geodetic Ground Surface Elevation: 210.5 m

Description	Elevation (m) / Depth (m)
about 100 mm ASPHALT	210.4 0.1
brown **Sand and Gravel FILL** moist	209.3 1.2
brown / dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	206.7 3.7
grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff	205.3 5.2
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	83	37
SS	2	92	9
SS	3	88	10
SS	4	100	11
SS	5	100	10
SS	6	100	10
SS	7	83	11

FIELD TESTING / LAB TESTING



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

Groundwater encountered on completion of drilling on 4/1/2020 at a depth of: 4.6 m.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH D18

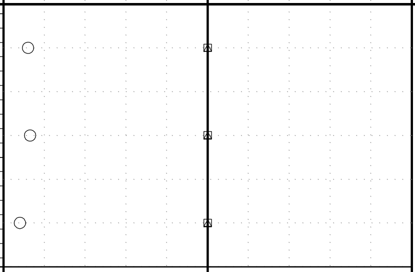
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 1+200 E:605387 N:4851534**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Apr 1, 2020** Date Completed: **Apr 1, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	**DESCRIPTION** Geodetic Ground Surface Elevation: 210.1 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	**DEPTH (m)**	**ELEVATION (m)**	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	**COMMENTS & GRAIN SIZE DISTRIBUTION (%)** GR SA SI CL
▨	brown **Sand and Gravel FILL** moist	SS	1	83	12						
▨	209.0	SS	2	75	13	1	209				
▨	1.1 dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics 208.2	SS	3	63	8	▽					
	END OF BOREHOLE 1.8										



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▽ Groundwater encountered on completion of drilling on 4/1/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D19

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**
Drilling Location: **Clarkway Dr., SBL, Sta. 1+350 E:605297 N:4851614**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020**
Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 210.6 m

DESCRIPTION	Elevation (m)	Depth (m)
about 90 mm ASPHALT	210.5	0.1
brown **Sand and Gravel FILL** moist	210.0	0.6
brown / dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	209.7	0.9
grey **SILTY CLAY TILL** trace to some sand, trace gravel stiff to very stiff	207.6	3.0
END OF BOREHOLE		

SOIL SAMPLING / LAB TESTING / COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water Content (%)	GR	SA	SI	CL
SS	1	100	47	5				
SS	2	58	13	19				
SS	3	79	23	16	2	22	49	27
SS	4	83	29	16				

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

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▽ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

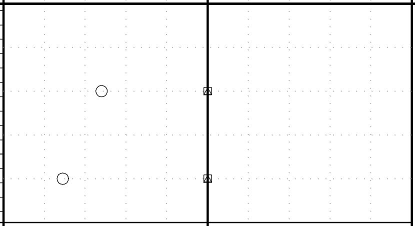
RECORD OF BOREHOLE No. BH D21

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 1+500 E:605194 N:4851719**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
DESCRIPTION Geodetic Ground Surface Elevation: 209.0 m	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)				GR SA SI CL
about 90 mm ASPHALT	209.0 0.1										
brown **Sand and Gravel FILL** cobbles/boulders moist		SS	1	79	48						
		SS	2	42	29	1 ▽	208				
END OF BOREHOLE	207.5 1.5										



▽ Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 1.2 m.

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D23

wood.

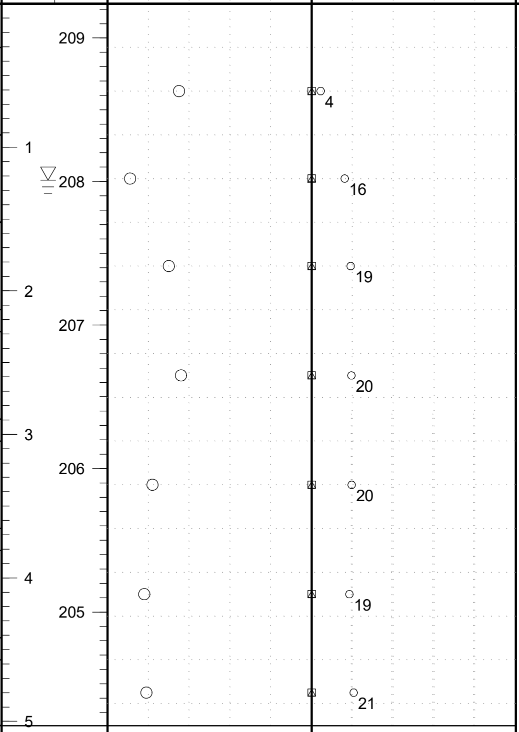
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 1+650 E:605071 N:4851839**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 19, 2020** Date Completed: **Feb 19, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 209.2 m

LITHOLOGY PROFILE DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 90 mm ASPHALT	209.1 0.1				
brown **Sand and Gravel FILL** moist	208.3 0.9	SS	1	58	35
grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	207.7 1.5	SS	2	75	11
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard to very stiff		SS	3	100	30
--------- grey		SS	4	100	36
		SS	5	100	22
		SS	6	0	18
	204.2 5.0	SS	7	22	19
END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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Groundwater encountered on completion of drilling on 2/19/2020 at a depth of: 1.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

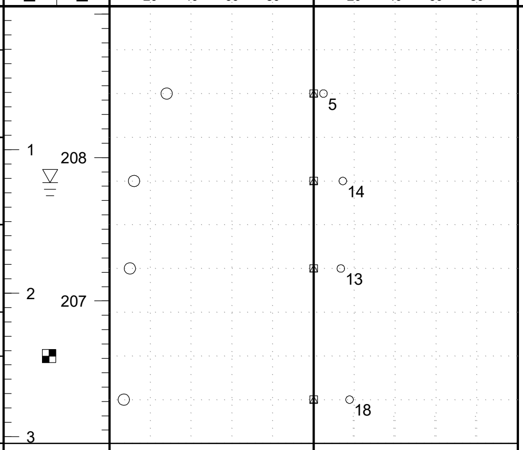
RECORD OF BOREHOLE No. BH D25

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., NBL, Sta. 1+800 E:604975 N:4851935**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 24, 2020** Date Completed: **Feb 24, 2020**	Revision No.:	**0, 3/25/21**

Geodetic Ground Surface Elevation: 209.1 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 90 mm ASPHALT	209.0 0.1				
brown **Sand and Gravel FILL** moist	208.1 0.9	SS	1	100	28
grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	207.5 1.5	SS	2	100	12
grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to firm	206.0 3.0	SS SS	3 4	83 83	10 7
END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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∇ Groundwater encountered on completion of drilling on 2/24/2020 at a depth of: 1.2 m. ▚ Cave in depth after removal of augers: 2.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D27

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**
Drilling Location: **Clarkway Dr., SBL, Sta. 1+950 E:604867 N:4852040**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 24, 2020** Date Completed: **Feb 24, 2020**
Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE — Lithology Plot; DESCRIPTION; Geodetic Ground Surface Elevation: 208.6 m

SOIL SAMPLING — Sample Type; Sample Number; Recovery (%); SPT 'N' / RQD (%)

DEPTH (m) — **ELEVATION (m)**

FIELD TESTING — PenetrationTesting: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING — Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

DESCRIPTION	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 90 mm ASPHALT	208.5 0.1						
brown **Sand and Gravel FILL** moist	207.7 0.9	SS	1	100	26		208
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	207.1 1.5	SS	2	100	7	1	
END OF BOREHOLE	1.5						

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D29

wood.

Project Number: **TP115086**

Project Client: **City of Brampton**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 2+100 E:604765 N:4852155**

Drilling Method: **150 mm Solid Stem Augers**

Drilling Machine: **Track Mounted Drill**

Date Started: **Feb 25, 2020** Date Completed: **Feb 25, 2020**

Logged by: **MM**

Compiled by: **SN**

Reviewed by: **SM**

Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING**

Field Testing: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Geodetic Ground Surface Elevation: 211.7 m

Lithology Plot	DESCRIPTION	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
■	**about 150 mm TOPSOIL**	211.6 0.2						
▨	brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	1	83	7		
			SS	2	100	17	1	211
		209.9	SS	3	92	20		210
	END OF BOREHOLE	1.8						

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D31

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

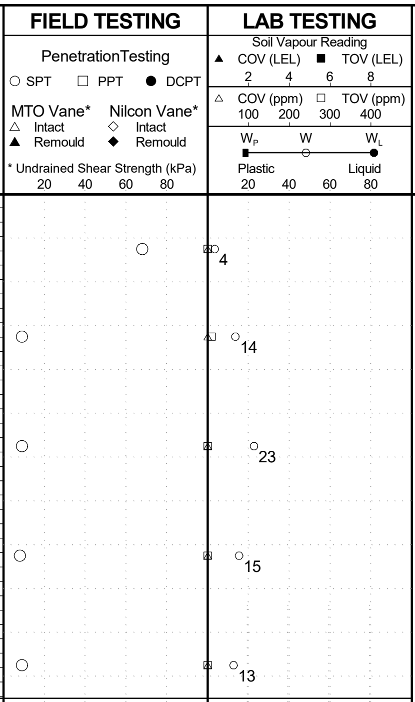
Drilling Location: **Clarkway Dr., SBL, Sta. 2+250 E:604668 N:4852236**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 210.0 m

Elevation (m) / Depth (m)	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
209.9 0.1	**about 130 mm ASPHALT**				
209.3 0.7	brown **Sand and Gravel FILL** moist	SS	1	94	68
207.9 2.1	dark brown **Sandy Silt FILL** trace to some clay, trace gravel	SS	2	100	9
		SS	3	100	9
206.5	grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to stiff	SS	4	100	8
		SS	5	100	9
3.5	**END OF BOREHOLE**				

DEPTH (m)	ELEVATION (m)
1	209
2	208
3	207



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D32

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Dr., SBL, Sta. 2+250 E:604666 N:4852234	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 12, 2020 Date Completed: Feb 12, 2020	Revision No.:	0, 3/25/21

Geodetic Ground Surface Elevation: 208.3 m

LITHOLOGY PROFILE DESCRIPTION	Elev./Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 110 mm ASPHALT	208.1 0.1				
brown **Sand and Gravel FILL** moist	207.6 0.6	SS	1	100	41
brown / dark brown **Sandy Silt FILL** trace tclay, trace gravel moist	207.0 1.2	SS	2	92	10
brown **Silty Clay / Clayey Silt FILL** some sand, trace gravel	206.4 1.8	SS	3	83	13
END OF BOREHOLE					

DEPTH (m): 1

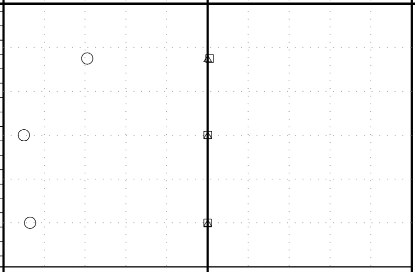
ELEVATION (m): 208, 207

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D33

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Dr., NBL, Sta. 2+400 E:604548 N:4852361	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 3/25/21

Geodetic Ground Surface Elevation: 214.0 m

DESCRIPTION	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 110 mm ASPHALT	213.9 0.1				
brown **Sand and Gravel FILL** moist		SS	1	89	41
	213.3 0.7				
dark brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	2	100	14
	212.0 2.0	SS	3	100	20
END OF BOREHOLE					

DEPTH (m): 1 — ELEVATION (m): 213

FIELD TESTING: Penetration Testing ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D35

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 2+550 E:604458 N:4852462**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 212.9 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
brown **Sand and Gravel FILL** moist **about 130 mm ASPHALT**	212.8 0.1	SS	1	89	46
grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel, trace wood fragments in SS2	212.2 0.7	SS	2	100	11
		SS	3	67	5
		SS	4	89	9
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to stiff	210.0 2.9	SS	5	89	16
--------- grey		SS	6	89	14
END OF BOREHOLE	207.9 5.0				

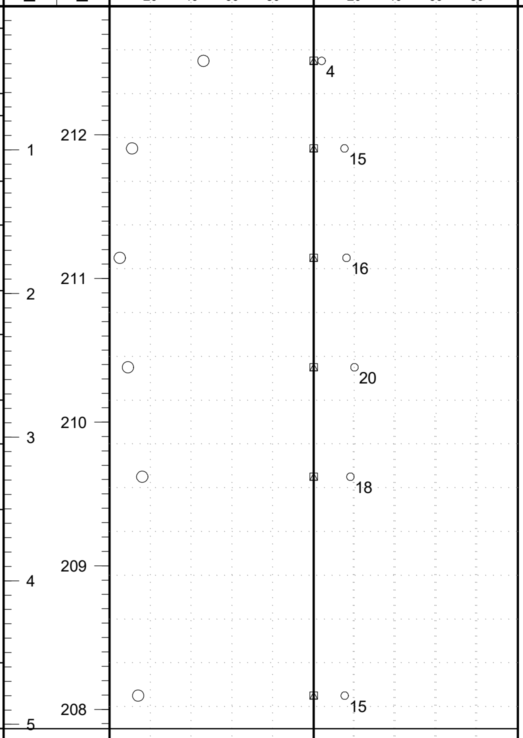
FIELD TESTING / LAB TESTING

Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Page: 1 of 1

RECORD OF BOREHOLE No. BH D36

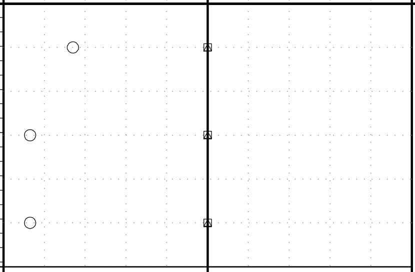
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 2+550 E:604437 N:4852462**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 211.9 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W$_P$ W W$_L$ Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
▨	brown **Sand and Gravel FILL** moist 211.3	SS	1	75	34						
▨	0.6 grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	SS	2	83	13	1	211				
▨	210.1	SS	3	75	13						
	END OF BOREHOLE 1.8										



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D37

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 2+700 E:604335 N:4852470**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 13, 2020** Date Completed: **Feb 13, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

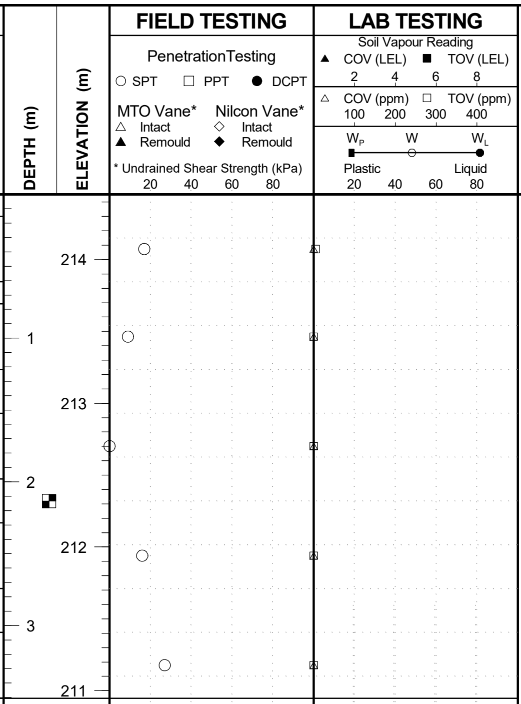
LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 214.5 m

DESCRIPTION	Elevation / Depth (m)
about 110 mm ASPHALT	214.3 0.1
brown **Sand and Gravel FILL** moist	213.8 0.7
grey / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	211.6 2.9
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	210.9
END OF BOREHOLE	3.5

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1		17
SS	2	100	9
SS	3	0	0
SS	4	100	16
SS	5	22	27



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Cave in depth after removal of augers: 2.1 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D38

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 2+700 E:604336 N:4852567**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 13, 2020** Date Completed: **Feb 13, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 215.3 m

Lithology Plot	DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
▨	brown **Sand and Gravel FILL** moist	214.7	SS	1	75	18		215		
▨	grey / brown **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	0.6	SS	2	83	12	1			
▨		213.4	SS	3	75	9		214		
	END OF BOREHOLE	1.8								

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D39

wood.

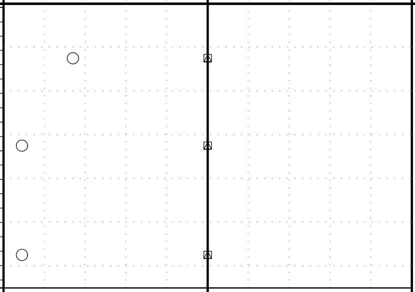
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 2+850 E:604234 N:4852659**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 213.0 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	SOIL SAMPLING: Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 150 mm ASPHALT	212.9 0.1						
brown **Sand and Gravel FILL** moist	212.3 0.7	SS	1	89	34		
dark brown / grey **Sandy Silt FILL** trace to some clay, trace gravel		SS	2	100	9	1	212
	211.0 2.0	SS	3	72	9		
END OF BOREHOLE							



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

No freestanding groundwater measured in open borehole on completion of drilling.

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Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D40

wood.

Project Number: TP115086
Project Client: City of Brampton
Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
Project Location: Clarkway Drive, Brampton, Ontario
Drilling Location: Clarkway Dr., SBL, Sta. 2+850 E:604138 N:4852764
Drilling Method: 150 mm Solid Stem Augers
Drilling Machine: Track Mounted Drill
Date Started: Feb 13, 2020 Date Completed: Feb 13, 2020
Logged by: MD
Compiled by: SN
Reviewed by: SM
Revision No.: 0, 3/25/21

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING | INSTRUMENTATION INSTALLATION | COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80
Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L Plastic Liquid 20 40 60 80
GR SA SI CL

Geodetic Ground Surface Elevation: 212.9 m

DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	COMMENTS
about 150 mm ASPHALT	212.8 0.1					Topsoil in the ditch ~ 216 mm thick.
brown **Sand and Gravel FILL** moist		SS	1	100	50 / 150mm	
		SS	2	89	20	
grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	211.5 1.4	SS	3	83	10	
		SS	4	56	7	
		SS	5	50	16	
grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to stiff	208.9 4.0	SS	6	94	8	
END OF BOREHOLE	207.9 5.0					

DEPTH (m): 1 2 3 4 5
ELEVATION (m): 212 211 210 209 208

50
150 mm

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▽ Groundwater encountered on completion of drilling on 2/13/2020 at a depth of: 2.7 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D41

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Dr., NBL, Sta. 3+000 E:604141 N:4852766	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 13, 2020 Date Completed: Feb 13, 2020	Revision No.:	0, 3/25/21

LITHOLOGY PROFILE / SOIL SAMPLING / FIELD TESTING / LAB TESTING / INSTRUMENTATION INSTALLATION / COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Field Testing: Penetration Testing ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Lab Testing: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 213.9 m

Elevation / Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water Content (%)	GR	SA	SI	CL
213.8 / 0.1	**about 110 mm ASPHALT**									
212.6 / 1.3	brown **Sand and Gravel FILL** moist	SS	1	100	50 / 150mm	4	35	50	13	2
		SS	2	89	45	7				
211.7 / 2.1	grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel	SS	3	100	12	16				
	END OF BOREHOLE									

Depth (m): 1, 2. Elevation (m): 213, 212.

SPT plot label: 50 150 mm

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

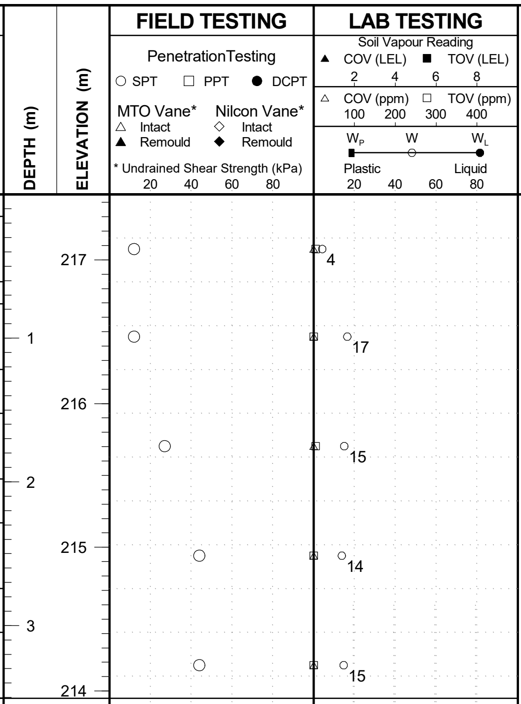
RECORD OF BOREHOLE No. BH D43

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 3+150 E:604009 N:4852887**	Logged by:	**MD**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 11, 2020** Date Completed: **Feb 11, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 217.5 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 130 mm ASPHALT	217.3 0.1				
brown **Sand and Gravel FILL** moist	217.2 0.3	SS	1	83	12
dark grey /brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	216.1 1.4	SS	2	100	12
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard		SS	3	100	27
		SS	4	100	44
--------- grey	214.0	SS	5	89	44
END OF BOREHOLE	3.5				



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D44

wood.

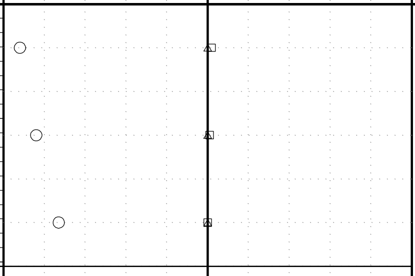
Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 3+150 E:604007 N:4852886**	Logged by:	**MD**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 11, 2020** Date Completed: **Feb 11, 2020**	Revision No.:	**0, 3/25/21**

Geodetic Ground Surface Elevation: 216.8 m

LITHOLOGY PROFILE DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
Sand and Gravel FILL	216.7 0.1				
brown / dark grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace gravel, trace organics		SS	1	83	8
	215.6 1.2	SS	2	75	16
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	215.0 1.8	SS	3	88	27
END OF BOREHOLE					

DEPTH (m): 1

ELEVATION (m): 216, 215



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D45

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 3+300 E:603917 N:4852984**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 218.8 m

DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 130 mm ASPHALT	218.7				
Sand and Gravel FILL	0.1 218.5				
brown / grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.3	SS	1	100	9
	217.6	SS	2	83	14
brown / grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard	1.2 217.0	SS	3	100	36
END OF BOREHOLE	1.8				

FIELD TESTING

Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

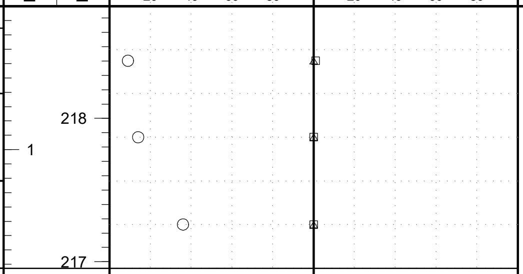
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D47

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 3+450 E:603816 N:4853079**	Logged by:	**MD**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 11, 2020** Date Completed: **Feb 11, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 219.9 m

DESCRIPTION	ELEVATION (m) DEPTH (m)
about 160 mm ASPHALT	219.8 0.2
Sand and Gravel FILL	219.6 0.3
dark brown / grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	218.5 1.4
brown / grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard ---------- grey	214.9 5.0
END OF BOREHOLE	

SOIL SAMPLING / FIELD TESTING / LAB TESTING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
SS	1	83	8	21
SS	2	89	12	17
SS	3	100	18	14
SS	4	100	41	14
SS	5	100	37	14
SS	6	94	17	17

FIELD TESTING: Penetration Testing ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; WP W WL Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

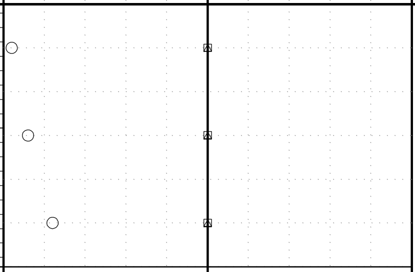
Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D48

Project Number:	TP115086	Drilling Location:	Clarkway Dr., SBL, Sta. 3+450 E:603814 N:4853078	Logged by:	MD
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 11, 2020 Date Completed: Feb 11, 2020	Revision No.:	0, 3/25/21

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation: 219.9 m	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting: ○ SPT ☐ PPT ● DCPT MTO Vane*: △ Intact ▲ Remould Nilcon Vane*: ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Sand and Gravel FILL	219.7 0.1										
	dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	1	75	4						
		218.6 1.2	SS	2	100	12	1	219				
	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	218.0 1.8	SS	3	100	24						
	END OF BOREHOLE											



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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D49

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 3+600 E:603698 N:4853200**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE		SOIL SAMPLING				COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
DESCRIPTION Geodetic Ground Surface Elevation: 220.8 m		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
about 120 mm ASPHALT	220.6 0.1								
Sand and Gravel FILL	220.4 0.3								
brown / grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	1	83	6				
		SS	2	89	10				
		SS	3	100	8				
brown **SILTY CLAY TILL** trace to some sand, trace gravel very stiff	218.6 2.1								
		SS	4	100	23				
------- grey		SS	5	100	28	2	19	48	31
END OF BOREHOLE	217.3 3.5								

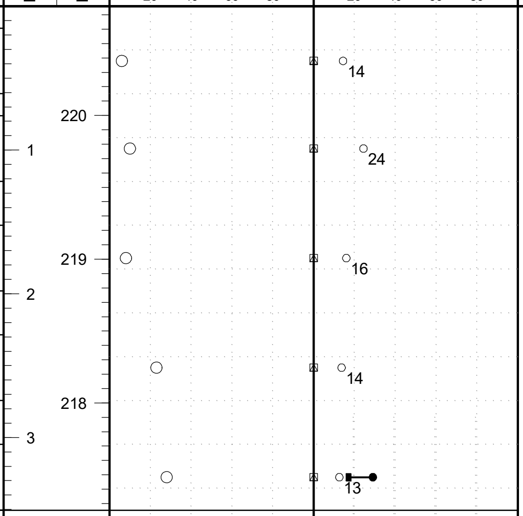
FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION



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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D50

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 3+600 E:603700 N:4853201**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING**

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
Geodetic Ground Surface Elevation: 220.8 m							
Sand and Gravel FILL	220.7 0.1						
brown / grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics		SS	1	79	7		
	219.6 1.2	SS	2	83	13	1	220
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	219.0 1.8	SS	3		24		219
END OF BOREHOLE							

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH D51

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 3+750 E:603599 N:4853290**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING

Geodetic Ground Surface Elevation: 221.5 m

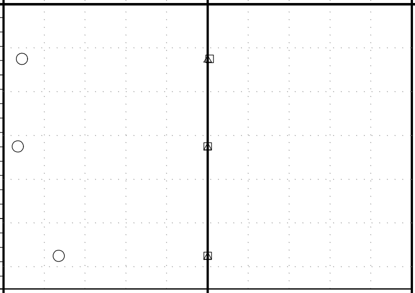
Lithology Plot	DESCRIPTION	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
	about 100 mm ASPHALT	221.4 0.1						
	Sand and Gravel FILL	221.2 0.2						
	dark brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel		SS	1	89	9		221
			SS	2	100	7	1	
		220.1 1.4						220
	brown / grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff	219.5 2.0	SS	3	100	27		
	END OF BOREHOLE							

FIELD TESTING

Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 100 200 300 400
W_P W W_L
Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH D53

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 3+900 E:603497 N:4853398**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 222.0 m

Lithology Plot	DESCRIPTION	
	about 130 mm ASPHALT	221.9 0.1
	Sand and Gravel FILL	221.7 0.3
	brown / dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	219.9 2.1
	brown / grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel very stiff to hard --------- grey	217.0 5.0
	END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	94	13
SS	2	100	10
SS	3	100	16
SS	4	100	29
SS	5	100	22
SS	6	100	36

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
20 40 60 80

LAB TESTING

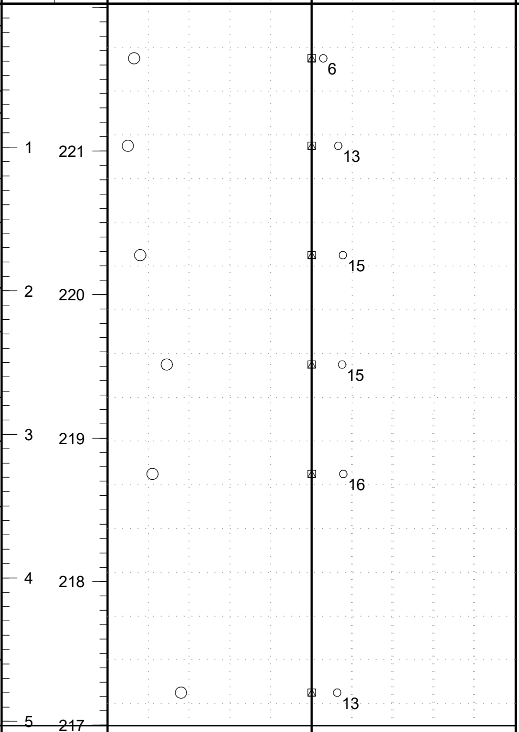
Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL)
2 4 6 8
△ COV (ppm) ☐ TOV (ppm)
100 200 300 400
W

W_P W W_L
Plastic Liquid
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH D54

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

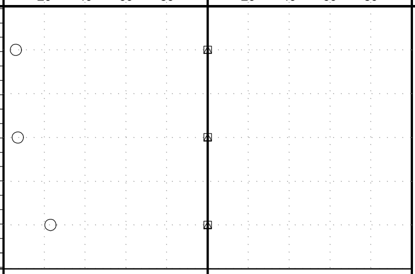
Drilling Location: **Clarkway Dr., NBL, Sta. 3+900 E:603499 N:4853399**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 12, 2020** Date Completed: **Feb 12, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 221.7 m

LITHOLOGY PROFILE: DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
Sand and Gravel FILL	221.6 0.1				
brown / dark brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	221.1 0.6	SS	1	100	6
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel firm to very stiff	219.9 1.8	SS	2	83	7
		SS	3	33	23
END OF BOREHOLE					

DEPTH (m): 1
ELEVATION (m): 221, 220



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH D55

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

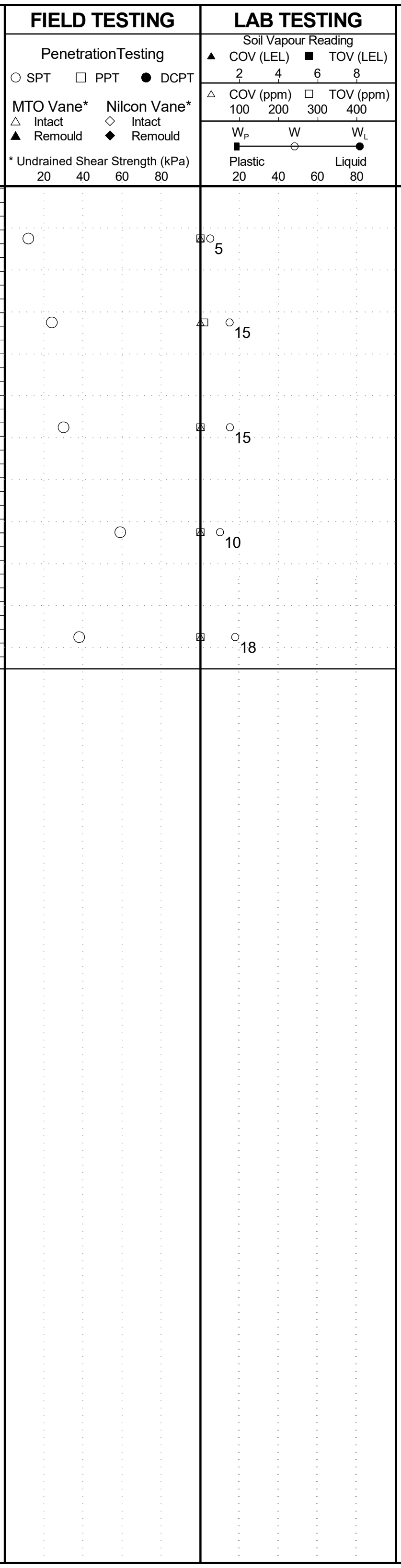
Drilling Location: **Clarkway Dr., SBL, Sta. 4+050 E:603388 N:4853502**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 11, 2020** Date Completed: **Feb 11, 2020**

Logged by: **MD**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 222.5 m

DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 150 mm ASPHALT	222.4						
Sand and Gravel FILL	222.2 0.1						
brown / grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	0.3	SS	1	89	12		222
		SS	2	94	24	1	
	221.1						
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel hard	1.4	SS	3	100	30		221
						2	
		SS	4	100	59		220
						3	
	219.0	SS	5	100	38		
END OF BOREHOLE	3.5						



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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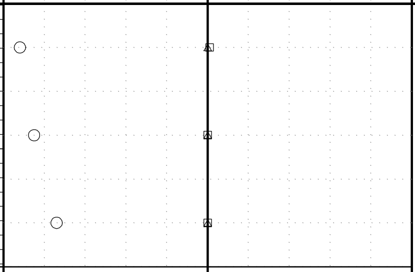
Scale: 1 : 53

RECORD OF BOREHOLE No. BH D56

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 4+050 E:603380 N:4853532**	Logged by:	**MD**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 11, 2020** Date Completed: **Feb 11, 2020**	Revision No.:	**0, 3/25/21**

Geodetic Ground Surface Elevation: 222.0 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR / SA / SI / CL
Sand and Gravel FILL	221.9 0.2								
brown / dark brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	221.4 0.6	SS	1	75	8				
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to very stiff		SS	2	92	15	1	221		
	220.2 1.8	SS	3	46	26				
END OF BOREHOLE									



$\underline{\nabla}$ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH D57

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., NBL, Sta. 4+200 E:603286 N:4853614**	Logged by:	**MD**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 12, 2020** Date Completed: **Feb 12, 2020**	Revision No.:	**0, 3/25/21**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 223.6 m

DESCRIPTION	Elevation / Depth (m)
about 85 mm ASPHALT	223.5 0.1
about 180 mm CONCRETE	223.4 0.3
dark grey **Silty Clay / Clayey Silt FILL** trace sand, trace gravel	222.9 0.7
brown / grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel stiff to very stiff	221.6 2.0
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
SS	1	94	6
SS	2	100	13
SS	3	89	20

DEPTH (m): 1

ELEVATION (m): 223, 222

FIELD TESTING

PenetrationTesting

○ SPT ☐ PPT ● DCPT

MTO Vane* △ Intact ▲ Remould

Nilcon Vane* ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

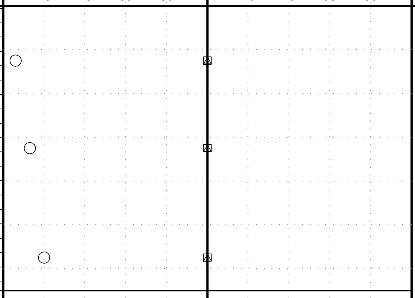
Soil Vapour Reading

▲ COV (LEL) ■ TOV (LEL) 2 4 6 8

△ COV (ppm) ☐ TOV (ppm) 100 200 300 400

W_P W W_L

Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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$\overline{\nabla}$ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH S13

wood.

Project Number:	**TP115086**	Drilling Location:	**Clarkway Dr., SBL, Sta. 2+275 E:604621 N:4852286**	Logged by:	**MM**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**SN**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM**
Project Location:	**Clarkway Drive, Brampton, Ontario**	Date Started:	**Feb 25, 2020** Date Completed: **Feb 25, 2020**	Revision No.:	**0, 3/30/21**

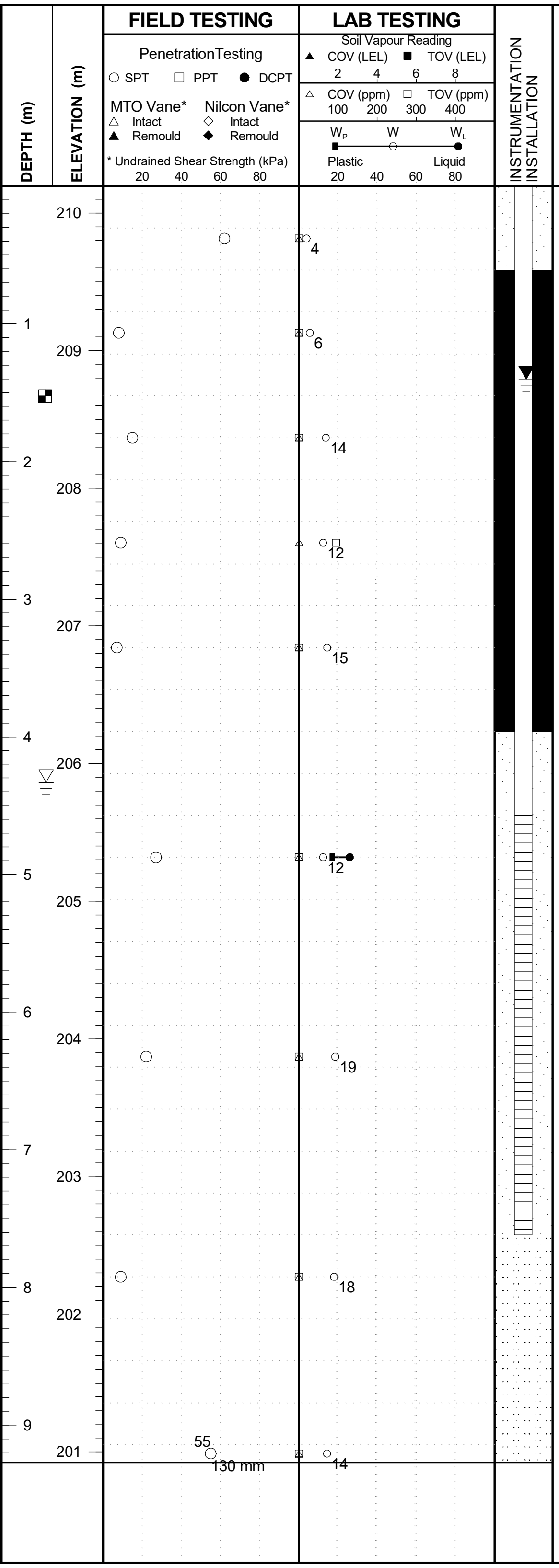
LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 210.2 m

DESCRIPTION	Elevation (m)	Depth (m)
about 80 mm ASPHALT	210.1	0.1
brown **Sand and Gravel FILL** trace to some silt moist	209.2	1.0
greyish brown **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel, trace organics	206.1	4.1
grey **SILTY CLAY TILL** some sand, trace gravel very stiff	204.6	5.6
grey **SILTY SAND / SAND AND SILT TILL** trace clay, trace gravel, cobbles/boulders loose to very dense moist to wet	200.9	9.3
END OF BOREHOLE		

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water content (%)	GR	SA	SI	CL
SS	1	100	62	4				
SS	2	63	8	6				
SS	3	100	15	14				
SS	4	100	9	12				
SS	5	100	7	15				
SS	6	100	27	12	3	16	50	31
SS	7	133	22	19				
SS	8	100	9	18				
SS	9	100	55 / 130mm	14				



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: 4.3 m. ▞ Cave in depth after removal of augers: 1.5 m.

▼ Groundwater depth observed on 5/12/2020 at a depth of: 1.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH S13

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Clarkway Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Sand: 0.0 - 0.6 m Bentonite: 0.6 - 4.0 m Sand Filter: 4.0 - 7.6 m Screen: 4.6 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 12 May 2020: 1.4 m										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S14

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., NBL, Sta. 2+275 E:604618 N:4852293**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 25, 2020** Date Completed: **Feb 25, 2020**

Logged by: **MM**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 210.0 m

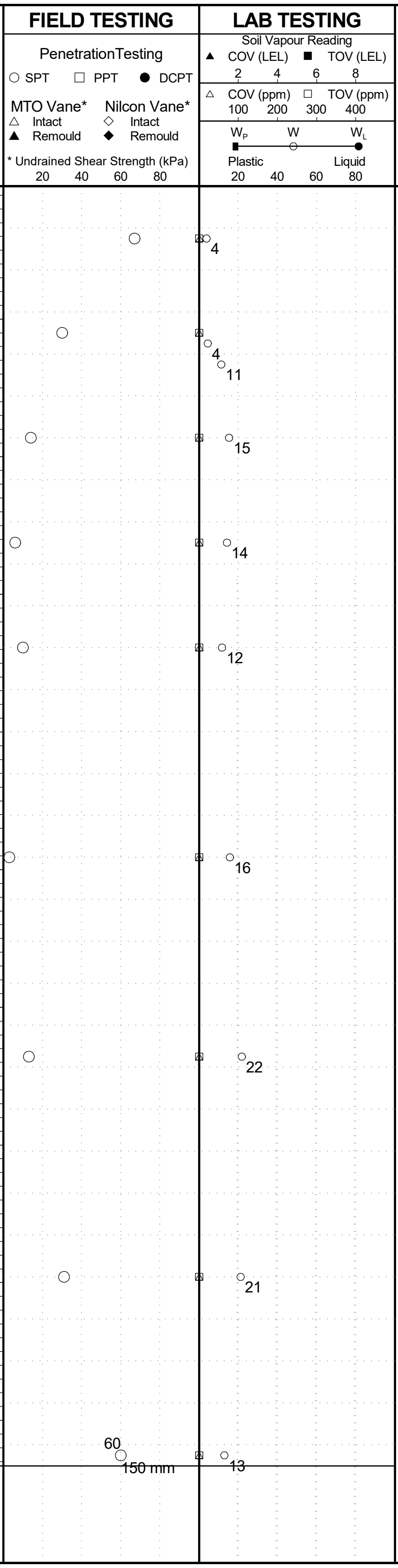
LITHOLOGY PROFILE

DESCRIPTION	Elevation (m) / Depth (m)
about 90 mm ASPHALT	209.9 0.1
grey **Sand and Gravel FILL** trace to some silt moist	208.7 1.2
brown to grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel	205.9 4.1
grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel soft to stiff	202.8 7.2
grey **SILTY SAND / SAND AND SILT TILL** trace clay, trace gravel dense to very dense moist to wet	200.7 9.3
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
SS	1	100	67				
SS	2	63	30				
SS	3	92	14				
SS	4	63	6				
SS	5	100	10				
SS	6	83	3				
SS	7	133	13				
SS	8	67	31	- Non-plastic	51	47	2
SS	9	100	60 / 150mm				

DEPTH (m)	ELEVATION (m)
1	209
2	208
3	207
4	206
5	205
6	204
7	203
8	202
9	201



INSTRUMENTATION INSTALLATION

Wood E&IS, a Division of Wood Canada Limited

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Canada
Tel. No.: (905) 415-2632
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∇ Groundwater encountered on completion of drilling on 2/25/2020 at a depth of: 4.1 m.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S15

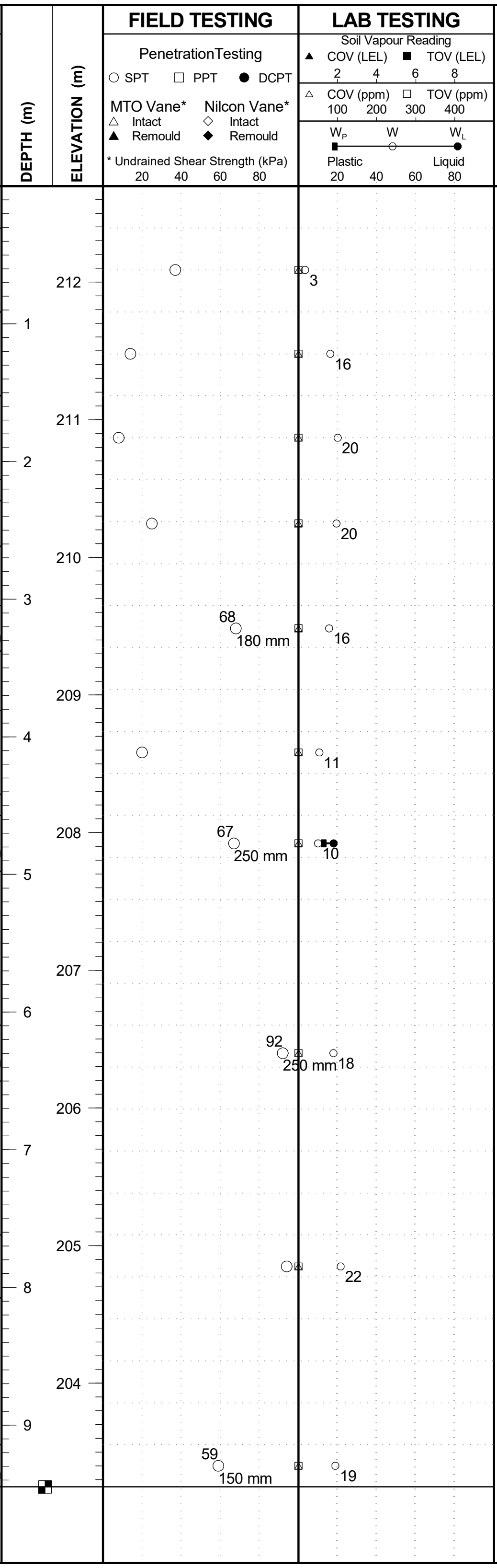
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Clarkway Drive, Brampton, Ontario**

Drilling Location: **Clarkway Dr., SBL, Sta. 3+325 E:604169 N:4852729**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Feb 24, 2020** Date Completed: **Feb 24, 2020**

Logged by: **MS**
Compiled by: **SN**
Reviewed by: **SM**
Revision No.: **0, 3/25/21**

Geodetic Ground Surface Elevation: 212.7 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
about 100 mm ASPHALT	212.6 0.1								
grey **Sand and Gravel FILL** trace to some silt moist		SS	1	79	37				
brown **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel	211.8 0.9	SS	2	42	14				
		SS	3	100	8				
grey **SILTY CLAY / CLAYEY SILT TILL** trace sand to sandy, trace gravel, cobbles/boulders very stiff to hard	210.5 2.2	SS	4	185	25				
		SS	5	100	68 / 180mm				
		SS	6	46	20				
		SS	7	100	67 / 250mm	6	31	46	17
		SS	8	100	92 / 250mm				
		SS	9	89	94				
		SS	10	100	59 / 150mm				
END OF BOREHOLE	203.2 9.4								



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▚ Cave in depth after removal of augers: 9.4 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH S16

wood.

Project Number:	TP115086	Drilling Location:	Clarkway Dr., NBL, Sta. 3+325 E:604158 N:4852745	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	SN
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM
Project Location:	Clarkway Drive, Brampton, Ontario	Date Started:	Feb 24, 2020 Date Completed: Feb 24, 2020	Revision No.:	0, 3/30/21

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 213.0 m

DESCRIPTION	Elevation (m) / Depth (m)
about 90 mm **ASPHALT**	213.0 0.1
grey **Sand and Gravel FILL** trace to some silt moist	212.1 0.9
dark grey **Silty Clay / Clayey Silt FILL** trace to some sand, trace to some gravel	210.8 2.2
brown to grey **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, cobbles/boulders very stiff to hard --------- grey	203.3 9.8
END OF BOREHOLE	

SOIL SAMPLING / FIELD TESTING / LAB TESTING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
SS	1	100	32	11
SS	2	83	14	12
SS	3	100	8	24
SS	4	100	22	16
SS	5	100	37	14
SS	6	100	29	12
SS	7	100	62	9
SS	8	100	50 / 100mm	12
SS	9	100	70 / 150mm	8
SS	10	100	71	16

DEPTH (m)	ELEVATION (m)
1	212
2	211
3	210
4	209
5	208
6	207
7	206
8	205
9	204

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

Plot labels: 50 100 mm; 70 150 mm

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 100 200 300 400; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

▼ Groundwater depth observed on 5/12/2020 at a depth of: 3.2 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

Continued on Next Page

RECORD OF BOREHOLE No. BH S16

Project Number: **TP115086**

Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**

Project Location: **Clarkway Drive, Brampton, Ontario**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ☐ PPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8 △ COV (ppm) ☐ TOV (ppm) 100 200 300 400 W_P W W_L Plastic Liquid 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	50 mm dia. monitoring well with flushmount protective casing installed (depth below ground surface): Concrete: 0.0 - 0.3 m Sand: 0.3 - 0.6 m Bentonite: 0.6 - 5.5 m Sand Filter: 5.5 - 6.1 m Screen: 6.1 - 9.1 m Groundwater measurements in monitoring well (depth below ground surface): 12 May 2020: 3.2 m										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

SECTION E
EAST – WEST ARTERIAL ROAD
(FROM THE GORE ROAD TO COLERAINE DRIVE, ~2.4 KM)

RECORD OF BOREHOLES

RECORD OF BOREHOLE No. BH E1

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

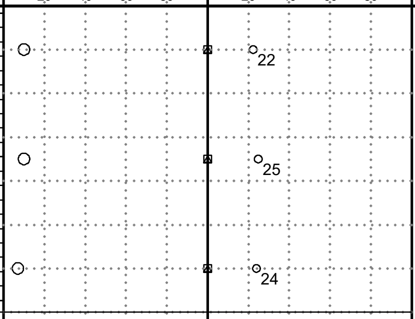
Drilling Location: **E-W Arterial Road, Sta. 0+000 E:604583 N:4850435**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Truck Mounted Drill**
Date Started: **Jan. 11, 2022** Date Completed: **Jan. 11, 2022**

Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

Geodetic Ground Surface Elevation: 203.0 m

LITHOLOGY PROFILE – DESCRIPTION	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm TOPSOIL	202.9 0.1				
brown **Silty Clay FILL** trace gravel, trace organics		SS	1	42	10
brown **SILTY CLAY / CLAYEY SILT TILL** trace gravel, oxidation firm to stiff	202.4 0.7	SS	2	46	10
------- grey		SS	3	75	7
END OF BOREHOLE	200.9 2.1				

DEPTH (m): 1, 2
ELEVATION (m): 202, 201



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH E2

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**
Drilling Location: **E-W Arterial Road, Sta. 0+100 E:604641 N:4850507**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 11, 2022** Date Completed: **Jan. 11, 2022**
Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 204.6 m

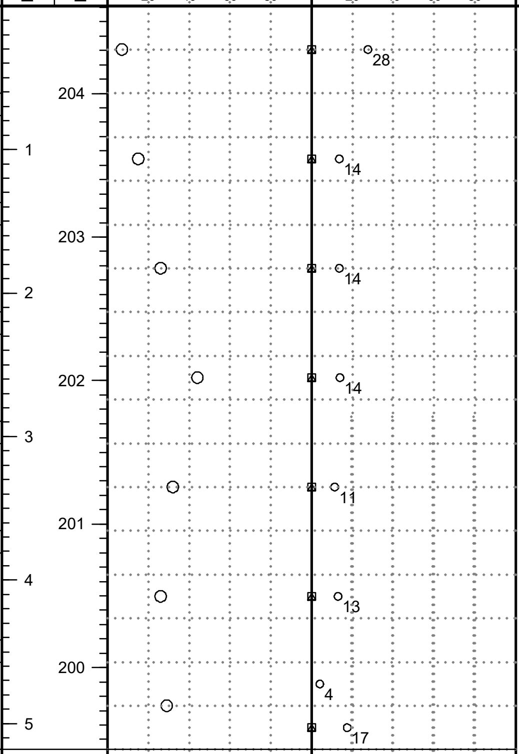
DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 76 mm TOPSOIL	204.5 0.1				
dark brown **Silty Clay FILL** trace gravel, trace cobbles, trace organics/rootlets	203.9 0.7	SS	1	38	7
brown **SILTY CLAY TILL** trace sand, trace gravel, oxidation very stiff to hard		SS	2	100	15
------- brownish grey		SS	3	50	26
		SS	4	100	44
------- grey		SS	5	83	32
		SS	6	71	26
about 100 mm of sandy seam with gravel	199.4	SS	7	79	29
END OF BOREHOLE	5.2				

FIELD TESTING

Penetration Testing: ○ SPT ☐ PPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 20 40 60 80
W_P W W_L Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E3

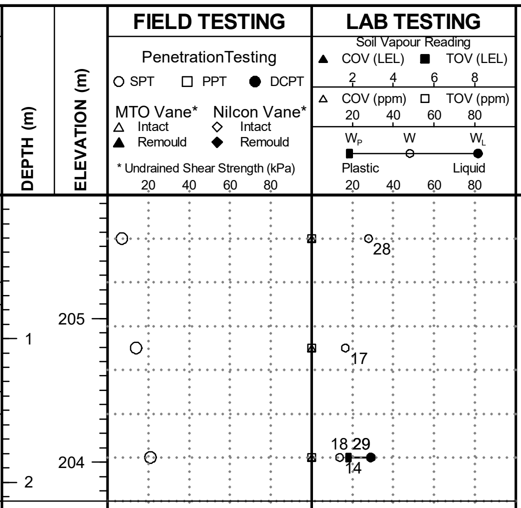
wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**
Drilling Location: **E-W Arterial Road, Sta. 0+200 E:604703 N:4850585**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 11, 2022** Date Completed: **Jan. 11, 2022**
Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

Geodetic Ground Surface Elevation: 205.9 m

LITHOLOGY PROFILE		SOIL SAMPLING				COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
DESCRIPTION		Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	GR	SA	SI	CL
about 76 mm TOPSOIL	205.8 0.1								
dark brown **Silty Clay FILL** some sand, trace gravel, trace organics	205.2 0.7	SS	1	42	7				
brown / brownish grey **SILTY CLAY TILL** some sand to sandy, trace gravel, oxidation stiff to very stiff		SS	2	100	14				
	203.7 2.1	SS	3	100	21	1	22	50	27
END OF BOREHOLE									

DEPTH (m) ELEVATION (m) INSTRUMENTATION INSTALLATION



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

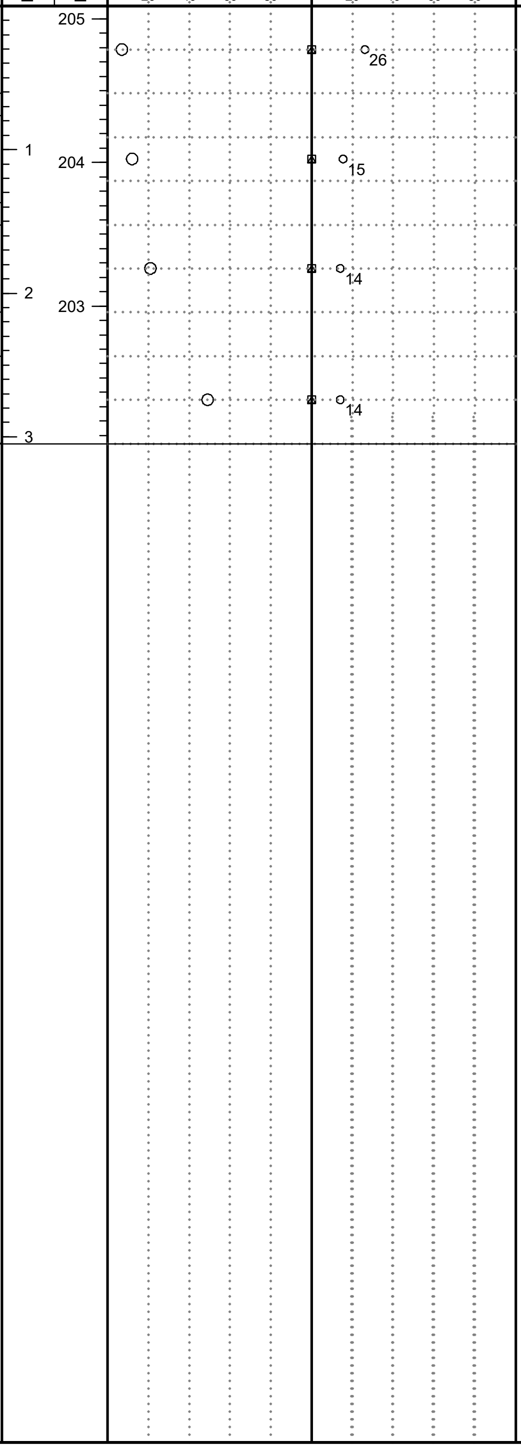
RECORD OF BOREHOLE No. BH E4

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**
Drilling Location: **E-W Arterial Road, Sta. 0+300 E:604766 N:4850663**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 11, 2022** Date Completed: **Jan. 11, 2022**
Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

Geodetic Ground Surface Elevation: 205.1 m

DESCRIPTION	Elevation (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 76 mm TOPSOIL	205.0 0.1				
dark brown **Silty Clay FILL** trace sand, trace gravel, trace organics	204.4 0.7	SS	1	79	7
brown **SILTY CLAY TILL** trace to some sand, trace gravel, oxidation stiff to hard		SS	2	100	12
		SS	3	100	21
trace cobbles	202.0 3.0	SS	4	33	49
END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E5

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **E-W Arterial Road, Sta. 0+400 E:604828 N:4850742**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 11, 2022** Date Completed: **Jan. 11, 2022**

Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

LITHOLOGY PROFILE / SOIL SAMPLING

Geodetic Ground Surface Elevation: 203.2 m

DESCRIPTION	Elevation / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm TOPSOIL	203.1 0.1				
dark brown / brown **Silty Clay FILL** some sand, trace gravel, trace organics	202.6 0.7	SS	1	83	7
brown **SANDY SILT TILL** trace clay, trace gravel, oxidation clay seams in SS2 loose to compact moist		SS	2	100	6
	201.1	SS	3	100	29
END OF BOREHOLE	2.1				

FIELD TESTING

PenetrationTesting
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

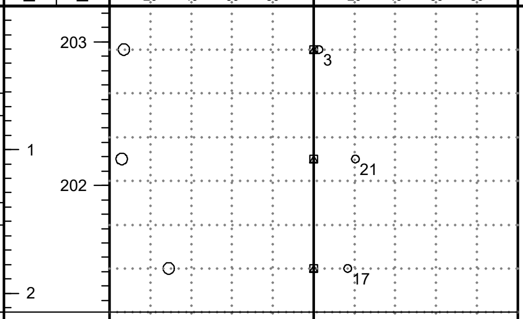
LAB TESTING

Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 20 40 60 80
W_P W W_L
Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL



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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF MONITORING WELL No. BH S17

wood.

Project Number:	**TP115086**	Drilling Location:	**E-W Arterial Road, Culvert E:604874 N:4850797**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan. 12, 2022** Date Completed: **Jan. 12, 2022**	Revision No.:	**0, 5/2/22**

LITHOLOGY PROFILE

Geodetic Ground Surface Elevation: 202.6 m

Elevation (m) / Depth (m)	DESCRIPTION
202.5 0.1	**about 100 mm TOPSOIL**
201.9 0.7	dark brown / brown **Sandy Silt FILL** trace clay, trace gravel, trace cobbles, trace organics moist
197.1 5.5	brown **SILTY SAND / SANDY SILT TILL** trace clay, trace gravel, trace cobbles, oxidation in SS2 and SS3 very dense moist ------- grey ------- wet
195.6 7.0	grey **WEATHERED SHALE** mixed with clayey soil
	END OF BOREHOLE

50 mm dia. monitoring well with 1.0 m stick-up protective casing installed (depth below ground surface):

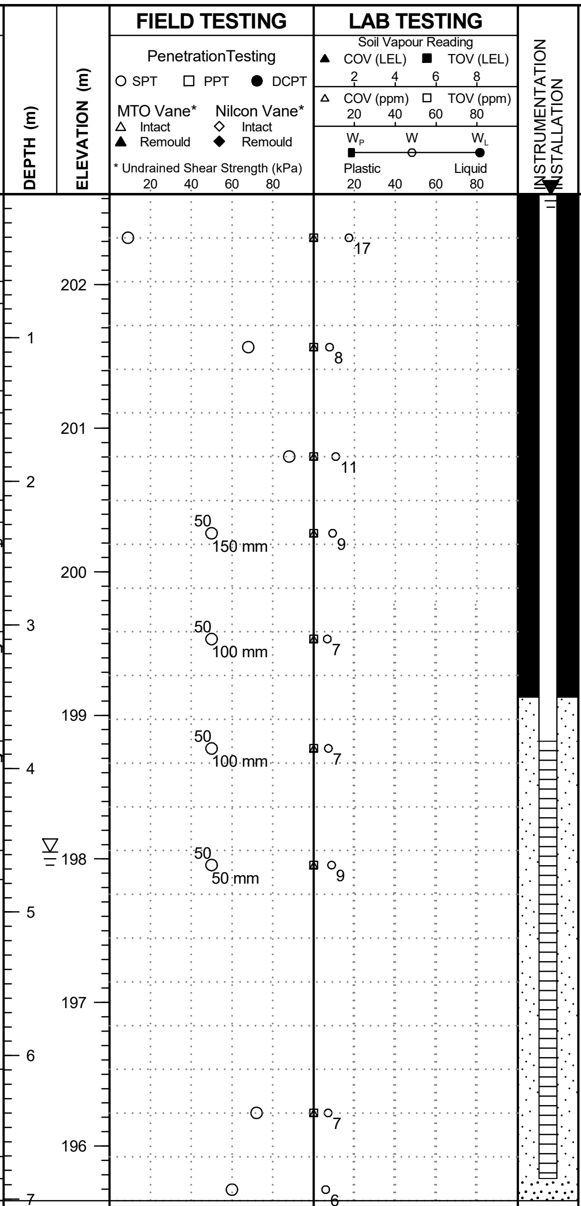
Bentonite: 0.0 - 3.4 m
Sand Filter: 3.4 - 6.9 m
Screen: 3.8 - 6.9 m

Groundwater level measured in monitoring well:

26 Jan 2022: 3.3 m
1 Apr 2022 : 0.0 m

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)	GR	SA	SI	CL
SS	1	100	9	17				
SS	2	100	68	8				
SS	3	100	88	11				
SS	4	100	50 / 150mm	9				
SS	5	100	50 / 100mm	7	7	41	49	3
SS	6	100	50 / 100mm	7				
SS	7	100	50 / 50mm	9				
SS	8	100	72	7				
SS	9	100	60	6				



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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∇ Groundwater level was inferred from soil conditions during drilling

▼ Groundwater depth observed on 4/1/2022 at a depth of: 0.0 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E6 / S18

wood.

Project Number:	**TP115086**	Drilling Location:	**E-W Arterial Road, Sta. 0+500 E:604885 N:4850810**	Logged by:	**MM**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**PR**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan. 12, 2022** Date Completed: **Jan. 12, 2022**	Revision No.:	**0, 5/2/22**

FIELD TESTING – Penetration Testing: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING – Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80; WP W WL Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 204.8 m

Elevation (m) / Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water Content (%)	Comments & Grain Size Distribution (%) GR / SA / SI / CL
204.7 0.1	**about 76 mm TOPSOIL**						
	dark brown / brown **Silty Clay FILL** trace gravel, trace cobbles, trace organics	SS	1	100	6	29	
204.1 0.7	brown **SILTY CLAY TILL** trace gravel, trace cobbles, oxidation hard	SS	2	100	30	12	
		SS	3	100	36	14	
202.6 2.2	brown **SILTY SAND / SANDY SILT TILL** trace clay, trace gravel, trace cobbles, oxidation in SS5 very dense moist	SS	4	100	50 / 80mm	7	
		SS	5	100	50 / 80mm	8	
	------- grey and wet	SS	6	100	84 / 100mm	13	
		SS	7	100	50 / 150mm	10	
		SS	8	100	64 / 150mm	8	
		SS	9	100	50 / 80mm	14	6 / 34 / 59 / 1
196.3 8.5	grey **Weathered SHALE**	SS	10	100	50 / 50mm	7	
195.4 9.3	**END OF BOREHOLE**						

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∇ Groundwater level was inferred from soil conditions during drilling

▞ Cave in depth after removal of augers: 4.6 m.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified Geotechnical Engineer or Professional Geoscientist. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E7

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **E-W Arterial Road, Sta. 0+600 E:604955 N:4850896**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 12, 2022** Date Completed: **Jan. 12, 2022**

Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

LITHOLOGY PROFILE

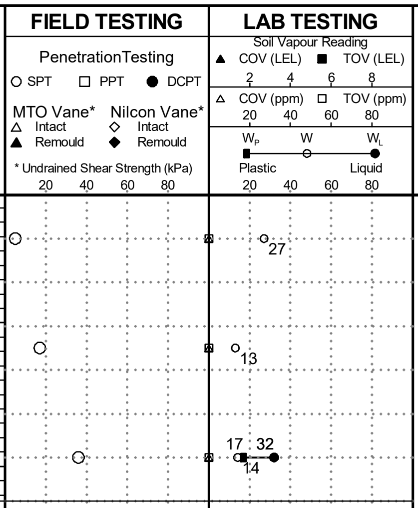
Geodetic Ground Surface Elevation: 204.9 m

DESCRIPTION	Elevation (m) / Depth (m)
about 76 mm TOPSOIL	204.8 0.1
dark brown / brown **Silty Clay FILL** some sand, trace gravel, trace organics	204.2 0.7
brown **SILTY CLAY / CLAYEY SILT TILL** some sand, trace gravel, oxidation very stiff to hard	202.8 2.1
END OF BOREHOLE	

SOIL SAMPLING

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	Water content W (%)	W_P : W_L	GR	SA	SI	CL
SS	1	33	5	27					
SS	2	100	17	13					
SS	3	100	36	14	17 : 32	5	17	46	32

DEPTH (m): 1, 2
ELEVATION (m): 204, 203



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E23

wood.

Project Number:	TP115086	Drilling Location:	E-W Arterial Road, Sta. 2+200 E:605606 N:4852284	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	ZF/KC
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Jan. 13, 2022 Date Completed: Jan. 13, 2022	Revision No.:	0, 3/17/22

Geodetic Ground Surface Elevation: 210.7 m

DESCRIPTION	Elevation (m)	Depth (m)
about 76 mm TOPSOIL	210.6	0.1
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics, oxidation	210.0	0.7
brown / light brown **SILTY CLAY / CLAYEY SILT TILL** some sand to sandy, trace gravel, oxidation stiff to very stiff	208.5	2.1
END OF BOREHOLE		2.1

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W_P	W	W_L	GR	SA	SI	CL
SS	1	100	3		28					
SS	2	100	10		18					
SS	3	100	27	15	9	25	1	28	51	20

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80; W_P W W_L Plastic Liquid 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH E24

wood.

Project Number:	TP115086	Drilling Location:	E-W Arterial Road, Sta. 2+300 E:605614 N:4852383	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	ZF/KC
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Jan. 13, 2022 Date Completed: Jan. 13, 2022	Revision No.:	0, 3/17/22

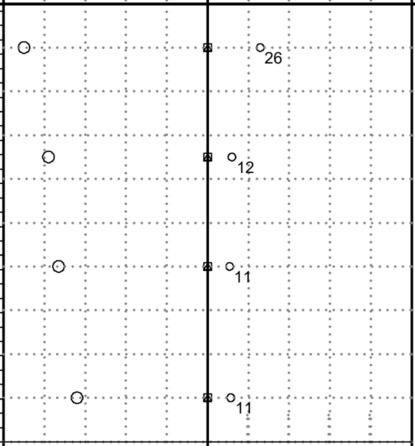
Geodetic Ground Surface Elevation: 210.7 m

LITHOLOGY PROFILE: DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 76 mm TOPSOIL	210.7 0.1				
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics		SS	1	100	10
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, trace cobbles, oxidation very stiff to hard	210.1 0.7	SS	2	100	22
		SS	3	100	27
brownish grey		SS	4	100	36
END OF BOREHOLE	207.7 3.0				

DEPTH (m): 1, 2, 3 — ELEVATION (m): 210, 209, 208

FIELD TESTING — PenetrationTesting: ○ SPT ☐ PPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING — Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80; W_P W W_L Plastic Liquid 20 40 60 80



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E25

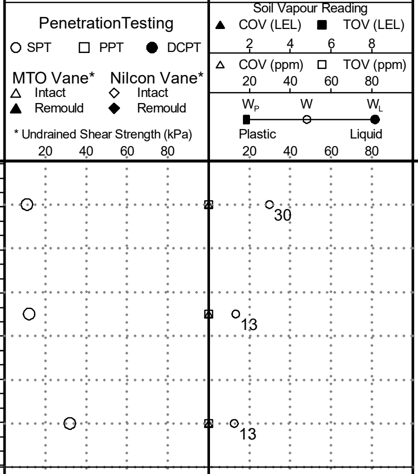
wood.

Project Number:	**TP115086**	Drilling Location:	**E-W Arterial Road, Sta. 2+400 E:605628 N:4852476**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**ZF/KC**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan. 13, 2022** Date Completed: **Jan. 13, 2022**	Revision No.:	**0, 3/17/22**

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | INSTRUMENTATION INSTALLATION | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Geodetic Ground Surface Elevation: 209.3 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)
about 76 mm TOPSOIL	209.2 0.1						
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	208.6	SS	1	100	11		209
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, trace cobbles, oxidation stiff to hard	0.7	SS	2	100	12	1	208
sandy/silty seams	207.2	SS	3	100	32	2	
END OF BOREHOLE	2.1						



GR SA SI CL

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH E26

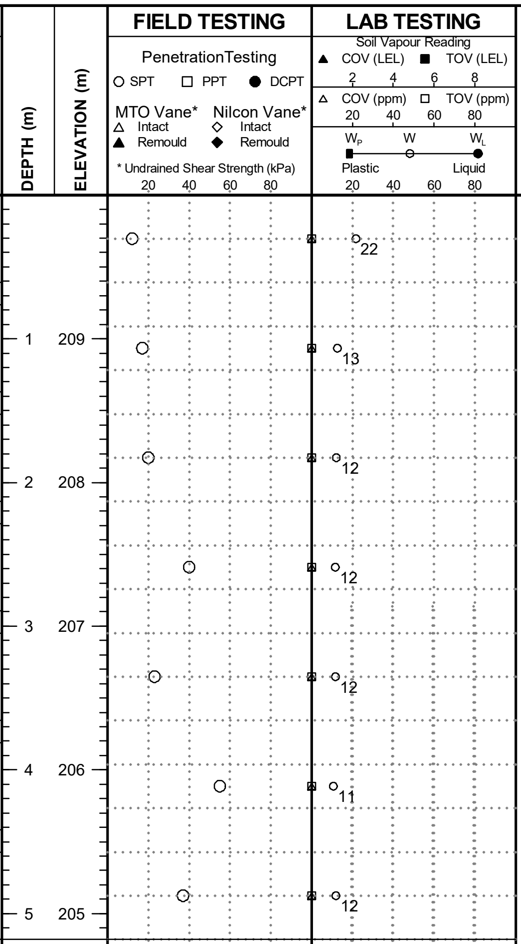
wood.

Project Number:	**TP115086**	Drilling Location:	**E-W Arterial Road, Sta. 2+500 E:605650 N:4852571**	Logged by:	**MS**
Project Client:	**City of Brampton**	Drilling Method:	**150 mm Solid Stem Augers**	Compiled by:	**ZF/KC**
Project Name:	**Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**	Drilling Machine:	**Track Mounted Drill**	Reviewed by:	**SM/DP**
Project Location:	**Brampton, Ontario**	Date Started:	**Jan. 13, 2022** Date Completed: **Jan. 13, 2022**	Revision No.:	**0, 3/17/22**

Geodetic Ground Surface Elevation: 210.0 m

Elevation (m) / Depth (m)	DESCRIPTION
209.9 / 0.1	**about 76 mm TOPSOIL**
209.3 / 0.7	dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics
206.3 / 3.7	brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, oxidation to SS5 very stiff to hard -------- grey
204.8 / 5.2	grey **SANDY SILT TILL** trace clay, trace gravel, dense to very dense moist to wet clayey seams
	END OF BOREHOLE

Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
SS	1	100	12	22
SS	2	100	17	13
SS	3	100	20	12
SS	4	100	40	12
SS	5	100	23	12
SS	6	100	55	11
SS	7	79	37	12



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E27

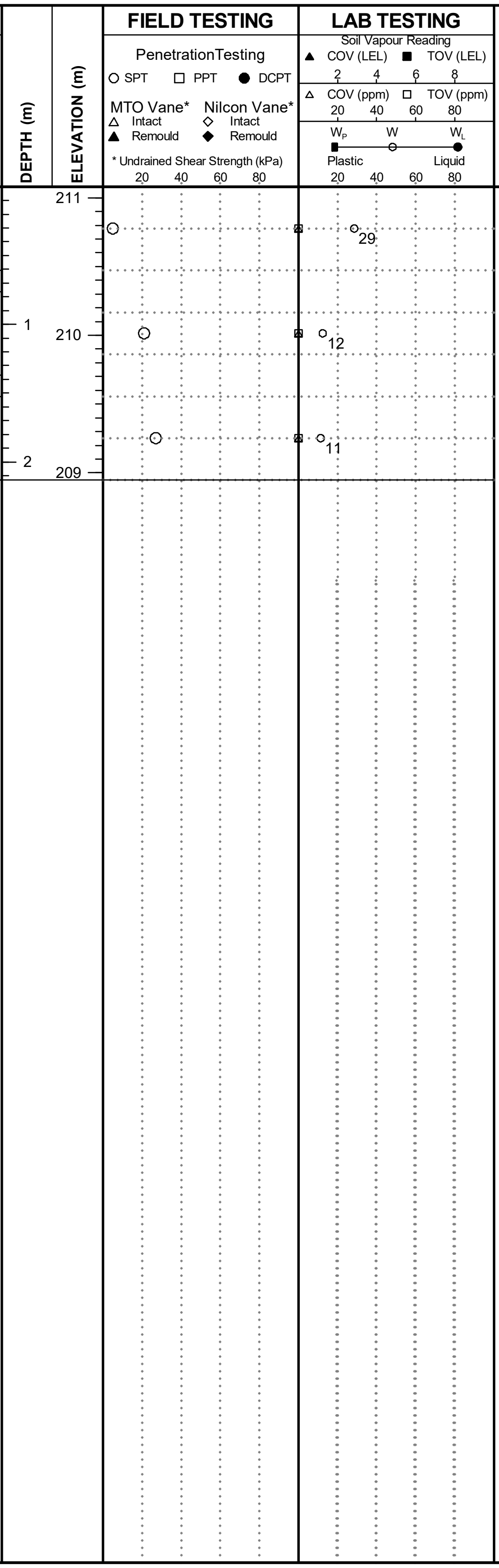
Project Number: TP115086
Project Client: City of Brampton
Project Name: Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
Project Location: Brampton, Ontario

Drilling Location: E-W Arterial Road, Sta. 2+600 E:605680 N:4852668
Drilling Method: 150 mm Solid Stem Augers
Drilling Machine: Track Mounted Drill
Date Started: Jan. 13, 2022 Date Completed: Jan. 13, 2022

Logged by: MS
Compiled by: ZF/KC
Reviewed by: SM/DP
Revision No.: 0, 3/17/22

Geodetic Ground Surface Elevation: 211.1 m

LITHOLOGY PROFILE: DESCRIPTION	Elev. (m) / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)
about 100 mm TOPSOIL	211.0 0.1				
dark brown / brown **Silty Clay FILL** trace sand, trace gravel, trace organics	210.4 0.7	SS	1	75	5
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, trace cobbles, oxidation very stiff	208.9 2.1	SS	2	100	21
		SS	3	100	27
END OF BOREHOLE					



INSTRUMENTATION INSTALLATION

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E28

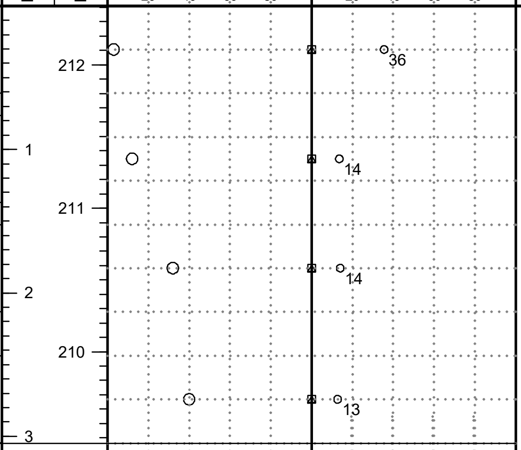
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**
Drilling Location: **E-W Arterial Road, Sta. 2+700 E:605714 N:4852764**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 13, 2022** Date Completed: **Jan. 13, 2022**
Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

FIELD TESTING
Penetration Testing
○ SPT ☐ PPT ● DCPT
MTO Vane* △ Intact ▲ Remould
Nilcon Vane* ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING
Soil Vapour Reading
▲ COV (LEL) ■ TOV (LEL) 2 4 6 8
△ COV (ppm) ☐ TOV (ppm) 20 40 60 80
W_P W W_L Plastic Liquid 20 40 60 80

COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

LITHOLOGY PROFILE – DESCRIPTION	Elev. / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
Geodetic Ground Surface Elevation: 212.4 m						
about 100 mm TOPSOIL	212.3 0.1					
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace cobbles		SS	1	83	3	36
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, trace cobbles, oxidation sandy pockets in SS2 stiff to hard	211.7 0.7	SS	2	100	12	14
		SS	3	13	32	14
		SS	4	8	40	13
END OF BOREHOLE	209.4 3.0					



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No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

RECORD OF BOREHOLE No. BH E29

wood.

Project Number:	TP115086	Drilling Location:	E-W Arterial Road, Sta. 2+800 E:605743 N:4852863	Logged by:	MS
Project Client:	City of Brampton	Drilling Method:	150 mm Solid Stem Augers	Compiled by:	ZF/KC
Project Name:	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)	Drilling Machine:	Track Mounted Drill	Reviewed by:	SM/DP
Project Location:	Brampton, Ontario	Date Started:	Jan. 13, 2022 Date Completed: Jan. 13, 2022	Revision No.:	0, 3/17/22

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | INSTRUMENTATION INSTALLATION | **COMMENTS & GRAIN SIZE DISTRIBUTION (%)** GR SA SI CL

Penetration Testing: ○ SPT ☐ PPT ● DCPT

MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

Soil Vapour Reading: ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80

WP W WL — Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 213.5 m

DESCRIPTION	Elevation / Depth (m)	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	W (%)
about 76 mm TOPSOIL	213.4 0.1					
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	212.8 0.7	SS	1	92	9	28
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, oxidation very stiff		SS	2	100	15	11
	211.3 2.1	SS	3	100	20	12
END OF BOREHOLE						

DEPTH (m): 1, 2 — ELEVATION (m): 213, 212

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH E30

wood.

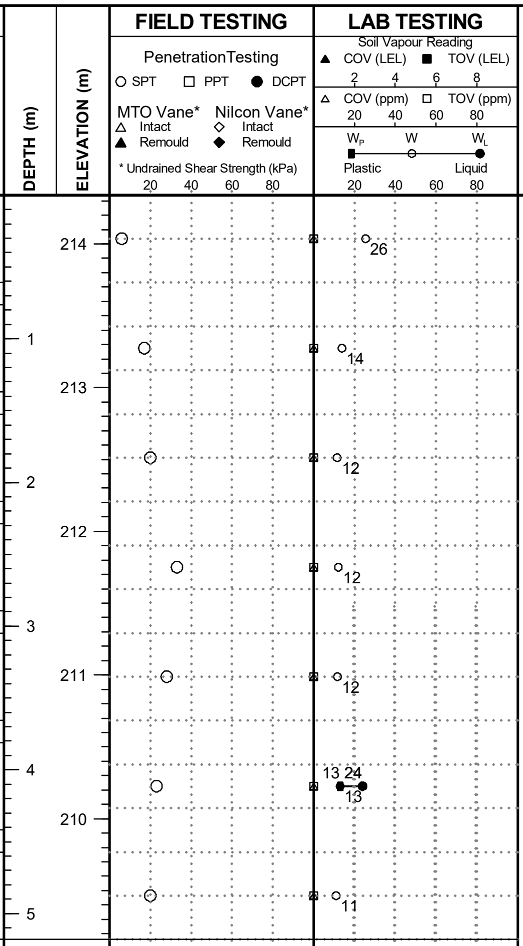
Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **E-W Arterial Road, Sta. 2+900 E:605749 N:4852965**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 13, 2022** Date Completed: **Jan. 13, 2022**

Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

Geodetic Ground Surface Elevation: 214.3 m

LITHOLOGY PROFILE		SOIL SAMPLING				INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%)			
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)		GR	SA	SI	CL
	about 76 mm TOPSOIL 214.3 0.1									
	dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics 213.7	SS	1	100	6					
	brown 0.7 **SILTY CLAY / CLAYEY SILT TILL** some sand to sandy, trace gravel, oxidation very stiff to hard	SS	2	100	17					
		SS	3	100	20					
		SS	4	100	33					
	------- greyish brown	SS	5	100	28					
	-------- grey	SS	6	100	23		1	24	52	23
	209.2	SS	7	100	20					
	END OF BOREHOLE 5.2									



No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH E31

wood.

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **E-W Arterial Road, Sta. 3+000 E:605728 N:4853064**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 13, 2022** Date Completed: **Jan. 13, 2022**

Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80; WP W WL Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 214.9 m

DESCRIPTION	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	LAB TESTING (W)	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
about 76 mm TOPSOIL	214.8 0.1									
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace organics	214.2 0.7	SS	1	100	10			29		
brown **SILTY CLAY / CLAYEY SILT TILL** trace to some sand, trace gravel, oxidation very stiff		SS	2	100	19	1	214	12		
	212.7 2.1	SS	3	100	20	2	213	12		
END OF BOREHOLE										

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No freestanding groundwater measured in open borehole on completion of drilling.

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Scale: 1 : 53

RECORD OF BOREHOLE No. BH E32

Project Number: **TP115086**
Project Client: **City of Brampton**
Project Name: **Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)**
Project Location: **Brampton, Ontario**

Drilling Location: **E-W Arterial Road, Sta. 3+100 E:605683 N:4853156**
Drilling Method: **150 mm Solid Stem Augers**
Drilling Machine: **Track Mounted Drill**
Date Started: **Jan. 13, 2022** Date Completed: **Jan. 13, 2022**

Logged by: **MS**
Compiled by: **ZF/KC**
Reviewed by: **SM/DP**
Revision No.: **0, 3/17/22**

LITHOLOGY PROFILE | SOIL SAMPLING | FIELD TESTING | LAB TESTING

FIELD TESTING: PenetrationTesting ○ SPT ☐ PPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Soil Vapour Reading ▲ COV (LEL) ■ TOV (LEL) 2 4 6 8; △ COV (ppm) ☐ TOV (ppm) 20 40 60 80; W$_P$ W W$_L$ Plastic Liquid 20 40 60 80

Geodetic Ground Surface Elevation: 215.0 m

DESCRIPTION	Elev. / Depth	Sample Type	Sample Number	Recovery (%)	SPT 'N' / RQD (%)	DEPTH (m)	ELEVATION (m)	W	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
about 76 mm TOPSOIL	214.9 0.1									
dark brown / brown **Silty Clay / Clayey Silt FILL** trace sand, trace gravel, trace cobbles, trace organics	214.3 0.7	SS	1	100	5			26		
brown **SILTY CLAY / CLAYEY SILT TILL** some sand, trace gravel, trace cobbles, oxidation very stiff to hard		SS	2	100	17	1	214	11		
		SS	3	100	18	2	213	12		
------------ brownish grey	211.9 3.0	SS	4	100	33	3	212	11		
END OF BOREHOLE										

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∇ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 53

APPENDIX A

VISUAL PAVEMENT CONDITION SURVEY

SECTION A
COLERAINE DRIVE
(FROM ARTERIAL A2 TO MAYFIELD DRIVE, ~3 KM)

APPENDIX A-A

VISUAL PAVEMENT CONDITION SURVEY

Coleraine Dr. -- Major Mackenzie Dr to Countryside Dr.

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

N-S ~1.8 km

Section Length:

Direction of Traffic ☐ B: Both Directions | SBL | | WBL

Survey Date:

Class of Rd ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr: 10, 8, 6, 4, 2, 0 — [✓ 7]

Wi = Weight of distress

Pavement Distress	**Wi**	Severity of Distress (Si) 0.5 Very Slight	1.0 Slight	2.0 Moderate	3.0 Severe	4.0 Very Severe	Density of Distress (Di) 0.5 Few <10%	1.0 Intermittent 10-20%	2.0 Frequent 20-50%	3.0 Extensive 50-80%	4.0 Throughout 80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0		✓	✓					✓		
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0		✓				✓				
Wheel Track Rutting	3.0			✓	✓			~~✓~~	✓		
Distortion	3.0										
Surface Cracking											
Longitudinal Wheel Track											
Single and Multiple	1.0			✓	✓				~~✓~~	✓	
Alligator	3.0			✓	✓				~~✓~~	✓	
Centerline											
Single / Multiple	0.5			✓	✓				~~✓~~	✓	
Alligator	2.0			✓	✓					✓	
Pavement Edge Cracking											
Single / Multiple	0.5		✓	✓	✓				~~✓~~	✓	
Alligator	1.5										
Transverse Cracking											
Single / Multiple	1.0			✓	✓				~~✓~~	✓	
Alligator	3.0			✓	✓				~~✓~~	✓	
Longitudinal -Meander or midlane	1.0			✓	✓				✓		
Map	0.5			✓	✓				✓		

Comments: Poor Condition. to V. Poor Condition.

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

$DMI = \sum Wi \times (Si + Di)$

Coleraine Dr – Countryside Dr to Mayfield Rd,
N–S ~ 1.2 Km

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

Section Length:

Direction of Traffic ☐ B: Both Directions | SBL | | WBL

Survey Date:

Class of Rd ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr: 10 – 8 – 6 – 4 – 2 – 0 [✓ 8]

Wi = Weight of distress

Pavement Distress	**Wi**	**Severity of Distress (Si)** 0.5 Very Slight	1.0 Slight	2.0 Moderate	3.0 Severe	4.0 Very Severe	**Density of Distress (Di)** 0.5 Few <10%	1.0 Intermittent 10-20%	2.0 Frequent 20-50%	3.0 Extensive 50-80%	4.0 Throughout 80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0				✓			✓			
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0			✓				✓			
Wheel Track Rutting	3.0				✓			✓			
Distortion	3.0										
Surface Cracking – Longitudinal Wheel Track											
Single and Multiple	1.0			✓					✓		
Alligator	3.0			✓					✓		
Centerline											
Single / Multiple	0.5			✓					✓		
Alligator	2.0			✓				✓			
Pavement Edge Cracking											
Single / Multiple	0.5			✓					✓		
Alligator	1.5				✓				✓		
Transverse Cracking											
Single / Multiple	1.0				✓					✓	
Alligator	3.0				✓					✓	
Longitudinal -Meander or midlane	1.0			✓				✓			
Map	0.5			✓				✓			

Comments: From 280m S of Mayfield to Mayfield, asph in good Condition.
From 280m S of Mayfield to Countryside, fairly poor – Poor Conditi

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

$DMI = \sum Wi \times (Si + Di)$

SECTION C
COUNTRYSIDE DRIVE
(FROM CLARKWAY DRIVE TO RR 50, ~3 KM)

APPENDIX A-C

VISUAL PAVEMENT CONDITION SURVEY

Countryside Drive - Clarkway to Coleraine Dr.

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

E - W ~ 1.35Km

Section Length: 1.35Km **Direction of Traffic** ☐ B: Both Directions | SBL | | WBL

Survey Date: Aug 10, 2010. **Class of Rd** ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr: 10 / 8 / 6 / 4 / 2 / 0 — 10

Wi = Weight of distress

Pavement Distress	Wi	Severity of Distress (Si) 0.5 Very Slight	1.0 Slight	2.0 Moderate	3.0 Severe	4.0 Very Severe	Density of Distress (Di) 0.5 Few <10%	1.0 Intermittent 10-20%	2.0 Frequent 20-50%	3.0 Extensive 50-80%	4.0 Throughout 80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0										
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0										
Wheel Track Rutting	3.0										
Distortion	3.0										
Surface Cracking – Longitudinal Wheel Track											
Single and Multiple	1.0	✓					✓				
Alligator	3.0										
Centerline											
Single / Multiple	0.5			✓							✓
Alligator	2.0		✓								✓
Pavement Edge Cracking											
Single / Multiple	0.5		✓					✓			
Alligator	1.5										
Transverse Cracking											
Single / Multiple	1.0		✓					✓			
Alligator	3.0										
Longitudinal -Meander or midlane	1.0										
Map	0.5										

Comments: Good Condition to fairly Good Condition

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

DMI = Σ Wi x (Si + Di)

Countryside Dr - Coleraine Dr - Hwy 50
E-W ~780 m

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

amec

Section Length: 780 m

Direction of Traffic ☐ B: Both Directions | SBL | | WBL

Survey Date:

Class of Rd ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr

10
8
6
4
2
0

10

Wi = Weight of distress

Pavement Distress	**Wi**	**Severity of Distress (Si)** 0.5 Very Slight	1.0 Slight	2.0 Moderate	3.0 Severe	4.0 Very Severe	**Density of Distress (Di)** 0.5 Few <10%	1.0 Intermittent 10-20%	2.0 Frequent 20-50%	3.0 Extensive 50-80%	4.0 Throughout 80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0										
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0										
Wheel Track Rutting	3.0										
Distortion	3.0										
Surface Cracking – **Longitudinal Wheel Track**											
Single and Multiple	1.0	✓					✓				
Alligator	3.0										
Centerline											
Single / Multiple	0.5			✓					✓		
Alligator	2.0										
Pavement Edge Cracking											
Single / Multiple	0.5		✓					✓			
Alligator	1.5										
Transverse Cracking											
Single / Multiple	1.0		✓					✓			
Alligator	3.0										
Longitudinal -Meander or midlane	1.0										
Map	0.5										

Comments: Good Condition to fairly Good Condition

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

$DMI = \sum Wi \times (Si + Di)$

SECTION D
CLARKWAY DRIVE
(FROM CASTLEMORE ROAD TO MAYFIELD DR, ~3 KM)

APPENDIX A-D

VISUAL PAVEMENT CONDITION SURVEY

Clarkway Dr – Castlemore Rd – Countryside Drive.
N-S ~ 3.1 Km

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR Poor Condition

Section Length: 3.1 Km **Direction of Traffic** ☐ | B: Both Directions | SBL | | WBL |

Survey Date: Aug 10, 2020 **Class of Rd** ☐ | F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr

10
8
6 ⑥
4
2
0

Wi = Weight of distress

Pavement Distress	Wi	Severity of Distress (Si)					Density of Distress (Di)				
		0.5	1.0	2.0	3.0	4.0	0.5	1.0	2.0	3.0	4.0
		Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
							<10%	10-20%	20-50%	50-80%	80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0			✓					✓		
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0										
Wheel Track Rutting	3.0		✓					✓			
Distortion	3.0										
Surface Cracking – **Longitudinal Wheel Track**											
Single and Multiple	1.0			✓	✓				✓	✓	
Alligator	3.0			✓	✓				✓	✓	
Centerline											
Single / Multiple	0.5			✓	✓				✓	✓	
Alligator	2.0			✓	✓				✓	✓	
Pavement Edge Cracking											
Single / Multiple	0.5			✓	✓				✓	✓	
Alligator	1.5										
Transverse Cracking											
Single / Multiple	1.0			✓	✓				✓	✓	
Alligator	3.0			✓	✓				✓	✓	
Longitudinal -Meander or midlane	1.0			✓	✓				✓	✓	
Map	0.5			✓	✓				✓	✓	

Comments: 300 m N of Castlemore to Castlemore recently paved, good cond, Poor Condition remainder,

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI
The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

DMI = $\sum$ Wi x (Si + Di)

Clarkway Drive - Countryside Dr to Mayfield,
N-S ~ 1.23 Km

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

Fairly Poor Condition

Section Length: 1.23 Km **Direction of Traffic** ☐ B: Both Directions | SBL | | WBL

Survey Date: Aug 10, 2020 **Class of Rd** ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr (scale 10, 8, 6, 4, 2, 0): ⑦

Wi = Weight of distress

Pavement Distress	**Wi**	**Severity of Distress (Si)** 0.5 Very Slight	 1.0 Slight	 2.0 Moderate	 3.0 Severe	 4.0 Very Severe	**Density of Distress (Di)** 0.5 Few <10%	 1.0 Intermittent 10-20%	 2.0 Frequent 20-50%	 3.0 Extensive 50-80%	 4.0 Throughout 80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0			✓				✓			
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0										
Wheel Track Rutting	3.0			✓			✓				
Distortion	3.0										
Surface Cracking											
Longitudinal Wheel Track											
Single and Multiple	1.0				✓				✓		
Alligator	3.0				✓				✓		
Centerline											
Single / Multiple	0.5			✓					✓		
Alligator	2.0			✓					✓		
Pavement Edge Cracking											
Single / Multiple	0.5				✓				✓		
Alligator	1.5				✓				✓		
Transverse Cracking											
Single / Multiple	1.0			✓					✓		
Alligator	3.0			✓					✓		
Longitudinal -Meander or midlane	1.0			✓					✓		
Map	0.5			✓					✓		

Comments: Patched WBL From 50-100m N of Countryside. & 125m-150m.
Patched From 10m S of Mayfield to 100m S of Mayfield.

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

DMI = $\sum$ Wi x (Si + Di)

Coleraine Dr. -- Major Mackenzie Dr to Countryside Dr.

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

N-S ~1.8 km

Section Length:

Direction of Traffic ☐ B: Both Directions | SBL | | WBL

Survey Date:

Class of Rd ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr: 10, 8, (7), 6, 4, 2, 0

Wi = Weight of distress

		Severity of Distress (Si)					Density of Distress (Di)				
		0.5	1.0	2.0	3.0	4.0	0.5	1.0	2.0	3.0	4.0
		Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
							<10%	10-20%	20-50%	50-80%	80-100%
Pavement Distress	**Wi**										
Surface Defects											
Ravelling & coarse aggregate loss	**3.0**		✓	✓					✓		
Flushing	**0.5**										
Surface Deformation											
Rippling and Shoving	**1.0**		✓				✓				
Wheel Track Rutting	**3.0**			✓	✓				✓		
Distortion	**3.0**										
Surface Cracking											
Longitudinal Wheel Track											
Single and Multiple	**1.0**			✓	✓					✓	
Alligator	**3.0**			✓	✓					✓	
Centerline											
Single / Multiple	**0.5**			✓	✓					✓	
Alligator	**2.0**			✓	✓					✓	
Pavement Edge Cracking											
Single / Multiple	**0.5**		✓	✓	✓					✓	
Alligator	**1.5**										
Transverse Cracking											
Single / Multiple	**1.0**			✓	✓					✓	
Alligator	**3.0**			✓	✓					✓	
Longitudinal -Meander or midlane	**1.0**			✓	✓				✓		
Map	**0.5**			✓	✓				✓		

Comments: Poor Condition. to V. Poor Condition.

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

DMI = $\sum$ Wi x (Si + Di)

Coleraine Dr – Countryside Dr to Mayfield Rd,
N–S ~1.2 Km

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

Section Length:

Direction of Traffic ☐ B: Both Directions | SBL | | WBL

Survey Date:

Class of Rd ☐ F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr
10
8 — 8
6
4
2
0

Wi = Weight of distress

Pavement Distress	Wi	Severity of Distress (Si)					Density of Distress (Di)				
		0.5	1.0	2.0	3.0	4.0	0.5	1.0	2.0	3.0	4.0
		Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
							<10%	10-20%	20-50%	50-80%	80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0				✓			✓			
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0			✓				✓			
Wheel Track Rutting	3.0				✓			✓			
Distortion	3.0										
Surface Cracking											
Longitudinal Wheel Track											
Single and Multiple	1.0			✓					✓		
Alligator	3.0			✓					✓		
Centerline											
Single / Multiple	0.5			✓					✓		
Alligator	2.0			✓				✓			
Pavement Edge Cracking											
Single / Multiple	0.5			✓					✓		
Alligator	1.5				✓				✓		
Transverse Cracking											
Single / Multiple	1.0				✓					✓	
Alligator	3.0				✓					✓	
Longitudinal -Meander or midlane	1.0			✓				✓			
Map	0.5			✓				✓			

Comments: From 280m S of Mayfield to Mayfield, asph. in good condition. From 280m S of Mayfield to Countryside, fairly poor – Poor Cond

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

$DMI = \sum Wi \times (Si + Di)$

Countryside Drive - Clarkway to Coleraine Dr.

amec

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

E - W ~ 1.35 Km

Section Length: 1.35 Km **Direction of Traffic** ☐ | B: Both Directions | SBL | | WBL |

Survey Date: Aug 10, 2010 **Class of Rd** ☐ | F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr 10 / 8 / 6 / 4 / 2 / 0 — 10

Wi = Weight of distress

Pavement Distress	Wi	Severity of Distress (Si)					Density of Distress (Di)				
		0.5	1.0	2.0	3.0	4.0	0.5	1.0	2.0	3.0	4.0
		Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
							<10%	10-20%	20-50%	50-80%	80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0										
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0										
Wheel Track Rutting	3.0										
Distortion	3.0										
Surface Cracking – Longitudinal Wheel Track											
Single and Multiple	1.0	✓					✓				
Alligator	3.0										
Centerline											
Single / Multiple	0.5			✓							✓
Alligator	2.0		✓								✓
Pavement Edge Cracking											
Single / Multiple	0.5		✓					✓			
Alligator	1.5										
Transverse Cracking											
Single / Multiple	1.0		✓					✓			
Alligator	3.0										
Longitudinal -Meander or midlane	1.0										
Map	0.5										

Comments: Good Condition to fairly Good Condition

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI

The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

$DMI = \Sigma Wi \times (Si + Di)$

Countryside Dr - Coleraine Dr - Hwy 50
E-W ~780 m

FLEXIBLE PAVEMENT CONDITION EVALUATION FOR

Section Length: 780 m **Direction of Traffic** ☐ | B: Both Directions | SBL | | WBL |

Survey Date: **Class of Rd** ☐ | F: Freeway, C: Connecting Link, A: Major Arterial M: Minor Arteri

Ride Condition Rating @ 80 km/hr
10
8
6
4
2
0

10

Wi = Weight of distress

Pavement Distress	Wi	Severity of Distress (Si)					Density of Distress (Di)				
		0.5	1.0	2.0	3.0	4.0	0.5	1.0	2.0	3.0	4.0
		Very Slight	Slight	Moderate	Severe	Very Severe	Few	Intermittent	Frequent	Extensive	Throughout
							<10%	10-20%	20-50%	50-80%	80-100%
Surface Defects											
Ravelling & coarse aggregate loss	3.0										
Flushing	0.5										
Surface Deformation											
Rippling and Shoving	1.0										
Wheel Track Rutting	3.0										
Distortion	3.0										
Surface Cracking											
Longitudinal Wheel Track											
Single and Multiple	1.0	✓					✓				
Alligator	3.0										
Centerline											
Single / Multiple	0.5			✓					✓		
Alligator	2.0										
Pavement Edge Cracking											
Single / Multiple	0.5		✓					✓			
Alligator	1.5										
Transverse Cracking											
Single / Multiple	1.0		✓					✓			
Alligator	3.0										
Longitudinal -Meander or midlane	1.0										
Map	0.5										

Comments: Good Condition to fairly Good Condition

Calculating the PCI

The numerical rating for the severity of the distress and for the density of the distress are combined and for the density of the distress are combined and then multiplied then multiplied by its weight. TDMI The sum of all the distresses gives the DMI **(Distress Manifestation Index)** for the road section.

DMI = $\sum$ Wi x (Si + Di)

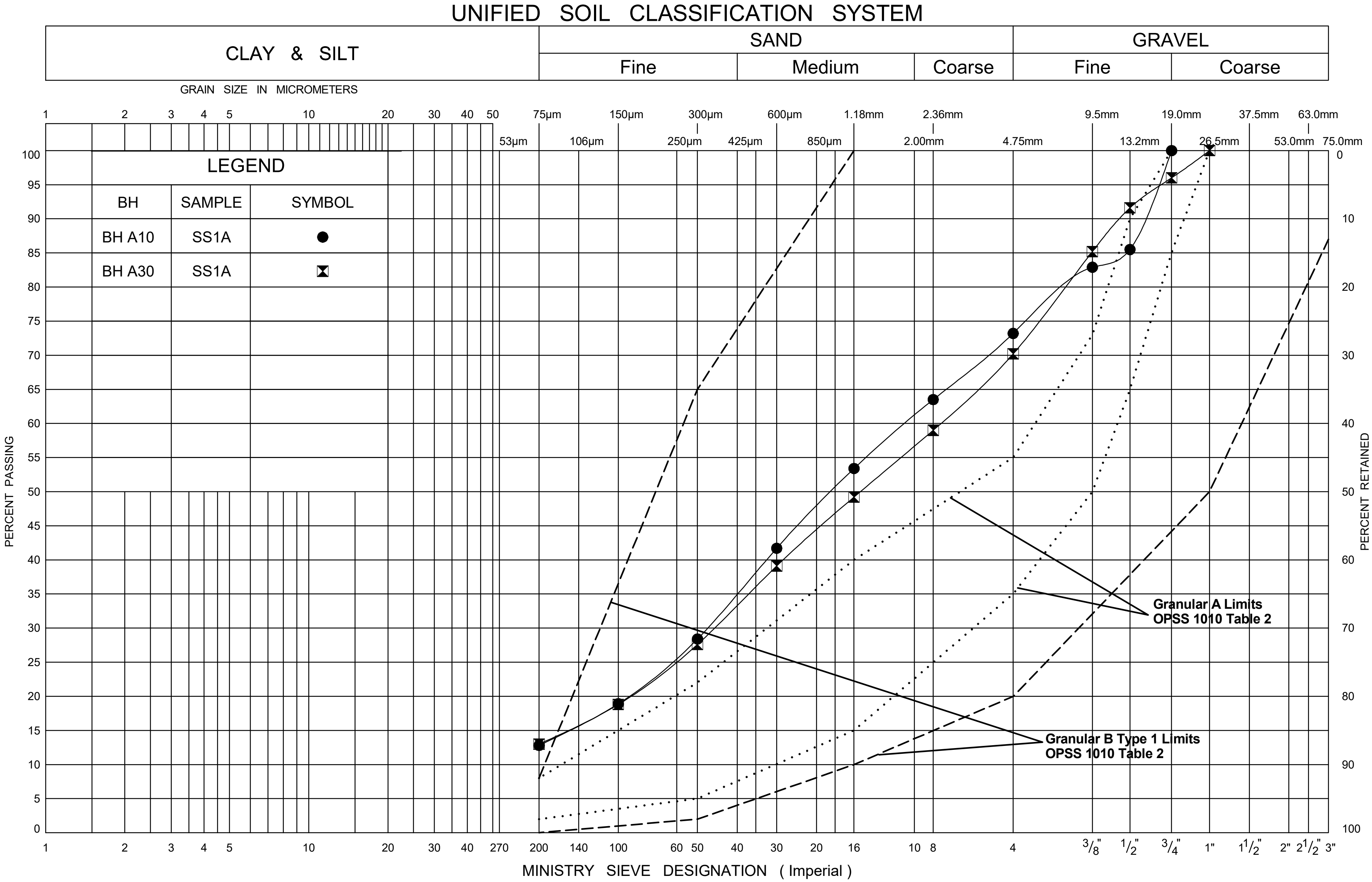
APPENDIX B

SOIL LABORATORY TEST RESULTS

SECTION A
COLERAINE DRIVE
(FROM ARTERIAL A2 TO MAYFIELD DRIVE, ~3 KM)

APPENDIX B-A

SOIL LABORATORY TEST RESULTS



wood.

GRAIN SIZE DISTRIBUTION

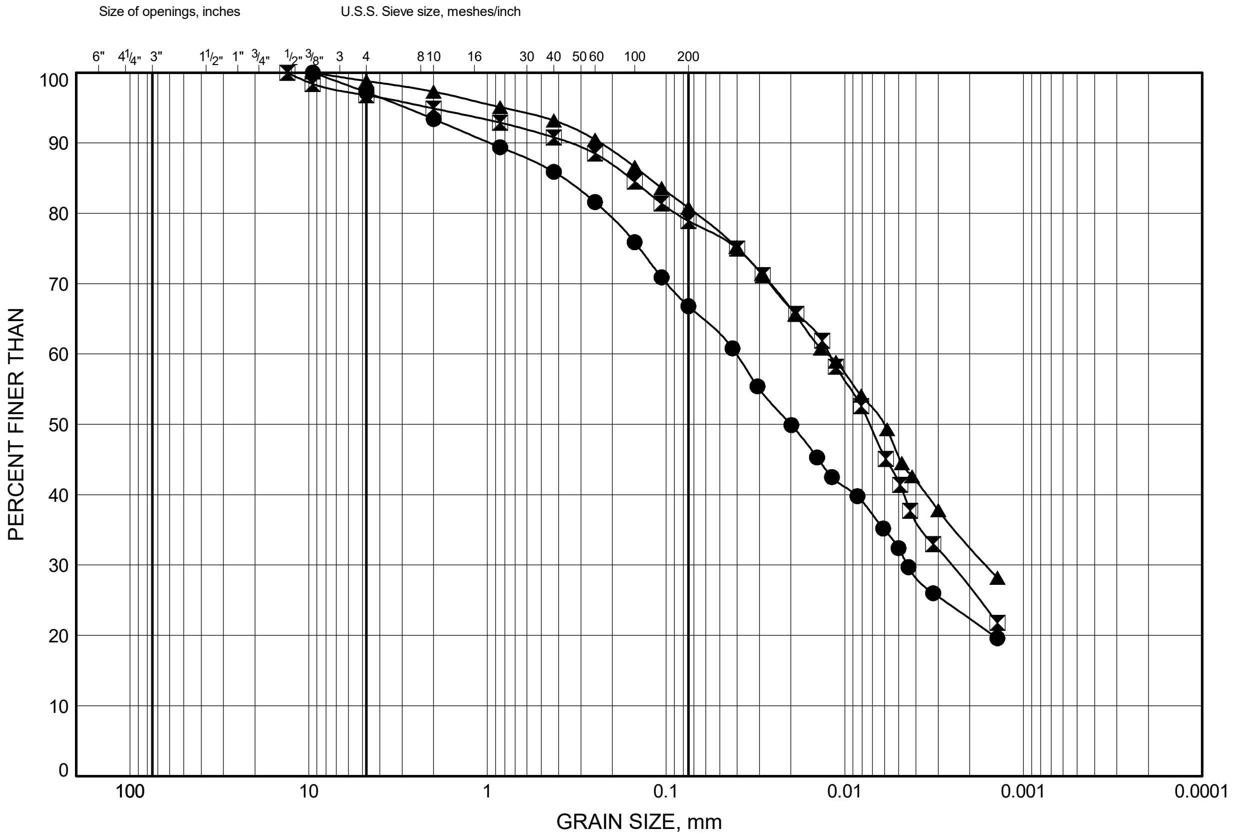
Granular Fill

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
Coleraine Drive, Brampton, Ontario

TP115086

Figure No. B-A1

wood.	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) **GRAIN SIZE DISTRIBUTION** **SILTY CLAY / CLAYEY SILT TILL**	FIGURE No. B-A2



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH A1	SS6	4.1	211.4
⧗	BH A3	SS4	2.7	213.6
▲	BH A23 / BH S1	SS5	3.4	219.4

Date December 2020
Project TP115086

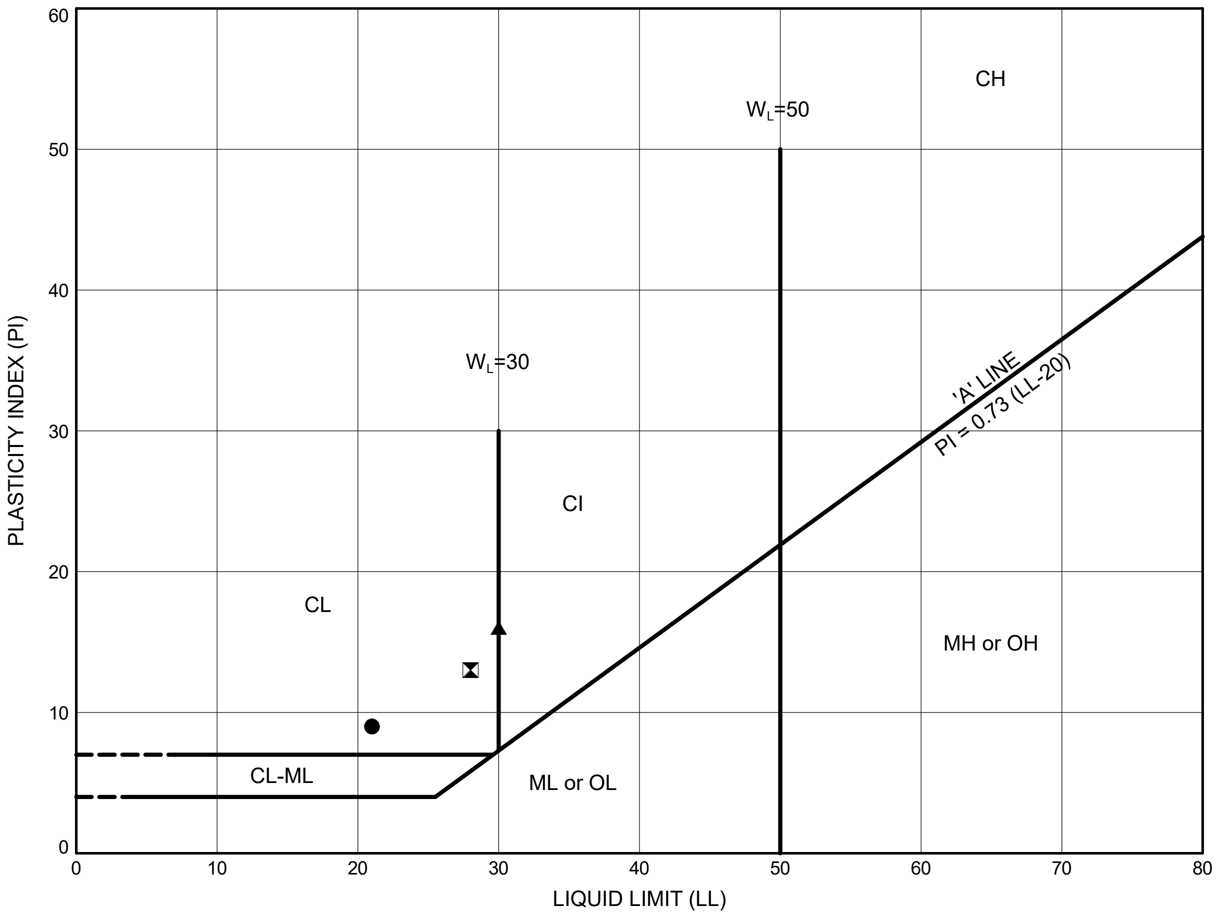
Prep'd WA
Chkd. SB

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

ATTERBERG LIMIT TEST RESULTS

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-A3



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH A1	SS6	4.1	211.4	21	12	9
⧗	BH A3	SS4	2.7	213.6	28	15	13
▲	BH A23 / BH S1	SS5	3.4	219.4	30	14	16

Date December 2020

Project TP115086

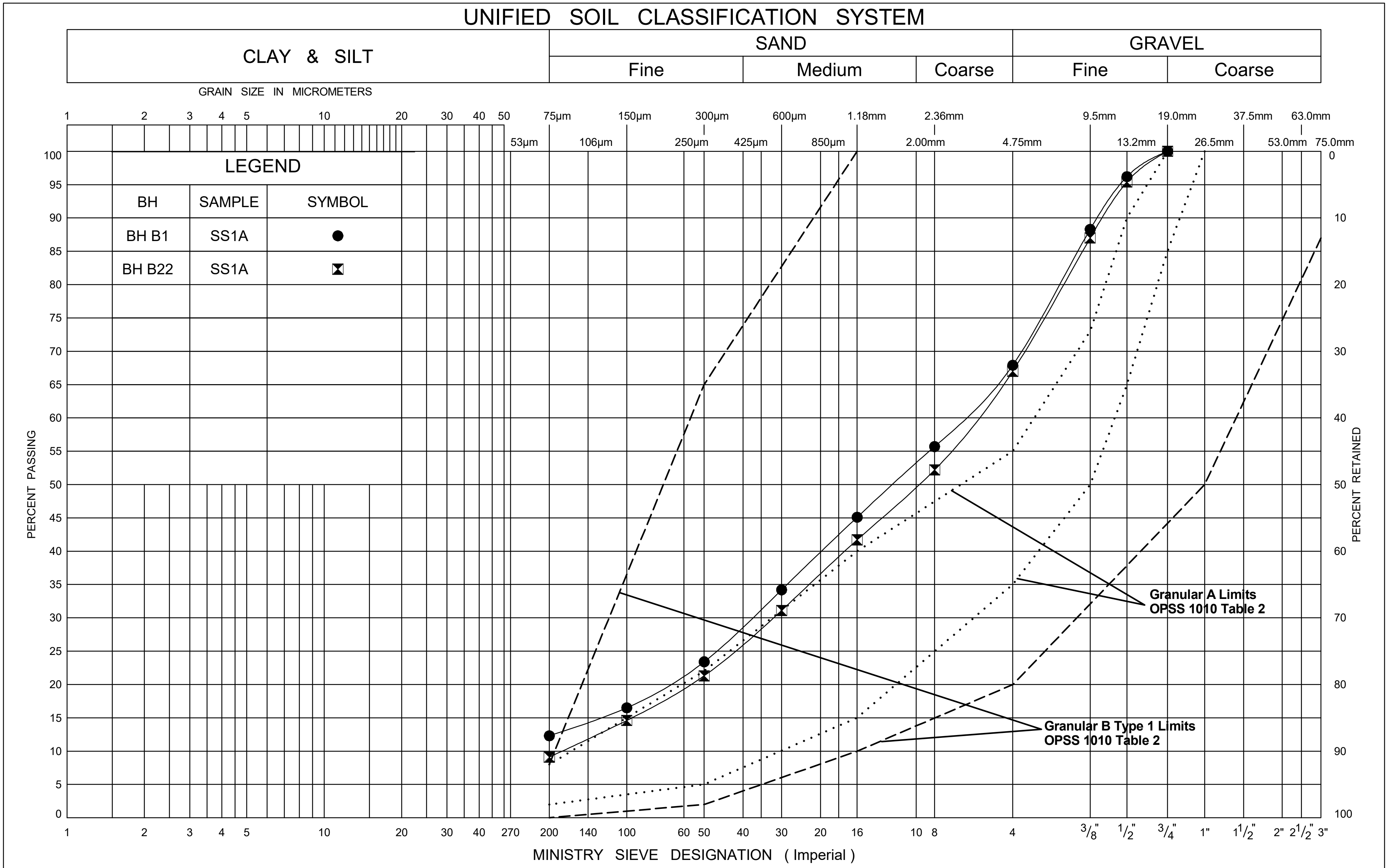
Prep'd SI

Chkd. SB

SECTION B
ARTERIAL A2
(FROM MAYFIELD ROAD TO MAJOR MACKENZIE DRIVE / RR 50, ~3.4 KM)

APPENDIX B-B

SOIL LABORATORY TEST RESULTS



wood.

GRAIN SIZE DISTRIBUTION

Granular Fill

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
Brampton, Ontario

TP115086

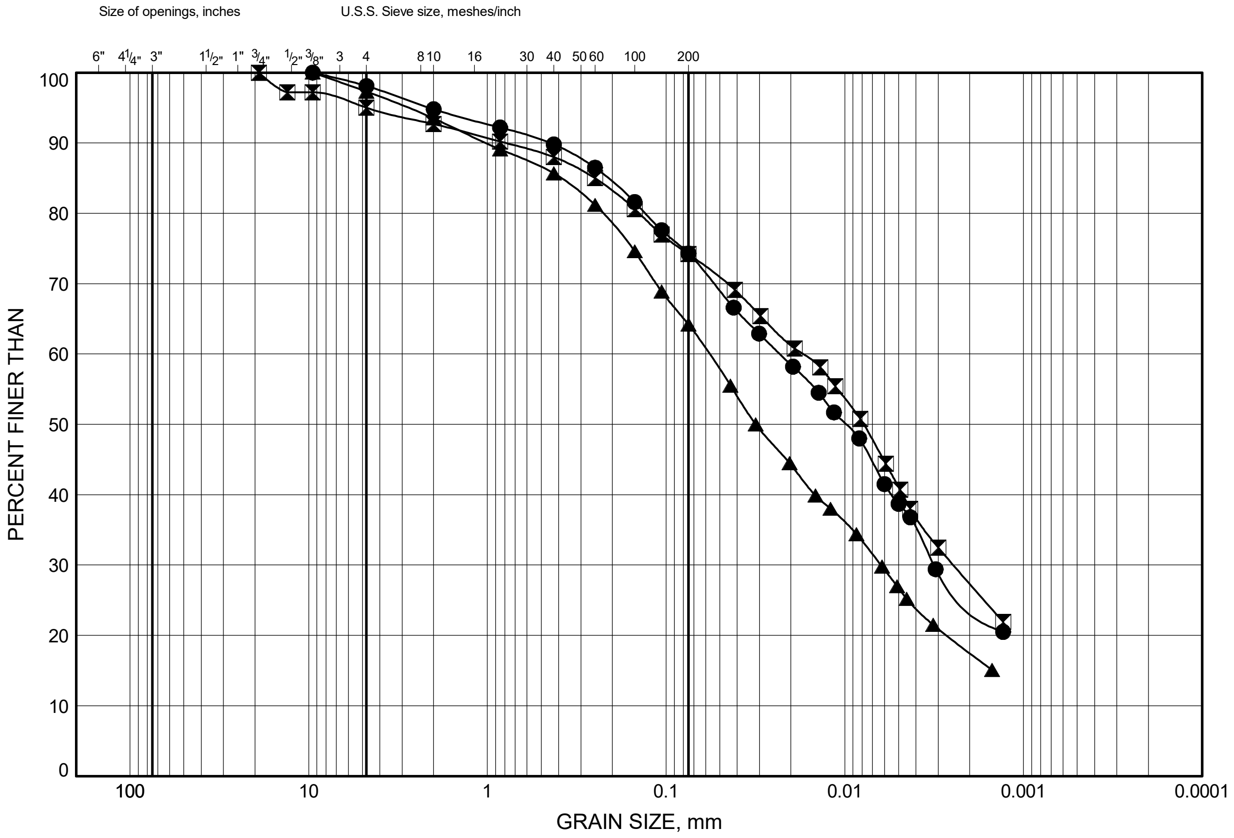
Figure No. B-B1

Arterial Road Network within Highway 427 Industrial Secondary
Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-B2



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH B11	SS3	1.8	210.5
⧗	BH B17	SS3	1.8	216.6
▲	BH S3	SS 6	4.1	206.5

Date December 2020

Project TP115086

Prep'd WA

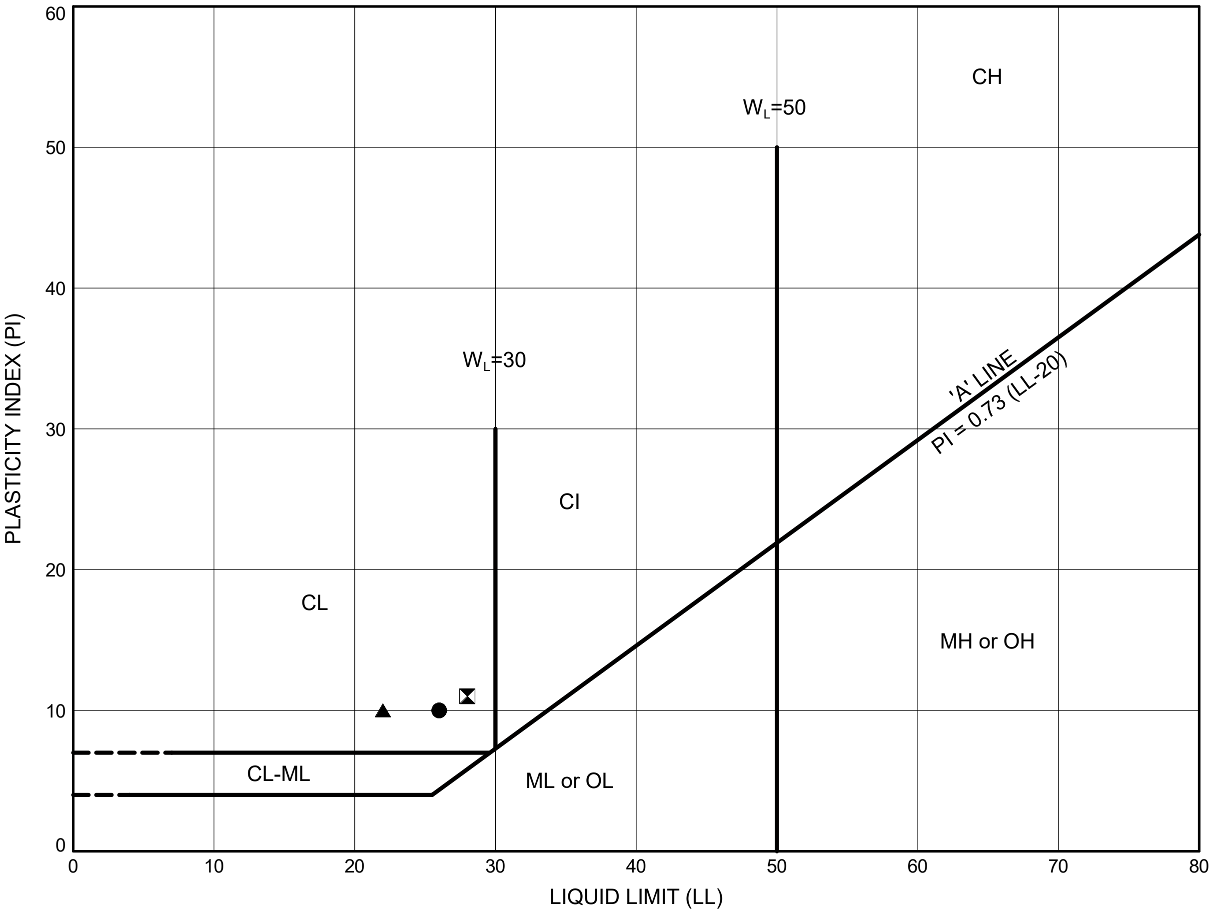
Chkd. SB

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

ATTERBERG LIMIT TEST RESULTS

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-B3



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH B11	SS3	1.8	210.5	26	16	10
⧗	BH B17	SS3	1.8	216.6	28	17	11
▲	BH S3	SS 6	4.1	206.5	22	12	10

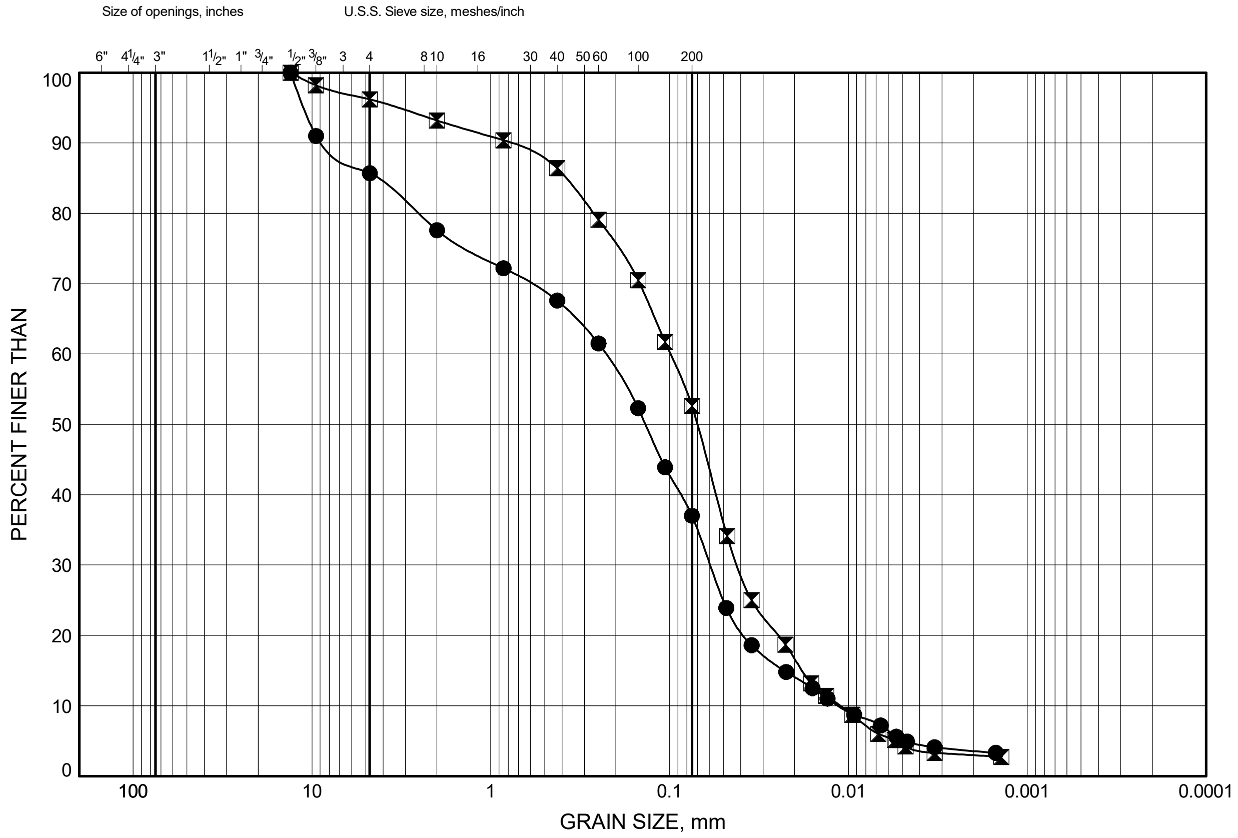
Date December 2020

Project TP115086

Prep'd CZ

Chkd. SB

wood.	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) **GRAIN SIZE DISTRIBUTION** **SILTY SAND / SAND AND SILT TILL**	FIGURE No. B-B4



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH B2	SS5	3.4	206.9
⧗	BH B7 / BH S5	SS6	4.1	205.2

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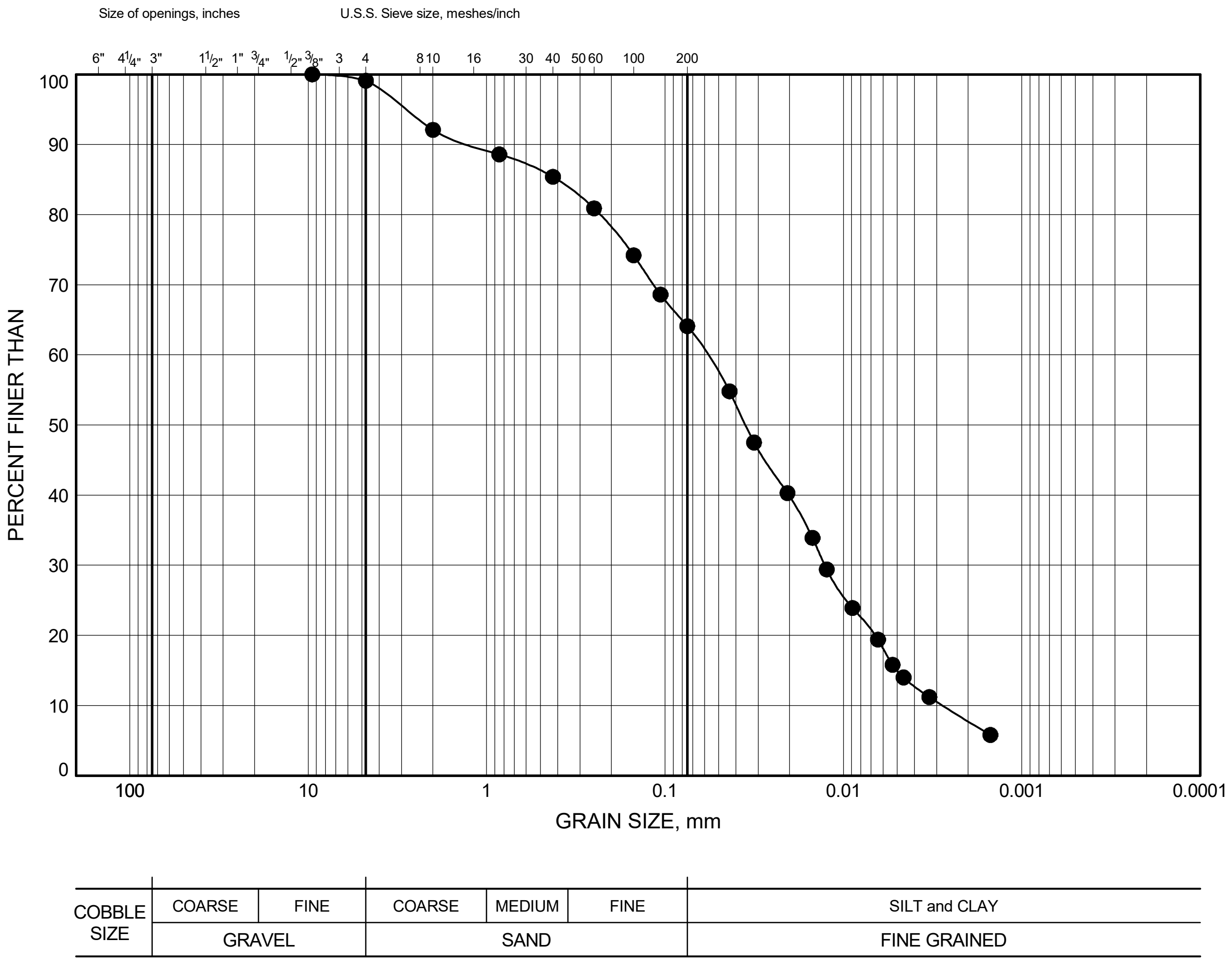
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

SILTY SAND / SANDY SILT TILL

FIGURE No. B-B5



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH S3	SS 9	7.8	202.8

Date December 2020

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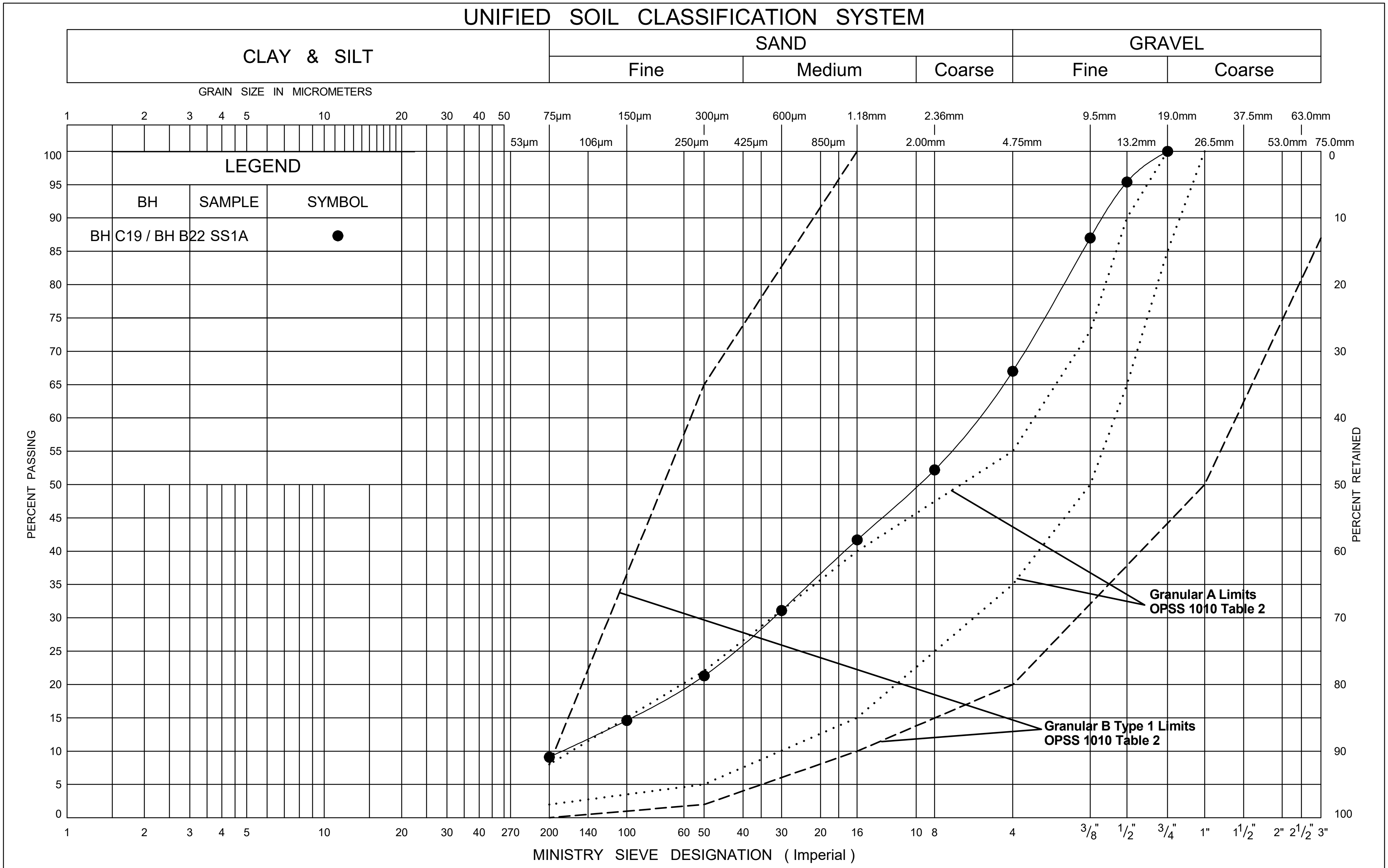
SECTION C
COUNTRYSIDE DRIVE
(FROM CLARKWAY DRIVE TO RR 50, ~3 KM)

APPENDIX B-C

SOIL LABORATORY TEST RESULTS



GRAIN SIZE DISTRIBUTION

Granular Fill

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
Brampton, Ontario

TP115086

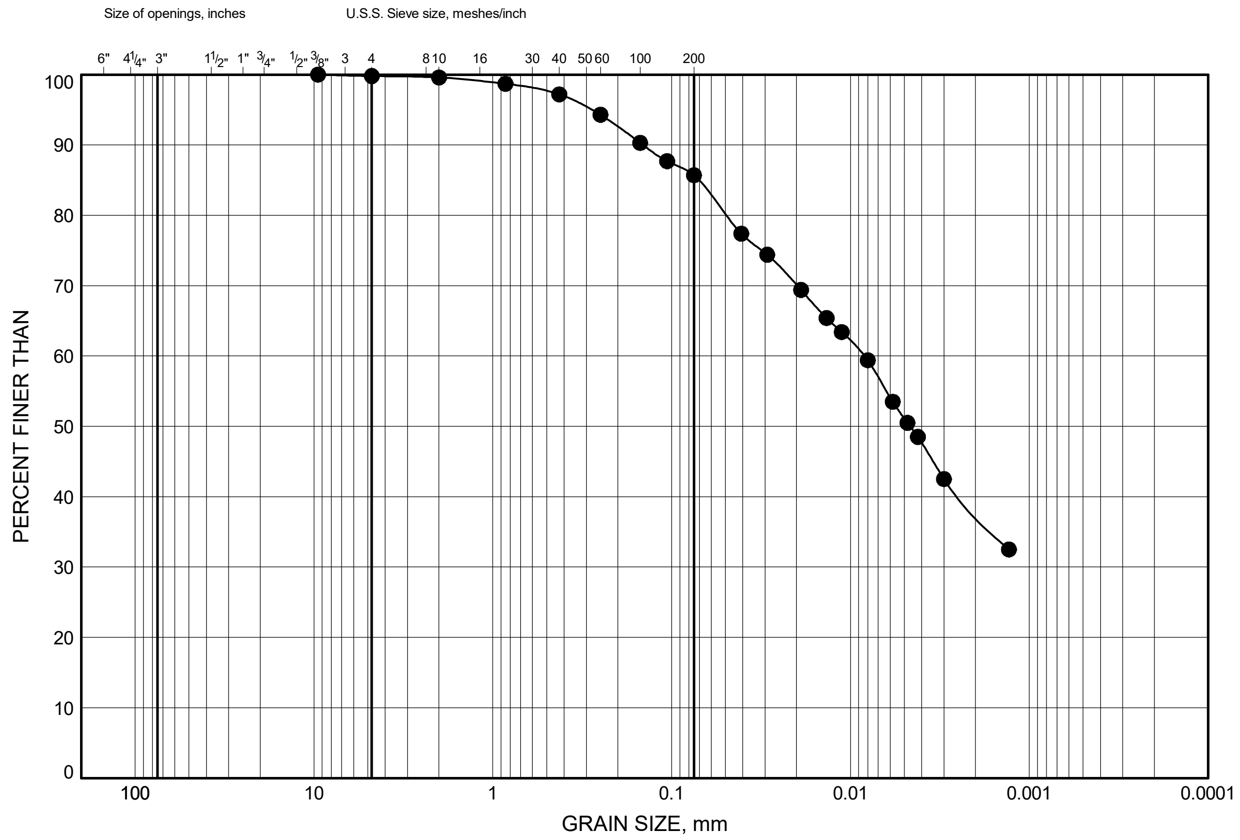
Figure No. B-C1

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

Silty Clay Fill

FIGURE No. B-C2



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH C1	SS3	1.8	214.0

Date December 2020

Project TP115086

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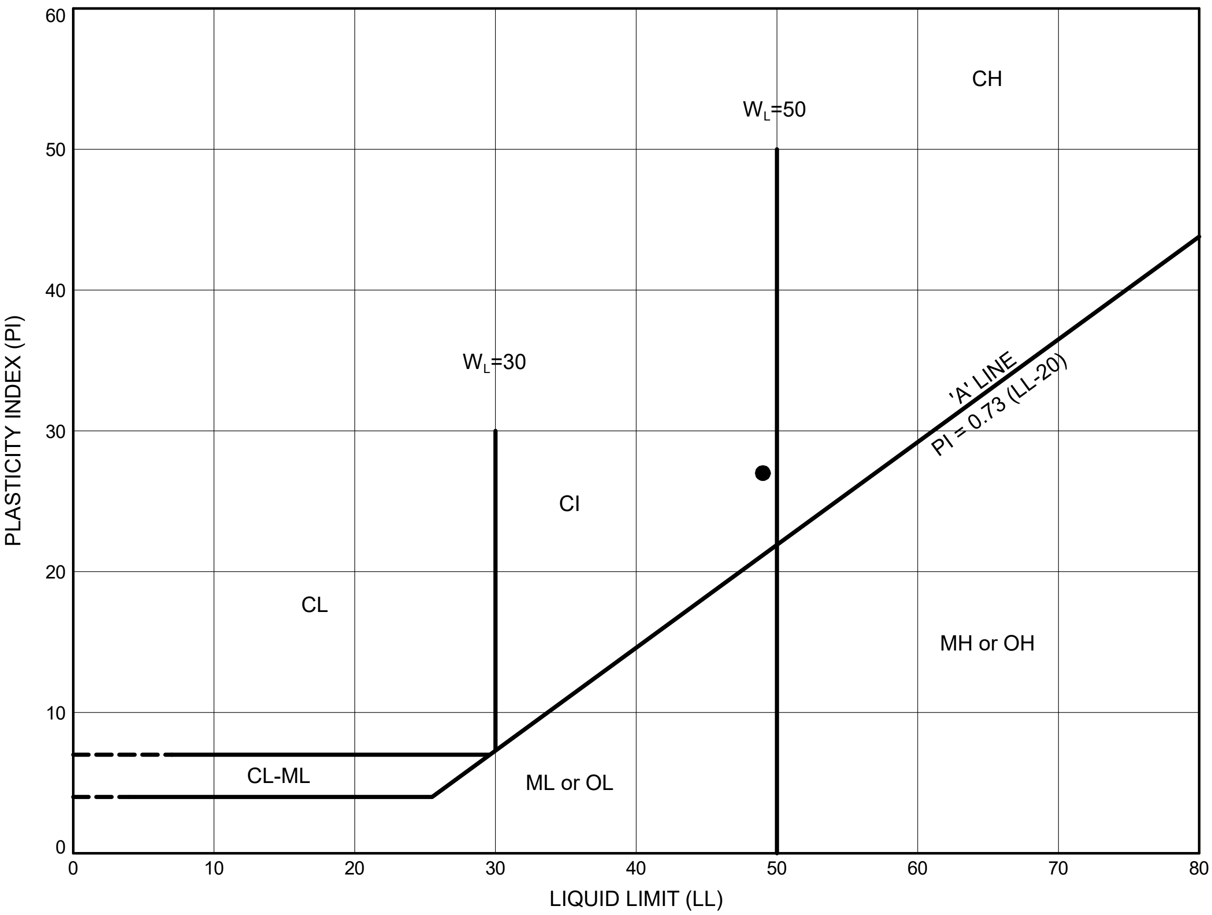
wood.	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) **ATTERBERG LIMIT TEST RESULTS** Silty Clay Fill	FIGURE No. B-C3



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH C1	SS3	1.8	214.0	49	22	27

Date December 2020
Project TP115086

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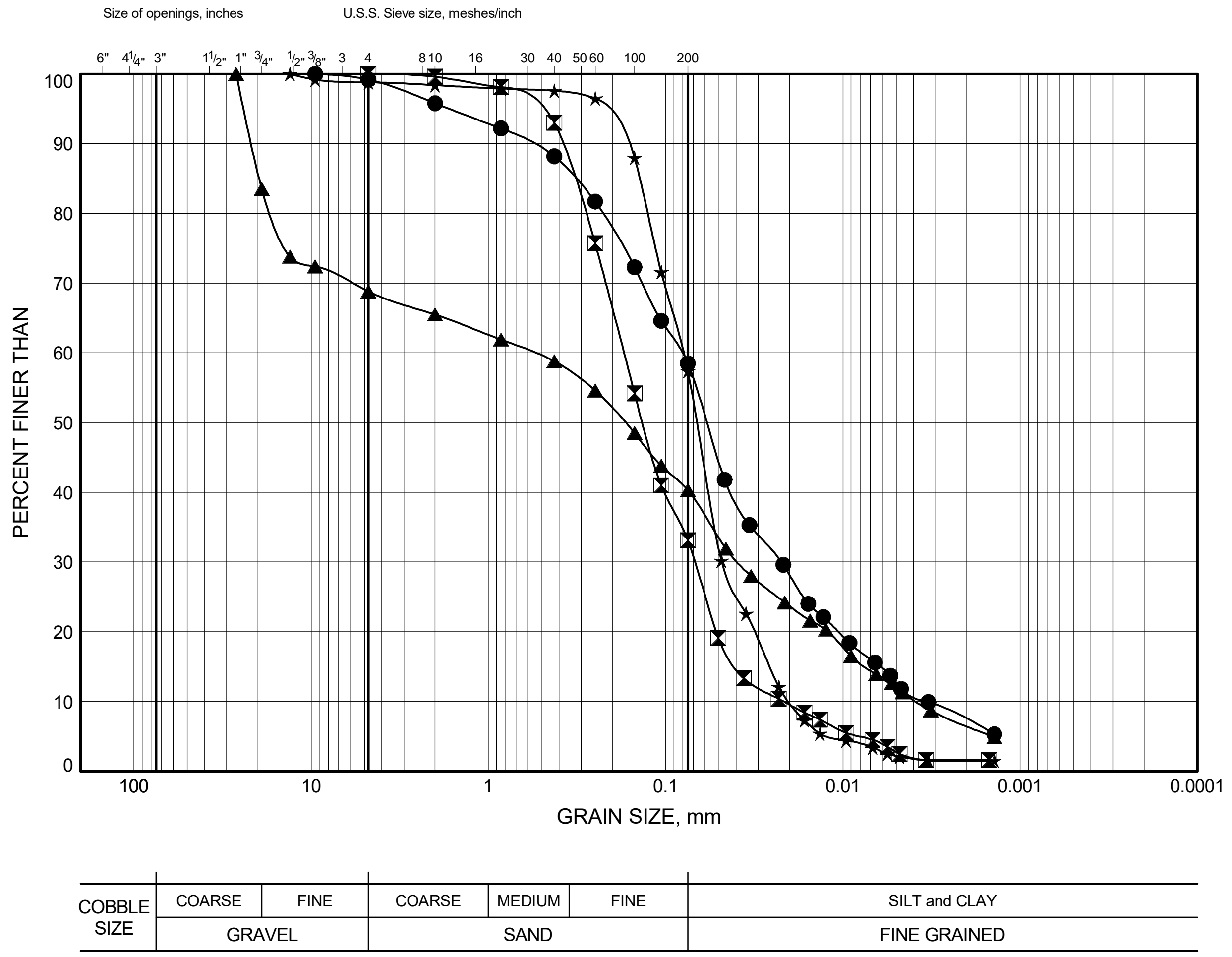
wood.

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

SILTY SAND / SANDY SILT / SAND AND SILT TILL

FIGURE No. B-C4



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH C27 / BH S7	SS4	2.6	215.2
⧗	BH C31	SS3	1.8	219.9
▲	BH S10	SS6	4.1	209.7
★	BH S11	SS6	4.1	209.1

Date December 2020

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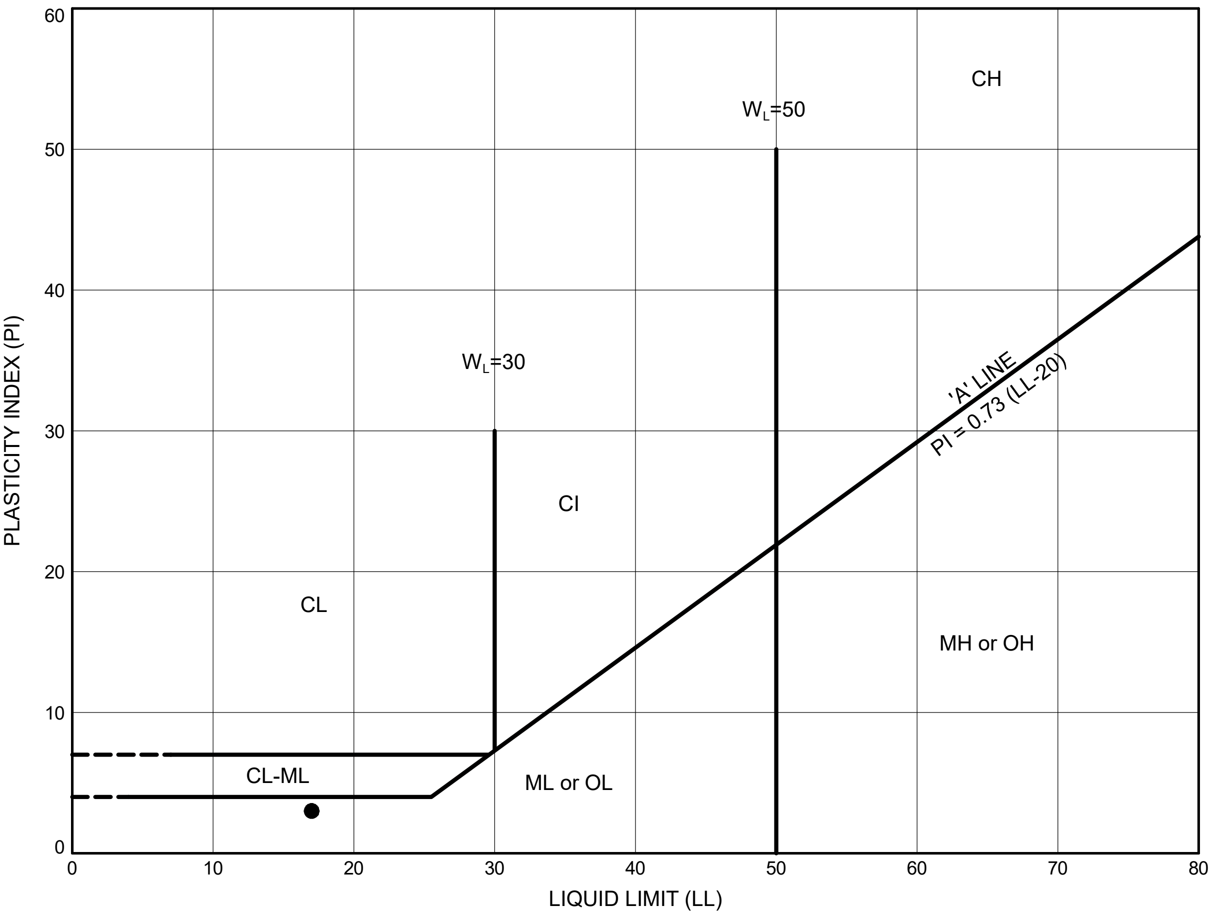
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

ATTERBERG LIMIT TEST RESULTS

SILTY SAND / SANDY SILT / SAND AND SILT TILL

FIGURE No. B-C5



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH C27 / BH S7	SS4	2.6	215.2	17	14	3

Date December 2020

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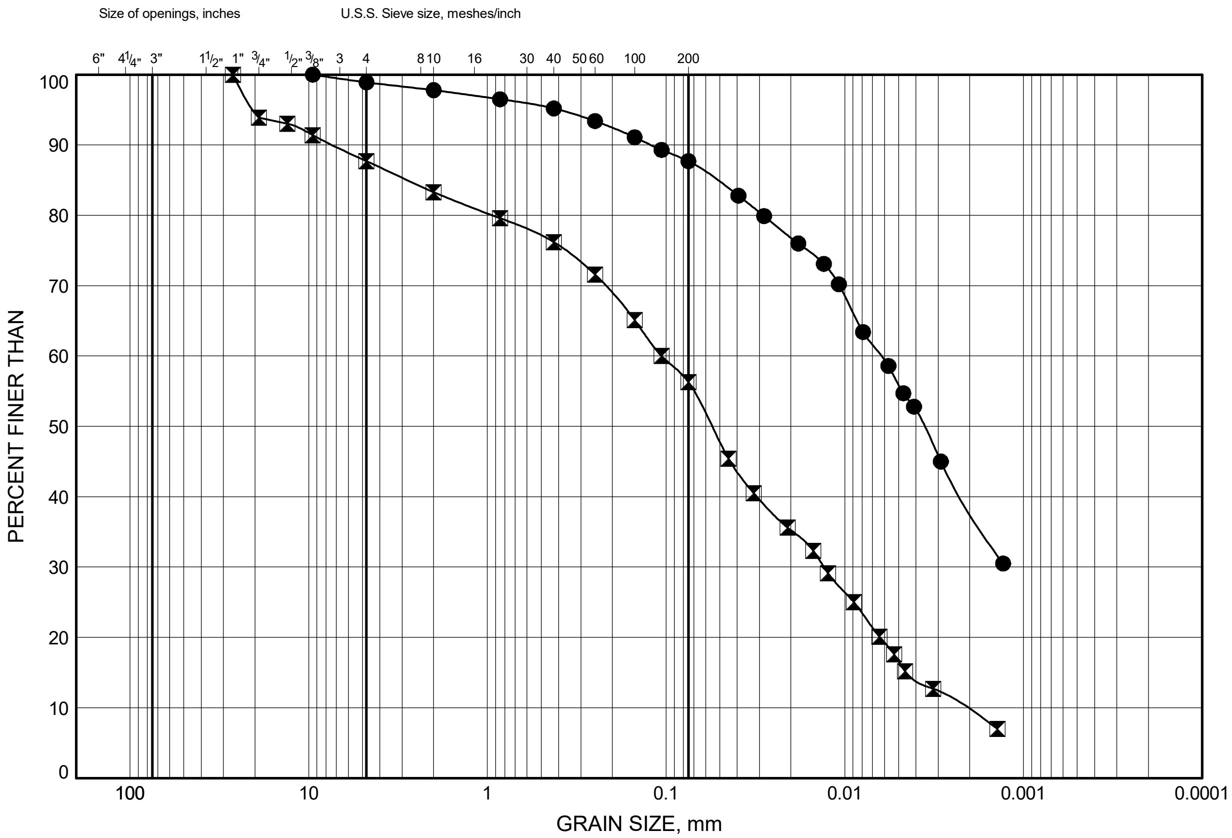
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-C6



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH C17	SS7	4.8	215.1
⧗	BH S9	SS7	4.7	209.8

Date December 2020

Project TP115086

Prep'd WA

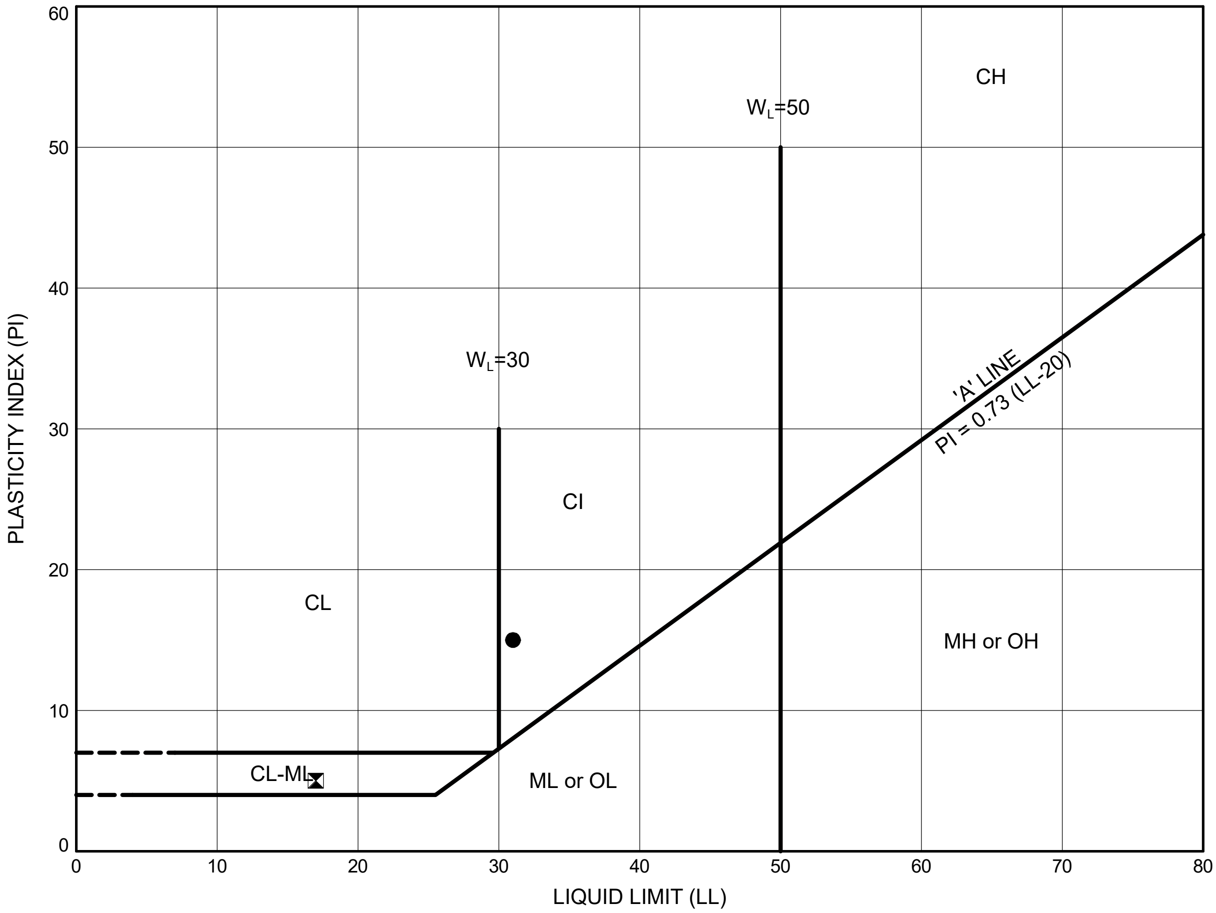
Chkd. SB

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

ATTERBERG LIMIT TEST RESULTS

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-C7



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH C17	SS7	4.8	215.1	31	16	15
⧗	BH S9	SS7	4.7	209.8	17	12	5

Date December 2020

Project TP115086

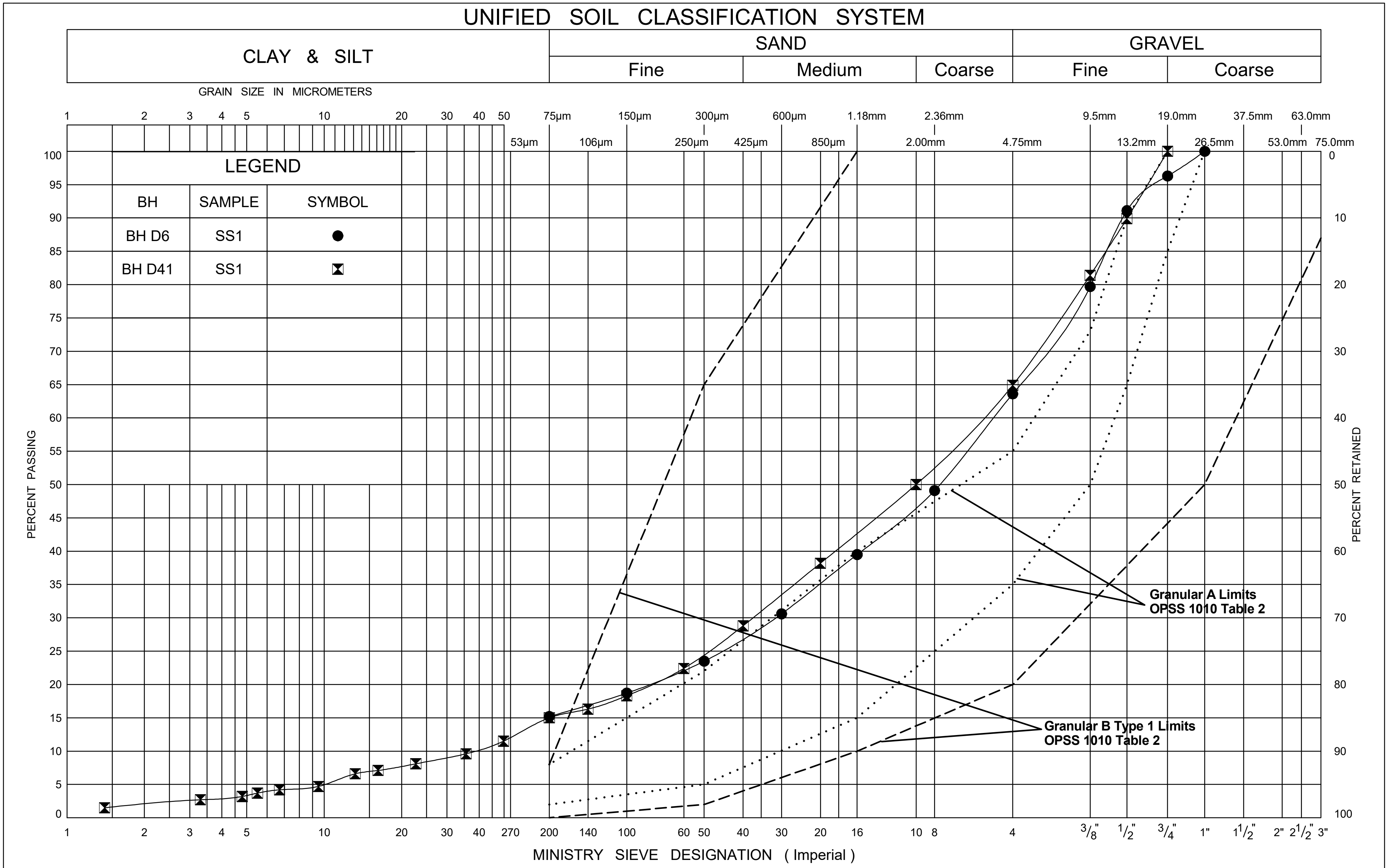
Prep'd CZ

Chkd. SB

SECTION D
CLARKWAY DRIVE
(FROM CASTLEMORE ROAD TO MAYFIELD DR, ~3 KM)

APPENDIX B-D

SOIL LABORATORY TEST RESULTS



GRAIN SIZE DISTRIBUTION

Granular Fill

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)
Clarkway Drive, Brampton, Ontario

TP115086

Figure No. B-D1

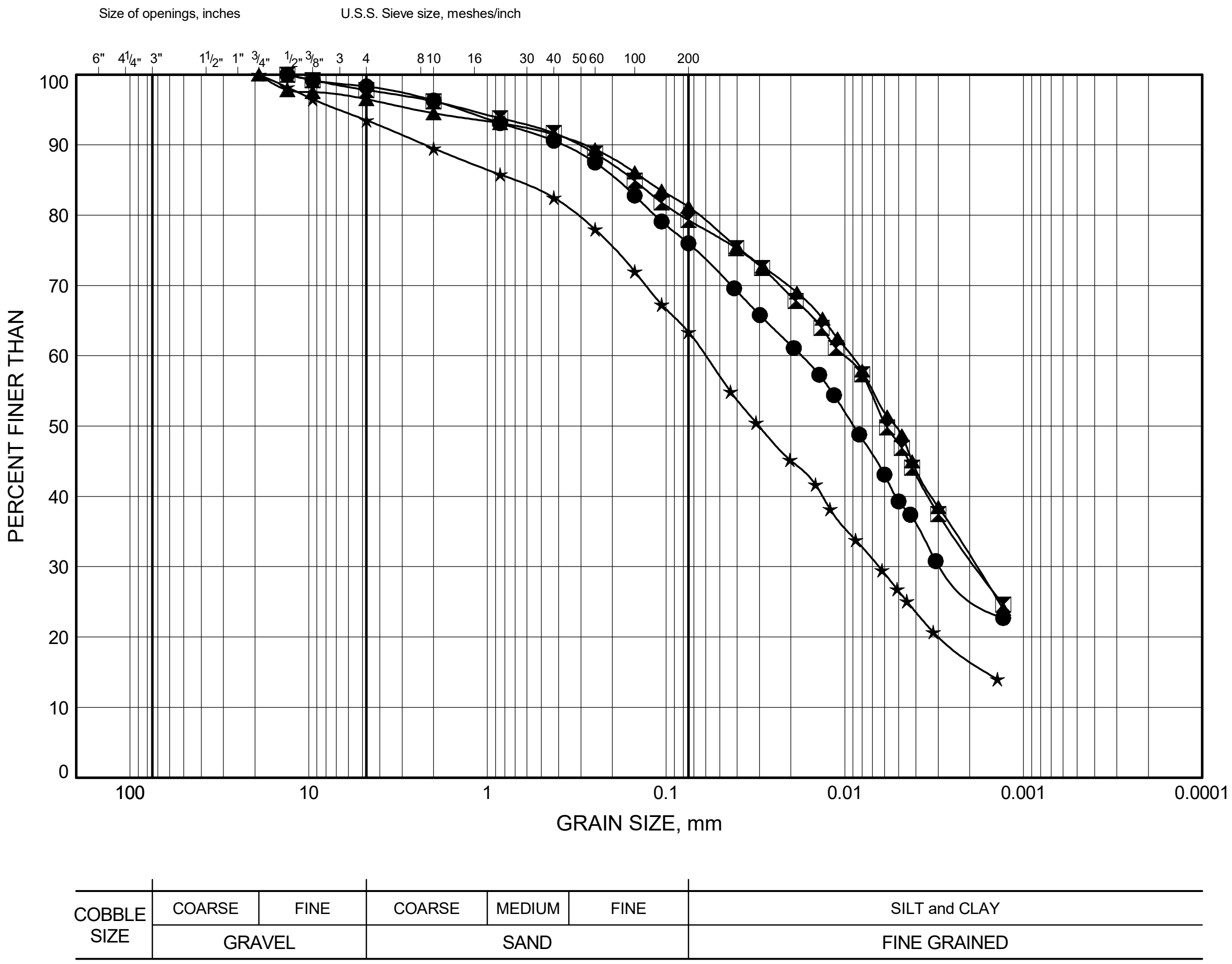
wood.

Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-D2



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH D19	SS3	1.8	208.8
⧗	BH D49	SS5	3.3	217.5
▲	BH S13	SS6	7.9	202.3
★	BH S15	SS7	4.8	207.9

Date December 2020

Project TP115086

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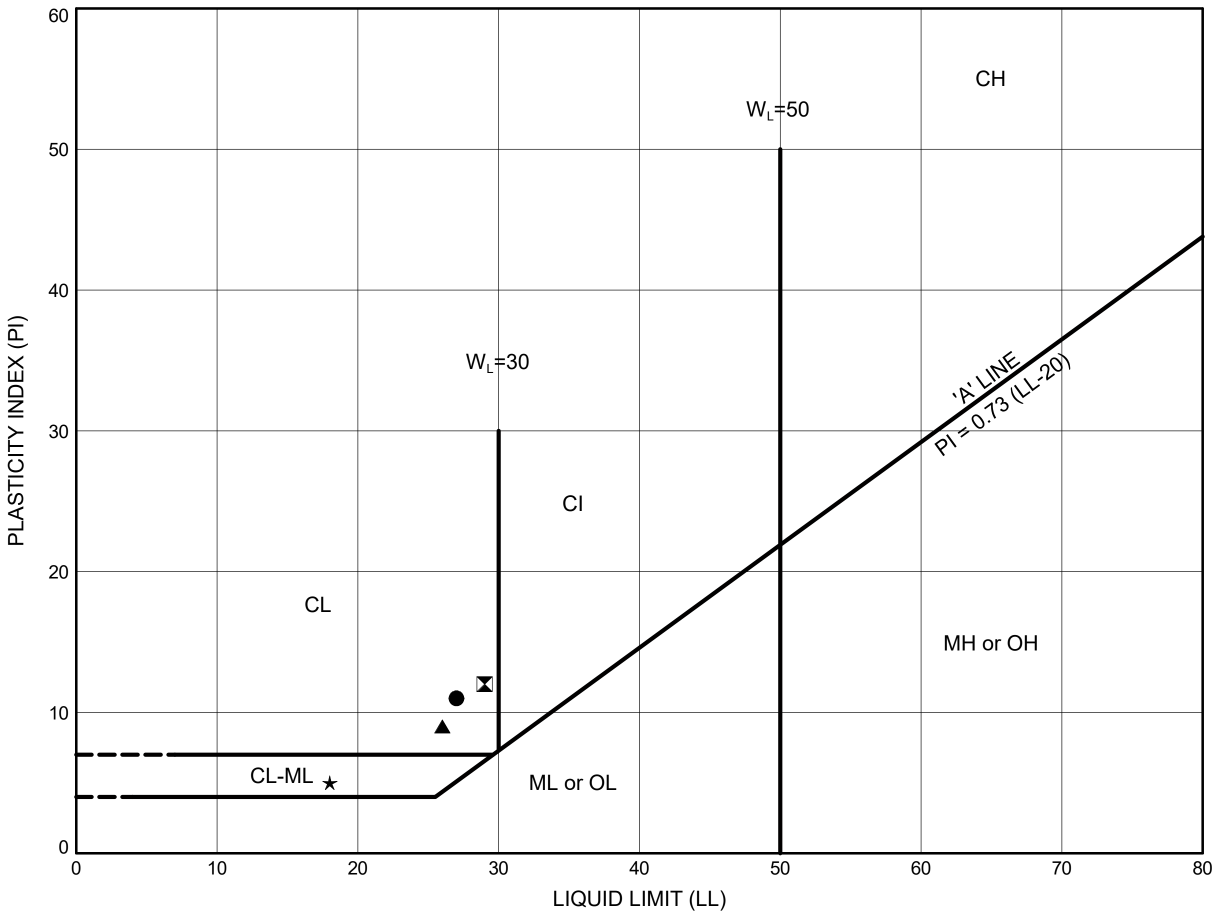
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

ATTERBERG LIMIT TEST RESULTS

SILTY CLAY / CLAYEY SILT TILL

FIGURE No. B-D3



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH D19	SS3	1.8	208.8	27	16	11
⧗	BH D49	SS5	3.3	217.5	29	17	12
▲	BH S13	SS6	7.9	202.3	26	17	9
★	BH S15	SS7	4.8	207.9	18	13	5

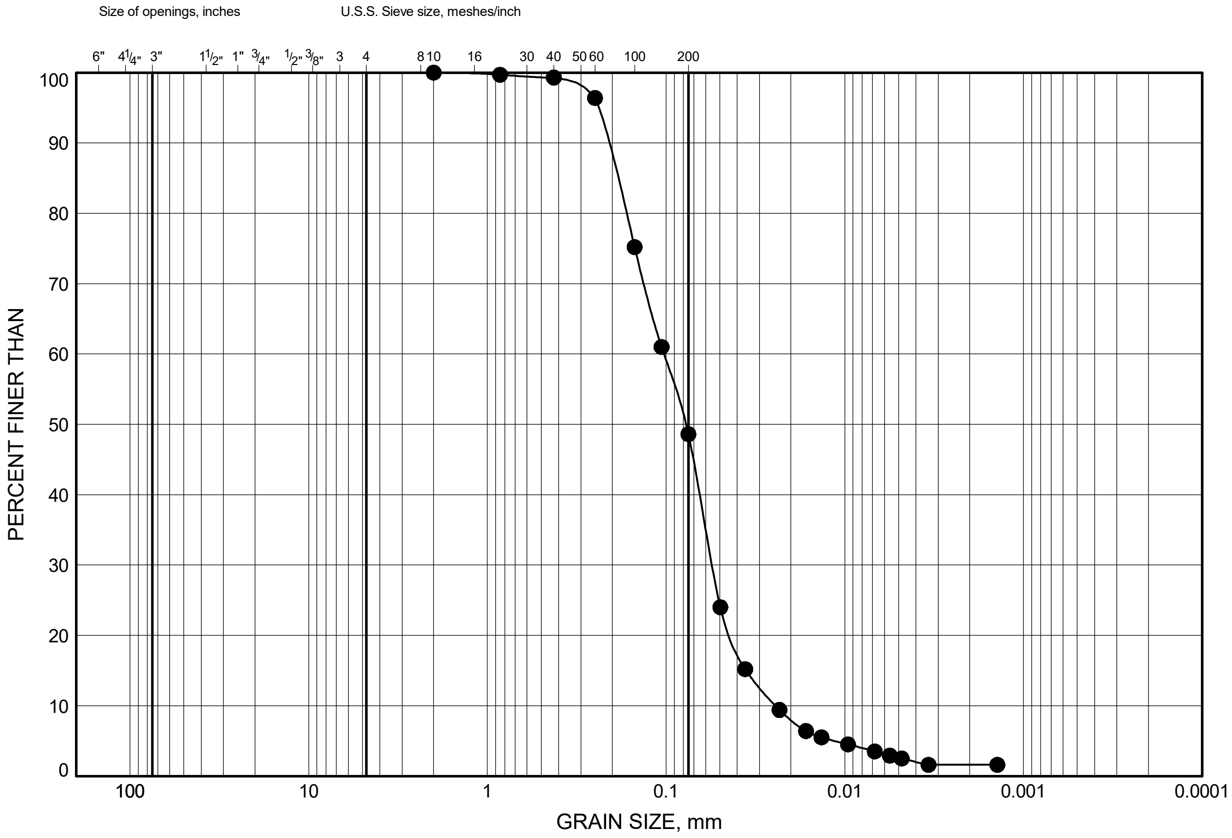
Date December 2020

Project TP115086

Prep'd CZ

Chkd. SB

wood.	Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47) GRAIN SIZE DISTRIBUTION SILTY SAND / SAND AND SILT TILL	FIGURE No. B-D4



COBBLE SIZE	GRAVEL		SAND			FINE GRAINED
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH S14	SS8	7.9	202.0

Date December 2020

Project TP115086

Prep'd WA

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SECTION E
EAST – WEST ARTERIAL RAOD
(FROM THE GORE ROAD TO COLERAINE DRIVE, ~2.4 KM)

APPENDIX B-E

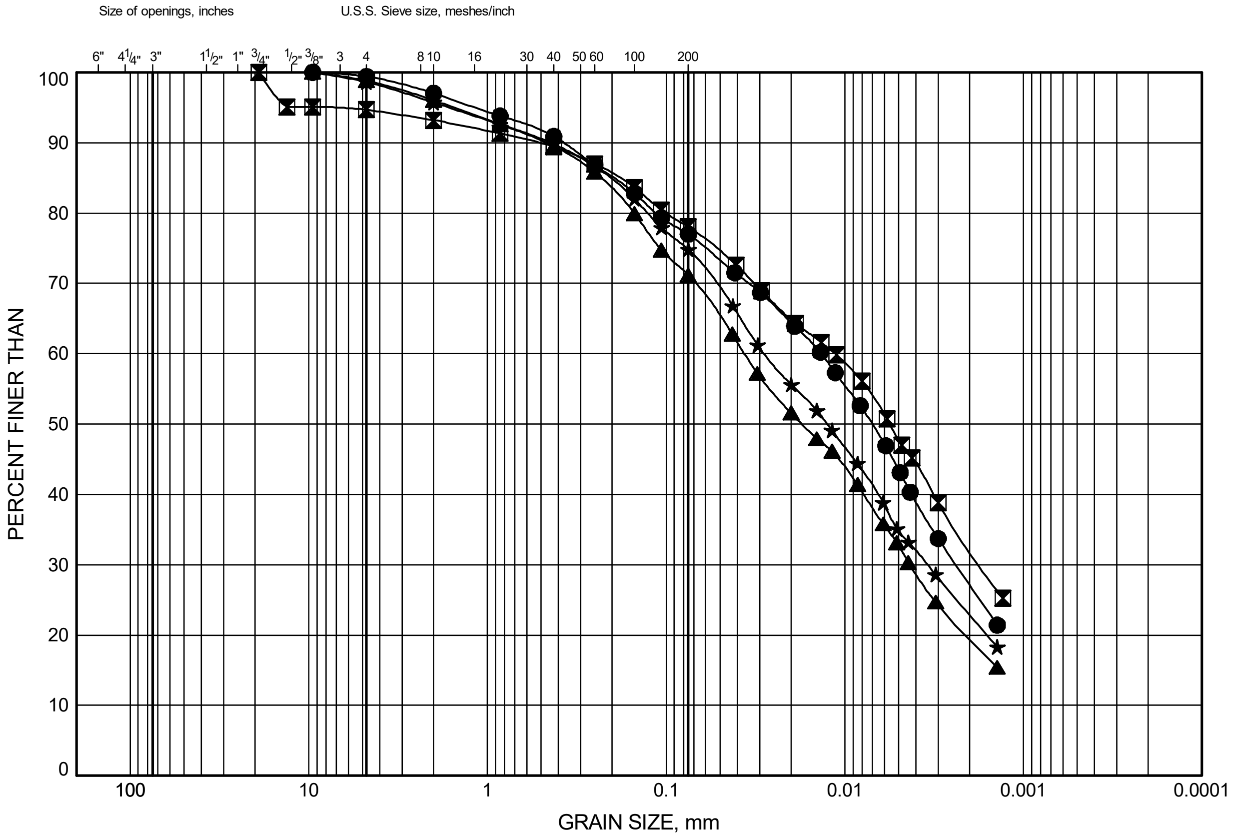
SOIL LABORATORY TEST RESULTS

Arterial Road Network within Highway 427 Industrial Secondary Plan
Area (Area 47)

GRAIN SIZE DISTRIBUTION

Silty Clay / Clayey Silt Till

FIGURE No. B-E1



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH E3	SS3	1.8	204.0
☒	BH E7	SS3	1.8	203.1
▲	BH E23	SS3	1.8	208.8
★	BH E30	SS6	4.1	210.2

Date March 2022

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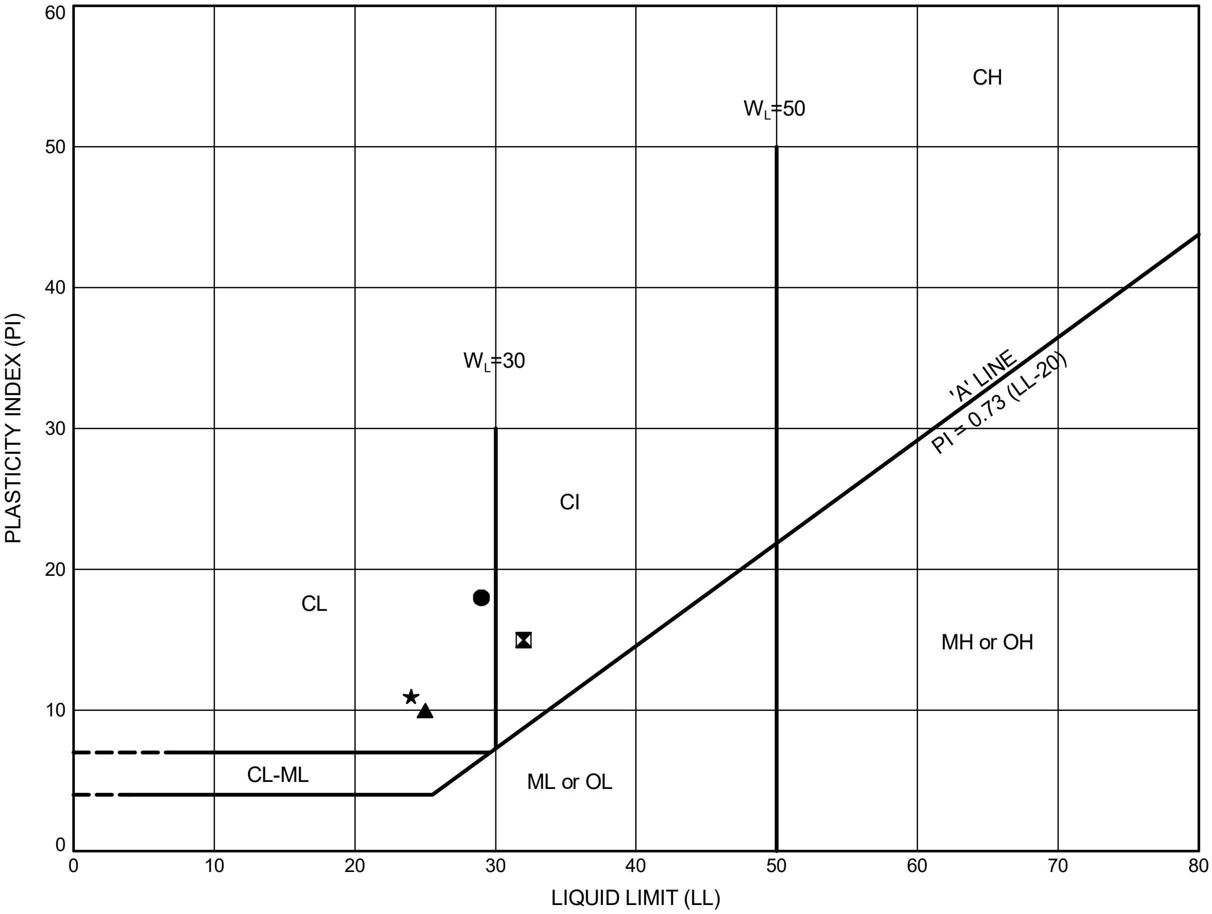
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

ATTERBERG LIMIT TEST RESULTS

Silty Clay / Clayey Silt Till

FIGURE No. B-E2



SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)	LL	PL	PI
●	BH E3	SS3	1.8	204.0	29	11	18
☒	BH E7	SS3	1.8	203.1	32	17	15
▲	BH E23	SS3	1.8	208.8	25	15	10
★	BH E30	SS6	4.1	210.2	24	13	11

Date March 2022

Project TP115086

Prep'd CZ

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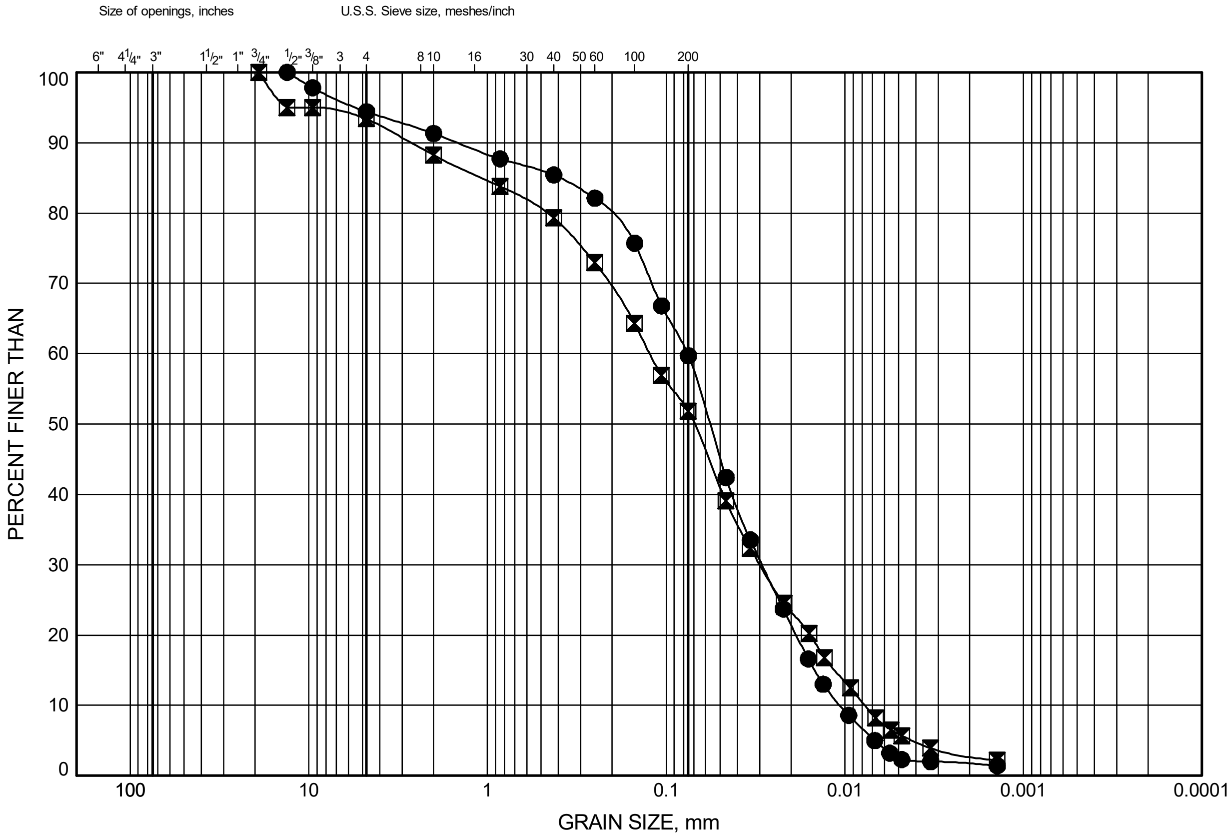
Arterial Road Network within Highway 427 Industrial Secondary Plan Area (Area 47)

GRAIN SIZE DISTRIBUTION

Silty Sand / Sandy Silt Till

FIGURE No. B-E3



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BOREHOLE	SAMPLE	DEPTH (m)	ELEVATION (m)
●	BH E6 / S18	SS9	7.9	196.9
☒	BH S17	SS5	3.4	199.3

Date March 2022

Project TP115086

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APPENDIX C

SOIL ANALYTICAL RESULTS

SECTION A
COLERAINE DRIVE
(FROM ARTERIAL A2 TO MAYFIELD DRIVE, ~3 KM)

APPENDIX C-A

SOIL ANALYTICAL RESULTS

Table 1A - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BHA3**	**Borehole BHA9**		**Borehole BHA13**
Sample ID				**A3 SS4**	**A9 SS1**	**DUP1**	**A13 SS1**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay FILL**	**Silty Clay FILL**	**Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**2.4-3.0**	**0.3-0.9**	**0.3-0.9**	**0.3-0.9**
Sampling Date				**21-Jan-20**	**21-Jan-20**	**21-Jan-20**	**21-Jan-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**12-Feb-20**	**12-Feb-20**
Laboratory ID				**884523**	**884525**	**884531**	**884529**
Certificate of Analysis No.				**20T566860**	**20T566860**	**20T566860**	**20T566860**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5.0	4.0	4.0	4.0
Barium (Ba)	1	220	670	66.0	96.0	111.0	100.0
Beryllium (Be)	0.5	2.5	10	0.50	0.60	0.60	0.60
Boron (B)	5	36	120	8.0	9.0	8.0	8.0
Boron (B), Hot Water Ext.	0.1	NV	2	0.11	0.12	0.17	0.17
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	18.0	24.0	27.0	23.0
Cobalt (Co)	1	21	100	9.2	9.8	11.2	8.6
Copper (Cu)	1	92	300	22.0	21.0	24.0	19.0
Lead (Pb)	1	120	120	9	9	11	10
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	19.0	19.0	22.0	19.0
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.60	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.60	0.60	0.60	0.50
Vanadium (V)	1	86	86	23.0	34.0	38.0	31.0
Zinc (Zn)	5	290	340	48.0	52.0	57.0	49.0
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.35	**1.34**	**1.46**	**0.81**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.23	**2.92**	**3.10**	1.62
pH (unitless)	0.1	NA	NA	7.57	7.61	7.65	7.29

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1A - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BHA17**	**Borehole BHA20**	**Borehole BHA28**	**Borehole BHA31**
Sample ID				**BH A17 SS3**	**BH A20 SS2**	**BH A28 SS2**	**BH A31 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Cly FILL and Silty Clay/Clayey Silt Till**	**Silty Clay FILL**	**Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**1.5-2.1**	**0.6-1.2**	**0.6-1.2**	**0.9-1.5**
Sampling Date				**22-Jan-20**	**23-Jan-20**	**22-Jan-20**	**22-Jan-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**12-Feb-20**	**12-Feb-20**
Laboratory ID				**890298**	**890260**	**890308**	**890310**
Certificate of Analysis No.				**20T567508**	**20T567556**	**20T567508**	**20T567508**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4.0	5.0	5.0	4.0
Barium (Ba)	1	220	670	64.0	92.0	66.0	96.0
Beryllium (Be)	0.5	2.5	10	<0.5	0.60	0.50	0.60
Boron (B)	5	36	120	6.0	8.0	9.0	6.0
Boron (B), Hot Water Ext.	0.1	NV	2	0.11	0.13	0.11	0.17
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	18.0	24.0	21.0	23.0
Cobalt (Co)	1	21	100	8.7	10.3	8.5	8.2
Copper (Cu)	1	92	300	18.0	22.0	21.0	15.0
Lead (Pb)	1	120	120	8	11	8	12
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	0.50
Nickel (Ni)	1	82	340	17.0	21.0	18.0	15.0
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	0.60
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	<0.5	0.50	<0.5	0.60
Vanadium (V)	1	86	86	24.0	32.0	28.0	35.0
Zinc (Zn)	5	290	340	44.0	55.0	42.0	78.0
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.270	20	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.570	1.4	0.50	**1.87**	**1.49**	**2.31**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	1.26	**6.21**	**24.00**	**6.74**
pH (unitless)	0.1	NA	NA	7.42	7.45	7.78	7.39

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 2A - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BHA3**	**Borehole BHA9**		**Borehole BHA13**
Sample ID				**A3 SS4**	**A9 SS1**	**DUP1**	**A13 SS1**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay FILL**	**Silty Clay FILL**	**Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**2.4-3.0**	**0.3-0.9**	**0.3-0.9**	**0.3-0.9**
Sampling Date				**21-Jan-20**	**21-Jan-20**	**21-Jan-20**	**21-Jan-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**12-Feb-20**	**12-Feb-20**
Laboratory ID				**884523**	**884525**	**884531**	**884529**
Certificate of Analysis No.				**20T566860**	**20T566860**	**20T566860**	**20T566860**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**				
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5.0	4.0	4.0	4.0
Barium (Ba)	1	220	670	66.0	96.0	111.0	100.0
Beryllium (Be)	0.5	2.5	8	0.50	0.60	0.60	0.60
Boron (B)	5	36	120	8.0	9.0	8.0	8.0
Boron (B), Hot Water Ext.	0.1	NV	2	0.11	0.12	0.17	0.17
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	18.0	24.0	27.0	23.0
Cobalt (Co)	1	21	80	9.2	9.8	11.2	8.6
Copper (Cu)	1	92	230	22.0	21.0	24.0	19.0
Lead (Pb)	1	120	120	9	9	11	10
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	19.0	19.0	22.0	19.0
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.60	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.60	0.60	0.60	0.50
Vanadium (V)	1	86	86	23.0	34.0	38.0	31.0
Zinc (Zn)	5	290	340	48.0	52.0	57.0	49.0
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.35	**1.34**	**1.46**	**0.81**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.23	**2.92**	**3.10**	1.62
pH (unitless)	0.1	NA	NA	7.57	7.61	7.65	7.29

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 2A - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BHA17**	**Borehole BHA20**	**Borehole BHA28**	**Borehole BHA31**
Sample ID				**BH A17 SS3**	**BH A20 SS2**	**BH A28 SS2**	**BH A31 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Cly FILL and Silty Clay/Clayey Silt Till**	**Silty Clay FILL**	**Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**1.5-2.1**	**0.6-1.2**	**0.6-1.2**	**0.9-1.5**
Sampling Date				**22-Jan-20**	**23-Jan-20**	**22-Jan-20**	**22-Jan-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**12-Feb-20**	**12-Feb-20**
Laboratory ID				**890298**	**890260**	**890308**	**890310**
Certificate of Analysis No.				**20T567508**	**20T567556**	**20T567508**	**20T567508**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**				
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4.0	5.0	5.0	4.0
Barium (Ba)	1	220	670	64.0	92.0	66.0	96.0
Beryllium (Be)	0.5	2.5	8	<0.5	0.60	0.50	0.60
Boron (B)	5	36		6.0	8.0	9.0	6.0
Boron (B), Hot Water Ext.	0.1	NV	2	0.11	0.13	0.11	0.17
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	18.0	24.0	21.0	23.0
Cobalt (Co)	1	21	80	8.7	10.3	8.5	8.2
Copper (Cu)	1	92	230	18.0	22.0	21.0	15.0
Lead (Pb)	1	120	120	8	11	8	12
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	0.50
Nickel (Ni)	1	82	270	17.0	21.0	18.0	15.0
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	0.60
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	<0.5	0.50	<0.5	0.60
Vanadium (V)	1	86	86	24.0	32.0	28.0	35.0
Zinc (Zn)	5	290	340	44.0	55.0	42.0	78.0
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.50	**1.87**	**1.49**	**2.31**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	1.26	**6.21**	**24.00**	**6.74**
pH (unitless)	0.1	NA	NA	7.42	7.45	7.78	7.39

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 3A - Ontario Regulation 347/90
Leachate Analyses
Waste Classification

Sample ID			**TCLP COMP2**
Sampling Date			**24-Jan-20**
Laboratory ID			**918885**
Certificate of Analysis No.			**20T569148**
	DL	**Schedule 4**	
Arsenic (As)	0.01	3	<0.010
Barium (Ba)	0.1	100	0.484
Boron (B)	0.05	500	0.056
Cadmium (Cd)	0.01	0.5	<0.010
Chromium (Cr)	0.01	5	<0.010
Lead (Pb)	0.01	5	<0.010
Selenium (Se)	0.01	1	<0.010
Silver (Ag)	0.01	5	<0.010
Uranium (U)	0.05	10	<0.05
Fluoride	0.1	150	0.23
Mercury	0.01	0.1	<0.01
Cyanide	0.05	20	<0.05
Nitrite + Nitrate	0.7	100	<0.70
Heptachlor + Heptachlor Epoxide	0.0003	0.3	<0.0003
Aldrin + Dieldrin	0.0007	0.07	<0.0007
DDT + Metabolites	0.003	3	<0.003
Methoxychlor	0.090	90	<0.09
Chlordane (Total)	0.0007	0.7	<0.0007
Aldrin	0.0004	0.07	<0.0002
alpha - chlordane	0.0005	NV	<0.0001
gamma-Chlordane	0.0002	NV	<0.0002
Oxychlordane	0.0004	NV	<0.0004
pp'-DDE	0.0005	NV	<0.0005
pp'-DDD	0.0015	NV	<0.0015
op'-DDT	0.0015	NV	<0.0015
pp'-DDT	0.0005	NV	<0.0005
Dieldrin	0.0005	0.07	<0.0005
Heptachlor	0.0001	0.3	<0.0001
Heptachlor Epoxide	0.0002	0.3	<0.0002
Lindane	0.0004	0.4	<0.0004
Endrin	0.0004	0.02	<0.0004
Toxaphene	0.0005	0.5	<0.0005
PCB's	0.0002	0.3	<0.0002
Vinyl Chloride	0.03	0.2	<0.030
1,1 Dichloroethene	0.02	1.4	<0.020
Dichloromethane	0.03	5	<0.030
Methyl Ethyl Ketone	0.09	200	<0.090
Chloroform	0.02	10	<0.020
1,2-Dichloroethane	0.02	0.5	<0.020
Carbon Tetrachloride	0.02	0.5	<0.020
Benzene	0.02	0.5	<0.020
Trichloroethene	0.02	5	<0.020
Tetrachloroethene	0.05	3	<0.050
Chlorobenzene	0.01	8	<0.010
1,2-Dichlorobenzene	0.01	20	<0.010
1,4-Dichlorobenzene	0.01	0.5	<0.010

Notes: Ontario Regulation 347/90, Schedule 4 Leachate Criteria. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Schedule 4 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

Table 4A - Ontario Regulation 406/19
Leachate Analyses
Waste Classification

Sample ID			TCLP COMP2
Sampling Date			24-Jan-20
Laboratory ID			918885
Certificate of Analysis No.			20T569148
	DL	Appendix 2 Table 3.1	
Arsenic (As)	0.01	NV	<0.010
Barium (Ba)	0.1	4600000	0.484
Boron (B)	0.05	NV	0.056
Cadmium (Cd)	0.01	NV	<0.010
Chromium (Cr)	0.01	130000	<0.010
Lead (Pb)	0.01	NV	<0.010
Selenium (Se)	0.01	10000	<0.010
Silver (Ag)	0.01	300	<0.010
Uranium (U)	0.05	66000	<0.05
Fluoride	0.1	NV	0.23
Mercury	0.01	NV	<0.01
Cyanide	0.05	NV	<0.05
Nitrite + Nitrate	0.7	NV	<0.70
Heptachlor + Heptachlor Epoxide	0.0003	NV	<0.0003
Aldrin + Dieldrin	0.0007	0.000097	<0.0007
DDT + Metabolites	0.003	NV	<0.003
Methoxychlor	0.090	NV	<0.09
Chlordane (Total)	0.0007	NV	<0.0007
Aldrin	0.0004	NV	<0.0002
alpha - chlordane	0.0005	NV	<0.0001
gamma-Chlordane	0.0002	NV	<0.0002
Oxychlordane	0.0004	NV	<0.0004
pp'-DDE	0.0005	NV	<0.0005
pp'-DDD	0.0015	NV	<0.0015
op'-DDT	0.0015	NV	<0.0015
pp'-DDT	0.0005	NV	<0.0005
Dieldrin	0.0005	NV	<0.0005
Heptachlor	0.0001	NV	<0.0001
Heptachlor Epoxide	0.0002	0.00001	<0.0002
Lindane	0.0004	NV	<0.0004
Endrin	0.0004	0.000062	<0.0004
Toxaphene	0.0005	NV	<0.0005
PCB's	0.0002	NV	<0.0002
Vinyl Chloride	0.03	NV	<0.030
1,1 Dichloroethene	0.02	500.0	<0.020
Dichloromethane	0.03	NV	<0.030
Methyl Ethyl Ketone	0.09	NV	<0.090
Chloroform	0.02	NV	<0.020
1,2-Dichloroethane	0.02	NV	<0.020
Carbon Tetrachloride	0.02	200.0	<0.020
Benzene	0.02	NV	<0.020
Trichloroethene	0.02	500	<0.020
Tetrachloroethene	0.05	500	<0.050
Chlorobenzene	0.01	NV	<0.010
1,2-Dichlorobenzene	0.01	NV	<0.010
1,4-Dichlorobenzene	0.01	NV	<0.010

Notes: Ontario Regulation 406/19, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse - Table 3.1: Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Table 3.1 exceedances indicated in **<u>BOLD underlined</u>**. "NV" means no value. "NA" means not applicable / not analyzed.

SECTION B
ARTERIAL A2
(FROM MAYFIELD ROAD TO MAJOR MACKENZIE DRIVE / RR 50, ~3.4 KM)

APPENDIX C-B

SOIL ANALYTICAL RESULTS

Table 1B - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				Borehole B2	Borehole B5	Borehole B9	Borehole B11
Sample ID				BH B2 SS5	BH B5 SS4	BH B9 SS5	BH B11 SS2
Soil Type				Silty Sand/Sandy Silt	Silty Clay/Clayey Silt Till	Silty Clay/Clayey Silt Till	Silty Clay/Clayey Silt Till
Field Vapour (ppm)				0/0	0/0	0/0	0/0
Sample Depth (mbgs)				3.05-3.6	2.3-2.9	4.6-5.0	0.8-1.4
Sampling Date				23-Jan-20	23-Jan-20	20-Feb-20	20-Feb-20
Latest Analyzed Date				12-Feb-20	12-Feb-20	3-Mar-20	3-Mar-20
Laboratory ID				890263	890268	969395	969397
Certificate of Analysis No.				20T567556	20T567556	20T577996	20T577996
	Lowest Detection Limit	Table 1 SCS	Table 3 SCS				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	2	4
Barium (Ba)	1	220	670	40	78	25	80
Beryllium (Be)	0.5	2.5	10	<0.5	<0.5	<0.5	0.6
Boron (B)	5	36	120	5	8	<5	11
Boron (B), Hot Water Ext.	0.1	NV	2	0.16	0.15	0.18	0.13
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	10	19	9	22
Cobalt (Co)	1	21	100	5.4	10.3	3.6	9.4
Copper (Cu)	1	92	300	20	21	14	20
Lead (Pb)	1	120	120	8	9	4	8
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	10	20	7	20
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	<0.5	0.5	<0.5	0.6
Vanadium (V)	1	86	86	16	25	17	32
Zinc (Zn)	5	290	340	34	51	22	44
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.166	0.164	0.172	0.246
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.25	0.163	0.282	0.75
pH (unitless)	0.1	NA	NA	7.93	7.84	7.94	7.85

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1B - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole B17**	**Borehole B22**	**Borehole B23**	**Borehole S3**
Sample ID				**BH B17 SS3**	**BH B22 SS1**	**BH B23 SS1**	**BH S3 SS3**
Soil Type				**Silty Clay/Clayey Silt Till**	**Sand and Gravel and Silty Clay FILL**	**Silty Clay FILL**	**Silty Caly FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**NA**
Sample Depth (mbgs)				**1.5-2.1**	**0.3-0.9**	**Surface-0.6**	**1.5-2.1**
Sampling Date				**24-Jan-20**	**23-Jan-20**	**26-Jan-22**	**10-Jan-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**7-Feb-22**	**20-Jan-20**
Laboratory ID				**918798**	**890269**	**3464483**	**862686**
Certificate of Analysis No.				**20T569148**	**20T567556**	**22T858487**	**20T563670**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	5	3	5
Barium (Ba)	1	220	670	85	175	72.3	131
Beryllium (Be)	0.5	2.5	10	0.5	1.1	0.5	0.7
Boron (B)	5	36	120	10	10	7	10
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	0.1	0.44	1.26
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	23	39	22	30
Cobalt (Co)	1	21	100	9.7	16.6	9	10.7
Copper (Cu)	1	92	300	20	28	19.8	27
Lead (Pb)	1	120	120	13	16	12	54
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	0.5
Nickel (Ni)	1	82	340	20	34	17	22
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.8	0.7
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.5	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.5	<0.4
Uranium (U)	0.5	2.5	33	0.5	0.6	0.52	0.7
Vanadium (V)	1	86	86	30	47	32.6	39
Zinc (Zn)	5	290	340	48	83	56	103
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10	0.21
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.236	**0.918**	0.359	**5.52**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.205	**1.24**	0.644	**45.3**
pH (unitless)	0.1	NA	NA	7.58	7.6	7.23	7.58

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 2B - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole B2**	**Borehole B28**
Sample ID				**BH B2 SS1**	**BH B28 SS2**
Soil Type				**Silty Clay FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**20/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.6**	**0.7-1.4**
Sampling Date				**23-Jan-20**	**26-Jan-22**
Latest Analyzed Date				**12-Feb-20**	**7-Feb-22**
Laboratory ID				**890263**	**3464492.00**
Certificate of Analysis No.				**20T567556**	**22T858487**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**		
PHC F1 (C6-C10 less BTEX)	5	25	65	<5.0	<5.0
PHC F2 (>C10-C16)	10	10	250	<10	<10
PHC F3 (>C16-C34)	50	240	2500	<50	<50
PHC F4 (>C34)	50	120	6600	<50	<50
PHC F4 (>C34)*	50	120	6600	-	-

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 3B - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole B2**	**Borehole B28**
Sample ID				**BH B2 SS1**	**BH B28 SS2**
Soil Type				**Silty Clay FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**20/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.6**	**0.7-1.4**
Sampling Date				**23-Jan-20**	**26-Jan-22**
Latest Analyzed Date				**12-Feb-20**	**7-Feb-22**
Laboratory ID				**890263**	**3464492.00**
Certificate of Analysis No.				**20T567556**	**22T858487**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**		
Dichlorodifluoromethane	0.05	0.05	25	<0.050	<0.050
Vinyl chloride	0.02	0.02	0.25	<0.020	<0.020
Bromomethane	0.05	0.05	0.05	<0.050	<0.050
Trichlorofluoromethane	0.05	0.25	5.8	<0.050	<0.050
Acetone	0.50	0.5	28	<0.50	<0.50
1,1-Dichloroethylene	0.05	0.05	0.48	<0.050	<0.050
Methylene Chloride	0.05	0.05	2	<0.050	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	9.3	<0.050	<0.050
MTBE	0.05	0.05	3.2	<0.050	<0.050
1,1-Dichloroethane	0.05	0.05	21	<0.050	<0.050
Methyl Ethyl Ketone	0.50	0.5	88	<0.50	<0.50
cis-1,2-Dichloroethylene	0.02	0.05	37	<0.02	<0.02
Chloroform	0.04	0.05	0.18	<0.04	<0.04
1,2-Dichloroethane	0.03	0.05	0.05	<0.03	<0.03
1,1,1-Trichloroethane	0.05	0.05	12	<0.050	<0.050
Carbon tetrachloride	0.05	0.05	1.5	<0.050	<0.050
Benzene	0.02	0.02	0.4	<0.02	<0.02
1,2-Dichloropropane	0.03	0.05	0.68	<0.03	<0.03
Trichloroethylene	0.03	0.05	0.61	<0.03	<0.03
Bromodichloromethane	0.05	0.05	18	<0.050	<0.050
Methyl Isobutyl Ketone	0.50	0.5	210	<0.50	<0.50
1,1,2-Trichloroethane	0.04	0.05	0.11	<0.04	<0.04
Toluene	0.05	0.2	78	<0.05	<0.05
Dibromochloromethane	0.05	0.05	13	<0.050	<0.050
1,2-Dibromoethane	0.04	0.05	0.05	<0.04	<0.04
Tetrachloroethylene	0.05	0.05	21	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.04	0.05	0.11	<0.04	<0.04
Chlorobenzene	0.05	0.05	2.7	<0.050	<0.050
Ethylbenzene	0.05	0.05	19	<0.050	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050	<0.050
Bromoform	0.05	0.05	1.7	<0.050	<0.050
Styrene	0.05	0.05	43	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	0.094	<0.050	<0.050
o-Xylene	0.05	NV	NV	<0.050	<0.050
1,3-Dichlorobenzene	0.05	0.05	12	<0.050	<0.050
1,4-Dichlorobenzene	0.05	0.05	0.84	<0.050	<0.050
1,2-Dichlorobenzene	0.05	0.05	8.5	<0.050	<0.050
Xylenes (Total)	0.05	0.05	30	<0.050	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.21	<0.04	<0.04
n-Hexane	0.05	0.05	88	<0.050	<0.050

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 4B - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole B2**	**Borehole B5**	**Borehole B8**	**Borehole B12**
Sample ID				**BH B2 SS1**	**BH B5 SS1**	**BH B8 SS1**	**BH B12 SS1**
Soil Type				**Silty Clay FILL**	**Silty Clay FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**
Field Vapour (ppm)				**20/0**	**10/1**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.6**	**0.3-0.6**	**Surface-0.6**	**Surface-0.6**
Sampling Date				**23-Jan-20**	**23-Jan-20**	**20-Feb-20**	**20-Feb-20**
Latest Analyzed Date				**11-Feb-20**	**11-Feb-20**	**2-Mar-20**	**2-Mar-20**
Laboratory ID				**890263**	**890267**	**969393**	**969400**
Certificate of Analysis No.				**20T567556**	**20T567556**	**20T577996**	**20T577996**
	Lowest	**Table 1 SCS**	**Table 3 SCS**				
Hexachloroethane	0.010	0.01	0.66	<0.01	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.063	<0.005	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.19	<0.005	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.38	<0.005	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.65	<0.007	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	1.6	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.095	<0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 4B - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				Borehole B15	Borehole B17	Borehole B21	Borehole B25
Sample ID				**BH B15 SS1**	**BH B17 SS1**	**BH B21 SS1**	**BH B25 SS1**
Soil Type				**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**	**Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**Surface-0.6**	**Surface-0.6**	**Surface-0.6**	**Surface-0.6**
Sampling Date				**24-Jan-20**	**24-Jan-20**	**24-Jan-20**	**26-Jan-22**
Latest Analyzed Date				**10-Feb-20**	**10-Feb-20**	**10-Feb-20**	**7-Feb-22**
Laboratory ID				**918801**	**918797**	**918790**	**3464486**
Certificate of Analysis No.				**20T569148**	**20T569148**	**20T569148**	**22T858487**
	Lowest	**Table 1 SCS**	**Table 3 SCS**				
Hexachloroethane	0.010	0.01	0.66	<0.01	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.063	<0.005	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.19	<0.005	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.38	<0.005	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.65	<0.007	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	1.6	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.095	<0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 5B - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole B2**	**Borehole B5**	**Borehole B9**	**Borehole B11**
Sample ID				**BH B2 SS5**	**BH B5 SS4**	**BH B9 SS5**	**BH B11 SS2**
Soil Type				**Silty Sand/Sandy Silt**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**3.05-3.6**	**2.3-2.9**	**4.6-5.0**	**0.8-1.4**
Sampling Date				**23-Jan-20**	**23-Jan-20**	**20-Feb-20**	**20-Feb-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**3-Mar-20**	**3-Mar-20**
Laboratory ID				**890263**	**890268**	**969395**	**969397**
Certificate of Analysis No.				**20T567556**	**20T567556**	**20T577996**	**20T577996**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**				
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	2	4
Barium (Ba)	1	220	670	40	78	25	80
Beryllium (Be)	0.5	2.5	8	<0.5	<0.5	<0.5	0.6
Boron (B)	5	36	120	5	8	<5	11
Boron (B), Hot Water Ext.	0.1	NV	2	0.16	0.15	0.18	0.13
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	10	19	9	22
Cobalt (Co)	1	21	80	5.4	10.3	3.6	9.4
Copper (Cu)	1	92	230	20	21	14	20
Lead (Pb)	1	120	120	8	9	4	8
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	10	20	7	20
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	<0.5	0.5	<0.5	0.6
Vanadium (V)	1	86	86	16	25	17	32
Zinc (Zn)	5	290	340	34	51	22	44
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.166	0.164	0.172	0.246
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.25	0.163	0.282	0.75
pH (unitless)	0.1	NA	NA	7.93	7.84	7.94	7.85

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5B - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole B17**	**Borehole B22**	**Borehole B23**	**Borehole S3**
Sample ID				**BH B17 SS3**	**BH B22 SS1**	**BH B23 SS1**	**BH S3 SS3**
Soil Type				**Silty Clay/Clayey Silt Till**	**Sand and Gravel and Silty Clay FILL**	**Silty Clay FILL**	**Silty Caly FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**NA**
Sample Depth (mbgs)				**1.5-2.1**	**0.3-0.9**	**Surface-0.6**	**1.5-2.1**
Sampling Date				**24-Jan-20**	**23-Jan-20**	**26-Jan-22**	**10-Jan-20**
Latest Analyzed Date				**12-Feb-20**	**12-Feb-20**	**7-Feb-22**	**20-Jan-20**
Laboratory ID				**918798**	**890269**	**3464483**	**862686**
Certificate of Analysis No.				**20T569148**	**20T567556**	**22T858487**	**20T563670**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**				
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	5	3	5
Barium (Ba)	1	220	670	85	175	72.3	131
Beryllium (Be)	0.5	2.5	8	0.5	1.1	0.5	0.7
Boron (B)	5	36	120	10	10	7	10
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	0.1	0.44	1.26
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	23	39	22	30
Cobalt (Co)	1	21	80	9.7	16.6	9	10.7
Copper (Cu)	1	92	230	20	28	19.8	27
Lead (Pb)	1	120	120	13	16	12	54
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	0.5
Nickel (Ni)	1	82	270	20	34	17	22
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.8	0.7
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.5	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.5	<0.4
Uranium (U)	0.5	2.5	33	0.5	0.6	0.52	0.7
Vanadium (V)	1	86	86	30	47	32.6	39
Zinc (Zn)	5	290	340	48	83	56	103
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10	0.21
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.236	**0.918**	0.359	**5.52**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.205	**1.24**	0.644	**45.3**
pH (unitless)	0.1	NA	NA	7.58	7.6	7.23	7.58

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in BOLD and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 6B - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole B2**	**Borehole B28**
Sample ID				**BH B2 SS1**	**BH B28 SS2**
Soil Type				**Silty Clay FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**20/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.6**	**0.7-1.4**
Sampling Date				**23-Jan-20**	**26-Jan-22**
Latest Analyzed Date				**12-Feb-20**	**7-Feb-22**
Laboratory ID				**890263**	**3464492.00**
Certificate of Analysis No.				**20T567556**	**22T858487**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**		
PHC F1 (C6-C10 less BTEX)	5	25	25	<5.0	<5.0
PHC F2 (>C10-C16)	10	10	26	<10	<10
PHC F3 (>C16-C34)	50	240	1700	<50	<50
PHC F4 (>C34)	50	120	3300	<50	<50
PHC F4 (>C34)*	50	120	3300	-	-

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 7B - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole B2**	**Borehole B28**
Sample ID				**BH B2 SS1**	**BH B28 SS2**
Soil Type				**Silty Clay FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**20/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.6**	**0.7-1.4**
Sampling Date				**23-Jan-20**	**26-Jan-22**
Latest Analyzed Date				**12-Feb-20**	**7-Feb-22**
Laboratory ID				**890263**	**3464492.00**
Certificate of Analysis No.				**20T567556**	**22T858487**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**		
Dichlorodifluoromethane	0.05	0.05	1.8	<0.050	<0.050
Vinyl chloride	0.02	0.02	0.02	<0.020	<0.020
Bromomethane	0.05	0.05	0.05	<0.050	<0.050
Trichlorofluoromethane	0.05	0.25	0.46	<0.050	<0.050
Acetone	0.50	0.5	1.8	<0.50	<0.50
1,1-Dichloroethylene	0.05	0.05	0.05	<0.050	<0.050
Methylene Chloride	0.05	0.05	0.2	<0.050	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	0.05	<0.050	<0.050
MTBE	0.05	0.05	0.05	<0.050	<0.050
1,1-Dichloroethane	0.05	0.05	0.57	<0.050	<0.050
Methyl Ethyl Ketone	0.50	0.5	26	<0.50	<0.50
cis-1,2-Dichloroethylene	0.02	0.05	0.05	<0.02	<0.02
Chloroform	0.04	0.05	0.26	<0.04	<0.04
1,2-Dichloroethane	0.03	0.05	0.05	<0.03	<0.03
1,1,1-Trichloroethane	0.05	0.05	0.4	<0.050	<0.050
Carbon tetrachloride	0.05	0.05	0.05	<0.050	<0.050
Benzene	0.02	0.02	0.034	<0.02	<0.02
1,2-Dichloropropane	0.03	0.05	0.05	<0.03	<0.03
Trichloroethylene	0.03	0.05	0.05	<0.03	<0.03
Bromodichloromethane	0.05	0.05	5.8	<0.050	<0.050
Methyl Isobutyl Ketone	0.50	0.5	17	<0.50	<0.50
1,1,2-Trichloroethane	0.04	0.05	0.05	<0.04	<0.04
Toluene	0.08	0.2	7.8	<0.05	<0.05
Dibromochloromethane	0.05	0.05	5.5	<0.050	<0.050
1,2-Dibromoethane	0.04	0.05	0.05	<0.04	<0.04
Tetrachloroethylene	0.05	0.05	0.05	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.04	0.05	0.05	<0.04	<0.04
Chlorobenzene	0.05	0.05	0.28	<0.050	<0.050
Ethylbenzene	0.05	0.05	1.9	<0.050	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050	<0.050
Bromoform	0.05	0.05	2.5	<0.050	<0.050
Styrene	0.05	0.05	6.8	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	0.05	<0.050	<0.050
o-Xylene	0.02	NV	NV	<0.050	<0.050
1,3-Dichlorobenzene	0.05	0.05	6.8	<0.050	<0.050
1,4-Dichlorobenzene	0.05	0.05	0.05	<0.050	<0.050
1,2-Dichlorobenzene	0.05	0.05	6.8	<0.050	<0.050
Xylenes (Total)	0.05	0.05	3	<0.050	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.05	<0.04	<0.04
n-Hexane	0.05	0.05	2.5	<0.050	<0.050

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 8B - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole B2**	**Borehole B5**	**Borehole B8**	**Borehole B12**
Sample ID				**BH B2 SS1**	**BH B5 SS1**	**BH B8 SS1**	**BH B12 SS1**
Soil Type				**Silty Clay FILL**	**Silty Clay FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**
Field Vapour (ppm)				**20/0**	**10/1**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.6**	**0.3-0.6**	**Surface-0.6**	**Surface-0.6**
Sampling Date				**23-Jan-20**	**23-Jan-20**	**20-Feb-20**	**20-Feb-20**
Latest Analyzed Date				**11-Feb-20**	**11-Feb-20**	**2-Mar-20**	**2-Mar-20**
Laboratory ID				**890263**	**890267**	**969393**	**969400**
Certificate of Analysis No.				**20T567556**	**20T567556**	**20T577996**	**20T577996**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**				
Hexachloroethane	0.010	0.01	0.13	<0.01	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.01	<0.005	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.072	<0.005	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.52	<0.007	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	0.19	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.01	<0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not tested. Detection Limits higher than SCS are in *ITALIC* .

Table 8B - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				Borehole B15	Borehole B17	Borehole B21	Borehole B25
Sample ID				BH B15 SS1	BH B17 SS1	BH B21 SS1	BH B25 SS1
Soil Type				Topsoil and Silty Clay FILL	Topsoil and Silty Clay FILL	Topsoil and Silty Clay FILL	Silty Clay FILL
Field Vapour (ppm)				0/0	0/0	0/0	0/0
Sample Depth (mbgs)				Surface-0.6	Surface-0.6	Surface-0.6	Surface-0.6
Sampling Date				24-Jan-20	24-Jan-20	24-Jan-20	26-Jan-22
Latest Analyzed Date				10-Feb-20	10-Feb-20	10-Feb-20	7-Feb-22
Laboratory ID				918801	918797	918790	3464486
Certificate of Analysis No.				20T569148	20T569148	20T569148	22T858487
	Lowest Detection Limit	Table 1 ESQS	Table 3.1 ESQS				
Hexachloroethane	0.010	0.01	0.13	<0.01	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexan	0.005	0.01	0.01	<0.005	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.072	<0.005	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.52	<0.007	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	0.19	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.01	<0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in BOLD, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not tested. Detection Limits higher than SCS are in ITALIC.

Table 9B - Ontario Regulation 347/90
Leachate Analyses
Waste Classification

Sample ID **Sampling Date** **Laboratory ID** **Certificate of Analysis No.**			**Comp 1 TCLP B** **20-Feb-20** **1028261** **20T584983**	**BH26 SS1** **26-Jan-22** **3464488** **22T858487**
	DL	**Schedule 4**		
Arsenic (As)	0.01	3	<0.010	<0.010
Barium (Ba)	0.1	100	0.41	0.466
Boron (B)	0.05	500	0.051	<0.050
Cadmium (Cd)	0.01	0.5	<0.010	<0.010
Chromium (Cr)	0.01	5	<0.010	<0.010
Lead (Pb)	0.01	5	<0.010	<0.010
Selenium (Se)	0.01	1	<0.010	<0.010
Silver (Ag)	0.01	5	<0.010	<0.010
Uranium (U)	0.05	10	<0.05	<0.05
Fluoride	0.1	150	0.24	0.18
Mercury	0.01	0.1	<0.01	<0.01
Cyanide	0.05	20	<0.05	<0.05
Nitrite + Nitrate	0.7	100	<0.70	<0.70
Benzo(a)pyrene	0.001	0.001	-	<0.001
Heptachlor + Heptachlor Epoxide	0.0003	0.3	<0.0003	-
Aldrin + Dieldrin	0.0007	0.07	<0.0007	-
DDT + Metabolites	0.003	3.0	<0.003	-
Methoxychlor	0.090	90.0	<0.09	-
Chlordane (Total)	0.0007	0.7	<0.0007	-
Endrin	0.0004	0.02	<0.0004	-
Toxaphene	0.0005	0.5	<0.0005	-
PCB's	0.0002	0.3	<0.0002	<0.005
Vinyl Chloride	0.03	0.2	<0.030	<0.030
1,1 Dichloroethene	0.02	1.4	<0.020	<0.020
Dichloromethane	0.03	5	<0.030	<0.030
Methyl Ethyl Ketone	0.09	200	<0.090	<0.090
Chloroform	0.02	10	<0.020	<0.020
1,2-Dichloroethane	0.02	0.5	<0.020	<0.020
Carbon Tetrachloride	0.02	0.5	<0.020	<0.020
Benzene	0.02	0.5	<0.020	<0.020
Trichloroethene	0.02	5	<0.020	<0.020
Tetrachloroethene	0.05	3	<0.050	<0.050
Chlorobenzene	0.01	8	<0.010	<0.010
1,2-Dichlorobenzene	0.01	20	<0.010	<0.010
1,4-Dichlorobenzene	0.01	0.5	<0.010	<0.010

Notes: Ontario Regulation 347/90, Schedule 4 Leachate Criteria. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Schedule 4 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

Table 10B - Ontario Regulation 416/09
Leachate Analyses
Waste Classification

Sample ID			**Comp 1 TCLP B**	**BH26 SS1**
Sampling Date			**20-Feb-20**	**26-Jan-22**
Laboratory ID			**1028261**	**3464488**
Certificate of Analysis No.			**20T584983**	**22T858487**
	DL	**Appendix 2 Table 3.1**		
Arsenic (As)	0.01	NV	<0.010	<0.010
Barium (Ba)	0.1	4600000	0.41	0.466
Boron (B)	0.05	NV	0.051	<0.050
Cadmium (Cd)	0.01	NV	<0.010	<0.010
Chromium (Cr)	0.01	130000	<0.010	<0.010
Lead (Pb)	0.01	NV	<0.010	<0.010
Selenium (Se)	0.01	10000	<0.010	<0.010
Silver (Ag)	0.01	300	<0.010	<0.010
Uranium (U)	0.05	66000	<0.05	<0.05
Fluoride	0.1	NV	0.24	0.18
Mercury	0.01	NV	<0.01	<0.01
Cyanide	0.05	NV	<0.05	<0.05
Nitrite + Nitrate	0.7	NV	<0.70	<0.70
Benzo(a)pyrene	0.001	NV	-	<0.001
Heptachlor + Heptachlor Epoxide	0.0003	NV	<0.0003	-
Aldrin + Dieldrin	0.0007	0.000097	<0.0007	-
DDT + Metabolites	0.003	NV	<0.003	-
Methoxychlor	0.090	NV	<0.09	-
Chlordane (Total)	0.0007	NV	<0.0007	-
Aldrin	0.0004	NV	<0.0002	-
alpha - chlordane	0.0005	NV	<0.0001	-
gamma-Chlordane	0.0002	NV	<0.0002	-
Oxychlordane	0.0004	NV	<0.0004	-
pp'-DDE	0.0005	NV	<0.0005	-
pp'-DDD	0.0015	NV	<0.0015	-
op'-DDT	0.0015	NV	<0.0015	-
pp'-DDT	0.0005	NV	<0.0005	-
Dieldrin	0.0005	NV	<0.0005	-
Heptachlor	0.0001	NV	<0.0001	-
Heptachlor Epoxide	0.0002	0.00001	<0.0002	-
Lindane	0.0004	NV	<0.0004	-
Endrin	0.0004	0.000062	<0.0004	-
Toxaphene	0.0005	NV	<0.0005	-
PCB's	0.0002	NV	<0.0002	<0.005
Vinyl Chloride	0.5	NV	<0.030	<0.030
1,1 Dichloroethene	0.2	500.0	<0.020	<0.020
Dichloromethane	1	NV	<0.030	<0.030
Methyl Ethyl Ketone	0.2	NV	<0.090	<0.090
Chloroform	0.5	NV	<0.020	<0.020
1,2-Dichloroethane	0.5	NV	<0.020	<0.020
Carbon Tetrachloride	0.5	200.0	<0.020	<0.020
Benzene	0.5	NV	<0.020	<0.020
Trichloroethene	0.5	500	<0.020	<0.020
Tetrachloroethene	0.5	500	<0.050	<0.050
Chlorobenzene	0.5	NV	<0.010	<0.010
1,2-Dichlorobenzene	0.5	NV	<0.010	<0.010
1,4-Dichlorobenzene	0.2	NV	<0.010	<0.010

Notes: Ontario Regulation 406/19, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse - Table 3.1: Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Table 3.1 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

SECTION C
COUNTRYSIDE DRIVE
(FROM CLARKWAY DRIVE TO RR 50, ~3 KM)

APPENDIX C-C

SOIL ANALYTICAL RESULTS

Table 1C - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BH C1**	**Borehole BH C6**	**Borehole BH C12**
Sample ID				**BH C1 SS4**	**BH C6 SS2**	**BH C12 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**2.3-3.9**	**0.6-1..2**	**0.6-1.2**
Sampling Date				**25-Mar-20**	**25-Mar-20**	**25-Mar-20**
Latest Analyzed Date				**3-Apr-20**	**3-Apr-20**	**3-Apr-20**
Laboratory ID				**1055899**	**1055906**	**1055904**
Certificate of Analysis No.				**20T588871**	**20T588871**	**20T588871**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	3	3	3
Barium (Ba)	1	220	670	96	44	78
Beryllium (Be)	0.5	2.5	10	0.6	<0.5	<0.5
Boron (B)	5	36	120	9	6	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	0.2
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	21	11	18
Cobalt (Co)	1	21	100	12.4	5.8	9.3
Copper (Cu)	1	92	300	19	16	16
Lead (Pb)	1	120	120	9	5	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	24	10	17
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.5	<0.5	<0.5
Vanadium (V)	1	86	86	33	22	32
Zinc (Zn)	5	290	340	52	29	47
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.312	**1.19**	**1.94**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.811	**14.3**	**23.1**
pH (unitless)	0.1	NA	NA	7.81	8.05	7.79

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1C - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BH C13**	**Borehole BH C17**	**Borehole BH C24**
Sample ID				**BH C13 SS3**	**BH C17 SS1**	**BH C24 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**1.5-2.1**	**0.3-0.9**	**0.6-1.2**
Sampling Date				**27-Mar-20**	**27-Mar-20**	**1-Apr-20**
Latest Analyzed Date				**3-Apr-20**	**3-Apr-20**	**13-Apr-20**
Laboratory ID				**1056574**	**1056577**	**1066586**
Certificate of Analysis No.				**20T588920**	**20T588920**	**20T590525**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	4	4
Barium (Ba)	1	220	670	96	65	74
Beryllium (Be)	0.5	2.5	10	0.6	<0.5	0.6
Boron (B)	5	36	120	12	7	8
Boron (B), Hot Water Ext.	0.1	NV	2	0.43	0.21	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	23	17	20
Cobalt (Co)	1	21	100	11.3	7.3	9.4
Copper (Cu)	1	92	300	19	18	19
Lead (Pb)	1	120	120	9	8	9
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	25	16	19
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.6	<0.5	0.5
Vanadium (V)	1	86	86	35	28	29
Zinc (Zn)	5	290	340	52	44	46
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.45**	0.552	**0.83**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**3.85**	1.6	**4.19**
pH (unitless)	0.1	NA	NA	7.75	7.71	7.88

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1C - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BH C25**		**Borehole BH C29**	**Borehole BH C37**
Sample ID				**BH C25 SS3**	**DUP**	**BH C29 SS1**	**BH C37 SS1**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**1.5-2.1**	**1.5-2.1**	**0.3-0.9**	**0.3-0.9**
Sampling Date				**27-Mar-20**	**27-Mar-20**	**19-Mar-20**	**19-Mar-20**
Latest Analyzed Date				**3-Apr-20**	**3-Apr-20**	**30-Mar-20**	**30-Mar-20**
Laboratory ID				**1056587**	**1056591**	**1046517**	**1046494**
Certificate of Analysis No.				**20T588920**	**20T588920**	**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	3	5
Barium (Ba)	1	220	670	77	78	119	79
Beryllium (Be)	0.5	2.5	10	<0.5	<0.5	0.6	0.6
Boron (B)	5	36	120	9	9	8	9
Boron (B), Hot Water Ext.	0.1	NV	2	0.25	0.25	0.5	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	19	19	21	21
Cobalt (Co)	1	21	100	8.6	8.9	8.3	10
Copper (Cu)	1	92	300	17	18	15	23
Lead (Pb)	1	120	120	7	8	10	10
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	19	19	17	23
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.6	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.6	0.6	1	<0.5
Vanadium (V)	1	86	86	29	29	31	28
Zinc (Zn)	5	290	340	44	45	67	51
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.57**	**1.42**	**2.06**	**1.33**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**4.76**	**3.98**	**8.09**	**3.2**
pH (unitless)	0.1	NA	NA	7.88	7.93	7.27	7.73

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 2C - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole BH C29**	**Borehole BH C33**	**Borehole BH S11**
Sample ID				**BH C29 SS1**	**BH C33 SS1**	**BH S11 SS5**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**	**Silty Sand/Sandy Silt**
Field Vapour (ppm)				**0/0**	**0/0**	**NA**
Sample Depth (mbgs)				**0.3-0.9**	**0.3-0.9**	**3.05-3.7**
Sampling Date				**19-Mar-20**	**19-Mar-20**	**25-Mar-20**
Latest Analyzed Date				**27-Mar-20**	**27-Mar-20**	**2-Apr-20**
Laboratory ID				**1046517**	**1046509**	**1055912**
Certificate of Analysis No.				**20T587352**	**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
PHC F1 (C6-C10 less BTEX)	5	25	65	<5.0	<5.0	<5.0
PHC F2 (>C10-C16)	10	10	250	<10	<10	<10
PHC F3 (>C16-C34)	50	240	2500	<50	<50	<50
PHC F4 (>C34)	50	120	6600	<50	<50	<50
PHC F4 (>C34)*	50	120	6600	-	-	-

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 3C - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole BH C29**	**Borehole BH C33**	**Borehole BH S11**
Sample ID				**BH C29 SS1**	**BH C33 SS1**	**BH S11 SS5**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**	**Silty Sand/Sandy Silt**
Field Vapour (ppm)				**0/0**	**0/0**	**NA**
Sample Depth (mbgs)				**0.3-0.9**	**0.3-0.9**	**3.05-3.7**
Sampling Date				**27-Mar-20**	**27-Mar-20**	**25-Mar-20**
Latest Analyzed Date				**0/0**	**0/0**	**NA**
Laboratory ID				**1046517**	**1046509**	**1055912**
Certificate of Analysis No.				**20T587352**	**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
Dichlorodifluoromethane	0.05	0.05	25	<0.050	<0.050	-
Vinyl chloride	0.02	0.02	0.25	<0.020	<0.020	-
Bromomethane	0.05	0.05	0.05	<0.050	<0.050	-
Trichlorofluoromethane	0.05	0.25	5.8	<0.050	<0.050	-
Acetone	0.50	0.5	28	<0.50	<0.50	-
1,1-Dichloroethylene	0.05	0.05	0.48	<0.050	<0.050	-
Methylene Chloride	0.05	0.05	2	<0.050	<0.050	-
trans-1,2-Dichloroethylene	0.05	0.05	9.3	<0.050	<0.050	-
MTBE	0.05	0.05	3.2	<0.050	<0.050	-
1,1-Dichloroethane	0.05	0.05	21	<0.050	<0.050	-
Methyl Ethyl Ketone	0.50	0.5	88	<0.50	<0.50	-
cis-1,2-Dichloroethylene	0.02	0.05	37	<0.02	<0.02	-
Chloroform	0.04	0.05	0.18	<0.04	<0.04	-
1,2-Dichloroethane	0.03	0.05	0.05	<0.03	<0.03	-
1,1,1-Trichloroethane	0.05	0.05	12	<0.050	<0.050	-
Carbon tetrachloride	0.05	0.05	1.5	<0.050	<0.050	-
Benzene	0.02	0.02	0.4	<0.02	<0.02	<0.02
1,2-Dichloropropane	0.03	0.05	0.68	<0.03	<0.03	-
Trichloroethylene	0.03	0.05	0.61	<0.03	<0.03	-
Bromodichloromethane	0.05	0.05	18	<0.050	<0.050	-
Methyl Isobutyl Ketone	0.50	0.5	210	<0.50	<0.50	-
1,1,2-Trichloroethane	0.04	0.05	0.11	<0.04	<0.04	-
Toluene	0.05	0.2	78	<0.05	<0.05	<0.05
Dibromochloromethane	0.05	0.05	13	<0.050	<0.050	-
1,2-Dibromoethane	0.04	0.05	0.05	<0.04	<0.04	-
Tetrachloroethylene	0.05	0.05	21	<0.050	<0.050	-
1,1,1,2-Tetrachloroethane	0.04	0.05	0.11	<0.04	<0.04	-
Chlorobenzene	0.05	0.05	2.7	<0.050	<0.050	-
Ethylbenzene	0.05	0.05	19	<0.050	<0.050	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050	<0.050	-
Bromoform	0.05	0.05	1.7	<0.050	<0.050	-
Styrene	0.05	0.05	43	<0.050	<0.050	-
1,1,2,2-Tetrachloroethane	0.05	0.05	0.094	<0.050	<0.050	-
o-Xylene	0.05	NV	NV	<0.050	<0.050	-
1,3-Dichlorobenzene	0.05	0.05	12	<0.050	<0.050	-
1,4-Dichlorobenzene	0.05	0.05	0.84	<0.050	<0.050	-
1,2-Dichlorobenzene	0.05	0.05	8.5	<0.050	<0.050	-
Xylenes (Total)	0.05	0.05	30	<0.050	<0.050	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.21	<0.04	<0.04	-
n-Hexane	0.05	0.05	88	<0.050	<0.050	-

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 4C - Soil Chemical Analyses
Polycyclic Aromatic Hydrocarbons

Sample Location				**Borehole BH C29**	**Borehole BH C33**
Sample ID				**BH C29 SS1**	**BH C33 SS1**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.9**	**0.3-0.9**
Sampling Date				**19-Mar-20**	**19-Mar-20**
Latest Analyzed Date				**30-Mar-20**	**30-Mar-20**
Laboratory ID				**1046517**	**1046509**
Certificate of Analysis No.				**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**		
Naphthalene	0.05	0.09	28	<0.05	<0.05
Acenaphthylene	0.05	0.093	0.17	<0.05	<0.05
Acenaphthene	0.05	0.072	96	<0.05	<0.05
Fluorene	0.05	0.12	69	<0.05	<0.05
Phenanthrene	0.05	0.69	16	<0.05	<0.05
Anthracene	0.05	0.16	0.74	<0.05	<0.05
Fluoranthene	0.05	0.56	9.6	<0.05	<0.05
Pyrene	0.05	1	96	<0.05	<0.05
Benzo(a)anthracene	0.05	0.36	0.96	<0.05	<0.05
Chrysene	0.05	2.8	9.6	<0.05	<0.05
Benzo(b)fluoranthene	0.05	0.47	0.96	<0.05	<0.05
Benzo(k)fluoranthene	0.05	0.48	0.96	<0.05	<0.05
Benzo(a)pyrene	0.05	0.3	0.3	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	0.05	0.23	0.95	<0.05	<0.05
Dibenz(a,h)anthracene	0.05	0.1	0.1	<0.05	<0.05
Benzo(g,h,i)perylene	0.05	0.68	9.6	<0.05	<0.05
Methylnaphthalene, 2-(1-)	0.05	0.59	85	<0.05	<0.05

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 5C - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BH C1**	**Borehole BH C6**	**Borehole BH C12**
Sample ID				**BH C1 SS4**	**BH C6 SS2**	**BH C12 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**2.3-3.9**	**0.6-1..2**	**0.6-1.2**
Sampling Date				**25-Mar-20**	**25-Mar-20**	**25-Mar-20**
Latest Analyzed Date				**3-Apr-20**	**3-Apr-20**	**3-Apr-20**
Laboratory ID				**1055899**	**1055906**	**1055904**
Certificate of Analysis No.				**20T588871**	**20T588871**	**20T588871**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	3	3	3
Barium (Ba)	1	220	670	96	44	78
Beryllium (Be)	0.5	2.5	8	0.6	<0.5	<0.5
Boron (B)	5	36	120	9	6	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	0.2
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	21	11	18
Cobalt (Co)	1	21	80	12.4	5.8	9.3
Copper (Cu)	1	92	230	19	16	16
Lead (Pb)	1	120	120	9	5	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	24	10	17
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.5	<0.5	<0.5
Vanadium (V)	1	86	86	33	22	32
Zinc (Zn)	5	290	340	52	29	47
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.312	**1.19**	**1.94**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.811	**14.3**	**23.1**
pH (unitless)	0.1	NA	NA	7.81	8.05	7.79

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5C - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BH C13**	**Borehole BH C17**	**Borehole BH C24**
Sample ID				**BH C13 SS3**	**BH C17 SS1**	**BH C24 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**1.5-2.1**	**0.3-0.9**	**0.6-1.2**
Sampling Date				**27-Mar-20**	**27-Mar-20**	**1-Apr-20**
Latest Analyzed Date				**3-Apr-20**	**3-Apr-20**	**13-Apr-20**
Laboratory ID				**1056574**	**1056577**	**1066586**
Certificate of Analysis No.				**20T588920**	**20T588920**	**20T590525**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	4	4
Barium (Ba)	1	220	670	96	65	74
Beryllium (Be)	0.5	2.5	8	0.6	<0.5	0.6
Boron (B)	5	36	120	12	7	8
Boron (B), Hot Water Ext.	0.1	NV	2	0.43	0.21	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	23	17	20
Cobalt (Co)	1	21	80	11.3	7.3	9.4
Copper (Cu)	1	92	230	19	18	19
Lead (Pb)	1	120	120	9	8	9
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	25	16	19
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.6	<0.5	0.5
Vanadium (V)	1	86	86	35	28	29
Zinc (Zn)	5	290	340	52	44	46
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.45**	0.552	**0.83**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**3.85**	1.6	**4.19**
pH (unitless)	0.1	NA	NA	7.75	7.71	7.88

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5C - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole BH C25**		**Borehole BH C29**	**Borehole BH C37**
Sample ID				**BH C25 SS3**	**DUP**	**BH C29 SS1**	**BH C37 SS1**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**1.5-2.1**	**1.5-2.1**	**0.3-0.9**	**0.3-0.9**
Sampling Date				**27-Mar-20**	**27-Mar-20**	**19-Mar-20**	**19-Mar-20**
Latest Analyzed Date				**3-Apr-20**	**3-Apr-20**	**30-Mar-20**	**30-Mar-20**
Laboratory ID				**1056587**	**1056591**	**1046517**	**1046494**
Certificate of Analysis No.				**20T588920**	**20T588920**	**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**				
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	3	5
Barium (Ba)	1	220	670	77	78	119	79
Beryllium (Be)	0.5	2.5	8	<0.5	<0.5	0.6	0.6
Boron (B)	5	36	120	9	9	8	9
Boron (B), Hot Water Ext.	0.1	NV	2	0.25	0.25	0.5	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	19	19	21	21
Cobalt (Co)	1	21	80	8.6	8.9	8.3	10
Copper (Cu)	1	92	230	17	18	15	23
Lead (Pb)	1	120	120	7	8	10	10
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	19	19	17	23
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.6	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.6	0.6	1	<0.5
Vanadium (V)	1	86	86	29	29	31	28
Zinc (Zn)	5	290	340	44	45	67	51
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.57**	**1.42**	**2.06**	**1.33**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**4.76**	**3.98**	**8.09**	**3.2**
pH (unitless)	0.1	NA	NA	7.88	7.93	7.27	7.73

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 6C - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole BH C29**	**Borehole BH C33**	**Borehole BH S11**
Sample ID				**BH C29 SS1**	**BH C33 SS1**	**BH S11 SS5**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**	**Silty Sand/Sandy Silt**
Field Vapour (ppm)				**0/0**	**0/0**	**NA**
Sample Depth (mbgs)				**0.3-0.9**	**0.3-0.9**	**3.05-3.7**
Sampling Date				**19-Mar-20**	**19-Mar-20**	**25-Mar-20**
Latest Analyzed Date				**27-Mar-20**	**27-Mar-20**	**2-Apr-20**
Laboratory ID				**1046517**	**1046509**	**1055912**
Certificate of Analysis No.				**20T587352**	**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**			
PHC F1 (C6-C10 less BTEX)	5	25	25	<5.0	<5.0	<5.0
PHC F2 (>C10-C16)	10	10	26	<10	<10	<10
PHC F3 (>C16-C34)	50	240	1700	<50	<50	<50
PHC F4 (>C34)	50	120	3300	<50	<50	<50
PHC F4 (>C34)*	50	120	3300	-	-	-

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 7C - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole BH C29**	**Borehole BH C33**	**Borehole BH S11**
Sample ID				**BH C29 SS1**	**BH C33 SS1**	**BH S11 SS5**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**	**Silty Sand/Sandy Silt**
Field Vapour (ppm)				**0/0**	**0/0**	**NA**
Sample Depth (mbgs)				**0.3-0.9**	**0.3-0.9**	**3.05-3.7**
Sampling Date				**19-Mar-20**	**19-Mar-20**	**25-Mar-20**
Latest Analyzed Date				**27-Mar-20**	**27-Mar-20**	**2-Apr-20**
Laboratory ID				**1046517**	**1046509**	**1055912**
Certificate of Analysis No.				**20T587352**	**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**			
Dichlorodifluoromethane	0.05	0.05	1.8	<0.050	<0.050	-
Vinyl chloride	0.02	0.02	0.02	<0.020	<0.020	-
Bromomethane	0.05	0.05	0.05	<0.050	<0.050	-
Trichlorofluoromethane	0.05	0.25	0.46	<0.050	<0.050	-
Acetone	0.50	0.5	1.8	<0.50	<0.50	-
1,1-Dichloroethylene	0.05	0.05	0.05	<0.050	<0.050	-
Methylene Chloride	0.05	0.05	0.2	<0.050	<0.050	-
trans-1,2-Dichloroethylene	0.05	0.05	0.05	<0.050	<0.050	-
MTBE	0.05	0.05	0.05	<0.050	<0.050	-
1,1-Dichloroethane	0.05	0.05	0.57	<0.050	<0.050	-
Methyl Ethyl Ketone	0.50	0.5	26	<0.50	<0.50	-
cis-1,2-Dichloroethylene	0.02	0.05	0.05	<0.02	<0.02	-
Chloroform	0.04	0.05	0.26	<0.04	<0.04	-
1,2-Dichloroethane	0.03	0.05	0.05	<0.03	<0.03	-
1,1,1-Trichloroethane	0.05	0.05	0.4	<0.050	<0.050	-
Carbon tetrachloride	0.05	0.05	0.05	<0.050	<0.050	-
Benzene	0.02	0.02	0.034	<0.02	<0.02	<0.02
1,2-Dichloropropane	0.03	0.05	0.05	<0.03	<0.03	-
Trichloroethylene	0.03	0.05	0.05	<0.03	<0.03	-
Bromodichloromethane	0.05	0.05	5.8	<0.050	<0.050	-
Methyl Isobutyl Ketone	0.50	0.5	17	<0.50	<0.50	-
1,1,2-Trichloroethane	0.04	0.05	0.05	<0.04	<0.04	-
Toluene	0.08	0.2	7.8	<0.05	<0.05	<0.05
Dibromochloromethane	0.05	0.05	5.5	<0.050	<0.050	-
1,2-Dibromoethane	0.04	0.05	0.05	<0.04	<0.04	-
Tetrachloroethylene	0.05	0.05	0.05	<0.050	<0.050	-
1,1,1,2-Tetrachloroethane	0.04	0.05	0.05	<0.04	<0.04	-
Chlorobenzene	0.05	0.05	0.28	<0.050	<0.050	-
Ethylbenzene	0.05	0.05	1.9	<0.050	<0.050	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050	<0.050	-
Bromoform	0.05	0.05	2.5	<0.050	<0.050	-
Styrene	0.05	0.05	6.8	<0.050	<0.050	-
1,1,2,2-Tetrachloroethane	0.05	0.05	0.05	<0.050	<0.050	-
o-Xylene	0.02	NV	NV	<0.050	<0.050	-
1,3-Dichlorobenzene	0.05	0.05	6.8	<0.050	<0.050	-
1,4-Dichlorobenzene	0.05	0.05	0.05	<0.050	<0.050	-
1,2-Dichlorobenzene	0.05	0.05	6.8	<0.050	<0.050	-
Xylenes (Total)	0.05	0.05	3	<0.050	<0.050	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.05	<0.04	<0.04	-
n-Hexane	0.05	0.05	2.5	<0.050	<0.050	-

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 8C - Soil Chemical Analyses
Polycyclic Aromatic Hydrocarbons

Sample Location				**Borehole BH C29**	**Borehole BH C33**
Sample ID				**BH C29 SS1**	**BH C33 SS1**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Calay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**
Sample Depth (mbgs)				**0.3-0.9**	**0.3-0.9**
Sampling Date				**19-Mar-20**	**19-Mar-20**
Latest Analyzed Date				**30-Mar-20**	**30-Mar-20**
Laboratory ID				**1046517**	**1046509**
Certificate of Analysis No.				**20T587352**	**20T587352**
	Lowest Detection Limit	**Table 1 new**	**Table 3.1 new SCS**		
Naphthalene	0.05	0.09	1.8	<0.05	<0.05
Acenaphthylene	0.05	0.093	0.093	<0.05	<0.05
Acenaphthene	0.05	0.072	15	<0.05	<0.05
Fluorene	0.05	0.12	6.8	<0.05	<0.05
Phenanthrene	0.05	0.69	12	<0.05	<0.05
Anthracene	0.05	0.16	0.16	<0.05	<0.05
Fluoranthene	0.05	0.56	70	<0.05	<0.05
Pyrene	0.05	1	70	<0.05	<0.05
Benzo(a)anthracene	0.05	0.36	1	<0.05	<0.05
Chrysene	0.05	2.8	14	<0.05	<0.05
Benzo(b)fluoranthene	0.05	0.47	7	<0.05	<0.05
Benzo(k)fluoranthene	0.05	0.48	7	<0.05	<0.05
Benzo(a)pyrene	0.05	0.3	0.7	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	0.05	0.23	0.76	<0.05	<0.05
Dibenz(a,h)anthracene	0.05	0.1	0.7	<0.05	<0.05
Benzo(g,h,i)perylene	0.05	0.68	13	<0.05	<0.05
Methylnaphthalene, 2-(1-)	0.05	0.59	8.7	<0.05	<0.05

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 9C - Ontario Regulation 347/90
Leachate Analyses
Waste Classification

Sample ID			**Comp. TCLP C**
Sampling Date			**01-Apr-20**
Laboratory ID			**1066587**
Certificate of Analysis No.			**20T590525**
	DL	**Schedule 4**	
Arsenic (As)	0.01	3	<0.01
Barium (Ba)	0.1	100	0.51
Boron (B)	0.05	500	0.084
Cadmium (Cd)	0.01	0.5	<0.01
Chromium (Cr)	0.01	5	<0.01
Lead (Pb)	0.01	5	<0.01
Selenium (Se)	0.01	1	<0.01
Silver (Ag)	0.01	5	<0.01
Uranium (U)	0.05	10	<0.05
Fluoride	0.1	150	0.16
Mercury	0.01	0.1	<0.01
Cyanide	0.05	20	<0.05
Nitrite + Nitrate	0.70	100	<0.70
PCB's	0.050	0.3	<0.05
Vinyl Chloride	0.5	0.2	<0.030
1,1 Dichloroethene	0.2	1.4	<0.020
Dichloromethane	1	5	<0.030
Methyl Ethyl Ketone	0.2	200	<0.090
Chloroform	0.5	10	<0.020
1,2-Dichloroethane	0.5	0.5	<0.020
Carbon Tetrachloride	0.5	0.5	<0.020
Benzene	0.5	0.5	<0.020
Trichloroethene	0.5	5	<0.020
Tetrachloroethene	0.5	3	<0.050
Chlorobenzene	0.5	8	<0.010
1,2-Dichlorobenzene	0.5	20	<0.010
1,4-Dichlorobenzene	0.2	0.5	<0.010

Notes: Ontario Regulation 347/90, Schedule 4 Leachate Criteria. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Schedule 4 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

Table 10C - Ontario Regulation 406/19
Leachate Analyses
Waste Classification

Sample ID **Sampling Date** **Laboratory ID** **Certificate of Analysis No.**			**Comp. TCLP C** **01-Apr-20** **1066587** **20T590525**
	DL	**Appendix 2 Table 3.1**	
Arsenic (As)	0.01	NV	<0.01
Barium (Ba)	0.1	4600000	0.51
Boron (B)	0.05	NV	0.084
Cadmium (Cd)	0.01	NV	<0.01
Chromium (Cr)	0.01	130000	<0.01
Lead (Pb)	0.01	NV	<0.01
Selenium (Se)	0.01	10000	<0.01
Silver (Ag)	0.01	300	<0.01
Uranium (U)	0.05	66000	<0.05
Fluoride	0.1	NV	0.16
Mercury	0.01	NV	<0.01
Cyanide	0.05	NV	<0.05
Nitrite + Nitrate	0.70	NV	<0.70
PCB's	0.050	NV	<0.05
Vinyl Chloride	0.5	NV	<0.030
1,1 Dichloroethene	0.2	500	<0.020
Dichloromethane	1	NV	<0.030
Methyl Ethyl Ketone	0.2	NV	<0.090
Chloroform	0.5	NV	<0.020
1,2-Dichloroethane	0.5	NV	<0.020
Carbon Tetrachloride	0.5	200	<0.020
Benzene	0.5	NV	<0.020
Trichloroethene	0.5	500	<0.020
Tetrachloroethene	0.5	500	<0.050
Chlorobenzene	0.5	NV	<0.010
1,2-Dichlorobenzene	0.5	NV	<0.010
1,4-Dichlorobenzene	0.2	NV	<0.010

Notes: Ontario Regulation 406/19, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse - Table 3.1: Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Table 3.1 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

SECTION D
CLARKWAY DRIVE
(FROM CASTLEMORE ROAD TO MAYFIELD DR, ~3 KM)

APPENDIX C-D

SOIL ANALYTICAL RESULTS

Table 1D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D5**	**Borehole D17**	**Borehole D18**	**Borehole D2**
Sample ID				**BH D5 SS6**	**BH D17 SS2**	**BH D18 SS3**	**BH D25 SS3**
Soil Type				**Silty Clay/Clayey Silt Till**	**Sand and Gravel and Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**3.8-4.4**	**0.9-1.5**	**1.2-1.8**	**1.5-2.1**
Sampling Date				**18-Feb-20**	**1-Apr-20**	**1-Apr-20**	**24-Feb-20**
Latest Analyzed Date				**27-Feb-20**	**13-Apr-20**	**13-Apr-20**	**4-Mar-20**
Laboratory ID				**957661**	**1066582**	**1066581**	**976171**
Certificate of Analysis No.				**20T576304**	**20T590525**	**20T590525**	**20T0578836**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	12	5	5
Barium (Ba)	1	220	670	86	14	70	64
Beryllium (Be)	0.5	2.5	10	<0.5	<0.5	0.5	0.6
Boron (B)	5	36	120	10	14	11	11
Boron (B), Hot Water Ext.	0.1	NV	2	0.26	0.3	0.32	0.29
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	23	6	19	20
Cobalt (Co)	1	21	100	10.2	5.1	8.1	8.3
Copper (Cu)	1	92	300	20	11	17	20
Lead (Pb)	1	120	120	9	18	10	13
Molybdenum (Mo)	0.5	2	40	<0.5	0.9	<0.5	0.6
Nickel (Ni)	1	82	340	21	8	17	18
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.7	<0.5	0.6	0.5
Vanadium (V)	1	86	86	32	9	29	26
Zinc (Zn)	5	290	340	51	79	48	46
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.9**	**1.68**	**1.25**	**2.1**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**5.64**	**12.4**	**4.37**	**8.71**
pH (unitless)	0.1	NA	NA	7.74	8.12	7.83	8.02

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D27**	**Borehole D31**	**Borehole D35**	**Borehole D37**
Sample ID				**BH D27 SS2**	**BH D31 SS3**	**BH D35 SS2**	**BH D37 SS4**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sandy Silt FILL**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.9-1.5**	**1.6-2.0**	**0.8-1.2**	**2.3-2.7**
Sampling Date				**24-Feb-20**	**12-Feb-20**	**12-Feb-20**	**12-Feb-20**
Latest Analyzed Date				**4-Mar-20**	**24-Feb-20**	**24-Feb-20**	**24-Feb-20**
Laboratory ID				**976172**	**940831**	**940834**	**940838**
Certificate of Analysis No.				**20T0578836**	**20T574535**	**20T574535**	**20T574535**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**				
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	5	5
Barium (Ba)	1	220	670	85	63	62	76
Beryllium (Be)	0.5	2.5	10	0.7	0.5	<0.5	<0.5
Boron (B)	5	36	120	12	6	8	9
Boron (B), Hot Water Ext.	0.1	NV	2	0.42	0.22	0.41	0.25
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	21	19	19	19
Cobalt (Co)	1	21	100	8.7	9.9	8.2	8.5
Copper (Cu)	1	92	300	19	21	19	20
Lead (Pb)	1	120	120	13	11	9	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	19	22	18	19
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.6	<0.5	0.5	0.6
Vanadium (V)	1	86	86	31	27	25	25
Zinc (Zn)	5	290	340	53	56	47	48
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.43**	**1.28**	**2.02**	**1.28**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**5.89**	2.11	**19.9**	**5.47**
pH (unitless)	0.1	NA	NA	7.49	7.66	7.73	7.7

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				Borehole D41	Borehole D44	Borehole D47
Sample ID				BH D41 SS3	BH D44 SS1	BH D47 SS4
Soil Type				Silty Clay/Clayey Silt FILL	Sand and Gravel and Silty Clay/Clayey Silt FILL	Silty Clay/Clayey Silt Till
Field Vapour (ppm)				0/0	10/0	0/1
Sample Depth (mbgs)				1.5-2.1	Surface-0.6	2.3-2.7
Sampling Date				12-Feb-20	11-Feb-20	11-Feb-20
Latest Analyzed Date				24-Feb-20	21-Feb-20	21-Feb-20
Laboratory ID				940843	939194	939197
Certificate of Analysis No.				20T574535	20T574091	20T574091
	Lowest Detection Limit	Table 1 SCS	Table 3 SCS			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	5
Barium (Ba)	1	220	670	63	71	88
Beryllium (Be)	0.5	2.5	10	<0.5	<0.5	0.6
Boron (B)	5	36	120	8	8	10
Boron (B), Hot Water Ext.	0.1	NV	2	0.43	0.19	0.14
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	17	17	21
Cobalt (Co)	1	21	100	6.9	7.6	11.6
Copper (Cu)	1	92	300	16	20	20
Lead (Pb)	1	120	120	7	10	9
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	15	16	25
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.5	<0.5	0.6
Vanadium (V)	1	86	86	23	24	27
Zinc (Zn)	5	290	340	42	43	50
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.13**	**1.51**	0.429
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**3.64**	**12.2**	0.989
pH (unitless)	0.1	NA	NA	7.71	7.79	7.74

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D50**	**Borehole D55**	**Borehole D57**
Sample ID				**BH D50 SS3**	**BH D55 SS2**	**BH D57 SS1**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Asphalt, Concrete, Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**10/0**	**0/0**
Sample Depth (mbgs)				**1.2-1.8**	**0.8-1.2**	**Surface-0.5**
Sampling Date				**12-Feb-20**	**11-Feb-20**	**12-Feb-20**
Latest Analyzed Date				**24-Feb-20**	**21-Feb-20**	**24-Feb-20**
Laboratory ID				**940845**	**939200**	**940849**
Certificate of Analysis No.				**20T574535**	**20T574091**	**20T574535**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	5	4
Barium (Ba)	1	220	670	70	86	126
Beryllium (Be)	0.5	2.5	10	<0.5	0.6	0.8
Boron (B)	5	36	120	8	9	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	0.41
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	17	23	28
Cobalt (Co)	1	21	100	8.4	11	12.5
Copper (Cu)	1	92	300	19	30	20
Lead (Pb)	1	120	120	9	14	14
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	18	22	24
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.6
Silver (Ag)	0.2	0.5	50	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.5	<0.5	0.6
Vanadium (V)	1	86	86	24	29	38
Zinc (Zn)	5	290	340	43	51	65
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.37**	**0.995**	**1.16**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**17.5**	**2.64**	**3.59**
pH (unitless)	0.1	NA	NA	7.9	7.61	8.0

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 2D - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole D17**
Sample ID				**BH D17 SS2**
Soil Type				**Sand and Gravel and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**
Sample Depth (mbgs)				**0.9-1.5**
Sampling Date				**1-Apr-20**
Latest Analyzed Date				**9-Apr-20**
Laboratory ID				**1066582**
Certificate of Analysis No.				**20T590525**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**	
PHC F1 (C6-C10 less BTEX)	5	25	65	<5.0
PHC F2 (>C10-C16)	10	10	250	<10
PHC F3 (>C16-C34)	50	240	2500	72
PHC F4 (>C34)	50	120	6600	62
PHC F4 (>C34)*	50	120	6600	-

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 3D - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole D17**
Sample ID				**BH D17 SS2**
Soil Type				**Sand and Gravel and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**
Sample Depth (mbgs)				**0.9-1.5**
Sampling Date				**1-Apr-20**
Latest Analyzed Date				**9-Apr-20**
Laboratory ID				**1066582**
Certificate of Analysis No.				**20T590525**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**	
Dichlorodifluoromethane	0.05	0.05	25	<0.050
Vinyl chloride	0.02	0.02	0.25	<0.020
Bromomethane	0.05	0.05	0.05	<0.050
Trichlorofluoromethane	0.05	0.25	5.8	<0.050
Acetone	0.50	0.5	28	<0.50
1,1-Dichloroethylene	0.05	0.05	0.48	<0.050
Methylene Chloride	0.05	0.05	2	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	9.3	<0.050
MTBE	0.05	0.05	3.2	<0.050
1,1-Dichloroethane	0.05	0.05	21	<0.050
Methyl Ethyl Ketone	0.50	0.5	88	<0.50
cis-1,2-Dichloroethylene	0.02	0.05	37	<0.02
Chloroform	0.04	0.05	0.18	<0.04
1,2-Dichloroethane	0.03	0.05	0.05	<0.03
1,1,1-Trichloroethane	0.05	0.05	12	<0.050
Carbon tetrachloride	0.05	0.05	1.5	<0.050
Benzene	0.02	0.02	0.4	<0.02
1,2-Dichloropropane	0.03	0.05	0.68	<0.03
Trichloroethylene	0.03	0.05	0.61	<0.03
Bromodichloromethane	0.05	0.05	18	<0.050
Methyl Isobutyl Ketone	0.50	0.5	210	<0.50
1,1,2-Trichloroethane	0.04	0.05	0.11	<0.04
Toluene	0.05	0.2	78	<0.05
Dibromochloromethane	0.05	0.05	13	<0.050
1,2-Dibromoethane	0.04	0.05	0.05	<0.04
Tetrachloroethylene	0.05	0.05	21	<0.050
1,1,1,2-Tetrachloroethane	0.04	0.05	0.11	<0.04
Chlorobenzene	0.05	0.05	2.7	<0.050
Ethylbenzene	0.05	0.05	19	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050
Bromoform	0.05	0.05	1.7	<0.050
Styrene	0.05	0.05	43	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	0.094	<0.050
o-Xylene	0.05	NV	NV	<0.050
1,3-Dichlorobenzene	0.05	0.05	12	<0.050
1,4-Dichlorobenzene	0.05	0.05	0.84	<0.050
1,2-Dichlorobenzene	0.05	0.05	8.5	<0.050
Xylenes (Total)	0.05	0.05	30	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.21	<0.04
n-Hexane	0.05	0.05	88	<0.050

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 4D - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole D17**
Sample ID				**BH D17 SS2**
Soil Type				**Sand and Gravel and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**
Sample Depth (mbgs)				**0.9-1.5**
Sampling Date				**1-Apr-20**
Latest Analyzed Date				**13-Apr-20**
Laboratory ID				**1066582**
Certificate of Analysis No.				**20T590525**
	Lowest	**Table 1 SCS**	**Table 3 SCS**	
Hexachloroethane	0.010	0.01	0.66	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.063	<0.005
Heptachlor	0.005	0.05	0.19	<0.005
Aldrin	0.005	0.05	0.11	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005
Endosulfan (Total)	0.005	0.04	0.38	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007
Total DDE	0.007	0.05	0.65	<0.007
Total DDD	0.007	0.05	4.6	<0.007
Total DDT	0.007	1.4	1.4	<0.007
Dieldrin	0.005	0.05	0.11	<0.005
Endrin	0.005	0.04	0.04	<0.005
Methoxychlor	0.005	0.05	1.6	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005
Hexachlorobutadiene	0.010	0.01	0.095	<0.01

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not

Table 5D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D5**	**Borehole D17**	**Borehole D18**	**Borehole D2**
Sample ID				**BH D5 SS6**	**BH D17 SS2**	**BH D18 SS3**	**BH D25 SS3**
Soil Type				**Silty Clay/Clayey Silt Till**	**Sand and Gravel and Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**3.8-4.4**	**0.9-1.5**	**1.2-1.8**	**1.5-2.1**
Sampling Date				**18-Feb-20**	**1-Apr-20**	**1-Apr-20**	**24-Feb-20**
Latest Analyzed Date				**27-Feb-20**	**13-Apr-20**	**13-Apr-20**	**4-Mar-20**
Laboratory ID				**957661**	**1066582**	**1066581**	**976171**
Certificate of Analysis No.				**20T576304**	**20T590525**	**20T590525**	**20T0578836**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**				
Antimony (Sb)	1	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	12	5	5
Barium (Ba)	1	220	670	86	14	70	64
Beryllium (Be)	0.5	2.5	8	<0.5	<0.5	0.5	0.6
Boron (B)	5	36	120	10	14	11	11
Boron (B), Hot Water Ext.	0.1	NV	2	0.26	0.3	0.32	0.29
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1.0	70	160	23	6	19	20
Cobalt (Co)	1.0	21	80	10.2	5.1	8.1	8.3
Copper (Cu)	1.0	92	230	20	11	17	20
Lead (Pb)	1.0	120	120	9	18	10	13
Molybdenum (Mo)	1.0	2	40	<0.5	0.9	<0.5	0.6
Nickel (Ni)	1.0	82	270	21	8	17	18
Selenium (Se)	1.0	1.5	5.5	<0.4	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.5	1	3.3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	1.0	2.5	33	0.7	<0.5	0.6	0.5
Vanadium (V)	1.0	86	86	32	9	29	26
Zinc (Zn)	5	290	340	51	79	48	46
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.05	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.01	0.27	0.27	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.00	0.57	1.4	**1.9**	**1.68**	**1.25**	**2.1**
Sodium Adsorption Ratio (unitless)	0.10	2.4	12	**5.64**	**12.4**	**4.37**	**8.71**
pH (unitless)	0.10	NA	NA	7.74	8.12	7.83	8.02

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D27**	**Borehole D31**	**Borehole D35**	**Borehole D37**
Sample ID				**BH D27 SS2**	**BH D31 SS3**	**BH D35 SS2**	**BH D37 SS4**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sandy Silt FILL**	**Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.9-1.5**	**1.6-2.0**	**0.8-1.2**	**2.3-2.7**
Sampling Date				**24-Feb-20**	**12-Feb-20**	**12-Feb-20**	**12-Feb-20**
Latest Analyzed Date				**4-Mar-20**	**24-Feb-20**	**24-Feb-20**	**24-Feb-20**
Laboratory ID				**976172**	**940831**	**940834**	**940838**
Certificate of Analysis No.				**20T0578836**	**20T574535**	**20T574535**	**20T574535**
	Lowest Detection Limit	**Table 1** **new SCS**	**Table 3.1** **new SCS**				
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	5	5
Barium (Ba)	1	220	670	85	63	62	76
Beryllium (Be)	0.5	2.5	8	0.7	0.5	<0.5	<0.5
Boron (B)	5	36	120	12	6	8	9
Boron (B), Hot Water Ext.	0.1	NV	2	0.42	0.22	0.41	0.25
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	21	19	19	19
Cobalt (Co)	1	21	80	8.7	9.9	8.2	8.5
Copper (Cu)	1	92	230	19	21	19	20
Lead (Pb)	1	120	120	13	11	9	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	19	22	18	19
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.6	<0.5	0.5	0.6
Vanadium (V)	1	86	86	31	27	25	25
Zinc (Zn)	5	290	340	53	56	47	48
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.43**	**1.28**	**2.02**	**1.28**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**5.89**	2.11	**19.9**	**5.47**
pH (unitless)	0.1	NA	NA	7.49	7.66	7.73	7.7

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D41**	**Borehole D44**	**Borehole D47**
Sample ID				**BH D41 SS3**	**BH D44 SS1**	**BH D47 SS4**
Soil Type				**Silty Clay/Clayey Silt FILL**	**Sand and Gravel and Silty Clay/Clayey Silt FILL**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**10/0**	**0/1**
Sample Depth (mbgs)				**1.5-2.1**	**Surface-0.6**	**2.3-2.7**
Sampling Date				**12-Feb-20**	**11-Feb-20**	**11-Feb-20**
Latest Analyzed Date				**24-Feb-20**	**21-Feb-20**	**21-Feb-20**
Laboratory ID				**940843**	**939194**	**939197**
Certificate of Analysis No.				**20T574535**	**20T574091**	**20T574091**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	4	5
Barium (Ba)	1	220	670	63	71	88
Beryllium (Be)	0.5	2.5	8	<0.5	<0.5	0.6
Boron (B)	5	36	120	8	8	10
Boron (B), Hot Water Ext.	0.1	NV	2	0.43	0.19	0.14
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	17	17	21
Cobalt (Co)	1	21	80	6.9	7.6	11.6
Copper (Cu)	1	92	230	16	20	20
Lead (Pb)	1	120	120	7	10	9
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	15	16	25
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	<0.4
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.5	<0.5	0.6
Vanadium (V)	1	86	86	23	24	27
Zinc (Zn)	5	290	340	42	43	50
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.13**	**1.51**	0.429
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**3.64**	**12.2**	0.989
pH (unitless)	0.1	NA	NA	7.71	7.79	7.74

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface

Table 5D - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole D50**	**Borehole D55**	**Borehole D57**
Sample ID				**BH D50 SS3**	**BH D55 SS2**	**BH D57 SS1**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt FILL**	**Asphalt, Concrete, Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**10/0**	**0/0**
Sample Depth (mbgs)				**1.2-1.8**	**0.8-1.2**	**Surface-0.5**
Sampling Date				**12-Feb-20**	**11-Feb-20**	**12-Feb-20**
Latest Analyzed Date				**24-Feb-20**	**21-Feb-20**	**24-Feb-20**
Laboratory ID				**940845**	**939200**	**940849**
Certificate of Analysis No.				**20T574535**	**20T574091**	**20T574535**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	5	4
Barium (Ba)	1	220	670	70	86	126
Beryllium (Be)	0.5	2.5	8	<0.5	0.6	0.8
Boron (B)	5	36	120	8	9	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	0.41
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	17	23	28
Cobalt (Co)	1	21	80	8.4	11	12.5
Copper (Cu)	1	92	230	19	30	20
Lead (Pb)	1	120	120	9	14	14
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	18	22	24
Selenium (Se)	0.4	1.5	5.5	<0.4	<0.4	0.6
Silver (Ag)	0.2	0.5	40	<0.2	<0.2	<0.2
Thallium (Tl)	0.4	1	3.3	<0.4	<0.4	<0.4
Uranium (U)	0.5	2.5	33	0.5	<0.5	0.6
Vanadium (V)	1	86	86	24	29	38
Zinc (Zn)	5	290	340	43	51	65
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.040	<0.040	<0.040
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	**1.37**	**0.995**	**1.16**
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	**17.5**	**2.64**	**3.59**
pH (unitless)	0.1	NA	NA	7.9	7.61	8.0

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is

Table 6D - Soil Chemical Analyses
Petroleum Parameters

Sample Location	**Borehole D17**
Sample ID	**BH D17 SS2**
Soil Type	**Sand and Gravel and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)	**0/0**
Sample Depth (mbgs)	**0.9-1.5**
Sampling Date	**1-Apr-20**
Latest Analyzed Date	**9-Apr-20**
Laboratory ID	**1066582**
Certificate of Analysis No.	**20T590525**

	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**	
PHC F1 (C6-C10 less BTEX)	5	25	25	<5.0
PHC F2 (>C10-C16)	10	10	26	<10
PHC F3 (>C16-C34)	50	240	1700	72
PHC F4 (>C34)	50	120	3300	62
PHC F4 (>C34)*	50	120	3300	-

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

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Table 7D - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole D17**
Sample ID				**BH D17 SS2**
Soil Type				**Sand and Gravel and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**
Sample Depth (mbgs)				**0.9-1.5**
Sampling Date				**1-Apr-20**
Latest Analyzed Date				**9-Apr-20**
Laboratory ID				**1066582**
Certificate of Analysis No.				**20T590525**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**	
Dichlorodifluoromethane	0.05	0.05	1.8	<0.050
Vinyl chloride	0.02	0.02	0.02	<0.020
Bromomethane	0.05	0.05	0.05	<0.050
Trichlorofluoromethane	0.05	0.25	0.46	<0.050
Acetone	0.50	0.5	1.8	<0.50
1,1-Dichloroethylene	0.05	0.05	0.05	<0.050
Methylene Chloride	0.05	0.05	0.2	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	0.05	<0.050
MTBE	0.05	0.05	0.05	<0.050
1,1-Dichloroethane	0.05	0.05	0.57	<0.050
Methyl Ethyl Ketone	0.50	0.5	26	<0.50
cis-1,2-Dichloroethylene	0.02	0.05	0.05	<0.02
Chloroform	0.04	0.05	0.26	<0.04
1,2-Dichloroethane	0.03	0.05	0.05	<0.03
1,1,1-Trichloroethane	0.05	0.05	0.4	<0.050
Carbon tetrachloride	0.05	0.05	0.05	<0.050
Benzene	0.02	0.02	0.034	<0.02
1,2-Dichloropropane	0.03	0.05	0.05	<0.03
Trichloroethylene	0.03	0.05	0.05	<0.03
Bromodichloromethane	0.05	0.05	5.8	<0.050
Methyl Isobutyl Ketone	0.50	0.5	17	<0.50
1,1,2-Trichloroethane	0.04	0.05	0.05	<0.04
Toluene	0.08	0.2	7.8	<0.05
Dibromochloromethane	0.05	0.05	5.5	<0.050
1,2-Dibromoethane	0.04	0.05	0.05	<0.04
Tetrachloroethylene	0.05	0.05	0.05	<0.050
1,1,1,2-Tetrachloroethane	0.04	0.05	0.05	<0.04
Chlorobenzene	0.05	0.05	0.28	<0.050
Ethylbenzene	0.05	0.05	1.9	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050
Bromoform	0.05	0.05	2.5	<0.050
Styrene	0.05	0.05	6.8	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	0.05	<0.050
o-Xylene	0.02	NV	NV	<0.050
1,3-Dichlorobenzene	0.05	0.05	6.8	<0.050
1,4-Dichlorobenzene	0.05	0.05	0.05	<0.050
1,2-Dichlorobenzene	0.05	0.05	6.8	<0.050
Xylenes (Total)	0.05	0.05	3	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.05	<0.04
n-Hexane	0.05	0.05	2.5	<0.050

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total

Table 8D - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole D17**
Sample ID				**BH D17 SS2**
Soil Type				**Sand and Gravel and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**
Sample Depth (mbgs)				**0.9-1.5**
Sampling Date				**1-Apr-20**
Latest Analyzed Date				**13-Apr-20**
Laboratory ID				**1066582**
Certificate of Analysis No.				**20T590525**
	Lowest Detection Limit	**Table 1 new SCS**	**Table 3.1 new SCS**	
Hexachloroethane	0.010	0.01	0.13	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.01	<0.005
Heptachlor	0.005	0.05	0.072	<0.005
Aldrin	0.005	0.05	0.088	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005
Endosulfan (Total)	0.005	0.04	0.04	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007
Total DDE	0.007	0.05	0.52	<0.007
Total DDD	0.007	0.05	4.6	<0.007
Total DDT	0.007	1.4	1.4	<0.007
Dieldrin	0.005	0.05	0.088	<0.005
Endrin	0.005	0.04	0.04	<0.005
Methoxychlor	0.005	0.05	0.19	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005
Hexachlorobutadiene	0.010	0.01	0.01	<0.01

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 new SCS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 new SCS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not tested. Detection Limits higher than SCS are in *ITALIC* .

Table 9D - Ontario Regulation 347/90
Leachate Analyses
Waste Classification

Sample ID			**Comp 1 TCLP D**
Sampling Date			**24-Feb-20**
Laboratory ID			**1028257**
Certificate of Analysis No.			**20T584983**
	DL	**Schedule 4**	
Antimony (Sb)	0.01	NV	<0.010
Barium (Ba)	0.1	100	0.738
Boron (B)	0.05	500	0.056
Cadmium (Cd)	0.01	0.5	<0.010
Chromium (Cr)	0.01	5	<0.010
Lead (Pb)	0.01	5	<0.010
Selenium (Se)	0.01	1	<0.010
Silver (Ag)	0.01	5	<0.010
Uranium (U)	0.05	10	<0.05
Fluoride	0.1	150	0.32
Mercury	0.01	0.1	<0.01
Cyanide	0.05	20	<0.05
Nitrite + Nitrate	0.7	100	<0.70
Heptachlor + Heptachlor Epoxide	0.0003	0.3	<0.0003
Aldrin + Dieldrin	0.0007	0.07	<0.0007
DDT + Metabolites	0.0003	3	<0.003
Methoxychlor	0.090	90	<0.09
Chlordane (Total)	0.0007	0.7	<0.0007
Aldrin	0.0002	0.07	<0.0002
alpha - chlordane	0.0001	NV	<0.0001
gamma-Chlordane	0.0002	NV	<0.0002
Oxychlordane	0.0004	NV	<0.0004
pp'-DDE	0.0005	NV	<0.0005
pp'-DDD	0.0015	NV	<0.0015
op'-DDT	0.0015	NV	<0.0015
pp'-DDT	0.0005	NV	<0.0005
Dieldrin	0.0005	0.07	<0.0005
Heptachlor	0.0001	0.3	<0.0001
Heptachlor Epoxide	0.0002	0.3	<0.0002
Lindane	0.0004	0.4	<0.0004
Endrin	0.0004	0.02	<0.0004
Toxaphene	0.0005	0.5	<0.0005
PCB's	0.0002	0.3	<0.0002
Vinyl Chloride	0.03	0.2	<0.030
1,1 Dichloroethene	0.02	1.4	<0.020
Dichloromethane	0.03	5	<0.030
Methyl Ethyl Ketone	0.09	200	<0.090
Chloroform	0.02	10	<0.020
1,2-Dichloroethane	0.02	0.5	<0.020
Carbon Tetrachloride	0.02	0.5	<0.020
Benzene	0.02	0.5	<0.020
Trichloroethene	0.02	5	<0.020
Tetrachloroethene	0.05	3	<0.050
Chlorobenzene	0.01	8	<0.010
1,2-Dichlorobenzene	0.01	20	<0.010
1,4-Dichlorobenzene	0.01	0.5	<0.010

Notes: Ontario Regulation 347/90, Schedule 4 Leachate Criteria. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Schedule 4 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

Table 10D - Ontario Regulation 406/19
Leachate Analyses
Waste Classification

Sample ID			**Comp 1 TCLP D**
Sampling Date			**24-Feb-20**
Laboratory ID			**1028257**
Certificate of Analysis No.			**20T584983**
	DL	**Appendix 2 Table 3.1**	
Antimony (Sb)	0.01	NV	<0.010
Barium (Ba)	0.1	4600000	0.738
Boron (B)	0.05	NV	0.056
Cadmium (Cd)	0.01	NV	<0.010
Chromium (Cr)	0.01	130000	<0.010
Lead (Pb)	0.01	NV	<0.010
Selenium (Se)	0.01	10000	<0.010
Silver (Ag)	0.01	300	<0.010
Uranium (U)	0.05	66000	<0.05
Fluoride	0.1	NV	0.32
Mercury	0.01	NV	<0.01
Cyanide	0.05	NV	<0.05
Nitrite + Nitrate	0.7	NV	<0.70
Heptachlor + Heptachlor Epoxide	0.0003	NV	<0.0003
Aldrin + Dieldrin	0.0007	0.000097	<0.0007
DDT + Metabolites	0.0003	NV	<0.003
Methoxychlor	0.090	NV	<0.09
Chlordane (Total)	0.0007	NV	<0.0007
Aldrin	0.0002	NV	<0.0002
alpha - chlordane	0.0001	NV	<0.0001
gamma-Chlordane	0.0002	NV	<0.0002
Oxychlordane	0.0004	NV	<0.0004
pp'-DDE	0.0005	NV	<0.0005
pp'-DDD	0.0015	NV	<0.0015
op'-DDT	0.0015	NV	<0.0015
pp'-DDT	0.0005	NV	<0.0005
Dieldrin	0.0005	NV	<0.0005
Heptachlor	0.0001	NV	<0.0001
Heptachlor Epoxide	0.0002	0.00001	<0.0002
Lindane	0.0004	NV	<0.0004
Endrin	0.0004	0.000062	<0.0004
Toxaphene	0.0005	NV	<0.0005
PCB's	0.0002	NV	<0.0002
Vinyl Chloride	0.5	NV	<0.030
1,1 Dichloroethene	0.2	500.0	<0.020
Dichloromethane	1	NV	<0.030
Methyl Ethyl Ketone	0.2	NV	<0.090
Chloroform	0.5	NV	<0.020
1,2-Dichloroethane	0.5	NV	<0.020
Carbon Tetrachloride	0.5	200.0	<0.020
Benzene	0.5	NV	<0.020
Trichloroethene	0.5	500	<0.020
Tetrachloroethene	0.5	500	<0.050
Chlorobenzene	0.5	NV	<0.010
1,2-Dichlorobenzene	0.5	NV	<0.010
1,4-Dichlorobenzene	0.2	NV	<0.010

Notes: Ontario Regulation 406/19, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse - Table 3.1: Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Table 3.1 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

SECTION E
EAST – WEST ARTERIAL RAOD
(FROM THE GORE ROAD TO COLERAINE DRIVE, ~2.4 KM)

APPENDIX C-E

SOIL ANAYLYTICAL RESULTS

Table 1E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E1**	**Borehole E2**	**Borehole E3**
Sample ID				**E1 SS1**	**E2 SS1**	**E3 SS1**
Soil Type				**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0-0.6**	**0-0.6**
Sampling Date				**11-Jan-22**	**11-Jan-22**	**11-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**25-Jan-22**	**25-Jan-22**
Laboratory ID				**3429023**	**3429025**	**3429028**
Certificate of Analysis No.				**22T853869**	**22T853869**	**22T853869**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	5	5
Barium (Ba)	1	220	670	99	96	125
Beryllium (Be)	0.5	2.5	10	0.8	0.8	0.8
Boron (B)	5	36	120	10	10	10
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	30	30	33
Cobalt (Co)	1	21	100	10.8	13.2	14.8
Copper (Cu)	1	92	300	24.1	26.4	27.8
Lead (Pb)	1	120	120	16	11	13
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	23	26	29
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	50	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.9	0.64	0.77
Vanadium (V)	1	86	86	39.1	40	46.9
Zinc (Zn)	5	290	340	94	67	72
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.304	0.227	0.26
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.508	0.343	0.423
pH (unitless)	0.1	NA	NA	7.1	7.24	7.37

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				Borehole E5	Borehole E7	Borehole E23
Sample ID				E5 SS2	E7 SS1	E23 SS1
Soil Type				Sandy Silt Till	Topsoil and Silty Clay FILL	Topsoil and Silty Clay/Clayey Silt FILL
Field Vapour (ppm)				0/0	0/0	0/0
Sample Depth (mbgs)				0.8-1.4	0-0.6	0-0.6
Sampling Date				11-Jan-22	11-Jan-22	13-Jan-22
Latest Analyzed Date				25-Jan-22	25-Jan-22	24-Jan-22
Laboratory ID				3429040	3429041	3428908
Certificate of Analysis No.				22T853869	22T853869	22T853859
	Lowest Detection Limit	Table 1 SCS	Table 3 SCS			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	5	4
Barium (Ba)	1	220	670	40.2	94	105
Beryllium (Be)	0.5	2.5	10	0.5	0.8	0.7
Boron (B)	5	36	120	<5	8	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	16	28	26
Cobalt (Co)	1	21	100	5.3	11.5	9
Copper (Cu)	1	92	300	14.9	23.1	15.8
Lead (Pb)	1	120	120	6	10	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	12	24	18
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	50	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.55	0.63	0.76
Vanadium (V)	1	86	86	27.5	37.9	40.2
Zinc (Zn)	5	290	340	35	59	46
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.167	0.211	0.206
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.127	0.235	0.368
pH (unitless)	0.1	NA	NA	7.24	7.33	7.58

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E25**	**Borehole E27**	**Borehole E29**
Sample ID				**E25 SS1**	**E27 SS1**	**E29 SS1**
Soil Type				**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0-0.6**	**0-0.6**
Sampling Date				**13-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**24-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3428911**	**3428915**	**3428919**
Certificate of Analysis No.				**22T853859**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	5	4
Barium (Ba)	1	220	670	90.6	166	151
Beryllium (Be)	0.5	2.5	10	0.7	1	0.7
Boron (B)	5	36	120	10	9	11
Boron (B), Hot Water Ext.	0.1	NV	2	0.28	0.12	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	29	38	34
Cobalt (Co)	1	21	100	14	14.3	12.2
Copper (Cu)	1	92	300	23.7	25.4	20.5
Lead (Pb)	1	120	120	13	15	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	31	30	25
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	50	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.58	1.62	0.67
Vanadium (V)	1	86	86	40.3	54	45.4
Zinc (Zn)	5	290	340	62	104	58
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.221	0.245	0.218
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.767	0.304	0.237
pH (unitless)	0.1	NA	NA	7.35	7.28	6.72

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 1E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E30**	**Borehole E32**	
Sample ID				**E30 SS1**	**E32 SS1**	**DUP1**
Soil Type				**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0-0.6**	**0-0.6**
Sampling Date				**13-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**24-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3428927**	**3428933**	**3428935**
Certificate of Analysis No.				**22T853859**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			Field duplicate of sample E32 SS1
Antimony (Sb)	0.8	1.3	50	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	3	3
Barium (Ba)	1	220	670	137	78.5	79.4
Beryllium (Be)	0.5	2.5	10	0.7	0.5	0.6
Boron (B)	5	36	120	10	7	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	36	23	25
Cobalt (Co)	1	21	100	14.3	7.5	8
Copper (Cu)	1	92	300	23.8	14.4	16.5
Lead (Pb)	1	120	120	13	8	9
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	340	28	17	19
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	50	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.7	0.59	0.59
Vanadium (V)	1	86	86	51	34.9	35.8
Zinc (Zn)	5	290	340	67	43	46
Chromium (VI)	0.2	0.66	10	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	20	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.25	0.244	0.263
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.266	0.809	0.815
pH (unitless)	0.1	NA	NA	7.06	7.09	7.11

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. *To apply generic SCS, pH of soil is to be between 5 and 9 for surface soil (<1.5 mbg) and between 5 and 11 for subsurface soil (>1.5 mbg). "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 2E - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole E2**	**Borehole E27**	
Sample ID				**E2 SS2**	**E27 SS2**	**DUP3**
Soil Type				**Silty Clay Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0.8-1.4**	**0.8-1.4**
Sampling Date				**11-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3429027**	**3428916**	**3428937**
Certificate of Analysis No.				**22T853869**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			Field duplicate of sample E27 SS2
PHC F1 (C6-C10 less BTEX)	5	25	65	<5.0	<5.0	<5.0
PHC F2 (>C10-C16)	10	10	250	<10	<10	<10
PHC F3 (>C16-C34)	50	240	2500	<50	<50	<50
PHC F4 (>C34)	50	120	6600	<50	<50	<50
PHC F4 (>C34)*	50	120	6600	-	-	-

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 3E - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole E2**	**Borehole E27**	
Sample ID				**E2 SS2**	**E27 SS2**	**DUP3**
Soil Type				**Silty Clay Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0.8-1.4**	**0.8-1.4**
Sampling Date				**11-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3429027**	**3428916**	**3428937**
Certificate of Analysis No.				**22T853869**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 SCS**	**Table 3 SCS**			Field duplicate of sample E27 SS2
Dichlorodifluoromethane	0.05	0.05	25	<0.050	<0.050	<0.050
Vinyl chloride	0.02	0.02	0.25	<0.020	<0.020	<0.020
Bromomethane	0.05	0.05	0.05	<0.050	<0.050	<0.050
Trichlorofluoromethane	0.05	0.25	5.8	<0.050	<0.050	<0.050
Acetone	0.50	0.5	28	<0.50	<0.50	<0.50
1,1-Dichloroethylene	0.05	0.05	0.48	<0.050	<0.050	<0.050
Methylene Chloride	0.05	0.05	2	<0.050	<0.050	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	9.3	<0.050	<0.050	<0.050
MTBE	0.05	0.05	3.2	<0.050	<0.050	<0.050
1,1-Dichloroethane	0.05	0.05	21	<0.050	<0.050	<0.050
Methyl Ethyl Ketone	0.50	0.5	88	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	0.02	0.05	37	<0.02	<0.02	<0.02
Chloroform	0.04	0.05	0.18	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.03	0.05	0.05	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	0.05	0.05	12	<0.050	<0.050	<0.050
Carbon tetrachloride	0.05	0.05	1.5	<0.050	<0.050	<0.050
Benzene	0.02	0.02	0.4	<0.02	<0.02	<0.02
1,2-Dichloropropane	0.03	0.05	0.68	<0.03	<0.03	<0.03
Trichloroethylene	0.03	0.05	0.61	<0.03	<0.03	<0.03
Bromodichloromethane	0.05	0.05	18	<0.050	<0.050	<0.050
Methyl Isobutyl Ketone	0.50	0.5	210	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	0.04	0.05	0.11	<0.04	<0.04	<0.04
Toluene	0.05	0.2	78	<0.05	<0.05	<0.05
Dibromochloromethane	0.05	0.05	13	<0.050	<0.050	<0.050
1,2-Dibromoethane	0.04	0.05	0.05	<0.04	<0.04	<0.04
Tetrachloroethylene	0.05	0.05	21	<0.050	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.04	0.05	0.11	<0.04	<0.04	<0.04
Chlorobenzene	0.05	0.05	2.7	<0.050	<0.050	<0.050
Ethylbenzene	0.05	0.05	19	<0.050	<0.050	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050	<0.050	<0.050
Bromoform	0.05	0.05	1.7	<0.050	<0.050	<0.050
Styrene	0.05	0.05	43	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	0.094	<0.050	<0.050	<0.050
o-Xylene	0.05	NV	NV	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	0.05	0.05	12	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	0.05	0.05	0.84	<0.050	<0.050	<0.050
1,2-Dichlorobenzene	0.05	0.05	8.5	<0.050	<0.050	<0.050
Xylenes (Total)	0.05	0.05	30	<0.050	<0.050	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.21	<0.04	<0.04	<0.04
n-Hexane	0.05	0.05	88	<0.050	<0.050	<0.050

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 4E - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole E2**	**Borehole E3**	**Borehole E24**	**Borehole E26**
Sample ID				**E2 SS1**	**E3 SS2**	**E24 SS1**	**E26 SS1**
Soil Type				**Topsoil and Silty Clay FILL**	**Silty Clay Till**	**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0.8-1.4**	**0-0.6**	**0-0.6**
Sampling Date				**11-Jan-22**	**11-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**25-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3429025**	**3429029**	**3428909**	**3428912**
Certificate of Analysis No.				**22T853869**	**22T853869**	**22T853859**	**22T853859**
	Lowest	**Table 1 SCS**	**Table 3 SCS**				
Hexachloroethane	0.010	0.01	0.66	<0.01	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.063	<0.005	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.19	<0.005	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.38	<0.005	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.65	<0.007	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	1.6	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.095	<0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 4E - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole E28**		**Borehole E32**
Sample ID				**E28 SS2**	**DUP2**	**E32 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0.8-1.4**	**0.8-1.4**
Sampling Date				**13-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**24-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3428918**	**3428936**	**3428934**
Certificate of Analysis No.				**22T853859**	**22T853859**	**22T853859**
	Lowest	**Table 1 SCS**	**Table 3 SCS**		Field duplicate of sample E28 SS2	
Hexachloroethane	0.010	0.01	0.66	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.063	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.19	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.38	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.65	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.11	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	1.6	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.095	<0.01	<0.01	<0.01

Notes: Ontario Regulation 153/04, as amended, Table 1 (Background) SCS for residential/parkland/institutional/industrial/commercial/community property use (Table 1 SCS) and Table 3 (non-potable ground water) SCS for industrial/commercial/community property use and medium/fine textured soils (Table 3 SCS). Table 1 exceedances indicated in **BOLD** and Table 3 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 5E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E1**	**Borehole E2**	**Borehole E3**
Sample ID				**E1 SS1**	**E2 SS1**	**E3 SS1**
Soil Type				**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0-0.6**	**0-0.6**
Sampling Date				**11-Jan-22**	**11-Jan-22**	**11-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**25-Jan-22**	**25-Jan-22**
Laboratory ID				**3429023**	**3429025**	**3429028**
Certificate of Analysis No.				**22T853869**	**22T853869**	**22T853869**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	5	5
Barium (Ba)	1	220	670	99	96	125
Beryllium (Be)	0.5	2.5	8	0.8	0.8	0.8
Boron (B)	5	36	120	10	10	10
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	30	30	33
Cobalt (Co)	1	21	80	10.8	13.2	14.8
Copper (Cu)	1	92	230	24.1	26.4	27.8
Lead (Pb)	1	120	120	16	11	13
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	23	26	29
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	40	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3.3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.9	0.64	0.77
Vanadium (V)	1	86	86	39.1	40	46.9
Zinc (Zn)	5	290	340	94	67	72
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.304	0.227	0.26
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.508	0.343	0.423
pH (unitless)	0.1	NA	NA	7.1	7.24	7.37

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E5**	**Borehole E7**	**Borehole E23**
Sample ID				**E5 SS2**	**E7 SS1**	**E23 SS1**
Soil Type				**Sandy Silt Till**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0-0.6**	**0-0.6**
Sampling Date				**11-Jan-22**	**11-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**25-Jan-22**	**24-Jan-22**
Laboratory ID				**3429040**	**3429041**	**3428908**
Certificate of Analysis No.				**22T853869**	**22T853869**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	5	4
Barium (Ba)	1	220	670	40.2	94	105
Beryllium (Be)	0.5	2.5	8	0.5	0.8	0.7
Boron (B)	5	36	120	<5	8	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	16	28	26
Cobalt (Co)	1	21	80	5.3	11.5	9
Copper (Cu)	1	92	230	14.9	23.1	15.8
Lead (Pb)	1	120	120	6	10	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	12	24	18
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	40	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3.3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.55	0.63	0.76
Vanadium (V)	1	86	86	27.5	37.9	40.2
Zinc (Zn)	5	290	340	35	59	46
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.167	0.211	0.206
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.127	0.235	0.368
pH (unitless)	0.1	NA	NA	7.24	7.33	7.58

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E25**	**Borehole E27**	**Borehole E29**
Sample ID				**E25 SS1**	**E27 SS1**	**E29 SS1**
Soil Type				**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0-0.6**	**0-0.6**
Sampling Date				**13-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**24-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3428911**	**3428915**	**3428919**
Certificate of Analysis No.				**22T853859**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**			
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	5	5	4
Barium (Ba)	1	220	670	90.6	166	151
Beryllium (Be)	0.5	2.5	8	0.7	1	0.7
Boron (B)	5	36	120	10	9	11
Boron (B), Hot Water Ext.	0.1	NV	2	0.28	0.12	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	29	38	34
Cobalt (Co)	1	21	80	14	14.3	12.2
Copper (Cu)	1	92	230	23.7	25.4	20.5
Lead (Pb)	1	120	120	13	15	11
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	31	30	25
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	40	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3.3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.58	1.62	0.67
Vanadium (V)	1	86	86	40.3	54	45.4
Zinc (Zn)	5	290	340	62	104	58
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.221	0.245	0.218
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.767	0.304	0.237
pH (unitless)	0.1	NA	NA	7.35	7.28	6.72

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 5E - Soil Chemical Analyses
Metal and Inorganic Parameters

Sample Location				**Borehole E30**	**Borehole E32**	
Sample ID				**E30 SS1**	**E32 SS1**	**DUP1**
Soil Type				**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0-0.6**	**0-0.6**
Sampling Date				**13-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**24-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3428927**	**3428933**	**3428935**
Certificate of Analysis No.				**22T853859**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**			Field duplicate of sample E32 SS1
Antimony (Sb)	0.8	1.3	40	<0.8	<0.8	<0.8
Arsenic (As)	1	18	18	4	3	3
Barium (Ba)	1	220	670	137	78.5	79.4
Beryllium (Be)	0.5	2.5	8	0.7	0.5	0.6
Boron (B)	5	36	120	10	7	7
Boron (B), Hot Water Ext.	0.1	NV	2	<0.10	<0.10	<0.10
Cadmium (Cd)	0.5	1.2	1.9	<0.5	<0.5	<0.5
Chromium (Cr)	1	70	160	36	23	25
Cobalt (Co)	1	21	80	14.3	7.5	8
Copper (Cu)	1	92	230	23.8	14.4	16.5
Lead (Pb)	1	120	120	13	8	9
Molybdenum (Mo)	0.5	2	40	<0.5	<0.5	<0.5
Nickel (Ni)	1	82	270	28	17	19
Selenium (Se)	0.4	1.5	5.5	<0.8	<0.8	<0.8
Silver (Ag)	0.2	0.5	40	<0.5	<0.5	<0.5
Thallium (Tl)	0.4	1	3.3	<0.5	<0.5	<0.5
Uranium (U)	0.5	2.5	33	0.7	0.59	0.59
Vanadium (V)	1	86	86	51	34.9	35.8
Zinc (Zn)	5	290	340	67	43	46
Chromium (VI)	0.2	0.66	8	<0.2	<0.2	<0.2
Cyanide	0.04	0.051	0.051	<0.04	<0.04	<0.04
Mercury (Hg)	0.1	0.27	0.27	<0.10	<0.10	<0.10
Electrical Conductivity (mS/cm)	0.04	0.57	1.4	0.25	0.244	0.263
Sodium Adsorption Ratio (unitless)	0.1	2.4	12	0.266	0.809	0.815
pH (unitless)	0.1	NA	NA	7.06	7.09	7.11

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD** and Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detecting Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NV" means no value. "NA" means not applicable. "-" means not tested. In red is indicated a value of pH above the allowed value for surface soil (<1.5 mbg).

Table 6E - Soil Chemical Analyses
Petroleum Parameters

Sample Location				**Borehole E2**	**Borehole E27**	
Sample ID				**E2 SS2**	**E27 SS2**	**DUP3**
Soil Type				**Silty Clay Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0.8-1.4**	**0.8-1.4**
Sampling Date				**11-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3429027**	**3428916**	**3428937**
Certificate of Analysis No.				**22T853869**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**			Field duplicate of Borehole E27
PHC F1 (C6-C10 less BTEX)	5	25	25	<5.0	<5.0	<5.0
PHC F2 (>C10-C16)	10	10	26	<10	<10	<10
PHC F3 (>C16-C34)	50	240	1700	<50	<50	<50
PHC F4 (>C34)	50	120	3300	<50	<50	<50
PHC F4 (>C34)*	50	120	3300	-	-	-

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "F" means fraction. * If F4 analysis by GC/FID did not reach baseline, F4 gravimetric analysis was conducted. Higher of two F4 values shown. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 7E - Soil Chemical Analyses
Volatile Organic Compounds

Sample Location				**Borehole E2**	**Borehole E27**	
Sample ID				**E2 SS2**	**E27 SS2**	**DUP3**
Soil Type				**Silty Clay Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0.8-1.4**	**0.8-1.4**
Sampling Date				**11-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3429027**	**3428916**	**3428937**
Certificate of Analysis No.				**22T853869**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**			Field duplicate of Borehole E27
Dichlorodifluoromethane	0.05	0.05	1.8	<0.050	<0.050	<0.050
Vinyl chloride	0.02	0.02	0.02	<0.020	<0.020	<0.020
Bromomethane	0.05	0.05	0.05	<0.050	<0.050	<0.050
Trichlorofluoromethane	0.05	0.25	0.46	<0.050	<0.050	<0.050
Acetone	0.50	0.5	1.8	<0.50	<0.50	<0.50
1,1-Dichloroethylene	0.05	0.05	0.05	<0.050	<0.050	<0.050
Methylene Chloride	0.05	0.05	0.2	<0.050	<0.050	<0.050
trans-1,2-Dichloroethylene	0.05	0.05	0.05	<0.050	<0.050	<0.050
MTBE	0.05	0.05	0.05	<0.050	<0.050	<0.050
1,1-Dichloroethane	0.05	0.05	0.57	<0.050	<0.050	<0.050
Methyl Ethyl Ketone	0.50	0.5	26	<0.50	<0.50	<0.50
cis-1,2-Dichloroethylene	0.02	0.05	0.05	<0.02	<0.02	<0.02
Chloroform	0.04	0.05	0.26	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.03	0.05	0.05	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	0.05	0.05	0.4	<0.050	<0.050	<0.050
Carbon tetrachloride	0.05	0.05	0.05	<0.050	<0.050	<0.050
Benzene	0.02	0.02	0.034	<0.02	<0.02	<0.02
1,2-Dichloropropane	0.03	0.05	0.05	<0.03	<0.03	<0.03
Trichloroethylene	0.03	0.05	0.05	<0.03	<0.03	<0.03
Bromodichloromethane	0.05	0.05	5.8	<0.050	<0.050	<0.050
Methyl Isobutyl Ketone	0.50	0.5	17	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	0.04	0.05	0.05	<0.04	<0.04	<0.04
Toluene	0.08	0.2	7.8	<0.05	<0.05	<0.05
Dibromochloromethane	0.05	0.05	5.5	<0.050	<0.050	<0.050
1,2-Dibromoethane	0.04	0.05	0.05	<0.04	<0.04	<0.04
Tetrachloroethylene	0.05	0.05	0.05	<0.050	<0.050	<0.050
1,1,1,2-Tetrachloroethane	0.04	0.05	0.05	<0.04	<0.04	<0.04
Chlorobenzene	0.05	0.05	0.28	<0.050	<0.050	<0.050
Ethylbenzene	0.05	0.05	1.9	<0.050	<0.050	<0.050
m+p-Xylenes	0.05	NV	NV	<0.050	<0.050	<0.050
Bromoform	0.05	0.05	2.5	<0.050	<0.050	<0.050
Styrene	0.05	0.05	6.8	<0.050	<0.050	<0.050
1,1,2,2-Tetrachloroethane	0.05	0.05	0.05	<0.050	<0.050	<0.050
o-Xylene	0.02	NV	NV	<0.050	<0.050	<0.050
1,3-Dichlorobenzene	0.05	0.05	6.8	<0.050	<0.050	<0.050
1,4-Dichlorobenzene	0.05	0.05	0.05	<0.050	<0.050	<0.050
1,2-Dichlorobenzene	0.05	0.05	6.8	<0.050	<0.050	<0.050
Xylenes (Total)	0.05	0.05	3	<0.050	<0.050	<0.050
1,3-Dichloropropene (cis & trans)	0.04	0.05	0.05	<0.04	<0.04	<0.04
n-Hexane	0.05	0.05	2.5	<0.050	<0.050	<0.050

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not analyzed. Detection Limits higher than SCS are in *ITALIC* .

Table 8E - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				**Borehole E2**	**Borehole E3**	**Borehole E24**	**Borehole E26**
Sample ID				**E2 SS1**	**E3 SS2**	**E24 SS1**	**E26 SS1**
Soil Type				**Topsoil and Silty Clay FILL**	**Silty Clay Till**	**Topsoil and Silty Clay/Clayey Silt FILL**	**Topsoil and Silty Clay/Clayey Silt FILL**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0-0.6**	**0.8-1.4**	**0-0.6**	**0-0.6**
Sampling Date				**11-Jan-22**	**11-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**25-Jan-22**	**25-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3429025**	**3429029**	**3428909**	**3428912**
Certificate of Analysis No.				**22T853869**	**22T853869**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**				
Hexachloroethane	0.010	0.01	0.13	<0.01	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexane	0.005	0.01	0.01	<0.005	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.072	<0.005	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.52	<0.007	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	0.19	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.01	<0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not tested. Detection Limits higher than SCS are in *ITALIC* .

Table 8E - Soil Chemical Analyses
Organochlorine Pesticides

Sample Location				Borehole E28		Borehole E32
Sample ID				**E28 SS2**	**DUP2**	**E32 SS2**
Soil Type				**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**	**Silty Clay/Clayey Silt Till**
Field Vapour (ppm)				**0/0**	**0/0**	**0/0**
Sample Depth (mbgs)				**0.8-1.4**	**0.8-1.4**	**0.8-1.4**
Sampling Date				**13-Jan-22**	**13-Jan-22**	**13-Jan-22**
Latest Analyzed Date				**24-Jan-22**	**24-Jan-22**	**24-Jan-22**
Laboratory ID				**3428918**	**3428936**	**3428934**
Certificate of Analysis No.				**22T853859**	**22T853859**	**22T853859**
	Lowest Detection Limit	**Table 1 ESQS**	**Table 3.1 ESQS**		Field duplicate of sample E28 SS2	
Hexachloroethane	0.010	0.01	0.13	<0.01	<0.01	<0.01
gamma-hexachlorocyclohexan	0.005	0.01	0.01	<0.005	<0.005	<0.005
Heptachlor	0.005	0.05	0.072	<0.005	<0.005	<0.005
Aldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005
Heptachlor Epoxide	0.005	0.05	0.05	<0.005	<0.005	<0.005
Endosulfan (Total)	0.005	0.04	0.04	<0.005	<0.005	<0.005
Chlordane (Total)	0.007	0.05	0.05	<0.007	<0.007	<0.007
Total DDE	0.007	0.05	0.52	<0.007	<0.007	<0.007
Total DDD	0.007	0.05	4.6	<0.007	<0.007	<0.007
Total DDT	0.007	1.4	1.4	<0.007	<0.007	<0.007
Dieldrin	0.005	0.05	0.088	<0.005	<0.005	<0.005
Endrin	0.005	0.04	0.04	<0.005	<0.005	<0.005
Methoxychlor	0.005	0.05	0.19	<0.005	<0.005	<0.005
Hexachlorobenzene	0.005	0.01	0.66	<0.005	<0.005	<0.005
Hexachlorobutadiene	0.010	0.01	0.01	<0.01	<0.01	<0.01

Notes: Ontario Regulation 406/19, Appendix 1-Generic Excess Soil Quality Standards, Table 1 (Full Depth Background Site Condition Standards) for residential/parkland/institutional/industrial/commercial/community property use (Table 1 ESQS) and Table 3.1 (Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition, Volume Independent) for industrial/commercial/community property use (Table 3.1 ESQS). Table 1 exceedances indicated in **BOLD**, Table 3.1 exceedances indicated in SHADING. All values reported in µg/g dry weight basis, unless otherwise noted. "<" indicates not detected above the laboratory Reporting Detection Limit (RDL). "ppm" means parts per million. Field vapour readings shown in ppm unless otherwise noted. Field vapour readings shown as combustible organic vapour (COV) / total organic vapour (TOV). "NA" means not applicable. "-" means not tested. Detection Limits higher than SCS are in *ITALIC* .

Table 9E - Ontario Regulation 347/90
Leachate Analyses
Waste Classification

Sample ID			**E5 SS1**
Sampling Date			**11-Jan-22**
Laboratory ID			**3429039**
Certificate of Analysis No.			**22T853869**
	DL	**Schedule 4**	
Arsenic (As)	0.01	3	<0.01
Barium (Ba)	0.1	100	0.25
Boron (B)	0.05	500	<0.05
Cadmium (Cd)	0.01	0.5	<0.01
Chromium (Cr)	0.01	5	<0.05
Lead (Pb)	0.01	5	<0.01
Selenium (Se)	0.01	1	<0.01
Silver (Ag)	0.01	5	<0.01
Uranium (U)	0.05	10	<0.05
Fluoride	0.1	150	<0.1
Mercury	0.01	0.1	<0.01
Cyanide	0.05	20	<0.05
Nitrite + Nitrate	0.7	100	<0.70
Benzo(a)pyrene	0.001	0.001	<0.001
PCB's	0.0002	0.3	<0.005
Vinyl Chloride	0.03	0.2	<0.03
1,1 Dichloroethene	0.02	1.4	<0.02
Dichloromethane	0.03	5	<0.03
Methyl Ethyl Ketone	0.09	200	<0.09
Chloroform	0.02	10	<0.02
1,2-Dichloroethane	0.02	0.5	<0.02
Carbon Tetrachloride	0.02	0.5	<0.02
Benzene	0.02	0.5	<0.02
Trichloroethene	0.02	5	<0.02
Tetrachloroethene	0.05	3	<0.05
Chlorobenzene	0.01	8	<0.01
1,2-Dichlorobenzene	0.01	20	<0.01
1,4-Dichlorobenzene	0.01	0.5	<0.01

Notes: Ontario Regulation 347/90, Schedule 4 Leachate Criteria. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Schedule 4 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

Table 10E - Ontario Regulation 416/09
Leachate Analyses
Waste Classification

Sample ID **Sampling Date** **Laboratory ID** **Certificate of Analysis No.**			**E5 SS1** **11-Jan-22** **3429039** **22T853869**
	DL	**Appendix 2 Table 3.1**	
Arsenic (As)	0.01	NV	<0.01
Barium (Ba)	0.1	4600000	0.25
Boron (B)	0.05	NV	<0.05
Cadmium (Cd)	0.01	NV	<0.01
Chromium (Cr)	0.01	130000	<0.05
Lead (Pb)	0.01	NV	<0.01
Selenium (Se)	0.01	10000	<0.01
Silver (Ag)	0.01	300	<0.01
Uranium (U)	0.05	66000	<0.05
Fluoride	0.1	NV	<0.1
Mercury	0.01	NV	<0.01
Cyanide	0.05	NV	<0.05
Nitrite + Nitrate	0.7	NV	<0.70
Benzo(a)pyrene	0.001	NV	<0.001
PCB's	0.0002	NV	<0.005
Vinyl Chloride	0.5	NV	<0.03
1,1 Dichloroethene	0.2	500.0	<0.02
Dichloromethane	1	NV	<0.03
Methyl Ethyl Ketone	0.2	NV	<0.09
Chloroform	0.5	NV	<0.02
1,2-Dichloroethane	0.5	NV	<0.02
Carbon Tetrachloride	0.5	200.0	<0.02
Benzene	0.5	NV	<0.02
Trichloroethene	0.5	500	<0.02
Tetrachloroethene	0.5	500	<0.05
Chlorobenzene	0.5	NV	<0.01
1,2-Dichlorobenzene	0.5	NV	<0.01
1,4-Dichlorobenzene	0.2	NV	<0.01

Notes: Ontario Regulation 406/19, Appendix 2 - Generic Leachate Screening Levels for Excess Soil Reuse - Table 3.1: Leachate Screening Levels for Full Depth Excess Soil in a Non-Potable Ground Water condition, Volume Independent, Industrial/Commercial/Community Property Use. All results reported in mg/L except for Ignitability and flammability which have no units. "RDL" means reportable detection limit. "<" indicates not detected above RDL as shown. Table 3.1 exceedances indicated in **BOLD underlined**. "NV" means no value. "NA" means not applicable / not analyzed.

APPENDIX D

CERTIFICATES OF ANALYSIS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Shami Malla
PROJECT: TP115086.1.6000
AGAT WORK ORDER: 20T563670
SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 8
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T563670
PROJECT: TP115086.1.6000

5835 COOPERS AVENUE
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Shami Malla

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-14

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH S3 SS3
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-10
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	862686
Antimony	µg/g	40	0.8	2020-01-17	2020-01-17	<0.8
Arsenic	µg/g	18	1	2020-01-17	2020-01-17	5
Barium	µg/g	670	2	2020-01-17	2020-01-17	131
Beryllium	µg/g	8	0.5	2020-01-17	2020-01-17	0.7
Boron	µg/g	120	5	2020-01-17	2020-01-17	10
Boron (Hot Water Soluble)	µg/g	2	0.10	2020-01-20	2020-01-20	1.26
Cadmium	µg/g	1.9	0.5	2020-01-17	2020-01-17	<0.5
Chromium	µg/g	160	2	2020-01-17	2020-01-17	30
Cobalt	µg/g	80	0.5	2020-01-17	2020-01-17	10.7
Copper	µg/g	230	1	2020-01-17	2020-01-17	27
Lead	µg/g	120	1	2020-01-17	2020-01-17	54
Molybdenum	µg/g	40	0.5	2020-01-17	2020-01-17	0.5
Nickel	µg/g	270	1	2020-01-17	2020-01-17	22
Selenium	µg/g	5.5	0.4	2020-01-17	2020-01-17	0.7
Silver	µg/g	40	0.2	2020-01-17	2020-01-17	<0.2
Thallium	µg/g	3.3	0.4	2020-01-17	2020-01-17	<0.4
Uranium	µg/g	33	0.5	2020-01-17	2020-01-17	0.7
Vanadium	µg/g	86	1	2020-01-17	2020-01-17	39
Zinc	µg/g	340	5	2020-01-17	2020-01-17	103
Chromium VI	µg/g	8	0.2	2020-01-20	2020-01-20	<0.2
Cyanide	µg/g	0.051	0.040	2020-01-20	2020-01-20	<0.040
Mercury	µg/g	3.9	0.10	2020-01-17	2020-01-17	0.21
Electrical Conductivity	mS/cm	1.4	0.005	2020-01-17	2020-01-17	5.52
Sodium Adsorption Ratio	NA	12	NA	2020-01-17	2020-01-17	45.3
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-01-20	2020-01-20	7.58

Certified By: Amanjot Bhela

AMANJOT BHELA

Certificate of Analysis

AGAT WORK ORDER: 20T563670
PROJECT: TP115086.1.6000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Shami Malla
SAMPLING SITE:
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-14
DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
862686	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

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Exceedance Summary

AGAT WORK ORDER: 20T563670

PROJECT: TP115086.1.6000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Shami Malla

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
862686	BH S3 SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	5.52
862686	BH S3 SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	45.3

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000
SAMPLING SITE:

AGAT WORK ORDER: 20T563670
ATTENTION TO: Shami Malla
SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	862858		<0.8	<0.8	NA	< 0.8	149%	70%	130%	92%	80%	120%	75%	70%	130%
Arsenic	862858		5	6	18.2%	< 1	119%	70%	130%	110%	80%	120%	122%	70%	130%
Barium	862858		157	157	0.0%	< 2	108%	70%	130%	101%	80%	120%	100%	70%	130%
Beryllium	862858		0.9	0.9	NA	< 0.5	100%	70%	130%	118%	80%	120%	78%	70%	130%
Boron	862858		13	13	NA	< 5	78%	70%	130%	115%	80%	120%	71%	70%	130%
Boron (Hot Water Soluble)	861768		2.12	2.15	1.4%	< 0.10	119%	60%	140%	102%	70%	130%	NA	60%	140%
Cadmium	862858		<0.5	<0.5	NA	< 0.5	96%	70%	130%	103%	80%	120%	100%	70%	130%
Chromium	862858		33	34	3.0%	< 2	100%	70%	130%	104%	80%	120%	98%	70%	130%
Cobalt	862858		15.1	15.1	0.0%	< 0.5	101%	70%	130%	102%	80%	120%	97%	70%	130%
Copper	862858		25	25	0.0%	< 1	94%	70%	130%	109%	80%	120%	90%	70%	130%
Lead	862858		14	15	6.9%	< 1	110%	70%	130%	105%	80%	120%	100%	70%	130%
Molybdenum	862858		0.5	0.6	NA	< 0.5	108%	70%	130%	106%	80%	120%	103%	70%	130%
Nickel	862858		31	31	0.0%	< 1	105%	70%	130%	104%	80%	120%	94%	70%	130%
Selenium	862858		0.5	<0.4	NA	< 0.4	123%	70%	130%	101%	80%	120%	99%	70%	130%
Silver	862858		<0.2	<0.2	NA	< 0.2	95%	70%	130%	98%	80%	120%	92%	70%	130%
Thallium	862858		<0.4	<0.4	NA	< 0.4	113%	70%	130%	100%	80%	120%	98%	70%	130%
Uranium	862858		0.8	0.9	NA	< 0.5	114%	70%	130%	97%	80%	120%	100%	70%	130%
Vanadium	862858		46	47	2.2%	< 1	103%	70%	130%	98%	80%	120%	95%	70%	130%
Zinc	862858		75	75	0.0%	< 5	104%	70%	130%	108%	80%	120%	96%	70%	130%
Chromium VI	862859		< 0.2	< 0.2	NA	< 0.2	84%	80%	120%	86%	70%	130%	90%	70%	130%
Cyanide	867012		<0.040	<0.040	NA	< 0.040	100%	70%	130%	93%	80%	120%	99%	70%	130%
Mercury	862858		<0.10	<0.10	NA	< 0.10	125%	70%	130%	96%	80%	120%	97%	70%	130%
Electrical Conductivity	863278		0.593	0.656	10.1%	< 0.005	101%	90%	110%	NA			NA		
Sodium Adsorption Ratio	863278		0.452	0.440	2.7%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	867009		5.80	5.85	0.9%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
QA Qualifier for metals - Antimony: Reference recovery is outside method's acceptance limit by more than an absolute maximum of 10% however, all other QCs i.e. duplicate, blank, blank spike and matrix spike are within method's QC acceptance criteria

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T563670

PROJECT: TP115086.1.6000

ATTENTION TO: Shami Malla

RPT Date: Nov 13, 2020

PARAMETER	Sample Id	Sample Description	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony		BH S3 SS3	149%	70%	130%	92%	80%	120%	75%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
QA Qualifier for metals - Antimony: Reference recovery is outside method's acceptance limit by more than an absolute maximum of 10% however, all other QCs i.e. duplicate, blank, blank spike and matrix spike are within method's QC acceptance criteria

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T563670
PROJECT: TP115086.1.6000
ATTENTION TO: Shami Malla
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium VI	INOR-93-6068	SW 846 Method 3060A; Method 7196A	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905 712 5100 Fax: 905 712 5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20T563670

Cooler Quantity: 1

Arrival Temperatures: 3.4 | 3.8 | 3
2.1 | 2.8 | 1.9

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4, Richmond Hill, ON
Phone: 905-415-2632
Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 (Indicate One)
☑ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture (Check One)
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ______ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ (Indicate One)

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☑ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1.6000
Site Location: SP47 Arterial Road
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848
PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood
Contact: Shami Malla
Address: 50 Vogell Road, Units 3 and 4, Richmond Hill, ON
Email: GTA_East@Woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI	O. Reg 153																		
						Y / N	Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	**ORPs:** ☐ B-HWS ☐ Cl^- ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	**Volatiles:** ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use					
BH S4 SS3	01/10/2020	11:25am	4	Soil	HOLD	N																			
BH S4 Comp 1	01/10/2020	NA	4	Soil	HOLD	N																			
BH S3 SS3	01/10/2020	2:20pm	4	Soil		N	X																		
BH S3 Comp 2	01/10/2020	2:25pm	4	Soil	HOLD	N																			
BH B1 SS1	01/10/2020	9:30am	4	Soil	HOLD	N																			
BH B1 SS2	01/10/2020	9:40am	4	Soil	HOLD	N																			
BH B1 Comp 1	01/10/2020	NA	4	Soil	HOLD	N																			

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	13 Jan 2020	9:43	Roy	JAN 14/20	10:09	
Samples Relinquished By (Print Name and Sign): Roy	Date Jan 14/20	Time 3:13	Samples Received By (Print Name and Sign):	Date	Time	Page ______ of ______
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

Document ID: [illegible]

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: [illegible]

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T566860
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 10
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-22

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	A3 SS4	A9 SS1	A13 SS1	DUP1
					SAMPLE TYPE:	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2020-01-21	2020-01-21	2020-01-21	2020-01-21
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	884523	884525	884529	884531
Antimony	µg/g	40	0.8	2020-02-11	2020-02-11	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-02-11	2020-02-11	5	4	4	4
Barium	µg/g	670	2	2020-02-11	2020-02-11	66	96	100	111
Beryllium	µg/g	8	0.5	2020-02-11	2020-02-11	0.5	0.6	0.6	0.6
Boron	µg/g	120	5	2020-02-11	2020-02-11	8	9	8	8
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-11	2020-02-11	0.11	0.12	0.17	0.17
Cadmium	µg/g	1.9	0.5	2020-02-11	2020-02-11	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	2	2020-02-11	2020-02-11	18	24	23	27
Cobalt	µg/g	80	0.5	2020-02-11	2020-02-11	9.2	9.8	8.6	11.2
Copper	µg/g	230	1	2020-02-11	2020-02-11	22	21	19	24
Lead	µg/g	120	1	2020-02-11	2020-02-11	9	9	10	11
Molybdenum	µg/g	40	0.5	2020-02-11	2020-02-11	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	270	1	2020-02-11	2020-02-11	19	19	19	22
Selenium	µg/g	5.5	0.4	2020-02-11	2020-02-11	<0.4	<0.4	<0.4	0.6
Silver	µg/g	40	0.2	2020-02-11	2020-02-11	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-02-11	2020-02-11	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-02-11	2020-02-11	0.6	0.6	0.5	0.6
Vanadium	µg/g	86	1	2020-02-11	2020-02-11	23	34	31	38
Zinc	µg/g	340	5	2020-02-11	2020-02-11	48	52	49	57
Chromium VI	µg/g	8	0.2	2020-02-12	2020-02-12	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-07	2020-02-07	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-02-11	2020-02-11	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-11	2020-02-11	0.347	1.34	0.814	1.46
Sodium Adsorption Ratio	NA	12	NA	2020-02-11	2020-02-11	0.229	2.92	1.62	3.10
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-12	2020-02-12	7.57	7.61	7.29	7.65

Certified By:

NIVINE BASILY

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-22

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
884523-884531	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

Certified By:

Exceedance Summary

AGAT WORK ORDER: 20T566860
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
884531	DUP1	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	1.46

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T566860
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	884525	884525	<0.8	<0.8	NA	< 0.8	103%	70%	130%	94%	80%	120%	71%	70%	130%
Arsenic	884525	884525	4	4	NA	< 1	104%	70%	130%	99%	80%	120%	100%	70%	130%
Barium	884525	884525	96	96	0.3%	< 2	117%	70%	130%	102%	80%	120%	109%	70%	130%
Beryllium	884525	884525	0.6	0.6	NA	< 0.5	98%	70%	130%	114%	80%	120%	87%	70%	130%
Boron	884525	884525	9	9	NA	< 5	80%	70%	130%	112%	80%	120%	77%	70%	130%
Boron (Hot Water Extractable)	884525	884525	0.12	0.13	NA	< 0.10	112%	60%	140%	98%	70%	130%	99%	60%	140%
Cadmium	884525	884525	<0.5	<0.5	NA	< 0.5	99%	70%	130%	101%	80%	120%	103%	70%	130%
Chromium	884525	884525	24	24	1.1%	< 2	102%	70%	130%	106%	80%	120%	102%	70%	130%
Cobalt	884525	884525	9.8	9.6	2.3%	< 0.5	98%	70%	130%	104%	80%	120%	98%	70%	130%
Copper	884525	884525	21	21	0.1%	< 1	98%	70%	130%	110%	80%	120%	96%	70%	130%
Lead	884525	884525	9	9	0.4%	< 1	106%	70%	130%	109%	80%	120%	102%	70%	130%
Molybdenum	884525	884525	<0.5	<0.5	NA	< 0.5	101%	70%	130%	102%	80%	120%	103%	70%	130%
Nickel	884525	884525	19	19	3.1%	< 1	101%	70%	130%	105%	80%	120%	97%	70%	130%
Selenium	884525	884525	<0.4	0.4	NA	< 0.4	102%	70%	130%	104%	80%	120%	104%	70%	130%
Silver	884525	884525	<0.2	<0.2	NA	< 0.2	98%	70%	130%	100%	80%	120%	93%	70%	130%
Thallium	884525	884525	<0.4	<0.4	NA	< 0.4	100%	70%	130%	96%	80%	120%	99%	70%	130%
Uranium	884525	884525	0.6	0.6	NA	< 0.5	119%	70%	130%	102%	80%	120%	107%	70%	130%
Vanadium	884525	884525	34	34	0.6%	< 1	102%	70%	130%	103%	80%	120%	99%	70%	130%
Zinc	884525	884525	52	52	0.8%	< 5	104%	70%	130%	110%	80%	120%	102%	70%	130%
Chromium VI	892870		<0.2	<0.2	NA	< 0.2	90%	80%	120%	86%	70%	130%	107%	70%	130%
Cyanide	892870		<0.040	<0.040	NA	< 0.040	99%	70%	130%	98%	80%	120%	97%	70%	130%
Mercury	884525	884525	<0.10	<0.10	NA	< 0.10	110%	70%	130%	103%	80%	120%	105%	70%	130%
Electrical Conductivity	884525	884525	1.34	1.32	0.8%	< 0.005	101%	90%	110%						
Sodium Adsorption Ratio	884525	884525	2.92	3.01	3.1%	NA									
pH, 2:1 CaCl2 Extraction	892870		7.90	8.00	1.3%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

O. Reg. 153(511) - Metals & Inorganics (Soil)	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Lower	Upper	Recovery	Lower	Upper	Recovery	Lower	Upper
Antimony	918638		<0.8	<0.8	NA	< 0.8	140%	70%	130%	99%	80%	120%	94%	70%	130%
Arsenic	918638		<1	<1	NA	< 1	113%	70%	130%	102%	80%	120%	102%	70%	130%
Barium	918638		23	23	1.4%	< 2	113%	70%	130%	98%	80%	120%	103%	70%	130%
Beryllium	918638		<0.5	<0.5	NA	< 0.5	94%	70%	130%	99%	80%	120%	90%	70%	130%
Boron	918638		<5	<5	NA	< 5	75%	70%	130%	98%	80%	120%	89%	70%	130%
Boron (Hot Water Extractable)	916607		0.26	0.30	NA	< 0.10	108%	60%	140%	95%	70%	130%	93%	60%	140%
Cadmium	918638		<0.5	<0.5	NA	< 0.5	112%	70%	130%	97%	80%	120%	95%	70%	130%
Chromium	918638		6	6	NA	< 5	94%	70%	130%	94%	80%	120%	90%	70%	130%
Cobalt	918638		1.9	1.9	NA	< 0.5	89%	70%	130%	91%	80%	120%	84%	70%	130%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T566860
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Copper	918638		4	4	NA	< 1	93%	70%	130%	100%	80%	120%	84%	70%	130%
Lead	918638		7	7	0.1%	< 1	106%	70%	130%	90%	80%	120%	84%	70%	130%
Molybdenum	918638		<0.5	<0.5	NA	< 0.5	103%	70%	130%	100%	80%	120%	98%	70%	130%
Nickel	918638		3	3	NA	< 1	89%	70%	130%	95%	80%	120%	86%	70%	130%
Selenium	918638		<0.4	<0.4	NA	< 0.4	116%	70%	130%	98%	80%	120%	99%	70%	130%
Silver	918638		<0.2	<0.2	NA	< 0.2	100%	70%	130%	95%	80%	120%	87%	70%	130%
Thallium	918638		<0.4	<0.4	NA	< 0.4	101%	70%	130%	97%	80%	120%	92%	70%	130%
Uranium	918638		<0.5	<0.5	NA	< 0.5	101%	70%	130%	98%	80%	120%	96%	70%	130%
Vanadium	918638		12	12	0.4%	< 1	88%	70%	130%	84%	80%	120%	83%	70%	130%
Zinc	918638		15	15	NA	< 5	104%	70%	130%	104%	80%	120%	86%	70%	130%
Chromium VI	921217		<0.2	<0.2	NA	< 0.2	88%	70%	130%	89%	80%	120%	87%	70%	130%
Cyanide	890298		<0.040	<0.040	NA	< 0.040	101%	70%	130%	92%	80%	120%	112%	70%	130%
Mercury	918638		<0.10	<0.10	NA	< 0.10	108%	70%	130%	103%	80%	120%	101%	70%	130%
Electrical Conductivity	916607		0.307	0.300	2.3%	< 0.005	100%	90%	110%						
Sodium Adsorption Ratio	916607		0.077	0.083	7.4%	NA									
pH, 2:1 CaCl2 Extraction	916689		7.49	7.55	0.8%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Certified By:

NIVINE BASILY

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T566860

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020			REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Sample Description	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony		A3 SS4	140%	70%	130%	99%	80%	120%	94%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T566860
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium VI	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20TS 66860

Cooler Quantity: ~~Ice~~

Arrival Temperatures: 4.1 | 3.0 | 3.7
Ice 3.3 | 2.7 | 2.5

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4
Richmond Hill
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐Sewer Use
☐Sanitary
☐Storm
Region ______ *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☑ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47 Arterial Road
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☑

Company: Wood
Contact: Shami Malla
Address:
Email: GTA East@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
A2 SS2	21 Jan 202(	9:10	1	S	HOLD															
A1 SS2	21 Jan 202(	9:35	1	S	HOLD															
A2 SS3	21 Jan 202(	9:40	1	S	HOLD															
A3 SS2	21 Jan 202(	10:50	1	S	HOLD															
A3 SS4	21 Jan 202(	11:10	1	S	HOLD															
A5 SS1	21 Jan 202(	11:25	1	S	HOLD															
A9 SS1	21 Jan 202(	12:10	1	S			☑													
A9 SS3	21 Jan 202(	12:25	1	S	HOLD															
A11 SS1	21 Jan 202(	1:30	1	S	HOLD															
A11 SS3	21 Jan 202(	1:40	1	S	HOLD															
A13 SS1	21 Jan 202(	2:15	1	S	HOLD															

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alessandro Pellerito	22 Jan 2020	3:05		Jan 23/20	11:56
	Jan 23/20	3:10			

Page 1 of 2

Nº:

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity:

Arrival Temperatures: 4.1 | 3.8 | 3.7
3.3 2.7 2.8

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4
Richmond Hill
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐Sewer Use
☐Sanitary
☐Storm
Region ____ *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☑ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT **(Rush Surcharges Apply)**

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47 Arterial Road
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☑

Company: Wood
Contact: Shami Malla
Address:
Email: GTA East@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153			Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH$_3$ ☐TKN ☐NO$_3$ ☐NO$_2$ ☐NO$_3$+NO$_2$	**Volatiles:** ☐VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	Sewer Use						
							Metals and Inorganics	☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (Incl. Hydrides)	**ORPs:** ☐B-HWS ☐Cl ☐CN⁻ ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR																	
A13 SS4	21 Jan 202	2:45	1	S	HOLD																					
DUP 1	21 Jan 202		1	S			☑																			

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	22 Jan 2020	3:05		Jan 23/20	11:56	
Samples Relinquished By (Print Name and Sign):	Date Jan 23/20	Time 3:10	Samples Received By (Print Name and Sign):	Date	Time	Page 2 of 2
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

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CANADA L4Z 1Y2
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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6

ATTENTION TO: Alessandro Pellerito

PROJECT: TP115086

AGAT WORK ORDER: 20T567508

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager

DATE REPORTED: Nov 13, 2020

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T567508
PROJECT: TP115086

5835 COOPERS AVENUE
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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47 Arterial Road

SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-24

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH A17 SS3	BH A28 SS2	BH A31 SS2
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2020-01-22	2020-01-22	2020-01-22
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	890298	890308	890310
Antimony	µg/g	40	0.8	2020-02-11	2020-02-11	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-02-11	2020-02-11	4	5	4
Barium	µg/g	670	2	2020-02-11	2020-02-11	64	66	96
Beryllium	µg/g	8	0.5	2020-02-11	2020-02-11	<0.5	0.5	0.6
Boron	µg/g	120	5	2020-02-11	2020-02-11	6	9	6
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-11	2020-02-11	0.11	0.11	0.17
Cadmium	µg/g	1.9	0.5	2020-02-11	2020-02-11	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-02-11	2020-02-11	18	21	23
Cobalt	µg/g	80	0.5	2020-02-11	2020-02-11	8.7	8.5	8.2
Copper	µg/g	230	1	2020-02-11	2020-02-11	18	21	15
Lead	µg/g	120	1	2020-02-11	2020-02-11	8	8	12
Molybdenum	µg/g	40	0.5	2020-02-11	2020-02-11	<0.5	<0.5	0.5
Nickel	µg/g	270	1	2020-02-11	2020-02-11	17	18	15
Selenium	µg/g	5.5	0.4	2020-02-11	2020-02-11	<0.4	<0.4	0.6
Silver	µg/g	40	0.2	2020-02-11	2020-02-11	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-02-11	2020-02-11	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-02-11	2020-02-11	<0.5	<0.5	0.6
Vanadium	µg/g	86	1	2020-02-11	2020-02-11	24	28	35
Zinc	µg/g	340	5	2020-02-11	2020-02-11	44	42	78
Chromium, Hexavalent	µg/g	8	0.2	2020-02-12	2020-02-12	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-07	2020-02-07	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-02-11	2020-02-11	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-12	2020-02-12	0.498	1.49	2.31
Sodium Adsorption Ratio	NA	12	NA	2020-02-12	2020-02-12	1.26	24.0	6.74
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-12	2020-02-12	7.42	7.78	7.39

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47 Arterial Road

SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-24

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
890298-890310	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

Exceedance Summary

AGAT WORK ORDER: 20T567508

PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
890308	BH A28 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	1.49
890308	BH A28 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	24.0
890310	BH A31 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	2.31

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47 Arterial Road

AGAT WORK ORDER: 20T567508
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	918798		<0.8	<0.8	NA	< 0.8	100%	70%	130%	90%	80%	120%	87%	70%	130%
Arsenic	918798		5	5	0.0%	< 1	103%	70%	130%	95%	80%	120%	102%	70%	130%
Barium	918798		85	84	1.2%	< 2	113%	70%	130%	98%	80%	120%	93%	70%	130%
Beryllium	918798		0.5	0.5	NA	< 0.5	102%	70%	130%	107%	80%	120%	90%	70%	130%
Boron	918798		10	11	NA	< 5	105%	70%	130%	102%	80%	120%	80%	70%	130%
Boron (Hot Water Extractable)	916607		0.26	0.30	NA	< 0.10	108%	60%	140%	95%	70%	130%	93%	60%	140%
Cadmium	918798		<0.5	<0.5	NA	< 0.5	110%	70%	130%	100%	80%	120%	94%	70%	130%
Chromium	918798		23	23	NA	< 5	98%	70%	130%	99%	80%	120%	91%	70%	130%
Cobalt	918798		9.7	9.9	2.0%	< 0.5	101%	70%	130%	87%	80%	120%	85%	70%	130%
Copper	918798		20	21	4.9%	< 1	94%	70%	130%	95%	80%	120%	82%	70%	130%
Lead	918798		13	13	0.0%	< 1	97%	70%	130%	86%	80%	120%	89%	70%	130%
Molybdenum	918798		<0.5	<0.5	NA	< 0.5	109%	70%	130%	99%	80%	120%	103%	70%	130%
Nickel	918798		20	21	4.9%	< 1	94%	70%	130%	89%	80%	120%	86%	70%	130%
Selenium	918798		<0.4	<0.4	NA	< 0.4	98%	70%	130%	93%	80%	120%	96%	70%	130%
Silver	918798		<0.2	<0.2	NA	< 0.2	106%	70%	130%	92%	80%	120%	87%	70%	130%
Thallium	918798		<0.4	<0.4	NA	< 0.4	99%	70%	130%	95%	80%	120%	92%	70%	130%
Uranium	918798		0.5	0.5	NA	< 0.5	98%	70%	130%	96%	80%	120%	97%	70%	130%
Vanadium	918798		30	30	0.0%	< 1	108%	70%	130%	84%	80%	120%	87%	70%	130%
Zinc	918798		48	49	2.1%	< 5	104%	70%	130%	99%	80%	120%	87%	70%	130%
Chromium, Hexavalent	921217		< 0.2	< 0.2	NA	< 0.2	87%	70%	130%	88%	80%	120%	92%	70%	130%
Cyanide	890298	890298	<0.040	<0.040	NA	< 0.040	101%	70%	130%	108%	80%	120%	112%	70%	130%
Mercury	918798		<0.10	<0.10	NA	< 0.10	106%	70%	130%	98%	80%	120%	98%	70%	130%
Electrical Conductivity	921516		0.163	0.168	3.0%	< 0.005	100%	90%	110%	NA			NA		
Sodium Adsorption Ratio	921031		0.110	0.101	8.5%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	916689		7.49	7.55	0.8%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST
ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

5835 COOPERS AVENUE
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Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47 Arterial Road

AGAT WORK ORDER: 20T567508
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

A747

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

yellow & Blue

Laboratory Use Only

Work Order #: 20T567508

Cooler Quantity: 1 cooler # 747

Arrival Temperatures: 3.2 | 2.9 | 3.4
ML 2.4 | 2.1 | 1.8

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4
Richmond Hill
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 (Indicate One)
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ____ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ (Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47 Arterial Road
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood
Contact: Shami Malla
Address: 50 Vogell Road, Units 3 and 4
Email: GTA East@woodplc.com

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides)	☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr6+ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH3 ☐ TKN ☐ NO3 ☐ NO2 ☐ NO3+NO2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
BH A15 SS1	22 Jan 2020	8:20	1	S	HOLD																
BH A17 SS2	22 Jan 2020	8:55	1	S																	
BH A17 SS3	22 Jan 2020	9:05	1	S																	
BH A18 SS2	22 Jan 2020	9:55	1	S																	
BH A19 SS1	22 Jan 2020	10:10	1	S																	
BH A19 SS3	22 Jan 2020	10:20	1	S																	
BH A21 SS1	22 Jan 2020	10:50	1	S																	
BH A25 SS1	22 Jan 2020	11:10	1	S																	
BH A25 SS2	22 Jan 2020	11:15	1	S																	
BH A26 SS2	22 Jan 2020	12:15	1	S																	
BH A27 SS1	22 Jan 2020	12:40	1	S																	

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alessandro Pellerito	23 Jan 2020	3pm		Jan24/20	9:29
	Jan24/20	3:08			

Page 1 of 2

Nº:

747

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Mississauga, Ontario L4Z 1Y2
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webearth.agatlabs.com

Laboratory Use Only

Work Order #:

Cooler Quantity: 1 cooler #747

Arrival Temperatures: 3.2 | 2.9 | 8.4
2.4 | 2.1 | 1.8

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4
Richmond Hill
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ______ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ *Indicate One*

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47 Arterial Road
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: *If quotation number is not provided, client will be billed full price for analysis.*

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood
Contact: Shami Malla
Address: 50 Vogell Road, Units 3 and 4
Email: GTA East@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	**ORPs:** ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	**Volatiles:** ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
BH A27 SS3	22 Jan 202(	12:50	1	S	HOLD															
BH A28 SS2	22 Jan 202(	1:25	1	S																
BH A29 SS2	22 Jan 202(	1:40	1	S																
BH A31 SS2	22 Jan 202(	2:05	1	S																
BH A31 SS3	22 Jan 202(	2:10	1	S																
DUP 2	22 Jan 202(		1	S																

Samples Relinquished By (Print Name and Sign): Alessandro Pellerito — Date: 23 Jan 2020 — Time: 3pm
Samples Received By (Print Name and Sign): — Date: Jan 24/20 — Time: 9:29

Samples Relinquished By (Print Name and Sign): — Date: Jan24/20 — Time: 3:08
Samples Received By (Print Name and Sign): — Date: — Time:

Samples Relinquished By (Print Name and Sign): — Date: — Time:
Samples Received By (Print Name and Sign): — Date: — Time:

Page 2 of 2

Nº:

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6

ATTENTION TO: Alessandro Pellerito

PROJECT: TP115086.1

AGAT WORK ORDER: 20T567556

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Nov 13, 2020

PAGES (INCLUDING COVER): 17

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T567556
PROJECT: TP115086.1

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:Leslie/Sheppard

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammhad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-24

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH A20 SS2	BH B2 SS5	BH B5 SS4	BH B22 SS1
					SAMPLE TYPE:	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2020-01-23	2020-01-23	2020-01-23	2020-01-23
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	890260	890263	890268	890269
Antimony	µg/g	40	0.8	2020-02-12	2020-02-12	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-02-12	2020-02-12	5	4	4	5
Barium	µg/g	670	2	2020-02-12	2020-02-12	92	40	78	175
Beryllium	µg/g	8	0.5	2020-02-12	2020-02-12	0.6	<0.5	<0.5	1.1
Boron	µg/g	120	5	2020-02-12	2020-02-12	8	5	8	10
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-12	2020-02-12	0.13	0.16	0.15	0.10
Cadmium	µg/g	1.9	0.5	2020-02-12	2020-02-12	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-02-12	2020-02-12	24	10	19	39
Cobalt	µg/g	80	0.5	2020-02-12	2020-02-12	10.3	5.4	10.3	16.6
Copper	µg/g	230	1	2020-02-12	2020-02-12	22	20	21	28
Lead	µg/g	120	1	2020-02-12	2020-02-12	11	8	9	16
Molybdenum	µg/g	40	0.5	2020-02-12	2020-02-12	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	270	1	2020-02-12	2020-02-12	21	10	20	34
Selenium	µg/g	5.5	0.4	2020-02-12	2020-02-12	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	40	0.2	2020-02-12	2020-02-12	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-02-12	2020-02-12	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-02-12	2020-02-12	0.5	<0.5	0.5	0.6
Vanadium	µg/g	86	1	2020-02-12	2020-02-12	32	16	25	47
Zinc	µg/g	340	5	2020-02-12	2020-02-12	55	34	51	83
Chromium, Hexavalent	µg/g	8	0.2	2020-02-12	2020-02-12	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-10	2020-02-10	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-02-12	2020-02-12	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-12	2020-02-12	1.87	0.166	0.164	0.918
Sodium Adsorption Ratio	NA	12	NA	2020-02-12	2020-02-12	6.21	0.250	0.163	1.24
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-12	2020-02-12	7.45	7.93	7.84	7.60

Certified By:

NIVINE BASILY

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T567556

PROJECT: TP115086.1

5835 COOPERS AVENUE
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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:Leslie/Sheppard

SAMPLED BY:Mohammhad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-24

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
890260-890269	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:Leslie/Sheppard

SAMPLED BY:Mohammhad Safarpanah

VOCs (Soil)

DATE RECEIVED: 2020-01-24

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B2 SS1
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-23
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	890262
Dichlorodifluoromethane	µg/g	16	0.05	2020-02-12	2020-02-12	<0.05
Vinyl Chloride	ug/g	0.032	0.02	2020-02-12	2020-02-12	<0.02
Bromomethane	ug/g	0.05	0.05	2020-02-12	2020-02-12	<0.05
Trichlorofluoromethane	ug/g	4	0.05	2020-02-12	2020-02-12	<0.05
Acetone	ug/g	16	0.50	2020-02-12	2020-02-12	<0.50
1,1-Dichloroethylene	ug/g	0.064	0.05	2020-02-12	2020-02-12	<0.05
Methylene Chloride	ug/g	1.6	0.05	2020-02-12	2020-02-12	<0.05
Trans- 1,2-Dichloroethylene	ug/g	1.3	0.05	2020-02-12	2020-02-12	<0.05
Methyl tert-butyl Ether	ug/g	1.6	0.05	2020-02-12	2020-02-12	<0.05
1,1-Dichloroethane	ug/g	0.47	0.02	2020-02-12	2020-02-12	<0.02
Methyl Ethyl Ketone	ug/g	70	0.50	2020-02-12	2020-02-12	<0.50
Cis- 1,2-Dichloroethylene	ug/g	1.9	0.02	2020-02-12	2020-02-12	<0.02
Chloroform	ug/g	0.47	0.04	2020-02-12	2020-02-12	<0.04
1,2-Dichloroethane	ug/g	0.05	0.03	2020-02-12	2020-02-12	<0.03
1,1,1-Trichloroethane	ug/g	6.1	0.05	2020-02-12	2020-02-12	<0.05
Carbon Tetrachloride	ug/g	0.21	0.05	2020-02-12	2020-02-12	<0.05
Benzene	ug/g	0.32	0.02	2020-02-12	2020-02-12	<0.02
1,2-Dichloropropane	ug/g	0.16	0.03	2020-02-12	2020-02-12	<0.03
Trichloroethylene	ug/g	0.55	0.03	2020-02-12	2020-02-12	<0.03
Bromodichloromethane	ug/g	1.5	0.05	2020-02-12	2020-02-12	<0.05
Methyl Isobutyl Ketone	ug/g	31	0.50	2020-02-12	2020-02-12	<0.50
1,1,2-Trichloroethane	ug/g	0.05	0.04	2020-02-12	2020-02-12	<0.04
Toluene	ug/g	6.4	0.05	2020-02-12	2020-02-12	<0.05
Dibromochloromethane	ug/g	2.3	0.05	2020-02-12	2020-02-12	<0.05
Ethylene Dibromide	ug/g	0.05	0.04	2020-02-12	2020-02-12	<0.04
Tetrachloroethylene	ug/g	1.9	0.05	2020-02-12	2020-02-12	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.087	0.04	2020-02-12	2020-02-12	<0.04
Chlorobenzene	ug/g	2.4	0.05	2020-02-12	2020-02-12	<0.05
Ethylbenzene	ug/g	1.1	0.05	2020-02-12	2020-02-12	<0.05
m & p-Xylene	ug/g		0.05	2020-02-12	2020-02-12	<0.05

Certified By:

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:Leslie/Sheppard

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammhad Safarpanah

VOCs (Soil)

DATE RECEIVED: 2020-01-24

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B2 SS1
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-23
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	890262
Bromoform	ug/g	0.61	0.05	2020-02-12	2020-02-12	<0.05
Styrene	ug/g	34	0.05	2020-02-12	2020-02-12	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	2020-02-12	2020-02-12	<0.05
o-Xylene	ug/g		0.05	2020-02-12	2020-02-12	<0.05
1,3-Dichlorobenzene	ug/g	9.6	0.05	2020-02-12	2020-02-12	<0.05
1,4-Dichlorobenzene	ug/g	0.2	0.05	2020-02-12	2020-02-12	<0.05
1,2-Dichlorobenzene	ug/g	1.2	0.05	2020-02-12	2020-02-12	<0.05
Xylene Mixture	ug/g	26	0.05	2020-02-12	2020-02-12	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g	0.059	0.04	2020-02-12	2020-02-12	<0.04
n-Hexane	µg/g	46	0.05	2020-02-12	2020-02-12	<0.05
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	50-140		2020-02-12	2020-02-12	98
4-Bromofluorobenzene	% Recovery	50-140		2020-02-12	2020-02-12	90

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

890262 The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T567556
PROJECT: TP115086.1

5835 COOPERS AVENUE
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:Leslie/Sheppard
SAMPLED BY:Mohammhad Safarpanah

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2020-01-24
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B2 SS1	BH B5 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-01-23	2020-01-23
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	890262	890267
Hexachloroethane	µg/g	0.21	0.01	2020-02-07	2020-02-11	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.056	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Heptachlor	µg/g	0.19	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Aldrin	µg/g	0.088	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Endosulfan	µg/g	0.3	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	2020-02-07	2020-02-11	<0.007	<0.007
DDE	µg/g	0.52	0.007	2020-02-07	2020-02-11	<0.007	<0.007
DDD	µg/g	4.6	0.007	2020-02-07	2020-02-11	<0.007	<0.007
DDT	µg/g	1.4	0.007	2020-02-07	2020-02-11	<0.007	<0.007
Dieldrin	µg/g	0.088	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Endrin	µg/g	0.04	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Methoxychlor	µg/g	1.6	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Hexachlorobenzene	µg/g	0.66	0.005	2020-02-07	2020-02-11	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.031	0.01	2020-02-07	2020-02-11	<0.01	<0.01
Moisture Content	%		0.1	2020-02-07	2020-02-11	16.8	16.3
Surrogate	Unit	Acceptable Limits					
TCMX	%	50-140		2020-02-07	2020-02-11	91	91
Decachlorobiphenyl	%	60-130		2020-02-07	2020-02-11	98	95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

890262-890267 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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SAMPLING SITE:Leslie/Sheppard
SAMPLED BY:Mohammhad Safarpanah

PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2020-01-24
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B2 SS1
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-23
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	890262
F1 (C6 to C10)	µg/g	55	5	2020-02-12	2020-02-12	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	2020-02-12	2020-02-12	<5
F2 (C10 to C16)	µg/g	230	10	2020-02-07	2020-02-10	<10
F3 (C16 to C34)	µg/g	1700	50	2020-02-07	2020-02-10	<50
F4 (C34 to C50)	µg/g	3300	50	2020-02-07	2020-02-10	<50
Gravimetric Heavy Hydrocarbons	µg/g	3300	50			NA
Moisture Content	%		0.1	2020-02-06	2020-02-06	16.8
Surrogate	Unit	Acceptable Limits				
Terphenyl	%	60-140		2020-02-07	2020-02-10	118

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

890262 The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.
Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Exceedance Summary

AGAT WORK ORDER: 20T567556

PROJECT: TP115086.1

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
890260	BH A20 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	1.87

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1
SAMPLING SITE:Leslie/Sheppard

AGAT WORK ORDER: 20T567556
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammhad Safarpanah

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	918268		<0.8	<0.8	NA	< 0.8	135%	70%	130%	88%	80%	120%	89%	70%	130%
Arsenic	918268		7	7	1.4%	< 1	118%	70%	130%	90%	80%	120%	93%	70%	130%
Barium	918268		62	63	1.8%	< 2	112%	70%	130%	94%	80%	120%	83%	70%	130%
Beryllium	918268		1.0	1.0	NA	< 0.5	84%	70%	130%	107%	80%	120%	91%	70%	130%
Boron	918268		20	21	NA	< 5	80%	70%	130%	100%	80%	120%	74%	70%	130%
Boron (Hot Water Extractable)	918268		0.17	0.16	NA	< 0.10	96%	60%	140%	93%	70%	130%	99%	60%	140%
Cadmium	918268		<0.5	<0.5	NA	< 0.5	111%	70%	130%	96%	80%	120%	95%	70%	130%
Chromium	918268		23	23	NA	< 5	96%	70%	130%	111%	80%	120%	85%	70%	130%
Cobalt	918268		16.5	16.7	0.9%	< 0.5	87%	70%	130%	85%	80%	120%	81%	70%	130%
Copper	918268		9	10	1.8%	< 1	95%	70%	130%	92%	80%	120%	79%	70%	130%
Lead	918268		15	16	2.8%	< 1	107%	70%	130%	85%	80%	120%	89%	70%	130%
Molybdenum	918268		<0.5	<0.5	NA	< 0.5	105%	70%	130%	97%	80%	120%	91%	70%	130%
Nickel	918268		30	31	0.5%	< 1	89%	70%	130%	87%	80%	120%	79%	70%	130%
Selenium	918268		<0.4	<0.4	NA	< 0.4	129%	70%	130%	96%	80%	120%	95%	70%	130%
Silver	918268		<0.2	<0.2	NA	< 0.2	98%	70%	130%	92%	80%	120%	89%	70%	130%
Thallium	918268		<0.4	<0.4	NA	< 0.4	95%	70%	130%	93%	80%	120%	90%	70%	130%
Uranium	918268		<0.5	<0.5	NA	< 0.5	100%	70%	130%	91%	80%	120%	92%	70%	130%
Vanadium	918268		28	28	1.0%	< 1	91%	70%	130%	83%	80%	120%	74%	70%	130%
Zinc	918268		73	73	0.5%	< 5	113%	70%	130%	98%	80%	120%	89%	70%	130%
Chromium, Hexavalent	921217		< 0.2	< 0.2	0.0%	< 0.2	87%	70%	130%	88%	80%	120%	92%	70%	130%
Cyanide	915854		<0.040	<0.040	NA	< 0.040	104%	70%	130%	98%	80%	120%	108%	70%	130%
Mercury	918268		<0.10	<0.10	NA	< 0.10	93%	70%	130%	83%	80%	120%	83%	70%	130%
Electrical Conductivity	916749		1.27	1.28	0.9%	< 0.005	100%	90%	110%						
Sodium Adsorption Ratio	916749		6.27	6.26	0.0%	NA									
pH, 2:1 CaCl2 Extraction	916689		7.49	7.55	0.8%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

NIVINE BASILY

Certified By:

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1
SAMPLING SITE:Leslie/Sheppard

AGAT WORK ORDER: 20T567556
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammhad Safarpanah

Trace Organics Analysis

RPT Date: Nov 13, 2020

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	901570		< 0.01	< 0.01	NA	< 0.01	94%	50%	140%	92%	50%	140%	99%	50%	140%
Gamma-Hexachlorocyclohexane	901570		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	98%	50%	140%	94%	50%	140%
Heptachlor	901570		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	94%	50%	140%	102%	50%	140%
Aldrin	901570		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	103%	50%	140%	103%	50%	140%
Heptachlor Epoxide	901570		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	106%	50%	140%	102%	50%	140%
Endosulfan	901570		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	103%	50%	140%	105%	50%	140%
Chlordane	901570		< 0.007	< 0.007	NA	< 0.007	108%	50%	140%	108%	50%	140%	103%	50%	140%
DDE	901570		< 0.007	< 0.007	NA	< 0.007	106%	50%	140%	102%	50%	140%	106%	50%	140%
DDD	901570		< 0.007	< 0.007	NA	< 0.007	107%	50%	140%	104%	50%	140%	108%	50%	140%
DDT	901570		< 0.007	< 0.007	NA	< 0.007	102%	50%	140%	98%	50%	140%	102%	50%	140%
Dieldrin	901570		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	107%	50%	140%	105%	50%	140%
Endrin	901570		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	106%	50%	140%	104%	50%	140%
Methoxychlor	901570		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	99%	50%	140%	103%	50%	140%
Hexachlorobenzene	901570		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	96%	50%	140%	98%	50%	140%
Hexachlorobutadiene	901570		< 0.01	< 0.01	NA	< 0.01	101%	50%	140%	97%	50%	140%	107%	50%	140%
VOCs (Soil)															
Dichlorodifluoromethane	922949		< 0.05	< 0.05	NA	< 0.05	110%	50%	140%	102%	50%	140%	94%	50%	140%
Vinyl Chloride	922949		< 0.02	< 0.02	NA	< 0.02	82%	50%	140%	92%	50%	140%	103%	50%	140%
Bromomethane	922949		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	117%	50%	140%	97%	50%	140%
Trichlorofluoromethane	922949		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	105%	50%	140%	109%	50%	140%
Acetone	922949		< 0.50	< 0.50	NA	< 0.50	107%	50%	140%	117%	50%	140%	85%	50%	140%
1,1-Dichloroethylene	922949		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	104%	60%	130%	81%	50%	140%
Methylene Chloride	922949		< 0.05	< 0.05	NA	< 0.05	114%	50%	140%	97%	60%	130%	120%	50%	140%
Trans- 1,2-Dichloroethylene	922949		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	92%	60%	130%	81%	50%	140%
Methyl tert-butyl Ether	922949		< 0.05	< 0.05	NA	< 0.05	79%	50%	140%	80%	60%	130%	87%	50%	140%
1,1-Dichloroethane	922949		< 0.02	< 0.02	NA	< 0.02	116%	50%	140%	98%	60%	130%	95%	50%	140%
Methyl Ethyl Ketone	922949		< 0.50	< 0.50	NA	< 0.50	106%	50%	140%	111%	50%	140%	72%	50%	140%
Cis- 1,2-Dichloroethylene	922949		< 0.02	< 0.02	NA	< 0.02	88%	50%	140%	104%	60%	130%	76%	50%	140%
Chloroform	922949		< 0.04	< 0.04	NA	< 0.04	93%	50%	140%	104%	60%	130%	75%	50%	140%
1,2-Dichloroethane	922949		< 0.03	< 0.03	NA	< 0.03	98%	50%	140%	107%	60%	130%	87%	50%	140%
1,1,1-Trichloroethane	922949		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	82%	60%	130%	106%	50%	140%
Carbon Tetrachloride	922949		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	83%	60%	130%	105%	50%	140%
Benzene	922949		< 0.02	< 0.02	NA	< 0.02	94%	50%	140%	107%	60%	130%	84%	50%	140%
1,2-Dichloropropane	922949		< 0.03	< 0.03	NA	< 0.03	96%	50%	140%	105%	60%	130%	76%	50%	140%
Trichloroethylene	922949		< 0.03	< 0.03	NA	< 0.03	87%	50%	140%	103%	60%	130%	84%	50%	140%
Bromodichloromethane	922949		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	91%	60%	130%	119%	50%	140%
Methyl Isobutyl Ketone	922949		< 0.50	< 0.50	NA	< 0.50	103%	50%	140%	116%	50%	140%	85%	50%	140%
1,1,2-Trichloroethane	922949		< 0.04	< 0.04	NA	< 0.04	99%	50%	140%	105%	60%	130%	78%	50%	140%
Toluene	922949		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	106%	60%	130%	82%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1
SAMPLING SITE:Leslie/Sheppard

AGAT WORK ORDER: 20T567556
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammhad Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dibromochloromethane	922949		< 0.05	< 0.05	NA	< 0.05	76%	50%	140%	81%	60%	130%	107%	50%	140%
Ethylene Dibromide	922949		< 0.04	< 0.04	NA	< 0.04	91%	50%	140%	98%	60%	130%	104%	50%	140%
Tetrachloroethylene	922949		< 0.05	< 0.05	NA	< 0.05	85%	50%	140%	103%	60%	130%	73%	50%	140%
1,1,1,2-Tetrachloroethane	922949		< 0.04	< 0.04	NA	< 0.04	76%	50%	140%	83%	60%	130%	119%	50%	140%
Chlorobenzene	922949		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	106%	60%	130%	80%	50%	140%
Ethylbenzene	922949		< 0.05	< 0.05	NA	< 0.05	90%	50%	140%	100%	60%	130%	75%	50%	140%
m & p-Xylene	922949		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	101%	60%	130%	79%	50%	140%
Bromoform	922949		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	79%	60%	130%	106%	50%	140%
Styrene	922949		< 0.05	< 0.05	NA	< 0.05	83%	50%	140%	90%	60%	130%	108%	50%	140%
1,1,2,2-Tetrachloroethane	922949		< 0.05	< 0.05	NA	< 0.05	110%	50%	140%	113%	60%	130%	118%	50%	140%
o-Xylene	922949		< 0.05	< 0.05	NA	< 0.05	92%	50%	140%	103%	60%	130%	79%	50%	140%
1,3-Dichlorobenzene	922949		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	101%	60%	130%	72%	50%	140%
1,4-Dichlorobenzene	922949		< 0.05	< 0.05	NA	< 0.05	93%	50%	140%	103%	60%	130%	79%	50%	140%
1,2-Dichlorobenzene	922949		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	100%	60%	130%	76%	50%	140%
1,3-Dichloropropene (Cis + Trans)	922949		< 0.04	< 0.04	NA	< 0.04	103%	50%	140%	76%	60%	130%	107%	50%	140%
n-Hexane	922949		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	102%	60%	130%	72%	50%	140%
PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 to C10)	928130		< 5	< 5	NA	< 5	100%	60%	130%	102%	85%	115%	90%	70%	130%
F2 (C10 to C16)	918607		< 10	< 10	NA	< 10	113%	60%	130%	120%	80%	120%	77%	70%	130%
F3 (C16 to C34)	918607		< 50	< 50	NA	< 50	108%	60%	130%	117%	80%	120%	75%	70%	130%
F4 (C34 to C50)	918607		< 50	< 50	NA	< 50	88%	60%	130%	105%	80%	120%	107%	70%	130%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T567556
PROJECT: TP115086.1
ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020			REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Sample Description	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony		BH A20 SS2	135%	70%	130%	88%	80%	120%	89%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T567556
PROJECT: TP115086.1
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:Leslie/Sheppard
SAMPLED BY:Mohammhad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T567556
PROJECT: TP115086.1
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:Leslie/Sheppard
SAMPLED BY:Mohammhad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260D	(P&T)GC/MS
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T567556

PROJECT: TP115086.1

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:Leslie/Sheppard

SAMPLED BY:Mohammhad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	CCME Tier 1 Method	GC/FID

600

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
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webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20T567556

Cooler Quantity: large #606

Arrival Temperatures: 3.3 | 3 | 2.9

1.7 | 2.2 | 2.3

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4
Richmond Hill
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 (Indicate One)
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ______ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ (Indicate One)

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1
Site Location: Leslie/Sheppard
Sampled By: Mohammhad Safarpanah
AGAT Quote #: 305848 PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood
Contact: Shami Malla
Address: 50 Vogell Road, Units 3 and 4
Email: GTA_East@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI	O. Reg 153			Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use						
						Y / N	Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR																	
BH A8 SS2	23 Jan 202(	9:05	1	S	HOLD																					
BH A10 SS2	23 Jan 202(	9:35	1	S	HOLD																					
BH A20 SS2	23 Jan 202(	10:10	1	S	HOLD																					
BH A30 SS2	23 Jan 202(	10:35	1	S	HOLD																					
BH B2 SS1	23 Jan 202(	12:55	1	S	HOLD																					
BH B2 SS5	23 Jan 202(	1:20	1	S	HOLD																					
BH B3 SS1	23 Jan 202(	1:55	1	S	HOLD																					
BH B3 SS2	23 Jan 202(	2:00	1	S	HOLD																					
BH B4 SS1	23 Jan 202(	2:25	1	S	HOLD																					
BH B5 SS1	23 Jan 202(	2:45	1	S	HOLD																					
BH B5 SS4	23 Jan 202(	3:00	1	S	HOLD																					

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alessandro Pellerito	24 Jan 2020	9:00am		Jan 24/20	9:07
Samples Relinquished By (Print Name and Sign):	Date: Jan 24/20	Time: 3:08	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page _____ of _____

Nº:

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity: 1 cmp #600

Arrival Temperatures: 3.3 | 3 | 2.9
ICE 1.7 | 2.2 | 2.3

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Units 3 and 4
Richmond Hill
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2
Indicate One
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture (Check One)
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region
Indicate One
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1
Site Location: Leslie/Sheppard
Sampled By: Mohammhad Safarpanah
AGAT Quote #: 305848 PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood
Contact: Shami Malla
Address: 50 Vogell Road, Units 3 and 4
Email: GTA_East@woodplc.com

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI	O. Reg 153			Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐TP ☐NH$_3$ ☐TKN ☐NO$_2$ ☐NO$_2$ ☐NO$_3$+NO$_2$	Volatiles: ☐VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	Sewe-Use						
						Y / N	Metals and Inorganics	☐All Metals ☐153 Metals (excl. Hydrides) ☐Hycride Metals ☐153 Metals (Incl. Hydrides)	ORPs: ☐B-HWS ☐Cl⁻ ☐CN⁻ ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR																	
BH B22 SS2	23 Jan 202(	11:35	1	S	HOLD																					

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Alessandro Pellerito	24 Jan 2020	9:00am		Jan 24/20	9:27
	Jan 24/20	3:08			

Page ______ of ______

Nº:

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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T569148
SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 18
VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

VERSION 2: SUPERSEDES VERSION 1, ISSUED FEBRUARY 12, 2020. CHROMIUM LEACHATE RESULT ADDED.

Certificate of Analysis

AGAT WORK ORDER: 20T569148
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-30

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B17 SS3
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-24
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	918798
Antimony	µg/g	40	0.8	2020-02-11	2020-02-11	<0.8
Arsenic	µg/g	18	1	2020-02-11	2020-02-11	5
Barium	µg/g	670	2	2020-02-11	2020-02-11	85
Beryllium	µg/g	8	0.5	2020-02-11	2020-02-11	0.5
Boron	µg/g	120	5	2020-02-11	2020-02-11	10
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-11	2020-02-11	<0.10
Cadmium	µg/g	1.9	0.5	2020-02-11	2020-02-11	<0.5
Chromium	µg/g	160	5	2020-02-11	2020-02-11	23
Cobalt	µg/g	80	0.5	2020-02-11	2020-02-11	9.7
Copper	µg/g	230	1	2020-02-11	2020-02-11	20
Lead	µg/g	120	1	2020-02-11	2020-02-11	13
Molybdenum	µg/g	40	0.5	2020-02-11	2020-02-11	<0.5
Nickel	µg/g	270	1	2020-02-11	2020-02-11	20
Selenium	µg/g	5.5	0.4	2020-02-11	2020-02-11	<0.4
Silver	µg/g	40	0.2	2020-02-11	2020-02-11	<0.2
Thallium	µg/g	3.3	0.4	2020-02-11	2020-02-11	<0.4
Uranium	µg/g	33	0.5	2020-02-11	2020-02-11	0.5
Vanadium	µg/g	86	1	2020-02-11	2020-02-11	30
Zinc	µg/g	340	5	2020-02-11	2020-02-11	48
Chromium, Hexavalent	µg/g	8	0.2	2020-02-12	2020-02-12	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-06	2020-02-06	<0.040
Mercury	µg/g	3.9	0.10	2020-02-11	2020-02-11	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-12	2020-02-12	0.236
Sodium Adsorption Ratio	NA	12	NA	2020-02-12	2020-02-12	0.205
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-12	2020-02-12	7.58

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-01-30

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
918798	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

Certificate of Analysis

AGAT WORK ORDER: 20T569148
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2020-01-30
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	TCLP COMP2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-24
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	918885
Arsenic Leachate	mg/L	2.5	0.010	2020-02-07	2020-02-07	<0.010
Barium Leachate	mg/L	100	0.100	2020-02-07	2020-02-07	0.484
Boron Leachate	mg/L	500	0.050	2020-02-07	2020-02-07	0.056
Cadmium Leachate	mg/L	0.5	0.010	2020-02-07	2020-02-07	<0.010
Chromium Leachate	mg/L	5	0.010	2020-02-07	2020-02-07	<0.010
Lead Leachate	mg/L	5	0.010	2020-02-07	2020-02-07	<0.010
Mercury Leachate	mg/L	0.1	0.01	2020-02-07	2020-02-07	<0.01
Selenium Leachate	mg/L	1	0.010	2020-02-07	2020-02-07	<0.010
Silver Leachate	mg/L	5	0.010	2020-02-07	2020-02-07	<0.010
Uranium Leachate	mg/L	10	0.050	2020-02-07	2020-02-07	<0.050
Fluoride Leachate	mg/L	150	0.05	2020-02-07	2020-02-07	0.23
Cyanide Leachate	mg/L	20	0.05	2020-02-07	2020-02-07	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	2020-02-07	2020-02-07	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

918885 Revised 2020 March 13
Revision: This report replaces the Certificate of Analysis issued on 2020 Feb 12. The certificate of analysis has been revised to include Chromium Leachate results that was acquired in the initial ICPMS metal scan.

Analysis performed at AGAT Toronto (unless marked by *)

Amanjot Bhela

CHARTERED AMANJOT BHELA CHEMIST

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T569148
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2020-01-30
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B21 SS1	BH B19 SS1	BH B17 SS1	BH B15 SS1
					SAMPLE TYPE:	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2020-01-24	2020-01-24	2020-01-24	2020-01-24
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	918790	918794	918797	918801
Hexachloroethane	µg/g	0.21	0.01	2020-02-07	2020-02-10	<0.01	<0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.056	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g	0.19	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Aldrin	µg/g	0.088	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Endosulfan	µg/g	0.3	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	2020-02-07	2020-02-10	<0.007	<0.007	<0.007	<0.007
DDE	µg/g	0.52	0.007	2020-02-07	2020-02-10	<0.007	<0.007	<0.007	<0.007
DDD	µg/g	4.6	0.007	2020-02-07	2020-02-10	<0.007	<0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	2020-02-07	2020-02-10	<0.007	<0.007	<0.007	<0.007
Dieldrin	µg/g	0.088	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g	1.6	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.66	0.005	2020-02-07	2020-02-10	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.031	0.01	2020-02-07	2020-02-10	<0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	2020-02-07	2020-02-10	<0.1	<0.1	<0.1	<0.1
Surrogate	Unit	Acceptable Limits							
TCMX	%	50-140		2020-02-07	2020-02-10	87	93	95	97
Decachlorobiphenyl	%	60-130		2020-02-07	2020-02-10	92	97	109	99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

918790-918801 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.

Analysis performed at AGAT Toronto (unless marked by *)

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 - OC Pesticides & PCBs

DATE RECEIVED: 2020-01-30

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	TCLP COMP2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-24
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	918885
Heptachlor + Heptachlor Epoxide	mg/L	0.3	0.0003	2020-02-12	2020-02-12	<0.0003
Aldrin + Dieldrin	mg/L	0.07	0.0007	2020-02-12	2020-02-12	<0.0007
DDT + Metabolites	mg/L	3.0	0.003	2020-02-12	2020-02-12	<0.003
Methoxychlor	mg/L	90.0	0.09	2020-02-12	2020-02-12	<0.09
Chlordane (Total)	mg/L	0.7	0.0007	2020-02-12	2020-02-12	<0.0007
Aldrin	mg/L		0.0002	2020-02-12	2020-02-12	<0.0002
alpha - chlordane	mg/L		0.0001	2020-02-12	2020-02-12	<0.0001
gamma-Chlordane	mg/L		0.0002	2020-02-12	2020-02-12	<0.0002
Oxychlordane	mg/L		0.0004	2020-02-12	2020-02-12	<0.0004
pp'-DDE	mg/L		0.0005	2020-02-12	2020-02-12	<0.0005
pp'-DDD	mg/L		0.0015	2020-02-12	2020-02-12	<0.0015
op'-DDT	mg/L		0.0015	2020-02-12	2020-02-12	<0.0015
pp'-DDT	mg/L		0.0005	2020-02-12	2020-02-12	<0.0005
Dieldrin	mg/L		0.0005	2020-02-12	2020-02-12	<0.0005
Heptachlor	mg/L		0.0001	2020-02-12	2020-02-12	<0.0001
Heptachlor Epoxide	mg/L		0.0002	2020-02-12	2020-02-12	<0.0002
Lindane	mg/L		0.0004	2020-02-12	2020-02-12	<0.0004
Endrin	mg/L	0.02	0.0004	2020-02-12	2020-02-12	<0.0004
Toxaphene	mg/L	0.5	0.0005	2020-02-12	2020-02-12	<0.0005
PCB's	mg/L	0.3	0.0002	2020-02-12	2020-02-12	<0.0002
OC/PCB Pest Extr	NA			2020-02-12	2020-02-12	Y
Surrogate	Unit	Acceptable Limits				
Decachlorobiphenyl	%	60-130		2020-02-12	2020-02-12	90

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 558 - OC Pesticides & PCBs

DATE RECEIVED: 2020-01-30

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
918885	The sample was leached according to Regulation 558 protocol. Analysis was performed after extraction of the leachate. Heptachlor + Heptachlor Epoxide is a calculated parameter. The calculated value is the sum of Heptachlor and Heptachlor Epoxide. Aldrin + Dieldrin is a calculated parameter. The calculated value is the sum of Aldrin and Dieldrin. PCB total is a calculated parameter. The calculated value is the sum of Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260. DDT + Metabolites is a calculated parameter. The calculated value is the sum of op'DDT, pp'DDT, pp'DDE and pp'DDD.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T569148
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

O. Reg. 558 - VOCs

DATE RECEIVED: 2020-01-30
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	TCLP COMP2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-01-24
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	918885
Vinyl Chloride	mg/L	0.2	0.030	2020-02-12	2020-02-12	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	2020-02-12	2020-02-12	<0.020
Dichloromethane	mg/L	5.0	0.030	2020-02-12	2020-02-12	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	2020-02-12	2020-02-12	<0.090
Chloroform	mg/L	10.0	0.020	2020-02-12	2020-02-12	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	2020-02-12	2020-02-12	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	2020-02-12	2020-02-12	<0.020
Benzene	mg/L	0.5	0.020	2020-02-12	2020-02-12	<0.020
Trichloroethene	mg/L	5.0	0.020	2020-02-12	2020-02-12	<0.020
Tetrachloroethene	mg/L	3.0	0.050	2020-02-12	2020-02-12	<0.050
Chlorobenzene	mg/L	8.0	0.010	2020-02-12	2020-02-12	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	2020-02-12	2020-02-12	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	2020-02-12	2020-02-12	<0.010
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	60-130		2020-02-12	2020-02-12	98

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

918885 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T569148

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	918798	918798	<0.8	<0.8	NA	< 0.8	100%	70%	130%	90%	80%	120%	87%	70%	130%
Arsenic	918798	918798	5	5	0.0%	< 1	103%	70%	130%	95%	80%	120%	102%	70%	130%
Barium	918798	918798	85	84	1.2%	< 2	113%	70%	130%	98%	80%	120%	93%	70%	130%
Beryllium	918798	918798	0.5	0.5	NA	< 0.5	102%	70%	130%	107%	80%	120%	90%	70%	130%
Boron	918798	918798	10	11	NA	< 5	105%	70%	130%	102%	80%	120%	80%	70%	130%
Boron (Hot Water Extractable)	921516		0.16	0.12	NA	< 0.10	80%	60%	140%	90%	70%	130%	88%	60%	140%
Cadmium	918798	918798	<0.5	<0.5	NA	< 0.5	110%	70%	130%	100%	80%	120%	94%	70%	130%
Chromium	918798	918798	23	23	NA	< 5	98%	70%	130%	99%	80%	120%	91%	70%	130%
Cobalt	918798	918798	9.7	9.9	2.0%	< 0.5	101%	70%	130%	87%	80%	120%	85%	70%	130%
Copper	918798	918798	20	21	4.9%	< 1	94%	70%	130%	95%	80%	120%	82%	70%	130%
Lead	918798	918798	13	13	0.0%	< 1	97%	70%	130%	86%	80%	120%	89%	70%	130%
Molybdenum	918798	918798	<0.5	<0.5	NA	< 0.5	109%	70%	130%	99%	80%	120%	103%	70%	130%
Nickel	918798	918798	20	21	4.9%	< 1	94%	70%	130%	89%	80%	120%	86%	70%	130%
Selenium	918798	918798	<0.4	<0.4	NA	< 0.4	98%	70%	130%	93%	80%	120%	96%	70%	130%
Silver	918798	918798	<0.2	<0.2	NA	< 0.2	106%	70%	130%	92%	80%	120%	87%	70%	130%
Thallium	918798	918798	<0.4	<0.4	NA	< 0.4	99%	70%	130%	95%	80%	120%	92%	70%	130%
Uranium	918798	918798	0.5	0.5	NA	< 0.5	98%	70%	130%	96%	80%	120%	97%	70%	130%
Vanadium	918798	918798	30	30	0.0%	< 1	108%	70%	130%	84%	80%	120%	87%	70%	130%
Zinc	918798	918798	48	49	2.1%	< 5	104%	70%	130%	99%	80%	120%	87%	70%	130%
Chromium, Hexavalent	921217		< 0.2	< 0.2	NA	< 0.2	87%	70%	130%	88%	80%	120%	92%	70%	130%
Cyanide	905868		<0.040	<0.040	NA	< 0.040	106%	70%	130%	93%	80%	120%	98%	70%	130%
Mercury	918798	918798	<0.10	<0.10	NA	< 0.10	106%	70%	130%	98%	80%	120%	98%	70%	130%
Electrical Conductivity	921516		0.163	0.168	3.0%	< 0.005	100%	90%	110%						
Sodium Adsorption Ratio	921516		0.077	0.080	3.8%	NA									
pH, 2:1 CaCl2 Extraction	916689		7.49	7.55	0.8%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Lower	Upper	Recovery	Lower	Upper	Recovery	Lower	Upper
O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	901505		<0.010	<0.010	NA	< 0.010	104%	70%	130%	96%	80%	120%	98%	70%	130%
Barium Leachate	901505		0.519	0.496	NA	< 0.100	104%	70%	130%	94%	80%	120%	92%	70%	130%
Boron Leachate	901505		0.259	0.247	NA	< 0.050	95%	70%	130%	96%	80%	120%	80%	70%	130%
Cadmium Leachate	901505		<0.010	<0.010	NA	< 0.010	101%	70%	130%	98%	80%	120%	95%	70%	130%
Chromium Leachate	916231		<0.010	<0.010	NA	< 0.010	95%	70%	130%	97%	80%	120%	94%	70%	130%
Lead Leachate	901505		<0.010	<0.010	NA	< 0.010	100%	70%	130%	96%	80%	120%	88%	70%	130%
Mercury Leachate	901505		<0.01	<0.01	NA	< 0.01	103%	70%	130%	96%	80%	120%	99%	70%	130%
Selenium Leachate	901505		<0.010	<0.010	NA	< 0.010	106%	70%	130%	102%	80%	120%	103%	70%	130%
Silver Leachate	901505		<0.010	<0.010	NA	< 0.010	89%	70%	130%	92%	80%	120%	80%	70%	130%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T569148
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Uranium Leachate	901505		<0.050	<0.050	NA	< 0.050	99%	70%	130%	101%	80%	120%	100%	70%	130%
Fluoride Leachate	901505		0.36	0.36	0.0%	< 0.05	100%	90%	110%	101%	90%	110%	92%	70%	130%
Cyanide Leachate	901505		<0.05	<0.05	NA	< 0.05	101%	90%	110%	108%	90%	110%	97%	70%	130%
(Nitrate + Nitrite) as N Leachate	901505		<0.70	<0.070	NA	< 0.70	104%	80%	120%	104%	80%	120%	100%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T569148
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

Trace Organics Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	901570		< 0.01	< 0.01	NA	< 0.01	94%	50%	140%	92%	50%	140%	99%	50%	140%
Gamma-Hexachlorocyclohexane	901570		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	98%	50%	140%	94%	50%	140%
Heptachlor	901570		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	94%	50%	140%	102%	50%	140%
Aldrin	901570		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	103%	50%	140%	103%	50%	140%
Heptachlor Epoxide	901570		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	106%	50%	140%	102%	50%	140%
Endosulfan	901570		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	103%	50%	140%	105%	50%	140%
Chlordane	901570		< 0.007	< 0.007	NA	< 0.007	108%	50%	140%	108%	50%	140%	103%	50%	140%
DDE	901570		< 0.007	< 0.007	NA	< 0.007	106%	50%	140%	102%	50%	140%	106%	50%	140%
DDD	901570		< 0.007	< 0.007	NA	< 0.007	107%	50%	140%	104%	50%	140%	108%	50%	140%
DDT	901570		< 0.007	< 0.007	NA	< 0.007	102%	50%	140%	98%	50%	140%	102%	50%	140%
Dieldrin	901570		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	107%	50%	140%	105%	50%	140%
Endrin	901570		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	106%	50%	140%	104%	50%	140%
Methoxychlor	901570		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	99%	50%	140%	103%	50%	140%
Hexachlorobenzene	901570		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	96%	50%	140%	98%	50%	140%
Hexachlorobutadiene	901570		< 0.01	< 0.01	NA	< 0.01	101%	50%	140%	97%	50%	140%	107%	50%	140%
O. Reg. 558 - OC Pesticides & PCBs															
Heptachlor + Heptachlor Epoxide	908399		< 0.0003	< 0.0003	NA	< 0.0003	95%	60%	140%	90%	60%	140%	NA	60%	140%
Aldrin + Dieldrin	908399		< 0.0007	< 0.0007	NA	< 0.0007	96%	60%	140%	92%	60%	140%	NA	60%	140%
DDT + Metabolites	908399		< 0.003	< 0.003	NA	< 0.003	108%	60%	140%	103%	60%	140%	NA	60%	140%
Methoxychlor	908399		< 0.09	< 0.09	NA	< 0.09	98%	60%	140%	102%	60%	140%	NA	60%	140%
Chlordane (Total)	908399		< 0.0007	< 0.0007	NA	< 0.0007	94%	60%	140%	93%	60%	140%	NA	60%	140%
Aldrin	908399		< 0.0002	< 0.0002	NA	< 0.0002	95%	60%	140%	90%	60%	140%	NA	60%	140%
alpha - chlordane	908399		< 0.0001	< 0.0001	NA	< 0.0001	95%	60%	140%	93%	60%	140%	NA	60%	140%
gamma-Chlordane	908399		< 0.0002	< 0.0002	NA	< 0.0002	94%	60%	140%	92%	60%	140%	NA	60%	140%
Oxychlordane	908399		< 0.0004	< 0.0004	NA	< 0.0004	104%	60%	140%	89%	60%	140%	NA	60%	140%
pp'-DDE	908399		< 0.0005	< 0.0005	NA	< 0.0005	100%	60%	140%	100%	60%	140%	NA	60%	140%
pp'-DDD	908399		< 0.0015	< 0.0015	NA	< 0.0015	86%	60%	140%	91%	60%	140%	NA	60%	140%
op'-DDT	908399		< 0.0015	< 0.0015	NA	< 0.0015	109%	60%	140%	100%	60%	140%	NA	60%	140%
pp'-DDT	908399		< 0.0005	< 0.0005	NA	< 0.0005	107%	60%	140%	105%	60%	140%	NA	60%	140%
Dieldrin	908399		< 0.0005	< 0.0005	NA	< 0.0005	96%	60%	140%	94%	60%	140%	NA	60%	140%
Heptachlor	908399		< 0.0001	< 0.0001	NA	< 0.0001	96%	60%	140%	87%	60%	140%	NA	60%	140%
Heptachlor Epoxide	908399		< 0.0002	< 0.0002	NA	< 0.0002	94%	60%	140%	93%	60%	140%	NA	60%	140%
Lindane	908399		< 0.0004	< 0.0004	NA	< 0.0004	91%	60%	140%	83%	60%	140%	NA	60%	140%
Endrin	908399		< 0.0004	< 0.0004	NA	< 0.0004	92%	60%	140%	90%	60%	140%	NA	60%	140%
Toxaphene	908399		< 0.0005	< 0.0005	NA	< 0.0005	NA	60%	140%	86%	60%	140%	NA	60%	140%
PCB's	908399		< 0.0002	< 0.0002	NA	< 0.0002	101%	60%	140%	97%	60%	140%	NA	60%	140%
O. Reg. 558 - VOCs															
Vinyl Chloride	911836		< 0.030	< 0.030	NA	< 0.030	82%	60%	140%	95%	60%	140%	114%	60%	140%
1,1 Dichloroethene	911836		< 0.020	< 0.020	NA	< 0.020	91%	70%	130%	104%	70%	130%	83%	60%	140%

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T569148
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dichloromethane	911836		< 0.030	< 0.030	NA	< 0.030	114%	70%	130%	97%	70%	130%	98%	60%	140%
Methyl Ethyl Ketone	911836		< 0.090	< 0.090	NA	< 0.090	106%	70%	130%	111%	70%	130%	79%	60%	140%
Chloroform	911836		< 0.020	< 0.020	NA	< 0.020	93%	70%	130%	104%	70%	130%	91%	60%	140%
1,2-Dichloroethane	911836		< 0.020	< 0.020	NA	< 0.020	98%	70%	130%	107%	70%	130%	106%	60%	140%
Carbon Tetrachloride	911836		< 0.020	< 0.020	NA	< 0.020	101%	70%	130%	83%	70%	130%	80%	60%	140%
Benzene	911836		< 0.020	< 0.020	NA	< 0.020	94%	70%	130%	107%	70%	130%	98%	60%	140%
Trichloroethene	911836		< 0.020	< 0.020	NA	< 0.020	87%	70%	130%	103%	70%	130%	90%	60%	140%
Tetrachloroethene	911836		< 0.050	< 0.050	NA	< 0.050	85%	70%	130%	106%	70%	130%	89%	60%	140%
Chlorobenzene	911836		< 0.010	< 0.010	NA	< 0.010	97%	70%	130%	106%	70%	130%	95%	60%	140%
1,2-Dichlorobenzene	911836		< 0.010	< 0.010	NA	< 0.010	94%	70%	130%	100%	70%	130%	93%	60%	140%
1,4-Dichlorobenzene	911836		< 0.010	< 0.010	NA	< 0.010	93%	70%	130%	103%	70%	130%	93%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T569148
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Arsenic Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Barium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Boron Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Cadmium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Chromium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Lead Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T569148

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Mercury Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Selenium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Silver Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Uranium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA 1311 & modified from SM4500-F-C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA 1311 & modified from MOE 3015 & SM 4500 CN-I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA 1311 & modified from SM 4500-NO3-I	LACHAT FIA

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T569148
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE
Heptachlor + Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin + Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
DDT + Metabolites	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 8081A & 8082	GC/ECD
Chlordane (Total)	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
alpha - chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
gamma-Chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Oxychlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDE	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDD	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
op'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Lindane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Toxaphene	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
PCB's	ORG-91-5112	EPA SW-846 3550 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
OC/PCB Pest Extr			N/A
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T569148
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Tetrachloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T569148

Cooler Quantity: 1 ~~

Arrival Temperatures: 3.7 | 3.5 | 3.9
3 | 2.6 | 2.4

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☑ Agriculture
Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
Indicate One

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47, Bramptom
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y/N	O. Reg 153 Metals and Inorganics	O. Reg 153 ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	O. Reg 153 ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH₃ ☐ TKN ☐ NO₃ ☐ NO₂ ☐ NO₃+NO₂	Volatiles: ☒ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☒ M&I ☒ VOCs ☐ ABNs ☒ B(a)P ☒ PCBs	Sewer Use
BH B21 SS1	24 Jan 202(	9:45	1	S	HOLD		☑						☑	☑		☑	☑	☑		
BH B21 SS4	24 Jan 202(	10:00	1	S	HOLD		☑						☑	☑		☑	☑	☑		
BH B20 SS2	24 Jan 202(	10:45	1	S	HOLD		☑						☑	☑		☑	☑	☑		
BH B19 SS1	24 Jan 202(	11:00	1	S	HOLD															
BH B19 SS4	24 Jan 202(	11:15	1	S	HOLD														☑	
BH B18 SS2	24 Jan 202(	11:50	1	S	HOLD															
BH B17 SS1	24 Jan 202(	12:05	1	S	HOLD															
BH B17 SS3	24 Jan 202(	12:15	1	S	HOLD															
BH B16 SS1	24 Jan 202(	1:00	1	S	HOLD															
BH B14 SS1	24 Jan 202(	1:05	1	S	HOLD															
BH B15 SS1	24 Jan 202(	1:25	1	S	HOLD															

Samples Relinquished By (Print Name and Sign): Alessandro Pellerito	Date Jan 29, 2020	Time 10:45	Samples Received By (Print Name and Sign):	Date Jan 30/20	Time 11
Samples Relinquished By (Print Name and Sign):	Date Jan 30/20	Time 3:30	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 2

Nº:

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity: 1 cooler

Arrival Temperatures: 3.7 | 3.5 | 3.9
2 | 2.6 | 2.4

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☑Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐Sewer Use
☐Sanitary
☐Storm
Region *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47, Bramptom
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

							O. Reg 153																		
Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	Metals and Inorganics	☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (incl. Hydrides)	**ORPs:** ☐B-HWS ☐Cl ☐CN ☐Cr^{6+} ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH_3 ☐TKN ☐NO_3 ☐NO_2 ☐NO_3+NO_2	**Volatiles:** ☒VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	**PCBs:** ☒Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☒M&I ☒VOCs ☐ABNs ☒B(a)P ☒PCBs	Sewer Use					
BH B15 SS4	24 Jan 202	1:45	1	S	HOLD		☑						☑	☑		☑	☑	☑							
TCLP COMP1	24 Jan 202		2	S	HOLD		☑						☑	☑		☑	☑	☑							
TCLP COMP2	24 Jan 202		2	S	HOLD		☑						☑	☑		☑	☑	☑							
																			☑						

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	Jan 29, 2020	10:45		Jan 30/20	11—	
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Page 2 of 2
	Jan 30/20	3:30				
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6

ATTENTION TO: Alessandro Pellerito

PROJECT: TP115086

AGAT WORK ORDER: 20T574091

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 13, 2020

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T574091
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-13

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D44 SS1	BH D47 SS4	BH D55 SS2
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2020-02-11	2020-02-11	2020-02-11
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	939194	939197	939200
Antimony	µg/g	40	0.8	2020-02-20	2020-02-20	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-02-20	2020-02-20	4	5	5
Barium	µg/g	670	2	2020-02-20	2020-02-20	71	88	86
Beryllium	µg/g	8	0.5	2020-02-20	2020-02-20	<0.5	0.6	0.6
Boron	µg/g	120	5	2020-02-20	2020-02-20	8	10	9
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-20	2020-02-20	0.19	0.14	<0.10
Cadmium	µg/g	1.9	0.5	2020-02-20	2020-02-20	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-02-20	2020-02-20	17	21	23
Cobalt	µg/g	80	0.5	2020-02-20	2020-02-20	7.6	11.6	11.0
Copper	µg/g	230	1	2020-02-21	2020-02-21	20	20	30
Lead	µg/g	120	1	2020-02-20	2020-02-20	10	9	14
Molybdenum	µg/g	40	0.5	2020-02-20	2020-02-20	<0.5	<0.5	<0.5
Nickel	µg/g	270	1	2020-02-20	2020-02-20	16	25	22
Selenium	µg/g	5.5	0.4	2020-02-20	2020-02-20	<0.4	<0.4	<0.4
Silver	µg/g	40	0.2	2020-02-20	2020-02-20	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-02-20	2020-02-20	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-02-20	2020-02-20	<0.5	0.6	<0.5
Vanadium	µg/g	86	1	2020-02-20	2020-02-20	24	27	29
Zinc	µg/g	340	5	2020-02-20	2020-02-20	43	50	51
Chromium, Hexavalent	µg/g	8	0.2	2020-02-20	2020-02-20	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-21	2020-02-21	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-02-20	2020-02-20	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-20	2020-02-20	1.51	0.429	0.995
Sodium Adsorption Ratio	NA	12	NA	2020-02-20	2020-02-20	12.2	0.989	2.64
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-21	2020-02-21	7.79	7.74	7.61

Certified By:

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O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-13

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
939194-939200	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

Exceedance Summary

AGAT WORK ORDER: 20T574091
PROJECT: TP115086

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
939194	BH D44 SS1	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	1.51
939194	BH D44 SS1	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	12.2

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086

SAMPLING SITE:

AGAT WORK ORDER: 20T574091

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	939194	939194	<0.8	<0.8	NA	< 0.8	125%	70%	130%	99%	80%	120%	79%	70%	130%
Arsenic	939194	939194	4	4	NA	< 1	117%	70%	130%	106%	80%	120%	107%	70%	130%
Barium	939194	939194	71	70	0.6%	< 2	113%	70%	130%	100%	80%	120%	90%	70%	130%
Beryllium	939194	939194	<0.5	<0.5	NA	< 0.5	93%	70%	130%	110%	80%	120%	92%	70%	130%
Boron	939194	939194	8	8	NA	< 5	82%	70%	130%	118%	80%	120%	90%	70%	130%
Boron (Hot Water Extractable)	939194	939194	0.19	0.19	NA	< 0.10	99%	60%	140%	93%	70%	130%	94%	60%	140%
Cadmium	939194	939194	<0.5	<0.5	NA	< 0.5	114%	70%	130%	99%	80%	120%	96%	70%	130%
Chromium	939194	939194	17	18	NA	< 5	106%	70%	130%	98%	80%	120%	95%	70%	130%
Cobalt	939194	939194	7.6	7.7	1.3%	< 0.5	91%	70%	130%	93%	80%	120%	89%	70%	130%
Copper	939194	939194	20	20	0.0%	< 1	100%	70%	130%	102%	80%	120%	88%	70%	130%
Lead	939194	939194	10	10	0.8%	< 1	109%	70%	130%	92%	80%	120%	82%	70%	130%
Molybdenum	939194	939194	<0.5	<0.5	NA	< 0.5	109%	70%	130%	109%	80%	120%	109%	70%	130%
Nickel	939194	939194	16	16	2.1%	< 1	95%	70%	130%	99%	80%	120%	91%	70%	130%
Selenium	939194	939194	<0.4	<0.4	NA	< 0.4	142%	70%	130%	103%	80%	120%	105%	70%	130%
Silver	939194	939194	<0.2	<0.2	NA	< 0.2	109%	70%	130%	98%	80%	120%	87%	70%	130%
Thallium	939194	939194	<0.4	<0.4	NA	< 0.4	95%	70%	130%	100%	80%	120%	94%	70%	130%
Uranium	939194	939194	<0.5	<0.5	NA	< 0.5	99%	70%	130%	102%	80%	120%	99%	70%	130%
Vanadium	939194	939194	24	24	0.7%	< 1	89%	70%	130%	88%	80%	120%	87%	70%	130%
Zinc	939194	939194	43	49	12.9%	< 5	109%	70%	130%	99%	80%	120%	92%	70%	130%
Chromium, Hexavalent	938204	938204	< 0.2	< 0.2	0.0%	< 0.2	86%	70%	130%	88%	80%	120%	73%	70%	130%
Cyanide	951249		<0.040	<0.040	NA	< 0.040	104%	70%	130%	86%	80%	120%	91%	70%	130%
Mercury	939194	939194	<0.10	<0.10	NA	< 0.10	110%	70%	130%	102%	80%	120%	100%	70%	130%
Electrical Conductivity	939194	939194	1.51	1.50	0.5%	< 0.005	100%	90%	110%						
Sodium Adsorption Ratio	939194	939194	12.2	12.0	1.7%	NA									
pH, 2:1 CaCl2 Extraction	951249		9.00	9.00	0.0%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Selenium Reference recovery is outside method’s acceptance limit by more than an absolute maximum of 10% however, all other QCs i.e. duplicate, blank, blank spike and matrix spike are within method’s QC acceptance criteria.

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Certified By:

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T574091
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020			REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Sample Description	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Selenium	939194	BH D44 SS1	142%	70%	130%	103%	80%	120%	105%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Selenium Reference recovery is outside method’s acceptance limit by more than an absolute maximum of 10% however, all other QCs i.e. duplicate, blank, blank spike and matrix spike are within method’s QC acceptance criteria.

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T574091
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
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webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20T574091

Cooler Quantity: four

Arrival Temperatures: 2.7 | 2.9 | 2.5
ice 1.6 | 1.9 | 2.1

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a Record of Site Condition?
☐ Yes ☑ No

Report Guideline on Certificate of Analysis
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	**ORPs:** ☐B-HWS ☐Cl⁻ ☐CN ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH₃ ☐TKN ☐NO₃ ☐NO₂ ☐NO₃+NO₂	**Volatiles:** ☐VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☐ ABNs ☑ B(a)P ☑PCBs	Sewer Use
BH D43 SS2	11 Feb 2020	1:10	1	S	HOLD															
BH D43 SS4	11 Feb 2020	1:30	1	S	HOLD															
BH D44 SS1	11 Feb 202	2:10	1	S			☑													
BH D45 SS2	11 Feb 202	3:06	1	S	HOLD															
BH D47 SS1	11 Feb 202	11:35	1	S	HOLD															
BH D47 SS4	11 Feb 202	11:45	1	S			☑													
BH D48 SS2	11 Feb 202	12:40	1	S	HOLD															
BH D51 SS2	11 Feb 202	11:10	1	S	HOLD															
BH D55 SS2	11 Feb 202	9:10	1	S			☑													
BH D55 SS4	11 Feb 202	9:45	1	S	HOLD															
BH D56 SS3	11 Feb 202	10:35	1	S	HOLD															

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alessandro Pellerito	Feb 12, 2020	11:20	Roy	Feb 13/20	10:53
Samples Relinquished By (Print Name and Sign):	Date Feb 13/20	Time 3—	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page ____ of ____

Nº:

5835 COOPERS AVENUE
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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T574535
SOIL ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 11
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

Certificate of Analysis

AGAT WORK ORDER: 20T574535
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

Corrosivity Package (Excl. Redox)

DATE RECEIVED: 2020-02-14
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D53 SS3
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-02-12
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	940847
Chloride (2:1)	µg/g		4	2020-02-24	2020-02-24	660
Sulphate (2:1)	µg/g		4	2020-02-24	2020-02-24	31
pH (2:1)	pH Units		NA	2020-02-02	2020-02-02	7.97
Resistivity (2:1) (Calculated)	ohm.cm		1	2020-02-21	2020-02-21	763

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

940847 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T574535

PROJECT: TP115086

5835 COOPERS AVENUE
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-14

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D31 SS3	BH D35 SS2	BH D37 SS4	BH D41 SS3	BH D50 SS3	BH D57 SS1
					SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2020-02-12	2020-02-12	2020-02-12	2020-02-12	2020-02-12	2020-02-12
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	940831	940834	940838	940843	940845	940849
Antimony	µg/g	40	0.8	2020-02-21	2020-02-21	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-02-21	2020-02-21	4	5	5	4	4	4
Barium	µg/g	670	2	2020-02-21	2020-02-21	63	62	76	63	70	126
Beryllium	µg/g	8	0.5	2020-02-21	2020-02-21	0.5	<0.5	<0.5	<0.5	<0.5	0.8
Boron	µg/g	120	5	2020-02-21	2020-02-21	6	8	9	8	8	7
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-21	2020-02-21	0.22	0.41	0.25	0.43	<0.10	0.41
Cadmium	µg/g	1.9	0.5	2020-02-21	2020-02-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-02-21	2020-02-21	19	19	19	17	17	28
Cobalt	µg/g	80	0.5	2020-02-21	2020-02-21	9.9	8.2	8.5	6.9	8.4	12.5
Copper	µg/g	230	1	2020-02-21	2020-02-21	21	19	20	16	19	20
Lead	µg/g	120	1	2020-02-21	2020-02-21	11	9	11	7	9	14
Molybdenum	µg/g	40	0.5	2020-02-21	2020-02-21	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	270	1	2020-02-21	2020-02-21	22	18	19	15	18	24
Selenium	µg/g	5.5	0.4	2020-02-21	2020-02-21	<0.4	<0.4	<0.4	<0.4	<0.4	0.6
Silver	µg/g	40	0.2	2020-02-21	2020-02-21	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-02-21	2020-02-21	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-02-21	2020-02-21	<0.5	0.5	0.6	0.5	0.5	0.6
Vanadium	µg/g	86	1	2020-02-21	2020-02-21	27	25	25	23	24	38
Zinc	µg/g	340	5	2020-02-21	2020-02-21	56	47	48	42	43	65
Chromium, Hexavalent	µg/g	8	0.2	2020-02-20	2020-02-20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-24	2020-02-24	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-02-21	2020-02-21	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-21	2020-02-21	1.28	2.02	1.28	1.13	1.37	1.16
Sodium Adsorption Ratio	NA	12	NA	2020-02-21	2020-02-21	2.11	19.9	5.47	3.64	17.5	3.59
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-24	2020-02-24	7.66	7.73	7.70	7.71	7.90	8.00

Certified By: Iris Verástegui

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-14

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
940831-940849	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

Exceedance Summary

AGAT WORK ORDER: 20T574535

PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
940834	BH D35 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	2.02
940834	BH D35 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	19.9
940845	BH D50 SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	17.5

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T574535
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	942696		<0.8	<0.8	NA	< 0.8	135%	70%	130%	101%	80%	120%	77%	70%	130%
Arsenic	942696		6	6	0.0%	< 1	113%	70%	130%	103%	80%	120%	105%	70%	130%
Barium	942696		49	52	5.9%	< 2	110%	70%	130%	97%	80%	120%	106%	70%	130%
Beryllium	942696		0.6	0.6	NA	< 0.5	86%	70%	130%	105%	80%	120%	84%	70%	130%
Boron	942696		12	13	NA	< 5	73%	70%	130%	99%	80%	120%	79%	70%	130%
Boron (Hot Water Extractable)	940831	940831	0.22	0.21	NA	< 0.10	117%	60%	140%	92%	70%	130%	91%	60%	140%
Cadmium	942696		<0.5	<0.5	NA	< 0.5	114%	70%	130%	100%	80%	120%	101%	70%	130%
Chromium	942696		21	22	NA	< 5	101%	70%	130%	92%	80%	120%	93%	70%	130%
Cobalt	942696		10.7	11.1	3.7%	< 0.5	85%	70%	130%	88%	80%	120%	86%	70%	130%
Copper	942696		36	37	2.7%	< 1	93%	70%	130%	99%	80%	120%	84%	70%	130%
Lead	942696		11	11	0.0%	< 1	105%	70%	130%	92%	80%	120%	88%	70%	130%
Molybdenum	942696		<0.5	<0.5	NA	< 0.5	94%	70%	130%	96%	80%	120%	95%	70%	130%
Nickel	942696		23	23	0.0%	< 1	93%	70%	130%	97%	80%	120%	91%	70%	130%
Selenium	942696		<0.4	<0.4	NA	< 0.4	113%	70%	130%	98%	80%	120%	99%	70%	130%
Silver	942696		<0.2	<0.2	NA	< 0.2	102%	70%	130%	100%	80%	120%	94%	70%	130%
Thallium	942696		<0.4	<0.4	NA	< 0.4	96%	70%	130%	99%	80%	120%	96%	70%	130%
Uranium	942696		0.7	0.7	NA	< 0.5	98%	70%	130%	103%	80%	120%	104%	70%	130%
Vanadium	942696		27	28	3.6%	< 1	88%	70%	130%	83%	80%	120%	85%	70%	130%
Zinc	942696		57	58	1.7%	< 5	105%	70%	130%	96%	80%	120%	90%	70%	130%
Chromium, Hexavalent	940391		< 0.2	< 0.2	NA	< 0.2	86%	70%	130%	88%	80%	120%	89%	70%	130%
Cyanide	946392		<0.040	<0.040	NA	< 0.040	101%	70%	130%	90%	80%	120%	85%	70%	130%
Mercury	942696		<0.10	<0.10	NA	< 0.10	98%	70%	130%	88%	80%	120%	88%	70%	130%
Electrical Conductivity	940831	940831	1.28	1.27	0.8%	< 0.005	100%	90%	110%	NA			NA		
Sodium Adsorption Ratio	946727		0.860	0.883	2.6%	NA	NA			NA					
pH, 2:1 CaCl2 Extraction	940843	940843	7.71	7.72	0.1%	NA	100%	80%	120%	NA			NA		

Comments: QA Qualifier for metals – Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Corrosivity Package (Excl. Redox)															
Chloride (2:1)	940831	940831	521	534	2.5%	< 2	92%	80%	120%	112%	80%	120%	NA	70%	130%
Sulphate (2:1)	940831	940831	217	218	0.5%	< 2	103%	80%	120%	107%	80%	120%	105%	70%	130%
pH (2:1)	940847	940847	7.97	8.05	1.0%	NA	100%	90%	110%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Matrix spike: Spike level < native concentration. Matrix spike acceptance limits do not apply.

Certified By: Iris Verástegui

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086

SAMPLING SITE:

AGAT WORK ORDER: 20T574535

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:

Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T574535

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020			REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Sample Description	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony		BH D31 SS3	135%	70%	130%	101%	80%	120%	77%	70%	130%

Comments: QA Qualifier for metals – Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T574535
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

1LS

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T574535

Cooler Quantity:

Arrival Temperatures: 5.1 | 5.2 | 5.2 / 5.0 | 5.1 | 5.1

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ___ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
___ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: *If quotation number is not provided, client will be billed full price for analysis.*

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y/N	O. Reg 153: Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH$_3$ ☐ TKN ☐ NO$_3$ ☐ NO$_2$ ☐ NO$_3$+NO$_2$	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☐ ABNs ☑ B(a)P ☑ PCBs	Sewer Use
BH D31 SS2	12 Feb 2020	2:30	1	S	HOLD															
BH D31 SS3	12 Feb 2020	2:40	1	S			☑													
BH D32 SS1	12 Feb 202	3:20	1	S	HOLD															
BH D33 SS2	13 Feb 202	9:30	1	S	HOLD															
BH D35 SS2	12 Feb 202	1:10	1	S			☒													
BH D35 SS4	12 Feb 202	1:25	1	S	HOLD															
BH D36 SS1	12 Feb 202	2:00	1	S	HOLD															
BH D37 SS1	12 Feb 202	10:10	1	S	HOLD															
BH D37 SS4	12 Feb 202	10:25	1	S			☑													
BH D38 SS2	13 Feb 202	10:45	1	S	HOLD															
BH D39 SS2	12 Feb 202	12:35	1	S	HOLD															

Samples Relinquished By (Print Name and Sign): Alessandro Pellerito Date: Feb 13, 2020 Time: 5:00PM

Samples Received By (Print Name and Sign): 2020/02/14 Date: Time: 11:25

Samples Relinquished By (Print Name and Sign): 2020/02/14 Date: Time: 2:35

Samples Received By (Print Name and Sign): Date: Time:

Samples Relinquished By (Print Name and Sign): Date: Time:

Samples Received By (Print Name and Sign): Date: Time:

Page 1 of 2

Nº:

AGAT Laboratories

LS

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity:

Arrival Temperatures: 5.1 | 5.2 | 5.2
5.0 | 5.1 | 5.1

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ No Regulatory Requirement

☑ Regulation 153/04
Table 2 (Indicate One)
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture (Check One)
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region (Indicate One)
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
(Indicate One)

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	Metals and Inorganics	O. Reg 153 ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	**ORPs:** ☐ B-HWS ☐ Cl^- ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	**Volatiles:** ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☒ M&I ☒ VOCs ☐ ABNs ☒ B(a)P ☒ PCBs	Sewer Use						
BH D40 SS2	13 Feb 202	10:55	1	S	HOLD																					
BH D40 SS4	13 Feb 202	11:10	1	S	HOLD																					
BH D41 SS3	12 Feb 202	11:45	1	S			☑																			
BH D49 SS4	12 Feb 202	9:20	1	S	HOLD																					
BH D50 SS3	12 Feb 202	9:45	1	S			☑																			
BH D53 SS1	12 Feb 202	10:05	1	S	HOLD																					
BH D53 SS3	12 Feb 202	10:20	1	S	HOLD																					
BH D54 SS2	12 Feb 202	11:00	1	S	HOLD																					
BH D57 SS1	12 Feb 202	11:30	1	S			☑																			

Samples Relinquished By (Print Name and Sign): Alessandro Pellerito	Date Feb 13, 2020	Time 5:00PM	Samples Received By (Print Name and Sign): 2020/02/14	Date	Time 11:25	
Samples Relinquished By (Print Name and Sign): 2020/02/14	Date	Time 12:35	Samples Received By (Print Name and Sign):	Date	Time	Page 2 of 2
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T576304
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 8
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T576304
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-20
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D5 SS6
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-02-18
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	957661
Antimony	µg/g	40	0.8	2020-02-25	2020-02-25	<0.8
Arsenic	µg/g	18	1	2020-02-25	2020-02-25	5
Barium	µg/g	670	2	2020-02-25	2020-02-25	86
Beryllium	µg/g	8	0.5	2020-02-25	2020-02-25	<0.5
Boron	µg/g	120	5	2020-02-25	2020-02-25	10
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-25	2020-02-25	0.26
Cadmium	µg/g	1.9	0.5	2020-02-25	2020-02-25	<0.5
Chromium	µg/g	160	5	2020-02-25	2020-02-25	23
Cobalt	µg/g	80	0.5	2020-02-25	2020-02-25	10.2
Copper	µg/g	230	1	2020-02-25	2020-02-25	20
Lead	µg/g	120	1	2020-02-25	2020-02-25	9
Molybdenum	µg/g	40	0.5	2020-02-25	2020-02-25	<0.5
Nickel	µg/g	270	1	2020-02-25	2020-02-25	21
Selenium	µg/g	5.5	0.4	2020-02-25	2020-02-25	<0.4
Silver	µg/g	40	0.2	2020-02-25	2020-02-25	<0.2
Thallium	µg/g	3.3	0.4	2020-02-25	2020-02-25	<0.4
Uranium	µg/g	33	0.5	2020-02-25	2020-02-25	0.7
Vanadium	µg/g	86	1	2020-02-25	2020-02-25	32
Zinc	µg/g	340	5	2020-02-25	2020-02-25	51
Chromium, Hexavalent	µg/g	8	0.2	2020-02-26	2020-02-26	<0.2
Cyanide	µg/g	0.051	0.040	2020-02-27	2020-02-27	<0.040
Mercury	µg/g	3.9	0.10	2020-02-25	2020-02-25	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	2020-02-25	2020-02-25	1.90
Sodium Adsorption Ratio	NA	12	NA	2020-02-25	2020-02-25	5.64
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-02-27	2020-02-27	7.74

Certified By:

NIVINE BASILY

Certificate of Analysis

AGAT WORK ORDER: 20T576304
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-20
DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
957661	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

NIVINE BASILY

Exceedance Summary

AGAT WORK ORDER: 20T576304
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
957661	BH D5 SS6	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	mS/cm	1.4	1.90

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T576304

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	957661	957661	<0.8	<0.8	NA	< 0.8	132%	70%	130%	97%	80%	120%	74%	70%	130%
Arsenic	957661	957661	5	5	0.0%	< 1	111%	70%	130%	95%	80%	120%	94%	70%	130%
Barium	957661	957661	86	85	1.2%	< 2	101%	70%	130%	99%	80%	120%	99%	70%	130%
Beryllium	957661	957661	<0.5	0.6	NA	< 0.5	95%	70%	130%	98%	80%	120%	87%	70%	130%
Boron	957661	957661	10	11	NA	< 5	80%	70%	130%	100%	80%	120%	87%	70%	130%
Boron (Hot Water Extractable)	960952		0.20	0.19	NA	< 0.10	107%	60%	140%	100%	70%	130%	107%	60%	140%
Cadmium	957661	957661	<0.5	<0.5	NA	< 0.5	106%	70%	130%	98%	80%	120%	101%	70%	130%
Chromium	957661	957661	23	23	NA	< 5	99%	70%	130%	105%	80%	120%	100%	70%	130%
Cobalt	957661	957661	10.2	10.1	1.0%	< 0.5	101%	70%	130%	101%	80%	120%	98%	70%	130%
Copper	957661	957661	20	20	0.0%	< 1	91%	70%	130%	101%	80%	120%	81%	70%	130%
Lead	957661	957661	9	10	10.5%	< 1	99%	70%	130%	100%	80%	120%	92%	70%	130%
Molybdenum	957661	957661	<0.5	<0.5	NA	< 0.5	102%	70%	130%	99%	80%	120%	99%	70%	130%
Nickel	957661	957661	21	20	4.9%	< 1	97%	70%	130%	97%	80%	120%	89%	70%	130%
Selenium	957661	957661	<0.4	<0.4	NA	< 0.4	119%	70%	130%	100%	80%	120%	98%	70%	130%
Silver	957661	957661	<0.2	<0.2	NA	< 0.2	94%	70%	130%	97%	80%	120%	91%	70%	130%
Thallium	957661	957661	<0.4	<0.4	NA	< 0.4	103%	70%	130%	102%	80%	120%	98%	70%	130%
Uranium	957661	957661	0.7	0.7	NA	< 0.5	111%	70%	130%	106%	80%	120%	107%	70%	130%
Vanadium	957661	957661	32	32	0.0%	< 1	108%	70%	130%	101%	80%	120%	99%	70%	130%
Zinc	957661	957661	51	50	2.0%	< 5	102%	70%	130%	101%	80%	120%	94%	70%	130%
Chromium, Hexavalent	954001		< 0.2	< 0.2	NA	< 0.2	87%	70%	130%	86%	80%	120%	91%	70%	130%
Cyanide	960998		<0.040	<0.040	NA	< 0.040	105%	70%	130%	105%	80%	120%	96%	70%	130%
Mercury	957661	957661	<0.10	<0.10	NA	< 0.10	122%	70%	130%	100%	80%	120%	98%	70%	130%
Electrical Conductivity	957661	957661	1.90	1.93	1.6%	< 0.005	100%	90%	110%						
Sodium Adsorption Ratio	957661	957661	5.64	5.85	3.7%	NA									
pH, 2:1 CaCl2 Extraction	960901		7.55	7.63	1.1%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Certified By:

NIVINE BASILY

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T576304

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020			REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Sample Description	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony	957661	BH D5 SS6	132%	70%	130%	97%	80%	120%	74%	70%	130%

Comments: NA signifies Not Applicable.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

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Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T576304
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20T576304

Cooler Quantity: Various

Arrival Temperatures: 3.3 | 3. | 2.9
1.8 | 2.1 | 2.4

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ No Regulatory Requirement

☑ Regulation 153/04
Table 2 (Indicate One)
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ______ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ (Indicate One)

Is this submission for a Record of Site Condition?
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	O. Reg 153 ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	O. Reg 153 **ORPs:** ☐ B-HWS ☐ Cl ☐ CN- ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	**Volatiles:** ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☐ ABNs ☑ B(a)P ☑ PCBs	Sewer Use						
BH D1 SS1	18 Feb 2020	9:35	1	S	HOLD																					
BH D1 SS3	18 Feb 2020	9:50	1	S	HOLD																					
BH D2 SS2	18 Feb 202	10:25	1	S	HOLD																					
BH D3 SS2	18 Feb 202	11:00	1	S	HOLD																					
BH D5 SS2	18 Feb 202	11:35	1	S	HOLD																					
BH D5 SS6	18 Feb 202	12:05	1	S			☑																			
BH D6 SS1	18 Feb 202	12:35	1	S	HOLD																					
BH D7 SS2	18 Feb 202	1:10	1	S	HOLD																					
BH D7 SS3	18 Feb 202	1:20	1	S	HOLD																					

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Alessandro Pellerito	Feb 19, 2020	7:15AM		2/20/20	10:47
	2/20/20	7:49			

Page 1 of 1

Nº:

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6

ATTENTION TO: Alessandro Pellerito

PROJECT: TP115086

AGAT WORK ORDER: 20T577996

SOIL ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Nov 13, 2020

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T577996
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-25
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B9 SS5	BH B11 SS2
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-02-20	2020-02-20
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	969395	969397
Antimony	µg/g	40	0.8	2020-02-27	2020-02-27	<0.8	<0.8
Arsenic	µg/g	18	1	2020-02-27	2020-02-27	2	4
Barium	µg/g	670	2	2020-02-27	2020-02-27	25	80
Beryllium	µg/g	8	0.5	2020-02-27	2020-02-27	<0.5	0.6
Boron	µg/g	120	5	2020-02-27	2020-02-27	<5	11
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-02-27	2020-02-27	0.18	0.13
Cadmium	µg/g	1.9	0.5	2020-02-27	2020-02-27	<0.5	<0.5
Chromium	µg/g	160	5	2020-02-27	2020-02-27	9	22
Cobalt	µg/g	80	0.5	2020-02-27	2020-02-27	3.6	9.4
Copper	µg/g	230	1	2020-02-27	2020-02-27	14	20
Lead	µg/g	120	1	2020-02-27	2020-02-27	4	8
Molybdenum	µg/g	40	0.5	2020-02-27	2020-02-27	<0.5	<0.5
Nickel	µg/g	270	1	2020-02-27	2020-02-27	7	20
Selenium	µg/g	5.5	0.4	2020-02-27	2020-02-27	<0.4	<0.4
Silver	µg/g	40	0.2	2020-02-27	2020-02-27	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-02-27	2020-02-27	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-02-27	2020-02-27	<0.5	0.6
Vanadium	µg/g	86	1	2020-02-27	2020-02-27	17	32
Zinc	µg/g	340	5	2020-02-27	2020-02-27	22	44
Chromium, Hexavalent	µg/g	8	0.2	2020-03-02	2020-03-02	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-03-03	2020-03-03	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-02-27	2020-02-27	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-02-27	2020-02-27	0.172	0.246
Sodium Adsorption Ratio	NA	12	NA	2020-02-27	2020-02-27	0.282	0.750
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0		2020-02-28	2020-02-28	7.94	7.85

Certified By: Iris Verástegui

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-25

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
969395-969397	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

Certificate of Analysis

AGAT WORK ORDER: 20T577996
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2020-02-25

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH B8 SS1	BH B12 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-02-20	2020-02-20
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	969393	969400
Hexachloroethane	µg/g	0.21	0.01	2020-03-02	2020-03-02	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.056	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Heptachlor	µg/g	0.19	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Aldrin	µg/g	0.088	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Endosulfan	µg/g	0.3	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	2020-03-02	2020-03-02	<0.007	<0.007
DDE	µg/g	0.52	0.007	2020-03-02	2020-03-02	<0.007	<0.007
DDD	µg/g	4.6	0.007	2020-03-02	2020-03-02	<0.007	<0.007
DDT	µg/g	1.4	0.007	2020-03-02	2020-03-02	<0.007	<0.007
Dieldrin	µg/g	0.088	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Endrin	µg/g	0.04	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Methoxychlor	µg/g	1.6	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Hexachlorobenzene	µg/g	0.66	0.005	2020-03-02	2020-03-02	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.031	0.01	2020-03-02	2020-03-02	<0.01	<0.01
Moisture Content	%		0.1	2020-03-02	2020-03-02	22.9	22.8
Surrogate	Unit	Acceptable Limits					
TCMX	%	50-140		2020-03-02	2020-03-02	100	75
Decachlorobiphenyl	%	50-140		2020-03-02	2020-03-02	107	92

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

969393-969400 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T577996
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	967735		<0.8	<0.8	NA	< 0.8	122%	70%	130%	100%	80%	120%	91%	70%	130%
Arsenic	967735		2	2	NA	< 1	110%	70%	130%	99%	80%	120%	101%	70%	130%
Barium	967735		24	24	0.0%	< 2	111%	70%	130%	101%	80%	120%	99%	70%	130%
Beryllium	967735		<0.5	<0.5	NA	< 0.5	95%	70%	130%	93%	80%	120%	107%	70%	130%
Boron	967735		<5	<5	NA	< 5	93%	70%	130%	101%	80%	120%	110%	70%	130%
Boron (Hot Water Extractable)	967735		0.17	0.16	NA	< 0.10	111%	60%	140%	102%	70%	130%	102%	60%	140%
Cadmium	967735		<0.5	<0.5	NA	< 0.5	108%	70%	130%	99%	80%	120%	101%	70%	130%
Chromium	967735		9	9	NA	< 5	103%	70%	130%	98%	80%	120%	103%	70%	130%
Cobalt	967735		3.2	3.3	3.1%	< 0.5	94%	70%	130%	96%	80%	120%	98%	70%	130%
Copper	967735		6	6	0.0%	< 1	90%	70%	130%	109%	80%	120%	99%	70%	130%
Lead	967735		5	5	0.0%	< 1	104%	70%	130%	94%	80%	120%	94%	70%	130%
Molybdenum	967735		<0.5	<0.5	NA	< 0.5	99%	70%	130%	99%	80%	120%	100%	70%	130%
Nickel	967735		6	7	15.4%	< 1	95%	70%	130%	97%	80%	120%	100%	70%	130%
Selenium	967735		<0.4	<0.4	NA	< 0.4	124%	70%	130%	98%	80%	120%	102%	70%	130%
Silver	967735		<0.2	<0.2	NA	< 0.2	93%	70%	130%	97%	80%	120%	97%	70%	130%
Thallium	967735		<0.4	<0.4	NA	< 0.4	98%	70%	130%	96%	80%	120%	97%	70%	130%
Uranium	967735		<0.5	<0.5	NA	< 0.5	101%	70%	130%	97%	80%	120%	97%	70%	130%
Vanadium	967735		19	19	0.0%	< 1	110%	70%	130%	103%	80%	120%	110%	70%	130%
Zinc	967735		20	21	NA	< 5	98%	70%	130%	104%	80%	120%	101%	70%	130%
Chromium, Hexavalent	967735		< 0.2	< 0.2	NA	< 0.2	87%	70%	130%	87%	80%	120%	89%	70%	130%
Cyanide	967735		<0.040	<0.040	NA	< 0.040	103%	70%	130%	105%	80%	120%	101%	70%	130%
Mercury	967735		<0.10	<0.10	NA	< 0.10	105%	70%	130%	98%	80%	120%	102%	70%	130%
Electrical Conductivity (2:1)	969395	969395	0.172	0.174	1.2%	< 0.005	100%	80%	120%	NA			NA		
Sodium Adsorption Ratio	969395	969395	0.282	0.292	3.5%	NA	NA			NA					
pH, 2:1 CaCl2 Extraction	967735		7.49	7.43	0.8%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By: Iris Verástegui

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T577996

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Nov 13, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	963503		< 0.01	< 0.01	NA	< 0.01	96%	50%	140%	92%	50%	140%	96%	50%	140%
Gamma-Hexachlorocyclohexane	963503		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	91%	50%	140%	89%	50%	140%
Heptachlor	963503		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	88%	50%	140%	96%	50%	140%
Aldrin	963503		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	93%	50%	140%	96%	50%	140%
Heptachlor Epoxide	963503		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	93%	50%	140%	95%	50%	140%
Endosulfan	963503		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	90%	50%	140%	92%	50%	140%
Chlordane	963503		< 0.007	< 0.007	NA	< 0.007	106%	50%	140%	87%	50%	140%	88%	50%	140%
DDE	963503		< 0.007	< 0.007	NA	< 0.007	103%	50%	140%	97%	50%	140%	86%	50%	140%
DDD	963503		< 0.007	< 0.007	NA	< 0.007	109%	50%	140%	84%	50%	140%	86%	50%	140%
DDT	963503		< 0.007	< 0.007	NA	< 0.007	106%	50%	140%	89%	50%	140%	98%	50%	140%
Dieldrin	963503		< 0.005	< 0.005	NA	< 0.005	110%	50%	140%	89%	50%	140%	92%	50%	140%
Endrin	963503		< 0.005	< 0.005	NA	< 0.005	114%	50%	140%	98%	50%	140%	96%	50%	140%
Methoxychlor	963503		< 0.005	< 0.005	NA	< 0.005	98%	50%	140%	104%	50%	140%	102%	50%	140%
Hexachlorobenzene	963503		< 0.005	< 0.005	NA	< 0.005	107%	50%	140%	93%	50%	140%	96%	50%	140%
Hexachlorobutadiene	963503		< 0.01	< 0.01	NA	< 0.01	107%	50%	140%	104%	50%	140%	107%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T577996

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	modified from ON MOECC E3015 and SM 4500-CN- I	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T577996
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20T577996

Cooler Quantity: [illegible]

Arrival Temperatures: 3.5 | 3.8 | 3.6

Ice 1.8 | 2.2 | 2.7

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 (Indicate One)
☑Ind/Com
☐Res/Park
☐Agriculture

Soil Texture (Check One)
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region (Indicate One)
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
(Indicate One)

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	O. Reg 153 ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	O. Reg 153 **ORPs:** ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	**Volatiles:** ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☒ M&I ☒ VOCs ☐ ABNs ☒ B(a)P ☒ PCBs	Sewer Use	CORROSIVITY				
BH B8 SS1	20 Feb 202	12:45	1	S														☑							
BH B9 SS2	20 Feb 202	11:45	1	S	HOLD																				
BH B9 SS5	20 Feb 202	12:15	1	S			☑																		
BH B10 SS1	20 Feb 202	11:20	1	S	HOLD																				
BH B11 SS2	20 Feb 202	10:55	1	S			☑																		
BH B11 SS3	20 Feb 202	11:05	1	S	HOLD																				
BH B12 SS1	20 Feb 202	10:15	1	S														☑							
BH B13 SS1	20 Feb 202	9:20	1	S	HOLD																				
BH B13 SS4	20 Feb 202	9:35	1	S	HOLD																				

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alessandro Pellerito	Feb 24, 2020	2:15PM		2/25/20	11:28
	2/25/20	4:33			

Page _____ of _____

Nº:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T578836
SOIL ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 10
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

Certificate of Analysis

AGAT WORK ORDER: 20T578836
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Moctar Diallo

Corrosivity Package

DATE RECEIVED: 2020-02-27

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH S14 SS4	BH S16 SS5	BH S6 SS5
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2020-02-25	2020-02-24	2020-02-26
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	976165	976169	976177
Chloride (2:1)	µg/g	NA	2	2020-03-03	2020-03-03	107	242	13
Sulphate (2:1)	µg/g		2	2020-03-03	2020-03-03	208	26	24
pH (2:1)	pH Units		NA	2020-04-03	2020-04-03	8.00	8.12	8.20
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-03-03	2020-03-03	0.554	0.575	0.145
Resistivity (2:1) (Calculated)	ohm.cm		1	2020-03-03	2020-03-03	1810	1740	6900
Redox Potential 1	mV		NA	2020-03-02	2020-03-02	272	160	114
Redox Potential 2	mV		NA	2020-03-02	2020-03-02	250	158	98
Redox Potential 3	mV		NA	2020-03-02	2020-03-02	232	152	110

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
976165-976177	EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter. Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T578836
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Moctar Diallo

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-27

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D25 SS3	BH D27 SS2
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-02-24	2020-02-24
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	976171	976172
Antimony	µg/g	40	0.8	2020-03-03	2020-03-03	<0.8	<0.8
Arsenic	µg/g	18	1	2020-03-03	2020-03-03	5	4
Barium	µg/g	670	2	2020-03-03	2020-03-03	64	85
Beryllium	µg/g	8	0.5	2020-03-03	2020-03-03	0.6	0.7
Boron	µg/g	120	5	2020-03-03	2020-03-03	11	12
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-03-03	2020-03-03	0.29	0.42
Cadmium	µg/g	1.9	0.5	2020-03-03	2020-03-03	<0.5	<0.5
Chromium	µg/g	160	5	2020-03-03	2020-03-03	20	21
Cobalt	µg/g	80	0.5	2020-03-03	2020-03-03	8.3	8.7
Copper	µg/g	230	1	2020-03-03	2020-03-03	20	19
Lead	µg/g	120	1	2020-03-03	2020-03-03	13	13
Molybdenum	µg/g	40	0.5	2020-03-03	2020-03-03	0.6	<0.5
Nickel	µg/g	270	1	2020-03-03	2020-03-03	18	19
Selenium	µg/g	5.5	0.4	2020-03-03	2020-03-03	<0.4	<0.4
Silver	µg/g	40	0.2	2020-03-03	2020-03-03	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-03-03	2020-03-03	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-03-03	2020-03-03	0.5	0.6
Vanadium	µg/g	86	1	2020-03-03	2020-03-03	26	31
Zinc	µg/g	340	5	2020-03-03	2020-03-03	46	53
Chromium, Hexavalent	µg/g	8	0.2	2020-03-04	2020-03-04	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	2020-03-04	2020-03-04	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-03-03	2020-03-03	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-03-03	2020-03-03	2.10	1.43
Sodium Adsorption Ratio	NA	12	NA	2020-03-03	2020-03-03	8.71	5.89
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0		2020-03-04	2020-03-04	8.02	7.49

Certified By: Iris Verástegui

Certificate of Analysis

AGAT WORK ORDER: 20T578836

PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Moctar Diallo

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-02-27

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
976171-976172	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
976171	BH D25 SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	2.10
976172	BH D27 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	1.43

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086

SAMPLING SITE:SP47

AGAT WORK ORDER: 20T578836

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:Moctar Diallo

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Corrosivity Package															
Chloride (2:1)	976244		252	247	2.0%	< 2	91%	70%	130%	101%	80%	120%	NA	70%	130%
Sulphate (2:1)	976244		25	25	0.0%	< 2	108%	70%	130%	94%	80%	120%	108%	70%	130%
pH (2:1)	972879		8.12	8.18	0.7%	NA	100%	90%	110%	NA			NA		
Electrical Conductivity (2:1)	978407		0.482	0.435	10.3%	< 0.005	114%	80%	120%	NA			NA		
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	976076		2.8	2.8	NA	< 0.8	119%	70%	130%	103%	80%	120%	81%	70%	130%
Arsenic	976076		8	8	0.0%	< 1	114%	70%	130%	102%	80%	120%	99%	70%	130%
Barium	976076		121	120	0.8%	< 2	108%	70%	130%	100%	80%	120%	87%	70%	130%
Beryllium	976076		<0.5	<0.5	NA	< 0.5	117%	70%	130%	111%	80%	120%	105%	70%	130%
Boron	976076		9	9	NA	< 5	94%	70%	130%	104%	80%	120%	97%	70%	130%
Boron (Hot Water Extractable)	976056		0.29	0.26	NA	< 0.10	93%	60%	140%	94%	70%	130%	95%	60%	140%
Cadmium	976076		<0.5	<0.5	NA	< 0.5	111%	70%	130%	99%	80%	120%	90%	70%	130%
Chromium	976076		12	12	NA	< 5	105%	70%	130%	94%	80%	120%	83%	70%	130%
Cobalt	976076		3.1	3.2	3.2%	< 0.5	94%	70%	130%	96%	80%	120%	85%	70%	130%
Copper	976076		48	48	0.0%	< 1	97%	70%	130%	102%	80%	120%	92%	70%	130%
Lead	976076		150	150	0.0%	< 1	108%	70%	130%	93%	80%	120%	91%	70%	130%
Molybdenum	976076		0.9	1.0	NA	< 0.5	101%	70%	130%	102%	80%	120%	101%	70%	130%
Nickel	976076		9	9	0.0%	< 1	97%	70%	130%	101%	80%	120%	87%	70%	130%
Selenium	976076		0.7	0.9	NA	< 0.4	130%	70%	130%	98%	80%	120%	96%	70%	130%
Silver	976076		<0.2	<0.2	NA	< 0.2	102%	70%	130%	98%	80%	120%	81%	70%	130%
Thallium	976076		<0.4	<0.4	NA	< 0.4	100%	70%	130%	99%	80%	120%	86%	70%	130%
Uranium	976076		<0.5	<0.5	NA	< 0.5	99%	70%	130%	100%	80%	120%	94%	70%	130%
Vanadium	976076		13	13	0.0%	< 1	102%	70%	130%	94%	80%	120%	90%	70%	130%
Zinc	976076		215	219	1.8%	< 5	104%	70%	130%	101%	80%	120%	95%	70%	130%
Chromium, Hexavalent	976133		< 0.2	< 0.2	NA	< 0.2	87%	70%	130%	88%	80%	120%	83%	70%	130%
Cyanide	976171	976171	<0.040	<0.040	NA	< 0.040	99%	70%	130%	99%	80%	120%	107%	70%	130%
Mercury	976076		0.28	0.25	NA	< 0.10	107%	70%	130%	102%	80%	120%	96%	70%	130%
Electrical Conductivity (2:1)	978407		0.482	0.435	10.3%	< 0.005	114%	80%	120%	NA			NA		
Sodium Adsorption Ratio	976076		2.13	2.13	0.0%	NA	NA			NA					
pH, 2:1 CaCl2 Extraction	978166		7.64	7.64	0.0%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Matrix spike: Spike level < native concentration. Matrix spike acceptance limits do not apply.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T578836
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Moctar Diallo

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	modified from ON MOECC E3015 and SM 4500-CN- I	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T578836

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Moctar Diallo

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER

AGAT Laboratories

ILS

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T578836

Cooler Quantity:

Arrival Temperatures: 4.9 | 5.0 | 5.0
4.8 | 4.9 | 4.9

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
Indicate One

Is this submission for a Record of Site Condition?
☐ Yes ☑ No

Report Guideline on Certificate of Analysis
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI	O. Reg 153			Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH$_3$ ☐TKN ☐NO$_2$ ☐NO$_3$+NO$_2$ ☐NO$_3$	**Volatiles:** ☐VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☒M&I ☒VOCs ☐ABNs ☒B(a)P ☒PCBs	Sewer Use	CORROSIVITY					
						Y / N	Metals and Inorganics	☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (Incl. Hydrides)	**ORPs:** ☐B-HWS ☐Cl ☐CN⁻ ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR																	
BH S13 SS1	25 Feb 202	9:45	1	S	HOLD																					
BH S13 SS3	25 Feb 202	9:50	1	S	HOLD																					
BH S14 SS2	25 Feb 202	11:10	1	S	HOLD																					
BH S14 SS4	25 Feb 202	11:15	1	S																	☑					
BH S15 SS2	24 Feb 202	9:00	1	S	HOLD																					
BH S15 SS4	24 Feb 202	9:15	1	S	HOLD																					
BH S16 SS2	24 Feb 202	10:50	1	S	HOLD																					
BH S16 SS5	24 Feb 202	11:15	1	S																	☑					
BH D25 SS2	24 Feb 202	1:20	1	S	HOLD																					
BH D25 SS3	24 Feb 202	1:25	1	S			☑																			
BH D27 SS2	24 Feb 202	12:55	1	S			☑																			

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	Feb 26, 2020	8:15AM	2020/02/27		10:15	
2020/02/27		3:10				Page 1 of 2
						Nº:

AGAT Laboratories

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Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity:

Arrival Temperatures: 4.9 | 5.0 | 5.0
4.8 | 4.9 | 4.9

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region ______ *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a Record of Site Condition?
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Moctar Diallo
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

							O. Reg 153																					
Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN^- ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☒ M&I ☒ VOCs ☐ ABNs ☒ B(a)P ☒ PCBs	Sewer Use	CORROSIVITY					
BH D29 SS2	25 Feb 2020	12:20	1	S	HOLD																					
BH B7/S5 SS1	26FEB20	9:20	1	S	HOLD																					
BH B7/S5 SS3		9:30	1	S	HOLD																					
BH S6 SS1		11:10	1	S	HOLD																					
BH S6 SS5		11:55	1	S																	X					

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	Feb 26, 2020	8:15AM	20 20/02/27	10:15		
2020/02/27		3:10				Page 2 of 2
						Nº:

5623 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
TEL (905)501-9998
FAX (905)501-0589
http://www.agatlabs.com

CLIENT NAME:	WOOD ENVIRONMENT & INFRASTRUCTURE 50 VOGELL ROAD, UNIT 3&4 RICHMOND HILL, ON L4B 3K6
ATTENTION TO:	Alessandro Pellerito
PROJECT:	20T578836
AGAT WORK ORDER:	20T580259
SOLID ANALYSIS REVIEWED BY:	Sherin Moussa, Senior Technician
DATE REPORTED:	Mar 04, 2020
PAGES (INCLUDING COVER):	5

Should you require any information regarding this analysis please contact your client services representative at (905) 501-9998

*NOTES

All samples are stored at no charge for 90 days. Please contact the lab if you require additional sample storage time.

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

(201-042) Sulfide

DATE SAMPLED: Mar 02, 2020

DATE RECEIVED: Mar 03, 2020

DATE REPORTED: Mar 04, 2020

SAMPLE TYPE: Soil

	Analyte:	Sulfide
	Unit:	%
Sample ID (AGAT ID)	RDL:	0.05
BH S14 SS4 (984917)		0.14
BH S16 SS5 (984918)		<0.05
BH S6 SS5 (984919)		0.22

Comments: RDL - Reported Detection Limit

Analysis performed at AGAT 5623 McAdam Rd., Mississauga, ON (unless marked by *)

Certified By:

(201-042) Sulfide

	REPLICATE #1				REPLICATE #2											
Parameter	Sample ID	Original	Replicate	RPD	Sample ID	Original	Replicate	RPD								
S	984917	0.137	0.139	1.4%	984919	0.215	0.21	2.4%								
Sulfate	984917	< 0.01	< 0.01	0.0%	984919	< 0.01	< 0.01	0.0%								
Sulfide	984917	0.14	0.14	0.0%	984919	0.22	0.21	4.7%								

Quality Assurance - Certified Reference materials

AGAT WORK ORDER: 20T580259
PROJECT: 20T578836

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

(201-042) Sulfide

	CRM #1				CRM #2											
Parameter	Expect	Actual	Recovery	Limits	Expect	Actual	Recovery	Limits								
S	0.80	0.81	101%	90% - 110%	0.80	0.79	98%	90% - 110%								
Sulfate	0.01	0.01	100%	90% - 110%	0.01	0.01	100%	90% - 110%								
Sulfide	0.80	0.80	100%	90% - 110%	0.80	0.78	97%	90% - 110%								

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T580259

PROJECT: 20T578836

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Solid Analysis			
Sulfide	MIN-200-12037		LECO

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T584983
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 11
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T584983
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammod Safarpanah

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2020-03-16

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp 1 TCLP D	Comp 1 TCLP B
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-02-24	2020-02-20
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1028257	1028261
Arsenic Leachate	mg/L	2.5	0.010	2020-03-23	2020-03-23	<0.010	<0.010
Barium Leachate	mg/L	100	0.100	2020-03-23	2020-03-23	0.738	0.410
Boron Leachate	mg/L	500	0.050	2020-03-23	2020-03-23	0.056	0.051
Cadmium Leachate	mg/L	0.5	0.010	2020-03-23	2020-03-23	<0.010	<0.010
Chromium Leachate	mg/L	5	0.010	2020-03-23	2020-03-23	<0.010	<0.010
Lead Leachate	mg/L	5	0.010	2020-03-23	2020-03-23	<0.010	<0.010
Mercury Leachate	mg/L	0.1	0.01	2020-03-23	2020-03-23	<0.01	<0.01
Selenium Leachate	mg/L	1	0.010	2020-03-23	2020-03-23	<0.010	<0.010
Silver Leachate	mg/L	5	0.010	2020-03-23	2020-03-23	<0.010	<0.010
Uranium Leachate	mg/L	10	0.050	2020-03-23	2020-03-23	<0.050	<0.050
Fluoride Leachate	mg/L	150	0.05	2020-03-23	2020-03-23	0.32	0.24
Cyanide Leachate	mg/L	20	0.05	2020-03-23	2020-03-23	<0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	2020-03-23	2020-03-23	<0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

NIVINE BASILY

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T584983
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammod Safarpanah

O. Reg. 558 - OC Pesticides & PCBs

DATE RECEIVED: 2020-03-16

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp 1 TCLP D	Comp 1 TCLP B
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-02-24	2020-02-20
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1028257	1028261
Heptachlor + Heptachlor Epoxide	mg/L	0.3	0.0003	2020-03-23	2020-03-23	<0.0003	<0.0003
Aldrin + Dieldrin	mg/L	0.07	0.0007	2020-03-23	2020-03-23	<0.0007	<0.0007
DDT + Metabolites	mg/L	3.0	0.003	2020-03-23	2020-03-23	<0.003	<0.003
Methoxychlor	mg/L	90.0	0.09	2020-03-23	2020-03-23	<0.09	<0.09
Chlordane (Total)	mg/L	0.7	0.0007	2020-03-23	2020-03-23	<0.0007	<0.0007
Aldrin	mg/L		0.0002	2020-03-23	2020-03-23	<0.0002	<0.0002
alpha - chlordane	mg/L		0.0001	2020-03-23	2020-03-23	<0.0001	<0.0001
gamma-Chlordane	mg/L		0.0002	2020-03-23	2020-03-23	<0.0002	<0.0002
Oxychlordane	mg/L		0.0004	2020-03-23	2020-03-23	<0.0004	<0.0004
pp'-DDE	mg/L		0.0005	2020-03-23	2020-03-23	<0.0005	<0.0005
pp'-DDD	mg/L		0.0015	2020-03-23	2020-03-23	<0.0015	<0.0015
op'-DDT	mg/L		0.0015	2020-03-23	2020-03-23	<0.0015	<0.0015
pp'-DDT	mg/L		0.0005	2020-03-23	2020-03-23	<0.0005	<0.0005
Dieldrin	mg/L		0.0005	2020-03-23	2020-03-23	<0.0005	<0.0005
Heptachlor	mg/L		0.0001	2020-03-23	2020-03-23	<0.0001	<0.0001
Heptachlor Epoxide	mg/L		0.0002	2020-03-23	2020-03-23	<0.0002	<0.0002
Lindane	mg/L		0.0004	2020-03-23	2020-03-23	<0.0004	<0.0004
Endrin	mg/L	0.02	0.0004	2020-03-23	2020-03-23	<0.0004	<0.0004
Toxaphene	mg/L	0.5	0.0005	2020-03-23	2020-03-23	<0.0005	<0.0005
PCB's	mg/L	0.3	0.0002	2020-03-23	2020-03-23	<0.0002	<0.0002
OC/PCB Pest Extr	NA			2020-03-23		Y	Y
Surrogate	Unit	Acceptable Limits					
Decachlorobiphenyl	%	60-130		2020-03-23	2020-03-23	92	85

Certified By: NPopukolof

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Mohammod Safarpanah

O. Reg. 558 - OC Pesticides & PCBs

DATE RECEIVED: 2020-03-16

DATE REPORTED: 2020-11-13

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1028257-1028261 The sample was leached according to Regulation 558 protocol. Analysis was performed after extraction of the leachate.
Heptachlor + Heptachlor Epoxide is a calculated parameter. The calculated value is the sum of Heptachlor and Heptachlor Epoxide.
Aldrin + Dieldrin is a calculated parameter. The calculated value is the sum of Aldrin and Dieldrin.
PCB total is a calculated parameter. The calculated value is the sum of Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260.
DDT + Metabolites is a calculated parameter. The calculated value is the sum of op'DDT, pp'DDT, pp'DDE and pp'DDD.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukolof

Certificate of Analysis

AGAT WORK ORDER: 20T584983
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammod Safarpanah

O. Reg. 558 - VOCs

DATE RECEIVED: 2020-03-16

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp 1 TCLP D	Comp 1 TCLP B
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-02-24	2020-02-20
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1028257	1028261
Vinyl Chloride	mg/L	0.2	0.030	2020-03-20	2020-03-23	<0.030	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	2020-03-20	2020-03-23	<0.020	<0.020
Dichloromethane	mg/L	5.0	0.030	2020-03-20	2020-03-23	<0.030	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	2020-03-20	2020-03-23	<0.090	<0.090
Chloroform	mg/L	10.0	0.020	2020-03-20	2020-03-23	<0.020	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	2020-03-20	2020-03-23	<0.020	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	2020-03-20	2020-03-23	<0.020	<0.020
Benzene	mg/L	0.5	0.020	2020-03-20	2020-03-23	<0.020	<0.020
Trichloroethene	mg/L	5.0	0.020	2020-03-20	2020-03-23	<0.020	<0.020
Tetrachloroethene	mg/L	3.0	0.050	2020-03-20	2020-03-23	<0.050	<0.050
Chlorobenzene	mg/L	8.0	0.010	2020-03-20	2020-03-23	<0.010	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	2020-03-20	2020-03-23	<0.010	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	2020-03-20	2020-03-23	<0.010	<0.010
Surrogate	Unit	Acceptable Limits					
Toluene-d8	% Recovery	60-130		2020-03-20	2020-03-23	117	110

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1028257-1028261 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukolof

AGAT Laboratories

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Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086

SAMPLING SITE:SP47

AGAT WORK ORDER: 20T584983

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:Mohammod Safarpanah

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	1031799		<0.010	<0.010	NA	< 0.010	102%	70%	130%	104%	80%	120%	111%	70%	130%
Barium Leachate	1031799		0.116	0.121	NA	< 0.100	104%	70%	130%	105%	80%	120%	112%	70%	130%
Boron Leachate	1031799		<0.050	<0.050	NA	< 0.050	98%	70%	130%	99%	80%	120%	82%	70%	130%
Cadmium Leachate	1031799		<0.010	<0.010	NA	< 0.010	99%	70%	130%	97%	80%	120%	96%	70%	130%
Chromium Leachate	1031799		<0.010	<0.010	NA	< 0.010	103%	70%	130%	106%	80%	120%	111%	70%	130%
Lead Leachate	1031799		<0.010	<0.010	NA	< 0.010	98%	70%	130%	92%	80%	120%	87%	70%	130%
Mercury Leachate	1031799		<0.01	<0.01	NA	< 0.01	100%	70%	130%	107%	80%	120%	112%	70%	130%
Selenium Leachate	1031799		<0.010	<0.010	NA	< 0.010	98%	70%	130%	97%	80%	120%	102%	70%	130%
Silver Leachate	1031799		<0.010	<0.010	NA	< 0.010	98%	70%	130%	101%	80%	120%	91%	70%	130%
Uranium Leachate	1031799		<0.050	<0.050	NA	< 0.050	98%	70%	130%	103%	80%	120%	104%	70%	130%
Fluoride Leachate	1031799		0.16	0.16	NA	< 0.05	102%	90%	110%	107%	90%	110%	106%	70%	130%
Cyanide Leachate	1031799		<0.05	<0.05	NA	< 0.05	95%	70%	130%	107%	80%	120%	100%	70%	130%
(Nitrate + Nitrite) as N Leachate	1031799		<0.70	<0.70	NA	< 0.70	96%	80%	120%	102%	80%	120%	103%	70%	130%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

NIVINE BASILY

Certified By:

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T584983
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammod Safarpanah

Trace Organics Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 - VOCs															
Vinyl Chloride	1026673		< 0.030	< 0.030	NA	< 0.030	98%	60%	140%	83%	60%	140%	116%	60%	140%
1,1 Dichloroethene	1026673		< 0.020	< 0.020	NA	< 0.020	106%	70%	130%	108%	70%	130%	106%	60%	140%
Dichloromethane	1026673		< 0.030	< 0.030	NA	< 0.030	106%	70%	130%	102%	70%	130%	76%	60%	140%
Methyl Ethyl Ketone	1026673		< 0.090	< 0.090	NA	< 0.090	73%	70%	130%	91%	70%	130%	103%	60%	140%
Chloroform	1026673		< 0.020	< 0.020	NA	< 0.020	106%	70%	130%	103%	70%	130%	92%	60%	140%
1,2-Dichloroethane	1026673		< 0.020	< 0.020	NA	< 0.020	87%	70%	130%	105%	70%	130%	108%	60%	140%
Carbon Tetrachloride	1026673		< 0.020	< 0.020	NA	< 0.020	79%	70%	130%	77%	70%	130%	78%	60%	140%
Benzene	1026673		< 0.020	< 0.020	NA	< 0.020	84%	70%	130%	86%	70%	130%	91%	60%	140%
Trichloroethene	1026673		< 0.020	< 0.020	NA	< 0.020	84%	70%	130%	96%	70%	130%	90%	60%	140%
Tetrachloroethene	1026673		< 0.050	< 0.050	NA	< 0.050	96%	70%	130%	107%	70%	130%	106%	60%	140%
Chlorobenzene	1026673		< 0.010	< 0.010	NA	< 0.010	100%	70%	130%	111%	70%	130%	104%	60%	140%
1,2-Dichlorobenzene	1026673		< 0.010	< 0.010	NA	< 0.010	103%	70%	130%	105%	70%	130%	94%	60%	140%
1,4-Dichlorobenzene	1026673		< 0.010	< 0.010	NA	< 0.010	102%	70%	130%	109%	70%	130%	98%	60%	140%
O. Reg. 558 - OC Pesticides & PCBs															
Heptachlor + Heptachlor Epoxide	908399		< 0.0003	< 0.0003	NA	< 0.0003	95%	60%	140%	90%	60%	140%	NA	60%	140%
Aldrin + Dieldrin	908399		< 0.0007	< 0.0007	NA	< 0.0007	96%	60%	140%	92%	60%	140%	NA	60%	140%
DDT + Metabolites	908399		< 0.003	< 0.003	NA	< 0.003	108%	60%	140%	103%	60%	140%	NA	60%	140%
Methoxychlor	908399		< 0.09	< 0.09	NA	< 0.09	98%	60%	140%	102%	60%	140%	NA	60%	140%
Chlordane (Total)	908399		< 0.0007	< 0.0007	NA	< 0.0007	94%	60%	140%	93%	60%	140%	NA	60%	140%
Aldrin	908399		< 0.0002	< 0.0002	NA	< 0.0002	95%	60%	140%	90%	60%	140%	NA	60%	140%
alpha - chlordane	908399		< 0.0001	< 0.0001	NA	< 0.0001	95%	60%	140%	93%	60%	140%	NA	60%	140%
gamma-Chlordane	908399		< 0.0002	< 0.0002	NA	< 0.0002	94%	60%	140%	92%	60%	140%	NA	60%	140%
Oxychlordane	908399		< 0.0004	< 0.0004	NA	< 0.0004	104%	60%	140%	89%	60%	140%	NA	60%	140%
pp'-DDE	908399		< 0.0005	< 0.0005	NA	< 0.0005	100%	60%	140%	100%	60%	140%	NA	60%	140%
pp'-DDD	908399		< 0.0015	< 0.0015	NA	< 0.0015	86%	60%	140%	91%	60%	140%	NA	60%	140%
op'-DDT	908399		< 0.0015	< 0.0015	NA	< 0.0015	109%	60%	140%	100%	60%	140%	NA	60%	140%
pp'-DDT	908399		< 0.0005	< 0.0005	NA	< 0.0005	107%	60%	140%	105%	60%	140%	NA	60%	140%
Dieldrin	908399		< 0.0005	< 0.0005	NA	< 0.0005	96%	60%	140%	94%	60%	140%	NA	60%	140%
Heptachlor	908399		< 0.0001	< 0.0001	NA	< 0.0001	96%	60%	140%	87%	60%	140%	NA	60%	140%
Heptachlor Epoxide	908399		< 0.0002	< 0.0002	NA	< 0.0002	94%	60%	140%	93%	60%	140%	NA	60%	140%
Lindane	908399		< 0.0004	< 0.0004	NA	< 0.0004	91%	60%	140%	83%	60%	140%	NA	60%	140%
Endrin	908399		< 0.0004	< 0.0004	NA	< 0.0004	92%	60%	140%	90%	60%	140%	NA	60%	140%
Toxaphene	908399		< 0.0005	< 0.0005	NA	< 0.0005	102%	60%	140%	86%	60%	140%	NA	60%	140%
PCB's	908399		< 0.0002	< 0.0002	NA	< 0.0002	96%	60%	140%	92%	60%	140%	89%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T584983
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammod Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By: NPopukolof

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T584983
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammod Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Barium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Boron Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Cadmium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Chromium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Lead Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Mercury Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Selenium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Silver Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Uranium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA 1311 & modified from SM4500-F-C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA 1311 & modified from MOE 3015 & SM 4500 CN-I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA 1311 & modified from SM 4500-NO3-I	LACHAT FIA

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T584983
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammod Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Heptachlor + Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin + Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
DDT + Metabolites	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 8081A & 8082	GC/ECD
Chlordane (Total)	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
alpha - chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
gamma-Chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Oxychlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDE	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDD	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
op'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Lindane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Toxaphene	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
PCB's	ORG-91-5112	EPA SW-846 3550 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
OC/PCB Pest Extr			N/A
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS

AGAT Laboratories

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webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T584983

Cooler Quantity: [illegible]

Arrival Temperatures: 7.3 | 7.7 | 8.1
5.2 | 4.7 | 4.3

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☐Regulation 153/04
Table 2 *Indicate One*
☐Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐Sewer Use
☐Sanitary
☐Storm
Region ____ *Indicate One*
☐MISA

☑Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
____ *Indicate One*

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammod Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153: Metals and Inorganics	O. Reg 153: ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	O. Reg 153: **ORPs:** ☐B-HWS ☐Cl⁻ ☐CN⁻ ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH$_3$ ☐TKN ☐NO$_3$ ☐NO$_2$ ☐NO$_3$+NO$_2$	**Volatiles:** ☐VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☒M&I ☒VOCs ☐ABNs ☐B(a)P ☒PCBs	Sewer Use	TCLP OC pesticides					
Comp 1 TCLP D	24 Feb 202(		2	S															☑		☑					
Comp 2 TCLP D	24 Feb 202(		2	S	HOLD																					
Comp 1 TCLP B	20 Feb 202		2	S															☑		☑					

Samples Relinquished By (Print Name and Sign): Alessandro Pellerito
Date: Mar 13, 2020 Time: 11:20

Samples Received By (Print Name and Sign):
Date: 3/16/20 Time: 11:08

Samples Relinquished By (Print Name and Sign):
Date: 3/16/20 Time: 1:19

Samples Received By (Print Name and Sign):
Date: Time:

Samples Relinquished By (Print Name and Sign):
Date: Time:

Samples Received By (Print Name and Sign):
Date: Time:

Page ______ of ______

Nº:

5835 COOPERS AVENUE
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T587352
SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 21
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.

Certificate of Analysis

AGAT WORK ORDER: 20T587352
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

Corrosivity Package

DATE RECEIVED: 2020-03-23

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH S10 SS5	BH C31 SS3
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-03-18	2020-03-19
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1046512	1046527
Chloride (2:1)	µg/g	NA	2	2020-03-30	2020-03-30	363	69
Sulphate (2:1)	µg/g		2	2020-03-30	2020-03-30	65	18
pH (2:1)	pH Units		NA			8.12	8.54
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-03-27	2020-03-27	0.798	0.224
Resistivity (2:1) (Calculated)	ohm.cm		1	2020-03-27	2020-03-27	1250	4460
Redox Potential 1	mV		NA	2020-03-25	2020-03-25	54	45
Redox Potential 2	mV		NA	2020-03-25	2020-03-25	39	46
Redox Potential 3	mV		NA	2020-03-25	2020-03-25	26	49

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1046512-1046527 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhel

AMANJOT BHELA

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 20T587352
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-03-23

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C37 SS1	BH C29 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-03-19	2020-03-19
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1046494	1046517
Antimony	µg/g	40	0.8	2020-03-27	2020-03-27	<0.8	<0.8
Arsenic	µg/g	18	1	2020-03-27	2020-03-27	5	3
Barium	µg/g	670	2	2020-03-27	2020-03-27	79	119
Beryllium	µg/g	8	0.5	2020-03-27	2020-03-27	0.6	0.6
Boron	µg/g	120	5	2020-03-27	2020-03-27	9	8
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-03-27	2020-03-27	<0.10	0.50
Cadmium	µg/g	1.9	0.5	2020-03-27	2020-03-27	<0.5	<0.5
Chromium	µg/g	160	5	2020-03-27	2020-03-27	21	21
Cobalt	µg/g	80	0.5	2020-03-27	2020-03-27	10.0	8.3
Copper	µg/g	230	1	2020-03-27	2020-03-27	23	15
Lead	µg/g	120	1	2020-03-27	2020-03-27	10	10
Molybdenum	µg/g	40	0.5	2020-03-27	2020-03-27	<0.5	<0.5
Nickel	µg/g	270	1	2020-03-27	2020-03-27	23	17
Selenium	µg/g	5.5	0.4	2020-03-27	2020-03-27	<0.4	0.6
Silver	µg/g	40	0.2	2020-03-27	2020-03-27	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-03-27	2020-03-27	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-03-27	2020-03-27	<0.5	1.0
Vanadium	µg/g	86	1	2020-03-27	2020-03-27	28	31
Zinc	µg/g	340	5	2020-03-27	2020-03-27	51	67
Chromium, Hexavalent	µg/g	8	0.2	2020-03-26	2020-03-26	<0.2	<0.2
Cyanide, Free	µg/g	0.051	0.040	2020-03-30	2020-03-30	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-03-27	2020-03-27	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-03-27	2020-03-27	1.33	2.06
Sodium Adsorption Ratio	NA	12	NA	2020-03-30	2020-03-30	3.20	8.09
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-03-28	2020-03-28	7.73	7.27

Certified By: Amanjot Bhela

AMANJOT BHELA

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Mohammahd Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-03-23

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
1046494-1046517	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Amanjot Bhela

CHARTERED AMANJOT BHELA CHEMIST

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T587352
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammahd Safarpanah

O. Reg. 153(511) - PAHs (Soil)

DATE RECEIVED: 2020-03-23
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C33 SS1	BH C29 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-03-19	2020-03-19
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1046509	1046517
Naphthalene	µg/g	9.6	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Acenaphthylene	µg/g	0.15	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Acenaphthene	µg/g	21	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Fluorene	µg/g	62	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Phenanthrene	µg/g	12	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Anthracene	µg/g	0.67	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Fluoranthene	µg/g	9.6	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Pyrene	µg/g	96	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Benz(a)anthracene	µg/g	0.96	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Chrysene	µg/g	9.6	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Benzo(b)fluoranthene	µg/g	0.96	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Benzo(k)fluoranthene	µg/g	0.96	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Benzo(a)pyrene	µg/g	0.3	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	µg/g	0.76	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Dibenz(a,h)anthracene	µg/g	0.1	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Benzo(g,h,i)perylene	µg/g	9.6	0.05	2020-03-27	2020-03-30	<0.05	<0.05
2-and 1-methyl Naphthalene	µg/g	30	0.05	2020-03-27	2020-03-30	<0.05	<0.05
Moisture Content	%		0.1	2020-03-27	2020-03-30	14.5	20.6
Surrogate	Unit	Acceptable Limits					
Naphthalene-d8	%	50-140		2020-03-27	2020-03-30	71	78
Acenaphthene-d10	%	50-140		2020-03-27	2020-03-30	81	89
Chrysene-d12	%	50-140		2020-03-27	2020-03-30	87	98

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1046509-1046517 Results are based on the dry weight of the soil.
Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&j)Fluoranthene isomers because the isomers co-elute on the GC column.
2- and 1-Methyl Naphthalene is a calculated parameter. The calculated value is the sum of 2-Methyl Naphthalene and 1-Methyl Naphthalene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammahd Safarpanah

O. Reg. 153(511) - PHCs F1 - F4 (with PAHs and VOC) (Soil)

DATE RECEIVED: 2020-03-23
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C33 SS1	BH C29 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-03-19	2020-03-19
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1046509	1046517
F1 (C6 to C10)	µg/g	55	5	2020-03-26	2020-03-27	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	2020-03-26	2020-03-27	<5	<5
F2 (C10 to C16)	µg/g	230	10	2020-03-25	2020-03-25	<10	<10
F2 (C10 to C16) minus Naphthalene	µg/g		10	2020-03-25	2020-03-25	<10	<10
F3 (C16 to C34)	µg/g	1700	50	2020-03-25	2020-03-25	<50	<50
F3 (C16 to C34) minus PAHs	µg/g		50	2020-03-25	2020-03-25	<50	<50
F4 (C34 to C50)	µg/g	3300	50	2020-03-25	2020-03-25	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	3300	50			NA	NA
Moisture Content	%		0.1	2020-03-26	2020-03-26	14.5	20.6
Surrogate	Unit	Acceptable Limits					
Terphenyl	%	60-140		2020-03-25	2020-03-25	73	75

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1046509-1046517 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX and PAH contributions.
C>10 – C16 (F2- Naphthalene) is a calculated parameter. The calculated value is F2 - Naphthalene.
C>16 - C34 (F3-PAH) is a calculated parameter. The calculated value is F3-PAH (PAH: sum of Phenanthrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-c,d)pyrene and Pyrene).
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T587352
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2020-03-23

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C33 SS1	BH C29 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-03-19	2020-03-19
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1046509	1046517
Dichlorodifluoromethane	µg/g	16	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Vinyl Chloride	ug/g	0.032	0.02	2020-03-26	2020-03-27	<0.02	<0.02
Bromomethane	ug/g	0.05	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Trichlorofluoromethane	ug/g	4	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Acetone	ug/g	16	0.50	2020-03-26	2020-03-27	<0.50	<0.50
1,1-Dichloroethylene	ug/g	0.064	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Methylene Chloride	ug/g	1.6	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g	1.3	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Methyl tert-butyl Ether	ug/g	1.6	0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,1-Dichloroethane	ug/g	0.47	0.02	2020-03-26	2020-03-27	<0.02	<0.02
Methyl Ethyl Ketone	ug/g	70	0.50	2020-03-26	2020-03-27	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g	1.9	0.02	2020-03-26	2020-03-27	<0.02	<0.02
Chloroform	ug/g	0.47	0.04	2020-03-26	2020-03-27	<0.04	<0.04
1,2-Dichloroethane	ug/g	0.05	0.03	2020-03-26	2020-03-27	<0.03	<0.03
1,1,1-Trichloroethane	ug/g	6.1	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Carbon Tetrachloride	ug/g	0.21	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Benzene	ug/g	0.32	0.02	2020-03-26	2020-03-27	<0.02	<0.02
1,2-Dichloropropane	ug/g	0.16	0.03	2020-03-26	2020-03-27	<0.03	<0.03
Trichloroethylene	ug/g	0.55	0.03	2020-03-26	2020-03-27	<0.03	<0.03
Bromodichloromethane	ug/g	1.5	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g	31	0.50	2020-03-26	2020-03-27	<0.50	<0.50
1,1,2-Trichloroethane	ug/g	0.05	0.04	2020-03-26	2020-03-27	<0.04	<0.04
Toluene	ug/g	6.4	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Dibromochloromethane	ug/g	2.3	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Ethylene Dibromide	ug/g	0.05	0.04	2020-03-26	2020-03-27	<0.04	<0.04
Tetrachloroethylene	ug/g	1.9	0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.087	0.04	2020-03-26	2020-03-27	<0.04	<0.04
Chlorobenzene	ug/g	2.4	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Ethylbenzene	ug/g	1.1	0.05	2020-03-26	2020-03-27	<0.05	<0.05
m & p-Xylene	ug/g		0.05	2020-03-26	2020-03-27	<0.05	<0.05

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T587352
PROJECT: TP115086

5835 COOPERS AVENUE
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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2020-03-23

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C33 SS1	BH C29 SS1
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2020-03-19	2020-03-19
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1046509	1046517
Bromoform	ug/g	0.61	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Styrene	ug/g	34	0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	2020-03-26	2020-03-27	<0.05	<0.05
o-Xylene	ug/g		0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,3-Dichlorobenzene	ug/g	9.6	0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,4-Dichlorobenzene	ug/g	0.2	0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,2-Dichlorobenzene	ug/g	1.2	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Xylenes (Total)	ug/g	26	0.05	2020-03-26	2020-03-27	<0.05	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g	0.059	0.04	2020-03-26	2020-03-27	<0.04	<0.04
n-Hexane	µg/g	46	0.05	2020-03-26	2020-03-27	<0.05	<0.05
Surrogate	Unit	Acceptable Limits					
Toluene-d8	% Recovery	50-140		2020-03-26	2020-03-27	97	96
4-Bromofluorobenzene	% Recovery	50-140		2020-03-26	2020-03-27	82	82

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1046509-1046517 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Exceedance Summary

AGAT WORK ORDER: 20T587352
PROJECT: TP115086

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1046517	BH C29 SS1	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	2.06

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T587352
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	1049857		<0.8	<0.8	NA	< 0.8	141%	70%	130%	100%	80%	120%	77%	70%	130%
Arsenic	1049857		6	7	15.4%	< 1	111%	70%	130%	103%	80%	120%	104%	70%	130%
Barium	1049857		90	90	0.0%	< 2	110%	70%	130%	100%	80%	120%	101%	70%	130%
Beryllium	1049857		0.6	0.6	NA	< 0.5	87%	70%	130%	95%	80%	120%	91%	70%	130%
Boron	1049857		10	10	NA	< 5	85%	70%	130%	104%	80%	120%	90%	70%	130%
Boron (Hot Water Extractable)	1046396		0.12	0.11	NA	< 0.10	114%	60%	140%	104%	70%	130%	98%	60%	140%
Cadmium	1049857		<0.5	<0.5	NA	< 0.5	110%	70%	130%	98%	80%	120%	100%	70%	130%
Chromium	1049857		20	20	NA	< 5	104%	70%	130%	94%	80%	120%	90%	70%	130%
Cobalt	1049857		10.0	10.2	2.0%	< 0.5	88%	70%	130%	90%	80%	120%	86%	70%	130%
Copper	1049857		26	26	0.0%	< 1	92%	70%	130%	97%	80%	120%	90%	70%	130%
Lead	1049857		16	17	6.1%	< 1	102%	70%	130%	89%	80%	120%	91%	70%	130%
Molybdenum	1049857		0.6	0.5	NA	< 0.5	100%	70%	130%	102%	80%	120%	101%	70%	130%
Nickel	1049857		22	22	0.0%	< 1	93%	70%	130%	100%	80%	120%	92%	70%	130%
Selenium	1049857		<0.4	<0.4	NA	< 0.4	79%	70%	130%	100%	80%	120%	99%	70%	130%
Silver	1049857		<0.2	<0.2	NA	< 0.2	105%	70%	130%	98%	80%	120%	93%	70%	130%
Thallium	1049857		<0.4	<0.4	NA	< 0.4	91%	70%	130%	98%	80%	120%	93%	70%	130%
Uranium	1049857		0.6	0.6	NA	< 0.5	95%	70%	130%	98%	80%	120%	101%	70%	130%
Vanadium	1049857		27	28	3.6%	< 1	91%	70%	130%	87%	80%	120%	85%	70%	130%
Zinc	1049857		66	66	0.0%	< 5	100%	70%	130%	102%	80%	120%	103%	70%	130%
Chromium, Hexavalent	1039746		<0.2	<0.2	NA	< 0.2	85%	70%	130%	82%	80%	120%	76%	70%	130%
Cyanide, Free	1051127		<0.040	<0.040	NA	< 0.040	86%	70%	130%	100%	80%	120%	108%	70%	130%
Mercury	1049857		<0.10	<0.10	NA	< 0.10	114%	70%	130%	99%	80%	120%	98%	70%	130%
Electrical Conductivity (2:1)	1046520		0.419	0.434	3.5%	< 0.005	109%	80%	120%						
Sodium Adsorption Ratio	1046520		5.06	5.67	11.4%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	1048063		7.70	7.71	0.1%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
QA Qualifier for metals - Antimony Reference recovery is outside method's acceptance limit by more than an absolute maximum of 10% however, all other QCs i.e. duplicate, blank, blank spike and matrix spike are within method's QC acceptance criteria.

Corrosivity Package															
Chloride (2:1)	1048575		2040	2060	1.0%	< 2	93%	70%	130%	105%	80%	120%	112%	70%	130%
Sulphate (2:1)	1048575		87	83	4.7%	< 2	99%	70%	130%	105%	80%	120%	107%	70%	130%
pH (2:1)	1049859		8.30	8.39	1.1%	NA	101%	90%	110%	NA			NA		
Redox Potential 1	1						100%	90%	110%						

Comments: NA signifies Not Applicable.

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T587352
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By: Amanjot Bhela

AMANJOT BHELA

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T587352
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

Trace Organics Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PAHs (Soil)															
Naphthalene	1047067		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	107%	50%	140%	118%	50%	140%
Acenaphthylene	1047067		< 0.05	< 0.05	NA	< 0.05	119%	50%	140%	104%	50%	140%	116%	50%	140%
Acenaphthene	1047067		< 0.05	< 0.05	NA	< 0.05	111%	50%	140%	102%	50%	140%	115%	50%	140%
Fluorene	1047067		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	102%	50%	140%	114%	50%	140%
Phenanthrene	1047067		< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	107%	50%	140%	108%	50%	140%
Anthracene	1047067		< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	99%	50%	140%	94%	50%	140%
Fluoranthene	1047067		< 0.05	< 0.05	NA	< 0.05	112%	50%	140%	102%	50%	140%	113%	50%	140%
Pyrene	1047067		< 0.05	< 0.05	NA	< 0.05	108%	50%	140%	102%	50%	140%	112%	50%	140%
Benz(a)anthracene	1047067		< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	94%	50%	140%	110%	50%	140%
Chrysene	1047067		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	103%	50%	140%	110%	50%	140%
Benzo(b)fluoranthene	1047067		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	94%	50%	140%	79%	50%	140%
Benzo(k)fluoranthene	1047067		< 0.05	< 0.05	NA	< 0.05	80%	50%	140%	99%	50%	140%	105%	50%	140%
Benzo(a)pyrene	1047067		< 0.05	< 0.05	NA	< 0.05	113%	50%	140%	101%	50%	140%	113%	50%	140%
Indeno(1,2,3-cd)pyrene	1047067		< 0.05	< 0.05	NA	< 0.05	113%	50%	140%	75%	50%	140%	80%	50%	140%
Dibenz(a,h)anthracene	1047067		< 0.05	< 0.05	NA	< 0.05	118%	50%	140%	86%	50%	140%	84%	50%	140%
Benzo(g,h,i)perylene	1047067		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	77%	50%	140%	74%	50%	140%
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	1035936		< 0.05	< 0.05	NA	< 0.05	86%	50%	140%	84%	50%	140%	72%	50%	140%
Vinyl Chloride	1035936		< 0.02	< 0.02	NA	< 0.02	93%	50%	140%	100%	50%	140%	93%	50%	140%
Bromomethane	1035936		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	71%	50%	140%	86%	50%	140%
Trichlorofluoromethane	1035936		< 0.05	< 0.05	NA	< 0.05	83%	50%	140%	96%	50%	140%	83%	50%	140%
Acetone	1035936		< 0.50	< 0.50	NA	< 0.50	102%	50%	140%	97%	50%	140%	91%	50%	140%
1,1-Dichloroethylene	1035936		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	112%	60%	130%	73%	50%	140%
Methylene Chloride	1035936		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	113%	60%	130%	111%	50%	140%
Trans- 1,2-Dichloroethylene	1035936		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	93%	60%	130%	110%	50%	140%
Methyl tert-butyl Ether	1035936		< 0.05	< 0.05	NA	< 0.05	87%	50%	140%	97%	60%	130%	106%	50%	140%
1,1-Dichloroethane	1035936		< 0.02	< 0.02	NA	< 0.02	113%	50%	140%	106%	60%	130%	111%	50%	140%
Methyl Ethyl Ketone	1035936		< 0.50	< 0.50	NA	< 0.50	82%	50%	140%	99%	50%	140%	89%	50%	140%
Cis- 1,2-Dichloroethylene	1035936		< 0.02	< 0.02	NA	< 0.02	99%	50%	140%	106%	60%	130%	115%	50%	140%
Chloroform	1035936		< 0.04	< 0.04	NA	< 0.04	88%	50%	140%	93%	60%	130%	118%	50%	140%
1,2-Dichloroethane	1035936		< 0.03	< 0.03	NA	< 0.03	112%	50%	140%	107%	60%	130%	94%	50%	140%
1,1,1-Trichloroethane	1035936		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	115%	60%	130%	90%	50%	140%
Carbon Tetrachloride	1035936		< 0.05	< 0.05	NA	< 0.05	92%	50%	140%	87%	60%	130%	106%	50%	140%
Benzene	1035936		< 0.02	< 0.02	NA	< 0.02	78%	50%	140%	93%	60%	130%	78%	50%	140%
1,2-Dichloropropane	1035936		< 0.03	< 0.03	NA	< 0.03	85%	50%	140%	78%	60%	130%	72%	50%	140%
Trichloroethylene	1035936		< 0.03	< 0.03	NA	< 0.03	103%	50%	140%	99%	60%	130%	100%	50%	140%
Bromodichloromethane	1035936		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	79%	60%	130%	97%	50%	140%
Methyl Isobutyl Ketone	1035936		< 0.50	< 0.50	NA	< 0.50	104%	50%	140%	87%	50%	140%	93%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T587352
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
1,1,2-Trichloroethane	1035936		< 0.04	< 0.04	NA	< 0.04	105%	50%	140%	105%	60%	130%	98%	50%	140%
Toluene	1035936		< 0.05	< 0.05	NA	< 0.05	111%	50%	140%	107%	60%	130%	100%	50%	140%
Dibromochloromethane	1035936		< 0.05	< 0.05	NA	< 0.05	83%	50%	140%	73%	60%	130%	95%	50%	140%
Ethylene Dibromide	1035936		< 0.04	< 0.04	NA	< 0.04	94%	50%	140%	98%	60%	130%	117%	50%	140%
Tetrachloroethylene	1035936		< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	113%	60%	130%	87%	50%	140%
1,1,1,2-Tetrachloroethane	1035936		< 0.04	< 0.04	NA	< 0.04	104%	50%	140%	100%	60%	130%	112%	50%	140%
Chlorobenzene	1035936		< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	119%	60%	130%	84%	50%	140%
Ethylbenzene	1035936		< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	110%	60%	130%	106%	50%	140%
m & p-Xylene	1035936		< 0.05	< 0.05	NA	< 0.05	110%	50%	140%	107%	60%	130%	96%	50%	140%
Bromoform	1035936		< 0.05	< 0.05	NA	< 0.05	90%	50%	140%	81%	60%	130%	100%	50%	140%
Styrene	1035936		< 0.05	< 0.05	NA	< 0.05	96%	50%	140%	104%	60%	130%	70%	50%	140%
1,1,2,2-Tetrachloroethane	1035936		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	103%	60%	130%	86%	50%	140%
o-Xylene	1035936		< 0.05	< 0.05	NA	< 0.05	112%	50%	140%	113%	60%	130%	79%	50%	140%
1,3-Dichlorobenzene	1035936		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	109%	60%	130%	105%	50%	140%
1,4-Dichlorobenzene	1035936		< 0.05	< 0.05	NA	< 0.05	93%	50%	140%	105%	60%	130%	94%	50%	140%
1,2-Dichlorobenzene	1035936		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	88%	60%	130%	89%	50%	140%
1,3-Dichloropropene (Cis + Trans)	1035936		< 0.04	< 0.04	NA	< 0.04	102%	50%	140%	108%	60%	130%	89%	50%	140%
n-Hexane	1035936		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	94%	60%	130%	103%	50%	140%
O. Reg. 153(511) - PHCs F1 - F4 (with PAHs and VOC) (Soil)															
F1 (C6 to C10)	1037345		< 5	< 5	NA	< 5	96%	60%	140%	101%	60%	140%	104%	60%	140%
F2 (C10 to C16)	1037334		< 10	< 10	NA	< 10	104%	60%	140%	103%	60%	140%	87%	60%	140%
F3 (C16 to C34)	1037334		< 50	< 50	NA	< 50	109%	60%	140%	96%	60%	140%	87%	60%	140%
F4 (C34 to C50)	1037334		< 50	< 50	NA	< 50	100%	60%	140%	99%	60%	140%	111%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T587352
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020

PARAMETER	Sample Id	Sample Description	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony		BH C37 SS1	141%	70%	130%	100%	80%	120%	77%	70%	130%

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
QA Qualifier for metals - Antimony Reference recovery is outside method’s acceptance limit by more than an absolute maximum of 10% however, all other QCs i.e. duplicate, blank, blank spike and matrix spike are within method’s QC acceptance criteria.

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T587352
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammahd Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015 and SM 4500-CN- I	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T587352

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Mohammahd Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T587352
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammahd Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Naphthalene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Acenaphthylene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Acenaphthene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Fluorene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Phenanthrene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Anthracene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Fluoranthene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Pyrene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Benz(a)anthracene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Chrysene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Benzo(b)fluoranthene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Benzo(k)fluoranthene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Benzo(a)pyrene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Indeno(1,2,3-cd)pyrene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Dibenz(a,h)anthracene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Benzo(g,h,i)perylene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
2-and 1-methyl Naphthalene	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Moisture Content	ORG-91-5106	Tier 1 Method	BALANCE
Naphthalene-d8	ORG-91-5106	modified from EPA SW-846 3541 & 8270E50	GC/MS
Acenaphthene-d10	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
Chrysene-d12	ORG-91-5106	modified from EPA SW-846 3541 & 8270E	GC/MS
F1 (C6 to C10)	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F2 (C10 to C16) minus Naphthalene	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34) minus PAHs	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T587352
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammahd Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Vinyl Chloride	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Acetone	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086

SAMPLING SITE:SP47

AGAT WORK ORDER: 20T587352

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:Mohammahd Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
m & p-Xylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T587352

Cooler Quantity: 1 large

Arrival Temperatures: 3.5 | 3.8 | 3.1

1 ca 1.8 | 2.4 | 2.6

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT **(Rush Surcharges Apply)**

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammahd Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	O. Reg 153 ☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (Incl. Hydrides)	O. Reg 153 **ORPs:** ☐B-HWS ☐Cl ☐CN ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH₃ ☐TKN ☐NO₃ ☐NO₂ ☐NO₃+NO₂	**Volatiles:** ☑VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☑M&I ☑VOCs ☐ABNs ☑B(a)P ☑PCBs	Sewer Use	CORROSIVITY
BH C37 SS1	19 Mar 202	NA	4	S			X														
BH C35 SS1	19 Mar 202	1:50	4	S	HOLD																
BH C33 SS1	19 Mar 202	1:15	4	S									X	X		X					
BH C32 SS2	19 Mar 202	12:00	4	S	HOLD																
BH S10 SS2	18 Mar 202	10:05	4	S	HOLD																
BH S10 SS5	18 Mar 202	10:30	4	S																	X
BH S9 SS1	18 Mar 202	1:30	4	S	HOLD																
BH S9 SS5	18 Mar 202	1:45	4	S	HOLD																
BH C29 SS1	19 Mar 202	9:45	4	S			X						X	X		X					
BH C29 SS3	19 Mar 202	10:00	4	S	HOLD																
BH C30 SS2	19 Mar 202	10:55	4	S	HOLD																

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alessandro Pellerito	Mar 20, 2020	11:20		3/23/20	10:35
	3/23/20	11:29			

Page 1 of 2

Nº:

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T587352

Cooler Quantity: [illegible]

Arrival Temperatures: 3.5 | 3.3 | 3.1
1.8 | 2.9 | 2.6

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region ____ *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammahd Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI	O. Reg 153			Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐TP ☐NH₃ ☐TKN ☐NO₃ ☐NO₂ ☐NO₃+NO₂	Volatiles: ☐VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☒M&I ☒VOCs ☐ABNs ☒B(a)P ☒PCBs	Sewer Use	Corrosivity					
						Y / N	Metals and Inorganics	☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (Incl. Hydrides)	ORPs: ☐B-HWS ☐Cl⁻ ☐CN ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR																	
BH C31 SS2	19 Mar 202	11:20	4	S	HOLD																					
BH C31 SS3	19 Mar 202	11:25	4	S																	X					

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	Mar 20, 2020	11:20		3/23/20	10:36	
Samples Relinquished By (Print Name and Sign):	Date 3/23/20	Time 11:29	Samples Received By (Print Name and Sign):	Date	Time	Page 2 of 2
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T588871
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 14
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T588871
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammad Safarpanah

Corrosivity Package

DATE RECEIVED: 2020-03-30
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH S12 SS5
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-03-25
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1055914
Chloride (2:1)	µg/g	NA	2	2020-04-03	2020-04-03	546
Sulphate (2:1)	µg/g		2	2020-04-03	2020-04-03	35
pH (2:1)	pH Units		NA	2020-03-06	2020-03-06	8.09
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-04-03	2020-04-03	1.08
Resistivity (2:1) (Calculated)	ohm.cm		1	2020-04-03	2020-04-03	926
Redox Potential 1	mV		NA	2020-04-02	2020-04-02	89
Redox Potential 2	mV		NA	2020-04-02	2020-04-02	92
Redox Potential 3	mV		NA	2020-04-02	2020-04-02	98

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1055914 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

NIVINE BASILY

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-03-30

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C1 SS4	BH C12 SS2	BH C6 SS2
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2020-03-25	2020-03-25	2020-03-25
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1055899	1055904	1055906
Antimony	µg/g	40	0.8	2020-04-01	2020-04-01	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-04-01	2020-04-01	3	3	3
Barium	µg/g	670	2	2020-04-01	2020-04-01	96	78	44
Beryllium	µg/g	8	0.5	2020-04-01	2020-04-01	0.6	<0.5	<0.5
Boron	µg/g	120	5	2020-04-01	2020-04-01	9	7	6
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-04-01	2020-04-01	<0.10	0.20	<0.10
Cadmium	µg/g	1.9	0.5	2020-04-01	2020-04-01	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-04-01	2020-04-01	21	18	11
Cobalt	µg/g	80	0.5	2020-04-01	2020-04-01	12.4	9.3	5.8
Copper	µg/g	230	1	2020-04-01	2020-04-01	19	16	16
Lead	µg/g	120	1	2020-04-01	2020-04-01	9	11	5
Molybdenum	µg/g	40	0.5	2020-04-01	2020-04-01	<0.5	<0.5	<0.5
Nickel	µg/g	270	1	2020-04-01	2020-04-01	24	17	10
Selenium	µg/g	5.5	0.4	2020-04-01	2020-04-01	<0.4	0.4	<0.4
Silver	µg/g	40	0.2	2020-04-01	2020-04-01	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-04-01	2020-04-01	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-04-01	2020-04-01	0.5	<0.5	<0.5
Vanadium	µg/g	86	1	2020-04-01	2020-04-01	33	32	22
Zinc	µg/g	340	5	2020-04-01	2020-04-01	52	47	29
Chromium, Hexavalent	µg/g	8	0.2	2020-04-01	2020-04-01	<0.2	<0.2	<0.2
Cyanide, Free	µg/g	0.051	0.040	2020-04-03	2020-04-03	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-04-01	2020-04-01	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-04-03	2020-04-03	0.312	1.94	1.19
Sodium Adsorption Ratio	NA	12	NA	2020-04-03	2020-04-03	0.811	23.1	14.3
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-04-03	2020-04-03	7.81	7.79	8.05

Certified By:

NIVINE BASILY

Certificate of Analysis

AGAT WORK ORDER: 20T588871
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-03-30

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
1055899-1055906	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

CHARTERED
NIVINE BASILY
CHEMIST

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T588871
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2020-03-30
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH S11 SS5
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-03-25
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1055912
Benzene	µg/g	0.32	0.02	2020-03-31	2020-04-01	<0.02
Toluene	µg/g	6.4	0.05	2020-03-31	2020-04-01	<0.05
Ethylbenzene	µg/g	1.1	0.05	2020-03-31	2020-04-01	<0.05
Xylenes (Total)	µg/g	26	0.05	2020-03-31	2020-04-01	<0.05
F1 (C6 to C10)	µg/g	55	5	2020-03-31	2020-04-01	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	2020-03-31	2020-04-01	<5
F2 (C10 to C16)	µg/g	230	10	2020-04-01	2020-04-02	<10
F3 (C16 to C34)	µg/g	1700	50	2020-04-01	2020-04-02	<50
F4 (C34 to C50)	µg/g	3300	50	2020-04-01	2020-04-02	<50
Gravimetric Heavy Hydrocarbons	µg/g	3300	50			NA
Moisture Content	%		0.1	2020-04-01	2020-04-01	17.0
Surrogate	Unit	Acceptable Limits				
Terphenyl	%	60-140		2020-04-01	2020-04-02	113

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1055912 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1055904	BH C12 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	1.94
1055904	BH C12 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	23.1
1055906	BH C6 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	14.3

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T588871
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	1057467		<0.8	<0.8	NA	< 0.8	136%	70%	130%	99%	80%	120%	85%	70%	130%
Arsenic	1057467		2	3	NA	< 1	100%	70%	130%	96%	80%	120%	98%	70%	130%
Barium	1057467		7	7	NA	< 2	106%	70%	130%	100%	80%	120%	100%	70%	130%
Beryllium	1057467		<0.5	<0.5	NA	< 0.5	81%	70%	130%	106%	80%	120%	95%	70%	130%
Boron	1057467		<5	<5	NA	< 5	77%	70%	130%	105%	80%	120%	91%	70%	130%
Boron (Hot Water Extractable)	1056220		0.13	0.13	NA	< 0.10	99%	60%	140%	91%	70%	130%	89%	60%	140%
Cadmium	1057467		<0.5	<0.5	NA	< 0.5	110%	70%	130%	97%	80%	120%	99%	70%	130%
Chromium	1057467		12	12	NA	< 5	101%	70%	130%	87%	80%	120%	82%	70%	130%
Cobalt	1057467		2.7	2.8	2.5%	< 0.5	92%	70%	130%	96%	80%	120%	95%	70%	130%
Copper	1057467		4	4	NA	< 1	92%	70%	130%	95%	80%	120%	86%	70%	130%
Lead	1057467		3	3	NA	< 1	105%	70%	130%	87%	80%	120%	83%	70%	130%
Molybdenum	1057467		<0.5	<0.5	NA	< 0.5	93%	70%	130%	92%	80%	120%	94%	70%	130%
Nickel	1057467		4	4	NA	< 1	90%	70%	130%	96%	80%	120%	93%	70%	130%
Selenium	1057467		<0.4	<0.4	NA	< 0.4	98%	70%	130%	94%	80%	120%	97%	70%	130%
Silver	1057467		<0.2	<0.2	NA	< 0.2	98%	70%	130%	96%	80%	120%	95%	70%	130%
Thallium	1057467		<0.4	<0.4	NA	< 0.4	86%	70%	130%	97%	80%	120%	92%	70%	130%
Uranium	1057467		<0.5	<0.5	NA	< 0.5	91%	70%	130%	98%	80%	120%	97%	70%	130%
Vanadium	1057467		31	32	1.7%	< 1	101%	70%	130%	95%	80%	120%	90%	70%	130%
Zinc	1057467		9	9	NA	< 5	99%	70%	130%	98%	80%	120%	109%	70%	130%
Chromium, Hexavalent	1057102		<0.2	<0.2	NA	< 0.2	89%	70%	130%	86%	80%	120%	86%	70%	130%
Cyanide, Free	1063190		<0.040	<0.040	NA	< 0.040	91%	70%	130%	98%	80%	120%	107%	70%	130%
Mercury	1057467		<0.10	<0.10	NA	< 0.10	107%	70%	130%	103%	80%	120%	103%	70%	130%
Electrical Conductivity (2:1)	1055899	1055899	0.312	0.321	2.6%	< 0.005	112%	80%	120%						
Sodium Adsorption Ratio	1055899	1055899	0.811	0.803	1.0%	NA									
pH, 2:1 CaCl2 Extraction	1056610		7.43	7.44	0.1%	NA	101%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Corrosivity Package															
Chloride (2:1)	1063243		8	8	NA	< 2	91%	70%	130%	101%	80%	120%	104%	70%	130%
Sulphate (2:1)	1063243		202	203	0.5%	< 2	101%	70%	130%	104%	80%	120%	108%	70%	130%
pH (2:1)	1055914	1055914	8.09	8.09	0.0%	NA	101%	90%	110%						
Electrical Conductivity (2:1)	1055899	1055899	0.312	0.321	2.8%	< 0.005	112%	80%	120%						
Redox Potential 1	1					NA	101%	90%	110%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086

SAMPLING SITE:SP47

AGAT WORK ORDER: 20T588871

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:Mohammad Safarpanah

Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By:

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T588871
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	1053371		< 0.02	< 0.02	NA	< 0.02	103%	50%	140%	105%	60%	130%	98%	50%	140%
Toluene	1053371		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	103%	60%	130%	107%	50%	140%
Ethylbenzene	1053371		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	96%	60%	130%	110%	50%	140%
Xylenes (Total)	1053371		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	99%	60%	130%	104%	50%	140%
F1 (C6 to C10)	1053371		< 5	< 5	NA	< 5	112%	60%	140%	104%	60%	140%	89%	60%	140%
F2 (C10 to C16)	1057461		< 10	< 10	NA	< 10	109%	60%	140%	89%	60%	140%	79%	60%	140%
F3 (C16 to C34)	1057461		< 50	< 50	NA	< 50	104%	60%	140%	86%	60%	140%	79%	60%	140%
F4 (C34 to C50)	1057461		< 50	< 50	NA	< 50	92%	60%	140%	120%	60%	140%	99%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

QA Violation

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T588871
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito

RPT Date: Nov 13, 2020			REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Sample Description	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
				Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)											
Antimony		BH C1 SS4	136%	70%	130%	99%	80%	120%	85%	70%	130%

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.
Antimony: For a multi-element scan for lab control standards and matrix spikes, up to 10% of analytes may exceed the quoted limits by up to 10% absolute and it is considered acceptable.

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T588871
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015 and SM 4500-CN- I	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T588871
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Trace Organics Analysis			
Benzene	VOL-91-5009	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5009	modified from EPA SW-846 5035C & 8260D	P&T GC/MS
Ethylbenzene	VOL-91-5009	modified from EPA SW-846 5035C & 8260D	P&T GC/MS
Xylenes (Total)	VOL-91-5009	modified from EPA SW-846 5035C & 8260D	P&T GC/MS
F1 (C6 to C10)	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID

(1) 3.5 - 3.3 5
1.8 22 25

(2) 3.4 . 3.6 - 3.2
2.3 2 1.8

(3) 3.5 . 3.5 . 3.3
2.5 23.2

AGAT Laboratories

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 20T588871

Cooler Quantity: 3 large

Arrival Temperatures:

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ______ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
Indicate One

Is this submission for a **Record of Site Condition?**
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT **(Rush Surcharges Apply)**

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr6+ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☐ ABNs ☑ B(a)P ☑ PCBs	Sewer Use
BH C1 SS2	25 Mar 20	10:45	4	S	HOLD															
BH C1 SS4	25 Mar 20	11:00	4	S			☑													
BH C5 SS2	25 Mar 202	12:00	4	S	HOLD															
BH C5 SS4	25 Mar 202	12:20	4	S	HOLD															
BH C7 SS2	25 Mar 202	9:45	4	S	HOLD															
BH C7 SS3	25 Mar 202	10:00	4	S	HOLD															
BH C12 SS2	25 Mar 202	2:45	4	S			☑													
BH C9 SS1	25 Mar 202	1:00	4	S	HOLD															
BH C6 SS2	25 Mar 202	1:20	4	S			☑													
BH C8 SS2	25 Mar 202	9:20	4	S	HOLD															
BH C2 SS2	25 Mar 202	11:15	4	S	HOLD															

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	
~~Alessandro Pellerito~~ EDWIN WHITFIELD	~~Mar 25, 2020~~ MAR 27, 2020	~~6:05pm~~ 12:00		3/30/20	9:04	
						Page 1 of 2
	3/30/20	11:44				Nº:

Document ID: DIV-78-1511.015

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Date Issued: March 16, 2018

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #:

Cooler Quantity: 3

Arrival Temperatures:

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐Sewer Use
☐Sanitary
☐Storm
Region *Indicate One*
☐MISA

☐Regulation 558
☐CCME
☐Prov. Water Quality Objectives (PWQO)
☐Other
Indicate One

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT **(Rush Surcharges Apply)**

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI	Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐B-HWS ☐Cl⁻ ☐CN⁻ ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐TP ☐NH$_3$ ☐TKN ☐NO$_3$ ☐NO$_2$ ☐NO$_3$+NO$_2$	Volatiles: ☐VOC ☒BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☒Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☒M&I ☒VOCs ☐ABNs ☒B(a)P ☒PCBs	Sewer Use						
						Y / N	O. Reg 153																			
BH C3 SS1	25 Mar 20	10:20	4	S	HOLD																					
BH S11 SS2	25 Mar 20	10:00	4	S	HOLD																					
BH S11 SS4	25 Mar 202	10:15	4	S	HOLD																					
BH S11 SS5	25 Mar 202	10:30	3	S									☑	☑												
BH S12 SS2	25 Mar 202	12:15	4	S	HOLD																					
BH S12 SS5	25 Mar 202	12:20	4	S	HOLD																					

Samples Relinquished By (Print Name and Sign): Alessandro Pellerito EDWIN WHITTON
Date ~~Mar-25, 2020~~ MAR 27, 2020 Time ~~6:05pm~~ 12:00
Samples Received By (Print Name and Sign):
Date 3/30/20 Time 9:04

Samples Relinquished By (Print Name and Sign):
Date 3/30/20 Time
Samples Received By (Print Name and Sign):
Date Time

Samples Relinquished By (Print Name and Sign):
Date Time 11:44
Samples Received By (Print Name and Sign):
Date Time

Page 2 of 2

Nº:

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5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON   L4B 3K6

ATTENTION TO: Alessandro Pellerito

PROJECT: TP115086

AGAT WORK ORDER: 20T588920

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 13, 2020

PAGES (INCLUDING COVER): 11

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Certificate of Analysis

AGAT WORK ORDER: 20T588920
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

Corrosivity Package

DATE RECEIVED: 2020-03-30
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C17 SS3
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-03-27
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1056578
Chloride (2:1)	µg/g	NA	2	2020-04-02	2020-04-02	141
Sulphate (2:1)	µg/g		2	2020-04-02	2020-04-02	21
pH (2:1)	pH Units		NA	2020-04-06	2020-04-06	8.17
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-03-27	2020-03-27	0.392
Resistivity (2:1) (Calculated)	ohm.cm		1	2020-03-27	2020-03-27	2550
Redox Potential 1	mV		NA	2020-03-30	2020-03-30	124
Redox Potential 2	mV		NA	2020-03-30	2020-03-30	117
Redox Potential 3	mV		NA	2020-03-30	2020-03-30	99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1056578 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.

Analysis performed at AGAT Toronto (unless marked by *)

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T588920

PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-03-30

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH C13 SS3	BH C17 SS1	BH C25 SS3	DUP
					SAMPLE TYPE:	Soil	Soil	Soil	Soil
					DATE SAMPLED:	2020-03-27	2020-03-27	2020-03-27	2020-03-27
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1056574	1056577	1056587	1056591
Antimony	µg/g	40	0.8	2020-04-02	2020-04-02	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-04-02	2020-04-02	5	4	4	4
Barium	µg/g	670	2	2020-04-02	2020-04-02	96	65	77	78
Beryllium	µg/g	8	0.5	2020-04-02	2020-04-02	0.6	<0.5	<0.5	<0.5
Boron	µg/g	120	5	2020-04-02	2020-04-02	12	7	9	9
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-04-01	2020-04-01	0.43	0.21	0.25	0.25
Cadmium	µg/g	1.9	0.5	2020-04-02	2020-04-02	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-04-02	2020-04-02	23	17	19	19
Cobalt	µg/g	80	0.5	2020-04-02	2020-04-02	11.3	7.3	8.6	8.9
Copper	µg/g	230	1	2020-04-02	2020-04-02	19	18	17	18
Lead	µg/g	120	1	2020-04-02	2020-04-02	9	8	7	8
Molybdenum	µg/g	40	0.5	2020-04-02	2020-04-02	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	270	1	2020-04-02	2020-04-02	25	16	19	19
Selenium	µg/g	5.5	0.4	2020-04-02	2020-04-02	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	40	0.2	2020-04-02	2020-04-02	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-04-02	2020-04-02	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-04-02	2020-04-02	0.6	<0.5	0.6	0.6
Vanadium	µg/g	86	1	2020-04-02	2020-04-02	35	28	29	29
Zinc	µg/g	340	5	2020-04-02	2020-04-02	52	44	44	45
Chromium, Hexavalent	µg/g	8	0.2	2020-03-31	2020-03-31	<0.2	<0.2	<0.2	<0.2
Cyanide, Free	µg/g	0.051	0.040	2020-04-03	2020-04-03	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-04-02	2020-04-02	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-03-27	2020-03-27	1.45	0.552	1.57	1.42
Sodium Adsorption Ratio	NA	12	NA	2020-04-02	2020-04-02	3.85	1.60	4.76	3.98
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-04-03	2020-04-03	7.75	7.71	7.88	7.93

Certified By:

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-03-30

DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
1056574-1056591	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

NIVINE BASILY

Exceedance Summary

AGAT WORK ORDER: 20T588920
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1056574	BH C13 SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	1.45
1056587	BH C25 SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	1.57
1056591	DUP	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	1.42

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 20T588920

PROJECT: TP115086

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	1059297		<0.8	<0.8	NA	< 0.8	123%	70%	130%	101%	80%	120%	70%	70%	130%
Arsenic	1059297		4	4	NA	< 1	103%	70%	130%	105%	80%	120%	109%	70%	130%
Barium	1059297		91	83	9.1%	< 2	99%	70%	130%	99%	80%	120%	106%	70%	130%
Beryllium	1059297		0.6	<0.5	NA	< 0.5	80%	70%	130%	103%	80%	120%	86%	70%	130%
Boron	1059297		9	9	NA	< 5	75%	70%	130%	109%	80%	120%	79%	70%	130%
Boron (Hot Water Extractable)	1057235		0.13	0.13	NA	< 0.10	94%	60%	140%	91%	70%	130%	86%	60%	140%
Cadmium	1059297		<0.5	<0.5	NA	< 0.5	103%	70%	130%	98%	80%	120%	99%	70%	130%
Chromium	1059297		20	18	NA	< 5	95%	70%	130%	93%	80%	120%	103%	70%	130%
Cobalt	1059297		9.5	8.3	12.8%	< 0.5	80%	70%	130%	92%	80%	120%	92%	70%	130%
Copper	1059297		19	17	9.8%	< 1	84%	70%	130%	96%	80%	120%	92%	70%	130%
Lead	1059297		9	8	4.8%	< 1	95%	70%	130%	90%	80%	120%	87%	70%	130%
Molybdenum	1059297		<0.5	<0.5	NA	< 0.5	96%	70%	130%	101%	80%	120%	103%	70%	130%
Nickel	1059297		21	19	11.2%	< 1	85%	70%	130%	99%	80%	120%	98%	70%	130%
Selenium	1059297		<0.4	<0.4	NA	< 0.4	107%	70%	130%	100%	80%	120%	101%	70%	130%
Silver	1059297		<0.2	<0.2	NA	< 0.2	108%	70%	130%	97%	80%	120%	90%	70%	130%
Thallium	1059297		<0.4	<0.4	NA	< 0.4	86%	70%	130%	100%	80%	120%	98%	70%	130%
Uranium	1059297		0.5	<0.5	NA	< 0.5	88%	70%	130%	102%	80%	120%	106%	70%	130%
Vanadium	1059297		32	28	12.8%	< 1	96%	70%	130%	99%	80%	120%	107%	70%	130%
Zinc	1059297		56	49	13.2%	< 5	104%	70%	130%	102%	80%	120%	106%	70%	130%
Chromium, Hexavalent	1048424		<0.2	<0.2	NA	< 0.2	87%	70%	130%	85%	80%	120%	81%	70%	130%
Cyanide, Free	1063190		<0.040	<0.040	NA	< 0.040	91%	70%	130%	98%	80%	120%	107%	70%	130%
Mercury	1059297		<0.10	<0.10	NA	< 0.10	101%	70%	130%	106%	80%	120%	107%	70%	130%
Electrical Conductivity (2:1)	1057235		0.179	0.178	0.6%	< 0.005	112%	80%	120%						
Sodium Adsorption Ratio	1057235		0.358	0.367	2.6%	NA									
pH, 2:1 CaCl2 Extraction	1056610		7.43	7.44	0.1%	NA	101%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Corrosivity Package															
Chloride (2:1)	1052899		34	36	6.0%	< 2	90%	70%	130%	99%	80%	120%	100%	70%	130%
Sulphate (2:1)	1052899		37	35	4.9%	< 2	98%	70%	130%	98%	80%	120%	102%	70%	130%
pH (2:1)	1057228		8.21	8.20	0.1%	NA	101%	90%	110%						
Electrical Conductivity (2:1)	1057235		0.179	0.178	0.6%	< 0.005	NA	80%	120%						
Redox Potential 1	1					NA	101%	90%	110%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T588920
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

NIVINE BASILY

Certified By:

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T588920
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	modified G200-09, SM 2580 B	REDOX POTENTIAL ELECTRODE
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015 and SM 4500-CN- I	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:

AGAT WORK ORDER: 20T588920
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER

1 3.5 3.3 3 2. 3.4 3.6 3.2 3. 3.8 3.5 3.3
1.8 2.2 2.5 3.3 2 1.8 2.5 2.3 2

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905 712 5100 Fax: 905 712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 20T588920

Cooler Quantity:

Arrival Temperatures: 3 | Lrge

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ______ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ *Indicate One*

Is this submission for a Record of Site Condition?
☐ Yes ☑ No

Report Guideline on Certificate of Analysis
☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	O. Reg 153 Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☐ ABNs ☑ B(a)P ☑ PCBs	Sewer Use	CORROSIVITY					
BH C13 SS1	27 Mar 202	9:20	4	S	HOLD																					
BH C13 SS3	27 Mar 202	9:30	4	S			☑																			
BH C11 SS2	27 Mar 202	1:00	4	S	HOLD																					
BH C11 SS4	27 Mar 202	1:15	4	S	HOLD																					
BH C17 SS1	27 Mar 202	9:50	4	S			☑																			
BH C17 SS3	27 Mar 202	10:00	4	S																	☑					
BH S8 SS2	26 Mar 202	10:15	4	S	HOLD																					
BH S8 SS4	26 Mar 202	10:30	4	S	HOLD																					
BH S7/C27 SS2	26 Mar 202	1:00	4	S	HOLD																					
BH S7/C27 SS3	26 Mar 202	1:10	4	S	HOLD																					
BH C15 SS1	27 Mar 202	12:30	4	S	HOLD																					

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	Mar 29, 2020	10:15AM	Neil Ramnaraine	3/30/20	11:44	
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Page ______ of ______
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

1. 3.5 3.3 3 2, 3.4 3-6 3.2 3. 3.5 3.5 3.3
1.8 2.2 2.5 2.3 2 1.8 2.5 2.3 2

AGAT Laboratories

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Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #:

Cooler Quantity: 3 large

Arrival Temperatures:

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *Indicate One*
☑ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☑ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region ____ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
Indicate One

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions
BH C25 SS1	27 Mar 202	11:00	4	S	HOLD
BH C25 SS3	27 Mar 202	11:15	4	S	
BH C23 SS1	27 Mar 202	11:40	4	S	HOLD
BH C23 SS3	27 Mar 202	11:50	4	S	HOLD
BH C21 SS1	27 Mar 202	10:45	4	S	HOLD
DUP	27 Mar 202		4	S	

Sample Identification	Field Filtered - Metals, Hg, CrVI	O. Reg 153			Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐ TP ☐ NH₃ ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	**Volatiles:** ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☑ M&I ☑ VOCs ☐ ABNs ☑ B(a)P ☑ PCBs	Sewer Use	CORROSIVITY					
	Y / N	Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	**ORPs:** ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR																	
BH C25 SS1																					
BH C25 SS3		☑																			
BH C23 SS1																					
BH C23 SS3																					
BH C21 SS1																					
DUP		☑																			

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	Mar 29, 2020	10:15AM	Neil Ramnadayan	3/30/20	11:44	
						Page ______ of ______
						Nº:

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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086
AGAT WORK ORDER: 20T590525
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
DATE REPORTED: Nov 13, 2020
PAGES (INCLUDING COVER): 23
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 20T590525
PROJECT: TP115086

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CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D18 SS3	BH D17 SS2	BH C24 SS2
					SAMPLE TYPE:	Soil	Soil	Soil
					DATE SAMPLED:	2020-04-01	2020-04-01	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066581	1066582	1066586
Antimony	µg/g	40	0.8	2020-04-13	2020-04-13	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	2020-04-08	2020-04-08	5	12	4
Barium	µg/g	670	2	2020-04-08	2020-04-08	70	14	74
Beryllium	µg/g	8	0.5	2020-04-08	2020-04-08	0.5	<0.5	0.6
Boron	µg/g	120	5	2020-04-08	2020-04-08	11	14	8
Boron (Hot Water Extractable)	µg/g	2	0.10	2020-04-08	2020-04-08	0.32	0.30	<0.10
Cadmium	µg/g	1.9	0.5	2020-04-08	2020-04-08	<0.5	<0.5	<0.5
Chromium	µg/g	160	5	2020-04-08	2020-04-08	19	6	20
Cobalt	µg/g	80	0.5	2020-04-08	2020-04-08	8.1	5.1	9.4
Copper	µg/g	230	1	2020-04-08	2020-04-08	17	11	19
Lead	µg/g	120	1	2020-04-08	2020-04-08	10	18	9
Molybdenum	µg/g	40	0.5	2020-04-08	2020-04-08	<0.5	0.9	<0.5
Nickel	µg/g	270	1	2020-04-08	2020-04-08	17	8	19
Selenium	µg/g	5.5	0.4	2020-04-08	2020-04-08	<0.4	<0.4	<0.4
Silver	µg/g	40	0.2	2020-04-08	2020-04-08	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	2020-04-08	2020-04-08	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	2020-04-08	2020-04-08	0.6	<0.5	0.5
Vanadium	µg/g	86	1	2020-04-08	2020-04-08	29	9	29
Zinc	µg/g	340	5	2020-04-08	2020-04-08	48	79	46
Chromium, Hexavalent	µg/g	8	0.2	2020-04-08	2020-04-08	<0.2	<0.2	<0.2
Cyanide, Free	µg/g	0.051	0.040	2020-04-13	2020-04-13	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	2020-04-08	2020-04-08	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm	1.4	0.005	2020-04-08	2020-04-08	1.25	1.68	0.830
Sodium Adsorption Ratio	NA	12	NA	2020-04-08	2020-04-08	4.37	12.4	4.19
pH, 2:1 CaCl2 Extraction	pH Units	5.0-9.0	NA	2020-04-13	2020-04-13	7.83	8.12	7.88

Certified By:

CHARTERED
NIVINE BASILY
CHEMIST

Certificate of Analysis

AGAT WORK ORDER: 20T590525
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2020-04-03
DATE REPORTED: 2020-11-13

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
1066581-1066586	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

NIVINE BASILY

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T590525
PROJECT: TP115086

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp. TCLP C
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066587
Arsenic Leachate	mg/L	2.5	0.010	2020-04-08	2020-04-08	<0.010
Barium Leachate	mg/L	100	0.100	2020-04-08	2020-04-08	0.510
Boron Leachate	mg/L	500	0.050	2020-04-08	2020-04-08	0.084
Cadmium Leachate	mg/L	0.5	0.010	2020-04-08	2020-04-08	<0.010
Chromium Leachate	mg/L	5	0.010	2020-04-08	2020-04-08	<0.010
Lead Leachate	mg/L	5	0.010	2020-04-08	2020-04-08	<0.010
Mercury Leachate	mg/L	0.1	0.01	2020-04-08	2020-04-08	<0.01
Selenium Leachate	mg/L	1	0.010	2020-04-08	2020-04-08	<0.010
Silver Leachate	mg/L	5	0.010	2020-04-08	2020-04-08	<0.010
Uranium Leachate	mg/L	10	0.050	2020-04-08	2020-04-08	<0.050
Fluoride Leachate	mg/L	150	0.05	2020-04-08	2020-04-08	0.16
Cyanide Leachate	mg/L	20	0.05	2020-04-08	2020-04-08	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	2020-04-08	2020-04-08	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

NIVINE BASILY

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 20T590525
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2020-04-03
DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D17 SS2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066582
Hexachloroethane	µg/g	0.21	0.01	2020-04-09	2020-04-13	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.056	0.005	2020-04-09	2020-04-13	<0.005
Heptachlor	µg/g	0.19	0.005	2020-04-09	2020-04-13	<0.005
Aldrin	µg/g	0.088	0.005	2020-04-09	2020-04-13	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	2020-04-09	2020-04-13	<0.005
Endosulfan	µg/g	0.3	0.005	2020-04-09	2020-04-13	<0.005
Chlordane	µg/g	0.05	0.007	2020-04-09	2020-04-13	<0.007
DDE	µg/g	0.52	0.007	2020-04-09	2020-04-13	<0.007
DDD	µg/g	4.6	0.007	2020-04-09	2020-04-13	<0.007
DDT	µg/g	1.4	0.007	2020-04-09	2020-04-13	<0.007
Dieldrin	µg/g	0.088	0.005	2020-04-09	2020-04-13	<0.005
Endrin	µg/g	0.04	0.005	2020-04-09	2020-04-13	<0.005
Methoxychlor	µg/g	1.6	0.005	2020-04-09	2020-04-13	<0.005
Hexachlorobenzene	µg/g	0.66	0.005	2020-04-09	2020-04-13	<0.005
Hexachlorobutadiene	µg/g	0.031	0.01	2020-04-09	2020-04-13	<0.01
Moisture Content	%		0.1	2020-04-07	2020-04-07	8.0
Surrogate	Unit	Acceptable Limits				
TCMX	%	50-140		2020-04-09	2020-04-13	79
Decachlorobiphenyl	%	50-140		2020-04-09	2020-04-13	80

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1066582 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopowkolof

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47

SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D17 SS2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066582
F1 (C6 to C10)	µg/g	55	5	2020-04-07	2020-04-07	<5
F1 (C6 to C10) minus BTEX	µg/g	55	5	2020-04-07	2020-04-07	<5
F2 (C10 to C16)	µg/g	230	10	2020-04-08	2020-04-09	<10
F3 (C16 to C34)	µg/g	1700	50	2020-04-08	2020-04-09	72
F4 (C34 to C50)	µg/g	3300	50	2020-04-08	2020-04-09	62
Gravimetric Heavy Hydrocarbons	µg/g	3300	50			NA
Moisture Content	%		0.1	2020-04-07	2020-04-07	8.0
Surrogate	Unit	Acceptable Limits				
Terphenyl	%	60-140		2020-04-08	2020-04-09	120

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1066582 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 20T590525
PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D17 SS2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066582
Dichlorodifluoromethane	µg/g	16	0.05	2020-04-07	2020-04-08	<0.05
Vinyl Chloride	ug/g	0.032	0.02	2020-04-07	2020-04-08	<0.02
Bromomethane	ug/g	0.05	0.05	2020-04-07	2020-04-08	<0.05
Trichlorofluoromethane	ug/g	4	0.05	2020-04-07	2020-04-08	<0.05
Acetone	ug/g	16	0.50	2020-04-07	2020-04-08	<0.50
1,1-Dichloroethylene	ug/g	0.064	0.05	2020-04-07	2020-04-08	<0.05
Methylene Chloride	ug/g	1.6	0.05	2020-04-07	2020-04-08	<0.05
Trans- 1,2-Dichloroethylene	ug/g	1.3	0.05	2020-04-07	2020-04-08	<0.05
Methyl tert-butyl Ether	ug/g	1.6	0.05	2020-04-07	2020-04-08	<0.05
1,1-Dichloroethane	ug/g	0.47	0.02	2020-04-07	2020-04-08	<0.02
Methyl Ethyl Ketone	ug/g	70	0.50	2020-04-07	2020-04-08	<0.50
Cis- 1,2-Dichloroethylene	ug/g	1.9	0.02	2020-04-07	2020-04-08	<0.02
Chloroform	ug/g	0.47	0.04	2020-04-07	2020-04-08	<0.04
1,2-Dichloroethane	ug/g	0.05	0.03	2020-04-07	2020-04-08	<0.03
1,1,1-Trichloroethane	ug/g	6.1	0.05	2020-04-07	2020-04-08	<0.05
Carbon Tetrachloride	ug/g	0.21	0.05	2020-04-07	2020-04-08	<0.05
Benzene	ug/g	0.32	0.02	2020-04-07	2020-04-08	<0.02
1,2-Dichloropropane	ug/g	0.16	0.03	2020-04-07	2020-04-08	<0.03
Trichloroethylene	ug/g	0.55	0.03	2020-04-07	2020-04-08	<0.03
Bromodichloromethane	ug/g	1.5	0.05	2020-04-07	2020-04-08	<0.05
Methyl Isobutyl Ketone	ug/g	31	0.50	2020-04-07	2020-04-08	<0.50
1,1,2-Trichloroethane	ug/g	0.05	0.04	2020-04-07	2020-04-08	<0.04
Toluene	ug/g	6.4	0.05	2020-04-07	2020-04-08	<0.05
Dibromochloromethane	ug/g	2.3	0.05	2020-04-07	2020-04-08	<0.05
Ethylene Dibromide	ug/g	0.05	0.04	2020-04-07	2020-04-08	<0.04
Tetrachloroethylene	ug/g	1.9	0.05	2020-04-07	2020-04-08	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.087	0.04	2020-04-07	2020-04-08	<0.04
Chlorobenzene	ug/g	2.4	0.05	2020-04-07	2020-04-08	<0.05
Ethylbenzene	ug/g	1.1	0.05	2020-04-07	2020-04-08	<0.05
m & p-Xylene	ug/g		0.05	2020-04-07	2020-04-08	<0.05

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	BH D17 SS2
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066582
Bromoform	ug/g	0.61	0.05	2020-04-07	2020-04-08	<0.05
Styrene	ug/g	34	0.05	2020-04-07	2020-04-08	<0.05
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	2020-04-07	2020-04-08	<0.05
o-Xylene	ug/g		0.05	2020-04-07	2020-04-08	<0.05
1,3-Dichlorobenzene	ug/g	9.6	0.05	2020-04-07	2020-04-08	<0.05
1,4-Dichlorobenzene	ug/g	0.2	0.05	2020-04-07	2020-04-08	<0.05
1,2-Dichlorobenzene	ug/g	1.2	0.05	2020-04-07	2020-04-08	<0.05
Xylenes (Total)	ug/g	26	0.05	2020-04-07	2020-04-08	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g	0.059	0.04	2020-04-07	2020-04-08	<0.04
n-Hexane	µg/g	46	0.05	2020-04-07	2020-04-08	<0.05
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	50-140		2020-04-07	2020-04-08	102
4-Bromofluorobenzene	% Recovery	50-140		2020-04-07	2020-04-08	84

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1066582 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp. TCLP C
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066587
Benzo(a)pyrene	mg/L	0.001	0.001	2020-04-09	2020-04-14	<0.001
Surrogate	Unit	Acceptable Limits				
Naphthalene-d8	%	50-140			2020-04-14	97
Acenaphthene-d10	%	50-140			2020-04-14	117
Chrysene-d12	%	50-140			2020-04-14	73

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1066587 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopnukolof

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 - PCBs

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp. TCLP C
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066587
Polychlorinated Biphenyls	mg/L	0.3	0.005	2020-04-08	2020-04-09	<0.005
PCB Extr	NA			2020-04-08		Y
Surrogate	Unit	Acceptable Limits				
Decachlorobiphenyl	%	60-130		2020-04-08	2020-04-09	85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1066587 The soil sample was leached using the Regulation 558 procedure. Analysis was performed on the leachate.
PCB total is a calculated parameter. The calculated value is the sum of Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopnukolof

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 - VOCs

DATE RECEIVED: 2020-04-03

DATE REPORTED: 2020-11-13

					SAMPLE DESCRIPTION:	Comp. TCLP C
					SAMPLE TYPE:	Soil
					DATE SAMPLED:	2020-04-01
Parameter	Unit	G / S	RDL	Date Prepared	Date Analyzed	1066587
Vinyl Chloride	mg/L	0.2	0.030	2020-04-08	2020-04-09	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	2020-04-08	2020-04-09	<0.020
Dichloromethane	mg/L	5.0	0.030	2020-04-08	2020-04-09	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	2020-04-08	2020-04-09	<0.090
Chloroform	mg/L	10.0	0.020	2020-04-08	2020-04-09	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	2020-04-08	2020-04-09	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	2020-04-08	2020-04-09	<0.020
Benzene	mg/L	0.5	0.020	2020-04-08	2020-04-09	<0.020
Trichloroethene	mg/L	5.0	0.020	2020-04-08	2020-04-09	<0.020
Tetrachloroethene	mg/L	3.0	0.050	2020-04-08	2020-04-09	<0.050
Chlorobenzene	mg/L	8.0	0.010	2020-04-08	2020-04-09	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	2020-04-08	2020-04-09	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	2020-04-08	2020-04-09	<0.010
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	60-130		2020-04-08	2020-04-09	120

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

1066587 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

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Exceedance Summary

AGAT WORK ORDER: 20T590525

PROJECT: TP115086

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

ATTENTION TO: Alessandro Pellerito

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1066582	BH D17 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity (2:1)	mS/cm	1.4	1.68
1066582	BH D17 SS2	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	NA	12	12.4

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T590525
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Soil Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	1067008		2.8	4.6	NA	< 0.8	115%	70%	130%	102%	80%	120%	95%	70%	130%
Arsenic	1067008		4	4	NA	< 1	111%	70%	130%	104%	80%	120%	108%	70%	130%
Barium	1067008		147	177	18.8%	< 2	112%	70%	130%	97%	80%	120%	98%	70%	130%
Beryllium	1067008		<0.5	<0.5	NA	< 0.5	83%	70%	130%	114%	80%	120%	94%	70%	130%
Boron	1067008		10	10	NA	< 5	98%	70%	130%	101%	80%	120%	77%	70%	130%
Boron (Hot Water Extractable)	1067008		0.43	0.46	NA	< 0.10	101%	60%	140%	96%	70%	130%	97%	60%	140%
Cadmium	1067008		1.2	1.1	NA	< 0.5	109%	70%	130%	102%	80%	120%	97%	70%	130%
Chromium	1067008		21	22	NA	< 5	95%	70%	130%	96%	80%	120%	112%	70%	130%
Cobalt	1067008		5.4	5.5	1.2%	< 0.5	87%	70%	130%	96%	80%	120%	92%	70%	130%
Copper	1067008		24	24	2.0%	< 1	89%	70%	130%	100%	80%	120%	78%	70%	130%
Lead	1067008		45	49	9.5%	< 1	101%	70%	130%	94%	80%	120%	94%	70%	130%
Molybdenum	1067008		<0.5	0.5	NA	< 0.5	89%	70%	130%	92%	80%	120%	94%	70%	130%
Nickel	1067008		12	12	2.6%	< 1	92%	70%	130%	96%	80%	120%	90%	70%	130%
Selenium	1067008		<0.4	0.4	NA	< 0.4	123%	70%	130%	97%	80%	120%	97%	70%	130%
Silver	1067008		<0.2	<0.2	NA	< 0.2	102%	70%	130%	103%	80%	120%	89%	70%	130%
Thallium	1067008		<0.4	<0.4	NA	< 0.4	91%	70%	130%	100%	80%	120%	93%	70%	130%
Uranium	1067008		<0.5	<0.5	NA	< 0.5	94%	70%	130%	103%	80%	120%	100%	70%	130%
Vanadium	1067008		23	23	1.1%	< 1	96%	70%	130%	95%	80%	120%	94%	70%	130%
Zinc	1067008		289	291	0.6%	< 5	101%	70%	130%	97%	80%	120%	105%	70%	130%
Chromium, Hexavalent	1064470		<0.2	<0.2	NA	< 0.2	92%	70%	130%	84%	80%	120%	74%	70%	130%
Cyanide, Free	1064433		<0.040	<0.040	NA	< 0.040	93%	70%	130%	113%	80%	120%	111%	70%	130%
Mercury	1067008		0.11	0.12	NA	< 0.10	110%	70%	130%	108%	80%	120%	103%	70%	130%
Electrical Conductivity (2:1)	1069840		0.228	0.219	4.2%	< 0.005	109%	80%	120%						
Sodium Adsorption Ratio	1069840		0.749	0.726	3.1%	NA									
pH, 2:1 CaCl2 Extraction	1068460		7.82	7.81	0.1%	NA	101%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	1066150		<0.010	<0.010	NA	< 0.010	101%	70%	130%	98%	80%	120%	102%	70%	130%
Barium Leachate	1066150		0.104	<0.100	NA	< 0.100	97%	70%	130%	97%	80%	120%	98%	70%	130%
Boron Leachate	1066150		0.063	0.056	NA	< 0.050	95%	70%	130%	103%	80%	120%	99%	70%	130%
Cadmium Leachate	1066150		<0.010	<0.010	NA	< 0.010	97%	70%	130%	91%	80%	120%	92%	70%	130%
Chromium Leachate	1066150		<0.010	<0.010	NA	< 0.010	101%	70%	130%	97%	80%	120%	110%	70%	130%
Lead Leachate	1066150		<0.010	<0.010	NA	< 0.010	96%	70%	130%	88%	80%	120%	82%	70%	130%
Mercury Leachate	1066150		<0.01	<0.01	NA	< 0.01	100%	70%	130%	93%	80%	120%	96%	70%	130%
Selenium Leachate	1066150		<0.010	<0.010	NA	< 0.010	94%	70%	130%	89%	80%	120%	96%	70%	130%
Silver Leachate	1066150		<0.010	<0.010	NA	< 0.010	93%	70%	130%	92%	80%	120%	89%	70%	130%
Uranium Leachate	1066150		<0.050	<0.050	NA	< 0.050	98%	70%	130%	96%	80%	120%	93%	70%	130%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T590525
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Soil Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Fluoride Leachate	1066150		0.05	0.05	NA	< 0.05	101%	90%	110%	106%	90%	110%	104%	70%	130%
Cyanide Leachate	1066150		<0.05	<0.05	NA	< 0.05	99%	70%	130%	110%	80%	120%	104%	70%	130%
(Nitrate + Nitrite) as N Leachate	1066150		<0.70	<0.70	NA	< 0.70	92%	80%	120%	95%	80%	120%	93%	70%	130%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:

NIVINE BASILY

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T590525
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	1068718		< 0.05	< 0.05	NA	< 0.05	105%	50%	140%	95%	50%	140%	86%	50%	140%
Vinyl Chloride	1068718		< 0.02	< 0.02	NA	< 0.02	91%	50%	140%	97%	50%	140%	84%	50%	140%
Bromomethane	1068718		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	106%	50%	140%	98%	50%	140%
Trichlorofluoromethane	1068718		< 0.05	< 0.05	NA	< 0.05	104%	50%	140%	94%	50%	140%	107%	50%	140%
Acetone	1068718		< 0.50	< 0.50	NA	< 0.50	103%	50%	140%	104%	50%	140%	90%	50%	140%
1,1-Dichloroethylene	1068718		< 0.05	< 0.05	NA	< 0.05	83%	50%	140%	83%	60%	130%	91%	50%	140%
Methylene Chloride	1068718		< 0.05	< 0.05	NA	< 0.05	90%	50%	140%	105%	60%	130%	83%	50%	140%
Trans- 1,2-Dichloroethylene	1068718		< 0.05	< 0.05	NA	< 0.05	98%	50%	140%	99%	60%	130%	102%	50%	140%
Methyl tert-butyl Ether	1068718		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	92%	60%	130%	98%	50%	140%
1,1-Dichloroethane	1068718		< 0.02	< 0.02	NA	< 0.02	98%	50%	140%	101%	60%	130%	83%	50%	140%
Methyl Ethyl Ketone	1068718		< 0.50	< 0.50	NA	< 0.50	104%	50%	140%	99%	50%	140%	112%	50%	140%
Cis- 1,2-Dichloroethylene	1068718		< 0.02	< 0.02	NA	< 0.02	90%	50%	140%	116%	60%	130%	108%	50%	140%
Chloroform	1068718		< 0.04	< 0.04	NA	< 0.04	102%	50%	140%	107%	60%	130%	82%	50%	140%
1,2-Dichloroethane	1068718		< 0.03	< 0.03	NA	< 0.03	103%	50%	140%	83%	60%	130%	110%	50%	140%
1,1,1-Trichloroethane	1068718		< 0.05	< 0.05	NA	< 0.05	93%	50%	140%	89%	60%	130%	82%	50%	140%
Carbon Tetrachloride	1068718		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	112%	60%	130%	83%	50%	140%
Benzene	1068718		< 0.02	< 0.02	NA	< 0.02	83%	50%	140%	82%	60%	130%	102%	50%	140%
1,2-Dichloropropane	1068718		< 0.03	< 0.03	NA	< 0.03	90%	50%	140%	84%	60%	130%	83%	50%	140%
Trichloroethylene	1068718		< 0.03	< 0.03	NA	< 0.03	106%	50%	140%	82%	60%	130%	92%	50%	140%
Bromodichloromethane	1068718		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	95%	60%	130%	102%	50%	140%
Methyl Isobutyl Ketone	1068718		< 0.50	< 0.50	NA	< 0.50	110%	50%	140%	116%	50%	140%	87%	50%	140%
1,1,2-Trichloroethane	1068718		< 0.04	< 0.04	NA	< 0.04	112%	50%	140%	104%	60%	130%	110%	50%	140%
Toluene	1068718		< 0.05	< 0.05	NA	< 0.05	89%	50%	140%	80%	60%	130%	90%	50%	140%
Dibromochloromethane	1068718		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	89%	60%	130%	85%	50%	140%
Ethylene Dibromide	1068718		< 0.04	< 0.04	NA	< 0.04	104%	50%	140%	104%	60%	130%	103%	50%	140%
Tetrachloroethylene	1068718		< 0.05	< 0.05	NA	< 0.05	92%	50%	140%	83%	60%	130%	83%	50%	140%
1,1,1,2-Tetrachloroethane	1068718		< 0.04	< 0.04	NA	< 0.04	99%	50%	140%	88%	60%	130%	95%	50%	140%
Chlorobenzene	1068718		< 0.05	< 0.05	NA	< 0.05	98%	50%	140%	86%	60%	130%	94%	50%	140%
Ethylbenzene	1068718		< 0.05	< 0.05	NA	< 0.05	86%	50%	140%	73%	60%	130%	81%	50%	140%
m & p-Xylene	1068718		< 0.05	< 0.05	NA	< 0.05	88%	50%	140%	104%	60%	130%	102%	50%	140%
Bromoform	1068718		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	109%	60%	130%	103%	50%	140%
Styrene	1068718		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	82%	60%	130%	82%	50%	140%
1,1,2,2-Tetrachloroethane	1068718		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	109%	60%	130%	106%	50%	140%
o-Xylene	1068718		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	83%	60%	130%	93%	50%	140%
1,3-Dichlorobenzene	1068718		< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	82%	60%	130%	88%	50%	140%
1,4-Dichlorobenzene	1068718		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	81%	60%	130%	82%	50%	140%
1,2-Dichlorobenzene	1068718		< 0.05	< 0.05	NA	< 0.05	99%	50%	140%	84%	60%	130%	83%	50%	140%
1,3-Dichloropropene (Cis + Trans)	1068718		< 0.04	< 0.04	NA	< 0.04	110%	50%	140%	93%	60%	130%	94%	50%	140%
n-Hexane	1068718		< 0.05	< 0.05	NA	< 0.05	106%	50%	140%	83%	60%	130%	106%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T590525
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 to C10)	1066669		< 5	< 5	NA	< 5	97%	60%	140%	98%	60%	140%	98%	60%	140%
F2 (C10 to C16)	1066189		< 10	< 10	NA	< 10	113%	60%	140%	89%	60%	140%	85%	60%	140%
F3 (C16 to C34)	1066189		< 50	< 50	NA	< 50	109%	60%	140%	86%	60%	140%	98%	60%	140%
F4 (C34 to C50)	1066189		< 50	< 50	NA	< 50	96%	60%	140%	89%	60%	140%	111%	60%	140%
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	1065709		< 0.01	< 0.01	NA	< 0.01	95%	50%	140%	103%	50%	140%	103%	50%	140%
Gamma-Hexachlorocyclohexane	1065709		< 0.005	< 0.005	NA	< 0.005	93%	50%	140%	108%	50%	140%	90%	50%	140%
Heptachlor	1065709		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	93%	50%	140%	99%	50%	140%
Aldrin	1065709		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	100%	50%	140%	97%	50%	140%
Heptachlor Epoxide	1065709		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	104%	50%	140%	108%	50%	140%
Endosulfan	1065709		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	106%	50%	140%	103%	50%	140%
Chlordane	1065709		< 0.007	< 0.007	NA	< 0.007	99%	50%	140%	107%	50%	140%	106%	50%	140%
DDE	1065709		< 0.007	< 0.007	NA	< 0.007	98%	50%	140%	104%	50%	140%	108%	50%	140%
DDD	1065709		< 0.007	< 0.007	NA	< 0.007	101%	50%	140%	105%	50%	140%	105%	50%	140%
DDT	1065709		< 0.007	< 0.007	NA	< 0.007	106%	50%	140%	104%	50%	140%	90%	50%	140%
Dieldrin	1065709		< 0.005	< 0.005	NA	< 0.005	104%	50%	140%	106%	50%	140%	106%	50%	140%
Endrin	1065709		< 0.005	< 0.005	NA	< 0.005	104%	50%	140%	100%	50%	140%	100%	50%	140%
Methoxychlor	1065709		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	99%	50%	140%	104%	50%	140%
Hexachlorobenzene	1065709		< 0.005	< 0.005	NA	< 0.005	108%	50%	140%	106%	50%	140%	104%	50%	140%
Hexachlorobutadiene	1065709		< 0.01	< 0.01	NA	< 0.01	100%	50%	140%	108%	50%	140%	107%	50%	140%
O. Reg. 558 - VOCs															
Vinyl Chloride	1062440		< 0.030	< 0.030	NA	< 0.030	91%	60%	140%	97%	60%	140%	84%	60%	140%
1,1 Dichloroethene	1062440		< 0.020	< 0.020	NA	< 0.020	83%	70%	130%	83%	70%	130%	91%	60%	140%
Dichloromethane	1062440		< 0.030	< 0.030	NA	< 0.030	99%	70%	130%	85%	70%	130%	96%	60%	140%
Methyl Ethyl Ketone	1062440		< 0.090	< 0.090	NA	< 0.090	104%	70%	130%	99%	70%	130%	112%	60%	140%
Chloroform	1062440		< 0.020	< 0.020	NA	< 0.020	105%	70%	130%	110%	70%	130%	99%	60%	140%
1,2-Dichloroethane	1062440		< 0.020	< 0.020	NA	< 0.020	95%	70%	130%	109%	70%	130%	98%	60%	140%
Carbon Tetrachloride	1062440		< 0.020	< 0.020	NA	< 0.020	98%	70%	130%	102%	70%	130%	92%	60%	140%
Benzene	1062440		< 0.020	< 0.020	NA	< 0.020	83%	70%	130%	82%	70%	130%	102%	60%	140%
Trichloroethene	1062440		< 0.020	< 0.020	NA	< 0.020	112%	70%	130%	102%	70%	130%	105%	60%	140%
Tetrachloroethene	1062440		< 0.050	< 0.050	NA	< 0.050	92%	70%	130%	83%	70%	130%	83%	60%	140%
Chlorobenzene	1062440		< 0.010	< 0.010	NA	< 0.010	98%	70%	130%	86%	70%	130%	94%	60%	140%
1,2-Dichlorobenzene	1062440		< 0.010	< 0.010	NA	< 0.010	99%	70%	130%	84%	70%	130%	83%	60%	140%
1,4-Dichlorobenzene	1062440		< 0.010	< 0.010	NA	< 0.010	97%	70%	130%	81%	70%	130%	82%	60%	140%
O. Reg. 558 - Benzo(a) pyrene															
Benzo(a)pyrene	1066225		< 0.001	< 0.001	NA	< 0.001	115%	70%	130%	100%	70%	130%	NA	70%	130%
O. Reg. 558 - PCBs															

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T590525
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Nov 13, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Polychlorinated Biphenyls	1066136		< 0.005	< 0.005	NA	< 0.005	99%	60%	130%	96%	60%	130%	104%	60%	130%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T590525
PROJECT: TP115086
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Extractable)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015 and SM 4500-CN- I	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010C	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Arsenic Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Barium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Boron Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Cadmium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Chromium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Lead Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Mercury Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Selenium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Silver Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Uranium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA 1311 & modified from SM4500-F-C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA 1311 & modified from MOE 3015 & SM 4500 CN-I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA 1311 & modified from SM 4500-NO3-I	LACHAT FIA

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086
SAMPLING SITE:SP47

AGAT WORK ORDER: 20T590525
ATTENTION TO: Alessandro Pellerito
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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	modified from EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE
F1 (C6 to C10)	VOL-91-5009	modified from CCME Tier 1 Method, SW846 5035	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method, SW846 5035	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS

Method Summary

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Acetone	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 20T590525
PROJECT: TP115086
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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
1,1,2,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	modified from EPA 5035C and EPA 8260D	(P&T)GC/MS
Benzo(a)pyrene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Naphthalene-d8	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Acenaphthene-d10	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Chrysene-d12	ORG-91-5105	modified from EPA 3541 and EPA 8270E	GC/MS
Polychlorinated Biphenyls	ORG-91-5112	Regulation 558, EPA SW846 3510C/8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW846 3510C/8082	GC/ECD
PCB Extr	ORG-91-5112	EPA SW846 3510C/8082	N/A
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS

AGAT Laboratories

1/S

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Mississauga, Ontario L4Z 1Y2
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2

Laboratory Use Only

Work Order #: 20TS90525

Cooler Quantity:

Arrival Temperatures: 5.0 5.1 5.1 / 4.9 4.9 5.0

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road Units 3 and 4
Richmond Hill, ON
Phone: 6479826220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 2 *(Indicate One)*
☑Ind/Com
☐Res/Park
☐Agriculture
Soil Texture *(Check One)*
☑Coarse
☐Fine

☐ Sewer Use
☐Sanitary
☐Storm
Region ______ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086
Site Location: SP47
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact: Shami Malla
Address:
Email: GTA_EAST@woodplc.com

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

O. Reg 153

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y / N	Metals and Inorganics	☐All Metals ☐153 Metals (excl. Hydrides) ☐Hydride Metals ☐153 Metals (Incl. Hydrides)	**ORPs:** ☐B-HWS ☐Cl ☐CN ☐Cr⁶⁺ ☐EC ☐FOC ☐Hg ☐pH ☐SAR	Full Metals Scan	Regulation/Custom Metals	**Nutrients:** ☐TP ☐NH_3 ☐TKN ☐NO_3 ☐NO_2 ☐NO_3+NO_2	**Volatiles:** ☑VOC ☐BTEX ☐THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☑Total ☐Aroclors	Organochlorine Pesticides	TCLP: ☑M&I ☑VOCs ☐ABNs ☑B(a)P ☑PCBs	Sewer Use						
BH D18 SS3	1 Apr 2020	10:00	4	S			☑																			
BH D17 SS2	1 Apr 2020	10:20	4	S			☑						☑	☑				☑								
BH D17 SS4	1 Apr 2020	10:35	4	S	HOLD																					
BH C18 SS2	1 Apr 2020	11:00	4	S	HOLD																					
BH C20 SS2	1 Apr 2020	11:30	4	S	HOLD																					
BH C24 SS2	1 Apr 2020	12:30	4	S			☑																			
Comp TCLP C	1 Apr 2020		4	S															☑							

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Alessandro Pellerito	1 Apr 2020	11:55am	2020/04/03		11:20	
Samples Relinquished By (Print Name and Sign): 2020/04/03	Date	Time 3:35	Samples Received By (Print Name and Sign):	Date	Time	Page ____ of ____
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

Document ID: DIV-78-1511.015

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: March 14, 2018

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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6

ATTENTION TO: Alessandro Pellerito

PROJECT: TP115086.1.6000.5800.573000

AGAT WORK ORDER: 22T858487

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Feb 07, 2022

PAGES (INCLUDING COVER): 25

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

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Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

Corrosivity Package

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B24 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 10:40
Parameter	Unit	G / S	RDL	3464485
Chloride (2:1)	µg/g		2	54
Sulphate (2:1)	µg/g		2	68
pH (2:1)	pH Units		NA	8.15
Electrical Conductivity (2:1)	mS/cm		0.005	0.335
Resistivity (2:1) (Calculated)	ohm.cm		1	2990

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3464485 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.
Redox potential measurement in soil is quite variable and non reproducible due in part, to the general heterogeneity of a given soil. It is also related to the introduction of increased oxygen into the sample after extraction. The interpretation of soil redox potential should be considered in terms of its general range rather than as an absolute measurement.

Analysis performed at AGAT Toronto (unless marked by *)

NIVINE BASILY

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B23 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 09:10
Parameter	Unit	G / S	RDL	3464483
Antimony	µg/g		0.8	<0.8
Arsenic	µg/g		1	3
Barium	µg/g		2.0	72.3
Beryllium	µg/g		0.4	0.5
Boron	µg/g		5	7
Boron (Hot Water Soluble)	µg/g		0.10	0.44
Cadmium	µg/g		0.5	<0.5
Chromium	µg/g		5	22
Cobalt	µg/g		0.5	9.0
Copper	µg/g		1.0	19.8
Lead	µg/g		1	12
Molybdenum	µg/g		0.5	<0.5
Nickel	µg/g		1	17
Selenium	µg/g		0.8	<0.8
Silver	µg/g		0.5	<0.5
Thallium	µg/g		0.5	<0.5
Uranium	µg/g		0.50	0.52
Vanadium	µg/g		0.4	32.6
Zinc	µg/g		5	56
Chromium, Hexavalent	µg/g		0.2	<0.2
Cyanide, Free	µg/g		0.040	<0.040
Mercury	µg/g		0.10	<0.10
Electrical Conductivity (2:1)	mS/cm		0.005	0.359
Sodium Adsorption Ratio (2:1) (Calc.)	N/A		N/A	0.644
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.23

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes B

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-01-28

DATE REPORTED: 2022-02-07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3464483 EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
NIVINE BASILY
CHEMIST

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes B

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2022-01-28

DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B26 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 13:00
Parameter	Unit	G / S	RDL	3464488
Arsenic Leachate	mg/L	2.5	0.010	<0.010
Barium Leachate	mg/L	100	0.010	0.466
Boron Leachate	mg/L	500	0.050	<0.050
Cadmium Leachate	mg/L	0.5	0.010	<0.010
Chromium Leachate	mg/L	5	0.050	<0.050
Lead Leachate	mg/L	5	0.010	<0.010
Mercury Leachate	mg/L	0.1	0.01	<0.01
Selenium Leachate	mg/L	1	0.010	<0.010
Silver Leachate	mg/L	5	0.010	<0.010
Uranium Leachate	mg/L	10	0.050	<0.050
Fluoride Leachate	mg/L	150	0.10	0.18
Cyanide Leachate	mg/L	20	0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

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NIVINE BASILY

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Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes B

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2022-01-28

DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B25 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 11:20
Parameter	Unit	G / S	RDL	3464486
Hexachloroethane	µg/g		0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g		0.005	<0.005
Heptachlor	µg/g		0.005	<0.005
Aldrin	µg/g		0.005	<0.005
Heptachlor Epoxide	µg/g		0.005	<0.005
Endosulfan I	µg/g		0.005	<0.005
Endosulfan II	µg/g		0.005	<0.005
Endosulfan	µg/g		0.005	<0.005
Alpha-Chlordane	µg/g		0.005	<0.005
gamma-Chlordane	µg/g		0.005	<0.005
Chlordane	µg/g		0.007	<0.007
op'-DDE	ug/g		0.005	<0.005
pp'-DDE	µg/g		0.005	<0.005
DDE	µg/g		0.007	<0.007
op'-DDD	µg/g		0.005	<0.005
pp'-DDD	µg/g		0.005	<0.005
DDD	µg/g		0.007	<0.007
op'-DDT	µg/g		0.005	<0.005
pp'-DDT	µg/g		0.005	<0.005
DDT (Total)	µg/g		0.007	<0.007
Dieldrin	µg/g		0.005	<0.005
Endrin	µg/g		0.005	<0.005
Methoxychlor	µg/g		0.005	<0.005
Hexachlorobenzene	µg/g		0.005	<0.005
Hexachlorobutadiene	µg/g		0.01	<0.01
Moisture Content	%		0.1	17.2
wet weight OC	g		0.01	10.88

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

		SAMPLE DESCRIPTION:	BH B25 SS1
		SAMPLE TYPE:	Soil
		DATE SAMPLED:	2022-01-26 11:20
Surrogate	Unit	Acceptable Limits	3464486
TCMX	%	50-140	72
Decachlorobiphenyl	%	50-140	91

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3464486 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

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Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B28 SS2
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 14:50
Parameter	Unit	G / S	RDL	3464492
F1 (C6 - C10)	µg/g		5	<5
F1 (C6 to C10) minus BTEX	µg/g		5	<5
F2 (C10 to C16)	µg/g		10	<10
F3 (C16 to C34)	µg/g		50	<50
F4 (C34 to C50)	µg/g		50	<50
Gravimetric Heavy Hydrocarbons	µg/g		50	NA
Moisture Content	%		0.1	16.9
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		86
Terphenyl	%	60-140		99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3464492 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B28 SS2
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 14:50
Parameter	Unit	G / S	RDL	3464492
Dichlorodifluoromethane	µg/g		0.05	<0.05
Vinyl Chloride	ug/g		0.02	<0.02
Bromomethane	ug/g		0.05	<0.05
Trichlorofluoromethane	ug/g		0.05	<0.05
Acetone	ug/g		0.50	<0.50
1,1-Dichloroethylene	ug/g		0.05	<0.05
Methylene Chloride	ug/g		0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g		0.05	<0.05
Methyl tert-butyl Ether	ug/g		0.05	<0.05
1,1-Dichloroethane	ug/g		0.02	<0.02
Methyl Ethyl Ketone	ug/g		0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g		0.02	<0.02
Chloroform	ug/g		0.04	<0.04
1,2-Dichloroethane	ug/g		0.03	<0.03
1,1,1-Trichloroethane	ug/g		0.05	<0.05
Carbon Tetrachloride	ug/g		0.05	<0.05
Benzene	ug/g		0.02	<0.02
1,2-Dichloropropane	ug/g		0.03	<0.03
Trichloroethylene	ug/g		0.03	<0.03
Bromodichloromethane	ug/g		0.05	<0.05
Methyl Isobutyl Ketone	ug/g		0.50	<0.50
1,1,2-Trichloroethane	ug/g		0.04	<0.04
Toluene	ug/g		0.05	<0.05
Dibromochloromethane	ug/g		0.05	<0.05
Ethylene Dibromide	ug/g		0.04	<0.04
Tetrachloroethylene	ug/g		0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g		0.04	<0.04
Chlorobenzene	ug/g		0.05	<0.05
Ethylbenzene	ug/g		0.05	<0.05

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B28 SS2
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 14:50
Parameter	Unit	G / S	RDL	3464492
m & p-Xylene	ug/g		0.05	<0.05
Bromoform	ug/g		0.05	<0.05
Styrene	ug/g		0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g		0.05	<0.05
o-Xylene	ug/g		0.05	<0.05
1,3-Dichlorobenzene	ug/g		0.05	<0.05
1,4-Dichlorobenzene	ug/g		0.05	<0.05
1,2-Dichlorobenzene	ug/g		0.05	<0.05
Xylenes (Total)	ug/g		0.05	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g		0.04	<0.04
n-Hexane	µg/g		0.05	<0.05
Moisture Content	%		0.1	16.9
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		90
4-Bromofluorobenzene	% Recovery	50-140		88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3464492 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B26 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 13:00
Parameter	Unit	G / S	RDL	3464488
Benzo(a)pyrene Leachate	mg/L	0.001	0.001	<0.001
Surrogate	Unit	Acceptable Limits		
Acridine-d9	%	50-140		74
Naphthalene-d8	%	50-140		86
Terphenyl-d14	%	50-140		115

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

3464488 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

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ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

O. Reg. 558 - PCBs

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B26 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 13:00
Parameter	Unit	G / S	RDL	3464488
PCB's Leachate	mg/L	0.3	0.005	<0.005
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	50-140		108

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

3464488 The soil sample was leached using the Regulation 558 procedure. Analysis was performed on the leachate.
PCB total is a calculated parameter. The calculated value is the sum of Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000

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SAMPLING SITE:SP47/Boreholes B
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

O. Reg. 558 - VOCs

DATE RECEIVED: 2022-01-28
DATE REPORTED: 2022-02-07

			SAMPLE DESCRIPTION:	BH B26 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-26 13:00
Parameter	Unit	G / S	RDL	3464488
Vinyl Chloride Leachate	mg/L	0.2	0.030	<0.030
1,1 Dichloroethene Leachate	mg/L	1.4	0.020	<0.020
Dichloromethane Leachate	mg/L	5.0	0.030	<0.030
Methyl Ethyl Ketone Leachate	mg/L	200	0.090	<0.090
Chloroform Leachate	mg/L	10.0	0.020	<0.020
1,2-Dichloroethane Leachate	mg/L	0.5	0.020	<0.020
Carbon Tetrachloride Leachate	mg/L	0.5	0.020	<0.020
Benzene Leachate	mg/L	0.5	0.020	<0.020
Trichloroethene Leachate	mg/L	5.0	0.020	<0.020
Tetrachloroethene Leachate	mg/L	3.0	0.050	<0.050
Chlorobenzene Leachate	mg/L	8.0	0.010	<0.010
1,2-Dichlorobenzene Leachate	mg/L	20.0	0.010	<0.010
1,4-Dichlorobenzene Leachate	mg/L	0.5	0.010	<0.010
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		97
4-Bromofluorobenzene	% Recovery	50-140		88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

3464488 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

Soil Analysis

RPT Date: Feb 07, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	3464318		<0.8	<0.8	NA	< 0.8	127%	70%	130%	100%	80%	120%	94%	70%	130%
Arsenic	3464318		3	4	NA	< 1	119%	70%	130%	100%	80%	120%	113%	70%	130%
Barium	3464318		40.1	42.3	5.3%	< 2.0	113%	70%	130%	102%	80%	120%	114%	70%	130%
Beryllium	3464318		<0.4	<0.4	NA	< 0.4	92%	70%	130%	83%	80%	120%	93%	70%	130%
Boron	3464318		7	8	NA	< 5	83%	70%	130%	93%	80%	120%	102%	70%	130%
Boron (Hot Water Soluble)	3457204		0.10	0.11	NA	< 0.10	107%	60%	140%	103%	70%	130%	110%	60%	140%
Cadmium	3464318		<0.5	<0.5	NA	< 0.5	110%	70%	130%	100%	80%	120%	109%	70%	130%
Chromium	3464318		15	15	NA	< 5	102%	70%	130%	102%	80%	120%	112%	70%	130%
Cobalt	3464318		4.9	4.2	15.4%	< 0.5	105%	70%	130%	102%	80%	120%	118%	70%	130%
Copper	3464318		8.5	8.4	1.2%	< 1.0	100%	70%	130%	109%	80%	120%	111%	70%	130%
Lead	3464318		4	4	NA	< 1	107%	70%	130%	109%	80%	120%	106%	70%	130%
Molybdenum	3464318		1.2	1.2	NA	< 0.5	114%	70%	130%	108%	80%	120%	126%	70%	130%
Nickel	3464318		6	6	0.0%	< 1	103%	70%	130%	103%	80%	120%	113%	70%	130%
Selenium	3464318		<0.8	<0.8	NA	< 0.8	120%	70%	130%	96%	80%	120%	114%	70%	130%
Silver	3464318		<0.5	<0.5	NA	< 0.5	106%	70%	130%	108%	80%	120%	100%	70%	130%
Thallium	3464318		<0.5	<0.5	NA	< 0.5	107%	70%	130%	103%	80%	120%	98%	70%	130%
Uranium	3464318		<0.50	<0.50	NA	< 0.50	112%	70%	130%	106%	80%	120%	109%	70%	130%
Vanadium	3464318		27.4	28.1	2.5%	< 0.4	113%	70%	130%	102%	80%	120%	113%	70%	130%
Zinc	3464318		30	33	9.5%	< 5	108%	70%	130%	105%	80%	120%	123%	70%	130%
Chromium, Hexavalent	3463940		<0.2	<0.2	NA	< 0.2	104%	70%	130%	90%	80%	120%	107%	70%	130%
Cyanide, Free	3464980		<0.040	<0.040	NA	< 0.040	105%	70%	130%	102%	80%	120%	101%	70%	130%
Mercury	3464318		0.17	0.16	NA	< 0.10	109%	70%	130%	100%	80%	120%	103%	70%	130%
Electrical Conductivity (2:1)	3471930		0.146	0.154	5.3%	< 0.005	105%	80%	120%						
Sodium Adsorption Ratio (2:1) (Calc.)	3457204		0.115	0.116	0.9%	NA									
pH, 2:1 CaCl2 Extraction	3464999		6.23	6.27	0.6%	NA	99%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Corrosivity Package															
Chloride (2:1)	3459198		15	15	0.0%	< 2	92%	70%	130%	107%	80%	120%	100%	70%	130%
Sulphate (2:1)	3459198		112	107	4.6%	< 2	99%	70%	130%	102%	80%	120%	101%	70%	130%
pH (2:1)	3459198		8.16	8.17	0.1%	NA	100%	80%	120%						
Electrical Conductivity (2:1)	3471930		0.146	0.154	5.3%	< 0.005	105%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	3460977		<0.010	<0.010	NA	< 0.010	94%	70%	130%	120%	80%	120%	128%	70%	130%
Barium Leachate	3460977		0.243	0.245	0.9%	< 0.010	100%	70%	130%	107%	80%	120%	116%	70%	130%
Boron Leachate	3460977		<0.050	<0.050	NA	< 0.050	106%	70%	130%	99%	80%	120%	116%	70%	130%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086.1.6000.5800.573000

SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:Ramin Zanganeh

Soil Analysis (Continued)

RPT Date: Feb 07, 2022

PARAMETER	Batch	Sample Id	DUPLICATE Dup #1	DUPLICATE Dup #2	DUPLICATE RPD	Method Blank	REFERENCE MATERIAL Measured Value	REFERENCE MATERIAL Acceptable Limits Lower	REFERENCE MATERIAL Acceptable Limits Upper	METHOD BLANK SPIKE Recovery	METHOD BLANK SPIKE Acceptable Limits Lower	METHOD BLANK SPIKE Acceptable Limits Upper	MATRIX SPIKE Recovery	MATRIX SPIKE Acceptable Limits Lower	MATRIX SPIKE Acceptable Limits Upper
Cadmium Leachate	3460977		<0.010	<0.010	NA	< 0.010	101%	70%	130%	106%	80%	120%	109%	70%	130%
Chromium Leachate	3460977		<0.050	<0.050	NA	< 0.050	101%	70%	130%	120%	80%	120%	121%	70%	130%
Lead Leachate	3460977		0.015	0.015	NA	< 0.010	104%	70%	130%	104%	80%	120%	102%	70%	130%
Mercury Leachate	3460977		<0.01	<0.01	NA	< 0.01	96%	70%	130%	90%	80%	120%	99%	70%	130%
Selenium Leachate	3460977		<0.010	<0.010	NA	< 0.010	102%	70%	130%	119%	80%	120%	117%	70%	130%
Silver Leachate	3460977		<0.010	<0.010	NA	< 0.010	100%	70%	130%	101%	80%	120%	104%	70%	130%
Uranium Leachate	3460977		<0.050	<0.050	NA	< 0.050	100%	70%	130%	108%	80%	120%	108%	70%	130%
Fluoride Leachate	3460977		0.24	0.24	NA	< 0.10	100%	90%	110%	102%	90%	110%	97%	70%	130%
Cyanide Leachate	3460977		<0.05	<0.05	NA	< 0.05	100%	70%	130%	94%	80%	120%	114%	70%	130%
(Nitrate + Nitrite) as N Leachate	3460977		<0.70	<0.70	NA	< 0.70	98%	80%	120%	94%	80%	120%	92%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:

NIVINE BASILY

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

Trace Organics Analysis

RPT Date: Feb 07, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	3451885		< 0.01	< 0.01	NA	< 0.01	88%	50%	140%	81%	50%	140%	79%	50%	140%
Gamma-Hexachlorocyclohexane	3451885		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	80%	50%	140%	86%	50%	140%
Heptachlor	3451885		< 0.005	< 0.005	NA	< 0.005	80%	50%	140%	81%	50%	140%	74%	50%	140%
Aldrin	3451885		< 0.005	< 0.005	NA	< 0.005	97%	50%	140%	83%	50%	140%	79%	50%	140%
Heptachlor Epoxide	3451885		< 0.005	< 0.005	NA	< 0.005	96%	50%	140%	86%	50%	140%	74%	50%	140%
Endosulfan I	3451885		< 0.005	< 0.005	NA	< 0.005	94%	50%	140%	74%	50%	140%	72%	50%	140%
Endosulfan II	3451885		< 0.005	< 0.005	NA	< 0.005	96%	50%	140%	78%	50%	140%	76%	50%	140%
Alpha-Chlordane	3451885		< 0.005	< 0.005	NA	< 0.005	95%	50%	140%	88%	50%	140%	76%	50%	140%
gamma-Chlordane	3451885		< 0.005	< 0.005	NA	< 0.005	95%	50%	140%	80%	50%	140%	74%	50%	140%
op'-DDE	3451885		< 0.005	< 0.005	NA	< 0.005	85%	50%	140%	90%	50%	140%	75%	50%	140%
pp'-DDE	3451885		< 0.005	< 0.005	NA	< 0.005	86%	50%	140%	81%	50%	140%	70%	50%	140%
op'-DDD	3451885		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	91%	50%	140%	86%	50%	140%
pp'-DDD	3451885		< 0.005	< 0.005	NA	< 0.005	80%	50%	140%	82%	50%	140%	82%	50%	140%
op'-DDT	3451885		< 0.005	< 0.005	NA	< 0.005	91%	50%	140%	83%	50%	140%	75%	50%	140%
pp'-DDT	3451885		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	79%	50%	140%	70%	50%	140%
Dieldrin	3451885		< 0.005	< 0.005	NA	< 0.005	93%	50%	140%	84%	50%	140%	72%	50%	140%
Endrin	3451885		< 0.005	< 0.005	NA	< 0.005	85%	50%	140%	80%	50%	140%	78%	50%	140%
Methoxychlor	3451885		< 0.005	< 0.005	NA	< 0.005	96%	50%	140%	73%	50%	140%	82%	50%	140%
Hexachlorobenzene	3451885		< 0.005	< 0.005	NA	< 0.005	94%	50%	140%	83%	50%	140%	87%	50%	140%
Hexachlorobutadiene	3451885		< 0.01	< 0.01	NA	< 0.01	100%	50%	140%	80%	50%	140%	79%	50%	140%
O. Reg. 558 - PCBs															
PCB's Leachate	3464488	3464488	< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	86%	50%	140%	101%	50%	140%
O. Reg. 558 - VOCs															
Vinyl Chloride Leachate	3462584		<0.030	<0.030	NA	< 0.030	90%	50%	140%	106%	50%	140%	106%	50%	140%
1,1 Dichloroethene Leachate	3462584		<0.020	<0.020	NA	< 0.020	111%	50%	140%	99%	60%	130%	96%	50%	140%
Dichloromethane Leachate	3462584		<0.030	<0.030	NA	< 0.030	93%	50%	140%	113%	60%	130%	107%	50%	140%
Methyl Ethyl Ketone Leachate	3462584		<0.090	<0.090	NA	< 0.090	93%	50%	140%	115%	50%	140%	102%	50%	140%
Chloroform Leachate	3462584		<0.020	<0.020	NA	< 0.020	105%	50%	140%	108%	60%	130%	91%	50%	140%
1,2-Dichloroethane Leachate	3462584		<0.020	<0.020	NA	< 0.020	86%	50%	140%	92%	60%	130%	86%	50%	140%
Carbon Tetrachloride Leachate	3462584		<0.020	<0.020	NA	< 0.020	80%	50%	140%	81%	60%	130%	85%	50%	140%
Benzene Leachate	3462584		<0.020	<0.020	NA	< 0.020	95%	50%	140%	94%	60%	130%	86%	50%	140%
Trichloroethene Leachate	3462584		<0.020	<0.020	NA	< 0.020	93%	50%	140%	92%	60%	130%	88%	50%	140%
Tetrachloroethene Leachate	3462584		<0.050	<0.050	NA	< 0.050	87%	50%	140%	87%	60%	130%	93%	50%	140%
Chlorobenzene Leachate	3462584		<0.010	<0.010	NA	< 0.010	89%	50%	140%	91%	60%	130%	96%	50%	140%
1,2-Dichlorobenzene Leachate	3462584		<0.010	<0.010	NA	< 0.010	88%	50%	140%	90%	60%	130%	93%	50%	140%
1,4-Dichlorobenzene Leachate	3462584		<0.010	<0.010	NA	< 0.010	92%	50%	140%	98%	60%	130%	101%	50%	140%
O. Reg. 558 - Benzo(a) pyrene															
Benzo(a)pyrene Leachate	3453767		<0.001	<0.001	NA	< 0.001	78%	50%	140%	89%	50%	140%	114%	50%	140%

Quality Assurance

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SAMPLING SITE:SP47/Boreholes B

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ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

Trace Organics Analysis (Continued)

RPT Date: Feb 07, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 - C10)	3464492		NA	NA	NA	< 5	99%	60%	140%	NA	60%	140%	NA	60%	140%
F2 (C10 to C16)	3451889		< 10	< 10	NA	< 10	96%	60%	140%	115%	60%	140%	65%	60%	140%
F3 (C16 to C34)	3451889		< 50	< 50	NA	< 50	89%	60%	140%	117%	60%	140%	68%	60%	140%
F4 (C34 to C50)	3451889		< 50	< 50	NA	< 50	89%	60%	140%	122%	60%	140%	72%	60%	140%
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	3464980		<0.05	<0.05	NA	< 0.05	60%	50%	140%	81%	50%	140%	85%	50%	140%
Vinyl Chloride	3464980		<0.02	<0.02	NA	< 0.02	104%	50%	140%	109%	50%	140%	109%	50%	140%
Bromomethane	3464980		<0.05	<0.05	NA	< 0.05	80%	50%	140%	82%	50%	140%	80%	50%	140%
Trichlorofluoromethane	3464980		<0.05	<0.05	NA	< 0.05	74%	50%	140%	77%	50%	140%	92%	50%	140%
Acetone	3464980		<0.50	<0.50	NA	< 0.50	114%	50%	140%	104%	50%	140%	106%	50%	140%
1,1-Dichloroethylene	3464980		<0.05	<0.05	NA	< 0.05	77%	50%	140%	80%	60%	130%	83%	50%	140%
Methylene Chloride	3464980		<0.05	<0.05	NA	< 0.05	71%	50%	140%	74%	60%	130%	74%	50%	140%
Trans- 1,2-Dichloroethylene	3464980		<0.05	<0.05	NA	< 0.05	76%	50%	140%	84%	60%	130%	79%	50%	140%
Methyl tert-butyl Ether	3464980		<0.05	<0.05	NA	< 0.05	74%	50%	140%	77%	60%	130%	83%	50%	140%
1,1-Dichloroethane	3464980		<0.02	<0.02	NA	< 0.02	74%	50%	140%	86%	60%	130%	83%	50%	140%
Methyl Ethyl Ketone	3464980		<0.50	<0.50	NA	< 0.50	90%	50%	140%	93%	50%	140%	96%	50%	140%
Cis- 1,2-Dichloroethylene	3464980		<0.02	<0.02	NA	< 0.02	71%	50%	140%	84%	60%	130%	80%	50%	140%
Chloroform	3464980		<0.04	<0.04	NA	< 0.04	80%	50%	140%	94%	60%	130%	91%	50%	140%
1,2-Dichloroethane	3464980		<0.03	<0.03	NA	< 0.03	74%	50%	140%	85%	60%	130%	92%	50%	140%
1,1,1-Trichloroethane	3464980		<0.05	<0.05	NA	< 0.05	75%	50%	140%	85%	60%	130%	91%	50%	140%
Carbon Tetrachloride	3464980		<0.05	<0.05	NA	< 0.05	79%	50%	140%	79%	60%	130%	76%	50%	140%
Benzene	3464980		<0.02	<0.02	NA	< 0.02	73%	50%	140%	74%	60%	130%	86%	50%	140%
1,2-Dichloropropane	3464980		<0.03	<0.03	NA	< 0.03	80%	50%	140%	78%	60%	130%	81%	50%	140%
Trichloroethylene	3464980		<0.03	<0.03	NA	< 0.03	91%	50%	140%	75%	60%	130%	81%	50%	140%
Bromodichloromethane	3464980		<0.05	<0.05	NA	< 0.05	74%	50%	140%	78%	60%	130%	77%	50%	140%
Methyl Isobutyl Ketone	3464980		<0.50	<0.50	NA	< 0.50	87%	50%	140%	93%	50%	140%	102%	50%	140%
1,1,2-Trichloroethane	3464980		<0.04	<0.04	NA	< 0.04	110%	50%	140%	94%	60%	130%	100%	50%	140%
Toluene	3464980		<0.05	<0.05	NA	< 0.05	116%	50%	140%	90%	60%	130%	86%	50%	140%
Dibromochloromethane	3464980		<0.05	<0.05	NA	< 0.05	101%	50%	140%	83%	60%	130%	84%	50%	140%
Ethylene Dibromide	3464980		<0.04	<0.04	NA	< 0.04	95%	50%	140%	86%	60%	130%	92%	50%	140%
Tetrachloroethylene	3464980		<0.05	<0.05	NA	< 0.05	105%	50%	140%	80%	60%	130%	87%	50%	140%
1,1,1,2-Tetrachloroethane	3464980		<0.04	<0.04	NA	< 0.04	97%	50%	140%	88%	60%	130%	83%	50%	140%
Chlorobenzene	3464980		<0.05	<0.05	NA	< 0.05	106%	50%	140%	89%	60%	130%	84%	50%	140%
Ethylbenzene	3464980		<0.05	<0.05	NA	< 0.05	102%	50%	140%	77%	60%	130%	71%	50%	140%
m & p-Xylene	3464980		<0.05	<0.05	NA	< 0.05	106%	50%	140%	99%	60%	130%	91%	50%	140%
Bromoform	3464980		<0.05	<0.05	NA	< 0.05	104%	50%	140%	93%	60%	130%	95%	50%	140%
Styrene	3464980		<0.05	<0.05	NA	< 0.05	84%	50%	140%	71%	60%	130%	74%	50%	140%
1,1,2,2-Tetrachloroethane	3464980		<0.05	<0.05	NA	< 0.05	107%	50%	140%	102%	60%	130%	101%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

Trace Organics Analysis (Continued)

RPT Date: Feb 07, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
o-Xylene	3464980		<0.05	<0.05	NA	< 0.05	117%	50%	140%	90%	60%	130%	84%	50%	140%
1,3-Dichlorobenzene	3464980		<0.05	<0.05	NA	< 0.05	96%	50%	140%	99%	60%	130%	93%	50%	140%
1,4-Dichlorobenzene	3464980		<0.05	<0.05	NA	< 0.05	105%	50%	140%	99%	60%	130%	92%	50%	140%
1,2-Dichlorobenzene	3464980		<0.05	<0.05	NA	< 0.05	104%	50%	140%	89%	60%	130%	89%	50%	140%
n-Hexane	3464980		<0.05	<0.05	NA	< 0.05	108%	50%	140%	98%	60%	130%	99%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086.1.6000.5800.573000

SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:Ramin Zanganeh

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Arsenic Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Barium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Boron Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Cadmium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Chromium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Lead Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Mercury Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Selenium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Silver Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Uranium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA 1311 & modified from SM4500-F-C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA 1311 modified from MOE 3015 SM 4500 CN-I,G387	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & modified from SM 4500 - NO3- I	LACHAT FIA

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Heptachlor	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Aldrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Heptachlor Epoxide	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan I	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan II	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
Alpha-Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
gamma-Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
op'-DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
op'-DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
op'-DDT	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDT	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDT (Total)	ORG-91-5113	modified from EPA 3570, 3620C & 8081B	CALCULATION
Dieldrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Methoxychlor	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Hexachlorobenzene	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Hexachlorobutadiene	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
TCMX	ORG-91-5112	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Decachlorobiphenyl	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
wet weight OC	ORG-91-5113		BALANCE
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Acetone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T858487
PROJECT: TP115086.1.6000.5800.573000
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes B
SAMPLED BY:Ramin Zanganeh

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Toluene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	modified from EPA 5035A & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	modified from EPA 5035A & EPA 8260D	(P&T)GC/MS
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Benzo(a)pyrene Leachate	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Acridine-d9	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Naphthalene-d8	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Terphenyl-d14	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
PCB's Leachate	ORG-91-5112	Regulation 558, EPA SW846 3510C/8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW846 3510C/8082	GC/ECD
Vinyl Chloride Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,1 Dichloroethene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes B

AGAT WORK ORDER: 22T858487
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Ramin Zanganeh

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Dichloromethane Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Chloroform Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Benzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Trichloroethene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Tetrachloroethene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Chlorobenzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 22T858487.

Cooler Quantity:

Arrival Temperatures: 3.7 | 3.5 | 3.5
2.8 | 2.5 | 2.3

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Richmond Hill, ON, L4B 3K6
Phone: 647-982-6220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

(Please check all applicable boxes)

☑ Regulation 153/04
Table ______ *Indicate One*
☐Ind/Com
☐Res/Park
☑Agriculture
Soil Texture *(Check One)*
☐Coarse
☐Fine

☐ Excess Soils R406
Table ______ *Indicate One*
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐Sanitary ☐Storm
______ *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ *Indicate One*

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☑ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT **(Rush Surcharges Apply)**

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1.6000.5800.573000
Site Location: SP47/Boreholes B
Sampled By: Ramin Zanganeh
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood PLC
Contact:
Address:
Email: APInvoice.Canada <apinvoice.canada@woodplc.com>

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled		# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y / N	O. Reg 153 Metals & Inorganics	O. Reg 153 Metals - ☐CrVI, ☐Hg, ☐HWSB	O. Reg 153 BTEX, F1-F4 PHCs Analyze F4G if required ☐Yes ☐No	PAHs	PCBs	VOC	O. Reg 558 Landfill Disposal Characterization TCLP: TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	O. Reg 406 Excess Soils SPLP Rainwater Leach SPLP: ☐Metals ☐VOCs ☐SVOCs	O. Reg 406 Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	OC pesticides	CORROSIVITY	TCLP M/I, PCB, VOC	TCLP B(a)P				Potentially Hazardous or High Concentration (Y/N)
BH B23 SS1	26 Jan 22	9:10	AM PM	1	S			☑																	
BH B23 SS2	26 Jan 22	9:15	AM PM	1	S	HOLD																			
BH B24 SS1	26 Jan 22	10:40	AM PM	1	S														☑						
BH B25 SS1	26 Jan 22	11:20	AM PM	1	S													☑							
BH B25 SS2	26 Jan 22	11:25	AM PM	1	S	HOLD																			
BH B26 SS1	26 Jan 22	13:00	AM PM	1	S															☑	✓				
BH B27 SS1	26 Jan 22	14:15	AM PM	1	S	HOLD																			
BH B27 SS2	26 Jan 22	14:20	AM PM	3	S	HOLD																			
BH B28 SS1	26 Jan 22	14:45	AM PM	1	S	HOLD																			
BH B28 SS2	26 Jan 22	14:50	AM PM	2	S					☑			☑												
			AM PM																						

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	
Ramin Zanganeh	27 January 20	1PM		11:11am		
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	Page 1 of 1
Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	Nº:

Pink Copy - Client I Yellow Copy - AGAT I White Copy- AGAT

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086.1.6000.5139.57
AGAT WORK ORDER: 22T853859
SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
DATE REPORTED: Jan 24, 2022
PAGES (INCLUDING COVER): 20
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 22T853859
PROJECT: TP115086.1.6000.5139.57

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47 Boreholes/E-W
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

Inorganic Chemistry (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-24

			SAMPLE DESCRIPTION:	E31 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-13 11:00
Parameter	Unit	G / S	RDL	3428929
Chloride (2:1)	µg/g		2	20
Sulphate (2:1)	µg/g		2	40
pH (2:1)	pH Units		NA	7.58
Electrical Conductivity (2:1)	mS/cm		0.005	0.235
Resistivity (2:1) (Calculated)	ohm.cm		1	4260

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3428929 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
AMANJOT BHELA
CHEMIST

Certificate of Analysis

AGAT WORK ORDER: 22T853859
PROJECT: TP115086.1.6000.5139.57

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47 Boreholes/E-W
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-24

			SAMPLE DESCRIPTION:	E23 SS1	E25 SS1	E27 SS1	E29 SS1	E30 SS1	E32 SS1	DUP1
			SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			DATE SAMPLED:	2022-01-13 14:50	2022-01-13 13:50	2022-01-13 12:30	2022-01-13 09:10	2022-01-13 09:35	2022-01-13 11:20	2022-01-13
Parameter	Unit	G / S	RDL	3428908	3428911	3428915	3428919	3428927	3428933	3428935
Antimony	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g		1	4	5	5	4	4	3	3
Barium	µg/g		2.0	105	90.6	166	151	137	78.5	79.4
Beryllium	µg/g		0.4	0.7	0.7	1.0	0.7	0.7	0.5	0.6
Boron	µg/g		5	7	10	9	11	10	7	7
Boron (Hot Water Soluble)	µg/g		0.10	<0.10	0.28	0.12	<0.10	<0.10	<0.10	<0.10
Cadmium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g		5	26	29	38	34	36	23	25
Cobalt	µg/g		0.5	9.0	14.0	14.3	12.2	14.3	7.5	8.0
Copper	µg/g		1.0	15.8	23.7	25.4	20.5	23.8	14.4	16.5
Lead	µg/g		1	11	13	15	11	13	8	9
Molybdenum	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g		1	18	31	30	25	28	17	19
Selenium	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Silver	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Uranium	µg/g		0.50	0.76	0.58	1.62	0.67	0.70	0.59	0.59
Vanadium	µg/g		0.4	40.2	40.3	54.0	45.4	51.0	34.9	35.8
Zinc	µg/g		5	46	62	104	58	67	43	46
Chromium, Hexavalent	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanide, Free	µg/g		0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm		0.005	0.206	0.221	0.245	0.218	0.250	0.244	0.263
Sodium Adsorption Ratio (2:1) (Calc.)	N/A		N/A	0.368	0.767	0.304	0.237	0.266	0.809	0.815
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.58	7.35	7.28	6.72	7.06	7.09	7.11

Certified By:

Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-24

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard
3428908-3428935	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Amanjot Bhela

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CHEMIST

Certificate of Analysis

AGAT WORK ORDER: 22T853859
PROJECT: TP115086.1.6000.5139.57

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47 Boreholes/E-W
SAMPLED BY:MS

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-24

			SAMPLE DESCRIPTION:	E24 SS1	E26 SS1	E28 SS2	E32 SS2	DUP2
			SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
			DATE SAMPLED:	2022-01-13 14:25	2022-01-13 12:50	2022-01-13 12:05	2022-01-13 11:25	2022-01-13
Parameter	Unit	G / S	RDL	3428909	3428912	3428918	3428934	3428936
Hexachloroethane	µg/g		0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan I	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan II	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Alpha-Chlordane	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
gamma-Chlordane	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlordane	µg/g		0.007	<0.007	<0.007	<0.007	<0.007	<0.007
op'-DDE	ug/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
pp'-DDE	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
DDE	µg/g		0.007	<0.007	<0.007	<0.007	<0.007	<0.007
op'-DDD	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
pp'-DDD	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
DDD	µg/g		0.007	<0.007	<0.007	<0.007	<0.007	<0.007
op'-DDT	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
pp'-DDT	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
DDT (Total)	µg/g		0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Dieldrin	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g		0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g		0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	20.7	13.6	12.9	10.6	12.1
wet weight OC	g		0.01	10.41	10.05	10.75	10.51	10.67

Certified By:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-24

		SAMPLE DESCRIPTION:	E24 SS1	E26 SS1	E28 SS2	E32 SS2	DUP2
		SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:	2022-01-13 14:25	2022-01-13 12:50	2022-01-13 12:05	2022-01-13 11:25	2022-01-13
Surrogate	Unit	Acceptable Limits	3428909	3428912	3428918	3428934	3428936
TCMX	%	50-140	91	103	82	95	104
Decachlorobiphenyl	%	50-140	100	104	87	107	108

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3428909-3428936 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopnukolof

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47 Boreholes/E-W
SAMPLED BY:MS

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-24

			SAMPLE DESCRIPTION:	E27 SS2	DUP3
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2022-01-13 12:35	2022-01-13
Parameter	Unit	G / S	RDL	3428916	3428937
F1 (C6 - C10)	µg/g		5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g		5	<5	<5
F2 (C10 to C16)	µg/g		10	<10	<10
F3 (C16 to C34)	µg/g		50	<50	<50
F4 (C34 to C50)	µg/g		50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g		50	NA	NA
Moisture Content	%		0.1	12.2	12.4
Surrogate	Unit	Acceptable Limits			
Toluene-d8	% Recovery	50-140		86	91
Terphenyl	%	60-140		98	89

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3428916-3428937 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukolof

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-24

			SAMPLE DESCRIPTION:	E27 SS2	DUP3
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2022-01-13 12:35	2022-01-13
Parameter	Unit	G / S	RDL	3428916	3428937
Dichlorodifluoromethane	µg/g		0.05	<0.05	<0.05
Vinyl Chloride	ug/g		0.02	<0.02	<0.02
Bromomethane	ug/g		0.05	<0.05	<0.05
Trichlorofluoromethane	ug/g		0.05	<0.05	<0.05
Acetone	ug/g		0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/g		0.05	<0.05	<0.05
Methylene Chloride	ug/g		0.05	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g		0.05	<0.05	<0.05
Methyl tert-butyl Ether	ug/g		0.05	<0.05	<0.05
1,1-Dichloroethane	ug/g		0.02	<0.02	<0.02
Methyl Ethyl Ketone	ug/g		0.50	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g		0.02	<0.02	<0.02
Chloroform	ug/g		0.04	<0.04	<0.04
1,2-Dichloroethane	ug/g		0.03	<0.03	<0.03
1,1,1-Trichloroethane	ug/g		0.05	<0.05	<0.05
Carbon Tetrachloride	ug/g		0.05	<0.05	<0.05
Benzene	ug/g		0.02	<0.02	<0.02
1,2-Dichloropropane	ug/g		0.03	<0.03	<0.03
Trichloroethylene	ug/g		0.03	<0.03	<0.03
Bromodichloromethane	ug/g		0.05	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g		0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/g		0.04	<0.04	<0.04
Toluene	ug/g		0.05	<0.05	<0.05
Dibromochloromethane	ug/g		0.05	<0.05	<0.05
Ethylene Dibromide	ug/g		0.04	<0.04	<0.04
Tetrachloroethylene	ug/g		0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g		0.04	<0.04	<0.04
Chlorobenzene	ug/g		0.05	<0.05	<0.05
Ethylbenzene	ug/g		0.05	<0.05	<0.05

Certified By: NPopukolof

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47 Boreholes/E-W
SAMPLED BY:MS

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-24

			SAMPLE DESCRIPTION:	E27 SS2	DUP3
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2022-01-13 12:35	2022-01-13
Parameter	Unit	G / S	RDL	3428916	3428937
m & p-Xylene	ug/g		0.05	<0.05	<0.05
Bromoform	ug/g		0.05	<0.05	<0.05
Styrene	ug/g		0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g		0.05	<0.05	<0.05
o-Xylene	ug/g		0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g		0.05	<0.05	<0.05
1,4-Dichlorobenzene	ug/g		0.05	<0.05	<0.05
1,2-Dichlorobenzene	ug/g		0.05	<0.05	<0.05
Xylenes (Total)	ug/g		0.05	<0.05	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g		0.04	<0.04	<0.04
n-Hexane	µg/g		0.05	<0.05	<0.05
Moisture Content	%		0.1	12.2	12.4
Surrogate	Unit	Acceptable Limits			
Toluene-d8	% Recovery	50-140		103	102
4-Bromofluorobenzene	% Recovery	50-140		98	97

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3428916-3428937 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukoloff

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MISSISSAUGA, ONTARIO
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TEL (905)712-5100
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Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5139.57
SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

Soil Analysis

RPT Date: Jan 24, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	3428908	3428908	<0.8	<0.8	NA	< 0.8	99%	70%	130%	97%	80%	120%	99%	70%	130%
Arsenic	3428908	3428908	4	4	NA	< 1	103%	70%	130%	103%	80%	120%	105%	70%	130%
Barium	3428908	3428908	105	108	2.8%	< 2.0	102%	70%	130%	111%	80%	120%	106%	70%	130%
Beryllium	3428908	3428908	0.7	0.7	NA	< 0.4	98%	70%	130%	91%	80%	120%	83%	70%	130%
Boron	3428908	3428908	7	6	NA	< 5	101%	70%	130%	93%	80%	120%	80%	70%	130%
Boron (Hot Water Soluble)	3428778		0.10	0.10	NA	< 0.10	101%	60%	140%	91%	70%	130%	104%	60%	140%
Cadmium	3428908	3428908	<0.5	<0.5	NA	< 0.5	97%	70%	130%	104%	80%	120%	103%	70%	130%
Chromium	3428908	3428908	26	28	7.4%	< 5	93%	70%	130%	108%	80%	120%	113%	70%	130%
Cobalt	3428908	3428908	9.0	9.3	3.3%	< 0.5	100%	70%	130%	110%	80%	120%	110%	70%	130%
Copper	3428908	3428908	15.8	16.6	4.9%	< 1.0	100%	70%	130%	110%	80%	120%	110%	70%	130%
Lead	3428908	3428908	11	12	8.7%	< 1	105%	70%	130%	110%	80%	120%	103%	70%	130%
Molybdenum	3428908	3428908	<0.5	<0.5	NA	< 0.5	103%	70%	130%	110%	80%	120%	109%	70%	130%
Nickel	3428908	3428908	18	19	5.4%	< 1	96%	70%	130%	105%	80%	120%	106%	70%	130%
Selenium	3428908	3428908	<0.8	<0.8	NA	< 0.8	103%	70%	130%	106%	80%	120%	109%	70%	130%
Silver	3428908	3428908	<0.5	<0.5	NA	< 0.5	102%	70%	130%	107%	80%	120%	105%	70%	130%
Thallium	3428908	3428908	<0.5	<0.5	NA	< 0.5	103%	70%	130%	104%	80%	120%	97%	70%	130%
Uranium	3428908	3428908	0.76	0.79	NA	< 0.50	102%	70%	130%	108%	80%	120%	104%	70%	130%
Vanadium	3428908	3428908	40.2	42.7	6.0%	< 0.4	93%	70%	130%	106%	80%	120%	112%	70%	130%
Zinc	3428908	3428908	46	48	4.3%	< 5	98%	70%	130%	112%	80%	120%	114%	70%	130%
Chromium, Hexavalent	3428908	3428908	<0.2	<0.2	NA	< 0.2	111%	70%	130%	96%	80%	120%	107%	70%	130%
Cyanide, Free	3433697		<0.040	<0.040	NA	< 0.040	92%	70%	130%	104%	80%	120%	106%	70%	130%
Mercury	3428908	3428908	<0.10	<0.10	NA	< 0.10	105%	70%	130%	97%	80%	120%	93%	70%	130%
Electrical Conductivity (2:1)	3428908	3428908	0.206	0.206	0.0%	< 0.005	109%	80%	120%	NA			NA		
Sodium Adsorption Ratio (2:1) (Calc.)	3428908	3428908	0.368	0.358	2.8%	N/A	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	3436064		6.58	6.67	1.4%	NA	99%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Duplicate NA: results are under 5X the RDL and will not be calculated.

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Lower	Upper	Recovery	Lower	Upper	Recovery	Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
pH, 2:1 CaCl2 Extraction	3428919	3428919	6.72	6.93	3.1%	NA	99%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Duplicate NA: results are under 5X the RDL and will not be calculated.

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Lower	Upper	Recovery	Lower	Upper	Recovery	Lower	Upper
Inorganic Chemistry (Soil)															
Chloride (2:1)	3427749		2	2	NA	< 2	95%	70%	130%	106%	80%	120%	107%	70%	130%
Sulphate (2:1)	3427749		108	109	0.9%	< 2	100%	70%	130%	105%	80%	120%	108%	70%	130%
pH (2:1)	3427749		7.35	7.36	0.1%	NA	101%	80%	120%	NA			NA		
Electrical Conductivity (2:1)	3428908	3428908	0.206	0.206	0.0%	< 0.005	109%	80%	120%	NA			NA		

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5139.57
SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

Soil Analysis (Continued)

RPT Date: Jan 24, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By: Amanjot Bhela

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
AMANJOT BHELA
CHEMIST

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5139.57
SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

Trace Organics Analysis

RPT Date: Jan 24, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	3417516		< 0.01	< 0.01	0.0%	< 0.01	79%	50%	140%	82%	50%	140%	70%	50%	140%
Gamma-Hexachlorocyclohexane	3417516		< 0.005	< 0.005	0.0%	< 0.005	93%	50%	140%	108%	50%	140%	97%	50%	140%
Heptachlor	3417516		< 0.005	< 0.005	0.0%	< 0.005	80%	50%	140%	87%	50%	140%	82%	50%	140%
Aldrin	3417516		< 0.005	< 0.005	0.0%	< 0.005	102%	50%	140%	96%	50%	140%	75%	50%	140%
Heptachlor Epoxide	3417516		< 0.005	< 0.005	0.0%	< 0.005	97%	50%	140%	96%	50%	140%	76%	50%	140%
Endosulfan I	3417516		< 0.005	< 0.005	0.0%	< 0.005	98%	50%	140%	85%	50%	140%	82%	50%	140%
Endosulfan II	3417516		< 0.005	< 0.005	0.0%	< 0.005	98%	50%	140%	82%	50%	140%	77%	50%	140%
Alpha-Chlordane	3417516		< 0.005	< 0.005	0.0%	< 0.005	101%	50%	140%	78%	50%	140%	72%	50%	140%
gamma-Chlordane	3417516		< 0.005	< 0.005	0.0%	< 0.005	100%	50%	140%	82%	50%	140%	70%	50%	140%
op'-DDE	3417516		< 0.005	< 0.005	0.0%	< 0.005	88%	50%	140%	78%	50%	140%	94%	50%	140%
pp'-DDE	3417516		< 0.005	< 0.005	0.0%	< 0.005	84%	50%	140%	86%	50%	140%	90%	50%	140%
op'-DDD	3417516		< 0.005	< 0.005	0.0%	< 0.005	91%	50%	140%	92%	50%	140%	86%	50%	140%
pp'-DDD	3417516		< 0.005	< 0.005	0.0%	< 0.005	90%	50%	140%	84%	50%	140%	81%	50%	140%
op'-DDT	3417516		< 0.005	< 0.005	0.0%	< 0.005	91%	50%	140%	80%	50%	140%	74%	50%	140%
pp'-DDT	3417516		< 0.005	< 0.005	0.0%	< 0.005	90%	50%	140%	86%	50%	140%	72%	50%	140%
Dieldrin	3417516		< 0.005	< 0.005	0.0%	< 0.005	93%	50%	140%	86%	50%	140%	70%	50%	140%
Endrin	3417516		< 0.005	< 0.005	0.0%	< 0.005	101%	50%	140%	82%	50%	140%	84%	50%	140%
Methoxychlor	3417516		< 0.005	< 0.005	0.0%	< 0.005	86%	50%	140%	76%	50%	140%	70%	50%	140%
Hexachlorobenzene	3417516		< 0.005	< 0.005	0.0%	< 0.005	103%	50%	140%	96%	50%	140%	102%	50%	140%
Hexachlorobutadiene	3417516		< 0.01	< 0.01	0.0%	< 0.01	103%	50%	140%	92%	50%	140%	74%	50%	140%
O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 - C10)	3428937	3428937	<5	<5	NA	< 5	102%	60%	140%	110%	60%	140%	103%	60%	140%
F2 (C10 to C16)	3433707		< 10	< 10	NA	< 10	101%	60%	140%	80%	60%	140%	83%	60%	140%
F3 (C16 to C34)	3433707		< 50	< 50	NA	< 50	108%	60%	140%	75%	60%	140%	65%	60%	140%
F4 (C34 to C50)	3433707		< 50	< 50	NA	< 50	86%	60%	140%	77%	60%	140%	79%	60%	140%
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	3425928		<0.05	<0.05	NA	< 0.05	83%	50%	140%	78%	50%	140%	102%	50%	140%
Vinyl Chloride	3425928		<0.02	<0.02	NA	< 0.02	84%	50%	140%	101%	50%	140%	89%	50%	140%
Bromomethane	3425928		<0.05	<0.05	NA	< 0.05	84%	50%	140%	99%	50%	140%	91%	50%	140%
Trichlorofluoromethane	3425928		<0.05	<0.05	NA	< 0.05	74%	50%	140%	83%	50%	140%	64%	50%	140%
Acetone	3425928		<0.50	<0.50	NA	< 0.50	93%	50%	140%	102%	50%	140%	108%	50%	140%
1,1-Dichloroethylene	3425928		<0.05	<0.05	NA	< 0.05	101%	50%	140%	118%	60%	130%	96%	50%	140%
Methylene Chloride	3425928		<0.05	<0.05	NA	< 0.05	103%	50%	140%	85%	60%	130%	115%	50%	140%
Trans- 1,2-Dichloroethylene	3425928		<0.05	<0.05	NA	< 0.05	101%	50%	140%	107%	60%	130%	82%	50%	140%
Methyl tert-butyl Ether	3425928		<0.05	<0.05	NA	< 0.05	106%	50%	140%	96%	60%	130%	98%	50%	140%
1,1-Dichloroethane	3425928		<0.02	<0.02	NA	< 0.02	118%	50%	140%	85%	60%	130%	101%	50%	140%
Methyl Ethyl Ketone	3425928		<0.50	<0.50	NA	< 0.50	86%	50%	140%	93%	50%	140%	101%	50%	140%
Cis- 1,2-Dichloroethylene	3425928		<0.02	<0.02	NA	< 0.02	115%	50%	140%	94%	60%	130%	99%	50%	140%
Chloroform	3425928		<0.04	<0.04	NA	< 0.04	106%	50%	140%	91%	60%	130%	92%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5139.57
SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

Trace Organics Analysis (Continued)

RPT Date: Jan 24, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
1,2-Dichloroethane	3425928		<0.03	<0.03	NA	< 0.03	119%	50%	140%	106%	60%	130%	89%	50%	140%
1,1,1-Trichloroethane	3425928		<0.05	<0.05	NA	< 0.05	83%	50%	140%	102%	60%	130%	108%	50%	140%
Carbon Tetrachloride	3425928		<0.05	<0.05	NA	< 0.05	81%	50%	140%	101%	60%	130%	85%	50%	140%
Benzene	3425928		<0.02	<0.02	NA	< 0.02	92%	50%	140%	111%	60%	130%	108%	50%	140%
1,2-Dichloropropane	3425928		<0.03	<0.03	NA	< 0.03	99%	50%	140%	92%	60%	130%	87%	50%	140%
Trichloroethylene	3425928		<0.03	<0.03	NA	< 0.03	76%	50%	140%	88%	60%	130%	107%	50%	140%
Bromodichloromethane	3425928		<0.05	<0.05	NA	< 0.05	98%	50%	140%	107%	60%	130%	98%	50%	140%
Methyl Isobutyl Ketone	3425928		<0.50	<0.50	NA	< 0.50	107%	50%	140%	98%	50%	140%	109%	50%	140%
1,1,2-Trichloroethane	3425928		<0.04	<0.04	NA	< 0.04	114%	50%	140%	116%	60%	130%	104%	50%	140%
Toluene	3425928		<0.05	<0.05	NA	< 0.05	86%	50%	140%	88%	60%	130%	78%	50%	140%
Dibromochloromethane	3425928		<0.05	<0.05	NA	< 0.05	98%	50%	140%	117%	60%	130%	107%	50%	140%
Ethylene Dibromide	3425928		<0.04	<0.04	NA	< 0.04	116%	50%	140%	83%	60%	130%	100%	50%	140%
Tetrachloroethylene	3425928		<0.05	<0.05	NA	< 0.05	72%	50%	140%	111%	60%	130%	93%	50%	140%
1,1,1,2-Tetrachloroethane	3425928		<0.04	<0.04	NA	< 0.04	84%	50%	140%	70%	60%	130%	101%	50%	140%
Chlorobenzene	3425928		<0.05	<0.05	NA	< 0.05	86%	50%	140%	86%	60%	130%	109%	50%	140%
Ethylbenzene	3425928		<0.05	<0.05	NA	< 0.05	75%	50%	140%	102%	60%	130%	97%	50%	140%
m & p-Xylene	3425928		<0.05	<0.05	NA	< 0.05	86%	50%	140%	106%	60%	130%	103%	50%	140%
Bromoform	3425928		<0.05	<0.05	NA	< 0.05	109%	50%	140%	101%	60%	130%	102%	50%	140%
Styrene	3425928		<0.05	<0.05	NA	< 0.05	82%	50%	140%	107%	60%	130%	86%	50%	140%
1,1,2,2-Tetrachloroethane	3425928		<0.05	<0.05	NA	< 0.05	109%	50%	140%	85%	60%	130%	82%	50%	140%
o-Xylene	3425928		<0.05	<0.05	NA	< 0.05	84%	50%	140%	119%	60%	130%	91%	50%	140%
1,3-Dichlorobenzene	3425928		<0.05	<0.05	NA	< 0.05	92%	50%	140%	80%	60%	130%	93%	50%	140%
1,4-Dichlorobenzene	3425928		<0.05	<0.05	NA	< 0.05	92%	50%	140%	84%	60%	130%	101%	50%	140%
1,2-Dichlorobenzene	3425928		<0.05	<0.05	NA	< 0.05	95%	50%	140%	113%	60%	130%	92%	50%	140%
n-Hexane	3425928		<0.05	<0.05	NA	< 0.05	76%	50%	140%	108%	60%	130%	103%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

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Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5139.57
SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

PROJECT: TP115086.1.6000.5139.57

SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859

ATTENTION TO: Alessandro Pellerito

SAMPLED BY:MS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5139.57
SAMPLING SITE:SP47 Boreholes/E-W

AGAT WORK ORDER: 22T853859
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:MS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Heptachlor	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Aldrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Heptachlor Epoxide	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan I	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan II	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
Alpha-Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
gamma-Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
op'-DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
op'-DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
op'-DDT	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDT	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDT (Total)	ORG-91-5113	modified from EPA 3570, 3620C & 8081B	CALCULATION
Dieldrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Methoxychlor	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Hexachlorobenzene	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Hexachlorobutadiene	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
TCMX	ORG-91-5112	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Decachlorobiphenyl	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T853859
PROJECT: TP115086.1.6000.5139.57
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47 Boreholes/E-W
SAMPLED BY:MS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
wet weight OC	ORG-91-5113		BALANCE
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Acetone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T853859
PROJECT: TP115086.1.6000.5139.57
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47 Boreholes/E-W
SAMPLED BY:MS

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Toluene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	modified from EPA 5035A & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	modified from EPA 5035A & EPA 8260D	(P&T)GC/MS
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 22T853859.

Cooler Quantity:

Arrival Temperatures: 3.5 | 3.3 | 3
2.4 | 2.2 | 2.2

Custody Seal Intact: ☐Yes ☑No ☐N/A

Notes: On ice.

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Richmond Hill, ON, L4B 3K6
Phone: 647-982-6220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

(Please check all applicable boxes)

☑ Regulation 153/04
Table ____ Indicate One
☐Ind/Com
☐Res/Park
☐Agriculture
Soil Texture (Check One)
☐Coarse
☐Fine

☐ Excess Soils R406
Table ____ Indicate One
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐Sanitary ☐Storm
____ Region
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ Indicate One

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1.6000.5139.573000
Site Location: SP47/Boreholes E-W
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☑ No

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood PLC
Contact:
Address:
Email: APInvoice.Canada <apinvoice.canada@woodplc.com>

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y / N	O. Reg 153			PAHs	PCBs	VOC	O. Reg 558	O. Reg 406		Salt - EC/SAR	OC pesticides							Potentially Hazardous or High Concentration (Y/N)
							Metals & Inorganics	Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	BTEX, F1-F4 PHCs Analyze F4G if required ☐ Yes ☐ No				Landfill Disposal Characterization TCLP: TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	Excess Soils SPLP Rainwater Leach SPLP: ☐Metals ☐VOCs ☐SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4									
E23 SS1	13 Jan 22	14:50 AM PM	1	S			☑																	
E24 SS1	13 Jan 22	14:25 AM PM	1	S													☑							
E24 SS2	13 Jan 22	14:30 AM PM	1	S	HOLD																			
E25 SS1	13 Jan 22	13:50 AM PM	1	S			☑																	
E26 SS1	13 Jan 22	12:50 AM PM	1	S													☑							
E26 SS2	13 Jan 22	12:55 AM PM	1	S	HOLD																			
E27 SS1	13 Jan 22	12:30 AM PM	1	S			☑																	
E27 SS2	13 Jan 22	12:35 AM PM	3	S					☑			☑												
E28 SS1	13 Jan 22	12:00 AM PM	1	S	HOLD																			
E28 SS2	13 Jan 22	12:05 AM PM	1	S													☑							
E29 SS1	13 Jan 22	9:10 AM PM	1	S			☑																	

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	
Mohammad Safarpanah	13 January 20:	18:00	Takcharya	Jan 14	14:50.	
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Page 1 of 2
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	N°

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AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #:

Cooler Quantity:
Arrival Temperatures:
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Richmond Hill, ON, L4B 3K6
Phone: 647-982-6220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

(Please check all applicable boxes)

☑ Regulation 153/04
Table ______ (Indicate One)
☐Ind/Com
☐Res/Park
☐Agriculture
Soil Texture (Check One)
☐Coarse
☐Fine

☐ Excess Soils R406
Table ______ (Indicate One)
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐Sanitary ☐Storm
______ Region
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
______ Indicate One

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☑ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1.6000.5139.573000
Site Location: SP47/Boreholes E-W
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐
Company: Wood PLC
Contact:
Address:
Email: APInvoice.Canada <apinvoice.canada@woodplc.com>

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y / N	O. Reg 153 Metals & Inorganics	Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	BTEX, F1-F4 PHCs Analyze F4G if required ☐ Yes ☐ No	PAHs	PCBs	VOC	O. Reg 558 Landfill Disposal Characterization TCLP: TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	O. Reg 406 Excess Soils SPLP Rainwater Leach SPLP: ☐Metals ☐VOCs ☐SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	OC pesticides	CORROSIVITY						Potentially Hazardous or High Concentration (Y/N)
E29 SS2	13 Jan 22	9:15 AM PM	3	S	HOLD																			
E30 SS1	13 Jan 22	9:35 AM PM	1	S			☑																	
E30 SS2	13 Jan 22	9:40 AM PM	1	S	HOLD																			
E31 SS1	13 Jan 22	11:00 AM PM	1	S														☑						
E31 SS2	13 Jan 22	11:05 AM PM	3	S	HOLD																			
E32 SS1	13 Jan 22	11:20 AM PM	1	S			☑																	
E32 SS2	13 Jan 22	11:25 AM PM	1	S													☑							
DUP 1	13 Jan 22	AM PM	1	S			☑																	
DUP 2	13 Jan 22	AM PM	1	S													☑							
DUP 3	13 Jan 22	AM PM	3	S					☑			☑												
		AM PM																						

Samples Relinquished By (Print Name and Sign): Mohammad Safarpanah	Date 13 January 20:	Time 18:00	Samples Received By (Print Name and Sign):	Date	Time	
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Page 2 of 2
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time	Nº:

Document ID: [illegible]

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Date Issued: March 9, 2021

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
50 VOGELL ROAD, UNIT 3&4
RICHMOND HILL, ON L4B 3K6
ATTENTION TO: Alessandro Pellerito
PROJECT: TP115086.1.6000.5800.573000
AGAT WORK ORDER: 22T853869
SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
DATE REPORTED: Jan 25, 2022
PAGES (INCLUDING COVER): 24
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E1 SS1	E2 SS1	E3 SS1	E5 SS2	E7 SS1
			SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
			DATE SAMPLED:	2022-01-11 12:00	2022-01-11 12:25	2022-01-11 13:10	2022-01-11 14:00	2022-01-11 14:15
Parameter	Unit	G / S	RDL	3429023	3429025	3429028	3429040	3429041
Antimony	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g		1	5	5	5	4	5
Barium	µg/g		2.0	99.0	96.0	125	40.2	94.0
Beryllium	µg/g		0.4	0.8	0.8	0.8	0.5	0.8
Boron	µg/g		5	10	10	10	<5	8
Boron (Hot Water Soluble)	µg/g		0.10	0.24	<0.10	<0.10	<0.10	<0.10
Cadmium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g		5	30	30	33	16	28
Cobalt	µg/g		0.5	10.8	13.2	14.8	5.3	11.5
Copper	µg/g		1.0	24.1	26.4	27.8	14.9	23.1
Lead	µg/g		1	16	11	13	6	10
Molybdenum	µg/g		0.5	0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g		1	23	26	29	12	24
Selenium	µg/g		0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Silver	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium	µg/g		0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Uranium	µg/g		0.50	0.90	0.64	0.77	0.55	0.63
Vanadium	µg/g		0.4	39.1	40.0	46.9	27.5	37.9
Zinc	µg/g		5	94	67	72	35	59
Chromium, Hexavalent	µg/g		0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanide, Free	µg/g		0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g		0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity (2:1)	mS/cm		0.005	0.304	0.227	0.260	0.167	0.211
Sodium Adsorption Ratio (2:1) (Calc.)	N/A		N/A	0.508	0.343	0.423	0.127	0.235
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.10	7.24	7.37	7.24	7.33

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

Comments:	RDL - Reported Detection Limit; G / S - Guideline / Standard
3429023-3429041	EC was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio. SAR is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

CHARTERED
AMANJOT BHELA
CHEMIST

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E5 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 13:55
Parameter	Unit	G / S	RDL	3429039
Arsenic Leachate	mg/L		0.010	<0.010
Barium Leachate	mg/L		0.010	0.250
Boron Leachate	mg/L		0.050	<0.050
Cadmium Leachate	mg/L		0.010	<0.010
Chromium Leachate	mg/L		0.050	<0.050
Lead Leachate	mg/L		0.010	<0.010
Mercury Leachate	mg/L		0.01	<0.01
Selenium Leachate	mg/L		0.010	<0.010
Silver Leachate	mg/L		0.010	<0.010
Uranium Leachate	mg/L		0.050	<0.050
Fluoride Leachate	mg/L		0.10	<0.10
Cyanide Leachate	mg/L		0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L		0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

CHARTERED AMANJOT BHELA CHEMIST

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E2 SS1	E3 SS2
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2022-01-11 12:25	2022-01-11 13:15
Parameter	Unit	G / S	RDL	3429025	3429029
Hexachloroethane	µg/g		0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g		0.005	<0.005	<0.005
Heptachlor	µg/g		0.005	<0.005	<0.005
Aldrin	µg/g		0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g		0.005	<0.005	<0.005
Endosulfan I	µg/g		0.005	<0.005	<0.005
Endosulfan II	µg/g		0.005	<0.005	<0.005
Endosulfan	µg/g		0.005	<0.005	<0.005
Alpha-Chlordane	µg/g		0.005	<0.005	<0.005
gamma-Chlordane	µg/g		0.005	<0.005	<0.005
Chlordane	µg/g		0.007	<0.007	<0.007
op'-DDE	ug/g		0.005	<0.005	<0.005
pp'-DDE	µg/g		0.005	<0.005	<0.005
DDE	µg/g		0.007	<0.007	<0.007
op'-DDD	µg/g		0.005	<0.005	<0.005
pp'-DDD	µg/g		0.005	<0.005	<0.005
DDD	µg/g		0.007	<0.007	<0.007
op'-DDT	µg/g		0.005	<0.005	<0.005
pp'-DDT	µg/g		0.005	<0.005	<0.005
DDT (Total)	µg/g		0.007	<0.007	<0.007
Dieldrin	µg/g		0.005	<0.005	<0.005
Endrin	µg/g		0.005	<0.005	<0.005
Methoxychlor	µg/g		0.005	<0.005	<0.005
Hexachlorobenzene	µg/g		0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g		0.01	<0.01	<0.01
Moisture Content	%		0.1	13.4	21.7
wet weight OC	g		0.01	10.18	10.25

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

		SAMPLE DESCRIPTION:	E2 SS1	E3 SS2
		SAMPLE TYPE:	Soil	Soil
		DATE SAMPLED:	2022-01-11 12:25	2022-01-11 13:15
Surrogate	Unit	Acceptable Limits	3429025	3429029
TCMX	%	50-140	81	104
Decachlorobiphenyl	%	50-140	88	108

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3429025-3429029 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopravko

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E2 SS2
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 12:30
Parameter	Unit	G / S	RDL	3429027
F1 (C6 - C10)	µg/g		5	<5
F1 (C6 to C10) minus BTEX	µg/g		5	<5
F2 (C10 to C16)	µg/g		10	<10
F3 (C16 to C34)	µg/g		50	<50
F4 (C34 to C50)	µg/g		50	<50
Gravimetric Heavy Hydrocarbons	µg/g		50	NA
Moisture Content	%		0.1	19.3
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		102
Terphenyl	%	60-140		95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3429027 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes E-W
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E2 SS2
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 12:30
Parameter	Unit	G / S	RDL	3429027
Dichlorodifluoromethane	µg/g		0.05	<0.05
Vinyl Chloride	ug/g		0.02	<0.02
Bromomethane	ug/g		0.05	<0.05
Trichlorofluoromethane	ug/g		0.05	<0.05
Acetone	ug/g		0.50	<0.50
1,1-Dichloroethylene	ug/g		0.05	<0.05
Methylene Chloride	ug/g		0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g		0.05	<0.05
Methyl tert-butyl Ether	ug/g		0.05	<0.05
1,1-Dichloroethane	ug/g		0.02	<0.02
Methyl Ethyl Ketone	ug/g		0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g		0.02	<0.02
Chloroform	ug/g		0.04	<0.04
1,2-Dichloroethane	ug/g		0.03	<0.03
1,1,1-Trichloroethane	ug/g		0.05	<0.05
Carbon Tetrachloride	ug/g		0.05	<0.05
Benzene	ug/g		0.02	<0.02
1,2-Dichloropropane	ug/g		0.03	<0.03
Trichloroethylene	ug/g		0.03	<0.03
Bromodichloromethane	ug/g		0.05	<0.05
Methyl Isobutyl Ketone	ug/g		0.50	<0.50
1,1,2-Trichloroethane	ug/g		0.04	<0.04
Toluene	ug/g		0.05	<0.05
Dibromochloromethane	ug/g		0.05	<0.05
Ethylene Dibromide	ug/g		0.04	<0.04
Tetrachloroethylene	ug/g		0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g		0.04	<0.04
Chlorobenzene	ug/g		0.05	<0.05
Ethylbenzene	ug/g		0.05	<0.05

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes E-W
SAMPLED BY:Mohammad Safarpanah

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E2 SS2
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 12:30
Parameter	Unit	G / S	RDL	3429027
m & p-Xylene	ug/g		0.05	<0.05
Bromoform	ug/g		0.05	<0.05
Styrene	ug/g		0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g		0.05	<0.05
o-Xylene	ug/g		0.05	<0.05
1,3-Dichlorobenzene	ug/g		0.05	<0.05
1,4-Dichlorobenzene	ug/g		0.05	<0.05
1,2-Dichlorobenzene	ug/g		0.05	<0.05
Xylenes (Total)	ug/g		0.05	<0.05
1,3-Dichloropropene (Cis + Trans)	µg/g		0.04	<0.04
n-Hexane	µg/g		0.05	<0.05
Moisture Content	%		0.1	19.3
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		101
4-Bromofluorobenzene	% Recovery	50-140		96

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3429027 The sample was analyzed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukolof

Certificate of Analysis

AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E5 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 13:55
Parameter	Unit	G / S	RDL	3429039
Benzo(a)pyrene Leachate	mg/L		0.001	<0.001
Surrogate	Unit	Acceptable Limits		
Acridine-d9	%	50-140		78
Naphthalene-d8	%	50-140		85
Terphenyl-d14	%	50-140		99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3429039 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukoloff

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CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes E-W
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 - PCBs

DATE RECEIVED: 2022-01-14
DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E5 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 13:55
Parameter	Unit	G / S	RDL	3429039
PCB's Leachate	mg/L		0.005	<0.005
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	50-140		117

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

3429039 The soil sample was leached using the Regulation 558 procedure. Analysis was performed on the leachate.
PCB total is a calculated parameter. The calculated value is the sum of Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukolof

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
SAMPLING SITE:SP47/Boreholes E-W

ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

O. Reg. 558 - VOCs

DATE RECEIVED: 2022-01-14

DATE REPORTED: 2022-01-25

			SAMPLE DESCRIPTION:	E5 SS1
			SAMPLE TYPE:	Soil
			DATE SAMPLED:	2022-01-11 13:55
Parameter	Unit	G / S	RDL	3429039
Vinyl Chloride Leachate	mg/L		0.030	<0.030
1,1 Dichloroethene Leachate	mg/L		0.020	<0.020
Dichloromethane Leachate	mg/L		0.030	<0.030
Methyl Ethyl Ketone Leachate	mg/L		0.090	<0.090
Chloroform Leachate	mg/L		0.020	<0.020
1,2-Dichloroethane Leachate	mg/L		0.020	<0.020
Carbon Tetrachloride Leachate	mg/L		0.020	<0.020
Benzene Leachate	mg/L		0.020	<0.020
Trichloroethene Leachate	mg/L		0.020	<0.020
Tetrachloroethene Leachate	mg/L		0.050	<0.050
Chlorobenzene Leachate	mg/L		0.010	<0.010
1,2-Dichlorobenzene Leachate	mg/L		0.010	<0.010
1,4-Dichlorobenzene Leachate	mg/L		0.010	<0.010
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		100
4-Bromofluorobenzene	% Recovery	50-140		83

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
3429039 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.
Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopukolof

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes E-W

AGAT WORK ORDER: 22T853869
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Soil Analysis

RPT Date: Jan 25, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	3429023	3429023	<0.8	<0.8	NA	< 0.8	110%	70%	130%	100%	80%	120%	101%	70%	130%
Arsenic	3429023	3429023	5	5	0.0%	< 1	123%	70%	130%	106%	80%	120%	96%	70%	130%
Barium	3429023	3429023	99.0	103	4.0%	< 2.0	112%	70%	130%	99%	80%	120%	94%	70%	130%
Beryllium	3429023	3429023	0.8	0.8	NA	< 0.4	91%	70%	130%	103%	80%	120%	90%	70%	130%
Boron	3429023	3429023	10	11	NA	< 5	88%	70%	130%	107%	80%	120%	85%	70%	130%
Boron (Hot Water Soluble)	3431742		<0.10	<0.10	NA	< 0.10	98%	60%	140%	92%	70%	130%	100%	60%	140%
Cadmium	3429023	3429023	<0.5	<0.5	NA	< 0.5	103%	70%	130%	106%	80%	120%	97%	70%	130%
Chromium	3429023	3429023	30	31	3.3%	< 5	109%	70%	130%	101%	80%	120%	116%	70%	130%
Cobalt	3429023	3429023	10.8	11.5	6.3%	< 0.5	111%	70%	130%	103%	80%	120%	99%	70%	130%
Copper	3429023	3429023	24.1	24.2	0.4%	< 1.0	101%	70%	130%	104%	80%	120%	92%	70%	130%
Lead	3429023	3429023	16	17	6.1%	< 1	110%	70%	130%	100%	80%	120%	94%	70%	130%
Molybdenum	3429023	3429023	0.5	0.5	NA	< 0.5	112%	70%	130%	106%	80%	120%	101%	70%	130%
Nickel	3429023	3429023	23	24	4.3%	< 1	106%	70%	130%	98%	80%	120%	91%	70%	130%
Selenium	3429023	3429023	<0.8	<0.8	NA	< 0.8	119%	70%	130%	109%	80%	120%	100%	70%	130%
Silver	3429023	3429023	<0.5	<0.5	NA	< 0.5	101%	70%	130%	105%	80%	120%	88%	70%	130%
Thallium	3429023	3429023	<0.5	<0.5	NA	< 0.5	125%	70%	130%	100%	80%	120%	95%	70%	130%
Uranium	3429023	3429023	0.90	0.93	NA	< 0.50	115%	70%	130%	96%	80%	120%	97%	70%	130%
Vanadium	3429023	3429023	39.1	41.2	5.2%	< 0.4	116%	70%	130%	95%	80%	120%	99%	70%	130%
Zinc	3429023	3429023	94	95	1.1%	< 5	114%	70%	130%	113%	80%	120%	106%	70%	130%
Chromium, Hexavalent	3428908		<0.2	<0.2	NA	< 0.2	111%	70%	130%	96%	80%	120%	107%	70%	130%
Cyanide, Free	3429041	3429041	<0.040	<0.040	NA	< 0.040	92%	70%	130%	104%	80%	120%	107%	70%	130%
Mercury	3429023	3429023	<0.10	<0.10	NA	< 0.10	109%	70%	130%	101%	80%	120%	97%	70%	130%
Electrical Conductivity (2:1)	3429023	3429023	0.304	0.300	1.3%	< 0.005	109%	80%	120%	NA			NA		
Sodium Adsorption Ratio (2:1) (Calc.)	3429023	3429023	0.508	0.508	0.0%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	3428919		6.72	6.93	3.1%	NA	99%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.
Duplicate NA: results are under 5X the RDL and will not be calculated.

O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	3432229		<0.010	<0.010	NA	< 0.010	102%	70%	130%	109%	80%	120%	120%	70%	130%
Barium Leachate	3432229		0.431	0.448	3.8%	< 0.010	108%	70%	130%	109%	80%	120%	124%	70%	130%
Boron Leachate	3432229		0.136	0.141	NA	< 0.050	100%	70%	130%	100%	80%	120%	91%	70%	130%
Cadmium Leachate	3432229		<0.010	<0.010	NA	< 0.010	99%	70%	130%	100%	80%	120%	98%	70%	130%
Chromium Leachate	3432229		<0.050	<0.050	NA	< 0.050	106%	70%	130%	112%	80%	120%	118%	70%	130%
Lead Leachate	3432229		<0.010	<0.010	NA	< 0.010	104%	70%	130%	106%	80%	120%	98%	70%	130%
Mercury Leachate	3432229		<0.01	<0.01	NA	< 0.01	103%	70%	130%	91%	80%	120%	90%	70%	130%
Selenium Leachate	3432229		<0.010	<0.010	NA	< 0.010	106%	70%	130%	111%	80%	120%	114%	70%	130%
Silver Leachate	3432229		<0.010	<0.010	NA	< 0.010	102%	70%	130%	108%	80%	120%	102%	70%	130%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes E-W

AGAT WORK ORDER: 22T853869
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Soil Analysis (Continued)

RPT Date: Jan 25, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Uranium Leachate	3432229		<0.050	<0.050	NA	< 0.050	101%	70%	130%	106%	80%	120%	103%	70%	130%
Fluoride Leachate	3428848		0.24	0.24	NA	< 0.10	96%	90%	110%	97%	90%	110%	98%	70%	130%
Cyanide Leachate	3432229		<0.05	<0.05	NA	< 0.05	92%	70%	130%	104%	80%	120%	108%	70%	130%
(Nitrate + Nitrite) as N Leachate	3432229		<0.70	<0.70	NA	< 0.70	102%	80%	120%	104%	80%	120%	94%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By: Amanjot Bhela

AMANJOT BHELA

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes E-W

AGAT WORK ORDER: 22T853869
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis

RPT Date: Jan 25, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	3426717		< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	96%	50%	140%	98%	50%	140%
Gamma-Hexachlorocyclohexane	3426717		< 0.005	< 0.005	NA	< 0.005	104%	50%	140%	92%	50%	140%	82%	50%	140%
Heptachlor	3426717		< 0.005	< 0.005	NA	< 0.005	107%	50%	140%	88%	50%	140%	88%	50%	140%
Aldrin	3426717		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	92%	50%	140%	80%	50%	140%
Heptachlor Epoxide	3426717		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	102%	50%	140%	92%	50%	140%
Endosulfan I	3426717		< 0.005	< 0.005	NA	< 0.005	107%	50%	140%	90%	50%	140%	91%	50%	140%
Endosulfan II	3426717		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	91%	50%	140%	84%	50%	140%
Alpha-Chlordane	3426717		< 0.005	< 0.005	NA	< 0.005	108%	50%	140%	88%	50%	140%	84%	50%	140%
gamma-Chlordane	3426717		< 0.005	< 0.005	NA	< 0.005	104%	50%	140%	85%	50%	140%	82%	50%	140%
op'-DDE	3426717		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	80%	50%	140%	79%	50%	140%
pp'-DDE	3426717		< 0.005	< 0.005	NA	< 0.005	108%	50%	140%	82%	50%	140%	82%	50%	140%
op'-DDD	3426717		< 0.005	< 0.005	NA	< 0.005	107%	50%	140%	107%	50%	140%	85%	50%	140%
pp'-DDD	3426717		< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	102%	50%	140%	80%	50%	140%
op'-DDT	3426717		< 0.005	< 0.005	NA	< 0.005	98%	50%	140%	89%	50%	140%	84%	50%	140%
pp'-DDT	3426717		< 0.005	< 0.005	NA	< 0.005	99%	50%	140%	82%	50%	140%	82%	50%	140%
Dieldrin	3426717		< 0.005	< 0.005	NA	< 0.005	97%	50%	140%	88%	50%	140%	102%	50%	140%
Endrin	3426717		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	102%	50%	140%	92%	50%	140%
Methoxychlor	3426717		< 0.005	< 0.005	NA	< 0.005	96%	50%	140%	102%	50%	140%	104%	50%	140%
Hexachlorobenzene	3426717		< 0.005	< 0.005	NA	< 0.005	108%	50%	140%	103%	50%	140%	89%	50%	140%
Hexachlorobutadiene	3426717		< 0.01	< 0.01	NA	< 0.01	106%	50%	140%	102%	50%	140%	79%	50%	140%
O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 - C10)	3429006		<5	<5	NA	< 5	90%	60%	140%	90%	60%	140%	95%	60%	140%
F2 (C10 to C16)	3433707		< 10	< 10	NA	< 10	101%	60%	140%	80%	60%	140%	83%	60%	140%
F3 (C16 to C34)	3433707		< 50	< 50	NA	< 50	108%	60%	140%	75%	60%	140%	65%	60%	140%
F4 (C34 to C50)	3433707		< 50	< 50	NA	< 50	86%	60%	140%	77%	60%	140%	79%	60%	140%
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	3427631		<0.05	<0.05	NA	< 0.05	83%	50%	140%	78%	50%	140%	66%	50%	140%
Vinyl Chloride	3427631		<0.02	<0.02	NA	< 0.02	84%	50%	140%	101%	50%	140%	97%	50%	140%
Bromomethane	3427631		<0.05	<0.05	NA	< 0.05	84%	50%	140%	99%	50%	140%	83%	50%	140%
Trichlorofluoromethane	3427631		<0.05	<0.05	NA	< 0.05	74%	50%	140%	83%	50%	140%	93%	50%	140%
Acetone	3427631		<0.50	<0.50	NA	< 0.50	93%	50%	140%	102%	50%	140%	105%	50%	140%
1,1-Dichloroethylene	3427631		<0.05	<0.05	NA	< 0.05	101%	50%	140%	118%	60%	130%	100%	50%	140%
Methylene Chloride	3427631		<0.05	<0.05	NA	< 0.05	103%	50%	140%	85%	60%	130%	112%	50%	140%
Trans- 1,2-Dichloroethylene	3427631		<0.05	<0.05	NA	< 0.05	101%	50%	140%	107%	60%	130%	84%	50%	140%
Methyl tert-butyl Ether	3427631		<0.05	<0.05	NA	< 0.05	106%	50%	140%	96%	60%	130%	80%	50%	140%
1,1-Dichloroethane	3427631		<0.02	<0.02	NA	< 0.02	118%	50%	140%	85%	60%	130%	100%	50%	140%
Methyl Ethyl Ketone	3427631		<0.50	<0.50	NA	< 0.50	86%	50%	140%	93%	50%	140%	102%	50%	140%
Cis- 1,2-Dichloroethylene	3427631		<0.02	<0.02	NA	< 0.02	115%	50%	140%	94%	60%	130%	96%	50%	140%
Chloroform	3427631		<0.04	<0.04	NA	< 0.04	106%	50%	140%	91%	60%	130%	87%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes E-W
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Jan 25, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
1,2-Dichloroethane	3427631		<0.03	<0.03	NA	< 0.03	119%	50%	140%	106%	60%	130%	94%	50%	140%
1,1,1-Trichloroethane	3427631		<0.05	<0.05	NA	< 0.05	83%	50%	140%	102%	60%	130%	88%	50%	140%
Carbon Tetrachloride	3427631		<0.05	<0.05	NA	< 0.05	81%	50%	140%	101%	60%	130%	100%	50%	140%
Benzene	3427631		<0.02	<0.02	NA	< 0.02	92%	50%	140%	111%	60%	130%	101%	50%	140%
1,2-Dichloropropane	3427631		<0.03	<0.03	NA	< 0.03	99%	50%	140%	92%	60%	130%	91%	50%	140%
Trichloroethylene	3427631		<0.03	<0.03	NA	< 0.03	76%	50%	140%	88%	60%	130%	86%	50%	140%
Bromodichloromethane	3427631		<0.05	<0.05	NA	< 0.05	98%	50%	140%	107%	60%	130%	86%	50%	140%
Methyl Isobutyl Ketone	3427631		<0.50	<0.50	NA	< 0.50	107%	50%	140%	98%	50%	140%	104%	50%	140%
1,1,2-Trichloroethane	3427631		<0.04	<0.04	NA	< 0.04	114%	50%	140%	116%	60%	130%	107%	50%	140%
Toluene	3427631		<0.05	<0.05	NA	< 0.05	86%	50%	140%	88%	60%	130%	90%	50%	140%
Dibromochloromethane	3427631		<0.05	<0.05	NA	< 0.05	98%	50%	140%	117%	60%	130%	109%	50%	140%
Ethylene Dibromide	3427631		<0.04	<0.04	NA	< 0.04	116%	50%	140%	83%	60%	130%	112%	50%	140%
Tetrachloroethylene	3427631		<0.05	<0.05	NA	< 0.05	72%	50%	140%	111%	60%	130%	90%	50%	140%
1,1,1,2-Tetrachloroethane	3427631		<0.04	<0.04	NA	< 0.04	84%	50%	140%	70%	60%	130%	96%	50%	140%
Chlorobenzene	3427631		<0.05	<0.05	NA	< 0.05	86%	50%	140%	86%	60%	130%	113%	50%	140%
Ethylbenzene	3427631		<0.05	<0.05	NA	< 0.05	75%	50%	140%	102%	60%	130%	107%	50%	140%
m & p-Xylene	3427631		<0.05	<0.05	NA	< 0.05	86%	50%	140%	106%	60%	130%	106%	50%	140%
Bromoform	3427631		<0.05	<0.05	NA	< 0.05	109%	50%	140%	101%	60%	130%	116%	50%	140%
Styrene	3427631		<0.05	<0.05	NA	< 0.05	82%	50%	140%	107%	60%	130%	101%	50%	140%
1,1,2,2-Tetrachloroethane	3427631		<0.05	<0.05	NA	< 0.05	109%	50%	140%	85%	60%	130%	104%	50%	140%
o-Xylene	3427631		<0.05	<0.05	NA	< 0.05	84%	50%	140%	119%	60%	130%	90%	50%	140%
1,3-Dichlorobenzene	3427631		<0.05	<0.05	NA	< 0.05	92%	50%	140%	80%	60%	130%	89%	50%	140%
1,4-Dichlorobenzene	3427631		<0.05	<0.05	NA	< 0.05	92%	50%	140%	84%	60%	130%	112%	50%	140%
1,2-Dichlorobenzene	3427631		<0.05	<0.05	NA	< 0.05	95%	50%	140%	113%	60%	130%	101%	50%	140%
n-Hexane	3427631		<0.05	<0.05	NA	< 0.05	76%	50%	140%	108%	60%	130%	109%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

O. Reg. 558 - VOCs

Vinyl Chloride Leachate	3432229		<0.030	<0.030	NA	< 0.030	99%	50%	140%	96%	50%	140%	95%	50%	140%
1,1 Dichloroethene Leachate	3432229		<0.020	<0.020	NA	< 0.020	86%	50%	140%	90%	60%	130%	70%	50%	140%
Dichloromethane Leachate	3432229		<0.030	<0.030	NA	< 0.030	103%	50%	140%	113%	60%	130%	74%	50%	140%
Methyl Ethyl Ketone Leachate	3432229		<0.090	<0.090	NA	< 0.090	102%	50%	140%	98%	50%	140%	97%	50%	140%
Chloroform Leachate	3432229		<0.020	<0.020	NA	< 0.020	101%	50%	140%	111%	60%	130%	102%	50%	140%
1,2-Dichloroethane Leachate	3432229		<0.020	<0.020	NA	< 0.020	103%	50%	140%	102%	60%	130%	101%	50%	140%
Carbon Tetrachloride Leachate	3432229		<0.020	<0.020	NA	< 0.020	116%	50%	140%	99%	60%	130%	71%	50%	140%
Benzene Leachate	3432229		<0.020	<0.020	NA	< 0.020	107%	50%	140%	92%	60%	130%	113%	50%	140%
Trichloroethene Leachate	3432229		<0.020	<0.020	NA	< 0.020	100%	50%	140%	98%	60%	130%	93%	50%	140%
Tetrachloroethene Leachate	3432229		<0.050	<0.050	NA	< 0.050	102%	50%	140%	84%	60%	130%	84%	50%	140%
Chlorobenzene Leachate	3432229		<0.010	<0.010	NA	< 0.010	90%	50%	140%	86%	60%	130%	112%	50%	140%
1,2-Dichlorobenzene Leachate	3432229		<0.010	<0.010	NA	< 0.010	104%	50%	140%	107%	60%	130%	106%	50%	140%

Quality Assurance

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes E-W

AGAT WORK ORDER: 22T853869
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

Trace Organics Analysis (Continued)

RPT Date: Jan 25, 2022			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
1,4-Dichlorobenzene Leachate	3432229		<0.010	<0.010	NA	< 0.010	78%	50%	140%	118%	60%	130%	101%	50%	140%
O. Reg. 558 - PCBs															
PCB's Leachate	3429039	3429039	< 0.005	< 0.005	NA	< 0.005	104%	50%	140%	91%	50%	140%	98%	50%	140%
O. Reg. 558 - Benzo(a) pyrene															
Benzo(a)pyrene Leachate	3432229		< 0.001	< 0.001	NA	< 0.001	78%	50%	140%	105%	50%	140%	99%	50%	140%

Certified By:

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes E-W

AGAT WORK ORDER: 22T853869
ATTENTION TO: Alessandro Pellerito
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	modified from EPA 6010D and MSA PART 3, CH 21	ICP/OES
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium, Hexavalent	INOR-93-6068	modified from EPA 3060 and EPA 7196	SPECTROPHOTOMETER
Cyanide, Free	INOR-93-6052	modified from ON MOECC E3015, SM 4500-CN- I, G-387	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	modified from EPA 7471B and SM 3112 B	ICP-MS
Electrical Conductivity (2:1)	INOR-93-6036	modified from MSA PART 3, CH 14 and SM 2510 B	EC METER
Sodium Adsorption Ratio (2:1) (Calc.)	INOR-93-6007	modified from EPA 6010D & Analytical Protocol	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Arsenic Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Barium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Boron Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Cadmium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Chromium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes E-W
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Lead Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Mercury Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Selenium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Silver Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Uranium Leachate	MET-93-6103	EPA 1311 & modified from EPA 6020B	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA 1311 & modified from SM4500-F-C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA 1311 modified from MOE 3015 SM 4500 CN-I,G387	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & modified from SM 4500 - NO3- I	LACHAT FIA

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
PROJECT: TP115086.1.6000.5800.573000
SAMPLING SITE:SP47/Boreholes E-W

AGAT WORK ORDER: 22T853869
ATTENTION TO: Alessandro Pellerito
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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Heptachlor	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Aldrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Heptachlor Epoxide	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan I	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan II	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endosulfan	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
Alpha-Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
gamma-Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Chlordane	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
op'-DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDE	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
op'-DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDD	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	CALCULATION
op'-DDT	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
pp'-DDT	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
DDT (Total)	ORG-91-5113	modified from EPA 3570, 3620C & 8081B	CALCULATION
Dieldrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Endrin	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Methoxychlor	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Hexachlorobenzene	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Hexachlorobutadiene	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
TCMX	ORG-91-5112	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Decachlorobiphenyl	ORG-91-5113	modified from EPA 3570 & 3620C & 8081B	GC/ECD
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE
AGAT WORK ORDER: 22T853869
PROJECT: TP115086.1.6000.5800.573000
ATTENTION TO: Alessandro Pellerito
SAMPLING SITE:SP47/Boreholes E-W
SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
wet weight OC	ORG-91-5113		BALANCE
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
Toluene-d8	VOL-91-5009	modified from EPA SW-846 5030C & 8260D	(P&T)GC/MS
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromomethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Acetone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 22T853869

PROJECT: TP115086.1.6000.5800.573000

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47/Boreholes E-W

SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Toluene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Bromoform	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Styrene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
o-Xylene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
1,3-Dichloropropene (Cis + Trans)	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
n-Hexane	VOL-91-5002	modified from EPA 5035A and EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5002	modified from EPA 5035A & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	modified from EPA 5035A & EPA 8260D	(P&T)GC/MS
Moisture Content	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Benzo(a)pyrene Leachate	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Acridine-d9	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Naphthalene-d8	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Terphenyl-d14	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
PCB's Leachate	ORG-91-5112	Regulation 558, EPA SW846 3510C/8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW846 3510C/8082	GC/ECD
Vinyl Chloride Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,1 Dichloroethene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS

Method Summary

CLIENT NAME: WOOD ENVIRONMENT & INFRASTRUCTURE

AGAT WORK ORDER: 22T853869

PROJECT: TP115086.1.6000.5800.573000

ATTENTION TO: Alessandro Pellerito

SAMPLING SITE:SP47/Boreholes E-W

SAMPLED BY:Mohammad Safarpanah

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Dichloromethane Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Methyl Ethyl Ketone Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Chloroform Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,2-Dichloroethane Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Carbon Tetrachloride Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Benzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Trichloroethene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Tetrachloroethene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Chlorobenzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene Leachate	VOL-91-5001	EPA 1311, modified from EPA 5030C & EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

P/U - 3.5/3.3/3

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Laboratory Use Only

Work Order #: 22T853869.

Cooler Quantity:

Arrival Temperatures: ~~[illegible] | [illegible] | [illegible]~~
2.4 | 2.2 | 2.2

Custody Seal Intact: ☐ Yes ☑ No ☐ N/A

Notes: on ice (free ice)

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Alessandro Pellerito
Address: 50 Vogell Road, Richmond Hill, ON, L4B 3K6
Phone: 647-982-6220 Fax:
Reports to be sent to:
1. Email: a.pellerito@woodplc.com
2. Email: shami.malla@woodplc.com

Regulatory Requirements:

(Please check all applicable boxes)

☑ Regulation 153/04
Table ____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Excess Soils R406
Table ____ *Indicate One*
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐ Sanitary ☐ Storm
____ *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
____ *Indicate One*

Is this submission for a Record of Site Condition?
☐ Yes ☑ No

Report Guideline on *Certificate of Analysis*
☐ Yes ☑ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: TP115086.1.6000.5139.573000
Site Location: SP47/Boreholes E-W
Sampled By: Mohammad Safarpanah
AGAT Quote #: 305848 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Wood PLC
Contact:
Address:
Email: APInvoice.Canada <apinvoice.canada@woodplc.com>

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC	O. Reg 153						O. Reg 558	O. Reg 406										
						Y / N	Metals & Inorganics	Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	BTEX, F1-F4 PHCs Analyze F4G if required ☐ Yes ☐ No	PAHs	PCBs	VOC	Landfill Disposal Characterization TCLP: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	OC pesticides	TCLP M/I, VOC, PCB	TCLP PCB					Potentially Hazardous or High Concentration (Y/N)
E1 SS1	11 Jan 22	12:00 AM PM	1	S			☑																	
E1 SS2	11 Jan 22	12:10 AM PM	1	S	HOLD																			
E2 SS1	11 Jan 22	12:25 AM PM	1	S			☑										☑							
E2 SS2	11 Jan 22	12:30 AM PM	3	S					☑			☑												
E3 SS1	11 Jan 22	13:10 AM PM	1	S			☑																	
E3 SS2	11 Jan 22	13:15 AM PM	1	S													☑							
E4 SS1	11 Jan 22	13:30 AM PM	1	S	HOLD																			
E5 SS1	11 Jan 22	13:55 AM PM	1	S														☑	☑					
E5 SS2	11 Jan 22	14:00 AM PM	4	S			☑																	
E7 SS1	11 Jan 22	14:15 AM PM	1	S			☑																	
		AM PM																						

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Mohammad Safarpanah	13 January 20	18:00		Jan 14	14:49.

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

Nº:

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT