

Appendix B – Geotechnical Report



CHUNG & VANDER DOELEN
ENGINEERING LTD.

**GEOTECHNICAL INVESTIGATION
UNIVERSITY AVENUE RECONSTRUCTION
ALBERT STREET TO WEBER STREET NORTH
WATERLOO, ONTARIO**

Submitted to:

IBI Group
410 Albert Street, Suite 101
Waterloo, Ontario
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Attention:

Mr. Kelly Cobbe, P. Eng.



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File No.: G19750

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Re: GEOTECHNICAL INVESTIGATION
UNIVERSITY AVENUE RECONSTRUCTION
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We take pleasure in enclosing one (1) copy of our Geotechnical Investigation Report carried out at the above-mentioned location and we will be glad to discuss any questions arising from this work.

Soil samples will be retained for a period of three (3) months and will thereafter be disposed of unless we are otherwise instructed.

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

Yours truly,

CHUNG & VANDER DOELEN ENGINEERING LTD.

Robert Vander Doelen, P. Eng.
Senior Engineer

TABLE OF CONTENTS

Letter of Transmittal	I
Table of Contents	ii
List of Enclosures	iii
1.0 INTRODUCTION	1
2.0 FIELD AND LABORATORY WORK	2
3.0 SITE CONDITION	3
4.0 SUBSURFACE CONDITION	3
4.1 Pavement	3
4.2 Fill	4
4.3 Topsoil	5
4.4 Native Soil Deposits	5
4.5 Groundwater Condition	5
4.6 Soil and Groundwater Chemistry	6
5.0 DISCUSSION AND RECOMMENDATIONS	8
5.1 Pavement	8
5.1.1 Pavement Structure Consideration	8
5.1.2 Pavement Construction	9
5.2 Underground Services Installation	10
5.2.1 Trenching	10
5.2.2 Groundwater Control	11
5.2.3 Bedding	12
5.2.4 Backfill	13
6.0 GEO-ENVIRONMENTAL CONSIDERATIONS	14
6.1 Applicable Regulatory Standards	14
6.2 Analytical Results and Considerations	15
6.2.1 Soil	15
6.2.2 Groundwater	16
7.0 CLOSURE	18



LIST OF APPENDICES AND ENCLOSURES

Appendix "A"	Limitations of Report
Appendix "B"	Soil Chemistry Results
Appendix "C"	Groundwater Chemistry Results
Appendix "D"	Comparison of Soil Chemistry Results to the Applicable Regulatory Criteria
Appendix "E"	Comparison of Groundwater Chemistry Results to the Applicable Regulatory Criteria
Appendix "F"	Borehole Location Plan
Enclosures 1 to 14	Borehole Log Sheets
Enclosures 15 to 26	Grain Size Distribution Charts
Enclosures 27 to 29	Standard Proctor Test Results



1.0 INTRODUCTION

CHUNG & VANDER DOELEN ENGINEERING LTD. (CVD) has been retained by IBI Group to conduct a geotechnical investigation for the proposed reconstruction of University Avenue, between Albert Street and Weber Street North, in Waterloo, Ontario.

The geotechnical investigation requirements pertaining to the project section are summarized as follows:

- Approximate length of the University Avenue project section is 1100 m and extends between Albert Street and Weber Street North
- The project involves the full reconstruction of the roadway (including widening for bicycle lanes) and full replacement of watermain, sanitary sewer and storm sewer infrastructure to similarly existing depths

The purpose of this investigation has been to determine the existing pavement structure and underlying soil and groundwater conditions. Geotechnical recommendations for the following aspects are to be provided:

- Replacement and construction of underground servicing including method of excavation, groundwater control, trench backfill, compaction requirements, suitability of reuse of existing granular base materials and insitu soils
- Recommendation for design and construction of a suitable flexible pavement structure
- Construction concerns including any required specification and provisions for materials and specialized construction activities, and recommendations for methods of overcoming anticipated construction problems, in particular, those relating to dewatering, classification of soils as per OHS Reg. 213/91 and the stability of the excavations
- Handling of surplus soil materials. Specifically, any potential for encountering contamination during construction, as well as methodology for handling contaminated substances in accordance with current MECP regulations and guidelines, and the implications on the construction of the project will be addressed
- Handling of groundwater resulting from dewatering operations during construction



2.0 FIELD AND LABORATORY WORK

The field work was conducted during the period between May 27 and May 29, 2019 and consisted of drilling and sampling fourteen (14) boreholes extending to depths of 6.55 m below existing grade. The boreholes were drilled on alternating sides of University Avenue. The boreholes were located in the field by CVD staff and their locations are illustrated on Drawings 1 to 3 in Appendix F. Ground surface elevations at the borehole locations were surveyed by IBI Group and supplied to CVD.

The field work for this project was carried out under the supervision of a member of our engineering team who logged the subsurface conditions encountered in the field, effected the subsurface sampling and testing, and monitored the groundwater conditions. Traffic control was provided during drilling operations and the underground utilities were located prior to drilling of the boreholes. A road occupancy permit was issued by the Region of Waterloo for the period of the field investigation program.

The boreholes were advanced to the sampling depths using a power auger drilling rig, equipped with continuous flight augers and standard soil sampling equipment. Standard penetration tests were carried out at frequent intervals of depth and the results are shown on the Borehole Log Sheets as penetration resistance or "N" values. The undrained shear strength of cohesive soil deposits were determined on slightly disturbed SPT samples using a field pocket penetrometer. The compactness condition or consistency of the soil strata has been inferred from these test results.

Groundwater conditions were monitored in the boreholes during and following withdrawal of the drilling augers at each borehole location. A 50 mm diameter monitoring well was installed in each of Boreholes 3, 6, 8, 9, 10 and 14 to enable measurement of the groundwater table and sampling of groundwater. Groundwater levels were measured on July 10, 2019.

Soil samples obtained from the in situ tests were examined in the field and subsequently taken to our laboratory for detailed description and moisture content determinations. Additional geotechnical laboratory testing included twelve (12) gradational analyses and three (3) Standard Proctor Maximum Dry Density (SPMDD) relationship tests which were conducted on representative soil samples collected during the field work program.

Ten (10) soil samples were submitted to ALS Laboratory Group of Waterloo, Ontario for analysis of inorganics, metals and petroleum hydrocarbons (PHCs). Six (6) of the ten (10) samples were also tested for Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), Volatile Organic Compounds (VOCs), and Polycyclic Aromatic Hydrocarbons (PAHs).

Groundwater samples from the six (6) monitoring wells were collected and submitted to ALS Laboratory Group of Waterloo, Ontario for analysis of inorganics, metals, PHCs (F1 to F4), BTEX, VOCs, and PAHs).



Chemical testing conducted on the soil samples was to assess the environmental quality of excess soil which may potentially be removed off-site during construction. Chemical testing of the groundwater samples was conducted to assess the environmental quality of groundwater potentially resulting from dewatering procedures that may be required during the replacement of underground infrastructure.

3.0 SITE CONDITION

The project section is a four-lane arterial roadway located in an urban mixed commercial, institutional, and a mid to high density residential setting. A gas station and a dry cleaning operation exist at the corners of Weber Street North and Regina Street North, respectively. Sidewalks, curbs, and gutters exist throughout the project section. The asphalt paved roadway is considered to be in fair condition.

4.0 SUBSURFACE CONDITION

The conditions encountered in the boreholes are detailed on the Borehole Log Sheets, Enclosures 1 to 12 of this report. The following notes are intended to amplify and comment on the subsurface data.

The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures and, therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions may vary between and beyond the borehole locations.

4.1 Pavement

The existing pavement structure components and their associated thicknesses were measured during the advancement of the boreholes. The findings are summarized in the table below:

Borehole No.	Asphaltic Concrete (mm)	Granular Base (mm)	Subgrade Soil Type
1	100	300	compact fine sand, trace to some silt
2	150	265	stiff silty clay
3	150	550	compact sand and silt fill, trace clay
4	175	675	compact sand and silt fill, trace clay
5	150	400	compact sandy silt, some clay



Borehole No.	Asphaltic Concrete (mm)	Granular Base (mm)	Subgrade Soil Type
6	170	650	loose sandy silt, some clay
7	175	390	compact sandy silt, occ. clayey seams
8	160	600	compact silty sand
9	200	400	loose sand and silt fill, then topsoil
10	275	300	loose sand and silt fill, trace organics
11	200	450	compact sand and silt fill
12	185	375	loose sand and silt fill
13	225	400	loose sandy silt
14	180	400	compact sandy silt

The Granular “A” base and Granular “B” sub-base courses could not be readily identified. Six (6) grain size distribution analyses were performed on samples of the granular base collected from Boreholes 1, 5, 7, 9, 11 and 14 beneath the travelled lanes and the results are presented graphically on Enclosures 15 to 20 of this report.

Four (4) of the six (6) samples failed the gradational requirements of OPSS Granular “B” Type I with greater than 8% passing the #200 sieve, however, two (2) of the failures were marginally greater than 8% silt content.

4.2 Fill

The pavement materials at Boreholes 3, 4 and 9 to 12 were underlain by dark brown to brown sand and silt fill which extended to depths between 0.9 and 1.8 m below existing grades. The fill contained trace clay and/or organics at Boreholes 3, 4 and 10.

Standard penetration testing in the fill yielded “N”-values between 4 and 17 blows per 300 mm, indicating a variable loose to compact compactness condition. Natural moisture contents were measured between 9 and 17%, indicating a damp to moist moisture condition.



4.3 Topsoil

The fill at Boreholes 3 and 9 was underlain by topsoil. The topsoil layer was $0.3\pm$ to $0.4\pm$ m thick and extended to depths of 1.7 and 1.3 m below existing grade at Boreholes 3 and 9, respectively.

4.4 Native Soil Deposits

The pavement materials at Boreholes 1, 2, 5 to 8, 13 and 14, the fill at Boreholes 4, 10, 11 and 12, and the topsoil at Boreholes 3 and 9 were underlain by native fine to coarse grained deposits of silty clay, clayey silt, silt, sandy silt, sand and silt, silty sand, and fine sand with trace to some silt. All fourteen (14) boreholes were terminated in the native soil deposits at depths of 6.55 m below existing grade.

Six (6) grain size distribution analyses were conducted on representative samples of the silty sand, sand and silt, sandy silt, and silty clay deposits and the results are graphically presented on Enclosures 21 to 26.

Standard penetration testing in the native deposits yielded “N”-values between 9 and greater than 100 blows per 300 mm. Undrained shear strength measured on slightly disturbed cohesive samples using a pocket penetrometer determined values of 160 kPa and greater than 250 kPa. Based on the penetration resistance values, measured shear strength and tactile examination, the fine-grained cohesive deposits exhibited a very stiff to hard consistency and the coarse-grained deposits generally exhibited a compact to very dense compactness condition. Natural moisture contents were generally measured between 3 and 19%, indicating variable damp to saturated moisture conditions.

Three (3) laboratory Standard Proctor tests were conducted on bulk samples of the sand and silt and silty sand collected at Boreholes 1, 8 and 14 and the results are presented on Enclosures 27 to 29. The density-moisture relationship test derived maximum dry densities between of 1740 and 1835 kg/m³ with corresponding optimum moisture contents between 13.2 and 15.0%.

4.5 Groundwater Condition

Groundwater conditions were monitored during advancement of borehole augering and immediately following withdrawal of the drilling augers at each borehole location. Water levels were measured (and estimated) at depths between 1.5 and 4.85 m below existing grade at eleven (11) borehole locations at withdrawal of the drilling augers. Borehole 5 remained dry and open at withdrawal of drilling augers.

50 mm diameter monitoring wells were installed to depths between 4.5 and 5.3 m below existing grade at Boreholes 3, 6, 8, 9, 10 and 14 to enable measurement of groundwater levels over the long term (if required). The following table provides the water levels measured on July 10, 2019 at the six (6) monitoring wells. It is noted that the groundwater table will fluctuate seasonally and in response to major weather events.



Borehole No.	Ground Surface Elevation (m)	Water Depth (m)	Water Elevation (m)
3	336.11	3.93	332.18
6	327.45	3.79	323.66
8	322.79	2.92	319.87
9	320.47	2.02	318.45
10	320.22	1.84	318.38
14	319.25	1.71	317.54

4.6 Soil and Groundwater Chemistry

Ten (10) soil samples were submitted to ALS Laboratory Group of Waterloo, Ontario for analysis of metals, inorganics and PHCs. Six (6) of the ten (10) samples were also tested for BTEX, VOCs, and PAHs. The chemical testing was conducted to assess the environmental quality of excess soil which may potentially be removed off-site during construction.

The following table presents the location, depth, description and parameters analyzed for each soil sample collected and submitted.

Sample I.D.	Sample Depth	Sample Description	Parameters Analysed
BH1-SA1	0.15 to 0.3 mbeg	granular base	metals, inorganics, PHCs (F2-F4)
BH3-SA2	0.75 to 1.2 mbeg	sand and silt fill	metals, inorganics, PHCs (F2-F4)
BH5-SA1	0.15 to 0.3 mbeg	granular base	metals, inorganics, PHCs (F2-F4)
BH7-SA2	0.75 to 1.2 mbeg	sandy silt	metals, inorganics, PHCs (F2-F4)
BH8-SA2	0.76 to 1.2 mbeg	silty sand	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
BH9-SA3	1.5 to 1.95 mbeg	sandy silt	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
BH9-SA5	3.05 to 3.5 mbeg	sandy silt	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
BH11-SA1	0.2 to 0.4 mbeg	granular base	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs



Sample I.D.	Sample Depth	Sample Description	Parameters Analysed
BH14-SA1	0.2 to 0.4 mbeg	granular base	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
BH14-SA3	1.5 to 1.95 mbeg	sandy silt	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs

The laboratory certificates of chemical analysis and results of the soil samples submitted to ALS Laboratory Group of Waterloo are enclosed in Appendix B.

Six (6) groundwater samples collected from the monitoring wells installed at Boreholes 3, 6, 8, 9, 10 and 14 were collected and submitted to ALS Laboratory Group of Waterloo, Ontario for analysis of metals, inorganics, PHCs (F1 to F4), BTEX, VOCs, and PAHs. The testing was conducted to assess the environmental quality of groundwater resulting from dewatering procedures that may be required during the replacement of underground infrastructure.

The following table presents the location, depth, description and parameters analysed for each groundwater sample collected and submitted.

Borehole No.	Sample Description	Parameters Analysed
3	groundwater	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
6	groundwater	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
8	groundwater	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
9	groundwater	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
10	groundwater	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs
14	groundwater	metals, inorganics, PHCs (F1-F4), BTEX, VOCs, PAHs

The laboratory certificates of chemical analysis and results of the groundwater samples submitted to ALS Laboratory Group of Waterloo are enclosed in Appendix C.



5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Pavement

The project will include full roadway reconstruction along the project section due to underground infrastructure replacement and construction. The roadway will also be widened to accommodate bicycle lanes.

5.1.1 Pavement Structure Consideration

The earth subgrade soil is expected to vary from silty clay to fine sand. Cognizant of the traffic volume and the subgrade soils, the following pavement component thicknesses are considered suitable.

Pavement Component	Component Thickness
HL3 Surface Asphaltic Concrete	50 mm
HL4 Binder Asphaltic Concrete	45 mm
HL4 Binder Asphaltic Concrete	45 mm
Granular "A" Base Course	150 mm
Granular "B" Sub-base Course ²	600 mm
Granular Base Equivalency (GBE)¹	830 mm

Note:

1. GBE denotes Granular Base Equivalency which is calculated using factors of 2 for asphaltic concrete, 1 for Granular "A" base and 0.67 for Granular "B" sub-base
2. Region of Waterloo Specification

The following SuperPave mixes can be adopted in place of the HL asphaltic concrete.

Mixes	Traffic Category	Lift Thickness
SuperPave 12.5	C	40 mm
SuperPave 19.0	C	2 layers of 50 mm
Total		140 mm



For the bicycle lane, the following pavement structure is recommended:

Pavement Component	Component Thickness
HL3 Surface Asphaltic Concrete	50 mm
Granular "A" Base Course	150 mm
Granular "B" Sub-base Course (Region of Waterloo Granular "B" gradation specification)	200 mm
Granular Base Equivalency (GBE)	384 mm

Longitudinal sub-drains with positive drainage outlets are recommended to be installed at the subgrade level along the edges of the roadway reconstruction to enhance the performance of the pavement. Systematic drainage of the granular base materials will promote the longevity of the pavement structure.

5.1.2 Pavement Construction

The exposed earth subgrade should be recompact from the surface with a minimum 10 tonne vibratory compactor to a density of no less than 98% Standard Proctor Maximum Dry Density (SPMDD) prior to placement of the Granular "B" (Region of Waterloo Specification). Any soft or otherwise incompactible areas detected should be removed and replaced with approved granular materials and should also be compacted to no less than 98% SPMDD.

The pavement design considers that road construction will be carried out during the drier time of the year and that the subgrade is stable, not heaving under construction equipment traffic. If the subgrade is wet or unstable, additional granular sub-base may be required.

The Granular "A" and Granular "B" (OPSS Granular "B" Type II or Region of Waterloo Specification) should be compacted to 100% SPMDD. Current testing of the existing granular base materials indicate non-compliance to the gradational requirements of OPSS Granular "B" Type II and the Region of Waterloo specification and, therefore, are not suitable to be reused as Granular "B" sub-base materials. However, a more thorough review and additional sample testing of the existing granular base materials may reveal the potential for reuse of some portion of the existing granular base materials.

The asphaltic concrete should be placed and compacted in accordance with OPSS Form 310 and to at least 92% of the Marshall Density (MRD). Performance Grade Asphalt Cement (PGAC) 58-28 should be utilized in the hot mix asphalt.



The surface course of the asphaltic concrete should be placed at least one (1) year after base course is placed to allow minor settlements of the trench backfill to complete. The incomplete pavement structure may not be capable of supporting the anticipated traffic. Consequently, minor repairs of the sub-base, base and asphaltic concrete may be required prior to paving the surface course asphaltic concrete.

Frequent in situ density testing by this office should be carried out to verify that the specified degree of compaction on the granular and asphalt is being achieved and maintained.

Vibration could be generated from various construction equipment, such as compactors and rollers which could be harmful to surrounding structures and buildings during construction. Peak Particle Velocity (PPV) of ground motion is widely accepted as the best descriptor of potential for vibration damage to structures. The safe vibration limit can be set to 10 to 20 mm/s PPV, depending on the sensitivity of surrounding structures to vibration.

Vibration monitoring can be carried out to measure the PPV of ground motion from vibration generated from typical compaction equipment at the beginning of the project in the potentially critical areas. This will set criteria and establish the type of equipment to be used for this project. It is also recommended that a pre-construction condition survey be conducted to document the condition of the existing structures within the possible zone of influence.

5.2 Underground Services Installation

Replacement of watermain and sewers to similarly existing depths will occur over the project length. Invert levels will be similar to existing installed elevations generally between 2± m and 4± m depth.

5.2.1 Trenching

The excavations will generally penetrate loose to compact fill, loose to dense native granular-based soil, and stiff to hard native cohesive soil. The fill and native soil deposits will generally provide suitable subgrade support at the pipe founding levels. Any loose or unstable soils encountered at the pipe invert should be sub-excavated and replaced with well compacted Granular "A" (or clean crushed gravel wrapped in non-woven geotextile) which should be placed in 150 mm thick layers and compacted to at least 100% Standard Proctor Maximum Dry Density (SPMDD). The support of pipes in these areas can also be achieved with non-shrinkable fill, if poor soil is encountered at the subgrade level and fully removed.

The soil materials are generally considered to be Type 3 Soils in accordance with the latest Occupational Health and Safety Act, provided that groundwater is adequately controlled by suitable means. Trenches can be cut to 1H to 1V throughout provided groundwater is being suitably controlled. Otherwise, the side slopes should be cut to 3H : 1V or flatter. The side slopes should be suitably protected from erosion



processes. The geotechnical engineer should be retained to examine and inspect cut slopes to ensure construction safety.

It may be necessary to provide support for nearby services if they are located within the applicable 45° influence zone measured from the vertical. The use of trench liner box or timber lagging can be considered to support the trench side walls and adjacent vehicular traffic, foundations, structures or utilities.

5.2.2 Groundwater Control

The groundwater table will likely be encountered during the servicing replacement and construction works. Groundwater levels drop from elevation 337.0± m at Borehole 1 (near Albert Street) to elevation 317.5± m at Borehole 14 (near Weber Street North). West of King Street North, the groundwater level in a saturated sand pocket in the area of Borehole 4 was near elevation 331.0± m. It should be noted that the groundwater table can be expected to fluctuate seasonally and with major weather events.

CVD recommends that test pits be dug during the tendering stage of the project, so that the potential contractors can examine the groundwater and soil conditions and arrive at suitable methods of excavation, groundwater control and backfilling based on their experience and plant.

The base of deeper sanitary sewer excavations are expected to be in the order of 0.1± m to 2.3± m below encountered groundwater levels at Boreholes 7 to 14 (King Street North to Weber Street North). Sandy silt, silt and clayey silt soil are expected to comprise the excavation side walls below the groundwater table, and no major problems due to groundwater are expected within the servicing replacement excavations. The seepage and groundwater ingress are expected to be relatively slow based on insitu hydraulic conductivity response testing performed at the monitoring wells installed at Boreholes 8, 9, 10 and 14 where values range between 1.5×10^{-4} and less than 1×10^{-8} cm/sec.

Locally at Borehole 4, the sanitary sewer invert is anticipated to be approximately 0.6± m below the groundwater table. In general, groundwater is expected to be controllable by pumping from several filtered sump pits (possibly together with intercept ditching) if the groundwater table at the time of construction is located within 0.6 m above the required excavation level. If the water table at the time of construction is located higher than 0.6 m above the required excavation level, it is expected that pre-lowering of the groundwater table will be required prior to excavation. This may require the use of well points.

The amount of groundwater to be pumped from sump pits and dewatering will depend on various factors such as length of construction trench open at any given time, depth of excavation below groundwater level, and hydraulic conductivity of the water-bearing soils. It is anticipated that the amount of groundwater to be handled in the eastern portion of the project area could exceed 50,000 Litres/day. Pumping over 50,000 Litres/day would be considered to be a “water taking” by the Ministry of Environment, Conservation and Parks (MECP) and is subject to the ministry’s “Permit To Take Water



(PTTW)” requirements.

In March 2016, the Ministry provided an exemption from the permitting requirements for “construction-only” water takings that do not exceed 400,000 Litres/day. For these modest “construction-only” water takings, the water taking must still be “registered” on the MECP “Environmental Activity and Sector Registry (EASR)”, but nevertheless a quicker and less formal process is now available to allow pumping to proceed.

In addition, the ministry has clarified that surface water from rainfall is not included in the water quantity and there is no time limitation for these regulated water takings, although a qualified person (QP) must still evaluate the water taking for all the same environmental impact issues and then indicate this through the online registration procedure. For all other water takings and construction water takings exceeding 400,000 Litres/day, a PTTW is still required along with a 90-day review process.

During the design stage when the depth/elevation of the excavations for the sewers are being finalized, a more detailed hydrogeological assessment by a QP is required to determine if the water taking at this site would exceed 400,000 L/day (278 L/min). Thereafter, the need for either EASR registration or a PTTW can be determined.

It is further noted that the groundwater is impacted with VOCs, metals and chloride (see Section 6.2.2 for further discussion). Therefore, the groundwater will need to be treated prior to being released into the storm water system. Alternatively, the groundwater could be released to the sanitary sewer, however permission from the Region of Waterloo (owner of the waste water treatment facility) will be required.

5.2.3 Bedding

Any unstable soils exposed at the pipe subgrade should be sub-excavated and replaced with imported Granular “A”, placed in thin layers and compacted to at least 100% SPMDD, or can be removed and supported on non-shrinkable fill as previously described in Section 5.2.1.

The bedding requirements for the services should be in accordance with Ontario Provincial Standard Drawings OPSD - 802 and Region of Waterloo SSMS E1-01 for flexible and rigid pipes provided that the groundwater table is adequately controlled and the pipe subgrade is stable. The bedding shall be a Class “B” and consist of at least 150 mm (to a maximum of 300 mm) thick Granular “A” compacted to 100% SPMDD.

Clear crushed stone bedding can be used to replace Granular “A” bedding if the subgrade is unstable and saturated, and compacting the Granular “A” bedding layer is not practical. This condition could occur between Boreholes 7 and 14 (King Street North to Weber Street North) where the pipe subgrade consists of saturated silt deposit. The clear crushed stone will need to be suitably densified and wrapped with a non-woven filter cloth (TerraFix 270R or equivalent) to prevent migration of fine soil



particles into the crushed stone mattress and prevent the loss of subgrade support for the pipes.

Granular "A" should be used to backfill around the pipe to at least 150 mm above the top of the pipe. This backfill should be placed in thin layers and each layer compacted to 100% SPMDD. Recycled asphalt will not be allowed to be used in Granular "A" bedding material.

5.2.4 Backfill

In general, the excavated soils are considered suitable for reuse as trench backfill. Mixing drier and wetter excavated soils may be feasible to arrive at a more compactable moisture content.

The backfill should be placed in thin layers, 300 mm thick or less dependant on the demonstrated success of compaction based on in-situ density test results. Other types of materials such as organic soils, overly wet soils, boulders and frozen materials (if work is carried out in the winter months) should not be used for backfilling. All backfill should be compacted to at least 98% SPMDD.

Backfilling operations should follow closely after excavation so that only a minimal length of trench slope is exposed at any one time so as to minimize potential problems. This will potentially minimize over-wetting of the subgrade material. Particular attention should be given to make sure frozen material is not used as backfill should construction extend into the winter season.

It has been our experience that excavated cohesive soils should be broken into smaller pieces (less than 150 mm diameter) before returning into the trench as backfill. This will eliminate "wedging" problems and reduce long term settlement. Particular attention must be made to backfilling the laterals where the trenches are narrow and against the manholes and catch-basins. Thinner lifts and additional compaction must be applied.

Frequent inspection by experienced geotechnical personnel should be carried out to examine and approve backfill material, to carefully inspect placement, and to verify that the specified degree of compaction has been obtained by in situ density testing.



6.0 GEO-ENVIRONMENTAL CONSIDERATIONS

It is our understanding that excess soils may potentially be removed off-site during construction. CVD recommends that a soil management plan be established to manage the quantity, as well as where and how the excess soils can be disposed of off-site.

The analytical results and environmental assessment findings must be disclosed to the receiving site owner(s) and approval by the receiving site owner(s) be obtained prior to exporting/transferring the materials. It is noted that the soils condition may differ between and beyond the sampled locations. If any impacted soils are discovered during construction, CVD should be contacted for further sampling and testing to determine the limit of the impacted soils.

Transportation of excess soils from the source site to the receiving site(s) should be carried out in accordance with the MECP document entitled "Management of Excess Soil - A Guide for Best Management Practices" dated January 2014. Additional soil sampling and analysis may be required as per the above-noted MECP document and/or as per the requirement of the receiving site owner(s), depending on the volume of excess soil generated during construction.

Any soils identified during construction to have been environmentally impacted are to be separately stockpiled and analysed to determine the appropriate measures for handling and disposal. Waste characterization testing (TCLP) to classify the material for disposal as prescribed in Ontario Regulation 558 is required.

Similarly, groundwater encountered during construction works must also be suitably assessed and handled.

6.1 Applicable Regulatory Standards

The Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act established in accordance with the amended Ontario Regulation 153/04 (April 15, 2011) was consulted in the assessment of the soil and groundwater at the project site.

The analytical results for soils were compared to the following "applicable regulatory standards":

- Table 1 (Full Depth Background Site Condition Standards) for Agricultural or Other Property Use
- Table 1 (Full Depth Background Site Condition Standards) for Residential/Institutional/Parkland/Industrial/Commercial/Community Property Use
- Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use for coarse textured soil



- Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for Industrial/Commercial/Community Property Use for coarse textured soil

The analytical results for groundwater were compared to the following “applicable regulatory standards”:

- Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for All Types of Property Use for coarse textured soil
- Ontario Provincial Water Quality Objectives (PWQO) Standard
- Region of Waterloo Storm Sewer Bylaw Standard

The project site exists as a public transportation corridor. The Region of Waterloo relies on groundwater as a source of potable water. The site is not located within 30 m of an area of natural significance and is not a shallow soil property. The soil results were therefore compared to the Ministry of the Environment, Conservation and Parkland (MECP) Table 2, Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for Industrial/Commercial/Community Property Use for coarse textured soil and groundwater results were therefore compared to the MECP Table 2, Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for All Types of Property Use for coarse textured soil.

Table 1 for Full Depth Background Standards for Agricultural or Other Property Use and Residential/Institutional/Parkland/Industrial/Commercial/Community Use would apply for off site disposal of soil and reuse with no environmental restrictions.

6.2 Analytical Results and Considerations

6.2.1 Soil

Ten (10) soil samples were submitted to ALS Laboratory Group of Waterloo, Ontario for analysis of metals, inorganics and PHCs. Six (6) of the ten (10) samples were also tested for BTEX, VOCs, and PAHs. The chemical testing was conducted to assess the environmental quality of excess soil which may potentially be removed off-site during construction. The laboratory certificates of chemical analysis and results provided by ALS Laboratory Group of Waterloo are enclosed in Appendix B. A comparison of the soil chemistry results to the applicable regulatory standards is enclosed in Appendix D.

The analytical results for the twelve (12) soil samples submitted for metals indicate that samples BH4-SA2 and BH10-SA1 have lead concentrations above the Table 1 standards for Agricultural or Other Property Use.



The analytical results for the ten (10) soil samples submitted for Sodium Adsorption Ratio (SAR) indicate that all ten (10) samples tested have concentrations exceeding the Table 2 regulatory standards. Since the elevated SAR values are related to salt use for pavement de-icing purposes, it is not considered to be an exceedance to the site regulatory standard in accordance with Regulation 153/04. If disposal of **solely SAR impacted soil** is required, the excavated soil can be moved to a similarly municipally owned road site where continued de-icing salt application will occur. Alternatively, the excess soil may be received by a holder of an appropriate certificate of approval.

The analytical results for the ten (10) soil samples submitted for PHCs indicate that four (4) of ten (10) samples tested have concentrations exceeding Table 1 (Full Depth Background Site Condition Standards) for Residential/Institutional/Parkland/Industrial/Commercial/Community Property Use and one (1) of ten (10) samples has a concentration exceeding Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use for coarse textured soil.

The analytical results for the ten (10) soil samples submitted for metals indicate that one (1) of ten (10) samples tested has a hexavalent chromium concentration exceeding Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for Residential/Parkland/Institutional Property Use for coarse textured soil.

All samples tested for PAHs and VOCs have concentrations below Table 1 (Full Depth Background Site Condition Standards) for Agricultural or Other Property Use.

Further sampling and testing to determine the limit of impacted soil within the project work area is recommended. Impacted soil is to be separately stockpiled and analysed to determine the appropriate measures for handling and disposal.

6.2.2 Groundwater

Six (6) groundwater samples collected from the six (6) monitoring wells installed at Boreholes 3, 6, 8, 9, 10 and 14 were submitted to ALS Laboratory Group of Waterloo, Ontario for analysis of PHCs (F1-F4), BTEX, VOCs, and metals. The testing was conducted to assess the environmental quality of the groundwater resulted from dewatering procedures that may be required during the replacement of underground infrastructure. The laboratory certificates of chemical analysis and results of the groundwater samples submitted to ALS Laboratory Group of Waterloo are enclosed in Appendix C. A comparison of the groundwater chemistry results to the applicable regulatory standards is enclosed in Appendix E.

The analytical results for five (5) of the six (6) groundwater samples submitted have sodium and chloride concentrations above the Table 2 standards for All Types of Property Use for coarse textured soil.

The sample from Borehole 10 has vinyl chloride, cis-1,2-dichloroethylene, and trans-1,2-



dichloroethylene concentrations above Table 2 standards for All Types of Property Use for coarse textured soil and, tetrachloroethylene, trichloroethylene, cobalt and copper concentrations above the PQWO standards.

The samples from Boreholes 6, 8, 9 and 14 have cobalt, copper, uranium, and/or cadmium concentrations above the PQWO standards.

Groundwater pumped from excavations during road reconstruction must be suitably treated before being discharged into the municipal storm sewer. Alternatively, the groundwater could be released to the sanitary sewer, however permission from the Region of Waterloo (owner of the waste water treatment facility) will be required. The discharge must be shown to meet the applicable guidelines outlined by the City of Waterloo and the Region of Waterloo.



7.0 CLOSURE

The Limitations of Report, as quoted in Appendix "A", is an integral part of this report.

We trust that the information presented in this report is complete within our terms of reference. If there are any further questions concerning this report, please do not hesitate to contact our office.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.



Robert Vander Doelen, P. Eng.
Senior Engineer



Eric Y. Chung, M. Eng., P. Eng.
Principal Engineer



APPENDIX “A”

Limitations of Report



APPENDIX “A”

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.



APPENDIX “B”

Soil Chemistry Results





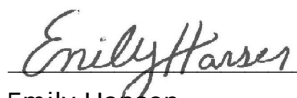
CHUNG AND VANDER DOELEN
ATTN: NANDOU ZHAO
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Date Received: 31-MAY-19
Report Date: 10-JUN-19 09:45 (MT)
Version: FINAL REV. 2

Client Phone: 519-701-8884

Certificate of Analysis

Lab Work Order #: L2282970
Project P.O. #: NOT SUBMITTED
Job Reference: G19750
C of C Numbers: 17-726637
Legal Site Desc:


Emily Hansen
Account Manager

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ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 2 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-1	BH1-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		1.82		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	*1.4
% Moisture		3.55		0.10	%	01-JUN-19				
pH		8.37		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		73.6	SAR:M	0.10	SAR	06-JUN-19	*1	*2.4	*5	*12
Calcium (Ca)		1.56		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		<0.50		0.50	mg/L	06-JUN-19				
Sodium (Na)		334		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		2.3		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		16.3		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		5.1		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		0.10		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		9.7		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		2.5		1.0	ug/g	06-JUN-19	19	21	22	80
Copper (Cu)		8.5		1.0	ug/g	06-JUN-19	62	92	140	230
Lead (Pb)		6.9		1.0	ug/g	06-JUN-19	45	120	120	120
Mercury (Hg)		0.0113		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
Molybdenum (Mo)		<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
Nickel (Ni)		5.5		1.0	ug/g	06-JUN-19	37	82	100	270
Selenium (Se)		<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
Silver (Ag)		<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
Thallium (Tl)		<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
Uranium (U)		<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
Vanadium (V)		16.2		1.0	ug/g	06-JUN-19	86	86	86	86
Zinc (Zn)		30.3		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
Chromium, Hexavalent		<0.20		0.20	ug/g	04-JUN-19	0.66	0.66	8	8
Hydrocarbons										
F2 (C10-C16)		<10		10	ug/g	03-JUN-19	10	10	98	230
F3 (C16-C34)		103		50	ug/g	03-JUN-19	240	240	300	1700
F4 (C34-C50)		388		50	ug/g	03-JUN-19	*120	*120	2800	3300
F4G-SG (GHH-Silica)		1300		250	ug/g	03-JUN-19	*120	*120	2800	3300
Chrom. to baseline at nC50		NO			No Unit	03-JUN-19				
Surrogate: 2-Bromobenzotrifluoride		95.5		60-140	%	03-JUN-19				
L2282970-2	BH3-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 3 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-2	BH3-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		1.40		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	1.4
% Moisture		10.1		0.10	%	01-JUN-19				
pH		7.73		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		22.5		0.10	SAR	06-JUN-19	*1	*2.4	*5	*12
Calcium (Ca)		9.46		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		0.62		0.50	mg/L	06-JUN-19				
Sodium (Na)		265		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		2.8		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		49.6		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		6.8		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		0.12		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		13.6		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		4.9		1.0	ug/g	06-JUN-19	19	21	22	80
Copper (Cu)		13.2		1.0	ug/g	06-JUN-19	62	92	140	230
Lead (Pb)		10.4		1.0	ug/g	06-JUN-19	45	120	120	120
Mercury (Hg)		0.0159		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
Molybdenum (Mo)		<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
Nickel (Ni)		10.0		1.0	ug/g	06-JUN-19	37	82	100	270
Selenium (Se)		<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
Silver (Ag)		<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
Thallium (Tl)		<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
Uranium (U)		<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
Vanadium (V)		25.4		1.0	ug/g	06-JUN-19	86	86	86	86
Zinc (Zn)		49.9		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
Chromium, Hexavalent		<0.20		0.20	ug/g	04-JUN-19	0.66	0.66	8	8
Hydrocarbons										
F2 (C10-C16)		<10		10	ug/g	03-JUN-19	10	10	98	230
F3 (C16-C34)		102		50	ug/g	03-JUN-19	240	240	300	1700
F4 (C34-C50)		222		50	ug/g	03-JUN-19	*120	*120	2800	3300
F4G-SG (GHH-Silica)		540		250	ug/g	03-JUN-19	*120	*120	2800	3300
Chrom. to baseline at nC50		NO			No Unit	03-JUN-19				
Surrogate: 2-Bromobenzotrifluoride		96.8		60-140	%	03-JUN-19				
L2282970-3	BH5-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 4 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-3	BH5-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		0.580		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	0.7	1.4
% Moisture		5.67		0.10	%	01-JUN-19				
pH		8.22		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		10.4		0.10	SAR	06-JUN-19	*1	*2.4	*5	12
Calcium (Ca)		4.37		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		2.93		0.50	mg/L	06-JUN-19				
Sodium (Na)		115		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		2.2		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		11.7		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		7.6		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		0.15		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		13.0		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		2.6		1.0	ug/g	06-JUN-19	19	21	22	80
Copper (Cu)		8.2		1.0	ug/g	06-JUN-19	62	92	140	230
Lead (Pb)		12.9		1.0	ug/g	06-JUN-19	45	120	120	120
Mercury (Hg)		0.0108		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
Molybdenum (Mo)		<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
Nickel (Ni)		6.4		1.0	ug/g	06-JUN-19	37	82	100	270
Selenium (Se)		<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
Silver (Ag)		<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
Thallium (Tl)		<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
Uranium (U)		<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
Vanadium (V)		15.7		1.0	ug/g	06-JUN-19	86	86	86	86
Zinc (Zn)		28.6		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
Chromium, Hexavalent		<0.20		0.20	ug/g	04-JUN-19	0.66	0.66	8	8
Hydrocarbons										
F2 (C10-C16)		<10		10	ug/g	03-JUN-19	10	10	98	230
F3 (C16-C34)		90		50	ug/g	03-JUN-19	240	240	300	1700
F4 (C34-C50)		243		50	ug/g	03-JUN-19	*120	*120	2800	3300
F4G-SG (GHH-Silica)		960		250	ug/g	03-JUN-19	*120	*120	2800	3300
Chrom. to baseline at nC50		NO			No Unit	03-JUN-19				
Surrogate: 2-Bromobenzotrifluoride		90.0		60-140	%	03-JUN-19				
L2282970-4	BH7-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 5 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-4	BH7-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		1.51		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	*1.4
% Moisture		15.1		0.10	%	01-JUN-19				
pH		7.94		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		50.6	SAR:M	0.10	SAR	06-JUN-19	*1	*2.4	*5	*12
Calcium (Ca)		2.22		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		<0.50		0.50	mg/L	06-JUN-19				
Sodium (Na)		274		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		1.9		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		16.5		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		5.3		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		<0.10		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		8.0		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		3.0		1.0	ug/g	06-JUN-19	19	21	22	80
Copper (Cu)		8.5		1.0	ug/g	06-JUN-19	62	92	140	230
Lead (Pb)		5.5		1.0	ug/g	06-JUN-19	45	120	120	120
Mercury (Hg)		<0.0050		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
Molybdenum (Mo)		<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
Nickel (Ni)		6.0		1.0	ug/g	06-JUN-19	37	82	100	270
Selenium (Se)		<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
Silver (Ag)		<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
Thallium (Tl)		<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
Uranium (U)		<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
Vanadium (V)		16.1		1.0	ug/g	06-JUN-19	86	86	86	86
Zinc (Zn)		33.5		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
Chromium, Hexavalent		<0.20		0.20	ug/g	05-JUN-19	0.66	0.66	8	8
Hydrocarbons										
F2 (C10-C16)		<10		10	ug/g	03-JUN-19	10	10	98	230
F3 (C16-C34)		<50		50	ug/g	03-JUN-19	240	240	300	1700
F4 (C34-C50)		<50		50	ug/g	03-JUN-19	120	120	2800	3300
Chrom. to baseline at nC50		YES			No Unit	03-JUN-19				
Surrogate: 2-Bromobenzotrifluoride		92.8		60-140	%	03-JUN-19				
L2282970-5	BH8-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		0.614		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	0.7	1.4

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 6 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-5	BH8-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
% Moisture		16.9		0.10	%	01-JUN-19				
pH		7.96		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		17.4		0.10	SAR	06-JUN-19	*1	*2.4	*5	*12
Calcium (Ca)		2.34		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		1.04		0.50	mg/L	06-JUN-19				
Sodium (Na)		127		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		1.9		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		34.4		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		<5.0		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		0.14		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		9.5		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		2.7		1.0	ug/g	06-JUN-19	19	21	22	80
Copper (Cu)		7.1		1.0	ug/g	06-JUN-19	62	92	140	230
Lead (Pb)		4.6		1.0	ug/g	06-JUN-19	45	120	120	120
Mercury (Hg)		0.0081		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
Molybdenum (Mo)		<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
Nickel (Ni)		6.7		1.0	ug/g	06-JUN-19	37	82	100	270
Selenium (Se)		<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
Silver (Ag)		<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
Thallium (Tl)		<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
Uranium (U)		<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
Vanadium (V)		14.9		1.0	ug/g	06-JUN-19	86	86	86	86
Zinc (Zn)		48.4		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
Chromium, Hexavalent		1.31		0.20	ug/g	05-JUN-19	*0.66	*0.66	8	8
Volatile Organic Compounds										
Acetone		<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	16
Benzene		<0.0068	VOCJ	0.0068	ug/g	05-JUN-19	0.02	0.02	0.21	0.32
Bromodichloromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.5	1.5
Bromoform		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.27	0.61
Bromomethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
Carbon tetrachloride		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.21
Chlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.4	2.4
Dibromochloromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.3	2.3
Chloroform		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.47
1,2-Dibromoethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
1,2-Dichlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.2	1.2
1,3-Dichlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	4.8	9.6

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Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 7 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-5	BH8-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Volatile Organic Compounds										
	1,4-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.083	0.2
	Dichlorodifluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	16	16
	1,1-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.47	0.47
	1,2-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,1-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.064
	cis-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.9	1.9
	trans-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.084	1.3
	Methylene Chloride	<0.48	RRR	0.48	ug/g	05-JUN-19	**0.05	**0.05	**0.1	1.6
	1,2-Dichloropropane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.16
	cis-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	trans-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g	05-JUN-19	0.05	0.05	0.05	0.059
	Ethylbenzene	<0.018	VOCJ	0.018	ug/g	05-JUN-19	0.05	0.05	1.1	1.1
	n-Hexane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.8	46
	Methyl Ethyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	70
	Methyl Isobutyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	1.7	31
	MTBE	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.75	1.6
	Styrene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.7	34
	1,1,1,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.058	0.087
	1,1,2,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Tetrachloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.28	1.9
	Toluene	<0.080	VOCJ	0.080	ug/g	05-JUN-19	0.2	0.2	2.3	6.4
	1,1,1-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.38	6.1
	1,1,2-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Trichloroethylene	<0.010	VOCJ	0.010	ug/g	05-JUN-19	0.05	0.05	0.061	0.55
	Trichlorofluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.25	4	4
	Vinyl chloride	<0.020	VOCJ	0.020	ug/g	05-JUN-19	0.02	0.02	0.02	0.032
	o-Xylene	<0.020	VOCJ	0.020	ug/g	05-JUN-19				
	m+p-Xylenes	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	Xylenes (Total)	<0.050		0.050	ug/g	05-JUN-19	0.05	0.05	3.1	26
	Surrogate: 4-Bromofluorobenzene	86.7		50-140	%	05-JUN-19				
	Surrogate: 1,4-Difluorobenzene	95.7		50-140	%	05-JUN-19				
Hydrocarbons										
	F1 (C6-C10)	<5.0	VOCJ	5.0	ug/g	05-JUN-19	17	25	55	55
	F1-BTEX	<5.0		5.0	ug/g	05-JUN-19	17	25	55	55
	F2 (C10-C16)	<10		10	ug/g	04-JUN-19	10	10	98	230
	F2-Naphth	<10		10	ug/g	05-JUN-19				
	F3 (C16-C34)	<50		50	ug/g	04-JUN-19	240	240	300	1700
	F3-PAH	<50		50	ug/g	05-JUN-19				
	F4 (C34-C50)	<50		50	ug/g	04-JUN-19	120	120	2800	3300
	Total Hydrocarbons (C6-C50)	<72		72	ug/g	05-JUN-19				
	Chrom. to baseline at nC50	YES			No Unit	04-JUN-19				
	Surrogate: 2-Bromobenzotrifluoride	96.0		60-140	%	04-JUN-19				
	Surrogate: 3,4-Dichlorotoluene	83.8		60-140	%	05-JUN-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.072	7.9	21

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Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 8 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-5	BH8-SA2									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Polycyclic Aromatic Hydrocarbons										
Acenaphthylene		<0.050		0.050	ug/g	05-JUN-19	0.093	0.093	0.15	0.15
Anthracene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.16	0.67	0.67
Benzo(a)anthracene		<0.050		0.050	ug/g	05-JUN-19	0.095	0.36	0.5	0.96
Benzo(a)pyrene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.3	0.3	0.3
Benzo(b)fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.3	0.47	0.78	0.96
Benzo(g,h,i)perylene		<0.050		0.050	ug/g	05-JUN-19	0.2	0.68	6.6	9.6
Benzo(k)fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.48	0.78	0.96
Chrysene		<0.050		0.050	ug/g	05-JUN-19	0.18	2.8	7	9.6
Dibenzo(ah)anthracene		<0.050		0.050	ug/g	05-JUN-19	0.1	0.1	0.1	0.1
Fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.24	0.56	0.69	9.6
Fluorene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.12	62	62
Indeno(1,2,3-cd)pyrene		<0.050		0.050	ug/g	05-JUN-19	0.11	0.23	0.38	0.76
1+2-Methylnaphthalenes		<0.042		0.042	ug/g	05-JUN-19	0.05	0.59	0.99	30
1-Methylnaphthalene		<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
2-Methylnaphthalene		<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
Naphthalene		<0.013		0.013	ug/g	05-JUN-19	0.05	0.09	0.6	9.6
Phenanthrene		<0.046		0.046	ug/g	05-JUN-19	0.19	0.69	6.2	12
Pyrene		<0.050		0.050	ug/g	05-JUN-19	0.19	1	78	96
Surrogate: 2-Fluorobiphenyl		100.7		50-140	%	05-JUN-19				
Surrogate: p-Terphenyl d14		86.8		50-140	%	05-JUN-19				
L2282970-6	BH9-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		1.24		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	1.4
% Moisture		20.9		0.10	%	01-JUN-19				
pH		7.20		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		13.7		0.10	SAR	06-JUN-19	*1	*2.4	*5	*12
Calcium (Ca)		15.1		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		2.04		0.50	mg/L	06-JUN-19				
Sodium (Na)		214		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		8.7		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		139		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		0.66		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		6.7		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		0.41		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		22.4		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		7.1		1.0	ug/g	06-JUN-19	19	21	22	80

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ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 9 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-6	BH9-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Metals										
	Copper (Cu)	13.0		1.0	ug/g	06-JUN-19	62	92	140	230
	Lead (Pb)	12.6		1.0	ug/g	06-JUN-19	45	120	120	120
	Mercury (Hg)	0.0736		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
	Molybdenum (Mo)	<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
	Nickel (Ni)	13.4		1.0	ug/g	06-JUN-19	37	82	100	270
	Selenium (Se)	<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
	Silver (Ag)	<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
	Thallium (Tl)	<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
	Uranium (U)	<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
	Vanadium (V)	29.5		1.0	ug/g	06-JUN-19	86	86	86	86
	Zinc (Zn)	100		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
	Chromium, Hexavalent	0.43		0.20	ug/g	05-JUN-19	0.66	0.66	8	8
Volatile Organic Compounds										
	Acetone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	16
	Benzene	<0.0068	VOCJ	0.0068	ug/g	05-JUN-19	0.02	0.02	0.21	0.32
	Bromodichloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.5	1.5
	Bromoform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.27	0.61
	Bromomethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Carbon tetrachloride	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.21
	Chlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.4	2.4
	Dibromochloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.3	2.3
	Chloroform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.47
	1,2-Dibromoethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,2-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.2	1.2
	1,3-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	4.8	9.6
	1,4-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.083	0.2
	Dichlorodifluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	16	16
	1,1-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.47	0.47
	1,2-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,1-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.064
	cis-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.9	1.9
	trans-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.084	1.3
	Methylene Chloride	<0.80	RRR	0.80	ug/g	05-JUN-19	**0.05	**0.05	**0.1	1.6
	1,2-Dichloropropane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.16
	cis-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	trans-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g	05-JUN-19	0.05	0.05	0.05	0.059
	Ethylbenzene	<0.018	VOCJ	0.018	ug/g	05-JUN-19	0.05	0.05	1.1	1.1
	n-Hexane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.8	46
	Methyl Ethyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	70
	Methyl Isobutyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	1.7	31
	MTBE	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.75	1.6
	Styrene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.7	34
	1,1,1,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.058	0.087

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 10 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-6	BH9-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Volatile Organic Compounds										
	1,1,2,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Tetrachloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.28	1.9
	Toluene	<0.080	VOCJ	0.080	ug/g	05-JUN-19	0.2	0.2	2.3	6.4
	1,1,1-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.38	6.1
	1,1,2-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Trichloroethylene	<0.010	VOCJ	0.010	ug/g	05-JUN-19	0.05	0.05	0.061	0.55
	Trichlorofluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.25	4	4
	Vinyl chloride	<0.020	VOCJ	0.020	ug/g	05-JUN-19	0.02	0.02	0.02	0.032
	o-Xylene	<0.020	VOCJ	0.020	ug/g	05-JUN-19				
	m+p-Xylenes	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	Xylenes (Total)	<0.050		0.050	ug/g	05-JUN-19	0.05	0.05	3.1	26
	Surrogate: 4-Bromofluorobenzene	85.2		50-140	%	05-JUN-19				
	Surrogate: 1,4-Difluorobenzene	96.1		50-140	%	05-JUN-19				
Hydrocarbons										
	F1 (C6-C10)	<5.0	VOCJ	5.0	ug/g	05-JUN-19	17	25	55	55
	F1-BTEX	<5.0		5.0	ug/g	05-JUN-19	17	25	55	55
	F2 (C10-C16)	<10		10	ug/g	04-JUN-19	10	10	98	230
	F2-Naphth	<10		10	ug/g	05-JUN-19				
	F3 (C16-C34)	<50		50	ug/g	04-JUN-19	240	240	300	1700
	F3-PAH	<50		50	ug/g	05-JUN-19				
	F4 (C34-C50)	<50		50	ug/g	04-JUN-19	120	120	2800	3300
	Total Hydrocarbons (C6-C50)	<72		72	ug/g	05-JUN-19				
	Chrom. to baseline at nC50	YES			No Unit	04-JUN-19				
	Surrogate: 2-Bromobenzotrifluoride	97.2		60-140	%	04-JUN-19				
	Surrogate: 3,4-Dichlorotoluene	83.7		60-140	%	05-JUN-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.072	7.9	21
	Acenaphthylene	<0.050		0.050	ug/g	05-JUN-19	0.093	0.093	0.15	0.15
	Anthracene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.16	0.67	0.67
	Benzo(a)anthracene	<0.050		0.050	ug/g	05-JUN-19	0.095	0.36	0.5	0.96
	Benzo(a)pyrene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.3	0.3	0.3
	Benzo(b)fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.3	0.47	0.78	0.96
	Benzo(g,h,i)perylene	<0.050		0.050	ug/g	05-JUN-19	0.2	0.68	6.6	9.6
	Benzo(k)fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.48	0.78	0.96
	Chrysene	<0.050		0.050	ug/g	05-JUN-19	0.18	2.8	7	9.6
	Dibenzo(ah)anthracene	<0.050		0.050	ug/g	05-JUN-19	0.1	0.1	0.1	0.1
	Fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.24	0.56	0.69	9.6
	Fluorene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.12	62	62
	Indeno(1,2,3-cd)pyrene	<0.050		0.050	ug/g	05-JUN-19	0.11	0.23	0.38	0.76
	1+2-Methylnaphthalenes	<0.042		0.042	ug/g	05-JUN-19	0.05	0.59	0.99	30
	1-Methylnaphthalene	<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
	2-Methylnaphthalene	<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
	Naphthalene	<0.013		0.013	ug/g	05-JUN-19	0.05	0.09	0.6	9.6
	Phenanthrene	<0.046		0.046	ug/g	05-JUN-19	0.19	0.69	6.2	12
	Pyrene	<0.050		0.050	ug/g	05-JUN-19	0.19	1	78	96
	Surrogate: 2-Fluorobiphenyl	101.5		50-140	%	05-JUN-19				

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#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 11 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-6	BH9-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Polycyclic Aromatic Hydrocarbons										
Surrogate: p-Terphenyl d14		89.7		50-140	%	05-JUN-19				
L2282970-7	BH9-SA5									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		0.717		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	1.4
% Moisture		11.3		0.10	%	01-JUN-19				
pH		7.85		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	03-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		9.07		0.10	SAR	06-JUN-19	*1	*2.4	*5	12
Calcium (Ca)		10.9		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		1.30		0.50	mg/L	06-JUN-19				
Sodium (Na)		119		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		2.0		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		99.3		1.0	ug/g	06-JUN-19	210	220	390	670
Beryllium (Be)		0.76		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
Boron (B)		14.0		5.0	ug/g	06-JUN-19	36	36	120	120
Boron (B), Hot Water Ext.		0.14		0.10	ug/g	06-JUN-19	36	36	1.5	2
Cadmium (Cd)		<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
Chromium (Cr)		23.9		1.0	ug/g	06-JUN-19	67	70	160	160
Cobalt (Co)		9.8		1.0	ug/g	06-JUN-19	19	21	22	80
Copper (Cu)		20.5		1.0	ug/g	06-JUN-19	62	92	140	230
Lead (Pb)		11.6		1.0	ug/g	06-JUN-19	45	120	120	120
Mercury (Hg)		0.0120		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
Molybdenum (Mo)		<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
Nickel (Ni)		20.8		1.0	ug/g	06-JUN-19	37	82	100	270
Selenium (Se)		<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
Silver (Ag)		<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
Thallium (Tl)		<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
Uranium (U)		<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
Vanadium (V)		36.6		1.0	ug/g	06-JUN-19	86	86	86	86
Zinc (Zn)		66.9		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
Chromium, Hexavalent		<0.20		0.20	ug/g	05-JUN-19	0.66	0.66	8	8
Volatile Organic Compounds										
Acetone		<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	16
Benzene		<0.0068	VOCJ	0.0068	ug/g	05-JUN-19	0.02	0.02	0.21	0.32
Bromodichloromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.5	1.5
Bromoform		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.27	0.61
Bromomethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05

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#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-7	BH9-SA5									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Volatile Organic Compounds										
	Carbon tetrachloride	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.21
	Chlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.4	2.4
	Dibromochloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.3	2.3
	Chloroform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.47
	1,2-Dibromoethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,2-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.2	1.2
	1,3-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	4.8	9.6
	1,4-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.083	0.2
	Dichlorodifluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	16	16
	1,1-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.47	0.47
	1,2-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,1-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.064
	cis-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.9	1.9
	trans-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.084	1.3
	Methylene Chloride	<0.88	RRR	0.88	ug/g	05-JUN-19	**0.05	**0.05	**0.1	1.6
	1,2-Dichloropropane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.16
	cis-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	trans-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g	05-JUN-19	0.05	0.05	0.05	0.059
	Ethylbenzene	<0.018	VOCJ	0.018	ug/g	05-JUN-19	0.05	0.05	1.1	1.1
	n-Hexane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.8	46
	Methyl Ethyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	70
	Methyl Isobutyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	1.7	31
	MTBE	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.75	1.6
	Styrene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.7	34
	1,1,1,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.058	0.087
	1,1,2,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Tetrachloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.28	1.9
	Toluene	<0.080	VOCJ	0.080	ug/g	05-JUN-19	0.2	0.2	2.3	6.4
	1,1,1-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.38	6.1
	1,1,2-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Trichloroethylene	<0.010	VOCJ	0.010	ug/g	05-JUN-19	0.05	0.05	0.061	0.55
	Trichlorofluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.25	4	4
	Vinyl chloride	<0.020	VOCJ	0.020	ug/g	05-JUN-19	0.02	0.02	0.02	0.032
	o-Xylene	<0.020	VOCJ	0.020	ug/g	05-JUN-19				
	m+p-Xylenes	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	Xylenes (Total)	<0.050		0.050	ug/g	05-JUN-19	0.05	0.05	3.1	26
	Surrogate: 4-Bromofluorobenzene	84.4		50-140	%	05-JUN-19				
	Surrogate: 1,4-Difluorobenzene	96.1		50-140	%	05-JUN-19				
Hydrocarbons										
	F1 (C6-C10)	<5.0	VOCJ	5.0	ug/g	05-JUN-19	17	25	55	55
	F1-BTEX	<5.0		5.0	ug/g	05-JUN-19	17	25	55	55
	F2 (C10-C16)	<10		10	ug/g	04-JUN-19	10	10	98	230
	F2-Naphth	<10		10	ug/g	05-JUN-19				
	F3 (C16-C34)	<50		50	ug/g	04-JUN-19	240	240	300	1700
	F3-PAH	<50		50	ug/g	05-JUN-19				

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ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 13 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-7	BH9-SA5									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Hydrocarbons										
F4 (C34-C50)		<50		50	ug/g	04-JUN-19	120	120	2800	3300
Total Hydrocarbons (C6-C50)		<72		72	ug/g	05-JUN-19				
Chrom. to baseline at nC50		YES			No Unit	04-JUN-19				
Surrogate: 2-Bromobenzotrifluoride		93.5		60-140	%	04-JUN-19				
Surrogate: 3,4-Dichlorotoluene		76.5		60-140	%	05-JUN-19				
Polycyclic Aromatic Hydrocarbons										
Acenaphthene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.072	7.9	21
Acenaphthylene		<0.050		0.050	ug/g	05-JUN-19	0.093	0.093	0.15	0.15
Anthracene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.16	0.67	0.67
Benzo(a)anthracene		<0.050		0.050	ug/g	05-JUN-19	0.095	0.36	0.5	0.96
Benzo(a)pyrene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.3	0.3	0.3
Benzo(b)fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.3	0.47	0.78	0.96
Benzo(g,h,i)perylene		<0.050		0.050	ug/g	05-JUN-19	0.2	0.68	6.6	9.6
Benzo(k)fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.48	0.78	0.96
Chrysene		<0.050		0.050	ug/g	05-JUN-19	0.18	2.8	7	9.6
Dibenzo(ah)anthracene		<0.050		0.050	ug/g	05-JUN-19	0.1	0.1	0.1	0.1
Fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.24	0.56	0.69	9.6
Fluorene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.12	62	62
Indeno(1,2,3-cd)pyrene		<0.050		0.050	ug/g	05-JUN-19	0.11	0.23	0.38	0.76
1+2-Methylnaphthalenes		<0.042		0.042	ug/g	05-JUN-19	0.05	0.59	0.99	30
1-Methylnaphthalene		<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
2-Methylnaphthalene		<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
Naphthalene		<0.013		0.013	ug/g	05-JUN-19	0.05	0.09	0.6	9.6
Phenanthrene		<0.046		0.046	ug/g	05-JUN-19	0.19	0.69	6.2	12
Pyrene		<0.050		0.050	ug/g	05-JUN-19	0.19	1	78	96
Surrogate: 2-Fluorobiphenyl		101.3		50-140	%	05-JUN-19				
Surrogate: p-Terphenyl d14		89.8		50-140	%	05-JUN-19				
L2282970-8	BH11-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		0.613		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	0.7	1.4
% Moisture		5.03		0.10	%	01-JUN-19				
pH		8.24		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	04-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		11.1		0.10	SAR	06-JUN-19	*1	*2.4	*5	12
Calcium (Ca)		4.79		0.50	mg/L	06-JUN-19				
Magnesium (Mg)		2.30		0.50	mg/L	06-JUN-19				
Sodium (Na)		118		0.50	mg/L	06-JUN-19				
Metals										
Antimony (Sb)		<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
Arsenic (As)		2.6		1.0	ug/g	06-JUN-19	11	18	18	18
Barium (Ba)		20.4		1.0	ug/g	06-JUN-19	210	220	390	670

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-8	BH11-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Metals										
	Beryllium (Be)	<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
	Boron (B)	7.1		5.0	ug/g	06-JUN-19	36	36	120	120
	Boron (B), Hot Water Ext.	0.19		0.10	ug/g	06-JUN-19	36	36	1.5	2
	Cadmium (Cd)	<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
	Chromium (Cr)	14.8		1.0	ug/g	06-JUN-19	67	70	160	160
	Cobalt (Co)	2.6		1.0	ug/g	06-JUN-19	19	21	22	80
	Copper (Cu)	10.3		1.0	ug/g	06-JUN-19	62	92	140	230
	Lead (Pb)	13.9		1.0	ug/g	06-JUN-19	45	120	120	120
	Mercury (Hg)	0.0132		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
	Molybdenum (Mo)	<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
	Nickel (Ni)	8.2		1.0	ug/g	06-JUN-19	37	82	100	270
	Selenium (Se)	<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
	Silver (Ag)	<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
	Thallium (Tl)	<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
	Uranium (U)	<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
	Vanadium (V)	17.8		1.0	ug/g	06-JUN-19	86	86	86	86
	Zinc (Zn)	48.9		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
	Chromium, Hexavalent	<0.20		0.20	ug/g	05-JUN-19	0.66	0.66	8	8
Volatile Organic Compounds										
	Acetone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	16
	Benzene	<0.0068	VOCJ	0.0068	ug/g	05-JUN-19	0.02	0.02	0.21	0.32
	Bromodichloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.5	1.5
	Bromoform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.27	0.61
	Bromomethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Carbon tetrachloride	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.21
	Chlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.4	2.4
	Dibromochloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.3	2.3
	Chloroform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.47
	1,2-Dibromoethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,2-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.2	1.2
	1,3-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	4.8	9.6
	1,4-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.083	0.2
	Dichlorodifluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	16	16
	1,1-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.47	0.47
	1,2-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,1-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.064
	cis-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.9	1.9
	trans-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.084	1.3
	Methylene Chloride	<0.20	RRR	0.20	ug/g	05-JUN-19	**0.05	**0.05	**0.1	1.6
	1,2-Dichloropropane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.16
	cis-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	trans-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g	05-JUN-19	0.05	0.05	0.05	0.059
	Ethylbenzene	<0.018	VOCJ	0.018	ug/g	05-JUN-19	0.05	0.05	1.1	1.1

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

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Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-8	BH11-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Volatile Organic Compounds										
	n-Hexane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.8	46
	Methyl Ethyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	70
	Methyl Isobutyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	1.7	31
	MTBE	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.75	1.6
	Styrene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.7	34
	1,1,1,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.058	0.087
	1,1,2,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Tetrachloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.28	1.9
	Toluene	<0.080	VOCJ	0.080	ug/g	05-JUN-19	0.2	0.2	2.3	6.4
	1,1,1-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.38	6.1
	1,1,2-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Trichloroethylene	<0.010	VOCJ	0.010	ug/g	05-JUN-19	0.05	0.05	0.061	0.55
	Trichlorofluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.25	4	4
	Vinyl chloride	<0.020	VOCJ	0.020	ug/g	05-JUN-19	0.02	0.02	0.02	0.032
	o-Xylene	<0.020	VOCJ	0.020	ug/g	05-JUN-19				
	m+p-Xylenes	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	Xylenes (Total)	<0.050		0.050	ug/g	05-JUN-19	0.05	0.05	3.1	26
	Surrogate: 4-Bromofluorobenzene	89.5		50-140	%	05-JUN-19				
	Surrogate: 1,4-Difluorobenzene	103.9		50-140	%	05-JUN-19				
Hydrocarbons										
	F1 (C6-C10)	<5.0	VOCJ	5.0	ug/g	05-JUN-19	17	25	55	55
	F1-BTEX	<5.0		5.0	ug/g	05-JUN-19	17	25	55	55
	F2 (C10-C16)	<20	DLM	20	ug/g	04-JUN-19	**10	**10	98	230
	F2-Naphth	<20		20	ug/g	05-JUN-19				
	F3 (C16-C34)	290	DLM	100	ug/g	04-JUN-19	*240	*240	300	1700
	F3-PAH	290		100	ug/g	05-JUN-19				
	F4 (C34-C50)	860	DLM	100	ug/g	04-JUN-19	*120	*120	2800	3300
	F4G-SG (GHH-Silica)	2360		250	ug/g	03-JUN-19	*120	*120	2800	3300
	Total Hydrocarbons (C6-C50)	1150		140	ug/g	05-JUN-19				
	Chrom. to baseline at nC50	NO			No Unit	04-JUN-19				
	Surrogate: 2-Bromobenzotrifluoride	99.0		60-140	%	04-JUN-19				
	Surrogate: 3,4-Dichlorotoluene	77.7		60-140	%	05-JUN-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.072	7.9	21
	Acenaphthylene	<0.050		0.050	ug/g	05-JUN-19	0.093	0.093	0.15	0.15
	Anthracene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.16	0.67	0.67
	Benzo(a)anthracene	<0.050		0.050	ug/g	05-JUN-19	0.095	0.36	0.5	0.96
	Benzo(a)pyrene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.3	0.3	0.3
	Benzo(b)fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.3	0.47	0.78	0.96
	Benzo(g,h,i)perylene	<0.050		0.050	ug/g	05-JUN-19	0.2	0.68	6.6	9.6
	Benzo(k)fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.48	0.78	0.96
	Chrysene	<0.050		0.050	ug/g	05-JUN-19	0.18	2.8	7	9.6
	Dibenzo(ah)anthracene	<0.050		0.050	ug/g	05-JUN-19	0.1	0.1	0.1	0.1
	Fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.24	0.56	0.69	9.6
	Fluorene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.12	62	62
	Indeno(1,2,3-cd)pyrene	<0.050		0.050	ug/g	05-JUN-19	0.11	0.23	0.38	0.76

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 16 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-8	BH11-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Polycyclic Aromatic Hydrocarbons										
	1+2-Methylnaphthalenes	<0.042		0.042	ug/g	05-JUN-19	0.05	0.59	0.99	30
	1-Methylnaphthalene	<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
	2-Methylnaphthalene	<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
	Naphthalene	<0.013		0.013	ug/g	05-JUN-19	0.05	0.09	0.6	9.6
	Phenanthrene	<0.046		0.046	ug/g	05-JUN-19	0.19	0.69	6.2	12
	Pyrene	<0.050		0.050	ug/g	05-JUN-19	0.19	1	78	96
	Surrogate: 2-Fluorobiphenyl	97.9		50-140	%	05-JUN-19				
	Surrogate: p-Terphenyl d14	86.2		50-140	%	05-JUN-19				
L2282970-9	BH14-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
	Conductivity	2.92		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	*1.4
	% Moisture	2.72		0.10	%	01-JUN-19				
	pH	8.33		0.10	pH units	05-JUN-19				
Cyanides										
	Cyanide, Weak Acid Diss	<0.050		0.050	ug/g	04-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
	SAR	35.2		0.10	SAR	06-JUN-19	*1	*2.4	*5	*12
	Calcium (Ca)	9.94		0.50	mg/L	06-JUN-19				
	Magnesium (Mg)	5.50		0.50	mg/L	06-JUN-19				
	Sodium (Na)	557		0.50	mg/L	06-JUN-19				
Metals										
	Antimony (Sb)	<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
	Arsenic (As)	2.6		1.0	ug/g	06-JUN-19	11	18	18	18
	Barium (Ba)	14.5		1.0	ug/g	06-JUN-19	210	220	390	670
	Beryllium (Be)	<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
	Boron (B)	7.1		5.0	ug/g	06-JUN-19	36	36	120	120
	Boron (B), Hot Water Ext.	0.14		0.10	ug/g	06-JUN-19	36	36	1.5	2
	Cadmium (Cd)	<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
	Chromium (Cr)	10.3		1.0	ug/g	06-JUN-19	67	70	160	160
	Cobalt (Co)	2.5		1.0	ug/g	06-JUN-19	19	21	22	80
	Copper (Cu)	10.3		1.0	ug/g	06-JUN-19	62	92	140	230
	Lead (Pb)	9.6		1.0	ug/g	06-JUN-19	45	120	120	120
	Mercury (Hg)	0.0086		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
	Molybdenum (Mo)	<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
	Nickel (Ni)	6.1		1.0	ug/g	06-JUN-19	37	82	100	270
	Selenium (Se)	<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
	Silver (Ag)	<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
	Thallium (Tl)	<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
	Uranium (U)	<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
	Vanadium (V)	13.7		1.0	ug/g	06-JUN-19	86	86	86	86
	Zinc (Zn)	43.6		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-9	BH14-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Speciated Metals										
Chromium, Hexavalent		<0.20		0.20	ug/g	05-JUN-19	0.66	0.66	8	8
Volatile Organic Compounds										
Acetone		<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	16
Benzene		<0.0068	VOCJ	0.0068	ug/g	05-JUN-19	0.02	0.02	0.21	0.32
Bromodichloromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.5	1.5
Bromoform		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.27	0.61
Bromomethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
Carbon tetrachloride		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.21
Chlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.4	2.4
Dibromochloromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.3	2.3
Chloroform		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.47
1,2-Dibromoethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
1,2-Dichlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.2	1.2
1,3-Dichlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	4.8	9.6
1,4-Dichlorobenzene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.083	0.2
Dichlorodifluoromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	16	16
1,1-Dichloroethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.47	0.47
1,2-Dichloroethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
1,1-Dichloroethylene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.064
cis-1,2-Dichloroethylene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.9	1.9
trans-1,2-Dichloroethylene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.084	1.3
Methylene Chloride		<0.15	RRR	0.15	ug/g	05-JUN-19	**0.05	**0.05	**0.1	1.6
1,2-Dichloropropane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.16
cis-1,3-Dichloropropene		<0.030	VOCJ	0.030	ug/g	05-JUN-19				
trans-1,3-Dichloropropene		<0.030	VOCJ	0.030	ug/g	05-JUN-19				
1,3-Dichloropropene (cis & trans)		<0.042		0.042	ug/g	05-JUN-19	0.05	0.05	0.05	0.059
Ethylbenzene		<0.018	VOCJ	0.018	ug/g	05-JUN-19	0.05	0.05	1.1	1.1
n-Hexane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.8	46
Methyl Ethyl Ketone		<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	70
Methyl Isobutyl Ketone		<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	1.7	31
MTBE		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.75	1.6
Styrene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.7	34
1,1,1,2-Tetrachloroethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.058	0.087
1,1,2,2-Tetrachloroethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
Tetrachloroethylene		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.28	1.9
Toluene		<0.080	VOCJ	0.080	ug/g	05-JUN-19	0.2	0.2	2.3	6.4
1,1,1-Trichloroethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.38	6.1
1,1,2-Trichloroethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
Trichloroethylene		<0.010	VOCJ	0.010	ug/g	05-JUN-19	0.05	0.05	0.061	0.55
Trichlorofluoromethane		<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.25	4	4
Vinyl chloride		<0.020	VOCJ	0.020	ug/g	05-JUN-19	0.02	0.02	0.02	0.032
o-Xylene		<0.020	VOCJ	0.020	ug/g	05-JUN-19				
m+p-Xylenes		<0.030	VOCJ	0.030	ug/g	05-JUN-19				
Xylenes (Total)		<0.050		0.050	ug/g	05-JUN-19	0.05	0.05	3.1	26
Surrogate: 4-Bromofluorobenzene		91.9		50-140	%	05-JUN-19				
Surrogate: 1,4-Difluorobenzene		105.6		50-140	%	05-JUN-19				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 18 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-9	BH14-SA1									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Hydrocarbons										
F1 (C6-C10)		<5.0	VOCJ	5.0	ug/g	05-JUN-19	17	25	55	55
F1-BTEX		<5.0		5.0	ug/g	05-JUN-19	17	25	55	55
F2 (C10-C16)		<20	DLM	20	ug/g	04-JUN-19	**10	**10	98	230
F2-Naphth		<20		20	ug/g	05-JUN-19				
F3 (C16-C34)		360	DLM	100	ug/g	04-JUN-19	*240	*240	*300	1700
F3-PAH		360		100	ug/g	05-JUN-19				
F4 (C34-C50)		990	DLM	100	ug/g	04-JUN-19	*120	*120	2800	3300
F4G-SG (GHH-Silica)		2230		250	ug/g	03-JUN-19	*120	*120	2800	3300
Total Hydrocarbons (C6-C50)		1350		140	ug/g	05-JUN-19				
Chrom. to baseline at nC50		NO			No Unit	04-JUN-19				
Surrogate: 2-Bromobenzotrifluoride		107.0		60-140	%	04-JUN-19				
Surrogate: 3,4-Dichlorotoluene		81.4		60-140	%	05-JUN-19				
Polycyclic Aromatic Hydrocarbons										
Acenaphthene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.072	7.9	21
Acenaphthylene		<0.050		0.050	ug/g	05-JUN-19	0.093	0.093	0.15	0.15
Anthracene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.16	0.67	0.67
Benzo(a)anthracene		<0.050		0.050	ug/g	05-JUN-19	0.095	0.36	0.5	0.96
Benzo(a)pyrene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.3	0.3	0.3
Benzo(b)fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.3	0.47	0.78	0.96
Benzo(g,h,i)perylene		<0.050		0.050	ug/g	05-JUN-19	0.2	0.68	6.6	9.6
Benzo(k)fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.48	0.78	0.96
Chrysene		<0.050		0.050	ug/g	05-JUN-19	0.18	2.8	7	9.6
Dibenzo(ah)anthracene		<0.050		0.050	ug/g	05-JUN-19	0.1	0.1	0.1	0.1
Fluoranthene		<0.050		0.050	ug/g	05-JUN-19	0.24	0.56	0.69	9.6
Fluorene		<0.050		0.050	ug/g	05-JUN-19	0.05	0.12	62	62
Indeno(1,2,3-cd)pyrene		<0.050		0.050	ug/g	05-JUN-19	0.11	0.23	0.38	0.76
1+2-Methylnaphthalenes		<0.042		0.042	ug/g	05-JUN-19	0.05	0.59	0.99	30
1-Methylnaphthalene		<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
2-Methylnaphthalene		<0.030		0.030	ug/g	05-JUN-19	0.05	0.59	0.99	30
Naphthalene		<0.013		0.013	ug/g	05-JUN-19	0.05	0.09	0.6	9.6
Phenanthrene		<0.046		0.046	ug/g	05-JUN-19	0.19	0.69	6.2	12
Pyrene		<0.050		0.050	ug/g	05-JUN-19	0.19	1	78	96
Surrogate: 2-Fluorobiphenyl		98.5		50-140	%	05-JUN-19				
Surrogate: p-Terphenyl d14		86.8		50-140	%	05-JUN-19				
L2282970-10	BH14-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Physical Tests										
Conductivity		1.31		0.0040	mS/cm	06-JUN-19	*0.47	*0.57	*0.7	1.4
% Moisture		18.0		0.10	%	01-JUN-19				
pH		7.93		0.10	pH units	05-JUN-19				
Cyanides										
Cyanide, Weak Acid Diss		<0.050		0.050	ug/g	04-JUN-19	0.051	0.051	0.051	0.051
Saturated Paste Extractables										
SAR		28.8	SAR:M	0.10	SAR	06-JUN-19	*1	*2.4	*5	*12

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#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 19 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-10	BH14-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Saturated Paste Extractables										
	Calcium (Ca)	4.88		0.50	mg/L	06-JUN-19				
	Magnesium (Mg)	<0.50		0.50	mg/L	06-JUN-19				
	Sodium (Na)	231		0.50	mg/L	06-JUN-19				
Metals										
	Antimony (Sb)	<1.0		1.0	ug/g	06-JUN-19	1	1.3	7.5	40
	Arsenic (As)	1.4		1.0	ug/g	06-JUN-19	11	18	18	18
	Barium (Ba)	10.0		1.0	ug/g	06-JUN-19	210	220	390	670
	Beryllium (Be)	<0.50		0.50	ug/g	06-JUN-19	2.5	2.5	4	8
	Boron (B)	<5.0		5.0	ug/g	06-JUN-19	36	36	120	120
	Boron (B), Hot Water Ext.	<0.10		0.10	ug/g	06-JUN-19	36	36	1.5	2
	Cadmium (Cd)	<0.50		0.50	ug/g	06-JUN-19	1	1.2	1.2	1.9
	Chromium (Cr)	5.3		1.0	ug/g	06-JUN-19	67	70	160	160
	Cobalt (Co)	1.8		1.0	ug/g	06-JUN-19	19	21	22	80
	Copper (Cu)	5.1		1.0	ug/g	06-JUN-19	62	92	140	230
	Lead (Pb)	5.0		1.0	ug/g	06-JUN-19	45	120	120	120
	Mercury (Hg)	0.0083		0.0050	ug/g	06-JUN-19	0.16	0.27	0.27	3.9
	Molybdenum (Mo)	<1.0		1.0	ug/g	06-JUN-19	2	2	6.9	40
	Nickel (Ni)	3.5		1.0	ug/g	06-JUN-19	37	82	100	270
	Selenium (Se)	<1.0		1.0	ug/g	06-JUN-19	1.2	1.5	2.4	5.5
	Silver (Ag)	<0.20		0.20	ug/g	06-JUN-19	0.5	0.5	20	40
	Thallium (Tl)	<0.50		0.50	ug/g	06-JUN-19	1	1	1	3.3
	Uranium (U)	<1.0		1.0	ug/g	06-JUN-19	1.9	2.5	23	33
	Vanadium (V)	11.4		1.0	ug/g	06-JUN-19	86	86	86	86
	Zinc (Zn)	33.9		5.0	ug/g	06-JUN-19	290	290	340	340
Speciated Metals										
	Chromium, Hexavalent	<0.20		0.20	ug/g	05-JUN-19	0.66	0.66	8	8
Volatile Organic Compounds										
	Acetone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	16
	Benzene	<0.0068	VOCJ	0.0068	ug/g	05-JUN-19	0.02	0.02	0.21	0.32
	Bromodichloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.5	1.5
	Bromoform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.27	0.61
	Bromomethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Carbon tetrachloride	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.21
	Chlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.4	2.4
	Dibromochloromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.3	2.3
	Chloroform	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.47
	1,2-Dibromoethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,2-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.2	1.2
	1,3-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	4.8	9.6
	1,4-Dichlorobenzene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.083	0.2
	Dichlorodifluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	16	16
	1,1-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.47	0.47
	1,2-Dichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	1,1-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.064
	cis-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	1.9	1.9

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ANALYTICAL GUIDELINE REPORT

L2282970 CONTD....

Page 20 of 24

10-JUN-19 09:45 (MT)

G19750

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	#4
L2282970-10	BH14-SA3									
Sampled By: NZ on 30-MAY-19 @ 08:00										
Matrix: SOIL										
Volatile Organic Compounds										
	trans-1,2-Dichloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.084	1.3
	Methylene Chloride	<0.38	RRR	0.38	ug/g	05-JUN-19	**0.05	**0.05	**0.1	1.6
	1,2-Dichloropropane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.16
	cis-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	trans-1,3-Dichloropropene	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	1,3-Dichloropropene (cis & trans)	<0.042		0.042	ug/g	05-JUN-19	0.05	0.05	0.05	0.059
	Ethylbenzene	<0.018	VOCJ	0.018	ug/g	05-JUN-19	0.05	0.05	1.1	1.1
	n-Hexane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	2.8	46
	Methyl Ethyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	16	70
	Methyl Isobutyl Ketone	<0.50	VOCJ	0.50	ug/g	05-JUN-19	0.5	0.5	1.7	31
	MTBE	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.75	1.6
	Styrene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.7	34
	1,1,1,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.058	0.087
	1,1,2,2-Tetrachloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Tetrachloroethylene	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.28	1.9
	Toluene	<0.080	VOCJ	0.080	ug/g	05-JUN-19	0.2	0.2	2.3	6.4
	1,1,1-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.38	6.1
	1,1,2-Trichloroethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.05	0.05	0.05
	Trichloroethylene	<0.010	VOCJ	0.010	ug/g	05-JUN-19	0.05	0.05	0.061	0.55
	Trichlorofluoromethane	<0.050	VOCJ	0.050	ug/g	05-JUN-19	0.05	0.25	4	4
	Vinyl chloride	<0.020	VOCJ	0.020	ug/g	05-JUN-19	0.02	0.02	0.02	0.032
	o-Xylene	<0.020	VOCJ	0.020	ug/g	05-JUN-19				
	m+p-Xylenes	<0.030	VOCJ	0.030	ug/g	05-JUN-19				
	Xylenes (Total)	<0.050		0.050	ug/g	05-JUN-19	0.05	0.05	3.1	26
	Surrogate: 4-Bromofluorobenzene	87.2		50-140	%	05-JUN-19				
	Surrogate: 1,4-Difluorobenzene	99.2		50-140	%	05-JUN-19				
Hydrocarbons										
	F1 (C6-C10)	<5.0	VOCJ	5.0	ug/g	05-JUN-19	17	25	55	55
	F1-BTEX	<5.0		5.0	ug/g	05-JUN-19	17	25	55	55
	F2 (C10-C16)	<10		10	ug/g	04-JUN-19	10	10	98	230
	F2-Naphth	<10		10	ug/g	05-JUN-19				
	F3 (C16-C34)	<50		50	ug/g	04-JUN-19	240	240	300	1700
	F3-PAH	<50		50	ug/g	05-JUN-19				
	F4 (C34-C50)	<50		50	ug/g	04-JUN-19	120	120	2800	3300
	Total Hydrocarbons (C6-C50)	<72		72	ug/g	05-JUN-19				
	Chrom. to baseline at nC50	YES			No Unit	04-JUN-19				
	Surrogate: 2-Bromobenzotrifluoride	91.9		60-140	%	04-JUN-19				
	Surrogate: 3,4-Dichlorotoluene	85.4		60-140	%	05-JUN-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.072	7.9	21
	Acenaphthylene	<0.050		0.050	ug/g	05-JUN-19	0.093	0.093	0.15	0.15
	Anthracene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.16	0.67	0.67
	Benzo(a)anthracene	<0.050		0.050	ug/g	05-JUN-19	0.095	0.36	0.5	0.96
	Benzo(a)pyrene	<0.050		0.050	ug/g	05-JUN-19	0.05	0.3	0.3	0.3
	Benzo(b)fluoranthene	<0.050		0.050	ug/g	05-JUN-19	0.3	0.47	0.78	0.96
	Benzo(g,h,i)perylene	<0.050		0.050	ug/g	05-JUN-19	0.2	0.68	6.6	9.6

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)



L2282970 CONTD....

Page 21 of 24

10-JUN-19 09:45 (MT)

G19750

* Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

Ontario Regulation 153/04 - April 15, 2011 Standards = [Suite] - ON-511-T1/T2-SOIL-RPIICC-C

#1: T1-Soil-Agricultural or Other Property Use

#2: T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use

#3: T2-Soil-Res/Park/Inst. Property Use (Coarse)

#4: T2-Soil-Ind/Com/Commu Property Use (Coarse)

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
SAR:M	Reported SAR represents a maximum value. Actual SAR may be lower if both Ca and Mg were detectable.
VOCJ	Soil jar was submitted as VOC sample container. VOC results may be biased low, and do not meet federal (CCME) or provincial requirements (for BC, AB-Tier1, MB, ON, SK).
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
RRR	Refer to Report Remarks for issues regarding this analysis

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
B-HWS-R511-WT	Soil	Boron-HWE-O.Reg 153/04 (July 2011)	HW EXTR, EPA 6010B

A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Soil	Cyanide (WAD)-O.Reg 153/04 (July 2011)	MOE 3015/APHA 4500CN I-WAD
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The sample is extracted with a strong base for 16 hours, and then filtered. The filtrate is then distilled where the cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-WT	Soil	Hexavalent Chromium in Soil	SW846 3060A/7199
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This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-WT	Soil	Conductivity (EC)	MOEE E3138
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A representative subsample is tumbled with de-ionized (DI) water. The ratio of water to soil is 2:1 v/w. After tumbling the sample is then analyzed by a conductivity meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

F1-F4-511-CALC-WT	Soil	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-S
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Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:

1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:

1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

Reference Information

F1-HS-511-WT Soil F1-O.Reg 153/04 (July 2011) E3398/CCME TIER 1-HS

Fraction F1 is determined by extracting a soil or sediment sample as received with methanol, then analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F2-F4-511-WT Soil F2-F4-O.Reg 153/04 (July 2011) CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from soil with 1:1 hexane:acetone using a rotary extractor. Extracts are treated with silica gel to remove polar organic interferences. F2, F3, & F4 are analyzed by GC-FID. F4G-sg is analyzed gravimetrically.

Notes:

1. F2 (C10-C16): Sum of all hydrocarbons that elute between nC10 and nC16.
2. F3 (C16-C34): Sum of all hydrocarbons that elute between nC16 and nC34.
3. F4 (C34-C50): Sum of all hydrocarbons that elute between nC34 and nC50.
4. F4G: Gravimetric Heavy Hydrocarbons
5. F4G-sg: Gravimetric Heavy Hydrocarbons (F4G) after silica gel treatment.
6. Where both F4 (C34-C50) and F4G-sg are reported for a sample, the larger of the two values is used for comparison against the relevant CCME guideline for F4.
7. F4G-sg cannot be added to the C6 to C50 hydrocarbon results to obtain an estimate of total extractable hydrocarbons.
8. This method is validated for use.
9. Data from analysis of validation and quality control samples is available upon request.
10. Reported results are expressed as milligrams per dry kilogram, unless otherwise indicated.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

F4G-ADD-511-WT Soil F4G SG-O.Reg 153/04 (July 2011) MOE DECPH-E3398/CCME TIER 1

F4G, gravimetric analysis, is determined if the chromatogram does not return to baseline at or before C50. A soil sample is extracted with a solvent mix, the solvent is evaporated and the weight of the residue is determined.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

HG-200.2-CVAA-WT Soil Mercury in Soil by CVAAS EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-200.2-CCMS-WT Soil Metals in Soil by CRC ICPMS EPA 200.2/6020A (mod)

Soil/sediment is dried, disaggregated, and sieved (2 mm). For tests intended to support Ontario regulations, the <2mm fraction is ground to pass through a 0.355 mm sieve. Strong Acid Leachable Metals in the <2mm fraction are solubilized by heated digestion with nitric and hydrochloric acids. Instrumental analysis is by Collision / Reaction Cell ICPMS.

Limitations: This method is intended to liberate environmentally available metals. Silicate minerals are not solubilized. Some metals may be only partially recovered (matrix dependent), including Al, Ba, Be, Cr, S, Sr, Ti, Tl, V, W, and Zr. Elemental Sulfur may be poorly recovered by this method. Volatile forms of sulfur (e.g. sulfide, H₂S) may be excluded if lost during sampling, storage, or digestion.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

METHYLNAPS-CALC-WT Soil ABN-Calculated Parameters SW846 8270
 MOISTURE-WT Soil % Moisture CCME PHC in Soil - Tier 1 (mod)
 PAH-511-WT Soil PAH-O.Reg 153/04 (July 2011) SW846 3510/8270

A representative sub-sample of soil is fortified with deuterium-labelled surrogates and a mechanical shaking technique is used to extract the sample with a mixture of methanol and toluene. The extracts are concentrated and analyzed by GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PH-WT Soil pH MOEE E3137A

A minimum 10g portion of the sample is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil and then analyzed using a pH meter and electrode.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

Reference Information

SAR-R511-WT

Soil

SAR-O.Reg 153/04 (July 2011)

SW846 6010C

A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

VOC-1,3-DCP-CALC-WT

Soil

Regulation 153 VOCs

SW8260B/SW8270C

VOC-511-HS-WT

Soil

VOC-O.Reg 153/04 (July 2011)

SW846 8260 (511)

Soil and sediment samples are extracted in methanol and analyzed by headspace-GC/MS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC-WT

Soil

Sum of Xylene Isomer Concentrations

CALCULATION

Total xylenes represents the sum of o-xylene and m&p-xylene.

*** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:

17-726637

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA		

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg wwt - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 3 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT		Soil						
Batch	R4656246							
WG3066478-4	DUP	WG3066478-3						
F1 (C6-C10)		<5.0	<5.0	RPD-NA	ug/g	N/A	30	05-JUN-19
WG3066478-2	LCS							
F1 (C6-C10)			101.8		%		80-120	04-JUN-19
WG3066478-1	MB							
F1 (C6-C10)			<5.0		ug/g		5	04-JUN-19
Surrogate: 3,4-Dichlorotoluene			81.3		%		60-140	04-JUN-19
WG3066478-6	MS	L2282627-4						
F1 (C6-C10)			97.2		%		60-140	05-JUN-19
F2-F4-511-WT		Soil						
Batch	R4655514							
WG3064165-3	DUP	WG3064165-5						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	03-JUN-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	03-JUN-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	03-JUN-19
WG3064165-2	LCS							
F2 (C10-C16)			105.1		%		80-120	03-JUN-19
F3 (C16-C34)			107.0		%		80-120	03-JUN-19
F4 (C34-C50)			109.8		%		80-120	03-JUN-19
WG3064165-1	MB							
F2 (C10-C16)			<10		ug/g		10	03-JUN-19
F3 (C16-C34)			<50		ug/g		50	03-JUN-19
F4 (C34-C50)			<50		ug/g		50	03-JUN-19
Surrogate: 2-Bromobenzotrifluoride			82.5		%		60-140	03-JUN-19
WG3064165-4	MS	WG3064165-5						
F2 (C10-C16)			102.1		%		60-140	03-JUN-19
F3 (C16-C34)			99.2		%		60-140	03-JUN-19
F4 (C34-C50)			103.5		%		60-140	03-JUN-19
Batch	R4656789							
WG3064958-3	DUP	WG3064958-5						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	04-JUN-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	04-JUN-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	04-JUN-19
WG3064958-2	LCS							
F2 (C10-C16)			106.1		%		80-120	04-JUN-19
F3 (C16-C34)			102.5		%		80-120	04-JUN-19



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 4 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F2-F4-511-WT		Soil						
Batch	R4656789							
WG3064958-2	LCS							
F4 (C34-C50)			106.4		%		80-120	04-JUN-19
WG3064958-1	MB							
F2 (C10-C16)			<10		ug/g		10	04-JUN-19
F3 (C16-C34)			<50		ug/g		50	04-JUN-19
F4 (C34-C50)			<50		ug/g		50	04-JUN-19
Surrogate: 2-Bromobenzotrifluoride			87.1		%		60-140	04-JUN-19
WG3064958-4	MS	WG3064958-5						
F2 (C10-C16)			108.1		%		60-140	04-JUN-19
F3 (C16-C34)			104.3		%		60-140	04-JUN-19
F4 (C34-C50)			108.0		%		60-140	04-JUN-19
Batch	R4658047							
WG3065288-3	DUP	WG3065288-5						
F2 (C10-C16)		<10	<10	RPD-NA	ug/g	N/A	30	04-JUN-19
F3 (C16-C34)		<50	<50	RPD-NA	ug/g	N/A	30	04-JUN-19
F4 (C34-C50)		<50	<50	RPD-NA	ug/g	N/A	30	04-JUN-19
WG3065288-2	LCS							
F2 (C10-C16)			111.2		%		80-120	04-JUN-19
F3 (C16-C34)			107.2		%		80-120	04-JUN-19
F4 (C34-C50)			108.0		%		80-120	04-JUN-19
WG3065288-1	MB							
F2 (C10-C16)			<10		ug/g		10	04-JUN-19
F3 (C16-C34)			<50		ug/g		50	04-JUN-19
F4 (C34-C50)			<50		ug/g		50	04-JUN-19
Surrogate: 2-Bromobenzotrifluoride			99.3		%		60-140	04-JUN-19
WG3065288-4	MS	WG3065288-5						
F2 (C10-C16)			110.6		%		60-140	04-JUN-19
F3 (C16-C34)			107.4		%		60-140	04-JUN-19
F4 (C34-C50)			110.7		%		60-140	04-JUN-19
F4G-ADD-511-WT		Soil						
Batch	R4656107							
WG3067072-2	LCS							
F4G-SG (GHH-Silica)			73.3		%		60-140	03-JUN-19
WG3067072-1	MB							
F4G-SG (GHH-Silica)			<250		ug/g		250	03-JUN-19

Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 5 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F4G-ADD-511-WT	Soil							
Batch R4659924								
WG3069363-2 LCS								
F4G-SG (GHH-Silica)			83.1		%		60-140	03-JUN-19
WG3069363-1 MB								
F4G-SG (GHH-Silica)			<250		ug/g		250	03-JUN-19
HG-200.2-CVAA-WT	Soil							
Batch R4660180								
WG3068794-2 CRM		WT-CANMET-TILL1						
Mercury (Hg)			98.2		%		70-130	06-JUN-19
WG3068794-6 DUP		WG3068794-5						
Mercury (Hg)		<0.0050	<0.0050	RPD-NA	ug/g	N/A	40	06-JUN-19
WG3068794-3 LCS								
Mercury (Hg)			99.5		%		80-120	06-JUN-19
WG3068794-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	06-JUN-19
MET-200.2-CCMS-WT	Soil							
Batch R4660385								
WG3068794-2 CRM		WT-CANMET-TILL1						
Antimony (Sb)			97.2		%		70-130	06-JUN-19
Arsenic (As)			94.4		%		70-130	06-JUN-19
Barium (Ba)			92.8		%		70-130	06-JUN-19
Beryllium (Be)			101.4		%		70-130	06-JUN-19
Boron (B)			3.3		mg/kg		0-8.2	06-JUN-19
Cadmium (Cd)			94.9		%		70-130	06-JUN-19
Chromium (Cr)			99.4		%		70-130	06-JUN-19
Cobalt (Co)			96.2		%		70-130	06-JUN-19
Copper (Cu)			96.0		%		70-130	06-JUN-19
Lead (Pb)			99.4		%		70-130	06-JUN-19
Molybdenum (Mo)			101.6		%		70-130	06-JUN-19
Nickel (Ni)			94.8		%		70-130	06-JUN-19
Selenium (Se)			0.33		mg/kg		0.11-0.51	06-JUN-19
Silver (Ag)			0.23		mg/kg		0.13-0.33	06-JUN-19
Thallium (Tl)			0.119		mg/kg		0.077-0.18	06-JUN-19
Uranium (U)			97.7		%		70-130	06-JUN-19
Vanadium (V)			99.5		%		70-130	06-JUN-19
Zinc (Zn)			98.4		%		70-130	06-JUN-19
WG3068794-6 DUP		WG3068794-5						

Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 6 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT		Soil						
Batch	R4660385							
WG3068794-6	DUP	WG3068794-5						
Antimony (Sb)		<0.10	<0.10	RPD-NA	ug/g	N/A	30	06-JUN-19
Arsenic (As)		1.85	1.50		ug/g	21	30	06-JUN-19
Barium (Ba)		16.5	13.4		ug/g	20	40	06-JUN-19
Beryllium (Be)		0.20	0.16		ug/g	24	30	06-JUN-19
Boron (B)		5.3	<5.0	RPD-NA	ug/g	N/A	30	06-JUN-19
Cadmium (Cd)		0.093	0.068	J	ug/g	0.025	0.04	06-JUN-19
Chromium (Cr)		8.00	6.62		ug/g	19	30	06-JUN-19
Cobalt (Co)		3.02	2.56		ug/g	17	30	06-JUN-19
Copper (Cu)		8.49	7.31		ug/g	15	30	06-JUN-19
Lead (Pb)		5.54	4.47		ug/g	21	40	06-JUN-19
Molybdenum (Mo)		0.24	0.18		ug/g	28	40	06-JUN-19
Nickel (Ni)		5.95	4.96		ug/g	18	30	06-JUN-19
Selenium (Se)		<0.20	<0.20	RPD-NA	ug/g	N/A	30	06-JUN-19
Silver (Ag)		<0.10	<0.10	RPD-NA	ug/g	N/A	40	06-JUN-19
Thallium (Tl)		<0.050	<0.050	RPD-NA	ug/g	N/A	30	06-JUN-19
Uranium (U)		0.405	0.319		ug/g	24	30	06-JUN-19
Vanadium (V)		16.1	13.0		ug/g	21	30	06-JUN-19
Zinc (Zn)		33.5	28.5		ug/g	16	30	06-JUN-19
WG3068794-4	LCS							
Antimony (Sb)			97.3		%		80-120	06-JUN-19
Arsenic (As)			96.6		%		80-120	06-JUN-19
Barium (Ba)			94.1		%		80-120	06-JUN-19
Beryllium (Be)			92.8		%		80-120	06-JUN-19
Boron (B)			86.0		%		80-120	06-JUN-19
Cadmium (Cd)			93.3		%		80-120	06-JUN-19
Chromium (Cr)			96.0		%		80-120	06-JUN-19
Cobalt (Co)			92.7		%		80-120	06-JUN-19
Copper (Cu)			92.0		%		80-120	06-JUN-19
Lead (Pb)			92.7		%		80-120	06-JUN-19
Molybdenum (Mo)			98.1		%		80-120	06-JUN-19
Nickel (Ni)			92.5		%		80-120	06-JUN-19
Selenium (Se)			93.4		%		80-120	06-JUN-19
Silver (Ag)			95.0		%		80-120	06-JUN-19



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 7 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-WT								
	Soil							
Batch	R4660385							
WG3068794-4	LCS							
Thallium (Tl)			91.9		%		80-120	06-JUN-19
Uranium (U)			94.5		%		80-120	06-JUN-19
Vanadium (V)			96.4		%		80-120	06-JUN-19
Zinc (Zn)			94.7		%		80-120	06-JUN-19
WG3068794-1	MB							
Antimony (Sb)			<0.10		mg/kg		0.1	06-JUN-19
Arsenic (As)			<0.10		mg/kg		0.1	06-JUN-19
Barium (Ba)			<0.50		mg/kg		0.5	06-JUN-19
Beryllium (Be)			<0.10		mg/kg		0.1	06-JUN-19
Boron (B)			<5.0		mg/kg		5	06-JUN-19
Cadmium (Cd)			<0.020		mg/kg		0.02	06-JUN-19
Chromium (Cr)			<0.50		mg/kg		0.5	06-JUN-19
Cobalt (Co)			<0.10		mg/kg		0.1	06-JUN-19
Copper (Cu)			<0.50		mg/kg		0.5	06-JUN-19
Lead (Pb)			<0.50		mg/kg		0.5	06-JUN-19
Molybdenum (Mo)			<0.10		mg/kg		0.1	06-JUN-19
Nickel (Ni)			<0.50		mg/kg		0.5	06-JUN-19
Selenium (Se)			<0.20		mg/kg		0.2	06-JUN-19
Silver (Ag)			<0.10		mg/kg		0.1	06-JUN-19
Thallium (Tl)			<0.050		mg/kg		0.05	06-JUN-19
Uranium (U)			<0.050		mg/kg		0.05	06-JUN-19
Vanadium (V)			<0.20		mg/kg		0.2	06-JUN-19
Zinc (Zn)			<2.0		mg/kg		2	06-JUN-19
MOISTURE-WT								
	Soil							
Batch	R4653269							
WG3064291-3	DUP	L2283082-1						
% Moisture		7.70	7.30		%	5.4	20	01-JUN-19
WG3064291-2	LCS							
% Moisture			99.5		%		90-110	01-JUN-19
WG3064291-1	MB							
% Moisture			<0.10		%		0.1	01-JUN-19
Batch	R4653270							
WG3064352-3	DUP	L2282970-4						
% Moisture		15.1	14.8		%	2.4	20	01-JUN-19
WG3064352-2	LCS							



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 8 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MOISTURE-WT		Soil						
Batch	R4653270							
WG3064352-2	LCS							
% Moisture			99.5		%		90-110	01-JUN-19
WG3064352-1	MB							
% Moisture			<0.10		%		0.1	01-JUN-19
PAH-511-WT		Soil						
Batch	R4659370							
WG3064373-3	DUP	WG3064373-5						
1-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	05-JUN-19
2-Methylnaphthalene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	05-JUN-19
Acenaphthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Acenaphthylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Benzo(a)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Benzo(a)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Benzo(b)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Benzo(g,h,i)perylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Benzo(k)fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Chrysene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Dibenzo(ah)anthracene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Fluoranthene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Fluorene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Indeno(1,2,3-cd)pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Naphthalene		<0.013	<0.013	RPD-NA	ug/g	N/A	40	05-JUN-19
Phenanthrene		<0.046	<0.046	RPD-NA	ug/g	N/A	40	05-JUN-19
Pyrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
WG3064373-2	LCS							
1-Methylnaphthalene			95.7		%		50-140	05-JUN-19
2-Methylnaphthalene			90.0		%		50-140	05-JUN-19
Acenaphthene			96.8		%		50-140	05-JUN-19
Acenaphthylene			101.1		%		50-140	05-JUN-19
Anthracene			96.4		%		50-140	05-JUN-19
Benzo(a)anthracene			96.1		%		50-140	05-JUN-19
Benzo(a)pyrene			91.3		%		50-140	05-JUN-19
Benzo(b)fluoranthene			90.3		%		50-140	05-JUN-19
Benzo(g,h,i)perylene			91.3				50-140	

Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 9 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT		Soil						
Batch	R4659370							
WG3064373-2	LCS							
Benzo(g,h,i)perylene			91.3		%		50-140	05-JUN-19
Benzo(k)fluoranthene			88.4		%		50-140	05-JUN-19
Chrysene			99.5		%		50-140	05-JUN-19
Dibenzo(ah)anthracene			98.1		%		50-140	05-JUN-19
Fluoranthene			93.4		%		50-140	05-JUN-19
Fluorene			95.5		%		50-140	05-JUN-19
Indeno(1,2,3-cd)pyrene			98.6		%		50-140	05-JUN-19
Naphthalene			90.7		%		50-140	05-JUN-19
Phenanthrene			93.2		%		50-140	05-JUN-19
Pyrene			93.6		%		50-140	05-JUN-19
WG3064373-1	MB							
1-Methylnaphthalene			<0.030		ug/g		0.03	05-JUN-19
2-Methylnaphthalene			<0.030		ug/g		0.03	05-JUN-19
Acenaphthene			<0.050		ug/g		0.05	05-JUN-19
Acenaphthylene			<0.050		ug/g		0.05	05-JUN-19
Anthracene			<0.050		ug/g		0.05	05-JUN-19
Benzo(a)anthracene			<0.050		ug/g		0.05	05-JUN-19
Benzo(a)pyrene			<0.050		ug/g		0.05	05-JUN-19
Benzo(b)fluoranthene			<0.050		ug/g		0.05	05-JUN-19
Benzo(g,h,i)perylene			<0.050		ug/g		0.05	05-JUN-19
Benzo(k)fluoranthene			<0.050		ug/g		0.05	05-JUN-19
Chrysene			<0.050		ug/g		0.05	05-JUN-19
Dibenzo(ah)anthracene			<0.050		ug/g		0.05	05-JUN-19
Fluoranthene			<0.050		ug/g		0.05	05-JUN-19
Fluorene			<0.050		ug/g		0.05	05-JUN-19
Indeno(1,2,3-cd)pyrene			<0.050		ug/g		0.05	05-JUN-19
Naphthalene			<0.013		ug/g		0.013	05-JUN-19
Phenanthrene			<0.046		ug/g		0.046	05-JUN-19
Pyrene			<0.050		ug/g		0.05	05-JUN-19
Surrogate: 2-Fluorobiphenyl			94.4		%		50-140	05-JUN-19
Surrogate: p-Terphenyl d14			81.6		%		50-140	05-JUN-19
WG3064373-4	MS	WG3064373-5						
1-Methylnaphthalene			95.5		%		50-140	05-JUN-19
2-Methylnaphthalene			89.4		%		50-140	05-JUN-19

Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 10 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT		Soil						
Batch	R4659370							
WG3064373-4	MS	WG3064373-5						
Acenaphthene			96.0		%		50-140	05-JUN-19
Acenaphthylene			99.0		%		50-140	05-JUN-19
Anthracene			98.1		%		50-140	05-JUN-19
Benzo(a)anthracene			95.4		%		50-140	05-JUN-19
Benzo(a)pyrene			91.4		%		50-140	05-JUN-19
Benzo(b)fluoranthene			101.0		%		50-140	05-JUN-19
Benzo(g,h,i)perylene			91.2		%		50-140	05-JUN-19
Benzo(k)fluoranthene			79.9		%		50-140	05-JUN-19
Chrysene			98.7		%		50-140	05-JUN-19
Dibenzo(ah)anthracene			98.6		%		50-140	05-JUN-19
Fluoranthene			92.5		%		50-140	05-JUN-19
Fluorene			94.4		%		50-140	05-JUN-19
Indeno(1,2,3-cd)pyrene			97.7		%		50-140	05-JUN-19
Naphthalene			91.7		%		50-140	05-JUN-19
Phenanthrene			93.1		%		50-140	05-JUN-19
Pyrene			92.5		%		50-140	05-JUN-19
PH-WT		Soil						
Batch	R4659268							
WG3065307-1	DUP	L2282989-7						
pH		7.79	7.87	J	pH units	0.08	0.3	05-JUN-19
WG3067982-1	LCS		7.03		pH units		6.9-7.1	05-JUN-19
Batch	R4659322							
WG3064959-6	DUP	L2282535-11						
pH		6.73	6.89	J	pH units	0.16	0.3	05-JUN-19
WG3067978-1	LCS		7.01		pH units		6.9-7.1	05-JUN-19
SAR-R511-WT		Soil						
Batch	R4659817							
WG3068943-4	DUP	WG3068943-3						
Calcium (Ca)		15.2	15.2		mg/L	0.0	30	06-JUN-19
Sodium (Na)		13.0	12.4		mg/L	4.7	30	06-JUN-19
Magnesium (Mg)		1.33	1.34		mg/L	0.7	30	06-JUN-19
WG3068943-2	IRM	WT SAR3						

Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 11 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SAR-R511-WT		Soil						
Batch	R4659817							
WG3068943-2	IRM	WT SAR3						
Calcium (Ca)			87.0		%		70-130	06-JUN-19
Sodium (Na)			100.1		%		70-130	06-JUN-19
Magnesium (Mg)			94.6		%		70-130	06-JUN-19
WG3068943-5	LCS							
Calcium (Ca)			101.0		%		70-130	06-JUN-19
Sodium (Na)			98.8		%		70-130	06-JUN-19
Magnesium (Mg)			100.2		%		70-130	06-JUN-19
WG3068943-1	MB							
Calcium (Ca)			<0.50		mg/L		0.5	06-JUN-19
Sodium (Na)			<0.50		mg/L		0.5	06-JUN-19
Magnesium (Mg)			<0.50		mg/L		0.5	06-JUN-19
Batch	R4659987							
WG3068931-4	DUP	WG3068931-3						
Calcium (Ca)		3.66	3.69		mg/L	0.8	30	06-JUN-19
Sodium (Na)		58.1	59.7		mg/L	2.7	30	06-JUN-19
Magnesium (Mg)		0.77	0.77		mg/L	0.0	30	06-JUN-19
WG3068931-2	IRM	WT SAR3						
Calcium (Ca)			99.0		%		70-130	06-JUN-19
Sodium (Na)			110.2		%		70-130	06-JUN-19
Magnesium (Mg)			107.0		%		70-130	06-JUN-19
WG3068931-5	LCS							
Calcium (Ca)			103.3		%		70-130	06-JUN-19
Sodium (Na)			100.4		%		70-130	06-JUN-19
Magnesium (Mg)			102.4		%		70-130	06-JUN-19
WG3068931-1	MB							
Calcium (Ca)			<0.50		mg/L		0.5	06-JUN-19
Sodium (Na)			<0.50		mg/L		0.5	06-JUN-19
Magnesium (Mg)			<0.50		mg/L		0.5	06-JUN-19
VOC-511-HS-WT		Soil						
Batch	R4656246							
WG3066478-4	DUP	WG3066478-3						
1,1,1,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,1,1-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,1,2-Trichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 12 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Soil						
Batch	R4656246							
WG3066478-4	DUP	WG3066478-3						
1,1-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,1-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,2-Dibromoethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,2-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,2-Dichloroethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,2-Dichloropropane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,3-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
1,4-Dichlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Acetone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	05-JUN-19
Benzene		<0.0068	<0.0068	RPD-NA	ug/g	N/A	40	05-JUN-19
Bromodichloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Bromoform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Bromomethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Carbon tetrachloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Chlorobenzene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Chloroform		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
cis-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
cis-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	05-JUN-19
Dibromochloromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Dichlorodifluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Ethylbenzene		<0.018	<0.018	RPD-NA	ug/g	N/A	40	05-JUN-19
n-Hexane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Methylene Chloride		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
MTBE		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
m+p-Xylenes		<0.030	<0.030	RPD-NA	ug/g	N/A	40	05-JUN-19
Methyl Ethyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	05-JUN-19
Methyl Isobutyl Ketone		<0.50	<0.50	RPD-NA	ug/g	N/A	40	05-JUN-19
o-Xylene		<0.020	<0.020	RPD-NA	ug/g	N/A	40	05-JUN-19
Styrene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Tetrachloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Toluene		<0.080	<0.080	RPD-NA	ug/g	N/A	40	05-JUN-19
trans-1,2-Dichloroethylene		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
trans-1,3-Dichloropropene		<0.030	<0.030		ug/g			05-JUN-19



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 13 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Soil						
Batch	R4656246							
WG3066478-4	DUP	WG3066478-3						
trans-1,3-Dichloropropene		<0.030	<0.030	RPD-NA	ug/g	N/A	40	05-JUN-19
Trichloroethylene		<0.010	<0.010	RPD-NA	ug/g	N/A	40	05-JUN-19
Trichlorofluoromethane		<0.050	<0.050	RPD-NA	ug/g	N/A	40	05-JUN-19
Vinyl chloride		<0.020	<0.020	RPD-NA	ug/g	N/A	40	05-JUN-19
WG3066478-2	LCS							
1,1,1,2-Tetrachloroethane			95.1		%		60-130	04-JUN-19
1,1,2,2-Tetrachloroethane			123.6		%		60-130	04-JUN-19
1,1,1-Trichloroethane			96.2		%		60-130	04-JUN-19
1,1,2-Trichloroethane			92.5		%		60-130	04-JUN-19
1,1-Dichloroethane			96.0		%		60-130	04-JUN-19
1,1-Dichloroethylene			93.1		%		60-130	04-JUN-19
1,2-Dibromoethane			91.6		%		70-130	04-JUN-19
1,2-Dichlorobenzene			99.8		%		70-130	04-JUN-19
1,2-Dichloroethane			91.1		%		60-130	04-JUN-19
1,2-Dichloropropane			93.0		%		70-130	04-JUN-19
1,3-Dichlorobenzene			101.8		%		70-130	04-JUN-19
1,4-Dichlorobenzene			103.4		%		70-130	04-JUN-19
Acetone			95.7		%		60-140	04-JUN-19
Benzene			99.3		%		70-130	04-JUN-19
Bromodichloromethane			94.0		%		50-140	04-JUN-19
Bromoform			95.4		%		70-130	04-JUN-19
Bromomethane			112.2		%		50-140	04-JUN-19
Carbon tetrachloride			99.95		%		70-130	04-JUN-19
Chlorobenzene			98.4		%		70-130	04-JUN-19
Chloroform			95.8		%		70-130	04-JUN-19
cis-1,2-Dichloroethylene			95.5		%		70-130	04-JUN-19
cis-1,3-Dichloropropene			100.5		%		70-130	04-JUN-19
Dibromochloromethane			93.4		%		60-130	04-JUN-19
Dichlorodifluoromethane			93.8		%		50-140	04-JUN-19
Ethylbenzene			92.4		%		70-130	04-JUN-19
n-Hexane			92.1		%		70-130	04-JUN-19
Methylene Chloride			101.6		%		70-130	04-JUN-19
MTBE			99.7		%		70-130	04-JUN-19
m+p-Xylenes			94.4				70-130	



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 14 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Soil						
Batch	R4656246							
WG3066478-2	LCS							
m+p-Xylenes			94.4		%		70-130	04-JUN-19
Methyl Ethyl Ketone			99.95		%		60-140	04-JUN-19
Methyl Isobutyl Ketone			90.2		%		60-140	04-JUN-19
o-Xylene			90.9		%		70-130	04-JUN-19
Styrene			94.0		%		70-130	04-JUN-19
Tetrachloroethylene			101.4		%		60-130	04-JUN-19
Toluene			94.3		%		70-130	04-JUN-19
trans-1,2-Dichloroethylene			99.3		%		60-130	04-JUN-19
trans-1,3-Dichloropropene			92.7		%		70-130	04-JUN-19
Trichloroethylene			102.5		%		60-130	04-JUN-19
Trichlorofluoromethane			103.3		%		50-140	04-JUN-19
Vinyl chloride			83.7		%		60-140	04-JUN-19
WG3066478-1	MB							
1,1,1,2-Tetrachloroethane			<0.050		ug/g		0.05	04-JUN-19
1,1,2,2-Tetrachloroethane			<0.050		ug/g		0.05	04-JUN-19
1,1,1-Trichloroethane			<0.050		ug/g		0.05	04-JUN-19
1,1,2-Trichloroethane			<0.050		ug/g		0.05	04-JUN-19
1,1-Dichloroethane			<0.050		ug/g		0.05	04-JUN-19
1,1-Dichloroethylene			<0.050		ug/g		0.05	04-JUN-19
1,2-Dibromoethane			<0.050		ug/g		0.05	04-JUN-19
1,2-Dichlorobenzene			<0.050		ug/g		0.05	04-JUN-19
1,2-Dichloroethane			<0.050		ug/g		0.05	04-JUN-19
1,2-Dichloropropane			<0.050		ug/g		0.05	04-JUN-19
1,3-Dichlorobenzene			<0.050		ug/g		0.05	04-JUN-19
1,4-Dichlorobenzene			<0.050		ug/g		0.05	04-JUN-19
Acetone			<0.50		ug/g		0.5	04-JUN-19
Benzene			<0.0068		ug/g		0.0068	04-JUN-19
Bromodichloromethane			<0.050		ug/g		0.05	04-JUN-19
Bromoform			<0.050		ug/g		0.05	04-JUN-19
Bromomethane			<0.050		ug/g		0.05	04-JUN-19
Carbon tetrachloride			<0.050		ug/g		0.05	04-JUN-19
Chlorobenzene			<0.050		ug/g		0.05	04-JUN-19
Chloroform			<0.050		ug/g		0.05	04-JUN-19
cis-1,2-Dichloroethylene			<0.050		ug/g		0.05	04-JUN-19



Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Page 15 of 17

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Soil						
Batch	R4656246							
WG3066478-1	MB							
cis-1,3-Dichloropropene			<0.030		ug/g		0.03	04-JUN-19
Dibromochloromethane			<0.050		ug/g		0.05	04-JUN-19
Dichlorodifluoromethane			<0.050		ug/g		0.05	04-JUN-19
Ethylbenzene			<0.018		ug/g		0.018	04-JUN-19
n-Hexane			<0.050		ug/g		0.05	04-JUN-19
Methylene Chloride			<0.050		ug/g		0.05	04-JUN-19
MTBE			<0.050		ug/g		0.05	04-JUN-19
m+p-Xylenes			<0.030		ug/g		0.03	04-JUN-19
Methyl Ethyl Ketone			<0.50		ug/g		0.5	04-JUN-19
Methyl Isobutyl Ketone			<0.50		ug/g		0.5	04-JUN-19
o-Xylene			<0.020		ug/g		0.02	04-JUN-19
Styrene			<0.050		ug/g		0.05	04-JUN-19
Tetrachloroethylene			<0.050		ug/g		0.05	04-JUN-19
Toluene			<0.080		ug/g		0.08	04-JUN-19
trans-1,2-Dichloroethylene			<0.050		ug/g		0.05	04-JUN-19
trans-1,3-Dichloropropene			<0.030		ug/g		0.03	04-JUN-19
Trichloroethylene			<0.010		ug/g		0.01	04-JUN-19
Trichlorofluoromethane			<0.050		ug/g		0.05	04-JUN-19
Vinyl chloride			<0.020		ug/g		0.02	04-JUN-19
Surrogate: 1,4-Difluorobenzene			107.7		%		50-140	04-JUN-19
Surrogate: 4-Bromofluorobenzene			96.4		%		50-140	04-JUN-19
WG3066478-5	MS	L2282627-2						
1,1,1,2-Tetrachloroethane			93.1		%		50-140	05-JUN-19
1,1,2,2-Tetrachloroethane			124.7		%		50-140	05-JUN-19
1,1,1-Trichloroethane			93.1		%		50-140	05-JUN-19
1,1,2-Trichloroethane			91.7		%		50-140	05-JUN-19
1,1-Dichloroethane			93.0		%		50-140	05-JUN-19
1,1-Dichloroethylene			89.4		%		50-140	05-JUN-19
1,2-Dibromoethane			90.8		%		50-140	05-JUN-19
1,2-Dichlorobenzene			96.1		%		50-140	05-JUN-19
1,2-Dichloroethane			89.4		%		50-140	05-JUN-19
1,2-Dichloropropane			90.7		%		50-140	05-JUN-19
1,3-Dichlorobenzene			95.4		%		50-140	05-JUN-19
1,4-Dichlorobenzene			93.7		%		50-140	05-JUN-19



Quality Control Report

Workorder: L2282970
 Report Date: 10-JUN-19
 Page 16 of 17

Client: CHUNG AND VANDER DOELEN
 311 VICTORIA ST. N.
 KITCHENER ON N2H 5E1
 Contact: NANDOU ZHAO

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Soil						
Batch	R4656246							
WG3066478-5	MS	L2282627-2						
Acetone			100.7		%		50-140	05-JUN-19
Benzene			95.4		%		50-140	05-JUN-19
Bromodichloromethane			92.0		%		50-140	05-JUN-19
Bromoform			94.4		%		50-140	05-JUN-19
Bromomethane			104.8		%		50-140	05-JUN-19
Carbon tetrachloride			96.4		%		50-140	05-JUN-19
Chlorobenzene			94.3		%		50-140	05-JUN-19
Chloroform			93.1		%		50-140	05-JUN-19
cis-1,2-Dichloroethylene			91.6		%		50-140	05-JUN-19
cis-1,3-Dichloropropene			90.1		%		50-140	05-JUN-19
Dibromochloromethane			92.2		%		50-140	05-JUN-19
Dichlorodifluoromethane			93.2		%		50-140	05-JUN-19
Ethylbenzene			87.5		%		50-140	05-JUN-19
n-Hexane			88.0		%		50-140	05-JUN-19
Methylene Chloride			98.3		%		50-140	05-JUN-19
MTBE			95.6		%		50-140	05-JUN-19
m+p-Xylenes			88.9		%		50-140	05-JUN-19
Methyl Ethyl Ketone			96.3		%		50-140	05-JUN-19
Methyl Isobutyl Ketone			90.8		%		50-140	05-JUN-19
o-Xylene			86.8		%		50-140	05-JUN-19
Styrene			89.1		%		50-140	05-JUN-19
Tetrachloroethylene			95.0		%		50-140	05-JUN-19
Toluene			90.0		%		50-140	05-JUN-19
trans-1,2-Dichloroethylene			92.6		%		50-140	05-JUN-19
trans-1,3-Dichloropropene			82.6		%		50-140	05-JUN-19
Trichloroethylene			96.3		%		50-140	05-JUN-19
Trichlorofluoromethane			99.5		%		50-140	05-JUN-19
Vinyl chloride			80.5		%		50-140	05-JUN-19

Quality Control Report

Workorder: L2282970

Report Date: 10-JUN-19

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1
Contact: NANDOU ZHAO

Page 17 of 17

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

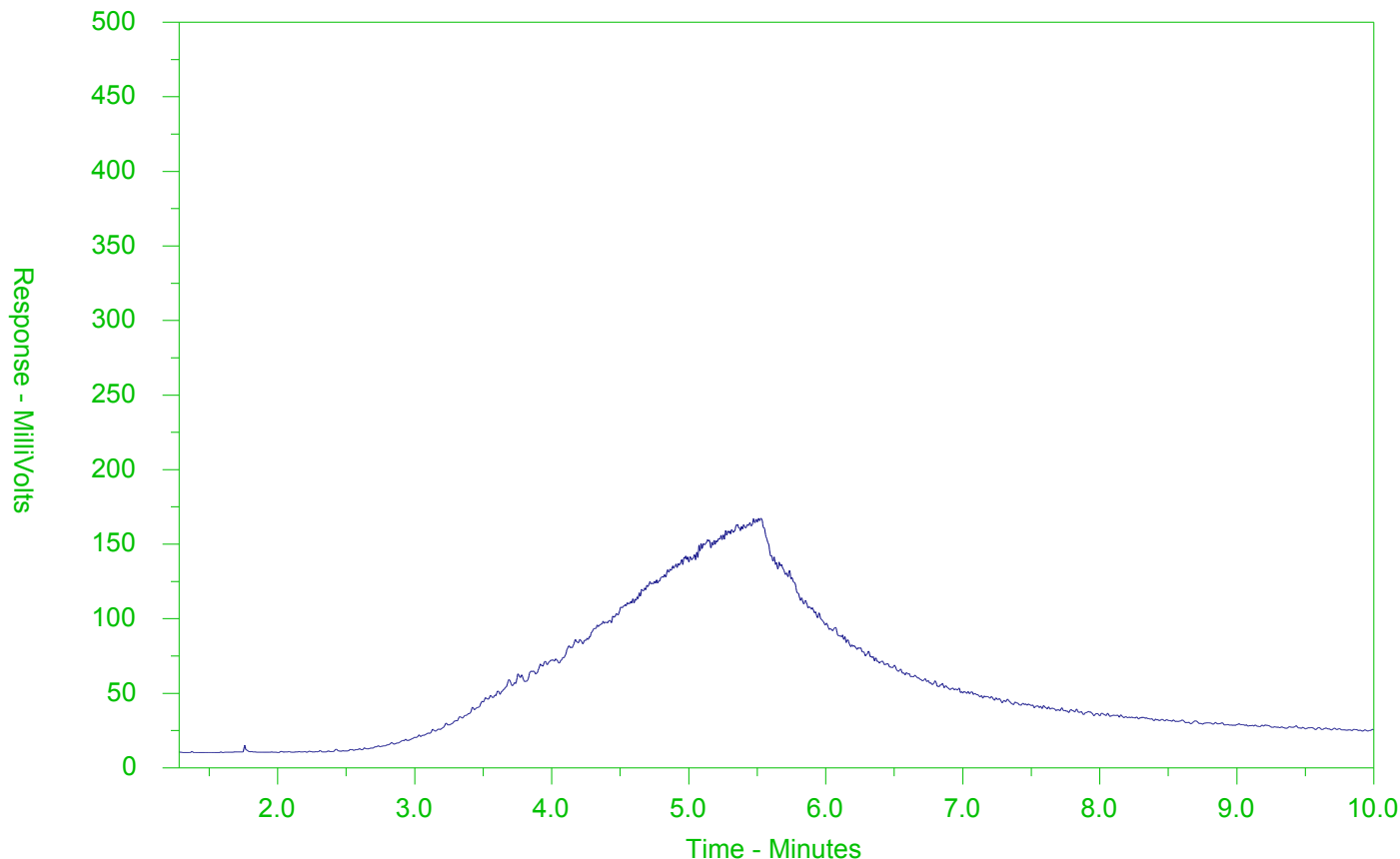
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-1
Client Sample ID: BH1-SA1



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

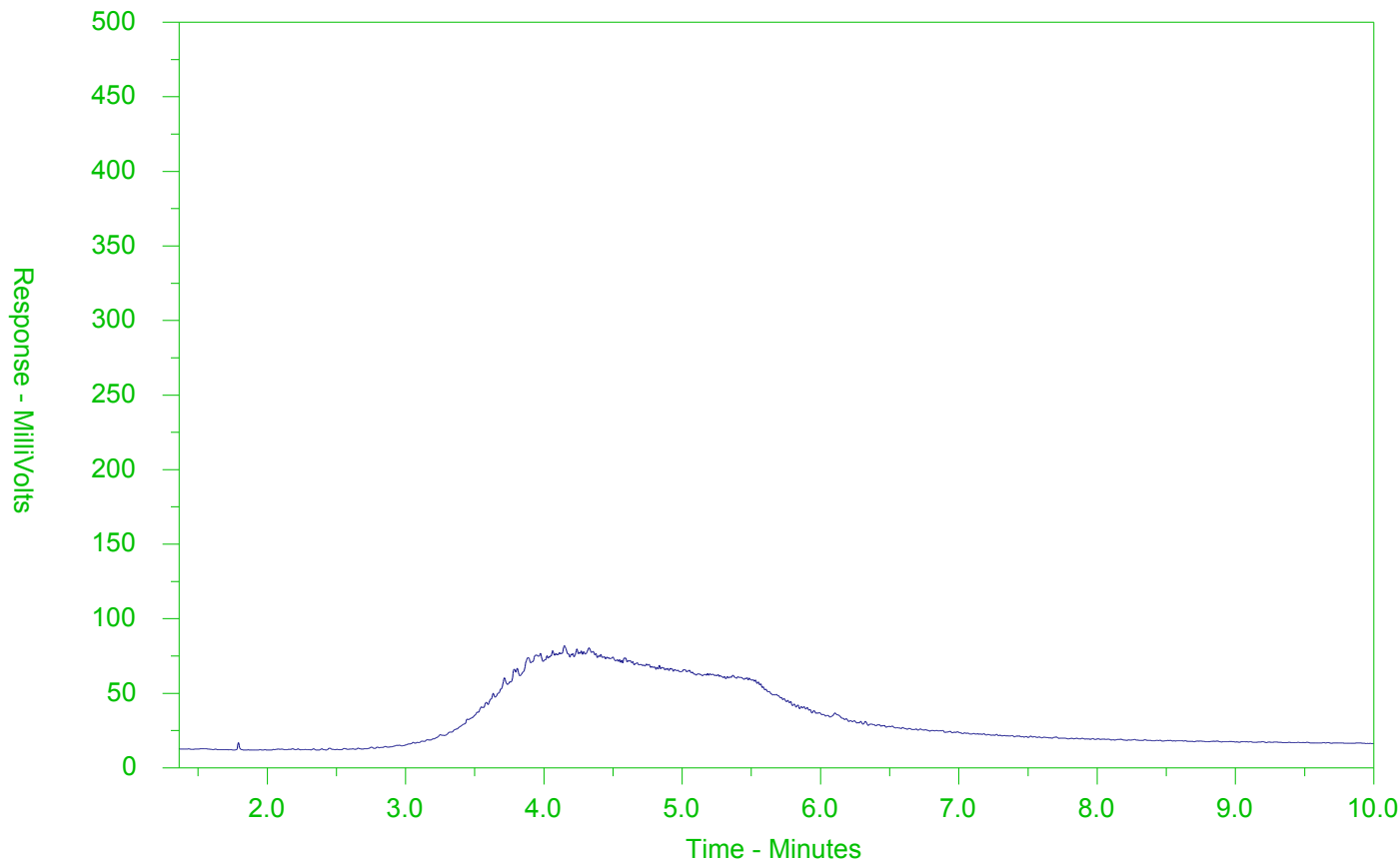
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-2
Client Sample ID: BH3-SA2



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

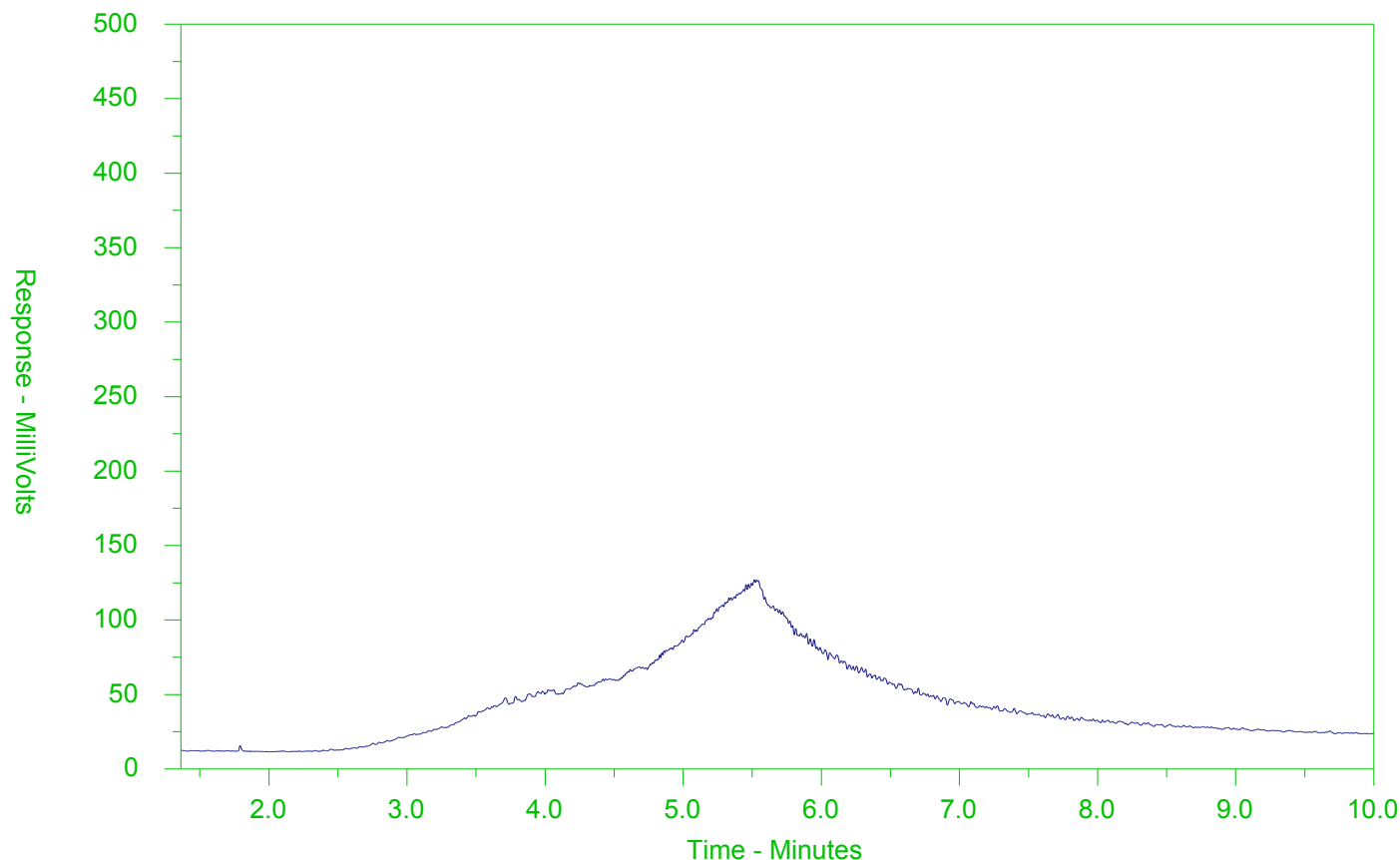
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-3
Client Sample ID: BH5-SA1



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

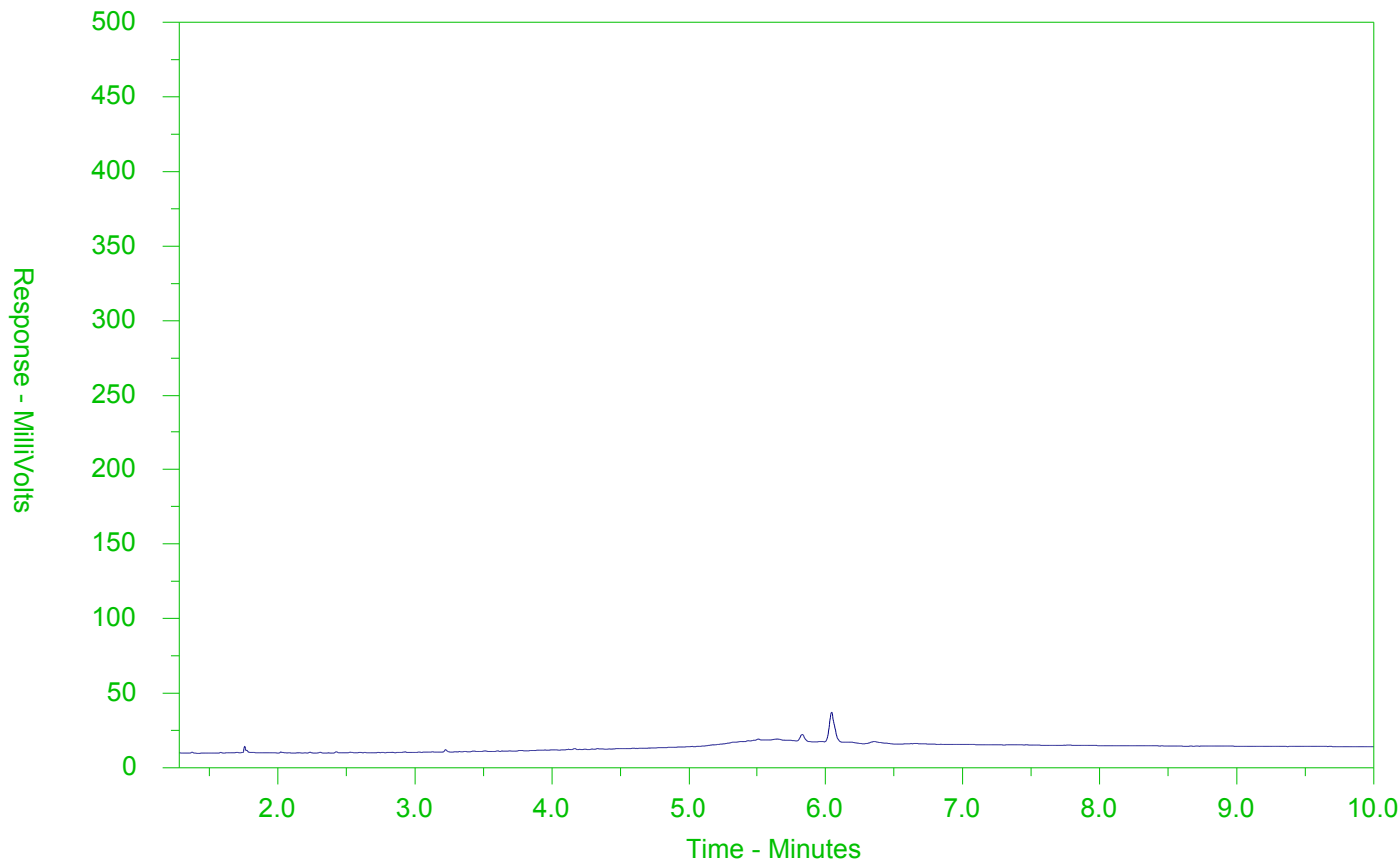
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-4
Client Sample ID: BH7-SA2



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

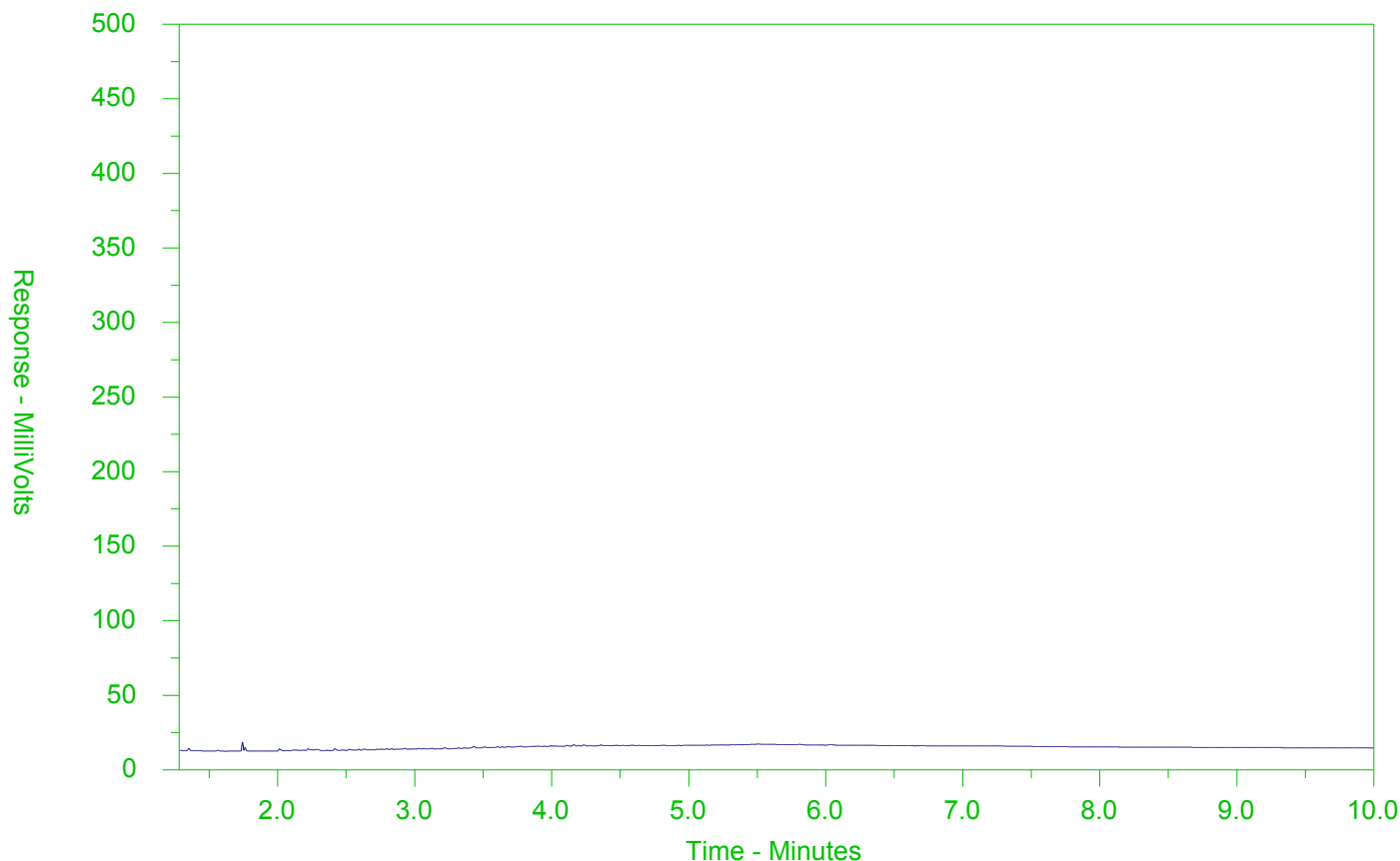
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-5
Client Sample ID: BH8-SA2



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

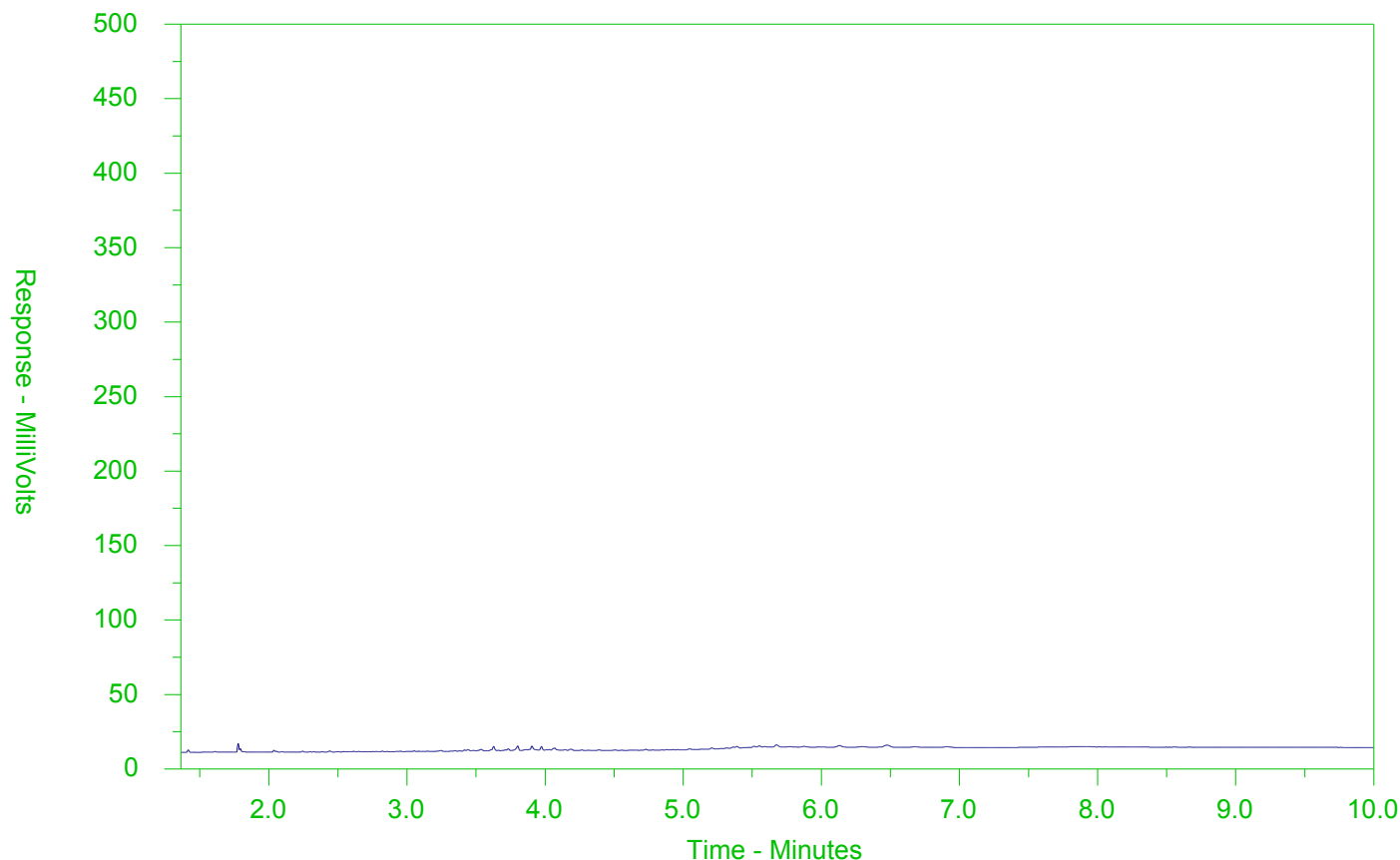
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-6
Client Sample ID: BH9-SA3



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

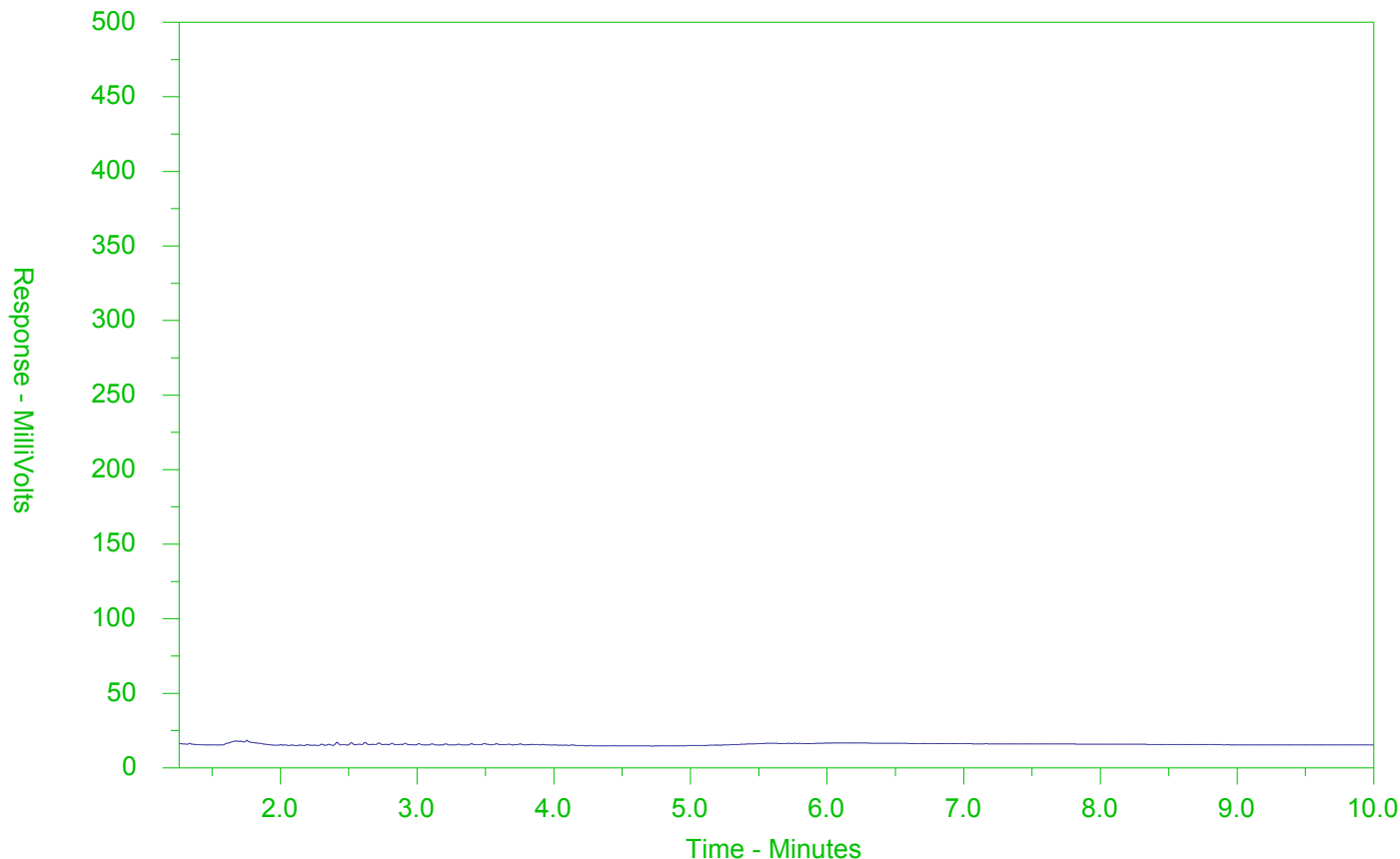
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-7
Client Sample ID: BH9-SA5



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

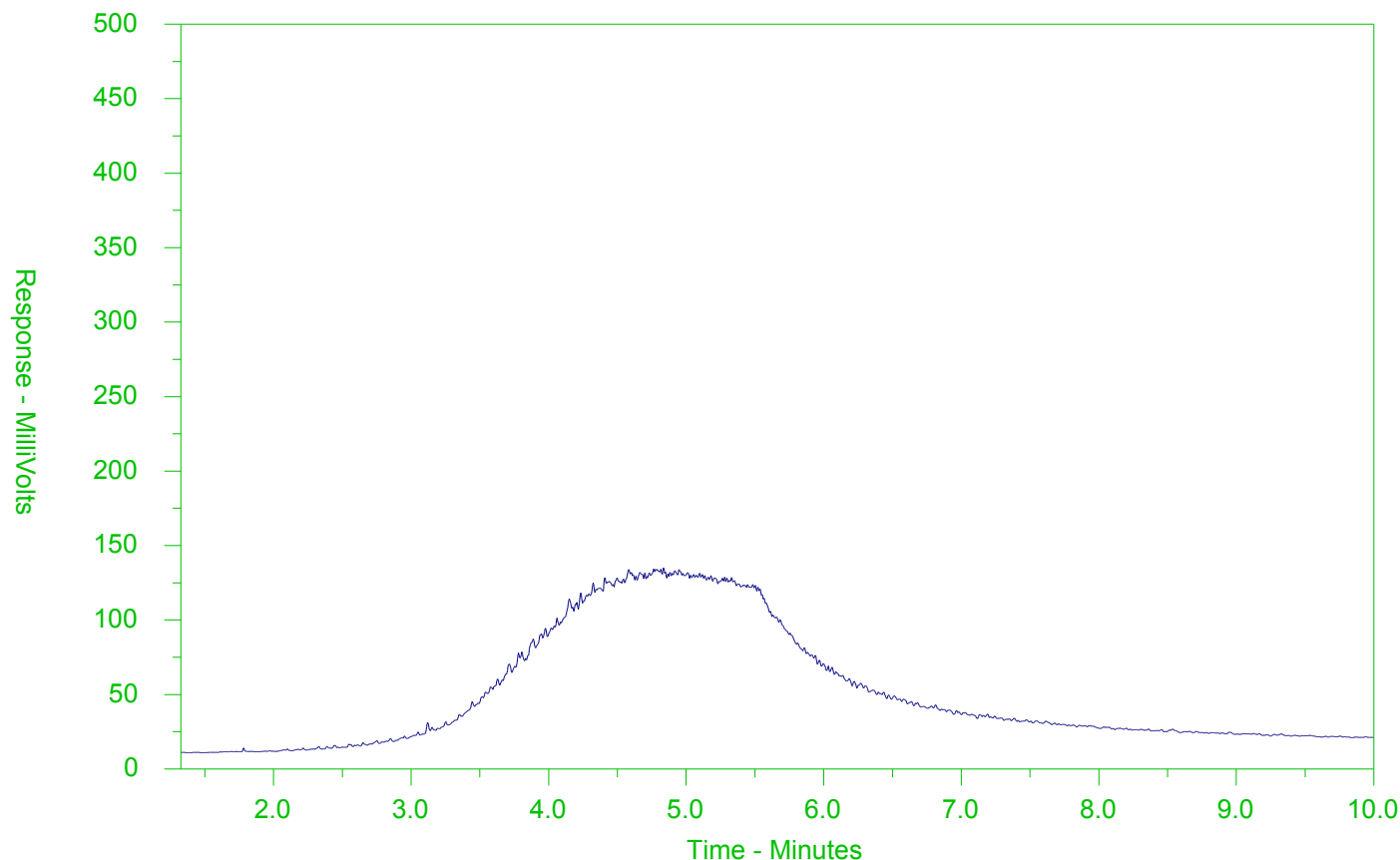
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-8
Client Sample ID: BH11-SA1



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

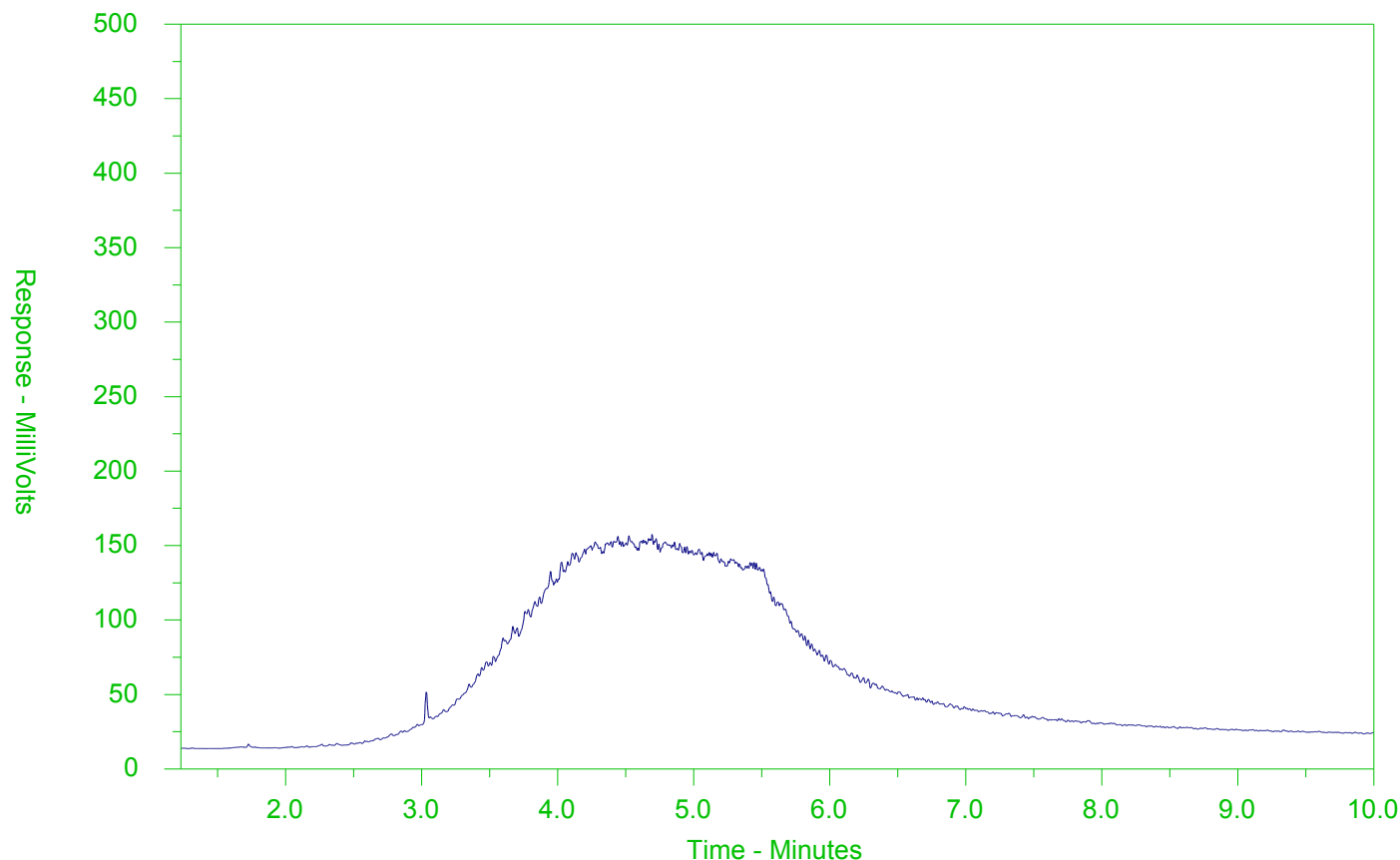
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-9
Client Sample ID: BH14-SA1



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

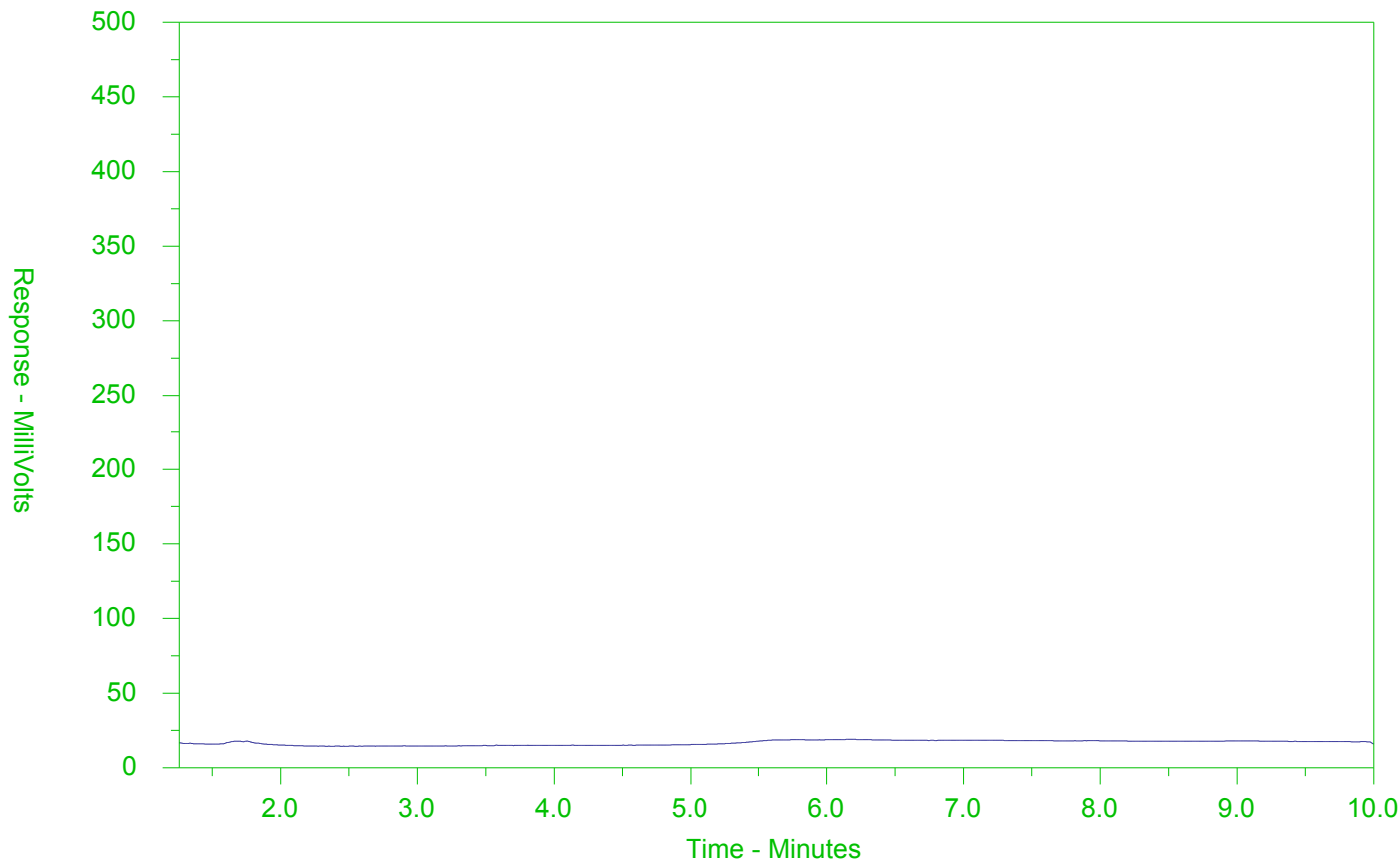
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2282970-10
Client Sample ID: BH14-SA3



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.



APPENDIX “C”

Groundwater Chemistry Results





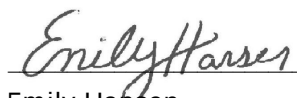
CHUNG AND VANDER DOELEN
ATTN: JOE VANDERZALM
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Date Received: 11-JUL-19
Report Date: 18-JUL-19 14:18 (MT)
Version: FINAL

Client Phone: 519-742-8979

Certificate of Analysis

Lab Work Order #: L2308511
Project P.O. #: NOT SUBMITTED
Job Reference: G19750-WATER
C of C Numbers: 17-726641
Legal Site Desc:


Emily Hansen
Account Manager

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ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-1	BH3									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Physical Tests										
Conductivity		11.2		0.0030	mS/cm	12-JUL-19				
pH		6.99		0.10	pH units	12-JUL-19	6.5-8.5	6-9		
Anions and Nutrients										
Chloride (Cl)		4540	DLDS	5.0	mg/L	12-JUL-19				*790
Cyanides										
Cyanide, Weak Acid Diss		<2.0		2.0	ug/L	16-JUL-19				66
Dissolved Metals										
Dissolved Mercury Filtration Location		FIELD			No Unit	12-JUL-19				
Dissolved Metals Filtration Location		FIELD			No Unit	12-JUL-19				
Antimony (Sb)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	20			6
Arsenic (As)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	5			25
Barium (Ba)-Dissolved		1000	DLHC	1.0	ug/L	12-JUL-19				1000
Beryllium (Be)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	11			4
Boron (B)-Dissolved		<100	DLHC	100	ug/L	12-JUL-19	200			5000
Cadmium (Cd)-Dissolved		0.085	DLHC	0.050	ug/L	12-JUL-19	0.1			2.7
Chromium (Cr)-Dissolved		<5.0	DLHC	5.0	ug/L	12-JUL-19				50
Cobalt (Co)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	**0.9			3.8
Copper (Cu)-Dissolved		<2.0	DLHC	2.0	ug/L	12-JUL-19	**1			87
Lead (Pb)-Dissolved		<0.50	DLHC	0.50	ug/L	12-JUL-19	1			10
Mercury (Hg)-Dissolved		<0.010		0.010	ug/L	12-JUL-19	0.2			0.29
Molybdenum (Mo)-Dissolved		1.17	DLHC	0.50	ug/L	12-JUL-19	40			70
Nickel (Ni)-Dissolved		<5.0	DLHC	5.0	ug/L	12-JUL-19	25			100
Selenium (Se)-Dissolved		<0.50	DLHC	0.50	ug/L	12-JUL-19	100			10
Silver (Ag)-Dissolved		<0.50	DLHC	0.50	ug/L	12-JUL-19	**0.1			1.5
Sodium (Na)-Dissolved		1680000	DLHC	5000	ug/L	12-JUL-19				*490000
Thallium (Tl)-Dissolved		<0.10	DLHC	0.10	ug/L	12-JUL-19	0.3			2
Uranium (U)-Dissolved		3.95	DLHC	0.10	ug/L	12-JUL-19	5			20
Vanadium (V)-Dissolved		<5.0	DLHC	5.0	ug/L	12-JUL-19	6			6.2
Zinc (Zn)-Dissolved		<10	DLHC	10	ug/L	12-JUL-19	20			1100
Speciated Metals										
Chromium, Hexavalent		<0.50		0.50	ug/L	12-JUL-19	1			25
Volatile Organic Compounds										
Acetone		<30		30	ug/L	16-JUL-19				2700
Benzene		<0.50		0.50	ug/L	16-JUL-19	100			5
Bromodichloromethane		<2.0		2.0	ug/L	16-JUL-19	200			16
Bromoform		<5.0		5.0	ug/L	16-JUL-19	60			25
Bromomethane		<0.50		0.50	ug/L	16-JUL-19				0.89
Carbon tetrachloride		<0.20		0.20	ug/L	16-JUL-19				0.79
Chlorobenzene		<0.50		0.50	ug/L	16-JUL-19	15			30
Dibromochloromethane		<2.0		2.0	ug/L	16-JUL-19	40			25
Chloroform		<1.0		1.0	ug/L	16-JUL-19				2.4
1,2-Dibromoethane		<0.20		0.20	ug/L	16-JUL-19	5			0.2
1,2-Dichlorobenzene		<0.50		0.50	ug/L	16-JUL-19	2.5			3
1,3-Dichlorobenzene		<0.50		0.50	ug/L	16-JUL-19	2.5			59
1,4-Dichlorobenzene		<0.50		0.50	ug/L	16-JUL-19	4			1

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-1	BH3									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Volatile Organic Compounds										
	Dichlorodifluoromethane	<2.0		2.0	ug/L	16-JUL-19			590	
	1,1-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	200		5	
	1,2-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	100		1.6	
	1,1-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19	40		1.6	
	cis-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	trans-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	Methylene Chloride	<5.0		5.0	ug/L	16-JUL-19	100		50	
	1,2-Dichloropropane	<0.50		0.50	ug/L	16-JUL-19	0.7		5	
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19	7			
	1,3-Dichloropropene (cis & trans)	<0.50		0.50	ug/L	16-JUL-19			0.5	
	Ethylbenzene	<0.50		0.50	ug/L	16-JUL-19	8		2.4	
	n-Hexane	<0.50		0.50	ug/L	16-JUL-19			51	
	Methyl Ethyl Ketone	<20		20	ug/L	16-JUL-19	400		1800	
	Methyl Isobutyl Ketone	<20		20	ug/L	16-JUL-19			640	
	MTBE	<2.0		2.0	ug/L	16-JUL-19			15	
	Styrene	<0.50		0.50	ug/L	16-JUL-19	4		5.4	
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	20.0		1.1	
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	70		1	
	Tetrachloroethylene	<0.50		0.50	ug/L	16-JUL-19	50		1.6	
	Toluene	<0.50		0.50	ug/L	16-JUL-19	0.8		24	
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	10		200	
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	800		4.7	
	Trichloroethylene	<0.50		0.50	ug/L	16-JUL-19	20		1.6	
	Trichlorofluoromethane	<5.0		5.0	ug/L	16-JUL-19			150	
	Vinyl chloride	<0.50		0.50	ug/L	16-JUL-19	600		0.5	
	o-Xylene	<0.30		0.30	ug/L	16-JUL-19	40			
	m+p-Xylenes	<0.40		0.40	ug/L	16-JUL-19	2			
	Xylenes (Total)	<0.50		0.50	ug/L	16-JUL-19			300	
	Surrogate: 4-Bromofluorobenzene	96.1		70-130	%	16-JUL-19				
	Surrogate: 1,4-Difluorobenzene	97.6		70-130	%	16-JUL-19				
Hydrocarbons										
	F1 (C6-C10)	<25		25	ug/L	16-JUL-19			750	
	F1-BTEX	<25		25	ug/L	17-JUL-19			750	
	F2 (C10-C16)	<100		100	ug/L	12-JUL-19			150	
	F2-Naphth	<100		100	ug/L	17-JUL-19				
	F3 (C16-C34)	<250		250	ug/L	12-JUL-19			500	
	F3-PAH	<250		250	ug/L	17-JUL-19				
	F4 (C34-C50)	<250		250	ug/L	12-JUL-19			500	
	Total Hydrocarbons (C6-C50)	<370		370	ug/L	17-JUL-19				
	Chrom. to baseline at nC50	YES			No Unit	12-JUL-19				
	Surrogate: 2-Bromobenzotrifluoride	70.9		60-140	%	12-JUL-19				
	Surrogate: 3,4-Dichlorotoluene	77.0		60-140	%	16-JUL-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.020		0.020	ug/L	17-JUL-19			4.1	
	Acenaphthylene	<0.020		0.020	ug/L	17-JUL-19			1	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

L2308511 CONTD....

Page 4 of 20

18-JUL-19 14:18 (MT)

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-1	BH3									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Polycyclic Aromatic Hydrocarbons										
	Anthracene	<0.020		0.020	ug/L	17-JUL-19	**0.0008		2.4	
	Benzo(a)anthracene	<0.020		0.020	ug/L	17-JUL-19	**0.0004		1	
	Benzo(a)pyrene	<0.010		0.010	ug/L	17-JUL-19			0.01	
	Benzo(b)fluoranthene	<0.020		0.020	ug/L	17-JUL-19			0.1	
	Benzo(g,h,i)perylene	<0.020		0.020	ug/L	17-JUL-19	**0.00002		0.2	
	Benzo(k)fluoranthene	<0.020		0.020	ug/L	17-JUL-19	**0.0002		0.1	
	Chrysene	<0.020		0.020	ug/L	17-JUL-19	**0.0001		0.1	
	Dibenzo(ah)anthracene	<0.020		0.020	ug/L	17-JUL-19	**0.002		0.2	
	Fluoranthene	<0.020		0.020	ug/L	17-JUL-19	**0.008		0.41	
	Fluorene	<0.020		0.020	ug/L	17-JUL-19	0.2		120	
	Indeno(1,2,3-cd)pyrene	<0.020		0.020	ug/L	17-JUL-19			0.2	
	1+2-Methylnaphthalenes	<0.028		0.028	ug/L	17-JUL-19			3.2	
	1-Methylnaphthalene	<0.020		0.020	ug/L	17-JUL-19	2		3.2	
	2-Methylnaphthalene	<0.020		0.020	ug/L	17-JUL-19	2		3.2	
	Naphthalene	<0.050		0.050	ug/L	17-JUL-19	7		11	
	Phenanthrene	<0.020		0.020	ug/L	17-JUL-19	0.03		1	
	Pyrene	<0.020		0.020	ug/L	17-JUL-19			4.1	
	Surrogate: d10-Acenaphthene	94.1		60-140	%	17-JUL-19				
	Surrogate: d12-Chrysene	94.5		60-140	%	17-JUL-19				
	Surrogate: d8-Naphthalene	96.6		60-140	%	17-JUL-19				
	Surrogate: d10-Phenanthrene	90.4		60-140	%	17-JUL-19				
L2308511-2	BH6									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Physical Tests										
	Conductivity	4.94		0.0030	mS/cm	12-JUL-19				
	pH	7.75		0.10	pH units	12-JUL-19	6.5-8.5	6-9		
Anions and Nutrients										
	Chloride (Cl)	1510	DLDS	2.5	mg/L	12-JUL-19			*790	
Cyanides										
	Cyanide, Weak Acid Diss	<2.0		2.0	ug/L	16-JUL-19			66	
Dissolved Metals										
	Dissolved Mercury Filtration Location	FIELD			No Unit	12-JUL-19				
	Dissolved Metals Filtration Location	FIELD			No Unit	12-JUL-19				
	Antimony (Sb)-Dissolved	<1.0	DLHC	1.0	ug/L	12-JUL-19	20		6	
	Arsenic (As)-Dissolved	1.2	DLHC	1.0	ug/L	12-JUL-19	5		25	
	Barium (Ba)-Dissolved	296	DLHC	1.0	ug/L	12-JUL-19			1000	
	Beryllium (Be)-Dissolved	<1.0	DLHC	1.0	ug/L	12-JUL-19	11		4	
	Boron (B)-Dissolved	140	DLHC	100	ug/L	12-JUL-19	200		5000	
	Cadmium (Cd)-Dissolved	<0.050	DLHC	0.050	ug/L	12-JUL-19	0.1		2.7	
	Chromium (Cr)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19			50	
	Cobalt (Co)-Dissolved	1.5	DLHC	1.0	ug/L	12-JUL-19	*0.9		3.8	
	Copper (Cu)-Dissolved	4.8	DLHC	2.0	ug/L	12-JUL-19	*1		87	
	Lead (Pb)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	1		10	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-2	BH6									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Dissolved Metals										
	Mercury (Hg)-Dissolved	<0.010		0.010	ug/L	12-JUL-19	0.2		0.29	
	Molybdenum (Mo)-Dissolved	36.8	DLHC	0.50	ug/L	12-JUL-19	40		70	
	Nickel (Ni)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19	25		100	
	Selenium (Se)-Dissolved	3.92	DLHC	0.50	ug/L	12-JUL-19	100		10	
	Silver (Ag)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	**0.1		1.5	
	Sodium (Na)-Dissolved	515000	DLHC	500	ug/L	12-JUL-19			*490000	
	Thallium (Tl)-Dissolved	<0.10	DLHC	0.10	ug/L	12-JUL-19	0.3		2	
	Uranium (U)-Dissolved	9.35	DLHC	0.10	ug/L	12-JUL-19	*5		20	
	Vanadium (V)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19	6		6.2	
	Zinc (Zn)-Dissolved	10	DLHC	10	ug/L	12-JUL-19	20		1100	
Speciated Metals										
	Chromium, Hexavalent	<0.50		0.50	ug/L	12-JUL-19	1		25	
Volatile Organic Compounds										
	Acetone	<30		30	ug/L	16-JUL-19			2700	
	Benzene	<0.50		0.50	ug/L	16-JUL-19	100		5	
	Bromodichloromethane	<2.0		2.0	ug/L	16-JUL-19	200		16	
	Bromoform	<5.0		5.0	ug/L	16-JUL-19	60		25	
	Bromomethane	<0.50		0.50	ug/L	16-JUL-19			0.89	
	Carbon tetrachloride	<0.20		0.20	ug/L	16-JUL-19			0.79	
	Chlorobenzene	<0.50		0.50	ug/L	16-JUL-19	15		30	
	Dibromochloromethane	<2.0		2.0	ug/L	16-JUL-19	40		25	
	Chloroform	<1.0		1.0	ug/L	16-JUL-19			2.4	
	1,2-Dibromoethane	<0.20		0.20	ug/L	16-JUL-19	5		0.2	
	1,2-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		3	
	1,3-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		59	
	1,4-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	4		1	
	Dichlorodifluoromethane	<2.0		2.0	ug/L	16-JUL-19			590	
	1,1-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	200		5	
	1,2-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	100		1.6	
	1,1-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19	40		1.6	
	cis-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	trans-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	Methylene Chloride	<5.0		5.0	ug/L	16-JUL-19	100		50	
	1,2-Dichloropropane	<0.50		0.50	ug/L	16-JUL-19	0.7		5	
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19	7			
	1,3-Dichloropropene (cis & trans)	<0.50		0.50	ug/L	16-JUL-19			0.5	
	Ethylbenzene	<0.50		0.50	ug/L	16-JUL-19	8		2.4	
	n-Hexane	<0.50		0.50	ug/L	16-JUL-19			51	
	Methyl Ethyl Ketone	<20		20	ug/L	16-JUL-19	400		1800	
	Methyl Isobutyl Ketone	<20		20	ug/L	16-JUL-19			640	
	MTBE	<2.0		2.0	ug/L	16-JUL-19			15	
	Styrene	<0.50		0.50	ug/L	16-JUL-19	4		5.4	
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	20.0		1.1	
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	70		1	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-2	BH6									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Volatile Organic Compounds										
	Tetrachloroethylene	<0.50		0.50	ug/L	16-JUL-19	50		1.6	
	Toluene	<0.50		0.50	ug/L	16-JUL-19	0.8		24	
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	10		200	
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	800		4.7	
	Trichloroethylene	<0.50		0.50	ug/L	16-JUL-19	20		1.6	
	Trichlorofluoromethane	<5.0		5.0	ug/L	16-JUL-19			150	
	Vinyl chloride	<0.50		0.50	ug/L	16-JUL-19	600		0.5	
	o-Xylene	<0.30		0.30	ug/L	16-JUL-19	40			
	m+p-Xylenes	<0.40		0.40	ug/L	16-JUL-19	2			
	Xylenes (Total)	<0.50		0.50	ug/L	16-JUL-19			300	
	Surrogate: 4-Bromofluorobenzene	95.0		70-130	%	16-JUL-19				
	Surrogate: 1,4-Difluorobenzene	98.0		70-130	%	16-JUL-19				
Hydrocarbons										
	F1 (C6-C10)	<25		25	ug/L	16-JUL-19			750	
	F1-BTEX	<25		25	ug/L	16-JUL-19			750	
	F2 (C10-C16)	<100		100	ug/L	12-JUL-19			150	
	F2-Naphth	<100		100	ug/L	16-JUL-19				
	F3 (C16-C34)	<250		250	ug/L	12-JUL-19			500	
	F3-PAH	<250		250	ug/L	16-JUL-19				
	F4 (C34-C50)	<250		250	ug/L	12-JUL-19			500	
	Total Hydrocarbons (C6-C50)	<370		370	ug/L	16-JUL-19				
	Chrom. to baseline at nC50	YES			No Unit	12-JUL-19				
	Surrogate: 2-Bromobenzotrifluoride	78.7		60-140	%	12-JUL-19				
	Surrogate: 3,4-Dichlorotoluene	81.6		60-140	%	16-JUL-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.020		0.020	ug/L	16-JUL-19			4.1	
	Acenaphthylene	<0.020		0.020	ug/L	16-JUL-19			1	
	Anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.0008		2.4	
	Benzo(a)anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.0004		1	
	Benzo(a)pyrene	<0.010		0.010	ug/L	16-JUL-19			0.01	
	Benzo(b)fluoranthene	<0.020		0.020	ug/L	16-JUL-19			0.1	
	Benzo(g,h,i)perylene	<0.020		0.020	ug/L	16-JUL-19	**0.00002		0.2	
	Benzo(k)fluoranthene	<0.020		0.020	ug/L	16-JUL-19	**0.0002		0.1	
	Chrysene	<0.020		0.020	ug/L	16-JUL-19	**0.0001		0.1	
	Dibenzo(ah)anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.002		0.2	
	Fluoranthene	<0.020		0.020	ug/L	16-JUL-19	**0.008		0.41	
	Fluorene	<0.020		0.020	ug/L	16-JUL-19	0.2		120	
	Indeno(1,2,3-cd)pyrene	<0.020		0.020	ug/L	16-JUL-19			0.2	
	1+2-Methylnaphthalenes	<0.028		0.028	ug/L	16-JUL-19			3.2	
	1-Methylnaphthalene	<0.020		0.020	ug/L	16-JUL-19	2		3.2	
	2-Methylnaphthalene	<0.020		0.020	ug/L	16-JUL-19	2		3.2	
	Naphthalene	<0.050		0.050	ug/L	16-JUL-19	7		11	
	Phenanthrene	<0.020		0.020	ug/L	16-JUL-19	0.03		1	
	Pyrene	<0.020		0.020	ug/L	16-JUL-19			4.1	
	Surrogate: d10-Acenaphthene	92.3		60-140	%	16-JUL-19				
	Surrogate: d12-Chrysene	95.7		60-140	%	16-JUL-19				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

L2308511 CONTD....

Page 7 of 20

18-JUL-19 14:18 (MT)

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-2	BH6									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Polycyclic Aromatic Hydrocarbons										
Surrogate: d8-Naphthalene		93.4		60-140	%	16-JUL-19				
Surrogate: d10-Phenanthrene		92.9		60-140	%	16-JUL-19				
L2308511-3	BH8									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Physical Tests										
Conductivity		1.52		0.0030	mS/cm	12-JUL-19				
pH		7.68		0.10	pH units	12-JUL-19	6.5-8.5	6-9		
Anions and Nutrients										
Chloride (Cl)		309	DLDS	2.5	mg/L	12-JUL-19			790	
Cyanides										
Cyanide, Weak Acid Diss		<2.0		2.0	ug/L	16-JUL-19			66	
Dissolved Metals										
Dissolved Mercury Filtration Location		FIELD			No Unit	12-JUL-19				
Dissolved Metals Filtration Location		FIELD			No Unit	12-JUL-19				
Antimony (Sb)-Dissolved		0.18		0.10	ug/L	15-JUL-19	20		6	
Arsenic (As)-Dissolved		0.83		0.10	ug/L	15-JUL-19	5		25	
Barium (Ba)-Dissolved		223		0.10	ug/L	15-JUL-19			1000	
Beryllium (Be)-Dissolved		<0.10		0.10	ug/L	15-JUL-19	11		4	
Boron (B)-Dissolved		126		10	ug/L	15-JUL-19	200		5000	
Cadmium (Cd)-Dissolved		<0.010		0.010	ug/L	15-JUL-19	0.1		2.7	
Chromium (Cr)-Dissolved		<0.50		0.50	ug/L	15-JUL-19			50	
Cobalt (Co)-Dissolved		0.64		0.10	ug/L	15-JUL-19	0.9		3.8	
Copper (Cu)-Dissolved		1.09		0.20	ug/L	15-JUL-19	*1		87	
Lead (Pb)-Dissolved		<0.050		0.050	ug/L	15-JUL-19	1		10	
Mercury (Hg)-Dissolved		<0.010		0.010	ug/L	12-JUL-19	0.2		0.29	
Molybdenum (Mo)-Dissolved		4.11		0.050	ug/L	15-JUL-19	40		70	
Nickel (Ni)-Dissolved		1.79		0.50	ug/L	15-JUL-19	25		100	
Selenium (Se)-Dissolved		0.339		0.050	ug/L	15-JUL-19	100		10	
Silver (Ag)-Dissolved		<0.050		0.050	ug/L	15-JUL-19	0.1		1.5	
Sodium (Na)-Dissolved		133000	DLHC	500	ug/L	12-JUL-19			490000	
Thallium (Tl)-Dissolved		0.019		0.010	ug/L	15-JUL-19	0.3		2	
Uranium (U)-Dissolved		3.90		0.010	ug/L	15-JUL-19	5		20	
Vanadium (V)-Dissolved		0.52		0.50	ug/L	15-JUL-19	6		6.2	
Zinc (Zn)-Dissolved		2.4		1.0	ug/L	15-JUL-19	20		1100	
Speciated Metals										
Chromium, Hexavalent		<0.50		0.50	ug/L	12-JUL-19	1		25	
Volatile Organic Compounds										
Acetone		<30		30	ug/L	16-JUL-19			2700	
Benzene		<0.50		0.50	ug/L	16-JUL-19	100		5	
Bromodichloromethane		<2.0		2.0	ug/L	16-JUL-19	200		16	
Bromoform		<5.0		5.0	ug/L	16-JUL-19	60		25	
Bromomethane		<0.50		0.50	ug/L	16-JUL-19			0.89	
Carbon tetrachloride		<0.20		0.20	ug/L	16-JUL-19			0.79	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

L2308511 CONTD....

Page 8 of 20

18-JUL-19 14:18 (MT)

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-3	BH8									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Volatile Organic Compounds										
	Chlorobenzene	<0.50		0.50	ug/L	16-JUL-19	15		30	
	Dibromochloromethane	<2.0		2.0	ug/L	16-JUL-19	40		25	
	Chloroform	<1.0		1.0	ug/L	16-JUL-19			2.4	
	1,2-Dibromoethane	<0.20		0.20	ug/L	16-JUL-19	5		0.2	
	1,2-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		3	
	1,3-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		59	
	1,4-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	4		1	
	Dichlorodifluoromethane	<2.0		2.0	ug/L	16-JUL-19			590	
	1,1-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	200		5	
	1,2-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	100		1.6	
	1,1-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19	40		1.6	
	cis-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	trans-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	Methylene Chloride	<5.0		5.0	ug/L	16-JUL-19	100		50	
	1,2-Dichloropropane	<0.50		0.50	ug/L	16-JUL-19	0.7		5	
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19	7			
	1,3-Dichloropropene (cis & trans)	<0.50		0.50	ug/L	16-JUL-19			0.5	
	Ethylbenzene	<0.50		0.50	ug/L	16-JUL-19	8		2.4	
	n-Hexane	<0.50		0.50	ug/L	16-JUL-19			51	
	Methyl Ethyl Ketone	<20		20	ug/L	16-JUL-19	400		1800	
	Methyl Isobutyl Ketone	<20		20	ug/L	16-JUL-19			640	
	MTBE	<2.0		2.0	ug/L	16-JUL-19			15	
	Styrene	<0.50		0.50	ug/L	16-JUL-19	4		5.4	
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	20.0		1.1	
	1,1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	70		1	
	Tetrachloroethylene	<0.50		0.50	ug/L	16-JUL-19	50		1.6	
	Toluene	<0.50		0.50	ug/L	16-JUL-19	0.8		24	
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	10		200	
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	800		4.7	
	Trichloroethylene	<0.50		0.50	ug/L	16-JUL-19	20		1.6	
	Trichlorofluoromethane	<5.0		5.0	ug/L	16-JUL-19			150	
	Vinyl chloride	<0.50		0.50	ug/L	16-JUL-19	600		0.5	
	o-Xylene	<0.30		0.30	ug/L	16-JUL-19	40			
	m+p-Xylenes	<0.40		0.40	ug/L	16-JUL-19	2			
	Xylenes (Total)	<0.50		0.50	ug/L	16-JUL-19			300	
	Surrogate: 4-Bromofluorobenzene	93.6		70-130	%	16-JUL-19				
	Surrogate: 1,4-Difluorobenzene	97.5		70-130	%	16-JUL-19				
Hydrocarbons										
	F1 (C6-C10)	<25		25	ug/L	16-JUL-19			750	
	F1-BTEX	<25		25	ug/L	16-JUL-19			750	
	F2 (C10-C16)	<100		100	ug/L	12-JUL-19			150	
	F2-Naphth	<100		100	ug/L	16-JUL-19				
	F3 (C16-C34)	<250		250	ug/L	12-JUL-19			500	
	F3-PAH	<250		250	ug/L	16-JUL-19				
	F4 (C34-C50)	<250		250	ug/L	12-JUL-19			500	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
L2308511-3	BH8						#1	#2	#3	
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Hydrocarbons										
Total Hydrocarbons (C6-C50)		<370		370	ug/L	16-JUL-19				
Chrom. to baseline at nC50		YES			No Unit	12-JUL-19				
Surrogate: 2-Bromobenzotrifluoride		78.3		60-140	%	12-JUL-19				
Surrogate: 3,4-Dichlorotoluene		83.0		60-140	%	16-JUL-19				
Polycyclic Aromatic Hydrocarbons										
Acenaphthene		<0.020		0.020	ug/L	16-JUL-19				4.1
Acenaphthylene		<0.020		0.020	ug/L	16-JUL-19				1
Anthracene		<0.020		0.020	ug/L	16-JUL-19	**0.0008			2.4
Benzo(a)anthracene		<0.020		0.020	ug/L	16-JUL-19	**0.0004			1
Benzo(a)pyrene		<0.010		0.010	ug/L	16-JUL-19				0.01
Benzo(b)fluoranthene		<0.020		0.020	ug/L	16-JUL-19				0.1
Benzo(g,h,i)perylene		<0.020		0.020	ug/L	16-JUL-19	**0.00002			0.2
Benzo(k)fluoranthene		<0.020		0.020	ug/L	16-JUL-19	**0.0002			0.1
Chrysene		<0.020		0.020	ug/L	16-JUL-19	**0.0001			0.1
Dibenzo(ah)anthracene		<0.020		0.020	ug/L	16-JUL-19	**0.002			0.2
Fluoranthene		<0.020		0.020	ug/L	16-JUL-19	**0.008			0.41
Fluorene		<0.020		0.020	ug/L	16-JUL-19	0.2			120
Indeno(1,2,3-cd)pyrene		<0.020		0.020	ug/L	16-JUL-19				0.2
1+2-Methylnaphthalenes		<0.028		0.028	ug/L	16-JUL-19				3.2
1-Methylnaphthalene		<0.020		0.020	ug/L	16-JUL-19	2			3.2
2-Methylnaphthalene		<0.020		0.020	ug/L	16-JUL-19	2			3.2
Naphthalene		<0.050		0.050	ug/L	16-JUL-19	7			11
Phenanthrene		<0.020		0.020	ug/L	16-JUL-19	0.03			1
Pyrene		<0.020		0.020	ug/L	16-JUL-19				4.1
Surrogate: d10-Acenaphthene		94.6		60-140	%	16-JUL-19				
Surrogate: d12-Chrysene		97.6		60-140	%	16-JUL-19				
Surrogate: d8-Naphthalene		97.2		60-140	%	16-JUL-19				
Surrogate: d10-Phenanthrene		95.1		60-140	%	16-JUL-19				
L2308511-4	BH9						#1	#2	#3	
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Physical Tests										
Conductivity		7.61		0.0030	mS/cm	12-JUL-19				
pH		7.25		0.10	pH units	12-JUL-19	6.5-8.5	6-9		
Anions and Nutrients										
Chloride (Cl)		2420	DLDS	5.0	mg/L	12-JUL-19				*790
Cyanides										
Cyanide, Weak Acid Diss		<2.0		2.0	ug/L	16-JUL-19				66
Dissolved Metals										
Dissolved Mercury Filtration Location		FIELD			No Unit	12-JUL-19				
Dissolved Metals Filtration Location		FIELD			No Unit	12-JUL-19				
Antimony (Sb)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	20			6
Arsenic (As)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	5			25
Barium (Ba)-Dissolved		540	DLHC	1.0	ug/L	12-JUL-19				1000
Beryllium (Be)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	11			4

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-4	BH9									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Dissolved Metals										
	Boron (B)-Dissolved	<100	DLHC	100	ug/L	12-JUL-19	200		5000	
	Cadmium (Cd)-Dissolved	0.502	DLHC	0.050	ug/L	12-JUL-19	*0.1		2.7	
	Chromium (Cr)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19			50	
	Cobalt (Co)-Dissolved	1.1	DLHC	1.0	ug/L	12-JUL-19	*0.9		3.8	
	Copper (Cu)-Dissolved	<2.0	DLHC	2.0	ug/L	12-JUL-19	**1		87	
	Lead (Pb)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	1		10	
	Mercury (Hg)-Dissolved	<0.010		0.010	ug/L	12-JUL-19	0.2		0.29	
	Molybdenum (Mo)-Dissolved	0.53	DLHC	0.50	ug/L	12-JUL-19	40		70	
	Nickel (Ni)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19	25		100	
	Selenium (Se)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	100		10	
	Silver (Ag)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	**0.1		1.5	
	Sodium (Na)-Dissolved	1300000	DLHC	5000	ug/L	12-JUL-19			*490000	
	Thallium (Tl)-Dissolved	<0.10	DLHC	0.10	ug/L	12-JUL-19	0.3		2	
	Uranium (U)-Dissolved	2.71	DLHC	0.10	ug/L	12-JUL-19	5		20	
	Vanadium (V)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19	6		6.2	
	Zinc (Zn)-Dissolved	<10	DLHC	10	ug/L	12-JUL-19	20		1100	
Speciated Metals										
	Chromium, Hexavalent	<0.50		0.50	ug/L	12-JUL-19	1		25	
Volatile Organic Compounds										
	Acetone	<30		30	ug/L	16-JUL-19			2700	
	Benzene	<0.50		0.50	ug/L	16-JUL-19	100		5	
	Bromodichloromethane	<2.0		2.0	ug/L	16-JUL-19	200		16	
	Bromoform	<5.0		5.0	ug/L	16-JUL-19	60		25	
	Bromomethane	<0.50		0.50	ug/L	16-JUL-19			0.89	
	Carbon tetrachloride	<0.20		0.20	ug/L	16-JUL-19			0.79	
	Chlorobenzene	<0.50		0.50	ug/L	16-JUL-19	15		30	
	Dibromochloromethane	<2.0		2.0	ug/L	16-JUL-19	40		25	
	Chloroform	<1.0		1.0	ug/L	16-JUL-19			2.4	
	1,2-Dibromoethane	<0.20		0.20	ug/L	16-JUL-19	5		0.2	
	1,2-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		3	
	1,3-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		59	
	1,4-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	4		1	
	Dichlorodifluoromethane	<2.0		2.0	ug/L	16-JUL-19			590	
	1,1-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	200		5	
	1,2-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	100		1.6	
	1,1-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19	40		1.6	
	cis-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	trans-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	Methylene Chloride	<5.0		5.0	ug/L	16-JUL-19	100		50	
	1,2-Dichloropropane	<0.50		0.50	ug/L	16-JUL-19	0.7		5	
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19	7			
	1,3-Dichloropropene (cis & trans)	<0.50		0.50	ug/L	16-JUL-19			0.5	
	Ethylbenzene	<0.50		0.50	ug/L	16-JUL-19	8		2.4	
	n-Hexane	<0.50		0.50	ug/L	16-JUL-19			51	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

L2308511 CONTD....

Page 11 of 20

18-JUL-19 14:18 (MT)

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-4	BH9									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Volatile Organic Compounds										
	Methyl Ethyl Ketone	<20		20	ug/L	16-JUL-19	400		1800	
	Methyl Isobutyl Ketone	<20		20	ug/L	16-JUL-19			640	
	MTBE	<2.0		2.0	ug/L	16-JUL-19			15	
	Styrene	<0.50		0.50	ug/L	16-JUL-19	4		5.4	
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	20.0		1.1	
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	70		1	
	Tetrachloroethylene	<0.50		0.50	ug/L	16-JUL-19	50		1.6	
	Toluene	<0.50		0.50	ug/L	16-JUL-19	0.8		24	
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	10		200	
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	800		4.7	
	Trichloroethylene	<0.50		0.50	ug/L	16-JUL-19	20		1.6	
	Trichlorofluoromethane	<5.0		5.0	ug/L	16-JUL-19			150	
	Vinyl chloride	<0.50		0.50	ug/L	16-JUL-19	600		0.5	
	o-Xylene	<0.30		0.30	ug/L	16-JUL-19	40			
	m+p-Xylenes	<0.40		0.40	ug/L	16-JUL-19	2			
	Xylenes (Total)	<0.50		0.50	ug/L	16-JUL-19			300	
	Surrogate: 4-Bromofluorobenzene	94.8		70-130	%	16-JUL-19				
	Surrogate: 1,4-Difluorobenzene	98.1		70-130	%	16-JUL-19				
Hydrocarbons										
	F1 (C6-C10)	<25		25	ug/L	16-JUL-19			750	
	F1-BTEX	<25		25	ug/L	16-JUL-19			750	
	F2 (C10-C16)	<100		100	ug/L	12-JUL-19			150	
	F2-Naphth	<100		100	ug/L	16-JUL-19				
	F3 (C16-C34)	<250		250	ug/L	12-JUL-19			500	
	F3-PAH	<250		250	ug/L	16-JUL-19				
	F4 (C34-C50)	<250		250	ug/L	12-JUL-19			500	
	Total Hydrocarbons (C6-C50)	<370		370	ug/L	16-JUL-19				
	Chrom. to baseline at nC50	YES			No Unit	12-JUL-19				
	Surrogate: 2-Bromobenzotrifluoride	83.3		60-140	%	12-JUL-19				
	Surrogate: 3,4-Dichlorotoluene	73.6		60-140	%	16-JUL-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.020		0.020	ug/L	16-JUL-19			4.1	
	Acenaphthylene	<0.020		0.020	ug/L	16-JUL-19			1	
	Anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.0008		2.4	
	Benzo(a)anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.0004		1	
	Benzo(a)pyrene	<0.010		0.010	ug/L	16-JUL-19			0.01	
	Benzo(b)fluoranthene	<0.020		0.020	ug/L	16-JUL-19			0.1	
	Benzo(g,h,i)perylene	<0.020		0.020	ug/L	16-JUL-19	**0.00002		0.2	
	Benzo(k)fluoranthene	<0.020		0.020	ug/L	16-JUL-19	**0.0002		0.1	
	Chrysene	<0.020		0.020	ug/L	16-JUL-19	**0.0001		0.1	
	Dibenzo(ah)anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.002		0.2	
	Fluoranthene	<0.020		0.020	ug/L	16-JUL-19	**0.008		0.41	
	Fluorene	<0.020		0.020	ug/L	16-JUL-19	0.2		120	
	Indeno(1,2,3-cd)pyrene	<0.020		0.020	ug/L	16-JUL-19			0.2	
	1+2-Methylnaphthalenes	<0.028		0.028	ug/L	16-JUL-19			3.2	
	1-Methylnaphthalene	<0.020		0.020	ug/L	16-JUL-19	2		3.2	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-4	BH9									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Polycyclic Aromatic Hydrocarbons										
2-Methylnaphthalene		<0.020		0.020	ug/L	16-JUL-19	2		3.2	
Naphthalene		<0.050		0.050	ug/L	16-JUL-19	7		11	
Phenanthrene		<0.020		0.020	ug/L	16-JUL-19	0.03		1	
Pyrene		<0.020		0.020	ug/L	16-JUL-19			4.1	
Surrogate: d10-Acenaphthene		92.2		60-140	%	16-JUL-19				
Surrogate: d12-Chrysene		92.7		60-140	%	16-JUL-19				
Surrogate: d8-Naphthalene		94.6		60-140	%	16-JUL-19				
Surrogate: d10-Phenanthrene		93.2		60-140	%	16-JUL-19				
L2308511-5	BH10									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Physical Tests										
Conductivity		14.9		0.0030	mS/cm	12-JUL-19				
pH		7.37		0.10	pH units	12-JUL-19	6.5-8.5	6-9		
Anions and Nutrients										
Chloride (Cl)		5540	DLDS	10	mg/L	12-JUL-19			*790	
Cyanides										
Cyanide, Weak Acid Diss		<2.0		2.0	ug/L	16-JUL-19			66	
Dissolved Metals										
Dissolved Mercury Filtration Location		FIELD			No Unit	12-JUL-19				
Dissolved Metals Filtration Location		FIELD			No Unit	12-JUL-19				
Antimony (Sb)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	20		6	
Arsenic (As)-Dissolved		1.5	DLHC	1.0	ug/L	12-JUL-19	5		25	
Barium (Ba)-Dissolved		437	DLHC	1.0	ug/L	12-JUL-19			1000	
Beryllium (Be)-Dissolved		<1.0	DLHC	1.0	ug/L	12-JUL-19	11		4	
Boron (B)-Dissolved		110	DLHC	100	ug/L	12-JUL-19	200		5000	
Cadmium (Cd)-Dissolved		<0.050	DLHC	0.050	ug/L	12-JUL-19	0.1		2.7	
Chromium (Cr)-Dissolved		<5.0	DLHC	5.0	ug/L	12-JUL-19			50	
Cobalt (Co)-Dissolved		1.4	DLHC	1.0	ug/L	12-JUL-19	*0.9		3.8	
Copper (Cu)-Dissolved		3.5	DLHC	2.0	ug/L	12-JUL-19	*1		87	
Lead (Pb)-Dissolved		<0.50	DLHC	0.50	ug/L	12-JUL-19	1		10	
Mercury (Hg)-Dissolved		<0.010		0.010	ug/L	12-JUL-19	0.2		0.29	
Molybdenum (Mo)-Dissolved		3.05	DLHC	0.50	ug/L	12-JUL-19	40		70	
Nickel (Ni)-Dissolved		<5.0	DLHC	5.0	ug/L	12-JUL-19	25		100	
Selenium (Se)-Dissolved		<0.50	DLHC	0.50	ug/L	12-JUL-19	100		10	
Silver (Ag)-Dissolved		<0.50	DLHC	0.50	ug/L	12-JUL-19	**0.1		1.5	
Sodium (Na)-Dissolved		2990000	DLHC	5000	ug/L	12-JUL-19			*490000	
Thallium (Tl)-Dissolved		<0.10	DLHC	0.10	ug/L	12-JUL-19	0.3		2	
Uranium (U)-Dissolved		2.31	DLHC	0.10	ug/L	12-JUL-19	5		20	
Vanadium (V)-Dissolved		<5.0	DLHC	5.0	ug/L	12-JUL-19	6		6.2	
Zinc (Zn)-Dissolved		<10	DLHC	10	ug/L	12-JUL-19	20		1100	
Speciated Metals										
Chromium, Hexavalent		<0.50		0.50	ug/L	12-JUL-19	1		25	
Volatile Organic Compounds										

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-5	BH10									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Volatile Organic Compounds										
	Acetone	<30		30	ug/L	16-JUL-19			2700	
	Benzene	<0.50		0.50	ug/L	16-JUL-19	100		5	
	Bromodichloromethane	<2.0		2.0	ug/L	16-JUL-19	200		16	
	Bromoform	<5.0		5.0	ug/L	16-JUL-19	60		25	
	Bromomethane	<0.50		0.50	ug/L	16-JUL-19			0.89	
	Carbon tetrachloride	<0.20		0.20	ug/L	16-JUL-19			0.79	
	Chlorobenzene	<0.50		0.50	ug/L	16-JUL-19	15		30	
	Dibromochloromethane	<2.0		2.0	ug/L	16-JUL-19	40		25	
	Chloroform	<1.0		1.0	ug/L	16-JUL-19			2.4	
	1,2-Dibromoethane	<0.20		0.20	ug/L	16-JUL-19	5		0.2	
	1,2-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		3	
	1,3-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		59	
	1,4-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	4		1	
	Dichlorodifluoromethane	<2.0		2.0	ug/L	16-JUL-19			590	
	1,1-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	200		5	
	1,2-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	100		1.6	
	1,1-Dichloroethylene	0.88		0.50	ug/L	16-JUL-19	40		1.6	
	cis-1,2-Dichloroethylene	411		0.50	ug/L	16-JUL-19			*1.6	
	trans-1,2-Dichloroethylene	8.92		0.50	ug/L	16-JUL-19			*1.6	
	Methylene Chloride	<5.0		5.0	ug/L	16-JUL-19	100		50	
	1,2-Dichloropropane	<0.50		0.50	ug/L	16-JUL-19	0.7		5	
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19	7			
	1,3-Dichloropropene (cis & trans)	<0.50		0.50	ug/L	16-JUL-19			0.5	
	Ethylbenzene	<0.50		0.50	ug/L	16-JUL-19	8		2.4	
	n-Hexane	<0.50		0.50	ug/L	16-JUL-19			51	
	Methyl Ethyl Ketone	<20		20	ug/L	16-JUL-19	400		1800	
	Methyl Isobutyl Ketone	<20		20	ug/L	16-JUL-19			640	
	MTBE	<2.0		2.0	ug/L	16-JUL-19			15	
	Styrene	<0.50		0.50	ug/L	16-JUL-19	4		5.4	
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	20.0		1.1	
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	70		1	
	Tetrachloroethylene	113		0.50	ug/L	16-JUL-19	*50		*1.6	
	Toluene	<0.50		0.50	ug/L	16-JUL-19	0.8		24	
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	10		200	
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	800		4.7	
	Trichloroethylene	112		0.50	ug/L	16-JUL-19	*20		*1.6	
	Trichlorofluoromethane	<5.0		5.0	ug/L	16-JUL-19			150	
	Vinyl chloride	56.2		0.50	ug/L	16-JUL-19	600		*0.5	
	o-Xylene	<0.30		0.30	ug/L	16-JUL-19	40			
	m+p-Xylenes	<0.40		0.40	ug/L	16-JUL-19	2			
	Xylenes (Total)	<0.50		0.50	ug/L	16-JUL-19			300	
	Surrogate: 4-Bromofluorobenzene	94.1		70-130	%	16-JUL-19				
	Surrogate: 1,4-Difluorobenzene	98.0		70-130	%	16-JUL-19				
Hydrocarbons										
	F1 (C6-C10)	82		25	ug/L	16-JUL-19			750	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-5	BH10									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Hydrocarbons										
F1-BTEX		82		25	ug/L	16-JUL-19			750	
F2 (C10-C16)		<100		100	ug/L	12-JUL-19			150	
F2-Naphth		<100		100	ug/L	16-JUL-19				
F3 (C16-C34)		<250		250	ug/L	12-JUL-19			500	
F3-PAH		<250		250	ug/L	16-JUL-19				
F4 (C34-C50)		<250		250	ug/L	12-JUL-19			500	
Total Hydrocarbons (C6-C50)		<370		370	ug/L	16-JUL-19				
Chrom. to baseline at nC50		YES			No Unit	12-JUL-19				
Surrogate: 2-Bromobenzotrifluoride		82.6		60-140	%	12-JUL-19				
Surrogate: 3,4-Dichlorotoluene		73.1		60-140	%	16-JUL-19				
Polycyclic Aromatic Hydrocarbons										
Acenaphthene		<0.020		0.020	ug/L	16-JUL-19			4.1	
Acenaphthylene		<0.020		0.020	ug/L	16-JUL-19			1	
Anthracene		<0.020		0.020	ug/L	16-JUL-19	**0.0008		2.4	
Benzo(a)anthracene		<0.020		0.020	ug/L	16-JUL-19	**0.0004		1	
Benzo(a)pyrene		<0.010		0.010	ug/L	16-JUL-19			0.01	
Benzo(b)fluoranthene		<0.020		0.020	ug/L	16-JUL-19			0.1	
Benzo(g,h,i)perylene		<0.020		0.020	ug/L	16-JUL-19	**0.00002		0.2	
Benzo(k)fluoranthene		<0.020		0.020	ug/L	16-JUL-19	**0.0002		0.1	
Chrysene		<0.020		0.020	ug/L	16-JUL-19	**0.0001		0.1	
Dibenzo(ah)anthracene		<0.020		0.020	ug/L	16-JUL-19	**0.0002		0.2	
Fluoranthene		<0.020		0.020	ug/L	16-JUL-19	**0.008		0.41	
Fluorene		<0.020		0.020	ug/L	16-JUL-19	0.2		120	
Indeno(1,2,3-cd)pyrene		<0.020		0.020	ug/L	16-JUL-19			0.2	
1+2-Methylnaphthalenes		<0.028		0.028	ug/L	16-JUL-19			3.2	
1-Methylnaphthalene		<0.020		0.020	ug/L	16-JUL-19	2		3.2	
2-Methylnaphthalene		<0.020		0.020	ug/L	16-JUL-19	2		3.2	
Naphthalene		<0.050		0.050	ug/L	16-JUL-19	7		11	
Phenanthrene		<0.020		0.020	ug/L	16-JUL-19	0.03		1	
Pyrene		<0.020		0.020	ug/L	16-JUL-19			4.1	
Surrogate: d10-Acenaphthene		100.5		60-140	%	16-JUL-19				
Surrogate: d12-Chrysene		100.7		60-140	%	16-JUL-19				
Surrogate: d8-Naphthalene		103.9		60-140	%	16-JUL-19				
Surrogate: d10-Phenanthrene		101.2		60-140	%	16-JUL-19				
L2308511-6	BH14									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Physical Tests										
Conductivity		5.18		0.0030	mS/cm	12-JUL-19				
pH		7.64		0.10	pH units	12-JUL-19	6.5-8.5	6-9		
Anions and Nutrients										
Chloride (Cl)		1650	DLDS	5.0	mg/L	12-JUL-19			*790	
Cyanides										
Cyanide, Weak Acid Diss		<2.0		2.0	ug/L	16-JUL-19			66	
Dissolved Metals										

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-6	BH14									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Dissolved Metals										
	Dissolved Mercury Filtration Location	FIELD			No Unit	12-JUL-19				
	Dissolved Metals Filtration Location	FIELD			No Unit	12-JUL-19				
	Antimony (Sb)-Dissolved	<1.0	DLHC	1.0	ug/L	12-JUL-19	20		6	
	Arsenic (As)-Dissolved	<1.0	DLHC	1.0	ug/L	12-JUL-19	5		25	
	Barium (Ba)-Dissolved	180	DLHC	1.0	ug/L	12-JUL-19			1000	
	Beryllium (Be)-Dissolved	<1.0	DLHC	1.0	ug/L	12-JUL-19	11		4	
	Boron (B)-Dissolved	<100	DLHC	100	ug/L	12-JUL-19	200		5000	
	Cadmium (Cd)-Dissolved	0.098	DLHC	0.050	ug/L	12-JUL-19	0.1		2.7	
	Chromium (Cr)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19			50	
	Cobalt (Co)-Dissolved	1.2	DLHC	1.0	ug/L	12-JUL-19	*0.9		3.8	
	Copper (Cu)-Dissolved	4.2	DLHC	2.0	ug/L	12-JUL-19	*1		87	
	Lead (Pb)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	1		10	
	Mercury (Hg)-Dissolved	<0.010		0.010	ug/L	12-JUL-19	0.2		0.29	
	Molybdenum (Mo)-Dissolved	2.85	DLHC	0.50	ug/L	12-JUL-19	40		70	
	Nickel (Ni)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19	25		100	
	Selenium (Se)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	100		10	
	Silver (Ag)-Dissolved	<0.50	DLHC	0.50	ug/L	12-JUL-19	**0.1		1.5	
	Sodium (Na)-Dissolved	829000	DLHC	500	ug/L	12-JUL-19			*490000	
	Thallium (Tl)-Dissolved	<0.10	DLHC	0.10	ug/L	12-JUL-19	0.3		2	
	Uranium (U)-Dissolved	2.05	DLHC	0.10	ug/L	12-JUL-19	5		20	
	Vanadium (V)-Dissolved	<5.0	DLHC	5.0	ug/L	12-JUL-19	6		6.2	
	Zinc (Zn)-Dissolved	<10	DLHC	10	ug/L	12-JUL-19	20		1100	
Speciated Metals										
	Chromium, Hexavalent	<0.50		0.50	ug/L	12-JUL-19	1		25	
Volatile Organic Compounds										
	Acetone	<30		30	ug/L	16-JUL-19			2700	
	Benzene	<0.50		0.50	ug/L	16-JUL-19	100		5	
	Bromodichloromethane	<2.0		2.0	ug/L	16-JUL-19	200		16	
	Bromoform	<5.0		5.0	ug/L	16-JUL-19	60		25	
	Bromomethane	<0.50		0.50	ug/L	16-JUL-19			0.89	
	Carbon tetrachloride	<0.20		0.20	ug/L	16-JUL-19			0.79	
	Chlorobenzene	<0.50		0.50	ug/L	16-JUL-19	15		30	
	Dibromochloromethane	<2.0		2.0	ug/L	16-JUL-19	40		25	
	Chloroform	<1.0		1.0	ug/L	16-JUL-19			2.4	
	1,2-Dibromoethane	<0.20		0.20	ug/L	16-JUL-19	5		0.2	
	1,2-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		3	
	1,3-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	2.5		59	
	1,4-Dichlorobenzene	<0.50		0.50	ug/L	16-JUL-19	4		1	
	Dichlorodifluoromethane	<2.0		2.0	ug/L	16-JUL-19			590	
	1,1-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	200		5	
	1,2-Dichloroethane	<0.50		0.50	ug/L	16-JUL-19	100		1.6	
	1,1-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19	40		1.6	
	cis-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	trans-1,2-Dichloroethylene	<0.50		0.50	ug/L	16-JUL-19			1.6	
	Methylene Chloride	<5.0		5.0	ug/L	16-JUL-19	100		50	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-6	BH14									
Sampled By:	JV on 10-JUL-19									
Matrix:	WATER									
Volatile Organic Compounds										
	1,2-Dichloropropane	<0.50		0.50	ug/L	16-JUL-19	0.7		5	
	cis-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19				
	trans-1,3-Dichloropropene	<0.30		0.30	ug/L	16-JUL-19	7			
	1,3-Dichloropropene (cis & trans)	<0.50		0.50	ug/L	16-JUL-19			0.5	
	Ethylbenzene	<0.50		0.50	ug/L	16-JUL-19	8		2.4	
	n-Hexane	<0.50		0.50	ug/L	16-JUL-19			51	
	Methyl Ethyl Ketone	<20		20	ug/L	16-JUL-19	400		1800	
	Methyl Isobutyl Ketone	<20		20	ug/L	16-JUL-19			640	
	MTBE	<2.0		2.0	ug/L	16-JUL-19			15	
	Styrene	<0.50		0.50	ug/L	16-JUL-19	4		5.4	
	1,1,1,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	20.0		1.1	
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	16-JUL-19	70		1	
	Tetrachloroethylene	<0.50		0.50	ug/L	16-JUL-19	50		1.6	
	Toluene	<0.50		0.50	ug/L	16-JUL-19	0.8		24	
	1,1,1-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	10		200	
	1,1,2-Trichloroethane	<0.50		0.50	ug/L	16-JUL-19	800		4.7	
	Trichloroethylene	<0.50		0.50	ug/L	16-JUL-19	20		1.6	
	Trichlorofluoromethane	<5.0		5.0	ug/L	16-JUL-19			150	
	Vinyl chloride	<0.50		0.50	ug/L	16-JUL-19	600		0.5	
	o-Xylene	<0.30		0.30	ug/L	16-JUL-19	40			
	m+p-Xylenes	<0.40		0.40	ug/L	16-JUL-19	2			
	Xylenes (Total)	<0.50		0.50	ug/L	16-JUL-19			300	
	Surrogate: 4-Bromofluorobenzene	94.8		70-130	%	16-JUL-19				
	Surrogate: 1,4-Difluorobenzene	97.2		70-130	%	16-JUL-19				
Hydrocarbons										
	F1 (C6-C10)	<25		25	ug/L	16-JUL-19			750	
	F1-BTEX	<25		25	ug/L	16-JUL-19			750	
	F2 (C10-C16)	<100		100	ug/L	12-JUL-19			150	
	F2-Naphth	<100		100	ug/L	16-JUL-19				
	F3 (C16-C34)	<250		250	ug/L	12-JUL-19			500	
	F3-PAH	<250		250	ug/L	16-JUL-19				
	F4 (C34-C50)	<250		250	ug/L	12-JUL-19			500	
	Total Hydrocarbons (C6-C50)	<370		370	ug/L	16-JUL-19				
	Chrom. to baseline at nC50	YES			No Unit	12-JUL-19				
	Surrogate: 2-Bromobenzotrifluoride	87.8		60-140	%	12-JUL-19				
	Surrogate: 3,4-Dichlorotoluene	68.2		60-140	%	16-JUL-19				
Polycyclic Aromatic Hydrocarbons										
	Acenaphthene	<0.020		0.020	ug/L	16-JUL-19			4.1	
	Acenaphthylene	<0.020		0.020	ug/L	16-JUL-19			1	
	Anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.0008		2.4	
	Benzo(a)anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.0004		1	
	Benzo(a)pyrene	<0.010		0.010	ug/L	16-JUL-19			0.01	
	Benzo(b)fluoranthene	<0.020		0.020	ug/L	16-JUL-19			0.1	
	Benzo(g,h,i)perylene	<0.020		0.020	ug/L	16-JUL-19	**0.00002		0.2	
	Benzo(k)fluoranthene	<0.020		0.020	ug/L	16-JUL-19	**0.0002		0.1	
	Chrysene	<0.020		0.020	ug/L	16-JUL-19	**0.0001		0.1	

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse



ANALYTICAL GUIDELINE REPORT

L2308511 CONTD....

Page 17 of 20

18-JUL-19 14:18 (MT)

G19750-WATER

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte						#1	#2	#3	
L2308511-6	BH14									
Sampled By: JV on 10-JUL-19										
Matrix: WATER										
Polycyclic Aromatic Hydrocarbons										
	Dibenzo(ah)anthracene	<0.020		0.020	ug/L	16-JUL-19	**0.002		0.2	
	Fluoranthene	<0.020		0.020	ug/L	16-JUL-19	**0.008		0.41	
	Fluorene	<0.020		0.020	ug/L	16-JUL-19	0.2		120	
	Indeno(1,2,3-cd)pyrene	<0.020		0.020	ug/L	16-JUL-19			0.2	
	1+2-Methylnaphthalenes	<0.028		0.028	ug/L	16-JUL-19			3.2	
	1-Methylnaphthalene	<0.020		0.020	ug/L	16-JUL-19	2		3.2	
	2-Methylnaphthalene	<0.020		0.020	ug/L	16-JUL-19	2		3.2	
	Naphthalene	<0.050		0.050	ug/L	16-JUL-19	7		11	
	Phenanthrene	<0.020		0.020	ug/L	16-JUL-19	0.03		1	
	Pyrene	<0.020		0.020	ug/L	16-JUL-19			4.1	
	Surrogate: d10-Acenaphthene	97.4		60-140	%	16-JUL-19				
	Surrogate: d12-Chrysene	97.4		60-140	%	16-JUL-19				
	Surrogate: d8-Naphthalene	100.9		60-140	%	16-JUL-19				
	Surrogate: d10-Phenanthrene	100.1		60-140	%	16-JUL-19				

** Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.

* Analytical result for this parameter exceeds Guideline Limit listed on this report. Guideline Limits applied:

[Combined] - Ontario PWQO+Waterloo San+R153-T2-Water = [Suite] - ON-PWQO+WAT-STORM+R153-T2-WATER-C

#1: Ontario PWQO

#2: Waterloo Storm Sewer

#3: O.Reg. 153 Table 2 Water Coarse

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
CL-IC-N-WT	Water	Chloride by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CN-WAD-R511-WT	Water	Cyanide (WAD)-O.Reg 153/04	APHA 4500CN I-Weak acid Dist Colorimet
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Weak acid dissociable cyanide (WAD) is determined by undergoing a distillation procedure. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

CR-CR6-IC-R511-WT	Water	Hex Chrom-O.Reg 153/04 (July 2011)	EPA 7199
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This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 7199, published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution. Chromium (III) is calculated as the difference between the total chromium and the chromium (VI) results.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-R511-WT	Water	Conductivity-O.Reg 153/04 (July 2011)	APHA 2510 B
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Water samples can be measured directly by immersing the conductivity cell into the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510
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Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

F1-F4-511-CALC-WT	Water	F1-F4 Hydrocarbon Calculated Parameters	CCME CWS-PHC, Pub #1310, Dec 2001-L
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Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.

In samples where BTEX and F1 were analyzed, F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:

1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:

1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F1-HS-511-WT	Water	F1-O.Reg 153/04 (July 2011)	E3398/CCME TIER 1-HS
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Fraction F1 is determined by analyzing by headspace-GC/FID.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

Reference Information

F2-F4-511-WT Water F2-F4-O.Reg 153/04 (July 2011) EPA 3511/CCME Tier 1

Petroleum Hydrocarbons (F2-F4 fractions) are extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, 2001.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

HG-D-UG/L-CVAA-WT Water Diss. Mercury in Water by EPA 1631E (mod)
CVAAS (ug/L)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

MET-D-UG/L-MS-WT Water Diss. Metals in Water by ICPMS EPA 200.8
(ug/L)

The metal constituents of a non-acidified sample that pass through a membrane filter prior to ICP/MS analysis.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

METHYLNAPS-CALC-WT Water PAH-Calculated Parameters SW846 8270
PAH-511-WT Water PAH-O. Reg 153/04 (July 2011) SW846 3510/8270

Aqueous samples, fortified with surrogates, are extracted using liquid/liquid extraction technique. The sample extracts are concentrated and then analyzed using GC/MS. Results for benzo(b) fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

PH-WT Water pH APHA 4500 H-Electrode

Water samples are analyzed directly by a calibrated pH meter.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days

VOC-1,3-DCP-CALC-WT Water Regulation 153 VOCs SW8260B/SW8270C
VOC-511-HS-WT Water VOC by GCMS HS O.Reg SW846 8260
153/04 (July 2011)

Liquid samples are analyzed by headspace GC/MSD.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011), unless a subset of the Analytical Test Group (ATG) has been requested (the Protocol states that all analytes in an ATG must be reported).

XYLENES-SUM-CALC- Water Sum of Xylene Isomer CALCULATION
WT Concentrations

Total xylenes represents the sum of o-xylene and m&p-xylene.

*** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody numbers:	
17-726641	

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA		

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

mg/kg - milligrams per kilogram based on dry weight of sample

mg/kg ww - milligrams per kilogram based on wet weight of sample

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight

mg/L - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 2 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F1-HS-511-WT		Water						
Batch	R4712282							
WG3104915-4	DUP	WG3104915-3						
F1 (C6-C10)		<25	<25	RPD-NA	ug/L	N/A	30	16-JUL-19
WG3104915-1	LCS							
F1 (C6-C10)			99.8		%		80-120	16-JUL-19
WG3104915-2	MB							
F1 (C6-C10)			<25		ug/L		25	16-JUL-19
Surrogate: 3,4-Dichlorotoluene			96.9		%		60-140	16-JUL-19
WG3104915-5	MS	WG3104915-3						
F1 (C6-C10)			84.6		%		60-140	16-JUL-19
F2-F4-511-WT		Water						
Batch	R4709012							
WG3102906-2	LCS							
F2 (C10-C16)			89.1		%		70-130	12-JUL-19
F3 (C16-C34)			93.7		%		70-130	12-JUL-19
F4 (C34-C50)			88.1		%		70-130	12-JUL-19
WG3102906-1	MB							
F2 (C10-C16)			<100		ug/L		100	12-JUL-19
F3 (C16-C34)			<250		ug/L		250	12-JUL-19
F4 (C34-C50)			<250		ug/L		250	12-JUL-19
Surrogate: 2-Bromobenzotrifluoride			84.4		%		60-140	12-JUL-19
Batch	R4711858							
WG3102902-2	LCS							
F2 (C10-C16)			95.0		%		70-130	12-JUL-19
F3 (C16-C34)			100.7		%		70-130	12-JUL-19
F4 (C34-C50)			94.1		%		70-130	12-JUL-19
WG3102902-1	MB							
F2 (C10-C16)			<100		ug/L		100	12-JUL-19
F3 (C16-C34)			<250		ug/L		250	12-JUL-19
F4 (C34-C50)			<250		ug/L		250	12-JUL-19
Surrogate: 2-Bromobenzotrifluoride			84.4		%		60-140	12-JUL-19
HG-D-UG/L-CVAA-WT		Water						
Batch	R4708879							
WG3103322-4	DUP	WG3103322-3						
Mercury (Hg)-Dissolved		<0.010	<0.010	RPD-NA	ug/L	N/A	20	12-JUL-19
WG3103322-2	LCS							
Mercury (Hg)-Dissolved			99.4		%		80-120	12-JUL-19

Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 3 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-UG/L-CVAA-WT Water								
Batch	R4708879							
WG3103322-1 MB								
Mercury (Hg)-Dissolved			<0.010		ug/L		0.01	12-JUL-19
WG3103322-6 MS		WG3103322-5						
Mercury (Hg)-Dissolved			100.9		%		70-130	12-JUL-19
MET-D-UG/L-MS-WT Water								
Batch	R4708820							
WG3103015-4 DUP		WG3103015-3						
Antimony (Sb)-Dissolved		<1.0	<1.0	RPD-NA	ug/L	N/A	20	12-JUL-19
Arsenic (As)-Dissolved		1.7	1.7		ug/L	0.0	20	12-JUL-19
Barium (Ba)-Dissolved		302	303		ug/L	0.3	20	12-JUL-19
Beryllium (Be)-Dissolved		<1.0	<1.0	RPD-NA	ug/L	N/A	20	12-JUL-19
Boron (B)-Dissolved		<100	<100	RPD-NA	ug/L	N/A	20	12-JUL-19
Cadmium (Cd)-Dissolved		<0.050	<0.050	RPD-NA	ug/L	N/A	20	12-JUL-19
Chromium (Cr)-Dissolved		<5.0	<5.0	RPD-NA	ug/L	N/A	20	12-JUL-19
Cobalt (Co)-Dissolved		1.3	1.2		ug/L	3.8	20	12-JUL-19
Copper (Cu)-Dissolved		<2.0	<2.0	RPD-NA	ug/L	N/A	20	12-JUL-19
Lead (Pb)-Dissolved		<0.50	<0.50	RPD-NA	ug/L	N/A	20	12-JUL-19
Molybdenum (Mo)-Dissolved		28.0	28.2		ug/L	0.6	20	12-JUL-19
Nickel (Ni)-Dissolved		5.8	5.8		ug/L	0.6	20	12-JUL-19
Selenium (Se)-Dissolved		<0.50	<0.50	RPD-NA	ug/L	N/A	20	12-JUL-19
Silver (Ag)-Dissolved		<0.50	<0.50	RPD-NA	ug/L	N/A	20	12-JUL-19
Sodium (Na)-Dissolved		246000	249000		ug/L	1.0	20	12-JUL-19
Thallium (Tl)-Dissolved		<0.10	<0.10	RPD-NA	ug/L	N/A	20	12-JUL-19
Uranium (U)-Dissolved		1.60	1.63		ug/L	1.5	20	12-JUL-19
Vanadium (V)-Dissolved		<5.0	<5.0	RPD-NA	ug/L	N/A	20	12-JUL-19
Zinc (Zn)-Dissolved		<10	<10	RPD-NA	ug/L	N/A	20	12-JUL-19
WG3103015-2 LCS								
Antimony (Sb)-Dissolved			100.2		%		80-120	12-JUL-19
Arsenic (As)-Dissolved			99.0		%		80-120	12-JUL-19
Barium (Ba)-Dissolved			100.6		%		80-120	12-JUL-19
Beryllium (Be)-Dissolved			98.5		%		80-120	12-JUL-19
Boron (B)-Dissolved			95.7		%		80-120	12-JUL-19
Cadmium (Cd)-Dissolved			96.7		%		80-120	12-JUL-19
Chromium (Cr)-Dissolved			100.2		%		80-120	12-JUL-19



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 4 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-UG/L-MS-WT		Water						
Batch	R4708820							
WG3103015-2	LCS							
Cobalt (Co)-Dissolved			99.3		%		80-120	12-JUL-19
Copper (Cu)-Dissolved			98.9		%		80-120	12-JUL-19
Lead (Pb)-Dissolved			101.1		%		80-120	12-JUL-19
Molybdenum (Mo)-Dissolved			102.4		%		80-120	12-JUL-19
Nickel (Ni)-Dissolved			99.0		%		80-120	12-JUL-19
Selenium (Se)-Dissolved			96.2		%		80-120	12-JUL-19
Silver (Ag)-Dissolved			103.7		%		80-120	12-JUL-19
Sodium (Na)-Dissolved			103.0		%		80-120	12-JUL-19
Thallium (Tl)-Dissolved			100.4		%		80-120	12-JUL-19
Uranium (U)-Dissolved			101.3		%		80-120	12-JUL-19
Vanadium (V)-Dissolved			101.5		%		80-120	12-JUL-19
Zinc (Zn)-Dissolved			97.9		%		80-120	12-JUL-19
WG3103015-1	MB							
Antimony (Sb)-Dissolved			<0.10		ug/L		0.1	12-JUL-19
Arsenic (As)-Dissolved			<0.10		ug/L		0.1	12-JUL-19
Barium (Ba)-Dissolved			<0.10		ug/L		0.1	12-JUL-19
Beryllium (Be)-Dissolved			<0.10		ug/L		0.1	12-JUL-19
Boron (B)-Dissolved			<10		ug/L		10	12-JUL-19
Cadmium (Cd)-Dissolved			<0.0050		ug/L		0.005	12-JUL-19
Chromium (Cr)-Dissolved			<0.50		ug/L		0.5	12-JUL-19
Cobalt (Co)-Dissolved			<0.10		ug/L		0.1	12-JUL-19
Copper (Cu)-Dissolved			<0.20		ug/L		0.2	12-JUL-19
Lead (Pb)-Dissolved			<0.050		ug/L		0.05	12-JUL-19
Molybdenum (Mo)-Dissolved			<0.050		ug/L		0.05	12-JUL-19
Nickel (Ni)-Dissolved			<0.50		ug/L		0.5	12-JUL-19
Selenium (Se)-Dissolved			<0.050		ug/L		0.05	12-JUL-19
Silver (Ag)-Dissolved			<0.050		ug/L		0.05	12-JUL-19
Sodium (Na)-Dissolved			<50		ug/L		50	12-JUL-19
Thallium (Tl)-Dissolved			<0.010		ug/L		0.01	12-JUL-19
Uranium (U)-Dissolved			<0.010		ug/L		0.01	12-JUL-19
Vanadium (V)-Dissolved			<0.50		ug/L		0.5	12-JUL-19
Zinc (Zn)-Dissolved			<1.0		ug/L		1	12-JUL-19
WG3103015-5	MS	WG3103015-6						
Antimony (Sb)-Dissolved			91.7		%		70-130	12-JUL-19

Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 5 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-UG/L-MS-WT		Water						
Batch	R4708820							
WG3103015-5 MS		WG3103015-6						
Arsenic (As)-Dissolved			94.1		%		70-130	12-JUL-19
Barium (Ba)-Dissolved			N/A	MS-B	%		-	12-JUL-19
Beryllium (Be)-Dissolved			93.7		%		70-130	12-JUL-19
Cadmium (Cd)-Dissolved			88.7		%		70-130	12-JUL-19
Chromium (Cr)-Dissolved			89.1		%		70-130	12-JUL-19
Cobalt (Co)-Dissolved			78.0		%		70-130	12-JUL-19
Lead (Pb)-Dissolved			88.3		%		70-130	12-JUL-19
Molybdenum (Mo)-Dissolved			80.9		%		70-130	12-JUL-19
Nickel (Ni)-Dissolved			77.4		%		70-130	12-JUL-19
Selenium (Se)-Dissolved			90.4		%		70-130	12-JUL-19
Silver (Ag)-Dissolved			91.8		%		70-130	12-JUL-19
Sodium (Na)-Dissolved			N/A	MS-B	%		-	12-JUL-19
Thallium (Tl)-Dissolved			89.4		%		70-130	12-JUL-19
Uranium (U)-Dissolved			N/A	MS-B	%		-	12-JUL-19
Vanadium (V)-Dissolved			95.6		%		70-130	12-JUL-19
PAH-511-WT		Water						
Batch	R4712426							
WG3102906-2 LCS								
1-Methylnaphthalene			105.0		%		50-140	16-JUL-19
2-Methylnaphthalene			99.4		%		50-140	16-JUL-19
Acenaphthene			113.7		%		50-140	16-JUL-19
Acenaphthylene			107.4		%		50-140	16-JUL-19
Anthracene			116.2		%		50-140	16-JUL-19
Benzo(a)anthracene			124.2		%		50-140	16-JUL-19
Benzo(a)pyrene			115.2		%		50-140	16-JUL-19
Benzo(b)fluoranthene			111.9		%		50-140	16-JUL-19
Benzo(g,h,i)perylene			110.9		%		50-140	16-JUL-19
Benzo(k)fluoranthene			117.8		%		50-140	16-JUL-19
Chrysene			125.7		%		50-140	16-JUL-19
Dibenzo(ah)anthracene			109.5		%		50-140	16-JUL-19
Fluoranthene			112.2		%		50-140	16-JUL-19
Fluorene			110.8		%		50-140	16-JUL-19
Indeno(1,2,3-cd)pyrene			114.3		%		50-140	16-JUL-19
Naphthalene			107.1		%		50-140	



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 6 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT		Water						
Batch	R4712426							
WG3102906-2	LCS							
Naphthalene			107.1		%		50-140	16-JUL-19
Phenanthrene			116.6		%		50-140	16-JUL-19
Pyrene			114.2		%		50-140	16-JUL-19
WG3102906-1	MB							
1-Methylnaphthalene			<0.020		ug/L		0.02	16-JUL-19
2-Methylnaphthalene			<0.020		ug/L		0.02	16-JUL-19
Acenaphthene			<0.020		ug/L		0.02	16-JUL-19
Acenaphthylene			<0.020		ug/L		0.02	16-JUL-19
Anthracene			<0.020		ug/L		0.02	16-JUL-19
Benzo(a)anthracene			<0.020		ug/L		0.02	16-JUL-19
Benzo(a)pyrene			<0.010		ug/L		0.01	16-JUL-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	16-JUL-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	16-JUL-19
Benzo(k)fluoranthene			<0.020		ug/L		0.02	16-JUL-19
Chrysene			<0.020		ug/L		0.02	16-JUL-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	16-JUL-19
Fluoranthene			<0.020		ug/L		0.02	16-JUL-19
Fluorene			<0.020		ug/L		0.02	16-JUL-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	16-JUL-19
Naphthalene			<0.050		ug/L		0.05	16-JUL-19
Phenanthrene			<0.020		ug/L		0.02	16-JUL-19
Pyrene			<0.020		ug/L		0.02	16-JUL-19
Surrogate: d8-Naphthalene			107.7		%		60-140	16-JUL-19
Surrogate: d10-Phenanthrene			98.3		%		60-140	16-JUL-19
Surrogate: d12-Chrysene			103.6		%		60-140	16-JUL-19
Surrogate: d10-Acenaphthene			103.8		%		60-140	16-JUL-19
Batch	R4713235							
WG3102902-2	LCS							
1-Methylnaphthalene			110.2		%		50-140	17-JUL-19
2-Methylnaphthalene			106.1		%		50-140	17-JUL-19
Acenaphthene			119.3		%		50-140	17-JUL-19
Acenaphthylene			112.7		%		50-140	17-JUL-19
Anthracene			116.8		%		50-140	17-JUL-19
Benzo(a)anthracene			133.6		%		50-140	17-JUL-19

Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 7 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT		Water						
Batch	R4713235							
WG3102902-2	LCS							
Benzo(a)pyrene			117.5		%		50-140	17-JUL-19
Benzo(b)fluoranthene			117.0		%		50-140	17-JUL-19
Benzo(g,h,i)perylene			120.0		%		50-140	17-JUL-19
Benzo(k)fluoranthene			120.1		%		50-140	17-JUL-19
Chrysene			125.5		%		50-140	17-JUL-19
Dibenzo(ah)anthracene			116.6		%		50-140	17-JUL-19
Fluoranthene			115.3		%		50-140	17-JUL-19
Fluorene			111.9		%		50-140	17-JUL-19
Indeno(1,2,3-cd)pyrene			123.0		%		50-140	17-JUL-19
Naphthalene			112.3		%		50-140	17-JUL-19
Phenanthrene			119.3		%		50-140	17-JUL-19
Pyrene			119.9		%		50-140	17-JUL-19
WG3102902-1	MB							
1-Methylnaphthalene			<0.020		ug/L		0.02	17-JUL-19
2-Methylnaphthalene			<0.020		ug/L		0.02	17-JUL-19
Acenaphthene			<0.020		ug/L		0.02	17-JUL-19
Acenaphthylene			<0.020		ug/L		0.02	17-JUL-19
Anthracene			<0.020		ug/L		0.02	17-JUL-19
Benzo(a)anthracene			<0.020		ug/L		0.02	17-JUL-19
Benzo(a)pyrene			<0.010		ug/L		0.01	17-JUL-19
Benzo(b)fluoranthene			<0.020		ug/L		0.02	17-JUL-19
Benzo(g,h,i)perylene			<0.020		ug/L		0.02	17-JUL-19
Benzo(k)fluoranthene			<0.020		ug/L		0.02	17-JUL-19
Chrysene			<0.020		ug/L		0.02	17-JUL-19
Dibenzo(ah)anthracene			<0.020		ug/L		0.02	17-JUL-19
Fluoranthene			<0.020		ug/L		0.02	17-JUL-19
Fluorene			<0.020		ug/L		0.02	17-JUL-19
Indeno(1,2,3-cd)pyrene			<0.020		ug/L		0.02	17-JUL-19
Naphthalene			<0.050		ug/L		0.05	17-JUL-19
Phenanthrene			<0.020		ug/L		0.02	17-JUL-19
Pyrene			<0.020		ug/L		0.02	17-JUL-19
Surrogate: d8-Naphthalene			117.1		%		60-140	17-JUL-19
Surrogate: d10-Phenanthrene			112.6		%		60-140	17-JUL-19
Surrogate: d12-Chrysene			116.8		%		60-140	17-JUL-19



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 8 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-511-WT								
Water								
Batch	R4713235							
WG3102902-1 MB								
Surrogate: d10-Acenaphthene			114.8		%		60-140	17-JUL-19
PH-WT								
Water								
Batch	R4709509							
WG3103281-4 DUP		WG3103281-3						
pH		7.62	7.64	J	pH units	0.02	0.2	12-JUL-19
WG3103281-2 LCS								
pH			7.03		pH units		6.9-7.1	12-JUL-19
VOC-511-HS-WT								
Water								
Batch	R4712282							
WG3104915-4 DUP		WG3104915-3						
1,1,1,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,1,1-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,1,2-Trichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,1-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,1-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ug/L	N/A	30	16-JUL-19
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,2-Dichloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,2-Dichloropropane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,3-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Acetone		<30	<30	RPD-NA	ug/L	N/A	30	16-JUL-19
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Bromodichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	16-JUL-19
Bromoform		<5.0	<5.0	RPD-NA	ug/L	N/A	30	16-JUL-19
Bromomethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Carbon tetrachloride		<0.20	<0.20	RPD-NA	ug/L	N/A	30	16-JUL-19
Chlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	16-JUL-19
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
cis-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	16-JUL-19
Dibromochloromethane		<2.0	<2.0		ug/L			16-JUL-19



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 9 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4712282							
WG3104915-4 DUP		WG3104915-3						
Dibromochloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	16-JUL-19
Dichlorodifluoromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	16-JUL-19
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
n-Hexane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	16-JUL-19
Methyl Ethyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	16-JUL-19
Methyl Isobutyl Ketone		<20	<20	RPD-NA	ug/L	N/A	30	16-JUL-19
Methylene Chloride		<5.0	<5.0	RPD-NA	ug/L	N/A	30	16-JUL-19
MTBE		<2.0	<2.0	RPD-NA	ug/L	N/A	30	16-JUL-19
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	16-JUL-19
Styrene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Toluene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
trans-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	16-JUL-19
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
Trichlorofluoromethane		<5.0	<5.0	RPD-NA	ug/L	N/A	30	16-JUL-19
Vinyl chloride		<0.50	<0.50	RPD-NA	ug/L	N/A	30	16-JUL-19
WG3104915-1 LCS								
1,1,1,2-Tetrachloroethane			106.4		%		70-130	16-JUL-19
1,1,2,2-Tetrachloroethane			101.3		%		70-130	16-JUL-19
1,1,1-Trichloroethane			104.4		%		70-130	16-JUL-19
1,1,2-Trichloroethane			102.0		%		70-130	16-JUL-19
1,1-Dichloroethane			109.0		%		70-130	16-JUL-19
1,1-Dichloroethylene			104.2		%		70-130	16-JUL-19
1,2-Dibromoethane			102.0		%		70-130	16-JUL-19
1,2-Dichlorobenzene			96.9		%		70-130	16-JUL-19
1,2-Dichloroethane			101.2		%		70-130	16-JUL-19
1,2-Dichloropropane			100.7		%		70-130	16-JUL-19
1,3-Dichlorobenzene			103.1		%		70-130	16-JUL-19
1,4-Dichlorobenzene			95.9		%		70-130	16-JUL-19
Acetone			106.3		%		60-140	16-JUL-19
Benzene			108.3		%		70-130	16-JUL-19



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 10 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4712282							
WG3104915-1	LCS							
Bromodichloromethane			113.4		%		70-130	16-JUL-19
Bromoform			104.1		%		70-130	16-JUL-19
Bromomethane			101.2		%		60-140	16-JUL-19
Carbon tetrachloride			107.1		%		70-130	16-JUL-19
Chlorobenzene			106.4		%		70-130	16-JUL-19
Chloroform			99.2		%		70-130	16-JUL-19
cis-1,2-Dichloroethylene			95.3		%		70-130	16-JUL-19
cis-1,3-Dichloropropene			105.9		%		70-130	16-JUL-19
Dibromochloromethane			111.3		%		70-130	16-JUL-19
Dichlorodifluoromethane			74.8		%		50-140	16-JUL-19
Ethylbenzene			105.1		%		70-130	16-JUL-19
n-Hexane			103.6		%		70-130	16-JUL-19
m+p-Xylenes			104.7		%		70-130	16-JUL-19
Methyl Ethyl Ketone			100.4		%		60-140	16-JUL-19
Methyl Isobutyl Ketone			102.2		%		60-140	16-JUL-19
Methylene Chloride			98.1		%		70-130	16-JUL-19
MTBE			104.7		%		70-130	16-JUL-19
o-Xylene			104.4		%		70-130	16-JUL-19
Styrene			107.4		%		70-130	16-JUL-19
Tetrachloroethylene			105.3		%		70-130	16-JUL-19
Toluene			107.2		%		70-130	16-JUL-19
trans-1,2-Dichloroethylene			104.8		%		70-130	16-JUL-19
trans-1,3-Dichloropropene			100.9		%		70-130	16-JUL-19
Trichloroethylene			105.3		%		70-130	16-JUL-19
Trichlorofluoromethane			108.1		%		60-140	16-JUL-19
Vinyl chloride			98.6		%		60-140	16-JUL-19
WG3104915-2	MB							
1,1,1,2-Tetrachloroethane			<0.50		ug/L		0.5	16-JUL-19
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	16-JUL-19
1,1,1-Trichloroethane			<0.50		ug/L		0.5	16-JUL-19
1,1,2-Trichloroethane			<0.50		ug/L		0.5	16-JUL-19
1,1-Dichloroethane			<0.50		ug/L		0.5	16-JUL-19
1,1-Dichloroethylene			<0.50		ug/L		0.5	16-JUL-19
1,2-Dibromoethane			<0.20		ug/L		0.2	16-JUL-19

Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 11 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4712282							
WG3104915-2	MB							
1,2-Dichlorobenzene			<0.50		ug/L		0.5	16-JUL-19
1,2-Dichloroethane			<0.50		ug/L		0.5	16-JUL-19
1,2-Dichloropropane			<0.50		ug/L		0.5	16-JUL-19
1,3-Dichlorobenzene			<0.50		ug/L		0.5	16-JUL-19
1,4-Dichlorobenzene			<0.50		ug/L		0.5	16-JUL-19
Acetone			<30		ug/L		30	16-JUL-19
Benzene			<0.50		ug/L		0.5	16-JUL-19
Bromodichloromethane			<2.0		ug/L		2	16-JUL-19
Bromoform			<5.0		ug/L		5	16-JUL-19
Bromomethane			<0.50		ug/L		0.5	16-JUL-19
Carbon tetrachloride			<0.20		ug/L		0.2	16-JUL-19
Chlorobenzene			<0.50		ug/L		0.5	16-JUL-19
Chloroform			<1.0		ug/L		1	16-JUL-19
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	16-JUL-19
cis-1,3-Dichloropropene			<0.30		ug/L		0.3	16-JUL-19
Dibromochloromethane			<2.0		ug/L		2	16-JUL-19
Dichlorodifluoromethane			<2.0		ug/L		2	16-JUL-19
Ethylbenzene			<0.50		ug/L		0.5	16-JUL-19
n-Hexane			<0.50		ug/L		0.5	16-JUL-19
m+p-Xylenes			<0.40		ug/L		0.4	16-JUL-19
Methyl Ethyl Ketone			<20		ug/L		20	16-JUL-19
Methyl Isobutyl Ketone			<20		ug/L		20	16-JUL-19
Methylene Chloride			<5.0		ug/L		5	16-JUL-19
MTBE			<2.0		ug/L		2	16-JUL-19
o-Xylene			<0.30		ug/L		0.3	16-JUL-19
Styrene			<0.50		ug/L		0.5	16-JUL-19
Tetrachloroethylene			<0.50		ug/L		0.5	16-JUL-19
Toluene			<0.50		ug/L		0.5	16-JUL-19
trans-1,2-Dichloroethylene			<0.50		ug/L		0.5	16-JUL-19
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	16-JUL-19
Trichloroethylene			<0.50		ug/L		0.5	16-JUL-19
Trichlorofluoromethane			<5.0		ug/L		5	16-JUL-19
Vinyl chloride			<0.50		ug/L		0.5	16-JUL-19



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 12 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1

Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT		Water						
Batch	R4712282							
WG3104915-2		MB						
Surrogate: 1,4-Difluorobenzene			97.7		%		70-130	16-JUL-19
Surrogate: 4-Bromofluorobenzene			96.8		%		70-130	16-JUL-19
WG3104915-5		MS	WG3104915-3					
1,1,1,2-Tetrachloroethane			107.3		%		50-140	16-JUL-19
1,1,2,2-Tetrachloroethane			98.6		%		50-140	16-JUL-19
1,1,1-Trichloroethane			107.6		%		50-140	16-JUL-19
1,1,2-Trichloroethane			100.8		%		50-140	16-JUL-19
1,1-Dichloroethane			111.7		%		50-140	16-JUL-19
1,1-Dichloroethylene			104.9		%		50-140	16-JUL-19
1,2-Dibromoethane			99.0		%		50-140	16-JUL-19
1,2-Dichlorobenzene			96.9		%		50-140	16-JUL-19
1,2-Dichloroethane			100.8		%		50-140	16-JUL-19
1,2-Dichloropropane			102.0		%		50-140	16-JUL-19
1,3-Dichlorobenzene			102.9		%		50-140	16-JUL-19
1,4-Dichlorobenzene			94.8		%		50-140	16-JUL-19
Acetone			104.2		%		50-140	16-JUL-19
Benzene			109.4		%		50-140	16-JUL-19
Bromodichloromethane			114.7		%		50-140	16-JUL-19
Bromoform			101.6		%		50-140	16-JUL-19
Bromomethane			99.4		%		50-140	16-JUL-19
Carbon tetrachloride			110.1		%		50-140	16-JUL-19
Chlorobenzene			105.9		%		50-140	16-JUL-19
Chloroform			101.1		%		50-140	16-JUL-19
cis-1,2-Dichloroethylene			95.6		%		50-140	16-JUL-19
cis-1,3-Dichloropropene			104.7		%		50-140	16-JUL-19
Dibromochloromethane			110.2		%		50-140	16-JUL-19
Dichlorodifluoromethane			68.8		%		50-140	16-JUL-19
Ethylbenzene			104.5		%		50-140	16-JUL-19
n-Hexane			103.3		%		50-140	16-JUL-19
m+p-Xylenes			104.3		%		50-140	16-JUL-19
Methyl Ethyl Ketone			95.1		%		50-140	16-JUL-19
Methyl Isobutyl Ketone			97.2		%		50-140	16-JUL-19
Methylene Chloride			97.6		%		50-140	16-JUL-19
MTBE			104.8		%		50-140	16-JUL-19



Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Page 13 of 14

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1
Contact: JOE VANDERZALM

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-511-HS-WT	Water							
Batch	R4712282							
WG3104915-5	MS	WG3104915-3						
o-Xylene			103.5		%		50-140	16-JUL-19
Styrene			104.3		%		50-140	16-JUL-19
Tetrachloroethylene			104.6		%		50-140	16-JUL-19
Toluene			106.6		%		50-140	16-JUL-19
trans-1,2-Dichloroethylene			103.5		%		50-140	16-JUL-19
trans-1,3-Dichloropropene			97.6		%		50-140	16-JUL-19
Trichloroethylene			105.4		%		50-140	16-JUL-19
Trichlorofluoromethane			109.3		%		50-140	16-JUL-19
Vinyl chloride			95.6		%		50-140	16-JUL-19

Quality Control Report

Workorder: L2308511

Report Date: 18-JUL-19

Client: CHUNG AND VANDER DOELEN
311 VICTORIA ST. N.
KITCHENER ON N2H 5E1
Contact: JOE VANDERZALM

Page 14 of 14

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

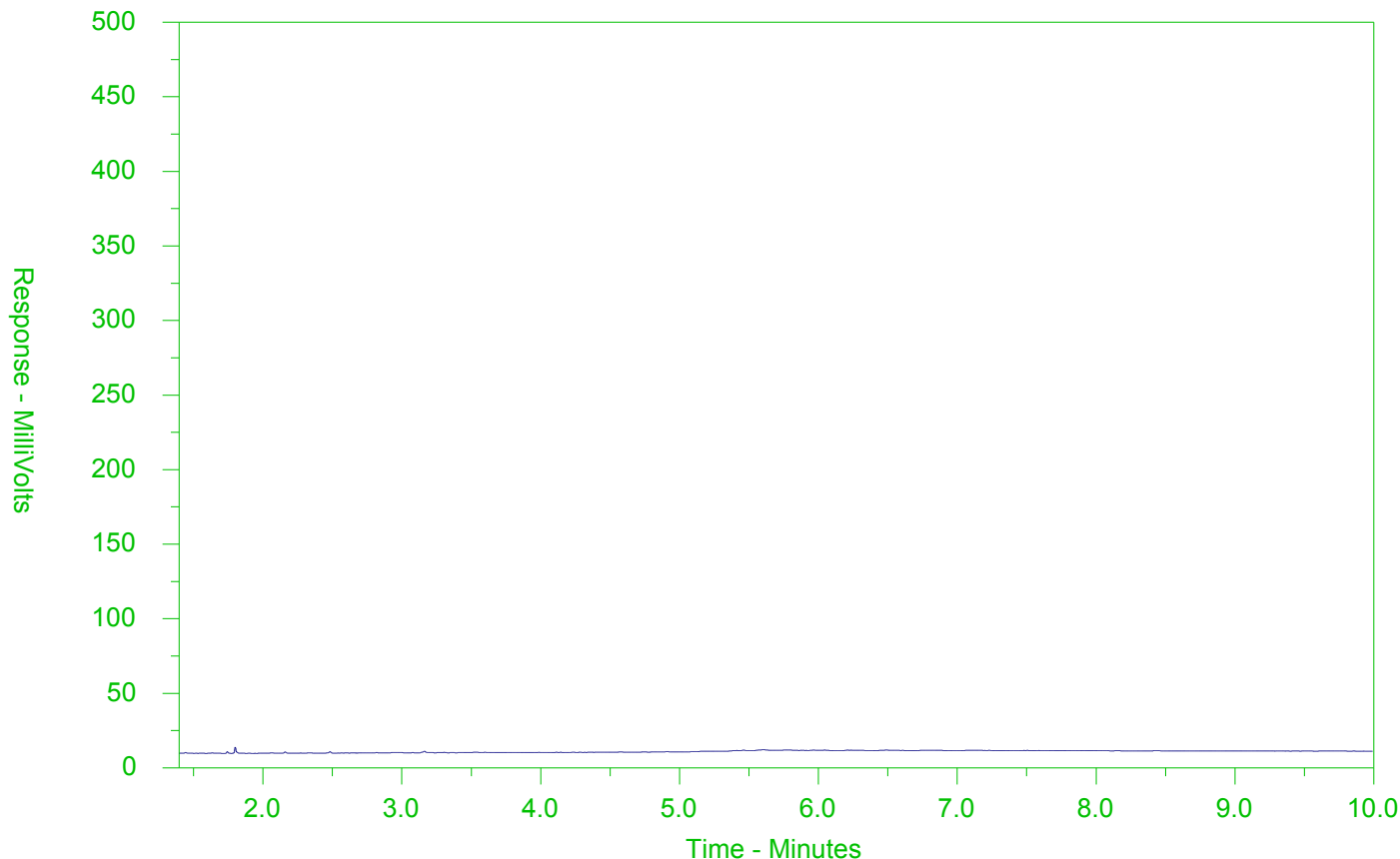
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2308511-1
Client Sample ID: BH3



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

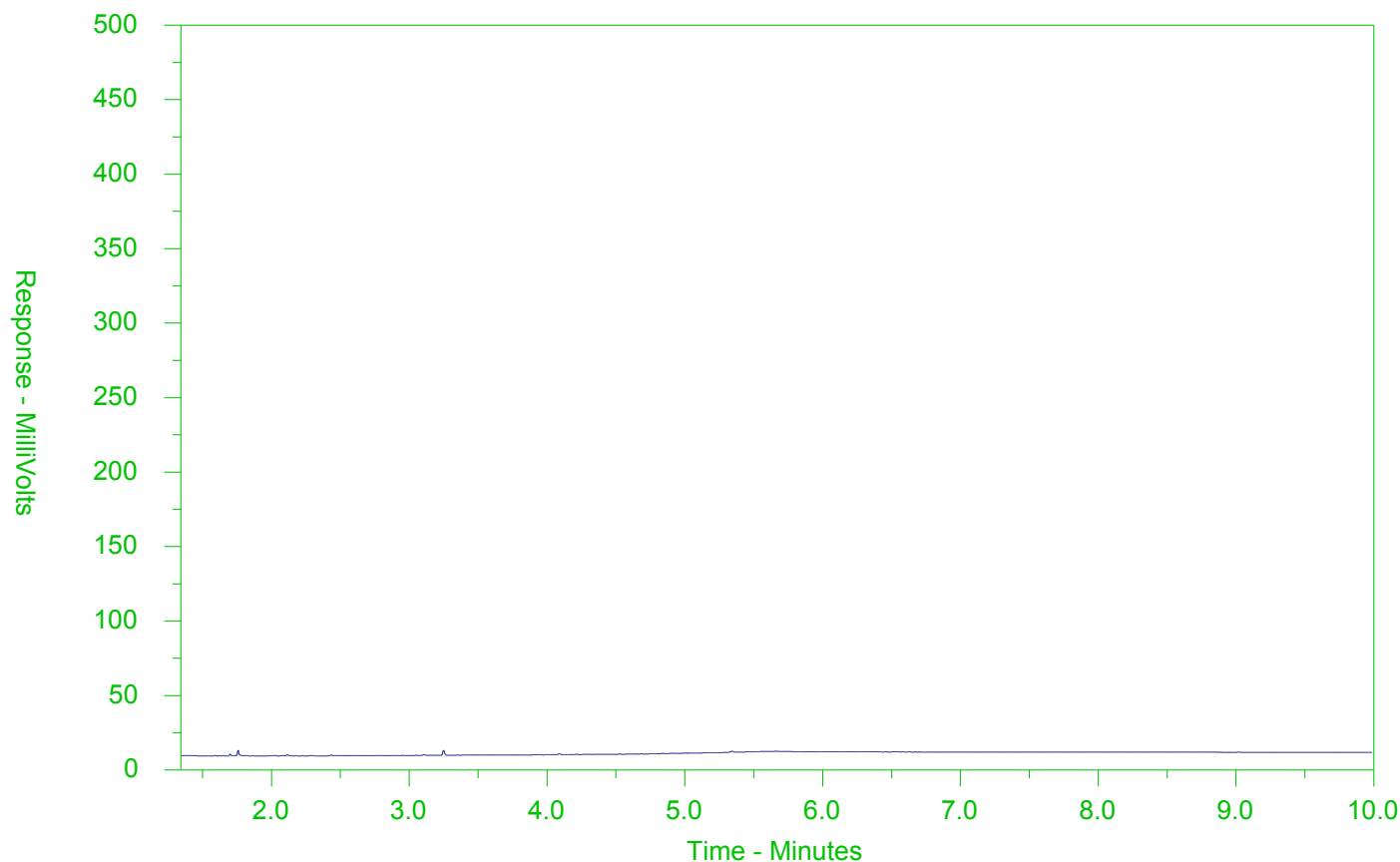
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2308511-2
Client Sample ID: BH6



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

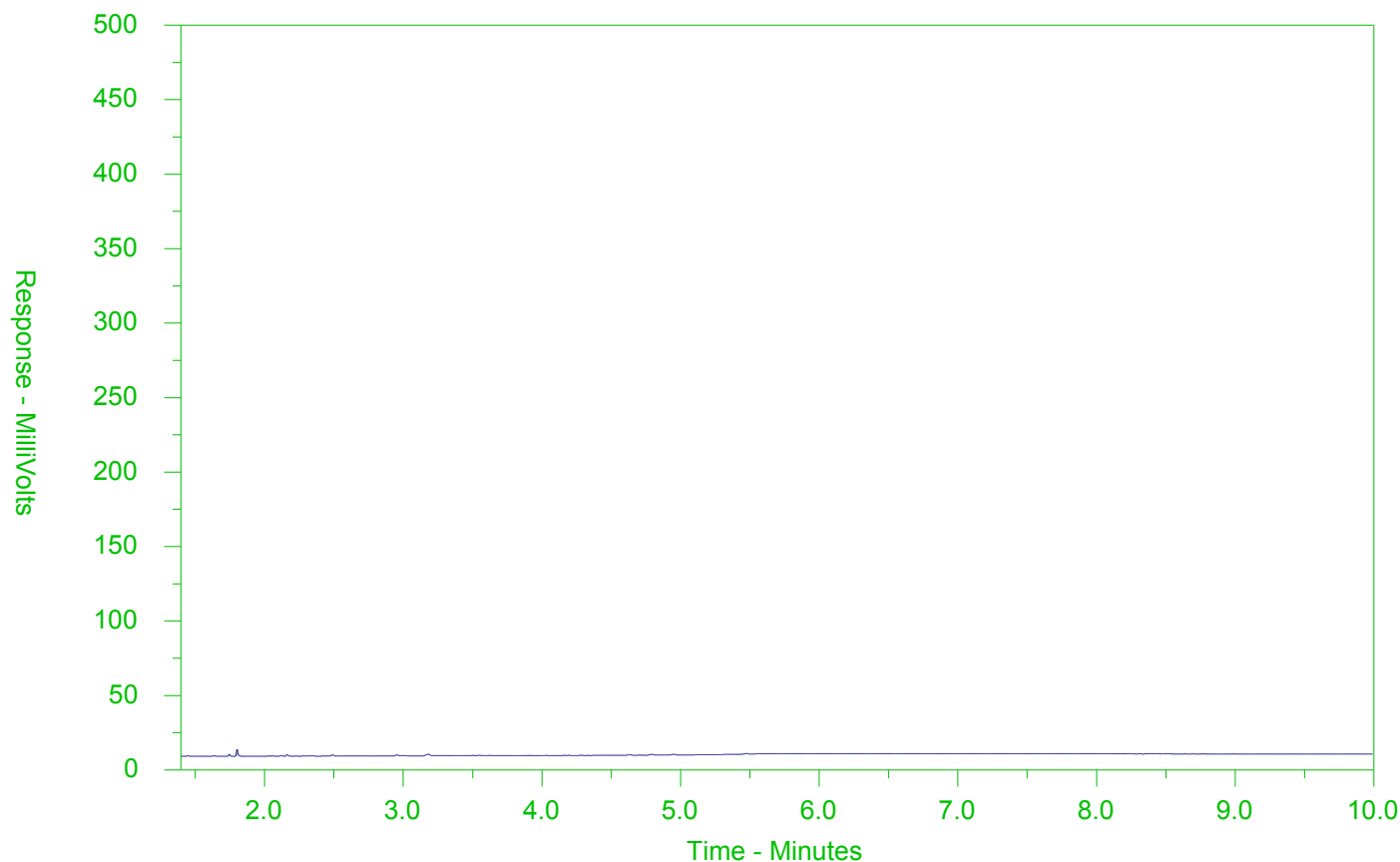
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2308511-3
Client Sample ID: BH8



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

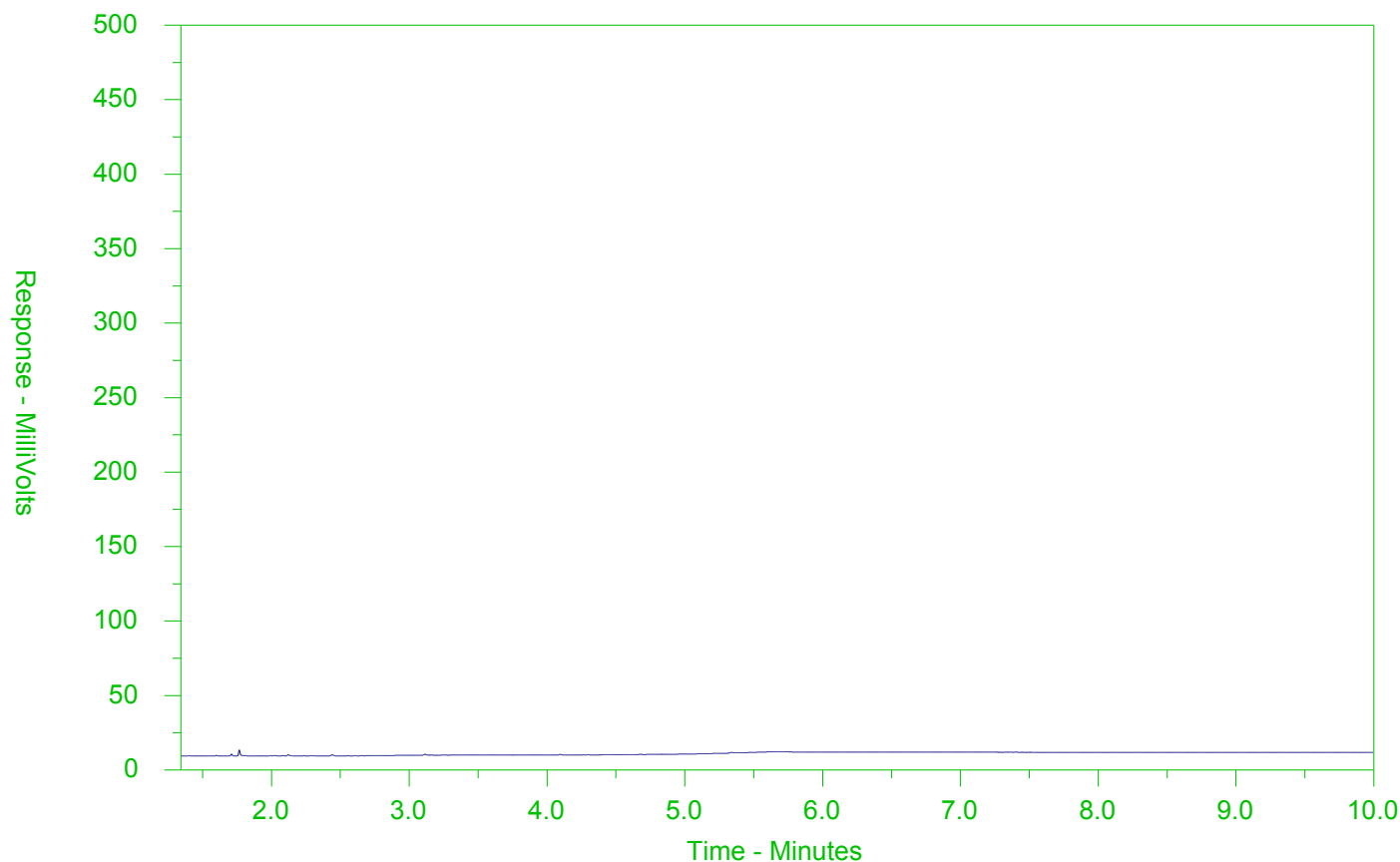
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2308511-4
Client Sample ID: BH9



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

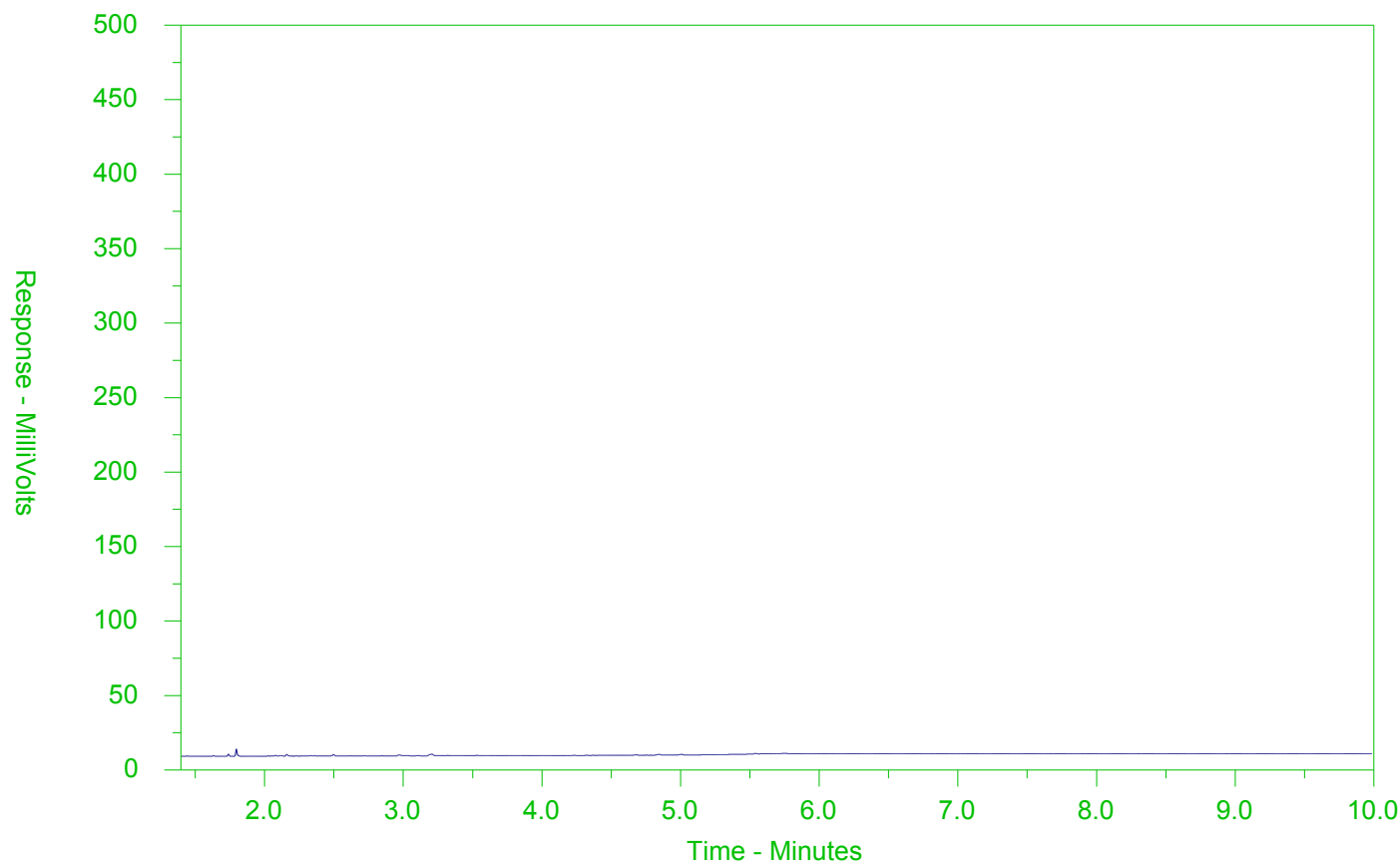
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2308511-5
Client Sample ID: BH10



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

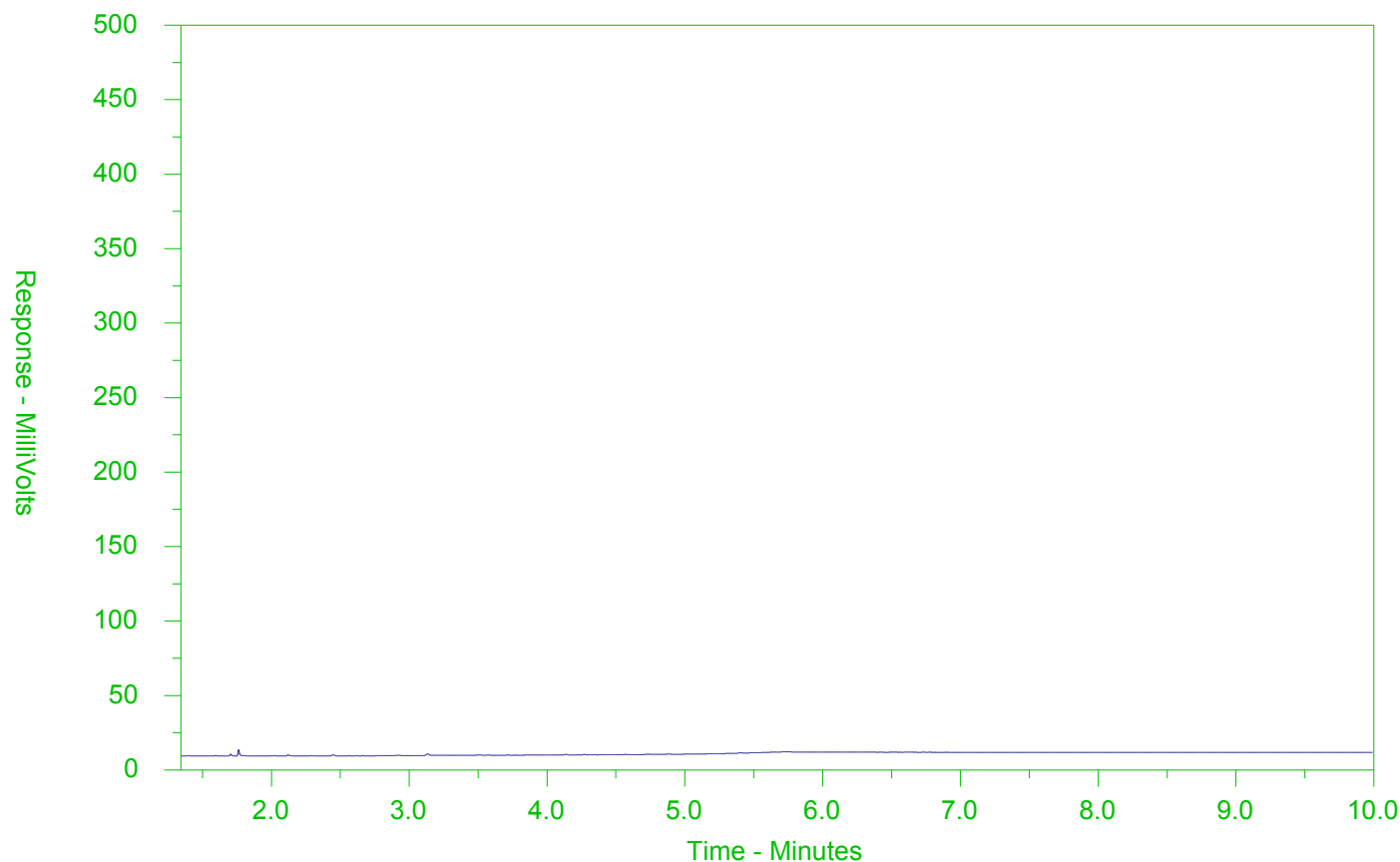
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L2308511-6
Client Sample ID: BH14



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
Gasoline →			← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.



Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878



L2308511-COFC

COC Number: 17 - 726641

Page 1 of 1

www.alsglobal.com

Report To		Report Format / Distribution		Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Contact and company name below will appear on the final report		Select Report Format: ☒ PDF ☐ EXCEL ☐ EDD (DIGITAL)		Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply	
Company:	CVD Engineering Ltd.	Quality Control (QC) Report with Report ☐ YES ☐ NO		4 day [P4-20%] ☐	
Contact:	Joe VanderZalm	☒ Compare Results to Criteria on Report - provide details below if box checked		3 day [P3-25%] ☐	
Phone:	905-536-2774	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX		2 day [P2-50%] ☐	
Company address below will appear on the final report		Email 1 or Fax: joe.vanderzalm@gmail.com		1 Business day [E-100%] ☐	
Street:	311 Victoria St. N.	Email 2		Same Day, Weekend or Statutory holiday [E2-200%] (Laboratory opening fees may apply) ☐	
City/Province:	Kitchener / ON	Email 3			
Postal Code:	N2H 5E2				
Invoice To	Same as Report To ☒ YES ☐ NO	Invoice Distribution		Analysis Request	
	Copy of Invoice with Report ☒ YES ☐ NO	Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	
Company:		Email 1 or Fax			
Contact:		Email 2			
Project Information					
ALS Account # / Quote #:		AFE/Cost Center:			
Job #: G19750 - Water		Major/Minor Code:			
PO / AFE:		Routing Code:			
LSD:		Requisitioner:			
		Location:			
ALS Lab Work Order # (lab use only): L2308511 JUL 11C		ALS Contact: EH		Sampler: JV	
ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	
1	BH3	10-JUL-19		WATER	
2	BH6				
3	BH8				
4	BH9				
5	BH10				
6	BH14				
Drinking Water (DW) Samples ¹ (client use)		Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)		SAMPLE CONDITION AS RECEIVED (lab use only)	
Are samples taken from a Regulated DW System? ☐ YES ☒ NO		D1, AEG 153/04 - Table 2 Potable (course + textured)		Frozen ☐ SIF Observations Yes ☐ No ☐	
Are samples for human consumption/ use? ☐ YES ☒ NO		PWQO (Provincial Water Quality Objectives)		Ice Packs ☒ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐	
		Region of Waterloo Stormwater Bylaw		Cooling Initiated ☐	
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)	
Released by:	Date: July 11/19	Received by:	Date: July 11/19	Received by:	Date: July 11/19
	Time: 4:30pm		Time: 4:30pm		Time: 4:30pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

JULY 2017 FRONT

APPENDIX “D”

Comparison of the Soil Chemistry Results to the Applicable Regulatory Criteria



ANALYTICAL RESULTS FOR SOIL
MOE Soil, Ground Water and Sediment Standards for Use Under Part XV.1
of the Environmental Protection Act, April 15, 2011

		Table 1 Agriculture or Other Property Use Standard	Table 1 Residential/ Parkland/ Institutional/ Commercial/ Community Property Use Standard	Table 2 Residential/ Parkland/ Institutional Property Use Standard (Coarse)	Table 2 Industrial/ Commercial/ Community Property Use Standard (Coarse)	BH 1 - SA 1	BH 3 - SA 2	BH 5 - SA 1	BH 7 - SA 2	BH 8 - SA 2	BH 9 - SA 3	BH 9 - SA 5	BH 11 - SA 1	BH 14 - SA 1	BH 14 - SA 3
Metals & Inorganics	Conductivity (mS/cm)	0.47	0.57	0.7	1.4	1.82	1.4	0.58	1.51	0.614	1.24	0.717	0.613	2.92	1.31
	% Moisture (%)	-	-	-	-	3.55	10.1	5.67	15.1	16.9	20.9	11.3	5.03	2.72	18
	pH (pH units)	-	-	-	-	8.37	7.73	8.22	7.94	7.96	7.2	7.85	8.24	8.33	7.93
	Cyanide, Weak Acid Diss (ug/g)	0.051	0.051	0.051	0.051	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	SAR	1	2.4	5	12	73.6	22.5	10.4	50.6	17.4	13.7	9.07	11.1	35.2	28.8
	Calcium (Ca) (mg/L)	-	-	-	-	1.56	9.46	4.37	2.22	2.34	15.1	10.9	4.79	9.94	4.88
	Magnesium (Mg) (mg/L)	-	-	-	-	<0.50	0.62	2.93	<0.50	1.04	2.04	1.3	2.3	5.5	<0.50
	Sodium (Na) (mg/L)	-	-	-	-	334	265	115	274	127	214	119	118	557	231
	Antimony (Sb)	1	1.3	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Arsenic (As)	11	18	18	18	2.3	2.8	2.2	1.9	1.9	8.7	2	2.6	2.6	1.4
	Barium (Ba)	210	220	390	670	16.3	49.6	11.7	16.5	34.4	139	99.3	20.4	14.5	10
	Beryllium (Be)	2.5	2.5	4	8	<0.50	<0.50	<0.50	<0.50	<0.50	0.66	0.76	<0.50	<0.50	<0.50
	Boron (B)	36	36	120	120	5.1	6.8	7.6	5.3	<5.0	6.7	14	7.1	7.1	<5.0
	Boron (B), Hot Water Ext. Available	36	36	1.5	2	0.1	0.12	0.15	<0.10	0.14	0.41	0.14	0.19	0.14	<0.10
	Cadmium (Cd)	1	1.2	1.2	1.9	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Chromium (Cr)	67	70	160	160	9.7	13.6	13	8	9.5	22.4	23.9	14.8	10.3	5.3
	Cobalt (Co)	19	21	22	80	2.5	4.9	2.6	3	2.7	7.1	9.8	2.6	2.5	1.8
	Copper (Cu)	62	92	140	230	8.5	13.2	8.2	8.5	7.1	13	20.5	10.3	10.3	5.1
	Lead (Pb)	45	120	120	120	6.9	10.4	12.9	5.5	4.6	12.6	11.6	13.9	9.6	5
	Mercury (Hg)	0.16	0.27	0.27	3.9	0.0113	0.0159	0.0108	<0.0050	0.0081	0.0736	0.012	0.0132	0.0086	0.0083
	Molybdenum (Mo)	2	2	6.9	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Nickel (Ni)	37	82	100	270	5.5	10	6.4	6	6.7	13.4	20.8	8.2	6.1	3.5
	Selenium (Se)	1.2	1.5	2.4	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Silver (Ag)	0.5	0.5	20	40	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Thallium (Tl)	1	1	1	3.3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Uranium (U)	1.9	2.5	23	33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	Vanadium (V)	86	86	86	86	16.2	25.4	15.7	16.1	14.9	29.5	36.6	17.8	13.7	11.4
	Zinc (Zn)	290	290	340	340	30.3	49.9	28.6	33.5	48.4	100	66.9	48.9	43.6	33.9
	Chromium, Hexavalent	0.66	0.66	8	8	<0.20	<0.20	<0.20	<0.20	1.31	0.43	<0.20	<0.20	<0.20	<0.20
Petroleum Hydrocarbons F1-F4	F1 (C6-C10)	17	25	55	55	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	F1-BTEX	17	25	55	55	-	-	-	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	F2 (C10-C16)	10	10	98	230	<10	<10	<10	<10	<10	<10	<10	<20	<20	<10
	F2-Naphth	-	-	-	-	-	-	-	-	<10	<10	<10	<20	<20	<10
	F3 (C16-C34)	240	240	300	1700	103	102	90	<50	<50	<50	<50	290	360	<50
	F3-PAH	-	-	-	-	-	-	-	-	<50	<50	<50	290	360	<50
	F4 (C34-C50)	120	120	2800	3300	388	222	243	<50	<50	<50	<50	860	990	<50
Polycyclic Aromatic Hydrocarbons (PAH's)	F4G-SG (GHH-Silica)	120	120	2800	3300	1300	540	960	-	-	-	-	2360	2230	-
	Acenaphthene	0.05	0.072	7.9	21	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Acenaphthylene	0.093	0.093	0.15	0.15	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Anthracene	0.05	0.16	0.67	0.67	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Benzo(a)anthracene	0.095	0.36	0.5	0.96	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Benzo(a)pyrene	0.05	0.3	0.3	0.3	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Benzo(b)fluoranthene	0.3	0.47	0.78	0.96	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Benzo(g,h,i)perylene	0.2	0.68	6.6	9.6	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Benzo(k)fluoranthene	0.05	0.48	0.78	0.96	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chrysene	0.18	2.8	7	9.6	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Dibenzo(ah)anthracene	0.1	0.1	0.1	0.1	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Fluoranthene	0.24	0.56	0.69	9.6	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Fluorene	0.05	0.12	62	62	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Indeno(1,2,3-cd)pyrene	0.11	0.23	0.38	0.76	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	1+2-Methylnaphthalenes	0.05	0.59	0.99	30	-	-	-	-	<0.042	<0.042	<0.042	<0.042	<0.042	<0.042
	1-Methylnaphthalene	0.05	0.59	0.99	30	-	-	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	2-Methylnaphthalene	0.05	0.59	0.99	30	-	-	-	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
	Naphthalene	0.05	0.09	0.6	9.6	-	-	-	-	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
Phenanthrene	0.19	0.69	6.2	12	-	-	-	-	<0.046	<0.046	<0.046	<0.046	<0.046	<0.046	
Pyrene	0.19	1	78	96	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Volatile Organic Compounds (VOC's)	Acetone	0.5	0.5	16	16	-	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Benzene	0.02	0.02	0.21	0.32	-	-	-	-	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068
	Bromodichloromethane	0.05	0.05	1.5	1.5	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Bromoform	0.05	0.05	0.27	0.61	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Bromomethane	0.05	0.05	0.05	0.05	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Carbon tetrachloride	0.05	0.05	0.05	0.21	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chlorobenzene	0.05	0.05	2.4	2.4	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Dibromochloromethane	0.05	0.05	2.3	2.3	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloroform	0.05	0.05	0.05	0.47	-	-	-	-	<0.050	<0.050	<0.050	<0.0		

APPENDIX “E”

Comparison of the Groundwater Chemistry Results to the Applicable Regulatory Criteria



ANALYTICAL RESULTS FOR GROUNDWATER

MOE Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, April 15, 2011
Ontario Region of Waterloo Sanitary and Storm Sewer Bylaw #50-92 (May,1992) - Region of Waterloo Storm Sewer Bylaw
Ontario Provincial Water Quality Objectives (PWQO) (July 1994) and Waterloo Storm Sewer (By-Law 1-90)
Ontario Regulation 153/04 - April 15, 2011 Standards - Table 2 Potable Groundwater (Coarse Soil) - All Types of Property Use

		Region of Waterloo Storm Sewer Bylaw	Ontario Provincial Water Quailty Objectives	Table 2 (Coarse Textured Soil)	BH 3	BH 6	BH 8	BH 9	BH 10	BH 14
Physical Tests & Cyanides	pH	9	8.5	-	6.99	7.75	7.68	7.25	7.37	7.64
	Conductivity	-	-	-	11.2	4.94	1.52	7.61	14.9	5.18
	Cyanide, Weak Acid Diss (mg/L)	-	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Anions & Nutrients (mg/L)	Chloride (Cl)	-	-	790	4540	1510	309	2420	5540	1650
Petroleum Hydrocarbons (F1-F4) (ug/L)	F1 (C6-C10)	-	-	750	<25	<25	<25	<25	82	<25
	F1-BTEX	-	-	750	<25	<25	<25	<25	82	<25
	F2 (C10-C16)	-	-	150	<100	<100	<100	<100	<100	<100
	F2-Naphth	-	-	-	<100	<100	<100	<100	<100	<100
	F3 (C16-C34)	-	-	500	<250	<250	<250	<250	<250	<250
	F3 -PAH	-	-	-	<250	<250	<250	<250	<250	<250
	F4 (C34-C50)	-	-	500	<250	<250	<250	<250	<250	<250
	Total Hydrocarbons (C6-C50)	-	-	-	<370	<370	<370	<370	<370	<370
Volatile Organic Compounds (VOCs) (ug/L)	Acetone	-	-	2700	<30	<30	<30	<30	<30	<30
	Benzene	-	100	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Bromodichloromethane	-	200	16	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Bromoform	-	60	25	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	Bromomethane	-	-	0.89	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Carbon tetrachloride	-	-	0.79	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	Chlorobenzene	-	15	30	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Dibromochloromethane	-	40	25	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Chloroform	-	-	2.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	1,2-Dibromoethane	-	5	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
	1,2-Dichlorobenzene	-	2.5	3	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,3-Dichlorobenzene	-	2.5	59	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,4-Dichlorobenzene	-	4	1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Dichlorodifluoromethane	-	-	590	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	1,1-Dichloroethane	-	200	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,2-Dichloroethane	-	100	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,1-Dichloroethylene	-	40	1.6	<0.50	<0.50	<0.50	<0.50	0.88	<0.50
	cis-1,2-Dichloroethylene	-	-	1.6	<0.50	<0.50	<0.50	<0.50	411	<0.50
	trans-1,2-Dichloroethylene	-	-	1.6	<0.50	<0.50	<0.50	<0.50	8.92	<0.50
	Methylene Chloride	-	100	50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	1,2-Dichloropropane	-	0.7	5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	cis-1,3-Dichloropropene	-	-	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
	trans-1,3-Dichloropropene	-	7	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
	1,3-Dichloropropene (cis & trans)	-	-	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene	-	8	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	n-Hexane	-	-	51	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Methyl Ethyl Ketone	-	400	1800	<20	<20	<20	<20	<20	<20
	Methyl Isobutyl Ketone	-	-	640	<20	<20	<20	<20	<20	<20
	MTBE	-	-	15	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
	Styrene	-	4	5.4	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,1,1,2-Tetrachloroethane	-	20	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,1,2,2-Tetrachloroethane	-	70	1	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Tetrachloroethylene	-	50	1.6	<0.50	<0.50	<0.50	<0.50	113	<0.50
	Toluene	-	0.8	24	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,1,1-Trichloroethane	-	10	200	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	1,1,2-Trichloroethane	-	800	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
	Trichloroethylene	-	20	1.6	<0.50	<0.50	<0.50	<0.50	112	<0.50
	Trichlorofluoromethane	-	-	150	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	Vinyl chloride	-	600	0.5	<0.50	<0.50	<0.50	<0.50	56.2	<0.50
	o-Xylene	-	40	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
	m+p-Xylenes	-	2	-	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
	Xylenes (Total)	-	-	300	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Metals (ug/L)	Antimony (Sb)-Dissolved	-	20	6	<1.0	<1.0	0.18	<1.0	<1.0	<1.0
	Arsenic (As)-Dissolved	-	5	25	<1.0	1.2	0.83	<1.0	1.5	<1.0
	Barium (Ba)-Dissolved	-	-	1000	1000	296	223	540	437	180
	Beryllium (Be)-Dissolved	-	11	4	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
	Boron (B)-Dissolved	-	200	5000	<100	140	126	<100	110	<100
	Cadmium (Cd)-Dissolved	50	0.1	2.7	0.085	<0.050	<0.010	0.502	<0.050	0.098
	Chromium (Cr)-Dissolved	200	-	50	<5.0	<5.0	<0.50	<5.0	<5.0	<5.0
	Cobalt (Co)-Dissolved	-	0.9	3.8	<1.0	1.5	0.64	1.1	1.4	1.2
	Copper (Cu)-Dissolved	1000	1	87	<2.0	4.8	1.09	<2.0	3.5	4.2
	Lead (Pb)-Dissolved	50	1	10	<0.50	<0.50	<0.050	<0.50	<0.50	<0.50
	Mercury (Hg)-Dissolved	1	0.2	0.29	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Molybdenum (Mo)-Dissolved	500	40	70	1.17	36.8	4.11	0.53	3.05	2.85
	Nickel (Ni)-Dissolved	-	25	100	<5.0	<5.0	1.79	<5.0	<5.0	<5.0
	Selenium (Se)-Dissolved	-	100	10	<0.50	3.92	0.339	<0.50	<0.50	<0.50
	Silver (Ag)-Dissolved	-	0.1	1.5	<0.50	<0.50	<0.050	<0.50	<0.50	<0.50
	Sodium (Na)-Dissolved	-	-	490000	1680000	515000	133000	1300000	2990000	829000
	Thallium (Tl)-Dissolved	-	0.3	2	<0.10	<0.10	0.019	<0.10	<0.10	<0.10
	Uranium (U)-Dissolved	-	5	20	3.95	9.35	3.9	2.71	2.31	2.05
	Vanadium (V)-Dissolved	-	6	6.2	<5.0	<5.0	0.52	<5.0	<5.0	<5.0
	Zinc (Zn)-Dissolved	500	20	1100	<10	10	2.4	<10	<10	<10
	Chromium, Hexavalent	-	1	25	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	-	-	4.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Acenaphthylene	-	-	1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Anthracene	-	0.0008	2.4	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Benzo(a)anthracene	-	0.0004	1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Benzo(a)pyrene	-	-	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b)fluoranthene	-	-	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Benzo(g,h,i)perylene	-	0.00002	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Benzo(k)fluoranthene	-	0.0002	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Chrysene	-	0.0001	0.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Dibenzo(ah)anthracene	-	0.002	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Fluoranthene	-	0.008	0.41	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Fluorene	-	0.2	120	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Indeno(1,2,3-cd)pyrene	-	-	0.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	1+2-Methylnaphthalenes	-	-	3.2	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028
	1-Methylnaphthalene	-	2	3.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	2-Methylnaphthalene	-	2	3.2	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Naphthalene	-	7	11	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene	-	0.03	1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	Pyrene	-	-	4.1	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020

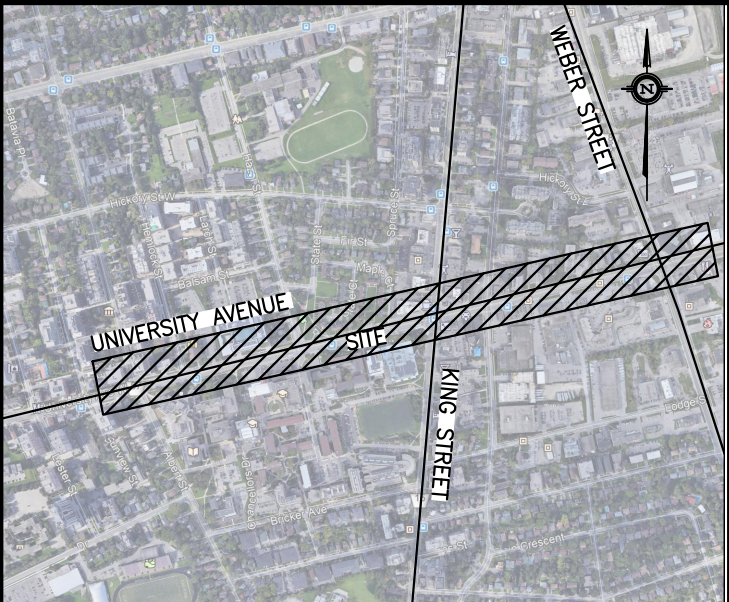
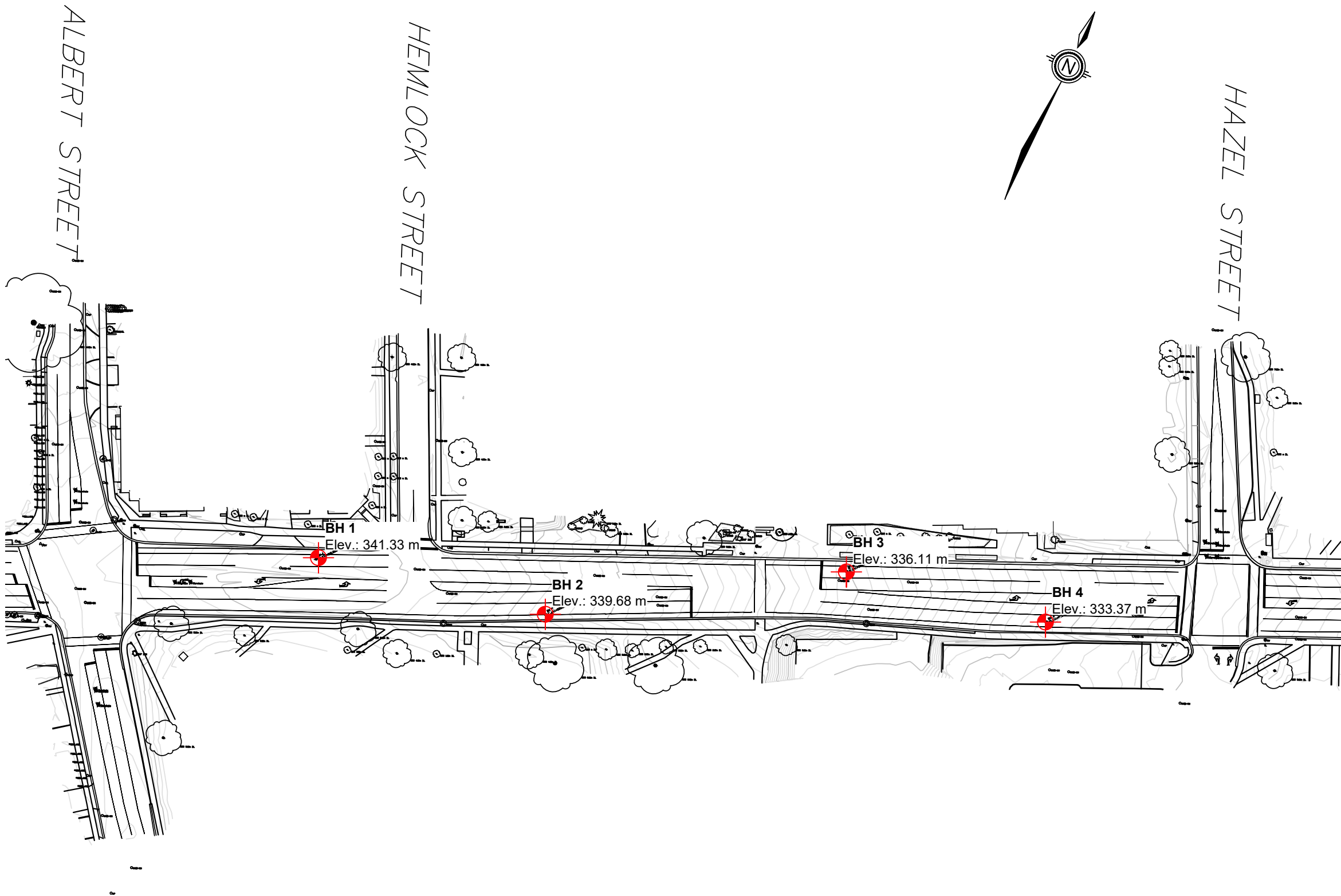
NOTES:

1. Test results shown in highlighted text exceed the Region of Waterloo Storm Sewer Bylaw Standard
2. Test results shown in highlighted text exceed the PWQO Standard
3. Test results shown in highlighted text exceed the O.-Reg. 153/04 - Table 2 (Coarse Soil) Standard

APPENDIX “F”

Borehole Location Plans





KEY PLAN SOURCE: Google Earth

LEGEND

 Borehole Location

Note: Base drawing, and borehole elevations and locations provided by IBI Group Inc.

BOREHOLE LOCATION PLAN

University Avenue Reconstruction

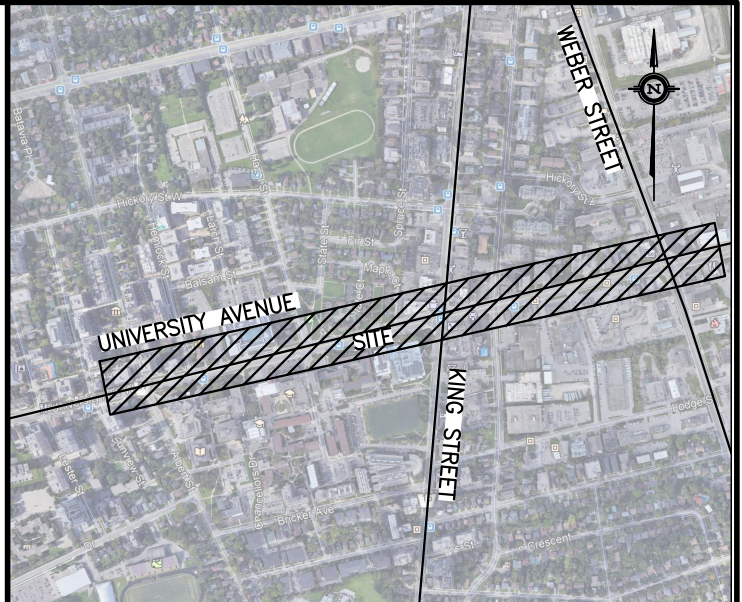
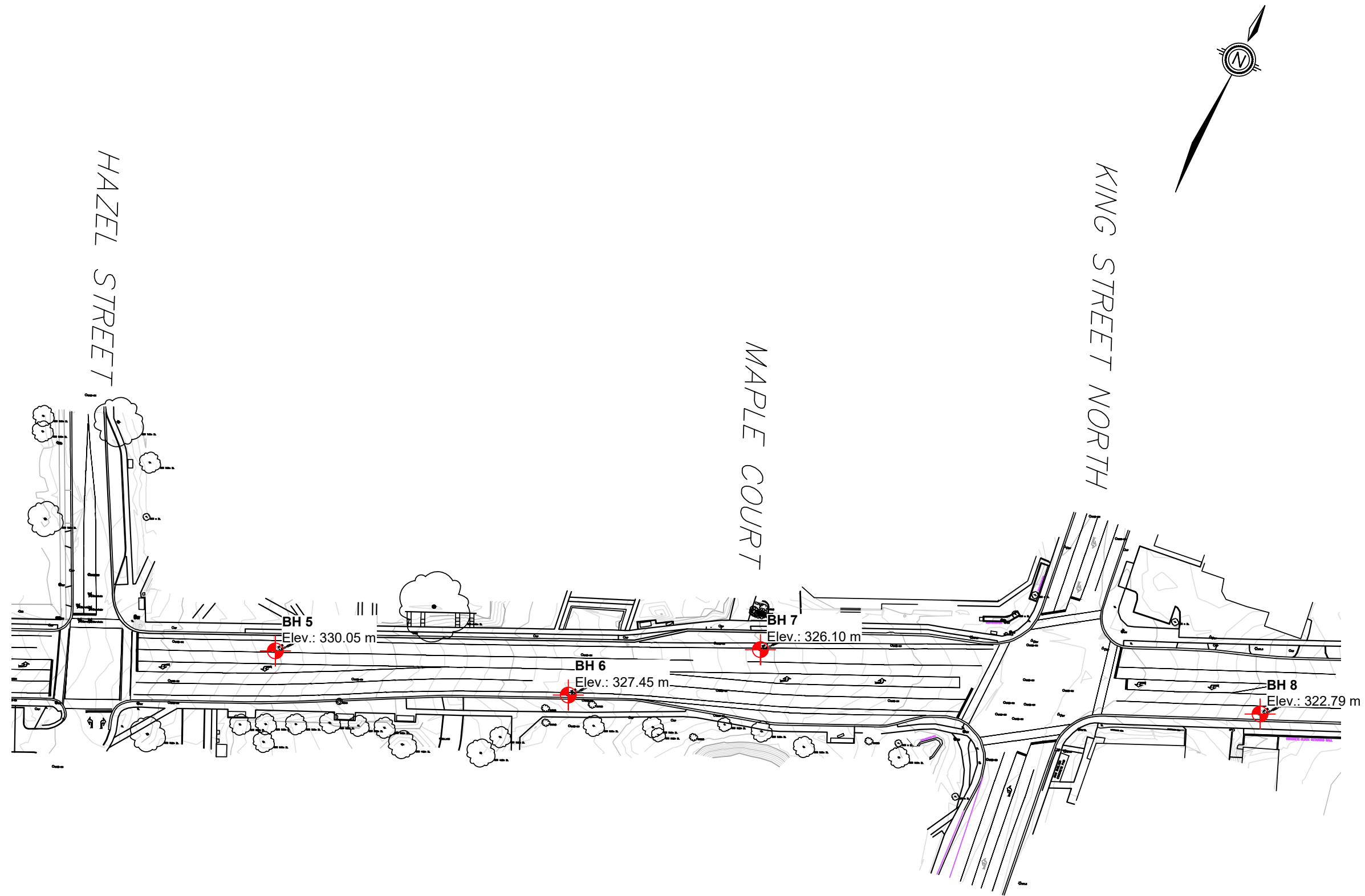
Albert Street to Weber Street North
Waterloo, Ontario



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ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: AB	Date: October, 2019	File No.: G19750
Checked By: RVD	Scale: 1:1250	Drawing No.: 1



KEY PLAN **SOURCE:** Google Earth

LEGEND

-  **TBM:**
-  **Borehole Location**

Note: Base drawing, and borehole elevations and locations provided by IBI Group Inc.

BOREHOLE LOCATION PLAN

University Avenue Reconstruction

Albert Street to Weber Street North
Waterloo, Ontario

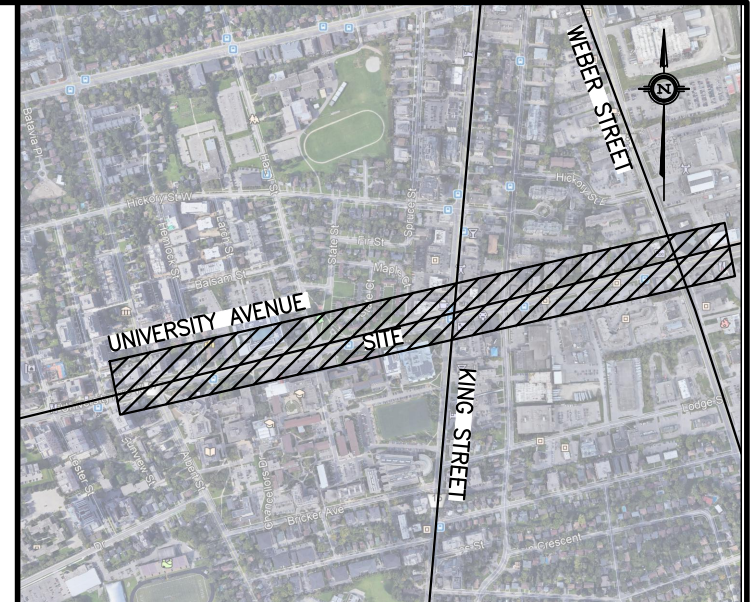
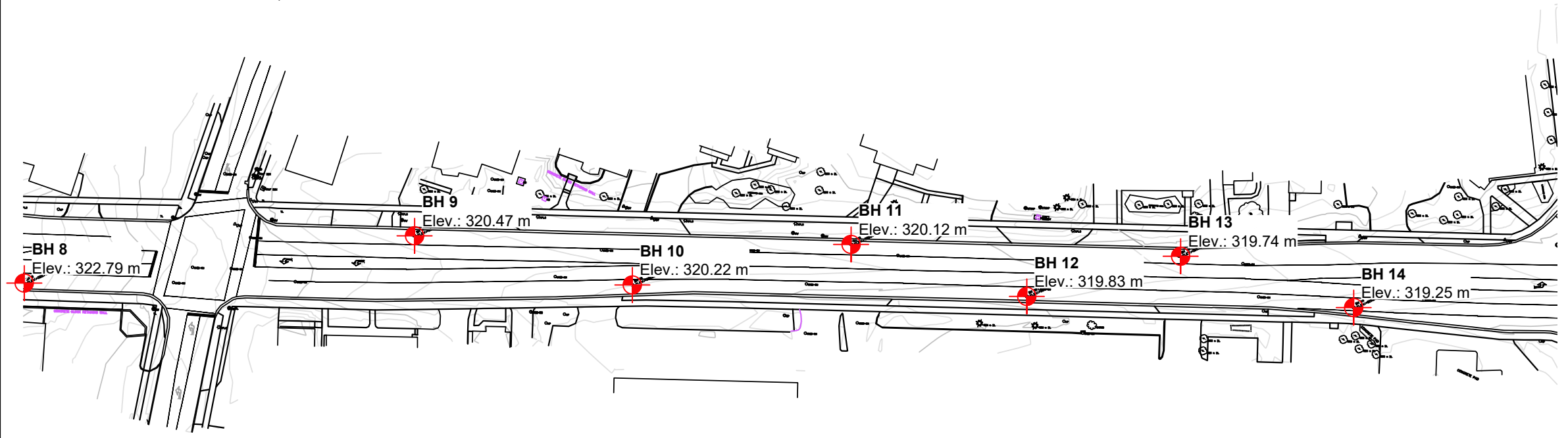
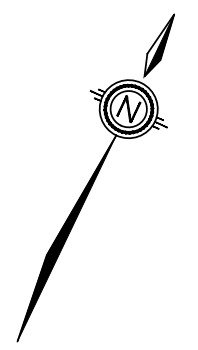


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Drawn By: AB	Date: October, 2019	File No.: G19750
Checked By: RVD	Scale: 1:1250	Drawing No.: 2

REGINA STREET NORTH

WEBER STREET NORTH



KEY PLAN SOURCE: Google Earth

LEGEND

 TBM:

 Borehole Location

Note: Base drawing, and borehole elevations and locations provided by IBI Group Inc.

BOREHOLE LOCATION PLAN

University Avenue Reconstruction

Albert Street to Weber Street North
Waterloo, Ontario



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Drawn By: AB	Date: October, 2019	File No.: G19750
Checked By: RVD	Scale: 1:1250	Drawing No.: 3

Enclosures



FILE No: G19750**BOREHOLE No. 1**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **May 29 - 19** TO **May 29 - 19**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				WATER CONTENT (%) W _p W W _L					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				↗ ○ ↖					
											10 20 30					
Ground Elevation: 341.33 m																
340.93 0.40	100mm Asphalt 300mm Granular Base			1	AS											
		0.5														
	compact to dense brown															
	Fine SAND trace to some silt	1.0	2	SS	31											
	damp to moist	1.5														
339.23 2.10				3	SS	24										
		2.0														
	compact brown SAND AND SILT	2.5	4	SS	19											
	damp	3.0														
		3.5		5	SS	23										
	compact brown Fine SAND trace to some silt	4.0	6	SS	24											
337.83 3.50	damp	4.5														
		5.0		7	SS	30										
	dense brown SAND AND SILT	5.5														
336.93 4.40	wet to saturated	6.0														
		6.5		8	SS	34										
334.78 6.55	End of Borehole															borehole dry at withdrawal of drilling augers

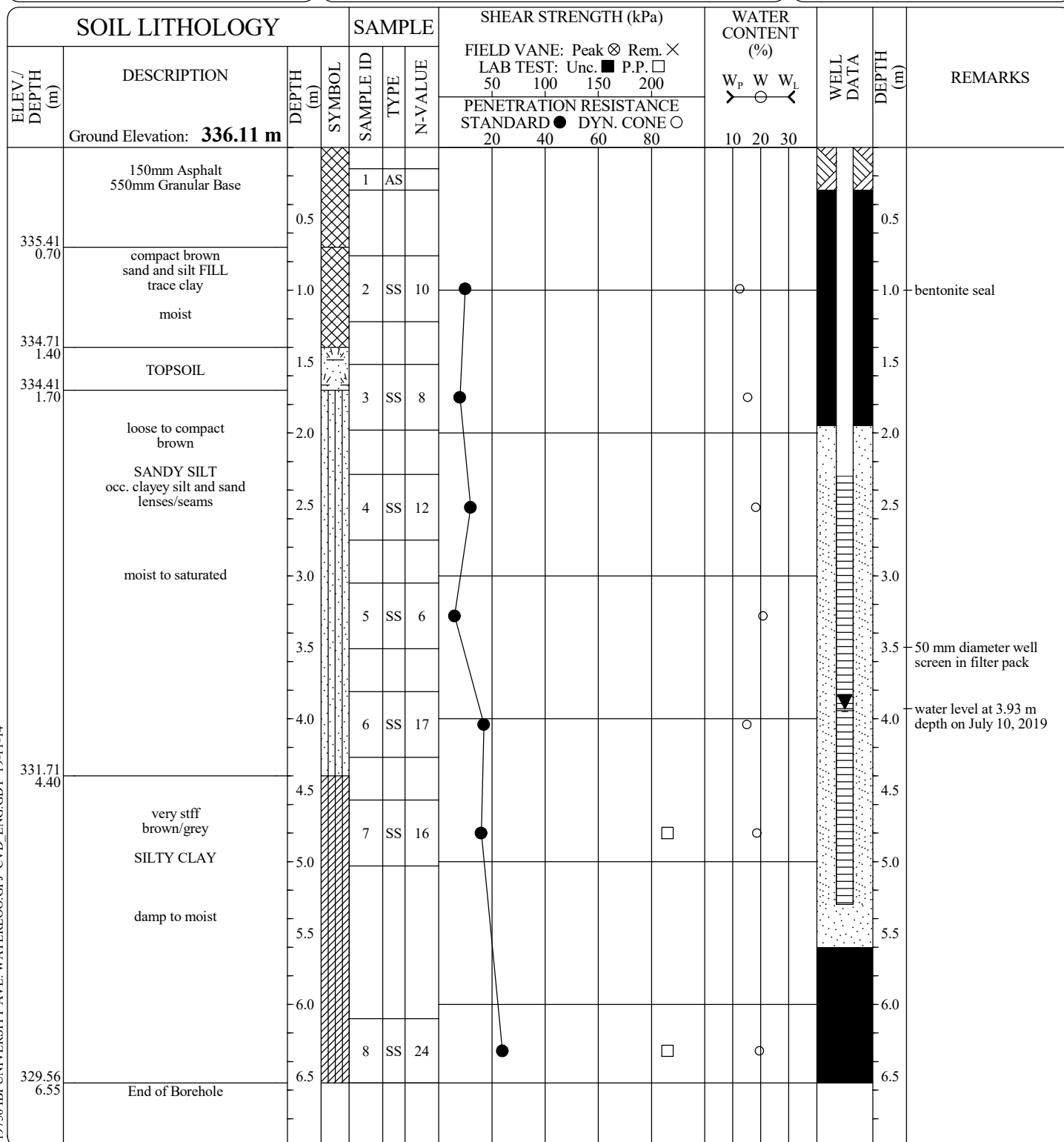
split spoon sampler is wet

borehole dry at
withdrawal of drilling
augersPROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
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FILE No: G19750**BOREHOLE No. 2**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Solid Stem Auger**Size: **152 mm O.D.**Date: **May 27 - 19 TO May 27 - 19**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↔○↔					
Ground Elevation: 339.68 m							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
339.26 0.42	150mm Asphalt 265mm Granular Base			1	AS											
		0.5														
	stiff to very stiff brown/grey SILTY CLAY damp	1.0		2	SS	11	●		□		○					
		1.5														
		2.0		3	SS	17	●		□		○					
		2.5														
337.08 2.60		2.5		4	SS	24	●		□		○					
	compact brown SANDY SILT occ. clayey silt lenses/seams	3.0														
		3.5		5	SS	21	●				○					
	damp to saturated	4.0														
		4.5														
		5.0		6	SS	28	●				○					split spoon sampler is wet
		5.5														
		6.0														
		6.5		7	SS	27	●				○					water level at 4.85 m depth at withdrawal of drilling augers
334.28 5.40	dense brown Fine SAND trace to some silt	5.5														
		6.0														
	saturated	6.5		8	SS	36	●				○					split spoon sampler is dripping
333.13 6.55	End of Borehole															

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FILE No: G19750**BOREHOLE No. 3**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **May 29 - 19 TO May 29 - 19**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
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FILE No: G19750**BOREHOLE No. 4**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 27 - 19 TO May 27 - 19**

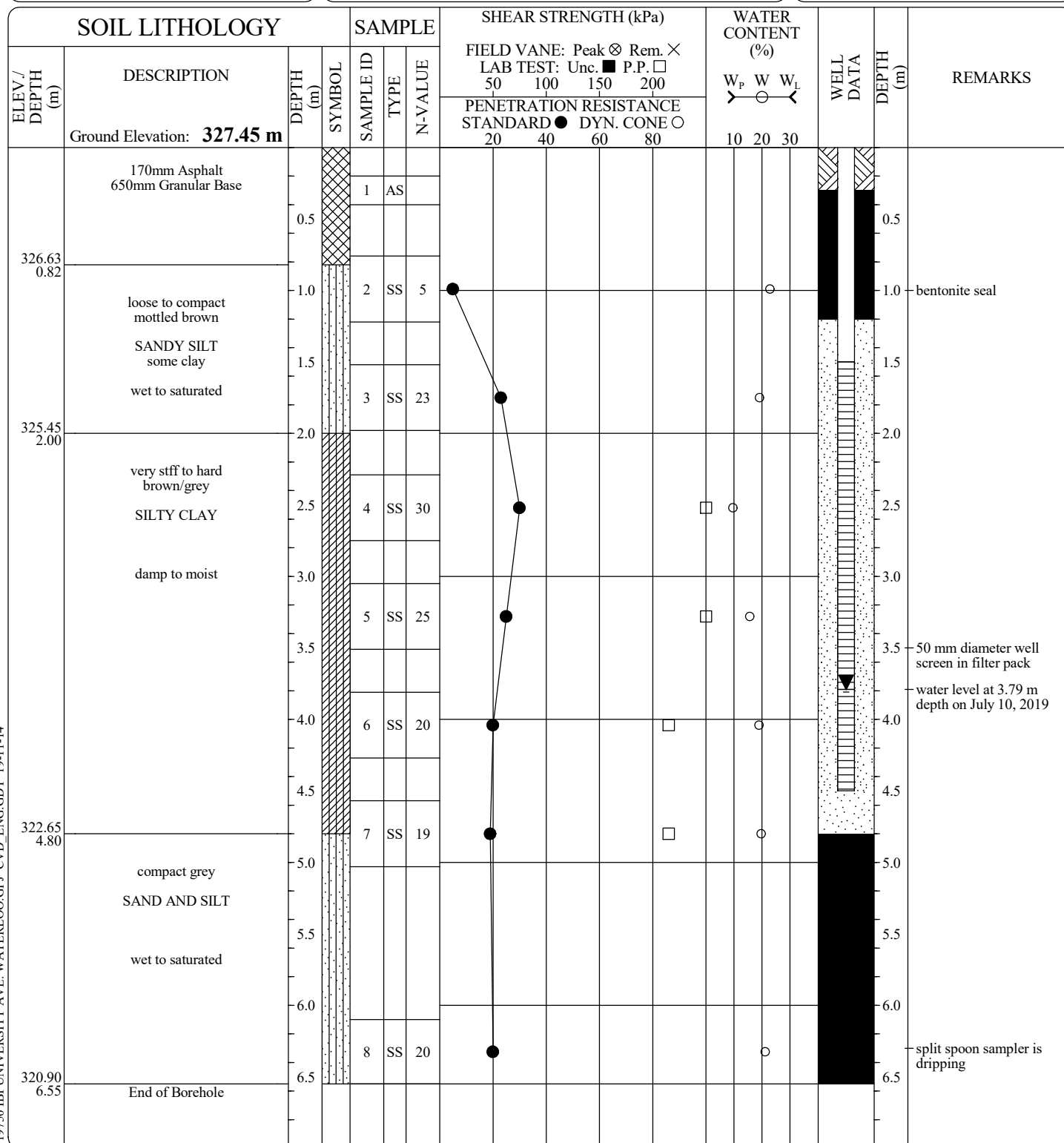
SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ — ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 333.37 m																
332.52 0.85 331.97 1.40	175mm Asphalt 675mm Granular Base	0.5		1	AS											
	compact brown sand and silt FILL trace clay	1.0		2	SS	11	●					○				
	moist	1.5														
	compact brown	2.0	3	SS	21	●					○					
	Fine SAND trace silt	2.5														
	occ. silty and gravelly lenses/seams	2.5	4	SS	19	●					○					
	damp to saturated	3.0														
		3.5	5	SS	24	●						○				
326.82 6.55		4.0														
		4.5														
		5.0														
		5.5														
		6.0														
		6.5	8	SS	30	●						○				
	End of Borehole															

water level at 2.4 m depth
at withdrawal of drilling
augerssplit spoon sampler is
drippingPROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
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FILE No: G19750**BOREHOLE No. 5**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **May 29 - 19** TO **May 29 - 19**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ ○ ↖					
Ground Elevation: 330.05 m							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○				10 20 30					
329.50 0.55	150mm Asphalt 400mm Granular Base	0.5		1	AS											
	compact mottled brown SANDY SILT some clay moist	1.0		2	SS	12										
328.25 1.80		1.5	3	SS	10											
		very stff brown/grey SILTY CLAY damp to moist	2.0													
	2.5		4	SS	26											
3.0																
3.5	5		SS	21												
4.0	6		SS	19												
4.5																
323.50 6.55	End of Borehole	5.0	7	SS	22											
		5.5														
		6.0														
		6.5	8	SS	19											
		6.5														borehole dry at withdrawal of drilling augers

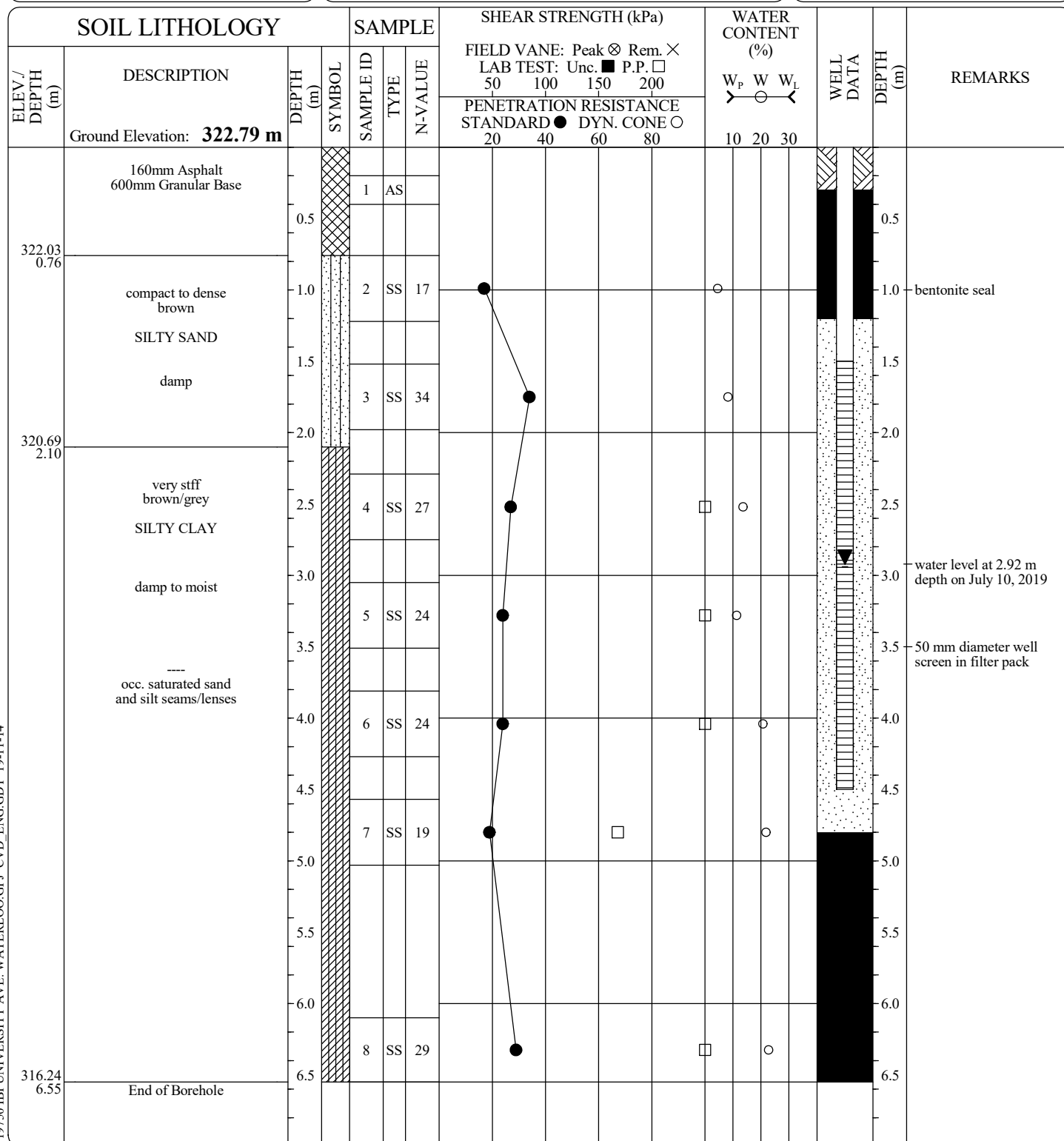
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FILE No: G19750**BOREHOLE No. 6**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 27 - 19 TO May 27 - 19**PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739

FILE No: G19750**BOREHOLE No. 7**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **83 mm I.D.**Date: **May 29 - 19 TO May 29 - 19**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _P W W _L ↗ ○ ↖						
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30						
Ground Elevation: 326.10 m																	
325.53 0.57	175mm Asphalt 390mm Granular Base	0.5		1	AS												
	compact brown SANDY SILT to SAND AND SILT occ. clayey silt and silty sand lenses/seams moist to saturated ---- grey ---- dense	1.0		2	SS	17	●						○				
		1.5		3	SS	23	●							○			
		2.0															
		2.5		4	SS	24	●							○			
		3.0															
		3.5		5	SS	22	●							○			split spoon sampler is dripping
		4.0		6	SS	36	●							○			
		4.5															
		5.0		7	SS	46	●						○		▼	water level at 4.85 m depth at withdrawal of drilling augers	
		5.5															
		6.0															
		6.5		8	SS	43	●						○				
319.55 6.55	End of Borehole																

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FILE No: G19750**BOREHOLE No. 8**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 27 - 19 TO May 27 - 19**water level at 2.92 m
depth on July 10, 201950 mm diameter well
screen in filter packPROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
ENGINEERING LTD.**311 Victoria Street North
Kitchener, Ontario N2H 5E1
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FILE No: G19750**BOREHOLE No. 9**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 28 - 19 TO May 28 - 19**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ — ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 320.47 m																
319.87 0.60	200mm Asphalt 400mm Granular Base	0.5		1	AS											
319.57 0.90	loose dark brown sand and silt FILL moist	1.0		2	SS	6	●					○			bentonite seal	
319.17 1.30	TOPSOIL	1.5														
	loose to compact dark brown to brown	1.5		3	SS	7	●					○				
	SANDY SILT trace clay	2.0													water level at 2.02 m depth on July10, 2019	
	wet to saturated	2.5		4	SS	18	●					○				
		3.0														
		3.5		5	SS	17	●					○			split spoon sampler is wet	
316.87 3.60	compact grey	4.0		6	SS	24	●					○			50 mm diameter well screen in filter pack	
	SILT trace sand and clay	4.5													split spoon sampler is dripping	
	saturated	5.0		7	SS	29	●					○				
315.07 5.40	very stff brown/grey	5.5														
	SILTY CLAY	6.0														
313.92 6.55	damp to moist	6.5		8	SS	28	●					○				
	End of Borehole															

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FILE No: G19750**BOREHOLE No. 10**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 27 - 19 TO May 27 - 19**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. ×				LAB TEST: Unc. ■ P.P. □					
							50 100 150 200				PENETRATION RESISTANCE					
							STANDARD ● DYN. CONE ○				20 40 60 80					
Ground Elevation: 320.22 m											W _p W W _L					
319.64 0.58	275mm Asphalt 300mm Granular Base	0.5		1	AS											
	loose dark brown sand and silt FILL trace organics	1.0		2	SS	7	●						○			bentonite seal
	moist to wet	1.5														
318.42 1.80				3	SS	4	●						○			water level at 1.84 m depth on July 10, 2019
	firm to very stiff brown	2.0														
	SILTY CLAY	2.5		4	SS	18	●				□		○			
	moist	3.0														
317.32 2.90	compact to very dense grey	3.0		5	SS	18	●				□		○			split spoon sampler is dripping
	SANDY SILT some clay	3.5														50 mm diameter well screen in filter pack
	saturated	4.0		6	SS	27	●						○			split spoon sampler is dripping
		4.5														
		5.0		7	SS	51	●						○			
314.72 5.50	hard brown/grey	5.5														
	SILTY CLAY	6.0														
	damp to moist	6.5		8	SS	58	●						○			
313.67 6.55	End of Borehole															

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FILE No: G19750**BOREHOLE No. 11**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 28 - 19 TO May 28 - 19**

SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗—○—↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 320.12 m																
319.47 0.65	200mm Asphalt 450mm Granular Base	0.5		1	AS											
	compact brown sand and silt FILL	1.0		2	SS	17										
318.72 1.40	damp to moist	1.5														
	loose to compact brown to grey	2.0		3	SS	9										
	SILT occ. to frequent clayey lenses/seams	2.5														
	moist to saturated	3.0		4	SS	7										
		3.5														
		4.0		5	SS	7										
315.72 4.40	compact grey SILTY SAND	4.5														
	saturated	5.0		6	SS	19										
		5.5														
		6.0		7	SS	16										
313.57 6.55	End of Borehole	6.5														
				8	SS	29										

water level at 4.1 m depth
at withdrawal of drilling
augerssplit spoon sampler is
drippingPROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
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BOREHOLE No. 12



Location: **Albert Street to Weber Street North,
Waterloo, Ontario**

Machine: **Diedrich D50T**
Method: **Hollow Stem Auger**
Size: **108 mm I.D.**
Date: **May 28 - 19** TO **May 28 - 1**

[illegible]PROJECT MANAGER: **RVD**

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CVD BOREHOLE (2017) G19750 IBI UNIVERSITY AVE. WATERLOO.GPJ CVD ENG.GDT 19-11-14

FILE No: G19750**BOREHOLE No. 13**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 28 - 19 TO May 28 - 19**

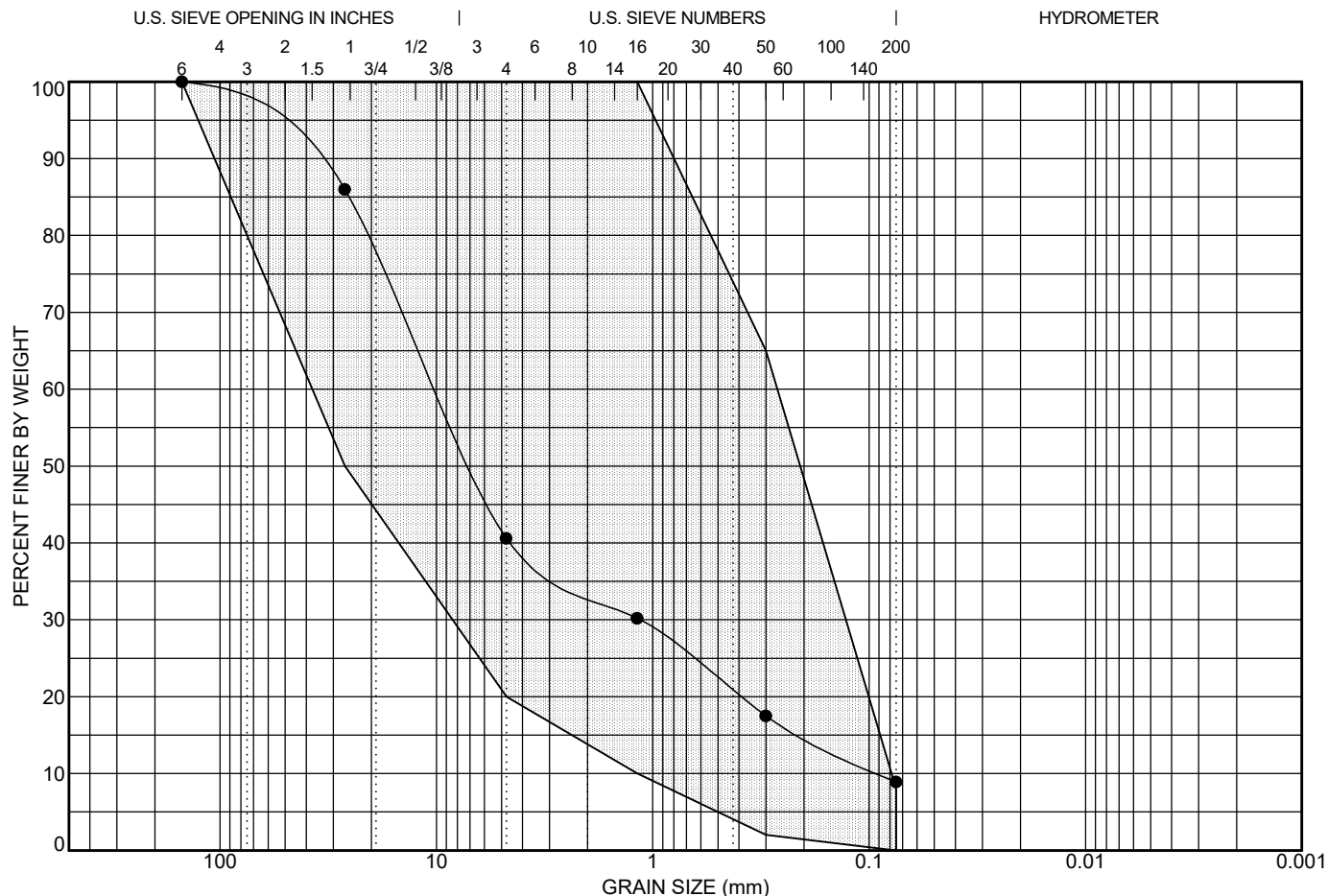
SOIL LITHOLOGY			SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS	
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. × LAB TEST: Unc. ■ P.P. □ 50 100 150 200				W _p W W _L ↗ ○ ↖					
							PENETRATION RESISTANCE STANDARD ● DYN. CONE ○ 20 40 60 80				10 20 30					
Ground Elevation: 319.74 m																
319.11 0.63	225mm Asphalt 400mm Granular Base	0.5		1	AS											
	very loose to loose brown SANDY SILT to SAND AND SILT	1.0		2	SS	5	●						○			
		1.5		3	SS	1	●						○			
		2.0														
		2.5		4	SS	1	●						○			
	3.0															
	3.5		5	SS	7	●						○				
	4.0		6	SS	34							○				
4.5																
313.19 6.55	compact to dense grey	5.0		7	SS	28	●						○			
		5.5														
		6.0		8	SS	24	●						○			
	End of Borehole	6.5														

PROJECT MANAGER: **RVD****CHUNG & VANDER DOELEN
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FILE No: G19750**BOREHOLE No. 14**Client: **IBI Group**Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North,
Waterloo, Ontario****EQUIPMENT DATA**Machine: **Diedrich D50T**Method: **Hollow Stem Auger**Size: **108 mm I.D.**Date: **May 28 - 19 TO May 28 - 19**

SOIL LITHOLOGY				SAMPLE			SHEAR STRENGTH (kPa)				WATER CONTENT (%)			WELL DATA	DEPTH (m)	REMARKS
ELEV./ DEPTH (m)	DESCRIPTION	DEPTH (m)	SYMBOL	SAMPLE ID	TYPE	N-VALUE	FIELD VANE: Peak ⊗ Rem. ×				LAB TEST: Unc. ■ P.P. □					
							50 100 150 200				PENETRATION RESISTANCE					
							STANDARD ● DYN. CONE ○				20 40 60 80					
							Ground Elevation: 319.25 m				W _p W W _L					
318.67 0.58	180mm Asphalt 400mm Granular Base	0.5		1	AS											
	compact brown SANDY SILT to SAND AND SILT moist to saturated	1.0		2	SS	10	●					○				bentonite seal
		1.5		3	SS	17	●					○				water level at 1.71 m depth on July 10, 2019
		2.0														
		2.5		4	SS	18	●					○				split spoon sampler is dripping
		3.0														
		3.5		5	SS	22	●					○				split spoon sampler is dripping 50 mm diameter well screen in filter pack
		4.0		6	SS	15	●					○				split spoon sampler is dripping
	4.5															
	5.0		7	SS	19	●					○					
313.85 5.40	compact brown Fine SAND trace silt saturated	5.5														
		6.0														
312.70 6.55	End of Borehole	6.5		8	SS	26	●					○				

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COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.50	110.57	150	9.902	1.155	0.09	53.8	31.7	8.9	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-1, 0.15 to 0.3 m depth
Sample No.: 1
Date Sampled: May. 29 - 2019
Sampled By: NZ
Lab No.: 0532
Date Tested: Jun. 03 - 2019
Type of Material: Granular Base

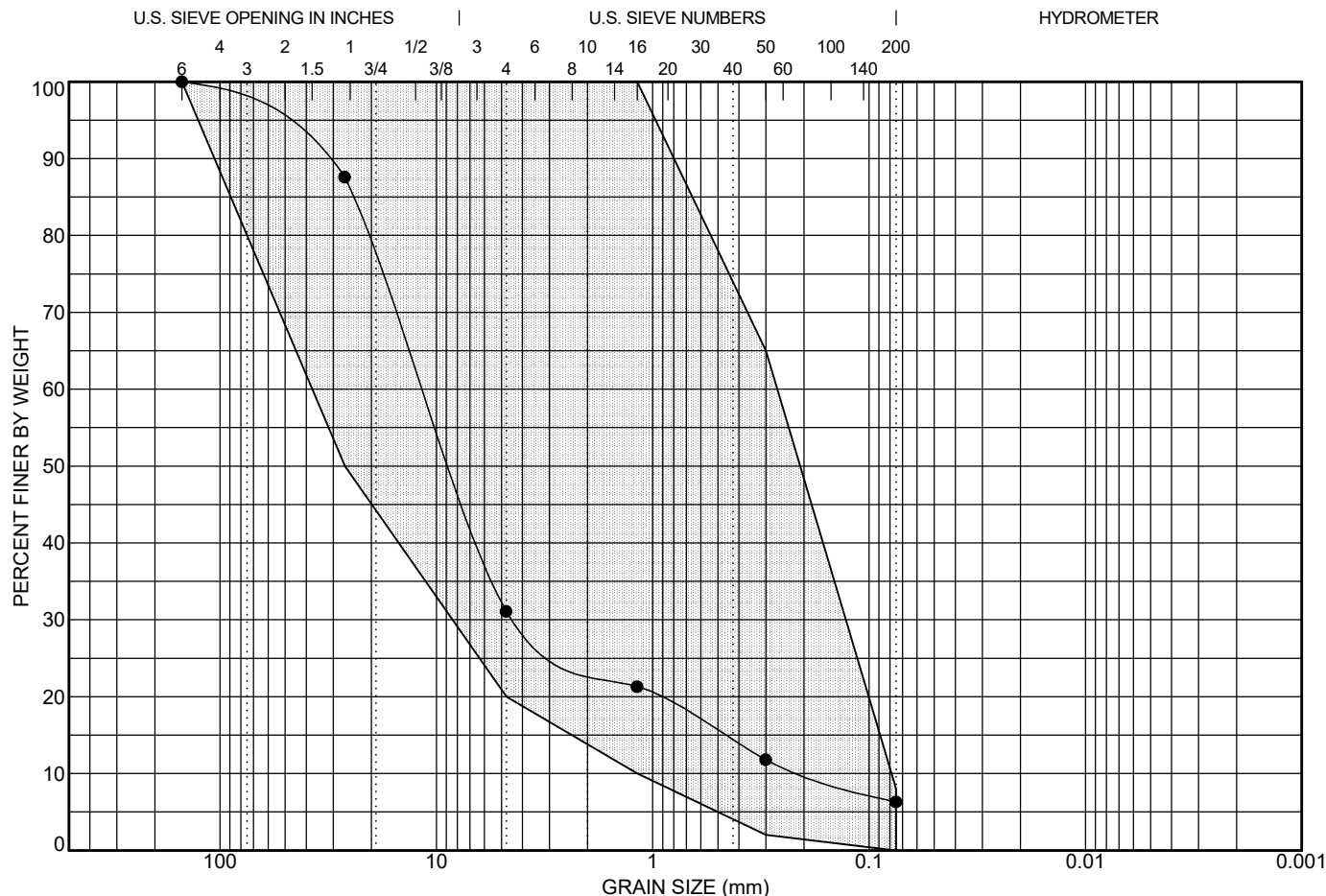
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150	100.0	100
75	86.0	50 - 100
4.75	40.6	20 - 100
1.18	30.2	10 - 100
0.300	17.5	2 - 65
0.075	8.9	0 - 8



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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			7.57	60.04	150	11.443	4.063	0.191	63.9	24.8	6.3	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-5, 0.15 to 0.3 m depth
Sample No.: 1
Date Sampled: May. 29 - 2019
Sampled By: NZ
Lab No.: 0533
Date Tested: Jun. 03 - 2019
Type of Material: Granular Base

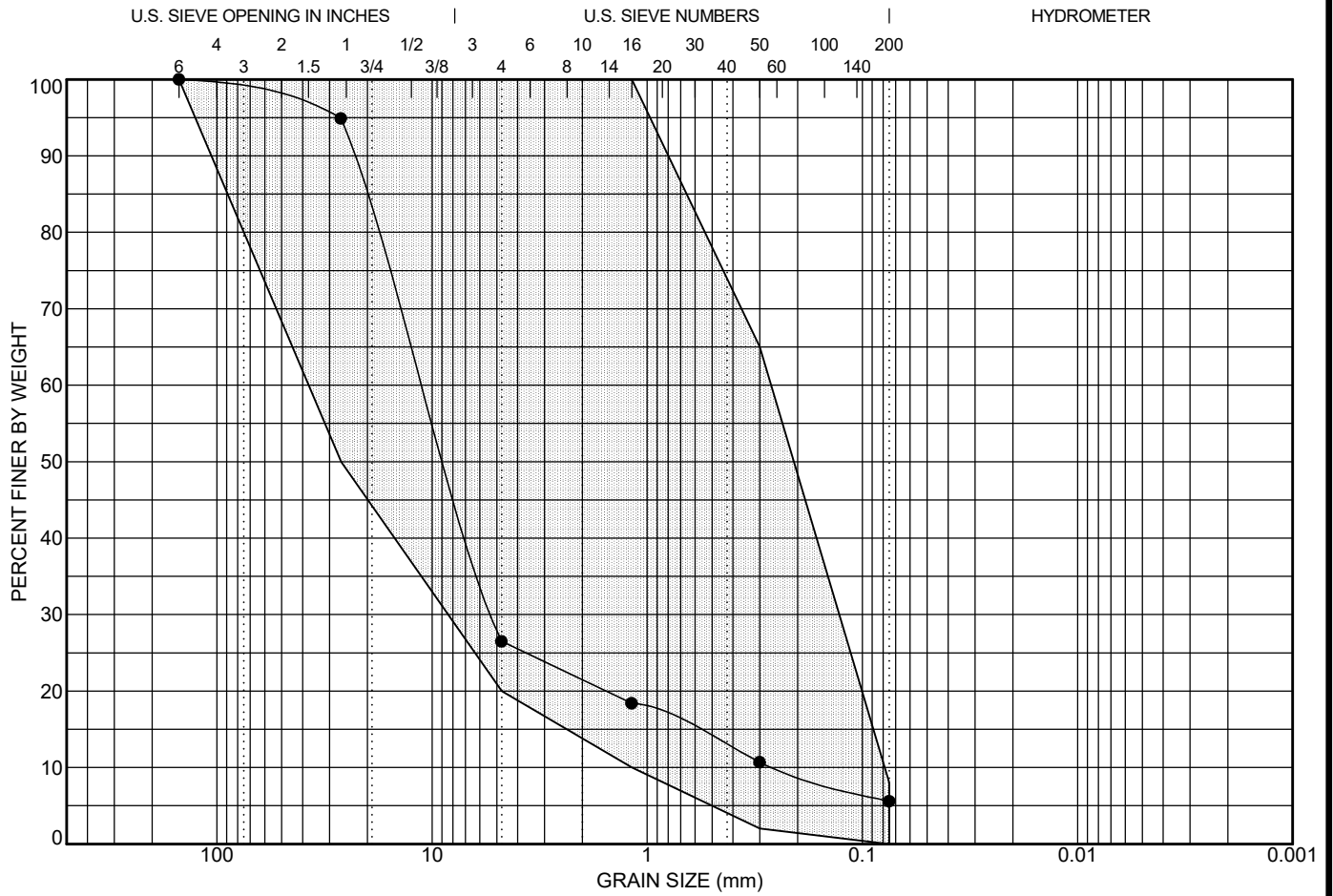
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150	100.0	100
26.5	87.6	50 - 100
4.75	31.1	20 - 100
1.18	21.3	10 - 100
0.300	11.8	2 - 65
0.075	6.3	0 - 8



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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			9.84	44.45	150	11.024	5.187	0.248	71.5	20.9	5.6	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-7, 0.2 to 0.35 m depth
Sample No.: 1
Date Sampled: May. 29 - 2019
Sampled By: NZ
Lab No.: 0572
Date Tested: Jun. 08 - 2019
Type of Material: Granular Base

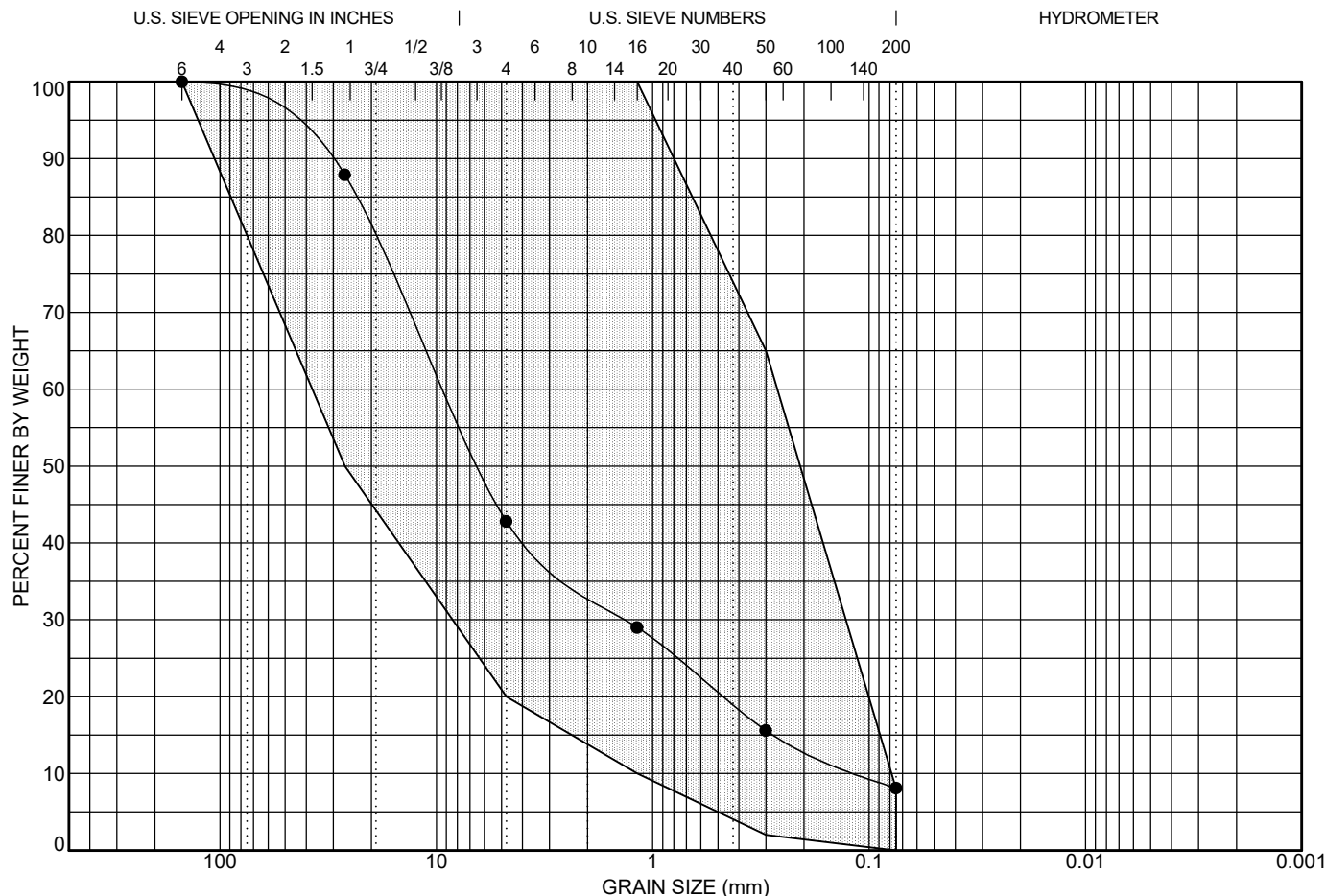
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150	100.0	100
26.5	94.9	50 - 100
4.75	26.5	20 - 100
1.18	18.4	10 - 100
0.300	10.7	2 - 65
0.075	5.6	0 - 8



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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.75	85.87	150	9.15	1.305	0.107	52.4	34.7	8.1	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-9, 0.2 to 0.35 m depth
Sample No.: 1
Date Sampled: May. 28 - 2019
Sampled By: NZ
Lab No.: 0573
Date Tested: Jun. 08 - 2019
Type of Material: Granular Base

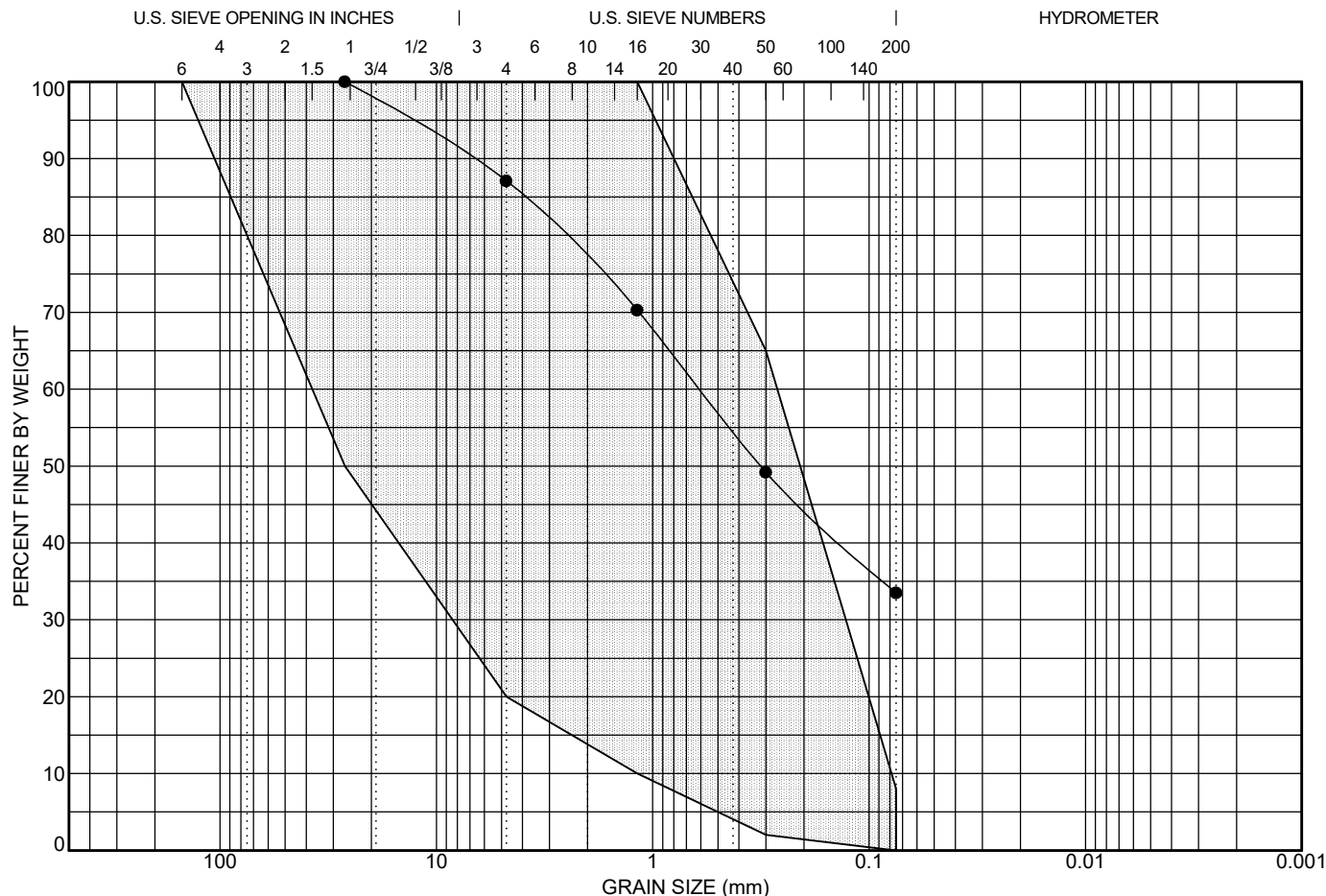
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150	100.0	100
26.5	87.9	50 - 100
4.75	42.8	20 - 100
1.18	29.0	10 - 100
0.300	15.6	2 - 65
0.075	8.1	0 - 8



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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					26.5	0.605			12.9	53.6	33.5	

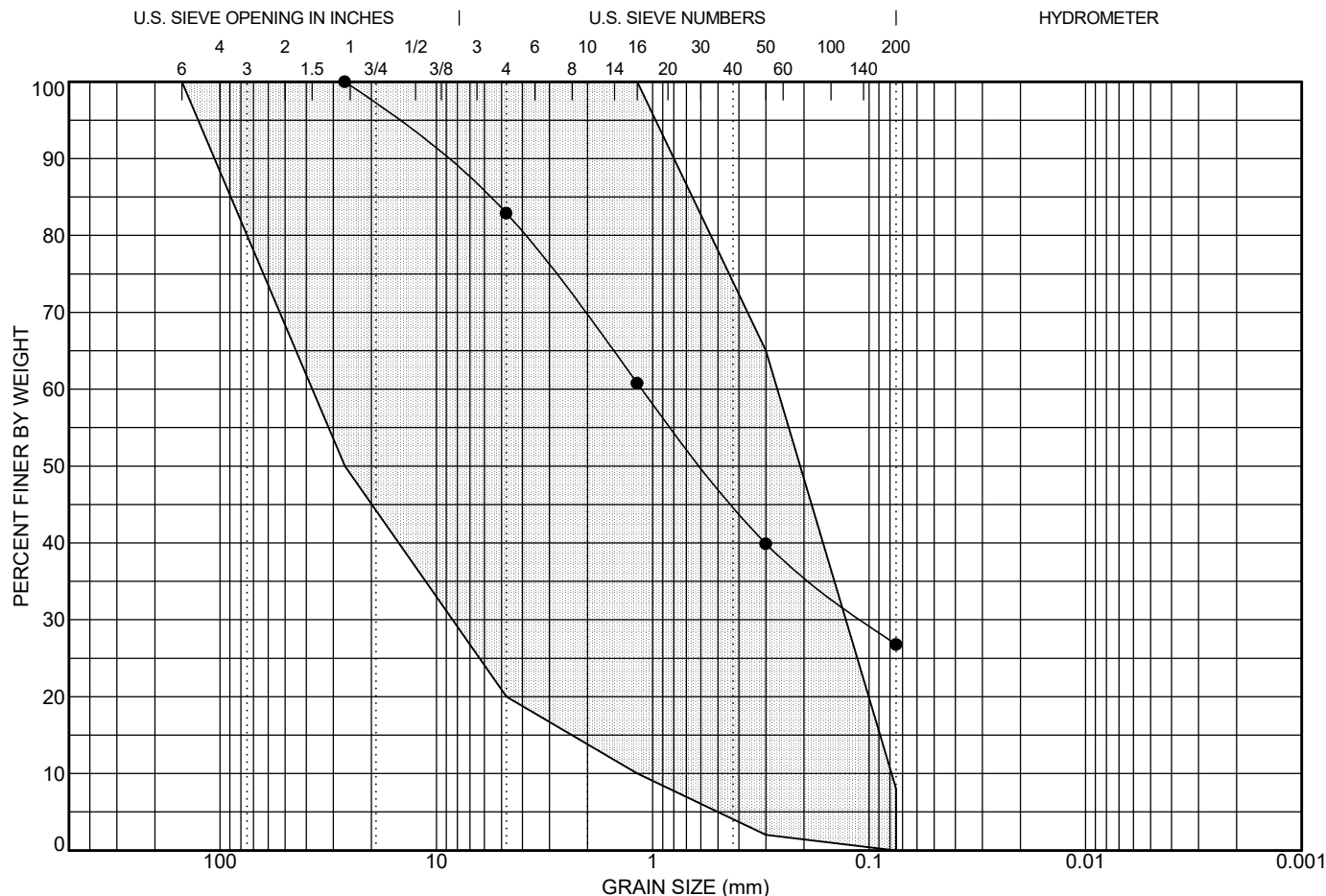
Date:	Jun. 19 - 2019	Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
Client:	IBI Group	150		100
Contractor:		26.5	100.0	50 - 100
Source:		4.75	87.1	20 - 100
Sampled From:	BH-11, 0.2 to 0.5 m depth	1.18	70.3	10 - 100
Sample No.:	1	0.300	49.2	2 - 65
Date Sampled:	May. 28 - 2019	0.075	33.5	0 - 8
Sampled By:	NZ			
Lab No.:	0534			
Date Tested:	Jun. 04 - 2019			
Type of Material:	Granular Base (Silty)			



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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					26.5	1.12	0.105		17.1	56.1	26.8	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-14, 0.15 to 0.3 m depth
Sample No.: 1
Date Sampled: May. 28 - 2019
Sampled By: NZ
Lab No.: 0535
Date Tested: Jun. 04 - 2019
Type of Material: Granular Base (Silty)

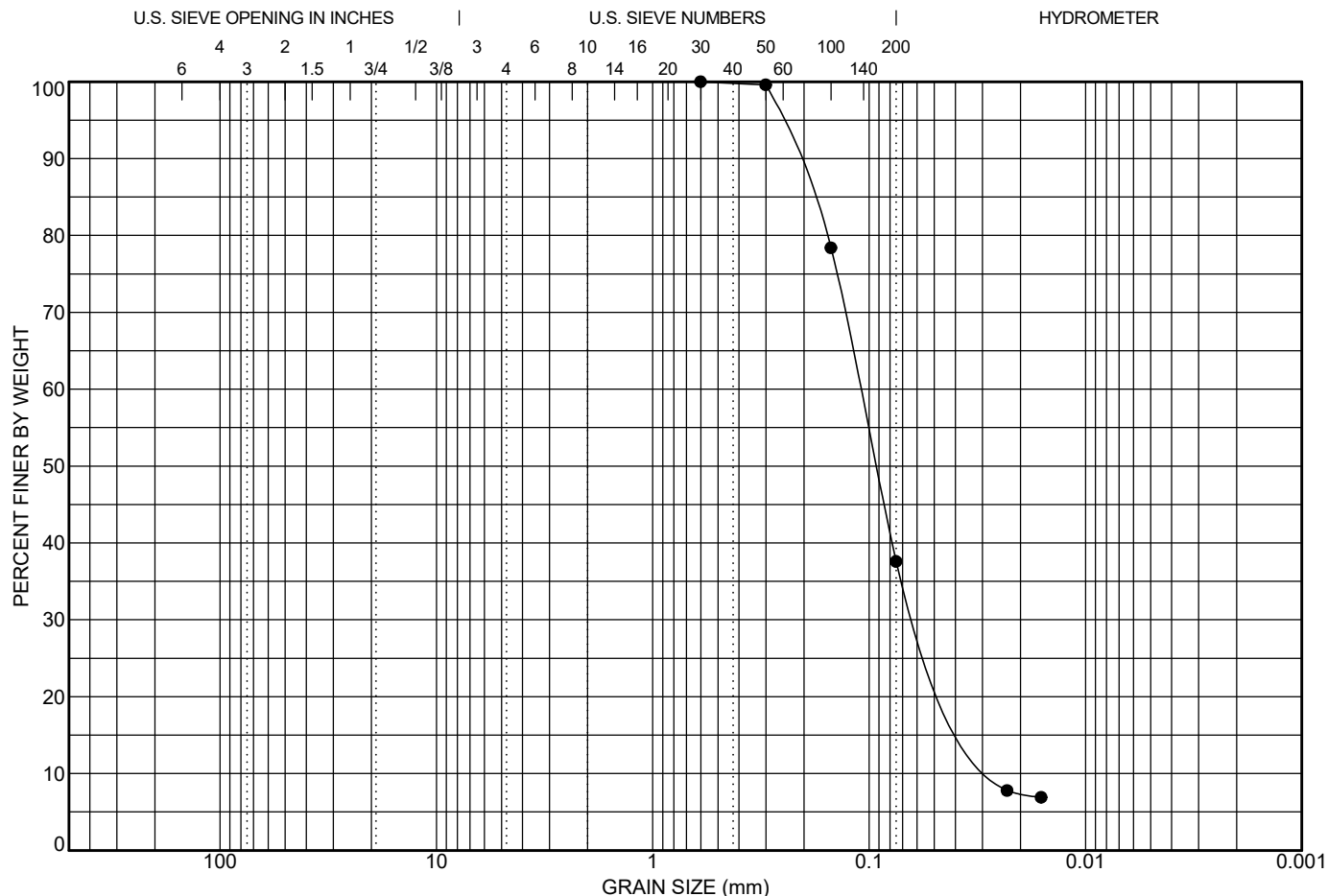
Sieve Size (mm)	Percent Passing	OPSS 1010 Granular 'B' Type I
150		100
26.5	100.0	50 - 100
4.75	82.9	20 - 100
1.18	60.8	10 - 100
0.300	39.9	2 - 65
0.075	26.8	0 - 8

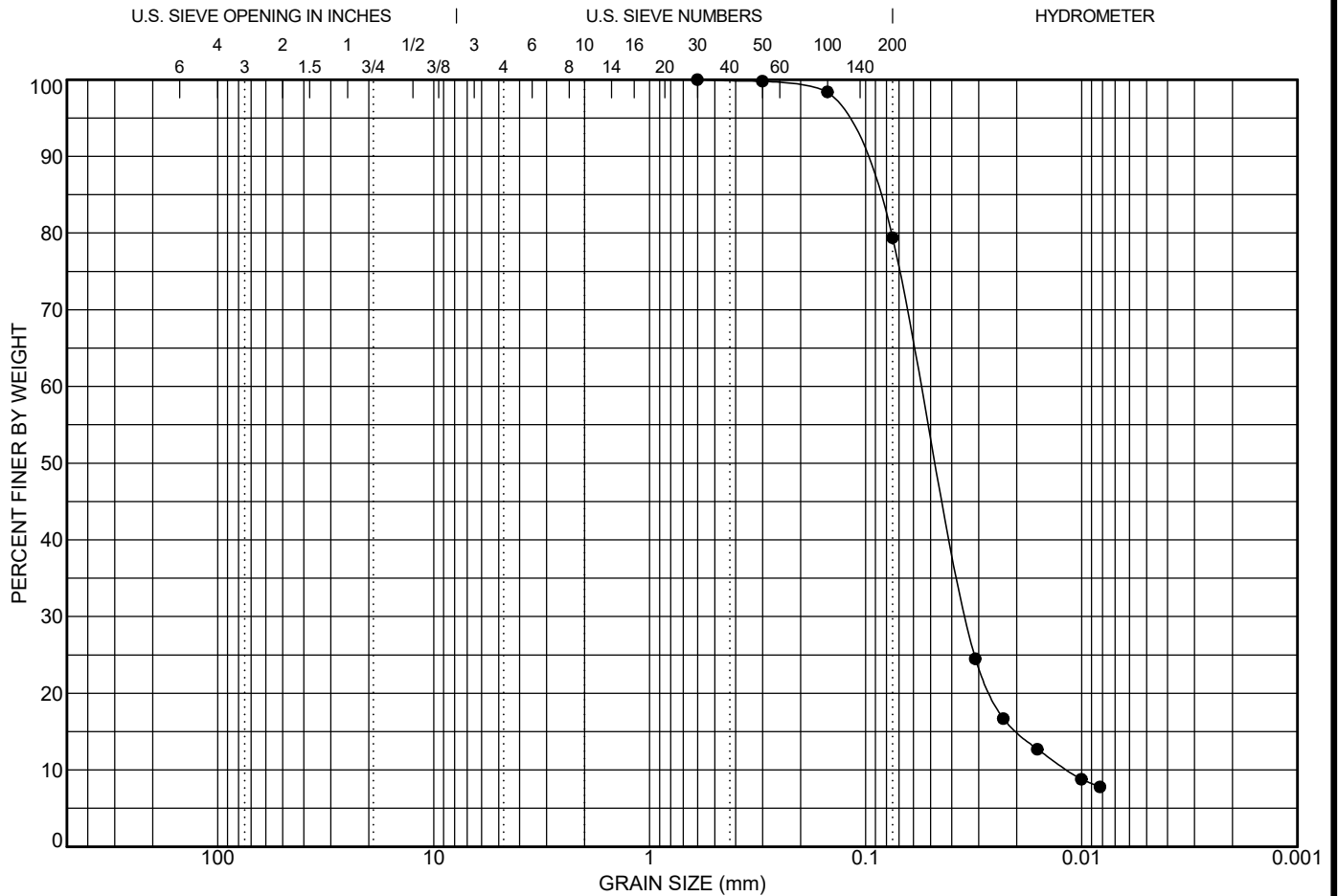


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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 20





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.81	4.75	0.6	0.055	0.034	0.012	0.0	20.6	79.4	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-2, 3.05 to 3.5 m depth
Sample No.: 5
Date Sampled: May. 27 - 2019
Sampled By: NZ
Lab No.: 0575
Date Tested: Jun. 07 - 2019
Type of Material: Sandy Silt

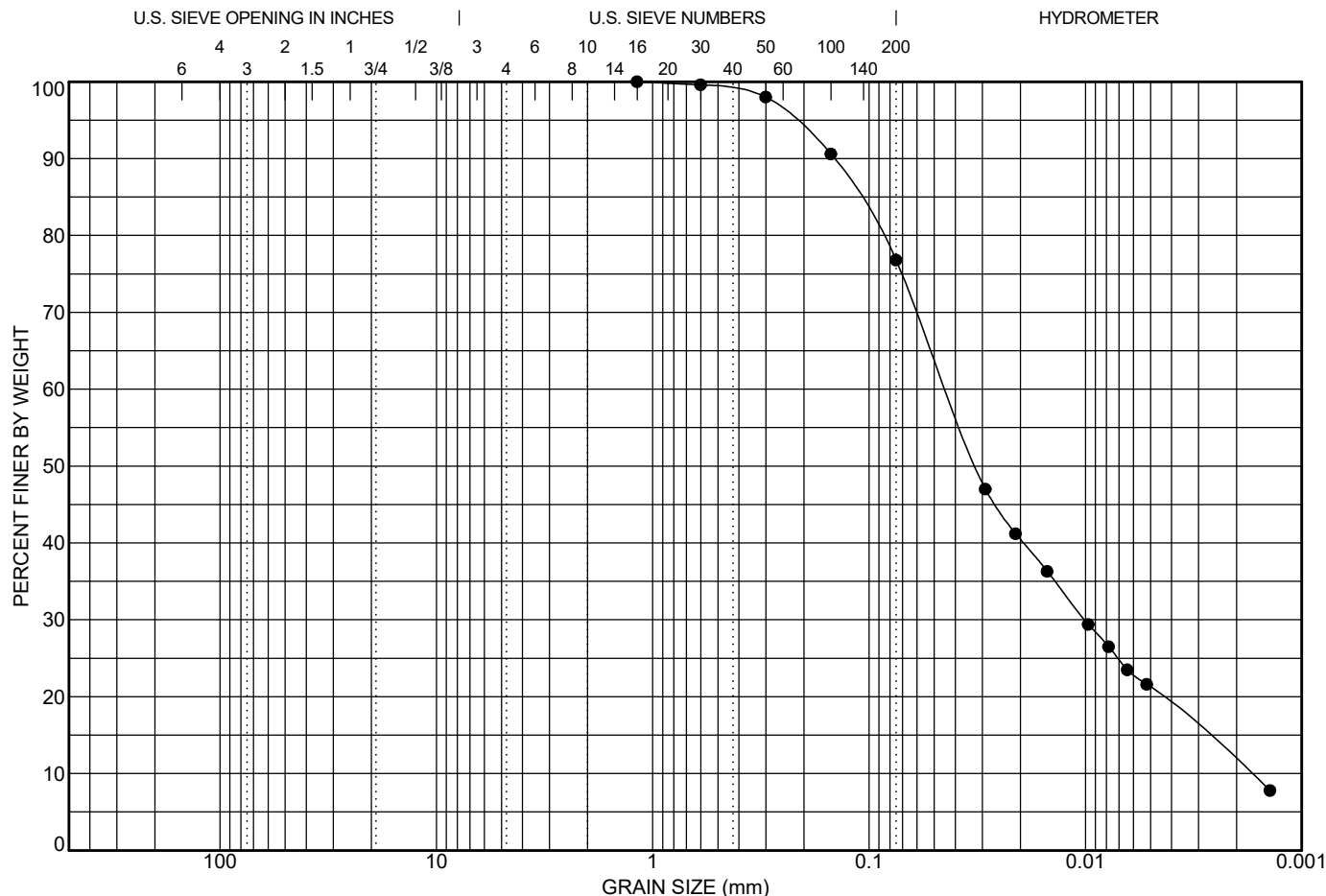
Sieve Size (mm)	Percent Passing	No Specifications

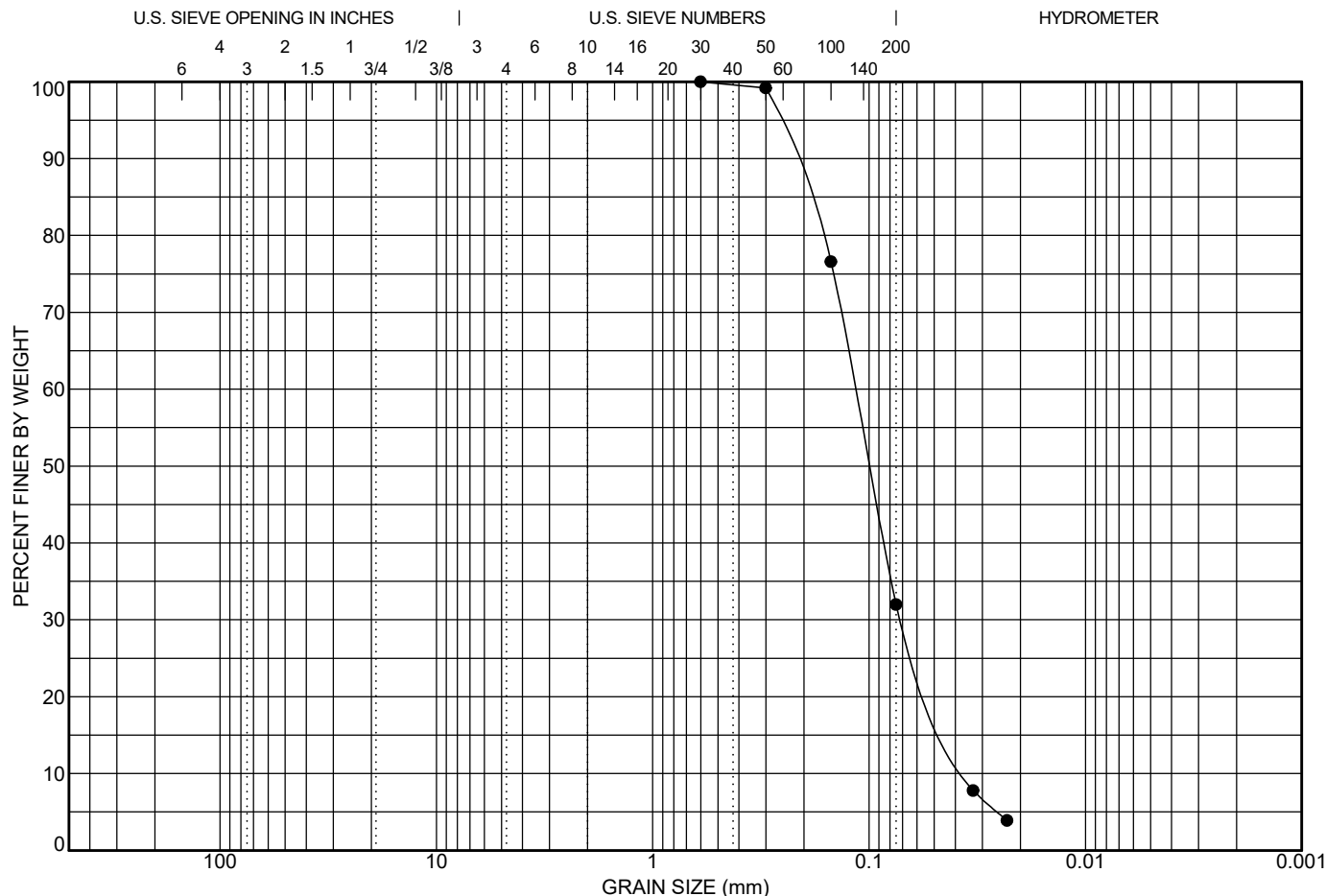


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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 22





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			1.19	3.26	0.6	0.116	0.07	0.036	0.0	68.0	32.0	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-7, 2.25 to 2.7 m depth
Sample No.: 4
Date Sampled: May. 29 - 2019
Sampled By: NZ
Lab No.: 0578
Date Tested: Jun. 07 - 2019
Type of Material: Silty Sand

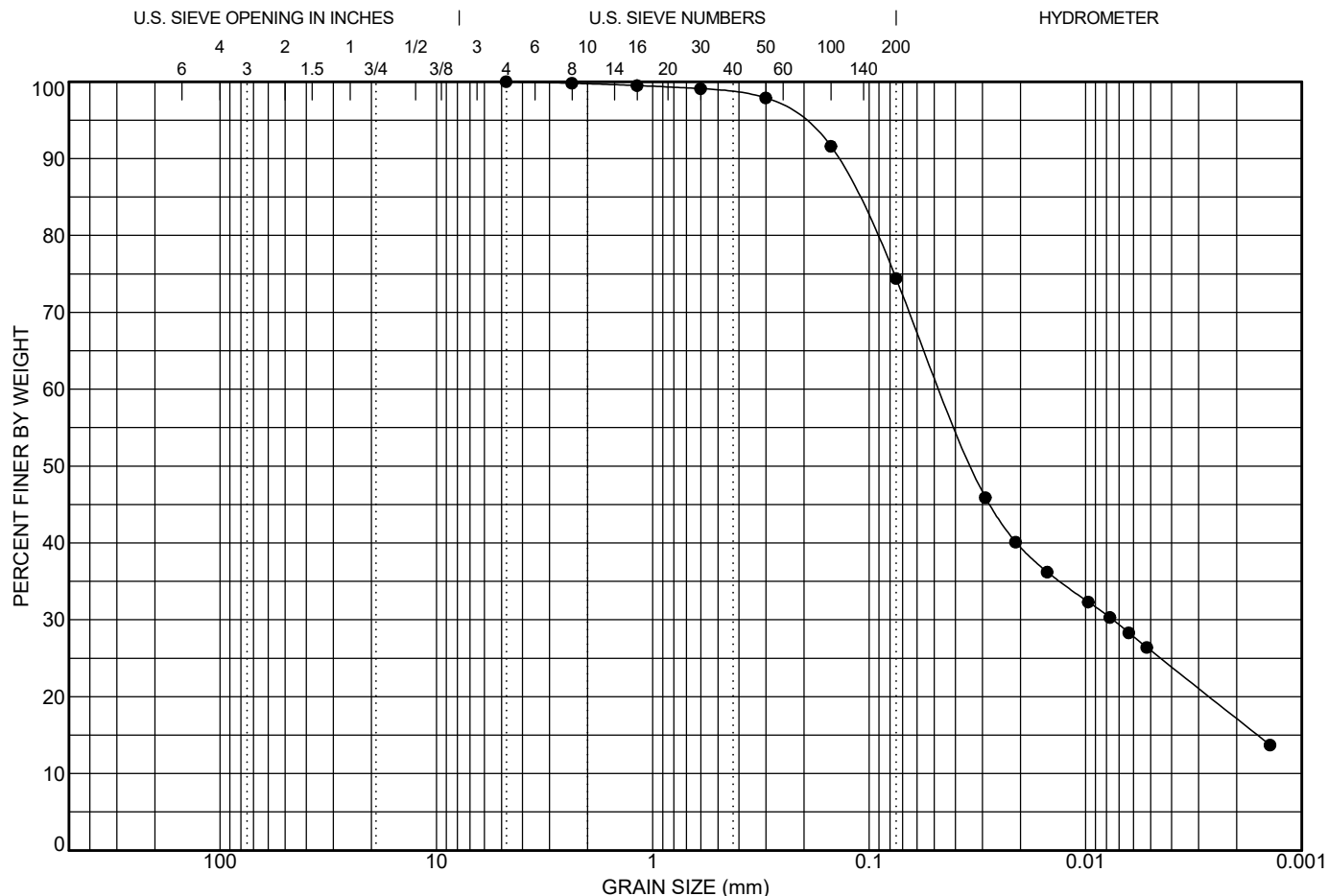
Sieve Size (mm)	Percent Passing	No Specifications

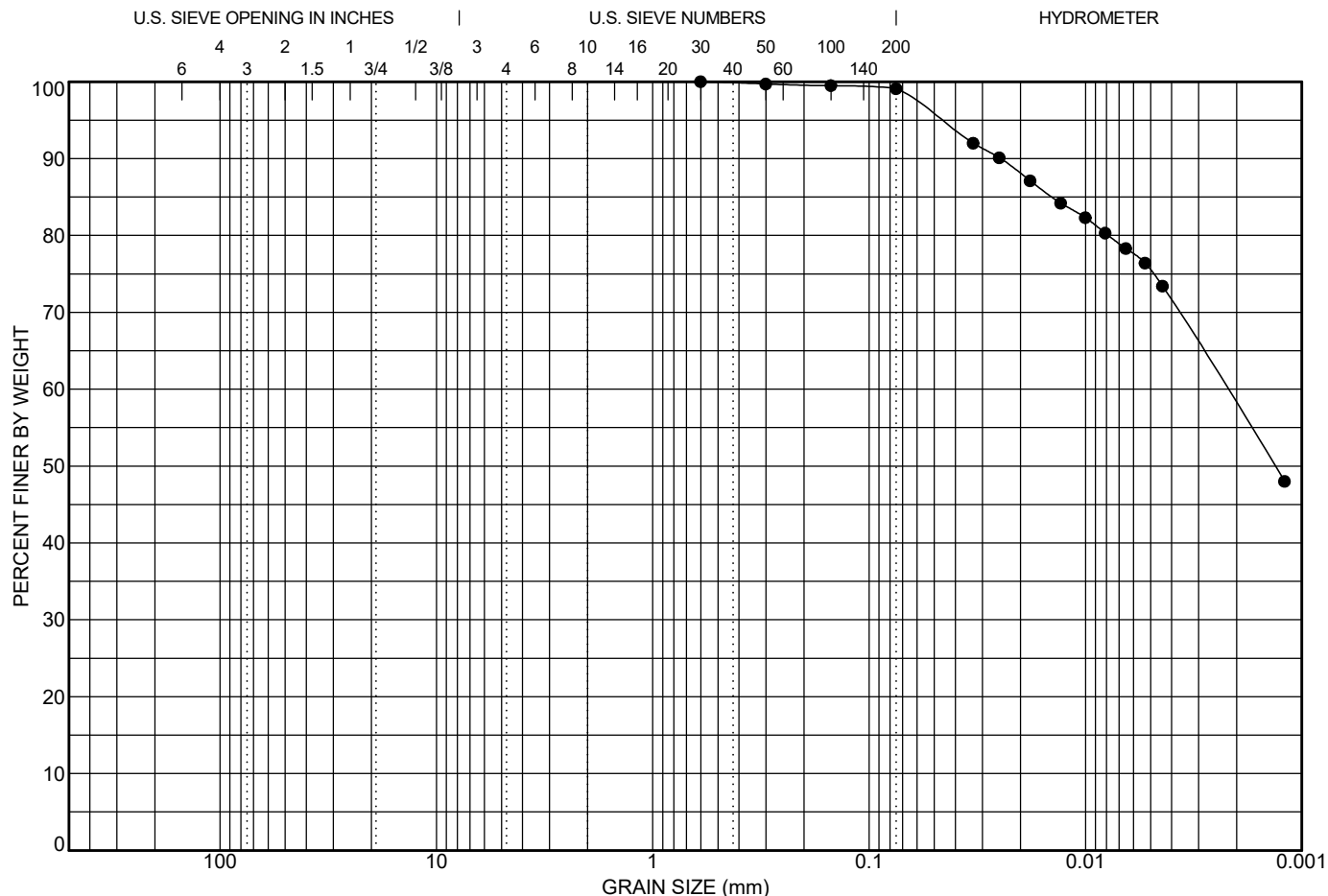


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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
Enclosure No.: 24





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
					0.6	0.002			0.0	0.9	99.1	

Date: Jun. 19 - 2019
Client: IBI Group
Contractor:
Source:
Sampled From: BH-5, 3.8 to 4.25 m depth
Sample No.: 6
Date Sampled: May. 29 - 2019
Sampled By: NZ
Lab No.: 0577
Date Tested: Jun. 07 - 2019
Type of Material: Silty Clay

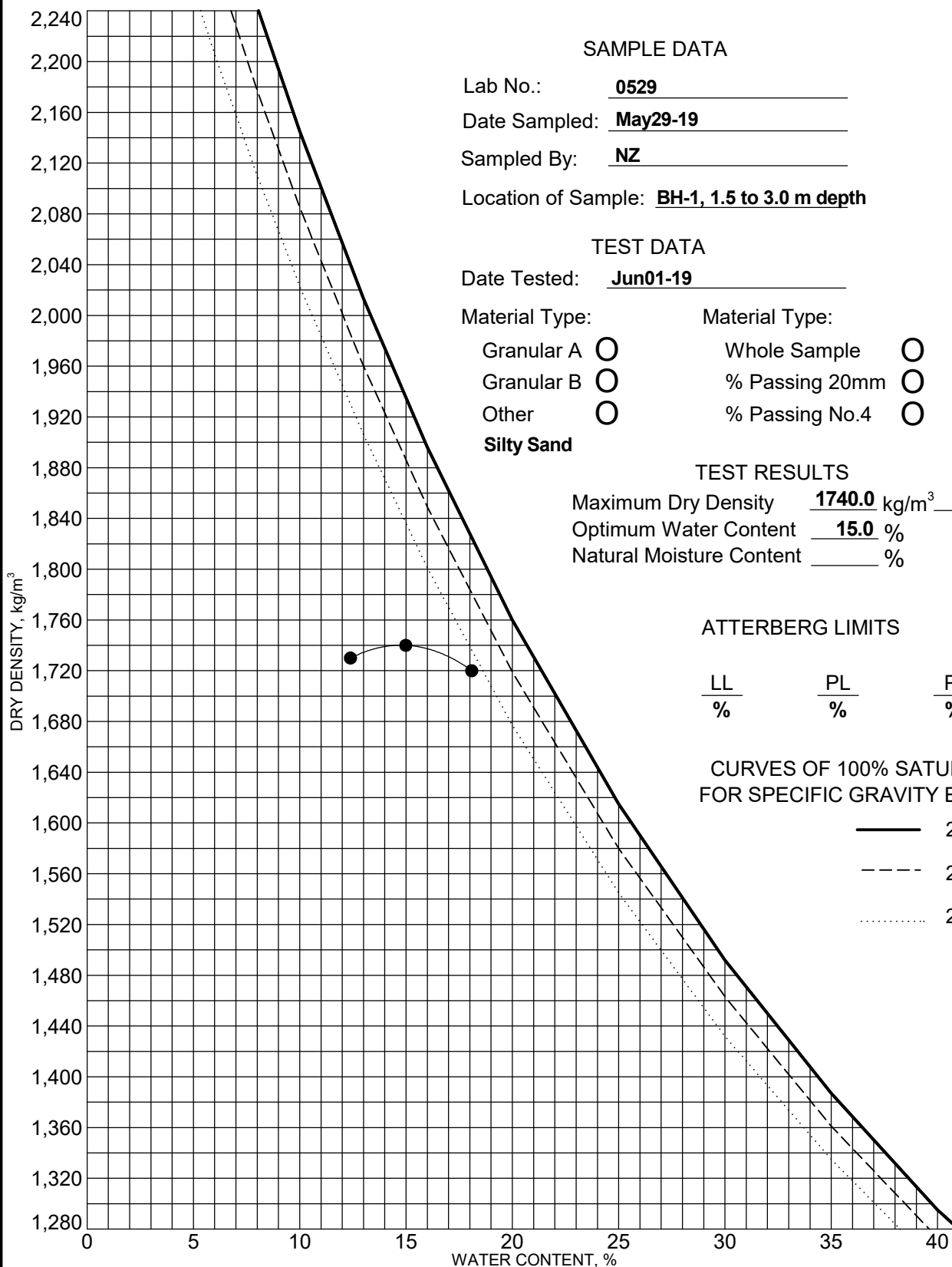
Sieve Size (mm)	Percent Passing	No Specifications



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GRAIN SIZE DISTRIBUTION

Project: University Avenue Reconstruction
Location: Albert Street to Weber Street North, Waterloo, Ontario
File No.: G19750
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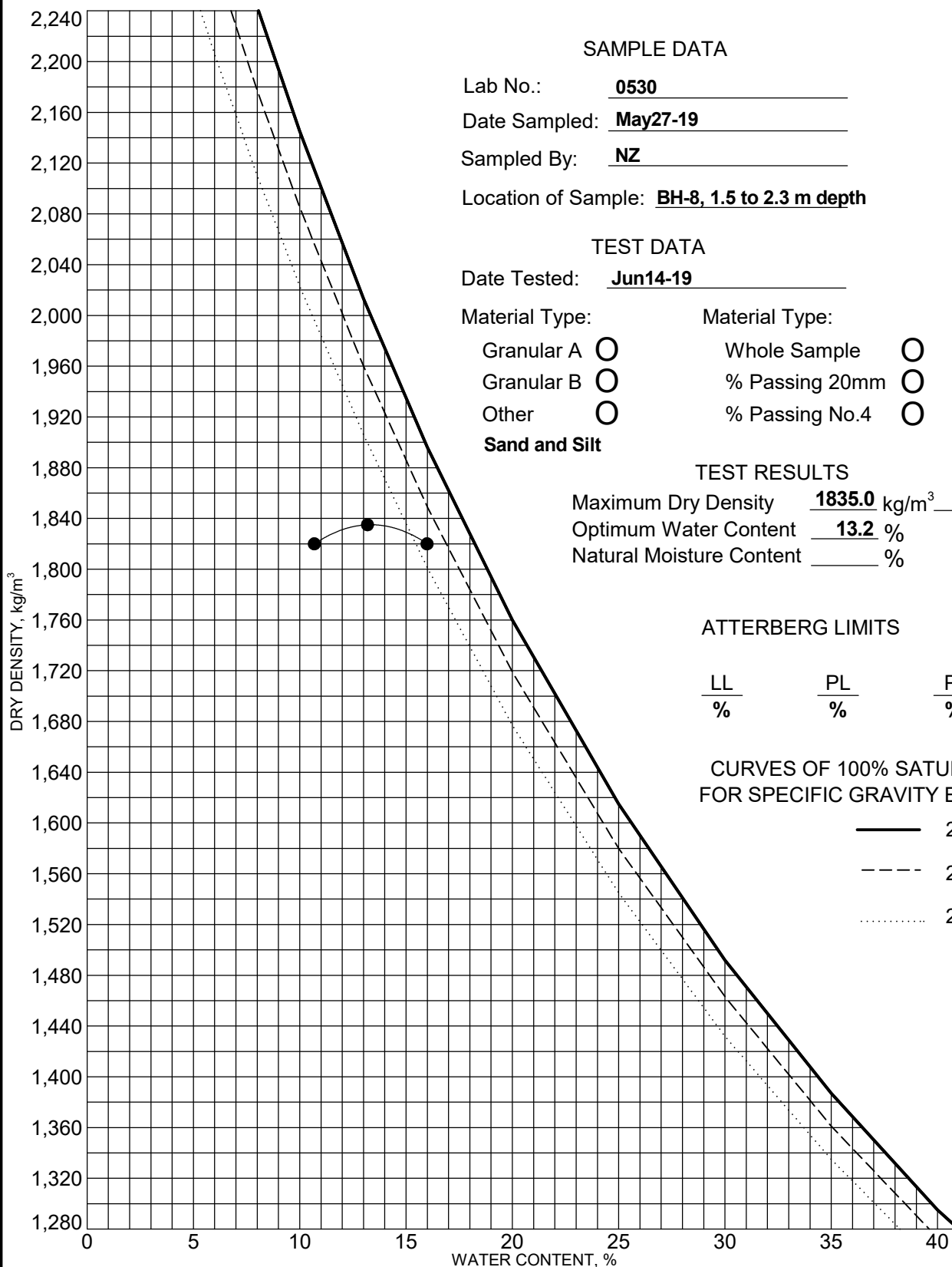
STANDARD PROCTOR TEST RESULTS

Project: **University Avenue Reconstruction**

Location: **Albert Street to Weber Street North, Waterloo, Ontario**

File No.: **G19750**

Enclosure No.: 27



SAMPLE DATA

Lab No.: 0530

Date Sampled: May27-19

Sampled By: NZ

Location of Sample: BH-8, 1.5 to 2.3 m depth

TEST DATA

Date Tested: Jun14-19

Material Type: ☐ Granular A ☐ Granular B ☐ Other ☐ Sand and Silt

Material Type: ☐ Whole Sample ☐ % Passing 20mm ☐ % Passing No.4 ☐

TEST RESULTS

Maximum Dry Density 1835.0 kg/m³ 114.6 PCF

Optimum Water Content 13.2 %

Natural Moisture Content _____ %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

— 2.80

- - - 2.70

..... 2.60



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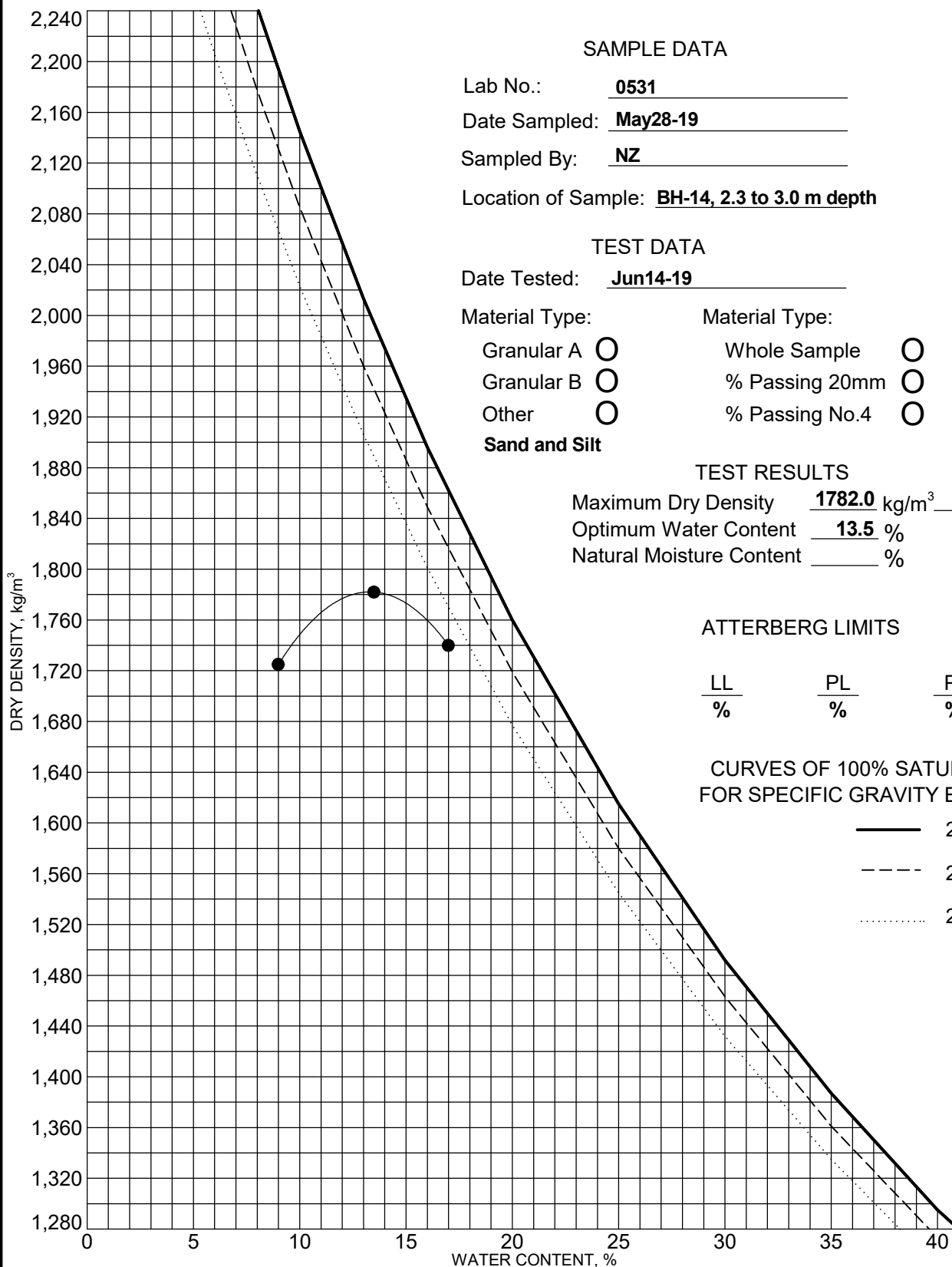
STANDARD PROCTOR TEST RESULTS

Project: **University Avenue Reconstruction**

Location: **Albert Street to Weber Street North, Waterloo, Ontario**

File No.: **G19750**

Enclosure No.: 28



SAMPLE DATA

Lab No.: 0531Date Sampled: May28-19Sampled By: NZLocation of Sample: BH-14, 2.3 to 3.0 m depth

TEST DATA

Date Tested: Jun14-19

Material Type:

Granular A ☐Granular B ☐Other ☐**Sand and Silt**

Material Type:

Whole Sample ☐% Passing 20mm ☐% Passing No.4 ☐

TEST RESULTS

Maximum Dry Density 1782.0 kg/m³ 111.2 PCFOptimum Water Content 13.5 %

Natural Moisture Content _____ %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

—	2.80
- - -	2.70
.....	2.60



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STANDARD PROCTOR TEST RESULTS

Project: **University Avenue Reconstruction**Location: **Albert Street to Weber Street North, Waterloo, Ontario**File No.: **G19750**

Enclosure No.: 29