

# **Scoped Hydrogeological Assessment**

**13656 Emil Kolb Parkway  
Colerain Drive and Harvest Moon Drive  
Town of Bolton (Caledon), Ontario**

**Project 10083**

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# **1. INTRODUCTION**

Hydrogeology Consulting Services (HCS) was retained by Harvestone Centre Inc. to conduct a scoped hydrogeological assessment for the proposed development at Colerain Drive and Harvest Moon Drive in the Town of Bolton (Caledon), Ontario. The location of the subject property is shown on Drawing 1 in Appendix A. Proposed development of the 0.45 hectare property includes a three block residential development of 45 units as shown on the Site Plan (Soscia Professional Engineers Inc., December 2020) included in Appendix A. The property is currently vacant and is serviced by municipal water supply and sewage effluent disposal.

This assessment has been prepared to respond to requirements from the Town of Caledon and the Region of Peel.

## **1.1 Previous and Concurrent Studies**

HCS has not been made aware of previous studies of the subject property. Concurrently with the hydrogeological assessment a geotechnical investigation is being completed by CMT Engineering Inc. The Geotechnical Engineering Report (CMT Engineering Inc., Project No. 21-242, June 2021) provides a description of the subsurface soil stratigraphy and geotechnical conditions beneath the property, along with evaluations of geotechnical parameters and requirements for the proposed redevelopment. The geotechnical investigation report should be read in conjunction with this report.

A Phase I Environmental Site Assessment is also being completed concurrently with this assessment (Peritus Environmental Consultants Inc., September 2021).

## **1.2 Scope of Work**

Field investigation for this scoped hydrogeological assessment comprised a site visit to assess the property and the proposed site plan layout. Six boreholes were drilled on the property by CMT Engineering Inc., with four boreholes completed as 38 mm diameter monitoring wells to investigate the presence of shallow groundwater. Soil samples were obtained from the boreholes for the purposes of particle size distribution (grain size) analysis, and monitoring wells were assessed via slug tests to estimate saturated soil hydraulic conductivity. Water chemistry samples were also obtained from selected wells for analysis of general chemistry parameters per the Region of Peel's Storm Sewer Use By-Law regulations.

### **1.2.1 Borehole Drilling and Monitoring Well Installation**

On June 2, 2021 CMT Engineering Inc. observed and performed drilling of six boreholes (BH 01 to BH 06) to depths between 3.88 and 6.10 metres below ground surface (mBGS) via direct push using a Geoprobe 7822DT drill rig.

Split spoon samples obtained at 0.76 and 1.52 m intervals within the first 3 m of drilling, with continuous soil core samples obtained at 1.52 m intervals below 3 m. Selected soil samples were submitted to CMT Engineering Inc. for particle size distribution (grain size) analysis.

Well locations and ground surface elevations were surveyed by CMT Engineering Inc., and the locations are shown on the appended Drawing 2 (CMT, 2021). The boreholes were located to a local datum.

Boreholes BH 01, 04, and 05 were completed as 38-mm diameter monitoring wells using 3.05 m slotted Schedule 40 PVC well screens and PVC riser pipes, with well sand installed around the well screens and the borehole annular spaces sealed with bentonite. All wells were constructed with flush mounted protective steel casings, and lockable vented protective caps. Monitoring well construction followed Ontario Regulation 903 (as amended). Borehole logs are included in Appendix C for reference.

The wells were developed (purged) using a Waterra inertial valve and tubing to remove fine-grained material from the well screen sand pack and mitigate smearing on the borehole walls during drilling.

Stabilized groundwater elevations were measured using a manual electronic water level tape on June 6, 2021. Well construction information and water level measurements are summarized in Table 1 in Appendix B.

## **2. STUDY AREA PHYSIOGRAPHY AND HYDROGEOLOGY**

### **2.1 Site Description**

The subject property is located within a predominantly residential area, within the Town of Bolton (Caledon). The property is bounded by existing residential properties to the north, and west as well as Coleraine Drive to the east and Harvest Moon Drive to the south.

As shown on the appended Drawing 2, the subject property is currently vacant. There are a few coniferous trees near the corner of the intersection and along the north property line. The surface topography of the subject property is relatively level with an elevation of approximately 259 metres above sea level (mASL), and a change in elevation of less than 1.5 m across the property. The topography is relatively level with a slight slope to the east.

## **2.2 Physiography**

The subject property is located within the South Slope physiographic region, and is within the Drumlinized Till Plains physiographic landform which is mainly comprised of drumlinized glacial till overlain by thin aeolian sand deposits (Chapman and Putnam, 2007). Within the Town of Bolton urban limits the Drumlinized Till Plains surface topography has generally been graded.

## **2.3 Geology**

Quaternary Geology mapping (Ontario Geological Survey, 2000) indicates the subject property is underlain by clay to silt-textured till with interbedded deposits of silt and sand (Halton Till) derived from glaciolacustrine deposits or shale.

Overburden soil stratigraphy observed in the six boreholes drilled on the subject property generally consists of topsoil underlain by clayey silt with some sand and trace gravel (till) to the borehole completion depths of up to 6.1 mBGS. The borehole logs are included in Appendix C for reference.

Paleozoic Geology mapping of Ontario (Anderson and Dodge, 2007) indicates underlying the overburden deposits is Georgian Bay Formation shale and limestone bedrock. Water well records from adjacent properties show that shale bedrock was encountered at depths between 45.4 and 77.7 mBGS.

## **2.4 Hydrogeology and Groundwater**

Perched groundwater was encountered in the fine-grained overburden till deposits at depths of 2.83 to 5.10 mBGS corresponding to elevations of 253.37 to 255.69 mASL on June 6, 2021. It is noted that seasonal fluctuations in groundwater elevations would be expected, with the June measurements expected to be somewhat lower than typical spring high water levels.

Groundwater encountered in the silt and clay till soils is considered perched water trapped within seams of more permeable material within the low permeability deposits, or within the deposits themselves, rather than a local or regional groundwater aquifer.

As shown on the groundwater contour map on the appended Drawing 3, shallow groundwater perched within the low permeability soils beneath the property is generally flowing south-eastwards generally following the flow direction of nearby creeks.

Locally, shallow overburden groundwater is expected to flow generally eastwards/north-eastwards following the tributary creeks and surface water features that flow towards the Humber River. As the site is located within the Black Creek Humber River Outlet subwatershed of the Main Humber River watershed; regionally, groundwater is expected to flow generally eastwards/south-eastwards following the general watershed topography and flow routes of the

creeks within the Humber River subwatershed. It is noted that the boundary of the Bolton Dam - Humber River subwatershed is located approximately 200m north of the subject property.

Percolation of precipitation into the shallow subsurface is governed by near-surface soil types, in addition to factors such as topography, evapotranspiration, and the degree of soil saturation. Small volumes of precipitation infiltrating into the near-surface native low-permeability deposits would be expected to become perched on top of and within low permeability deposits of clayey silt till. Over time small volumes of perched water could gradually percolate vertically downwards or flow laterally following ground surface topography. The lack of hummocky terrain within the South Slope region means that ponding of precipitation and depression-focused infiltration are unlikely.

Based on subsurface stratigraphy consisting of deposits of low permeability till, no shallow overburden aquifer is present beneath the property. As discussed previously, small amounts of perched water exist in overburden soils, which generally acts as an aquitard beneath the subject property. As no monitoring wells were screened/completed in deeper overburden aquifer units an evaluation of deep overburden groundwater was not performed.

More regional hydrostratigraphy would be expected to consist of the Halton Till Aquitard overlying the Oak Ridges Aquifer, which in turn overlies sequences of aquifers and aquitards such as the Newmarket Aquitard, the Thorncliffe Aquifer, and older overburden deposits. The silt till encountered in the boreholes could represent the Halton Till; however, without deeper boreholes on site it is difficult to conclusively determine whether the soils encountered represent a vertically extensive aquitard, or whether they are simply minor variations of more regional near surface stratigraphy.

## **2.5 Surface Water Features**

Based on the site visit completed June 6, 2021, there are no visible surface water features on the subject property. A stormwater management pond is located across the road, south of Harvest Moon Drive. There is a tributary of Jaffary's Creek located east of the property leading to Jaffary's pond. TRCA mapping indicates that the creek and surrounding area are regulated by the TRCA; however, the subject property is not within a regulated area.

## **2.6 Soil Hydraulic Conductivity**

Hydraulic conductivity estimates for the site soils were determined using single response hydraulic (slug) tests of the soil deposits screened by the monitoring wells. Estimates of hydraulic conductivity were also made using soil sample grain size analyses and the Kaubisch, Breyer, Kozeny-Carman, and Hazen formulae where appropriate.

### 2.6.1 Slug Test Results

Prior to conducting slug testing of the monitoring wells, each well was developed (purged) to mitigate smearing during drilling and remove fine-grained material from the sand pack around the well screen and the screened interval.

The slug test methodology followed the procedures developed by Hvorslev (1951), as described in Freeze and Cherry (1979). The slug tests were conducted as falling head tests by introducing a volume (slug) of potable water into the well to cause a temporary rise in the water table; or, as rising head tests by purging a well dry and allowing water to flow naturally back into the well. The displacement and gradual re-equilibration of the water level in the wells was recorded using electronic pressure transducers (dataloggers).

Hvorslev's method is expressed by the following equation:

$$K = \frac{r^2 \ln(L/R)}{2LT_{0.37}}$$

where:

- K = hydraulic conductivity of the tested material (m/sec)
- r = inner radius of the well riser pipe (m)
- R = outer radius of the well riser pipe (m)
- L = length of screen and sand pack (m)
- T<sub>0.37</sub> = time lag (sec), where (H-h)/(H-H<sub>0</sub>) = 0.37
- h = water level at each time of measurement (m)
- H<sub>0</sub> = initial water level (m, start of test)
- H = stabilized water level prior to slug testing (m)

The time lag, T<sub>0.37</sub>, represents the time required for the water level to recover to the stabilized level if the initial flow rate from the surrounding aquifer into the well is maintained. This time lag is determined graphically as the time where (H-h) divided by (H-H<sub>0</sub>) is equal to 0.37.

Graphical analyses of the slug tests are included in Appendix E, and the hydraulic conductivity estimates are listed in the appended Table 2. As none of the three slug tests achieved T<sub>0.37</sub>, an estimated hydraulic conductivity values of <1 x 10<sup>-7</sup> m/sec suggests very low permeability for the clayey silt till soils.

### 2.6.2 Grain Size Analysis Results

Samples of soil collected from Boreholes BH 03 and 05 during drilling were submitted to the CMT Engineering Inc. laboratory facility in St. Clements, Ontario for analysis of particle size distribution (grain size). As shown on the grain size analysis graphs included in Appendix F, the near-surface soils predominantly consist of clay and silt with trace amounts of sand and gravel. The grain size analysis results were used to estimate soil hydraulic conductivity (K) values by applying the Kaubisch, Breyer, Hazen, and Kozeny-Carman formulae where appropriate based

on the limitations of each formula. The hydraulic conductivity estimates are summarized in the appended Table 2.

It is noted that for both soil samples a high percentage of fine-grained material was present in a sample, requiring the  $D_{10}$  value of the sample to be approximated; therefore, calculated values are considered estimates.

Hydraulic conductivity values of  $<1 \times 10^{-9}$  and  $1.4 \times 10^{-9}$  m/sec correlate well with the slug test calculated values and indicate a very low permeability for the soils underlying the property.

The hydraulic conductivity estimates from both slug test and grain size analyses correlate reasonably well with published ranges for the major soil types (Freeze and Cherry, 1979).

## 2.7 Groundwater Chemistry

On June 6, 2021 one water chemistry sample was obtained from on-site monitoring well BH 01. The samples were collected in the appropriate laboratory-supplied containers, stored in a cooler, and delivered to ALS Environmental Laboratories in Waterloo, Ontario for analysis of the Region of Peel's Storm Sewer and Sanitary Sewer Use By-Law chemistry parameters. The laboratory Certificate of Analysis (COA) is included in Appendix G for reference, and the appended Table 3 summarizes parameters of interest.

It is important to consider the water chemistry samples were obtained using an inertial valve (Waterra Valve) and tubing. The method of water collection inherently results in the inclusion of sediments into the water sample which can increase concentrations of parameters such as colour, turbidity, total suspended solids, total dissolved solids, and total metals where metals are adsorbed onto soil particles.

The sample from BH 01 exhibited exceedances of the Region of Peel's Storm Sewer By-Law limits for the following parameters:

- Total Suspended Solids (TSS)
- Total Manganese
- Total Zinc

The sample from BH 01 exhibited exceedances of the Region of Peel's Sanitary Sewer By-Law limits for the following parameters:

- Total Suspended Solids (TSS)

It is understood proposed development on the site includes slab-on-grade construction which will not require excavation below the level of perched groundwater. It is important to note that if any dewatering is required and discharge is not collected using a hydrovac truck for off-site treatment and disposal, discharge to municipal storm sewers would require discharge chemistry



testing to ensure all Storm Sewer Use By-Law criteria are met, and permission to discharge to municipal sewers from the municipality or Region of Peel. Treatment of discharge to resolve potential exceedances of total manganese would likely be necessary.

### **3. WATER USERS**

Well Records from the Ministry of the Environment, Conservation, and Parks (MECP) Water Well Record (WWR) Database (2020) were reviewed to determine the number of supply wells present. According to the MECP WWR Database sixteen wells are located within an approximate radius of 500 m from the subject property.

Of these wells, six are identified as test holes or monitoring wells, with one additional well having a diameter of 50 mm or less assumed to be a monitoring well not used for water supply. Five well records pertain to abandoned wells, and two additional wells are identified as not in use. These records have been excluded from further consideration.

The two remaining domestic use wells are completed in overburden soils at depths of 15.24 and 75.28 mBGS, respectively. A copy of the MECP well records is included in Appendix D, and the two wells are plotted on the appended Drawing 4.

It is noted that some wells plotted on the appended Drawing 4 are located in areas where the actual existence of a well is unlikely (they may be associated with nearby properties), and that some properties shown on the aerial imagery do not have a well associated with them; however, the MECP WWR coordinate data has been used in the absence of more reliable information.

The Region of Peel Department of Public Works was consulted to determine where municipal watermains existed within a 500 m radius of the property. Watermains were identified along Colerain Drive, Harvest Moon Drive, King Street (Emil Kolb Parkway), and 6<sup>th</sup> Line. It is anticipated that MECP WWRs which may plot along these roadways could represent wells which have been previously decommissioned, or wells which are not used for drinking water supply.

#### **3.1 Door-to-Door Well Survey**

On June 11, 2021 a survey of properties where a private water supply well might exist within a 500 m radius of the subject property was conducted to determine the locations and construction details of private water supply wells in the area. It is noted due to COVID-19 protocol the door-to-door survey was completed by leaving a copy of the survey along with a self-addressed stamped envelope at each residence.

Two homes were canvassed. Zero surveys were filled out and received by mail prior to the preparation of this report.

### 3.2 Municipal Wellhead Protection Areas

Ontario Source Protection Information Atlas (OSPPIA) mapping shows that the property is not located within a Wellhead Protection Area (WHPA). There are no WHPAs more than 6 km southeast of the subject property.

### 3.3 Sensitive Features

Ontario Source Protection Information Atlas mapping indicates that the subject property does not fall within a highly vulnerable aquifer zone, or a significant groundwater recharge area.

Based on the presence of low permeability clayey silt till overburden soils from ground surface to a depth of more than 6 mBGS there is no shallow overburden aquifer beneath the subject property, and any deeper overburden aquifer would be sufficiently isolated by the overburden aquitard to be protected from any potential ground surface contaminants. Since all pavement stormwater runoff will be directed to municipal storm sewers, it is reasonable to conclude that no potential surface contaminants that might be accidentally released at the site would be able to migrate vertically downwards to a deep overburden or bedrock aquifer, or laterally to surface water features.

Natural Heritage Area maps from the Ministry of Natural Resources and Forestry (MNRF; 2020) reveal no Areas of Natural and Scientific Interest (ANSIs) within the subject property or surrounding area. As discussed in Section 2.5, TRCA mapping (2019) indicates that Jaffary's Creek and surrounding area southeast of the site are regulated by the TRCA.

Minimum buffer requirements must be satisfied for all sensitive features.

## 4. CONSTRUCTION DEWATERING ASSESSMENT

Table I below summarizes the construction excavation parameters based on information provided on the engineering drawings for the project (Soscia Professional Engineers, Inc. 2020).

Table I: Construction Excavation Parameters

Task	Excavation Dimensions (approximate) (m)	Excavation Depth (mBGS)	Estimated Seasonally High Groundwater Elevation (mBGS)*
Building Footings	40 x 16 m (3 buildings)	0.5 mBGS	1.58 mBGS

\*- Estimated seasonally high groundwater elevation is the highest measured groundwater elevation from June 2021, increased by 1.25 m.

Temporary dewatering requirements are dependent on factors such as excavation parameters (excavation dimensions, infrastructure invert elevations, the number of concurrent excavations, etc.), hydrogeological conditions at the site (groundwater levels, soil/bedrock hydrogeological parameters, etc.), construction and dewatering methodologies (open cuts, dewatering pits, sumps, wellpoints, etc.), and the amount of groundwater drawdown required to achieve and maintain dry working conditions and stable excavations.

Additionally, factors such as the use of shoring would be expected to influence the rate of groundwater inflow into an excavation. The calculations provided below assume an open excavation as a conservative factor of safety.

Based on preliminary excavation locations, dimensions, and depths provided for this report, construction of the slab on grade buildings will not require excavation below the elevation of perched water at the site. As a result, no construction dewatering requirements are anticipated for construction of the building. Additionally, it is noted the measured water level from June 6 has been increased by 1.25 m to account for seasonal groundwater fluctuation.

With no construction dewatering anticipated, there is no anticipated requirement for an Environmental Activity and Sector Registry (EASR), or Permit to Take Water (PTTW); however, the possibility for dewatering after a significant precipitation event should be considered by the client. Ontario Regulation 387/04 (as amended) requires authorization from the Ministry of the Environment, Conservation, and Parks (MECP) for all water takings over 50,000 L/day. Ontario Regulation 63/16 specifies that for temporary construction dewatering at rates between 50,000 and 400,000 L/day an Environmental Activity and Sector Registry (EASR) may be obtained in lieu of a Permit to Take Water (PTTW). Obtaining an EASR as an “insurance policy” for potential dewatering after a precipitation event can be completed by HCS should it be desired.

Discharge of any construction dewatering effluent (in the event dewatering is required) to a municipal sewer would require permission from the Town of Bolton/Region of Peel; however, based on the low daily dewatering rates that might realistically be encountered it is expected that collection of discharge using a hydrovac truck or similar equipment for off-site treatment and disposal will be sufficient for control of inflow into the excavation.

As discussed in Section 2.6 and its subsections groundwater chemistry samples exhibited measured exceedances of the Region of Peel Storm Sewer Use By-Law criteria limits for TSS, total manganese, and total zinc. The groundwater chemistry samples exhibited measured exceedances of the Region of Peer Sanitary Sewer Use By-Law criteria limits for TSS.

In the event construction dewatering for precipitation management is necessary, a cost-benefit analysis should be undertaken to evaluate the potential to discharge to municipal sewers vs. collection of water using a hydrovac truck or similar equipment for off-site disposal.

## 5. CLOSURE

Subsurface stratigraphy beneath the subject property consists of fill underlain by more than 6 m of clay/silt till deposits. Perched water was encountered at a depth of 2.83 to 5.10 mBGS, flowing generally south-eastwards in the general flow direction of nearby creeks. These perched water conditions do not represent a local or regional shallow aquifer.

Soil hydraulic conductivity estimates from grain size analyses and slug tests indicate the clayey silt till deposits have a low hydraulic conductivity ranging from  $<1 \times 10^{-9}$  to  $<1 \times 10^{-7}$  m/sec.

There are no visible surface water features on the property and a stormwater management pond is located south of the subject site.

TRCA mapping indicates that Jaffary's Creek and surrounding area are regulated by the TRCA; however, the subject property does not lie within a regulated area. Mapping indicates the subject property is not within a highly vulnerable aquifer zone, significant groundwater recharge area, or wellhead protection area.

The construction dewatering assessment performed for the site demonstrates that the proposed slab on grade construction will not require excavation below the measured perched water levels beneath the property. Any construction dewatering discharge that might be generated (e.g. during precipitation management) that is not collected for off-site treatment and disposal would need to be tested and treated to ensure it meets Region of Peel Sewer Use By-Law criteria prior to discharge to a municipal sewer. Additionally, any discharge to a municipal sewer would require permission from the Town of Bolton/Region of Peel.

We trust that this report satisfies your present requirements, and we thank you for this opportunity to be of service. If you have any questions, or require further hydrogeological consulting services, please feel free to contact the undersigned directly.

Respectfully submitted,



Chris Helmer, B.Sc., P.Geo.  
Senior Hydrogeologist  
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## 6. LIMITATIONS AND USE

This report has been prepared for the exclusive use of the Client indicated in Section 1. Chris F Helmer hereby disclaims any liability or responsibility to any person or party for any loss, damage, expense, fines, or penalties which may arise from the use of any information or recommendations contained in this report by anyone other than the Client.

The conclusions and recommendations provided in this report are not intended as specifications or instructions to contractors. Any use contractors may make of this report, or decisions made based on it, are the responsibility of the contractors. Contractors must accept responsibility for means and methods of construction they select, seek additional information if required, and draw their own conclusions as to how the subsurface conditions may affect them.

In preparing this report Chris F Helmer has relied in good faith on information provided by individuals and companies noted in this report, and assumes that the information provided is factual and accurate. No responsibility is accepted for any deficiencies, misstatements, or inaccuracies contained in this report as a result of errors, omissions, misinterpretations, or fraudulent acts in the resources referenced, or of persons interviewed or consulted during the preparation of this report.

The report and its complete contents are based on data and information collected during investigations conducted by Chris F Helmer, and pertains solely to the conditions of the site at the time of the investigation, supplemented by historical information and data as described in this report. It is important to note that the investigation involves sampling of the site at specific locations, and the conclusions in this report are based on the information gathered. Limitations of the data and information include the fact that conditions between and beyond the sampling locations may vary; that the assessment is dependent upon the accuracy of the analytical data generated through sample analysis; and that conditions or contaminants may exist for which no analyses have been conducted. Furthermore, no assurance is made regarding potential changes in site conditions and/or the regulatory regime (standards, guidelines, etc.), subsequent to the time of investigation.

The professional services provided for this project include only the hydrogeological aspects of the subsurface conditions at the site, unless otherwise stated specifically in the report. No other warranty or representation is either expressed or implied, as to the accuracy of the information or recommendations included or intended in this report.

## 7. REFERENCES

- Armstrong, D.K. and Dodge, J.E.P. 2007. *Paleozoic Geology of Southern Ontario, Ontario Geological Survey*. Miscellaneous Release – Data 219.
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- Toronto and Region Conservation Authority (TRCA), 2019. TRCA Regulation Mapping: Web-GIS Application. Online GIS mapping.
- Toronto and Region Conservation Authority (TRCA), 2008. *Humber River Watershed Plan, Pathways to a Healthy Humber*.

## **APPENDIX A: DRAWINGS**

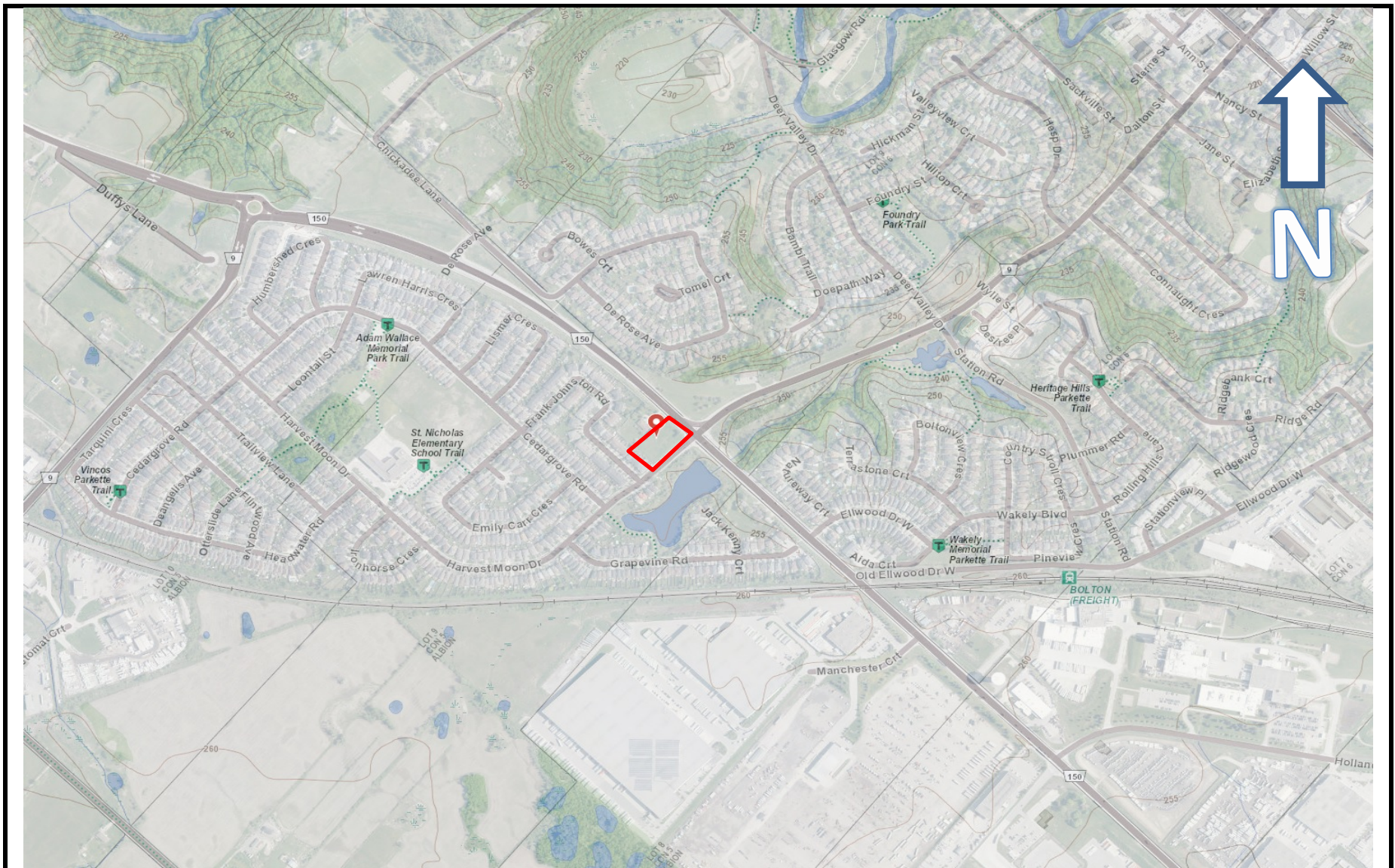
Drawing 1 – Location Plan

Drawing 2 – Site Plan (CMT Engineering, 2021)


Drawing 3 – Perched Groundwater Contours

Drawing 4 – MECP Water Well Records





# LEGEND

 Subject Property

imagery from OSPIA © 2021

## Drawing 1 - Location Plan 13656 Emil Kolb Parkway, Bolton






Drawn: CFH  
Date: 13-Jun-21



# NOTES:

Base map provided by Google.  
Site Concept Plan provided by client.

## Legend

-  CMT Borehole
-  CMT Borehole with Monitoring Well
-  Temporary Benchmark (TBM)  
Top of Existing Catchbasin  
(Elevation: 256.39m)



NO.	DESCRIPTION	DATE
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## REVISIONS



**CMT ENGINEERING INC.**  
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Tel.: 519-699-5775  
Fax: 519-699-4664  
www.cmtinc.net

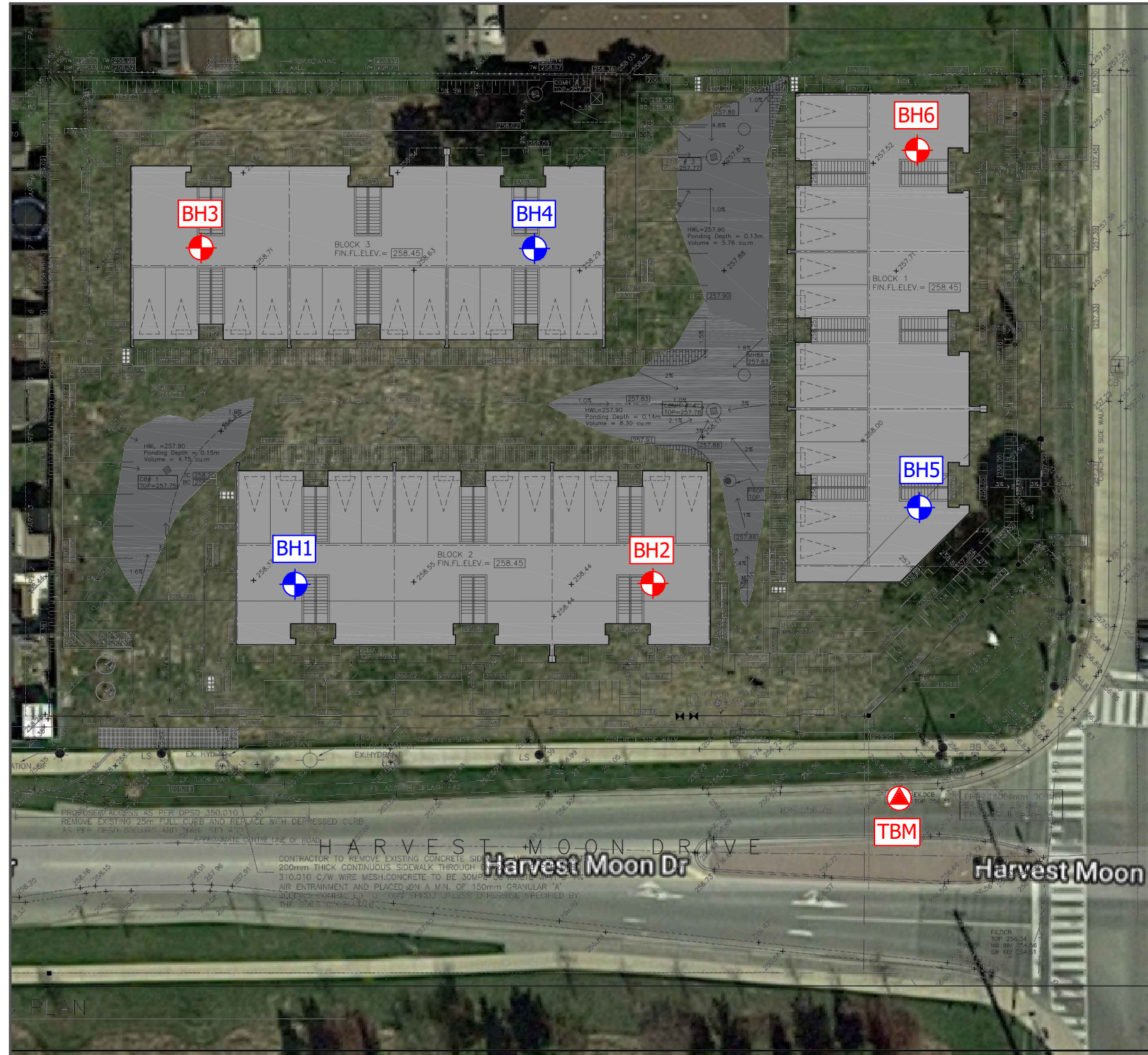
## PROJECT:

Proposed Townhouse Development  
Harvest Moon Dr. and Coleraine Dr.  
Bolton, Ontario

## DRAWING TITLE:

**AERIAL VIEW SHOWING  
BOREHOLE LOCATIONS**

PROJECT NO.:	DATE:
21-242	June 10, 2021
SCALE:	DRAWING NO.
N.T.S.	2







imagery from Google Earth © 2021

#### LEGEND



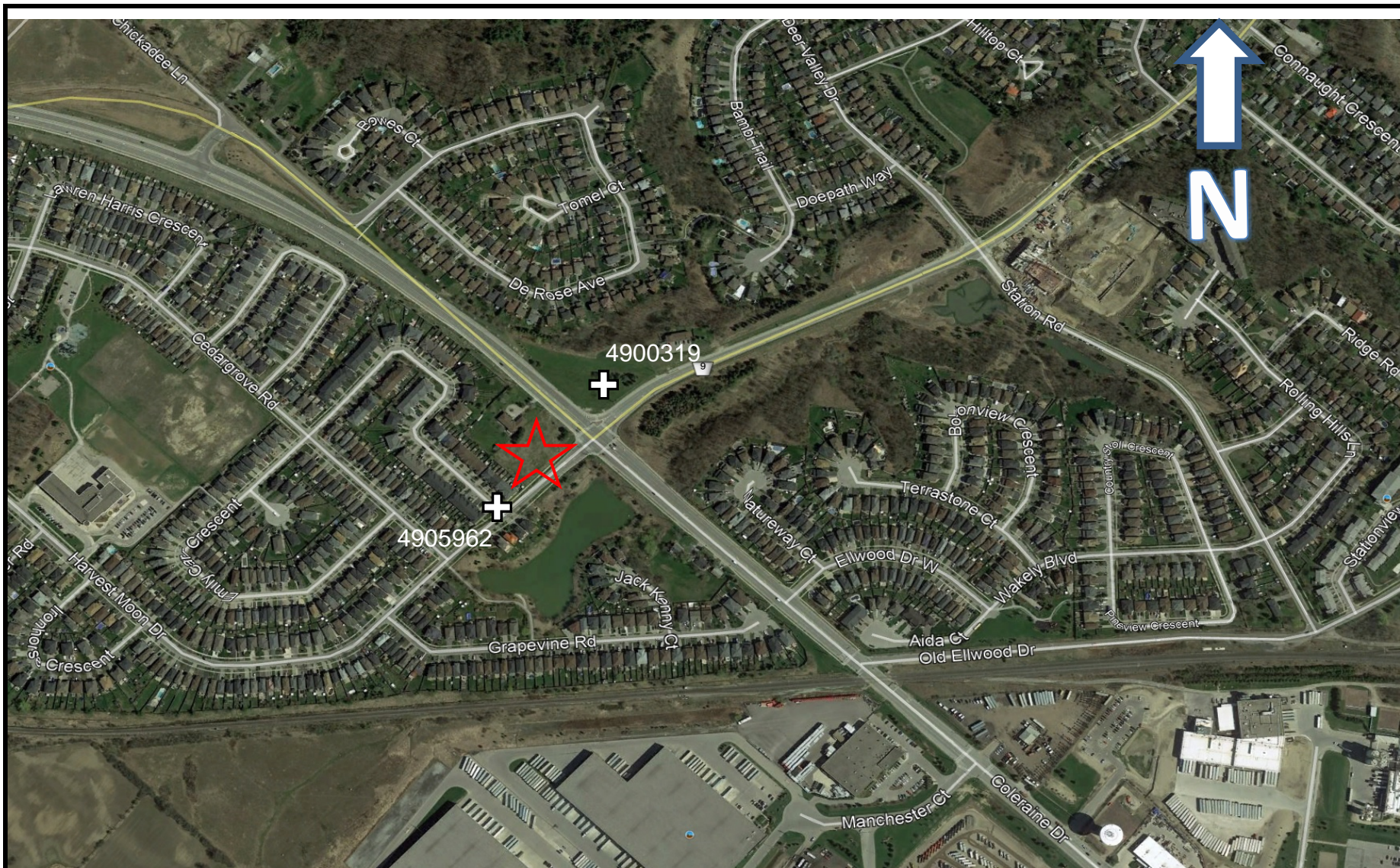
Groundwater Contour  
(mASL)

### Drawing 3 - Perched Groundwater Contour Mapping 13656 Emil Kolb Parkway, Bolton





Drawn:	CFH
Date:	15-Jun-21





**LEGEND**

-  Subject Property
-  Supply Well

imagery from Google Earth © 2021

**Drawing 4 - MECP WWRs**  
**13656 Emil Kolb Parkway, Bolton**



Drawn:	CFH
Date:	15-Jun-21

## **APPENDIX B: TABLES**

Table 1 – Groundwater Level  
Measurements

Table 2 – Hydraulic Conductivity  
Estimates

Table 3 – Water Chemistry Analysis  
Results

**13656 Emil Kolb Parkway, Bolton**  
**Table 1 - Groundwater Level Measurements**

Name	Ground Surface Elevation (m)*	Stickup (m)	06-Jun-21		
			WL (mBTOP)	WL (mBGS)	WL (mASL)
BH 01	258.46	1.09	6.19	5.10	253.37
BH 04	258.51	1.12	3.95	2.83	255.69
BH 05	257.97	1.05	5.40	4.35	253.62

mASL - metres Above Sea Level

mBGS - metres Below Ground Surface



**13656 Emil Kolb Parkway, Bolton**  
**Table 2 - Hydraulic Conductivity Estimates**

Name	Soil Sample Depth or Screened Interval (mBGS)	Soil Type	Analysis Method	Hydraulic Conductivity (m/sec)
BH 01	2.8 - 5.8	clayey silt, some sand, trace gravel	Hvorslev**	$<1 \times 10^{-7}$
BH 03	1.52 - 2.13	clayey silt, some sand, trace gravel	Kaubisch*	$1.4 \times 10^{-9}$
BH 04	3.1 - 6.1	clayey silt, some sand, trace gravel	Hvorslev**	$<1 \times 10^{-7}$
BH 05	4.57 - 5.18	clayey silt, some sand, trace gravel	Kaubisch*	$<1 \times 10^{-9}$
BH 05	2.6 - 5.6	clayey silt, some sand, trace gravel	Hvorslev**	$<1 \times 10^{-7}$

mBGS - metres Below Ground Surface

m/sec - metres per second

\* -  $D_{10}$  values were approximated; therefore, the hydraulic conductivity value is considered an estimate

\*\* -  $T_{0.37}$  was not achieved; therefore, the hydraulic conductivity value is considered approximate

13656 Emil Kolb Parkway, Bolton  
**Table 3 - Water Chemistry Analysis Results**  
06-Jun-21

Parameter	Units <sup>(i)</sup>	Region of Peel Storm Sewer Use By-Law Limits	Region of Peel Sanitary Sewer Use By-Law Limits	BH 01
<b>Physical Tests</b>				
pH	pH units	6-9	5.5 - 10	7.74
Total Suspended Solids	mg/L	15	350	<b>367</b>
<b>Anions and Nutrients</b>				
Total Kjeldahl Nitrogen	mg/L	1	100	0.32
Phosphorus, Total	mg/L	0.4	10	0.358
<b>Cyanides</b>				
Cyanide, Total	mg/L	0.02	2	<0.010
<b>Bateriological Tests</b>				
E. Coli	CFU <sup>(iii)</sup> /mL	200	-	0
<b>Total Metals</b>				
Arsenic (As)-Total	mg/L	0.02	1	0.0036
Cadmium (Cd)-Total	mg/L	0.008	0.7	0.000085
Chromium (Cr)-Total	mg/L	0.08	5	0.0383
Copper (Cu)-Total	mg/L	0.05	3	0.0269
Lead (Pb)-Total	mg/L	0.120	3.000	0.01010
Manganese (Mn)-Total	mg/L	0.05	5	<b>0.423</b>
Mercury (Hg)-Total	mg/L	0.0004	0.01	<0.0000050
Nickel (Ni)-Total	mg/L	0.08	3	0.01960
Zinc (Zn)-Total	mg/L	0.04	3	<b>0.0950</b>
<b>Aggregate Organics</b>				
BOD Carbonaceous	ug/L	15	300	3.9
Phenols (4AAP)	ug/L	0.008	1	<0.0010
<b>Volatile Organic Compounds</b>				
Benzene	ug/L	2	10	<0.50
Chloroform	ug/L	2	40	<1.0
Ethylbenzene	ug/L	2	160	<0.50
Tetrachloroethylene	ug/L	4	1,000	<0.50
Toluene	ug/L	2	270	<0.50
Trichloroethylene	ug/L	8	400	<0.50
Total PAHs	ug/L	-	-	<1.7

i - All measured concentrations are in units indicated.

ii - Concentrations in *italicized* text exceed the Region of Peel's Sanitary Sewer Use By-Law Limits.

iii - Concentrations in **bold** text exceed the Region of Peel's Storm Sewer Use By-Law Limits.

iv- CFU: Coliform Units.



## **APPENDIX C: BOREHOLE LOGS**

CMT Engineering Inc. Boreholes BH 1 through BH 6





CMT Engineering Inc.  
1011 Industrial Crescent, Unit 1  
St. Clements, Ontario N0B 2M0  
Telephone: 519-699-5775  
Fax: 519-699-4664

# BOREHOLE NUMBER 1

PAGE 1 OF 1

PROJECT: Geotechnical Investigation for Townhouse Development

PROJECT ADDRESS: Harvest Moon Drive & Coleraine Drive

PROJECT LOCATION: Bolton, Ontario

PROJECT NUMBER: 21-242

DRILLING DATE: 21-6-2

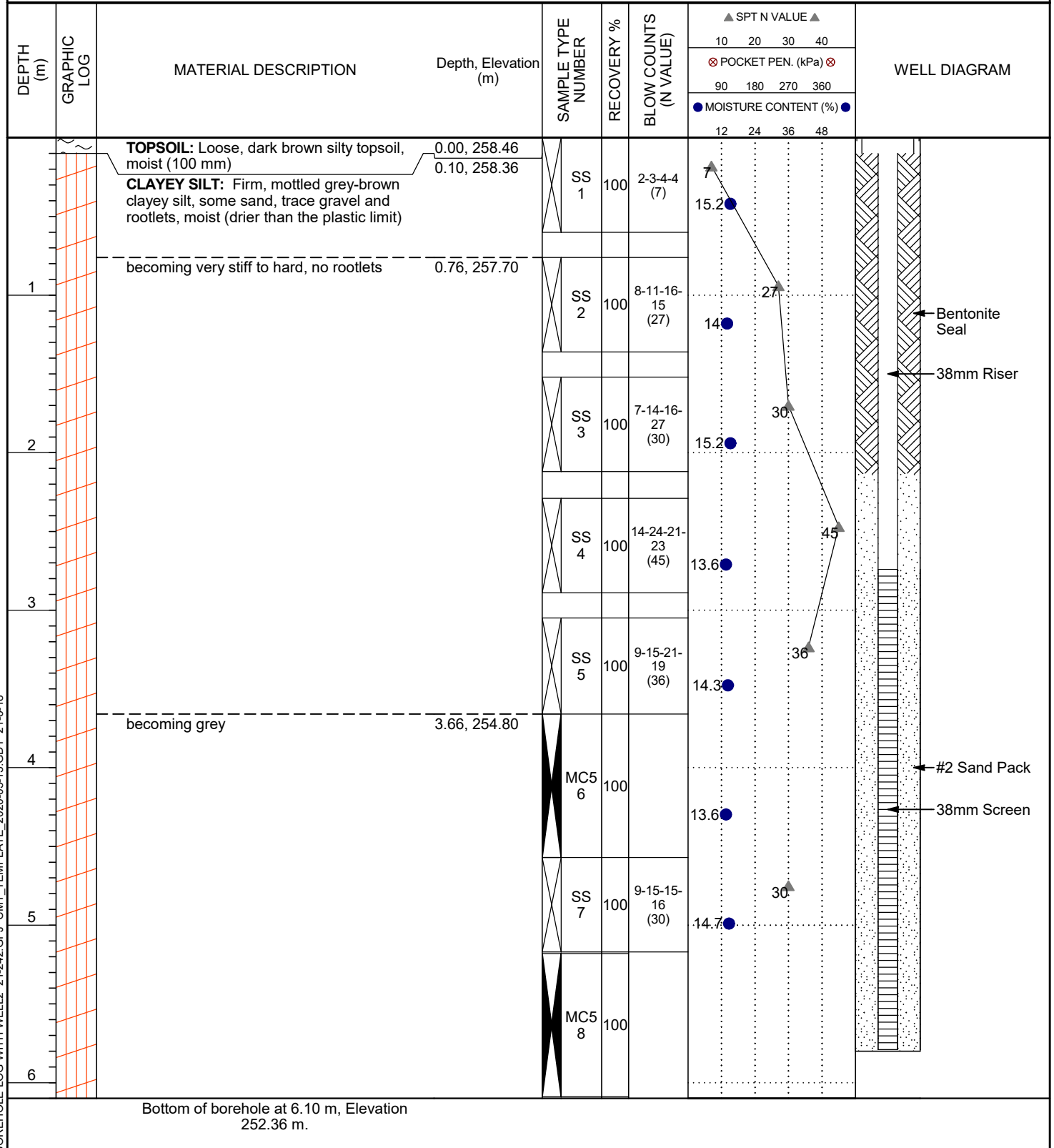
GROUND ELEVATION: 258.46 m

DRILLING CONTRACTOR: CMT Drilling Inc.

LOGGED BY: BB

DRILLING EQUIPMENT: Geoprobe 7822DT

SAMPLING METHOD: SPT/MC5



BOREHOLE LOG WITH WELL2 21-242.GPJ CMT\_TEMPLATE\_2020-05-15.GDT 21-6-18



CMT Engineering Inc.  
1011 Industrial Crescent, Unit 1  
St. Clements, Ontario N0B 2M0  
Telephone: 519-699-5775  
Fax: 519-699-4664

## BOREHOLE NUMBER 2

PAGE 1 OF 1

PROJECT: Geotechnical Investigation for Townhouse Development

PROJECT ADDRESS: Harvest Moon Drive & Coleraine Drive

PROJECT LOCATION: Bolton, Ontario

PROJECT NUMBER: 21-242

DRILLING DATE: 21-6-2

GROUND ELEVATION: 258.33 m

DRILLING CONTRACTOR: CMT Drilling Inc.

LOGGED BY: BB

DRILLING EQUIPMENT: Geoprobe 7822DT

SAMPLING METHOD: SPT/MC5

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲				WELL DIAGRAM
							10	20	30	40	
							⊗ POCKET PEN. (kPa) ⊗				
							90	180	270	360	
							● MOISTURE CONTENT (%) ●				
							12	24	36	48	
1		<b>TOPSOIL:</b> Loose, dark brown silty topsoil, moist (100 mm)	0.00, 258.33	MC5 1	100						
		<b>CLAYEY SILT:</b> Firm, mottled grey-brown clayey silt, some sand, trace gravel and rootlets, moist (drier than the plastic limit) becoming very stiff, no rootlets	0.10, 258.23								
2			0.46, 257.87	SS 2	100	5-10-9-15 (19)					
3				MC5 3	100						
				SS 4	100	14-15-18-17 (33)					

Bottom of borehole at 3.66 m, Elevation  
254.67 m.



CMT Engineering Inc.  
1011 Industrial Crescent, Unit 1  
St. Clements, Ontario N0B 2M0  
Telephone: 519-699-5775  
Fax: 519-699-4664

# BOREHOLE NUMBER 3

PAGE 1 OF 1

PROJECT: Geotechnical Investigation for Townhouse Development

PROJECT ADDRESS: Harvest Moon Drive & Coleraine Drive

PROJECT LOCATION: Bolton, Ontario

PROJECT NUMBER: 21-242

DRILLING DATE: 21-6-2

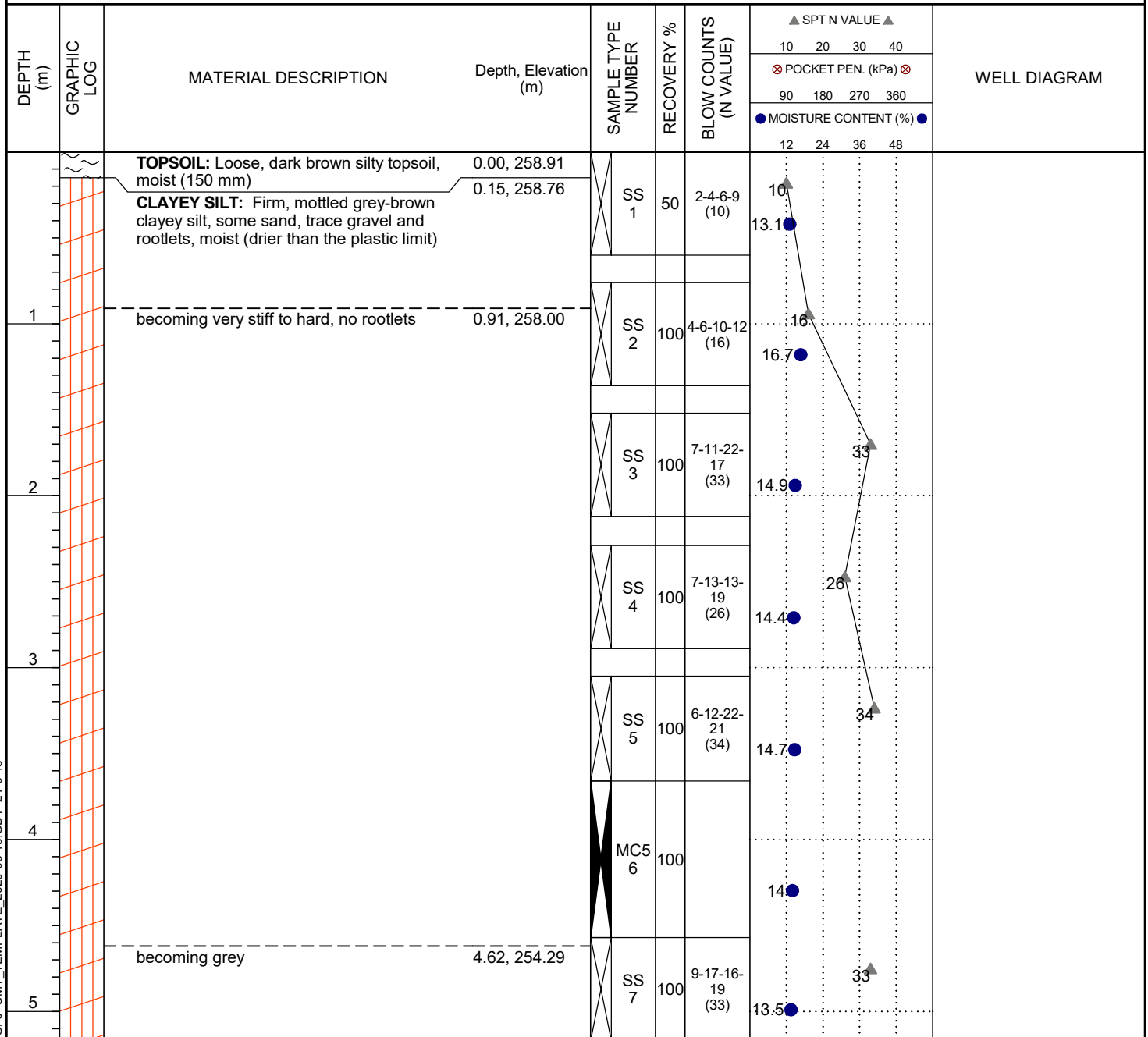
DRILLING CONTRACTOR: CMT Drilling Inc.

DRILLING EQUIPMENT: Geoprobe 7822DT

GROUND ELEVATION: 258.91 m

LOGGED BY: BB

SAMPLING METHOD: SPT/MC5



Bottom of borehole at 5.18 m, Elevation 253.73 m.



CMT Engineering Inc.  
1011 Industrial Crescent, Unit 1  
St. Clements, Ontario N0B 2M0  
Telephone: 519-699-5775  
Fax: 519-699-4664

# BOREHOLE NUMBER 4

PAGE 1 OF 1

PROJECT: Geotechnical Investigation for Townhouse Development

PROJECT ADDRESS: Harvest Moon Drive & Coleraine Drive

PROJECT LOCATION: Bolton, Ontario

PROJECT NUMBER: 21-242

DRILLING DATE: 21-6-2

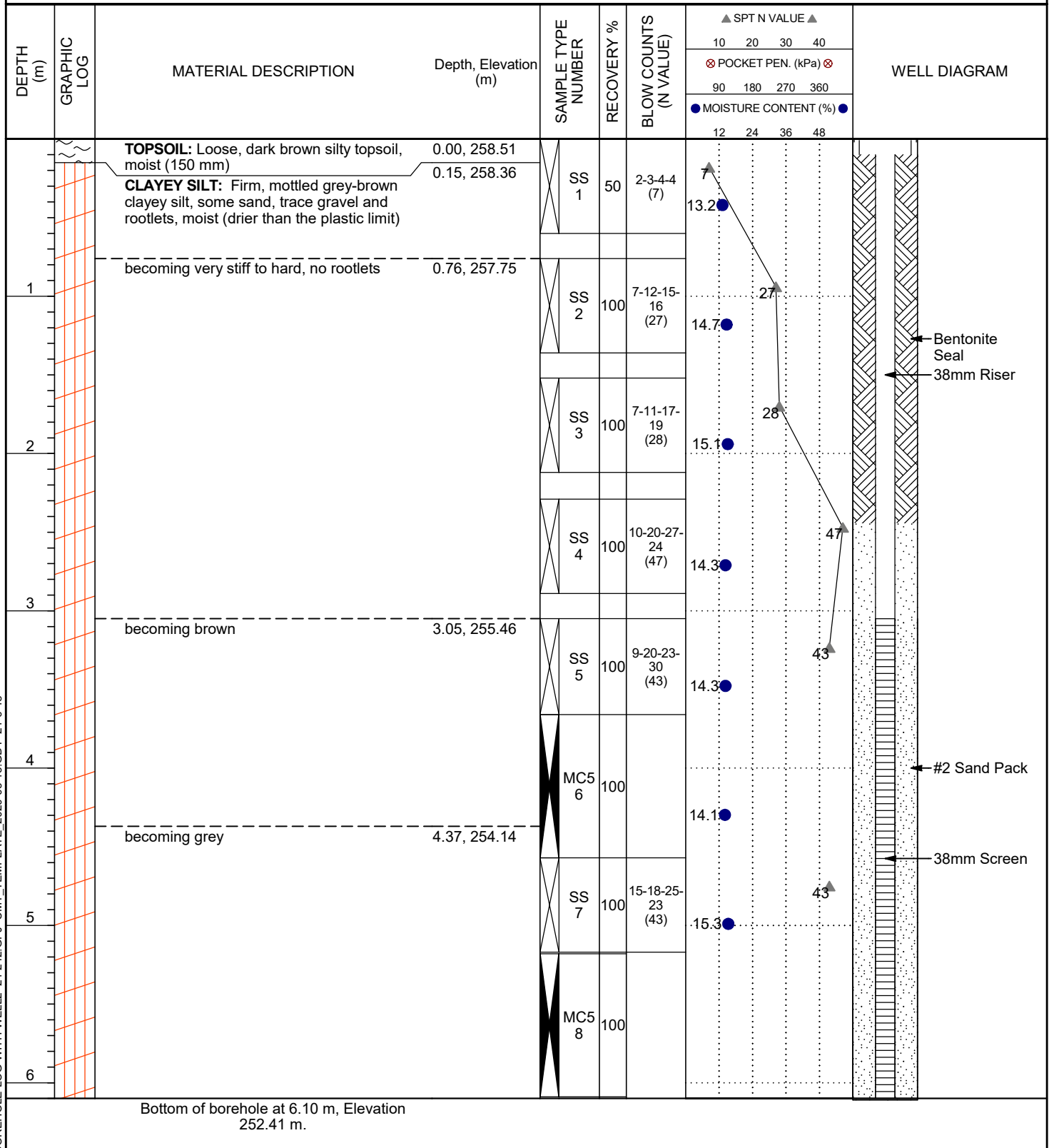
DRILLING CONTRACTOR: CMT Drilling Inc.

DRILLING EQUIPMENT: Geoprobe 7822DT

GROUND ELEVATION: 258.51 m

LOGGED BY: BB

SAMPLING METHOD: SPT/MC5



BOREHOLE LOG WITH WELL2 21-242.GPJ CMT\_TEMPLATE\_2020-05-15.GDT 21-6-18



CMT Engineering Inc.  
1011 Industrial Crescent, Unit 1  
St. Clements, Ontario N0B 2M0  
Telephone: 519-699-5775  
Fax: 519-699-4664

# BOREHOLE NUMBER 5

PAGE 1 OF 1

PROJECT: Geotechnical Investigation for Townhouse Development

PROJECT ADDRESS: Harvest Moon Drive & Coleraine Drive

PROJECT LOCATION: Bolton, Ontario

PROJECT NUMBER: 21-242

DRILLING DATE: 21-6-2

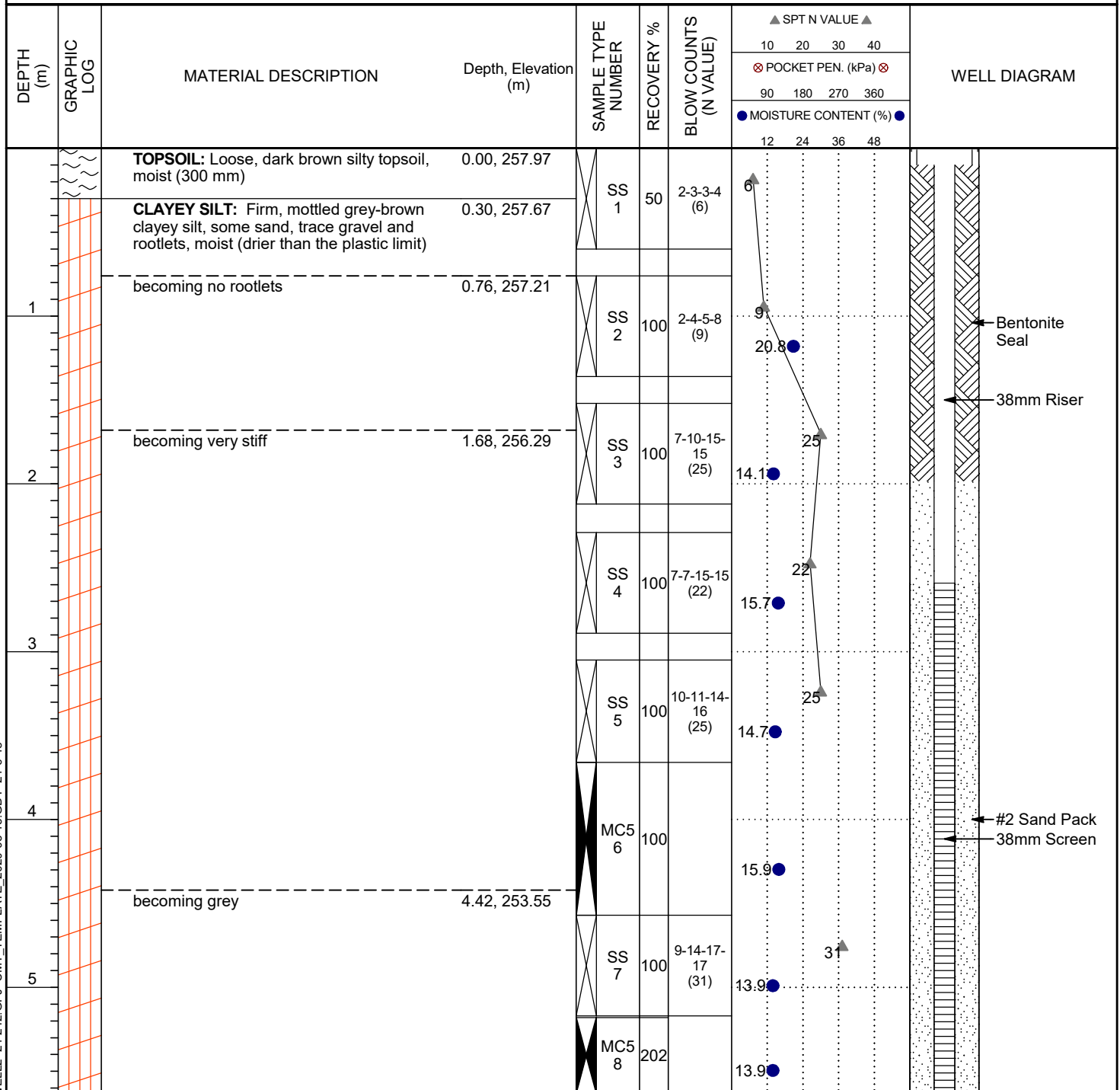
DRILLING CONTRACTOR: CMT Drilling Inc.

DRILLING EQUIPMENT: Geoprobe 7822DT

GROUND ELEVATION: 257.97 m

LOGGED BY: BB

SAMPLING METHOD: SPT/MC5



BOREHOLE LOG WITH WELL2 21-242.GPJ CMT\_TEMPLATE\_2020-05-15.GDT 21-6-18

**PROJECT:** Geotechnical Investigation for Townhouse Development

**PROJECT ADDRESS:** Harvest Moon Drive & Coleraine Drive

**PROJECT LOCATION:** Bolton, Ontario

**GROUND ELEVATION:** 257.60 m

LOGGED BY: BB

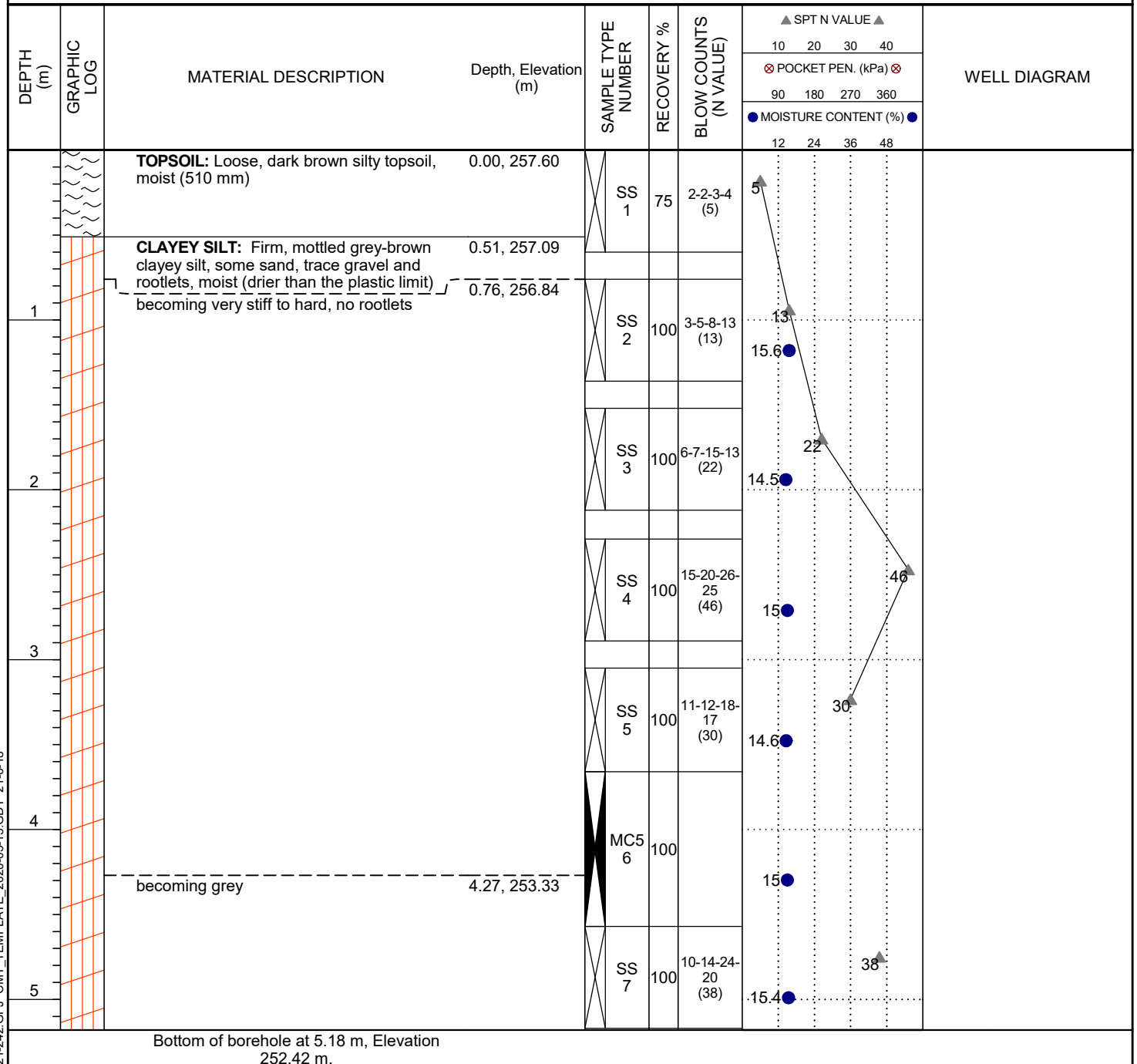
**SAMPLING METHOD:** SPT/MC5

**PROJECT NUMBER:** 21-242

**DRILLING DATE:** 21-6-2

**DRILLING CONTRACTOR:** CMT Drilling Inc.

**DRILLING EQUIPMENT:** Geoprobe 7822DT



## **APPENDIX D: MECP WATER WELL RECORDS AND WELL SURVEY FORMS**

# Water Well Records

May 31, 2021

2:10:03 PM

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION)	17 600585 4858004 W	2006-03 7230	1.97			NU	0010 10	4910244 (Z44332) A039816	BLCK SAND LOOS 0001 BRWN CLAY DNSE 0010 GREY CLAY DNSE 0020
CALEDON TOWN (ALBION)	17 600485 4858450 W	2017-08 7147	1.25	UT 0008		MO	0010 5	7294294 (Z255072) A223378	BLCK LOAM 0001 BRWN SILT CLAY 0012 BRWN CLAY SILT TILL 0015
CALEDON TOWN (ALBION)	17 600526 4858466 W	2017-08 7147	1.25	UT 0008		MO	0010 5	7294293 (Z255071) A223377	BLCK LOAM 0001 BRWN SILT CLAY 0012 BRWN CLAY SILT TILL 0015
CALEDON TOWN (ALBION)	17 600458 4858270 W	2017-03 7464						7286282 (C37185) A208366 P	
CALEDON TOWN (ALBION)	17 600108 4858347 W	2014-02 7360	0.75			MO	0015 5	7217676 (Z174452) A161292	SILT 0015 CLAY 0020
CALEDON TOWN (ALBION CON 05 009	17 600215 4858323 W	1982-11 3108	6	FR 0238	147/240/10/3:0	DO	0244 3	4905962 ( )	LOAM 0002 BRWN CLAY GVLY 0017 GREY CLAY 0043 GREY CLAY SNDY 0072 GREY CLAY 0201 GREY CLAY SNDY 0235 GREY SAND 0247
CALEDON TOWN (ALBION CON 05 010	17 599797 4858856 W	2016-05 7147	3.20 5				0037 2 0032 6	7263986 (Z228026) A	
CALEDON TOWN (ALBION CON 05 010	17 599905 4858789 W	1129						4907845 (149039)	
CALEDON TOWN (ALBION CON 05 010	17 600252 4858370 W	2004-05 1663				NU		4909422 (Z13072) A	
CALEDON TOWN (ALBION CON 06 009	17 600320 4858462 W	1957-07 1307	36	FR 0050	30///:	DO		4900319 ( )	BRWN LOAM CLAY 0015 BLUE CLAY 0049 GRVL 0050
CALEDON TOWN (ALBION CON 06 009	17 600329 4858432 W	2009-03 7147	35.4	FR 0023				7121185 (Z85214) A	
CALEDON TOWN (ALBION CON 06 009	17 600426 4858389 W	2017-08 7147	0.75	UT 0008		MO	0008 5	7294296 (Z255073) A223375	BLCK LOAM 0001 BRWN SILT CLAY 0012 GREN CLAY SILT TILL 0012
CALEDON TOWN (ALBION CON 06 009	17 600451 4858422 W	2017-08 7147	0.75	UT 0008		MO	0008 5	7294295 (Z255074) A223376	BLCK LOAM 0001 BRWN SILT CLAY 0012 BRWN CLAY SILT 0012
CALEDON TOWN (ALBION CON 06 010	17 600031 4858855 W	2003-04 1663				NU		4909128 (253125) A	
CALEDON TOWN (ALBION CON 06 010	17 600264 4858447 W	1985-09 4778	6 4	FR 0249	156/240/4/3:0	DO	0249 6	4906483 (NA)	BRWN CLAY STNS 0018 BLUE CLAY STNS 0074 BLUE CLAY 0180 BLUE CLAY SILT 0249 FSND 0255



TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 06 010	17 599937 4858893 W	2013-07 7147	35.4	FR 0007				7205856 (Z171558) A	

Notes:

UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid

DATE CNTR: Date Work Completedand Well Contractor Licence Number

CASING DIA: .Casing diameter in inches

WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes

WELL USE: See Table 3 for Meaning of Code

SCREEN: Screen Depth and Length in feet

WELL: WEL ( AUDIT # ) Well Tag . A: Abandonment; P: Partial Data Entry Only

FORMATION: See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYP SUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		

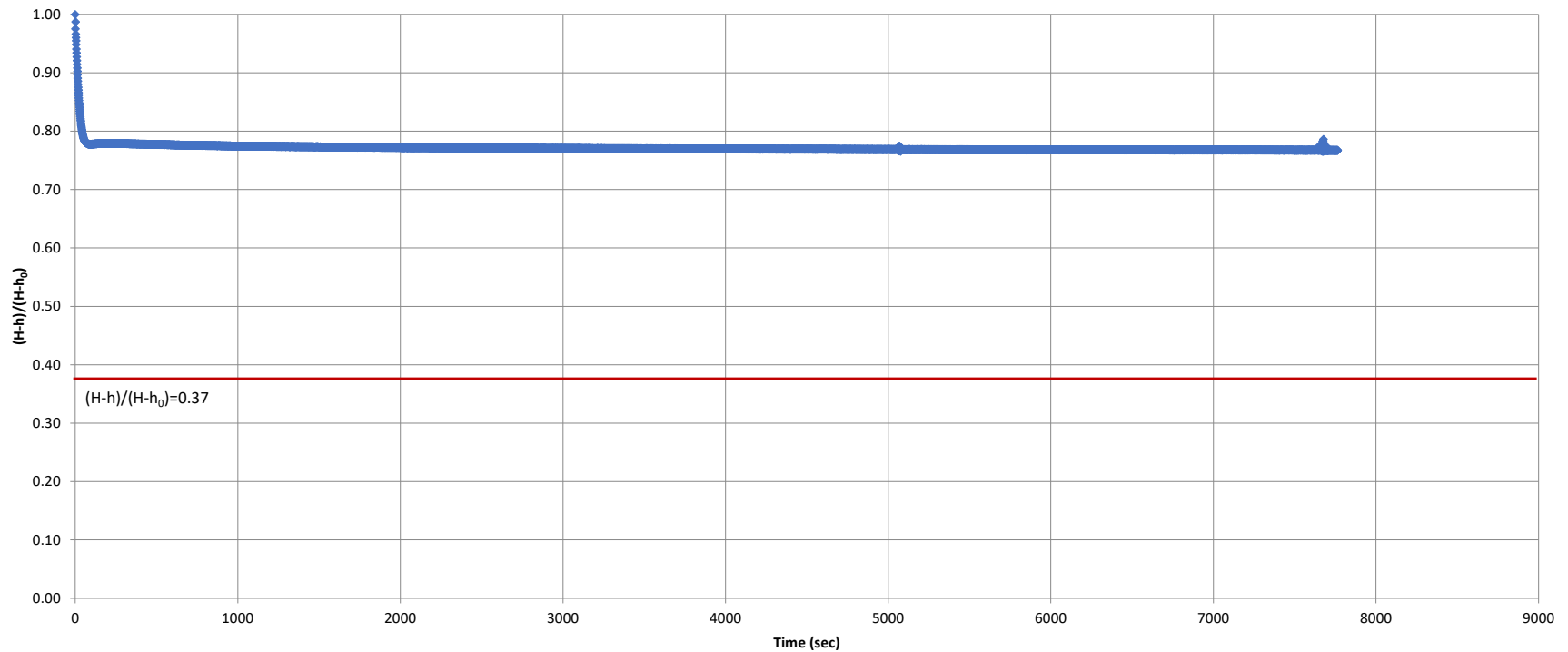
## **APPENDIX E: SLUG TEST ANALYSIS GRAPHS**

Figure 1: BH 1

Figure 2: BH 2

Figure 3: BH 3

**Figure 1**  
**BH 01 Slug Test Analysis**  
 Colerain & Harvest Moon



**Hvorslev Method for Slug Test Analysis**

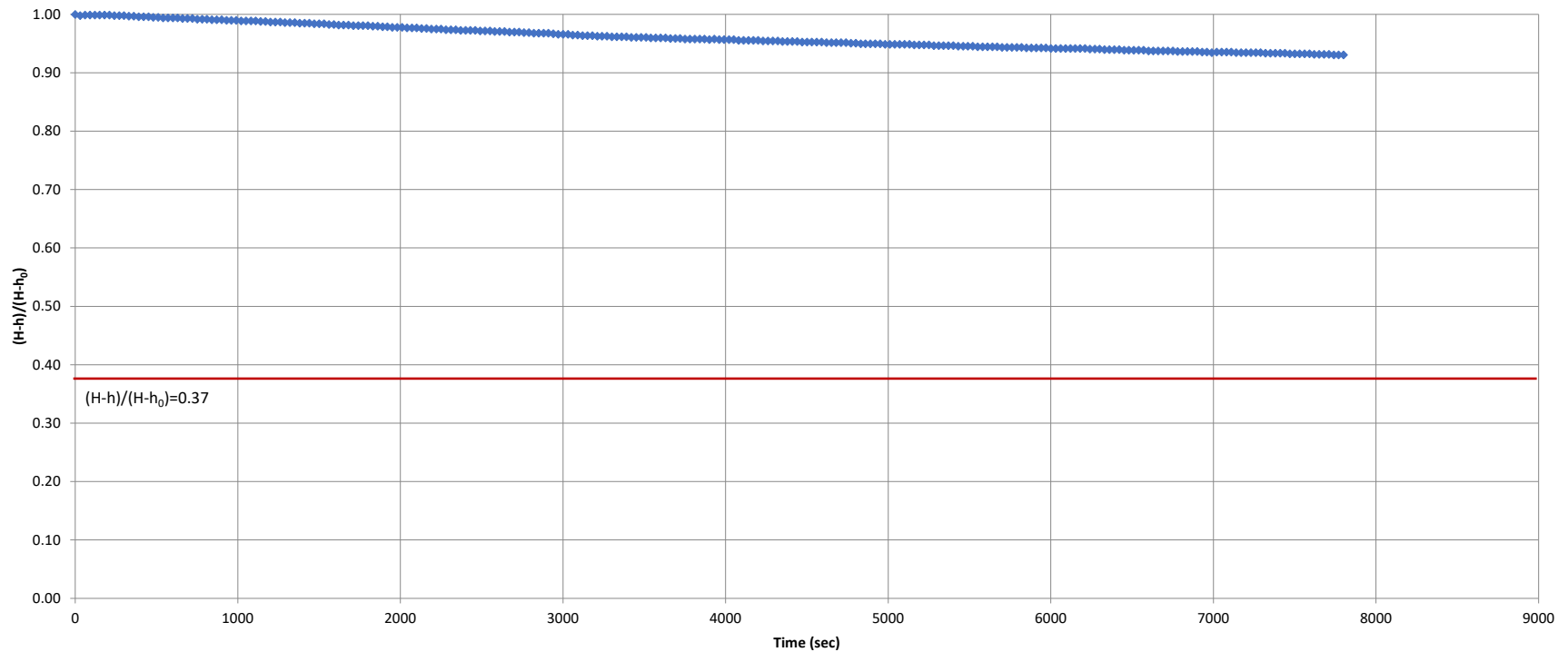
stickup=	1.09 m	casing stickup from ground surface
SWL=	6.08 m	Static Water Level (mBTOP)
r =	0.019 m	casing radius
L =	3.05 m	screen length
R =	0.02 m	borehole radius
H-h <sub>0</sub> =	5.45 m	Water level change at T=0
T <sub>0.37</sub> =	n/a sec	T at (H-h)/(H-h <sub>0</sub> )=0.37

$$k = (r^2 \ln[(L/R)]) / 2LT_{0.37}$$

$$k = < 1 \times 10^{-7} \text{ m/sec}$$



**Figure 2**  
**BH 04 Slug Test Analysis**  
 Colerain & Harvest Moon



**Hvorslev Method for Slug Test Analysis**

stickup=	1.12 m	casing stickup from ground surface
SWL=	3.95 m	Static Water Level (mBTOP)
r =	0.019 m	casing radius
L =	3.05 m	screen length
R =	0.02 m	borehole radius
H-h <sub>0</sub> =	2.98 m	Water level change at T=0
T <sub>0.37</sub> =	n/a sec	T at (H-h)/(H-h <sub>0</sub> )=0.37

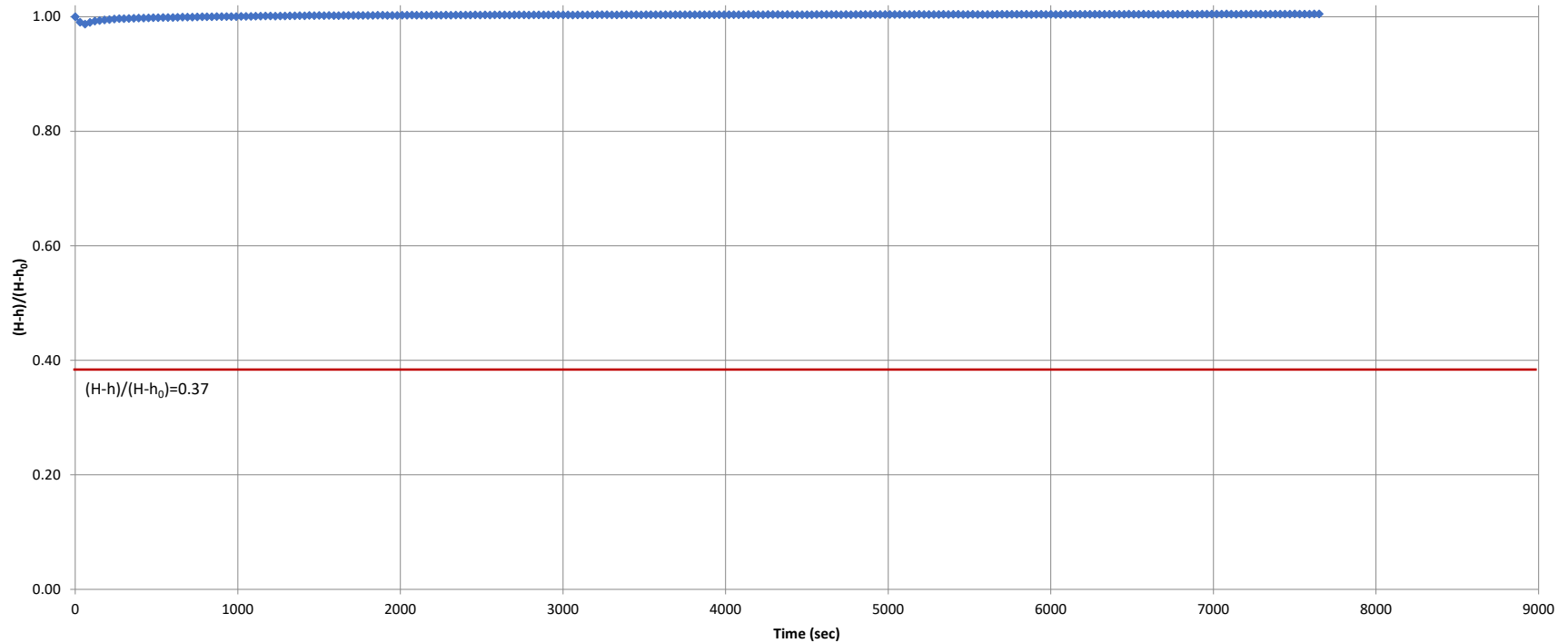
$$k = (r^2 \ln[(L/R)]) / 2LT_{0.37}$$

$$k < 1 \times 10^{-7} \text{ m/sec}$$



13/06/2021

**Figure 3**  
**BH 05 Slug Test Analysis**  
 Colerain & Harvest Moon



**Hvorslev Method for Slug Test Analysis**

stickup=	1.05 m	casing stickup from ground surface
SWL=	5.40 m	Static Water Level (mBTOP)
r =	0.019 m	casing radius
L =	3.05 m	screen length
R =	0.02 m	borehole radius
H-h <sub>0</sub> =	4.60 m	Water level change at T=0
T <sub>0.37</sub> =	n/a sec	T at (H-h)/(H-h <sub>0</sub> )=0.37

$$k = (r^2 \ln[(L/R)]) / 2LT_{0.37}$$

$$k = < 1 \times 10^{-7} \text{ m/sec}$$



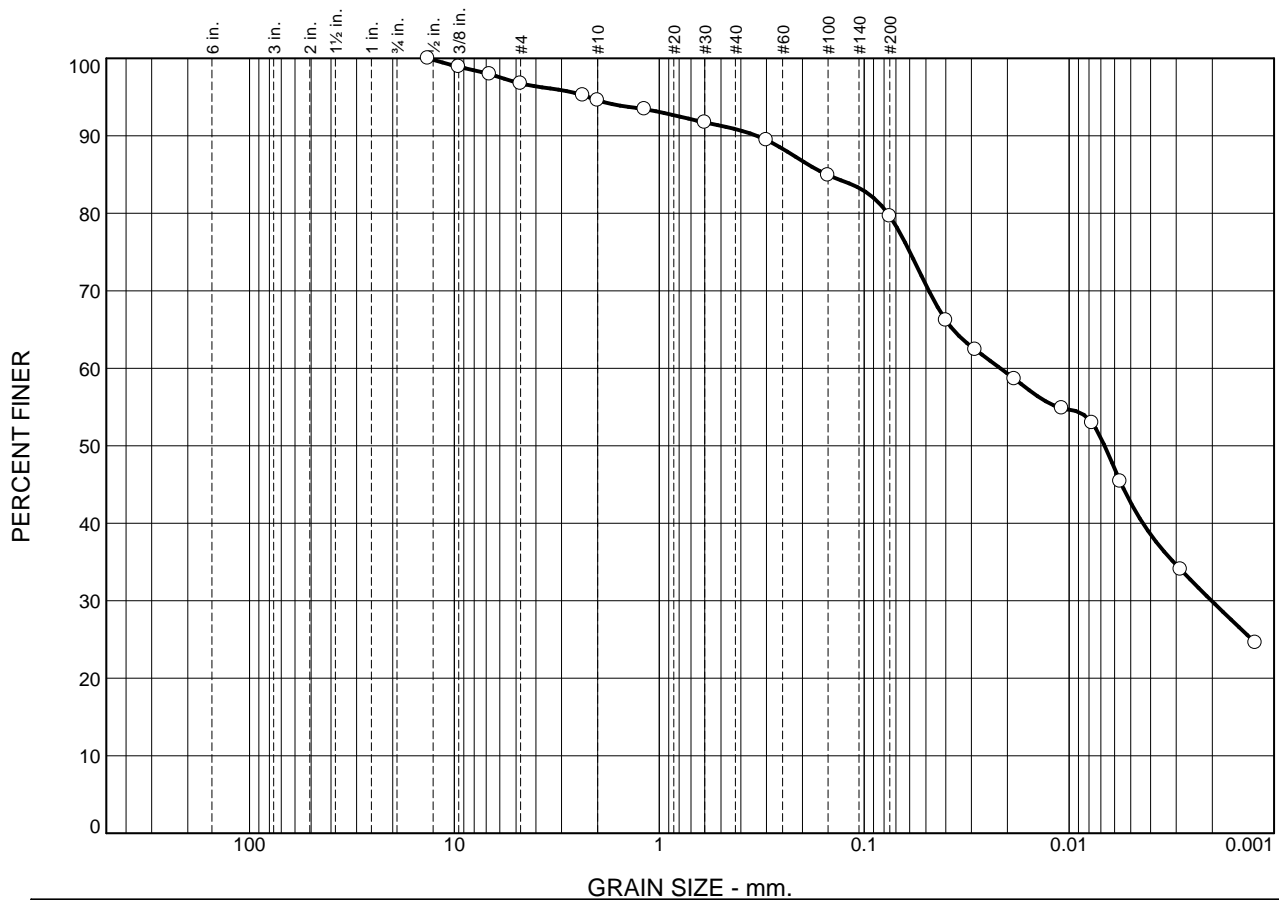
13/06/2021



## **APPENDIX F: GRAIN SIZE ANALYSIS GRAPHS**

Figures 1-2 (CMT Engineering Inc.)

# Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.2	2.2	3.7	11.3	49.7	29.9

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH3	3	1.52-2.13m	clayey silt, some sand, trace gravel	ML
				Sampled by BB of CMT Engineering Inc., June 2, 2021	
				Tested by MS of CMT Engineering Inc., June 4, 2021	

**CMT Engineering Inc.**

**St. Clements, ON**

**Client:** Hydrogeology Consulting Services (HCS)

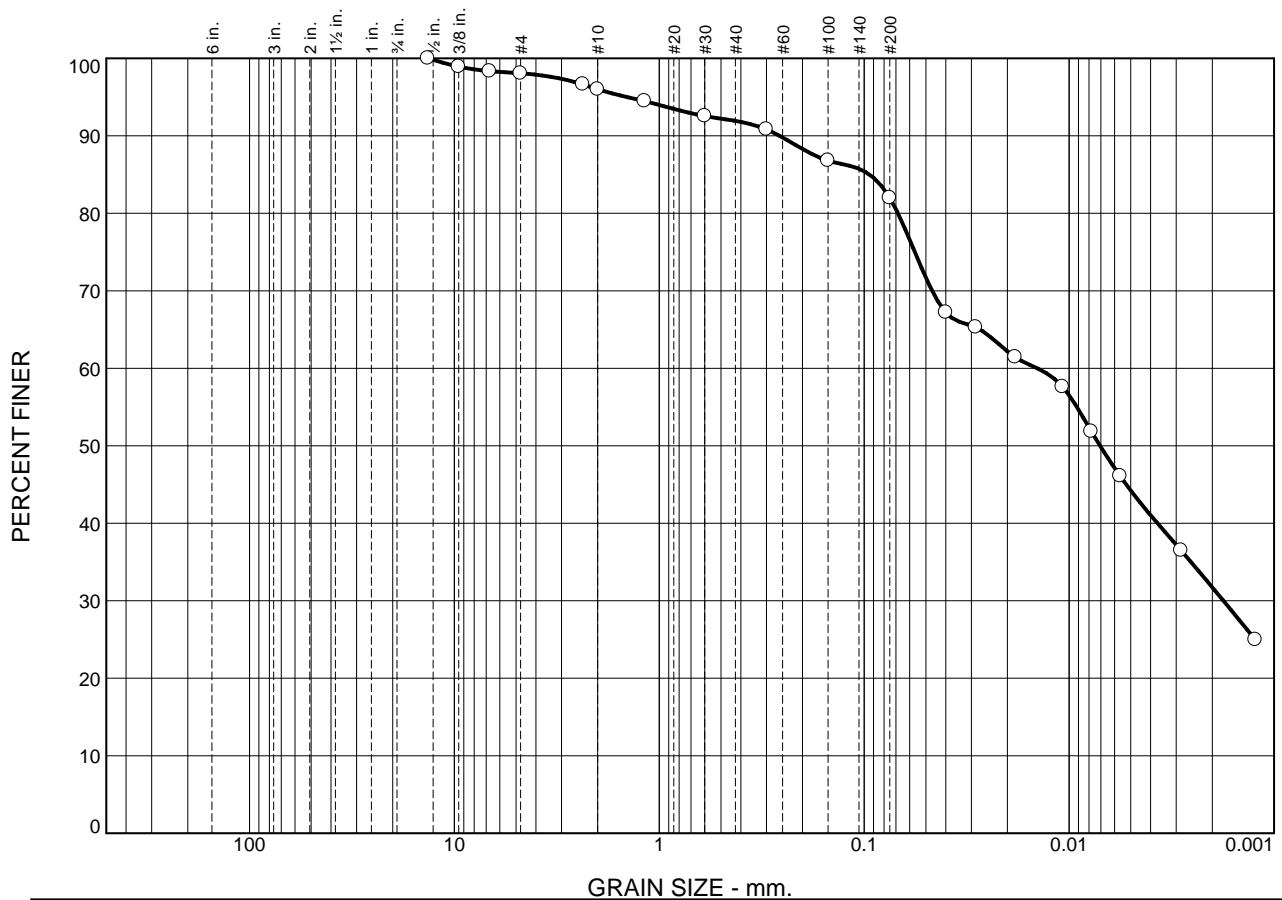
**Project:** Stacked Townhouse Development

Harvest Moon Drive and Coleraine Drive, Bolton, Ontario

**Project No.:** 21-242

**Figure** 1

# Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.9	2.1	4.1	9.9	50.3	31.7

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH5	7	4.57-5.18m	clayey silt, some sand, trace gravel	ML
				Sampled by BB of CMT Engineering Inc., June 2, 2021	
				Tested by MS of CMT Engineering Inc., June 4, 2021	

**CMT Engineering Inc.**

**St. Clements, ON**

**Client:** Hydrogeology Consulting Services (HCS)

**Project:** Stacked Townhouse Development

Harvest Moon Drive and Coleraine Drive, Bolton, Ontario


**Project No.:** 21-242

**Figure** 2



## **APPENDIX G: LABORATORY CERTIFICATE OF ANALYSIS**

L2568028



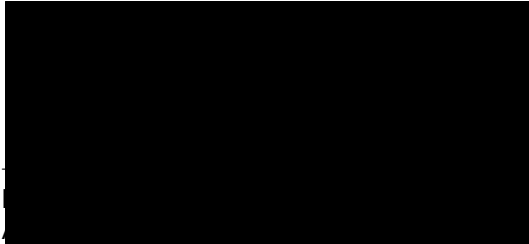
Hydrogeology Consulting Services  
(Kitchener)  
ATTN: Chris Helmer  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Date Received: 07-JUN-21  
Report Date: 18-JUN-21 14:02 (MT)  
Version: FINAL

Client Phone: 905-550-0969


## Certificate of Analysis

Lab Work Order #: L2597301  
Project P.O. #: NOT SUBMITTED  
Job Reference: COLERAIN  
C of C Numbers:  
Legal Site Desc:



[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 60 Northland Road, Unit 1, Waterloo, ON N2V 2B8, Canada | Phone: +1 519 886 6910 | Fax: +1 519 886 9047





# ANALYTICAL GUIDELINE REPORT

L2597301 CONTD....

Page 2 of 7

18-JUN-21 14:02 (MT)

## COLERAIN

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte									
L2597301-1	BH02-21 & BH03-21									
Sampled By:	CLIENT on 06-JUN-21 @ 17:38									
Matrix:	WATER									
<b>Physical Tests</b>							#1	#2		
pH		7.74		0.10	pH units	08-JUN-21	5.5-10	6-9		
Total Suspended Solids		367		3.0	mg/L	10-JUN-21	*350	*15		
<b>Anions and Nutrients</b>										
Fluoride (F)		0.161		0.020	mg/L	10-JUN-21	10			
Total Kjeldahl Nitrogen		0.320		0.050	mg/L	14-JUN-21	100	1		
Phosphorus, Total		0.358		0.0030	mg/L	11-JUN-21	10	0.4		
<b>Cyanides</b>										
Cyanide, Total		<0.010	DLM	0.010	mg/L	09-JUN-21	2	0.02		
<b>Bacteriological Tests</b>										
E. Coli		0		0	CFU/100m L	07-JUN-21		200		
<b>Total Metals</b>										
Aluminum (Al)-Total		7.58	DLHC	0.050	mg/L	08-JUN-21	50			
Antimony (Sb)-Total		<0.0010	DLHC	0.0010	mg/L	08-JUN-21	5			
Arsenic (As)-Total		0.0036	DLHC	0.0010	mg/L	08-JUN-21	1	0.02		
Cadmium (Cd)-Total		0.000085	DLHC	0.000050	mg/L	08-JUN-21	0.7	0.008		
Chromium (Cr)-Total		0.0383	DLHC	0.0050	mg/L	08-JUN-21	5	0.08		
Cobalt (Co)-Total		0.0058	DLHC	0.0010	mg/L	08-JUN-21	5			
Copper (Cu)-Total		0.0269	DLHC	0.0050	mg/L	08-JUN-21	3	0.05		
Lead (Pb)-Total		0.0101	DLHC	0.00050	mg/L	08-JUN-21	3	0.120		
Manganese (Mn)-Total		0.423	DLHC	0.0050	mg/L	08-JUN-21	5	*0.05		
Mercury (Hg)-Total		<0.0000050		0.0000050	mg/L	09-JUN-21	0.01	0.0004		
Molybdenum (Mo)-Total		0.0175	DLHC	0.00050	mg/L	08-JUN-21	5			
Nickel (Ni)-Total		0.0196	DLHC	0.0050	mg/L	08-JUN-21	3	0.08		
Selenium (Se)-Total		0.00394	DLHC	0.00050	mg/L	08-JUN-21	1	0.02		
Silver (Ag)-Total		<0.00050	DLHC	0.00050	mg/L	08-JUN-21	5	0.12		
Tin (Sn)-Total		0.0059	DLHC	0.0010	mg/L	08-JUN-21	5			
Titanium (Ti)-Total		0.203	DLHC	0.0030	mg/L	08-JUN-21	5			
Zinc (Zn)-Total		0.095	DLHC	0.030	mg/L	08-JUN-21	3	*0.04		
<b>Speciated Metals</b>										
Chromium, Hexavalent		<0.00050		0.00050	mg/L	08-JUN-21				
<b>Aggregate Organics</b>										
BOD		3.9		2.0	mg/L	08-JUN-21	300			
Oil and Grease, Total		<5.0		5.0	mg/L	17-JUN-21				
Animal/Veg Oil & Grease		<5.0		5.0	mg/L	18-JUN-21	150			
Mineral Oil and Grease		<2.5		2.5	mg/L	17-JUN-21	15			
Phenols (4AAP)		<0.0010		0.0010	mg/L	10-JUN-21	1	0.008		
<b>Volatile Organic Compounds</b>										
Benzene		<0.50		0.50	ug/L	14-JUN-21	10	2		
Chloroform		<1.0		1.0	ug/L	14-JUN-21	40	2		
1,2-Dichlorobenzene		<0.50		0.50	ug/L	14-JUN-21	50	5.6		
1,4-Dichlorobenzene		<0.50		0.50	ug/L	14-JUN-21	80	6.8		
cis-1,2-Dichloroethylene		<0.50		0.50	ug/L	14-JUN-21	4000	5.6		
Dichloromethane		<2.0		2.0	ug/L	14-JUN-21	2000	5.2		

\*\* 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:

**Ontario Reg. Mun. of Peel Sanitary Bylaw #53-2010 (APR. 2011) = [Suite] - ON-SAN+STORM-PEEL**

**#1: Reg. Mun. of Peel Sanitary by-law #53-2010**

**#2: Peel Storm Sewer By-Law #53-201- (APR. 2011)**

# ANALYTICAL GUIDELINE REPORT

L2597301 CONTD....

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18-JUN-21 14:02 (MT)

## COLERAIN

Sample Details		Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits			
Grouping	Analyte									
L2597301-1	BH02-21 & BH03-21									
Sampled By:	CLIENT on 06-JUN-21 @ 17:38									
Matrix:	WATER						#1	#2		
<b>Volatile Organic Compounds</b>										
	trans-1,3-Dichloropropene	<0.50		0.50	ug/L	14-JUN-21	140	5.6		
	Ethylbenzene	<0.50		0.50	ug/L	14-JUN-21	160	2		
	1,1,2,2-Tetrachloroethane	<0.50		0.50	ug/L	14-JUN-21	1400	17		
	Tetrachloroethylene	<0.50		0.50	ug/L	14-JUN-21	1000	4.4		
	Toluene	<0.50		0.50	ug/L	14-JUN-21	270	2		
	Trichloroethylene	<0.50		0.50	ug/L	14-JUN-21	400	8		
	o-Xylene	<0.50		0.50	ug/L	14-JUN-21				
	m+p-Xylenes	<1.0		1.0	ug/L	14-JUN-21				
	Xylenes (Total)	<1.1		1.1	ug/L	14-JUN-21	1400	4.4		
	Surrogate: 4-Bromofluorobenzene	93.2		70-130	%	14-JUN-21				
	Surrogate: 1,4-Difluorobenzene	98.3		70-130	%	14-JUN-21				
<b>Polycyclic Aromatic Hydrocarbons</b>										
	Acenaphthene	<0.010		0.010	ug/L	18-JUN-21				
	Anthracene	<0.010		0.010	ug/L	18-JUN-21				
	Benzo(a)anthracene	<0.010		0.010	ug/L	18-JUN-21				
	Benzo(a)pyrene	<0.010		0.010	ug/L	18-JUN-21				
	Benzo(b&j)fluoranthene	<0.010		0.010	ug/L	18-JUN-21				
	Benzo(e)pyrene	<0.050		0.050	ug/L	18-JUN-21				
	Benzo(ghi)perylene	<0.010		0.010	ug/L	18-JUN-21				
	Benzo(k)fluoranthene	<0.010		0.010	ug/L	18-JUN-21				
	Chrysene	0.033		0.010	ug/L	18-JUN-21				
	Dibenz(a,h)acridine	<0.050		0.050	ug/L	18-JUN-21				
	Dibenz(a,j)acridine	<0.050		0.050	ug/L	18-JUN-21				
	Dibenz(a,h)anthracene	<0.010		0.010	ug/L	18-JUN-21				
	Dibenzo(a,i)pyrene	<0.050		0.050	ug/L	18-JUN-21				
	7H-Dibenzo(c,g)carbazole	<0.050		0.050	ug/L	18-JUN-21				
	1,3-Dinitropyrene	<1.0		1.0	ug/L	18-JUN-21				
	1,6-Dinitropyrene	<1.0		1.0	ug/L	18-JUN-21				
	1,8-Dinitropyrene	<1.0		1.0	ug/L	18-JUN-21				
	Fluoranthene	<0.010		0.010	ug/L	18-JUN-21				
	Fluorene	<0.010		0.010	ug/L	18-JUN-21				
	Indeno(1,2,3-cd)pyrene	<0.010		0.010	ug/L	18-JUN-21				
	Naphthalene	0.032		0.010	ug/L	18-JUN-21				
	Perylene	<0.010		0.010	ug/L	18-JUN-21				
	Phenanthrene	0.037		0.010	ug/L	18-JUN-21				
	Pyrene	0.019	R	0.010	ug/L	18-JUN-21				
	Surrogate: 2-Fluorobiphenyl	87.8		40-130	%	18-JUN-21				
	Surrogate: D14-Terphenyl	85.8		40-130	%	18-JUN-21				
	Surrogate: d14-Terphenyl	83.5		40-130	%	18-JUN-21				
	Total PAHs	<1.7		1.7	ug/L	18-JUN-21				
<b>Semi-Volatile Organics</b>										
	3,3'-Dichlorobenzidine	<0.40		0.40	ug/L	18-JUN-21				
	Di-n-butylphthalate	<1.0		1.0	ug/L	18-JUN-21	80	15		
	Bis(2-ethylhexyl)phthalate	<2.0		2.0	ug/L	18-JUN-21	12	8.8		
	Pentachlorophenol	<0.50		0.50	ug/L	18-JUN-21				
	Surrogate: 2-Fluorobiphenyl	93.5		40-130	%	18-JUN-21				

\*\* 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 Reg. Mun. of Peel Sanitary Bylaw #53-2010 (APR. 2011) = [Suite] - ON-SAN+STORM-PEEL**

**#1: Reg. Mun. of Peel Sanitary by-law #53-2010**

**#2: Peel Storm Sewer By-Law #53-201- (APR. 2011)**



Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
R	The ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
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***
625-PAH-LOW-WT	Water	EPA 8270 PAH (Low Level)	SW846 8270
Aqueous samples are extracted and extracts are analyzed on GC/MSD. Depending on the analytical GC/MS column used benzo(j)fluoranthene may chromatographically co-elute with benzo(b)fluoranthene or benzo(k)fluoranthene.			
625-SAN-WT	Water	Ontario Sanitary Sewer SVOC Target List	SW-846 8270
Samples are extracted with solvent and then analyzed by GC/MS.			
BOD-WT	Water	BOD	APHA 5210 B
This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2
Total cyanide is determined by the combination of UV digestion and distillation. 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.			
When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference			
CR-CR6-IC-WT	Water	Chromium +6	EPA 7199
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-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
EC-WW-MF-WT	Water	E. Coli	SM 9222D
A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200			
F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
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).			
NP,NPE-LCMS-WT	Water	Nonylphenols and Ethoxylates by LC/MS-MS	J. Chrom A849 (1999) p.467-482
Water samples are filtered and analyzed on LCMS/MS by direct injection.			
OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION
Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.			
OGG-SPEC-WT	Water	Speciated Oil and Grease- Gravimetric	APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

Reference Information

P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.			
PAH-EXTRA-WT	Water	Sanitary Sewer Use By-Law Additional PAH	SW 846 8270
PAH-SUM-CALC-WT	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
PCB-WT	Water	Polychlorinated Biphenyls	EPA 8082
PCBs are extracted from an aqueous sample at neutral pH with aliquots of dichloromethane using a modified separatory funnel technique. The extracts are analyzed by GC/MSD.			
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			
PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066
An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.			
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.			
TKN-F-WT	Water	TKN in Water by Fluorescence	J. ENVIRON. MONIT., 2005,7,37-42,RSC
Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection			
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
Aqueous samples are analyzed by headspace-GC/MS.			
XYLENES-SUM-CALC-WT	Water	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:			
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: L2597301

Report Date: 18-JUN-21

Page 1 of 11

Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>625-PAH-LOW-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5493049</b>							
<b>WG3556907-2</b>	<b>LCS</b>							
Acenaphthene			68.5		%		50-140	18-JUN-21
Anthracene			81.4		%		50-140	18-JUN-21
Benzo(a)anthracene			94.4		%		50-140	18-JUN-21
Benzo(a)pyrene			77.9		%		60-130	18-JUN-21
Benzo(b&j)fluoranthene			88.7		%		60-130	18-JUN-21
Benzo(ghi)perylene			89.5		%		50-140	18-JUN-21
Benzo(k)fluoranthene			85.3		%		50-140	18-JUN-21
Chrysene			94.1		%		50-140	18-JUN-21
Dibenz(a,h)anthracene			86.5		%		50-140	18-JUN-21
Fluoranthene			91.2		%		50-140	18-JUN-21
Fluorene			76.7		%		50-140	18-JUN-21
Indeno(1,2,3-cd)pyrene			77.9		%		50-140	18-JUN-21
Naphthalene			64.5		%		50-130	18-JUN-21
Perylene			82.9		%		50-140	18-JUN-21
Phenanthrene			87.4		%		50-140	18-JUN-21
Pyrene			89.5		%		50-140	18-JUN-21
<b>WG3556907-1</b>	<b>MB</b>							
Acenaphthene			<0.010		ug/L		0.01	18-JUN-21
Anthracene			<0.010		ug/L		0.01	18-JUN-21
Benzo(a)anthracene			<0.010		ug/L		0.01	18-JUN-21
Benzo(a)pyrene			<0.010		ug/L		0.01	18-JUN-21
Benzo(b&j)fluoranthene			<0.010		ug/L		0.01	18-JUN-21
Benzo(ghi)perylene			<0.010		ug/L		0.01	18-JUN-21
Benzo(k)fluoranthene			<0.010		ug/L		0.01	18-JUN-21
Chrysene			<0.010		ug/L		0.01	18-JUN-21
Dibenz(a,h)anthracene			<0.010		ug/L		0.01	18-JUN-21
Fluoranthene			<0.010		ug/L		0.01	18-JUN-21
Fluorene			<0.010		ug/L		0.01	18-JUN-21
Indeno(1,2,3-cd)pyrene			<0.010		ug/L		0.01	18-JUN-21
Naphthalene			<0.010		ug/L		0.01	18-JUN-21
Perylene			<0.010		ug/L		0.01	18-JUN-21
Phenanthrene			<0.010		ug/L		0.01	18-JUN-21
Pyrene			<0.010		ug/L		0.01	18-JUN-21
Surrogate: 2-Fluorobiphenyl			90.7		%		40-130	18-JUN-21

# Quality Control Report

Workorder: L2597301

Report Date: 18-JUN-21

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Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>625-PAH-LOW-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5493049</b>							
<b>WG3556907-1 MB</b>								
Surrogate: D14-Terphenyl			94.1		%		40-130	18-JUN-21
<b>625-SAN-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5493271</b>							
<b>WG3556907-2 LCS</b>								
3,3'-Dichlorobenzidine			53.7		%		50-140	18-JUN-21
Bis(2-ethylhexyl)phthalate			122.4		%		50-140	18-JUN-21
Di-n-butylphthalate			105.4		%		50-140	18-JUN-21
Pentachlorophenol			126.0		%		50-140	18-JUN-21
<b>WG3556907-1 MB</b>								
3,3'-Dichlorobenzidine			<0.40		ug/L		0.4	18-JUN-21
Bis(2-ethylhexyl)phthalate			<2.0		ug/L		2	18-JUN-21
Di-n-butylphthalate			<1.0		ug/L		1	18-JUN-21
Pentachlorophenol			<0.50		ug/L		0.5	18-JUN-21
Surrogate: 2-Fluorobiphenyl			93.5		%		40-130	18-JUN-21
Surrogate: 2,4,6-Tribromophenol			78.8		%		40-130	18-JUN-21
Surrogate: p-Terphenyl d14			117.3		%		40-130	18-JUN-21
<b>BOD-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5490238</b>							
<b>WG3550551-2 DUP</b>		<b>L2597448-1</b>						
BOD		<3.0	<3.0	RPD-NA	mg/L	N/A	30	08-JUN-21
<b>WG3550551-3 LCS</b>								
BOD			99.3		%		85-115	08-JUN-21
<b>WG3550551-1 MB</b>								
BOD			<2.0		mg/L		2	08-JUN-21
<b>CN-TOT-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5482520</b>							
<b>WG3551152-8 DUP</b>		<b>WG3551152-10</b>						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	09-JUN-21
<b>WG3551152-7 LCS</b>								
Cyanide, Total			92.2		%		80-120	09-JUN-21
<b>WG3551152-6 MB</b>								
Cyanide, Total			<0.0020		mg/L		0.002	09-JUN-21
<b>WG3551152-9 MS</b>		<b>WG3551152-10</b>						
Cyanide, Total			95.3		%		70-130	09-JUN-21

# Quality Control Report

Workorder: L2597301

Report Date: 18-JUN-21

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**Client:** Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CR-CR6-IC-WT		Water						
Batch	R5481741							
WG3550239-4	DUP	WG3550239-3						
Chromium, Hexavalent		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-JUN-21
WG3550239-2	LCS		101.4		%		80-120	08-JUN-21
Chromium, Hexavalent								
WG3550239-1	MB		<0.00050		mg/L		0.0005	08-JUN-21
Chromium, Hexavalent								
WG3550239-5	MS	WG3550239-3	99.7		%		70-130	08-JUN-21
Chromium, Hexavalent								
EC-WW-MF-WT		Water						
Batch	R5480437							
WG3549571-3	DUP	L2597425-2						
E. Coli		0	<10	RPD-NA	CFU/100mL	N/A	65	07-JUN-21
WG3549571-1	MB		0		CFU/100mL		1	07-JUN-21
E. Coli								
F-IC-N-WT		Water						
Batch	R5486076							
WG3552585-4	DUP	WG3552585-3						
Fluoride (F)		0.673	0.680		mg/L	1.1	20	10-JUN-21
WG3552585-2	LCS		102.9		%		90-110	10-JUN-21
Fluoride (F)								
WG3552585-1	MB		<0.020		mg/L		0.02	10-JUN-21
Fluoride (F)								
WG3552585-5	MS	WG3552585-3	100.1		%		75-125	10-JUN-21
Fluoride (F)								
HG-T-CVAA-WT		Water						
Batch	R5481137							
WG3550938-3	DUP	L2597182-2						
Mercury (Hg)-Total		0.0000083	0.0000083		mg/L	0.0	20	09-JUN-21
WG3550938-2	LCS		109.0		%		80-120	09-JUN-21
Mercury (Hg)-Total								
WG3550938-1	MB		<0.0000050		mg/L		0.000005	09-JUN-21
Mercury (Hg)-Total								
WG3550938-4	MS	L2597182-3	113.1		%		70-130	09-JUN-21
Mercury (Hg)-Total								
MET-T-CCMS-WT		Water						

## Quality Control Report

Workorder: L2597301

Report Date: 18-JUN-21

Page 4 of 11

Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5480235</b>							
<b>WG3549806-4</b>	<b>DUP</b>	<b>WG3549806-3</b>						
Aluminum (Al)-Total		0.0218	0.0234		mg/L	7.4	20	08-JUN-21
Antimony (Sb)-Total		0.00052	0.00048		mg/L	6.5	20	08-JUN-21
Arsenic (As)-Total		0.00066	0.00066		mg/L	0.4	20	08-JUN-21
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	08-JUN-21
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-JUN-21
Cobalt (Co)-Total		0.00056	0.00057		mg/L	1.7	20	08-JUN-21
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	08-JUN-21
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-JUN-21
Manganese (Mn)-Total		0.305	0.298		mg/L	2.2	20	08-JUN-21
Molybdenum (Mo)-Total		0.00293	0.00283		mg/L	3.3	20	08-JUN-21
Nickel (Ni)-Total		0.00217	0.00212		mg/L	2.3	20	08-JUN-21
Selenium (Se)-Total		0.000141	0.000161		mg/L	13	20	08-JUN-21
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	08-JUN-21
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-JUN-21
Titanium (Ti)-Total		0.00100	0.00076	J	mg/L	0.00023	0.0006	08-JUN-21
Zinc (Zn)-Total		0.0063	0.0060		mg/L	4.2	20	08-JUN-21
<b>WG3549806-2</b>	<b>LCS</b>							
Aluminum (Al)-Total			106.7		%		80-120	08-JUN-21
Antimony (Sb)-Total			106.6		%		80-120	08-JUN-21
Arsenic (As)-Total			106.8		%		80-120	08-JUN-21
Cadmium (Cd)-Total			103.3		%		80-120	08-JUN-21
Chromium (Cr)-Total			102.6		%		80-120	08-JUN-21
Cobalt (Co)-Total			104.9		%		80-120	08-JUN-21
Copper (Cu)-Total			103.9		%		80-120	08-JUN-21
Lead (Pb)-Total			106.7		%		80-120	08-JUN-21
Manganese (Mn)-Total			104.8		%		80-120	08-JUN-21
Molybdenum (Mo)-Total			103.6		%		80-120	08-JUN-21
Nickel (Ni)-Total			102.8		%		80-120	08-JUN-21
Selenium (Se)-Total			102.1		%		80-120	08-JUN-21
Silver (Ag)-Total			106.1		%		80-120	08-JUN-21
Tin (Sn)-Total			105.3		%		80-120	08-JUN-21
Titanium (Ti)-Total			101.4		%		80-120	08-JUN-21
Zinc (Zn)-Total			104.1		%		80-120	08-JUN-21

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Report Date: 18-JUN-21

**Client:** Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

NP,NPE-LCMS-WT      Water



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Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NP,NPE-LCMS-WT		Water						
Batch	R5486025							
WG3550841-3	DUP	L2597174-1						
Nonylphenol		<1.0	<1.0	RPD-NA	ug/L	N/A	30	10-JUN-21
Nonylphenol Monoethoxylates		<2.0	<2.0	RPD-NA	ug/L	N/A	30	10-JUN-21
Nonylphenol Diethoxylates		<0.10	<0.10	RPD-NA	ug/L	N/A	30	10-JUN-21
WG3550841-2	LCS							
Nonylphenol			88.2		%		75-125	10-JUN-21
Nonylphenol Monoethoxylates			104.9		%		75-125	10-JUN-21
Nonylphenol Diethoxylates			97.2		%		75-125	10-JUN-21
WG3550841-1	MB							
Nonylphenol			<1.0		ug/L		1	10-JUN-21
Nonylphenol Monoethoxylates			<2.0		ug/L		2	10-JUN-21
Nonylphenol Diethoxylates			<0.10		ug/L		0.1	10-JUN-21
WG3550841-4	MS	L2597174-1						
Nonylphenol			118.9		%		50-150	10-JUN-21
Nonylphenol Monoethoxylates			115.8		%		50-150	10-JUN-21
Nonylphenol Diethoxylates			99.6		%		50-150	10-JUN-21
OGG-SPEC-WT		Water						
Batch	R5492828							
WG3556896-2	LCS							
Oil and Grease, Total			84.6		%		70-130	17-JUN-21
Mineral Oil and Grease			79.6		%		70-130	17-JUN-21
WG3556896-1	MB							
Oil and Grease, Total			<5.0		mg/L		5	17-JUN-21
Mineral Oil and Grease			<2.5		mg/L		2.5	17-JUN-21
P-T-COL-WT		Water						
Batch	R5485778							
WG3552009-3	DUP	L2597174-1						
Phosphorus, Total		0.0301	0.0277		mg/L	8.2	20	11-JUN-21
WG3552009-2	LCS							
Phosphorus, Total			97.2		%		80-120	11-JUN-21
WG3552009-1	MB							
Phosphorus, Total			<0.0030		mg/L		0.003	11-JUN-21
WG3552009-4	MS	L2597174-1						
Phosphorus, Total			99.1		%		70-130	11-JUN-21
PAH-EXTRA-WT		Water						

## Quality Control Report

Workorder: L2597301

Report Date: 18-JUN-21

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Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
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### PAH-EXTRA-WT Water

Batch R5493087

#### WG3556907-2 LCS

Benzo(e)pyrene	90.1		%		60-130	18-JUN-21
1,3-Dinitropyrene	301.5	RRQC	%		60-130	18-JUN-21
1,6-Dinitropyrene	378.2	RRQC	%		60-130	18-JUN-21
Dibenz(a,h)acridine	108.1		%		60-130	18-JUN-21
1,8-Dinitropyrene	264.5	RRQC	%		60-130	18-JUN-21
Dibenz(a,j)acridine	115.3		%		60-130	18-JUN-21
7H-Dibenzo(c,g)carbazole	110.2		%		60-130	18-JUN-21
Dibenzo(a,i)pyrene	106.8		%		60-130	18-JUN-21

COMMENTS: RRQC; Result is outside ALS control limits; associated non-detect results are considered reliable.

#### WG3556907-1 MB

Benzo(e)pyrene	<0.050		ug/L		0.05	18-JUN-21
1,3-Dinitropyrene	<1.0		ug/L		1	18-JUN-21
1,6-Dinitropyrene	<1.0		ug/L		1	18-JUN-21
Dibenz(a,h)acridine	<0.050		ug/L		0.05	18-JUN-21
1,8-Dinitropyrene	<1.0		ug/L		1	18-JUN-21
Dibenz(a,j)acridine	<0.050		ug/L		0.05	18-JUN-21
7H-Dibenzo(c,g)carbazole	<0.050		ug/L		0.05	18-JUN-21
Dibenzo(a,i)pyrene	<0.050		ug/L		0.05	18-JUN-21
Surrogate: d14-Terphenyl	99.0		%		40-130	18-JUN-21

### PCB-WT Water

Batch R5481386

#### WG3550836-2 LCS

Aroclor 1242	105.3		%		65-130	09-JUN-21
Aroclor 1248	93.6		%		65-130	09-JUN-21
Aroclor 1254	102.3		%		65-130	09-JUN-21
Aroclor 1260	100.9		%		65-130	09-JUN-21

#### WG3550836-1 MB

Aroclor 1242	<0.020		ug/L		0.02	09-JUN-21
Aroclor 1248	<0.020		ug/L		0.02	09-JUN-21
Aroclor 1254	<0.020		ug/L		0.02	09-JUN-21
Aroclor 1260	<0.020		ug/L		0.02	09-JUN-21
Surrogate: Decachlorobiphenyl	110.1		%		50-150	09-JUN-21
Surrogate: Tetrachloro-m-xylene	80.2		%		50-150	09-JUN-21

### PH-WT Water

## Quality Control Report

Workorder: L2597301

Report Date: 18-JUN-21

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Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>PH-WT</b>		<b>Water</b>						
Batch	R5480810							
WG3550346-4	DUP	WG3550346-3						
pH		7.63	7.63	J	pH units	0.00	0.2	08-JUN-21
WG3550346-2	LCS							
pH			7.00		pH units		6.9-7.1	08-JUN-21
<b>PHENOLS-4AAP-WT</b>		<b>Water</b>						
Batch	R5483976							
WG3551671-3	DUP	L2598423-1						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-JUN-21
WG3551671-2	LCS							
Phenols (4AAP)			98.8		%		85-115	10-JUN-21
WG3551671-1	MB							
Phenols (4AAP)			<0.0010		mg/L		0.001	10-JUN-21
WG3551671-4	MS	L2598423-1						
Phenols (4AAP)			98.2		%		75-125	10-JUN-21
<b>SOLIDS-TSS-WT</b>		<b>Water</b>						
Batch	R5481758							
WG3550962-3	DUP	L2597191-1						
Total Suspended Solids		<3.0	<3.0	RPD-NA	mg/L	N/A	20	10-JUN-21
WG3550962-2	LCS							
Total Suspended Solids			91.2		%		85-115	10-JUN-21
WG3550962-1	MB							
Total Suspended Solids			<3.0		mg/L		3	10-JUN-21
<b>TKN-F-WT</b>		<b>Water</b>						
Batch	R5490717							
WG3553533-3	DUP	L2597448-1						
Total Kjeldahl Nitrogen		1.99	1.90		mg/L	4.6	20	14-JUN-21
WG3553533-2	LCS							
Total Kjeldahl Nitrogen			103.8		%		75-125	14-JUN-21
WG3553533-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	14-JUN-21
WG3553533-4	MS	L2597448-1						
Total Kjeldahl Nitrogen			110.8		%		70-130	14-JUN-21
<b>VOC-ROU-HS-WT</b>		<b>Water</b>						
Batch	R5490019							
WG3554064-4	DUP	WG3554064-3						
1,1,2,2-Tetrachloroethane		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
1,2-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21

## Quality Control Report

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Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>VOC-ROU-HS-WT</b>		<b>Water</b>						
<b>Batch</b>	<b>R5490019</b>							
<b>WG3554064-4</b>	<b>DUP</b>	<b>WG3554064-3</b>						
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	14-JUN-21
cis-1,2-Dichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	14-JUN-21
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
m+p-Xylenes		<0.40	<0.40	RPD-NA	ug/L	N/A	30	14-JUN-21
o-Xylene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	14-JUN-21
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	14-JUN-21
trans-1,3-Dichloropropene		<0.30	<0.30	RPD-NA	ug/L	N/A	30	14-JUN-21
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	14-JUN-21
<b>WG3554064-1</b>	<b>LCS</b>							
1,1,2,2-Tetrachloroethane			96.7		%		70-130	14-JUN-21
1,2-Dichlorobenzene			99.5		%		70-130	14-JUN-21
1,4-Dichlorobenzene			101.2		%		70-130	14-JUN-21
Benzene			94.3		%		70-130	14-JUN-21
Chloroform			97.5		%		70-130	14-JUN-21
cis-1,2-Dichloroethylene			98.6		%		70-130	14-JUN-21
Dichloromethane			103.7		%		70-130	14-JUN-21
Ethylbenzene			98.0		%		70-130	14-JUN-21
m+p-Xylenes			101.7		%		70-130	14-JUN-21
o-Xylene			105.0		%		70-130	14-JUN-21
Tetrachloroethylene			101.7		%		70-130	14-JUN-21
Toluene			96.9		%		70-130	14-JUN-21
trans-1,3-Dichloropropene			99.4		%		70-130	14-JUN-21
Trichloroethylene			95.5		%		70-130	14-JUN-21
<b>WG3554064-2</b>	<b>MB</b>							
1,1,2,2-Tetrachloroethane			<0.50		ug/L		0.5	14-JUN-21
1,2-Dichlorobenzene			<0.50		ug/L		0.5	14-JUN-21
1,4-Dichlorobenzene			<0.50		ug/L		0.5	14-JUN-21
Benzene			<0.50		ug/L		0.5	14-JUN-21
Chloroform			<1.0		ug/L		1	14-JUN-21
cis-1,2-Dichloroethylene			<0.50				0.5	

## Quality Control Report

Workorder: L2597301

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Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

Contact: Chris Helmer

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT		Water						
Batch	R5490019							
WG3554064-2	MB							
cis-1,2-Dichloroethylene			<0.50		ug/L		0.5	14-JUN-21
Dichloromethane			<2.0		ug/L		2	14-JUN-21
Ethylbenzene			<0.50		ug/L		0.5	14-JUN-21
m+p-Xylenes			<0.40		ug/L		0.4	14-JUN-21
o-Xylene			<0.30		ug/L		0.3	14-JUN-21
Tetrachloroethylene			<0.50		ug/L		0.5	14-JUN-21
Toluene			<0.40		ug/L		0.4	14-JUN-21
trans-1,3-Dichloropropene			<0.30		ug/L		0.3	14-JUN-21
Trichloroethylene			<0.50		ug/L		0.5	14-JUN-21
Surrogate: 1,4-Difluorobenzene			98.6		%		70-130	14-JUN-21
Surrogate: 4-Bromofluorobenzene			92.3		%		70-130	14-JUN-21

# Quality Control Report

Workorder: L2597301

Report Date: 18-JUN-21

Client: Hydrogeology Consulting Services (Kitchener)  
28 Upper Mercer Street  
Kitchener ON N2A 4M9

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Contact: Chris Helmer

## Legend:

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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:

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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.
RRQC	Refer to report remarks for information regarding this QC result.

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## 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.

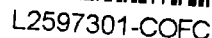
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The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared 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.



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REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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

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