APPENDIX

K

GEOTECHNICAL INVESTIGATION REPORT

BRAMPTON EAST-WEST CONNECTOR

GEOTECHNICAL INVESTIGATION

CITY OF BRAMPTON

CONFIDENTIAL

PROJECT NO.: 141-15409-00.
DATE: JUNE 01, 2018

WSP
294 RINK STREET, SUITE 103
PETERBOROUGH, ON K9J 2K2

T: +1 705-743-6850
WSP.COM

June 01, 2018

Confidential

The Corporation of the City of Brampton
2 Wellington Street West
Brampton, ON L6Y 4R2

Attention: Mr. Mario Goolsarran, P.Eng.

Dear Sir:

Subject: Geotechnical Investigation Report, Brampton East-West Connector

We are pleased to submit our geotechnical investigation report addressing subsurface conditions for the Environmental Assessment (EA) Phase of the design and subsequent construction of the proposed Brampton East-West Connector, to be located in the vicinity of Bovaird Drive and Mississauga Road, in Brampton, Ontario.

It is WSP's understanding that a new roadway is proposed in the area, which will require at least two creek crossings.

A geotechnical soils investigation within the project limits was completed by WSP on April 2, 2018. The investigation comprised subsurface exploration by means of advancing and sampling a total of six (6) boreholes. A track mounted drill rig was used and drilling was completed using continuous flight power augers with standard penetration testing (SPT)

This report summarizes the procedures and findings of the geotechnical investigation completed in April 2018, including results of the drilling and laboratory testing program, and our general preliminary recommendations with regards to design and construction of the proposed roadway and creek crossings.

We trust that the information in this report is straightforward and meets with your present requirements.

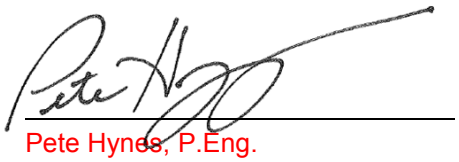
Yours sincerely,

Pete Hynes, P.Eng.
Project Engineer, Environment

WSP ref.:

SIGNATURES

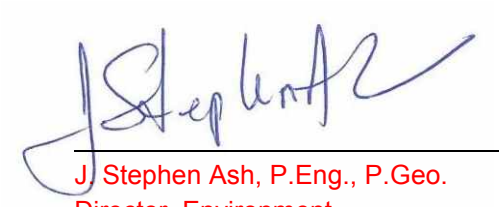
PREPARED BY



Pete Hynes, P.Eng.
Project Engineer, Environment

June 1, 2018
Date

APPROVED[1] BY



J. Stephen Ash, P.Eng., P.Geo.
Director, Environment

June 1, 2018
Date

WSP Canada Inc. prepared this report solely for the use of the intended recipient, The Corporation of the City of Brampton, in accordance with the professional services agreement. The intended recipient is solely responsible for the disclosure of any information contained in this report. The content and opinions contained in the present report are based on the observations and/or information available to WSP Canada Inc. at the time of preparation. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP Canada Inc. does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report. This limitations statement is considered an integral part of this report.

The original of this digital file will be conserved by WSP Canada Inc. for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP Canada Inc., its integrity cannot be assured. As such, WSP Canada Inc. does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

It is understood that the Corporation of the City of Brampton (the "Client") is proposing a new roadway in the vicinity of Bovaird Drive and Mississauga Road, in the City of Brampton, Ontario (the "Site"). Test hole location plans for the subject geotechnical investigation are included as **Figures 1** and **2** of this report. It is WSP's understanding that the proposed roadway shall require at least two (2) creek crossings.

This geotechnical report provides information on subsurface conditions at the site, including a description of the existing soil profile and groundwater conditions. Based on the investigation findings, WSP has provided select preliminary geotechnical recommendations for consideration during the Environmental Assessment (EA) phase of the project.

2 INVESTIGATION METHODOLOGY

2.1 FIELD INVESTIGATION

WSP completed a borehole investigation at the Site on April 1, 2018. Buried utility clearances were obtained prior to equipment mobilization, using Ontario One Call services. A total of six (6) boreholes were advanced to depths ranging from approximately 3.5 to 5.2 m below ground level (mBGL). The boreholes were located as illustrated on **Figures 1** and **2**.

WSP field personnel supervised the drilling operations and recorded the subsurface conditions encountered in the boreholes. The boreholes were advanced using a commercial track-mount drill rig equipped with continuous flight augers and SPT hammer. Soil samples were recovered at regular intervals (approximately 0.75 and 1.5 m) using a 51 mm outside diameter split-spoon sampler, driven in accordance with the SPT procedures (i.e. ASTM D1586). The results of the SPTs in terms of N values are referred to in this report as consistency for cohesive soils and relative density for non-cohesive materials. Soil samples recovered from the boreholes were placed in moisture proof bags and transported to our CCIL-certified laboratory for detailed classification and testing.

The boreholes were checked for groundwater seepage and general stability upon completion. The boreholes were then backfilled using compacted cuttings. Borehole location coordinates were obtained using a handheld GPS unit, referencing the NAD 83 UTM datum. Borehole coordinates are provided on the Borehole Logs in **Appendix A** of this report. Borehole locations are for analytical purposes only, and information is intended for EA and preliminary design considerations.

2.2 PHYSICAL LABORATORY ANALYSIS

Upon completion of drilling, recovered soil samples were transported to the WSP geotechnical laboratory for more detailed visual examinations and engineering classifications. Laboratory particle size distribution analyses (as per ASTM D422) were performed on selected soil samples from the borings to assess gradation, textural descriptions and engineering properties. Results are presented in the **Appendix B** and are discussed in the following sections below.

Unless requested in advance, soil samples from the investigation will be stored in our laboratory facility for a period of three (3) months after the issuance of the final report.

2.3 CHEMICAL LABORATORY ANALYSIS

In addition to the physical laboratory analysis, selected representative samples were submitted for chemical analysis of selected parameters, to assess the requirements for material management during construction and possible disposal options if required.

As outlined in our proposal (P13-11192-31, dated November 21, 2013), six (6) representative samples were submitted for analysis for metals and inorganic related parameters, and three (3) samples were submitted for OC Pesticide related parameters.

3 SUBSURFACE FINDINGS

Based on the borehole information, the subsurface soil profile at the site comprises surficial topsoil, overlying layers of native soils consisting predominantly of silty sand, sandy silt and clayey silt till. Individual soil units encountered in the boreholes are described as follows.

3.1 TOPSOIL

A surficial layer of topsoil was encountered in each of the six (6) boreholes. The topsoil layer ranged from approximately 150 to 560 mm in thickness. The topsoil generally had a silty texture, and contained significant organic material. The topsoil is expected to be devoid of structural properties and should be removed from structural loading areas, including the proposed roadway alignment.

3.2 TILL

Layers of glacial till were encountered immediately beneath the topsoil layers, and extended to the full depth of the investigation (i.e., depths ranging from 3.5 to 5.2 mBGL). The composition of the till varied across the site (and with depth), but generally comprised silty sand, sandy silt or clayey silt. Occasional sand seams were observed within the material.

Based on field observations and laboratory- determined moisture content ranging from 6 to 30%, the till was generally moist to wet (or about the plastic limit (APL) for cohesive till material) at the time of the investigation. N-values from SPT testing ranged from 4 to >50 blows, suggesting that the relative density of the fill ranged from loose to very dense.

The following sections, provided further details to the individual till subunits encountered in this investigation.

3.2.1 SILTY SAND TILL

Layers of silty sand till were encountered in boreholes BH18-01 to BH18-03, and BH18-05.

Within borehole BH18-01, the silty sand till was encountered immediately beneath the topsoil, from approximately 0.3 to 1.1 mBGL, and immediately beneath a cobbly silty sand till layer from approximately 3.4 mBGL to the full depth of the investigation (approximately 3.5 mBGL).

Within boreholes BH18-02, BH18-03 and BH18-05, the silty sand till was encountered immediately beneath a sandy silt till layer, at depths ranging from approximately 2.3 to 4.0 mBGL, and extended to the full depth of the investigation (depths ranging from approximately 3.5 to 5.2 mBGL).

The silty sand till consisted predominantly of silty sand, with trace to some amounts of gravel, trace amounts of clay, and occasional cobbles. The silty sand till was generally light brown to brown to reddish brown in colour.

Based on field observations and laboratory moisture tests ranging from 6 to 14%, the silty sand till was generally moist at the time of the investigation. N-Values from SPT testing ranged from 29 to >50 blows, suggesting that the relative density of the silty sand till ranged from compact to very dense.

Laboratory test results (moistures content tests) are presented on the borehole logs in **Appendix A**.

3.2.2 CLAYEY SILT TILL

A layer of clayey silt till was encountered in borehole BH18-01, immediately beneath the upper silty sand till layer (approximately 1.1 mBGL), and extended to a depth of approximately 2.3 mBGL.

The clayey silt till consisted predominantly of clayey silt, with trace amounts of sand and gravel and occasional cobbles. The clayey silt till was generally reddish brown in colour.

Based on field observations and a laboratory moisture test of 30%, the clayey silt till was generally about the plastic limit (APL) at the time of the investigation. N-Values from SPT testing were 6 blows, suggesting that the relative consistency of the clayey silt till was firm.

Laboratory test results (moistures content tests) are presented on the borehole logs in **Appendix A**.

3.2.3 COBBLY SILTY SAND TILL

Layers of cobbly silty sand till were encountered in boreholes BH18-01 and BH18-06. The cobbly silty sand till was encountered immediately beneath the clayey silt till in borehole BH18-01 and interbedded between two sand seams in borehole BH18-06. The cobbly silty sand till was first encountered at depths ranging from 2.3 to 2.7 mBGL and extended to depths ranging from 3.0 to 3.4 mBGL.

The cobbly silty sand till was compositionally similar to the silty sand till, but based on inspections of down-hole conditions and auger samples during drilling, it had a significantly higher amount of cobbles (i.e., greater than 75 mm in size based on USCS). The cobbly silty sand till was generally reddish brown in colour.

Based on field observations and a laboratory moisture test of 13%, the cobbly silty sand till was generally moist at the time of the investigation. N-Values from SPT testing ranged from 25 to >50 blows, suggesting that the relative density of the cobbly silty sand till was compact to dense.

Two (2) laboratory particle size distribution analyses were completed on selected representative samples (BH18-01 SS3 and BH18-06 SS3). Test results are as follows (Unified Soil Classification System, USCS):

- Gravel (greater than 4.75 mm sieve size) 24 to 30 %
- Sand (75 µm to 4.75 mm sieve size) 27 to 43 %
- Silt and Clay (less than 75 µm sieve size) 33 to 43 %

It is noted that cobble content is not represented in split spoon sampling methods, but is estimated to be >20 % of the bulk material. Laboratory test results are presented on the borehole logs in **Appendix A** and the particle size distribution plots included in **Appendix B**.

3.2.4 SANDY SILT TILL

Layers of sandy silt till were encountered, immediately beneath the topsoil in boreholes BH18-02 to BH18-06. The sandy silt till extended to depths of approximately 2.3 mBGL in borehole BH18-02, 3.0 mBGL in borehole BH18-03, the full depth of the investigation (approximately 5.2 mBGL) in borehole BH18-04, 4.0 mBGL in borehole BH18-05, and 2.1 mBGL in borehole BH18-06. A second layer of sandy silt till was encountered in borehole BH18-06 at a depth of approximately 3.3 mBGL and extended to the full depth of the investigation (approximately 4.8 mBGL).

The sandy silt till consisted predominantly of sandy silt, with trace to some amounts of clay, trace amounts of gravel, and occasional cobbles. The sandy silt till was generally reddish brown to brown to grey in colour.

Based on field observations and laboratory moisture tests ranging from 9 to 24%, the sandy silt till was generally moist to wet at the time of the investigation. N-Values from SPT testing ranged from 4 to >50 blows, suggesting that the relative density of the sandy silt till was loose to dense.

One (1) laboratory particle size distribution analysis was completed on a selected representative sample (BH18-03 SS2). Test results are as follows (Unified Soil Classification System, USCS):

- Gravel (greater than 4.75 mm sieve size) 5 %
- Sand (75 µm to 4.75 mm sieve size) 23 %
- Silt and Clay (less than 75 µm sieve size) 72 %

Laboratory test results are presented on the borehole logs in **Appendix A** and the particle size distribution plots are included in **Appendix B**.

3.2.5 SAND SEAMS

Interbedded sand seams were occasional encountered within the till units, specifically in borehole BH18-06. Two distinct sand seams were observed within borehole BH18-06; the first from approximately 2.1 to 2.7 mBGL and the second from approximately 3.0 to 3.3 mBGL.

The sand seams generally consisted of light brown sand, with trace amounts of silt. Based on field observations, the sand seams were generally wet to saturated at the time of the investigation. Due to the depth and thicknesses of these sand seams, they did not intersect a full SPT testing interval. Partial SPT testing intervals results suggest that the relative density is consistent with till units above and below the seams, generally being dense.

3.3 GROUNDWATER

Groundwater observations were made within the open boreholes upon completion. Groundwater accumulation was observed in three of the boreholes (BH18-01, BH18-05 and BH18-06) at depths ranging from approximately 1.8 to 3.4 mBGL. The remaining boreholes did not encounter groundwater seepage and/or accumulation during the drilling operations. Borehole caving was observed and recorded for three (3) of the boreholes (BH18-04 to BH18-06). It should be noted, although no groundwater seepage and/or accumulation was noted in borehole BH18-04, above the depth of borehole caving, the cave-in itself may be an indication of groundwater below this depth.

Monitoring wells were installed in four (4) selected boreholes following drilling operations. The monitoring wells were installed in boreholes BH18-01, BH18-04, BH18-05 and BH18-06. The monitoring wells will be used for a Hydrogeological EA report, provided separately.

Groundwater levels are subject to seasonal fluctuations, specifically in response to extreme precipitation events and the spring thaw. As such variable levels should be anticipated, and groundwater could be encountered during construction, depending on site location and depth.

3.4 CHEMICAL LABORATORY ANALYSIS

As noted earlier, six (6) representative samples were submitted for analysis for metals and inorganic related parameters, and three (3) samples were submitted for OC Pesticide related parameters.

The test results are provided in Appendix C , and were compared to the most stringent criteria of the current O. Reg. 153/04 guidelines (Table 1 for Agricultural property use). All samples and parameters met the criteria for Table 1 Agricultural property use with the exception of Uranium within sample SS1 from BH18-01. The Uranium parameter met the criteria for Residential/Parkland/Institutional property use and Industrial/Commercial/Community property use under Table 1. Further, results met all criteria for Tables 2 through 9, with the exception of Agricultural property use under Table 8.

The Uranium exceedance is not considered a significant environmental concern, provided that this soil is not moved to a Table 1 or Table 8 receiver site designated for Agricultural land use. Review by a qualified person (QP) is required for material acceptability, under pending environmental regulations.

4 RECOMMENDATIONS

It is understood that the Client is proposing a new roadway in the vicinity of Bovaird Drive and Mississauga Road, in the City of Brampton, Ontario. It is further understood that at least two (2) creek crossings will be required to connect the alignment.

The following preliminary geotechnical recommendations, for consideration during the Environmental Assessment (EA) phase, are based on the borehole information provided in **Section 3**. While we believe our findings are representative, conditions may vary beyond the investigated locations. If significant differences in the subsurface conditions described above are found at a later time, WSP should be contacted immediately to revise our findings and recommendations, if necessary.

Recommendations are intended for Designers and should not be construed as instructions to Contractors, who should form their own opinions about Site conditions for tendering purposes, and to determine appropriate equipment, construction methods, and their costs.

4.1 SITE PREPARATION

All areas of the proposed road reconstruction and proposed creek crossing abutments should be stripped of topsoil and sub-excavated to the proposed subgrade level. The subgrade should then be inspected to confirm no organic, saturated or loose soils (as determined by a subgrade inspection) are present prior to placement of fill materials, foundations or structures associated to the underground infrastructure. Prepared structural subgrade areas should be proof-rolled using a self-propelled vibratory compactor with a minimum static weight of 8 tonnes. Proof-rolling should be completed in the presence of WSP Geotechnical Engineers or qualified personnel working under their direct supervision. Loose or soft subsoils, if any, should be removed and replaced with approved fill that is texturally consistent with the native material. Alternatively, if excessive rutting or loose areas are noted during the proof roll inspection a geotextile separator (Terrafix 270R or an approved equivalent) may be an option to limit the depth of any sub-excavation, approval for specific use of the geotextile must be approved by the Geotechnical Engineer.

Any new fill from onsite cuts or offsite borrow sources, should be approved by the Geotechnical Engineer and /or designated QP. Material should be placed in 200 mm maximum loose lifts, compacted to the following Standard Proctor Maximum Dry Density (SPMDD) requirements (per ASTM D698) based on presumptive loading conditions:

- Material placed below structurally loaded areas: 100 % SPMDD
- Material placed below roadways: 98 % SPMDD
- Materials placed within general fill areas: 95 % SPMDD

Moisture adjustments may be required to compact materials to the required design standards, as directed by the Geotechnical Engineer.

Silts and silty sands may become loose/weak or otherwise unstable when construction loads are applied in wet weather conditions. This material may require stabilization or full removal, subject to the moisture conditions at the time of construction. This material may also be frost susceptible and should be removed from below footing or pavement areas that are potentially exposed to freezing.

4.2 EXCAVATIONS AND DEWATERING

Excavations should be constructed in accordance with the most recent version (O. Reg. 123/08) of the Occupational Health and Safety Act (OHSA). Based on OHSA criteria, the site soils (till) above the groundwater table may be considered a Type 2 soil, while site soils below the groundwater tables should be considered a Type 4 soil.

Excavation sidewalls in a Type 2 soil should be sloped at a maximum of 1H:1V to within 1.2 m of the base of the excavation, while excavation sidewalls in a Type 4 soil should be sloped at a maximum of 3H:1V to the base of the excavation. Excavations should be protected from exposure to precipitation and associated ground surface runoff, and should be inspected regularly for signs of instability. If localized instability is noted during excavation, or if wet conditions are encountered, side slopes should be flattened as required to maintain safe working conditions. If excavation side slopes cannot be achieved due to site confinement, shoring should be designed and installed.

Relatively minor seepage into open cut excavations above the groundwater table may be controlled using filtered sumps and pumps. Surface water inflow can also be controlled in this manner, but preferably it should be directed away from the excavations. For service trenches, to minimize potential problems, backfilling operations should follow closely after excavation and pipe installation so that only minimal lengths of trench are exposed at any given time.

Depending of final service installation depth (if applicable), advance dewatering systems may be required when excavations extend below the groundwater table. All dewatering shall be completed according to OPSS 518 and shall be completed using submersible pumps and sumps, well points or diversions as required.

If required, construction trench dimensions (length, width and depths) as well as dewatering methods and techniques can greatly affect the volume of dewatering that will be required for excavation operations. If dewatering activities are to exceed 50,000 L/day the project would either need to be registered under the Environmental Sector and Registry (ESAR) program by the MOECC (for up to 400,000 L/day) or require a permit to take water (PTTW) (greater than 400,000 L/day). Both an EASR or a PTTW application should be done well in advance of construction, by a Qualified Person (QP), and consider the pumping rates, drawdown, water quality for discharge, ground effects, and monitoring requirements.

4.3 BEDDING AND COVER MATERIALS

Buried infrastructure pipes below the proposed route may be installed with Class B bedding, in accordance with the OPSD 802.010. Bedding materials can be well graded, granular fill, such as Granular A (OPSS 1010), 19 mm crushed Clear Stone Bedding (OPSS 1010) or HPBS (OPSS 1010) with a minimum compacted thickness of 150 mm. Pipe bedding and cover materials should be compacted to at least 98 percent of SPMDD for Granular Materials.

4.4 FROST PENETRATION DEPTH

Based on Ontario Provincial Standard Drawing (OPSD) 3090.101 (Foundation Frost Penetration Depths for Southern Ontario), professional experience, soil types, and proposed structures, foundation elements and roadways should be designed in consideration of at least 1.3 m frost penetration. Earth cover or an equivalent thickness of insulation installed according to manufacturer's specifications may be used for frost protection.

4.5 EARTHQUAKE CONSIDERATIONS

The 2012 Ontario Building Code of Canada specifies that structures should be designed to withstand forces due to earthquake.

Based on the soil conditions encountered in the boreholes, available information, and in accordance with Table 4.1.8.4.A of the 2012 Ontario Building Code, we recommend that Site Class 'D' be assumed for design. Additional investigations (MASW survey) may be required if the assumed Site Class has significant implications to the design. Contact WSP for details.

4.6 ROADWAY CONSTRUCTION

Estimated AADT values for the proposed connector route were not available at the time of preparing this report. It is expected that the proposed East-West Connector shall be designed as an arterial roadway. Recommended pavement structures have been determined based on expected road classification and the City of Brampton Design Standards, specifically Standard 208 dated May 13, 2014. The City of Brampton Design Standards outlines the pavement structure for the proposed roads, based on the R.O.W. width and pavement widths.

Provided that exposed subgrade surfaces are prepared in accordance with the preceding recommendations, the following asphalt thickness design may be considered for the Site. SuperPave equivalents may be used, if appropriate.

Table 4-1: Preliminary Asphalt Pavement Structure Design

PAVEMENT LAYER	EAST-WEST CONNECTOR	COMPACTION REQUIREMENTS
Asphaltic Concrete OPSS HL-1	50 mm	92.5 % to 97.5 % MRD
Asphaltic Concrete OPSS HL-8	100 mm (2 lifts)	
Base Course OPSS 1010 Granular 'A'	150 mm	98% SPMDD
Subbase Course OPSS 1010 Granular 'B' Type 1	450 mm	98% SPMDD

The thickness of the granular base material could be increased at the discretion of the Engineer, or granular sub-base layers could be added, to accommodate site conditions at the time of construction.

The asphalt mix designs should be reviewed and approved by the Geotechnical Engineer and the City of Brampton prior to construction.

The final subgrade should be sloped towards storm water control structure at a minimum cross fall of 2 %. Geotextile wrapped perforated subdrains consisting of a 150 mm diameter pipe are recommended at curb lines within the subgrade. The subdrains should be constructed in a minimum 300 mm wide and 300 mm deep trench, backfilled with an OPSS 1010 19 mm crushed clear stone. Subdrains should be connected to catch basins or other positive, frost free outlets. The clear stone should be wrapped on all sides with a geotextile (Terrafix 270R or an approved equivalent), and adjacent sheets of geotextile should be overlapped a minimum 450 mm. The pavement structure should also be graded towards the drainage ditches, or an approved alternative storm water control structure.

The western leg of the proposed Brampton East-West Connector is proposed to cross a Trans-Canada pipeline. The presence of the pipeline is not expected to affect the proposed pavement structure. However Trans-Canada may require modifications to provide a thicker pavement structure where the proposed road crosses the pipeline. WSP should be consulted to confirm that any modified pavement structure is suitable.

4.7 CREEK CROSSINGS

4.7.1 FOUNDATION DESIGN

It is recommended that proposed creek crossing structures be supported on concrete footings, placed directly on compact to dense native till, or engineered fill placed directly on such soils. Alternatively, higher bearing capacities may be achieved if foundations are extended deeper into the till; groundwater controls and shoring system may be required for deeper foundation construction below the water table. Alternative deep foundation solutions may include (but not necessarily be limited to) driven piles, augered piles, or helical piers. Should the Client wish to consider alternative foundation solutions, WSP should be consulted for additional recommendations.

For design purposes, the recommended geotechnical resistance at Ultimate Limit States (ULS) (factored) and geotechnical reaction at Serviceability Limit States (SLS) for shallow spread footing foundations bearing on compact to dense till (or engineered fill placed directly on such material), are 225 kPa and 150 kPa, respectively. The geotechnical reaction at SLS is based on a total allowable settlement of 25 mm and maximum differential settlement of 15 mm.

Engineered fill upon which footings are placed must be at least 300 mm in thickness.

Prior to forming, all foundation excavation must be inspected and approved by WSP's Geotechnical Engineer. Inspections should address foundation bearing material preparation, including subgrade soil stabilization, and that exposed soils are consistent with expectations. Under no circumstances should the foundation be placed directly on organic material, loose, frozen subgrade, construction debris, or within ponded water.

4.7.2 ABUTMENTS

It is recommended that a free draining, non-frost susceptible granular material, such as Granular 'B' (OPSS Form 1010), be utilized as backfill to the structure abutments. The backfill should extend horizontally from the back of the abutment for a minimum distance of 1.5 m. Provision for drainage of the backfill should be implemented.

4.7.3 LATERAL EARTH PRESSURES

For the purpose of preliminary design it is assumed that lateral earth pressures are developed from free-draining granular backfill. The following unfactored earth pressure coefficients are recommended for design of retaining walls and underground structures.

- Unit weight of Granular Materials (compacted to 100% SPMDD) : 23 kN/m^3
- Passive Earth Pressure Coefficient, K_p =3.3
- Active Earth Pressure Coefficient, K_a =0.3

Active (yielding) lateral thrust may be derived from the expression:

$$P = K_a (\gamma h + q)$$

Where,

γ = unit weight (kN/m^3)

h = height of wall or structure (m)

q = surcharge loadings (kPa)

Triangular stress distributions should be assumed for active and/or passive loading cases in well drained soil/fill conditions.

4.7.4 SCOUR PROTECTION

Once the location-specific hydraulic factors are determined, scour protection measures, if required, should be implemented as outlined in the Canadian Bridge Design Code.

4.7.5 FURTHER INVESTIGATION

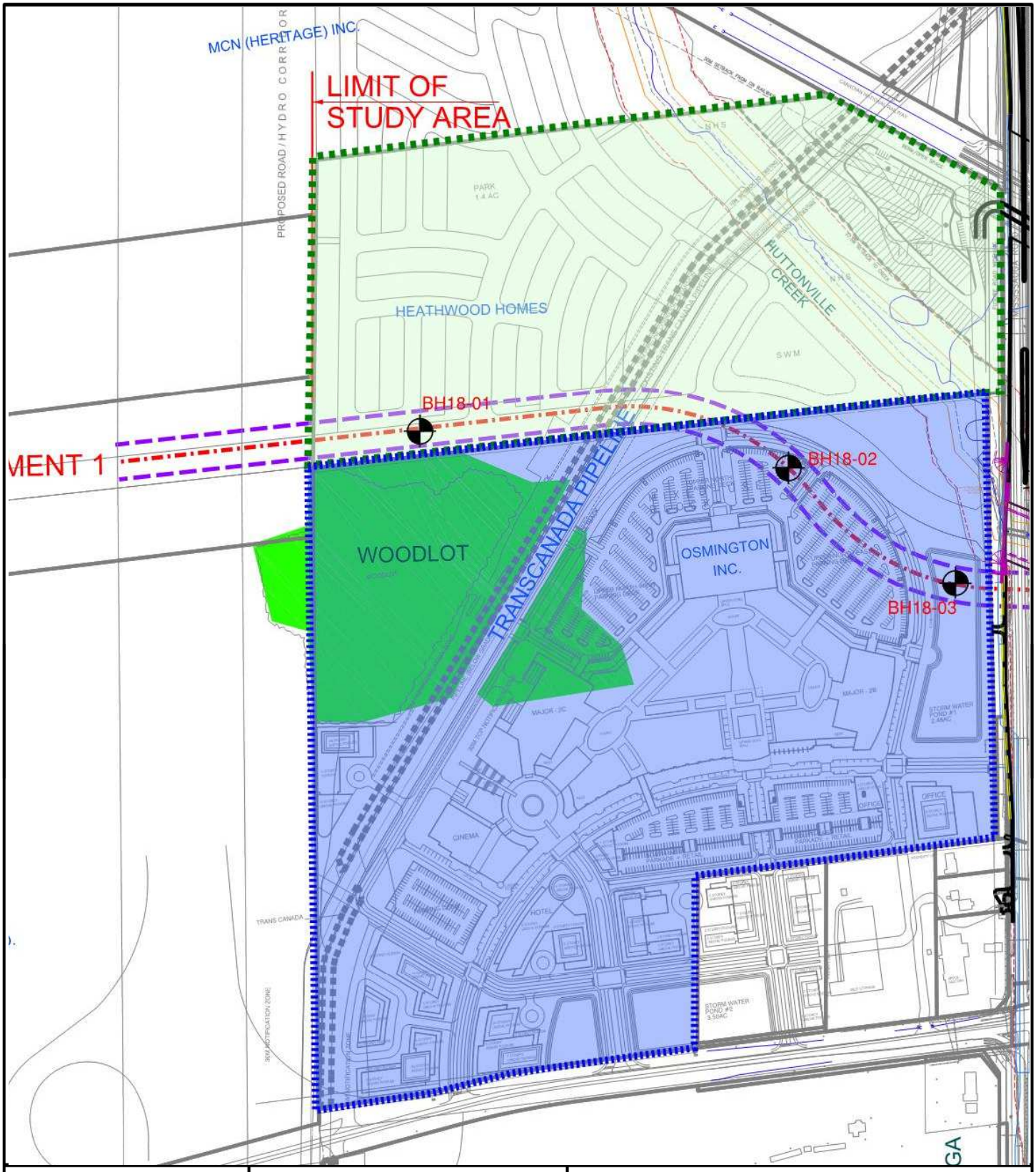
The above recommendations related to the proposed creek crossing are preliminary in nature, as the exact location of the crossing abutments and proposed loading have not yet been determined. Once the exact location of the abutments and proposed loadings are determined, it is recommended additional boreholes be advanced for detailed design.

5 DESIGN REVIEW, TESTING AND INSPECTION

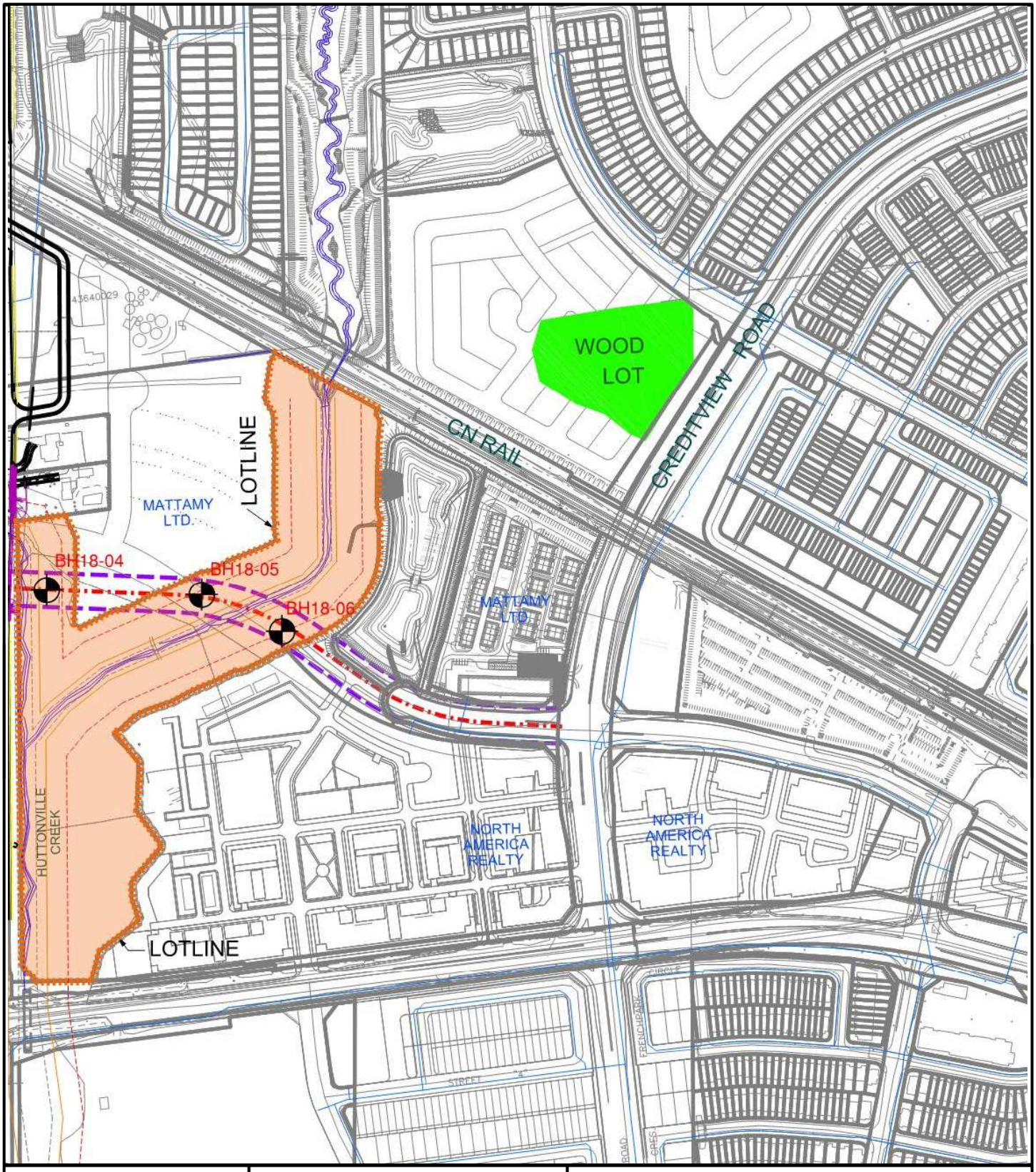
WSP should be afforded the opportunity to complete a review of final roadway, grading, foundation and servicing designs to verify that assumptions and geotechnical recommendations discussed in this report are appropriate. If not given this opportunity, WSP cannot assume liability for omissions, misinterpretations or deficiencies in our recommendations. Conditions beyond borehole locations may vary from those discussed in the report. WSP should be contacted if any significant subsurface variability is found at a later time. WSP should be requested to confirm requirements for soil handling and disposal, and the need for dewatering and a Permit to Take Water according to Provincial Regulations when more information is available.

Based on the limited information related to the proposed creek crossing, the relevant bridge crossing recommendations should be considered as preliminary. Once exact location and loadings are available, WSP should be afforded the opportunity to review the recommendations provided in this report, and make modifications if required. WSP should be contacted to provide geotechnical inspections and material testing during construction operations. Exposed subgrade soils are to be inspected to confirm the material is stable and competent to support design loads. Inspections of seepage and groundwater conditions during construction are also required, to further address requirements for dewatering. Testing and inspections for general QA/QC should include sampling and laboratory testing of fill materials and asphalt, and compaction testing.

We trust that this report satisfies your requirements. Please contact our office if you have any questions.



REF NO: 141-15409-00 F01	Borehole Location Plan	
DATE: May 2018	GEOTECHNICAL INVESTIGATION Brampton East-West Connector Western Portion For: City of Brampton	**Figure 1**
PROJECT: 141-15409-00		
WSP		



	REF NO: 141-15409-00 F01	Borehole Location Plan
	DATE: May 2018	GEOTECHNICAL INVESTIGATION Brampton East-West Connector Eastern Portion For: City of Brampton
	PROJECT: 141-15409-00	**Figure 2**
	wsp	

APPENDIX

A BOREHOLE LOGS

BOREHOLE NO. BH18-01

PROJECT NAME: BRAMPTON EAST-WEST CONNECTOR
PROJECT NO.: 141-15409-00
CLIENT: CITY OF BRAMPTON
DATE COMPLETED: Apr 02, 2018
BOREHOLE TYPE: HOLLOW STEM AUGER / 50 mm OD SPLIT SPOON
SUPERVISOR: MN
GROUND ELEVATION: NOT SURVEYED
REVIEWER: PH

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 593558
Northing: 4835526

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH (Intact (MaX) Cu, Remoulded Cu)	WATER CONTENT % (W_P, W_L)	REMARKS
0.0		TOPSOIL (300mm)										
0.3		SILTY SAND TILL: Brown, mottled orange SILTY SAND TILL, trace gravel, trace clay, moist, loose			SS1	6	22	75				
1.1		CLAYEY SILT TILL: Reddish brown CLAYEY SILT TILL, trace gravel, trace sand, occasional cobbles, APL, firm			SS2	6	30	56				Groundwater at 2.1 m below ground surface in open borehole upon completion
2.3		COBBLY SILTY SAND TILL: Reddish brown COBBLY SILTY SAND TILL, trace gravel, trace clay, wet, compact			SS3	25	13	83				GSA SS3: Gravel: 30% Sand: 27% Silt & Clay: 43%
3.4		SILTY SAND TILL: Reddish brown SILTY SAND TILL, trace gravel, trace clay, moist, very dense			SS4	84		71		84		Borehole open to 3.5 m below ground surface upon completion
3.5		Borehole terminated at 3.5 m below ground surface in SILTY SAND TILL.										

WSP GEOTECH (METRIC) WITH UTM AND MASL 141-15409-00_BRAMPTON EAST-WEST CONNECTOR.GPJ WSP_ENV_V1.GDT 4/20/18

BOREHOLE LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the borehole logs. Each of the headings used on the borehole log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

Soil Classification*		Terminology	Proportion
Silt & Clay	< 0.075 mm	"trace" (e.g. trace sand)	<10%
Sand	0.075 to 4.75 mm	"some" (e.g. some sand)	10% - 20%
Gravel	4.75 to 75 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	75 to 300 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>300 mm	noun (e.g. sand)	>50%

* Extension of USCS Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

COHESIONLESS SOIL		COHESIVE SOIL	
Compactness	Standard Penetration Resistance "N", Blows / 0.3 m	Consistency	Standard Penetration Resistance "N", Blows / 0.3 m
Very Loose	0 to 4	Very Soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Compact	10 to 30	Firm	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very Dense	Over 50	Very Stiff	15 to 30
		Hard	Over 30

The moisture conditions of cohesionless and cohesive soils are defined as follows.

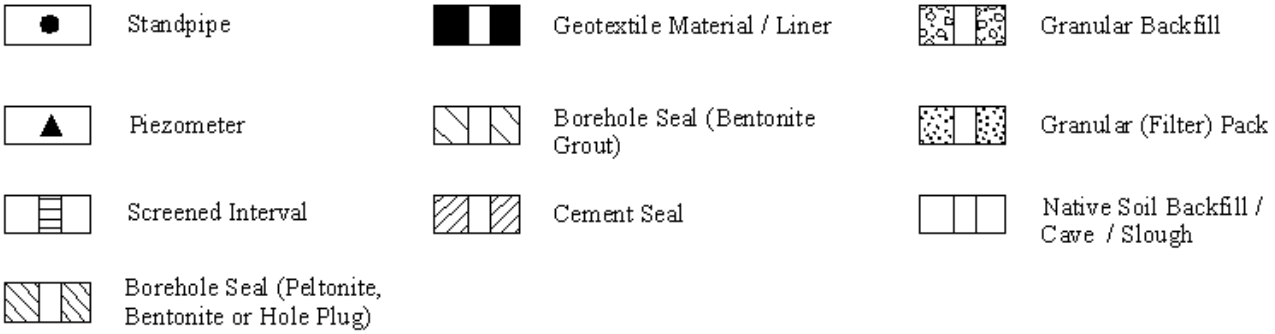
COHESIONLESS SOILS	COHESIVE SOILS		
Dry	DTPL	-	Drier Than Plastic Limit
Moist	APL	-	About Plastic Limit
Wet	WTPL	-	Wetter Than Plastic Limit
Saturated	MWTPL	-	Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.



Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "N" value, the water content, the percentage recovery, and Rock Quality Designation (RQD), of each sample obtained from the borehole where applicable. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS	=	Split Spoon	GS	=	Grab Sample
ST	=	Thin Walled Shelby Tube	CS	=	Channel Sample
AS	=	Auger Flight Sample	WS	=	Wash Sample
CC	=	Continuous Core	RC	=	Rock Core

$$\% \text{ Recovery} = \frac{\text{Length of Core Recovered Per Run}}{\text{Total Length of Run}} \times 100$$

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of core recovered, counting only those pieces of sound core that are 100 mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Penetration Resistance - The number of blows required to advance a 51 mm diameter, 60º steel cone fitted to the end of 45 mm OD drill rods, 0.3 m into the subsoil. The cone is driven with a 63.5 kg hammer over a fall of 750 mm.

Standard Penetration Resistance - Standard Penetration Test (SPT) "N" Value - The number of blows required to advance a 51 mm diameter standard split-spoon sampler 300 mm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 750 mm. In cases where the split spoon does not penetrate 300 mm, the number of blows over the distance of actual penetration in millimetres is shown as $\frac{xBlows}{mm}$

Water Content - The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

W_P - Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

W_L - Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

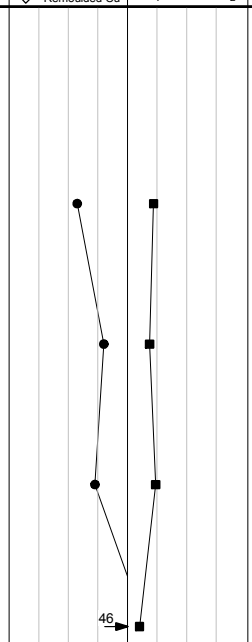
The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.

BOREHOLE NO. BH18-02

PROJECT NAME: BRAMPTON EAST-WEST CONNECTOR
PROJECT NO.: 141-15409-00
CLIENT: CITY OF BRAMPTON
DATE COMPLETED: Apr 02, 2018
BOREHOLE TYPE: HOLLOW STEM AUGER / 50 mm OD SPLIT SPOON
SUPERVISOR: MN
GROUND ELEVATION: NOT SURVEYED
REVIEWER: PH

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 593817
Northing: 4835775

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	REMARKS
0.0		TOPSOIL (300mm)								
0.3		SANDY SILT TILL: Brown SANDY SILT TILL, trace gravel, trace clay, moist, compact to dense								
1.0					SS1	23	13	83		
		- Occasional cobbles			SS2	32	11	75		
2.0										
2.3		SILTY SAND TILL: Light brown SILTY SAND TILL, trace gravel, trace clay, moist, compact to dense			SS3	29	14	92		
3.0										Borehole open and dry upon completion of drilling
					SS4	46	6	83		
3.7		Borehole terminated at 3.7 m below ground surface in SILTY SAND TILL.								
4.0										
5.0										
6.0										
7.0										
8.0										



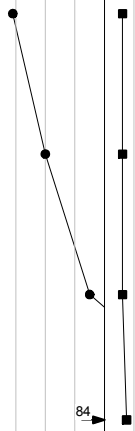
BOREHOLE NO. BH18-03

PROJECT NAME: BRAMPTON EAST-WEST CONNECTOR
PROJECT NO.: 141-15409-00
CLIENT: CITY OF BRAMPTON
DATE COMPLETED: Apr 02, 2018
BOREHOLE TYPE: HOLLOW STEM AUGER / 50 mm OD SPLIT SPOON
SUPERVISOR: MN
GROUND ELEVATION: NOT SURVEYED
REVIEWER: PH

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 593962
Northing: 4835804

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	REMARKS
0.0		TOPSOIL (150mm)								
0.2		SANDY SILT TILL: Brown SANDY SILT TILL, trace gravel, moist, loose			SS1	9	9	75		
1.5		SANDY SILT TILL: Dark brown SANDY SILT TILL, some clay, trace gravel, occasional cobbles, moist, compact to dense			SS2	20	9	100		GSA SS2: Gravel: 5% Sand: 23% Silt & Clay: 72%
3.0		- Reddish brown			SS3	35	9	92		
3.0		SILTY SAND TILL: Brown SILTY SAND TILL, trace gravel, trace clay, occasional cobbles, moist, very dense			SS4	84	11	71		
3.5		Borehole terminated at 3.5 m below ground surface in SILTY SAND TILL.								
4.0										
5.0										
6.0										
7.0										
8.0										

CONE PENETRATION "N" VALUE 10 20 30
SHEAR STRENGTH 10 20 30 40
Intact (MaX) Cu
Remoulded Cu
WATER CONTENT % 15 30 45
W_P W_L



BOREHOLE NO. BH18-04

PROJECT NAME: BRAMPTON EAST-WEST CONNECTOR
PROJECT NO.: 141-15409-00
CLIENT: CITY OF BRAMPTON
DATE COMPLETED: Apr 02, 2018
BOREHOLE TYPE: HOLLOW STEM AUGER / 50 mm OD SPLIT SPOON
SUPERVISOR: MN
GROUND ELEVATION: NOT SURVEYED
REVIEWER: PH

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 594095
Northing: 4835917

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH (Intact (MaX) Cu, Remoulded Cu)	WATER CONTENT % (W_P, W_L)	REMARKS
0.0		TOPSOIL (360mm)										
0.4		SANDY SILT TILL: Brown SANDY SILT TILL, trace gravel, trace clay, moist, loose to compact			SS1	5	17	75				
1.0		- Occasional cobbles			SS2	22	9	100				
2.0					SS3	27	10	100				Borehole caved at 2.4 m below ground surface upon completion
3.0		- Moist to wet			SS4	28	12	83				
4.0												
4.1		SANDY SILT TILL: Grey SANDY SILT TILL, trace clay, moist, compact			SS5	17	14	100				
5.0												
5.2		Borehole terminated at 5.2 m below ground surface in SANDY SILT TILL.										
6.0												
7.0												
8.0												

BOREHOLE NO. BH18-05

PROJECT NAME: BRAMPTON EAST-WEST CONNECTOR
PROJECT NO.: 141-15409-00
CLIENT: CITY OF BRAMPTON
DATE COMPLETED: Apr 02, 2018
BOREHOLE TYPE: HOLLOW STEM AUGER / 50 mm OD SPLIT SPOON
SUPERVISOR: MN
GROUND ELEVATION: NOT SURVEYED
REVIEWER: PH

UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 594218
Northing: 4836002

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH (Intact (MaX) Cu, Remoulded Cu)	WATER CONTENT % (W_P, W_L)	REMARKS
0.0		TOPSOIL (560mm)										
0.6		SANDY SILT TILL: Brown SANDY SILT TILL, trace gravel, trace clay, moist to wet, loose			SS1	4	23	83				
1.0		- Compact			SS2	10	14	100				
2.0		- Grey reddish			SS3	18	19	75				
3.0		- Reddish brown, wet, occasional cobbles			SS4	18	10	67				Groundwater at 3.4 m below ground surface in open borehole upon completion
4.0		SILTY SAND TILL: Brown SILTY SAND TILL, some gravel, trace clay, occasional cobbles, moist, dense			SS5	57		63		57		Borehole caved at 4.0 m below ground surface upon completion
5.0												
5.2		Borehole terminated at 5.2 m below ground surface in SILTY SAND TILL.										
6.0												
7.0												
8.0												

BOREHOLE NO. BH18-06

PROJECT NAME: BRAMPTON EAST-WEST CONNECTOR
PROJECT NO.: 141-15409-00
CLIENT: CITY OF BRAMPTON
DATE COMPLETED: Apr 02, 2018
BOREHOLE TYPE: HOLLOW STEM AUGER / 50 mm OD SPLIT SPOON
SUPERVISOR: MN
GROUND ELEVATION: NOT SURVEYED
REVIEWER: PH

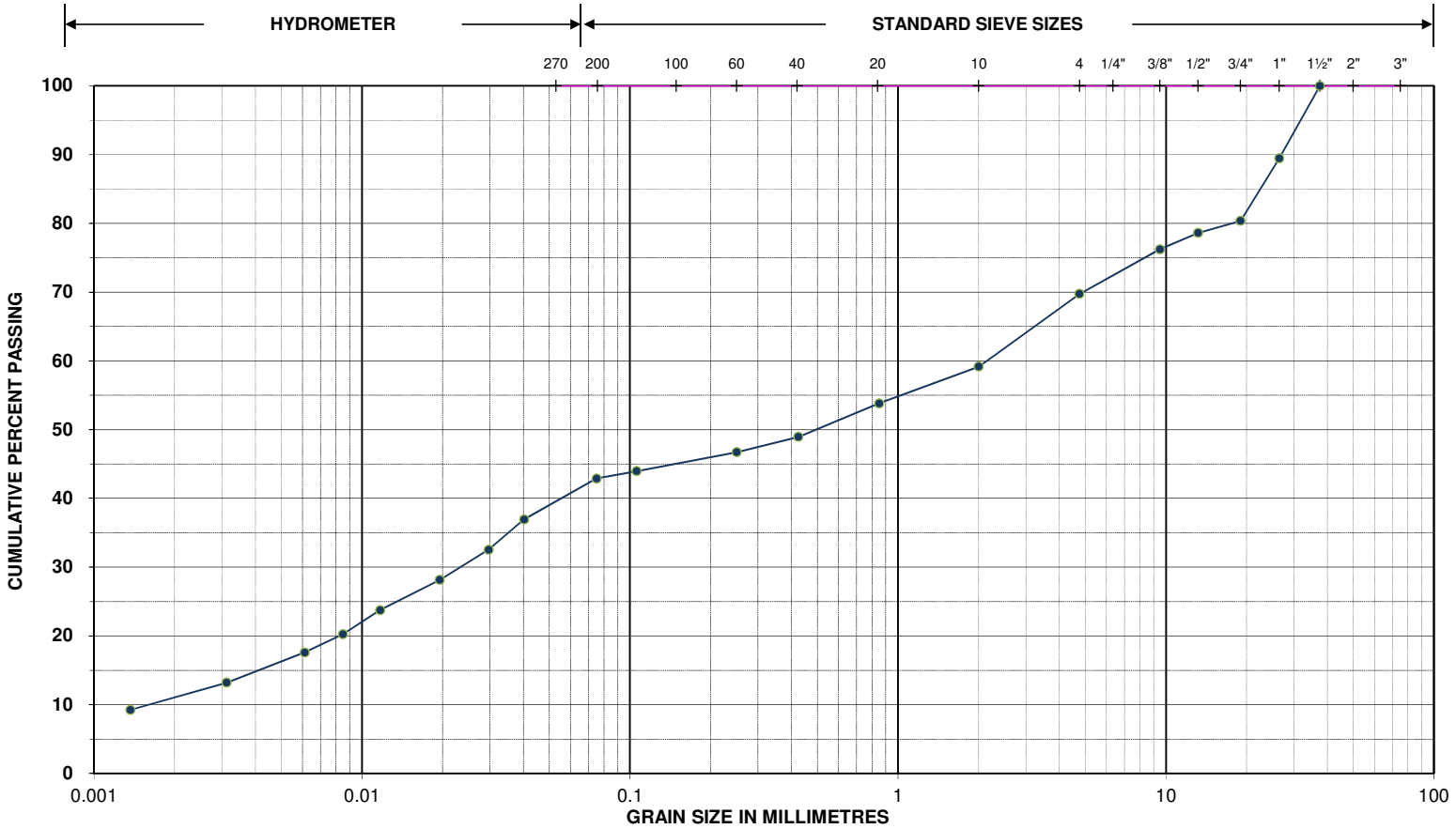
UTM CO-ORDINATES
UTM Zone: 17 NAD: 83
Easting: 594280
Northing: 4836004

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	PID/TOV (ppm)	CONE PENETRATION "N" VALUE / SHEAR STRENGTH (Intact (MaX) Cu, Remoulded Cu)	WATER CONTENT % (W_P, W_L)	REMARKS
0.0		TOPSOIL (530mm)										
0.5		SANDY SILT TILL: Light brown mottled orange and grey SANDY SILT TILL, trace gravel, trace clay, occasional cobbles, moist to wet, compact			SS1	11	24	100				
1.5		SANDY SILT TILL: Reddish brown SANDY SILT TILL, trace gravel, occasional cobbles, moist, compact			SS2	23	10	92				Groundwater at 1.8 m below ground surface in open borehole upon completion
2.1		SAND: Light brown SAND, trace silt, wet, dense			SS3	35	16	75				GSA SS3: Gravel: 24% Sand: 43% Silt & Clay: 33%
2.7		COBBLY SILTY SAND TILL: Reddish brown COBBLY SILTY SAND TILL, trace gravel, moist, dense										
3.0		SAND: Light brown SAND, trace silt, saturated, very dense			SS4	87	16	100		87		Borehole caved at 3.0 m below ground surface upon completion
3.3		SANDY SILT TILL: Reddish brown SANDY SILT TILL, trace gravel, occasional cobbles, moist, very dense										
4.8		Borehole terminated at 4.8 m below ground surface in SANDY SILT TILL.			SS5	50/ 75mm	8	100		50		
5.0												
6.0												
7.0												
8.0												

APPENDIX

B PHYSICAL LABORATORY DATA

PARTICLE SIZE DISTRIBUTION ASTM D422



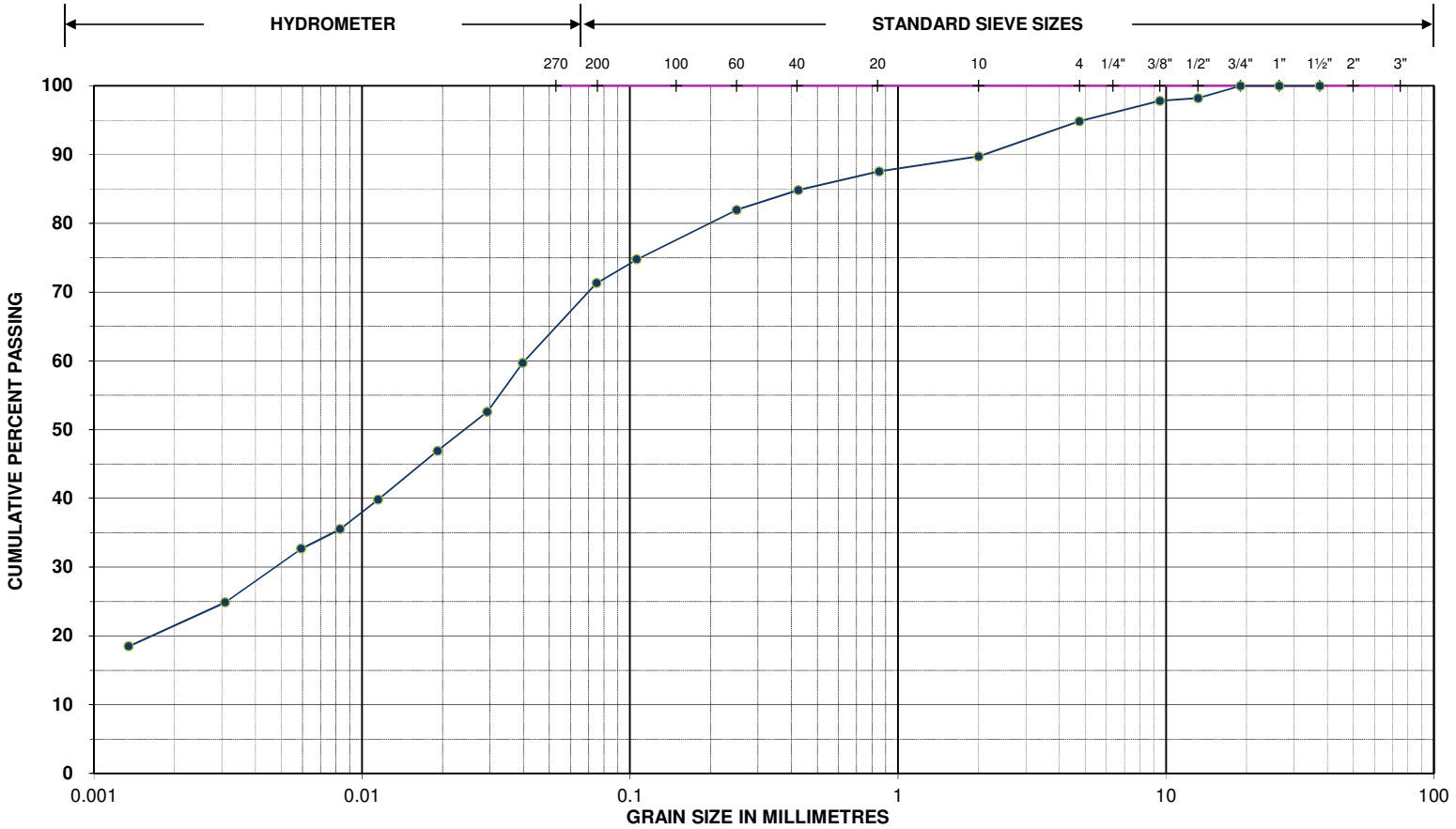
Unified Classification System

SILT AND CLAY	SAND	GRAVEL

Project Name:	Brampton East-West Connector	**Project No.:**	141-15409-00
Location ID.:	BH18-01	**Sample No./Depth:**	SS3 / 2.3-2.9m

Sieve Size	% Passing Coarse	**Sieve Size**	% Passing Fine	Hydrometer (mm)	% Passing
37.5 mm	100.0	**2.00 mm**	59.2	**0.040**	36.9
26.5 mm	89.5	**0.850 mm**	53.8	**0.020**	28.1
19.0 mm	80.4	**0.425 mm**	48.9	**0.008**	20.2
13.2 mm	78.6	**0.250 mm**	46.7	**0.003**	13.2
9.50 mm	76.2	**0.106 mm**	44.0	**0.001**	9.2
4.75 mm	69.7	**0.075 mm**	42.9		

PARTICLE SIZE DISTRIBUTION ASTM D422



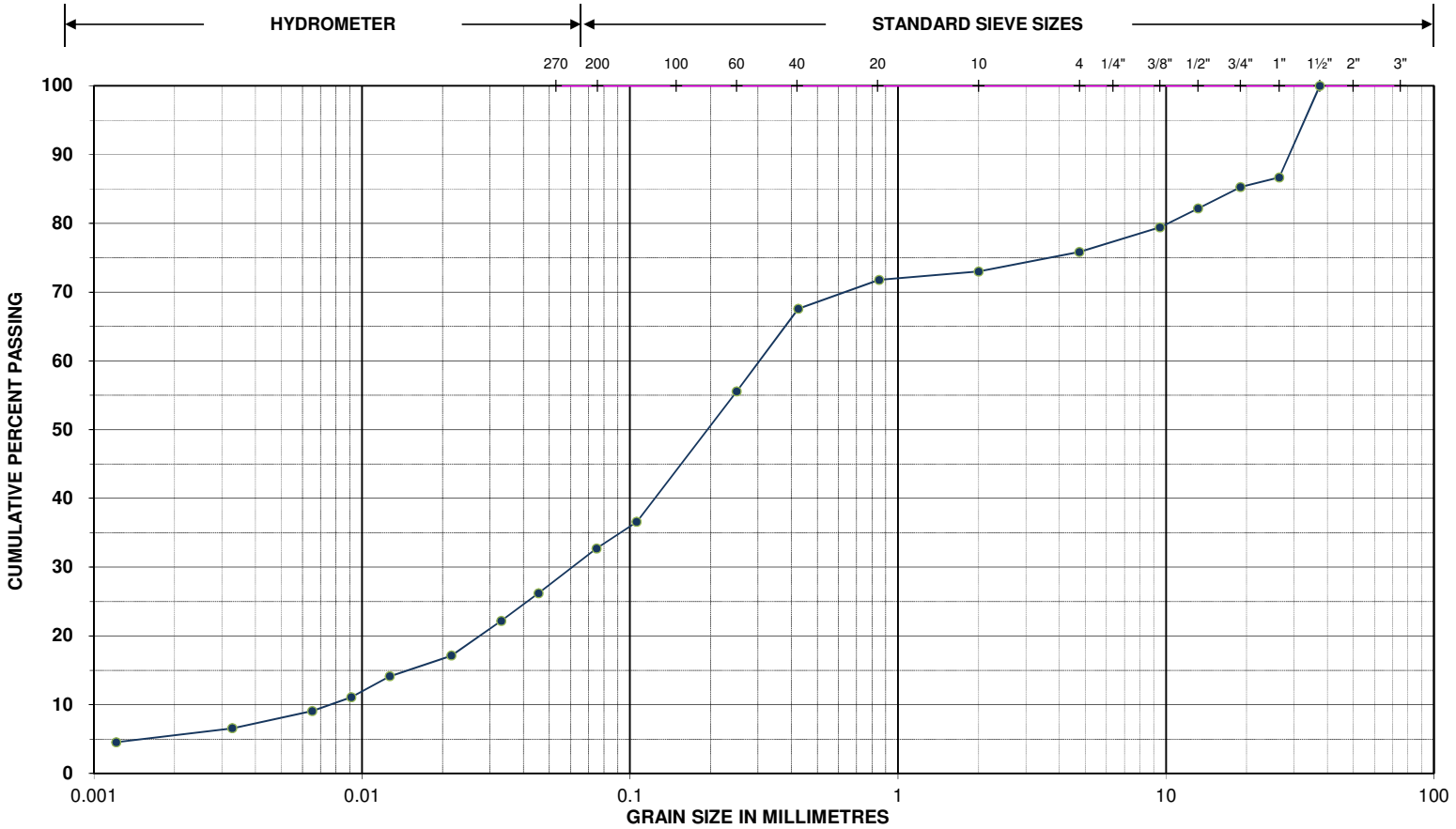
Unified Classification System

SILT AND CLAY	SAND	GRAVEL

Project Name:	Brampton East-West Connector	**Project No.:**	141-15409-00
Location ID.:	BH18-03	**Sample No./Depth:**	SS2 / 1.5-2.1m

Sieve Size	% Passing Coarse	**Sieve Size**	% Passing Fine	Hydrometer (mm)	% Passing
37.5 mm	100.0	**2.00 mm**	89.7	**0.040**	59.7
26.5 mm	100.0	**0.850 mm**	87.6	**0.019**	46.9
19.0 mm	100.0	**0.425 mm**	84.8	**0.008**	35.5
13.2 mm	98.2	**0.250 mm**	82.0	**0.003**	24.9
9.50 mm	97.8	**0.106 mm**	74.8	**0.001**	18.5
4.75 mm	94.8	**0.075 mm**	71.3		

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

SILT AND CLAY	SAND	GRAVEL

Project Name:	Brampton East-West Connector	**Project No.:**	141-15409-00
Location ID.:	BH18-06	**Sample No./Depth:**	SS3 / 2.3-2.9m

Sieve Size	% Passing Coarse	**Sieve Size**	% Passing Fine	Hydrometer (mm)	% Passing
37.5 mm	100.0	**2.00 mm**	73.0	**0.046**	26.2
26.5 mm	86.7	**0.850 mm**	71.8	**0.022**	17.1
19.0 mm	85.3	**0.425 mm**	67.6	**0.009**	11.1
13.2 mm	82.2	**0.250 mm**	55.5	**0.003**	6.6
9.50 mm	79.4	**0.106 mm**	36.6	**0.001**	4.5
4.75 mm	75.8	**0.075 mm**	32.7		

APPENDIX

C CHEMICAL LABORATORY DATA

FINAL REPORT

CA14068-APR18 R

141-15409-00 Brampton East-West Conn.

Prepared for

WSP Canada Group Limited

FINAL REPORT

CA14068-APR18 R

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	WSP Canada Group Limited	Project Specialist	Deanna Edwards, B.Sc, C.Chem
		Laboratory	SGS Canada Inc.
Address	294 Rink St. Peterborough, ON K9J 2K2.	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Pete Hynes	Telephone	705-652-2000
Telephone	705.743.6850	Facsimile	705-652-6365
Facsimile		Email	deanna.edwards@sgs.com
Email	Peter.hynes@wspgroup.com	SGS Reference	CA14068-APR18
Project	141-15409-00 Brampton East-West Conn.	Received	04/04/2018
Order Number		Approved	04/10/2018
Samples	Soil (6)	Report Number	CA14068-APR18 R
		Date Reported	04/10/2018

COMMENTS

Temperature of Sample upon Receipt: 4 degrees C
Cooling Agent Present: Yes
Custody Seal Present: No

SIGNATORIES

Deanna Edwards, B.Sc, C.Chem

TABLE OF CONTENTS

Client: WSP Canada Group Limited

Project: 141-15409-00 Brampton East-West Conn.

Project Manager: Pete Hynes

Samplers: M. Nievkirk

PACKAGE: **REG153 - Hydrides** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

				Sample Number	8	9	10	11	12	13
				Sample Name	BH18-01 SS1	BH18-02 SS1	BH18-03 SS1	BH18-04 SS1	BH18-05 SS1	Bh18-06 SS1
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
				Sample Date	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Hydrides										
Antimony	µg/g	0.8	1	1.3	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Arsenic	µg/g	0.5	11	18	8.0	5.3	6.5	5.1	6.8	5.2
Selenium	µg/g	0.7	1.2	1.5	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

PACKAGE: **REG153 - Metals and Inorganics** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

				Sample Number	8	9	10	11	12	13
				Sample Name	BH18-01 SS1	BH18-02 SS1	BH18-03 SS1	BH18-04 SS1	BH18-05 SS1	Bh18-06 SS1
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
				Sample Date	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics										
Moisture Content	%	-			21.4	12.7	13.2	15.7	19.5	14.7
Barium	µg/g	0.01	210	220	140	65	61	44	90	58
Beryllium	µg/g	0.02	2.5	2.5	0.84	0.56	0.54	0.35	0.89	0.34
Boron	µg/g	1	36	36	5	6	7	5	4	4
Cadmium	µg/g	0.02	1	1.2	0.17	0.06	0.09	0.08	0.07	0.05
Chromium	µg/g	0.5	67	70	24	18	16	12	23	13
Cobalt	µg/g	0.01	19	21	13	11	11	6.5	13	7.8
Copper	µg/g	0.1	62	92	25	37	45	35	43	23
Lead	µg/g	0.1	45	120	11	9.0	8.4	7.1	9.4	5.2
Molybdenum	µg/g	0.1	2	2	1.3	0.3	0.3	0.3	0.3	0.3
Nickel	µg/g	0.1	37	82	26	23	23	15	26	16
Silver	µg/g	0.01	0.5	0.5	0.05	0.02	0.01	0.01	0.01	0.01
Thallium	µg/g	0.02	1	1	0.11	0.11	0.09	0.08	0.13	0.07

PACKAGE: **REG153 - Metals and Inorganics** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

Parameter	Units	RL	L1	L2	Sample Number	8	9	10	11	12	13
					Sample Name	BH18-01 SS1	BH18-02 SS1	BH18-03 SS1	BH18-04 SS1	BH18-05 SS1	Bh18-06 SS1
					Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
					Sample Date	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018
Metals and Inorganics (continued)											
Uranium	µg/g	0.002	1.9	2.5		2.2	0.39	0.45	0.32	0.45	0.30
Vanadium	µg/g	3	86	86		35	24	24	20	32	19
Zinc	µg/g	0.7	290	290		87	53	68	40	63	38
Water Soluble Boron	µg/g	0.5				< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

PACKAGE: **REG153 - Organochlorine Pests (OCs)** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

Parameter	Units	RL	L1	L2	Sample Number	8	10	12
					Sample Name	BH18-01 SS1	BH18-03 SS1	BH18-05 SS1
					Sample Matrix	Soil	Soil	Soil
					Sample Date	02/04/2018	02/04/2018	02/04/2018
Organochlorine Pests (OCs)								
Aldrin	µg/g	0.05	0.05	0.05		< 0.05	< 0.05	< 0.05
alpha-Chlordane	µg/g	0.02				< 0.02	< 0.02	< 0.02
gamma-Chlordane	µg/g	0.02				< 0.02	< 0.02	< 0.02
Chlordane (total)	µg/g	0.05	0.05	0.05		< 0.05	< 0.05	< 0.05
o,p-DDD	µg/g	0.02				< 0.02	< 0.02	< 0.02
pp-DDD	µg/g	0.02				< 0.02	< 0.02	< 0.02
DDD (total)	µg/g	0.05	0.05	0.05		< 0.05	< 0.05	< 0.05
o,p-DDE	µg/g	0.02				< 0.02	< 0.02	< 0.02
pp-DDE	µg/g	0.02				< 0.02	< 0.02	< 0.02
DDE (total)	µg/g	0.05	0.05	0.05		< 0.05	< 0.05	< 0.05
op-DDT	µg/g	0.02				< 0.02	< 0.02	< 0.02

Client: WSP Canada Group Limited

Project: 141-15409-00 Brampton East-West Conn.

Project Manager: Pete Hynes

Samplers: M. Nievkirk

PACKAGE: **REG153 - Organochlorine Pests (OCs)**
(SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

					Sample Number	8	10	12
					Sample Name	BH18-01 SS1	BH18-03 SS1	BH18-05 SS1
					Sample Matrix	Soil	Soil	Soil
					Sample Date	02/04/2018	02/04/2018	02/04/2018
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**
Organochlorine Pests (OCs) (continued)							
pp-DDT	µg/g	0.02			< 0.02	< 0.02	< 0.02
DDT (total)	µg/g	0.05	0.078	1.4	< 0.05	< 0.05	< 0.05
Dieldrin	µg/g	0.05	0.05	0.05	< 0.05	< 0.05	< 0.05
gamma-BHC	µg/g	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01
Endosulfan I	µg/g	0.02			< 0.02	< 0.02	< 0.02
Endosulfan II	µg/g	0.02			< 0.02	< 0.02	< 0.02
Endrin	µg/g	0.04	0.04	0.04	< 0.04	< 0.04	< 0.04
Heptachlor	µg/g	0.01	0.05	0.05	< 0.01	< 0.01	< 0.01
Heptachlor epoxide	µg/g	0.01	0.05	0.05	< 0.01	< 0.01	< 0.01
Hexachlorobenzene	µg/g	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	µg/g	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01
Hexachloroethane	µg/g	0.01	0.01	0.01	< 0.01	< 0.01	< 0.01
Methoxychlor	µg/g	0.05	0.05	0.05	< 0.05	< 0.05	< 0.05

PACKAGE: **REG153 - Other (ORP)** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

				Sample Number	8	9	10	11	12	13
				Sample Name	BH18-01 SS1	BH18-02 SS1	BH18-03 SS1	BH18-04 SS1	BH18-05 SS1	Bh18-06 SS1
				Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
				Sample Date	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018	02/04/2018
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Other (ORP)										
Mercury	µg/g	0.05	0.16	0.27	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Sodium Adsorption Ratio	---	0.2	1	2.4	0.2	< 0.2	0.3	< 0.2	< 0.2	< 0.2
Conductivity	mS/cm	0.002	0.47	0.57	0.22	0.18	0.13	0.16	0.14	0.12
pH	no unit	0.05			6.65	7.73	7.75	7.69	7.35	7.57
Chromium VI	µg/g	0.2	0.66	0.66	0.5	0.4	< 0.2	< 0.2	0.4	< 0.2
Free Cyanide	µg/g	0.05	0.051	0.051	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

PACKAGE: **REG153 - Pesticides** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

				Sample Number	8	10	12
				Sample Name	BH18-01 SS1	BH18-03 SS1	BH18-05 SS1
				Sample Matrix	Soil	Soil	Soil
				Sample Date	02/04/2018	02/04/2018	02/04/2018
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**
Pesticides							
Endosulfan (total)	µg/g	0.04	0.04	0.04	< 0.04	< 0.04	< 0.04

Client: WSP Canada Group Limited

Project: 141-15409-00 Brampton East-West Conn.

Project Manager: Pete Hynes

Samplers: M. Nievkirk

PACKAGE: **REG153 - Pesticides Surrogate** (SOIL)

L1 = REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED

L2 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

				Sample Number	8	10	12
				Sample Name	BH18-01 SS1	BH18-03 SS1	BH18-05 SS1
				Sample Matrix	Soil	Soil	Soil
				Sample Date	02/04/2018	02/04/2018	02/04/2018
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**
Pesticides Surrogate							
Surr Decachlorobiphenyl	Surr Rec %	-			95	68	90

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	REG153 / SOIL / COARSE - TABLE 1 - Agricultural/Other - UNDEFINED L1	REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED L2
BH18-01 SS1					
Uranium	EPA 3050/EPA 200.8	µg/g	2.2	1.9	

QC SUMMARY

Conductivity

Method: EPA 6010/SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0092-APR18	mS/cm	0.002	<0.002	0	10	99	90	110	NA		

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Free Cyanide	SKA5009-APR18	µg/g	0.05	<0.05	ND	20	100	80	120	0	75	125

Hexavalent Chromium by IC

Method: EPA218.6/EPA3060A | Internal ref.: ME-CA-IENVIIC-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chromium VI	DIO0056-APR18	µg/g	0.2	<0.2	ND	20	104	80	120	90	75	125

QC SUMMARY

Mercury by CVAAS

Method: EPA 7471A/EPA 245 | Internal ref.: ME-CA-IENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury	EMS0029-APR18	µg/g	0.05	<0.05	ND	20	103	80	120	94	70	130

Metals in aqueous samples - ICP-OES

Method: MOE 4696e01/EPA 6010 | Internal ref.: ME-CA-IENVISPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
SAR Calcium	ESG0016-APR18	mg/L	0.09	<0.09	1	20	95	80	120	NV	70	130
SAR Magnesium	ESG0016-APR18	mg/L	0.02	<0.02	0	20	95	80	120	87	70	130
SAR Sodium	ESG0016-APR18	mg/L	0.15	<0.15	3	20	93	80	120	81	70	130

QC SUMMARY

Metals in Soil - Aqua-regia/ICP-MS

Method: EPA 3050/EPA 200.8 | Internal ref.: ME-CA-[ENVISPE-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver	EMS0029-APR18	µg/g	0.01	<0.01	9	20	100	70	130	107	70	130
Arsenic	EMS0029-APR18	µg/g	0.5	<0.5	2	20	102	70	130	110	70	130
Barium	EMS0029-APR18	µg/g	0.01	<0.01	5	20	102	70	130	96	70	130
Beryllium	EMS0029-APR18	µg/g	0.02	<0.02	16	20	102	70	130	104	70	130
Boron	EMS0029-APR18	µg/g	1	<1	2	20	105	70	130	105	70	130
Cadmium	EMS0029-APR18	µg/g	0.02	<0.02	4	20	102	70	130	101	70	130
Cobalt	EMS0029-APR18	µg/g	0.01	<0.01	0	20	101	70	130	107	70	130
Chromium	EMS0029-APR18	µg/g	0.5	<0.5	14	20	100	70	130	111	70	130
Copper	EMS0029-APR18	µg/g	0.1	<0.1	6	20	102	70	130	105	70	130
Molybdenum	EMS0029-APR18	µg/g	0.1	<0.1	2	20	100	70	130	116	70	130
Nickel	EMS0029-APR18	µg/g	0.1	<0.1	1	20	99	70	130	107	70	130
Lead	EMS0029-APR18	µg/g	0.1	<0.1	1	20	98	70	130	102	70	130
Antimony	EMS0029-APR18	µg/g	0.8	<0.8	ND	20	47	70	130	118	70	130
Selenium	EMS0029-APR18	µg/g	0.7	<0.7	ND	20	105	70	130	99	70	130
Thallium	EMS0029-APR18	µg/g	0.02	<0.02	10	20	98	70	130	105	70	130
Uranium	EMS0029-APR18	µg/g	0.002	<0.002	2	20	93	70	130	91	70	130
Vanadium	EMS0029-APR18	µg/g	3	<3	2	20	101	70	130	105	70	130
Zinc	EMS0029-APR18	µg/g	0.7	<0.7	1	20	103	70	130	106	70	130

QC SUMMARY

Metals Prep

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Prep-Hotblock	EMS0029-APR18	Prep	no	Error!								

QC SUMMARY

Pesticides

Method: EPA 3541/8270D | Internal ref.: ME-CA-[ENVIGC-LAK-AN-018

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Aldrin	GCM0092-APR18	µg/g	0.05	< 0.05	ND	40	84	50	140	79	50	140
alpha-Chlordane	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	86	50	140	83	50	140
Dieldrin	GCM0092-APR18	µg/g	0.05	< 0.05	ND	40	90	50	140	80	50	140
Endosulfan I	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	91	50	140	90	50	140
Endosulfan II	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	87	50	140	83	50	140
Endrin	GCM0092-APR18	µg/g	0.04	< 0.04	ND	40	80	50	140	85	50	140
gamma-BHC	GCM0092-APR18	µg/g	0.01	< 0.01	ND	40	91	50	140	89	50	140
gamma-Chlordane	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	90	50	140	86	50	140
Heptachlor epoxide	GCM0092-APR18	µg/g	0.01	< 0.01	ND	40	86	50	140	78	50	140
Heptachlor	GCM0092-APR18	µg/g	0.01	< 0.01	ND	40	91	50	140	85	50	140
Hexachlorobenzene	GCM0092-APR18	µg/g	0.01	< 0.01	ND	40	127	50	140	120	50	140
Hexachlorobutadiene	GCM0092-APR18	µg/g	0.01	< 0.01	ND	40	91	50	140	86	50	140
Hexachloroethane	GCM0092-APR18	µg/g	0.01	< 0.01	ND	40	90	50	140	88	50	140
Methoxychlor	GCM0092-APR18	µg/g	0.05	< 0.05	ND	40	80	50	140	80	50	140
o,p-DDD	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	86	50	140	84	50	140
o,p-DDE	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	92	50	140	85	50	140
op-DDT	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	84	50	140	79	50	140
pp-DDD	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	82	50	140	80	50	140
pp-DDE	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	89	50	140	86	50	140
pp-DDT	GCM0092-APR18	µg/g	0.02	< 0.02	ND	40	79	50	140	79	50	140

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	ARD0016-APR18	no unit	0.05		0	20	100	80	120			

Water Soluble Boron

Method: O.Reg. 153/04 I Internal ref.: ME-CA-[ENV] SPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Water Soluble Boron	ESG0011-APR18	µg/g	0.5	<0.5	5	20	102	80	120	118	70	130

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates 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.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

-- End of Analytical Report --

SGS — Request for Laboratory Services and CHAIN OF CUSTODY

No: CA 14068-APR18

Page 1 of 1

SGS Environment, Health and Safety
- Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com

Laboratory Information Section - Lab use only

Received By: DReid
Received Date: 04/04/18 (mm\dd\yy)
Received Time: 11:45 am pm (circle)
Received By (signature):
Custody Seal Present: Y / N (circle)
Custody Seal Intact: Y / N
Cooling Agent Present: Y / N Type: ice
Temperature Upon Receipt (°C): 8.4 - 10.8° 4x3
LAB LIMS #:

REPORT INFORMATION

Company: WSP Canada Inc
Contact: Pete Hynes
Address: 294 Rink St, Suite 103
Peterborough, ON K9J 2K2
Phone: 705.743.6850
Fax: 705.743.6854
Email: peter.hynes@wsp.com

INVOICE INFORMATION

☒ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

PROJECT INFORMATION

Quotation #:
P.O. #:
Project #: 141-15409-00
Site Location/ID: Brampton East-West Connector

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days) — TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 3pm or on weekends : TAT begins the next business day

RUSH TAT (Additional Charges May Apply) ☐ 1 Day ☐ 2 Days ☐ 3-4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date: Rush Confirmation ID:

REGULATIONS

Regulation 153 (2011):
☒ Table 1 ☐ Res/Park ☐ Ind/Com ☐ Agri/Other
☐ Table 2 ☐ Table 3 ☐ Table ____
Soil Texture: ☐ Coarse ☐ Medium ☐ Fine

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER ☐ CCME ☐ Other: ☐ MISA

Sewer By-Law:
☐ Sanitary ☐ Storm
Municipality:

DRINKING WATER SAMPLES (POTABLE WATER FOR HUMAN CONSUMPTION) MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	METALS & INORGANICS	OC PESTICIDES	COMMENTS: Field Filtered (F) Preserved (P)
1	BH18-01 SS1	2 APR 2018	915	1	S	X	X	
2	BH18-02 SS1		1015	1	S	X	X ALKP	
3	BH18-03 SS1		1100	1	S	X	X	
4	BH18-04 SS1		1445	1	S	X		
5	BH18-05 SS1		1550	1	S	X	X	
6	BH18-06 SS1	↓	1300	1	S	X		
7								
8								
9								
10								

Observations/Comments/Special Instructions

Sampled By (NAME): M. Nievkirk
Signature: For M.N.
Date: 04/02/18 (mm/dd/yy)

Relinquished by (NAME): P. Hynes
Signature:
Date: 04/03/18 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

SGS

SAMPLE INTEGRITY REPORT

Project Number: 141-15469-00 Brampton Eastwest Conn

ONTARIO REGULATION 153/04

SGS Sample ID CA 14068-Apr 18

Date / Time Sampled April 2/2018

Client Sample ID See CofC.

	ALL
Sample Submission General Sample Integrity Violations	
Temperature >10 C upon receipt if not sampled same day	☐
No evidence of cooling trend initiated if sampled same day	☐
Chain of Custody not submitted	☐
Chain of Custody incomplete	☐
Chain of Custody not signed / dated	☐
Chain of Custody not a current version	☐
Bottles / Samples listed on CoC but not received	☐
Bottles / Samples received but not listed on the CoC	☐
Sample container received empty	☐

Sample Specific Sample Integrity Violations							
Sample received past hold time	☐	☐	☐	☐	☐	☐	☐
Incorrect preservation (including no preservation where required)	☐	☐	☐	☐	☐	☐	☐
Headspace present in VOC vial (aqueous)	☐	☐	☐	☐	☐	☐	☐
Sample(s) received frozen	☐	☐	☐	☐	☐	☐	☐
Bottle(s) broken or damaged in transport	☐	☐	☐	☐	☐	☐	☐
Discrepancy between sample label and chain of custody	☐	☐	☐	☐	☐	☐	☐
Analysis requirements absent / unclear	☐	☐	☐	☐	☐	☐	☐
Missing or incorrect sample label(s)	☐	☐	☐	☐	☐	☐	☐
Inappropriate sample container used	☐	☐	☐	☐	☐	☐	☐
Insufficient number of bottles received	☐	☐	☐	☐	☐	☐	☐
Limited sample volume	☐	☐	☐	☐	☐	☐	☐
Insufficient sample volume	☐	☐	☐	☐	☐	☐	☐
Sample contains multiple phases	☐	☐	☐	☐	☐	☐	☐
Sediment Log							
Groundwater samples contain visible sediment / particulate	☐	☐	☐	☐	☐	☐	☐
Groundwater contains greater than 1cm of sediment / particulate matter in bottle	☐	☐	☐	☐	☐	☐	☐

Additional Comments/Remarks:

No issues upon receipt

☑ Initials: PW