Northgate and Erbsville Kartway Subdivisions – Beaver Creek Meadows District

Hydrogeological Assessment – Final Report

Project Location:

East of Erbsville Road
West of Beaver Creek Road
South of Conservation Drive
Waterloo, Ontario

Prepared for:

1017081 Ontario Limited and Gabriella Elizabeth Groff (Northgate)
1455136 Ontario Inc. (Erbsville Kartway)
c/o Mr. Paul Grespan
675 Riverbend Drive
Kitchener, ON N2K 3S3

Prepared by:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

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Engineers, Scientists, Surveyors.

Executive Summary

MTE Consultants Inc. (MTE) was retained by Gatestone Development Corporation to complete a Hydrogeological Assessment within the lands encompassing Lot 28 in the German Company Tract Concession south of Conservation Drive in Waterloo, Ontario (hereafter referred to as the "Subject Lands"). The Subject Lands boundary is shown on **Figure 1**. The hydrogeology study was initiated in support of Draft Plan of Subdivision for the Northgate and Erbsville Kartway lands comprising 49.29 hectares. The Hydrogeological Assessment summarizes existing site geology and hydrogeology and assesses the potential impacts on the natural environment from the proposed future residential development, underground municipal services, Stormwater Management (SWM) and infiltration facilities.

The Hydrogeological Assessment helped to guide the development of a Conceptual Site Model (CSM), which was used to conceptualize the relationship between the local and regional groundwater flow system and to help with addressing the impact assessment. The following summarizes the conclusions and recommendations from the Hydrogeological Assessment:

- The subsurface sediment stratigraphy can be summarized as primarily being fine sand up to a depth of 17 metres below ground surface (m bgs) that is interspersed with silt to clay silt till material. The primary aquifer of interest is focused on the shallow overburden aquifer deposit (Regional Aquifer 1).
- Groundwater flow is interpreted to flow locally toward Beaver Creek, Laurel Creek, and the Provincially Significant Wetland (PSW), located in the central portion of the Subject Lands, and regionally toward the Laurel Creek Reservoir.
- Groundwater seeps were observed locally adjacent to the PSW, which is thought to partially dewater the shallow overburden aquifer (Regional Aquifer 1).
- Vertical hydraulic gradients vary with location on the Subject Lands that is characterized by local topographic influences controlling the location of recharge and discharge areas. Downward vertical hydraulic gradients are inferred for the topographically high regions in the northwest and northeast of the Subject Lands. By comparison, groundwater is expressed as discharge in topographic low regions as groundwater seeps located adjacent to the PSW and as base flow discharge in Beaver Creek.
- Groundwater levels were encountered at a depth range of 0.3m bgs to 7.4m bgs.
- The Subject Lands area is not considered to be vulnerable to contamination according to the Source Protection Policy criteria.
- On-going groundwater monitoring should be continued.
- If required, an evaluation of construction dewatering volumes will need to be conducted to support a construction dewatering plan that may include a Permit to Take Water (PTTW) approval.
- A private well inventory survey should be conducted as part of this (PTTW) evaluation.
- In-situ permeameter tests should be conducted in the immediate area of the proposed SWM and infiltration facilities to verify infiltration rates for the subsurface sediment conditions.

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1.0 Introduction

MTE Consultants Inc. (MTE) was retained by 1017081 Ontario Limited and Gabriella Elizabeth Groff (Northgate Subdivision) and 1455136 Ontario Inc. (Erbsville Kartway Subdivision) to complete a Hydrogeological Assessment within the lands encompassing Lot 28 in the German Company Tract Concession south of Conservation Drive in Waterloo, Ontario. The term "Subject Lands" was used to refer to the lands owned by the client(s) where the proposed subdivision development is planned to occur and is displayed on **Figure 1**. The hydrogeological study was initiated in 2014 to support the Draft Plan of Subdivision application for the Northgate and Erbsville Kartway lands bounded by Conservation Drive to the north, Beaver Creek Road to the east, and Laurel Creek Nature Centre to the south in Waterloo, Ontario.

The Hydrogeological Assessment Report was originally submitted in July 2017, to support the Northgate and Erbsville Kartway Subdivision applications. Since that time, comments have been received from review Agencies and this report has been updated to address those comments. This report has also been revised to support the revised Draft Plan of Subdivision, dated July 14, 2020, as it has been an iterative process to develop this plan based on input from all disciplines of the project team.

This Hydrogeological Assessment Report summarizes the regional and local scale subsurface geology and hydrogeology and brings together five years' worth of groundwater data compiled from the long-term groundwater monitoring program established in early 2015. The findings presented in this revised Hydrogeological Assessment Report assimilate historical site data, other consultant's data and documentation to inform the Conceptual Site Model (CSM) development process, presented in Section 4.0, in support of the hydrogeological characterization of the Subject Lands. The purpose for the CSM is to aid with addressing potential impacts from development to protect, improve or restore water quantity and water quality within the Subject Lands.

1.1 Development Considerations

The hydrogeology study was aimed to support the proposed subdivision consisting of single detached, town home and multiple density residential, open space, parks, SWM management blocks, infiltration facilities (Low Impact Development or LID), and two pumping station blocks[1]. This Hydrogeological Assessment Report makes use of findings from previous geotechnical and hydrogeological investigations with supplemental field data collected by MTE since 2017. This report addresses potential concerns with respect to managing groundwater resources to the satisfaction of the City of Waterloo, among other stakeholders, and has sufficient regard for relevant portions of the *Provincial Policy Statement*[2]. More specifically, the Hydrogeological Assessment Report demonstrates a sufficient regard for matters related to potential groundwater issues, such as, but not limited to, seasonal groundwater level fluctuations, infiltration impacts, source water supply issues, and short-term construction dewatering, if required, through the assessment of the following:

1. Interpretation of the groundwater flow direction beneath the Subject Lands.
2. Differentiating between a shallow groundwater condition and the regional water table.

[1] Englobe, 2017, pp.2.
[2] Provincial Policy Statement, 2014. Section 2.2.

3. Evaluating the connection between groundwater and surface water features (e.g. Beaver Creek).
4. Addressing groundwater flow with respect to the closest municipal water supply wells and Source Water Protection.
5. Evaluating potential groundwater mounding issues related to infiltration (LID).
6. Addressing the ability to achieve recharge targets in post-development conditions.
7. Supporting suitable mitigation measures and related recommendations.

The Hydrogeological Assessment Report should be read in conjunction with MTE's Stormwater Management (SWM) report entitled, "*Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District, Waterloo, Ontario - Stormwater Management Report*" dated July 6, 2020, and MTE's Functional Servicing Report (FSR) entitled, "*Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District, Waterloo, Ontario – Functional Servicing Report*", dated July 6, 2020.

1.2 Purpose and Objectives

The purpose of the Hydrogeological Assessment is to develop a comprehensive CSM, which captures the local scale geologic and hydrogeologic framework, in order to help identify and address potential areas of concern related to the proposed future development. The objectives of the Hydrogeological Assessment are:

- Describe the local scale geology and hydrogeology in relation to the regional scale context;
- Assess hydraulic conditions and functions of the local scale water features (i.e. Beaver Creek, groundwater seepage, and/or wetland areas);
- Assess suitability of subsurface sediment conditions for Stormwater Management (SWM) ponds and infiltration facilities (LID); and
- Identify and address potential areas of concerns related to groundwater and environmental feature impacts (i.e. impacts on water quality and water quantity) as they relate to the proposed land use changes.

1.3 Scope of work

The scope of work includes a review of regional and local scale geology (i.e. surficial and subsurface geology), physical characteristics of regional aquifer and aquitard units, evaluation of the groundwater flow system, summary of groundwater takings near the Subject Lands, estimates of groundwater recharge, and groundwater-surface water interaction between the local surface water features and the regional overburden aquifer system.

In order to facilitate readability and use of this document, the Hydrogeological Assessment Report is divided into a number of sections[3], described below:

[3] Hydrogeological Assessment Submissions, 2013, pp.8-22.

- Section 1 presents an Introduction to the study, including development considerations, purpose, objectives and scope of work;
- Section 2 reviews the Investigation Methods used to carry out the Hydrogeological Assessment;
- Section 3 summarizes the Existing Conditions that describes the geology and hydrogeology of the Subject Lands and surrounding area;
- Section 4 presents the Conceptual Site Model, which is used to conceptualize the relationship between the local and regional groundwater system;
- Section 5 provides the Impact Assessment that details the potential future development impacts;
- Section 6 delivers the Conclusions since the completion of the field work in 2014 and long-term monitoring (five years) at the Subject Lands;
- Section 7 provides the Recommendations for future work that will address long-term monitoring needs; and
- Section 8 and Section 9 provides the Limitations and lists all References, respectfully, used in the Hydrogeological Assessment Report.

1.4 Previous Studies

In addition to the field work program completed as part of this study, MTE reviewed a number of reports and/or documents applicable to the Subject Lands regarding the physical framework and hydrologic characteristics, some regional in nature and some site specific. Each investigation contributed to an improved understanding of the CSM within the limitations of the scope of this Hydrogeological Assessment. A background review of previous studies was completed for this report using the following:

- Terraqua Investigation Ltd., *Waterloo North Aquifer System Study.* Prepared for the Regional Municipality of Waterloo, April 1992.
- Stantec Consulting Ltd., *Green Acre Hydrogeological Study*. Job. No. 603-10576. April 2006.
- Ontario Geological Survey, *Three-dimensional Mapping of Surficial Deposits in the Regional Municipality of Waterloo, Southwestern Ontario, Groundwater Resource Study 3*, (Bajc and Shirota, 2007).
- Golder Associates, *IUS Groundwater Supply Optimization and Expansion Project.* March 2009.
- LVM Naylor, *Green Acre Park Scoped Hydrogeology Study Report*, Waterloo, Ontario. Ref. No.: 7477H1.R01. November 2009.
- AECOM, Waterloo North Water Supply Class EA Environmental Study Report Volume 1 and Volume 2 North Waterloo Supply Study. December 5, 2011.
- Blackport Hydrogeology Inc. (Blackport). *Tier Three Water Budget and Local Area Risk Assessment: Waterloo North, William Street and Lancaster Well Fields Characterization Study.* Report submitted to the Regional Municipality of Waterloo. Waterloo, Ontario. January 2012a.

- Stantec Consulting Ltd., *North Waterloo Scoped Subwatershed Study* (NWSSS). November 2013.
- Lake Erie Region Source Protection Committee (LERSPC). *Grand River Source Protection Area Proposed Assessment Report*. November 2015.
- Matrix Solutions Inc. (Matrix). *Waterloo North Wellhead Protection Area Delineation Study, Well W5A and the Laurel Tank Well.* Prepared for the Region of Waterloo, November, 2015.

The Ontario Geological Survey (OGS) developed a three-dimensional (3-D) conceptual geological model of overburden sediments within the ROW[4]. The OGS's conceptual geological model is comprised of 19 stratigraphic layers, which are summarized in Table 1. Overburden sediments encountered beneath the Subject Lands have been separated into 12 stratigraphic units based on their properties and depth. The OGS geological model was used to aid in our understanding of the lateral extent of various regional geological and hydrogeological units beyond the Subject Lands boundary.

The Ministry of Environment, Conservation, and Parks (MECP) Water Well Record Database (WWRD) was also used as a source of geologic information. However, the locations and elevations of the MECP well records are not always accurate but they were still plotted to assist with local and regional hydrogeologic characterization of the Subject Lands.

1.5 Study Area and Subject Lands Description

The Subject Lands have an area of approximately 49.29ha (~119 acres). They are bounded by Conservation Drive to the north, Beaver Creek Road to the east, Laurel Creek Nature Centre to the south and environmental features to the west (**Figure 1**). The Subject Lands are divided by Beaver Creek and are currently a mixture of open spaces and interim agricultural fields and a former kartway race track. The topographic contours are sloped toward Beaver Creek, rising from approximately 355 metres above mean sea level (m amsl) to 360m amsl in the northwest and northeast regions of the Subject Lands sloping down toward Beaver Creek, from either side, to an elevation of approximately 345m amsl, which ultimately slopes down further to an elevation of 342m amsl at the confluence of Beaver Creek and Laurel Creek (**Figure 1**). Beaver Creek is a tributary that flows into Laurel Creek upstream of the Laurel Creek Reservoir.

The Subject Lands are located within the Laurel Creek subwatershed. The GRCA and Ministry of Natural Resources and Forestry (MNRF) delineated a Provincially Significant Wetland (PSW) in the central portion of the Subject Lands[5] (**Figure 1**), which is discussed further in Section 3.4.3 of this report.

The Subject Lands are situated in the physiographic region known as the Waterloo Hills[6]. The Waterloo Hills are also referred to as the Waterloo Moraine, which is a hummocky kame moraine that formed between glacial lobes extending from the Ontario-Erie, Huron, and Georgian Bay Basins. Advances and retreats of ice lobes during a series of glaciations have resulted in a complex deposit of ice-contact and glacial outwash sands and gravels separated by silt and clay rich till units.

[4] Bajc and Shirota, 2007.
[5] https://maps.grandriver.ca, March 30, 2020.
[6] Chapman and Putnam, 1984.

Climate in the study area is termed “humid continental”. The temperature high averages to about 12°C and the lows average to approximately 2°C[7]. Historical average precipitation (1951 to 2005) is 844.8mm from the Waterloo Wellington airport weather station, which is a lower annual average compared to the other available climate data presented in the NWSSS[8]. Most precipitation falls as snow from November to March.

The Waterloo North municipal well field (including wells W05A and W10) are located approximately 1.2km to 3km southeast of the Subject Lands. Municipal well W05A, the closest well field to the Subject Lands (~1.2km), was completed in Regional Aquifer 3 (see Table 1) as part of the Class Environmental Assessment (EA) study[9], which was installed to replace an abandoned municipal well (i.e. W05). Municipal well W10 is screened in the shallow overburden aquifer system (or Regional Aquifer 1) and is classified as Groundwater Under the Direct Influence (GUDI) of surface water with effective filtration[10]. W10 is currently the only municipal well in operation in the Waterloo North well field[11]. These two regional aquifer systems are separated by confining aquitards corresponding to the Lower Maryhill Till and Catfish Creek Till (Table 1). Aquifer vulnerability in relation to Source Water Protection (SWP) under the Clean Water Act[12] is discussed further in Section 3.4.4. W10 was not included in the discussion as the Subject Lands are outside of W10’s 25-year time of travel.

2.0 Investigation Methods

Investigative sampling and monitoring tools were employed to collect detailed geologic and hydrogeologic information to supplement existing local scale knowledge. An initial desktop hydrogeological review and field work program was initiated in 2014 to assist with evaluating the shallow and deep regional groundwater conditions beneath the Subject Lands as part of the Draft Plan of subdivision process. Results from this work were used to initially improve our conceptual hydrogeological understanding of the Subject Lands. Investigation methods specifically in 2014 and those included as part of the current Hydrogeological Assessment update are the following:

- Review of secondary sources of geologic information (Section 1.4). Source Water Protection (Tier 3) documents and other historical hydrogeological studies in Waterloo North, were reviewed as part of this revised Hydrogeological Assessment Report.
- Drilling of 14 boreholes was initiated in early December 2014 and completed in late December 2014 with installing monitoring wells in each borehole to varying depths from five metres below ground surface (m bgs) to 25m bgs, which were used for groundwater level monitoring and water quality sampling. Groundwater and surface water quality sampling was conducted in March 2017. The samples were tested for general chemistry, including metals.

[7] Environment Canada: Climate Normals 1981-2010. https://climate.weather.gc.ca/climate_normals/, December 4, 2019.
[8] Stantec, 2013, pp.186.
[9] AECOM, 2011.
[10] Blackport Hydrogeology Inc., 2012, pp.6.10.
[11] Blackport Hydrogeology Inc. 2012, pp.3.1.
[12] Ministry of the Environment (MOE), 2006.

- Manual groundwater level measurements and installation of 10 electronic data loggers to measure continuous groundwater levels. An on-going groundwater monitoring program was implemented for the Subject Lands in 2015 to document pre-construction groundwater levels. The current review incorporates over five years' worth of groundwater level monitoring data.
- Single well hydraulic response testing (i.e. slug testing).
- Installing one stand-alone drive-point piezometer (MP1-19) in June 2019 to monitor water levels in a topographically high area in the south region of the Subject Lands.
- Abandoning one monitoring well that was damaged (MW109b-14) and re-drilling a new monitoring well to replace it (MW209b-19) in September 2019.

2.1 Well Drilling and Construction

The borehole drilling and monitoring well installations were completed by Aardvark Drilling Limited, in consultation with MTE field personnel. The drilling method utilized was the Hollow Stem Auger with the split spoon sampling technique. The borehole and monitoring well locations are displayed on **Figure 2**. The borehole logs are presented in Appendix A and monitoring well construction details are provided in Table 2. Monitoring wells were labeled "MW" with the sequential number and year indicating date of completion (i.e. MW100-14 represents monitoring well number 100 drilled in 2014). Monitoring wells labeled with a letter identifier indicates the order and depth of installation ("A" being the first and deepest well). Similarly, boreholes and/or monitoring wells drilled and installed by other consultants for a specific year are named by the same procedure.

Monitoring wells were equipped with two-inch diameter schedule 80 PVC casing and a #10 slotted 1.52m long PVC well screen. A sand pack was installed in the borehole annulus across the screened interval and bentonite seals were placed between the top of the sand pack and ground surface. Locked steel protective surface casings were cemented in place over each monitoring well in order to ensure their safety and integrity according to Ontario Regulation 903 (as amended).

Prior to initiating the groundwater level monitoring program, monitoring wells were developed by hand using Waterra tubing with an attached foot valve to remove any fine grained material from around the screened interval and water added during drilling.

2.2 Groundwater Level Monitoring

MTE performed an initial field reconnaissance in November 2014 prior to drilling to determine the accessibility of previously drilled monitoring wells, mini-piezometers, and staff gauges for the groundwater monitoring program. Table 2 summarizes the status of the historical and current monitoring locations, which are displayed on **Figure 2**.

In addition to the 14 monitoring wells installed by MTE in 2014 MW100-14 to MW111-14, continuous groundwater level readings were recorded at six other monitoring well locations installed by Stantec in 2010 MW8-10 to MW13-10. MTE collected manual groundwater level measurements at these monitoring wells at irregular intervals between January 2015 and March 2020.

Automatic pressure transducers (data loggers) were installed by MTE in 2015 in 10 monitoring wells (i.e. MW100-14, MW102-14, MW103-14, MW104-14, MW105a-14, MW105b-14, MW108-14, MW109a, MW109b, and MW110-14) and programmed to collect continuous groundwater levels at hourly intervals. The purpose of the continuous groundwater level monitoring is to:

- Observe long term groundwater level trends and linkages between the groundwater system and surface water features;
- Assess factors contributing to groundwater level fluctuations;
- Assess horizontal and vertical hydraulic gradients between and within shallow and deep aquifer units;
- Determine the direction of groundwater flow and average linear groundwater velocity across the Subject Lands; and
- Assess the separation distance between the groundwater table and proposed final grade surface.

Manual and automatic water level measurements were recorded as metres below top of casing (m btoc). The ground surface elevation and top of casing elevation at each monitoring well was surveyed by MTE staff to a geodetic elevation and are summarized in Table 2.

2.3 Hydraulic Testing

In addition to reviewing historical hydraulic testing and results performed by the various consultants, hydraulic conductivity estimates for subsurface sediment units were estimated by MTE using the single well in-situ hydraulic response test (by slug test/bail test methods).

Slug/bail testing was conducted on 14 monitoring well locations by MTE field personnel in January 2015 and June 2015. An electronic pressure transducer was used to collect groundwater level measurements during the hydraulic response testing. Data was analyzed using Aquifer Test Pro software (WHI, 2018) with the Bouwer & Rice (1976) method. The analysis and resultant hydraulic conductivity values are presented in Appendix B.

2.4 Groundwater Quality Analysis

In March 2017, MTE collected groundwater samples from monitoring wells MW101-14 to MW105a,b-14; MW109a,b-14 to MW110-14; and four older Stantec monitoring wells (MW8s,d-10, MW10-10, MW12s,d-10, and MW13-10) in order to establish a benchmark for water quality changes in the post-development phase but also for comparative purposes to Stantec's baseline groundwater quality conditions presented in the NWSSS[13] .

Analytical results were compared to the Provincial Water Quality Objectives (PWQO)[14] and Ontario Drinking Water Quality Standards (ODWQS)[15]. Prior to water quality sampling, each monitoring well was purged to remove any fine grained material from the screened interval to ensure representative samples were collected. A minimum of three well volumes were removed during purging. During the process, field parameters (conductivity, pH, Total Dissolved Solids (TDS), and temperature) were collected. The monitoring wells were considered sufficiently purged to allow for a representative sample to be collected when field parameters stabilized.

[13] Stantec, 2013, Section 5.4.4. pp.197-200.
[14] Ministry of the Environment, 1994, Table 2.
[15] Ministry of the Environment, 2006, Table 4.

Water samples were collected in pre-cleaned laboratory supplied sample bottles; stored in coolers with ice; and, delivered to ALS Laboratories – Environmental Division of Waterloo, Ontario under Chain of Custody documentation for analysis.

3.0 Existing Conditions

The importance for characterizing existing conditions is necessary for planning and protecting the ecological and hydrogeological integrity within a watershed. Provided that a detailed local characterization is established, an integrated and long-term monitoring plan can then consider potential negative cumulative impacts of development.

3.1 Regional Geology Setting

An extensive amount of work on the Quaternary geology in the Region of Waterloo (ROW) was completed since the 1950's. The current regional Quaternary geologic review is based on the following information:

- Quaternary Geology, Stratford-Conestogo Area[16];
- Quaternary Geology of the Hamilton-Cambridge Area[17]; and
- Ontario Geological Survey (OGS) three-dimensional (3-D) geologic conceptual model[18].

To understand and recognize the geological and hydrogeological terms, the reader is referred to Table 1.

3.1.1 Quaternary Geology

The Subject Lands has relatively thick glacial overburden deposits overlying bedrock. In general, silty to clayey till was deposited as extensive sheets during different periods of glacial ice advance from four different directions, represented by the Ontario, Erie, Huron and Georgian Bay ice lobes. Granular materials such as outwash and kame sands and gravels and glaciolacustrine fine-grained deposits (such as silt and clay), were deposited during periods of ice retreat. The various ice sheet advances and then retreat laid down and reworked several till sequences and because of this the overburden material beneath the Subject Lands can be complex and variable.

The 1:50,000 Quaternary geology map (**Figure 3**) identifies regional surficial deposits of silty to sandy till, silty to clayey till, and ice-contact stratified sands and gravels within and surrounding the Subject Lands. Important hydrostratigraphic units (Table 1) from a groundwater recharge and flow perspective are:

- Youngest tills represented by the Port Stanley and/or Upper Maryhill Till (ATB1 or Regional Aquitard 1);

[16] Karrow, 1993
[17] Karrow, 1997
[18] Bajc and Shirota, 2007

- Shallow (Upper Waterloo Moraine Aquifer – AFB1 or Regional Aquifer 1) and intermediate (Middle Waterloo Moraine – AFB2 or Regional Aquifer 2) regional Waterloo Moraine overburden aquifer deposits). In some areas Regional Aquifer 1 is interpreted to be bisected by the Middle Maryhill Till (ATB2 or Regional Aquitard 1), effectively separating it into two aquifer units;
- Lower, older till units (i.e. Lower Maryhill Till (ATB3 or Regional Aquitard 2) and Catfish Creek Till (ATC1 or Regional Aquitard 3); and
- Deep regional aquifer unit (Pre-Catfish Creek Sand and Gravel – AFD1 or Regional Aquifer 3) that is spatially discontinuous throughout much of the core areas of the Waterloo Moraine

The Maryhill Till is a fine textured clay rich till closely associated with glaciolacustrine sediments and is further subdivided into three units (Upper, Middle, and Lower Maryhill Till). The Lower Maryhill Till is considered to be a regionally significant aquitard and will "act as a significant barrier to vertical water movement where present in a thickness greater than 5 metres"[19]. The Lower Maryhill Till is compositionally distinct and can be observed to a large degree across the ROW[20] . Field studies completed by Stantec in 2013 identified areas in the Quaternary Geology that may be revised according to the new local scale information collected at that time[21].

Underlying these younger tills is the Catfish Creek Till, a stoney, silty to sandy diamicton, which is often over consolidated and forms an important marker horizon beneath Regional Aquifer 1and Regional Aquifer 2 within the ROW[22]. As a result of these characteristics, it is often referred to as "hardpan" by water well drillers. The Catfish Creek Till acts as an important, relatively continuous regional aquitard that is compositionally distinct and is widely distributed across the ROW.

3.1.2 Paleozoic Bedrock Geology

The ROW is located on the eastern rim of the Michigan Basin. The Paleozoic bedrock dips gently to the southwest towards the centre of this basin. The regional bedrock mapping surface by the OGS indicates bedrock subcrops the Subject Lands at elevations in the 272m amsl to 287m amsl range. In topographically high areas, such as the northeast region of the Subject Lands (i.e. 359m amsl), approximately 77m of overburden thickness may be found above bedrock. Comparatively, in topographically low areas the overburden thickness is approximately 60m thick.

The ROW is underlain, east to west and oldest to youngest, by Silurian age Guelph (dolostone), Salina (dolostone, shale, salt, and gypsum) and Bass Islands (dolostone) Formations. Bedrock underlying the Subject Lands is the Salina Formation of the Silurian Period. The Salina Formation consists of interlayered green shale and brown dolomite and contains abundant evaporite minerals such as gypsum ($CaSO_4 \cdot 2H_2O$). There were no boreholes or monitoring wells drilled into the bedrock as part of this Hydrogeological Assessment.

[19] Terraqua Ltd., 1995.
[20] Farvolden et al., 1987.
[21] Stantec, 2013, Figure 5.5.
[22] Bajc and Shirota, 2007. pp.15.

3.2 Regional Hydrogeologic Setting

Groundwater flow within the Subject Lands is controlled by topography, geology, aquifer thickness, and hydrostratigraphic structure. The northeast region of the Subject Lands was identified as a significant recharge area[23] primarily in the permeable upland sandhill, which in turn contributes significant amounts of recharge water to the shallow and deep regional aquifer systems. Further to the northwest, there is an increased occurrence of low permeability till materials near ground surface and at depth, resulting in less water infiltrating and more evapotranspiration and surface water runoff. In these low recharge/low permeable environments groundwater may discharge to surface water features such as Beaver Creek or local wetland areas.

The shallow groundwater system is primarily composed of Waterloo Moraine sediments (i.e. sand and gravel material) extending across a large portion of the ROW and is typically subdivided into Upper and Lower Waterloo Moraine with intervening fine-grained units of till. For the purpose of this Hydrogeological Assessment, the overburden aquifer system represents Regional Aquifer 1. Regional Aquifer 1 is a significant municipal supply aquifer that is utilized by the ROW in primarily the Mannheim area.

The Upper Waterloo Moraine aquifer (Regional Aquifer 1) deposit overlies the Lower Maryhill Till and Catfish Creek Till and consist primarily of fine to medium sand with localized accumulations of gravel and isolated lenses of muddy glaciolacustrine sediments and diamicton[24]. Moraine topography, surficial geology, aquifer thickness, and hydrostratigraphic structure control the path of infiltrating water from ground surface downwards and laterally to groundwater in Regional Aquifer 1.

The regional groundwater flow direction in Regional Aquifer 1 is from west to east across the core of the Waterloo Moraine. Regional groundwater flow is predominately horizontal in Regional Aquifer 1, due to the separation from Regional Aquifer 3, by the Lower Maryhill Till (Regional Aquitard 2). Within the Subject Lands, the regional groundwater flow direction is inferred to be primarily from the northwest to southeast and is influenced primarily by Beaver Creek.

The deep overburden municipal aquifer, defined as the Pre-Catfish Creek Sands and Gravel Aquifer (AFD1), forms Regional Aquifer 3. The Assessment Report[25] also identified the Canning Drift Till and Pre-Canning aquifers as part of Regional Aquifer 3, which in places rests on the bedrock surface at depths in the order of 70m bgs. Regional Aquifer 3 is overlain by thick deposits of the Lower Maryhill Till (Regional Aquitard 2) and the Catfish Creek Till (Regional Aquitard 3) with a cumulative thickness ranging from 10m to upwards of 25m thick. Regional groundwater flow in Regional Aquifer 3 flows in an easterly direction[26].

In general, Regional Aquifer 3 is utilized by the municipal well supplies on the eastern flank of the Waterloo Moraine (primarily Parkway and Strasburg municipal well fields) but is also used by the Waterloo North municipal well field (W05, W05A, and W10) located approximately 1.2km to 3km southeast of the Subject Lands[27]. Municipal well W05 was screened in Regional Aquifer 3 at a depth of approximately 33m bgs to 37m bgs. The ROW ceased full-time production at

[23] https://maps.grandriver.ca, March 30, 2020.
[24] Bajc and Shirota, 2007, pp.32-33.
[25] Lake Erie Region Source Protection Committee (LERSPC), 2015, Table 8-4, pp.8-15.
[26] AECOM, Volume 2, 2011, Appendix B, pp. 11.
[27] Blackport 2012, pp.2.10, Figure 7.

W05 in the mid to late 1970's due to water quality concerns[28]. Municipal well W05A, which is the closest well field to the Subject Lands, was installed, tested, and completed as part of the Class EA study[29].

3.3 Local Geologic and Hydrogeologic Setting

Previously drilled boreholes by Stantec and Englobe, MECP Water Well Records, ROW monitoring wells, and MTE monitoring wells (MW100-14 to MW111-14) were used to interpret local hydrostratigraphic units and generate four geological cross-sections through the Subject Lands. The cross-section locations are displayed on **Figure 2** and each cross-section schematic is displayed on **Figure 4** through **Figure 7**. The cross-sections were used to prepare the CSM, which was used to guide MTE's impact assessment. The borehole log information only considers the details of the subsurface sediment material down to the top of Regional Aquifer 3. The CSM was used to interpret local subsurface sediments as follows:

- 0 – 1m bgs: Top soil material consisting of some organics and silty sand;
- 1 – 17m bgs: Fine sand interspersed with till and/or clay silt material; and
- 17 – 25m bgs: Primarily stratified fine-textured glaciolacustrine sediments composed primarily of silty clay.

The geologic interpretation is used to determine the extent and continuity of the underlying aquifer and aquitard units beneath the Subject Lands. All cross-sections illustrate the locations of boreholes and monitoring wells available from previous geotechnical and hydrogeological studies. In addition to this borehole information, geological model layer surfaces from the OGS geological model[30] were also incorporated into the CSM. The well name or MECP well record number are displayed on the top of the cross-section line, followed by the offset distance in metres between the well and the cross-section line. Wells that are further away from the cross-section line may display as being above or below the cross-section line because the elevations of the hydrostratigraphic layers are displayed along the cross-section line, whereas the wells/boreholes are overlain on the cross-sections. Therefore, there may be variability in the elevation of the various hydrostratigraphic units along the cross-section at individual boreholes.

Geological Cross-section A-A' (**Figure 4**):

- Extends approximately 1km southwest to northeast through the Subject Lands (from Erbsville Kartway to Conservation Drive at Beaver Creek Road).
- Illustrates a gradual increase in topography from 349m amsl in the west near the former Erbsville Kartway track to a high of approximately 359m amsl in the east.
- Portrays a relatively thick subsurface sequence of overburden aquifer material (Regional Aquifer 1) that is composed primarily of sand with overlying discontinuous lenses of low permeable material composed primarily of silt till with thicknesses ranging from 5m to 12m.
- The depth to the water table ranges from approximately 1m bgs to 7m bgs across the Subject Lands within Regional Aquifer 1 (~348m amsl to 351m amsl).

[28] LERSPC, 2015, pp.8-65.
[29] AECOM, Volume 1, 2011, Section 2.5.1.3, pp.23
[30] Bajc and Shirota, 2007. pp13-16.

- A relatively thin aquitard material, identified as Lower Maryhill Till (Regional Aquitard 2), is between 5m to 8m thick.
- The Catfish Creek Till (Regional Aquitard 3) is also present and the approximate thickness was projected from the OGS geological model layer, which is predicted to be between 14m and 25m thick.

Geological Cross-section B-B' (**Figure 5**):

- Extends approximately 0.6km north to south through the Subject Lands (from Conservation Drive to the south edge of the Subject Lands boundary adjacent to Laurel Creek and within the PSW).
- Illustrates a relative flat topography of approximately 346m amsl.
- Portrays various sequences of alternating aquifer and aquitard deposits reflecting discontinuous deposits of Regional Aquitard 1 (ATB1), a relatively thick subsurface sequence of overburden aquifer material identified as Regional Aquifer 1 (AFB1), Regional Aquitard 2 (Lower Maryhill Till or ATB3), and Regional Aquitard 3 (ATC1).
- In the north Regional Aquitard 2 is relatively thin (~3m thick) but thickens toward the south (toward Laurel Creek Reservoir) to a thickness of approximately 13m.
- The Catfish Creek Till (Regional Aquitard 3) is also present and its thickness is relatively consistent across the Subject Lands at 14m.
- The depth to the water table ranges from approximately 1m bgs to 2m bgs within Regional Aquifer 1 (~343m amsl to 344m amsl). It was noted in other consultant's reports that the north area, near Conservation Drive at Beaver Creek, exhibited artesian conditions beneath the Subject Lands[31].
- The water table is connected to Beaver Creek and the local PSW.

Geological Cross-section C-C' (**Figure 6**):

- Extends approximately 2km; west (Erbsville Road) to approximately 400m east of Beaver Creek Road depicting a regional scale overview outside and through the Subject Lands.
- Illustrates a slightly undulating topography from approximately 350m amsl to a high of 358m amsl, which cross-cuts perpendicular to Beaver Creek.
- The Lower Maryhill Till (Regional Aquitard 2) pinches out in the western area and gradually thickens to approximately 3m to 10m in the east.
- The Catfish Creek Till (Regional Aquitard 3) is thinner in the western area and also gradually thickens toward the east to thicknesses of upwards of 14m.
- The cumulative aquitard thickness (i.e. Regional Aquitard 2 and Regional Aquitard 3) is upwards of 20m thick in the northeastern region of the Subject Lands and as low as 10m thick toward the west where Regional Aquitard 2 looks to pinch out.

[31] Stantec, 2013, pp.174.

- The depth to the water table ranges from approximately less than 1m bgs to greater than 6m bgs, in the northeast region of a sandhill area within Regional Aquifer 1 (~344m amsl to ~352m amsl). It was noted in other consultant reporting that the north area, near Conservation Drive at Beaver Creek, was identified with artesian conditions beneath the Subject Lands[32].
- The water table is connected to Laurel Creek, Beaver Creek, and the local wetland areas.

Geological Cross-section D-D' (**Figure 7**):

- Extends approximately 1.8km; 500m west of Erbsville Road to 400m east of Beaver Creek Road, depicting a regional scale overview though the south portion of the Subject Lands.
- Illustrates a slightly undulating topography with a local topographic high in the southeast region of the Subject Lands of approximately 349m amsl that trends downward sharply toward Beaver Creek and Laurel Creek at approximately 344m amsl.
- The depth to the water table ranges from approximately less than 1m bgs to 4m bgs within Regional Aquifer.
- The water table is generally a subdued reflection of the ground surface topography. The groundwater elevation ranges from a high of about 347m amsl in the western portion of the Subject Lands to approximately 343m amsl toward the east where groundwater daylights (discharges) to Beaver Creek and/or Laurel Creek.
- The Lower Maryhill Till (Regional Aquitard 2) thins in the western region of the Subject Lands (~3m) and gradually thickens toward the east to approximately 20m.
- The Catfish Creek Till (Regional Aquitard 3) has a consistent thickness of approximately 14m and is laterally extensive.
- The cumulative aquitard thickness (i.e. Regional Aquitard 2 and Regional Aquitard 3) is approximately 25m overlaying the deep overburden municipal water supply aquifer identified as Regional Aquifer 3.

3.4 Local Hydrogeologic Setting

Hydrogeology must be understood at the local level to assess potential development impacts on groundwater and surface water features. The Hydrogeological Assessment focuses on a detailed examination of the various factors controlling the movement of groundwater within Regional Aquifer 1. The detailed field data collected from the Subject Lands improves our understanding of the overburden aquifer system and the interpretation of local geology and hydrogeology within a regional scale context.

3.4.1 Hydraulic Conductivity

Qualitatively, hydraulic conductivity (K) is a parameter describing the ease with which groundwater flow occurs through a porous medium. Permeable aquifer deposits like sand and gravel have relatively large K values, less permeable material like silt or clay have relatively

[32] Stantec, 2013, pp.174.

small K values. Representative values for hydraulic conductivity for various sediment types are presented in Freeze and Cherry (1979)[33].

MTE completed single well hydraulic response tests (slug tests) for the following monitoring wells: MW100-14, MW101-14, MW102-14, MW103-14, MW104-14, MW105a-14, MW105b-14, MW106-14, MW107-14, MW108-14, MW109a-14, MW109b-14, MW110-14, and MW111-14. Slug tests involved adding or removing a known volume of water from the well and measuring the water level response. Slug tests were repeated three times for each monitoring well and water level response data was analyzed using the Bouwer & Rice (1976) method. Slug test assumptions and analysis are provided in Appendix B.

The single well hydraulic response test analyses resulted in K values ranging from $2.0x10^{-4}$m/sec (for aquifer type materials) to $9.4x10^{-8}$m/sec (for aquitard type materials). The single well hydraulic response tests performed by Stantec on their monitoring wells (MW1-10 through MW13-10) were in general agreement with MTE's findings (K values ranged from $1.2x10^{-4}$m/sec to $8.4x10^{-8}$m/sec)[34].

The lowest K value ($9.4x10^{-8}$m/sec) was observed at MW102-14, which was screened within a silt to silt till material located adjacent to Beaver Creek, in an elevated topographic area, which is representative of the Upper Maryhill Till (**Figure 3**). Typical K values in literature for silt till vary between $1.0x10^{-6}$m/sec to $1.0x10^{-9}$m/sec[35].

The highest K value ($2.0x10^{-4}$m/sec) was observed in the northeast corner of the Subject Lands at MW101-14 where it is screened within the ice-contact stratified deposits to 9m depth (i.e. Regional Aquifer 1), composed primarily of medium to coarse grained sand. This regional overburden aquifer is a thick laterally extensive sand unit and can vary from a layered silt and fine sand to coarse sand and gravel throughout the area. Typical K values in literature for sand vary between $1.0x10^{-4}$ m/sec to $1.0x10^{-6}$m/sec.

3.4.2 Local Groundwater Flow System

Historical groundwater monitoring data for monitoring wells MW1-10 through MW13-10 is found in the *North Water Scoped Subwatershed Study* (NWSSS)[36]. Manual groundwater levels were collected by MTE between 2015 and 2020 and are summarized in Table 3. A steady-state groundwater flow map, using the average groundwater level values from both manual and continuously recorded water levels, is depicted on **Figure 8**. Groundwater is depicted to flow toward Beaver Creek from the topographically high recharge areas in the northwest and the northeast to the Laurel Creek Reservoir.

Hydrographs (Hydrograph 1 to Hydrograph 18) are presented in Appendix C. Four out of the eight locations (i.e. at MW105a, b-14, MW109a, b-14, MW8s, d-10, and MW12s, d-10) are identified as well cluster pairs, which indicates that a shallow and deep monitoring well was installed at that location. Pressure transducers were installed in each of these monitoring wells to measure the groundwater levels in order to evaluate the vertical hydraulic gradients.

The field data shows that the depth to groundwater ranges from approximately 0.3m bgs to 7.4m bgs (342.67m amsl to 352.03m amsl in Regional Aquifer 1). The greatest depth to groundwater occurs near the topographic high in the northeast region at MW101-14 (**Figure 9**). The shallowest depth occurs adjacent to Beaver Creek and the PSW in the central portion of the Subject Lands (at MW10-10) where groundwater seeps were identified by MTE field staff. This

[33] Freeze and Cherry 1979, Table 2.2, pp.29.
[34] Stantec, 2013, Section 5.4.2, pp.182-184.
[35] Freeze and Cherry, 1979, Table 2.2, pp.29.
[36] Stantec, 2013, Section 5.4.3.2 to 5.4.3.6, pp.187-189.

is consistent with previous reporting[37]. MTE installed two mini-piezometers (MP1-15 and MP2-15) to evaluate the seasonal fluctuations in shallow groundwater levels at these locations.

The shallow groundwater table ranges from a high of approximately 351m amsl in the northeast to 343m amsl at the confluence of Beaver Creek and Laurel Creek in the south. The high groundwater levels observed in the northwest region of the Subject Lands (near MW8s-10) exhibit seasonally high water levels in response to precipitation events due to its well screen position (i.e. in low permeable sediment) and its location in a localized depression situated at the topographically high area (i.e. recharge zone) that receives stormwater recharge from a nearby drainage ditch. It is noted that the high water levels are temporary and decline over a short period of time where it eventually equilibrates back to the regional water table position (~348m amsl). Stantec noted that a swale, or drainage ditch feature adjacent to Conservation Drive in this area may account for the increased recharge at this location[38], which corresponds with the high chloride and sodium concentrations reported on in Section 3.4.5 due to anthropogenic winter de-icing operations. Similarly, groundwater levels in the east and southeast portion of the Subject Lands were found at higher elevations (~348m amsl) because of the combined effects of topographic influences, groundwater seepage along the PSW, and some groundwater discharge to Beaver Creek all of which cause variation in the depth at which groundwater is encountered and the direction that it flows in. Seasonal groundwater level fluctuations observed during the monitoring period ranged between 0.15m to 0.53m. It is expected that over a long period of time the natural groundwater level fluctuations will be reflective of natural dynamics in seasonal precipitation and/or due to other anthropogenic factors, such as the operation of municipal water wells.

The horizontal hydraulic gradient is a measurement of the slope of the water table surface, which is simply the change in hydraulic head over the change in distance between two or more monitoring points. The estimated horizontal hydraulic gradient based on **Figure 8** was approximately 0.02m/m. The relatively high calculated horizontal hydraulic gradient for the shallow overburden aquifer system (Regional Aquifer 1) suggests that it is not a highly transmissive aquifer unit.

Vertical hydraulic gradients vary with location within the Subject Lands due to local topographic influences controlling the location of recharge and discharge areas. Downward vertical hydraulic gradients are inferred for the topographically high regions in the northwest and northeast of the Subject Lands based on information from the Grand River Information Network (GRIN) website (GRCA, 2017). Moreover, the relative water level differences at MW8s, d-10 infer a downward vertical hydraulic gradient of approximately 0.012m/m. Even though MW8s-10 is screened at a shallow depth (i.e. Regional Aquitard 1), the rapid water level rise of approximately 1.2m[39], in response to individual precipitation events is seasonal and temporary that eventually equilibrates back to the regional water table elevation (~348m amsl). It is noted that nearby Conservation Drive is to be upgraded to a full urban cross-section with storm sewers and once this work is completed it will remove the supply of stormwater from the drainage ditch and the temporary recharging of surface water to this depression.

By comparison, groundwater is expressed as discharge in topographic low regions as groundwater seeps located adjacent to the PSW and as baseflow discharge in Beaver Creek. It should be noted that Stantec's monitoring well MW9s,d-10, located adjacent to Beaver Creek, was reflective of flowing artesian conditions (i.e. upward vertical hydraulic gradient) and since

[37] Stantec, 2013, pp192; AECOM, Volume 2, Appendix B, 2011, pp.27.
[38] Stantec, 2013, pp189.
[39] Stantec, 2013, pp.189.

the flow could not be stopped, it was abandoned in accordance with Ontario Regulation 903 (as amended)[40]. An upward vertical hydraulic gradient was calculated for MTE monitoring well MW109a, b-14, in the topographic low region near Beaver Creek, to be 0.068m/m upwards.

The average linear groundwater velocity was estimated based on three variables: hydraulic conductivity, horizontal hydraulic gradient and effective porosity. The equation for calculating groundwater velocity is:

$$q = Ki/n_e \qquad \text{[Eq. 1.]}$$

Where: q = groundwater velocity (m^3/m^2/unit of time)
K = effective hydraulic conductivity (m/sec)
i = horizontal hydraulic gradient (dh/dl) (m/m)
n_e = effective soil porosity

Utilizing a measured geometric mean K value of $1.3x10^{-5}$m/sec for the shallow overburden aquifer; an aquifer porosity of 0.20, and a horizontal hydraulic gradient of 0.01m/m, the average horizontal linear groundwater velocity (q) using Darcy's Law (Eq.1) was estimated to be approximately 20m/yr. A porosity value of 0.20 was used and considered reasonable for the fine sand unit[41] [42].

3.4.3 Groundwater-Surface Water Interactions

The NWSSS included the installation of mini-piezometers (or drive points) at nine locations, three of which are located within the Subject Lands boundaries (DP3-09, DP4-09, and DP5-09). These locations were monitored by Stantec between April 2009 and October 2010 during low and high flow periods. Beaver Creek flows from the northwest to the southeast before discharging into Laurel Creek. Upward vertical hydraulic gradients were observed at DP3-09 to DP5-09 indicating the potential for groundwater discharge. However, it should be noted that the overall conclusions from the NWSSS would suggest that groundwater recharge or discharge along Beaver Creek was at best minimal or negligible[43].

The Ministry of Natural Resources and Forestry (MNRF) identified a PSW in the central portion of the Subject Lands, which is monitored by monitoring wells MW10-10 and MW104-14. It was noted in the NWSSS that the central PSW is supported by groundwater discharge from the shallow overburden aquifer system. The mini-piezometers installed by MTE in 2015 (MP1-15 and MP2-15) were used to observe groundwater-surface water interaction with the PSW. The groundwater levels were measured manually between October 2015 and March 2020. Field measurements indicated that groundwater levels averaged 1.1m btoc at MP1-15 and approximately 0.97m btoc at MP2-15. The water levels outside of the mini-piezometers were dry. It would appear that there is some groundwater supporting the wetland at certain times of the year.

3.4.4 Source Water Protection Considerations

The Clean Water Act[44] (CWA) was passed by the Ontario legislature to protect drinking water at its source throughout Ontario. Protecting water at its source ensures safe drinking water for all. The task of developing Source Protection Plans (SPP) within the Grand River watershed was

[40] Stantec, 2013, pp.174.
[41] Freeze and Cherry, 1979, Table 2.4, pp. 37.
[42] Fetter, 2001, Table 4.4, pp.75.
[43] Stantec, 2013, pp.192.
[44] Ministry of the Environment, 2006.

guided by the Lake Erie Region Source Protection Committee (LERSPC) and included the involvement of the ROW, among other stakeholders.

Prior to the development of the SPP, several technical groundwater and surface water studies were completed. An Assessment Report[45] was completed by the LERSPC that included results from the groundwater and surface water technical studies. The Assessment Report identified municipal drinking water sources and described how vulnerable they were to contamination. Vulnerability describes how easily a well can become polluted by a contaminant. The ROW studied each municipal well field to determine its vulnerability and through those studies delineated groundwater capture zone areas known as Wellhead Protection Areas (WHPAs).

The vulnerability assessment shows that the Subject Lands are rated as low to medium vulnerability (**Figure 10**). The vulnerability assessment provides the means with which to assign an intrinsic vulnerability score to the Wellhead Protection Area (WHPA) and Significant Groundwater Recharge Area (SGRA). The Assessment Report implies that the majority of the land area within the Subject Lands is not vulnerable to contamination. There are no Issue Contributing Areas (ICA) or known Source Water Protection Restrictions in place for a majority of the area except for the small northeast portion of the Subject Lands where Source Water Protection Policies for DNAPLs may apply.

The majority of the Subject Lands are located within WHPA-D, which is the 5 to 25-year Time of Travel (TOT) capture zone for the supply well W05A (**Figure 11**). The northeast corner of the Subject Lands falls under the WHPA-C, which is within the five-year TOT for well W05A.

A significant portion of the Subject Lands are located outside of a SGRA, with the exception of a small eastern portion of the Subject Lands (**Figure 12**). The role of SGRAs is to support the protection of drinking water across the broader landscape.

3.4.5 Groundwater Quality

Natural groundwater quality is an important issue to address when proposed developments are near groundwater and/or surface water features such that these features and their related hydrologic functions will be protected, improved or restored. As such, it is important to establish a benchmark for background water quality prior to development to ensure SWM facilities or LID structures can help to maintain, or improve upon existing water quality conditions.

A groundwater monitoring program was established by Stantec in 2010, within monitoring wells MW1-10 to MW13-10, to document baseline groundwater quality conditions primarily in Regional Aquifer 1 as part of the NWSSS[46]. Similarly, MTE collected additional groundwater samples in March 2017 from MTE monitoring wells MW101-14 to MW105a, b-14; MW109a, b-14 to MW110-14; and four Stantec monitoring wells (MW8s, d-10, MW10-10, MW12s, d-10, and MW13-10) for comparative purposes. Analytical results were compared to the PWQO and ODWQS as discussed previously in Section 2.4. The analytical chemistry results (Table 4) and Laboratory Certificate of Analysis results are found in Appendix D.

Groundwater sampling was conducted to determine if an inter-connection between the shallow (Regional Aquifer 1) and deep (Regional Aquifer 3) overburden aquifer systems and Beaver Creek exists. The spatial distribution of dissolved inorganic chemical species (e.g. Cl^-, SO_4^-, HCO_3^-, Na^+, K^+, Mg^{2+}, Ca^{2+}, NO_3^-N) and other parameters (e.g. conductivity) are useful for understanding groundwater flow pathways and contribution areas.

[45] LERSPC, 2015.
[46] Stantec, 2013, Section 5.4.4, pp.197.

The Piper Plot (**Figure 13**) displays the major cation and anion concentration from each monitoring well location plus two surface water locations on Beaver Creek from March 2017. The major ionic species is controlled by Ca-Mg-(HCO_3-CO_3) type fresh water. In North America there are three main compositional categories in which most natural groundwater can be placed (Type I, Type II, and Type III)[47]. The groundwater chemistry at the Subject Lands can be classified as Type II waters: slightly alkaline, fresh waters (< 1000mg/L TDS), in which the Ca^{2+} and Mg^{2+} are the dominant cations and HCO^{3-} is the dominant anion.

Monitoring wells MW8s-10, MW10-10, MW12s-10 and MW13-10 are installed within the shallow overburden deposits (Regional Aquitard 1 at MW8s-10 and Regional Aquifer 1 for the remaining monitoring wells) on the western portion of the Subject Lands. Historical (2010) and recent (2017) groundwater quality samples are reasonably consistent. The groundwater is characterized by slightly anaerobic conditions (low Dissolved Oxygen); low levels of Nitrate (NO_3-N) ranging from non-detect to 2.9mg/L; Iron concentrations ranging from non-detect up to 0.27mg/L; and Manganese concentrations ranging from 0.03mg/L up to 0.34mg/L. The Chloride (Cl^-) and Sodium (Na^+) concentrations at MW8s-10, adjacent to Conservation Drive have steadily increased from 2010 to 2017 which is inferred to be a function of impacts from winter road de-icing activities from the artificial recharge taking place from the swale feature located adjacent to Conservation Drive.

Monitoring wells MW103-14, MW104-14, MW109b-14, and MW110-14, located on the western portion of the Subject Lands, are screened within the shallow overburden aquifer deposit (Regional Aquifer 1). The groundwater samples collected in March 2017 closely reflect the groundwater quality summarized for the Stantec monitoring wells described above. Nitrate (NO_3-N) concentrations ranged from non-detect to an exceedance of 10mg/L under the ODWQS and PWQO at MW104-14 (12.7mg/L). Elevated NO_3-N concentrations are usually representative of rural areas as a result of decades of agricultural fertilizer use. The Chloride (Cl^-) and Sodium (Na^+) concentrations ranged from non-detect to 19.9mg/L for Cl^- and 2.1mg/L to 17.9mg/L for Na^+. The low concentrations are inferred to represent natural background water quality conditions.

Monitoring wells located east of Beaver Creek (MW101-14 and MW102-14) screened within the shallow overburden aquifer deposit, show somewhat similar water quality characteristics as in the west. Water quality in the east region of the Subject Lands is characterized by:

- Non-detect Iron concentrations;
- Manganese concentrations ranging from non-detect to 0.005mg/L;
- NO_3-N concentrations of 7.95mg/L and 7.38mg/L;
- Cl^- concentrations of 37.9mg/L and 24.1mg/L; and
- Na^+ concentrations 16.5mg/L and 15.5mg/L.

Again, the low concentrations of Cl^- and Sodium Na^+ are inferred to represent natural background water quality conditions.

The water quality characteristics of the monitoring wells screened deeper into the overburden aquifer deposit are represented by monitoring wells MW8d-10, MW12d-10, MW105a-14, and MW109a-14. Water quality from the deeper overburden monitoring wells is characterized by:

[47] Freeze and Cherry, 1979, pp.242.

- Low Dissolved Oxygen levels ranging from 0.4mg/L to 3.7mg/L.
- Iron concentrations ranging from non-detect to 1.28mg/L. The high iron concentrations exceed the ODWQ Aesthetic Objectives (0.3mg/L) at MW8d-10 (0.51mg/L) and MW12d-10 (1.28mg/L). These levels are consistent with historical water quality conditions at these two monitoring locations.
- Manganese concentrations ranging from 0.004mg/L to 0.16mg/L, which falls within the same range as those observed in 2010.
- Non-detect NO_3-N concentrations similar to the 2010 analytical results.
- Cl^- concentrations ranging from 1.65mg/L to an exceedance at MW8d-10 of 300mg/L. In contrast, the Cl^- concentration at MW8d-10 in 2010 was observed to be 11mg/L. This infers downward migration of Cl^- in the topographic high or recharging area.
- Na^+ concentrations were generally consistent with results from 2010. The exception is MW8d-10 where Na^+ concentrations rose from 30mg/L to 181mg/L in 2017. This infers downward migration of Na^+ in the topographic high or recharging area.

4.0 Conceptual Site Model (CSM)

A Conceptual Site Model (CSM) was developed for the Subject Lands based on the findings from previous reporting and the recent geology and hydrogeology field work program (**Figure14**). The CSM is used to describe general hydrogeologic and hydrologic conditions of the natural system. CSM components include, but are not limited to:

- The areal extent being studied;
- Identification of a geological framework and subsurface hydrogeological properties;
- Derivation of subsurface hydrostratigraphic units (aquifers and aquitards);
- An understanding of regional and/or local groundwater movements including groundwater elevations and patterns;
- Identification of hydrologic features, such as groundwater seeps/springs, water courses, and watershed divides; and
- Basic understanding of water budget components including recharge and discharge conditions.

Conceptual model formulation requires three key steps:

1. Defining hydrostratigraphic units;
2. Defining groundwater and surface water systems; and
3. Preparing a water budget.

Within the local setting the surface water flow system consists of Beaver Creek and the PSW. Beaver Creek flows into Laurel Creek, which flows south into the Laurel Creek Reservoir. Groundwater seepage was identified through the field work program near the PSW. Baseflow measurements obtained through previous studies were reviewed but not presented in the Hydrogeological Assessment Report.

A preliminary water balance assessment was completed for the NWSSS[48]. MTE completed its own water budget assessment using the hydrologic model (GAWSER), which was run for a 54-year simulation period to determine the average annual evapotranspiration, runoff and infiltration values for each catchment within the Beaver Creek subwatershed[49]. The results for the catchments containing the Subject Lands are summarized in Table 5. The reader is referred to MTE's SWM report for further discussion on the existing and post-development water balance results.

5.0 Impact Assessment

The Subject Lands are proposed to be developed as a residential development comprised of single family residential blocks, multiple residential blocks, a stormwater management (SWM) facility, a neighbourhood park, walkways, open space block, emergency access and service corridors, and municipal rights-of-way. As part of the proposed development design, including SWM and infiltration facilities, the seasonal high composite groundwater levels were contoured to identify potential areas of conflict with a particularly shallow groundwater table (**Figure 15A**). Furthermore, due to the temporary nature of the seasonal water level highs in the northwest region of the Subject Lands (near MW8s, d-10), which are interpreted to be affected by artificial recharging conditions from the swale feature, **Figure 15B** was generated to better represent the post-development composite high groundwater level. These figures can be used to evaluate changes to groundwater depth after post-development grading activities with respect to the residential foundation elevations.

There is an increased recognition within the Region of potential sensitivities to wetlands and watercourses from chlorides and other potential contaminants of concern, which are addressed in Sections 5.1 to 5.6 below.

5.1 Stormwater Management (SWM) – Infiltration Facilities Design Considerations

Infiltration rates are an important consideration for Stormwater Management (SWM) planning and design. The field testing program conducted for this study was considered suitable to estimate infiltration rates in areas where there is suitable vertical separation between the SWM facilities and the groundwater table.

The Subject Lands will contain three SWM facilities and some lot-level infiltration galleries within the multi-residential blocks. Infiltration facilities have been conceptually designed at this stage (refer to **Figure 16**).

For the purpose of designing any type of infiltration facility the hydraulic conductivity (K) values (m/sec) generated from the slug test analysis can be used for conversion into infiltration rates (typically in millimeters per hour). The tables and figures provided in the *SG-6 Percolation Time and Soil Descriptions Guideline*[50] will be used to approximate the empirical relationships between K and percolation time. The results of this testing will identify any limiting conditions on

[48] Stantec, 2013, Table 6.3, pp.209.
[49] MTE, 2020, pp13. Table 3.2.
[50] OMMAH, 1997, Volume 2, Code 8.2.1.2 (2).

the Subject Lands that would preclude these proposed areas for their designated infiltration purpose (i.e. aquitard presence or shallow depth to the water table).

A preliminary estimate of infiltration rate(s) was calculated using the geometric mean K value of $1.3x10^{-5}$m/sec for the shallow overburden aquifer deposit (Section 3.4.1). The K value was deemed representative of the shallow overburden aquifer conditions within the vicinity of the proposed SWM and infiltration facilities. The percolation times (T) is estimated to be between 8 to 20min/cm. To convert percolation times (T) to infiltration, the following relationship is used – 1/T, which is converted into mm/hour. The resulting infiltration rates (1/T) range between 30 to 75mm/hour.

5.2 Groundwater Mounding Considerations

Analytical calculations are used to estimate the magnitude and extent of groundwater mounding beneath the infiltration facilities presented in Section 5.1. Analytical equations are evaluated with the use of a spreadsheet developed to solve the Hantush (1967) equation (for growth of groundwater mounds in response to uniform infiltration beneath the infiltration structure[51]). The required input values were measured in the field or estimated from published values. The values used for each facility are presented in Appendix E. Predicted groundwater mounding heights are calculated from the spreadsheets and are summarized in Table 6.

The maximum groundwater mound height is estimated to be approximately one metre. In general, the groundwater mound height ranges between 0.02m to 0.9m above the average background groundwater level.

5.3 Excavation and Dewatering Considerations

Deep sewer installations may be required for the proposed development and therefore construction dewatering requirements should be examined. The purpose of construction dewatering is to control the amount of groundwater seepage entering the excavation to ensure worker safety. Construction dewatering requirements will be assessed based on an understanding of:

- Groundwater inflow rates to an excavation;
- Shallow overburden aquifer characteristics (e.g. permeability, thickness);
- Radius of influence calculations; and
- Influence of surface water features (e.g. PSW and/or Beaver Creek).

Assuming that depths to servicing installations are approximately 3m bgs to 8m bgs it can be expected that some construction dewatering will likely occur below the water table because depth to groundwater averages from 0.3m bgs to 7.4m bgs across the Subject Lands. MTE will need to conduct a detailed construction dewatering assessment to estimate the requirements for a Permit to Take Water (PTTW) or Environmental Activity Sector Registry (EASR) applicability. The category type for the PTTW or EASR will depend on the construction methods used and dewatering methods employed, which are yet to be confirmed.

[51] Carleton, 2010.

Groundwater collected as part of construction dewatering in the vicinity of the PSW or Beaver Creek will likely be discharged downstream into Beaver Creek. A discharge plan will need to be developed to support the dewatering activities, which will include a water quality assessment and development of treatment and discharge criteria. A groundwater monitoring program will be developed and carried out for the dewatering phase during the construction and post-construction phase. Any monitoring wells requiring decommissioning to allow for construction activities to take place shall be decommissioned in accordance with Ontario Regulation 903 (as amended).

Based on the preliminary design, MTE does not anticipate that the proposed SWM facilities being constructed at the north and central portion of the Subject Lands will extend into the shallow groundwater table. Any dewatering activities may have localized short-term impacts to surface water features.

Under the Ontario Water Resources Act (OWRA) a construction dewatering assessment will need to be completed to estimate the requirements for a MECP Permit to Take Water (PTTW) application during the construction of the proposed development. The construction dewatering requirements is assessed based on an understanding of: construction timing; groundwater inflow rates to an excavation; shallow overburden sediment characteristics (e.g. permeability, thickness); and radius of influence calculations.

The MECP implemented new changes to the PTTW process under Ontario Regulation 64/16 and Ontario Regulation 63/16 where a Category 3 PTTW is required for dewatering rates in excess of 400,000L/day and an Environmental Activity and Sector Registry (EASR) is required for dewatering volumes between 50,000L/day and 400,000L/day. For an EASR, the MECP requires the preparation of a Water Taking Report and a Discharge Plan Report, if required. Conditions of the PTTW would include the monitoring of groundwater levels within and adjacent to wetland and surface water features to ensure unacceptable impacts do not occur. Monitoring will be conducted at pre-construction, during construction and post construction phases. Servicing that extends into the groundwater table should be constructed with cut-off collars consisting of clay or lean concrete to prevent the formation of preferential flow pathways in more permeable materials and to ensure existing groundwater flow regimes are maintained.

5.4 Well Interference Considerations

The NWSSS identified a number of private domestic wells, typically dug wells or screened within the shallow and/or deep overburden aquifers, near the Subject Lands[52]. Golder monitored nearby private wells, in support of AECOM's Class EA Study, and determined that private wells typically supported short-term pumping rates in the range of 1.5L/sec to 2.3L/sec. Given the well screen depths of private wells within the overburden aquifer, source water supply is received by recharge in the form of locally and regionally infiltrated precipitation. Further assessment will be required prior to final design to assess if construction activities (e.g. dewatering) will impact the local shallow private wells by conducting a private well survey.

MTE does not anticipate any development impacts on the deep overburden aquifer (Regional Aquifer 3) as the construction activities described above are limited in depth only to Regional Aquifer 1. The ROW municipal wells discussed in Section 3.2 will not be adversely impacted by construction activities because of their distance away from the Subject Lands (i.e. over 1km away); Aquifer 3's separation from Regional Aquifer 1 by a relatively thick sequence of Lower Maryhill Till (Regional Aquitard 2) and Catfish Creek Till (Regional Aquitard 3) with a cumulative

[52] Stantec, 2013, pp.160.

thickness of between 10m and 25m, and the municipal supply well's screen depths of greater than 30m bgs. Aquifer vulnerability in relation to Source Water Protection (SWP) under the Clean Water Act is discussed in Section 3.4.4.

5.5 Beaver Creek and Wetland (PSW) Considerations

Water quality samples, discussed in Section 3.4.5, were collected to establish background water chemistry and provide a comparison with historical water quality data. Beaver Creek and the PSW both serve as groundwater discharge areas. Groundwater discharged during construction dewatering activities (if required) may be directed down gradient in Beaver Creek provided that erosion and sediment control measures are implemented.

There is a potential that temporary construction dewatering may impact Beaver Creek and the PSW in the short term. A short-term construction dewatering assessment should be completed at final design and reviewed by the MECP to assess the extent of the short term impacts. The PTTW, should one be required, will include a groundwater and surface water monitoring program to ensure any temporary impacts are restored when construction is complete.

6.0 Summary & Conclusions

Based on the hydrogeological investigation and background literature review, MTE offers the following summary and conclusions:

Geology:

- Deep overburden deposits of the Waterloo Moraine aquifer material (Regional Aquifer1);
- Table 1 highlights (in grey) units interpreted to exist beneath the Subject Lands from the borehole logs; and
- Stratigraphic conditions beneath the Subject Lands consist of fine sand, silt, and silt till deposits.

Hydrogeology:

- Direction of groundwater flow is generally from northwest to southeast;
- Groundwater flow occurs from the topographic highs in the north regions of the Subject Lands and slopes toward Beaver Creek and south towards the confluence of Beaver Creek and Laurel Creek;
- Groundwater levels were encountered at a depth range of 0.3m bgs and 7.4m bgs. – water table conditions;
- Groundwater velocity in the regional shallow overburden aquifer deposit (Regional Aquifer 1) was estimated to be 20m/yr;
- A component of groundwater discharge supports the PSW in the central portion of the Subject Lands;
- Based on the preliminary groundwater mounding analysis, the groundwater mound height beneath the infiltration facilities ranges between 0.02m to 0.9m above the composite high groundwater level, which is within an acceptable range of groundwater separation (i.e. less than one metre);

- The Subject Lands are located within the 5 to 25-year TOT capture zone (WHPA-D) for the Waterloo North well field (LERSPC, 2015); and
- Construction dewatering needs will be evaluated at the detailed design stage to determine if a PTTW will be required.

Water Quality:

- WHPA vulnerability mapping shows the Subject Lands is situated in a low vulnerability environment that will provide adequate protection to the groundwater resource from contamination;
- The Subject Lands are not located in an Issue Contributing Area (ICA);
- The shallow and deep overburden aquifer system water quality are generally distinct from one another but there are locations near the topographical lows where the shallow overburden aquifer deposit is influenced by the deep overburden aquifer system in areas of upward movement of groundwater (e.g. MW109a, b-14); and
- The two surface water samples (SW-North and SW-South) were distinct from the shallow overburden aquifer groundwater quality that infers a minimal connection to groundwater.

7.0 Recommendations

- Groundwater monitoring should continue prior to Final Design, including the collection of groundwater levels and groundwater and surface water quality samples.
- The on-going groundwater monitoring program should continue to document pre-construction groundwater conditions. Any monitoring wells requiring decommissioning to allow for construction activities to take place shall be decommissioned in accordance with Ontario Regulation 903 (as amended).
- Since infiltration rates are an important consideration for SWM planning and design in-situ permeameter tests should be conducted to confirm the estimates put forth in Section 5.1 and Section 5.2.
- Groundwater mounding calculations should be re-visited during final design to ensure appropriate separation from infiltration facilities and high groundwater levels.
- A private well inventory of existing wells should be completed to establish background water level and water quality conditions prior to construction dewatering activities.
- A construction dewatering assessment will be required to determine if a Permit to Take Water (PTTW) is needed.

8.0 Limitations

Services performed by **MTE Consultants Inc**. (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

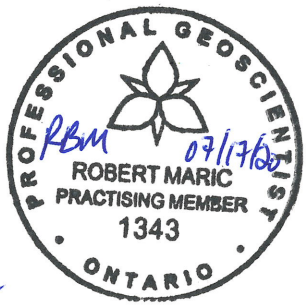
This report was completed for the sole use of MTE and 1017081 Ontario Limited and Gabriella Elizabeth Groff (Northgate Subdivision) and 1455136 Ontario Inc. (Erbsville Kartway Subdivision) to support a proposed residential development proposal. It was completed in accordance with the approved Scope of Work referred to herein. As such, this report may not deal with all issues potentially applicable to the Subject Lands and may omit issues that are or may be of interest to the reader. MTE makes no representation that the present report has dealt with all important environmental features, except as provided in the Scope of Work. All findings and conclusions presented in this report are based on Subject Lands conditions, as they existed during the time period of the investigation.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by any third party as a result of decisions made or actions taken, based upon this report. Others with interest in the Subject Lands should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time might affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may re-assess the contents of this report.

All of which is respectfully submitted,

MTE Consultants Inc.





Robert Maric, M.Sc., P.Geo., QP$_{ESA}$
Senior Hydrogeologist
519-743-6500 ext. 1312
rmaric@mte85.com

Peter A. Gray, P.Geo., QP$_{ESA}$
VP., Senior Hydrogeologist
519-743-6500 ext. 1306
pgray@mte85.com

RBM: apm
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Tables

Table 1. Regional Geological and Hydrogeological Framework.

OGS[1] Nomenclature	Regional Unit	Hydrogeologic Unit	Geologic Description
ATA1		Whittlesey Clay	Composed primarily of sands (Bajc and Shirota, 2007).
AFA1		Whittlesey Sand	Composed primarily of silts and clays (Bajc and Shirota, 2007)
ATA2		Wentworth Till	This till is closely associated with stratified deposits of sand and cobble-boulder gravel and therefore acts regionally, as a poor aquitard and locally, as an aquifer with the RMOW. May contain abundant aquifer material (Bajc and Newton, 2007).
AFA2		Grand River valley	Outwash deposits consisting of well bedded sands and gravels restricted to the valleys of the Conestogo, Grand, Nith and Speed rivers (Bajc and Newton, 2007).
ATA3		Lower Grand River Valley	Silt and clay valley fill.
ATB1	**Aquitard 1**	Upper Maryhill Till, Port Stanley Till, Tavistock Till, Mornington Till	These tills are silty to clayey tills (e.g. Upper Maryhill Till) and silty to sandy and slightly more transmissive (e.g. Port Stanley Till) (Bajc and Shirota, 2007).
AFB1	**Aquifer 1**	Upper Waterloo Moraine	Aquifer and equivalents. Consists primarily of fine to medium sand with localized accumulations of gravel and isolated lenses of muddy glaciolacustrine sediments and diamicton (Bajc and Newton, 2007). This unit is probably the most significant regional aquifer exploited to date within the RMOW.
ATB2	**Aquitard 1**	Middle Maryhill Till	Stratified equivalents and represents the intervening fine-grained units of till or glaciolacustrine sediments (Bajc and Shirota, 2007).
AFB2	Aquifer 1	Middle Waterloo Moraine	Aquifer and equivalents.
ATB3	**Aquitard 2**	Lower Maryhill Till	Stratified equivalents, tends to be fine-textured, closely associated with glaciolacustrine sediments. This unit acts as a significant regional aquitard with local breaches to underlying deposits (Bajc and Newton, 2007). The aquitard is referred to by the RMOW as Regional Aquitard 2.
AFB3	Aquifer 2	Lower Waterloo Moraine aquifer or Catfish Creek Till outwash	This aquifer is described as a sand and gravel unit.
ATC1	**Aquitard 3**	Upper/Main Catfish Creek Till	Consists of stoney, silty to sandy diamicton. This unit acts as an important, relatively continuous regional aquitard (Bajc and Newton, 2007).
AFC1		Middle Catfish aquifer	Catfish Creek glaciofuvial deposits, which are often closely associated with the Catfish Creek Till locally act as an important aquifer (Bajc and Newton, 2007).
ATC2	Aquitard 3	Lower Catfish Creek Till	Properties of the till are fairly consistent with ATC1. The till is stoney with a silty to sandy matrix (Bajc and Newton, 2007).
AFD1	**Aquifer 3**	Pre-Catfish Creek Sands and Gravels	Pre-Catfish Creek glaciofluvial deposits that contains stratified sand and gravel that thickens in bedrock depressions including the buried bedrock valleys (Bajc and Shirota, 2007).
ATE1		Canning Drift	Till and associated fine-textured lake deposits, which are silty to clayey in texture. "Windows" through this aquitard link the underlying aquifer (AFF1) with the overlying Pre-Catfish Creek aquifer (AFD1) (Bajc and Shirota, 2007).
AFF1		Pre-Canning aquifers	Comprised of the oldest sediments (sand & gravel) in the Waterloo Moraine area. These sediments are generally discontinuous in their distribution and tend to be isolated in bedrock depressions.
ATG1	**Aquitard 4**	Pre-Canning aquitards	These sediments (stony, silty to sandy till) are generally discontinuous in their distribution.
Bedrock	**Aquifer 4**	Silurian and Lower Devonian	Weathered bedrock, carbonates and shales.

Notes:

1. Grey highlighted areas were interpreted to be present beneath the Subject Lands.
2. Ontario Geological Survey naming convention (Bajc and Shirota, 2007).

Table 2. Summary of Monitoring Well Construction Details.

Well ID	Date Installed	Status	Easting[1]	Northing[1]	Ground Elevation	Top of Casing	Stickup	Drilled Depth	Well Screen Interval		Mid-Screen Depth	Screened Unit Description
			(m)	(m)	(m amsl)	(m amsl)	(m)	(m bgs)	From (m bgs)	To (m bgs)	(m bgs)	
MW100-14	December-14	Active	533278.80	4814444.50	344.68	345.57	0.89	5.35	1.52	4.50	3.01	Silty Sand
MW101-14	December-14	Active	533055.00	4814915.40	357.85	358.76	0.90	9.75	5.79	9.35	7.57	Fine Sand
MW102-14	December-14	Active	532852.60	4814712.90	350.95	351.70	0.75	5.95	2.29	5.24	3.76	Clayey Silt
MW103-14	December-14	Active	532648.00	4814657.70	345.78	346.60	0.82	10.52	1.52	4.57	3.05	Clayey Silt Till
MW104-14	December-14	Active	532767.40	4814530.70	346.17	347.09	0.92	5.12	1.40	4.22	2.81	Fine Sand
MW105a-14	December-14	Active	532531.40	4814502.80	349.58	350.51	0.93	20.42	16.76	19.81	18.29	Fine Sand
MW105b-14	December-14	Active	532535.30	4814505.20	349.66	350.20	0.54	12.96	11.27	12.43	11.85	Clayey Silt Till
MW106-14	December-14	Active	532553.80	4814270.40	350.79	351.63	0.84	12.80	3.05	6.10	4.58	Silt Till
MW107-14	December-14	Active	532831.60	4814301.70	350.58	351.44	0.86	8.47	4.57	7.68	6.13	Fine Sand
MW108-14	December-14	Active	532877.70	4814479.20	346.21	346.93	0.72	5.80	2.97	5.10	4.04	Fine Sand
MW109a-15	December-14	Active	532942.10	4844346.00	349.77	350.49	0.72	24.58	21.34	23.88	22.61	Silty Fine Sand
MW109b-14	December-14	Abandoned	532945.90	4814348.50	349.73	350.52	0.79	9.66	7.62	8.87	8.25	Fine Sand
MW209b-19	September-19	Active	532946.75	4814347.92	349.75	350.62	0.87	9.10	7.62	9.10	8.36	Fine Sand
MW110-14	December-14	Active	532450.70	4814182.30	349.37	350.18	0.81	7.05	3.05	6.24	4.64	Fine Sand
MW111-14	December-14	Active	532355.50	4814376.20	349.43	349.31	-0.12	6.93	4.00	6.93	5.47	Clayey Silt
MW1-10	March-10	Unknown	531967.00	4814976.00	350.07	350.96	0.89	3.05	3.05	4.57	3.81	Silty Sand
MW2-10	March-10	Unknown	532498.00	4815271.00	355.56	356.52	0.96	3.08	3.08	4.60	3.84	Sand
MW3-10S	March-10	Unknown	532776.00	4815407.00	366.81	367.62	0.81	12.18	12.18	13.70	12.94	Sand
MW3-10D	March-10	Unknown	532774.00	4815406.00	366.84	367.60	0.76	40.08	40.08	41.60	40.84	Clay Till/Sand Till
MW4-10	March-10	Unknown	532399.00	4815010.00	347.87	348.64	0.77	1.52	1.52	3.05	2.29	Silty Sand to Clayey Silt
MW5-10	March-10	Unknown	532368.00	4814834.00	351.08	351.91	0.83	4.27	2.74	4.27	3.51	Silty Sand
MW6-10	March-10	Unknown	532737.00	4814972.00	355.58	356.48	0.90	4.57	3.05	4.57	3.81	Medium Sand
MW7-10	March-10	Unknown	533031.00	4815108.00	358.74	359.67	0.93	7.32	5.79	7.32	6.56	Fine to Medium Sand
MW8-10S	March-10	Active	532271.00	4814538.00	350.38	351.28	0.90	4.57	3.05	4.57	3.81	Silt
MW8-10D	March-10	Active	532269.00	4814537.00	350.44	351.26	0.82	39.68	38.16	39.68	38.92	Sand/Sand and Cobble
MW9-10S	March-10	Abandoned	532634.00	4814715.00	345.83	346.69	0.86	4.57	3.05	4.57	3.81	Clay
MW9-10D	March-10	Abandoned	532634.00	4814717.00	345.71	346.50	0.79	26.39	25.99	27.51	26.75	Silt Till
MW10-10	March-10	Active	532654.00	4814388.00	346.25	347.05	0.80	3.05	1.52	3.05	2.29	Fine Sand
MW11-10	March-10	Active	533047.00	4814655.00	355.07	355.96	0.89	5.79	4.27	5.79	5.03	Fine to Coarse Sand
MW12-10S	March-10	Active	532585.00	4814123.00	348.51	349.35	0.84	6.71	5.06	6.58	5.82	Silty Clay
MW12-10D	March-10	Active	532584.00	4814125.00	348.63	349.52	0.89	25.60	23.98	25.50	24.74	Sand and Gravel
MW13-10	March-10	Active	533060.00	4814339.00	345.34	346.15	0.81	4.57	3.05	4.57	3.81	Silty Sand

Notes: *dashed line = not applicable*

[1] Easting and Northing coordinates are referenced to NAD 83 UTM control system.

Table 3. Summary of Manual Groundwater Level Readings (2015 to 2020).

Well ID	MW100-14	MW101-14	MW102-14	MW103-14	MW104-14	MW105a-14	MW105b-14	MW106-14	MW107-14	MW108-14	MW109a-15
Easting	533278.8	533055.0	532852.6	532648.0	532767.4	532531.4	532535.3	532553.8	532831.6	532877.7	532942.1
Northing	4814444.5	4814915.4	4814712.9	4814657.7	4814530.7	4814502.8	4814505.2	4814270.4	4814301.7	4814479.2	4844346.0
Ground elevation (m amsl)	344.68	357.85	350.95	345.78	346.17	349.58	349.66	350.79	350.58	346.21	349.77
Depth (m bgs)	5.35	9.75	5.95	10.52	5.12	20.42	12.96	12.80	8.47	5.80	24.58
Stick Up	0.89	0.90	0.75	0.82	0.92	0.93	0.54	0.84	0.86	0.72	0.72
Date	**Groundwater Elevation (m amsl)**										
9-Jan-2015	343.53	351.91	349.90	345.26	345.22	348.99	348.33	348.55	346.26	345.08	346.62
23-Jan-2015	343.42	351.86	349.82	345.15	345.17	348.28	348.27	348.42	346.11	344.85	346.51
13-Mar-2015	343.55	351.66	349.82	345.21	345.11	348.28	348.16	348.26	345.88	344.86	346.43
29-May-2015	342.91	351.73	349.85	-	345.04	348.22	348.20	348.27	346.08	344.71	346.42
14-Oct-2015	342.77	351.33	349.66	345.14	344.87	348.06	348.01	347.97	345.51	344.60	346.20
15-Jan-2016	343.64	351.32	349.97	345.21	345.27	348.33	348.33	348.61	346.09	345.02	346.56
18-Jan-2016	-	-	-	-	-	-	-	-	-	-	-
16-May-2016	343.43	352.03	349.98	345.06	345.25	348.43	348.42	348.66	346.34	344.90	346.63
3-Aug-2016	-	-	349.57	-	344.71	-	-	348.41	346.13	344.48	346.20
4-Aug-2016	342.67	351.55	-	344.39	-	347.99	348.00	-	-	-	-
4-Jan-2017	344.22	351.81	350.41	345.61	345.36	348.46	348.46	348.80	345.93	345.35	346.58
23-Mar-2017	-	-	-	-	-	-	-	348.75	-	-	-
24-Mar-2017	343.68	351.90	350.17	345.31	345.35	348.45	348.46	-	346.42	344.99	346.61
19-Oct-2017	343.07	351.54	349.99	345.15	345.01	348.21	348.20	348.25	345.66	344.75	346.30
15-Feb-2018	343.45	351.53	349.85	345.09	345.23	348.29	348.24	-	-	-	-
16-Feb-2018	-	-	-	-	-	-	-	348.50	346.07	345.06	346.44
8-Mar-2018	343.49	351.64	349.90	345.06	345.26	348.35	348.36	348.51	346.37	344.99	346.55
10-Jun-2018	343.13	351.84	349.87	345.06	345.10	348.30	-	-	346.22	344.80	346.49
11-Jun-2018	-	-	-	-	-	-	-	-	-	-	-
4-Oct-2018	343.57	351.33	350.21	345.50	345.04	348.28	-	348.48	345.63	344.99	346.40
6-Mar-2019	343.47	351.53	349.66	-	345.16	348.26	-	348.22	346.06	344.85	346.43
25-Apr-2019	343.70	351.70	350.04	345.22	345.41	348.51	348.52	348.87	346.74	345.13	346.76
4-Jul-2019	343.06	351.89	349.87	345.13	345.15	348.29	347.97	348.51	346.16	344.76	346.45
1-Aug-2019	342.66	351.72	349.65	344.76	344.93	348.11	347.79	348.08	345.59	344.51	346.27
11-Nov-2019	-	-	-	-	-	-	-	-	-	-	-
21-Nov-2019	343.62	351.34	349.98	345.25	345.21	348.30	347.97	348.46	345.84	344.99	346.40
9-Mar-2020	344.10	351.83	350.41	345.61	345.39	348.49	348.18	348.88	346.20	345.27	346.63
Minimum	*342.66*	*351.32*	*349.57*	*344.39*	*344.71*	*347.99*	*347.79*	*347.97*	*345.51*	*344.48*	*346.20*
Maximum	*344.22*	*352.03*	*350.41*	*345.61*	*345.41*	*348.99*	*348.52*	*348.88*	*346.74*	*345.35*	*346.76*
Average	*343.39*	*351.66*	*349.94*	*345.17*	*345.15*	*348.33*	*348.21*	*348.47*	*346.06*	*344.90*	*346.47*

Notes: dashed line = not measured

** dry*

Table 3. Summary of Manual Groundwater Level Readings (2015 to 2020) (cont.).

Well ID	MW109b-14	MW209b-19	MW110-14	MW111-14	MW8-10S	MW8-10D	MW10-10	MW11-10	MW12-10S	MW12-10D	MW13-10
Easting	532945.9	532946.7	532450.7	532355.5	532271.0	532269.0	532654.0	533047.0	532585.0	532584.0	533060.0
Northing	4814348.5	4814347.9	4814182.3	4814376.2	4814538.0	4814537.0	4814388.0	4814655.0	4814123.0	4814125.0	4814339.0
Ground elevation (m amsl)	349.73	349.75	349.37	349.43	350.38	350.44	346.25	355.07	348.51	348.63	345.34
Depth (m bgs)	9.66	9.10	7.05	6.93	4.57	39.68	3.05	5.79	6.71	25.60	4.57
Stick Up	0.79	0.87	0.81	-0.12	0.90	0.82	0.80	0.89	0.84	0.89	0.81
Date	**Groundwater Elevation (m amsl)**										
9-Jan-2015	345.76	-	348.08	348.83	-	-	-	-	-	-	-
23-Jan-2015	345.58	-	348.05	348.71	348.79	348.42	-	350.93	347.03	348.14	344.57
13-Mar-2015	345.36	-	348.05	348.66	-	-	-	-	-	-	-
29-May-2015	345.48	-	347.98	348.21	348.56	348.35	345.98	-	347.90	347.09	344.34
14-Oct-2015	344.93	-	347.87	348.29	348.45	348.11	345.82	-	347.84	347.02	344.10
15-Jan-2016	345.74	-	348.10	348.97	-	-	-	-	-	-	-
18-Jan-2016	-	-	-	-	349.22	348.47	346.10	-	348.01	347.82	344.35
16-May-2016	345.76	-	348.18	348.73	349.07	348.57	346.25	-	348.08	347.30	344.72
3-Aug-2016	344.98	-	348.81	347.97	-	-	-	-	-	-	-
4-Aug-2016	-	-	-	-	348.20	348.15	345.88	-	347.72	346.55	343.91
4-Jan-2017	345.76	-	348.33	348.46	-	-	-	-	-	-	-
23-Mar-2017	-	-	348.16	348.75	349.20	348.54	frozen	-	347.55	348.21	344.82
24-Mar-2017	345.91	-	-	-	-	-	-	-	-	-	-
19-Oct-2017	345.11	-	348.00	348.68	348.59	348.32	346.36	-	346.53	348.05	344.17
15-Feb-2018	-	-	-	-	-	-	-	-	-	-	-
16-Feb-2018	345.60	-	348.09	348.76	-	-	-	-	-	-	-
8-Mar-2018	345.88	-	348.12	-	-	-	-	-	-	-	-
10-Jun-2018	-	-	-	-	-	-	-	-	-	-	-
11-Jun-2018	-	-	348.03	348.47	-	-	-	-	-	-	-
4-Oct-2018	-	-	348.09	348.46	-	-	-	-	-	-	-
6-Mar-2019	-	-	348.01	-	-	-	-	-	-	-	-
25-Apr-2019	-	-	348.27	348.82	-	-	-	-	-	-	-
4-Jul-2019	-	-	348.05	348.45	-	-	-	-	-	-	-
1-Aug-2019	-	-	347.89	348.61	348.23	348.24	345.80	-	346.61	347.96	344.01
11-Nov-2019	abandoned	-	-	-	-	-	-	-	-	-	-
21-Nov-2019	abandoned	345.42	348.08	-	-	-	-	-	-	-	-
9-Mar-2020	abandoned	345.78	348.28	-	-	-	-	-	-	-	-
Minimum	*344.93*	*345.42*	*347.87*	*347.97*	*348.20*	*348.11*	*345.80*	*350.93*	*346.53*	*346.55*	*343.91*
Maximum	*345.91*	*345.78*	*348.81*	*348.97*	*349.22*	*348.57*	*346.36*	*350.93*	*348.08*	*348.21*	*344.82*
Average	*345.53*	*345.60*	*348.12*	*348.58*	*348.70*	*348.35*	*346.03*	*350.93*	*347.47*	*347.57*	*344.33*

Notes: dashed line = not measured

** dry*

Table 4. Groundwater and Surface Water Analytical Results - March 2017.

Parameter	Units	ODWQS Guidelines	ODWQS Standards	PWQO Standards	Field ID	MW101-14	MW102-14	MW103-14	MW104-14	MW105A-14	MW105B-14	MW109A-14	MW109B-14	MW110-14
					Laboatory ID	L1905250-2	L1905250-3	L1905250-4	L1905250-5	L1905250-6	L1905250-7	L1905250-8	L1905250-9	L1905250-1
					Date Sampled	24-Mar-17	24-Mar-17	24-Mar-17	24-Mar-17	24-Mar-17	24-Mar-17	24-Mar-17	24-Mar-17	23-Mar-17
					RDL									
General Chemistry														
Colour, Apparent	CU	5 (U)	NV	NV	2.0	12.9	21.8	28.3	89.7	22.8	70.8	8.5	31.4	32.7
Conductivity	umhos/cm	NV	NV	NV	3.0	690	655	610	616	477	410	544	722	695
Hardness (as CaCO3)	mg/L	80 -> 100	NV	NV	10	303	290	284	301	218	181	248	366	360
pH	pH units	6.5 -> 8.5	NV	6.5 -> 8.5	0.1	7.8	7.9	8.0	7.9	8.0	8.2	7.9	7.7	7.67
Total Dissolved Solids	mg/L	500 (U)	NV	NV	20	404	393	362	392	267	244	313	412	399
Turbidity	NTU	5 (U)	NV	NV	0.1	350	>4000	>4000	1090	67.9	>4000	4.4	2100	>4000
Alkalinity, Total (as CaCO3)	mg/L	30 -> 500	NV	NV	10.0	264	259	273	247	253	218	222	329	392
Ammonia, Total (as N)	mg/L	NV	NV	0.02	0.02	<0.020	0.060	**0.123**	<0.020	<0.020	**0.184**	**0.073**	<0.020	**0.082**
Chloride (Cl)	mg/L	250 (U)	NV	NV	0.50	37.90	24.10	9.72	11.90	2.29	0.66	1.65	19.90	<0.50
Fluoride (F)	mg/L	NV	1.5 (U)	NV	0.02	0.03	0.03	0.11	0.05	0.21	0.34	0.23	0.02	0.048
Nitrate (as N)	mg/L	NV	10 (U)	NV	0.02	7.95	7.38	2.91	**12.7**	0.06	0.16	<0.020	6.41	<0.020
Nitrite (as N)	mg/L	NV	1 (U)	NV	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.020	<0.010	<0.010	<0.010
Orthophosphate-Dissolved (as P)	mg/L	NV	NV	NV	0.003	0.0035	<0.0030	0.0035	<0.0030	<0.0030	0.0155	<0.0030	<0.0030	<0.0030
Sulfate (SO4)	mg/L	500 (U)	NV	NV	0.30	20.70	28.70	24.40	17.70	14.20	9.08	70.70	5.68	10.60
Metals														
Aluminum (Al)	mg/L	0.1 (U)	NV	0.075	0.010	<0.010	<0.010	**0.103**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Antimony (Sb)	mg/L	NV	0.006 (U)	0.02	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Arsenic (As)	mg/L	NV	0.025 (U)	0.10	0.001	<0.0010	<0.0010	<0.0010	<0.0010	0.0025	0.0102	0.0023	<0.0010	<0.0010
Barium (Ba)	mg/L	NV	1 (U)	NV	0.010	0.025	0.086	0.085	0.017	0.077	0.066	0.048	0.022	0.054
Beryllium (Be)	mg/L	NV	NV	1.1	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Bismuth (Bi)	mg/L	NV	NV	NV	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Boron (B)	mg/L	NV	5 (U)	0.2	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	0.085	<0.050	<0.050	<0.050
Cadmium (Cd)	mg/L	NV	0.005 (U)	0.0002	0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Calcium (Ca)	mg/L	NV	NV	NV	0.500	85.50	80.00	77.90	93.60	41.10	20.00	57.90	104.00	115
Chromium (Cr)	mg/L	NV	0.05 (U)	0.001	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00102	<0.00050
Cobalt (Co)	mg/L	NV	NV	0.0009	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052
Copper (Cu)	mg/L	1 (U)	NV	0.005	0.001	0.0026	0.0029	0.0034	0.0034	0.0043	**0.0088**	0.0027	0.0028	<0.0010
Iron (Fe)	mg/L	0.3 (U)	NV	0.3	0.050	<0.050	<0.050	0.103	<0.050	<0.050	<0.050	0.081	<0.050	<0.050
Lead (Pb)	mg/L	NV	0.01 (U)	0.005	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)	mg/L	NV	NV	NV	0.500	21.60	21.80	21.80	16.50	28.10	31.90	25.10	25.60	17.5
Manganese (Mn)	mg/L	0.05 (U)	NV	NV	0.001	<0.0010	0.0054	0.0358	<0.0010	0.0044	<0.0010	0.0490	<0.0010	0.168
Molybdenum (Mo)	mg/L	NV	NV	0.04	0.001	<0.0010	<0.0010	0.0021	0.0180	0.0074	0.0027	0.0073	<0.0010	0.0015
Nickel (Ni)	mg/L	NV	NV	0.025	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Phosphorus (P)	mg/L	NV	NV	0.02	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)	mg/L	NV	NV	NV	1.0	1.7	2.2	1.3	<1.0	1.3	1.1	1.6	<1.0	1.8
Selenium (Se)	mg/L	NV	0.01 (U)	0.1	0.0004	0.00041	0.00081	0.00075	0.00046	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Silicon (Si)	mg/L	NV	NV	NV	1.0	4.0	3.4	3.6	3.6	9.3	7.0	8.8	5.6	3.3
Silver (Ag)	mg/L	NV	NV	0.0001	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Sodium (Na)	mg/L	200 (U)	20 (U)	NV	0.500	16.50	15.50	17.90	2.28	16.90	15.20	12.20	2.13	4.63
Strontium (Sr)	mg/L	NV	NV	NV	0.001	0.1380	0.1340	0.2370	0.1330	0.4690	0.9260	0.7740	0.1420	0.193
Thallium (Tl)	mg/L	NV	NV	NV	0.000	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tin (Sn)	mg/L	NV	NV	NV	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Titanium (Ti)	mg/L	NV	NV	NV	0.002	<0.0020	<0.0020	<0.0070	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Tungsten (W)	mg/L	NV	NV	0.03	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (U)	mg/L	NV	0.02 (U)	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Vanadium (V)	mg/L	NV	NV	0.006	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)	mg/L	5 (U)	NV	0.02	0.003	<0.0030	<0.0030	0.0034	0.0032	0.0031	<0.0030	0.0030	0.0043	<0.0030
Zirconium (Zr)	mg/L	NV	NV	0.004	0.004	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040

Notes:

RDL = Reportable Detection Limit

NV = No ODWQS or PWQO available; ND = Non-detect

ODWQS: Ontario Drinking Water Regulation, Jan. 1, 2017.

Guidelines: Ontario Drinking Water Asthetic and Operational Guidelines

Standards: Schedule 1 (Microbiological) and 2 (chemical) Standards. Jan, 2017

Standards from Provincial Water Quality Objectives (PWQO), published July 1994

Standards from Ontario Drinking Water Quality Standards, O. Reg 169/03, published June 2003 (Revised June 2006)

350	*Exceeds ODWQS only*
350	*Exceeds PWQO only*
350	*Exceeds ODWQS and PWQO*

Highlighted and Bold represent ODWQS and/or PWQO Exceedances:

Table 4. Groundwater and Surface Water Analytical Results - March 2017 (cont.).

Parameter	Units	ODWQS Guidelines	ODWQS Standards	PWQO Standards	Field ID	MW8-10S	MW8-10D	MW10-10D	MW12-10S	MW12-10D	MW13-10	SW (North)	SW (South)	
					Laboatory ID	L1905251-1	L1905251-2	L1908093-1	L1905251-3	L1905251-4	L1905251-5	L1905250-11	L1905250-10	
					Date Sampled	23-Mar-17	23-Mar-17	3-Apr-17	23-Mar-17	23-Mar-17	23-Mar-17	23-Mar-17	23-Mar-17	
					RDL									
General Chemistry														
Colour, Apparent	CU	5 (U)	NV	NV	2.0	19.9	28.2	345.0	27.8	28.8	33.1	20.4	23.3	Intentionally Left Blank
Conductivity	umhos/cm	NV	NV	NV	3.0	2780	1560	473	837	1220	715	596	609	
Hardness (as CaCO3)	mg/L	80 -> 100	NV	NV	10	460	334	240	462	653	386	264	283	
pH	pH units	6.5 -> 8.5	NV	6.5 -> 8.5	0.1	7.9	7.9	8.0	7.8	7.8	7.8	8.3	8.2	
Total Dissolved Solids	mg/L	500 (U)	NV	NV	20	1440	817	312	475	887	427	335	342	
Turbidity	NTU	5 (U)	NV	NV	0.1	>4000	33.2	3980.0	>4000	27.7	3180	2	4.0	
Alkalinity, Total (as CaCO3)	mg/L	30 -> 500	NV	NV	10.0	346	289	276	439	248	341	240	245	
Ammonia, Total (as N)	mg/L		NV	0.02	0.02	**0.022**	**0.078**	**0.18**	**0.023**	0.145	<0.020	<0.020	**0.026**	
Chloride (Cl)	mg/L	250 (U)	NV	NV	0.50	**625**	**300**	1.22	10.7	21.7	12.1	35.0	37.4	
Fluoride (F)	mg/L	NV	1.5 (U)	NV	0.02	<0.20	0.13	0.15	0.07	0.50	0.04	0.05	0.07	
Nitrate (as N)	mg/L	NV	10 (U)	NV	0.02	<0.20	<0.10	<0.020	1.20	<0.020	1.85	1.94	2.21	
Nitrite (as N)	mg/L	NV	1 (U)	NV	0.010	<0.10	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Orthophosphate-Dissolved (as P)	mg/L	NV	NV	NV	0.003	<0.0030	<0.0030	0.0056	<0.0030	<0.0030	<0.0030	0.0042	0.0039	
Sulfate (SO4)	mg/L	500 (U)	NV	NV	0.30	13.2	44.8	13.4	14.2	406	38.1	25.8	25	
Metals														
Aluminum (Al)	mg/L	0.1 (U)	NV	0.075	0.010	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	0.026	0.066	
Antimony (Sb)	mg/L	NV	0.006 (U)	0.02	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.00010	<0.00010	
Arsenic (As)	mg/L	NV	0.025 (U)	0.10	0.001	<0.0010	<0.0010	**0.0135**	<0.0010	0.0036	<0.0010	0.0006	0.0006	
Barium (Ba)	mg/L	NV	1 (U)	NV	0.010	0.091	0.082	0.097	0.098	0.027	0.076	0.037	0.039	
Beryllium (Be)	mg/L	NV	NV	1.1	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	
Bismuth (Bi)	mg/L	NV	NV	NV	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.000050	<0.000050	
Boron (B)	mg/L	NV	5 (U)	0.2	0.05	<0.10	<0.050	<0.050	<0.050	0.056	<0.050	<0.010	<0.010	
Cadmium (Cd)	mg/L	NV	0.005 (U)	0.0002	0.00009	<0.00010	<0.000090	<0.000090	<0.000090	<0.000090	<0.000090	<0.000010	<0.000010	
Calcium (Ca)	mg/L	NV	NV	NV	0.500	141.00	89.50	52.90	115.00	194.00	105.00	78.50	77.80	
Chromium (Cr)	mg/L	NV	0.05 (U)	0.001	0.001	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
Cobalt (Co)	mg/L	NV	NV	0.0009	0.001	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00010	<0.00010	
Copper (Cu)	mg/L	1 (U)	NV	0.005	0.001	0.0032	0.0020	0.0021	0.0030	0.0023	0.0030	<0.0010	<0.0010	
Iron (Fe)	mg/L	0.3 (U)	NV	0.3	0.050	<0.10	**0.505**	0.274	<0.050	**1.28**	<0.050	0.121	0.159	
Lead (Pb)	mg/L	NV	0.01 (U)	0.005	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	0.0001	
Magnesium (Mg)	mg/L	NV	NV	NV	0.500	26.40	26.90	26.10	42.60	41.20	30.30	20.80	19.80	
Manganese (Mn)	mg/L	0.05 (U)	NV	NV	0.001	0.0141	0.1600	0.0180	0.0137	0.0402	0.0058	0.0313	0.0324	
Molybdenum (Mo)	mg/L	NV	NV	0.04	0.001	<0.0010	0.0015	0.0012	<0.0010	<0.0010	<0.0010	0.0004	0.0004	
Nickel (Ni)	mg/L	NV	NV	0.025	0.002	<0.0050	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.00050	<0.00050	
Phosphorus (P)	mg/L	NV	NV	0.02	0.050	<0.50	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Potassium (K)	mg/L	NV	NV	NV	1.0	1.7	1.4	1.0	2.1	1.5	<1.0	1.5	1.5	
Selenium (Se)	mg/L	NV	0.01 (U)	0.1	0.0004	<0.00050	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	0.00014	0.00014	
Silicon (Si)	mg/L	NV	NV	NV	1.0	3.7	7.8	11.2	8.5	8.3	6.6	3.9	3.7	
Silver (Ag)	mg/L	NV	NV	0.0001	0.0001	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000050	<0.000050	
Sodium (Na)	mg/L	200 (U)	20 (U)	NV	0.500	**342**	**181**	7.54	6.83	18.60	3.62	19.20	19.50	
Strontium (Sr)	mg/L	NV	NV	NV	0.001	0.313	0.894	0.324	0.360	3.260	0.161	0.152	0.152	
Thallium (Tl)	mg/L	NV	NV	NV	0.000	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.000010	<0.000010	
Tin (Sn)	mg/L	NV	NV	NV	0.001	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.00010	<0.00010	
Titanium (Ti)	mg/L	NV	NV	NV	0.002	<0.0030	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	0.0011	0.0023	
Tungsten (W)	mg/L	NV	NV	0.03	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.00010	<0.00010	
Uranium (U)	mg/L	NV	0.02 (U)	0.005	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0007	0.0008	
Vanadium (V)	mg/L	NV	NV	0.006	0.001	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	
Zinc (Zn)	mg/L	5 (U)	NV	0.02	0.003	<0.010	0.0031	0.0033	0.0041	<0.0030	0.0099	<0.0030	<0.0030	
Zirconium (Zr)	mg/L	NV	NV	0.004	0.004	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.00030	<0.00030	

Notes:

RDL = Reportable Detection Limit

NV = No ODWQS or PWQO available; ND = Non-detect

ODWQS: Ontario Drinking Water Regulation, Jan. 1, 2017.

Guidelines: Ontario Drinking Water Asthetic and Operational Guidelines

Standards: Schedule 1 (Microbiological) and 2 (chemical) Standards. Jan, 2017

Standards from Provincial Water Quality Objectives (PWQO), published July 1994

Standards from Ontario Drinking Water Quality Standards, O. Reg 169/03, published June 2003 (Revised June 2006)

350	*Exceeds ODWQS only*
350	*Exceeds PWQO only*
350	*Exceeds ODWQS and PWQO*

Highlighted and Bold represent ODWQS and/or PWQO Exceedances:

Table 5. Existing Conditions Water Balance By Catchment Area.

Sub-Catchment	Hydrologic Component Values (mm/yr)			
	Precipitation	Evapotranspiration	Runoff	Infiltration
3091	**844.8**	**520.1**	**131.2**	**193.5**
3092	844.8	539.4	147.0	158.3
3093	844.8	555.8	123.9	165.1
3914	844.8	553.0	79.9	211.9
3915	844.8	551.9	69.9	222.9
3911	844.8	563.7	83.8	197.3
3917	844.8	551.0	116.7	177.0
3102	844.8	507.2	154.2	183.4
3103	844.8	542.3	93.2	209.2

Table 6. Predicted groundwater mounding results.

ID	Contact Area[1] (m^2)	Infiltration Volume[2] (m^3/yr)	Groundwater Elevation[3] (m amsl)	Predicted Mound Height[4] (m)	Predicted Groundwater Elevation (m amsl)	Facility Invert Elevation (bottom) (m amsl)
Condo LID-5917a Permeable Pavement	2,050	6,291	346.3	0.13	346.4	348.6
Condo LID-5917b Bioretention Swale	320	649	346.3	0.02	346.3	348.1
Multi-Res SWMF-5915 Volume Reduction Facility	795	9,845	349.5	0.68	350.2	350.5
INF-7914a Multi-Res Block 19, Stage 3	46	695	348.0	0.88	348.9	349.0
INF-7914b Multi-Res Block 18, Stage 3	67	1,012	346.5	0.11	346.6	347.5

Notes: 1. Area of the infiltration facility.

2. Volume of infiltration water calculated by GAWSER model (MTE, May 2020).

3. High composite groundwater level (2015 to 2020).

4. Predicted groundwater mound at the centre point beneath the infiltration facility using the USGS Hantush (1967) Analytical Model (Carleton, 2010).

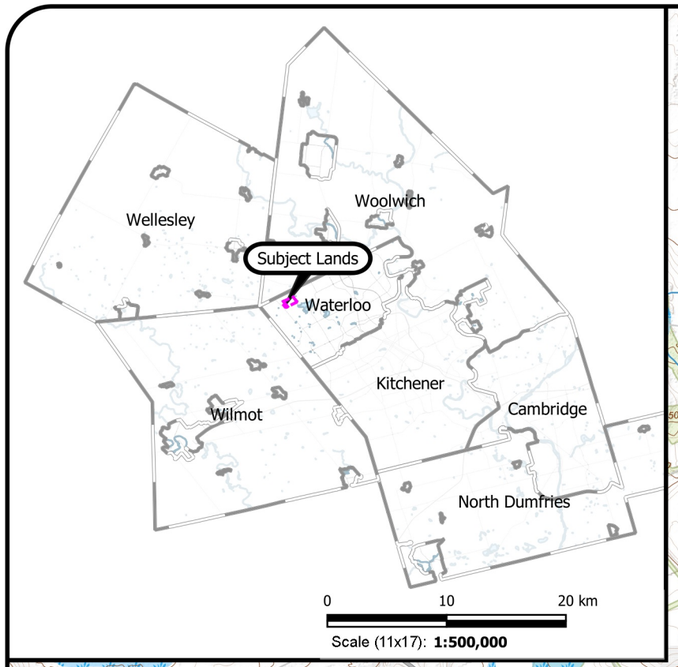
5. First three ID's above are conceptual and subject to site plan approval.

Figures

Project No: 39502-104 P:\P\39502\1\04gis\39502_104_gwr1.qgz

GWR1.1

July 02, 2020 - 11:06 - Plotted By: mellenor



N
NORTH

N
PROJECT NORTH

Legend

Site Data
- Subject Lands

Base Map

Roads
- Arterial
- Street

Building
- Building Footprint

Surface Water
- Surface Water Body
- Provincially Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Unevaluated Wetland
- Surface Water Course

Geographic Lots
- Geographic Lot Fabric

Groundsurface
- Ground Surface Contour (1m Interval)

Landuse
- Wooded Area

Data Sources:

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Project CRS: NAD83 / UTM zone 17N

MTE
Engineers,Scientists, Surveyors
Ph. (519) 743-6500

Client
1017081 Ontario Ltd. & Gabriella Elizabeth Groff / 1455136 Ontario Inc.

Project
Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site
Waterloo, ON

Title
Key Map

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	1
Date	July 2020		

Project No: 39502-104 P:\P\39502\1\104\gis\39502_104_gwr1.qgz

GWR1.2

July 02, 2020 - 13:43 - Plotted By: mellenor

NORTH

PROJECT NORTH

Legend

Site Data

Boundaries

- Subject Lands
- A A' Geological Cross Section Location
- Surface Water Drainage Divide

Monitoring Wells

- MTE - Monitoring Well
- Stantec - Monitoring Well
- Englobe - Monitoring Well

Minipiezometers

- MTE - Minipiezometer
- Stantec - Minipiezometer
- Englobe - Borehole
- MECP Well

Base Map

Roads

- Arterial
- Street

Buildings

- Building Footprint

Surface Water

- Surfacewater Body
- Provincially Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Surfacewater Course

Lots and Concessions

- Geographic Lot Fabric

Groundsurface

- Groundsurface Contour (1m Interval)

Landuse

- Wooded Area

Project CRS: NAD83 / UTM zone 17N

MTE

Engineers,Scientists, Surveyors

Ph. (519) 743-6500

Client

1017081 Ontario Ltd. & Gabriella Elizabeth Groff / 1455136 Ontario Inc.

Project

Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site

Waterloo, ON

Title

Existing Conditions and Well Location Map

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	2
Date	July 2020		

Data Sources:

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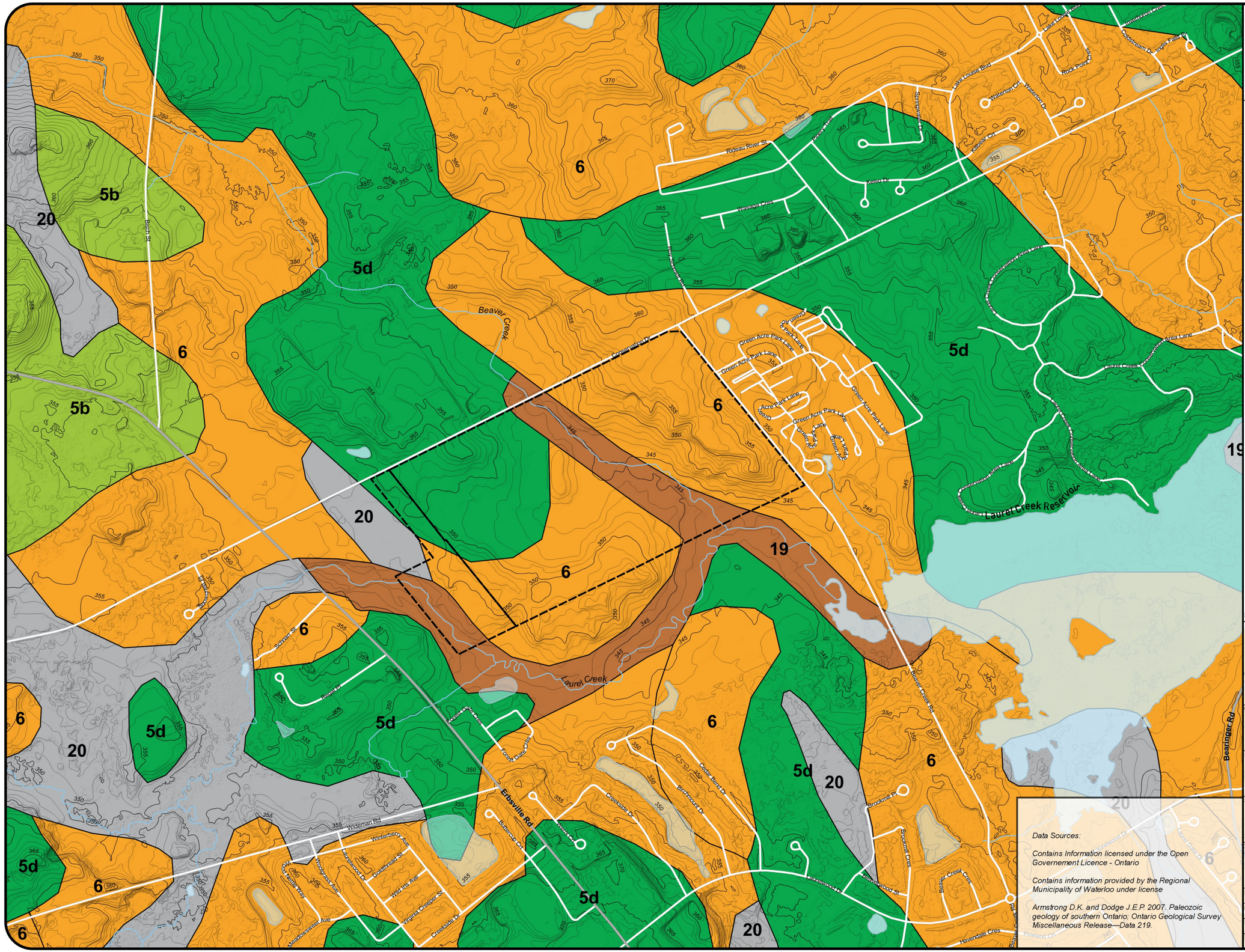
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Project No: 39502-104 P:\P\39502\104\gis\39502_104_gwr1.qgz

GWR1.3

July 02, 2020 - 11:09 - Plotted By: mellenor



NORTH

PROJECT NORTH

Legend

Site Data

Boundaries

- Subject Lands

Base Map

Surface Water

- Surfacewater Body
- Surfacewater Course

Groundsurface

- Groundsurface Contour (1m Interval)

Quaternary geology

- Quaternary
- 20. Organic Deposits: peat, muck, marl
- 19. Modern alluvial deposits: clay, silt, sand, gravel, may contain organic remains
- 6. Ice-contact stratified deposit: sand and gravel, minor silt, clay and till
- 5b. Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain
- 5d. Clay to silt-textured till (derived from glaciolacustrine deposits or shale)

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Scale (11x17): 1:10,000

Project CRS: NAD83 / UTM zone 17N

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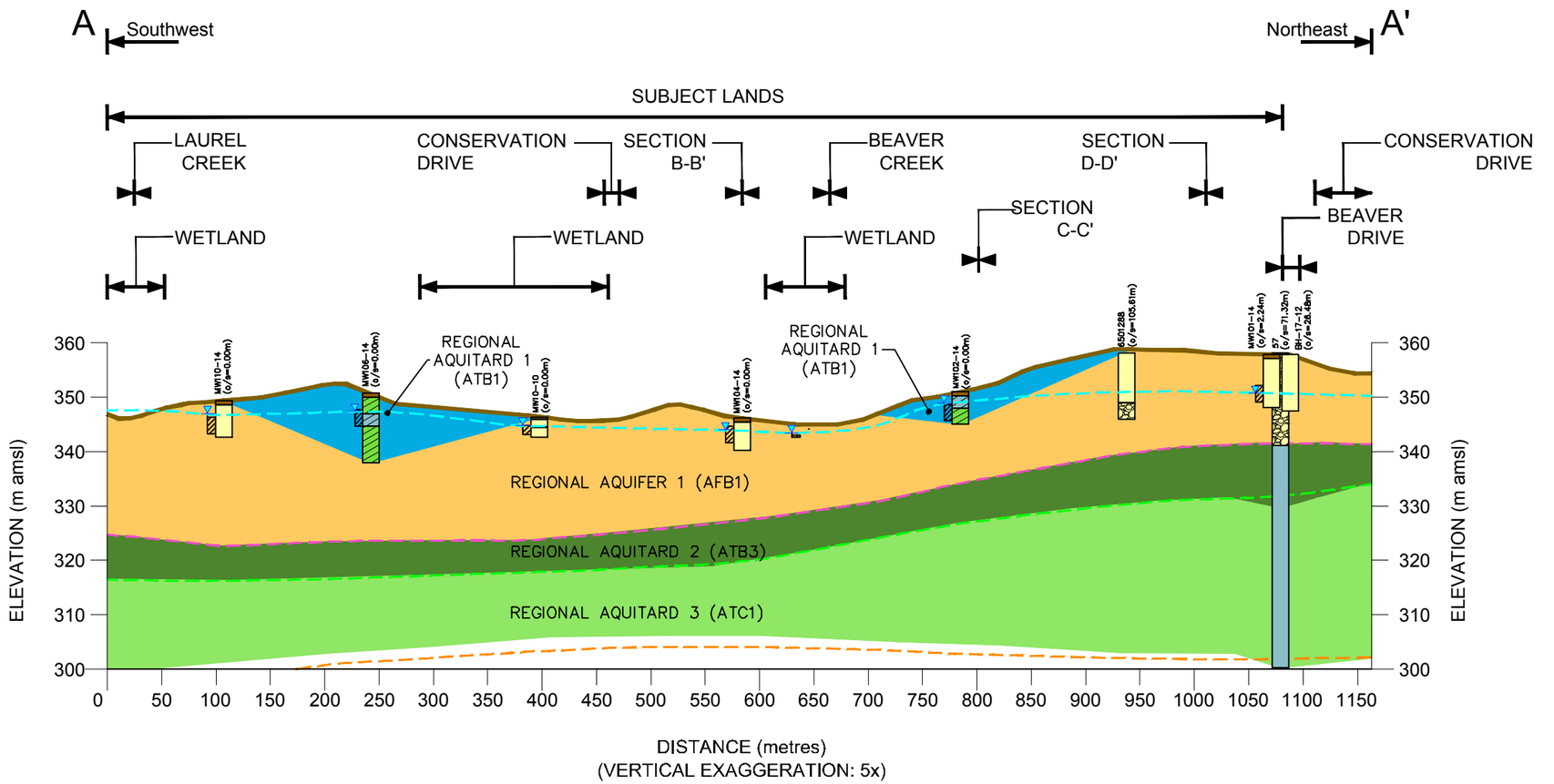
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Project
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Site
Waterloo, ON

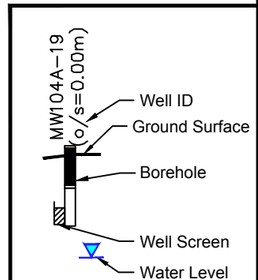
Title
Quaternary Geology

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	3
Date	July 2020		



Notes:

1. Geological sequence is based on professional interpretation from sediments encountered during drilling, geological descriptions provided by MECP Water Well Records database, and borehole logs reviewed as part of other consultant reports. Actual geological conditions can vary between tested locations.
2. Contains information licensed under the Open Government Licence Act
3. Water levels for on-site monitoring wells were measured March 9, 2020.
4. Property boundaries and road locations are approximate.
5. Wells further from the cross-section line may, in some places, be displayed as having the well top lying above or below the ground surface due to the differences in offsets. Similarly, static water levels at individual wells may be situated above or below interpreted water table / potentiometric surface due to this offset.
6. Offsets may show 0.00m, but the well may be above or below interpreted ground surface due to different sources of information and their accuracy.



Well Construction Detail

Legend

Ground Surface

Borehole Lithology

- Topsoil
- FILL
- Sand / Silty Sand
- Gravel
- Clay
- Silt
- Clayey Silt

Interpreted Geology

- Upper Maryhill Till (ATB1)
- Upper Waterloo Moraine (AFB1)
- Middle Maryhill Till (ATB2)
- Lower Maryhill Till (ATB3)
- Lower Waterloo Moraine Aquifer or Catfish Creek Till Outwash (AFB3)
- Upper/Main Catfish Creek Till (ATC1)

Aquifer 1 Groundwater Elevation (mAMSL)

Interpreted Aquifer 1 Water Table

Lower Maryhill Till (OGS, 2007)

Upper/Main Catfish Creek Till (OGS, 2007)

Pre-Catfish Creek (OGS, 2007)

Scale(11x17): As Noted

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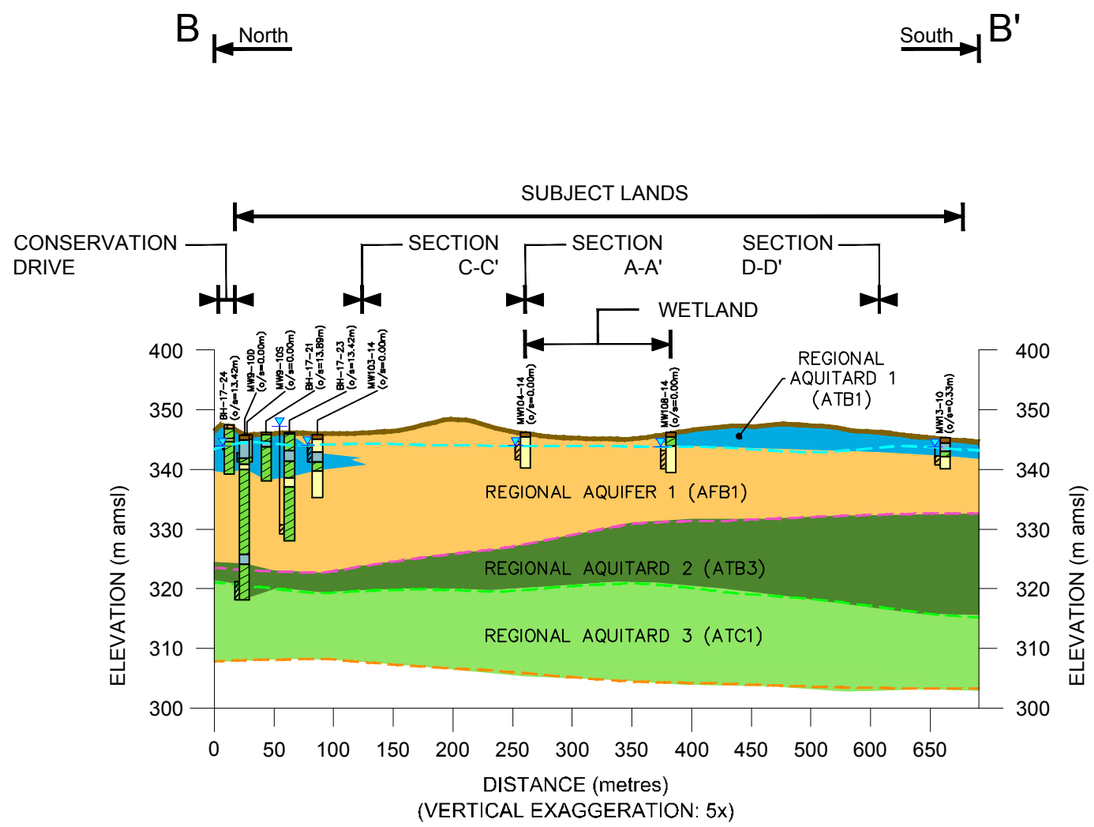
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PROJECT
Northgate and Erbsville Kartway Subdivision -Beaver Creek Meadows District- Hydrogeological Assessment

SITE
East of Erbsville Road, West of Beaver Creek Road, Waterloo, ON

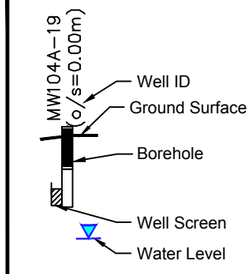
TITLE
CROSS-SECTION A-A'

Reviewed By	PAG		
Prepared By	RBM	Project No.	39502-104
Drawn By	DMB	Figure No.	4
Date	May 2020		



Notes:

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Well Construction Detail

Legend

Ground Surface

Borehole Lithology

- Topsoil
- FILL
- Sand / Silty Sand
- Gravel
- Clay
- Silt
- Clayey Silt

Interpreted Geology

- Upper Maryhill Till (ATB1)
- Upper Waterloo Moraine (AFB1)
- Middle Maryhill Till (ATB2)
- Lower Maryhill Till (ATB3)
- Lower Waterloo Moraine Aquifer or Catfish Creek Till Outwash (AFB3)
- Upper/Main Catfish Creek Till (ATC1)

- Aquifer 1 Groundwater Elevation (mAMSL)
- Interpreted Aquifer 1 Water Table
- Lower Maryhill Till (OGS, 2007)
- Upper/Main Catfish Creek Till (OGS, 2007)
- Pre-Catfish Creek (OGS, 2007)

Scale(11x17): As Noted

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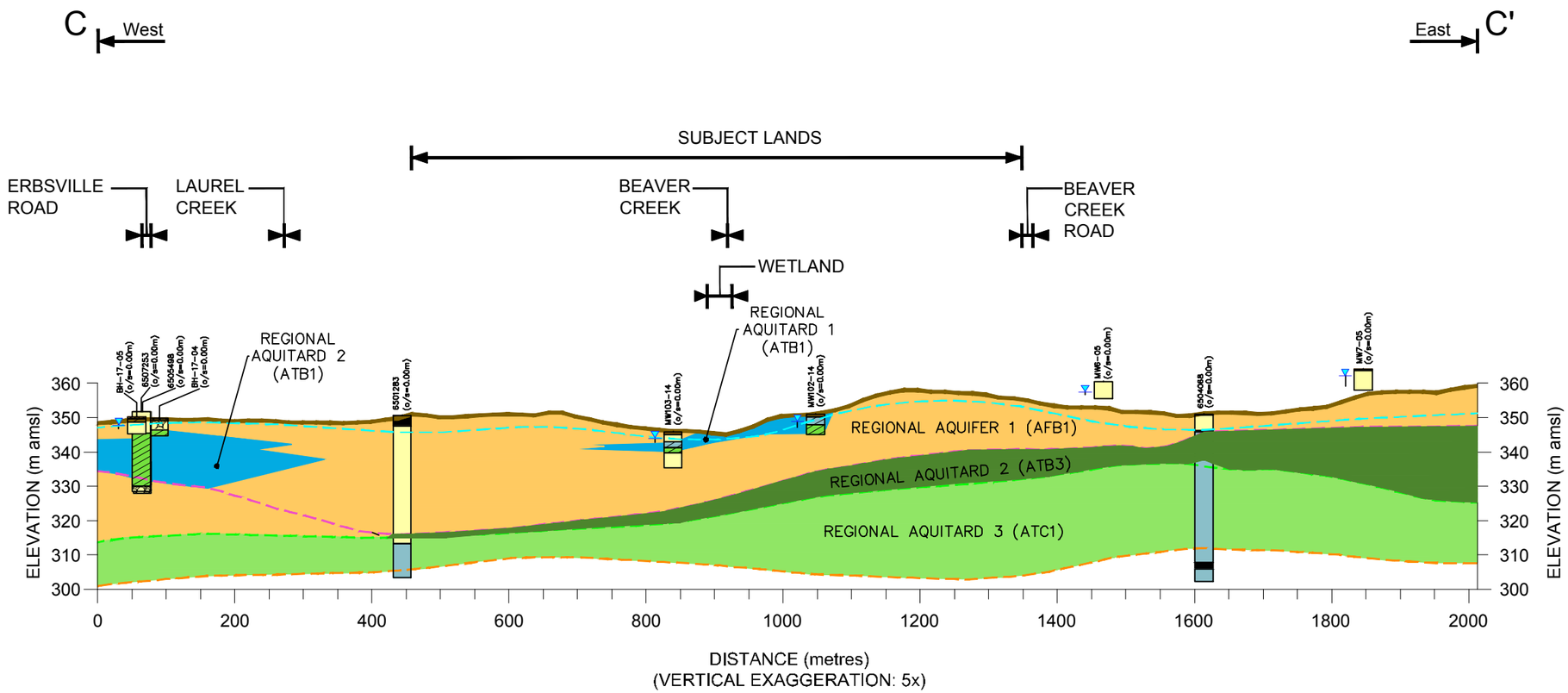
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PROJECT
Northgate and Erbsville Kartway Subdivision -Beaver Creek Meadows District- Hydrogeological Assessment

SITE
East of Erbsville Road, West of Beaver Creek Road, Waterloo, ON

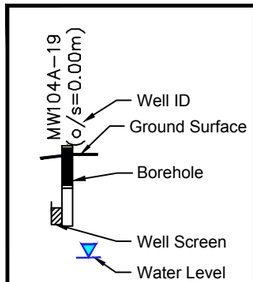
TITLE
CROSS-SECTION B-B'

Reviewed By	PAG		
Prepared By	RBM	Project No.	39502-104
Drawn By	DMB	Figure No.	5
Date	May 2020		



Notes:

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6. Offsets may show 0.00m, but the well may be above or below interpreted ground surface due to different sources of information and their accuracy.



Well Construction Detail

Legend

Ground Surface

Borehole Lithology

- Topsoil
- FILL
- Sand / Silty Sand
- Gravel
- Clay
- Silt
- Clayey Silt

Interpreted Geology

- Upper Maryhill Till (ATB1)
- Upper Waterloo Moraine (AFB1)
- Middle Maryhill Till (ATB2)
- Lower Maryhill Till (ATB3)
- Lower Waterloo Moraine Aquifer or Catfish Creek Till Outwash (AFB3)
- Upper/Main Catfish Creek Till (ATC1)

- Aquifer 1 Groundwater Elevation (mAMSL)
- Interpreted Aquifer 1 Water Table
- Lower Maryhill Till (OGS, 2007)
- Upper/Main Catfish Creek Till (OGS, 2007)
- Pre-Catfish Creek (OGS, 2007)

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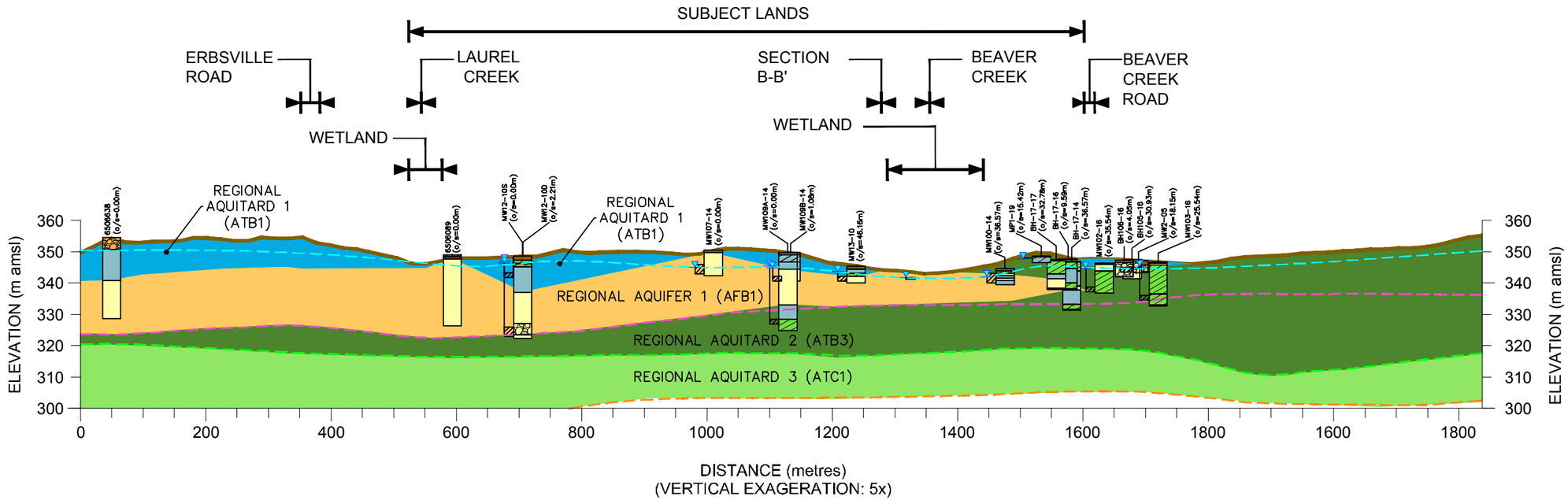
SITE
East of Erbsville Road, West of Beaver Creek Road, Waterloo, ON

TITLE
CROSS-SECTION C-C'

Reviewed By	PAG		
Prepared By	RBM	Project No.	39502-104
Drawn By	DMB	Figure No.	6
Date	May 2020		

D West

East D'



Legend

Ground Surface

Borehole Lithology

- Topsoil
- FILL
- Sand / Silty Sand
- Gravel
- Clay
- Silt
- Clayey Silt

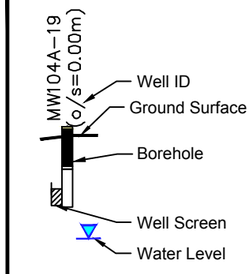
Interpreted Geology

- Upper Maryhill Till (ATB1)
- Upper Waterloo Moraine (AFB1)
- Middle Maryhill Till (ATB2)
- Lower Maryhill Till (ATB3)
- Lower Waterloo Moraine Aquifer or Catfish Creek Till Outwash (AFB3)
- Upper/Main Catfish Creek Till (ATC1)

- Aquifer 1 Groundwater Elevation (mAMSL)
- Interpreted Aquifer 1 Water Table
- Lower Maryhill Till (OGS, 2007)
- Upper/Main Catfish Creek Till (OGS, 2007)
- Pre-Catfish Creek (OGS, 2007)

Notes:

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Well Construction Detail

Scale(11x17): As Noted

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PROJECT
Northgate and Erbsville Kartway Subdivision -Beaver Creek Meadows District- Hydrogeological Assessment

SITE
East of Erbsville Road, West of Beaver Creek Road, Waterloo, ON

TITLE
CROSS-SECTION D-D'

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Prepared By	RBM	Project No.	39502-104
Drawn By	DMB	Figure No.	7
Date	May 2020		

Project No: 39502-104 P:\P\39502\1\104\gis\39502_104_gwr1.qgz

GWR1.8

July 02, 2020 - 11:20 - Plotted By: mellenor

N
NORTH

N
PROJECT NORTH

Legend

Site Data

Boundaries
- Subject Lands

Monitoring Well Location (Groundwater Elevation mAMSL)
- MTE - Monitoring Well
- Stantec - Monitoring Well
- Englobe - Monitoring Well

Minipiezometer Location (Groundwater Elevation mAMSL)
- MTE - Minipiezometer
- Stantec - Minipiezometer

- Groundwater Contour (0.5 m Interval)

Base Map

Roads
- Arterial
- Street

Buildings
- Building Footprint

Surface Water
- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Surfacewater Course

Lots and Concessions
- Geographic Lot Fabric

Groundsurface
- Groundsurface Contour (1m Interval)

Landuse
- Wooded Area

Project CRS: NAD83 / UTM zone 17N

Data Sources:

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0 40 80 120 160 200 m

Scale (11x17): 1:5,000

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Ph. (519) 743-6500

Client: 1017081 Ontario Ltd. & Gabriella Elizabeth Groff / 1455136 Ontario Inc.

Project: Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site: Waterloo, ON

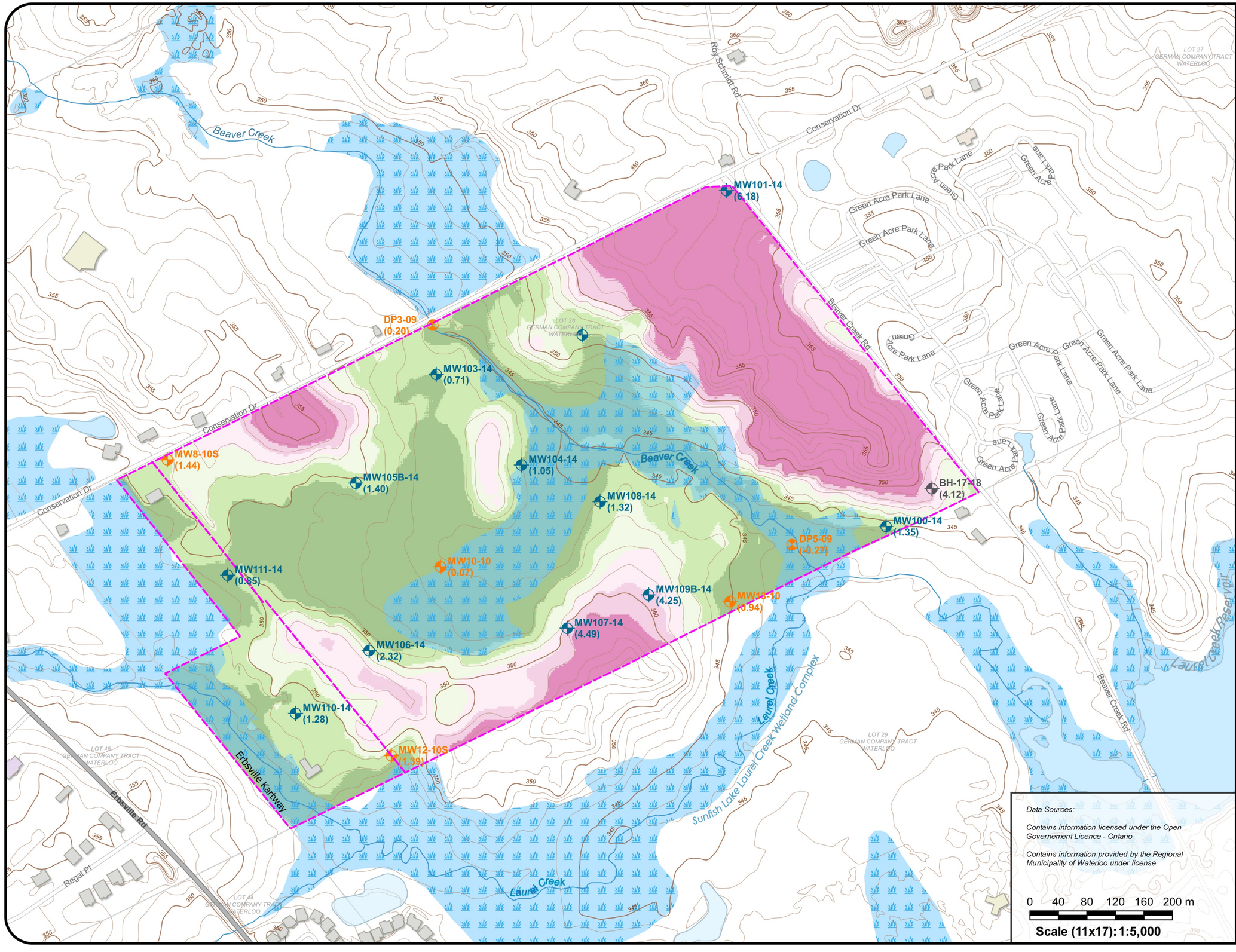
Title: **Interpreted Steady State Groundwater Flow Direction**

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	8
Date	July 2020		

Project No: 39502-104 P:\P\39502\104\gis\39502_104_gwr1.qgz

GWR1.11

July 02, 2020 - 11:21 - Plotted By: mellenor



NORTH

PROJECT NORTH

Legend

Site Data

- Subject Lands
- Monitoring Well Location (Groundwater Depth mBGS)
  - MTE - Monitoring Well
  - Stantec - Monitoring Well
  - Englobe - Monitoring Well
- Minipiezometer Location (Groundwater Depth mBGS)
  - MTE - Minipiezometer
  - Stantec - Minipiezometer

Average Groundwater Depth (mBGS)

- < 1 mBGS
- 1 - 2 mBGS
- 2 - 3 mBGS
- 3 - 4 mBGS
- 4 - 5 mBGS
- > 5 mBGS

Base Map

Roads
- Arterial
- Street

Buildings
- Building Footprint

Surface Water
- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Surfacewater Course

Lots and Concessions
- Geographic Lot Fabric

Groundsurface
- Groundsurface Contour (1m Interval)

Project CRS: NAD83 / UTM zone 17N

Data Sources:

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0 40 80 120 160 200 m

Scale (11x17): 1:5,000

MTE

Engineers,Scientists, Surveyors

Ph. (519) 743-6500

Client: 1017081 Ontario Ltd. & Gabriella Elizabeth Groff / 1455136 Ontario Inc.

Project: Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site: Waterloo, ON

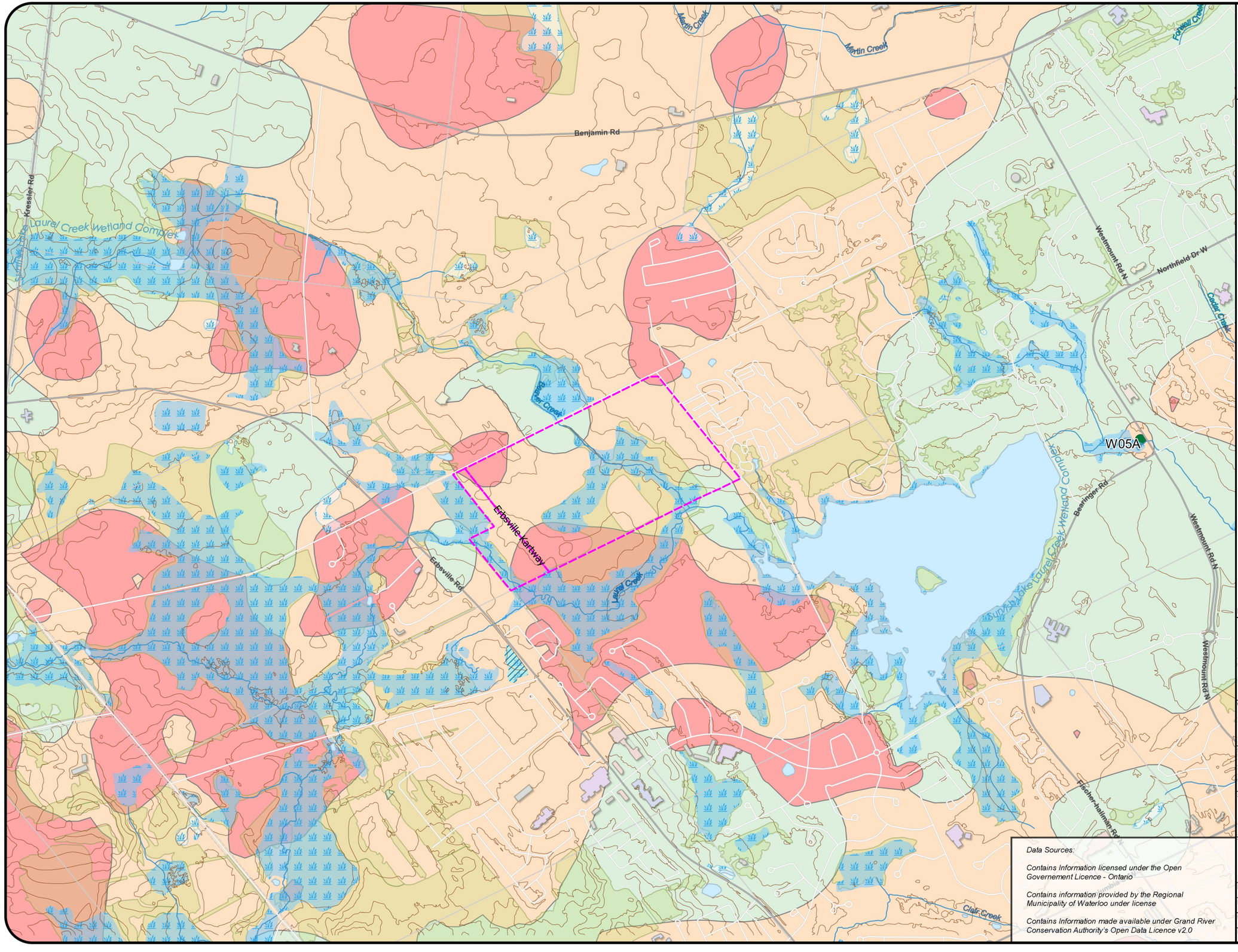
Title: **Average Depth to Groundwater (mBGS)**

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	9
Date	July 2020		

Project No: 39502-104 P:\P\39502\1104\gis\39502_104_gwr1.qgz

GWR1.5

July 02, 2020 - 11:10 - Plotted By: mellenor



N
NORTH

N
PROJECT NORTH

Legend

Site Data

Boundaries
- Subject Lands

Source Water Protection
- Municipal Well

Intrinsic Vulnerability
- High
- Medium
- Low

Base Map

Roads
- Arterial
- Street

Buildings
- Building Footprint

Surface Water
- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Unevaluated Wetland
- Surfacewater Course

Lots and Concessions
- Geographic Lot Fabric

Groundsurface
- Groundsurface Contour (1m Interval)

Landuse
- Wooded Area

0 100 200 300 400 500 m

Scale (11x17): 1:15,000

Project CRS: NAD83 / UTM zone 17N

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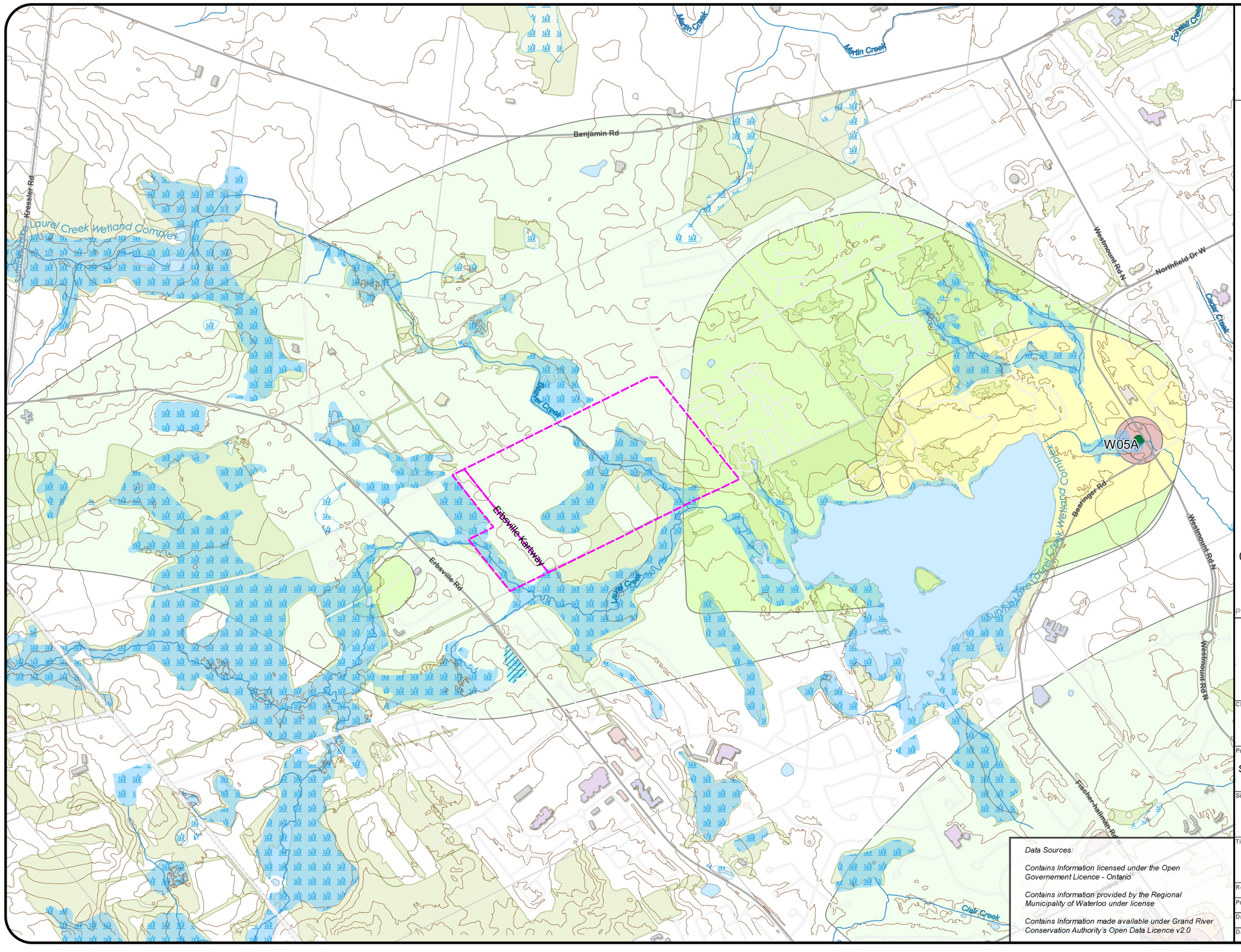
Client
1017081 Ontario Ltd. & Gabriella Elizabeth Groff / 1455136 Ontario Inc.

Project
Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site
Waterloo, ON

Title
Intrinsic Vulnerability

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	10
Date	July 2020		



Project No: 39502-104 P:\P\39502\1104gis\39502_104_gwr1.qgz

GWR1.7

July 02, 2020 - 11:19 - Plotted By: mellenor

N
NORTH

N
PROJECT NORTH

Legend

Site Data

Boundaries
- Subject Lands

Source Water Protection
- Municipal Well

WHPA Vulnerabily Scoring
- 2
- 4
- 6
- 8
- 10

Base Map

Roads
- Arterial
- Street

Buildings
- Building Footprint

Surface Water
- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Unevaluated Wetland
- Surfacewater Course

Lots and Concessions
- Geographic Lot Fabric

Groundsurface
- Groundsurface Contour (1m Interval)

Landuse
- Wooded Area

0 100 200 300 400 500 m

Scale (11x17): 1:15,000

Project CRS: NAD83 / UTM zone 17N

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Project
Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site
Waterloo, ON

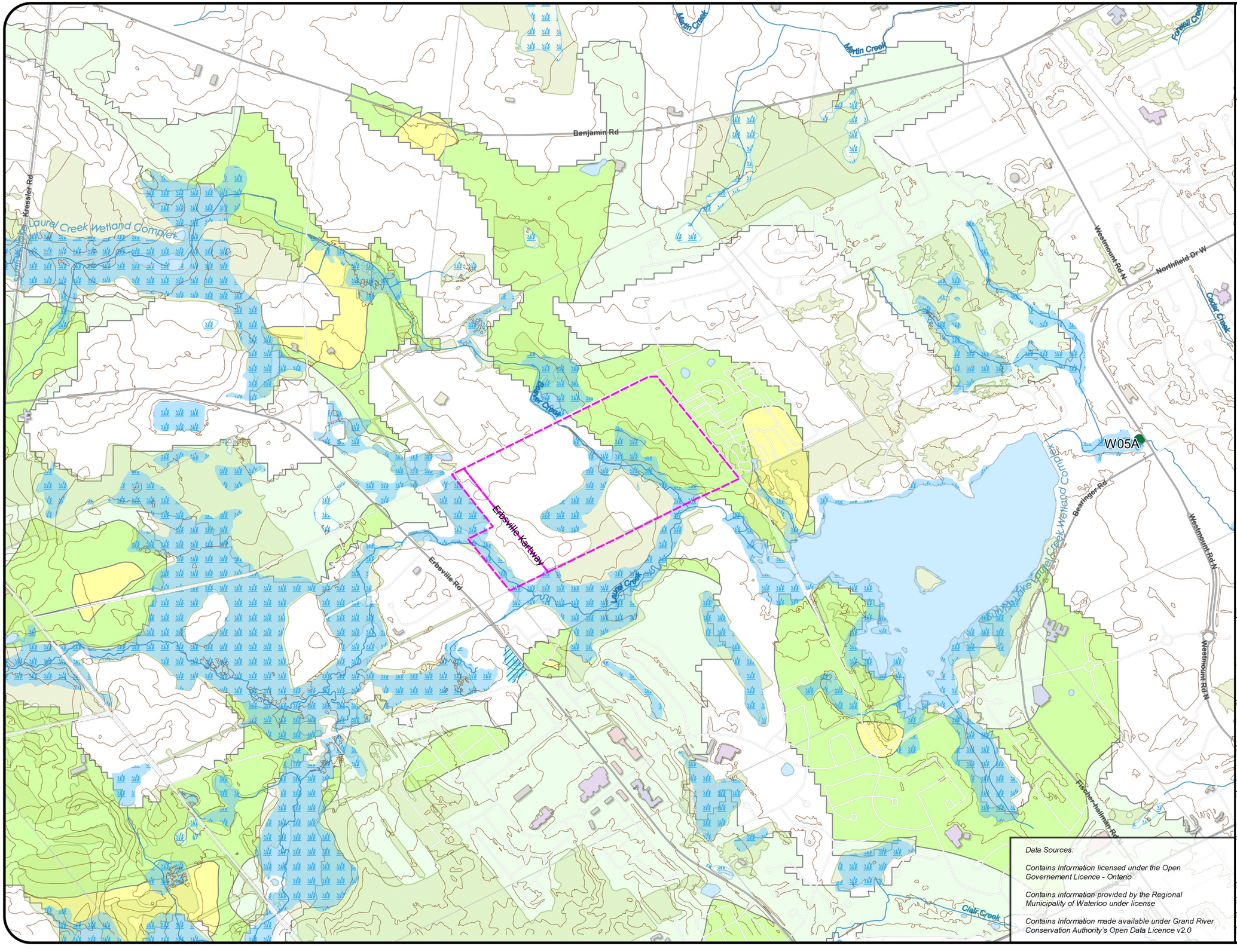
Title
WHPA Vulnerability

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	11
Date	July 2020		

Project No: 39502-104 P:\P\39502\1104\gis\39502_104_gwr1.qgz

GWR1.6

July 02, 2020 - 11:12 - Plotted By: mellenor



NORTH

PROJECT NORTH

Legend

Site Data

Boundaries
- Subject Lands

Source Water Protection
- Municipal Well

Signficant Groundwater Recharge Area
- 2
- 4
- 6

Base Map

Roads
- Arterial
- Street

Buildings
- Building Footprint

Surface Water
- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Unevaluated Wetland
- Surfacewater Course

Lots and Concessions
- Geographic Lot Fabric

Groundsurface
- Groundsurface Contour (1m Interval)

Landuse
- Wooded Area

0 100 200 300 400 500 m

Scale (11x17): 1:15,000

Project CRS: NAD83 / UTM zone 17N

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Client: 1017081 Ontario Ltd. & Gabriella Elizabeth Groff / 1455136 Ontario Inc.

Project: Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site: Waterloo, ON

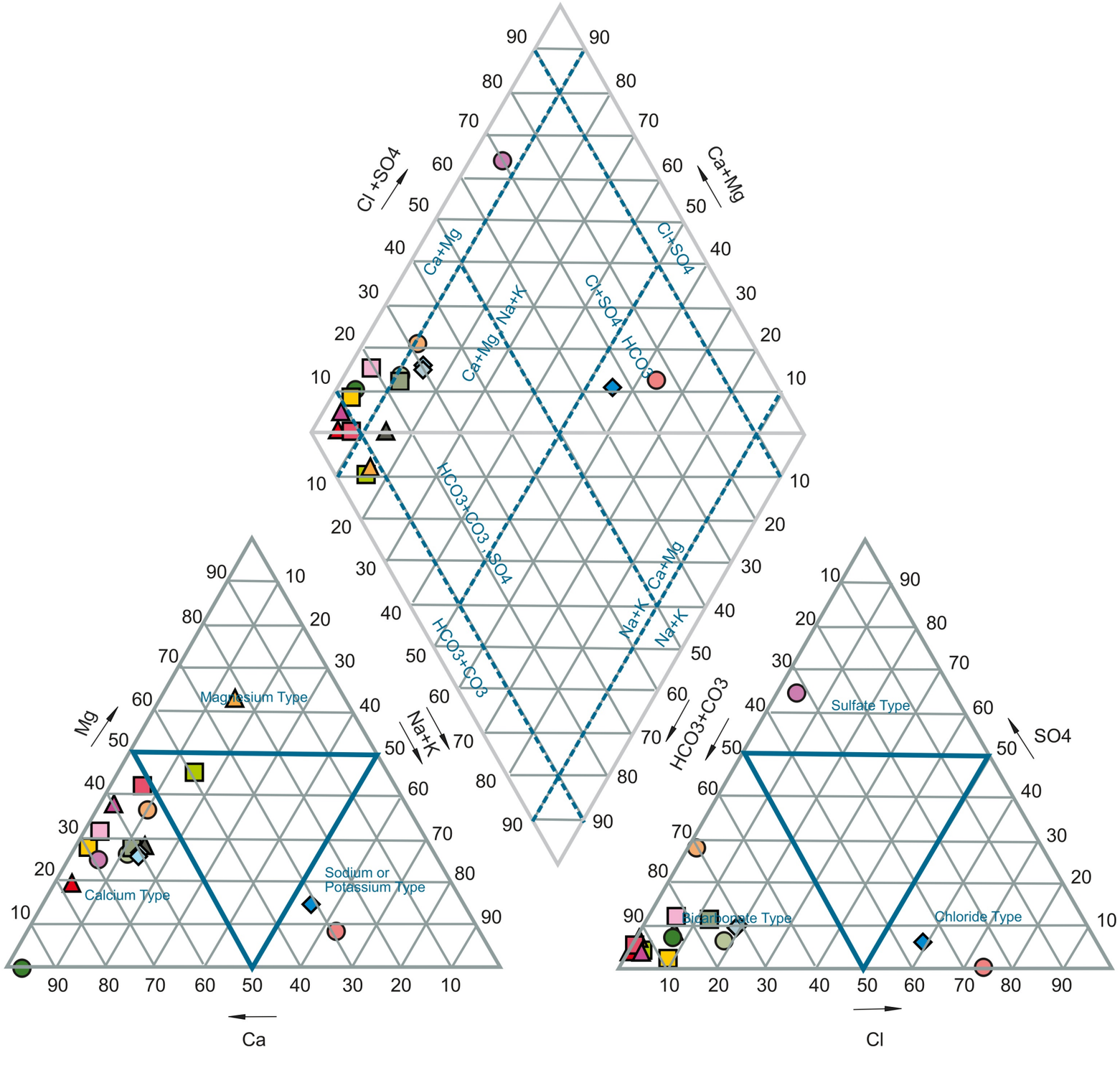
Title: **Significant Groundwater Recharge Areas**

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	12
Date	July 2020		

Project No: 39502-104 P:\P\39502\1\04\gis\39502_104_gwr1.qgz

GWR1.12

July 02, 2020 - 11:21 - Plotted By: mellenor



Legend

- MW101-14
- MW102-14
- MW103-14
- MW104-14
- MW105a-14
- MW105b-14
- MW109a-14
- MW109b-14
- MW110-14
- MW8s-10
- MW8d-10
- MW10-10
- MW12s-10
- MW12d-10
- MW13-10
- Sw-South
- Sw-North

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Client

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Project

Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site

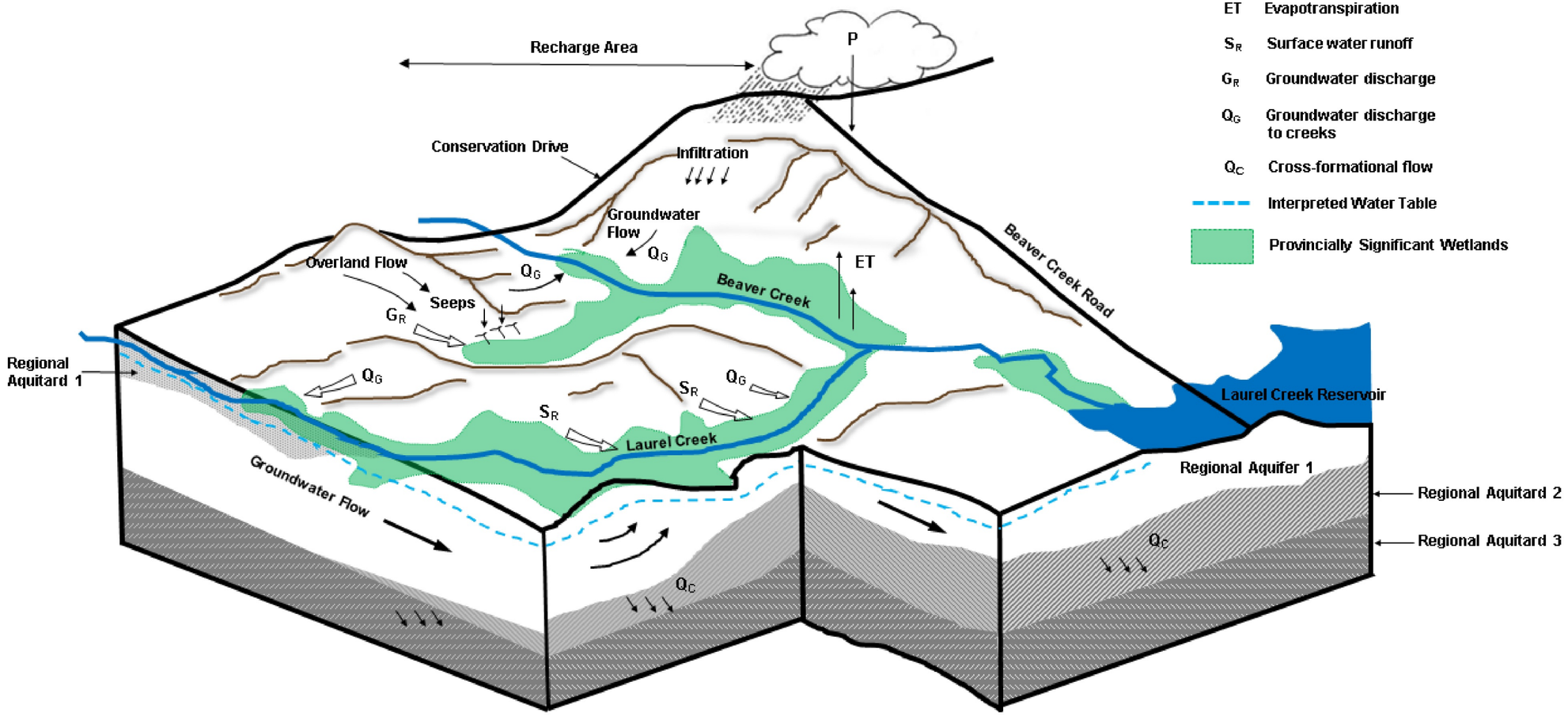
Waterloo, ON

Title

Groundwater Composition - March 2017

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	13
Date	July 2020		

Project No: 39502-104 P:\P\39502\1\04gis\39502_104_gwr1.qgz
GWR1.13
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Project
Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site
Waterloo, ON

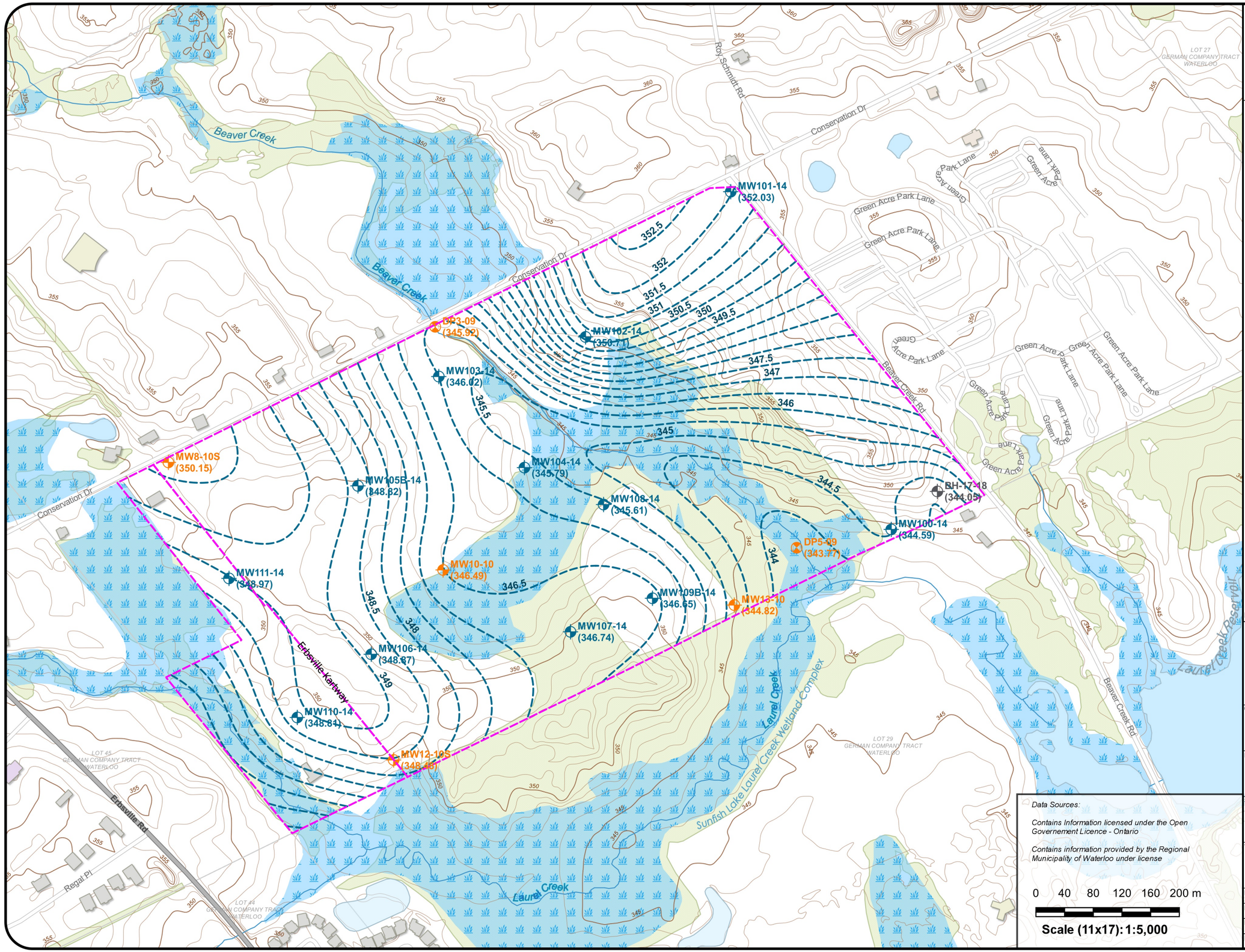
Title
Conceptual Site Model (CSM)

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	14
Date	July 2020		

Project No: 39502-104 P:\P\39502\1\104\gis\39502_104_gwr1.qgz

GWR1.9

July 02, 2020 - 11:20 - Plotted By: mellenor



NORTH

PROJECT NORTH

Legend

Site Data

Boundaries

- Subject Lands
- Monitoring Well Location (Groundwater Elevation mAMSL)
- MTE - Monitoring Well
- Stantec - Monitoring Well
- Englobe - Monitoring Well
- Minipiezometer Location (Groundwater Elevation mAMSL)
- MTE - Minipiezometer
- Stantec - Minipiezometer
- Groundwater Contour (0.5 m Interval)

Base Map

Roads

- Arterial
- Street

Buildings

- Building Footprint

Surface Water

- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Surfacewater Course

Lots and Concessions

- Geographic Lot Fabric

Groundsurface

- Groundsurface Contour (1m Interval)

Landuse

- Wooded Area

Project CRS: NAD83 / UTM zone 17N

Data Sources:

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0 40 80 120 160 200 m

Scale (11x17): 1:5,000

MTE

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Client

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Project

Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site

Waterloo, ON

Title

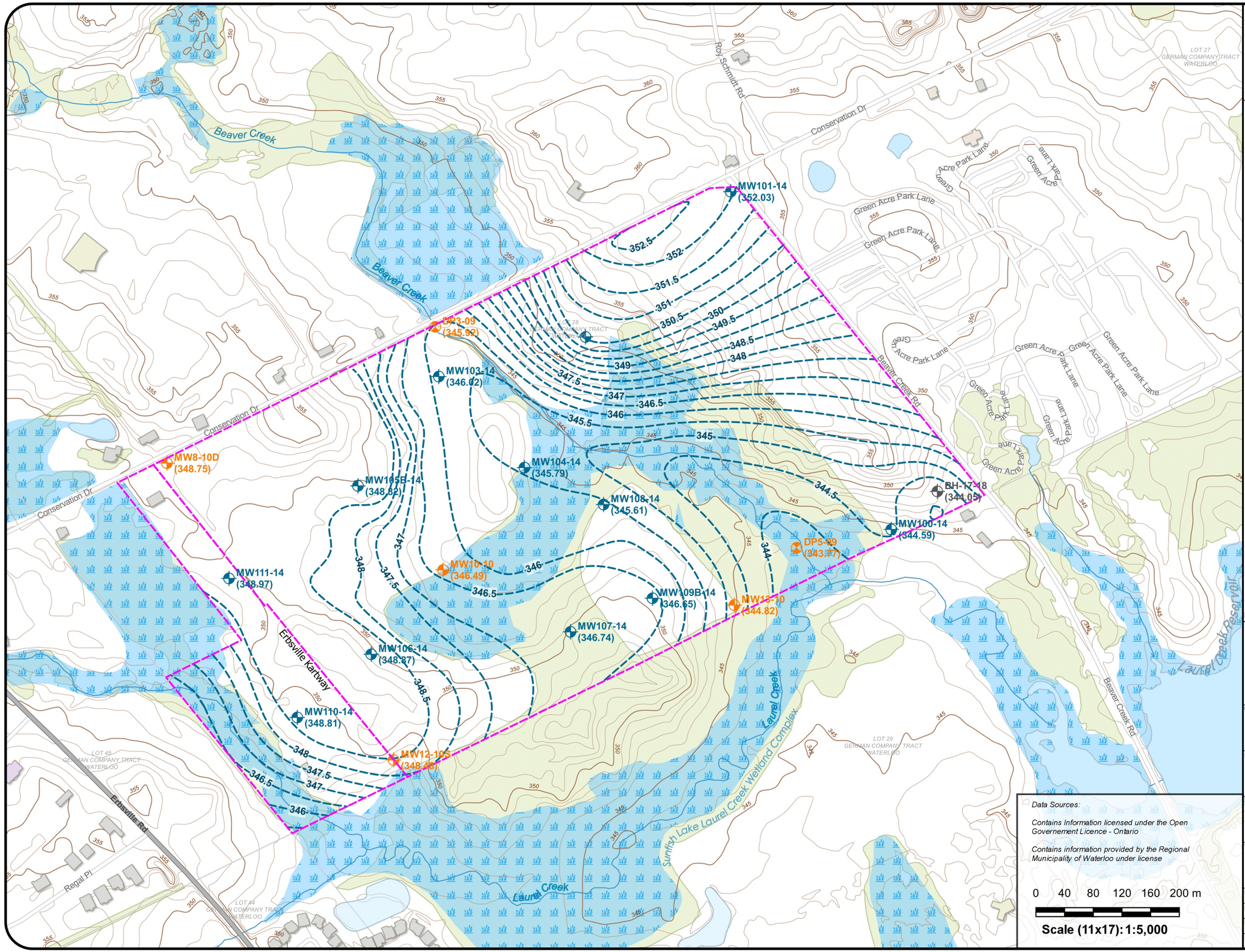
Seasonal High Groundwater Levels

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	15a
Date	July 2020		

Project No: 39502-104 P:\P\39502\1\104\gis\39502_104_gwr1.qgz

GWR1.14

July 02, 2020 - 12:19 - Plotted By: mellenor



N
NORTH

N
PROJECT NORTH

Legend

Site Data

Boundaries

- Subject Lands
- Monitoring Well Location (Groundwater Elevation mAMSL)
- MTE - Monitoring Well
- Stantec - Monitoring Well
- Englobe - Monitoring Well
- Minipiezometer Location (Groundwater Elevation mAMSL)
- MTE - Minipiezometer
- Stantec - Minipiezometer
- Groundwater Contour (0.5 m Interval)

Base Map

Roads

- Arterial
- Street

Buildings

- Building Footprint

Surface Water

- Surfacewater Body
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Surfacewater Course

Lots and Concessions

- Geographic Lot Fabric

Groundsurface

- Groundsurface Contour (1m Interval)

Landuse

- Wooded Area

Project CRS: NAD83 / UTM zone 17N

Data Sources:

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0 40 80 120 160 200 m

Scale (11x17): 1:5,000

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Project

Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site

Waterloo, ON

Title

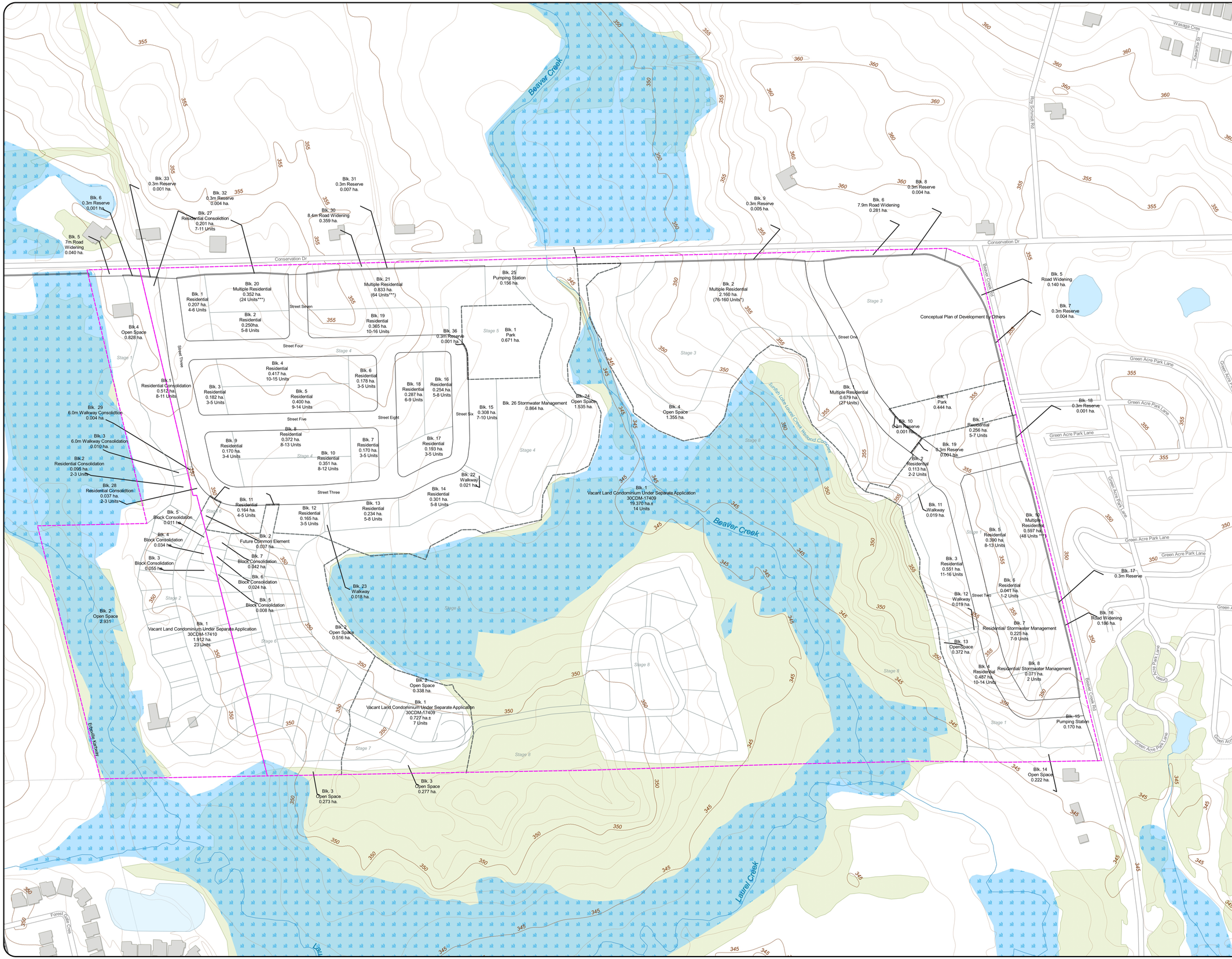
Post-Development Composite High Groundwater Elevation

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	15b
Date	July 2020		

Project No: 39502-104 P:\P-39502\104\gis\39502_104_gw01.qgz

GWR1.4

July 17, 2020 - 11:07 - Plotted By: mellenor



NORTH

PROJECT NORTH

Legend

Site Data
- Subject Lands

Base Map

Transportation
- Arterial
- Street

Buildings
- Bulding Footprint

Surface Water
- Provincally Significant Wetland
- Non-Provincially Significant Wetland (Evaluated)
- Unevaluated Wetland
- Surfacewater Body
- Surfacewater Course

Lots and Concessions
- Geographic Lot Fabric

Groundsurface
- Groundsurface Contour (1m Interval)

Landuse
- Wooded Area

Data Sources:

Contains Informatiion from MHBC Draft Plan of Subdivision (April 9 2020) - MHBC File No: 14148A

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0 50 100 150 m

Scale (24x36): 1:1,750

Project CRS: NAD83 / UTM zone 17N

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Client

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Project

Northgate and Erbsville Kartway Subdivisions Beaver Creek Meadows District - Hydrogeology Assessment

Site

Waterloo, ON

Title

Post-Development Conditions Map

Reviewed By	PAG		
Prepared By	RBM	Project No	39502-104
Drawn By	MDE	Figure No	16
Date	Jul. 2020		

Appendix A

Well Logs

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

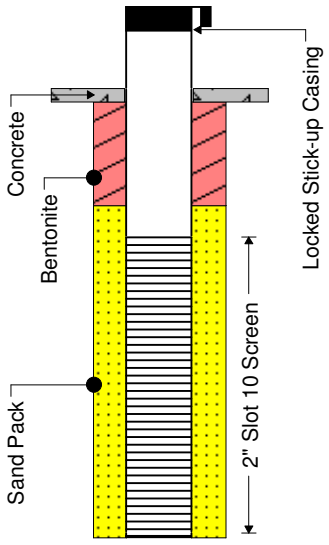
Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW100-14

Job Number: 39502-104

Drill Date: 12/12/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
0.00	344.68	Ground Elevation							
0.00	344.68	**TOPSOIL** borwn, sandy silt, trace organics, damp							
0.76	343.92	**SILT** stiff, brown, clayey silt, little sand, trace gravel, moist		1	SS	3			
1.52	343.16	**SAND** compact, borwnish grey, medium sand, some gravel, little silt, saturated		2	SS	14			
2.29	342.39	compact, brown, fine sand		3	SS	13			
3.10	341.58	**CLAY** stiff, grey, silty clay, wet		4	SS	26			
3.81	340.87	**SAND** compact, brown, fine sand, brown, saturated		5	SS	22			
4.57	340.11	**CLAY TILL** very stiff, grey, clay till , some silt, wet		6	SS	21			
5.18	339.50	no clasts observed, some silt							
5.18		Borehole Terminated at 5.18m							



January 9, 2015
Water Level 1.8 mbTOC (343.77 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9
(519) 743-6500

Logged By: TFC

Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW101-14

Job Number: 39502-104

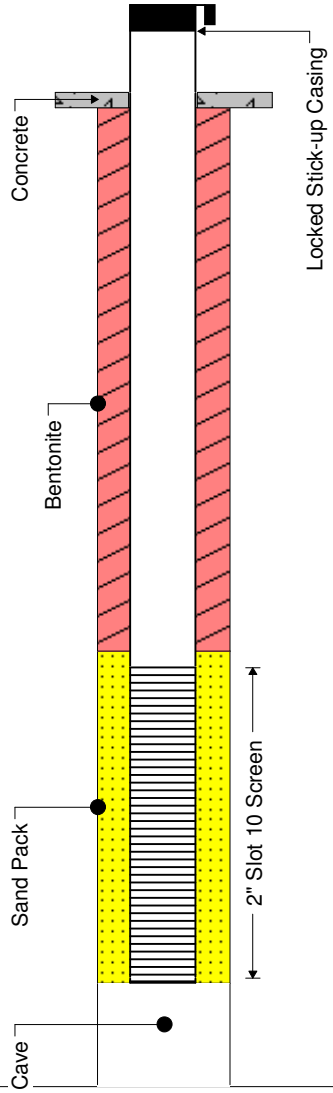
Drill Date: 12/12/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	357.85	Ground Elevation			
	0.00	**TOPSOIL** light brown, silty sand, little organics, damp			
	357.09				
	0.76	**SAND** loose, brown, medium to coarse sand, trace gravel, moist	1	SS	6
	356.33				
	1.52	compact, grey brown, medium to coarse sand, little gravel, moist	2	SS	11
2.0			3	SS	8
	354.80				
	3.05	compact, grey brown, fine to medium sand, trace gravel, moist	4	SS	13
	354.04				
	3.81	compact, grey borwn, fine to medium sand, moist	5	SS	22
4.0	353.58				
	4.27	wet	6	SS	30
	352.52				
	5.33	compact, grey brown, fine to medium sand, trace gravel, wet	7	SS	21
	352.06				
6.0	5.79	saturated			
		compact, grey brown, fine sand	8	SS	18
	350.23				
	7.62	compact, brown, fine sand	9	SS	25
8.0					
	348.71				
	9.14	compact, grey brown, medium to coarse sand	10	SS	30
	348.10				
10.0	9.75	Borehole Terminated at 9.75			

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 12, 2015
Water level at 6.9m mbTOC
(351.86 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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N2B 3X9
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Logged By: TFC

Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

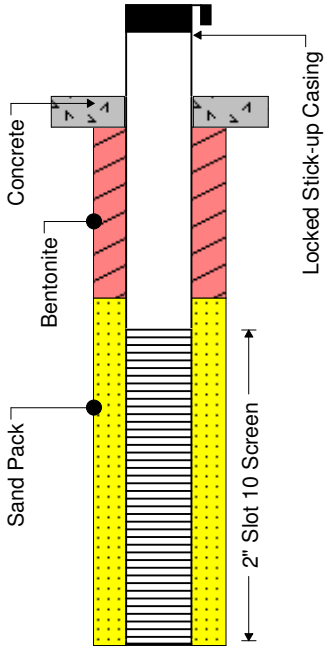
Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW102-14

Job Number: 39502-104

Drill Date: 12/12/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
0.0	350.95	Ground Elevation							
0.0 – 0.76	350.95 – 350.19	**TOPSOIL** dark brown, silty sand, little organics, damp							
0.76 – 1.52	350.19 – 349.43	**SILT TILL** firm, brown, clayey silt till, some sand, trace gravel, moist		1	SS	6			
1.52 – 1.98	349.43 – 348.97	stiff, brown, oxidation staining, mottled tan brown, some fine sand moist		2	SS	17			
1.98 – 3.05	348.97 – 347.90	stiff, grey, clayey silt till, trace sand, grey, wet		3	SS	11			
3.05 – 5.94	347.90 – 345.01	**SILT** stiff, grey, clayey silt, saturated		4	SS	9			
				5	SS	13			
				6	SS	11			
				7	SS	16			
5.94	345.01	Borehole Terminated at 5.94							



January 12, 2015
Water level 1.8 mbTOC (349.9 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Kitchener, Ontario
N2B 3X9
(519) 743-6500

Logged By: TFC

Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW103-14

Job Number: 39502-104

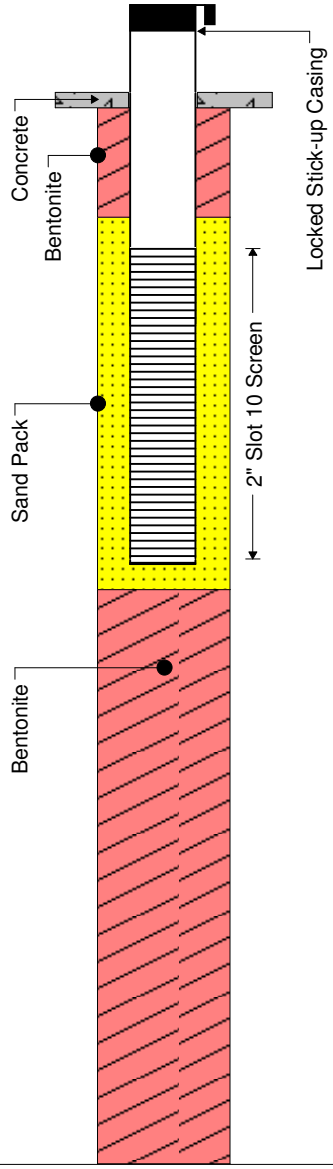
Drill Date: 12/11/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	345.78	Ground Elevation			
	0.00	**TOPSOIL** dark brown, silty sand, little organics, moist			
	345.02				
	0.76	**SAND** loose, brown, medium to course sand, few gravel, trace organics, wet	1	SS	8
	344.26				
	1.52		2	SS	26
2.0	343.80	compact, brown, medium sand, trace gravel, saturated			
	1.98		3	SS	16
	342.88	compact, greyish brown, medium to course sand, trace gravel			
	2.90	**CLAY TILL** very stiff, grey, clay till, some silt, trace fine sand, wet	4	SS	17
4.0		**SAND** compact, grey, medium sand, grey, saturated	5	SS	12
	341.21				
	4.57	**CLAY** very stiff, grey, clay till, some silt, trace fine sand, wet	6	SS	17
	340.45				
	5.33	**SILT** compact, grey, sandy silt, saturated	7	SS	10
6.0	339.68				
	6.10	**SILT** compact, brownish grey, clayey silt, some fine sand, saturated	8	SS	2
	338.16				
	7.62	**SAND** very loose, brownish grey, silty fine sand	9	SS	17
8.0		compact brownish grey, fine sand, some silt			
			10	SS	36
	335.87				
10.0	9.91	**SAND** dense, brownish grey, silty fine sand	11	SS	33
	335.26				
	10.52	Borehole Terminated at 10.52m			

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 8, 2015
Water level 1.3 mbTOC (345.3 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9
(519) 743-6500

Logged By: TFC

Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

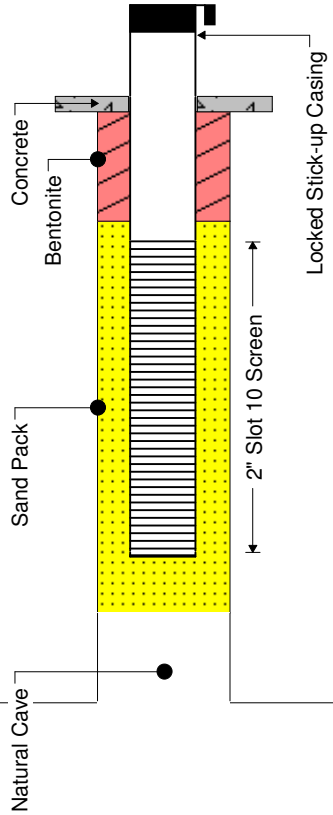
Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW104-14

Job Number: 39502-104

Drill Date: 12/11/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
0.00	346.17	Ground Elevation							
0.00	346.17	**TOPSOIL** dark brown, silty sand, little organics, damp							
0.76	345.41	**SAND** loose, orange brown, fine sand, moist		1	SS	7			
1.52	344.65	compact, saturated		2	SS	14			
3.53	342.64	compact, greyish brown, fine sand		3	SS	10			
				4	SS	15			
				5	SS	26			
				6	SS	11			
				7	SS	4			
5.94	340.23	Borehole Terminated at 5.94							



January 8, 2015
Water level 1.9 mbTOC (345.19 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Kitchener, Ontario
N2B 3X9
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Logged By: TFC

Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW105A-14

Job Number: 39502-104

Drill Date: 12/15/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	349.58	Ground Elevation			
	0.00	**TOPSOIL** brown, silty sand, little organics, damp			
	348.82		1	SS	8
	0.76	**SILT** firm, brown, clayey silt, little sand, laminated grey silt layers, moist			
	348.28		2	SS	6
	1.30				
2.0	347.29	**SAND** loose, brown, silty fine sand,wet saturated	3	SS	7
	2.29				
			4	SS	20
	345.77				
4.0	3.81	**SAND** compact, dark brown, fine sand	5	SS	13
			6	SS	23
			7	SS	19
6.0			8	SS	23
	341.96				
8.0	7.62	**SILT** dense, grey, clayey silt till	9	SS	18
			10	SS	26
10.0			11	SS	20

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details: Concrete; Locked Stick-up Casing; Bentonite

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes: * Sampler advanced under static pressure

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Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

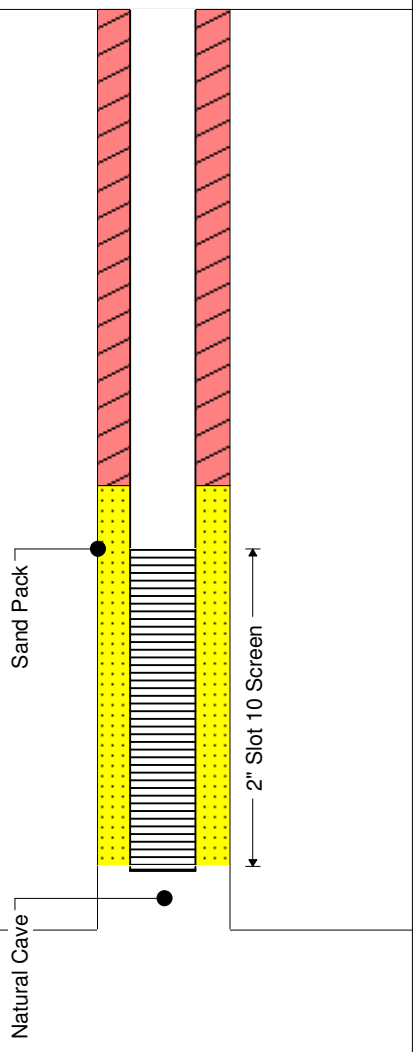
Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW105A-14

Job Number: 39502-104

Drill Date: 12/15/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
40.0	337.39								
	12.19	**SILT** compact, grey		12	SS	15			
42.0									
	13.0								
44.0									
46.0				13	SS	14			
48.0									
	15.0								
50.0									
				14	SS	14			
52.0									
54.0									
56.0	17.0								
58.0									
60.0	331.29								
	18.29	**SAND** very loose, greyish brown, fine sand		15	SS	0*			
62.0	19.0								
64.0									
66.0				16	SS	15			
	329.16								
	20.42	Borehole Terminate at 20.42m							
68.0									
	21.0								
70.0									
72.0									
74.0									
	23.0								
76.0									
78.0									



January 8, 2015
Water level 1.87 mbTOC (348.64 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes: * Sampler advanced under static pressure

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Sheet: 2 of 2

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW105B-14

Job Number: 39502-104

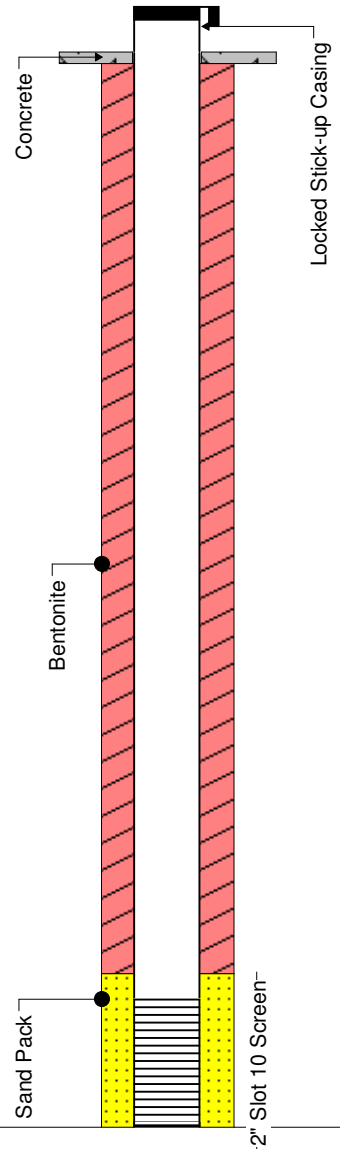
Drill Date: 12/15/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	349.66	Ground Elevation			
	0.00	**TOPSOIL** brown, silty sand, little organics, moist			
	348.90		1	SS	8
	0.76				
	348.36	**SILT** firm, brown, clayey silt, little sand, laminated grey silt layers, moist	2	SS	6
	1.30				
2.0	347.37		3	SS	7
	2.29	**SAND** loose, brown, silty fine sand,wet saturated	4	SS	20
	345.85				
4.0	3.81	**SAND** compact, dark brown, fine sand	5	SS	13
			6	SS	23
			7	SS	19
6.0			8	SS	23
	342.04				
	7.62	**SILT TILL** dense, grey, clayey silt till	9	SS	18
8.0					
			10	SS	26
10.0					
			11	SS	20
	337.47				
12.0	12.19	**SILT** compact, grey	12	SS	15
	336.86				
	12.80	Borehole Terminate at 12.8m			
14.0					

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 8, 2015
Water level 1.87 mbTOC (348.33 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes: * Sampler advanced under static pressure

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Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW106-14

Job Number: 39502-104

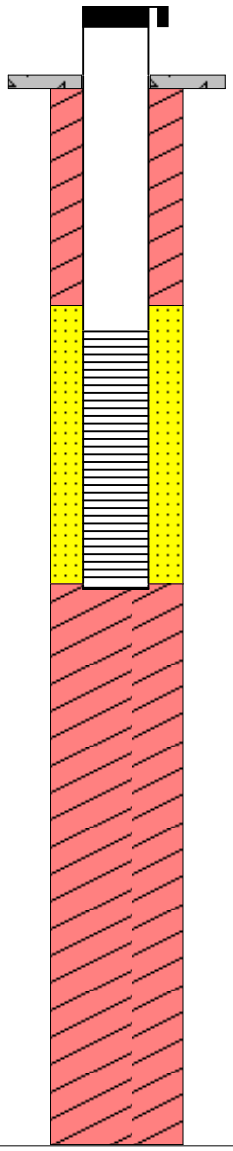
Drill Date: 12/10/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	350.79	Ground Elevation			
	0.00	**TOPSOIL** light brown, silty sand, little organics, damp			
	350.03		1	SS	10
	0.76	**SILT** compact, tan, sandy silt, little fine sand, little clay, trace organic, moist	2	SS	9
	349.27				
	1.52	wet	3	SS	27
	347.74				
	3.05	**SILT TILL** dense, light brown, silt till, moist	4	SS	33
	346.98				
	3.81	**SILT** compact, grey, clayey silt till, moist	5	SS	22
			6	SS	34
	345.46				
	5.33	compact, grey, clayey silt	7	SS	40
	344.69				
	6.10	**SILT** compact, grey, silt saturated	8	SS	28
	343.17				
	7.62	compact, grey, some fine sand layers	9	SS	14
			10	SS	21
			11	SS	16
			12	SS	12
	337.99				
	12.80				

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 8, 2015
Water level 3.08 mbTOC (348.55 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW107-14

Job Number: 39502-104

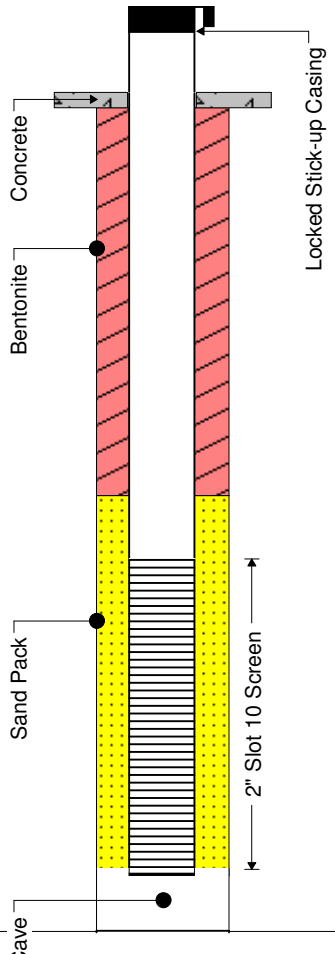
Drill Date: 12/17/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	350.58	Ground Elevation			
	0.00	**TOPSOIL** grey brown to dark brown, sandy silt, trace organics, damp			
	349.74				
	0.84	**SAND** loose, brown, silty fine sand, damp	1	SS	4
2.0		**SAND** compact, tan, fine sand, damp	2	SS	12
			3	SS	16
	347.53				
	3.05	moist	4	SS	15
	346.62				
4.0	3.96	compact, dark brown, fine sand, wet	5	SS	25
	346.01				
	4.57	saturated	6	SS	27
			7	SS	20
6.0			8	SS	5
	342.90				
	7.68	dense, brownish grey, fine sand	9	SS	48
8.0	342.35				
	8.23	Borehole Terminated at 8.23m			
10.0					

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 7, 2015
Water level 5.18 mbTOC (346.26 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes: Aardvark

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N2B 3X9
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Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW108-14

Job Number: 39502-104

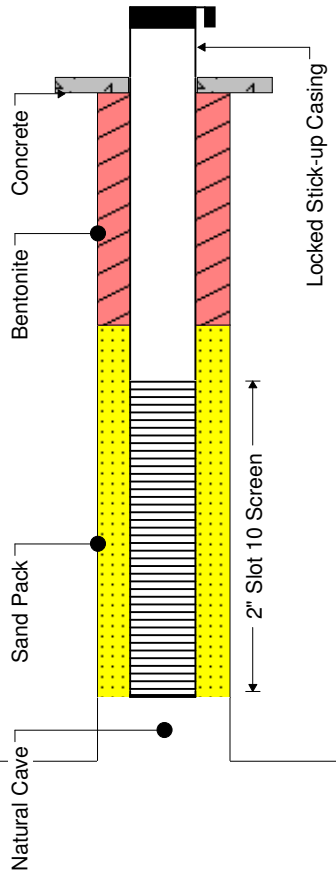
Drill Date: 12/16/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	346.21	Ground Elevation			
	0.00	**TOPSOIL** brown to dark brown, some clay, organics, damp			
	345.45				
	0.76	**SILT** stiff, tan, clayey silt, trace course sand, trace organics, damp	1	SS	11
	344.69				
	1.52	compact, tan, clayey silt, some fine sand, trace course sand, moist	2	SS	14
2.0	343.92				
	2.29	**SAND** compact, tan, fine sand, saturated	3	SS	17
			4	SS	20
	342.40				
	3.81	dense, mottled tan brown with oxidation staining, fine sand	5	SS	40
4.0	341.64	dense, brown, fine sand			
	4.57	compact, grey brown, fine sand	6	SS	14
			7	SS	20
6.0	340.11				
	6.10	compact, grey, fine sand	8	SS	15
	339.50				
	6.71	Borehole Terminated at 6.71m			
8.0					
10.0					

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 8, 2015
Water level 1.85 mbTOC (345.08 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW109A-14

Job Number: 39502-104

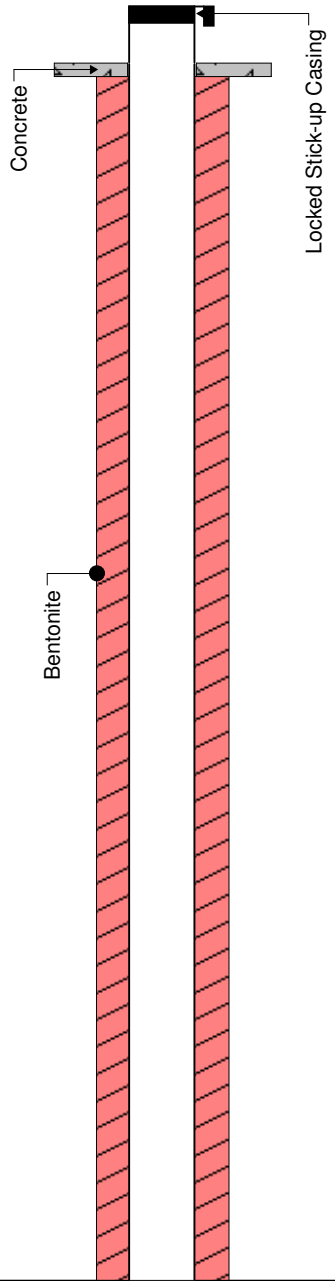
Drill Date: 12/18/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	349.77	Ground Elevation			
	0.00	**TOPSOIL** loose, dark brown, fill, silty sand, little organics, damp	1	SS	8
		SILT TILL stiff, brown, clayey silt till, moist	2	SS	15
2.0		mottled brown, no clasts observed, moist	3	SS	15
			4	SS	9
	346.72				
	3.05	**CLAY** stiff, grey, little silt, moist	5	SS	10
4.0			6	SS	7
			7	SS	9
	344.41				
	5.36	**SAND** loose, brown, silty fine sand, wet	8	SS	8
6.0	343.67				
	6.10	**SAND** loose, brownish grey, fine to medium sand, saturated	9	SS	18
		compact, brown, fine sand			
8.0			10	SS	16
			11	SS	5
10.0					
			12	SS	11
12.0	337.58				
	12.19	compact, brown, fine sand, little silt	13	SS	14
	336.05				
	13.72	compact brownish grey, fine sand, little silt	14	SS	23
14.0					

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

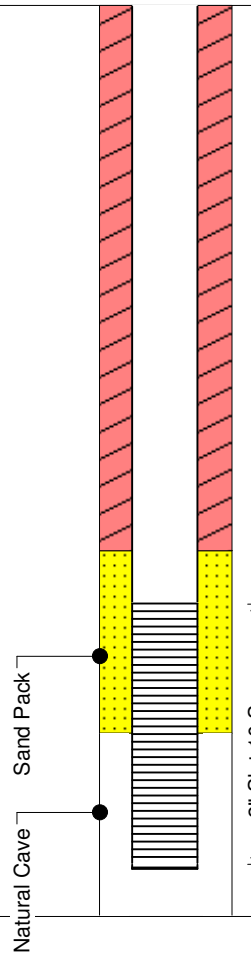
Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW109A-14

Job Number: 39502-104

Drill Date: 12/18/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
16.0	333.01			15	SS	30			
	16.76	**CLAY** hard, brownish grey, silty clay, some fine sand,wet		16	SS	40			
18.0	331.48								
	18.29	**SAND** dense, brown, fine sand, saturated		17	SS	37			
		CLAY hard, brownish grey, clay, wet		18	SS	22			
20.0	328.43								
	21.34	**SAND** dense, brownish grey, silty fine sand, saturated		19	SS	36			
22.0				20	SS	37			
24.0									
	324.78			21	SS	19			
	24.99	Borehole Terminated at 24.99m							
26.0									
28.0									



January 7, 2015
Water level 3.87 mbTOC (346.62 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Sheet: 2 of 2

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

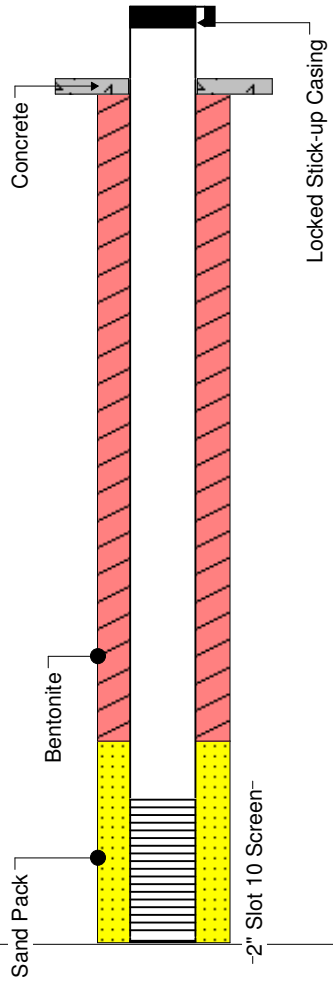
Location: Conservation Dr. Waterloo, Ontario

Borehole Number: MW109B-14

Job Number: 39502-104

Drill Date: 12/18/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
	349.77	Ground Elevation							
0.00		**TOPSOIL** loose, dark brown, fill, silty sand, little organics, damp		1	SS	8			
2.0		**SILT TILL** stiff, brown, clayey silt till, moist		2	SS	15			
		mottled brown, no clasts observed, moist		3	SS	15			
				4	SS	9			
	346.72								
3.05		**CLAY** stiff, grey, little silt, moist		5	SS	10			
4.0				6	SS	7			
				7	SS	9			
	344.41								
5.36		**SAND** loose, brown, silty fine sand, wet		8	SS	8			
6.0	343.67								
6.10		**SAND** loose, brownish grey, fine to medium sand, saturated		9	SS	18			
		compact, brown, fine sand							
8.0				10	SS	16			
	340.63								
9.14		Borehole Terminated at 9.14m							
10.0									
12.0									



January 5, 2015
Water level 4.76 mbTOC (345.76 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Sheet: 1 of 1

ID Number: MW209B-19

Project: Northgate and Erbsville Kartway Subdivisions

Project No: 39502-104

Client: 1017081 Ontario Limited & 1455136 Ontario Inc.

Site Location: Conservation Dr. Waterloo, ON

Drill Date: 4/9/2019

Drilling Contractor: London Soil Test Ltd.

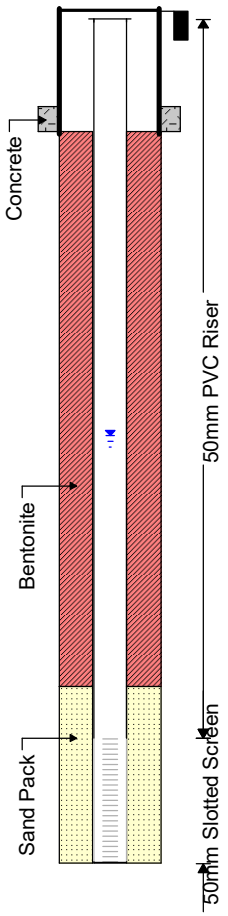
Drill Rig: D50 Track Mount

Drill Method: HSA

Protective Cover: Yes

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Recovery (%)	N-Value	Soil Sample Lab Analysis	Headspace: PID ppm (20 40 60 80) / Hydrocarbon ppm (100 200 300 400)
0 / 0	Ground Surface	349.6						
	TOPSOIL dark brown, silty sand topsoil, trace to some organics, moist	0.0						
	SILT TILL brown, clayey silt till, moist		1	SSP	100	14		
4 / 2			2	SSP	100	16		
			3	SSP	100	13		
10 / 3		346.6						
	CLAY grey, ltrace silt, moist	3.0	4	SSP	100	13		
14 / 4			5	SSP	100	8		
16 / 5		344.4	6	SSP	100	7		
	SILTY SAND brown, fine grained, saturated	5.2	7	SSP	100	9		
20 / 6		343.5						
	SAND brown to brownish grey, fine to medium grained, saturated	6.1	8	SSP	100	14		
24 / 7			9	SSP	100	16		
26 / 8			10	SSP	100	22		
28 / 9			11	SSP	100	13		
30 / 10		340.5						
	Drilling Terminated	9.1						
32 / 10								
34 / 11								
36 / 12								
38 / 13								
40 / 14								

Well Completion Details



Field Technician: YXM

Drafted by: YXM

Reviewed by: ALB

Groundwater elevation 345.78m amsl measured on March 9, 2020

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

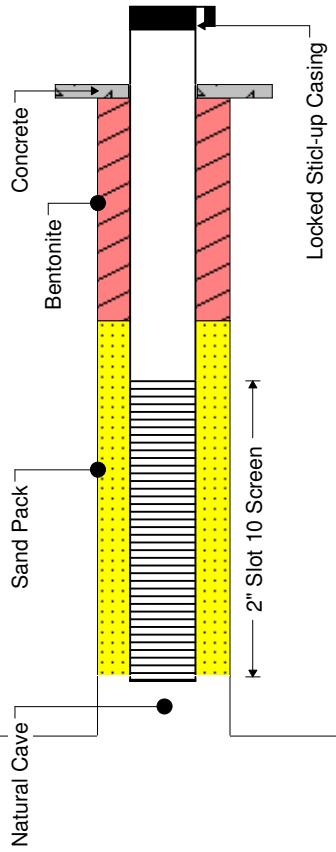
Location: 675 Conservation Dr. Waterloo, Ontario

Borehole Number: MW110-14

Job Number: 39502-104

Drill Date: 12/17/14

Depth (m)	Elevation (m)	Soil Description	Symbol	Number	Type	N-Value	Standard Penetration Graph (25 50 75)	Headspace (ppm)	Groundwater Observations and Well Details
0.0	349.37	Ground Elevation							
0.0	0.00	**TOPSOIL** dark brown, silty sand, trace organics, moist							
0.8	348.61								
0.8	0.76	**SAND** compact, grey, fine to medium sand,some silt, some gravel, wet		1	SS	19			
1.5	347.85			2	SS	16			
1.5	1.52	compact, brownish grey, fine sand, some silt, wet							
2.4	346.93			3	SS	13			
2.4	2.44	saturated		4	SS	8			
3.5				5	SS	9			
4.6				6	SS	14			
5.7				7	SS	0*			
6.7	342.66			8	SS	1			
6.7	6.71	Borehole Terminated at 6.71m							



January 7, 2015
Water level 2.10 mbTOC (348.08 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes: * Sampler advanced under static pressure

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Sheet: 1 of 1

Client: Northgate Lands Corp.

Project: Northgate Lands Subdivision

Location: 675 Conservation Dr. Waterloo, Ontario

Borehole Number: MW111-14

Job Number: 39502-104

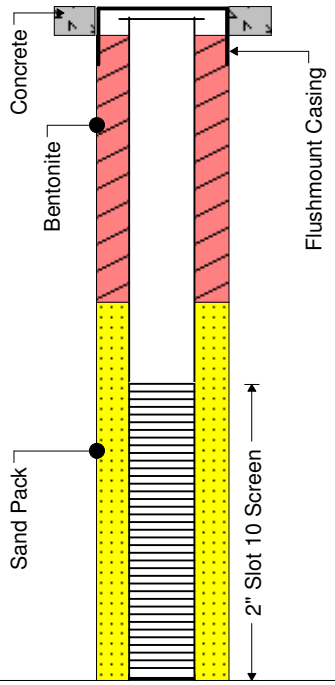
Drill Date: 12/17/14

Depth (m)	Elevation (m)	Soil Description	Number	Type	N-Value
	349.43	Ground Elevation			
0.0	0.00	**TOPSOIL** tan brown, silty sand, trace organics, moist			
	348.67				
0.8	0.76	**SILT** firm, mottled borwn, clayey silt till, moist	1	SS	6
2.0			2	SS	9
	347.14				
	2.29	**SAND** compact, brown, silty fine sand, saturated	3	SS	21
4.0		**CLAY** very stiff, brown, clay, little silt, little sand, wet	4	SS	19
		SAND compact, grey, fine sand, saturated	5	SS	26
	344.86				
	4.57	**CLAY** very stiff, brown, clay, little silt, little sand, wet	6	SS	43
6.0			7	SS	34
	343.33				
	6.10	**SILT** hard, grey, clayey silt, little sand, wet	8	SS	17
	342.50				
	6.93	**CLAY** very stiff, grey, clay, some silt, wet			
8.0		Borehole Terminated at 6.93m			
10.0					
12.0					

Standard Penetration Graph: 25 50 75

Headspace (ppm)

Groundwater Observations and Well Details



January 7, 2015
Water level 0.75 mbTOC (348.56 masl)

Reviewed By: ALB

Method: CME75 Hollow Stem Auger

Notes:

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Sheet: 1 of 1

ID Number: MP1-19

Project Name: North Waterloo Community SWM Facility

Project No: 39502-200

Client: Activa Holdings Inc.

Site Location: Waterloo

Date Completed: 6/21/2019

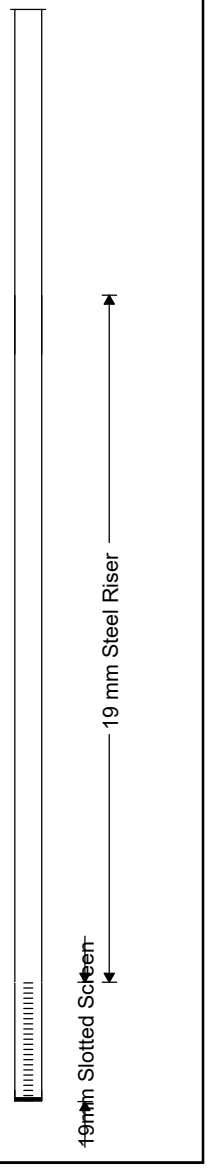
Drilling Contractor: MTE Consultants

Drill Rig: NA

Drill Method: Soil Probe

Protective Cover: NA

Depth Scale (ft)	Depth Scale (m)	Symbol	Soil Description	Elevation (masl)	Depth (m)	Number	Type	Recovery (%)	SPT N-Value (Blows/305mm)	Moisture Content (%)	Well Completion Details
			Ground Surface	348.6							
0	0		**TOPSOIL** dark brown, sandy, moist	348.4	0.0 0.2						
			SAND brown, some silt, moist	348.2	0.3						
2			**CLAYEY SILT TILL** brown, some sand, moist	347.2	1.4						
4			**SILTY CLAY** brown, trace sand, moist	346.7	1.8						
6	2		Drilling Terminated								



Field Technician: TXG

Drafted by: TXG

Reviewed by:

Soil probe advanced to 1.8m, mini piezometer advanced to 2.06m. MP dry upon completion

Monitoring Well: MW1-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	19-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	350.07 m AMSL
Number:	160340875	**Top of casing elevation:**	350.96 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	531967
Contractor:	Pro Core Drilling	**Northing:**	4814976

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS				WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.89 m
0	0		Ground Surface	350.07								
			TOPSOIL some sand and organics, dark brown	0.00 349.84			1	SS	0-0-2-2 (2)	10" 42%		Concrete
			SILTY SAND some organics, light brown	0.23 349.31								
			CLAYEY SILT trace sand sand content increasing with depth	0.76			2	SS	0-1-2-4 (3)	24" 100%		52 mm Schedule 40 PVC casing
5			clay content decreasing with depth	348.54	ATB1	Upper Maryhill Till and Equivalents						Holeplug
	2		SANDY SILT fine grained sand, some clay, grey	1.52			3	SS	0-1-2-2 (3)	15" 63%		
			becoming light greyish brown at 2.3 m BGS				4	SS	0-0-0-0 (0)	23" 96%		Top of sand (2.4 m BGS)
10			becoming wet at 2.8 m BGS	347.02								
			SILTY SAND fine grained, light brown, wet	3.05	AFB1 / AFB2	Upper / Middle Moraine Stratified Sediments and Equivalents	5	SS	0-0-0-0 (0)	21" 88%		Top of screen (3.1 m BGS) No.2 Silica Sand
	4											No.10 Slot PVC screen 50 mm diameter
15				345.29								Bottom of screen (4.6 m BGS)
			SAND medium grained, light brown/grey, wet	4.78 344.89			6	SS	2-2-3-5 (5)	21" 88%		
			End of Borehole	5.18								
20	6											
25	8											

Screen Interval: 3.05 - 4.57 m BGS
Sand Pack Interval: 2.44 - 4.57 m BGS
Well Seal Interval: 0.30 - 2.44 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW2-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	17-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	355.56 m AMSL
Number:	160340875	**Top of casing elevation:**	356.52 m AMSL
Field investigator:	A.MacKay	**Easting:**	532498
Contractor:	Pro Core Drilling	**Northing:**	4815271

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.96 m
0	0		Ground Surface	355.56								
			TOPSOIL organics and fine sand, very dark brown, very moist	0.00 355.25								Concrete
			SAND fine grained, trace gravel, dark brown, loose, moist	0.30			1	SS	0-1-1-4 (2)	16.5" 69%		
			becoming brown, very moist, very loose at 0.9 m BGS				2	SS	0-1-0-1 (1)	10.5" 44%		52 mm Schedule 40 PVC casing
5			fine to medium grained sand beginning at 1.5 m BGS				3	SS	0-0-0-0 (0)	13" 54%		Holeplug
	2		becoming grey-brown at 2.3 m BGS		AFB1 / AFB2	Upper / Middle Moraine Stratified Sediments and Equivalents	4	SS	0-0-1-7 (1)	n/a		Top of sand (2.4 m BGS)
10			becoming wet at 3.1 m BGS				5	SS	4-5-8-8 (13)	n/a		Top of screen (3.1 m BGS) No.2 Silica Sand
	4											No.10 Slot PVC screen 50 mm diameter
15							6	SS	3-9-9-12 (18)	n/a		Bottom of screen (4.6 m BGS)
				350.38								
			End of Borehole	5.18								
20	6											
25	8											

Screen Interval: 3.05 - 4.57 m BGS
Sand Pack Interval: 2.44 - 4.57 m BGS
Well Seal Interval: 0.30 - 2.44 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

Drawn By/Checked By: OR/LV

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Sheet 1 of 1

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW3-10

Project: North Waterloo Subwatershed Study
Client:
Location: North Waterloo, ON; 03
Number: 160340875

Field investigator: A.MacKay
Contractor: Pro Core Drilling
Drilling method: Track Mount, CME55, Hollow Stem Auger
Date started/completed: 12-Mar-2010 / 17-Mar-2010

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
			Ground Surface	366.84						
0	0		TOPSOIL	0.00						
			fine sand, dark brown, loose, wet	366.53						
			SAND	0.30						
			fine grained, brown, loose, wet				1	SS	1-10-11-3 (21)	15" 63%
							2	SS	1-2-3-3 (5)	13" 54%
5	2		light brown from 1.5 to 2.9 m BGS				3	SS	2-5-5-5 (10)	12" 50%
							4	SS	1-1 (1)	13" 54%
10			fine to medium grained sand beginning at 2.9 m BGS				5	PQ	n/a	31" 124%
			some coarse grained sand beginning at 3.6 m BGS	362.98						
	4		SILT	3.86						
15			some fine grained sand, brown, firm to stiff, wet				6	PQ	n/a	58" 100%
				361.25						
			SAND	5.59						
20	6		fine grained, brown, loose				7	PQ	n/a	58" 97%
			fine to medium grained, some coarse grained, brown, loose, wet				8	PQ	n/a	50" 83%
25	8									
30							9	PQ	n/a	57" 97%
	10		layer of fine sand, trace silt, stiff, wet at 10 m to 10.3 m BGS				10	PQ	n/a	56" 93%
35										
					AFB1	Upper Moraine Stratified Sediments and Equivalents	11	PQ	n/a	55" 90%
40	12									
							12	PQ	n/a	49" 82%
45										
	14		fine to medium grained, trace silt, brown, loose, wet				13	PQ	n/a	45" 75%
50										
							14	PQ	n/a	41" 68%
55	16									
			layer of fine sand and silt, stiff at 17.4 to 17.7 m BGS				15	PQ	n/a	51" 85%
60			some silt beginning at 17.7 m BGS							
	18			348.09						
			SILT AND SAND	18.75			16	PQ	n/a	48.5" 81%
65			fine grained sand, brown, loose, wet							
	20									
70			layer of fine sand with silt, stiff, brownish grey at 20.3 to 21.8 m BGS				17	PQ	n/a	52" 87%
	22		some clay, grey beginning at 21.8 m BGS				18	PQ	n/a	41" 68%
75				343.52						
			SILTY CLAY	23.32						
80	24		grey, stiff, wet				19	PQ	n/a	46" 77%
							20	PQ	n/a	56" 93%
85	26			340.47						
			SILT	26.37	ATB2	Middle Maryhill Till and Equivalents	21	PQ	n/a	57" 95%
90	28		some fine sand, trace to some clay, greyish brown, soft, wet							

WELL DETAILS

GS Elev: 366.84 m AMSL	GS Elev: 366.81 m AMSL
TOC Elev: 367.60 m AMSL	TOC Elev: 367.62 m AMSL
Easting: 532774	Easting: 532776
Northing: 4815406	Northing: 4815407
Stick-up: 0.76 m	Stick-up: 0.81 m

Cement
Holeplug
52 mm Schedule 80 PVC casing
Bentonite Grout

Cement
52 mm Schedule 40 PVC casing
Holeplug
Top of sand (11.6 m BGS)
Top of screen (12.2 m BGS)
No.2 Silica Sand
No.10 Slot PVC screen 50 mm diameter
Bottom of screen (13.7 m BGS)

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
PQ - wireline continuous core sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

PQ - continuous core sampling
SS - split spoon sampling

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL - CLUST 11X17 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW3-10

Project: North Waterloo Subwatershed Study
Client:
Location: North Waterloo, ON; 03
Number: 160340875

Field investigator: A.MacKay
Contractor: Pro Core Drilling
Drilling method: Track Mount, CME55, Hollow Stem Auger
Date started/completed: 12-Mar-2010 / 17-Mar-2010

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
95			SILT some fine sand, trace to some clay, greyish brown, soft, wet				22	PQ	n/a	44" 75%
	30						23	PQ	n/a	59" 97%
100				336.15						
			SILTY CLAY TILL trace coarse sand and fine gravel, greyish brown, very stiff, wet	30.68			24	PQ	n/a	58.5" 98%
105	32									
							25	PQ	n/a	52" 88%
110										
	34		trace coarse grained gravel beginning at 34.0 m BGS							
					ATB3	Lower Maryhill Till and Equivalents	26	PQ	n/a	61" 100%
115										
			some coarse sand, fine to coarse gravel, dark brown beginning at 35.5 m BGS				27	PQ	n/a	61" 102%
	36									
120										
			cobble, 0.13 m diameter, at 36.7 m BGS				28	PQ	n/a	55" 92%
	38									
125										
							29	PQ	n/a	60" 100%
				327.21						
130			SAND AND SILT some gravel, firm to stiff, wet	39.62 327.04						
	40		SILTY SAND TILL some sand and gravel, grey, very hard, moist	39.80	ATC1	Upper/ Main Catfish Creek Till	30	PQ	n/a	60" 100%
135										
				325.23						
			End of Borehole	41.61						
	42									
140										
	44									
145										
150	46									
155										
	48									
160										
	50									
165										
170	52									
175										
	54									
180										
	56									
185										

WELL DETAILS

GS Elev: 366.84 m AMSL
TOC Elev: 367.60 m AMSL
Easting: 532774
Northing: 4815406
Stick-up: 0.76 m

GS Elev: 366.81 m AMSL
TOC Elev: 367.62 m AMSL
Easting: 532776
Northing: 4815407
Stick-up: 0.81 m

Bentonite Grout
Holelplug
Top of sand (37.6 m BGS)
Top of screen (38.6 m BGS)
No.2 Silica Sand
No.10 Slot PVC screen 50 mm diameter
Bottom of screen (41.6 m BGS)

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
PQ - wireline continuous core sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

PQ - continuous core sampling
SS - split spoon sampling

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL - CLUST 11X17 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW4-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	18-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	347.87 m AMSL
Number:	160340875	**Top of casing elevation:**	348.64 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	532399
Contractor:	Pro Core Drilling	**Northing:**	4815010

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS				WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.77 m
0	0		Ground Surface	347.87								
			TOPSOIL dark brown, moist	0.00 347.26			1	SS	0-0-3-3 (3)	8" 33%		Concrete Holeplug
			SANDY SILT fine grained sand, light brown, moist	0.61 346.60			2	SS	1-2-3-3 (5)	22" 92%		Top of sand (0.9 m BGS)
5	2		SILTY SAND fine grained, light brown, loose, wet silt content increasing with depth	1.27 345.43	ATB1	Upper Maryhill Port Stanley Till and Equivalents	3	SS	6-4-4-3 (8)	18" 75%		52 mm Schedule 40 PVC casing Top of screen (1.5 m BGS) No.2 Silica Sand
			CLAYEY SILT trace sand	2.44 344.21			4	SS	0-2-3-4 (5)	24" 100%		No.10 Slot PVC screen 50 mm diameter
10	4						5	SS	2-5-6-9 (11)	0" 0%		Bottom of screen (3.0 m BGS)
			End of Borehole	3.66								
15												
20	6											
25	8											

Screen Interval: 1.52 - 3.05 m BGS
Sand Pack Interval: 0.91 - 3.05 m BGS
Well Seal Interval: 0.15 - 0.91 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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Sheet 1 of 1

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW5-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	19-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	351.08 m AMSL
Number:	160340875	**Top of casing elevation:**	351.91 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	532368
Contractor:	Pro Core Drilling	**Northing:**	4814834

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS				WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.8. m
			Ground Surface	351.08								
0	0		TOPSOIL dark brown, moist	0.00 350.93			1	SS	0-2-4-8 (6)	18" 75%		Concrete
			CLAYEY SILT trace organics, light reddish brown, firm to stiff	0.15								Holeplug
					ATB1	Upper Maryhill Port Stanley Till and Equivalents	2	SS	2-3-4-6 (7)	11" 46%		52 mm Schedule 40 PVC casing
5			some gravel light brown beginning at 1.5 m BGS seams of medium grained sand beginning at 1.7 m BGS				3	SS	2-4-12-7 (16)	24" 100%		
	2		layer of coarse gravel at 2.1 m BGS trace sand and gravel at 2.3 m BGS									Top of sand (2.1 m BGS)
				348.33			4	SS	9-11-10-11 (21)	9" 38%		Top of screen (2.7 m BGS)
10			SILTY SAND fine to medium grained sand, light brown, wet	2.74			5	SS	10-14-12-8 (26)	14" 58%		No.2 Silica Sand
	4				AFB1 / AFB2	Upper / Middle Moraine Stratified Sediments and Equivalents						No.10 Slot PVC screen 50 mm diameter
15				346.51								Bottom of screen (4.3 m BGS)
			End of Borehole	4.57								Natural cave
20	6											
25	8											

Screen Interval: 2.74 - 4.27 m BGS
Sand Pack Interval: 2.13 - 4.27 m BGS
Well Seal Interval: 0.30 - 2.13 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW6-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	18-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	355.58 m AMSL
Number:	160340875	**Top of casing elevation:**	356.48 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	532737
Contractor:	Pro Core Drilling	**Northing:**	4814972

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS				WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.90 m
0	0		Ground Surface	355.58								
			SAND fine to medium grained,dark brown, loose, moist	0.00			1	SS	3-4-5-5 (9)	13" 54%		Concrete
			becoming reddish brown at 0.8 m BGS				2	SS	2-3-3-3 (6)	14" 58%		52 mm Schedule 40 PVC casing
5			trace gravel beginning at 1.5 m BGS				3	SS	1-1-1-2 (2)	14" 58%		Holeplug
	2			353.29								
			SAND medium grained, trace gravel, light brown, loose, moist	2.29	AFB1 / AFB2	Upper / Middle Moraine Stratified Sediments and Equivalents	4	SS	3-5-5-5 (10)	16" 67%		Top of sand (2.4 m BGS)
10							5	SS	3-3-2-4 (5)	13" 54%		Top of screen (3.1 m BGS) No.2 Silica Sand
	4		some gravel, wet at 3.6 m BGS									No.10 Slot PVC screen 50 mm diameter
15			some coarse grained sand, trace gravel at 4.6 m BGS				6	SS	4-15-20-25 (35)	20" 83%		Bottom of screen (4.6 m BGS)
				350.40								
			End of Borehole	5.18								
20	6											
25	8											

Screen Interval: 3.05 - 4.57 m BGS
Sand Pack Interval: 2.44 - 4.57 m BGS
Well Seal Interval: 0.15 - 2.44 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW7-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	18-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	358.74 m AMSL
Number:	160340875	**Top of casing elevation:**	359.67 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	533031
Contractor:	Pro Core Drilling	**Northing:**	4815108

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.93 m
0	0		Ground Surface	358.74								
			TOPSOIL dark brown	0.00 358.48								Concrete
			CLAYEY SILT trace gravel, light brown, firm to stiff, moist	0.25			1	SS	1-1-2-3 (3)	19" 79%		
							2	SS	2-3-5-5 (8)	13" 54%		52 mm Schedule 40 PVC casing
				357.52								
5	2		SAND fine to medium grained, trace silt, trace gravel, light reddish brown, loose, moist	1.22			3	SS	6-1-4-5 (5)	11" 46%		
				356.30	ATB1	Upper Maryhill Port Stanley Till and Equivalents						Holeplug
			SILT trace fine to coarse sand, trace gravel, stiff, light brown, moist	2.44			4	SS	1-5-7-12 (12)	15" 63%		
10	4		becoming clayey at 3.1 m BGS				5	SS	2-5-6-10 (11)	24" 100%		
				354.17								
15			SAND fine to medium grained, light brown, compact, moist	4.57			6	SS	4-14-20-24 (34)	18" 75%		Top of sand (5.2 m BGS)
			becoming wet at 5.2 to 6.1 m BGS									Top of screen (5.8 m BGS)
20	6				AFB1 / AFB2	Upper / Middle Moraine Stratified Sediments and Equivalents	7	SS	8-20-22->50 (>42)	24" 100%		No.2 Silica Sand
												No.10 Slot PVC screen 50 mm diameter
25	8						8	SS	9-20-32-39 (52)	24" 100%		Bottom of screen (7.3 m BGS)
				350.51								Natural Cave
			End of Borehole	8.23								

Screen Interval: 5.79 - 7.32 m BGS
Sand Pack Interval: 5.18 - 7.32 m BGS
Well Seal Interval: 0.30 - 5.18 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW8-10

Project: North Waterloo Subwatershed Study
Client:
Location: North Waterloo, ON; 08
Number: 160340875

Field investigator: R.Dong/L.Veale
Contractor: Pro Core Drilling
Drilling method: Track Mount, CME55, Hollow Stem Auger
Date started/completed: 05-Mar-2010 / 08-Mar-2010

Depth (ft)	Depth (m)	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
		Ground Surface	350.44						
0	0	TOPSOIL some organic material, dark brown, stiff, dry	0.00 349.60			1	SS	2-2-2-3 (4)	12" 50%
		SILT little fine sand, trace clay, light brown	0.84 348.91			2	SS	5-7-9-2 (16)	9" 38%
5		becoming wet at 1.37 m BGS	1.52						
	2	SILT light brown, homogeneous, stiff, wet				3	SS	3-5-7-12 (12)	24" 100%
						4	SS	9-13-14-14 (27)	24" 100%
10						5	PQ	n/a	29" 161%
		some clay beginning at 3.6 m BGS, becoming brownish grey, firm		ATB1	Upper Maryhill Till and Equivalents	6	PQ	n/a	54" 90%
15	4					7	PQ	n/a	54" 90%
						8	PQ	n/a	54" 90%
20	6								
			341.93			9	PQ	n/a	49" 82%
25	8	SAND fine grained, some silt, brown, homogeneous, wet	8.51						
		trace silt beginning at 9.6 m BGS				10	PQ	n/a	55" 92%
30	10								
						11	PQ	n/a	51" 85%
35									
	12	little silt beginning at 12.5 m BGS, becoming greyish brown, soft				12	PQ	n/a	55" 92%
40									
						13	PQ	n/a	55" 92%
45	14								
						14	PQ	n/a	28" 47%
50									
	16	layer of fine sand, trace silt, stiff at 16.2 to 17.1 m BGS				15	PQ	n/a	55" 92%
55									
						16	PQ	n/a	58" 97%
60	18	some silt beginning at 18.9 m BGS							
						17	PQ	n/a	56" 93%
65	20								
		trace silt beginning at 21.6 m BGS				18	PQ	n/a	37" 62%
70									
	22		328.03						
		fine grained, little medium grained sand, grey brown, wet	22.40	AFB1 / AFB2	Upper / Middle Moraine Stratified Sediments and Equivalents	19	PQ	n/a	38" 63%
75									
	24								
80		seam of grey brown, fine sand with little silt 0.2 m thick at 24.5 m BGS							
		medium sand content between 24.7 to 26.2 m BGS				20	PQ	n/a	44" 73%
85	26								
						21	PQ	n/a	60" 100%
90		seam of medium sand 0.2 m thick at 27.7 m BGS							

WELL DETAILS

GS Elev:	350.44 m AMSL
TOC Elev:	351.26 m AMSL
Easting:	532269
Northing:	4814537
Stick-up:	0.82 m

GS Elev:	350.38 m AMSL
TOC Elev:	351.28 m AMSL
Easting:	532271
Northing:	4814538
Stick-up:	0.90 m

Cement
Cement
Holeplug
52 mm Schedule 40 PVC casing
Top of sand (2.74 m BGS)
Top of screen (3.05 m BGS)
No.2 Silica Sand
No.10 Slot PVC screen 50 mm diameter
Bottom of screen (4.57 m BGS)
52 mm Schedule 80 PVC casing
Bentonite Grout

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
PQ - wireline continuous core sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

PQ - continuous core sampling
SS - split spoon sampling

Drawn By/Checked By: OR/LV

STANTEC BOREHOLE AND WELL - CLUST 11X17 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW8-10

Project: North Waterloo Subwatershed Study
Client:
Location: North Waterloo, ON; 08
Number: 160340875

Field investigator: R.Dong/L.Veale
Contractor: Pro Core Drilling
Drilling method: Track Mount, CME55, Hollow Stem Auger
Date started/completed: 05-Mar-2010 / 08-Mar-2010

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
			little silt from 28.0 to 28.7 m BGS fine grained, little medium grained sand, grey brown, wet				22	PQ	n/a	60" 100%
95										
	30						23	PQ	n/a	14" 23%
100										
							24	PQ	n/a	50" 83%
105	32									
							25	PQ	n/a	25" 42%
110			seam of fine sand 5 cm thick at 33.8 m BGS							
	34						26	PQ	n/a	3" 5%
115										
	36						27	PQ	n/a	3" 5%
120			seam of homogeneous fine sand between 36.9 and 37.4 m BGS, and							
							28	PQ	n/a	60" 100%
125	38		37.8 and 38.1 m BGS, and							
			38.6 and 38.8 m BGS	311.42						
			trace gravel beginning at 39.0 m BGS	39.01			29	PQ	n/a	41" 82%
			SAND AND COBBLE		AFB3	Lower Moraine Stratified Sediments				
130			large cobble at 39 m BGS, at 39.5 m and 39.7 m BGS	310.76						
	40		End of Borehole	39.68						
135										
	42									
140										
	44									
145										
150	46									
155										
	48									
160										
	50									
165										
170	52									
175										
	54									
180										
	56									
185										

WELL DETAILS

GS Elev: 350.44 m AMSL
TOC Elev: 351.26 m AMSL
Easting: 532269
Northing: 4814537
Stick-up: 0.82 m

GS Elev: 350.38 m AMSL
TOC Elev: 351.28 m AMSL
Easting: 532271
Northing: 4814538
Stick-up: 0.90 m

- Bentonite Grout
- Holeplug
- Top of sand (35.97 m BGS)
- Top of screen (36.58 m BGS)
- No.2 Silica Sand
- No.10 Slot PVC screen 50 mm diameter
- Bottom of screen (39.68)

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
PQ - wireline continuous core sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

PQ - continuous core sampling
SS - split spoon sampling

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL - CLUST 11X17 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW9-10

Project: North Waterloo Subwatershed Study
Client:
Location: North Waterloo, ON; 09
Number: 160340875

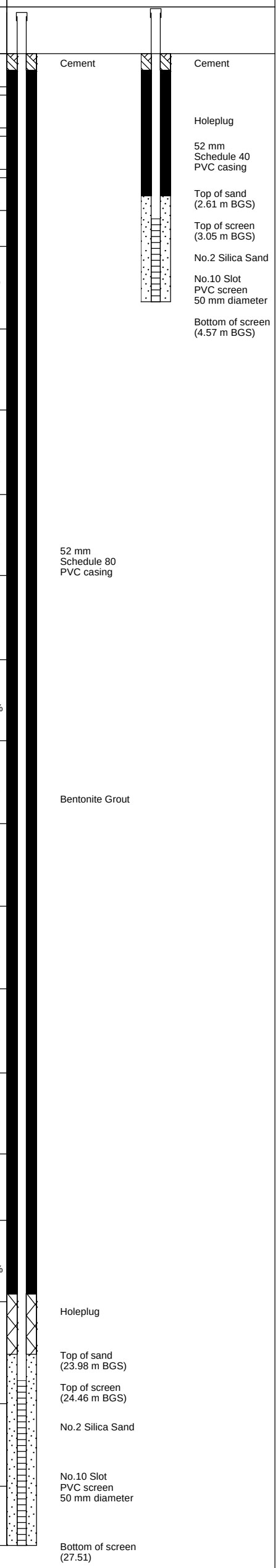
Field investigator: J.Koch
Contractor: Pro Core Drilling
Drilling method: Track Mount, CME75, Hollow Stem Auger
Date started/completed: 02-Mar-2010 / 04-Mar-2010

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
			Ground Surface	345.71						
0	0		TOPSOIL some clay and silt, dark brown	0.00 344.95	ATB1	Upper Maryhill Port Stanley Till and Equivalents	1	SS	n/a	6" 25%
			CLAY some silt, trace gravel, brown, firm	0.76 344.19			2	SS	2-5-7-9 (12)	14" 58%
5	2		brownish grey, homogeneous, firm, wet	1.52			3	SS	4-5-7-9 (12)	15" 63%
							4	SS	2-3-4-6 (7)	15" 63%
10				341.90			5	PQ	n/a	25" 96%
	4		SANDY SILT some clay, brownish grey, firm, wet	3.81 340.93			6	PQ	n/a	52.5" 88%
15			SAND medium grained, silty to some silt, brownish grey, soft, wet	4.78 340.02			7	PQ	n/a	44" 75%
20	6		SILT sandy to some sand, greyish brown, very stiff, wet	5.69						
			seam of fine sand, little silt between 6.6 and 9.5 m BGS				8	PQ	n/a	59" 96%
25	8		little clay between 8.1 and 9.5 m BGS				9	PQ	n/a	58" 99%
30			stratified layers of clayey silt, little to some sand, firm to soft and silt, little clay, very hard between 9.5 and 11.3 m BGS				10	PQ	n/a	58" 95%
35	10		becoming soft at 11.3 m BGS				11	PQ	n/a	59" 100%
40	12				AFB1 / AFB2	Upper / Midle Moraine Stratified Sediments and Equivalents				
45			laminated sediments at 13.4 m BGS				12	PQ	n/a	57" 95%
	14		little fine sand beginning at 14.2 m BGS, soft to firm				13	PQ	n/a	51" 85%
50										
	16						14	PQ	n/a	58" 97%
55			laminated sediments at 17.1 m BGS							
	18						15	PQ	n/a	54" 88%
60			trace fine sand beginning at 18.8 m BGS							
65	20		cobble, 11 cm diameter, at 19.8 m BGS	325.82			16	PQ	n/a	43" 73%
			SAND AND GRAVEL coarse grained gravel, some fine gravel, some cobbles, rounded particles	19.89 324.09	AFB3	Lower Moraine Stratified Sediments	17	PQ	n/a	n/a
70			SILT TILL some fine sand, some coarse gravel, trace fine gravel, grey, very hard, moist	21.62			18	PQ	n/a	60" 101%
75	22						19	PQ	n/a	45" 61%
80	24				ATC1	Upper/ Main Catfish Creek Till				
							20	PQ	n/a	54" 90%
85	26									
90			End of Borehole	318.20 27.51						
	28									

WELL DETAILS

GS Elev: 345.71 m AMSL
TOC Elev: 346.50 m AMSL
Easting: 532634
Northing: 4814717
Stick-up: 0.79 m

GS Elev: 345.83 m AMSL
TOC Elev: 346.69 m AMSL
Easting: 532634
Northing: 4814715
Stick-up: 0.86 m



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
PQ - wireline continuous core sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

PQ - continuous core sampling
SS - split spoon sampling

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL - CLUST 11X17 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW10-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	19-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	346.25 m AMSL
Number:	160340875	**Top of casing elevation:**	347.05 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	532654
Contractor:	Pro Core Drilling	**Northing:**	4814388

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS				WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.80 m
			Ground Surface	346.25								
0	0		TOPSOIL some clay, organics, dark brown	0.00 345.94								
			SAND fine to medium grained, light brown with oxidation staining throughout	0.30			1	SS	2-4-5-8 (9)	16" 67%		Concrete
												Holeplug
							2	SS	10-8-6-6 (14)	0" 0%		52 mm Schedule 40 PVC casing
5				344.57		Upper / Midle Moraine Stratified Sediments and Equivalents						Top of sand (0.9 m BGS)
			SILTY CLAY light brown	1.68 344.42	AFB1 / AFB2		3	SS	3-5-5-5 (10)	18" 75%		Top of screen (1.5 m BGS)
	2		SAND fine grained, some medium sand and silt, light brown, loose to compact, wet	1.83								No.2 Silica Sand
			becoming finer with depth				4	SS	2-3-4-5 (7)	8" 33%		No.10 Slot PVC screen 50 mm diameter
10												Bottom of screen (3.1 m BGS)
							5	SS	6-8-10-8 (18)	16" 67%		
				342.59								
			End of Borehole	3.66								
	4											
15												
	6											
20												
	8											
25												

Screen Interval: 1.52 - 3.05 m BGS
Sand Pack Interval: 0.91 - 3.05 m BGS
Well Seal Interval: 0.30 - 0.91 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

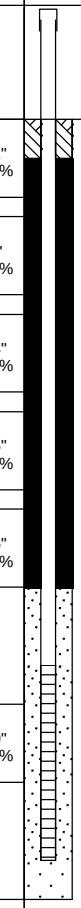
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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW11-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	05-Mar-2010 / 08-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	355.07 m AMSL
Number:	160340875	**Top of casing elevation:**	355.96 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	533047
Contractor:	Pro Core Drilling	**Northing:**	4814655

Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
			Ground Surface	355.07						
0	0		SAND fine to medium grained, trace silt and organics, light brown	0.00 354.76						
			SAND fine to medium grained, light brown, some oxidation staining, loose	0.30			1	SS	1-3-3-5 (6)	11" 46%
			some coarse sand and gravel at 0.8 to 1.4 m BGS				2	SS	4-6-7-6 (13)	6" 25%
5				353.09			3	SS	4-7-12-14 (19)	14" 58%
	2		SILTY SAND fine grained sand, light brown, compact, moist	1.98 352.93						
			SAND fine grained, some medium sand, light brown, loose to compact, moist	2.13			4	SS	5-10-12-12 (22)	15" 63%
10					AFB1 / AFB2	Upper / Midle Moraine Stratified Sediments and Equivalents	5	SS	2-10-16-18 (26)	15" 63%
				351.41						
	4		fine to coarse grained sand, trace gravel, light brown, loose, wet	3.66						
15							6	SS	7-11-12-12 (23)	20" 83%
	6			348.97						
20			SILTY CLAY grey	6.10			7	SS	2-4-5-5 (9)	24" 100%
				348.36						
			End of Borehole	6.71						
25	8									



Stick-up = 0.89 m
Concrete
52 mm Schedule 40 PVC casing
Holeplug
Top of sand (3.7 m BGS)
Top of screen (4.3 m BGS)
No.2 Silica Sand
No.10 Slot PVC screen 50 mm diameter
Bottom of screen (5.8 m BGS)
Natural Cave

Screen Interval: 4.27 - 5.79 m BGS
Sand Pack Interval: 3.66 - 5.79 m BGS
Well Seal Interval: 0.30 - 3.66 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW12-10

Project: North Waterloo Subwatershed Study
Client:
Location: North Waterloo, ON; 12
Number: 160340875

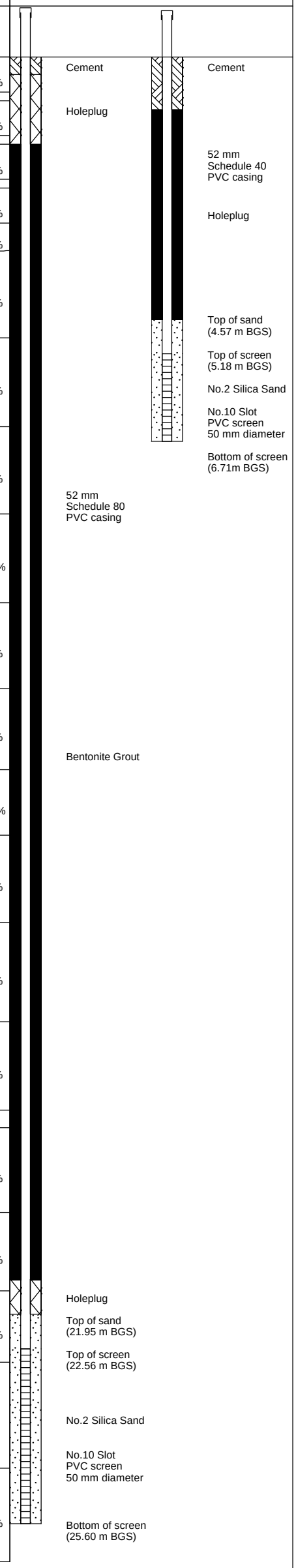
Field investigator: R.Dong
Contractor: Pro Core Drilling
Drilling method: Track Mount, CME55, Hollow Stem Auger
Date started/completed: 09-Mar-2010 / 11-Mar-2010

Depth (ft)	Depth (m)	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery
		Ground Surface	348.63						
0	0	TOPSOIL brown, decaying wood, moist	0.00 347.26			1	SS	2-3-4-4 (7)	12" 50%
						2	SS	3-4-4-4 (8)	10" 42%
5		CLAYEY SILT trace fine sand, light and dark brown mottled, soft, moist	1.37 346.34			3	SS	6-1-7-4 (8)	8" 33%
	2	SILTY CLAY light brown and brown mottled, very stiff, moist	2.29 346.17			4	SS	6-6-8-14 (14)	17" 71%
10		SILT little clay, trace coarse and fine gravel, trace well graded sand, brown, very soft, moist to wet	2.46 345.25			5	SS	n/a	14" 74%
		SILTY CLAY little fine sand, trace cobbles, light brown, firm, moist to wet	3.38			6	PQ	n/a	24" 40%
15	4	becoming stiff, brown at 4.9m BGS seam of wet, brown, fine sand, 0.23 m thick at 5.3 m BGS becoming brown grey at 5.9 m BGS		ATB1	Upper Maryhill Port Stanley Till and Equivalents	7	PQ	n/a	48" 79%
20	6	trace gravel beginning at 7.0 m BGS trace coarse and medium sand beginning at 7.5 m BGS lensed trace soft clay pockets (1-2 mm in diameter), red and grey starting at 7.5 m BGS				8	PQ	n/a	50" 83%
25	8	lensed trace to little silt pockets				9	PQ	n/a	61" 100%
30		laminated 2 mm thick of soft grey clay at 9.4 m BGS							
	10					10	PQ	n/a	49" 83%
35		seam of wet silt and very fine sand, 0.05 m thick at 10.4 m BGS seam of little fine and coarse gravel, little well graded sand, 0.2 m thick at 10.5 m BGS seam of silt and very fine sand 0.05 thick between 10.7 and 11.0 m BGS							
		seam of fine sand 2 mm thick at 11.4 m BGS	337.10			11	PQ	n/a	52" 93%
		SILT AND SAND fine grained, brown grey, homogeneous, wet	11.53 336.64						
40	12	SAND fine grained, brown grey, homogeneous, wet	11.99						
		seam of silt, 0.01 m thick at 12.9 m BGS				12	PQ	n/a	46" 102%
45		seam of silt, 0.01 m thick at 13.3 m BGS							
	14	seam of silt, 0.01 m thick at 14.4 m BGS				13	PQ	n/a	42" 70%
50									
	16	seam of browny grey silty clay with lensed grey clay 0.05 m thick at 15.8 m BGS some medium sand between 16.1 and 16.5 m BGS		AFB1 / AFB2	Upper / Midle Moraine Stratified Sediments and Equivalents	14	PQ	n/a	43" 63%
55						15	PQ	n/a	42" 69%
	18	pocket of very fine sand, 0.03 m diameter at 18.5 m BGS some medium sand between 18.3 and 18.7 m BGS seam of firm silty clay 0.03 m thick at 18.7 m BGS							
60		seam of coarse gravel 0.05 m thick at 19.3 m BGS				16	PQ	n/a	34" 59%
65	20	seam of sand, stiff, 0.1 m thick at 20.0 m BGS							
		seam of some silt 0.04 m thick at 20.8 m BGS seam of some silt 0.13 m thick at 20.9 m BGS	327.50			17	PQ	n/a	48" 89%
70		stratified clayey silt 0.03 m thick at 21.1 m BGS	21.13						
		SAND AND SILT stratified fine sand with little silt, 2 cm thick and coarse sand with fine gravel 0.2 cm thick browny grey, wet	327.09 21.54						
75	22	SAND AND GRAVEL well graded, brown and grey, wet		AFB3	Lower Moraine Stratified Sediments	18	PQ	n/a	36" 74%
	24								
80			323.48			19	PQ	n/a	44" 69%
		SANDY SILT TILL little medium sand coarse sand, trace to little fine and coarse gravel, grey brown, brown very hard, moist	25.15	ATC1	Upper/Main Catfish Creek Till				
85	26		322.37						
		End of Borehole	26.26						
90	28								

WELL DETAILS

GS Elev:	348.63 m AMSL
TOC Elev:	349.52 m AMSL
Easting:	532584
Northing:	4814125
Stick-up:	0.89 m

GS Elev:	348.51 m AMSL
TOC Elev:	349.35 m AMSL
Easting:	532585
Northing:	4814123
Stick-up:	0.84 m



Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
PQ - wireline continuous core sample
n/a - not available

mAMSL - metres above mean sea level
mBGS - metres below ground surface

PQ - continuous core sampling
SS - split spoon sampling

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL - CLUST 11X17 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Monitoring Well: MW13-10

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Track Mount, CME55, Hollow Stem Auger
Client:		**Date started/completed:**	19-Mar-2010
Location:	North Waterloo, ON	**Ground surface elevation:**	345.34 m AMSL
Number:	160340875	**Top of casing elevation:**	346.15 m AMSL
Field investigator:	A.Vandenhoff	**Easting:**	533060
Contractor:	Pro Core Drilling	**Northing:**	4814339

SUBSURFACE PROFILE				HYDROGEOLOGY		SAMPLE DETAILS				WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Hydro Stratigraphic Unit	Description	Sample Number	Sample Type	N Value	Recovery	Diagram	Description
												Stick-up = 0.81 m
			Ground Surface	345.34								
0	0		TOPSOIL clay, organic material, dark brown	0.00			1	SS	1-2-4-6 (6)	7" 29%		Concrete
				344.42								Holeplug
			SILTY CLAY light brown	0.91			2	SS	1-2-4-4 (6)	24" 100%		
5			becoming coarser with depth		ATB1	Upper Maryhill Port Stanley Till and Equivalents						52 mm Schedule 40 PVC casing
	2		becoming clayey silt, some sandy silt				3	SS	2-3-6-8 (9)	14" 58%		
				343.05								
			SANDY SILT fine grained sand, light brown, moist	2.29			4	SS	6-6-6-7 (12)	2" 8%		Top of sand (2.4 m BGS)
10				342.14								Top of screen (3.1 m BGS)
			SILTY SAND fine grained, light brown, wet	3.20			5	SS	0-3-3-7 (6)	16" 67%		No.2 Silica Sand
	4				AFB1 / AFB2	Upper / Midle Moraine Stratified Sediments and Equivalents						No.10 Slot PVC screen 50 mm diameter
15			some medium sand, trace silt beginning at 4.6 m BGS				6	SS	1-2-2-3 (4)	24" 100%		Bottom of screen (4.6 m BGS)
				340.16								
			End of Borehole	5.18								
20	6											
25	8											

Screen Interval: 3.05 - 4.57 m BGS
Sand Pack Interval: 2.44 - 4.57 m BGS
Well Seal Interval: 0.30 - 2.44 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
SS - split-spoon sample
n/a - not available

Drawn By/Checked By: OR/LV

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STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 2/1/11 MJFRASER

Englobe

Ground Elevation:	*353.70 m*	**Borehole Number:**	**BH-17-01**
Northing:	*4814054.9 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532213.7 m*	**Drill Date:**	*2017-08-04*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

SOIL PROFILE			SAMPLE									
Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Dynamic Cone / Std Penetration	Shear Strength (PP) kPa / Initial / Remold / Shear Strength (FV) kPa	Water Content (%)	Headspace (ppm)	Environmental Testing	Groundwater Observations and Standpipe Details
	Ground Elevation		353.70									
0	***PAVEMENT SRUCTURE:***		0.00 / 353.34									
	Asphaltic Concrete: 100 mm		0.36									
	Granular Base: 80 mm											
1	Granular Fill: 280 mm, brown/dark brown silty sand and gravel, occasional cobbles		352.18 / 1.52	SS-1	2-3 / 4	7				0		
	SAND:			SS-2	8-12 / 14	26				0		
2	loose brown sand, some silt, moist			SS-3	6-10 / 18	28				0		
	compact			SS-4	7-11 / 15	26				0		
3			349.89 / 3.81									
	dense		349.43 / 4.27	SS-5	11-15 / 20	35				0		
4	Borehole terminated at 4.27 m											

Dynamic Cone / Std Penetration: 20 40 60 80

Shear Strength (PP) kPa / Shear Strength (FV) kPa: 50 100 150 200 — Initial, Remold

Water Content (%): WP, WL; 10 20 30 40

Groundwater Observations and Standpipe Details:
- asphaltic concrete
- native backfill
- bentonite seal
- At drilling completion, borehole open and dry.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*352.42 m*	**Borehole Number:**	**BH-17-02**
Northing:	*4814110.1 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532158.4 m*	**Drill Date:**	*2017-08-04*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		352.42			
0	***PAVEMENT STRUCTURE:*** Asphaltic Concrete: 100 mm; Granular Fill: 200 mm		0.00 / 352.12	AS-1		
1	***FILL:*** loose dark brown sandy silt, trace gravel, moist to very moist		0.30 / 350.90	SS-2	2-2 / 2	4
2	brown silty sand, trace gravel		1.52 / 350.13	SS-3	2-3 / 3	6
3	***SAND:*** compact brown sand, some silt, moist		2.29 / 349.37	SS-4	6-6 / 9	15
4	very moist; wet		3.05 / 348.92	SS-5	8-10 / 11	21
5	wet to saturated		3.50 / 348.31	SS-6	4-7 / 7	14
	Borehole terminated at 4.27 m		4.12 / 348.15			
			4.27			

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Depth (m)	Headspace (ppm)	Environmental Testing
0	0	
1	0	PHC F1-F4, BTEX, Metals PAHs
2	0	
3	0	
4	0	
4	0	

Groundwater Observations and Standpipe Details

- asphaltic concrete
- native backfill
- bentonite seal
- native cave

At drilling completion, wet cave at 3.66 m.

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Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*350.91 m*	**Borehole Number:**	**BH-17-03**
Northing:	*4814163.6 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532104.8 m*	**Drill Date:**	*2017-08-04*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

SOIL PROFILE			SAMPLE									
Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Dynamic Cone / Std Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content (%)	Headspace (ppm)	Environmental Testing	Groundwater Observations and Standpipe Details
	Ground Elevation		350.91									
	PAVEMENT STRUCTURE: Asphaltic Concrete: 150 mm		0.00 / 350.30									asphaltic concrete
1	Granular Base: 100 mm Granular Fill: 360 mm, brown/dark brown silty sand, some gravel, occasional cobbles, very moist		0.61 / 349.39	SS-1	2-3 4	7				0		native backfill
2	***FILL:*** loose dark brown organic silt, some sand and gravel, very moist to wet		1.52 / 348.62	SS-2	1-2 3-4	5				0	Metals, SAR, EC, pH	bentonite seal
3	***SAND:*** compact brown sand, some silt, moist		2.29	SS-3	4-6 7	13				0		native cave
4	compact silty sand, saturated		346.64 / 4.27	SS-4	3-5 5	10				0		At drilling completion, wet cave at 3.05 m, water level at 2.29 m in open borehole.
5	Borehole terminated at 4.27 m			SS-5	4-5 8	13				0		

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial — Remold — Shear Strength (FV) kPa: 50 100 150 200

Water Content (%): WP WL — 10 20 30 40

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Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*349.79 m*	**Borehole Number:**	**BH-17-04**
Northing:	*4814255.9 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532010.4 m*	**Drill Date:**	*2017-08-04*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Headspace (ppm)	Environmental Testing
	Ground Elevation	349.79					
	PAVEMENT SRUCTURE: Asphaltic Concrete: 200 mm; Granular Base: 300 mm	0.00 / 349.29					
		0.50	SS-1	5-3 3-3	6	5	PHC F1-F4, BTEX, PAHs
	FILL: loose brown sand and gravel, some silt, moist	348.27					
		1.52	SS-2	5-3 3	6	0	
	grey/dark brown organic silt, some sand and gravel, wet	347.50					
		2.29	SS-3	2-3 3	6	40	Metals, SAR, EC, pH
	black/dark brown organic silt, some sand, gravel, and wood, wet	346.59					
		3.20	SS-4	3-5 8	13	0	
	SAND: compact brown silty sand, saturated	346.44					
		3.35					
	SILT: hard brown clayey silt, APL; trace wet sand seams	344.76	SS-5	3-6 10	16	0	
	Borehole terminated at 5.03 m	5.03					

Groundwater Observations and Standpipe Details

- asphaltic concrete
- native backfill
- bentonite seal
- native cave

At drilling completion, wet cave at 4.57 m and water level at 3.35 m.

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Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*350.20 m*	**Borehole Number:**	**BH-17-05**
Northing:	*4814321.9 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*531941.4 m*	**Drill Date:**	*2017-08-04*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

SOIL PROFILE			SAMPLE										
Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Dynamic Cone / Std Penetration	Shear Strength (PP) kPa / Initial / Remold / Shear Strength (FV) kPa	Water Content (%)	Headspace (ppm)	Environmental Testing	Groundwater Observations and Standpipe Details
	Ground Elevation		350.20									
	PAVEMENT STRUCTURE: Asphaltic Concrete: 200 mm Granular Base: 300 mm, slight PHC odour		0.00 / 349.70	AS-1								
			0.50 / 348.68	SS-2	2-3 9	12				20	PHC F1-F4, BTEX, PAHs	
1										15		
	FILL: compact brown/dark brown organic silt and sand, some gravel, trace brick, moist; slight PHC odour		1.52 / 347.91	SS-3	5-7 10	17				0	PHC F1-F4, BTEX, PAHs	
2												
			2.29	SS-4	4-5 10	15				0	PHC F1-F4, BTEX, Metals, SAR, EC, pH	
3												
	SAND: compact brown sand, trace silt and clay, wet saturated			SS-5	3-5 10	15				15		
4												
			345.17	SS-6	4-11 16	27				10		
5	Borehole terminated at 5.03 m		5.03									
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												

Groundwater Observations and Standpipe Details:
- flushmount cover and concrete
- bentonite seal
- sand pack
- 50 mm pipe
- 1.52 m slotted screen
- native cave
- el. 348.13 m 2017-08-08

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Notes: *Headspace readings expressed as parts per million (ppm).*
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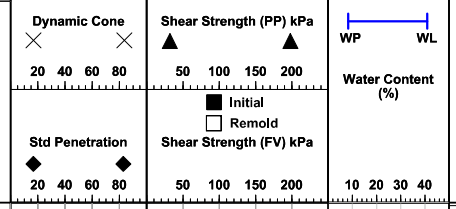
Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

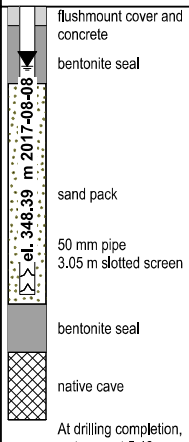
Englobe

Ground Elevation:	*349.25 m*	**Borehole Number:**	**BH-17-06**
Northing:	*4814471.5 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532105 m*	**Drill Date:**	*2017-07-26*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		349.25			
0	***PAVEMENT STRUCTURE:*** Asphaltic Concrete: 50 mm; Granular Base: 250 mm		0.00 / 348.94	AS-1		
			0.30 / 348.49	AS-2		
1	***FILL:*** dark brown/grey silty sand, some gravel, moist; PHC odour		0.76 / 348.34	SS-3	2-2 2-4	4
2	loose, grey, trace organics, very moist		0.91 / 347.73	SS-4	11-6 5-10	11
			1.52 / 347.27	SS-5	3-5 5-5	10
3	***PEAT:*** loose dark brown organic peat, very moist		1.98 / 346.66	SS-6	5-6 4-11	10
			2.59 / 346.20			
4	***SILT:*** compact grey silt, some sand and clay, moist		3.05 / 344.68	SS-7	5-5 8	13
5	wet		4.57			
	hard clayey silt, some fine sand, APL		343.15	SS-8	9-11 9	20
6	saturated sand layers		6.10 / 343.00			
	hard clayey silt, APL to WTPL		6.25 / 342.70			
7	firm to stiff, WTPL		6.55			
	compact fine sandy silt, trace clay, saturated					
8	Borehole terminated at 6.55 m					



Headspace (ppm)	Environmental Testing
0	
15	PHC F1-F4, BTEX, PAHs
70	
5	PHC F1-F4, BTEX, Metals, SAR, EC, pH
10	
35	PHC F1-F4, BTEX
5	
60	



Groundwater Observations and Standpipe Details

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*350.72 m*	**Borehole Number:**	**BH-17-07**
Northing:	*4814538.9 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532241.9 m*	**Drill Date:**	*2017-07-26*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		350.72			
0	***PAVEMENT STRUCTURE:*** Asphaltic Concrete: 50 mm; Granular Base: 150 mm; Granular Subbase: 500 mm		0.00 / 350.02	AS-1		
1			0.70 / 349.20	SS-2	8-12 13-9	25
2	***FILL:*** compact brown sand and gravel, some silt, moist		1.52 / 348.43	SS-3	3-5 6-7	11
3	***SILT TILL:*** compact brown sandy silt, trace clay and gravel, moist to very moist		2.29	SS-4	5-8 9-9	17
4				SS-5	6-7 9-9	16
5	***SILT:*** compact grey fine sandy silt, wet to saturated; some clay		346.15 / 4.57	SS-6	4-6 7	13
6			344.62			
7	***SILT AND SAND:*** compact grey silt and sand, trace clay, saturated		6.10	SS-7	0-6 6	12
8				SS-8	4-5 6	11
9			341.12	SS-9	4-5 5	10
10	Borehole terminated at 9.60 m		9.60			

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Headspace (ppm)	Environmental Testing
0	
5	PHC F1-F4, BTEX, Metals
0	
45	PHC F1-F4, BTEX, Metals
20	
45	
25	
0	
35	

Groundwater Observations and Standpipe Details

- flushmount cover and concrete
- bentonite seal
- el. 348.38 m 2017-08-08
- sand pack
- 50 mm pipe
- 1.52 m slotted screen
- native cave
- At drilling completion, wet cave at 9.14 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*
Bulk sample AS-10 taken from 7.62 to 9.14 m.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*353.20 m*	**Borehole Number:**	**BH-17-08**
Northing:	*4814583.9 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532331.1 m*	**Drill Date:**	*2017-07-26*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		353.20			
	PAVEMENT STRUCTURE: Asphaltic Concrete: 50 mm		0.00 / 352.75			
	Granular Base: 400 mm		0.45 / 352.44	SS-1	4-2 3-5	5
	FILL: brown silty sand, trace gravel, moist		0.76 / 351.98	SS-2	4-5 10-12	15
	loose		1.22 / 351.68	SS-3	6-10 13-17	23
	SAND: brown sand, trace silt, moist		1.52 / 350.61	SS-5	6-7 12-15	19
	compact		2.59 / 350.15			
	some silt, trace gravel, wet		3.05	SS-6	5-9 13	22
	sand, some silt, saturated			SS-7	2-5 5	10
	CLAY TILL: hard grey silty clay, trace sand and gravel, APL		7.77 / 345.43	SS-8	5-8 9	17
	very stiff, WTPL		9.14 / 344.06	SS-9	7-7 9	16
	SILT: compact grey silt, some fine sand and clay, wet		10.67 / 342.53	SS-10	6-7 7	14
	SAND: dense grey silty fine sand, trace clay, saturated		11.43 / 341.77	SS-11	12-16 18-24	34
	Borehole terminated at 12.04 m		12.04 / 341.16			

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Headspace (ppm)	Environmental Testing
0	
0	
0	
0	
0	
0	
0	
0	
130	
60	

Groundwater Observations and Standpipe Details

asphaltic concrete
native backfill
bentonite seal
native cave

At drilling completion, wet cave at 3.05 m and water level at 2.74 m.

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Notes: *Headspace readings expressed as parts per million (ppm).*
Bulk sample AS-4 taken from 1.52 to 3.05 m.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*353.86 m*	**Borehole Number:**	**BH-17-09**
Northing:	*4814608.7 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532389.5 m*	**Drill Date:**	*2017-07-25*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation	353.86			
	PAVEMENT STRUCTURE: Asphaltic Concrete: 50 mm; Granular Base: 150 mm; Granular Subbase: 400 mm	0.00 / 353.26; 0.60 / 352.64			
	FILL: loose brown silt, some sand, trace clay and gravel, moist to very moist	1.22 / 351.57	SS-1	2-3 4-4	7
			SS-2	3-5 5-6	10
	SAND: compact brown sand, some silt, trace gravel, very moist to wet	2.29 / 350.81; 3.05 / 350.41	SS-3	3-4 5-6	9
	SILT: loose brown silt, some clay and sand, trace gravel, wet	3.45 / 349.29; 4.57	SS-4	9-12 14	26
	SAND: compact brown sand, trace silt, moist		SS-5	5-10 15	25
	wet	347.76			
	some silt, saturated	6.10	SS-7	12-19 33	52
	very dense silty sand	346.24			
	dense	7.62	SS-8	10-16 19	35
	SILT: compact grey/brown silt, some fine sand, wet to saturated	344.72 / 9.14	SS-9	5-10 12	22
	SILT TILL: hard grey clayey silt, some fine sand, trace gravel, APL	343.19 / 10.67	SS-10	5-10 18	28
	compact grey silt, some clay, trace sand, saturated	341.67 / 12.19	SS-11	7-7 10	17
	hard clayey silt, some fine sand, trace gravel, APL with saturated layers	340.91 / 12.95	SS-12	6-8 8	16
	Borehole terminated at 13.41 m	340.45 / 13.41			

Dynamic Cone: Std Penetration (20 40 60 80)

Shear Strength (PP) kPa / Shear Strength (FV) kPa: Initial, Remold (50 100 150 200)

Water Content (%): WP, WL (10 20 30 40)

Headspace (ppm)
0
0
0
0
0
0
0
0
0
0
5

Environmental Testing

Groundwater Observations and Standpipe Details

asphaltic concrete
native backfill
bentonite seal
native cave

At drilling completion, wet cave at 4.27 m and water level at 3.81 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*
Bulk sample AS-6 taken from 4.57 to 6.10 m.
Pocket penetrometer results for sample SS-12 vary from <50 kPa (soft layers) to 225 kPa.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*352.83 m*	**Borehole Number:**	**BH-17-10**
Northing:	*4814642.1 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532457.6 m*	**Drill Date:**	*2017-07-25*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		352.83			
	PAVEMENT STRUCTURE: Asphaltic Concrete: 50 mm; Granular Base: 150 mm; Granular Subbase: 400 mm		0.00 / 352.23	AS-1		
1	***FILL:*** compact brown sand and gravel, some silt, trace organics, moist to very moist		0.60 / 351.31	SS-2	11-11 9-7	20
2			1.52 / 350.54	SS-3	7-6 9-12	15
			2.29 / 349.78	SS-4	4-6 8	14
3	***SILT TILL:*** compact brown silt, some clay and fine sand, trace gravel, very moist		3.05 / 348.26	SS-5	4-10 18	28
4	trace sand and gravel					
5	very stiff grey/brown sandy silt, some gravel, trace clay, APL		4.57 / 346.73	SS-6	8-8 8	16
6	***SAND:*** compact brown fine sand, some silt, wet to saturated		6.10 / 345.21	SS-7	5-8 11	19
7	***CLAY:*** very stiff grey silty clay, APL					
8	***SAND:*** compact brown silty sand, saturated		7.62 / 343.53	SS-8	4-6 8	14
9						
10	***SILT TILL:*** hard grey clayey silt, trace gravel, APL to WTPL		9.30 / 342.16	SS-9	5-7 11	18
11	***CLAY:*** stiff grey silty clay, trace gravel, APL to WTPL		10.67 / 340.64	SS-10	3-5 14	19
12						
13	***SILT TILL:*** stiff grey clayey silt, trace sand and gravel, WTPL		12.19 / 339.88	SS-11	6-11 11	22
	hard, some fine sand, trace gravel, APL		12.95 / 339.42	SS-12	9-15 18	33
14	Borehole terminated at 13.41 m		13.41			
15						
16						
17						
18						
19						
20						
21						

Dynamic Cone: Std Penetration — 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Headspace (ppm)	Environmental Testing
0	
0	Metals
0	
0	
0	
0	
0	Metals, SAR, EC, pH
0	
0	
0	
0	
0	

Groundwater Observations and Standpipe Details

- asphaltic concrete
- native backfill
- bentonite seal
- native cave
- At drilling completion, wet cave at 6.71 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*349.47 m*	**Borehole Number:**	**BH-17-11**
Northing:	*4814678.4 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532531.4 m*	**Drill Date:**	*2017-07-24*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		349.47			
	PAVEMENT STRUCTURE: Asphaltic Concrete: 50 mm		0.00 / 348.87			
	Granular Base: 150 mm		0.60 / 348.30	SS-1	3-4 / 4	8
	Granular Subbase: 400 mm		1.17			
	FILL: loose dark brown organic sandy silt, trace gravel, wet		347.18	SS-2	5-4 / 7-8	11
	SILT TILL: hard grey/brown clayey silt, some fine sand, trace gravel, APL		2.29	SS-3	4-6 / 10-12	16
			345.97	SS-4	4-7 / 9-9	16
	very stiff, trace sand and gravel		3.50			
	grey		344.90			
	compact brown sandy silt, some clay and gravel, wet; some saturated sand seams		4.57 / 343.37	SS-6	3-5 / 10	15
	SILT AND SAND: dense brown silt and sand, trace clay, saturated		6.10	SS-7	11-14 / 17	31
			341.85			
	compact grey/brown silty sand		7.62	SS-8	8-9 / 13	22
	SILT TILL: hard grey clayey silt, trace sand, APL		341.55 / 7.92			
			339.87	SS-9	8-11 / 12	23
	Borehole terminated at 9.60 m		9.60			

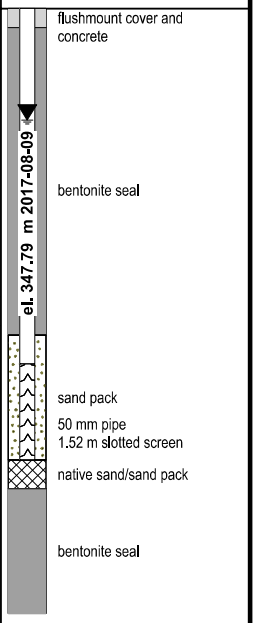
Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

Water Content (%): WP WL — 10 20 30 40

Headspace (ppm)	Environmental Testing
0	
0	
0	
0	
10	PHC F1-F4, BTEX
0	
0	
5	

Groundwater Observations and Standpipe Details



Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*
Bulk sample AS-5 taken from 1.52 to 3.05 m.
MOECC Well Tag No.A175484.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*357.83 m*	**Borehole Number:**	**BH-17-12**
Northing:	*4814944.6 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*533050.1 m*	**Drill Date:**	*2017-07-24*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

SOIL PROFILE		SAMPLE										
Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Dynamic Cone / Std Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content (%)	Headspace (ppm)	Environmental Testing	Groundwater Observations and Standpipe Details
	Ground Elevation		357.83									
0	***FILL:*** loose brown/dark brown sand, some gravel, silt, and topsoil, moist		0.00 / 357.37 / 0.46	SS-1	4-3 / 2-4	5				0		flushmount cover and concrete
1				SS-2	4-4 / 5-6	9				0	Metals, SAR, EC, pH	
2	***POSSIBLE FILL:*** loose to compact, brown sand and gravel, some silt, moist		355.54	SS-3	4-6 / 6-8	12				0	Metals, SAR, EC, pH	
	SAND: compact brown sand, trace silt and gravel, moist		2.29	SS-4	3-5 / 6-7	11				0		
3				SS-5	4-6 / 6-7	12				0		
4			353.26									bentonite seal
	some silt		4.57	SS-7	4-11 / 16	27				0		
5												
6	saturated		351.73 / 6.10	SS-8	5-9 / 12	21				0	Metals	
7												
	trace to some gravel, trace silt		350.21 / 7.62	SS-9	6-10 / 10	20				0		
8												
9			348.69									sand pack
	dense gravelly sand, some silt		9.14	SS-10	15-16 / 17	33				0		50 mm pipe
10				SS-12	8-14 / 21	35				5		1.52 m slotted screen
	Borehole terminated at 10.36 m		347.47 / 10.36									native cave
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

el. 352.02 m 2017-08-10

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*
Bulk samples AS-6 taken from 3.05 to 4.57 m and AS-11 taken from 9.14 to 9.91 m.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*343.65 m*	**Borehole Number:**	**BH-17-13**
Northing:	*4814082.8 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*533656.2 m*	**Drill Date:**	*2017-07-27*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		343.65			
0	***PAVEMENT STRUCTURE:*** Asphaltic Concrete: 30 mm; Granular Base: 150 mm; Granular Subbase: 350 mm		0.00 / 343.12	AS-1		
1	***FILL:*** compact brown sand and gravel, some silt, very moist		0.53 / 342.13	SS-2	7-13 9-9	22
2	grey, some organics		1.52 / 341.57	SS-3	12-8 9-6	17
			2.08 / 340.60	SS-4	4-3 3-8	6
3	***SAND:*** loose grey/dark brown sand, some organics, silt, and gravel, very moist to wet		3.05 / 340.14	SS-5	10-13 13-11	26
4			3.50			
5	***SAND AND GRAVEL:*** compact grey silty sand and gravel, trace organics, saturated			SS-6	8-6 8-13	14
6	***SILT:*** compact grey silt, trace clay, saturated		337.55 / 6.10	SS-7	9-12 10	22
7	compact grey fine sandy silt, trace clay and gravel, saturated					
8			335.57	SS-8	9-12 12	24
	Borehole terminated at 8.08 m		8.08			

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Headspace (ppm)	Environmental Testing
0	
0	Metals, SAR, EC, pH, PAHs
0	
0	
65	
110	PHC F1-F4, VOCs
55	

Groundwater Observations and Standpipe Details

- flushmount cover and concrete
- bentonite seal
- el. 342.42 m 2017-08-09
- sand pack
- 50 mm pipe
- 3.05 m slotted screen
- bentonite seal

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*346.93 m*	**Borehole Number:**	**BH-17-14**
Northing:	*4814492.2 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*533373.4 m*	**Drill Date:**	*2017-07-31*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		346.93			
0	***TOPSOIL:*** dark brown silt, trace sand and gravel, moist		0.00 / 346.68 / 0.25	AS-1		
1	***SILT TILL:*** compact brown/grey silt, some clay, trace sand and gravel, very moist		345.41 / 1.52	SS-2	3-6 / 8	14
2	hard greyish brown clayey silt, DTPL to APL		344.64 / 2.29	SS-3	3-5 / 11	16
3	grey, some fine sand, APL; wet sand seams		343.88 / 3.05	SS-4	3-5 / 6	11
4	***CLAY:*** hard grey silty clay, APL			SS-5	2-5 / 7	12
5	firm to very stiff clay, some silt, APL to WTPL		342.36 / 4.57	SS-7	2-4 / 4	8
6			340.83			
7	stiff, APL		6.10	SS-8	3-5 / 5	10
8	hard silty clay, APL		339.31 / 7.62	SS-9	3-5 / 5	10
9	***SAND:*** compact grey silty sand, saturated		339.16 / 7.77			
10	***CLAY:*** hard grey silty clay, APL; saturated sand seams		337.79 / 9.14	SS-10	3-4 / 9	13
11	very stiff, APL		336.26 / 10.67	SS-11	5-8 / 9	17
12	hard		334.74 / 12.19	SS-12	4-6 / 10	16
13			333.21			
14	***SILT:*** very stiff grey clayey silt, some fine sand, APL; wet sand seams		13.72	SS-13	5-5 / 5-5	10
15			331.69			
16	***SAND:*** dense grey silty fine sand, some clay, saturated		15.24 / 331.23 / 15.70	SS-14	8-17 / 16	33
17	Borehole terminated at 15.70 m					
18						
19						
20						
21						

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Depth (m)	Headspace (ppm)
0	0
1	0
2	5
3	5
4	0
5	0
6	5
7	
8	5
9	
10	5
11	10
12	5
13	
14	10
15	
16	160
17	
18	
19	
20	
21	

Environmental Testing: OCPs

Groundwater Observations and Standpipe Details: bentonite seal; native cave; At drilling completion, wet cave at 8.23 m, water level at 7.92 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Bulk sample AS-6 taken from 3.05 to 4.75 m.*
Headspace readings expressed as parts per million (ppm).

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation: *347.23 m* **Borehole Number:** **BH-17-15**

Northing: *4814503.5 m* **Job N°:** *P-0008118-0-02-101*

Easting: *533364.4 m* **Drill Date:** *2017-07-31*

Project: *Beaver Creek Road and Conservation Drive Sanitary Pump Stations* **Field Tech:** *D.Souter*

Location: *Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario* **Drill Method:** *Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Headspace (ppm)
	Ground Elevation		347.23				
	TOPSOIL: dark brown silt, trace sand and gravel, moist		0.00 / 347.03	AS-1			0
			0.20 / 346.47	SS-2	2-4 10	14	0
1	***SILT:*** brown silt, some sand, trace gravel, moist		0.76 / 345.71	SS-3	4-6 10	16	0
			1.52 / 344.94	SS-4	4-9 9	18	5
2	***SILT TILL:*** compact brown silt, some clay and sand, trace gravel, very moist		2.29 / 344.18	SS-5	2-2 2	4	5
3	hard grey clayey silt, trace sand and gravel, DTPL to APL; wet sand seams at 1.52 m		3.05 / 342.66	SS-6	2-3 4	7	0
4	***SILT:*** very stiff grey clayey silt, some fine sand, APL to WTPL		4.57	SS-7	2-4 5	9	5
5	***SILT AND CLAY:*** stiff to very stiff grey silt and clay, APL						
6	very stiff, APL to WTPL						
7			7.62 / 339.61	SS-8	3-5 7	12	0
8	***SILT:*** very stiff grey clayey silt, APL						
9			9.14 / 338.09	SS-9	5-10 15	25	0
10	***SILT TILL:*** hard grey clayey silt, trace sand and gravel, APL		9.60 / 337.63				
	Borehole terminated at 9.60 m						
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30

Environmental Testing

Groundwater Observations and Standpipe Details

bentonite seal

native cave

At drilling completion, dry cave at 3.35 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

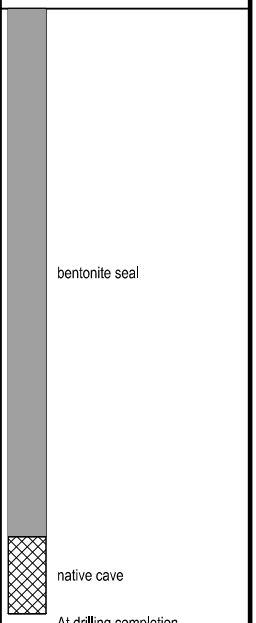
Ground Elevation:	*347.74 m*	**Borehole Number:**	**BH-17-16**
Northing:	*4814513.7 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*533356.1 m*	**Drill Date:**	*2017-07-28*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		347.74			
0	***TOPSOIL:*** dark brown silt, trace sand and gravel, moist		0.00 / 347.54	AS-1		
			0.20 / 346.98	SS-2	5-3 / 5	8
1	***SILT:*** brown sandy silt, trace gravel, moist		0.76 / 346.67			
			1.07 / 346.22	SS-3	5-7 / 8	15
2	***SAND:*** loose brown sand, some silt and gravel, wet		1.52 / 345.45	SS-4	3-4 / 7	11
			2.29 / 344.69	SS-5	2-5 / 10	15
3	***SILT:*** loose brown silt, some clay and fine sand, very moist		3.05			
4	compact, grey/brown, wet					
	SILT TILL: hard grey clayey silt, trace sand and fine gravel, DTPL		343.17 / 4.57	SS-6	2-3 / 3	6
5						
6	***CLAY:*** hard to very stiff grey silty clay, APL; wet silty sand seams			SS-7	3-5 / 5	10
7	firm to stiff clay, some silt, APL		340.12			
	SILT: very stiff to hard grey clayey silt, APL; some wet sand seams		7.62	SS-8	3-5 / 6	11
8						
9	hard; saturated sand layers		338.60 / 9.14	SS-9	5-8 / 10	18
	Borehole terminated at 9.60 m		338.14 / 9.60			
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

Dynamic Cone: 20 40 60 80
Std Penetration: 20 40 60 80
Shear Strength (PP) kPa: 50 100 150 200
Initial
Remold
Shear Strength (FV) kPa: 50 100 150 200
WP WL
Water Content (%): 10 20 30 40

Depth (m)	Headspace (ppm)	Environmental Testing
0	0	
1	0	
2	20	
3	0	
4	25	PHC F1-F4, BTEX, Metals
5	5	
6	20	
7		
8	0	
9	35	
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		

Groundwater Observations and Standpipe Details



At drilling completion, wet cave at 8.38 m and water level at 7.92 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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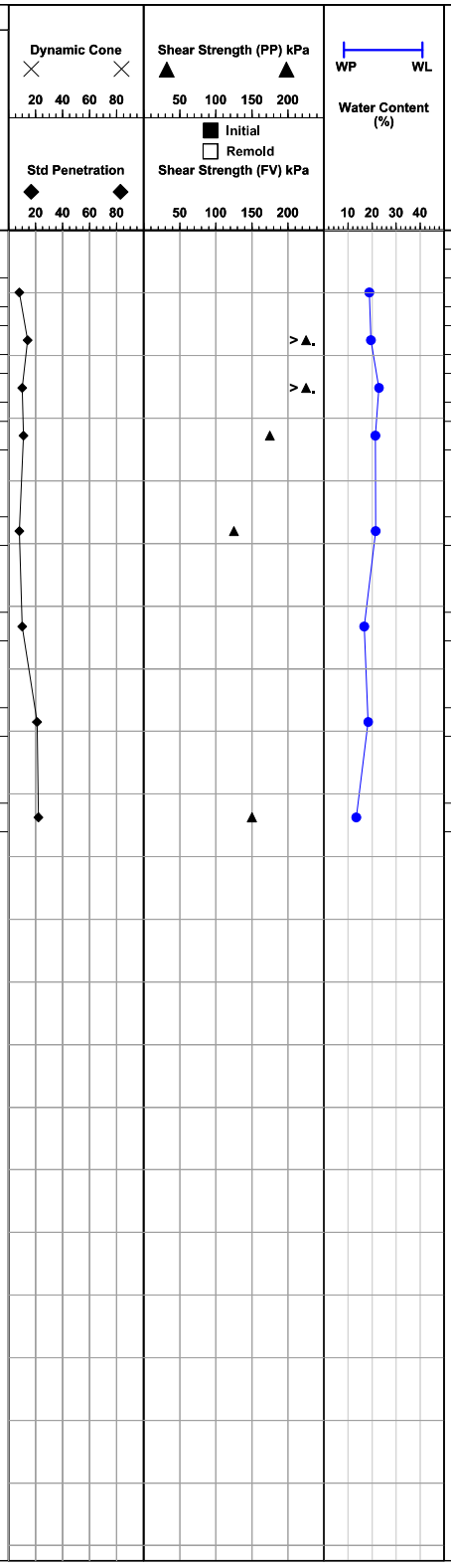
Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*347.54 m*	**Borehole Number:**	**BH-17-17**
Northing:	*4814484.7 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*533350.1 m*	**Drill Date:**	*2017-07-31*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

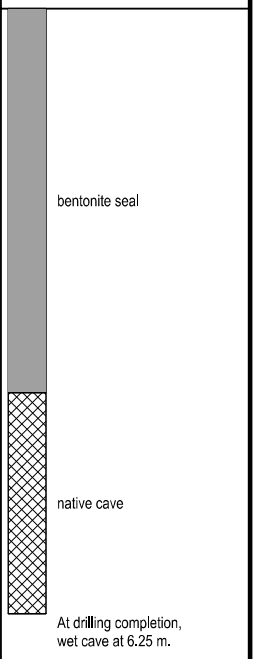
Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		347.54			
	TOPSOIL: dark brown silt, trace sand and gravel, moist		0.00 / 347.16	AS-1		
1	***SILT:*** brown/dark brown silt, some topsoil and sand, trace gravel, moist		0.38 / 346.78	SS-2	3-3 5	8
2	***SILT TILL:*** loose brown silt, some clay and sand, trace gravel, very moist to wet		0.76 / 346.02	SS-3	2-5 9	14
3	hard clayey silt, trace sand and gravel, DTPL		1.52 / 345.25	SS-4	3-4 6	10
	APL		2.29 / 344.49	SS-5	3-5 6	11
4			3.05 / 342.97			
	SILT: very stiff brown with thin grey seams clayey silt, APL		4.57	SS-6	2-3 5	8
5	***CLAY:*** very stiff grey clay, some silt, APL		341.44			
6	***SAND:*** compact grey silty sand, trace clay, saturated		6.10	SS-7	3-5 5	10
7			339.92			
	layers of clayey silt, APL		7.62	SS-8	8-11 10	21
8			338.40			
9	***SILT TILL:*** very stiff grey clayey silt, some sand, APL; saturated sand seams		9.14 / 337.94	SS-9	6-7 15	22
	Borehole terminated at 9.60 m		9.60			
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						



Headspace (ppm)
0
0
0
0
0
15
25
15

Environmental Testing

Groundwater Observations and Standpipe Details



Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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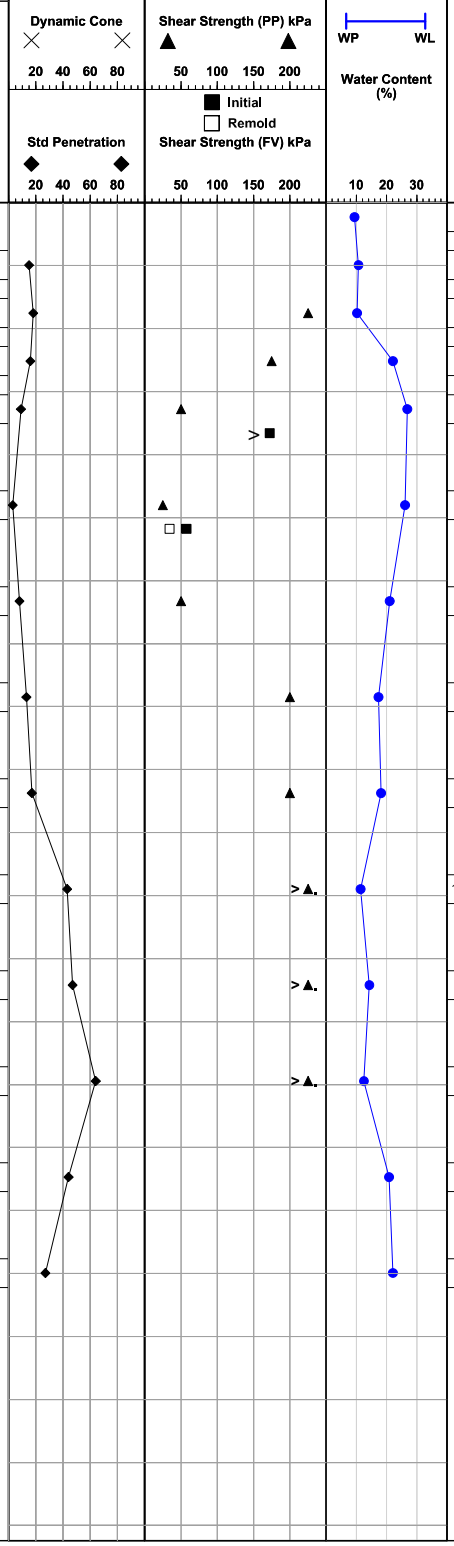
Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

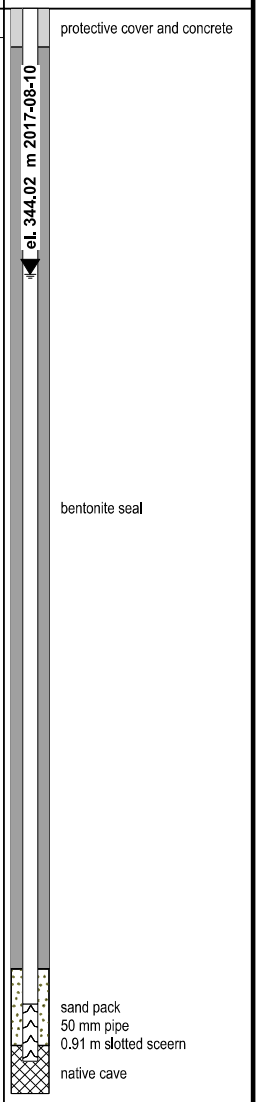
Englobe

Ground Elevation:	*348.15 m*	**Borehole Number:**	**BH-17-18**
Northing:	*4814497.5 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*533343.1 m*	**Drill Date:**	*2017-07-28*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		348.15			
0	***TOPSOIL:*** dark brown silt, trace sand and gravel, moist		0.00 / 347.90	AS-1		
			0.25 / 347.39	SS-2	6-7 8	15
1	***SAND:*** brown/dark brown silty sand, some gravel, trace topsoil, occasional cobbles, moist		0.76 / 347.08	SS-3	6-8 10	18
			1.07 / 346.63	SS-4	7-8 8	16
2	compact brown sand, some silt, wet		1.52 / 345.71	SS-5	4-4 5	9
	SAND AND GRAVEL: compact brown sand and gravel, some silt, wet		2.44 / 345.10	SS-6	1-1 2	3
3	***SILT TILL:*** hard brown clayey silt, trace sand and gravel, APL		3.05 / 343.58	SS-7	2-3 5	8
	CLAY: hard to very stiff grey silty clay, APL		4.57 / 342.05	SS-8	4-6 7	13
4	firm clay, some silt, WTPL		6.10 / 340.53	SS-9	4-8 9	17
	soft		7.62 / 339.01	SS-10	15-18 25	43
5	stiff, APL		9.14 / 337.48	SS-11	15-17 30	47
	SILT TILL: hard grey clayey silt, trace sand and gravel, APL; saturated sand layers		10.67 / 332.76	SS-12	14-24 40	64
6	***CLAY:*** hard grey silty clay, APL; trace wet sand seams		15.39 / 331.39	SS-13	15-23 21	44
	SILT TILL: hard grey clayey silt, trace sand and gravel, DTPL; trace wet sand seams		16.76 / 330.93	SS-14	5-9 18	27
7	***SAND:*** dense grey sand, trace silt, saturated		17.22			
	compact					
8	Borehole terminated at 17.22 m					



Headspace (ppm)	Environmental Testing
10	OCPs
0	
0	
0	
5	
0	
0	
15	
0	
150	
60	
20	
50	
20	



Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*
Bulk sample AS-6A taken from 4.75 to 6.10 m.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*347.08 m*	**Borehole Number:**	**BH-17-19**
Northing:	*4814681.2 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532591.5 m*	**Drill Date:**	*2017-08-02*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Headspace (ppm)
	Ground Elevation	347.08				
	TOPSOIL: dark brown silt, trace sand and gravel, moist	0.00 / 346.88	AS-1			15
		0.20 / 346.32	SS-2	4-6 / 10	16	0
1	***SILT:*** brown/dark brown silt, trace topsoil, sand, and gravel, moist	0.76 / 345.56	SS-3	4-7 / 11	18	0
2	hard mottled grey/brown clayey silt, trace sand, DTPL	1.52 / 344.79	SS-4	3-4 / 5	9	0
	SILT TILL: hard brown/grey clayey silt, trace sand and gravel, DTPL	2.29 / 344.03	SS-5	2-6 / 5	11	0
3		3.05 / 342.51				
4	***CLAY:*** very stiff grey silty clay, APL					
	stiff, APL to WTPL	4.57 / 340.98	SS-6	3-9 / 12	21	40
5	***SAND:*** compact grey silty sand, trace clay, wet					
6		6.10 / 339.46	SS-7	5-6 / 14	20	5
	SILT: hard grey clayey silt, some sand, APL					
7		7.62 / 339.00	SS-8	8-15 / 24	39	50
	SAND: dense grey silty sand, saturated					
8	Borehole terminated at 8.08 m	8.08				
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30

Environmental Testing: PHC F1-F4, BTEX

Groundwater Observations and Standpipe Details:
- bentonite seal
- native cave
- At drilling completion, dry cave at 7.62 m and water level at 3.35 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*346.62 m*	**Borehole Number:**	**BH-17-20**
Northing:	*4814687.6 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532608.6 m*	**Drill Date:**	*2017-08-02*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		346.62			
0	***TOPSOIL:*** dark brown silt, trace sand and gravel, moist		0.00 / 346.39	AS-1		
1	***SILT:*** grey/brown mottled silt, some clay, trace sand and gravel, moist		0.23 / 345.86	SS-2	4-6 11	17
2	hard grey/brown clayey silt, DTPL to APL		0.76 / 345.10	SS-3	3-6 7	13
			1.52 / 344.33	SS-4	3-5 7	12
3	grey, trace sand, APL; some wet sand seams		2.29 / 343.57	SS-5	3-6 11	17
4	APL to WTPL		3.05 / 341.90			
5	***SAND:*** compact grey silty sand, trace clay and gravel, wet to saturated		4.72 / 340.52	SS-6	7-12 14	26
6	***SILT:*** hard grey clayey silt, some sand, trace gravel, APL		6.10 / 337.48	SS-7	12-17 22	39
7	***SAND:*** dense grey silty sand, some clay, trace gravel, wet to saturated			SS-8	11-16 22	38
9	***SILT TILL:*** hard grey clayey silt, trace sand and gravel, DTPL		9.14 / 335.95	SS-9	12-15 20	35
10	***SILT:*** dense grey sandy silt, some clay, wet to saturated		10.67 / 334.43	SS-10	8-14 20	34
12	compact		12.19 / 331.38	SS-11	6-11 15	26
14				SS-12	4-10 16	26
15	dense		15.24 / 329.86	SS-13	8-15 20	35
17	compact silt, some sand and clay, saturated		16.76 / 328.33	SS-14	5-6 9	15
18	sandy silt, some clay, saturated		18.29 / 327.88	SS-15	10-14 10	24
19	Borehole terminated at 18.75 m		18.75			

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30

Depth (m)	Headspace (ppm)
0	0
1	0
2	0
3	15
5	10
6	0
8	20
10	20
11	10
13	50
14	25
16	30
17	15
19	350

Environmental Testing: PHC F1-F4, BTEX

Groundwater Observations and Standpipe Details: bentonite seal; native cave

At drilling completion, wet cave at 5.49 m and water level at 3.05 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*346.14 m*	**Borehole Number:**	**BH-17-21**
Northing:	*4814696.2 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532624.3 m*	**Drill Date:**	*2017-08-03*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		346.14			
	TOPSOIL: dark brown silt, trace sand and gravel, moist		0.00 / 345.81	AS-1		
1			0.33 / 345.38	SS-2	4-7 9	16
	SILT: mottled grey/brown silt, some clay, trace sand and gravel, moist		0.76 / 344.62			
2			1.52 / 343.85	SS-3	3-5 5	10
	SILT TILL: hard grey clayey silt, trace gravel, DTPL		2.29 / 343.09	SS-4	3-4 4	8
3			3.05	SS-5	3-5 5	10
	CLAY: stiff to very stiff grey silty clay, APL					
4	***SILT:*** very stiff grey clayey silt, some sand, APL		341.57			
5			4.57 / 341.26	SS-6	3-6 11	17
	trace fine sand, APL		4.88			
6	compact silt, some clay and sand, wet to saturated		340.04			
	sandy silt, saturated		6.10	SS-7	10-12 18	30
7	***SILT TILL:*** hard grey clayey silt, trace fine sand and gravel, DTPL		338.52			
	DTPL; wet silty sand seams		7.62 / 338.06	SS-8	11-14 18	32
8	Borehole terminated at 8.08 m		8.08			
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Headspace (ppm)
0
0
0
0
0
0
0
0

Environmental Testing

Groundwater Observations and Standpipe Details

bentonite seal

native cave

At drilling completion, wet cave at 5.49 m,

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

Vertical Scale = 1 : 120.0

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EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*346.50 m*	**Borehole Number:**	**BH-17-22**
Northing:	*4814667.2 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532610.9 m*	**Drill Date:**	*2017-08-03*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation		346.50			
0	***TOPSOIL:*** dark brown silt, trace sand and gravel, moist		0.00 / 346.25	AS-1		
			0.25 / 345.74	SS-2	3-7 / 11	18
1	***SILT:*** brown silt, some clay, trace sand and gravel, moist		0.76 / 344.98	SS-3	4-7 / 10	17
			1.52 / 344.21	SS-4	3-4 / 4	8
2	***SILT TILL:*** hard mottled grey/brown clayey silt, trace sand and gravel, DTPL		2.29 / 343.45	SS-5	4-4 / 6	10
	brown, some sand		3.05 / 343.15			
3	***CLAY:*** very stiff grey silty clay, trace fine sand, APL		3.35			
	hard		341.47	SS-6	6-9 / 9	18
4	***SAND:*** compact grey silty sand, saturated		5.03			
	SILT: dense grey silt, some sand and clay, wet to saturated			SS-7	8-17 / 16	33
5						
			338.42	SS-8	9-15 / 25	40
6	Borehole terminated at 8.08 m		8.08			
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

Dynamic Cone: 20 40 60 80
Std Penetration: 20 40 60 80
Shear Strength (PP) kPa: 50 100 150 200
Initial
Remold
Shear Strength (FV) kPa: 50 100 150 200
WP WL
Water Content (%): 10 20 30 40

Headspace (ppm)
0
0
0
0
0
15
0
0

Environmental Testing

Groundwater Observations and Standpipe Details

bentonite seal

native cave

At drilling completion, wet cave at 7.01 m and water level at 3.66 m.

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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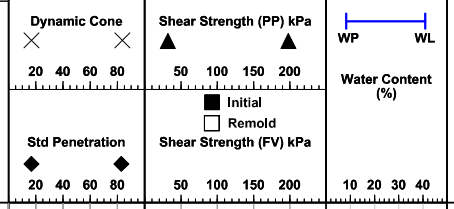
Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

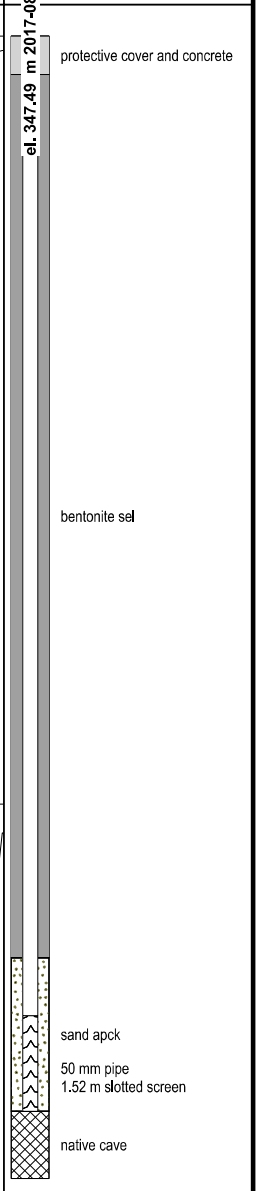
Englobe

Ground Elevation:	*346.20 m*	**Borehole Number:**	**BH-17-23**
Northing:	*4814677.3 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532629.4 m*	**Drill Date:**	*2017-08-01*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value
	Ground Elevation	346.20			
0	***TOPSOIL:*** dark brown silt, some clay, trace sand and gravel, moist	0.00 / 345.97 / 0.23	AS-1		
1	***SILT TILL:*** hard mottled grey/brown clayey silt, trace sand and gravel, DTPL		SS-2	3-6 / 10	16
2	grey/brown	344.68 / 1.52	SS-3	4-8 / 10	18
	grey, trace fine fravel, APL	343.91 / 2.29	SS-4	5-6 / 10	16
3	***CLAY:*** hard grey silty clay, APL	343.15 / 3.05	SS-5	3-5 / 9	14
4					
5	***SILT:*** compact grey fine sandy silt, trace clay, very moist to wet	341.32 / 4.88	SS-7	3-6 / 7	13
6	very stiff clayey silt, trace sand, APL; saturated sand layers	340.10 / 6.10	SS-8	4-7 / 9	16
7		338.58			
8	***SAND:*** loose grey silty fine sand, some clay, saturated	7.62	SS-9	1-1 / 4-4	5
9		337.06			
10	***SILT TILL:*** hard grey clayey silt, some fine sand, trace gravel, APL	9.14	SS-10	10-15 / 19	34
11	***SILT:*** compact grey silt, some sand and clay, wet; saturated sand layers	335.53 / 10.67	SS-11	8-12 / 12	24
12	dense fine sandy silt, saturated	334.01 / 12.19	SS-12	9-16 / 18	34
13		332.48			
14	compact, trace clay	13.72	SS-13	7-11 / 14	25
15		330.96			
16	silt, some clay, trace sand	15.24	SS-14	4-8 / 15	23
17			SS-15	6-5 / 5-5	10
18		328.06	SS-16	4-4 / 8-10	12
	Borehole terminated at 18.14 m	18.14			
19					
20					



Headspace (ppm)	Environmental Testing
5	OCPs
10	
0	
0	
5	
15	
10	
40	
15	
20	
130	PHC F1-F4, VOCs, Metals
130	
110	
40	
90	



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Notes: *Headspace readings expressed as parts per million (ppm).*
Auger sample AS-6 taken from 3.05 to 4.57 m.

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Englobe

Ground Elevation:	*347.43 m*	**Borehole Number:**	**BH-17-24**
Northing:	*4814730 .0 m*	**Job N°:**	*P-0008118-0-02-101*
Easting:	*532634.6 m*	**Drill Date:**	*2017-07-24*
Project:	*Beaver Creek Road and Conservation Drive Sanitary Pump Stations*	**Field Tech:**	*D.Souter*
Location:	*Beaver Creek Rd., Conservation Dr. and Erbsville Rd., Waterloo, Ontario*	**Drill Method:**	*Hollow Stem Auger*

Depth (m)	Description	Symbol	Elevation (m) / Depth (m)	Type and Number	"Blows" /150 mm	SPT 'N' Value	Headspace (ppm)	Environmental Testing	Groundwater Observations and Standpipe Details
	Ground Elevation		347.43						
0	***PAVEMENT STRUCTURE:*** Asphaltic Concrete: 50 mm; Granular Base: 100 mm; Granular Subbase: 400 mm		0.00 / 346.88	SA-1			5		asphaltic concrete; native backfill
1			0.55 / 345.91	SS-2	6-4 5-5	9	20	PHC F1-F4, BTEX, PAHs	
2	***FILL:*** loose brown/dark brown silt, some sand and gravel, trace clay and topsoil, moist; PHC - like odour		1.52 / 345.14	SS-3	4-4 5-6	9	5	Metals, PAHs	
			2.29 / 344.69	SS-4	8-10 6-6	16	5		
3	some sand, organics and brick, trace gravel, wet		2.74	SS-5	5-8 9	17	5		
4	***SAND:*** compact grey/brown silty sand, wet								bentonite seal
	SILT TILL: hard grey clayey silt, trace sand and gravel, APL		342.86 / 4.57	SS-6	4-6 7	13	0		
5	very stiff								
6			341.33						
	compact silt, some fine sand and clay, trace gravel, moist to very moist		6.10	SS-7	9-12 12	24	0		
7			339.81						
8	hard clayey silt, trace sand and gravel, APL		7.62 / 339.20	SS-8	8-13 17-21	30	0		native cave
	Borehole terminated at 8.23 m		8.23						At drilling completion, wet cave at 7.32 m and water level at 5.79 m.
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									

Dynamic Cone: 20 40 60 80 — Std Penetration: 20 40 60 80

Shear Strength (PP) kPa: 50 100 150 200 — Initial / Remold — Shear Strength (FV) kPa: 50 100 150 200

WP WL — Water Content (%): 10 20 30 40

Reviewed by: *K.Thrams* **Drafted by:** *E.Ciochon* **Sheet:** *1 of 1*

Notes: *Headspace readings expressed as parts per million (ppm).*

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Vertical Scale = 1 : 120.0

EQ-09-Ge-72 R.1 18.02.2011

Drive Point: DP1-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	349.30 m AMSL
Number:	160340875	**Top of casing elevation:**	350.09 m AMSL
Field investigator:	RD/LJ	**Easting:**	532107
Contractor:	Stantec Consulting Ltd.	**Northing:**	4815046

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.79 m 25 mm diameter steel casing
0	0		Ground Surface	349.30					
			SEDIMENT	0.00					
2									
	1								Top of screen (1.04 m BGS) 19 mm diameter Ingleton drive-point
4				347.84					
			End of Drive Point	1.46					Bottom of screen (1.46 m BGS)
6									
	2								
8									
10	3								
12									

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP2-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	347.60 m AMSL
Number:	160340875	**Top of casing elevation:**	348.46 m AMSL
Field investigator:	RD/LJ	**Easting:**	532526
Contractor:	Stantec Consulting Ltd.	**Northing:**	4814968

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.86 m 25 mm diameter steel casing
0	0		Ground Surface	347.60					
			SEDIMENT	0.00					
2									Top of screen (0.97 m BGS) 19 mm diameter Ingleton drive-point
4	1			346.21					Bottom of screen (1.39 m BGS)
			End of Drive Point	1.39					
6	2								
8									
10	3								
12									

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP3-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	345.07 m AMSL
Number:	160340875	**Top of casing elevation:**	346.65 m AMSL
Field investigator:	RD/LJ	**Easting:**	532643
Contractor:	Stantec Consulting Ltd.	**Northing:**	4814727

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-4	-1								Stick-up = 1.58 m
-2									25 mm diameter steel casing
0	0		Ground Surface	345.07					
			SEDIMENT	0.00					
2	1								Top of screen (0.72 m BGS)
									19 mm diameter Ingleton drive-point
				343.93					Bottom of screen (1.14 m BGS)
4			End of Drive Point	1.14					
6	2								
8									

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP4-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	344.17 m AMSL
Number:	160340875	**Top of casing elevation:**	345.13 m AMSL
Field investigator:	RD/LJ	**Easting:**	532840
Contractor:	Stantec Consulting Ltd.	**Northing:**	4814564

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.96 m 25 mm diameter steel casing
0	0		Ground Surface	344.17					
			SEDIMENT	0.00					Top of screen (1.17 m BGS) 19 mm diameter Ingleton drive-point
2									
	1								
4									
				342.57					Bottom of screen (1.59 m BGS)
			End of Drive Point	1.59					
6									
	2								
8									
10									
	3								

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP5-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	342.86 m AMSL
Number:	160340875	**Top of casing elevation:**	343.84 m AMSL
Field investigator:	RD/LJ	**Easting:**	533147
Contractor:	Stantec Consulting Ltd.	**Northing:**	4814419

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.98 m 25 mm diameter steel casing
0	0		Ground Surface	342.86					
			SEDIMENT	0.00					
2									
	1								
4									Top of screen (1.15 m BGS) 19 mm diameter Ingleton drive-point
				341.29					Bottom of screen (1.57 m BGS)
			End of Drive Point	1.57					
6									
	2								
8									
	3								
10									

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP6-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	342.55 m AMSL
Number:	160340875	**Top of casing elevation:**	343.44 m AMSL
Field investigator:	RD/LJ	**Easting:**	533151
Contractor:	Stantec Consulting Ltd.	**Northing:**	4814321

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.90 m 25 mm diameter steel casing
0	0		Ground Surface	342.55					
			SEDIMENT	0.00					
2	1								Top of screen (1.24 m BGS) 19 mm diameter Ingleton drive-point
4				340.89					Bottom of screen (1.66 m BGS)
			End of Drive Point	1.66					
6	2								
8									
10	3								

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP7-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	23-Apr-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	345.58 m AMSL
Number:	160340875	**Top of casing elevation:**	346.46 m AMSL
Field investigator:	RD/LJ	**Easting:**	532358
Contractor:	Stantec Consulting Ltd.	**Northing:**	4814153

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.88 m 25 mm diameter steel casing
0	0		Ground Surface	345.58					
			SEDIMENT	0.00					
2									Top of screen (0.95 m BGS) 19 mm diameter Ingleton drive-point
4	1								
				344.21					Bottom of screen (1.37 m BGS)
			End of Drive Point	1.37					
6	2								
8									
10	3								
12									

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP8-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	25-Nov-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	347.35 m AMSL
Number:	160340875	**Top of casing elevation:**	348.27 m AMSL
Field investigator:	RD/KL	**Easting:**	532314
Contractor:	Stantec Consulting Ltd.	**Northing:**	4815003

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.92 m 25 mm diameter steel casing
0	0		Ground Surface	347.35					
			SEDIMENT	0.00					
2									
	1								
4									Top of screen 1.22 m BGS 19 mm diameter Ingleton drive-point Bottom of screen 1.64 m BGS
				345.71					
			End of Drive Point	1.64					
6									
	2								
8									
	3								
10									

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Drive Point: DP9-09

Project:	North Waterloo Subwatershed Study	**Drilling method:**	Fence-post driver
Client:		**Date started/completed:**	25-Nov-2009
Location:	North Waterloo, ON	**Ground surface elevation:**	344.48 m AMSL
Number:	160340875	**Top of casing elevation:**	345.45 m AMSL
Field investigator:	RD/KL	**Easting:**	532735
Contractor:	Stantec Consulting Ltd.	**Northing:**	4813939

SUBSURFACE PROFILE				SAMPLE DETAILS			WELL DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Diagram	Description
-2									Stick-up = 0.97 m 25 mm diameter steel casing
0	0		Ground Surface	344.48					
			SEDIMENT	0.00					
2									
	1								
4									Top of screen 1.16 m BGS 19 mm diameter Ingleton drive-point
				342.89					
			End of Drive Point	1.58					Bottom of screen 1.58 m BGS
6									
	2								
8									
10	3								

Screen Interval: n/a
Sand Pack Interval: n/a
Well Seal Interval: n/a

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
m BTOC - metres below top of casing
n/a - not available

Drawn By/Checked By: OR/RD

Stantec

STANTEC BOREHOLE AND WELL 160330875 - DPS.GPJ EQUIS DATA TEMPLATE.GDT 1/28/11 MJFRASER

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	LOT OR GOLF HOLE SURVEY, ETC	LOT
Waterloo	Waterloo Twp. (City of Waterloo)	Con. G.C.T.	Pt.45
OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED	
SUGARBUSH HOLDING LTD.	690 Belmont W. Kitchener, Ontario.	DAY 9 MO Mar. YR 88.	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	Topsoil			0	1
Brown	Sand	Gravel	Soft	1	4
Brown	Clay		Soft	4	6
Grey	Sand		Soft	6	33
Grey	Clay	Silt	Soft	33	54
Grey	Sand	Gravel	Hard & Soft	54	101
Grey	Hardpan	Stones	Hard	101	172
Grey	Fine sand	Silt	Soft	172	178
Grey	Hardpan	Stones	Hard	178	186
Grey	Clay		Hard	186	209
Grey	Sand	Gravel	Soft	201	225
Grey	Limestone	Shale	Soft	225	236

TWZ-88 →

WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER	
209-223	☒ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERALS ☐ GAS

CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC	.188	0	216-0
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			

SCREEN

TYPE OF OPENING (SLOT NO.)	DIAMETER	LENGTH
# 20 slot	5.75 INCHES	7 FEET
MATERIAL AND TYPE: Stainless Steel Telescope	DEPTH TO TOP OF SCREEN: 216 FEET	

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☒ PUMP ☐ BAILER	22 IMP GPM	3 HOURS MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING				☐ PUMPING ☐ RECOVERY
		10 MINUTES	20 MINUTES	30 MINUTES	40 MINUTES	
9 FEET	25.3 FEET	22.9 FEET	23.6 FEET	24.1 FEET	24.6 FEET	

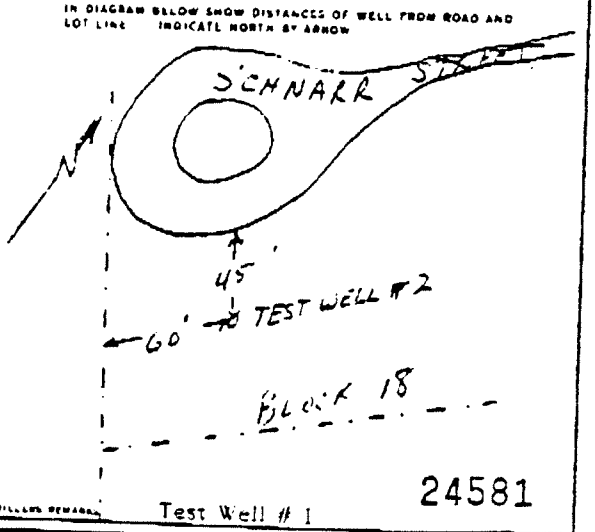
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	30 FEET	☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☐ DEEP	FEET	GPM

FINAL STATUS OF WELL	☐ WATER SUPPLY ☐ OBSERVATION WELL ☒ TEST HOLE ☐ RECHARGE WELL	☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED ☐ DEWATERING
WATER USE	☐ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER	☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED
METHOD OF CONSTRUCTION	☐ CABLE TOOL ☒ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION	☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING ☐ DIGGING ☐ OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLER'S REMARKS

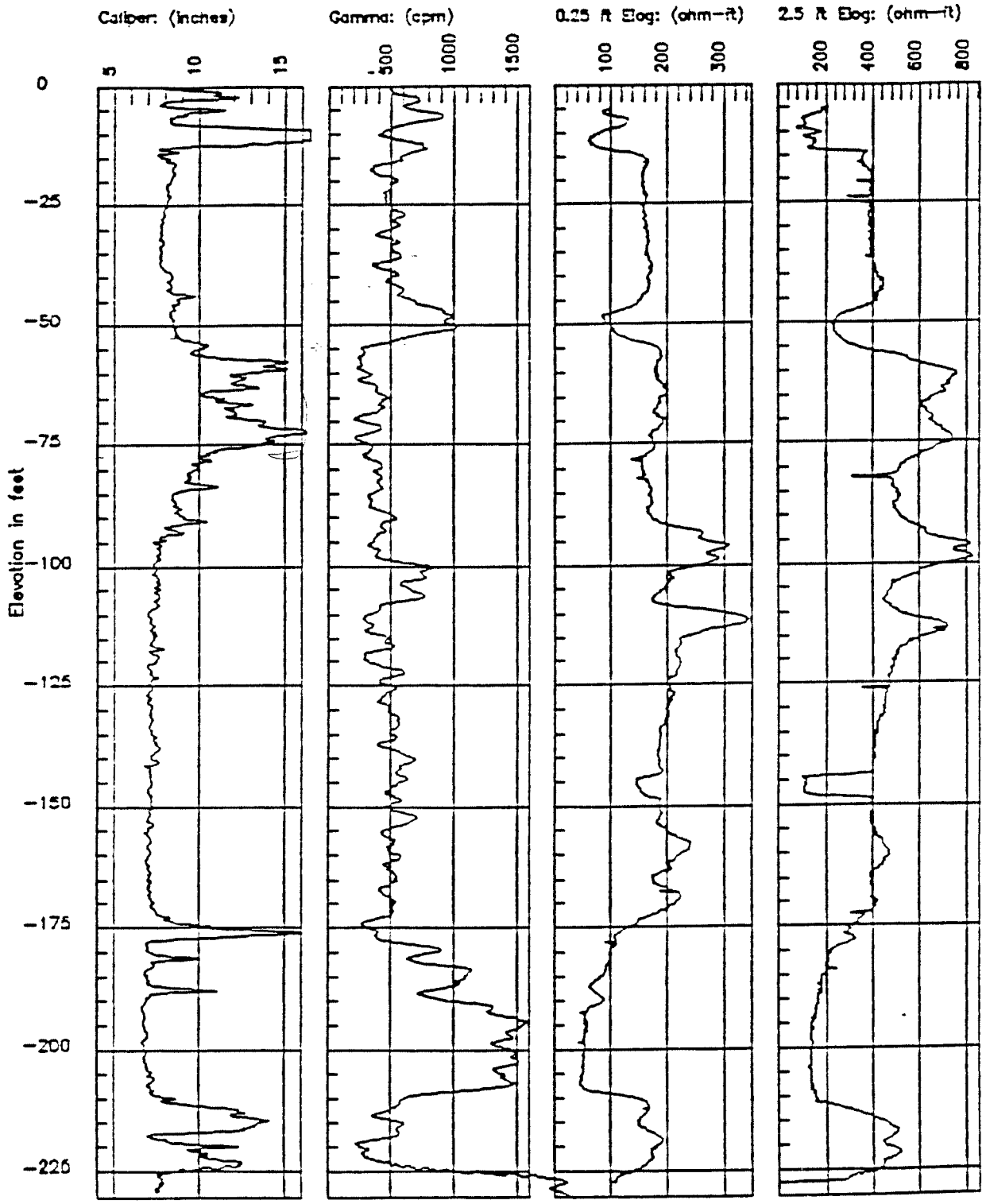
CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Davidson Well Drilling Limited	1737
ADDRESS: Box 486, Wingham, Ontario. N0G 2W0	
NAME OF WELL TECHNICIAN: G. Reavie	WELL TECHNICIAN'S LICENCE NUMBER: T0156
SIGNATURE OF TECHNICIAN/CONTRACTOR	SUBMISSION DATE: DAY 6 MO Apr. YR 88.

CONTRACTOR'S COPY

OFFICE USE ONLY

LOTOWATER LTD.
FEB. 14, 1992



TROW DAMES & MOORE
CONSULTANTS IN HYDROLOGY, WASTE MANAGEMENT
ENVIRONMENTAL ENGINEERING AND HYDROGEOLOGY

LAUREL WOODS SUBDIVISION
GEOPHYSICAL LOGS
TW1/88

LOTOWATER LTD.
FEB 15, 1991
TW 1-88

Appendix B

Slug Test Analyses

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9

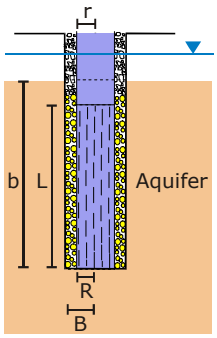
Wells

Project: Northgate Lands Subdivision

Number: 39502-104

Client: Northgate Land Corp.

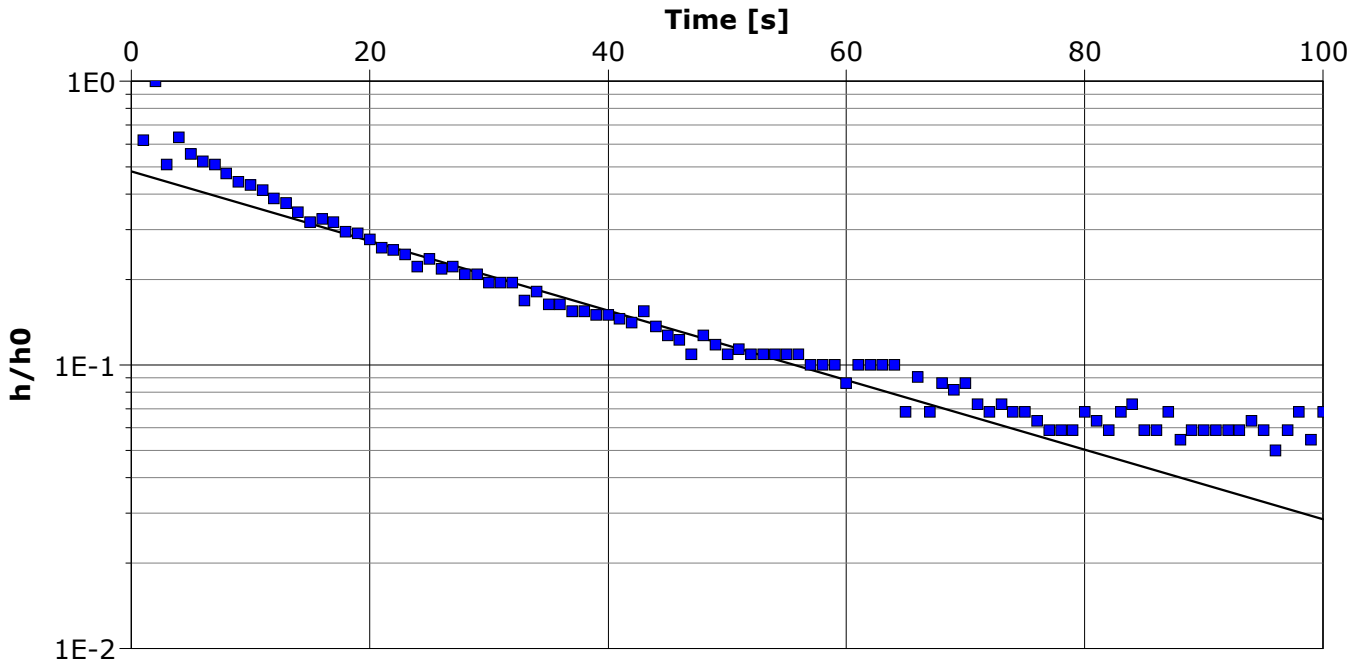
Location: Conservation Drive, Waterloo



	Name	Benchmark [m]	Penetration	R [m]	L [m]	r [m]	B [m]	b [m]
1	MW100-14		Fully	0.0254	3.05	0.0254	0.1	3.05
2	MW101-14		Fully	0.0254	3.05	0.0254	0.1	2.4
3	MW102-14		Fully	0.0254	3.05	0.0254	0.1	4.3
4	MW103-14		Fully	0.0254	3.05	0.0254	0.1	4.28
5	MW104-15		Fully	0.0254	3.05	0.0254	0.1	4.93
6	MW105a-14		Fully	0.0254	1.6	0.0254	0.1	1.6
7	MW105b-14		Fully	0.0254	1.8	0.0254	0.1	5.18
8	MW106-14		Fully	0.0254	3.05	0.0254	0.1	3.7
9	MW107-14		Fully	0.0254	3.05	0.0254	0.1	3.18
10	MW108-14		Fully	0.0254	3.05	0.0254	0.1	4.7
11	MW109a-14		Fully	0.0254	4.19	0.0254	0.1	4.19
12	MW109b-14		Fully	0.0254	2.14	0.0254	0.1	3.78
13	MW110-14		Fully	0.0254	3.05	0.0254	0.1	4.7
14	MW111-14		Fully	0.0254	3.93	0.0254	0.1	6.18

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW100-14 - F1	Test Well: MW100-14
Test Conducted by: YXM?TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.67 m		

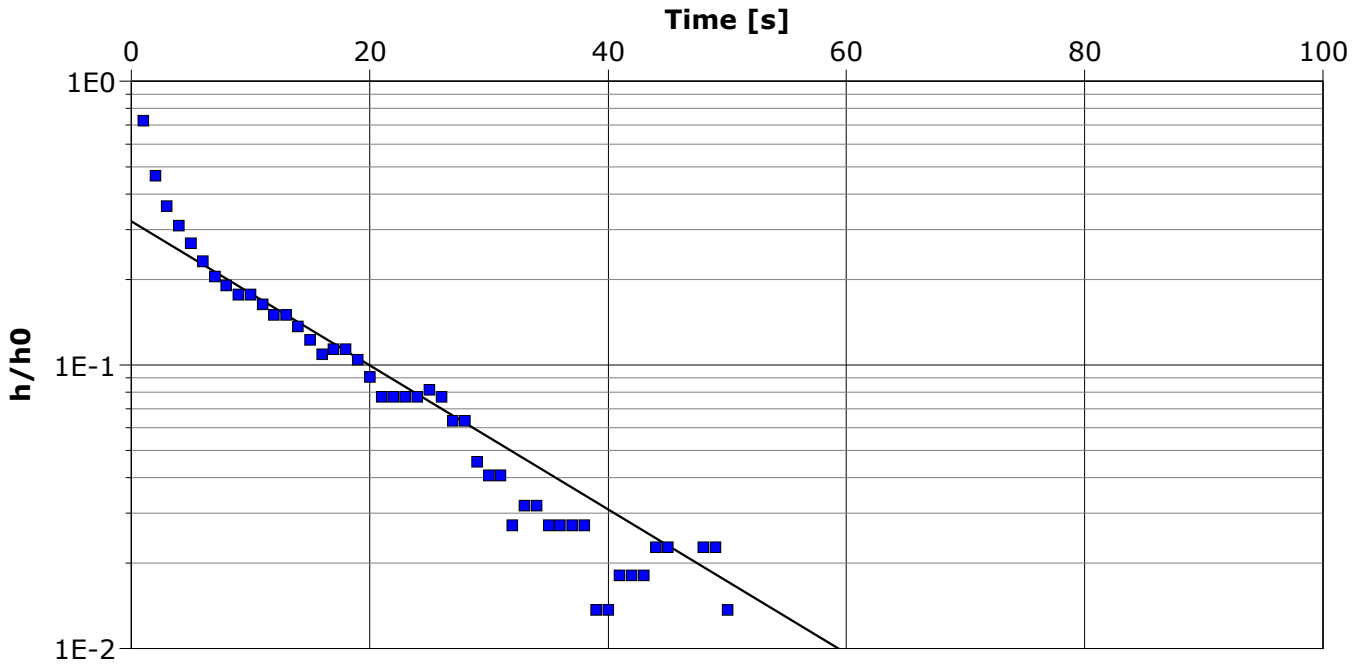


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW100-14	1.11×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW100-14 - R1	Test Well: MW100-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.67 m		

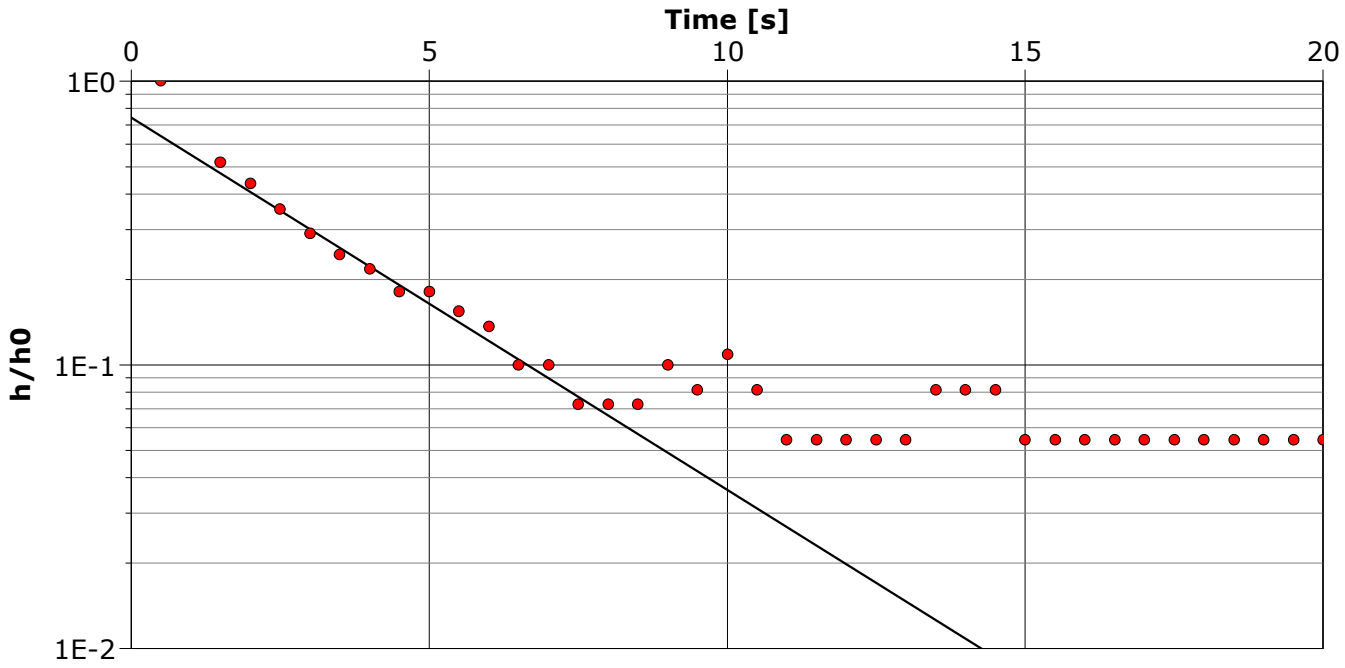


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW100-14	2.29×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW101-14 - F3	Test Well: MW101-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.55 m		

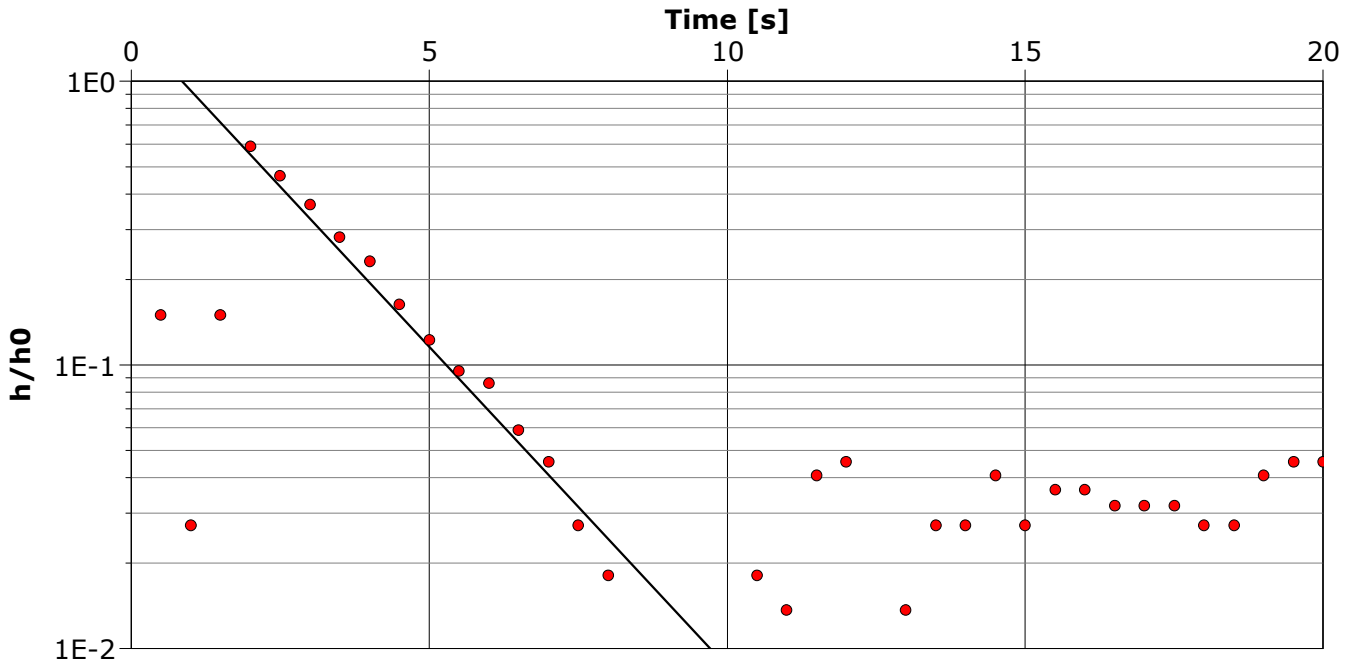


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW101-14	1.18×10^{-4}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW101-14 - R1	Test Well: MW101-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.55 m		

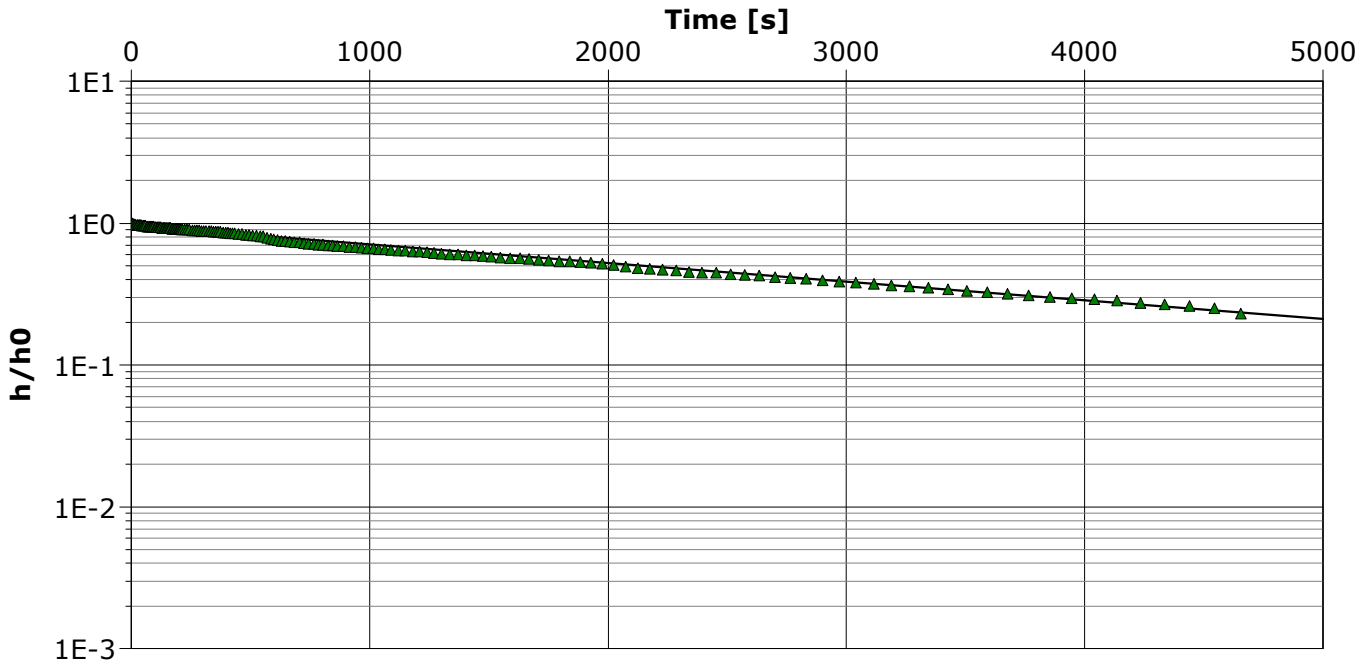


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW101-14	2.03×10^{-4}	

MTE Consultants Inc. **520 Bingemans Centre Drive** **Kitchener, Ontario** **N2B 3X9**	**Slug Test Analysis Report** Project: Northgate Lands Subdivision Number: 39502-104 Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW102-14 - R1	Test Well: MW102-14
Test Conducted by: YXm/TFC		Test Date: 1/12/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/14/2015
Aquifer Thickness: 4.85 m		

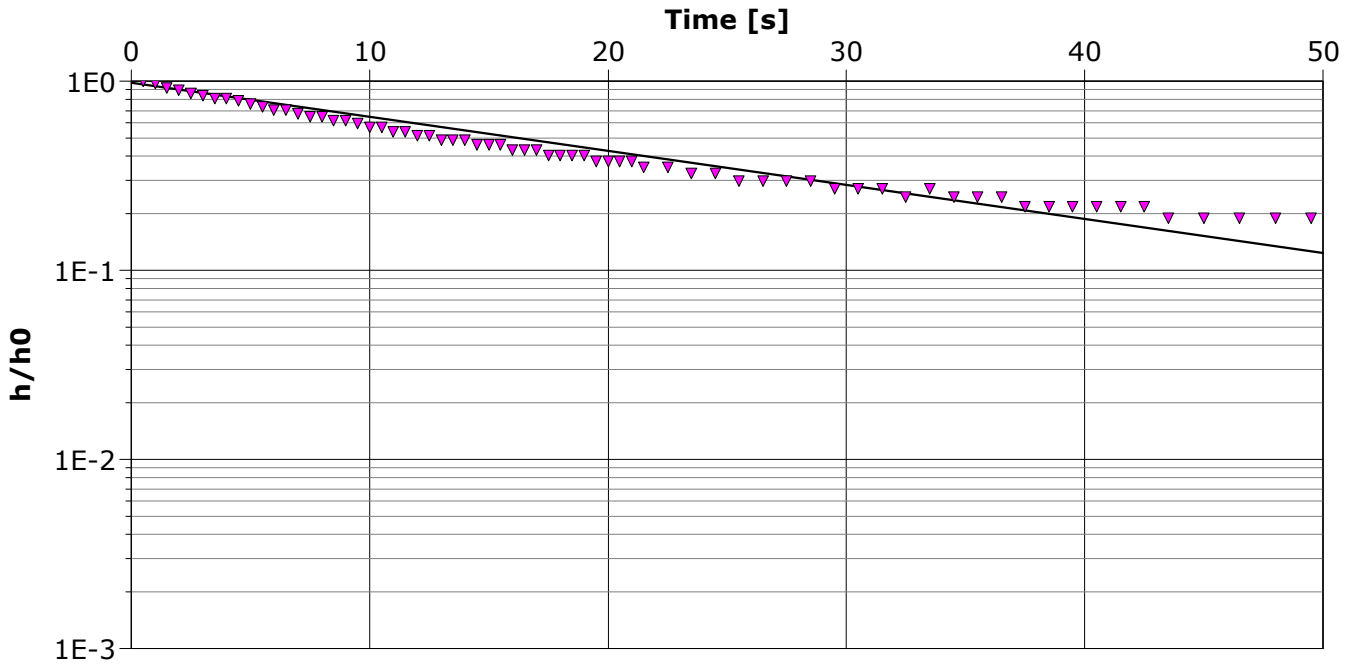


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW102-14	1.18×10^{-7}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW103-14 - R1	Test Well: MW103-14
Test Conducted by: YXM/TFC		Test Date: 1/9/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/14/2015
Aquifer Thickness: 4.28 m		

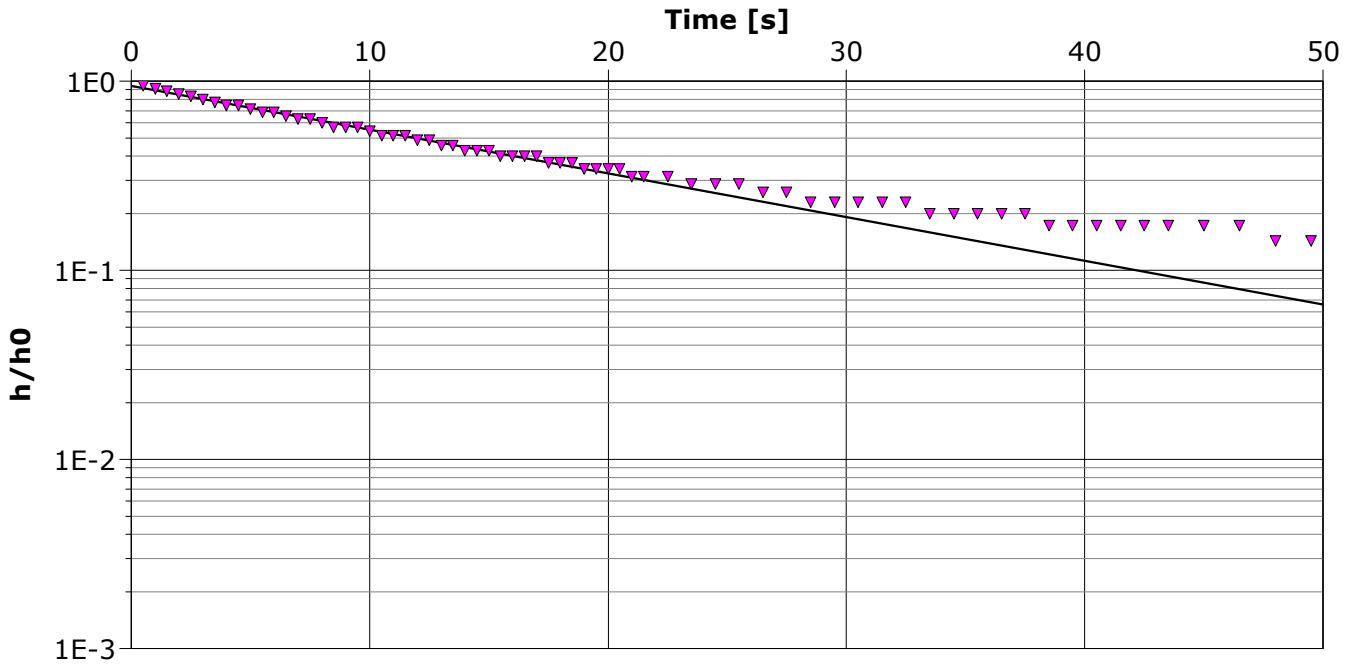


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW103-14	1.62×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW103-14 - R2	Test Well: MW103-14
Test Conducted by: YXM/TFC		Test Date: 1/9/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/14/2015
Aquifer Thickness: 4.28 m		

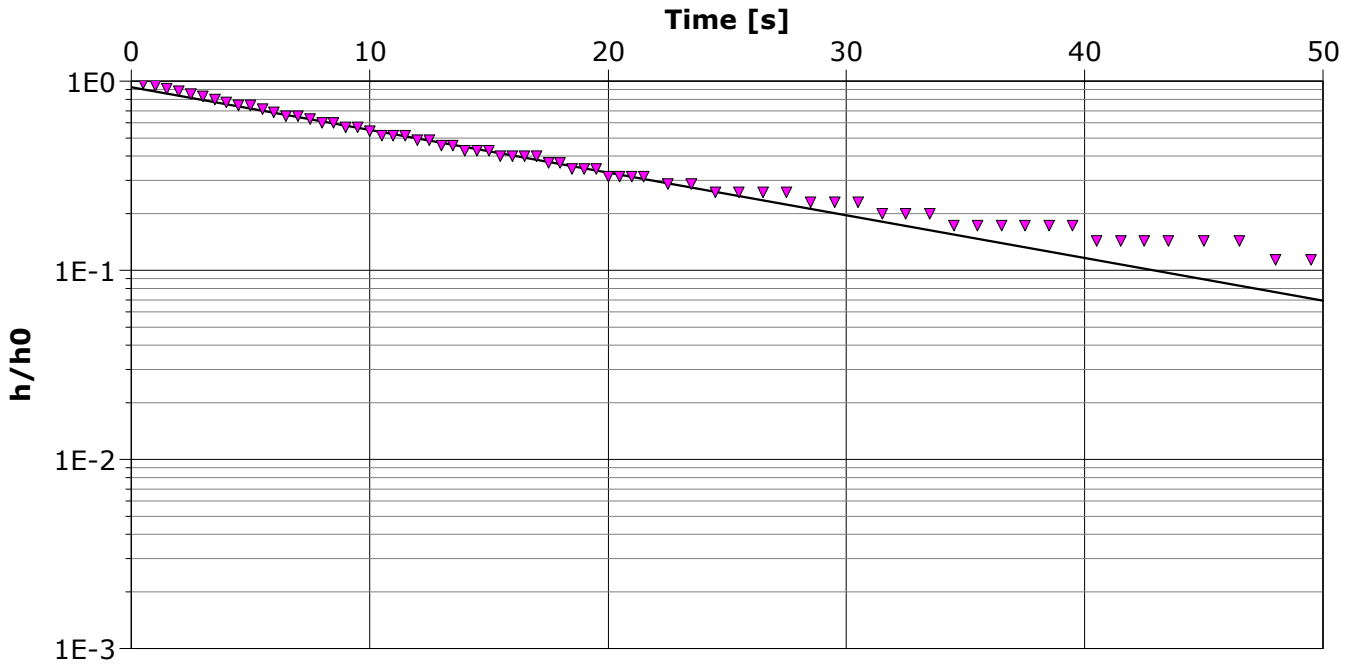


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW103-14	2.09×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW103-14 - R3	Test Well: MW103-14
Test Conducted by: YXM/TFC		Test Date: 1/9/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/14/2015
Aquifer Thickness: 4.28 m		

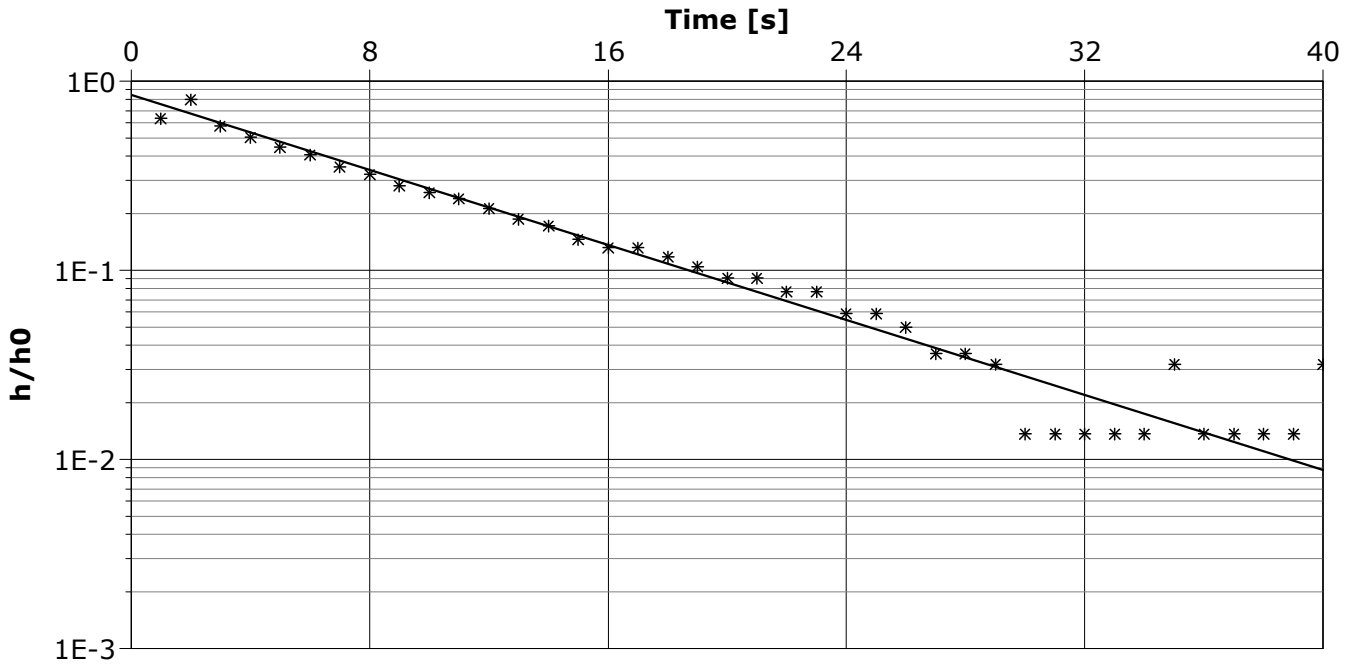


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW103-14	2.03×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW104-14 - F2	Test Well: MW104-15
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.87 m		

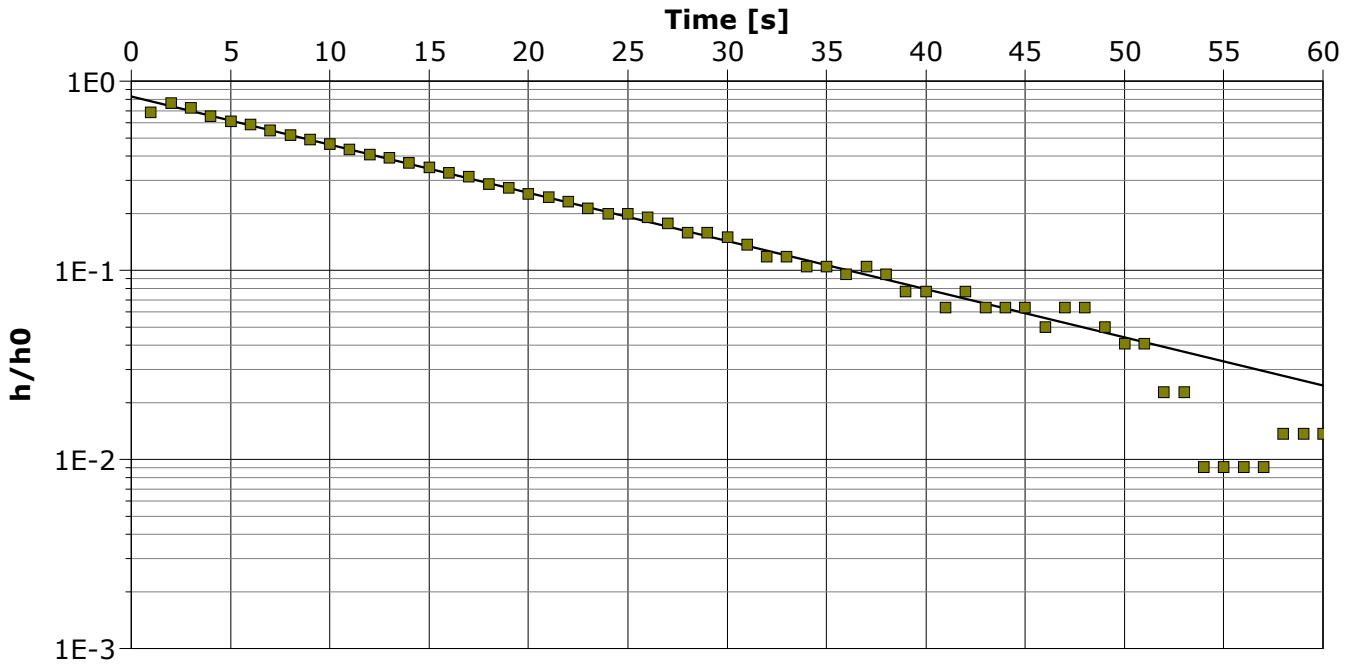


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW104-15	4.47×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW105a-14 - F2	Test Well: MW105a-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Hvorslev	Analysis Date: 6/22/2015
Aquifer Thickness: 2.13 m		

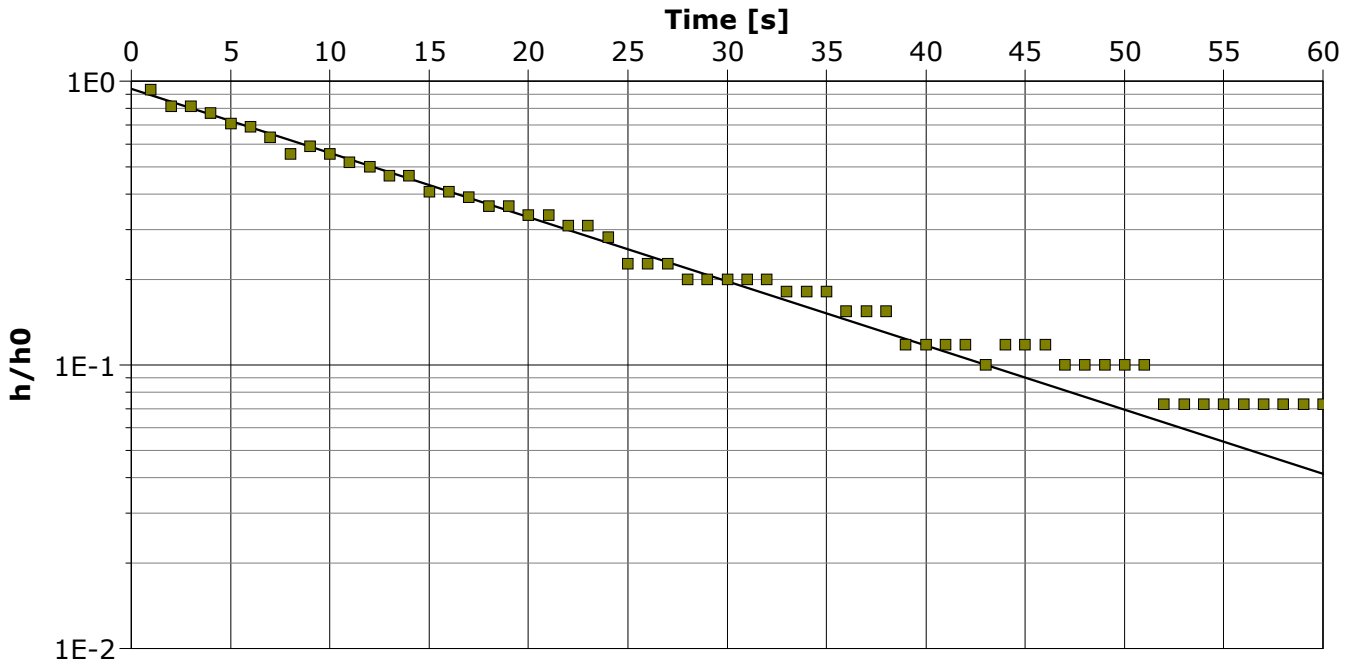


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW105a-14	4.90×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW105a-14 - R3	Test Well: MW105a-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Hvorslev	Analysis Date: 6/22/2015
Aquifer Thickness: 2.13 m		

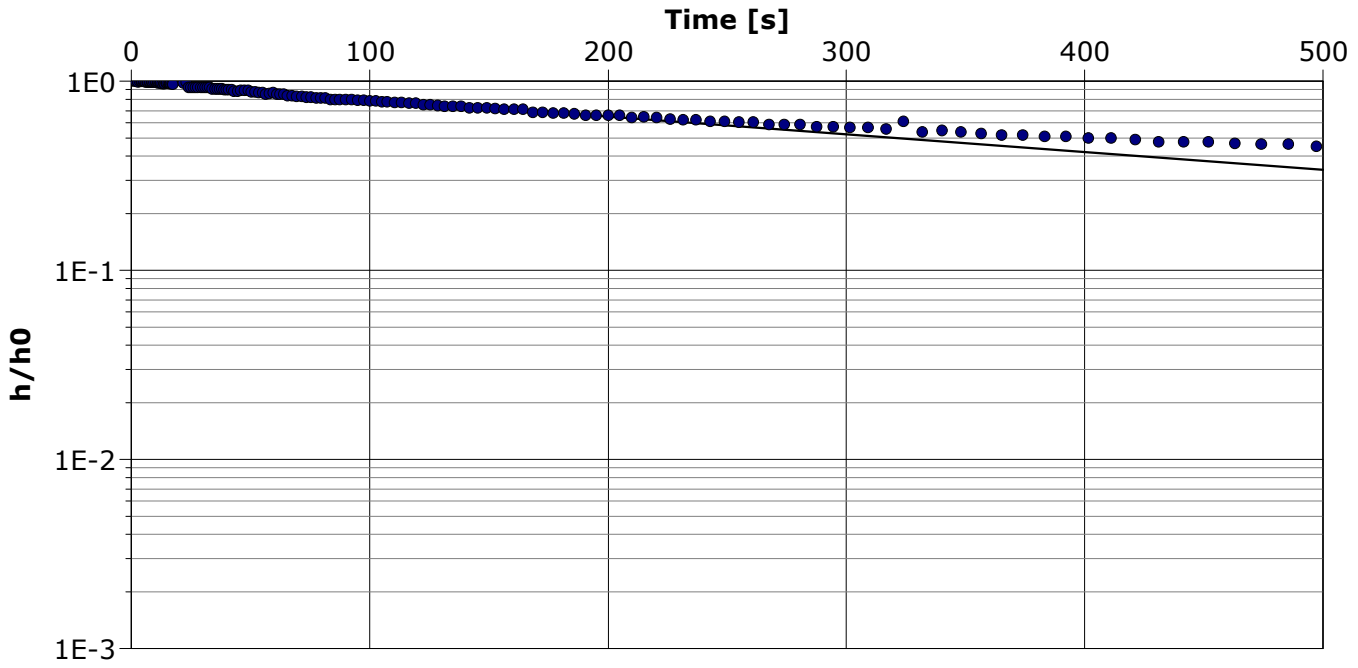


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
MW105a-14	4.35×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW105b-14 - F1	Test Well: MW105b-14
Test Conducted by: YXM/TFC		Test Date: 1/14/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/14/2015
Aquifer Thickness: 1.87 m		

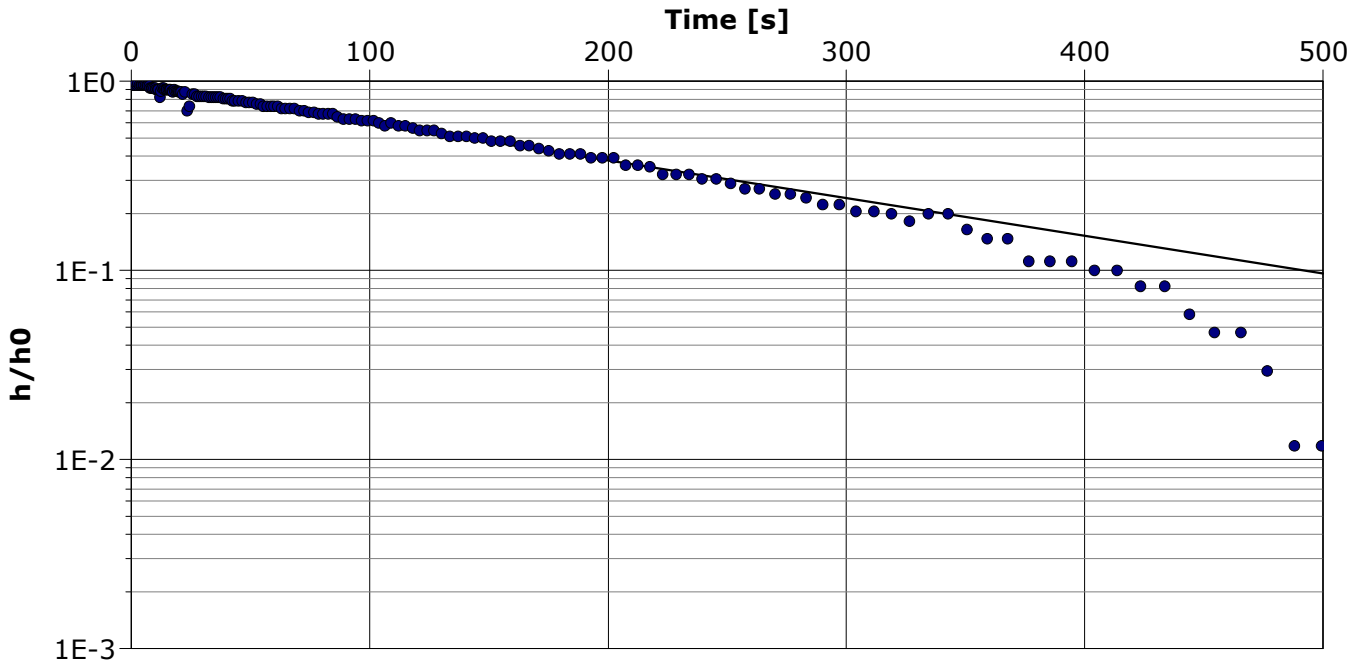


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW105b-14	1.26×10^{-6}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW105b-14 - R1	Test Well: MW105b-14
Test Conducted by: YXM/TFC		Test Date: 1/14/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/14/2015
Aquifer Thickness: 5.18 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW105b-14	2.70×10^{-6}	

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9

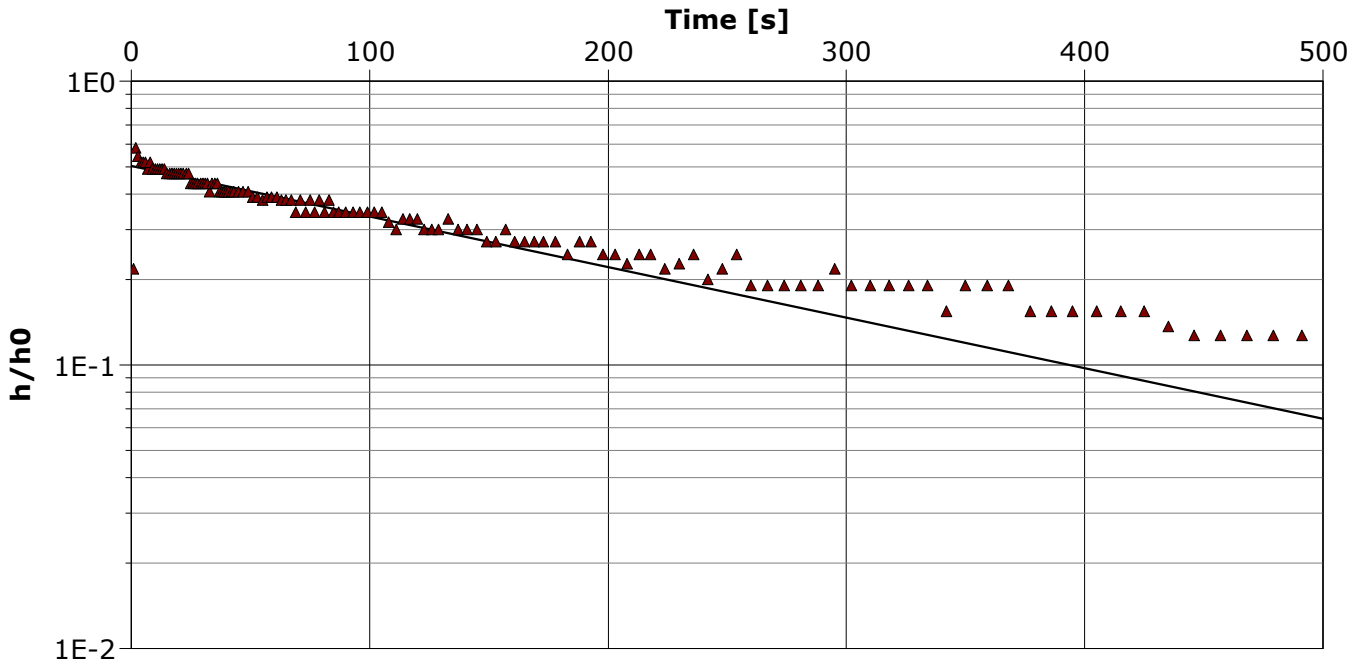
Slug Test Analysis Report

Project: Northgate Lands Subdivision

Number: 39502-104

Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW106-14 - F2	Test Well: MW106-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.70 m		

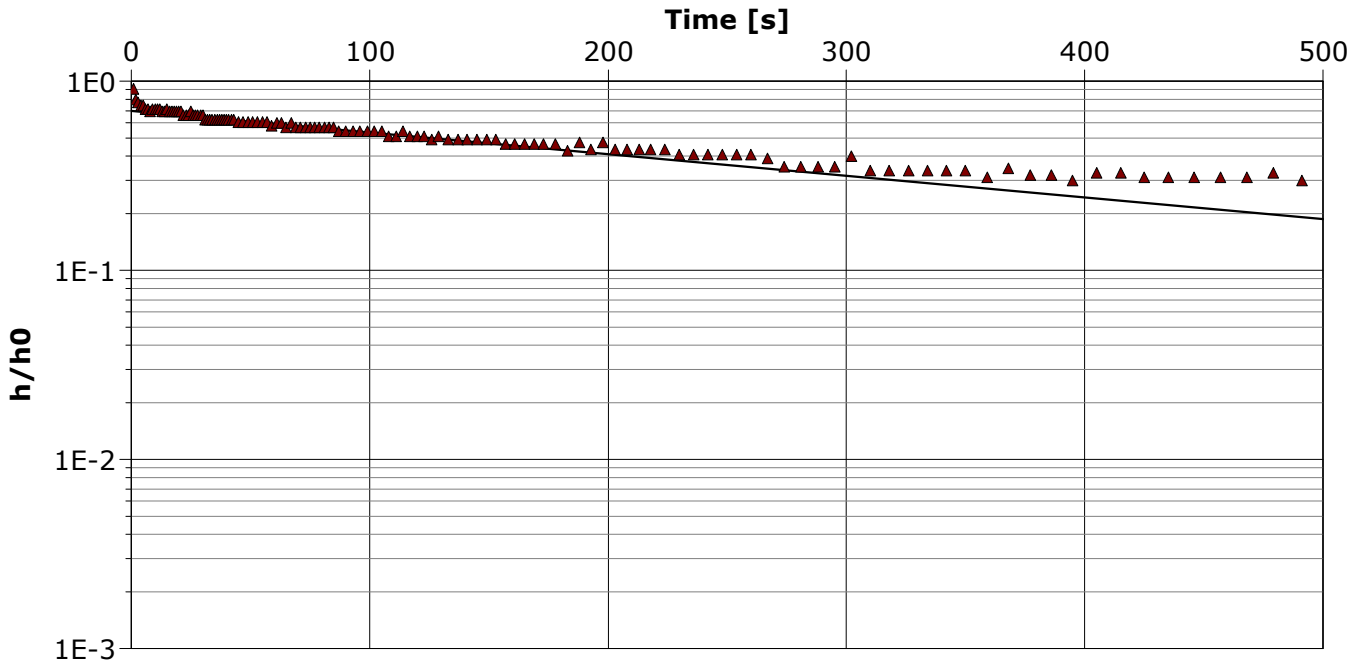


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW106-14	1.60×10^{-6}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW106-14 - R2	Test Well: MW106-14
Test Conducted by: YXM/TFC		Test Date: 1/8/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.70 m		

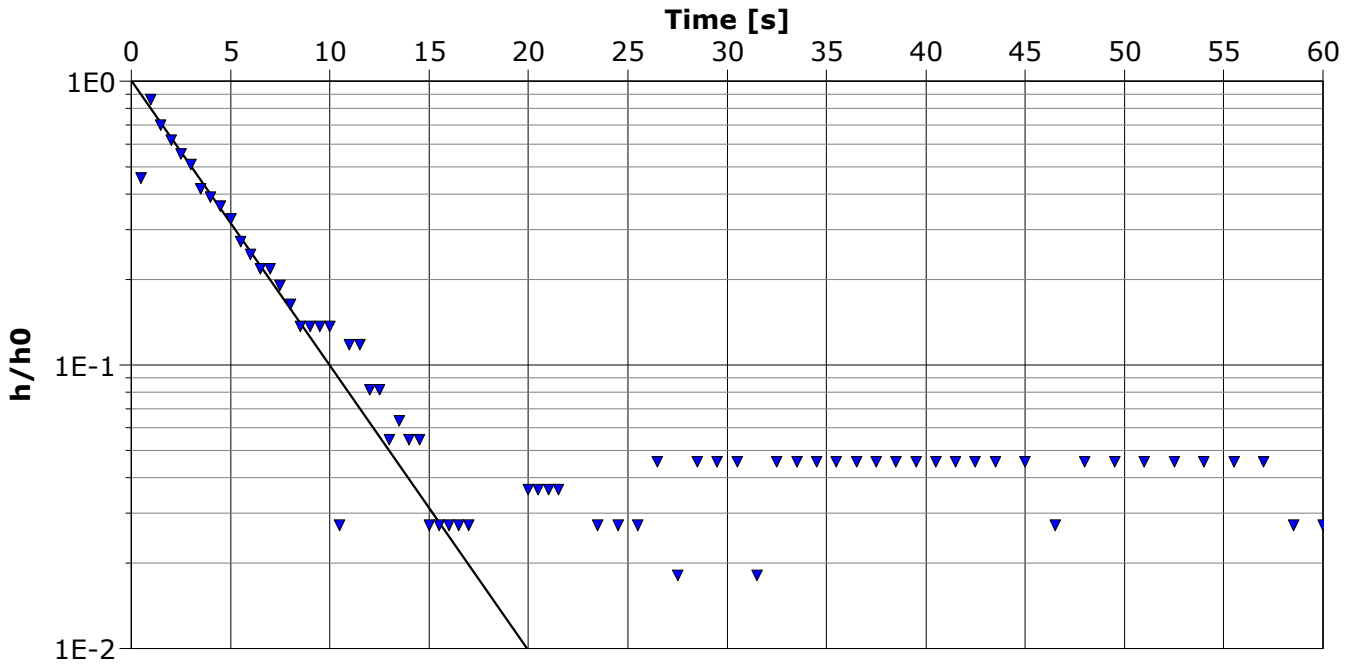


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW106-14	1.03×10^{-6}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW107-14 - R3	Test Well: MW107-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bower and Rice	Analysis Date: 1/15/2015
Aquifer Thickness: 3.73 m		

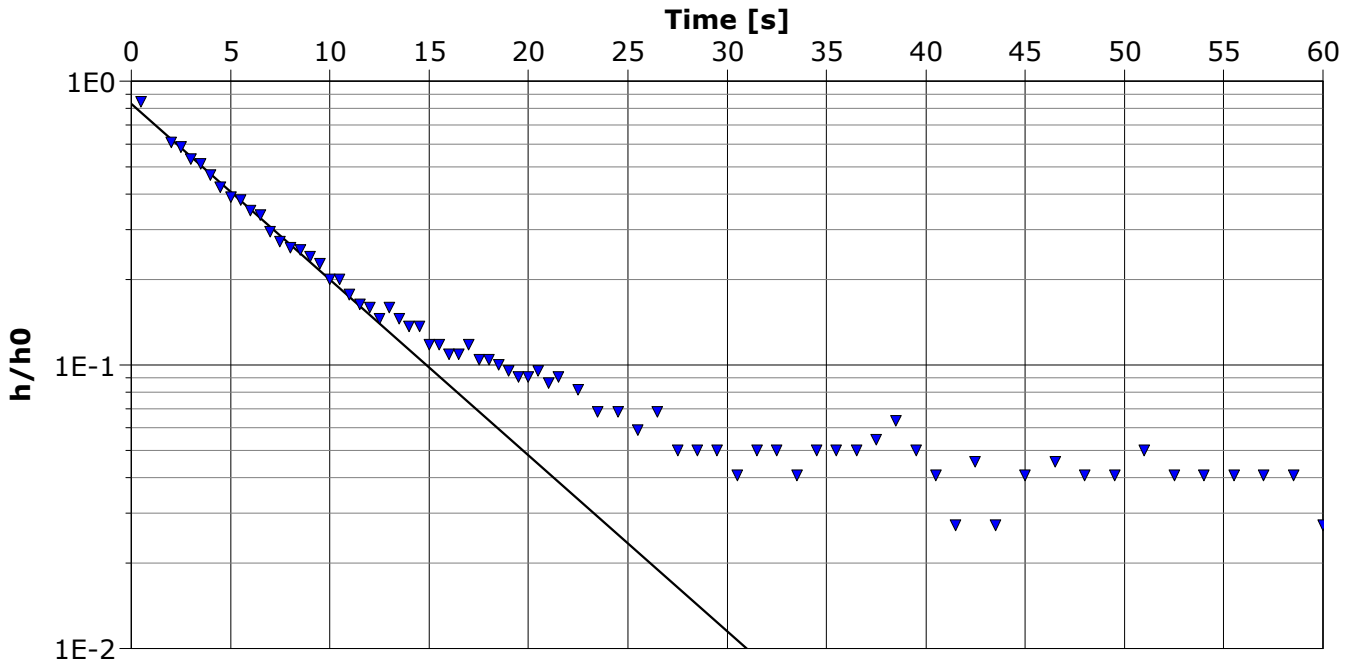


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW107-14	9.06×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW107-14 - F1	Test Well: MW107-14
Test Conducted by: YXM/MDE		Test Date: 1/7/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 3.73 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW107-14	5.59×10^{-5}	

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520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9

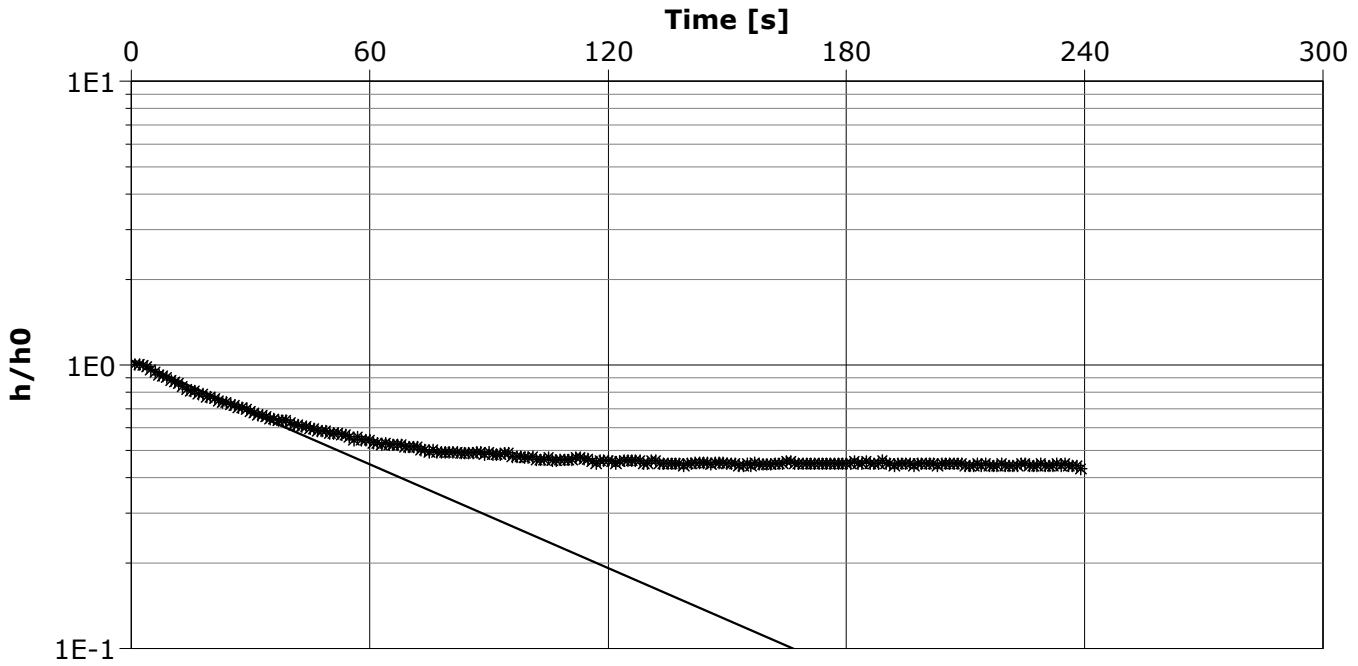
Slug Test Analysis Report

Project: Northgate Lands Subdivision

Number: 39502-104

Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW108-14 - F2	Test Well: MW108-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bower and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 5.41 m		

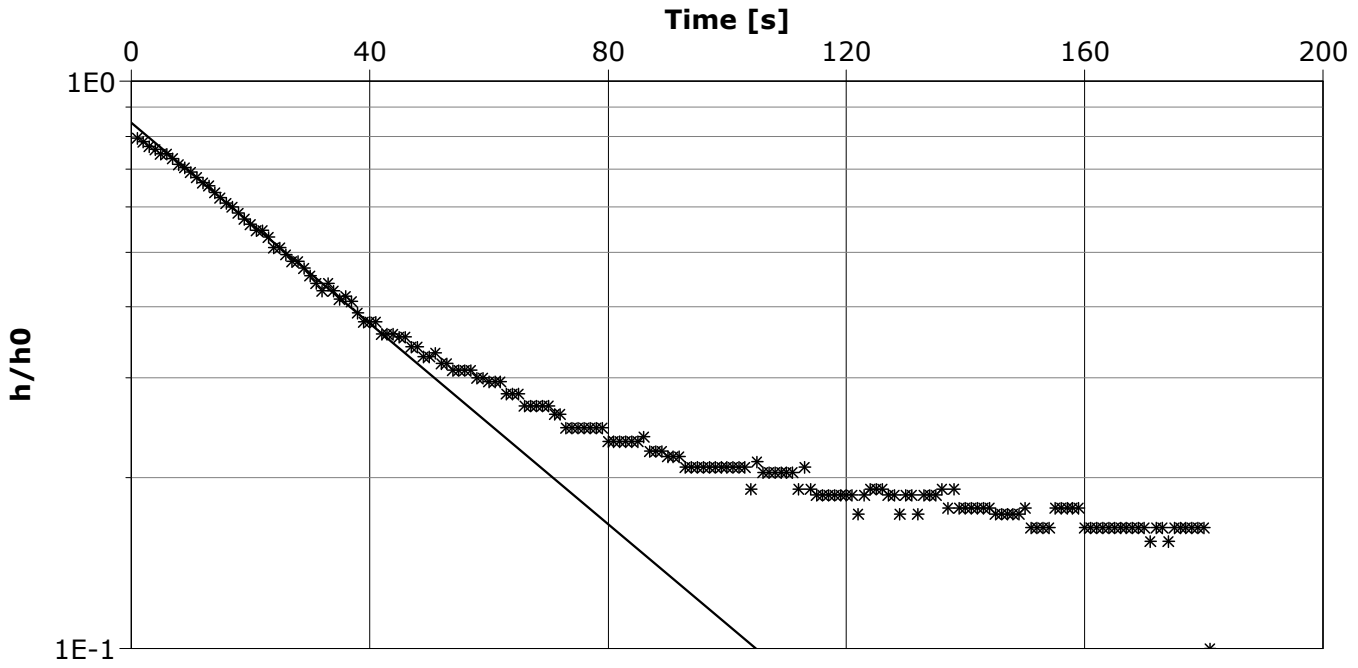


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW108-14	5.50×10^{-6}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW108-14 - R1	Test Well: MW108-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 5.41 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW108-14	7.97×10^{-6}	

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520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9

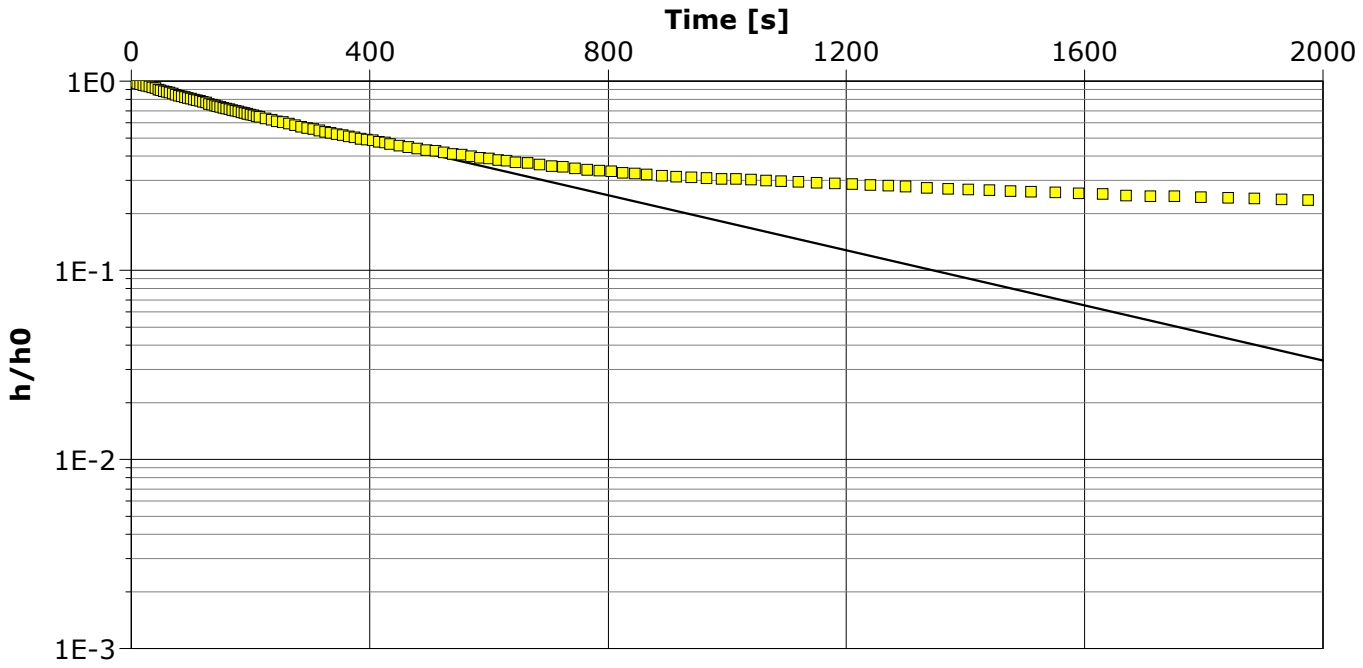
Slug Test Analysis Report

Project: Northgate Lands Subdivision

Number: 39502-104

Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW109a-14 - R1	Test Well: MW109a-14
Test Conducted by: YXM/TFC		Test Date: 1/7/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/15/2015
Aquifer Thickness: 4.19 m		

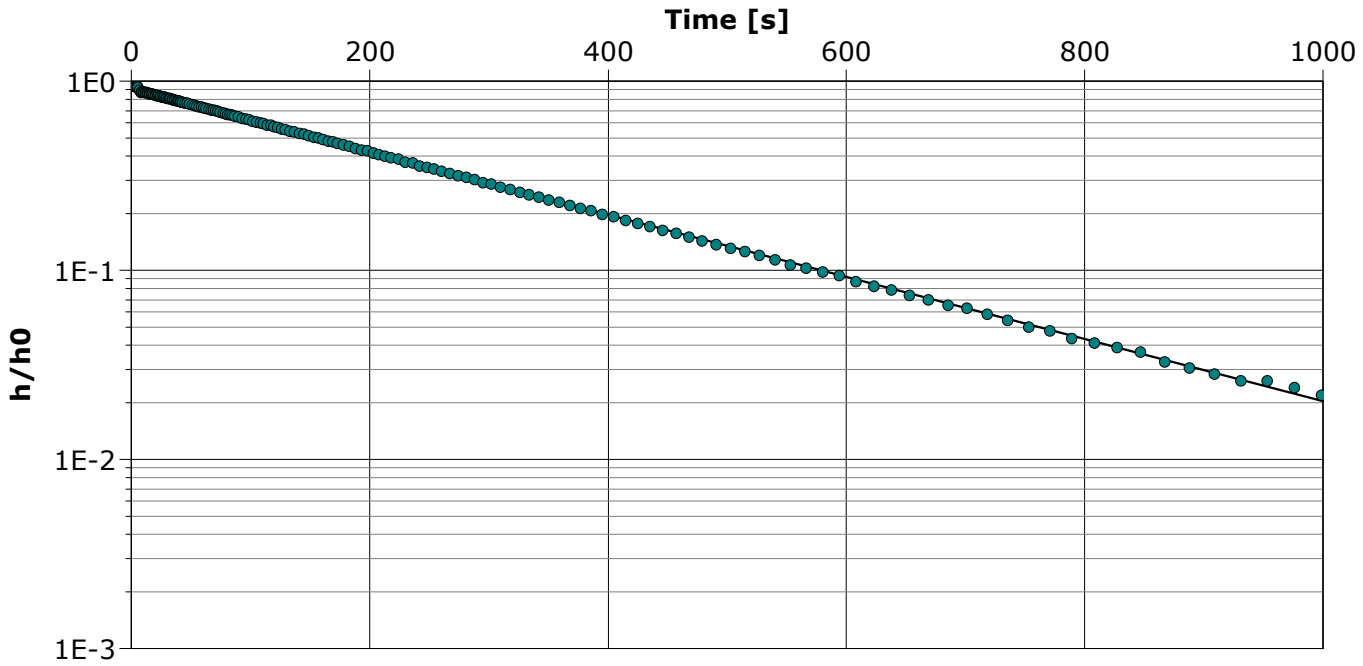


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW109a-14	5.11×10^{-7}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW109b-14 - R1	Test Well: MW109b-14
Test Conducted by: YXM/TFC		Test Date: 1/7/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/15/2015
Aquifer Thickness: 3.78 m		

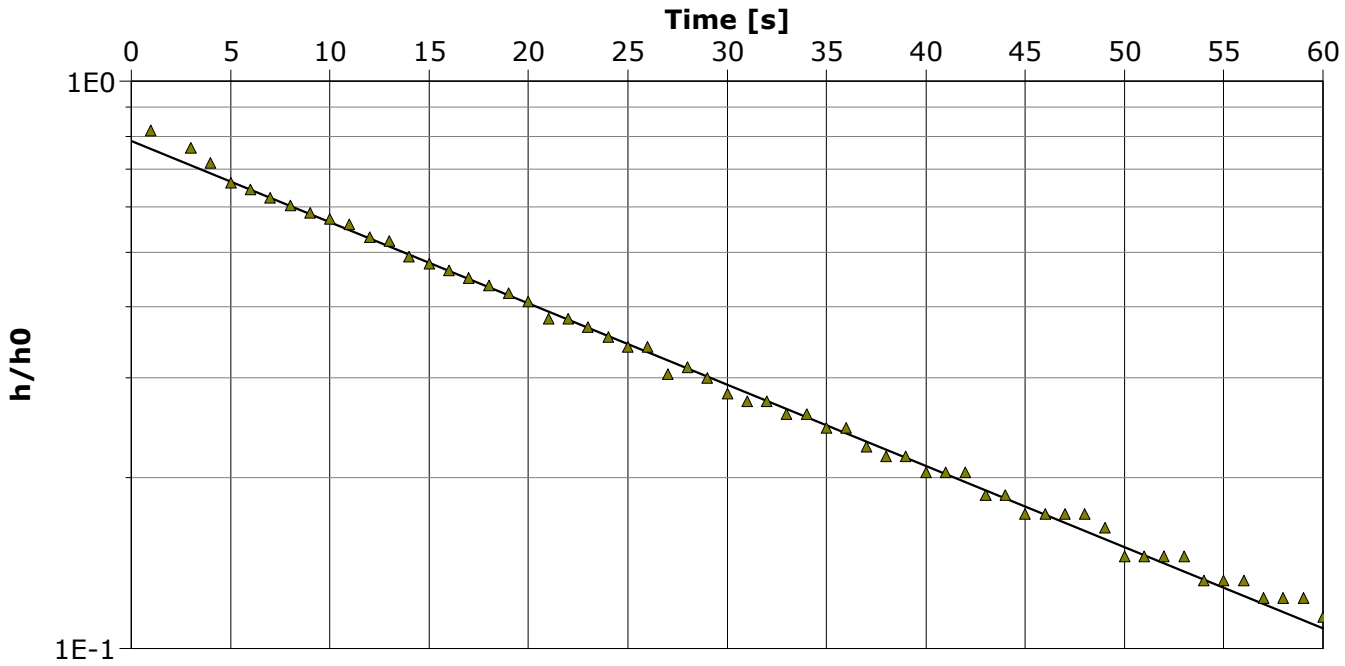


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW109b-14	1.95×10^{-6}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	Slug Test Analysis Report
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW110-14 - F2	Test Well: MW110-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 5.31 m		

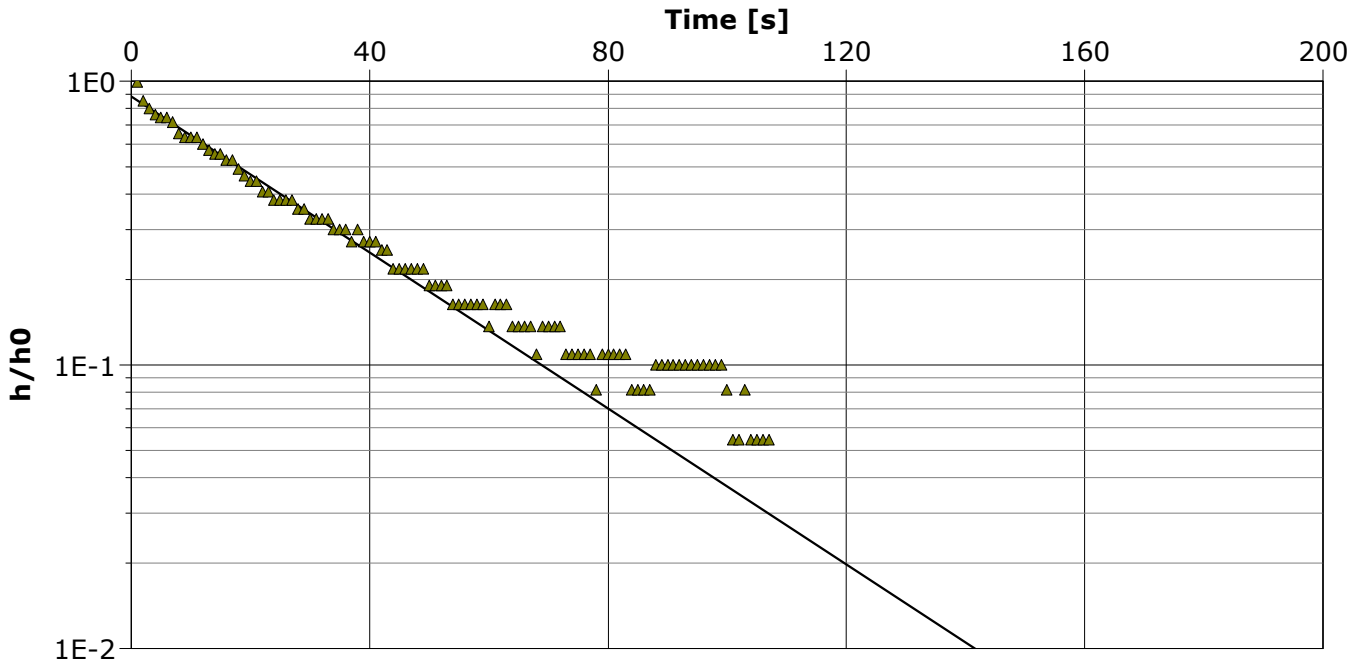


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW110-14	1.29×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW110-14 - R3	Test Well: MW110-14
Test Conducted by: YXM/TFC		Test Date: 6/4/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 6/22/2015
Aquifer Thickness: 5.31 m		

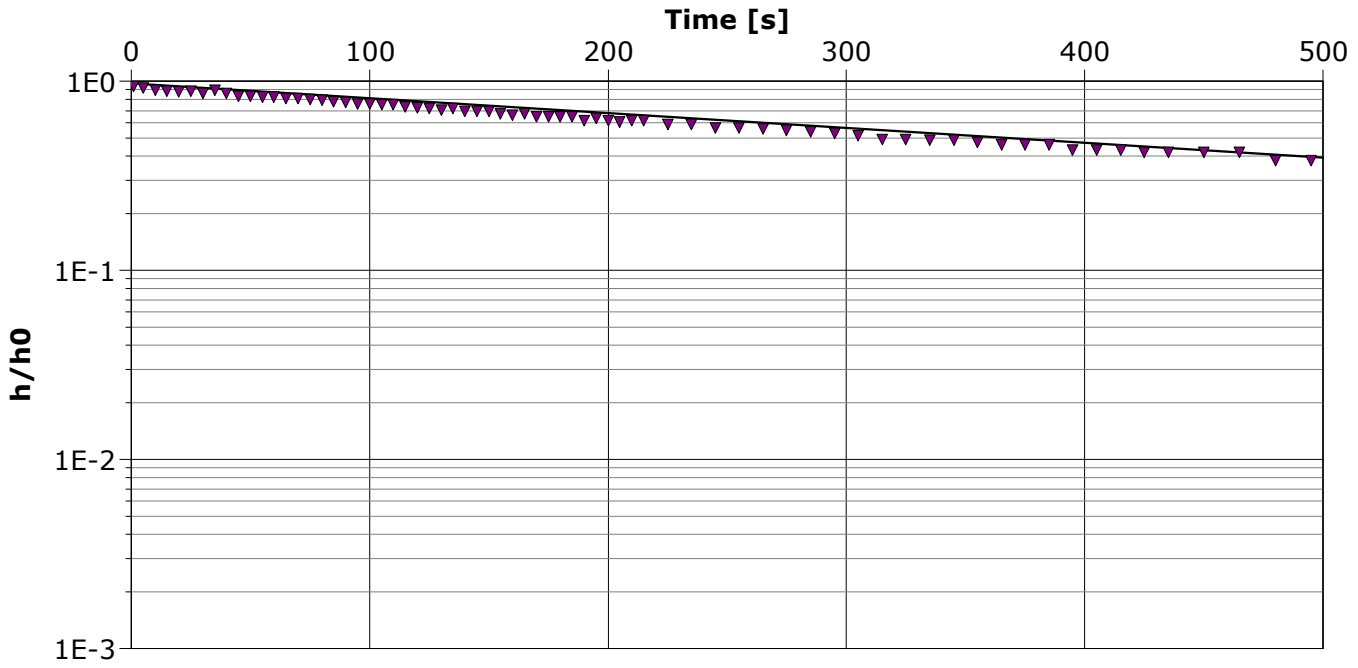


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW110-14	1.24×10^{-5}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW111-14 - F1	Test Well: MW111-14
Test Conducted by: TXm/TFC		Test Date: 1/12/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/15/2015
Aquifer Thickness: 6.18 m		

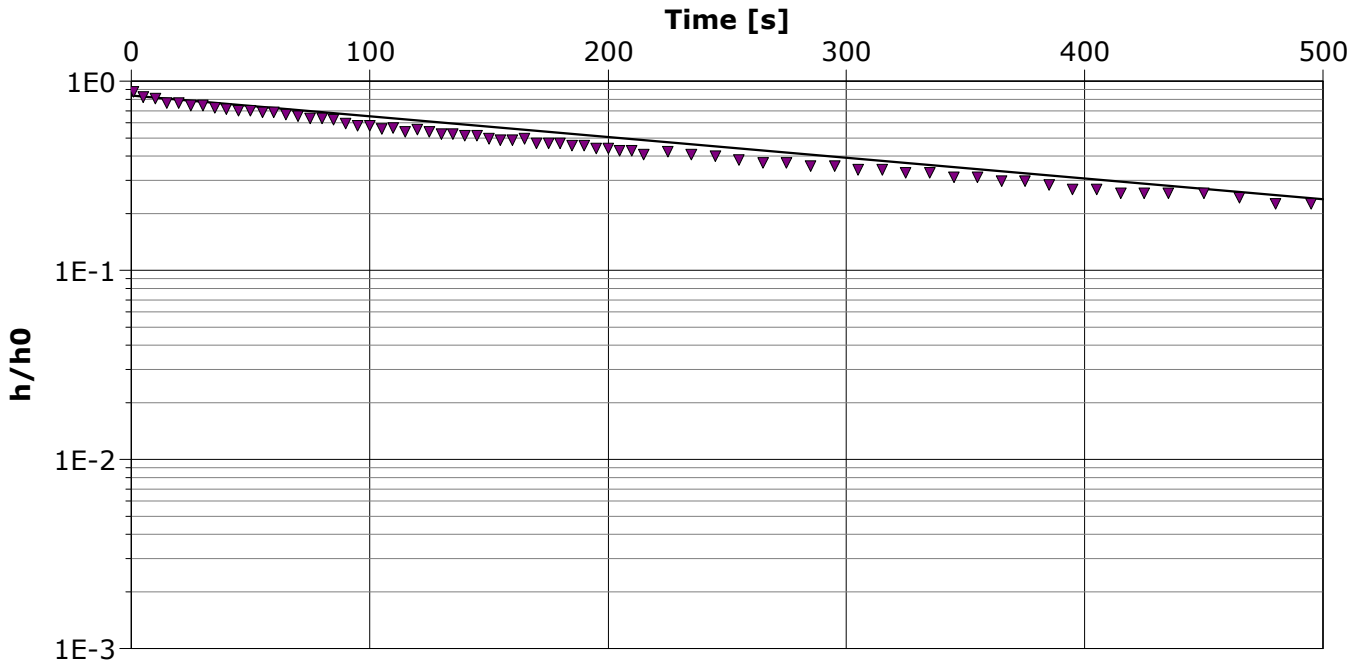


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW111-14	5.81×10^{-7}	

MTE Consultants Inc. 520 Bingemans Centre Drive Kitchener, Ontario N2B 3X9	**Slug Test Analysis Report**
	Project: Northgate Lands Subdivision
	Number: 39502-104
	Client: Northgate Land Corp.

Location: Conservation Drive, Waterloo	Slug Test: MW111-14 - R1	Test Well: MW111-14
Test Conducted by: YXM/MDE		Test Date: 1/12/2015
Analysis Performed by: MDE	Bouwer and Rice	Analysis Date: 1/15/2015
Aquifer Thickness: 6.18 m		



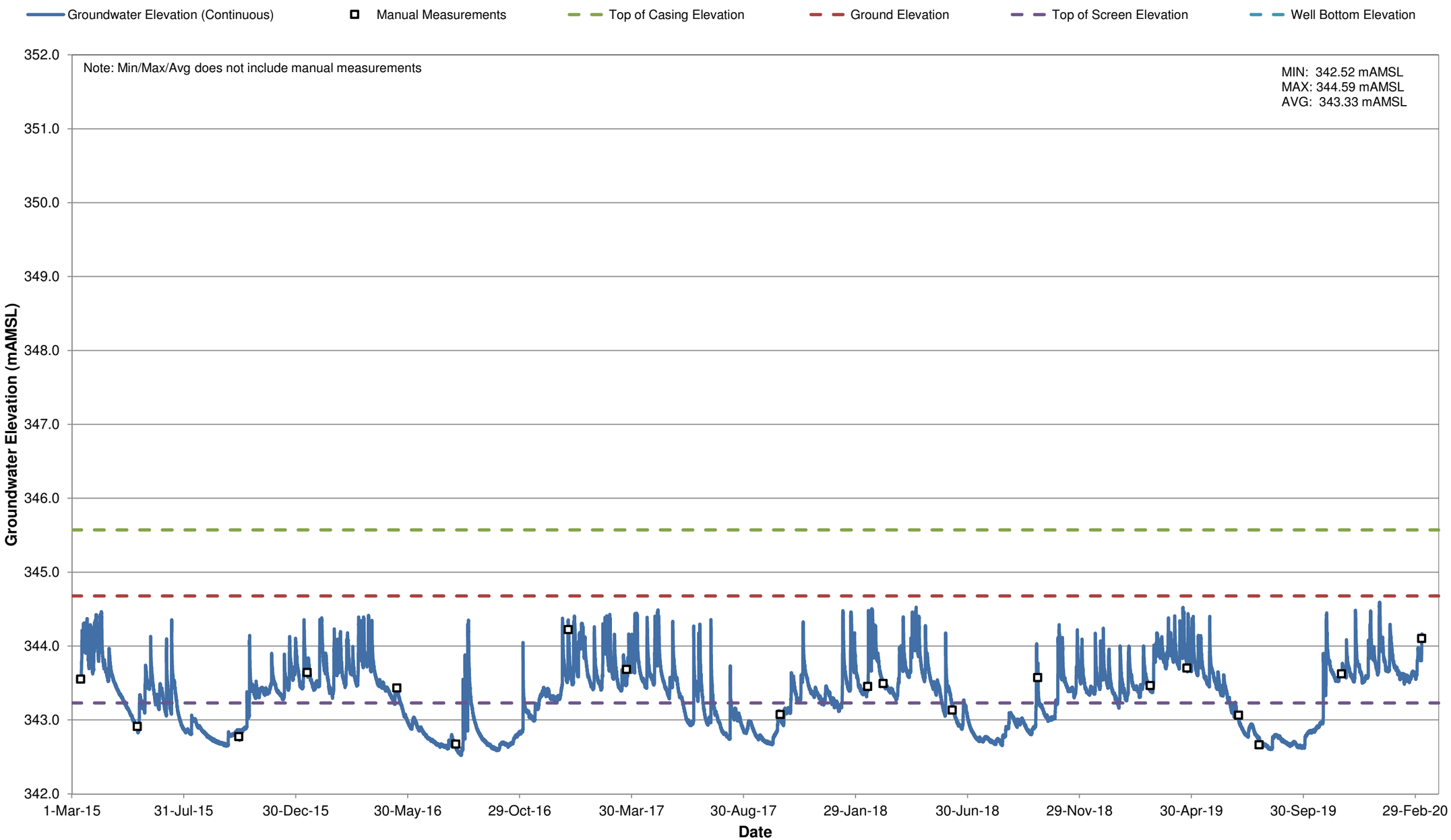
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW111-14	8.10×10^{-7}	

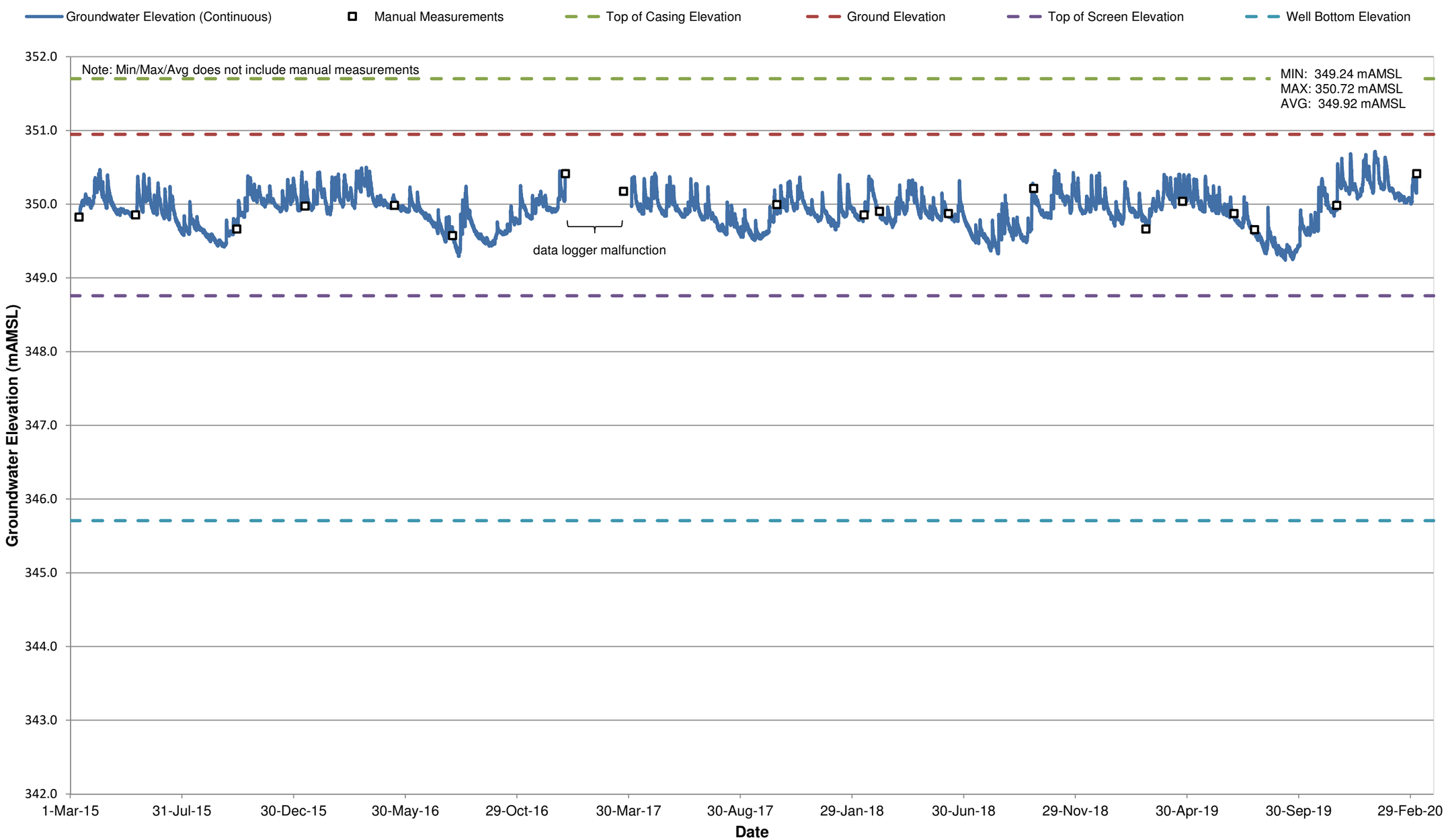
Appendix C

Hydrographs

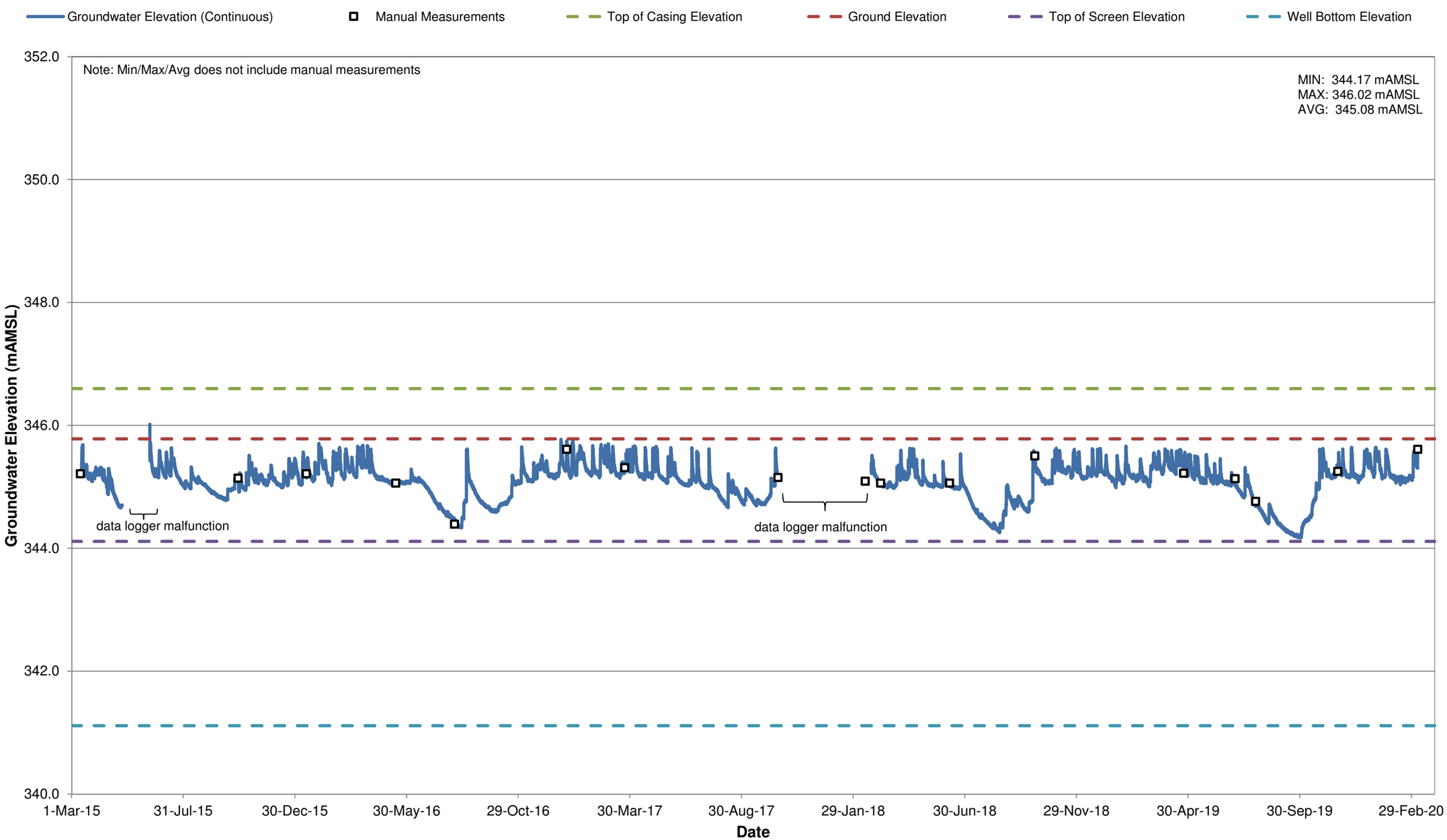
Hydrograph 1: Groundwater Elevations (mAMSL) - MW100-14



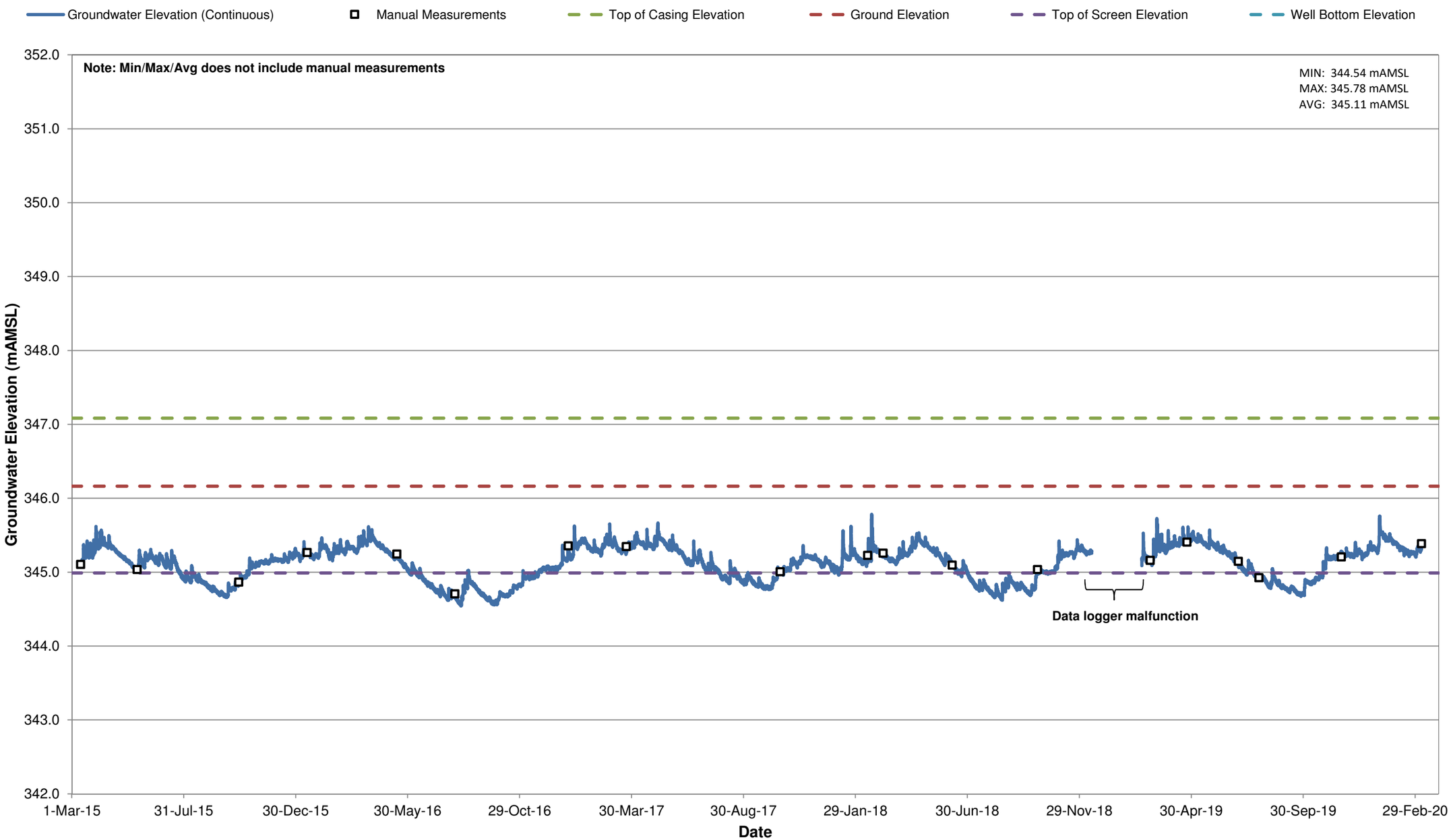
Hydrograph 2: Groundwater Elevations (mAMSL) - MW102-14



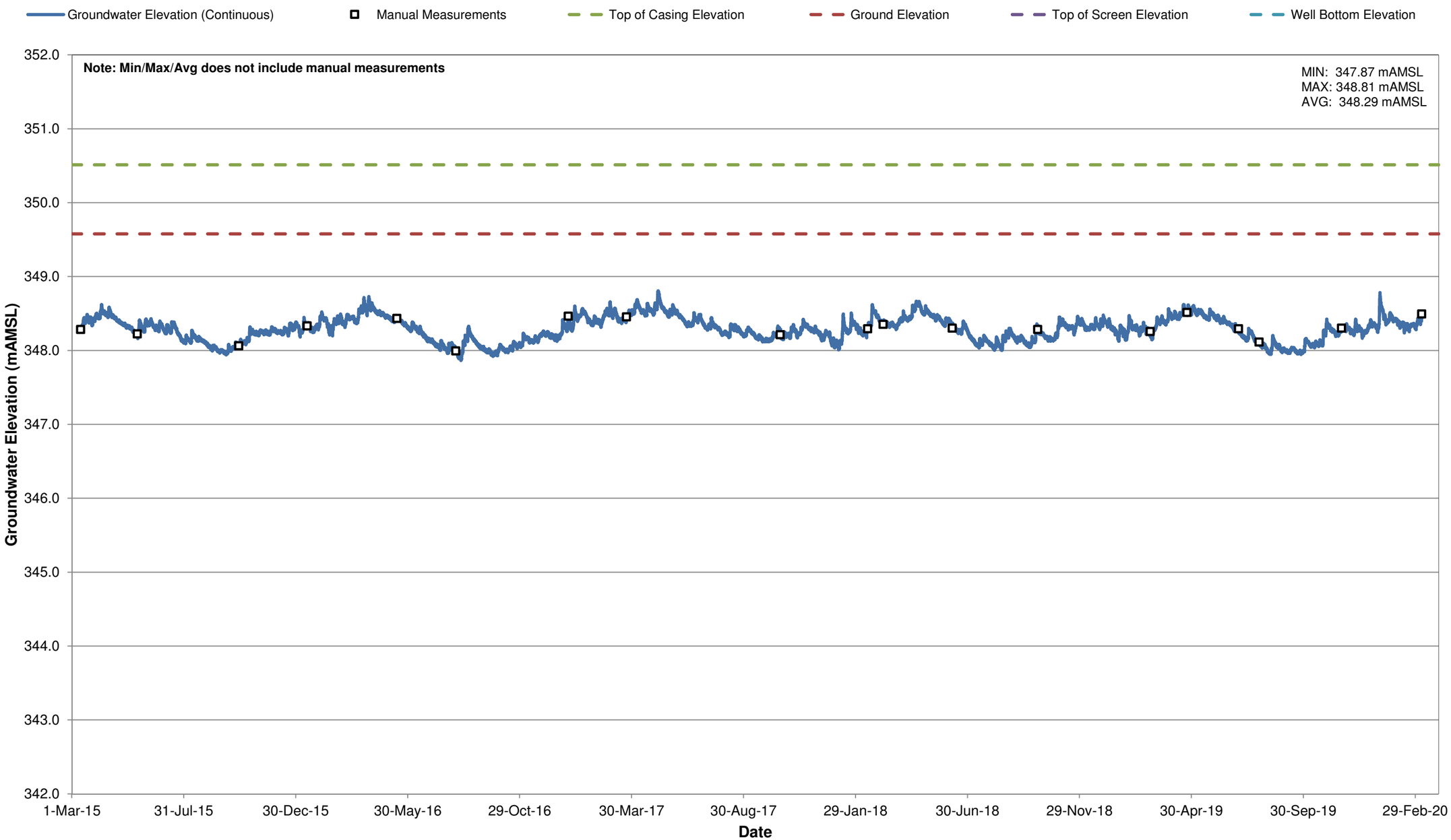
Hydrograph 3: Groundwater Elevations (mAMSL) - MW103-14



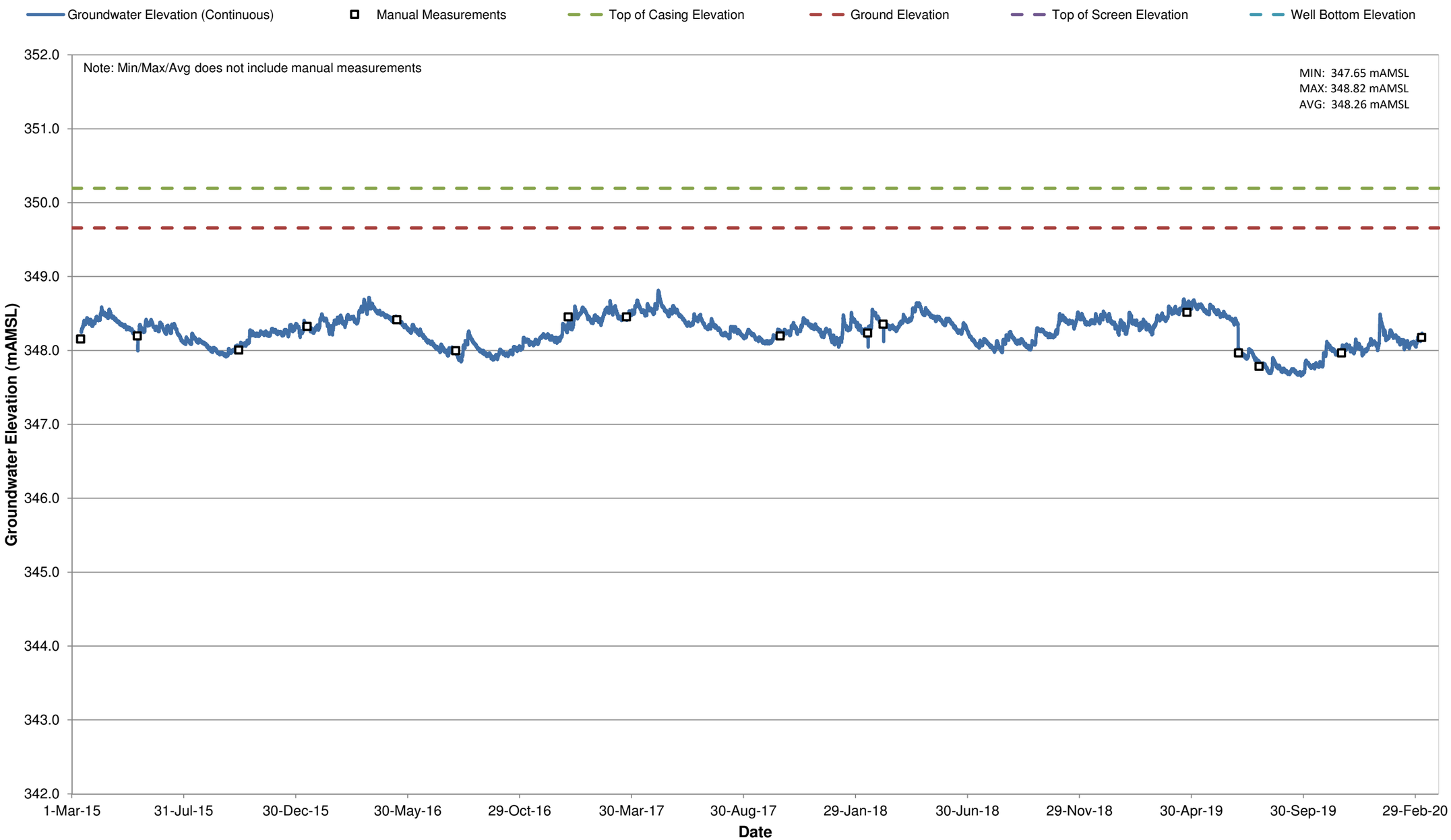
Hydrograph 4: Groundwater Elevations (mAMSL) - MW104-14



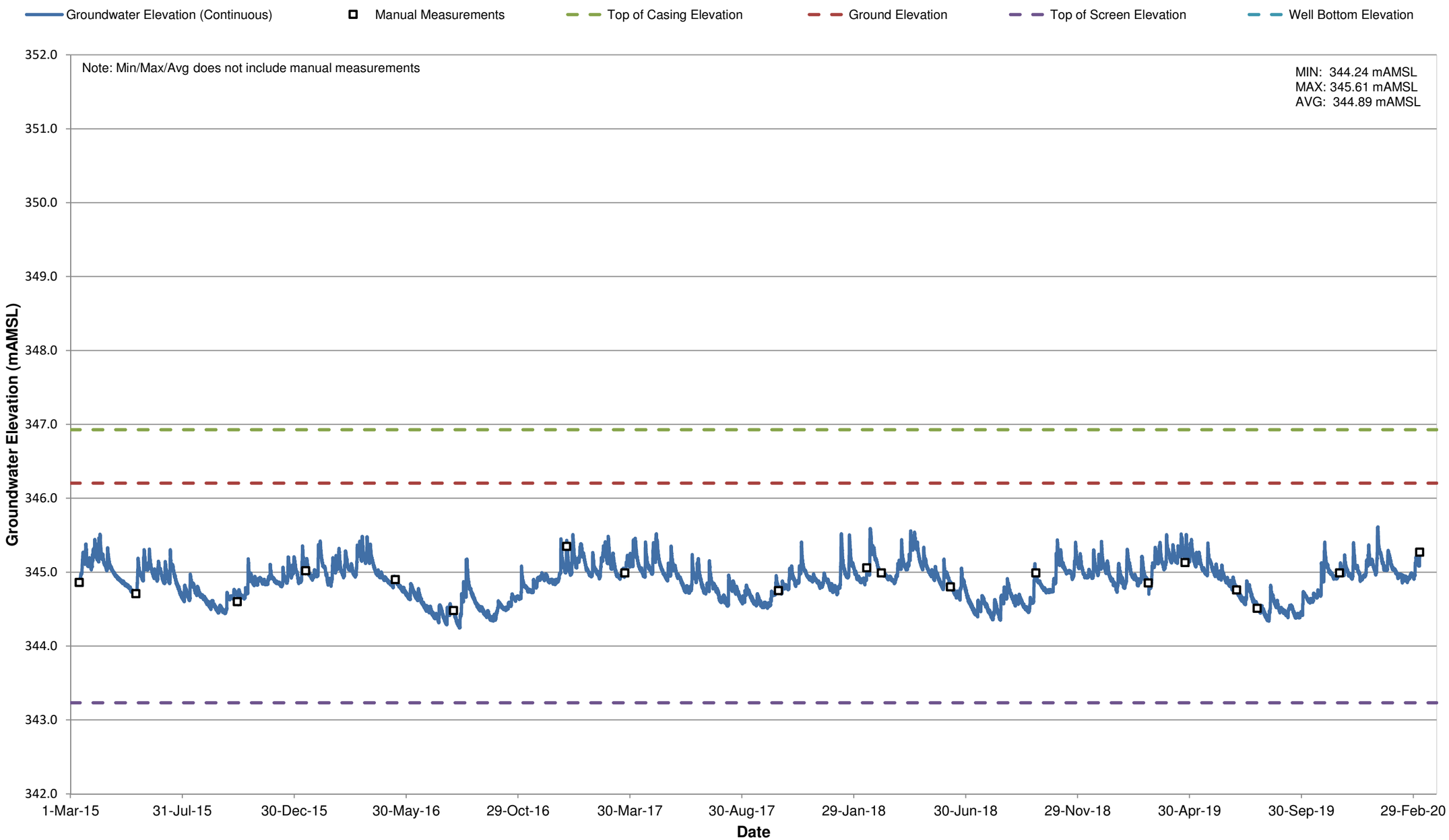
Hydrograph 5: Groundwater Elevations (mAMSL) - MW105A-14



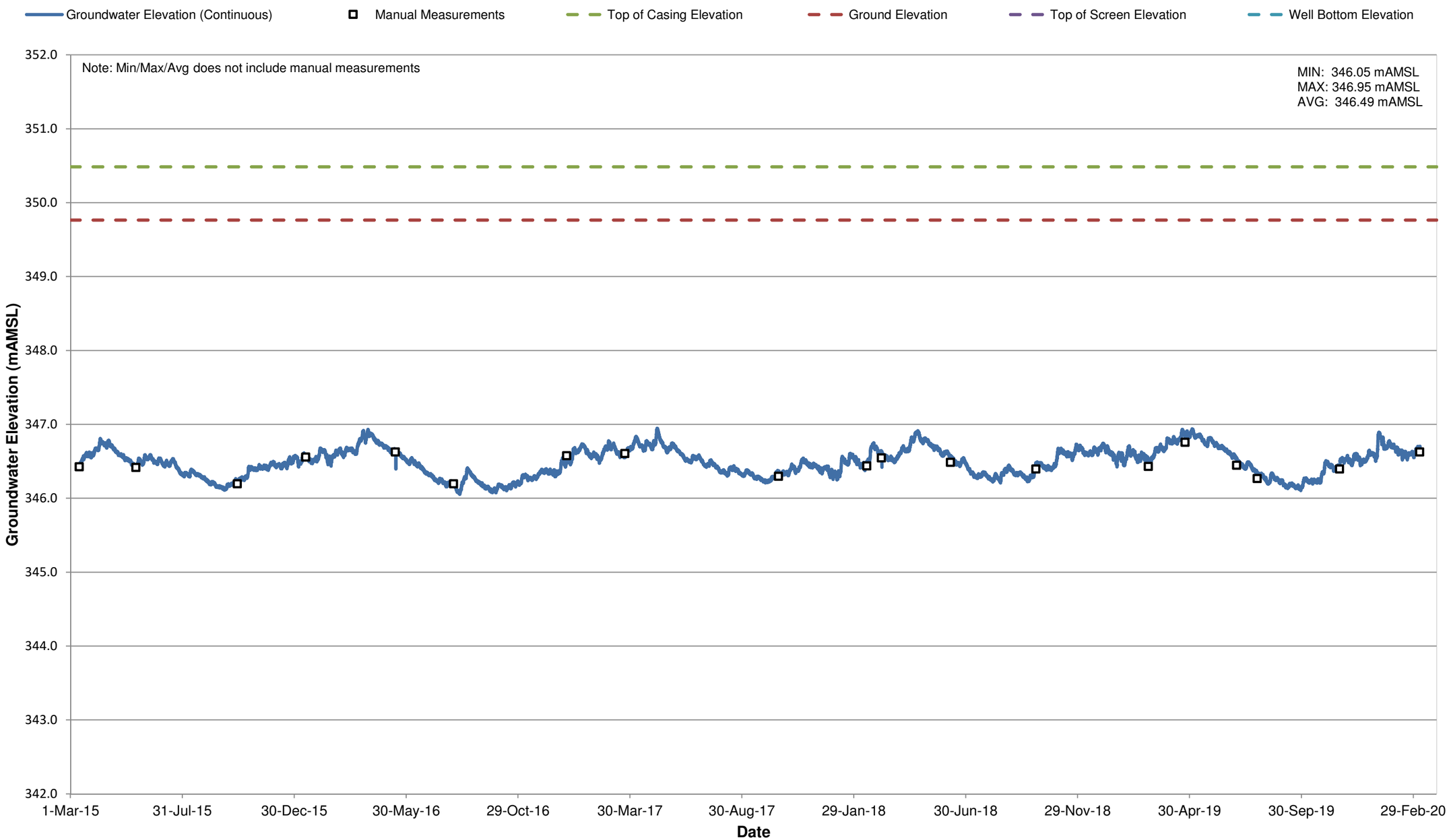
Hydrograph 6: Groundwater Elevations (mAMSL) - MW105B-14



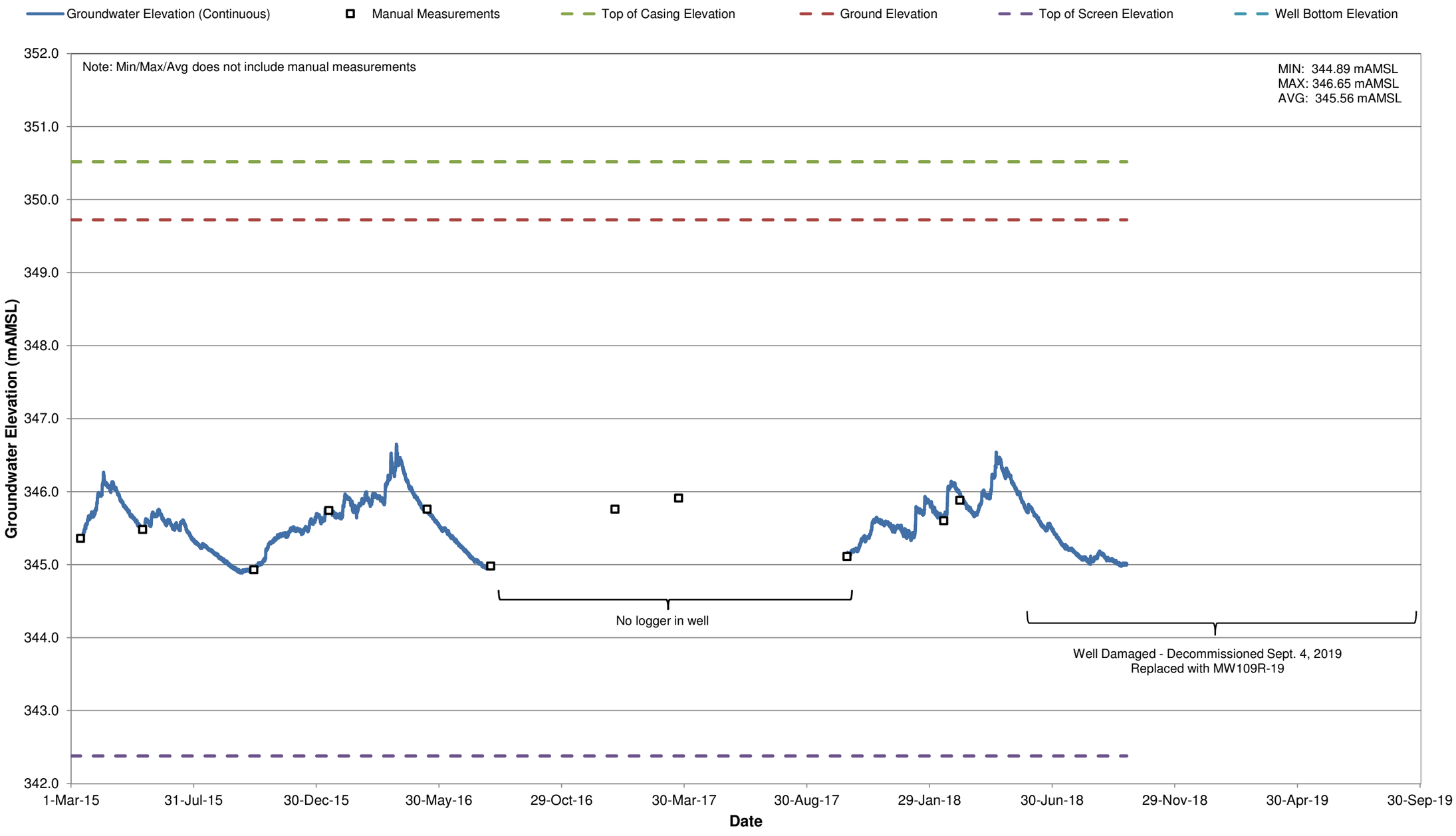
Hydrograph 7: Groundwater Elevations (mAMSL) - MW108-14



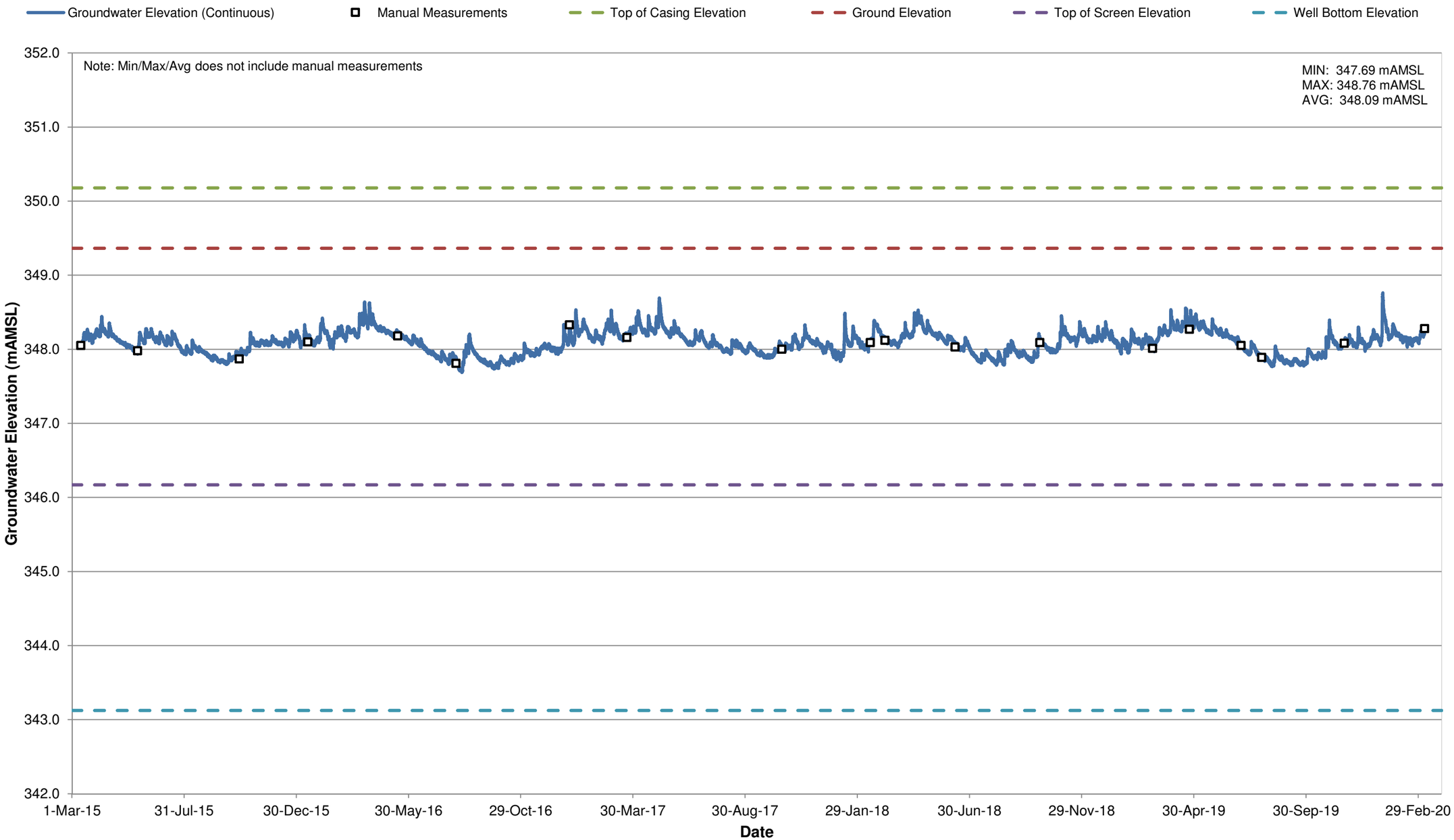
Hydrograph 8: Groundwater Elevations (mAMSL) - MW109A-14



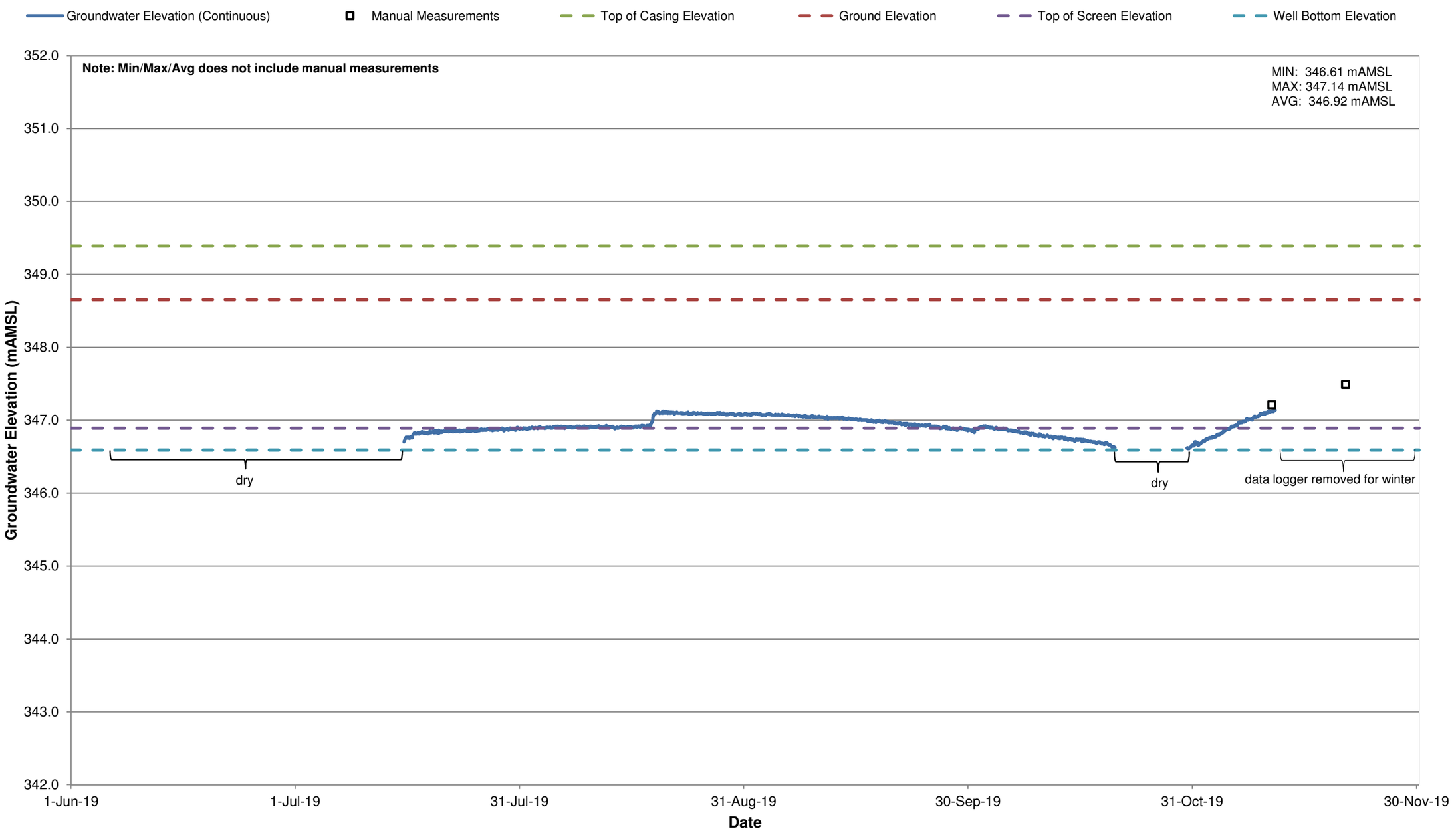
Hydrograph 9: Groundwater Elevations (mAMSL) - MW109B-14



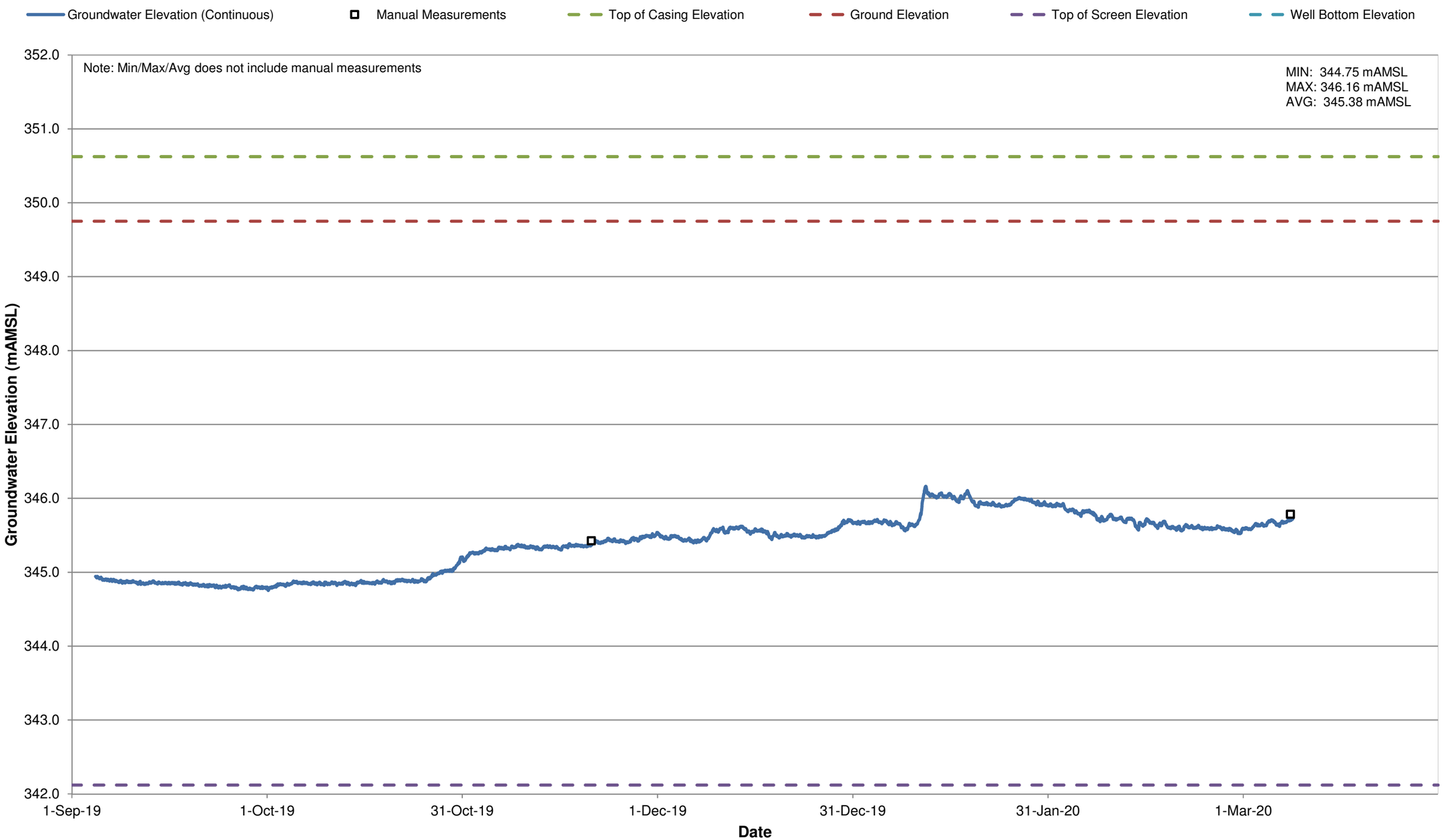
Hydrograph 10: Groundwater Elevations (mAMSL) - MW110-14



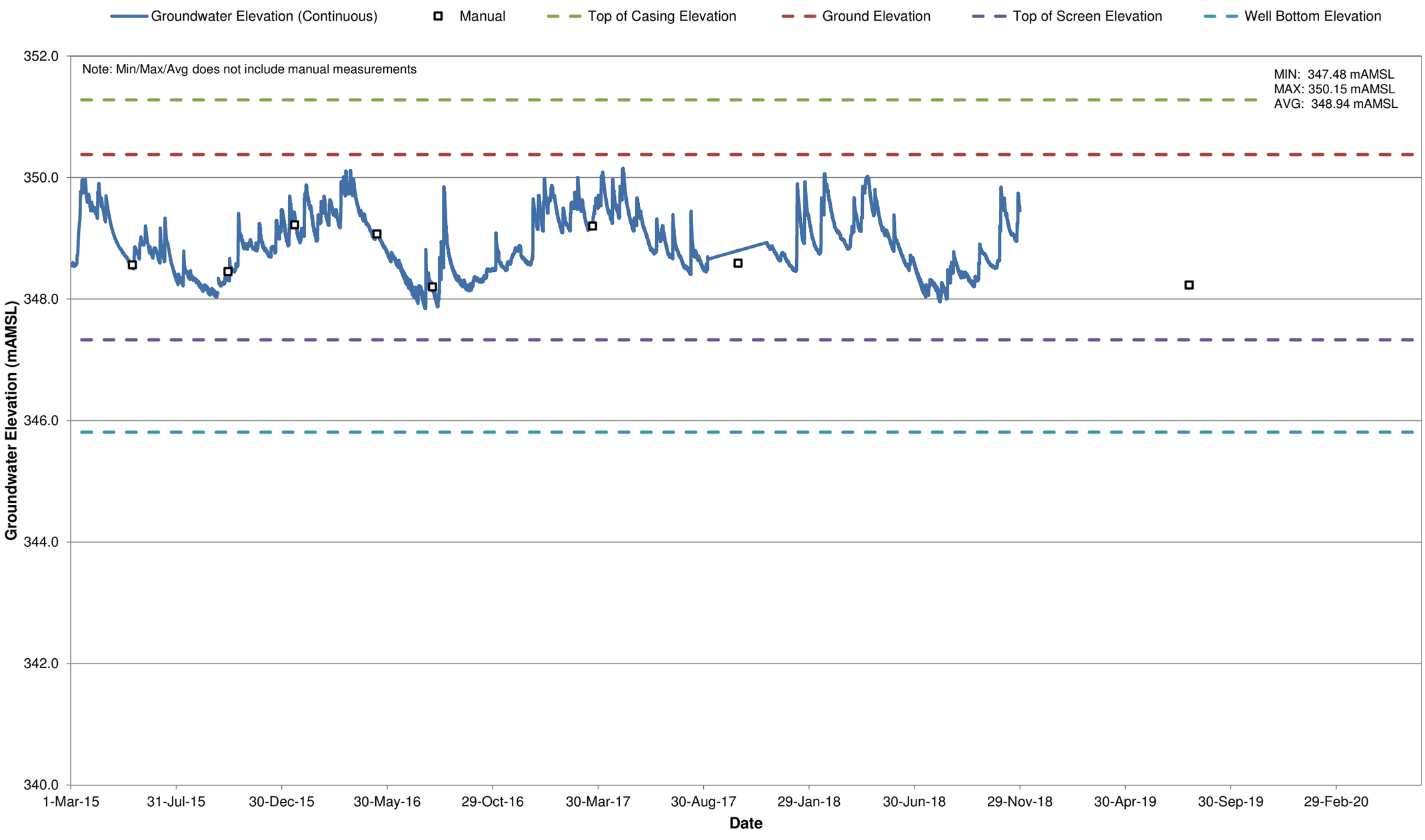
Hydrograph 11: Groundwater Elevations (mAMSL) - MP1-19



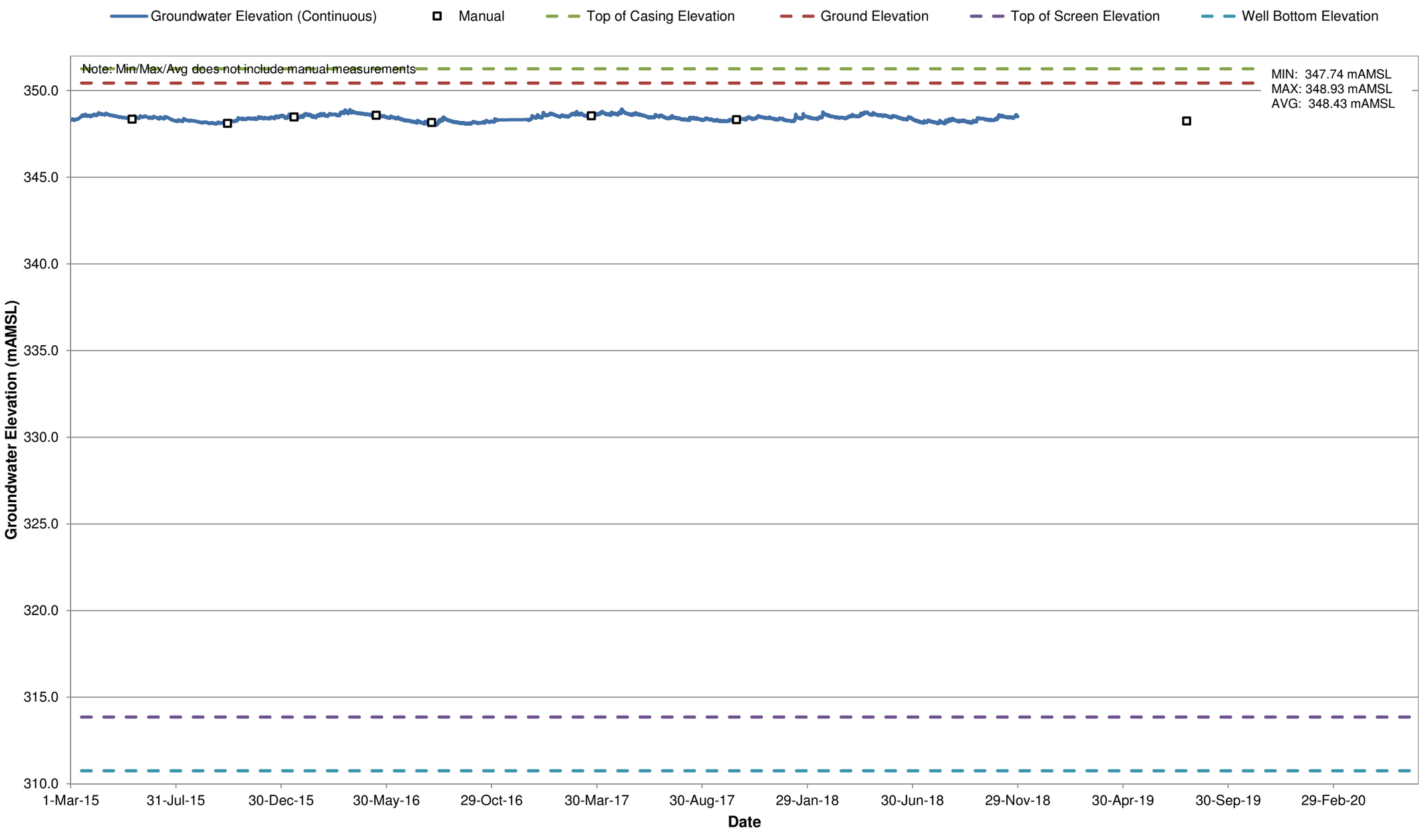
Hydrograph 12: Groundwater Elevations (mAMSL) - MW109b-19R



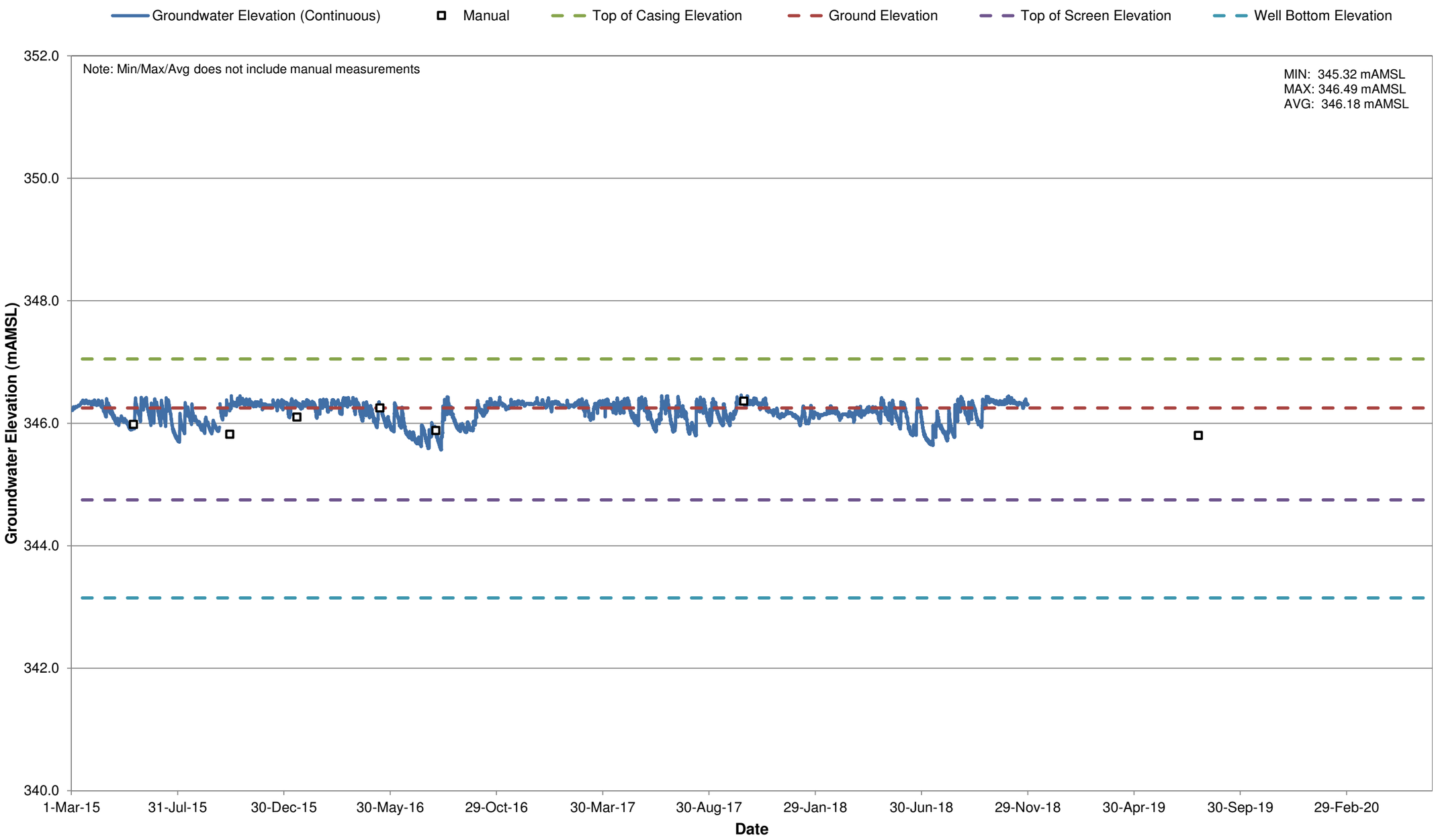
Hydrograph 13: Groundwater Elevations (mAMSL) - MW8S-10



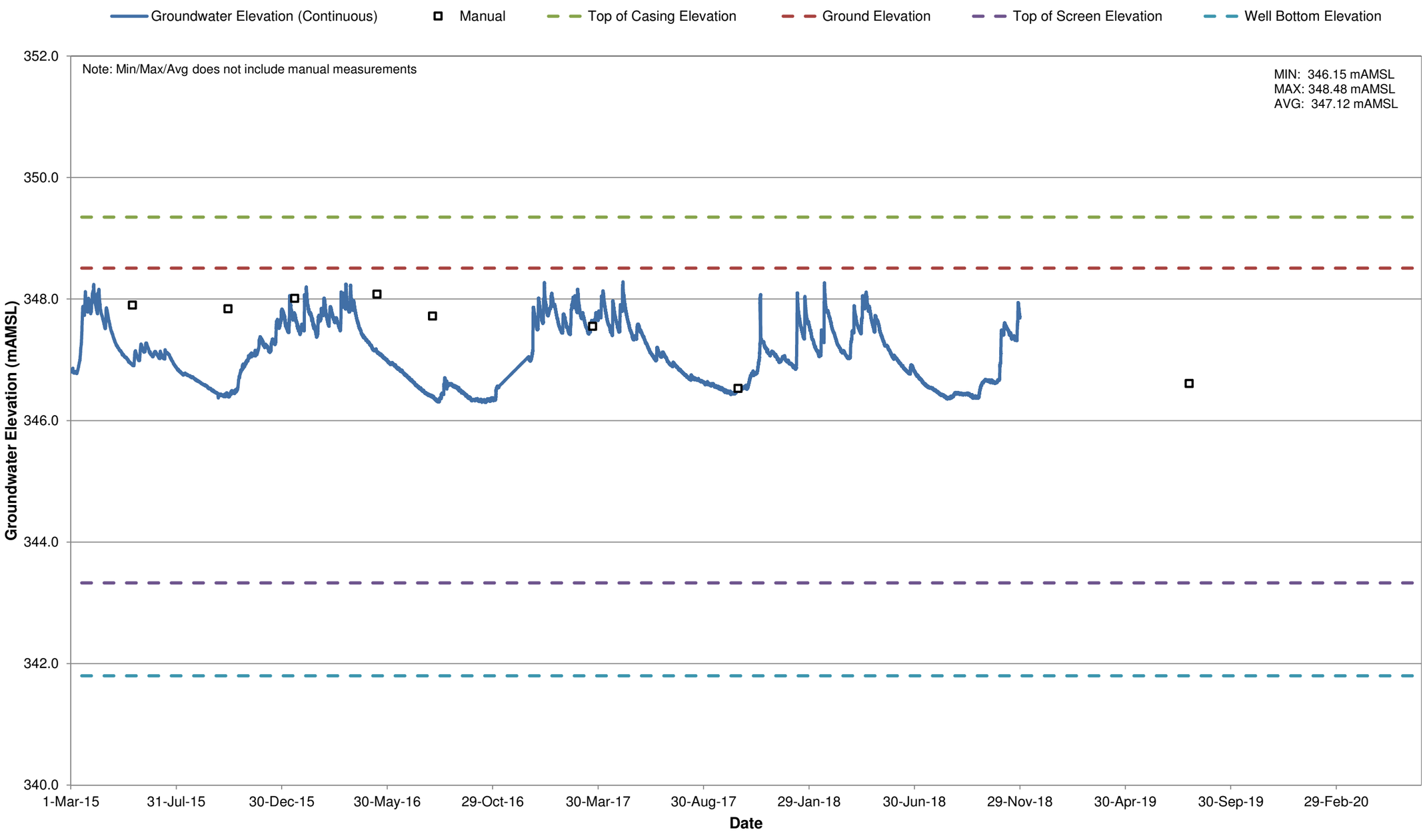
Hydrograph 14: Groundwater Elevations (mAMSL) - MW8D-10



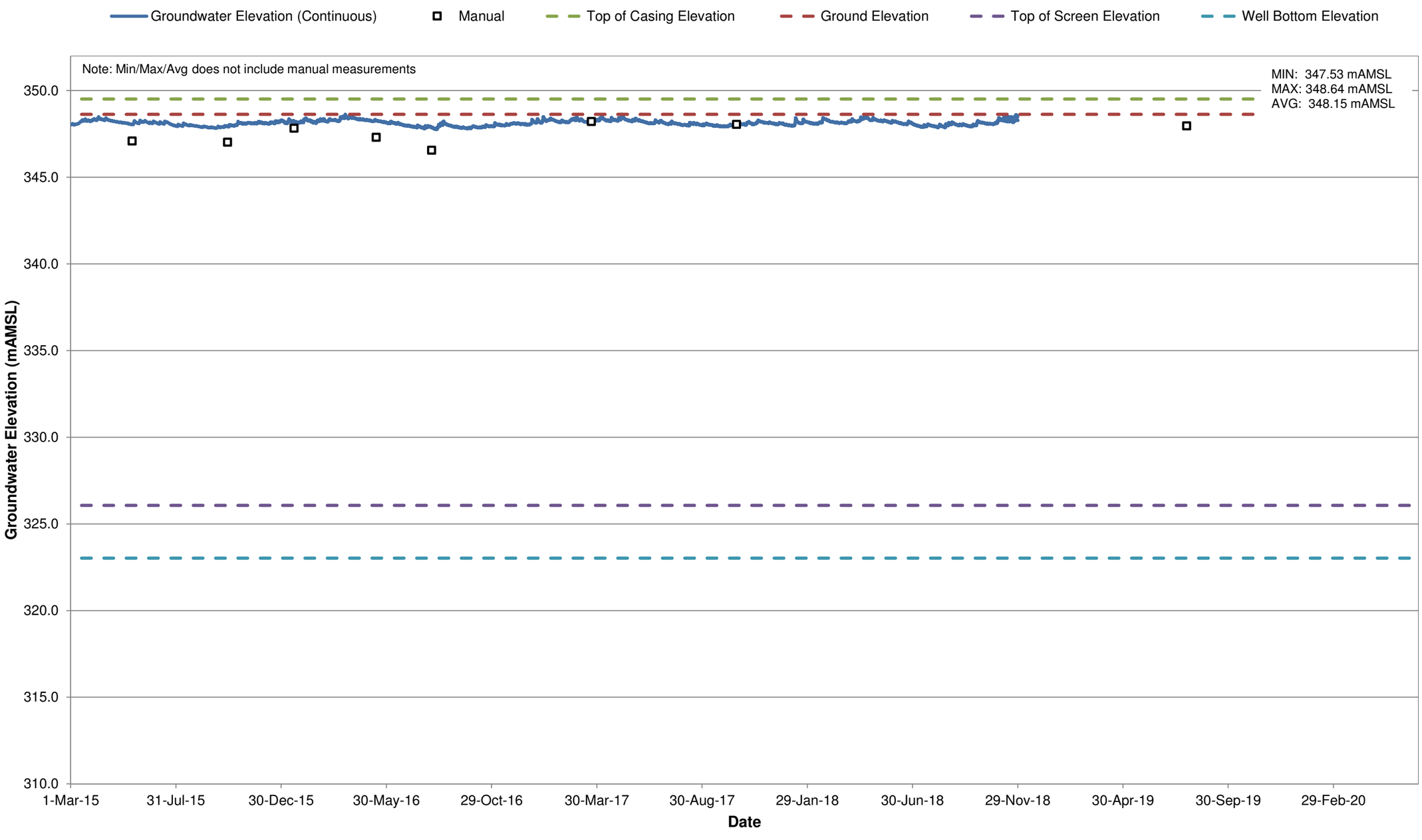
Hydrograph 15: Groundwater Elevations (mAMSL) - MW10-10



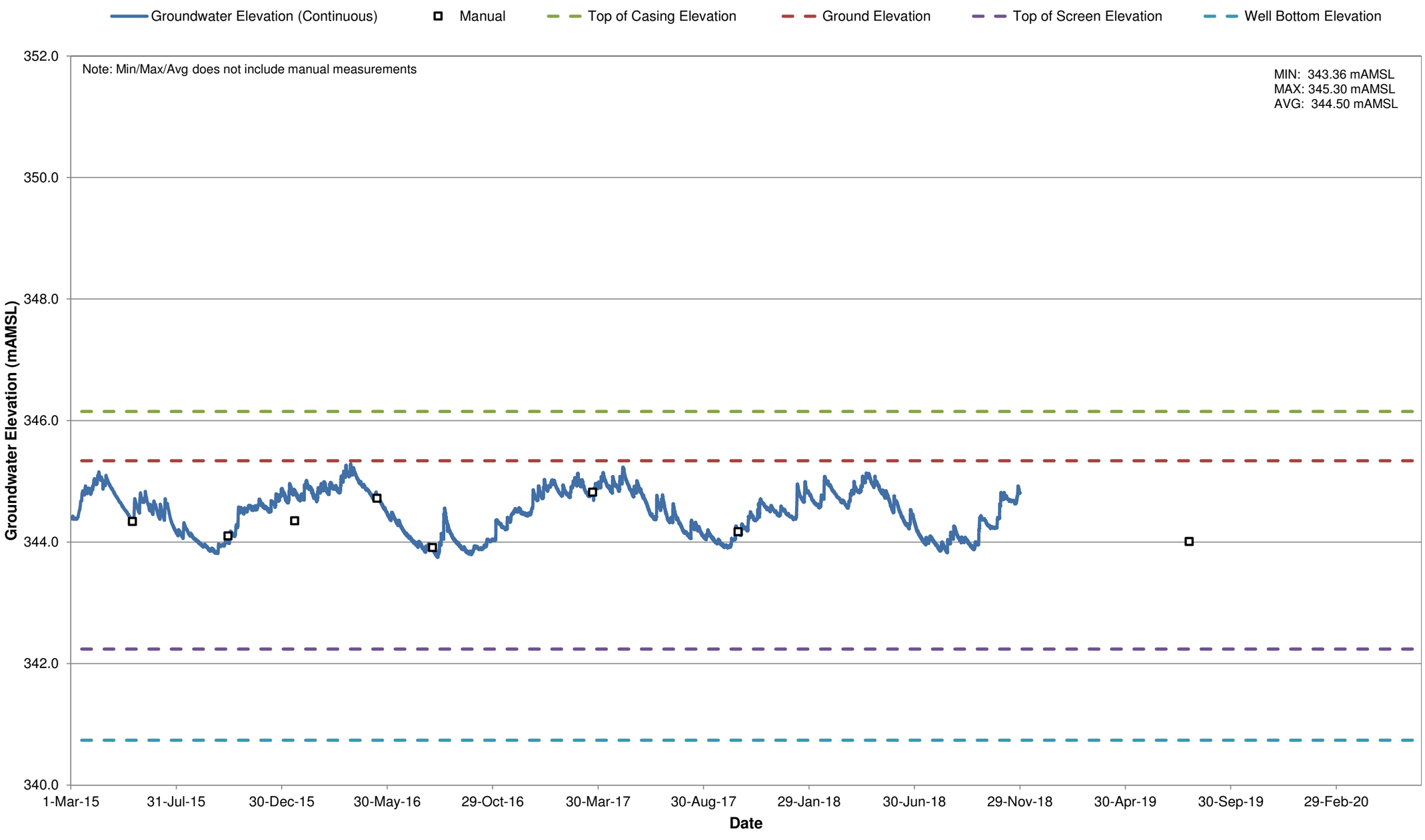
Hydrograph 16: Groundwater Elevations (mAMSL) - MW12S-10



Hydrograph 17: Groundwater Elevations (mAMSL) - MW12D-10



Hydrograph 18: Groundwater Elevations (mAMSL) - MW13-10



Appendix D

Laboratory Certificate of Analyses

MTE CONSULTANTS INC.
ATTN: ANDREW BINGEMAN
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9

Date Received: 24-MAR-17
Report Date: 03-APR-17 12:52 (MT)
Version: FINAL

Client Phone: 519-743-6500

Certificate of Analysis

Lab Work Order #: L1905250

Project P.O. #: NOT SUBMITTED
Job Reference: 39502-104
C of C Numbers: 15-555503
Legal Site Desc:

Mary-Lynn Pike
Client Services Supervisor

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Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-1 MTE-MW110-14							
Sampled By: CLIENT on 23-MAR-17 @ 16:20							
Matrix: WATER							
Physical Tests							
Colour, Apparent	32.7		2.0	CU	25-MAR-17		*5
Conductivity	695		3.0	umhos/cm	27-MAR-17		
Hardness (as CaCO3)	360		10	mg/L	28-MAR-17		*80-100
pH	7.67		0.10	pH units	27-MAR-17		6.5-8.5
Total Dissolved Solids	399	DLDS	20	mg/L	29-MAR-17		500
Turbidity	>4000		0.10	NTU	25-MAR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	392		10	mg/L	28-MAR-17		30-500
Ammonia, Total (as N)	0.082	DLM	0.040	mg/L	27-MAR-17		
Chloride (Cl)	<0.50		0.50	mg/L	27-MAR-17		250
Fluoride (F)	0.048		0.020	mg/L	27-MAR-17	1.5	
Nitrate (as N)	<0.020		0.020	mg/L	27-MAR-17	10	
Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
Sulfate (SO4)	10.6		0.30	mg/L	27-MAR-17		500
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006	
Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.025	
Barium (Ba)-Dissolved	0.054		0.010	mg/L	27-MAR-17	1	
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5	
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
Calcium (Ca)-Dissolved	115		0.50	mg/L	27-MAR-17		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
Cobalt (Co)-Dissolved	0.00052		0.00050	mg/L	27-MAR-17		
Copper (Cu)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		1
Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
Magnesium (Mg)-Dissolved	17.5		0.50	mg/L	27-MAR-17		
Manganese (Mn)-Dissolved	0.168		0.0010	mg/L	27-MAR-17		*0.05
Molybdenum (Mo)-Dissolved	0.0015		0.0010	mg/L	27-MAR-17		
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
Potassium (K)-Dissolved	1.8		1.0	mg/L	27-MAR-17		
Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	27-MAR-17	0.01	
Silicon (Si)-Dissolved	3.3		1.0	mg/L	27-MAR-17		
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
Sodium (Na)-Dissolved	4.63		0.50	mg/L	27-MAR-17	20	200
Strontium (Sr)-Dissolved	0.193		0.0010	mg/L	27-MAR-17		
Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		

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

Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2		
L1905250-1	MTE-MW110-14									
Sampled By:	CLIENT on 23-MAR-17 @ 16:20									
Matrix:	WATER									
Dissolved Metals										
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02			
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-17		5		
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17				
L1905250-2	MTE-MW101-14									
Sampled By:	CLIENT on 24-MAR-17 @ 17:30									
Matrix:	WATER						#1	#2		
Physical Tests										
	Colour, Apparent	12.9		2.0	CU	25-MAR-17		*5		
	Conductivity	690		3.0	umhos/cm	27-MAR-17				
	Hardness (as CaCO3)	303		10	mg/L	28-MAR-17		*80-100		
	pH	7.84		0.10	pH units	27-MAR-17		6.5-8.5		
	Total Dissolved Solids	404	DLDS	20	mg/L	29-MAR-17		500		
	Turbidity	350		0.10	NTU	25-MAR-17		*5		
Anions and Nutrients										
	Alkalinity, Total (as CaCO3)	264		10	mg/L	28-MAR-17		30-500		
	Ammonia, Total (as N)	<0.020		0.020	mg/L	27-MAR-17				
	Chloride (Cl)	37.9		0.50	mg/L	27-MAR-17		250		
	Fluoride (F)	0.027		0.020	mg/L	27-MAR-17	1.5			
	Nitrate (as N)	7.95		0.020	mg/L	27-MAR-17	10			
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1			
	Orthophosphate-Dissolved (as P)	0.0035		0.0030	mg/L	27-MAR-17				
	Sulfate (SO4)	20.7		0.30	mg/L	27-MAR-17		500		
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17				
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1		
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006			
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.025			
	Barium (Ba)-Dissolved	0.025		0.010	mg/L	27-MAR-17	1			
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5			
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005			
	Calcium (Ca)-Dissolved	85.5		0.50	mg/L	27-MAR-17				
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05			
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17				
	Copper (Cu)-Dissolved	0.0026		0.0010	mg/L	27-MAR-17		1		
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3		
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01			
	Magnesium (Mg)-Dissolved	21.6		0.50	mg/L	27-MAR-17				
	Manganese (Mn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		0.05		
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17				
	Potassium (K)-Dissolved	1.7		1.0	mg/L	27-MAR-17				

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-2	MTE-MW101-14							
Sampled By:	CLIENT on 24-MAR-17 @ 17:30							
Matrix:	WATER							
Dissolved Metals								
	Selenium (Se)-Dissolved	0.00041		0.00040	mg/L	27-MAR-17	0.01	
	Silicon (Si)-Dissolved	4.0		1.0	mg/L	27-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
	Sodium (Na)-Dissolved	16.5		0.50	mg/L	27-MAR-17	20	200
	Strontium (Sr)-Dissolved	0.138		0.0010	mg/L	27-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17		
L1905250-3	MTE-MW102-14							
Sampled By:	CLIENT on 24-MAR-17 @ 16:30							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	21.8		2.0	CU	25-MAR-17		*5
	Conductivity	655		3.0	umhos/cm	27-MAR-17		
	Hardness (as CaCO3)	290		10	mg/L	28-MAR-17		*80-100
	pH	7.94		0.10	pH units	27-MAR-17		6.5-8.5
	Total Dissolved Solids	393	DLDS	20	mg/L	29-MAR-17		500
	Turbidity	>4000		0.10	NTU	25-MAR-17		*5
Anions and Nutrients								
	Alkalinity, Total (as CaCO3)	259		10	mg/L	28-MAR-17		30-500
	Ammonia, Total (as N)	0.060		0.020	mg/L	27-MAR-17		
	Chloride (Cl)	24.1		0.50	mg/L	27-MAR-17		250
	Fluoride (F)	0.029		0.020	mg/L	27-MAR-17	1.5	
	Nitrate (as N)	7.38		0.020	mg/L	27-MAR-17	10	
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
	Sulfate (SO4)	28.7		0.30	mg/L	27-MAR-17		500
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006	
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.025	
	Barium (Ba)-Dissolved	0.086		0.010	mg/L	27-MAR-17	1	
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5	
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
	Calcium (Ca)-Dissolved	80.0		0.50	mg/L	27-MAR-17		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17		

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-3	MTE-MW102-14							
Sampled By:	CLIENT on 24-MAR-17 @ 16:30							
Matrix:	WATER							
Dissolved Metals								
	Copper (Cu)-Dissolved	0.0029		0.0010	mg/L	27-MAR-17		1
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
	Magnesium (Mg)-Dissolved	21.8		0.50	mg/L	27-MAR-17		
	Manganese (Mn)-Dissolved	0.0054		0.0010	mg/L	27-MAR-17		0.05
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
	Potassium (K)-Dissolved	2.2		1.0	mg/L	27-MAR-17		
	Selenium (Se)-Dissolved	0.00081		0.00040	mg/L	27-MAR-17	0.01	
	Silicon (Si)-Dissolved	3.4		1.0	mg/L	27-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
	Sodium (Na)-Dissolved	15.5		0.50	mg/L	27-MAR-17	20	200
	Strontium (Sr)-Dissolved	0.134		0.0010	mg/L	27-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17		
L1905250-4	MTE-MW103-14							
Sampled By:	CLIENT on 24-MAR-17 @ 13:45							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	28.3		2.0	CU	25-MAR-17		*5
	Conductivity	610		3.0	umhos/cm	27-MAR-17		
	Hardness (as CaCO3)	284		10	mg/L	28-MAR-17		*80-100
	pH	7.95		0.10	pH units	27-MAR-17		6.5-8.5
	Total Dissolved Solids	362	DLDS	20	mg/L	29-MAR-17		500
	Turbidity	>4000		0.10	NTU	25-MAR-17		*5
Anions and Nutrients								
	Alkalinity, Total (as CaCO3)	273		10	mg/L	28-MAR-17		30-500
	Ammonia, Total (as N)	0.123		0.020	mg/L	27-MAR-17		
	Chloride (Cl)	9.72		0.50	mg/L	27-MAR-17		250
	Fluoride (F)	0.105		0.020	mg/L	27-MAR-17	1.5	
	Nitrate (as N)	2.91		0.020	mg/L	27-MAR-17	10	
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
	Orthophosphate-Dissolved (as P)	0.0035		0.0030	mg/L	27-MAR-17		
	Sulfate (SO4)	24.4		0.30	mg/L	27-MAR-17		500
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
	Aluminum (Al)-Dissolved	0.103		0.010	mg/L	27-MAR-17		*0.1
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006	

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-4 MTE-MW103-14							
Sampled By: CLIENT on 24-MAR-17 @ 13:45							
Matrix: WATER							
Dissolved Metals							
Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.025	
Barium (Ba)-Dissolved	0.085		0.010	mg/L	27-MAR-17	1	
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5	
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
Calcium (Ca)-Dissolved	77.9		0.50	mg/L	27-MAR-17		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17		
Copper (Cu)-Dissolved	0.0034		0.0010	mg/L	27-MAR-17		1
Iron (Fe)-Dissolved	0.103		0.050	mg/L	27-MAR-17		0.3
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
Magnesium (Mg)-Dissolved	21.8		0.50	mg/L	27-MAR-17		
Manganese (Mn)-Dissolved	0.0358		0.0010	mg/L	27-MAR-17		0.05
Molybdenum (Mo)-Dissolved	0.0021		0.0010	mg/L	27-MAR-17		
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
Potassium (K)-Dissolved	1.3		1.0	mg/L	27-MAR-17		
Selenium (Se)-Dissolved	0.00075		0.00040	mg/L	27-MAR-17	0.01	
Silicon (Si)-Dissolved	3.6		1.0	mg/L	27-MAR-17		
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
Sodium (Na)-Dissolved	17.9		0.50	mg/L	27-MAR-17	20	200
Strontium (Sr)-Dissolved	0.237		0.0010	mg/L	27-MAR-17		
Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Titanium (Ti)-Dissolved	<0.0070	DLUI	0.0070	mg/L	27-MAR-17		
Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		
Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02	
Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Zinc (Zn)-Dissolved	0.0034		0.0030	mg/L	27-MAR-17		5
Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17		
L1905250-5 MTE-MW104-14							
Sampled By: CLIENT on 24-MAR-17 @ 12:45							
Matrix: WATER							
Physical Tests							
Colour, Apparent	89.7		2.0	CU	25-MAR-17		*5
Conductivity	616		3.0	umhos/cm	27-MAR-17		
Hardness (as CaCO3)	301		10	mg/L	28-MAR-17		*80-100
pH	7.91		0.10	pH units	27-MAR-17		6.5-8.5
Total Dissolved Solids	392	DLDS	20	mg/L	29-MAR-17		500
Turbidity	1090		0.10	NTU	25-MAR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	247		10	mg/L	28-MAR-17		30-500
Ammonia, Total (as N)	<0.020		0.020	mg/L	27-MAR-17		
Chloride (Cl)	11.9		0.50	mg/L	27-MAR-17		250

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-5	MTE-MW104-14							
Sampled By:	CLIENT on 24-MAR-17 @ 12:45							
Matrix:	WATER							
Anions and Nutrients								
	Fluoride (F)	0.050		0.020	mg/L	27-MAR-17	1.5	
	Nitrate (as N)	12.7		0.020	mg/L	27-MAR-17	*10	
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
	Sulfate (SO4)	17.7		0.30	mg/L	27-MAR-17		500
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006	
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.025	
	Barium (Ba)-Dissolved	0.017		0.010	mg/L	27-MAR-17	1	
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5	
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
	Calcium (Ca)-Dissolved	93.6		0.50	mg/L	27-MAR-17		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17		
	Copper (Cu)-Dissolved	0.0034		0.0010	mg/L	27-MAR-17		1
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
	Magnesium (Mg)-Dissolved	16.5		0.50	mg/L	27-MAR-17		
	Manganese (Mn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		0.05
	Molybdenum (Mo)-Dissolved	0.0180		0.0010	mg/L	27-MAR-17		
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
	Potassium (K)-Dissolved	<1.0		1.0	mg/L	27-MAR-17		
	Selenium (Se)-Dissolved	0.00046		0.00040	mg/L	27-MAR-17	0.01	
	Silicon (Si)-Dissolved	3.6		1.0	mg/L	27-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
	Sodium (Na)-Dissolved	2.28		0.50	mg/L	27-MAR-17	20	200
	Strontium (Sr)-Dissolved	0.133		0.0010	mg/L	27-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Zinc (Zn)-Dissolved	0.0032		0.0030	mg/L	27-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17		
L1905250-6	MTE-MW105A-14							
Sampled By:	CLIENT on 24-MAR-17 @ 14:35							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	22.8		2.0	CU	25-MAR-17		*5

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-6 MTE-MW105A-14							
Sampled By: CLIENT on 24-MAR-17 @ 14:35							
Matrix: WATER							
Physical Tests							
Conductivity	477		3.0	umhos/cm	27-MAR-17		
Hardness (as CaCO3)	218		10	mg/L	28-MAR-17		*80-100
pH	7.99		0.10	pH units	27-MAR-17		6.5-8.5
Total Dissolved Solids	267	DLDS	20	mg/L	29-MAR-17		500
Turbidity	67.9		0.10	NTU	25-MAR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	253		10	mg/L	28-MAR-17		30-500
Ammonia, Total (as N)	<0.020		0.020	mg/L	27-MAR-17		
Chloride (Cl)	2.29		0.50	mg/L	27-MAR-17		250
Fluoride (F)	0.212		0.020	mg/L	27-MAR-17	1.5	
Nitrate (as N)	0.063		0.020	mg/L	27-MAR-17	10	
Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
Sulfate (SO4)	14.2		0.30	mg/L	27-MAR-17		500
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006	
Arsenic (As)-Dissolved	0.0025		0.0010	mg/L	27-MAR-17	0.025	
Barium (Ba)-Dissolved	0.077		0.010	mg/L	27-MAR-17	1	
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5	
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
Calcium (Ca)-Dissolved	41.1		0.50	mg/L	27-MAR-17		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17		
Copper (Cu)-Dissolved	0.0043		0.0010	mg/L	27-MAR-17		1
Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
Magnesium (Mg)-Dissolved	28.1		0.50	mg/L	27-MAR-17		
Manganese (Mn)-Dissolved	0.0044		0.0010	mg/L	27-MAR-17		0.05
Molybdenum (Mo)-Dissolved	0.0074		0.0010	mg/L	27-MAR-17		
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
Potassium (K)-Dissolved	1.3		1.0	mg/L	27-MAR-17		
Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	27-MAR-17	0.01	
Silicon (Si)-Dissolved	9.3		1.0	mg/L	27-MAR-17		
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
Sodium (Na)-Dissolved	16.9		0.50	mg/L	27-MAR-17	20	200
Strontium (Sr)-Dissolved	0.469		0.0010	mg/L	27-MAR-17		
Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		
Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02	

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-6 MTE-MW105A-14							
Sampled By: CLIENT on 24-MAR-17 @ 14:35							
Matrix: WATER							
Dissolved Metals							
Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Zinc (Zn)-Dissolved	0.0031		0.0030	mg/L	27-MAR-17		5
Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17		
L1905250-7 MTE-MW105B-14							
Sampled By: CLIENT on 24-MAR-17 @ 15:20							
Matrix: WATER							
Physical Tests							
Colour, Apparent	70.8		2.0	CU	25-MAR-17		*5
Conductivity	410		3.0	umhos/cm	27-MAR-17		
Hardness (as CaCO3)	181		10	mg/L	28-MAR-17		*80-100
pH	8.23		0.10	pH units	27-MAR-17		6.5-8.5
Total Dissolved Solids	244	DLDS	20	mg/L	29-MAR-17		500
Turbidity	>4000		0.10	NTU	25-MAR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	218		10	mg/L	28-MAR-17		30-500
Ammonia, Total (as N)	0.184		0.020	mg/L	27-MAR-17		
Chloride (Cl)	0.66		0.50	mg/L	27-MAR-17		250
Fluoride (F)	0.338		0.020	mg/L	27-MAR-17	1.5	
Nitrate (as N)	0.164		0.020	mg/L	27-MAR-17	10	
Nitrite (as N)	0.020		0.010	mg/L	27-MAR-17	1	
Orthophosphate-Dissolved (as P)	0.0155		0.0030	mg/L	27-MAR-17		
Sulfate (SO4)	9.08		0.30	mg/L	27-MAR-17		500
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006	
Arsenic (As)-Dissolved	0.0102		0.0010	mg/L	27-MAR-17	0.025	
Barium (Ba)-Dissolved	0.066		0.010	mg/L	27-MAR-17	1	
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
Boron (B)-Dissolved	0.085		0.050	mg/L	27-MAR-17	5	
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
Calcium (Ca)-Dissolved	20.0		0.50	mg/L	27-MAR-17		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17		
Copper (Cu)-Dissolved	0.0088		0.0010	mg/L	27-MAR-17		1
Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
Magnesium (Mg)-Dissolved	31.9		0.50	mg/L	27-MAR-17		
Manganese (Mn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		0.05
Molybdenum (Mo)-Dissolved	0.0027		0.0010	mg/L	27-MAR-17		
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
Potassium (K)-Dissolved	1.1		1.0	mg/L	27-MAR-17		
Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	27-MAR-17	0.01	

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2		
L1905250-7	MTE-MW105B-14									
Sampled By:	CLIENT on 24-MAR-17 @ 15:20									
Matrix:	WATER									
Dissolved Metals										
	Silicon (Si)-Dissolved	7.0		1.0	mg/L	27-MAR-17				
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17				
	Sodium (Na)-Dissolved	15.2		0.50	mg/L	27-MAR-17	20	200		
	Strontium (Sr)-Dissolved	0.926		0.0010	mg/L	27-MAR-17				
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17				
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17				
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17				
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02			
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	27-MAR-17		5		
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17				
L1905250-8	MTE-MW109A-14									
Sampled By:	CLIENT on 24-MAR-17 @ 10:55									
Matrix:	WATER						#1	#2		
Physical Tests										
	Colour, Apparent	8.5		2.0	CU	25-MAR-17		*5		
	Conductivity	544		3.0	umhos/cm	27-MAR-17				
	Hardness (as CaCO3)	248		10	mg/L	28-MAR-17		*80-100		
	pH	7.92		0.10	pH units	27-MAR-17		6.5-8.5		
	Total Dissolved Solids	313	DLDS	20	mg/L	29-MAR-17		500		
	Turbidity	4.41		0.10	NTU	25-MAR-17		5		
Anions and Nutrients										
	Alkalinity, Total (as CaCO3)	222		10	mg/L	28-MAR-17		30-500		
	Ammonia, Total (as N)	0.073		0.020	mg/L	27-MAR-17				
	Chloride (Cl)	1.65		0.50	mg/L	27-MAR-17		250		
	Fluoride (F)	0.230		0.020	mg/L	27-MAR-17	1.5			
	Nitrate (as N)	<0.020		0.020	mg/L	27-MAR-17	10			
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1			
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17				
	Sulfate (SO4)	70.7		0.30	mg/L	27-MAR-17		500		
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17				
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1		
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006			
	Arsenic (As)-Dissolved	0.0023		0.0010	mg/L	27-MAR-17	0.025			
	Barium (Ba)-Dissolved	0.048		0.010	mg/L	27-MAR-17	1			
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5			
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005			
	Calcium (Ca)-Dissolved	57.9		0.50	mg/L	27-MAR-17				
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17	0.05			
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17				
	Copper (Cu)-Dissolved	0.0027		0.0010	mg/L	27-MAR-17		1		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2		
L1905250-8	MTE-MW109A-14									
Sampled By:	CLIENT on 24-MAR-17 @ 10:55									
Matrix:	WATER									
Dissolved Metals										
	Iron (Fe)-Dissolved	0.081		0.050	mg/L	27-MAR-17		0.3		
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01			
	Magnesium (Mg)-Dissolved	25.1		0.50	mg/L	27-MAR-17				
	Manganese (Mn)-Dissolved	0.0490		0.0010	mg/L	27-MAR-17		0.05		
	Molybdenum (Mo)-Dissolved	0.0073		0.0010	mg/L	27-MAR-17				
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17				
	Potassium (K)-Dissolved	1.6		1.0	mg/L	27-MAR-17				
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	27-MAR-17	0.01			
	Silicon (Si)-Dissolved	8.8		1.0	mg/L	27-MAR-17				
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17				
	Sodium (Na)-Dissolved	12.2		0.50	mg/L	27-MAR-17	20	200		
	Strontium (Sr)-Dissolved	0.774		0.0010	mg/L	27-MAR-17				
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17				
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17				
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17				
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02			
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17				
	Zinc (Zn)-Dissolved	0.0030		0.0030	mg/L	27-MAR-17		5		
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17				
L1905250-9	MTE-MW109B-14									
Sampled By:	CLIENT on 24-MAR-17 @ 12:00									
Matrix:	WATER						#1	#2		
Physical Tests										
	Colour, Apparent	31.4		2.0	CU	25-MAR-17		*5		
	Conductivity	722		3.0	umhos/cm	27-MAR-17				
	Hardness (as CaCO3)	366		10	mg/L	28-MAR-17		*80-100		
	pH	7.74		0.10	pH units	27-MAR-17		6.5-8.5		
	Total Dissolved Solids	412	DLDS	20	mg/L	29-MAR-17		500		
	Turbidity	2100		0.10	NTU	25-MAR-17		*5		
Anions and Nutrients										
	Alkalinity, Total (as CaCO3)	329		10	mg/L	28-MAR-17		30-500		
	Ammonia, Total (as N)	<0.020		0.020	mg/L	27-MAR-17				
	Chloride (Cl)	19.9		0.50	mg/L	27-MAR-17		250		
	Fluoride (F)	0.022		0.020	mg/L	27-MAR-17	1.5			
	Nitrate (as N)	6.41		0.020	mg/L	27-MAR-17	10			
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1			
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17				
	Sulfate (SO4)	5.68		0.30	mg/L	27-MAR-17		500		
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17				
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		0.1		
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.006			
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.025			

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

Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-9	MTE-MW109B-14							
Sampled By:	CLIENT on 24-MAR-17 @ 12:00							
Matrix:	WATER							
Dissolved Metals								
	Barium (Ba)-Dissolved	0.022		0.010	mg/L	27-MAR-17	1	
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Boron (B)-Dissolved	<0.050		0.050	mg/L	27-MAR-17	5	
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	27-MAR-17	0.005	
	Calcium (Ca)-Dissolved	104		0.50	mg/L	27-MAR-17		
	Chromium (Cr)-Dissolved	0.00102		0.00050	mg/L	27-MAR-17	0.05	
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	27-MAR-17		
	Copper (Cu)-Dissolved	0.0028		0.0010	mg/L	27-MAR-17		1
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		0.3
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17	0.01	
	Magnesium (Mg)-Dissolved	25.6		0.50	mg/L	27-MAR-17		
	Manganese (Mn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		0.05
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	27-MAR-17		
	Potassium (K)-Dissolved	<1.0		1.0	mg/L	27-MAR-17		
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	27-MAR-17	0.01	
	Silicon (Si)-Dissolved	5.6		1.0	mg/L	27-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	27-MAR-17		
	Sodium (Na)-Dissolved	2.13		0.50	mg/L	27-MAR-17	20	200
	Strontium (Sr)-Dissolved	0.142		0.0010	mg/L	27-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	27-MAR-17		
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	27-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	27-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	27-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	27-MAR-17		
	Zinc (Zn)-Dissolved	0.0043		0.0030	mg/L	27-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	27-MAR-17		
L1905250-10	SW-SOUTH							
Sampled By:	CLIENT on 24-MAR-17 @ 09:00							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	23.3		2.0	CU	25-MAR-17		*5
	Conductivity	609		3.0	umhos/cm	27-MAR-17		
	Hardness (as CaCO3)	283		10	mg/L	28-MAR-17		*80-100
	pH	8.17		0.10	pH units	27-MAR-17		6.5-8.5
	Total Dissolved Solids	342	DLDS	20	mg/L	29-MAR-17		500
	Turbidity	4.02		0.10	NTU	25-MAR-17		5
Anions and Nutrients								
	Alkalinity, Total (as CaCO3)	245		10	mg/L	28-MAR-17		30-500
	Ammonia, Total (as N)	0.026		0.020	mg/L	27-MAR-17		
	Chloride (Cl)	37.4		0.50	mg/L	27-MAR-17		250
	Fluoride (F)	0.070		0.020	mg/L	27-MAR-17	1.5	

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-10	SW-SOUTH							
Sampled By:	CLIENT on 24-MAR-17 @ 09:00							
Matrix:	WATER							
Anions and Nutrients								
	Nitrate (as N)	2.21		0.020	mg/L	27-MAR-17	10	
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
	Orthophosphate-Dissolved (as P)	0.0039		0.0030	mg/L	27-MAR-17		
	Sulfate (SO4)	25.0		0.30	mg/L	27-MAR-17		500
Total Metals								
	Aluminum (Al)-Total	0.066		0.010	mg/L	27-MAR-17		0.1
	Antimony (Sb)-Total	<0.00010		0.00010	mg/L	27-MAR-17	0.006	
	Arsenic (As)-Total	0.00064		0.00010	mg/L	27-MAR-17	0.025	
	Barium (Ba)-Total	0.0386		0.00020	mg/L	27-MAR-17	1	
	Beryllium (Be)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
	Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	27-MAR-17		
	Boron (B)-Total	<0.010		0.010	mg/L	27-MAR-17	5	
	Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	27-MAR-17	0.005	
	Calcium (Ca)-Total	77.8		0.50	mg/L	27-MAR-17		
	Cesium (Cs)-Total	<0.000010		0.000010	mg/L	27-MAR-17		
	Chromium (Cr)-Total	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
	Cobalt (Co)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
	Copper (Cu)-Total	<0.0010		0.0010	mg/L	27-MAR-17		1
	Iron (Fe)-Total	0.159		0.050	mg/L	27-MAR-17		0.3
	Lead (Pb)-Total	0.00011		0.00010	mg/L	27-MAR-17	0.01	
	Lithium (Li)-Total	0.0014		0.0010	mg/L	27-MAR-17		
	Magnesium (Mg)-Total	19.8		0.050	mg/L	27-MAR-17		
	Manganese (Mn)-Total	0.0324		0.00050	mg/L	27-MAR-17		0.05
	Molybdenum (Mo)-Total	0.000391		0.000050	mg/L	27-MAR-17		
	Nickel (Ni)-Total	<0.00050		0.00050	mg/L	27-MAR-17		
	Phosphorus (P)-Total	<0.050		0.050	mg/L	27-MAR-17		
	Potassium (K)-Total	1.48		0.050	mg/L	27-MAR-17		
	Rubidium (Rb)-Total	0.00045		0.00020	mg/L	27-MAR-17		
	Selenium (Se)-Total	0.000140		0.000050	mg/L	27-MAR-17	0.01	
	Silicon (Si)-Total	3.69		0.10	mg/L	27-MAR-17		
	Silver (Ag)-Total	<0.000050		0.000050	mg/L	27-MAR-17		
	Sodium (Na)-Total	19.5		0.50	mg/L	27-MAR-17	20	200
	Strontium (Sr)-Total	0.152		0.0010	mg/L	27-MAR-17		
	Sulfur (S)-Total	9.31		0.50	mg/L	27-MAR-17		
	Tellurium (Te)-Total	<0.00020		0.00020	mg/L	27-MAR-17		
	Thallium (Tl)-Total	<0.000010		0.000010	mg/L	27-MAR-17		
	Thorium (Th)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
	Tin (Sn)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
	Titanium (Ti)-Total	0.00227		0.00030	mg/L	27-MAR-17		
	Tungsten (W)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
	Uranium (U)-Total	0.000818		0.000010	mg/L	27-MAR-17	0.02	
	Vanadium (V)-Total	<0.00050		0.00050	mg/L	27-MAR-17		
	Zinc (Zn)-Total	<0.0030		0.0030	mg/L	27-MAR-17		5
	Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	27-MAR-17		
Dissolved Metals								
	Dissolved Metals Filtration Location	LAB			No Unit	27-MAR-17		
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		0.1

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-10	SW-SOUTH							
Sampled By:	CLIENT on 24-MAR-17 @ 09:00							
Matrix:	WATER							
Dissolved Metals								
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.006	
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.025	
	Barium (Ba)-Dissolved	0.036		0.010	mg/L	28-MAR-17	1	
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Boron (B)-Dissolved	<0.050		0.050	mg/L	28-MAR-17	5	
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	28-MAR-17	0.005	
	Calcium (Ca)-Dissolved	80.3		0.50	mg/L	28-MAR-17		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17	0.05	
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17		
	Copper (Cu)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		1
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		0.3
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.01	
	Magnesium (Mg)-Dissolved	20.1		0.50	mg/L	28-MAR-17		
	Manganese (Mn)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		0.05
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		
	Potassium (K)-Dissolved	1.4		1.0	mg/L	28-MAR-17		
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	28-MAR-17	0.01	
	Silicon (Si)-Dissolved	3.5		1.0	mg/L	28-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-17		
	Sodium (Na)-Dissolved	19.5		0.50	mg/L	28-MAR-17	20	200
	Strontium (Sr)-Dissolved	0.163		0.0010	mg/L	28-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	28-MAR-17		
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	28-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	28-MAR-17		
L1905250-11	SW-NORTH							
Sampled By:	CLIENT on 24-MAR-17 @ 14:00							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	20.4		2.0	CU	25-MAR-17		*5
	Conductivity	596		3.0	umhos/cm	27-MAR-17		
	Hardness (as CaCO3)	264		10	mg/L	28-MAR-17		*80-100
	pH	8.26		0.10	pH units	27-MAR-17		6.5-8.5
	Total Dissolved Solids	335	DLDS	20	mg/L	29-MAR-17		500
	Turbidity	2.24		0.10	NTU	25-MAR-17		5
Anions and Nutrients								
	Alkalinity, Total (as CaCO3)	240		10	mg/L	28-MAR-17		30-500
	Ammonia, Total (as N)	<0.020		0.020	mg/L	27-MAR-17		

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#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905250-11 SW-NORTH							
Sampled By: CLIENT on 24-MAR-17 @ 14:00							
Matrix: WATER							
Anions and Nutrients							
Chloride (Cl)	35.0		0.50	mg/L	27-MAR-17		250
Fluoride (F)	0.051		0.020	mg/L	27-MAR-17	1.5	
Nitrate (as N)	1.94		0.020	mg/L	27-MAR-17	10	
Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
Orthophosphate-Dissolved (as P)	0.0042		0.0030	mg/L	27-MAR-17		
Sulfate (SO4)	25.8		0.30	mg/L	27-MAR-17		500
Total Metals							
Aluminum (Al)-Total	0.026		0.010	mg/L	27-MAR-17		0.1
Antimony (Sb)-Total	<0.00010		0.00010	mg/L	27-MAR-17	0.006	
Arsenic (As)-Total	0.00061		0.00010	mg/L	27-MAR-17	0.025	
Barium (Ba)-Total	0.0373		0.00020	mg/L	27-MAR-17	1	
Beryllium (Be)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L	27-MAR-17		
Boron (B)-Total	<0.010		0.010	mg/L	27-MAR-17	5	
Cadmium (Cd)-Total	<0.000010		0.000010	mg/L	27-MAR-17	0.005	
Calcium (Ca)-Total	78.5		0.50	mg/L	27-MAR-17		
Cesium (Cs)-Total	<0.000010		0.000010	mg/L	27-MAR-17		
Chromium (Cr)-Total	<0.00050		0.00050	mg/L	27-MAR-17	0.05	
Cobalt (Co)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
Copper (Cu)-Total	<0.0010		0.0010	mg/L	27-MAR-17		1
Iron (Fe)-Total	0.121		0.050	mg/L	27-MAR-17		0.3
Lead (Pb)-Total	<0.00010		0.00010	mg/L	27-MAR-17	0.01	
Lithium (Li)-Total	0.0015		0.0010	mg/L	27-MAR-17		
Magnesium (Mg)-Total	20.8		0.050	mg/L	27-MAR-17		
Manganese (Mn)-Total	0.0313		0.00050	mg/L	27-MAR-17		0.05
Molybdenum (Mo)-Total	0.000418		0.000050	mg/L	27-MAR-17		
Nickel (Ni)-Total	<0.00050		0.00050	mg/L	27-MAR-17		
Phosphorus (P)-Total	<0.050		0.050	mg/L	27-MAR-17		
Potassium (K)-Total	1.47		0.050	mg/L	27-MAR-17		
Rubidium (Rb)-Total	0.00039		0.00020	mg/L	27-MAR-17		
Selenium (Se)-Total	0.000136		0.000050	mg/L	27-MAR-17	0.01	
Silicon (Si)-Total	3.89		0.10	mg/L	27-MAR-17		
Silver (Ag)-Total	<0.000050		0.000050	mg/L	27-MAR-17		
Sodium (Na)-Total	19.2		0.50	mg/L	27-MAR-17	20	200
Strontium (Sr)-Total	0.152		0.0010	mg/L	27-MAR-17		
Sulfur (S)-Total	9.50		0.50	mg/L	27-MAR-17		
Tellurium (Te)-Total	<0.00020		0.00020	mg/L	27-MAR-17		
Thallium (Tl)-Total	<0.000010		0.000010	mg/L	27-MAR-17		
Thorium (Th)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
Tin (Sn)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
Titanium (Ti)-Total	0.00106		0.00030	mg/L	27-MAR-17		
Tungsten (W)-Total	<0.00010		0.00010	mg/L	27-MAR-17		
Uranium (U)-Total	0.000704		0.000010	mg/L	27-MAR-17	0.02	
Vanadium (V)-Total	<0.00050		0.00050	mg/L	27-MAR-17		
Zinc (Zn)-Total	<0.0030		0.0030	mg/L	27-MAR-17		5
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L	27-MAR-17		
Dissolved Metals							

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

Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2		
L1905250-11 SW-NORTH Sampled By: CLIENT on 24-MAR-17 @ 14:00 Matrix: WATER									
Dissolved Metals									
Dissolved Metals Filtration Location	LAB			No Unit	27-MAR-17				
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		0.1		
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.006			
Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.025			
Barium (Ba)-Dissolved	0.034		0.010	mg/L	28-MAR-17	1			
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
Boron (B)-Dissolved	<0.050		0.050	mg/L	28-MAR-17	5			
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	28-MAR-17	0.005			
Calcium (Ca)-Dissolved	73.4		0.50	mg/L	28-MAR-17				
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17	0.05			
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17				
Copper (Cu)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		1		
Iron (Fe)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		0.3		
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.01			
Magnesium (Mg)-Dissolved	19.7		0.50	mg/L	28-MAR-17				
Manganese (Mn)-Dissolved	0.0045		0.0010	mg/L	28-MAR-17		0.05		
Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17				
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	28-MAR-17				
Potassium (K)-Dissolved	1.4		1.0	mg/L	28-MAR-17				
Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	28-MAR-17	0.01			
Silicon (Si)-Dissolved	3.5		1.0	mg/L	28-MAR-17				
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-17				
Sodium (Na)-Dissolved	16.8		0.50	mg/L	28-MAR-17	20	200		
Strontium (Sr)-Dissolved	0.154		0.0010	mg/L	28-MAR-17				
Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	28-MAR-17				
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17				
Tungsten (W)-Dissolved	<0.010		0.010	mg/L	28-MAR-17				
Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.02			
Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	28-MAR-17		5		
Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	28-MAR-17				

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

CL-IC-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).

COLOUR-WT	Water	Colour	APHA 2120

Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

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.

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, 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).

MET-T-CCMS-WT	Water	Total Metals 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).

NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

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

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

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

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

Reference Information

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

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

Chain of Custody numbers:

15-555503

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.

Quality Control Report

Workorder: L1905250 Report Date: 03-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9

Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-WT	**Water**							
Batch R3687085								
WG2501792-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			101.7		%		80-120	28-MAR-17
WG2501792-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			100.3		%		80-120	28-MAR-17
WG2501792-4 DUP		**L1904933-1**						
Alkalinity, Total (as CaCO3)		91	88		mg/L	3.5	20	28-MAR-17
WG2501792-8 DUP		**L1905251-1**						
Alkalinity, Total (as CaCO3)		346	353		mg/L	1.8	20	28-MAR-17
WG2501792-2 LCS								
Alkalinity, Total (as CaCO3)			96.6		%		85-115	28-MAR-17
WG2501792-6 LCS								
Alkalinity, Total (as CaCO3)			98.1		%		85-115	28-MAR-17
WG2501792-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	28-MAR-17
WG2501792-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	28-MAR-17
CL-IC-WT	**Water**							
Batch R3686257								
WG2500466-15 DUP		**WG2500466-13**						
Chloride (Cl)		53.9	54.1		mg/L	0.3	25	27-MAR-17
WG2500466-20 DUP		**L1905250-4**						
Chloride (Cl)		9.72	10.0		mg/L	3.1	25	27-MAR-17
WG2500466-12 LCS								
Chloride (Cl)			102.0		%		70-130	27-MAR-17
WG2500466-17 LCS								
Chloride (Cl)			102.3		%		70-130	27-MAR-17
WG2500466-11 MB								
Chloride (Cl)			<0.50		mg/L		0.5	27-MAR-17
WG2500466-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	27-MAR-17
WG2500466-14 MS		**WG2500466-13**						
Chloride (Cl)			78.5		%		70-130	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Chloride (Cl)			100.9		%		70-130	27-MAR-17
COLOUR-WT	**Water**							

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COLOUR-WT	**Water**							
Batch R3685230								
WG2500102-3 CRM		**WT-COLOUR-CRM**						
Colour, Apparent			96.5		%		80-120	25-MAR-17
WG2500102-4 DUP		**L1905250-1**						
Colour, Apparent		32.7	29.2		CU	12	20	25-MAR-17
WG2500102-2 LCS								
Colour, Apparent			99.4		%		80-120	25-MAR-17
WG2500102-1 MB								
Colour, Apparent			<2.0		CU		2	25-MAR-17
EC-WT	**Water**							
Batch R3686126								
WG2500598-8 DUP		**WG2500598-7**						
Conductivity		2140	2140		umhos/cm	0.0	10	27-MAR-17
WG2500598-5 LCS								
Conductivity			101.5		%		90-110	27-MAR-17
WG2500598-6 MB								
Conductivity			<3.0		umhos/cm		3	27-MAR-17
F-IC-N-WT	**Water**							
Batch R3686257								
WG2500466-15 DUP		**WG2500466-13**						
Fluoride (F)		0.021	0.020		mg/L	2.5	20	27-MAR-17
WG2500466-20 DUP		**L1905250-4**						
Fluoride (F)		0.105	0.111		mg/L	5.9	20	27-MAR-17
WG2500466-12 LCS								
Fluoride (F)			100.5		%		90-110	27-MAR-17
WG2500466-17 LCS								
Fluoride (F)			100.4		%		90-110	27-MAR-17
WG2500466-11 MB								
Fluoride (F)			<0.020		mg/L		0.02	27-MAR-17
WG2500466-16 MB								
Fluoride (F)			<0.020		mg/L		0.02	27-MAR-17
WG2500466-14 MS		**WG2500466-13**						
Fluoride (F)			93.7		%		75-125	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Fluoride (F)			103.8		%		75-125	27-MAR-17
MET-D-CCMS-WT	**Water**							

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500485-4 DUP		**WG2500485-3**						
Aluminum (Al)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-17
Antimony (Sb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Arsenic (As)-Dissolved		0.0055	0.0055		mg/L	1.4	20	27-MAR-17
Barium (Ba)-Dissolved		0.922	0.906		mg/L	1.8	20	27-MAR-17
Beryllium (Be)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Boron (B)-Dissolved		0.13	0.13		mg/L	1.8	20	27-MAR-17
Cadmium (Cd)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Calcium (Ca)-Dissolved		116	116		mg/L	0.6	20	27-MAR-17
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-MAR-17
Cobalt (Co)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Copper (Cu)-Dissolved		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	27-MAR-17
Iron (Fe)-Dissolved		0.75	0.76		mg/L	1.2	20	27-MAR-17
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Magnesium (Mg)-Dissolved		31.0	30.7		mg/L	0.9	20	27-MAR-17
Manganese (Mn)-Dissolved		1.52	1.50		mg/L	0.8	20	27-MAR-17
Molybdenum (Mo)-Dissolved		0.00483	0.00492		mg/L	1.8	20	27-MAR-17
Nickel (Ni)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-MAR-17
Phosphorus (P)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	27-MAR-17
Potassium (K)-Dissolved		5.50	5.53		mg/L	0.6	20	27-MAR-17
Selenium (Se)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Silicon (Si)-Dissolved		6.38	6.42		mg/L	0.6	20	27-MAR-17
Silver (Ag)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Sodium (Na)-Dissolved		68.4	68.8		mg/L	0.7	20	27-MAR-17
Strontium (Sr)-Dissolved		1.11	1.10		mg/L	0.9	20	27-MAR-17
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Titanium (Ti)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-17
Tungsten (W)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Uranium (U)-Dissolved		0.00132	0.00128		mg/L	3.5	20	27-MAR-17
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-MAR-17
Zinc (Zn)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAR-17
Zirconium (Zr)-Dissolved		<0.0030	<0.0030		mg/L			27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500485-4 DUP		**WG2500485-3**						
Zirconium (Zr)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-17
WG2500485-2 LCS								
Aluminum (Al)-Dissolved			96.9		%		80-120	27-MAR-17
Antimony (Sb)-Dissolved			98.8		%		80-120	27-MAR-17
Arsenic (As)-Dissolved			95.8		%		80-120	27-MAR-17
Barium (Ba)-Dissolved			94.7		%		80-120	27-MAR-17
Beryllium (Be)-Dissolved			90.6		%		80-120	27-MAR-17
Bismuth (Bi)-Dissolved			99.6		%		80-120	27-MAR-17
Boron (B)-Dissolved			91.7		%		80-120	27-MAR-17
Cadmium (Cd)-Dissolved			94.3		%		80-120	27-MAR-17
Calcium (Ca)-Dissolved			96.1		%		80-120	27-MAR-17
Chromium (Cr)-Dissolved			93.4		%		80-120	27-MAR-17
Cobalt (Co)-Dissolved			94.9		%		80-120	27-MAR-17
Copper (Cu)-Dissolved			94.8		%		80-120	27-MAR-17
Iron (Fe)-Dissolved			93.8		%		80-120	27-MAR-17
Lead (Pb)-Dissolved			99.9		%		80-120	27-MAR-17
Magnesium (Mg)-Dissolved			94.6		%		80-120	27-MAR-17
Manganese (Mn)-Dissolved			95.4		%		80-120	27-MAR-17
Molybdenum (Mo)-Dissolved			96.9		%		80-120	27-MAR-17
Nickel (Ni)-Dissolved			93.8		%		80-120	27-MAR-17
Phosphorus (P)-Dissolved			97.3		%		80-120	27-MAR-17
Potassium (K)-Dissolved			98.5		%		80-120	27-MAR-17
Selenium (Se)-Dissolved			98.1		%		80-120	27-MAR-17
Silicon (Si)-Dissolved			97.6		%		80-120	27-MAR-17
Silver (Ag)-Dissolved			98.5		%		80-120	27-MAR-17
Sodium (Na)-Dissolved			95.8		%		80-120	27-MAR-17
Strontium (Sr)-Dissolved			103.3		%		80-120	27-MAR-17
Thallium (Tl)-Dissolved			97.5		%		80-120	27-MAR-17
Tin (Sn)-Dissolved			96.1		%		80-120	27-MAR-17
Titanium (Ti)-Dissolved			94.8		%		80-120	27-MAR-17
Tungsten (W)-Dissolved			101.5		%		80-120	27-MAR-17
Uranium (U)-Dissolved			104.1		%		80-120	27-MAR-17
Vanadium (V)-Dissolved			96.8		%		80-120	27-MAR-17
Zinc (Zn)-Dissolved			94.0		%		80-120	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500485-2 LCS								
Zirconium (Zr)-Dissolved			96.5		%		80-120	27-MAR-17
WG2500485-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	27-MAR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAR-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	27-MAR-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	27-MAR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500485-1 MB								
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-17
WG2500485-5 MS		**WG2500485-3**						
Aluminum (Al)-Dissolved			80.7		%		70-130	27-MAR-17
Antimony (Sb)-Dissolved			94.9		%		70-130	27-MAR-17
Arsenic (As)-Dissolved			84.2		%		70-130	27-MAR-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Beryllium (Be)-Dissolved			89.0		%		70-130	27-MAR-17
Bismuth (Bi)-Dissolved			93.4		%		70-130	27-MAR-17
Boron (B)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Cadmium (Cd)-Dissolved			90.6		%		70-130	27-MAR-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Chromium (Cr)-Dissolved			90.9		%		70-130	27-MAR-17
Cobalt (Co)-Dissolved			90.2		%		70-130	27-MAR-17
Copper (Cu)-Dissolved			76.2		%		70-130	27-MAR-17
Iron (Fe)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Lead (Pb)-Dissolved			94.4		%		70-130	27-MAR-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Nickel (Ni)-Dissolved			86.0		%		70-130	27-MAR-17
Phosphorus (P)-Dissolved			106.8		%		70-130	27-MAR-17
Potassium (K)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Selenium (Se)-Dissolved			97.1		%		70-130	27-MAR-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Silver (Ag)-Dissolved			91.4		%		70-130	27-MAR-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Thallium (Tl)-Dissolved			92.8		%		70-130	27-MAR-17
Tin (Sn)-Dissolved			93.6		%		70-130	27-MAR-17
Titanium (Ti)-Dissolved			88.1		%		70-130	27-MAR-17
Tungsten (W)-Dissolved			96.7		%		70-130	27-MAR-17
Uranium (U)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Vanadium (V)-Dissolved			90.4		%		70-130	27-MAR-17
Zinc (Zn)-Dissolved			79.2		%		70-130	27-MAR-17
Zirconium (Zr)-Dissolved			88.1		%		70-130	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3686677								
WG2501073-4 DUP		**WG2501073-3**						
Aluminum (Al)-Dissolved		0.283	0.284		mg/L	0.1	20	28-MAR-17
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-MAR-17
Arsenic (As)-Dissolved		0.00042	0.00040		mg/L	5.2	20	28-MAR-17
Barium (Ba)-Dissolved		0.0175	0.0170		mg/L	3.2	20	28-MAR-17
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-MAR-17
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	28-MAR-17
Boron (B)-Dissolved		0.013	0.013		mg/L	1.8	20	28-MAR-17
Cadmium (Cd)-Dissolved		0.000015	0.000018		mg/L	15	20	28-MAR-17
Calcium (Ca)-Dissolved		30.3	30.7		mg/L	1.3	20	28-MAR-17
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	28-MAR-17
Cobalt (Co)-Dissolved		0.00011	0.00011		mg/L	2.3	20	28-MAR-17
Copper (Cu)-Dissolved		0.00162	0.00163		mg/L	0.8	20	28-MAR-17
Iron (Fe)-Dissolved		0.256	0.262		mg/L	2.3	20	28-MAR-17
Lead (Pb)-Dissolved		0.000171	0.000185		mg/L	8.1	20	28-MAR-17
Magnesium (Mg)-Dissolved		6.96	6.88		mg/L	1.2	20	28-MAR-17
Manganese (Mn)-Dissolved		0.00232	0.00232		mg/L	0.1	20	28-MAR-17
Molybdenum (Mo)-Dissolved		0.000338	0.000336		mg/L	0.8	20	28-MAR-17
Nickel (Ni)-Dissolved		0.00079	0.00080		mg/L	1.8	20	28-MAR-17
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	28-MAR-17
Potassium (K)-Dissolved		1.61	1.56		mg/L	3.5	20	28-MAR-17
Selenium (Se)-Dissolved		0.000191	0.000206		mg/L	7.6	20	28-MAR-17
Silicon (Si)-Dissolved		1.72	1.74		mg/L	1.0	20	28-MAR-17
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	28-MAR-17
Sodium (Na)-Dissolved		17.0	16.1		mg/L	5.7	20	28-MAR-17
Strontium (Sr)-Dissolved		0.309	0.303		mg/L	1.7	20	28-MAR-17
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	28-MAR-17
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-MAR-17
Titanium (Ti)-Dissolved		0.0208	0.0212		mg/L	1.7	20	28-MAR-17
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	28-MAR-17
Uranium (U)-Dissolved		0.000454	0.000456		mg/L	0.4	20	28-MAR-17
Vanadium (V)-Dissolved		0.00086	0.00090		mg/L	4.4	20	28-MAR-17
Zinc (Zn)-Dissolved		0.0014	0.0019	J	mg/L	0.0005	0.002	28-MAR-17
Zirconium (Zr)-Dissolved		0.00077	0.00090		mg/L			28-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3686677								
WG2501073-4 DUP		**WG2501073-3**						
Zirconium (Zr)-Dissolved		0.00077	0.00090		mg/L	16	20	28-MAR-17
WG2501073-2 LCS								
Aluminum (Al)-Dissolved			99.2		%		80-120	28-MAR-17
Antimony (Sb)-Dissolved			91.1		%		80-120	28-MAR-17
Arsenic (As)-Dissolved			95.3		%		80-120	28-MAR-17
Barium (Ba)-Dissolved			98.6		%		80-120	28-MAR-17
Beryllium (Be)-Dissolved			96.5		%		80-120	28-MAR-17
Bismuth (Bi)-Dissolved			96.5		%		80-120	28-MAR-17
Boron (B)-Dissolved			100.8		%		80-120	28-MAR-17
Cadmium (Cd)-Dissolved			100.3		%		80-120	28-MAR-17
Calcium (Ca)-Dissolved			101.5		%		80-120	28-MAR-17
Chromium (Cr)-Dissolved			95.0		%		80-120	28-MAR-17
Cobalt (Co)-Dissolved			94.7		%		80-120	28-MAR-17
Copper (Cu)-Dissolved			95.6		%		80-120	28-MAR-17
Iron (Fe)-Dissolved			97.3		%		80-120	28-MAR-17
Lead (Pb)-Dissolved			100.4		%		80-120	28-MAR-17
Magnesium (Mg)-Dissolved			103.0		%		80-120	28-MAR-17
Manganese (Mn)-Dissolved			98.6		%		80-120	28-MAR-17
Molybdenum (Mo)-Dissolved			97.7		%		80-120	28-MAR-17
Nickel (Ni)-Dissolved			95.8		%		80-120	28-MAR-17
Phosphorus (P)-Dissolved			91.1		%		80-120	28-MAR-17
Potassium (K)-Dissolved			99.99		%		80-120	28-MAR-17
Selenium (Se)-Dissolved			98.4		%		80-120	28-MAR-17
Silicon (Si)-Dissolved			109.4		%		80-120	28-MAR-17
Silver (Ag)-Dissolved			93.4		%		80-120	28-MAR-17
Sodium (Na)-Dissolved			99.8		%		80-120	28-MAR-17
Strontium (Sr)-Dissolved			105.4		%		80-120	28-MAR-17
Thallium (Tl)-Dissolved			98.6		%		80-120	28-MAR-17
Tin (Sn)-Dissolved			95.5		%		80-120	28-MAR-17
Titanium (Ti)-Dissolved			93.9		%		80-120	28-MAR-17
Tungsten (W)-Dissolved			100.2		%		80-120	28-MAR-17
Uranium (U)-Dissolved			102.8		%		80-120	28-MAR-17
Vanadium (V)-Dissolved			96.4		%		80-120	28-MAR-17
Zinc (Zn)-Dissolved			89.8		%		80-120	28-MAR-17

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Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3686677								
WG2501073-2 LCS								
Zirconium (Zr)-Dissolved			103.4		%		80-120	28-MAR-17
WG2501073-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	28-MAR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	28-MAR-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	28-MAR-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	28-MAR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	28-MAR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	28-MAR-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	28-MAR-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	28-MAR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	28-MAR-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-17
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	28-MAR-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	28-MAR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	28-MAR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	28-MAR-17

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520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3686677								
WG2501073-1 MB								
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	28-MAR-17
WG2501073-5 MS		**WG2501073-3**						
Aluminum (Al)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Antimony (Sb)-Dissolved			97.8		%		70-130	28-MAR-17
Arsenic (As)-Dissolved			101.1		%		70-130	28-MAR-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Beryllium (Be)-Dissolved			97.1		%		70-130	28-MAR-17
Bismuth (Bi)-Dissolved			91.8		%		70-130	28-MAR-17
Boron (B)-Dissolved			104.9		%		70-130	28-MAR-17
Cadmium (Cd)-Dissolved			101.6		%		70-130	28-MAR-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Chromium (Cr)-Dissolved			99.0		%		70-130	28-MAR-17
Cobalt (Co)-Dissolved			94.7		%		70-130	28-MAR-17
Copper (Cu)-Dissolved			100.1		%		70-130	28-MAR-17
Iron (Fe)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Lead (Pb)-Dissolved			96.6		%		70-130	28-MAR-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Manganese (Mn)-Dissolved			95.4		%		70-130	28-MAR-17
Molybdenum (Mo)-Dissolved			97.9		%		70-130	28-MAR-17
Nickel (Ni)-Dissolved			97.7		%		70-130	28-MAR-17
Phosphorus (P)-Dissolved			120.5		%		70-130	28-MAR-17
Potassium (K)-Dissolved			102.8		%		70-130	28-MAR-17
Selenium (Se)-Dissolved			105.5		%		70-130	28-MAR-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Silver (Ag)-Dissolved			96.1		%		70-130	28-MAR-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Thallium (Tl)-Dissolved			94.6		%		70-130	28-MAR-17
Tin (Sn)-Dissolved			97.1		%		70-130	28-MAR-17
Titanium (Ti)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Tungsten (W)-Dissolved			99.4		%		70-130	28-MAR-17
Uranium (U)-Dissolved			N/A	MS-B	%		-	28-MAR-17
Vanadium (V)-Dissolved			102.1		%		70-130	28-MAR-17
Zinc (Zn)-Dissolved			102.9		%		70-130	28-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3686677								
WG2501073-5 MS		**WG2501073-3**						
Zirconium (Zr)-Dissolved			99.6		%		70-130	28-MAR-17
MET-T-CCMS-WT	**Water**							
Batch R3685703								
WG2500455-4 DUP		**WG2500455-3**						
Aluminum (Al)-Total		0.309	0.299		mg/L	3.4	20	27-MAR-17
Antimony (Sb)-Total		0.00067	0.00067		mg/L	0.1	20	27-MAR-17
Arsenic (As)-Total		0.00455	0.00436		mg/L	4.4	20	27-MAR-17
Barium (Ba)-Total		0.0756	0.0713		mg/L	5.8	20	27-MAR-17
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-17
Boron (B)-Total		0.040	0.039		mg/L	2.4	20	27-MAR-17
Cadmium (Cd)-Total		0.000035	0.000037		mg/L	4.2	20	27-MAR-17
Calcium (Ca)-Total		118	119		mg/L	0.7	20	27-MAR-17
Chromium (Cr)-Total		0.00108	0.00074	J	mg/L	0.00034	0.001	27-MAR-17
Cesium (Cs)-Total		0.000057	0.000048		mg/L	16	20	27-MAR-17
Cobalt (Co)-Total		0.00125	0.00120		mg/L	4.1	20	27-MAR-17
Copper (Cu)-Total		0.0037	0.0036		mg/L	4.0	20	27-MAR-17
Iron (Fe)-Total		0.969	0.918		mg/L	5.4	20	27-MAR-17
Lead (Pb)-Total		0.00062	0.00062		mg/L	0.6	20	27-MAR-17
Lithium (Li)-Total		0.0062	0.0059		mg/L	4.0	20	27-MAR-17
Magnesium (Mg)-Total		32.4	31.3		mg/L	3.4	20	27-MAR-17
Manganese (Mn)-Total		0.148	0.143		mg/L	3.2	20	27-MAR-17
Molybdenum (Mo)-Total		0.00622	0.00617		mg/L	0.9	20	27-MAR-17
Nickel (Ni)-Total		0.00554	0.00537		mg/L	3.1	20	27-MAR-17
Phosphorus (P)-Total		0.062	0.063		mg/L	1.1	20	27-MAR-17
Potassium (K)-Total		5.93	5.45		mg/L	8.3	20	27-MAR-17
Rubidium (Rb)-Total		0.00532	0.00450		mg/L	17	20	27-MAR-17
Selenium (Se)-Total		0.000656	0.000640		mg/L	2.5	20	27-MAR-17
Silicon (Si)-Total		7.94	7.44		mg/L	6.5	20	27-MAR-17
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-MAR-17
Sodium (Na)-Total		54.4	52.9		mg/L	2.8	20	27-MAR-17
Strontium (Sr)-Total		0.383	0.379		mg/L	1.1	20	27-MAR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3685703								
WG2500455-4 DUP		**WG2500455-3**						
Sulfur (S)-Total		37.6	37.4		mg/L	0.7	25	27-MAR-17
Thallium (Tl)-Total		0.000037	0.000037		mg/L	0.5	20	27-MAR-17
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	27-MAR-17
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	25	27-MAR-17
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Titanium (Ti)-Total		0.0110	0.0121		mg/L	10	20	27-MAR-17
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Uranium (U)-Total		0.00320	0.00324		mg/L	1.4	20	27-MAR-17
Vanadium (V)-Total		0.00199	0.00139	J	mg/L	0.00060	0.001	27-MAR-17
Zinc (Zn)-Total		0.0035	0.0031		mg/L	11	20	27-MAR-17
Zirconium (Zr)-Total		0.00106	0.00071	J	mg/L	0.00035	0.0006	27-MAR-17
WG2500455-2 LCS								
Aluminum (Al)-Total			104.3		%		80-120	27-MAR-17
Antimony (Sb)-Total			101.5		%		80-120	27-MAR-17
Arsenic (As)-Total			98.7		%		80-120	27-MAR-17
Barium (Ba)-Total			107.8		%		80-120	27-MAR-17
Beryllium (Be)-Total			99.7		%		80-120	27-MAR-17
Bismuth (Bi)-Total			101.5		%		80-120	27-MAR-17
Boron (B)-Total			104.0		%		80-120	27-MAR-17
Cadmium (Cd)-Total			93.4		%		80-120	27-MAR-17
Calcium (Ca)-Total			102.8		%		80-120	27-MAR-17
Chromium (Cr)-Total			97.4		%		80-120	27-MAR-17
Cesium (Cs)-Total			104.1		%		80-120	27-MAR-17
Cobalt (Co)-Total			99.1		%		80-120	27-MAR-17
Copper (Cu)-Total			94.8		%		80-120	27-MAR-17
Iron (Fe)-Total			96.0		%		80-120	27-MAR-17
Lead (Pb)-Total			103.7		%		80-120	27-MAR-17
Lithium (Li)-Total			109.8		%		80-120	27-MAR-17
Magnesium (Mg)-Total			103.5		%		80-120	27-MAR-17
Manganese (Mn)-Total			100.6		%		80-120	27-MAR-17
Molybdenum (Mo)-Total			94.1		%		80-120	27-MAR-17
Nickel (Ni)-Total			97.9		%		80-120	27-MAR-17
Phosphorus (P)-Total			94.2		%		80-120	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3685703								
WG2500455-2 LCS								
Potassium (K)-Total			100.1		%		80-120	27-MAR-17
Rubidium (Rb)-Total			98.5		%		80-120	27-MAR-17
Selenium (Se)-Total			96.3		%		80-120	27-MAR-17
Silicon (Si)-Total			113.8		%		80-120	27-MAR-17
Silver (Ag)-Total			102.3		%		80-120	27-MAR-17
Sodium (Na)-Total			102.2		%		80-120	27-MAR-17
Strontium (Sr)-Total			103.1		%		80-120	27-MAR-17
Sulfur (S)-Total			103.7		%		70-130	27-MAR-17
Thallium (Tl)-Total			98.7		%		80-120	27-MAR-17
Tellurium (Te)-Total			96.6		%		80-120	27-MAR-17
Thorium (Th)-Total			99.5		%		70-130	27-MAR-17
Tin (Sn)-Total			95.0		%		80-120	27-MAR-17
Titanium (Ti)-Total			97.4		%		80-120	27-MAR-17
Tungsten (W)-Total			103.6		%		80-120	27-MAR-17
Uranium (U)-Total			102.7		%		80-120	27-MAR-17
Vanadium (V)-Total			103.1		%		80-120	27-MAR-17
Zinc (Zn)-Total			92.8		%		80-120	27-MAR-17
Zirconium (Zr)-Total			103.5		%		80-120	27-MAR-17
WG2500455-1 MB								
Aluminum (Al)-Total			<0.010		mg/L		0.01	27-MAR-17
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Arsenic (As)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Barium (Ba)-Total			<0.00020		mg/L		0.0002	27-MAR-17
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	27-MAR-17
Boron (B)-Total			<0.010		mg/L		0.01	27-MAR-17
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	27-MAR-17
Calcium (Ca)-Total			<0.50		mg/L		0.5	27-MAR-17
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	27-MAR-17
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	27-MAR-17
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Copper (Cu)-Total			<0.0010		mg/L		0.001	27-MAR-17
Iron (Fe)-Total			<0.050		mg/L		0.05	27-MAR-17
Lead (Pb)-Total			<0.00010		mg/L		0.0001	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3685703								
WG2500455-1 MB								
Lithium (Li)-Total			<0.0010		mg/L		0.001	27-MAR-17
Magnesium (Mg)-Total			<0.050		mg/L		0.05	27-MAR-17
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	27-MAR-17
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	27-MAR-17
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	27-MAR-17
Phosphorus (P)-Total			<0.050		mg/L		0.05	27-MAR-17
Potassium (K)-Total			<0.050		mg/L		0.05	27-MAR-17
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	27-MAR-17
Selenium (Se)-Total			<0.000050		mg/L		0.00005	27-MAR-17
Silicon (Si)-Total			<0.10		mg/L		0.1	27-MAR-17
Silver (Ag)-Total			<0.000050		mg/L		0.00005	27-MAR-17
Sodium (Na)-Total			<0.50		mg/L		0.5	27-MAR-17
Strontium (Sr)-Total			<0.0010		mg/L		0.001	27-MAR-17
Sulfur (S)-Total			<0.50		mg/L		0.5	27-MAR-17
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	27-MAR-17
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	27-MAR-17
Thorium (Th)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Tin (Sn)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	27-MAR-17
Tungsten (W)-Total			<0.00010		mg/L		0.0001	27-MAR-17
Uranium (U)-Total			<0.000010		mg/L		0.00001	27-MAR-17
Vanadium (V)-Total			<0.00050		mg/L		0.0005	27-MAR-17
Zinc (Zn)-Total			<0.0030		mg/L		0.003	27-MAR-17
Zirconium (Zr)-Total			<0.00030		mg/L		0.0003	27-MAR-17
WG2500455-5 MS		**WG2500455-3**						
Aluminum (Al)-Total			N/A	MS-B	%		-	27-MAR-17
Antimony (Sb)-Total			104.4		%		70-130	27-MAR-17
Arsenic (As)-Total			97.9		%		70-130	27-MAR-17
Barium (Ba)-Total			N/A	MS-B	%		-	27-MAR-17
Beryllium (Be)-Total			97.0		%		70-130	27-MAR-17
Bismuth (Bi)-Total			93.5		%		70-130	27-MAR-17
Boron (B)-Total			103.1		%		70-130	27-MAR-17
Cadmium (Cd)-Total			93.6		%		70-130	27-MAR-17
Calcium (Ca)-Total			N/A	MS-B	%		-	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R3685703								
WG2500455-5 MS		**WG2500455-3**						
Chromium (Cr)-Total			96.3		%		70-130	27-MAR-17
Cesium (Cs)-Total			105.5		%		70-130	27-MAR-17
Cobalt (Co)-Total			93.9		%		70-130	27-MAR-17
Copper (Cu)-Total			88.6		%		70-130	27-MAR-17
Iron (Fe)-Total			N/A	MS-B	%		-	27-MAR-17
Lead (Pb)-Total			96.8		%		70-130	27-MAR-17
Lithium (Li)-Total			103.7		%		70-130	27-MAR-17
Magnesium (Mg)-Total			N/A	MS-B	%		-	27-MAR-17
Manganese (Mn)-Total			N/A	MS-B	%		-	27-MAR-17
Molybdenum (Mo)-Total			96.2		%		70-130	27-MAR-17
Nickel (Ni)-Total			90.6		%		70-130	27-MAR-17
Phosphorus (P)-Total			90.7		%		70-130	27-MAR-17
Potassium (K)-Total			N/A	MS-B	%		-	27-MAR-17
Rubidium (Rb)-Total			N/A	MS-B	%		-	27-MAR-17
Selenium (Se)-Total			95.5		%		70-130	27-MAR-17
Silicon (Si)-Total			N/A	MS-B	%		-	27-MAR-17
Silver (Ag)-Total			97.9		%		70-130	27-MAR-17
Sodium (Na)-Total			N/A	MS-B	%		-	27-MAR-17
Strontium (Sr)-Total			N/A	MS-B	%		-	27-MAR-17
Sulfur (S)-Total			N/A	MS-B	%		-	27-MAR-17
Thallium (Tl)-Total			92.9		%		70-130	27-MAR-17
Tellurium (Te)-Total			96.9		%		70-130	27-MAR-17
Thorium (Th)-Total			90.1		%		70-130	27-MAR-17
Tin (Sn)-Total			96.8		%		70-130	27-MAR-17
Titanium (Ti)-Total			80.0		%		70-130	27-MAR-17
Tungsten (W)-Total			102.2		%		70-130	27-MAR-17
Uranium (U)-Total			N/A	MS-B	%		-	27-MAR-17
Vanadium (V)-Total			99.8		%		70-130	27-MAR-17
Zinc (Zn)-Total			88.7		%		70-130	27-MAR-17
Zirconium (Zr)-Total			78.9		%		70-130	27-MAR-17
NH3-WT	**Water**							

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-WT	**Water**							
Batch R3685854								
WG2500561-7 DUP		**L1904582-4**						
Ammonia, Total (as N)		0.026	0.033	J	mg/L	0.007	0.04	27-MAR-17
WG2500561-6 LCS								
Ammonia, Total (as N)			99.6		%		85-115	27-MAR-17
WG2500561-5 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	27-MAR-17
WG2500561-8 MS		**L1904582-4**						
Ammonia, Total (as N)			103.9		%		75-125	27-MAR-17
NO2-IC-WT	**Water**							
Batch R3686257								
WG2500466-15 DUP		**WG2500466-13**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	27-MAR-17
WG2500466-20 DUP		**L1905250-4**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	27-MAR-17
WG2500466-12 LCS								
Nitrite (as N)			102.5		%		70-130	27-MAR-17
WG2500466-17 LCS								
Nitrite (as N)			103.2		%		70-130	27-MAR-17
WG2500466-11 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-MAR-17
WG2500466-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-MAR-17
WG2500466-14 MS		**WG2500466-13**						
Nitrite (as N)			88.6		%		70-130	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Nitrite (as N)			96.1		%		70-130	27-MAR-17
NO3-IC-WT	**Water**							
Batch R3686257								
WG2500466-15 DUP		**WG2500466-13**						
Nitrate (as N)		0.100	0.099		mg/L	1.0	25	27-MAR-17
WG2500466-20 DUP		**L1905250-4**						
Nitrate (as N)		2.91	2.98		mg/L	2.2	25	27-MAR-17
WG2500466-12 LCS								
Nitrate (as N)			100.7		%		70-130	27-MAR-17
WG2500466-17 LCS								
Nitrate (as N)			101.3		%		70-130	27-MAR-17
WG2500466-11 MB								
Nitrate (as N)			<0.020		mg/L		0.02	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R3686257								
WG2500466-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	27-MAR-17
WG2500466-14 MS		**WG2500466-13**						
Nitrate (as N)			87.1		%		70-130	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Nitrate (as N)			N/A	MS-B	%		-	27-MAR-17
PH-WT	**Water**							
Batch R3686126								
WG2500598-8 DUP		**WG2500598-7**						
pH		8.00	8.00	J	pH units	0.00	0.2	27-MAR-17
WG2500598-5 LCS								
pH			7.00		pH units		6.9-7.1	27-MAR-17
PO4-DO-COL-WT	**Water**							
Batch R3686260								
WG2500564-3 DUP		**L1905251-1**						
Orthophosphate-Dissolved (as P)		<0.0030	<0.0030	RPD-NA	mg/L	N/A	30	27-MAR-17
WG2500564-2 LCS								
Orthophosphate-Dissolved (as P)			85.1		%		70-130	27-MAR-17
WG2500564-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	27-MAR-17
WG2500564-4 MS		**L1905251-1**						
Orthophosphate-Dissolved (as P)			113.3		%		70-130	27-MAR-17
SO4-IC-N-WT	**Water**							
Batch R3686257								
WG2500466-15 DUP		**WG2500466-13**						
Sulfate (SO4)		41.5	41.6		mg/L	0.2	20	27-MAR-17
WG2500466-20 DUP		**L1905250-4**						
Sulfate (SO4)		24.4	25.3		mg/L	3.6	20	27-MAR-17
WG2500466-12 LCS								
Sulfate (SO4)			102.2		%		90-110	27-MAR-17
WG2500466-17 LCS								
Sulfate (SO4)			102.3		%		90-110	27-MAR-17
WG2500466-11 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	27-MAR-17
WG2500466-16 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	27-MAR-17
WG2500466-14 MS		**WG2500466-13**						

Quality Control Report

Workorder: L1905250 Report Date: 03-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-WT	**Water**							
Batch R3686257								
WG2500466-14 MS		**WG2500466-13**						
Sulfate (SO4)			81.2		%		75-125	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Sulfate (SO4)			101.3		%		75-125	27-MAR-17
SOLIDS-TDS-WT	**Water**							
Batch R3690640								
WG2501906-3 DUP		**L1904727-8**						
Total Dissolved Solids		693	701		mg/L	1.1	20	29-MAR-17
WG2501906-2 LCS								
Total Dissolved Solids			99.1		%		85-115	29-MAR-17
WG2501906-1 MB								
Total Dissolved Solids			<10		mg/L		10	29-MAR-17
TURBIDITY-WT	**Water**							
Batch R3685398								
WG2500145-3 DUP		**L1905251-2**						
Turbidity		33.2	32.1		NTU	3.4	15	25-MAR-17
WG2500145-2 LCS								
Turbidity			105.0		%		85-115	25-MAR-17
WG2500145-1 MB								
Turbidity			<0.10		NTU		0.1	25-MAR-17

Quality Control Report

Workorder: L1905250 Report Date: 03-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1905250-COFC

COC Number: 15 - 555503

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	MTE Consultants	Select Report Format: PDF EXCEL EDD (DIGITAL)	Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply.
Contact:	Andrew Bingleman	Quality Control (QC) Report with Report: YES NO	PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]
Phone:	519 743-6500	Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]
	Company address below will appear on the final report	Select Distribution: EMAIL MAIL FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:		Email 1 or Fax abingleman@mtecs.ca	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:		Email 2 kmarich@mtecs.ca	
Postal Code:		Email 3 jmunkittrick@mtecs.ca	
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		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	1395 02-104	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1905250 JOB Mar24

ALS Contact: MIL Sampler: YM

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	G-Chem-PKG-1	Metals (Total)	Number of Containers
1	MTE-MW 110-14	23-03-17	16:20	GW	X		4
2	MTE-MW 101-14	24-03-17	17:20	"	X		4
3	MTE-MW 102-14	"	16:30	"	X		4
4	MTE-MW 103-14	"	13:45	"	X		4
5	MTE-MW 104-14	"	12:45	"	X		4
6	MTE-MW 105A-14	"	14:35	"	X		4
7	MTE-MW 105B-14	"	15:20	"	X		4
8	MTE-MW 109A-14	"	10:55	"	X		4
9	MTE-MW 109B-14	"	12:xx	"	X		4
16	SW-South	"	9:xx	SW	X	X	5
11	SW-North	"	11:xx	"	X	X	5

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	ODWQS Metals for Samples SW South & SW-North are not field filtered, lab-filtering required	Frozen SIF Observations Yes No; Ice Packs Ice Cubes Custody seal intact Yes No; Cooling Initiated
Are samples for human drinking water use? YES NO		INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C: 7.9 9.4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: March 24, 2017	Time:	Received by:	Date:	Time:	Received by:	Date: 24-Mar-17	Time: 19:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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.

White Paper Co. 604 951-3900

Sample Receipt Confirmation

Report Distribution:

Company Name: MTE CONSULTANTS INC.
Contact: ANDREW BINGEMAN
Address: 520 BINGEMANS CENTRE DRIVE, KITCHENER, ON, N2B 3X9
Phone: 519-743-6500
Fax: 519-741-9323
Email: abingeman@mte85.com vmarick@mte85.com ymuhammad@mte85.com
EDD Email: abingeman@mte85.com vmarick@mte85.com ymuhammad@mte85.com
Distribution: Hard Copy: Y Email: Y Fax: N EDD: Y

Invoice Distribution:

Acct Name: MTE CONSULTANTS INC.
Contact: ACCOUNTS PAYABLE
Address: 520 BINGEMANS CENTRE DRIVE, KITCHENER, ON, N2B 3X9
Phone: 519-743-6500
Fax: 519-743-6513
Invoice Email: accounting@mte85.com
Project #: N/A
Account #: 13838

Client Information:

Job Reference #: 39502-104
Project PO #:
Legal Site Description: N/A
Quote #: N/A
Date Sampled: 23-MAR-17
Date Received: 24-MAR-17
Sampled By: CLIENT
Chain Of Custody: 15-555503

Workorder Summary:

Lab Work Order #: **L1905250**
Estimated completion date: 03-APR-17
11 Samples received at ALS in **WATERLOO**
Client Job #: 39502-104
Account Manager: Mary-Lynn Pike
Estimated sample disposal date: See Sample Disposal Information section below.

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1905250-1	MTE-MW110-14	23-MAR-17 16:20	24-MAR-17 19:20	03-APR-17		WATER
L1905250-2	MTE-MW101-14	24-MAR-17 17:30	24-MAR-17 19:20	03-APR-17		WATER
L1905250-3	MTE-MW102-14	24-MAR-17 16:30	24-MAR-17 19:20	03-APR-17		WATER
L1905250-4	MTE-MW103-14	24-MAR-17 13:45	24-MAR-17 19:20	03-APR-17		WATER
L1905250-5	MTE-MW104-14	24-MAR-17 12:45	24-MAR-17 19:20	03-APR-17		WATER
L1905250-6	MTE-MW105A-14	24-MAR-17 14:35	24-MAR-17 19:20	03-APR-17		WATER
L1905250-7	MTE-MW105B-14	24-MAR-17 15:20	24-MAR-17 19:20	03-APR-17		WATER
L1905250-8	MTE-MW109A-14	24-MAR-17 10:55	24-MAR-17 19:20	03-APR-17		WATER
L1905250-9	MTE-MW109B-14	24-MAR-17 12:00	24-MAR-17 19:20	03-APR-17		WATER
L1905250-10	SW-SOUTH	24-MAR-17 09:00	24-MAR-17 19:20	03-APR-17		WATER
L1905250-11	SW-NORTH	24-MAR-17 14:00	24-MAR-17 19:20	03-APR-17		WATER

Analysis Requested :	General Chemistry Package 1-Groundwater	Total Metals by CRC ICPMS	Sample Handling and Disposal Fee
MTE-MW110-14	✓		✓
MTE-MW101-14	✓		✓
MTE-MW102-14	✓		✓
MTE-MW103-14	✓		✓
MTE-MW104-14	✓		✓
MTE-MW105A-14	✓		✓
MTE-MW105B-14	✓		✓
MTE-MW109A-14	✓		✓
MTE-MW109B-14	✓		✓
SW-SOUTH	✓	✓	✓
SW-NORTH	✓	✓	✓

Login Comments:

Your samples were at 9.4 °C when unpacked at the laboratory.

Sample Integrity Observations:

No observations were identified for this work order submission.

Sample Disposal Information:

Where possible, ALS will store samples for 30 days from the date a final report is issued, or 30 days from the date samples are placed on hold without analytical requests, after which samples may be discarded. Air samples collected on re-usable media are an exception, and are stored for 7 days from the date a final report is issued. Longer storage times are available upon request.

For information about ALS accreditations and certifications please contact your Account Manager or visit our webpage at www.alsglobal.com (see Canada downloads).

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

ALS Group appreciates your business. Thank you for the opportunity to work with you.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1905250-COFC

COC Number: 15 - 555503

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	MTE Consultants	Select Report Format: PDF EXCEL EDD (DIGITAL)	Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply.
Contact:	Andrew Bingleman	Quality Control (QC) Report with Report: YES NO	PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]
Phone:	519 743-6500	Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]
	Company address below will appear on the final report	Select Distribution: EMAIL MAIL FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:		Email 1 or Fax abingleman@mtecs.ca	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:		Email 2 kmarich@mtecs.ca	
Postal Code:		Email 3 jmunkittrick@mtecs.ca	
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		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	1395 02-104	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): L1905250 JOB Mar24

ALS Contact: MIL Sampler: YM

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	G-Chem-PKG-1	Metals (Total)	Number of Containers
1	MTE-MW 110-14	23-03-17	16:20	GW	X		4
2	MTE-MW 101-14	24-03-17	17:20	"	X		4
3	MTE-MW 102-14	"	16:30	"	X		4
4	MTE-MW 103-14	"	13:45	"	X		4
5	MTE-MW 104-14	"	12:45	"	X		4
6	MTE-MW 105A-14	"	14:35	"	X		4
7	MTE-MW 105B-14	"	15:20	"	X		4
8	MTE-MW 109A-14	"	10:55	"	X		4
9	MTE-MW 109B-14	"	12:xx	"	X		4
16	SW-South	"	9:xx	SW	X	X	5
11	SW-North	"	11:xx	"	X	X	5

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	ODWQS Metals for Samples SW South & SW-North are not field filtered, lab-filtering required	Frozen SIF Observations Yes No; Ice Packs Ice Cubes Custody seal intact Yes No; Cooling Initiated
Are samples for human drinking water use? YES NO		INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C: 7.9 9.4

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: March 24, 2017	Time:	Received by:	Date:	Time:	Received by:	Date: 24-Mar-17	Time: 19:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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.

White Paper Co. 604 951-3900

MTE CONSULTANTS INC.
ATTN: ANDREW BINGEMAN
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9

Date Received: 24-MAR-17
Report Date: 03-APR-17 12:53 (MT)
Version: FINAL

Client Phone: 519-743-6500

Certificate of Analysis

Lab Work Order #: L1905251

Project P.O. #: NOT SUBMITTED
Job Reference: 39502-104
C of C Numbers: 15-555502
Legal Site Desc:

Mary-Lynn Pike
Client Services Supervisor

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

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905251-1 STANTEC-MW8-10S							
Sampled By: CLIENT on 23-MAR-17 @ 13:00							
Matrix: WATER							
Physical Tests							
Colour, Apparent	19.9		2.0	CU	25-MAR-17		*5
Conductivity	2780		3.0	umhos/cm	27-MAR-17		
Hardness (as CaCO3)	460		10	mg/L	28-MAR-17		*80-100
pH	7.89		0.10	pH units	27-MAR-17		6.5-8.5
Total Dissolved Solids	1440	DLDS	20	mg/L	29-MAR-17		*500
Turbidity	>4000		0.10	NTU	25-MAR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	346		10	mg/L	28-MAR-17		30-500
Ammonia, Total (as N)	0.022		0.020	mg/L	27-MAR-17		
Chloride (Cl)	625	DLDS	5.0	mg/L	27-MAR-17		*250
Fluoride (F)	<0.20	DLDS	0.20	mg/L	27-MAR-17	1.5	
Nitrate (as N)	<0.20	DLDS	0.20	mg/L	27-MAR-17	10	
Nitrite (as N)	<0.10	DLDS	0.10	mg/L	27-MAR-17	1	
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
Sulfate (SO4)	13.2	DLDS	3.0	mg/L	27-MAR-17		500
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
Aluminum (Al)-Dissolved	<0.050	DLHC	0.050	mg/L	27-MAR-17		0.1
Antimony (Sb)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-MAR-17	0.006	
Arsenic (As)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17	0.025	
Barium (Ba)-Dissolved	0.091	DLHC	0.010	mg/L	27-MAR-17	1	
Beryllium (Be)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17		
Bismuth (Bi)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17		
Boron (B)-Dissolved	<0.10	DLHC	0.10	mg/L	27-MAR-17	5	
Cadmium (Cd)-Dissolved	<0.00010	DLHC	0.00010	mg/L	27-MAR-17	0.005	
Calcium (Ca)-Dissolved	141	DLHC	0.50	mg/L	27-MAR-17		
Chromium (Cr)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-MAR-17	0.05	
Cobalt (Co)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17		
Copper (Cu)-Dissolved	0.0032	DLHC	0.0020	mg/L	27-MAR-17		1
Iron (Fe)-Dissolved	<0.10	DLHC	0.10	mg/L	27-MAR-17		0.3
Lead (Pb)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17	0.01	
Magnesium (Mg)-Dissolved	26.4	DLHC	0.50	mg/L	27-MAR-17		
Manganese (Mn)-Dissolved	0.0141	DLHC	0.0050	mg/L	27-MAR-17		0.05
Molybdenum (Mo)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17		
Nickel (Ni)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-MAR-17		
Phosphorus (P)-Dissolved	<0.50	DLHC	0.50	mg/L	27-MAR-17		
Potassium (K)-Dissolved	1.7	DLHC	1.0	mg/L	27-MAR-17		
Selenium (Se)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-MAR-17	0.01	
Silicon (Si)-Dissolved	3.7	DLHC	1.0	mg/L	27-MAR-17		
Silver (Ag)-Dissolved	<0.00050	DLHC	0.00050	mg/L	27-MAR-17		
Sodium (Na)-Dissolved	342	DLHC	5.0	mg/L	27-MAR-17	*20	*200
Strontium (Sr)-Dissolved	0.313	DLHC	0.010	mg/L	27-MAR-17		
Thallium (Tl)-Dissolved	<0.00030	DLHC	0.00030	mg/L	27-MAR-17		
Tin (Sn)-Dissolved	<0.0010	DLHC	0.0010	mg/L	27-MAR-17		
Titanium (Ti)-Dissolved	<0.0030	DLHC	0.0030	mg/L	27-MAR-17		
Tungsten (W)-Dissolved	<0.010	DLHC	0.010	mg/L	27-MAR-17		

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905251-1 STANTEC-MW8-10S							
Sampled By: CLIENT on 23-MAR-17 @ 13:00							
Matrix: WATER							
Dissolved Metals							
Uranium (U)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-MAR-17	0.02	
Vanadium (V)-Dissolved	<0.0050	DLHC	0.0050	mg/L	27-MAR-17		
Zinc (Zn)-Dissolved	<0.010	DLHC	0.010	mg/L	27-MAR-17		5
Zirconium (Zr)-Dissolved	<0.0040	DLHC	0.0040	mg/L	27-MAR-17		
L1905251-2 STANTEC-MW8-10D							
Sampled By: CLIENT on 23-MAR-17 @ 13:10							
Matrix: WATER							
Physical Tests							
Colour, Apparent	28.2		2.0	CU	25-MAR-17		*5
Conductivity	1560		3.0	umhos/cm	27-MAR-17		
Hardness (as CaCO3)	334		10	mg/L	28-MAR-17		*80-100
pH	7.92		0.10	pH units	27-MAR-17		6.5-8.5
Total Dissolved Solids	817	DLDS	20	mg/L	29-MAR-17		*500
Turbidity	33.2		0.10	NTU	25-MAR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	289		10	mg/L	28-MAR-17		30-500
Ammonia, Total (as N)	0.078		0.020	mg/L	27-MAR-17		
Chloride (Cl)	300	DLDS	2.5	mg/L	27-MAR-17		*250
Fluoride (F)	0.13	DLDS	0.10	mg/L	27-MAR-17	1.5	
Nitrate (as N)	<0.10	DLDS	0.10	mg/L	27-MAR-17	10	
Nitrite (as N)	<0.050	DLDS	0.050	mg/L	27-MAR-17	1	
Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
Sulfate (SO4)	44.8	DLDS	1.5	mg/L	27-MAR-17		500
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		0.1
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.006	
Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.025	
Barium (Ba)-Dissolved	0.082		0.010	mg/L	28-MAR-17	1	
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
Boron (B)-Dissolved	<0.050		0.050	mg/L	28-MAR-17	5	
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	28-MAR-17	0.005	
Calcium (Ca)-Dissolved	89.5		0.50	mg/L	28-MAR-17		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17	0.05	
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17		
Copper (Cu)-Dissolved	0.0020		0.0010	mg/L	28-MAR-17		1
Iron (Fe)-Dissolved	0.505		0.050	mg/L	28-MAR-17		*0.3
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.01	
Magnesium (Mg)-Dissolved	26.9		0.50	mg/L	28-MAR-17		
Manganese (Mn)-Dissolved	0.160		0.0010	mg/L	28-MAR-17		*0.05
Molybdenum (Mo)-Dissolved	0.0015		0.0010	mg/L	28-MAR-17		
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		
Potassium (K)-Dissolved	1.4		1.0	mg/L	28-MAR-17		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905251-2	STANTEC-MW8-10D							
Sampled By:	CLIENT on 23-MAR-17 @ 13:10							
Matrix:	WATER							
Dissolved Metals								
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	28-MAR-17	0.01	
	Silicon (Si)-Dissolved	7.8		1.0	mg/L	28-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-17		
	Sodium (Na)-Dissolved	181	DLHC	5.0	mg/L	27-MAR-17	*20	200
	Strontium (Sr)-Dissolved	0.894		0.0010	mg/L	28-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	28-MAR-17		
	Tin (Sn)-Dissolved	0.0017		0.0010	mg/L	28-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Zinc (Zn)-Dissolved	0.0031		0.0030	mg/L	28-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	28-MAR-17		
L1905251-3	STANTEC-MW12-10S							
Sampled By:	CLIENT on 23-MAR-17 @ 14:00							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	27.8		2.0	CU	25-MAR-17		*5
	Conductivity	837		3.0	umhos/cm	27-MAR-17		
	Hardness (as CaCO3)	462		10	mg/L	28-MAR-17		*80-100
	pH	7.79		0.10	pH units	27-MAR-17		6.5-8.5
	Total Dissolved Solids	475	DLDS	20	mg/L	29-MAR-17		500
	Turbidity	>4000		0.10	NTU	25-MAR-17		*5
Anions and Nutrients								
	Alkalinity, Total (as CaCO3)	439		10	mg/L	28-MAR-17		30-500
	Ammonia, Total (as N)	0.023		0.020	mg/L	27-MAR-17		
	Chloride (Cl)	10.7		0.50	mg/L	27-MAR-17		250
	Fluoride (F)	0.066		0.020	mg/L	27-MAR-17	1.5	
	Nitrate (as N)	1.20		0.020	mg/L	27-MAR-17	10	
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1	
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17		
	Sulfate (SO4)	14.2		0.30	mg/L	27-MAR-17		500
Dissolved Metals								
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17		
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		0.1
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.006	
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.025	
	Barium (Ba)-Dissolved	0.098		0.010	mg/L	28-MAR-17	1	
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Boron (B)-Dissolved	<0.050		0.050	mg/L	28-MAR-17	5	
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	28-MAR-17	0.005	
	Calcium (Ca)-Dissolved	115		0.50	mg/L	28-MAR-17		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17	0.05	
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17		

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2		
L1905251-3	STANTEC-MW12-10S									
Sampled By:	CLIENT on 23-MAR-17 @ 14:00									
Matrix:	WATER									
Dissolved Metals										
	Copper (Cu)-Dissolved	0.0030		0.0010	mg/L	28-MAR-17		1		
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		0.3		
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.01			
	Magnesium (Mg)-Dissolved	42.6		0.50	mg/L	28-MAR-17				
	Manganese (Mn)-Dissolved	0.0137		0.0010	mg/L	28-MAR-17		0.05		
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	28-MAR-17				
	Potassium (K)-Dissolved	2.1		1.0	mg/L	28-MAR-17				
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	28-MAR-17	0.01			
	Silicon (Si)-Dissolved	8.5		1.0	mg/L	28-MAR-17				
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-17				
	Sodium (Na)-Dissolved	6.83		0.50	mg/L	28-MAR-17	20	200		
	Strontium (Sr)-Dissolved	0.360		0.0010	mg/L	28-MAR-17				
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	28-MAR-17				
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17				
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	28-MAR-17				
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.02			
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Zinc (Zn)-Dissolved	0.0041		0.0030	mg/L	28-MAR-17		5		
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	28-MAR-17				
L1905251-4	STANTEC-MW12-10D									
Sampled By:	CLIENT on 23-MAR-17 @ 15:10									
Matrix:	WATER						#1	#2		
Physical Tests										
	Colour, Apparent	28.8		2.0	CU	25-MAR-17		*5		
	Conductivity	1220		3.0	umhos/cm	27-MAR-17				
	Hardness (as CaCO3)	653		10	mg/L	28-MAR-17		*80-100		
	pH	7.77		0.10	pH units	27-MAR-17		6.5-8.5		
	Total Dissolved Solids	887	DLDS	20	mg/L	29-MAR-17		*500		
	Turbidity	27.7		0.10	NTU	25-MAR-17		*5		
Anions and Nutrients										
	Alkalinity, Total (as CaCO3)	248		10	mg/L	28-MAR-17		30-500		
	Ammonia, Total (as N)	0.145		0.020	mg/L	27-MAR-17				
	Chloride (Cl)	21.7		0.50	mg/L	27-MAR-17		250		
	Fluoride (F)	0.497		0.020	mg/L	27-MAR-17	1.5			
	Nitrate (as N)	<0.020		0.020	mg/L	27-MAR-17	10			
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1			
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17				
	Sulfate (SO4)	406		0.30	mg/L	27-MAR-17		500		
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17				
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		0.1		
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.006			

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Ontario Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1905251-4	STANTEC-MW12-10D							
Sampled By:	CLIENT on 23-MAR-17 @ 15:10							
Matrix:	WATER							
Dissolved Metals								
	Arsenic (As)-Dissolved	0.0036		0.0010	mg/L	28-MAR-17	0.025	
	Barium (Ba)-Dissolved	0.027		0.010	mg/L	28-MAR-17	1	
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Boron (B)-Dissolved	0.056		0.050	mg/L	28-MAR-17	5	
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	28-MAR-17	0.005	
	Calcium (Ca)-Dissolved	194		0.50	mg/L	28-MAR-17		
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17	0.05	
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17		
	Copper (Cu)-Dissolved	0.0023		0.0010	mg/L	28-MAR-17		1
	Iron (Fe)-Dissolved	1.28		0.050	mg/L	28-MAR-17		*0.3
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.01	
	Magnesium (Mg)-Dissolved	41.2		0.50	mg/L	28-MAR-17		
	Manganese (Mn)-Dissolved	0.0402		0.0010	mg/L	28-MAR-17		0.05
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17		
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		
	Potassium (K)-Dissolved	1.5		1.0	mg/L	28-MAR-17		
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	28-MAR-17	0.01	
	Silicon (Si)-Dissolved	8.3		1.0	mg/L	28-MAR-17		
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-17		
	Sodium (Na)-Dissolved	18.6		0.50	mg/L	28-MAR-17	20	200
	Strontium (Sr)-Dissolved	3.26	DLHC	0.010	mg/L	27-MAR-17		
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	28-MAR-17		
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17		
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.02	
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17		
	Zinc (Zn)-Dissolved	<0.0030		0.0030	mg/L	28-MAR-17		5
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	28-MAR-17		
L1905251-5	STANTEC-MW13-10							
Sampled By:	CLIENT on 24-MAR-17 @ 10:00							
Matrix:	WATER							
Physical Tests								
	Colour, Apparent	33.1		2.0	CU	25-MAR-17		*5
	Conductivity	715		3.0	umhos/cm	27-MAR-17		
	Hardness (as CaCO3)	386		10	mg/L	28-MAR-17		*80-100
	pH	7.82		0.10	pH units	27-MAR-17		6.5-8.5
	Total Dissolved Solids	427	DLDS	20	mg/L	29-MAR-17		500
	Turbidity	3180		0.10	NTU	25-MAR-17		*5
Anions and Nutrients								
	Alkalinity, Total (as CaCO3)	341		10	mg/L	28-MAR-17		30-500
	Ammonia, Total (as N)	<0.020		0.020	mg/L	27-MAR-17		
	Chloride (Cl)	12.1		0.50	mg/L	27-MAR-17		250

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	#2		
L1905251-5	STANTEC-MW13-10									
Sampled By:	CLIENT on 24-MAR-17 @ 10:00									
Matrix:	WATER									
Anions and Nutrients										
	Fluoride (F)	0.038		0.020	mg/L	27-MAR-17	1.5			
	Nitrate (as N)	1.85		0.020	mg/L	27-MAR-17	10			
	Nitrite (as N)	<0.010		0.010	mg/L	27-MAR-17	1			
	Orthophosphate-Dissolved (as P)	<0.0030		0.0030	mg/L	27-MAR-17				
	Sulfate (SO4)	38.1		0.30	mg/L	27-MAR-17		500		
Dissolved Metals										
	Dissolved Metals Filtration Location	FIELD			No Unit	27-MAR-17				
	Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	28-MAR-17		0.1		
	Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.006			
	Arsenic (As)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.025			
	Barium (Ba)-Dissolved	0.076		0.010	mg/L	28-MAR-17	1			
	Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Boron (B)-Dissolved	<0.050		0.050	mg/L	28-MAR-17	5			
	Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	28-MAR-17	0.005			
	Calcium (Ca)-Dissolved	105		0.50	mg/L	28-MAR-17				
	Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17	0.05			
	Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	28-MAR-17				
	Copper (Cu)-Dissolved	0.0030		0.0010	mg/L	28-MAR-17		1		
	Iron (Fe)-Dissolved	<0.050		0.050	mg/L	28-MAR-17		0.3		
	Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17	0.01			
	Magnesium (Mg)-Dissolved	30.3		0.50	mg/L	28-MAR-17				
	Manganese (Mn)-Dissolved	0.0058		0.0010	mg/L	28-MAR-17		0.05		
	Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17				
	Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	28-MAR-17				
	Potassium (K)-Dissolved	<1.0		1.0	mg/L	28-MAR-17				
	Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	28-MAR-17	0.01			
	Silicon (Si)-Dissolved	6.6		1.0	mg/L	28-MAR-17				
	Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	28-MAR-17				
	Sodium (Na)-Dissolved	3.62		0.50	mg/L	28-MAR-17	20	200		
	Strontium (Sr)-Dissolved	0.161		0.0010	mg/L	28-MAR-17				
	Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	28-MAR-17				
	Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	28-MAR-17				
	Tungsten (W)-Dissolved	<0.010		0.010	mg/L	28-MAR-17				
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	28-MAR-17	0.02			
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	28-MAR-17				
	Zinc (Zn)-Dissolved	0.0099		0.0030	mg/L	28-MAR-17		5		
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	28-MAR-17				

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

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***
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

CL-IC-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).

COLOUR-WT	Water	Colour	APHA 2120

Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

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.

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, 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).

NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

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

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

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

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

Reference Information

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

Chain of Custody numbers:

15-555502

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.

Quality Control Report

Workorder: L1905251 Report Date: 03-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-WT	**Water**							
Batch R3687085								
WG2501792-7 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			100.3		%		80-120	28-MAR-17
WG2501792-8 DUP		**L1905251-1**						
Alkalinity, Total (as CaCO3)		346	353		mg/L	1.8	20	28-MAR-17
WG2501792-6 LCS								
Alkalinity, Total (as CaCO3)			98.1		%		85-115	28-MAR-17
WG2501792-5 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	28-MAR-17
CL-IC-WT	**Water**							
Batch R3686257								
WG2500466-20 DUP		**L1905250-4**						
Chloride (Cl)		9.72	10.0		mg/L	3.1	25	27-MAR-17
WG2500466-17 LCS								
Chloride (Cl)			102.3		%		70-130	27-MAR-17
WG2500466-16 MB								
Chloride (Cl)			<0.50		mg/L		0.5	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Chloride (Cl)			100.9		%		70-130	27-MAR-17
COLOUR-WT	**Water**							
Batch R3685230								
WG2500102-3 CRM		**WT-COLOUR-CRM**						
Colour, Apparent			96.5		%		80-120	25-MAR-17
WG2500102-4 DUP		**L1905250-1**						
Colour, Apparent		32.7	29.2		CU	12	20	25-MAR-17
WG2500102-2 LCS								
Colour, Apparent			99.4		%		80-120	25-MAR-17
WG2500102-1 MB								
Colour, Apparent			<2.0		CU		2	25-MAR-17
EC-WT	**Water**							
Batch R3686126								
WG2500598-12 DUP		**WG2500598-11**						
Conductivity		78.8	79.0		umhos/cm	0.3	10	27-MAR-17
WG2500598-9 LCS								
Conductivity			101.1		%		90-110	27-MAR-17
WG2500598-10 MB								
Conductivity			<3.0		umhos/cm		3	27-MAR-17
F-IC-N-WT	**Water**							

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R3686257								
WG2500466-20 DUP		**L1905250-4**						
Fluoride (F)		0.105	0.111		mg/L	5.9	20	27-MAR-17
WG2500466-17 LCS								
Fluoride (F)			100.4		%		90-110	27-MAR-17
WG2500466-16 MB								
Fluoride (F)			<0.020		mg/L		0.02	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Fluoride (F)			103.8		%		75-125	27-MAR-17
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500498-4 DUP		**WG2500498-3**						
Aluminum (Al)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-MAR-17
Antimony (Sb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Arsenic (As)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Barium (Ba)-Dissolved		0.0909	0.0896		mg/L	1.5	20	27-MAR-17
Beryllium (Be)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-MAR-17
Cadmium (Cd)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Calcium (Ca)-Dissolved		141	147		mg/L	4.5	20	27-MAR-17
Chromium (Cr)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-MAR-17
Cobalt (Co)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Copper (Cu)-Dissolved		0.0032	0.0035		mg/L	9.2	20	27-MAR-17
Iron (Fe)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	20	27-MAR-17
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Magnesium (Mg)-Dissolved		26.4	28.0		mg/L	6.0	20	27-MAR-17
Manganese (Mn)-Dissolved		0.0141	0.0136		mg/L	3.5	20	27-MAR-17
Molybdenum (Mo)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Nickel (Ni)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-MAR-17
Phosphorus (P)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	27-MAR-17
Potassium (K)-Dissolved		1.75	1.78		mg/L	1.6	20	27-MAR-17
Selenium (Se)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Silicon (Si)-Dissolved		3.71	3.77		mg/L	1.6	20	27-MAR-17
Silver (Ag)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	27-MAR-17
Sodium (Na)-Dissolved		342	345		mg/L	1.1	20	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500498-4 DUP		**WG2500498-3**						
Strontium (Sr)-Dissolved		0.313	0.330		mg/L	5.2	20	27-MAR-17
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-MAR-17
Tin (Sn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Titanium (Ti)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-17
Tungsten (W)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	27-MAR-17
Uranium (U)-Dissolved		0.00064	0.00065		mg/L	1.8	20	27-MAR-17
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	27-MAR-17
Zinc (Zn)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	27-MAR-17
Zirconium (Zr)-Dissolved		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	27-MAR-17
WG2500498-2 LCS								
Aluminum (Al)-Dissolved			93.0		%		80-120	27-MAR-17
Antimony (Sb)-Dissolved			98.5		%		80-120	27-MAR-17
Arsenic (As)-Dissolved			95.6		%		80-120	27-MAR-17
Barium (Ba)-Dissolved			91.4		%		80-120	27-MAR-17
Beryllium (Be)-Dissolved			89.1		%		80-120	27-MAR-17
Bismuth (Bi)-Dissolved			96.8		%		80-120	27-MAR-17
Boron (B)-Dissolved			89.2		%		80-120	27-MAR-17
Cadmium (Cd)-Dissolved			95.3		%		80-120	27-MAR-17
Calcium (Ca)-Dissolved			94.7		%		80-120	27-MAR-17
Chromium (Cr)-Dissolved			93.0		%		80-120	27-MAR-17
Cobalt (Co)-Dissolved			94.6		%		80-120	27-MAR-17
Copper (Cu)-Dissolved			94.1		%		80-120	27-MAR-17
Iron (Fe)-Dissolved			94.1		%		80-120	27-MAR-17
Lead (Pb)-Dissolved			96.8		%		80-120	27-MAR-17
Magnesium (Mg)-Dissolved			96.5		%		80-120	27-MAR-17
Manganese (Mn)-Dissolved			93.8		%		80-120	27-MAR-17
Molybdenum (Mo)-Dissolved			97.1		%		80-120	27-MAR-17
Nickel (Ni)-Dissolved			93.4		%		80-120	27-MAR-17
Phosphorus (P)-Dissolved			101.0		%		80-120	27-MAR-17
Potassium (K)-Dissolved			95.4		%		80-120	27-MAR-17
Selenium (Se)-Dissolved			97.8		%		80-120	27-MAR-17
Silicon (Si)-Dissolved			97.9		%		80-120	27-MAR-17
Silver (Ag)-Dissolved			96.5		%		80-120	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500498-2 LCS								
Sodium (Na)-Dissolved			94.2		%		80-120	27-MAR-17
Strontium (Sr)-Dissolved			103.0		%		80-120	27-MAR-17
Thallium (Tl)-Dissolved			95.5		%		80-120	27-MAR-17
Tin (Sn)-Dissolved			96.6		%		80-120	27-MAR-17
Titanium (Ti)-Dissolved			92.5		%		80-120	27-MAR-17
Tungsten (W)-Dissolved			98.7		%		80-120	27-MAR-17
Uranium (U)-Dissolved			103.0		%		80-120	27-MAR-17
Vanadium (V)-Dissolved			94.8		%		80-120	27-MAR-17
Zinc (Zn)-Dissolved			90.4		%		80-120	27-MAR-17
Zirconium (Zr)-Dissolved			96.2		%		80-120	27-MAR-17
WG2500498-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	27-MAR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAR-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-MAR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-MAR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAR-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500498-1 MB								
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	27-MAR-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	27-MAR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-MAR-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	27-MAR-17
WG2500498-5 MS		**WG2500498-3**						
Aluminum (Al)-Dissolved			85.8		%		70-130	27-MAR-17
Antimony (Sb)-Dissolved			95.9		%		70-130	27-MAR-17
Arsenic (As)-Dissolved			94.4		%		70-130	27-MAR-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Beryllium (Be)-Dissolved			87.9		%		70-130	27-MAR-17
Bismuth (Bi)-Dissolved			91.4		%		70-130	27-MAR-17
Boron (B)-Dissolved			74.4		%		70-130	27-MAR-17
Cadmium (Cd)-Dissolved			90.0		%		70-130	27-MAR-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Chromium (Cr)-Dissolved			91.1		%		70-130	27-MAR-17
Cobalt (Co)-Dissolved			91.4		%		70-130	27-MAR-17
Iron (Fe)-Dissolved			83.5		%		70-130	27-MAR-17
Lead (Pb)-Dissolved			90.8		%		70-130	27-MAR-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Molybdenum (Mo)-Dissolved			92.0		%		70-130	27-MAR-17
Nickel (Ni)-Dissolved			87.8		%		70-130	27-MAR-17
Phosphorus (P)-Dissolved			99.3		%		70-130	27-MAR-17
Selenium (Se)-Dissolved			96.2		%		70-130	27-MAR-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Silver (Ag)-Dissolved			91.5		%		70-130	27-MAR-17
Sodium (Na)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	27-MAR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3685833								
WG2500498-5 MS		**WG2500498-3**						
Thallium (Tl)-Dissolved			90.0		%		70-130	27-MAR-17
Tin (Sn)-Dissolved			91.4		%		70-130	27-MAR-17
Titanium (Ti)-Dissolved			92.7		%		70-130	27-MAR-17
Tungsten (W)-Dissolved			95.1		%		70-130	27-MAR-17
Uranium (U)-Dissolved			N/A	MS-B	%		-	27-MAR-17
Vanadium (V)-Dissolved			95.4		%		70-130	27-MAR-17
Zinc (Zn)-Dissolved			71.9		%		70-130	27-MAR-17
Zirconium (Zr)-Dissolved			92.7		%		70-130	27-MAR-17
NH3-WT	**Water**							
Batch R3685854								
WG2500561-7 DUP		**L1904582-4**						
Ammonia, Total (as N)		0.026	0.033	J	mg/L	0.007	0.04	27-MAR-17
WG2500561-6 LCS								
Ammonia, Total (as N)			99.6		%		85-115	27-MAR-17
WG2500561-5 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	27-MAR-17
WG2500561-8 MS		**L1904582-4**						
Ammonia, Total (as N)			103.9		%		75-125	27-MAR-17
NO2-IC-WT	**Water**							
Batch R3686257								
WG2500466-20 DUP		**L1905250-4**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	27-MAR-17
WG2500466-17 LCS								
Nitrite (as N)			103.2		%		70-130	27-MAR-17
WG2500466-16 MB								
Nitrite (as N)			<0.010		mg/L		0.01	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Nitrite (as N)			96.1		%		70-130	27-MAR-17
NO3-IC-WT	**Water**							
Batch R3686257								
WG2500466-20 DUP		**L1905250-4**						
Nitrate (as N)		2.91	2.98		mg/L	2.2	25	27-MAR-17
WG2500466-17 LCS								
Nitrate (as N)			101.3		%		70-130	27-MAR-17
WG2500466-16 MB								
Nitrate (as N)			<0.020				0.02	

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R3686257								
WG2500466-16 MB								
Nitrate (as N)			<0.020		mg/L		0.02	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Nitrate (as N)			N/A	MS-B	%		-	27-MAR-17
PH-WT	**Water**							
Batch R3686126								
WG2500598-12 DUP		**WG2500598-11**						
pH		7.12	7.12	J	pH units	0.00	0.2	27-MAR-17
WG2500598-9 LCS								
pH			7.00		pH units		6.9-7.1	27-MAR-17
PO4-DO-COL-WT	**Water**							
Batch R3686260								
WG2500564-3 DUP		**L1905251-1**						
Orthophosphate-Dissolved (as P)		<0.0030	<0.0030	RPD-NA	mg/L	N/A	30	27-MAR-17
WG2500564-2 LCS								
Orthophosphate-Dissolved (as P)			85.1		%		70-130	27-MAR-17
WG2500564-1 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	27-MAR-17
WG2500564-4 MS		**L1905251-1**						
Orthophosphate-Dissolved (as P)			113.3		%		70-130	27-MAR-17
SO4-IC-N-WT	**Water**							
Batch R3686257								
WG2500466-20 DUP		**L1905250-4**						
Sulfate (SO4)		24.4	25.3		mg/L	3.6	20	27-MAR-17
WG2500466-17 LCS								
Sulfate (SO4)			102.3		%		90-110	27-MAR-17
WG2500466-16 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	27-MAR-17
WG2500466-19 MS		**L1905250-4**						
Sulfate (SO4)			101.3		%		75-125	27-MAR-17
SOLIDS-TDS-WT	**Water**							
Batch R3690640								
WG2501906-3 DUP		**L1904727-8**						
Total Dissolved Solids		693	701		mg/L	1.1	20	29-MAR-17
WG2501906-2 LCS								
Total Dissolved Solids			99.1		%		85-115	29-MAR-17
WG2501906-1 MB								

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R3690640								
WG2501906-1 MB								
Total Dissolved Solids			<10		mg/L		10	29-MAR-17
TURBIDITY-WT	**Water**							
Batch R3685398								
WG2500145-3 DUP		**L1905251-2**						
Turbidity		33.2	32.1		NTU	3.4	15	25-MAR-17
WG2500145-2 LCS								
Turbidity			105.0		%		85-115	25-MAR-17
WG2500145-1 MB								
Turbidity			<0.10		NTU		0.1	25-MAR-17

Quality Control Report

Workorder: L1905251 Report Date: 03-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1905251-COFC

COC Number: 15 - 555502

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	MTE Consultants	Select Report Format: PDF EXCEL EDD (DIGITAL)	Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Andrew Bingleman	Quality Control (QC) Report with Report: YES NO	PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]
Phone:	519-243-6500	Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]
	Company address below will appear on the final report	Select Distribution: EMAIL MAIL FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:		Email 1 or Fax: abingleman@mtecs.ca	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:		Email 2: mmarie@mtecs.ca	Analysis Request
Postal Code:		Email 3: groundwaterandsurface@mtecs.ca	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Invoice To	Same as Report To: YES NO	Invoice Distribution	
	Copy of Invoice with Report: YES NO	Select Invoice Distribution: EMAIL MAIL FAX	
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:	39502-104	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L1905251	ALS Contact: ML	Sampler: YM

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	G. Chem: Reg 1	Number of Containers
1	Stantec-MW 8-10S	23-03-17	13:00	GW	X	4
2	Stantec MW 8-10D	"	13:10	"	X	4
3	Stantec MW 12-10S	"	14:00	"	X	4
4	Stantec MW 12-10D	"	15:10	"	X	4
5	Stantec MW 13-10	24-03-17	10:00	"	X	4

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)
Are samples taken from a Regulated DW System? YES NO	ODWQS
Are samples for human drinking water use? YES NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact ☒ Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			7.9	9.4	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Mar 24, 2017						24-Mar-17	19:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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.

White Paper Co. 604 951-3900

Sample Receipt Confirmation

Report Distribution:

Company Name: MTE CONSULTANTS INC.
Contact: ANDREW BINGEMAN
Address: 520 BINGEMANS CENTRE DRIVE, KITCHENER, ON, N2B 3X9
Phone: 519-743-6500
Fax: 519-741-9323
Email: abingeman@mte85.com ymuhammad@mte85.com vmarick@mte85.com
EDD Email: abingeman@mte85.com ymuhammad@mte85.com vmarick@mte85.com
Distribution: Hard Copy: Y Email: Y Fax: N EDD: Y

Invoice Distribution:

Acct Name: MTE CONSULTANTS INC.
Contact: ACCOUNTS PAYABLE
Address: 520 BINGEMANS CENTRE DRIVE, KITCHENER, ON, N2B 3X9
Phone: 519-743-6500
Fax: 519-743-6513
Invoice Email: accounting@mte85.com
Project #: N/A
Account #: 13838

Client Information:

Job Reference #: 39502-104
Project PO #:
Legal Site Description: N/A
Quote #: N/A
Date Sampled: 23-MAR-17
Date Received: 24-MAR-17
Sampled By: CLIENT
Chain Of Custody: 15-555502

Workorder Summary:

Lab Work Order #: **L1905251**
Estimated completion date: 03-APR-17
5 Samples received at ALS in **WATERLOO**
Client Job #: 39502-104
Account Manager: Mary-Lynn Pike
Estimated sample disposal date: See Sample Disposal Information section below.

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1905251-1	STANTEC-MW8-10S	23-MAR-17 13:00	24-MAR-17 19:20	03-APR-17		WATER
L1905251-2	STANTEC-MW8-10D	23-MAR-17 13:10	24-MAR-17 19:20	03-APR-17		WATER
L1905251-3	STANTEC-MW12-10S	23-MAR-17 14:00	24-MAR-17 19:20	03-APR-17		WATER
L1905251-4	STANTEC-MW12-10D	23-MAR-17 15:10	24-MAR-17 19:20	03-APR-17		WATER
L1905251-5	STANTEC-MW13-10	24-MAR-17 10:00	24-MAR-17 19:20	03-APR-17		WATER

Analysis Requested :	General Chemistry Package 1-Groundwater	Sample Handling and Disposal Fee
STANTEC-MW8-10S	✓	✓
STANTEC-MW8-10D	✓	✓
STANTEC-MW12-10S	✓	✓
STANTEC-MW12-10D	✓	✓
STANTEC-MW13-10	✓	✓

Login Comments:

Your samples were at 9.4 °C when unpacked at the laboratory.

Sample Integrity Observations: No observations were identified for this work order submission.

Sample Disposal Information:

Where possible, ALS will store samples for 30 days from the date a final report is issued, or 30 days from the date samples are placed on hold without analytical requests, after which samples may be discarded. Air samples collected on re-usable media are an exception, and are stored for 7 days from the date a final report is issued. Longer storage times are available upon request.

For information about ALS accreditations and certifications please contact your Account Manager or visit our webpage at www.alsglobal.com (see Canada downloads).

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

ALS Group appreciates your business. Thank you for the opportunity to work with you.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1905251-COFC

COC Number: 15 - 555502

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	MTE Consultants	Select Report Format: PDF EXCEL EDD (DIGITAL)	Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Andrew Bingleman	Quality Control (QC) Report with Report: YES NO	PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]
Phone:	519-243-6500	Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]
	Company address below will appear on the final report	Select Distribution: EMAIL MAIL FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:		Email 1 or Fax: abingleman@mtecs.ca	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:		Email 2: mmarie@mtecs.ca	Analysis Request
Postal Code:		Email 3: groundwaterandsurface@mtecs.ca	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Invoice To	Same as Report To: YES NO	Invoice Distribution	
	Copy of Invoice with Report: YES NO	Select Invoice Distribution: EMAIL MAIL FAX	
Company:		Email 1 or Fax	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:	39502-104	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	L1905251	ALS Contact: ML	Sampler: YM

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	G. Chem: Reg 1	Number of Containers
1	Stantec-MW 8-10S	23-03-17	13:00	GW	X	4
2	Stantec MW 8-10D	"	13:10	"	X	4
3	Stantec MW 12-10S	"	14:00	"	X	4
4	Stantec MW 12-10D	"	15:10	"	X	4
5	Stantec MW 13-10	24-03-17	10:00	"	X	4

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)
Are samples taken from a Regulated DW System? YES NO	ODWQS
Are samples for human drinking water use? YES NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ Custody seal intact ☒ Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			7.9	9.4	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Mar 24, 2017						24-Mar-17	19:20

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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.

White Paper Co. 604 951-3900

MTE CONSULTANTS INC.
ATTN: ANDREW BINGEMAN
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9

Date Received: 03-APR-17
Report Date: 10-APR-17 10:36 (MT)
Version: FINAL

Client Phone: 519-743-6500

Certificate of Analysis

Lab Work Order #: L1908093

Project P.O. #: NOT SUBMITTED
Job Reference: 39502-104
C of C Numbers: 15-555396
Legal Site Desc:

Mary-Lynn Pike
Client Services Supervisor

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Sample Details Grouping / Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2
L1908093-1 STANTEC-MW10-10							
Sampled By: YM on 03-APR-17 @ 14:30							
Matrix: WATER							
Physical Tests							
Colour, Apparent	345		2.0	CU	03-APR-17		*5
Conductivity	473		3.0	umhos/cm	04-APR-17		
Hardness (as CaCO3)	240		10	mg/L	04-APR-17		*80-100
pH	7.97		0.10	pH units	04-APR-17		6.5-8.5
Total Dissolved Solids	312	DLDS	20	mg/L	05-APR-17		500
Turbidity	3980		0.10	NTU	05-APR-17		*5
Anions and Nutrients							
Alkalinity, Total (as CaCO3)	276		10	mg/L	04-APR-17		30-500
Ammonia, Total (as N)	0.180	DLM	0.040	mg/L	04-APR-17		
Chloride (Cl)	1.22		0.50	mg/L	05-APR-17		250
Fluoride (F)	0.154		0.020	mg/L	05-APR-17	1.5	
Nitrate (as N)	<0.020		0.020	mg/L	05-APR-17	10	
Nitrite (as N)	<0.010		0.010	mg/L	05-APR-17	1	
Orthophosphate-Dissolved (as P)	0.0056		0.0030	mg/L	03-APR-17		
Sulfate (SO4)	13.4		0.30	mg/L	05-APR-17		500
Dissolved Metals							
Dissolved Metals Filtration Location	FIELD			No Unit	04-APR-17		
Aluminum (Al)-Dissolved	<0.010		0.010	mg/L	04-APR-17		0.1
Antimony (Sb)-Dissolved	<0.0050		0.0050	mg/L	04-APR-17	0.006	
Arsenic (As)-Dissolved	0.0135		0.0010	mg/L	04-APR-17	0.025	
Barium (Ba)-Dissolved	0.097		0.010	mg/L	04-APR-17	1	
Beryllium (Be)-Dissolved	<0.0010		0.0010	mg/L	04-APR-17		
Bismuth (Bi)-Dissolved	<0.0010		0.0010	mg/L	04-APR-17		
Boron (B)-Dissolved	<0.050		0.050	mg/L	04-APR-17	5	
Cadmium (Cd)-Dissolved	<0.000090		0.000090	mg/L	04-APR-17	0.005	
Calcium (Ca)-Dissolved	52.9		0.50	mg/L	04-APR-17		
Chromium (Cr)-Dissolved	<0.00050		0.00050	mg/L	04-APR-17	0.05	
Cobalt (Co)-Dissolved	<0.00050		0.00050	mg/L	04-APR-17		
Copper (Cu)-Dissolved	0.0021		0.0010	mg/L	04-APR-17		1
Iron (Fe)-Dissolved	0.274		0.050	mg/L	04-APR-17		0.3
Lead (Pb)-Dissolved	<0.0010		0.0010	mg/L	04-APR-17	0.01	
Magnesium (Mg)-Dissolved	26.1		0.50	mg/L	04-APR-17		
Manganese (Mn)-Dissolved	0.0180		0.0010	mg/L	04-APR-17		0.05
Molybdenum (Mo)-Dissolved	0.0012		0.0010	mg/L	04-APR-17		
Nickel (Ni)-Dissolved	<0.0020		0.0020	mg/L	04-APR-17		
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L	04-APR-17		
Potassium (K)-Dissolved	1.0		1.0	mg/L	04-APR-17		
Selenium (Se)-Dissolved	<0.00040		0.00040	mg/L	04-APR-17	0.01	
Silicon (Si)-Dissolved	11.2		1.0	mg/L	04-APR-17		
Silver (Ag)-Dissolved	<0.00010		0.00010	mg/L	04-APR-17		
Sodium (Na)-Dissolved	7.54		0.50	mg/L	04-APR-17	20	200
Strontium (Sr)-Dissolved	0.324		0.0010	mg/L	04-APR-17		
Thallium (Tl)-Dissolved	<0.00030		0.00030	mg/L	04-APR-17		
Tin (Sn)-Dissolved	<0.0010		0.0010	mg/L	04-APR-17		
Titanium (Ti)-Dissolved	<0.0020		0.0020	mg/L	04-APR-17		
Tungsten (W)-Dissolved	<0.010		0.010	mg/L	04-APR-17		

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Sample Details Grouping	Analyte	Result	Qualifier	D.L.	Units	Analyzed	Guideline Limits #1	Guideline Limits #2		
L1908093-1	STANTEC-MW10-10									
Sampled By:	YM on 03-APR-17 @ 14:30									
Matrix:	WATER									
Dissolved Metals										
	Uranium (U)-Dissolved	<0.0050		0.0050	mg/L	04-APR-17	0.02			
	Vanadium (V)-Dissolved	<0.0010		0.0010	mg/L	04-APR-17				
	Zinc (Zn)-Dissolved	0.0033		0.0030	mg/L	04-APR-17		5		
	Zirconium (Zr)-Dissolved	<0.0040		0.0040	mg/L	04-APR-17				

** 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 Drinking Water Regulation (ODWQS) JAN.1,2017 = [Suite] - ON-DW-STANDARD+GUIDELINES

#1: Schedule 1 (Microbiological) and 2 (Chemical) Standards (JAN,2017) **#2: Ontario DW Aesthetic and Operational Guidelines**

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference***
ALK-WT	Water	Alkalinity, Total (as CaCO3)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

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).

COLOUR-WT	Water	Colour	APHA 2120

Apparent Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method after sample decanting. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.

EC-WT	Water	Conductivity	APHA 2510 B

Water samples can be measured directly by immersing the conductivity cell into the sample.

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.

HARDNESS-CALC-WT	Water	Hardness	APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

MET-D-CCMS-WT	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, 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).

NH3-WT	Water	Ammonia, Total as N	EPA 350.1

Sample is measured colorimetrically. When sample is turbid a distillation step is required, sample is distilled into a solution of boric acid and measured colorimetrically.

NO2-IC-WT	Water	Nitrite in Water by IC	EPA 300.1 (mod)

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

NO3-IC-WT	Water	Nitrate in Water by IC	EPA 300.1 (mod)

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

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

PO4-DO-COL-WT	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)

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

SOLIDS-TDS-WT	Water	Total Dissolved Solids	APHA 2540C

A well-mixed sample is filtered though glass fibres filter. A known volume of the filtrate is evaporated and dried at 105–5°C overnight and then 180–10°C for 1hr.

TURBIDITY-WT	Water	Turbidity	APHA 2130 B

Sample result is based on a comparison of the intensity of the light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension under the same conditions. Sample readings are obtained from a Nephelometer.

Reference Information

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

Chain of Custody numbers:

15-555396

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.

Quality Control Report

Workorder: L1908093 Report Date: 10-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9

Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ALK-WT	**Water**							
Batch R3692940								
WG2505639-3 CRM		**WT-ALK-CRM**						
Alkalinity, Total (as CaCO3)			105.1		%		80-120	04-APR-17
WG2505639-4 DUP		**L1907638-1**						
Alkalinity, Total (as CaCO3)		319	315		mg/L	1.1	20	04-APR-17
WG2505639-2 LCS								
Alkalinity, Total (as CaCO3)			109.1		%		85-115	04-APR-17
WG2505639-1 MB								
Alkalinity, Total (as CaCO3)			<10		mg/L		10	04-APR-17
CL-IC-N-WT	**Water**							
Batch R3694399								
WG2505897-10 DUP		**WG2505897-8**						
Chloride (Cl)		1.22	1.22		mg/L	0.1	20	05-APR-17
WG2505897-7 LCS								
Chloride (Cl)			102.8		%		90-110	05-APR-17
WG2505897-6 MB								
Chloride (Cl)			<0.50		mg/L		0.5	05-APR-17
WG2505897-9 MS		**WG2505897-8**						
Chloride (Cl)			102.8		%		75-125	05-APR-17
COLOUR-WT	**Water**							
Batch R3692821								
WG2504859-3 CRM		**WT-COLOUR-CRM**						
Colour, Apparent			96.5		%		80-120	03-APR-17
WG2504859-4 DUP		**L1908093-1**						
Colour, Apparent		345	355		CU	2.6	20	03-APR-17
WG2504859-2 LCS								
Colour, Apparent			100.9		%		80-120	03-APR-17
WG2504859-1 MB								
Colour, Apparent			<2.0		CU		2	03-APR-17
EC-WT	**Water**							
Batch R3692518								
WG2505079-3 DUP		**WG2505079-2**						
Conductivity		723	723		umhos/cm	0.0	10	04-APR-17
WG2505079-1 LCS								
Conductivity			100.5		%		90-110	04-APR-17
WG2505079-4 MB								
Conductivity			<3.0		umhos/cm		3	04-APR-17
F-IC-N-WT	**Water**							

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-WT	**Water**							
Batch R3694399								
WG2505897-10 DUP		**WG2505897-8**						
Fluoride (F)		0.154	0.154		mg/L	0.0	20	05-APR-17
WG2505897-7 LCS								
Fluoride (F)			101.9		%		90-110	05-APR-17
WG2505897-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	05-APR-17
WG2505897-9 MS		**WG2505897-8**						
Fluoride (F)			103.2		%		75-125	05-APR-17
MET-D-CCMS-WT	**Water**							
Batch R3692105								
WG2505014-4 DUP		**WG2505014-3**						
Aluminum (Al)-Dissolved		0.0280	0.0288		mg/L	2.9	20	04-APR-17
Antimony (Sb)-Dissolved		0.00024	0.00023		mg/L	4.0	20	04-APR-17
Arsenic (As)-Dissolved		0.00162	0.00159		mg/L	1.7	20	04-APR-17
Barium (Ba)-Dissolved		0.0872	0.0860		mg/L	1.4	20	04-APR-17
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-APR-17
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-APR-17
Boron (B)-Dissolved		0.020	0.020		mg/L	1.7	20	04-APR-17
Cadmium (Cd)-Dissolved		0.000018	0.000017		mg/L	4.1	20	04-APR-17
Calcium (Ca)-Dissolved		152	152		mg/L	0.0	20	04-APR-17
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	04-APR-17
Cobalt (Co)-Dissolved		0.00060	0.00059		mg/L	1.7	20	04-APR-17
Copper (Cu)-Dissolved		0.00205	0.00202		mg/L	1.2	20	04-APR-17
Iron (Fe)-Dissolved		1.07	1.03		mg/L	3.7	20	04-APR-17
Lead (Pb)-Dissolved		0.000247	0.000250		mg/L	1.5	20	04-APR-17
Magnesium (Mg)-Dissolved		25.4	26.1		mg/L	2.7	20	04-APR-17
Manganese (Mn)-Dissolved		0.444	0.453		mg/L	2.0	20	04-APR-17
Molybdenum (Mo)-Dissolved		0.000865	0.000890		mg/L	2.9	20	04-APR-17
Nickel (Ni)-Dissolved		0.00066	0.00066		mg/L	0.4	20	04-APR-17
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	04-APR-17
Potassium (K)-Dissolved		4.51	4.54		mg/L	0.6	20	04-APR-17
Selenium (Se)-Dissolved		0.000176	0.000177		mg/L	0.6	20	04-APR-17
Silicon (Si)-Dissolved		6.37	6.32		mg/L	0.8	20	04-APR-17
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	04-APR-17
Sodium (Na)-Dissolved		77.0	78.5		mg/L	1.9	20	04-APR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3692105								
WG2505014-4 DUP		**WG2505014-3**						
Strontium (Sr)-Dissolved		0.343	0.320		mg/L	7.1	20	04-APR-17
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	04-APR-17
Tin (Sn)-Dissolved		0.00018	0.00017		mg/L	6.7	20	04-APR-17
Titanium (Ti)-Dissolved		0.00151	0.00152		mg/L	0.3	20	04-APR-17
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	04-APR-17
Uranium (U)-Dissolved		0.000629	0.000685		mg/L	8.4	20	04-APR-17
Vanadium (V)-Dissolved		0.00451	0.00461		mg/L	2.3	20	04-APR-17
Zinc (Zn)-Dissolved		0.0029	0.0028		mg/L	2.1	20	04-APR-17
Zirconium (Zr)-Dissolved		0.00067	0.00067		mg/L	0.5	20	04-APR-17
WG2505014-2 LCS								
Aluminum (Al)-Dissolved			98.6		%		80-120	04-APR-17
Antimony (Sb)-Dissolved			99.4		%		80-120	04-APR-17
Arsenic (As)-Dissolved			100.2		%		80-120	04-APR-17
Barium (Ba)-Dissolved			100.7		%		80-120	04-APR-17
Beryllium (Be)-Dissolved			91.9		%		80-120	04-APR-17
Bismuth (Bi)-Dissolved			96.2		%		80-120	04-APR-17
Boron (B)-Dissolved			96.1		%		80-120	04-APR-17
Cadmium (Cd)-Dissolved			102.9		%		80-120	04-APR-17
Calcium (Ca)-Dissolved			98.7		%		80-120	04-APR-17
Chromium (Cr)-Dissolved			96.8		%		80-120	04-APR-17
Cobalt (Co)-Dissolved			96.4		%		80-120	04-APR-17
Copper (Cu)-Dissolved			97.0		%		80-120	04-APR-17
Iron (Fe)-Dissolved			97.3		%		80-120	04-APR-17
Lead (Pb)-Dissolved			100.5		%		80-120	04-APR-17
Magnesium (Mg)-Dissolved			96.9		%		80-120	04-APR-17
Manganese (Mn)-Dissolved			99.7		%		80-120	04-APR-17
Molybdenum (Mo)-Dissolved			93.8		%		80-120	04-APR-17
Nickel (Ni)-Dissolved			98.5		%		80-120	04-APR-17
Phosphorus (P)-Dissolved			100.2		%		80-120	04-APR-17
Potassium (K)-Dissolved			99.7		%		80-120	04-APR-17
Selenium (Se)-Dissolved			97.2		%		80-120	04-APR-17
Silicon (Si)-Dissolved			104.8		%		80-120	04-APR-17
Silver (Ag)-Dissolved			100.8		%		80-120	04-APR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3692105								
WG2505014-2 LCS								
Sodium (Na)-Dissolved			97.0		%		80-120	04-APR-17
Strontium (Sr)-Dissolved			102.3		%		80-120	04-APR-17
Thallium (Tl)-Dissolved			98.0		%		80-120	04-APR-17
Tin (Sn)-Dissolved			100.9		%		80-120	04-APR-17
Titanium (Ti)-Dissolved			98.5		%		80-120	04-APR-17
Tungsten (W)-Dissolved			100.5		%		80-120	04-APR-17
Uranium (U)-Dissolved			104.6		%		80-120	04-APR-17
Vanadium (V)-Dissolved			99.5		%		80-120	04-APR-17
Zinc (Zn)-Dissolved			92.6		%		80-120	04-APR-17
Zirconium (Zr)-Dissolved			97.1		%		80-120	04-APR-17
WG2505014-1 MB								
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	04-APR-17
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	04-APR-17
Boron (B)-Dissolved			<0.010		mg/L		0.01	04-APR-17
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	04-APR-17
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	04-APR-17
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	04-APR-17
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	04-APR-17
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	04-APR-17
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	04-APR-17
Magnesium (Mg)-Dissolved			<0.050		mg/L		0.05	04-APR-17
Manganese (Mn)-Dissolved			<0.00050		mg/L		0.0005	04-APR-17
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	04-APR-17
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	04-APR-17
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	04-APR-17
Potassium (K)-Dissolved			<0.050		mg/L		0.05	04-APR-17
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	04-APR-17
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	04-APR-17
Silver (Ag)-Dissolved			<0.000050		mg/L		0.00005	04-APR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3692105								
WG2505014-1 MB								
Sodium (Na)-Dissolved			<0.50		mg/L		0.5	04-APR-17
Strontium (Sr)-Dissolved			<0.0010		mg/L		0.001	04-APR-17
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	04-APR-17
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	04-APR-17
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	04-APR-17
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	04-APR-17
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	04-APR-17
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	04-APR-17
Zirconium (Zr)-Dissolved			<0.00030		mg/L		0.0003	04-APR-17
WG2505014-5 MS		**WG2505014-3**						
Aluminum (Al)-Dissolved			98.8		%		70-130	04-APR-17
Antimony (Sb)-Dissolved			105.0		%		70-130	04-APR-17
Arsenic (As)-Dissolved			115.9		%		70-130	04-APR-17
Barium (Ba)-Dissolved			N/A	MS-B	%		-	04-APR-17
Beryllium (Be)-Dissolved			102.6		%		70-130	04-APR-17
Bismuth (Bi)-Dissolved			81.1		%		70-130	04-APR-17
Boron (B)-Dissolved			108.4		%		70-130	04-APR-17
Cadmium (Cd)-Dissolved			99.5		%		70-130	04-APR-17
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	04-APR-17
Chromium (Cr)-Dissolved			94.1		%		70-130	04-APR-17
Cobalt (Co)-Dissolved			91.4		%		70-130	04-APR-17
Copper (Cu)-Dissolved			89.3		%		70-130	04-APR-17
Iron (Fe)-Dissolved			N/A	MS-B	%		-	04-APR-17
Lead (Pb)-Dissolved			91.6		%		70-130	04-APR-17
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	04-APR-17
Manganese (Mn)-Dissolved			N/A	MS-B	%		-	04-APR-17
Molybdenum (Mo)-Dissolved			97.4		%		70-130	04-APR-17
Nickel (Ni)-Dissolved			91.1		%		70-130	04-APR-17
Phosphorus (P)-Dissolved			108.5		%		70-130	04-APR-17
Potassium (K)-Dissolved			N/A	MS-B	%		-	04-APR-17
Selenium (Se)-Dissolved			127.8		%		70-130	04-APR-17
Silicon (Si)-Dissolved			N/A	MS-B	%		-	04-APR-17
Silver (Ag)-Dissolved			75.5		%		70-130	04-APR-17

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-WT	**Water**							
Batch R3692105								
WG2505014-5 MS		**WG2505014-3**						
Sodium (Na)-Dissolved			N/A	MS-B	%		-	04-APR-17
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	04-APR-17
Thallium (Tl)-Dissolved			89.0		%		70-130	04-APR-17
Tin (Sn)-Dissolved			99.7		%		70-130	04-APR-17
Titanium (Ti)-Dissolved			102.6		%		70-130	04-APR-17
Tungsten (W)-Dissolved			94.6		%		70-130	04-APR-17
Uranium (U)-Dissolved			N/A	MS-B	%		-	04-APR-17
Vanadium (V)-Dissolved			101.1		%		70-130	04-APR-17
Zinc (Zn)-Dissolved			92.8		%		70-130	04-APR-17
Zirconium (Zr)-Dissolved			98.4		%		70-130	04-APR-17
NH3-WT	**Water**							
Batch R3692844								
WG2505212-3 DUP		**L1908093-1**						
Ammonia, Total (as N)		0.180	0.172		mg/L	4.2	20	04-APR-17
WG2505212-2 LCS								
Ammonia, Total (as N)			103.8		%		85-115	04-APR-17
WG2505212-1 MB								
Ammonia, Total (as N)			<0.020		mg/L		0.02	04-APR-17
WG2505212-4 MS		**L1908093-1**						
Ammonia, Total (as N)			80.3		%		75-125	04-APR-17
NO2-IC-WT	**Water**							
Batch R3694399								
WG2505897-10 DUP		**WG2505897-8**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	25	05-APR-17
WG2505897-7 LCS								
Nitrite (as N)			103.1		%		70-130	05-APR-17
WG2505897-6 MB								
Nitrite (as N)			<0.010		mg/L		0.01	05-APR-17
WG2505897-9 MS		**WG2505897-8**						
Nitrite (as N)			102.6		%		70-130	05-APR-17
NO3-IC-WT	**Water**							
Batch R3694399								
WG2505897-10 DUP		**WG2505897-8**						
Nitrate (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	25	05-APR-17
WG2505897-7 LCS								

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-IC-WT	**Water**							
Batch R3694399								
WG2505897-7 LCS								
Nitrate (as N)			102.7		%		70-130	05-APR-17
WG2505897-6 MB								
Nitrate (as N)			<0.020		mg/L		0.02	05-APR-17
WG2505897-9 MS		**WG2505897-8**						
Nitrate (as N)			99.5		%		70-130	05-APR-17
PH-WT	**Water**							
Batch R3692518								
WG2505079-3 DUP		**WG2505079-2**						
pH		7.83	7.78	J	pH units	0.05	0.2	04-APR-17
WG2505079-1 LCS								
pH			6.99		pH units		6.9-7.1	04-APR-17
PO4-DO-COL-WT	**Water**							
Batch R3692400								
WG2504860-7 DUP		**L1907514-19**						
Orthophosphate-Dissolved (as P)		<0.0030	<0.0030	RPD-NA	mg/L	N/A	30	03-APR-17
WG2504860-6 LCS								
Orthophosphate-Dissolved (as P)			94.6		%		70-130	03-APR-17
WG2504860-5 MB								
Orthophosphate-Dissolved (as P)			<0.0030		mg/L		0.003	03-APR-17
WG2504860-8 MS		**L1907514-19**						
Orthophosphate-Dissolved (as P)			96.3		%		70-130	03-APR-17
SO4-IC-N-WT	**Water**							
Batch R3694399								
WG2505897-10 DUP		**WG2505897-8**						
Sulfate (SO4)		13.4	13.3		mg/L	0.2	20	05-APR-17
WG2505897-7 LCS								
Sulfate (SO4)			102.9		%		90-110	05-APR-17
WG2505897-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	05-APR-17
WG2505897-9 MS		**WG2505897-8**						
Sulfate (SO4)			103.4		%		75-125	05-APR-17
SOLIDS-TDS-WT	**Water**							
Batch R3694589								
WG2505767-3 DUP		**L1908093-1**						
Total Dissolved Solids		312	322		mg/L	3.0	20	05-APR-17
WG2505767-2 LCS								

Quality Control Report

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TDS-WT	**Water**							
Batch R3694589								
WG2505767-2 LCS								
Total Dissolved Solids			94.5		%		85-115	05-APR-17
WG2505767-1 MB								
Total Dissolved Solids			<10		mg/L		10	05-APR-17
TURBIDITY-WT	**Water**							
Batch R3692928								
WG2505894-3 DUP		**L1908666-1**						
Turbidity		8.21	8.20		NTU	0.1	15	05-APR-17
WG2505894-2 LCS								
Turbidity			107.0		%		85-115	05-APR-17
WG2505894-1 MB								
Turbidity			<0.10		NTU		0.1	05-APR-17

Quality Control Report

Workorder: L1908093 Report Date: 10-APR-17

Client: MTE CONSULTANTS INC.
520 BINGEMANS CENTRE DRIVE
KITCHENER ON N2B 3X9
Contact: ANDREW BINGEMAN

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.

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1908093-COFC

COC Number: 15 - 555396

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	MTE - Consultants
Contact:	Andrew Bingleman
Phone:	519-743-6500
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [ ] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [X] PDF [X] EXCEL [X] EDD (DIGITAL)
Quality Control (QC) Report with Report [X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: [X] EMAIL [X] MAIL [ ] FAX
Email 1 or Fax abingleman@mtecon.com
Email 2 kmarier@mtecon.com
Email 3 gmadaunda@mtecon.com

Invoice Distribution

Select Invoice Distribution: [X] EMAIL [X] MAIL [X] FAX
Email 1 or Fax
Email 2

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] [ ] | 3 day [P3] [ ] | 2 day [P2] [ ]
EMERGENCY: 1 Business day [E1] [ ] | Same Day, Weekend or Statutory holiday [E0] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

Project Information	
ALS Account # / Quote #:	
Job #:	39502-104
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L1908093 RM 3/7

ALS Contact: ML Sampler: YM

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	G. Chem. PKG-1	Number of Containers
1	Stantec-MW10-10	03-04-17	14:30	GW	X	4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [X] NO
Are samples for human drinking water use? [ ] YES [X] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Ontario Drinking Water Standards (ODWQS)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]
Ice Packs [X] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]
Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			9.7°C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	April 3, 2017						3 APR 17	1435

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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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.

SM

Sample Receipt Confirmation

Report Distribution:

Company Name: MTE CONSULTANTS INC.
Contact: ANDREW BINGEMAN
Address: 520 BINGEMANS CENTRE DRIVE, KITCHENER, ON, N2B 3X9
Phone: 519-743-6500
Fax: 519-741-9323
Email: abingeman@mte85.com ymuhammad@mte85.com rmaric@mte85.com
EDD Email: abingeman@mte85.com
Distribution: Hard Copy: Y Email: Y Fax: N EDD: Y

Invoice Distribution:

Acct Name: MTE CONSULTANTS INC.
Contact: ACCOUNTS PAYABLE
Address: 520 BINGEMANS CENTRE DRIVE, KITCHENER, ON, N2B 3X9
Phone: 519-743-6500
Fax: 519-743-6513
Invoice Email: accounting@mte85.com
Project #: N/A
Account #: 13838

Client Information:

Job Reference #: 39502-104
Project PO #:
Legal Site Description: N/A
Quote #: N/A
Date Sampled: 03-APR-17
Date Received: 03-APR-17
Sampled By: YM
Chain Of Custody: 15-555396

Workorder Summary:

Lab Work Order #: **L1908093**
Estimated completion date: 10-APR-17
1 Samples received at ALS in **WATERLOO**
Client Job #: 39502-104
Account Manager: Mary-Lynn Pike
Estimated sample disposal date: See Sample Disposal Information section below.

Lab Sample ID	Client Sample ID	Date Sampled	Date Received	Sample Due Date	Priority Flag	Sample Type
L1908093-1	STANTEC-MW10-10	03-APR-17 14:30	03-APR-17 14:35	10-APR-17		WATER

Analysis Requested:

	General Chemistry Package 1-Groundwater	Sample Handling and Disposal Fee
STANTEC-MW10-10	✓	✓

Login Comments:

Your samples were at 9.7 °C when unpacked at the laboratory.

Sample Integrity Observations:

No observations were identified for this work order submission.

Sample Disposal Information:

Where possible, ALS will store samples for 30 days from the date a final report is issued, or 30 days from the date samples are placed on hold without analytical requests, after which samples may be discarded. Air samples collected on re-usable media are an exception, and are stored for 7 days from the date a final report is issued. Longer storage times are available upon request.

For information about ALS accreditations and certifications please contact your Account Manager or visit our webpage at www.alsglobal.com (see Canada downloads).

ALS Group strives to deliver on-time results to our clients at all times. However, there are times when due to capacity issues or other unforeseen circumstances we are unable to meet our expected turnaround times. The information above is related to a recent workorder you have submitted to our laboratory. In the event that you have an inquiry, please refer to the Lab Work Order # when calling your Account Manager.

ALS Group appreciates your business. Thank you for the opportunity to work with you.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1908093-COFC

COC Number: 15 - 555396

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	MTE - Consultants
Contact:	Andrew Bingleman
Phone:	519-743-6500
	Company address below will appear on the final report
Street:	
City/Province:	
Postal Code:	
Invoice To	Same as Report To [X] YES [ ] NO
	Copy of Invoice with Report [ ] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution

Select Report Format: [X] PDF [X] EXCEL [X] EDD (DIGITAL)
Quality Control (QC) Report with Report [X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: [X] EMAIL [X] MAIL [ ] FAX
Email 1 or Fax abingleman@mtecon.com
Email 2 kmarier@mtecon.com
Email 3 gmadaunda@mtecon.com

Invoice Distribution

Select Invoice Distribution: [X] EMAIL [X] MAIL [X] FAX
Email 1 or Fax
Email 2

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] [ ] | 3 day [P3] [ ] | 2 day [P2] [ ]
EMERGENCY: 1 Business day [E1] [ ] | Same Day, Weekend or Statutory holiday [E0] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

Project Information	
ALS Account # / Quote #:	
Job #:	39502-104
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): L1908093 RM 3/7

ALS Contact: ML Sampler: YM

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	G. Chem. PKG-1	Number of Containers
1	Stantec-MW10-10	03-04-17	14:30	GW	X	4

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? [ ] YES [X] NO
Are samples for human drinking water use? [ ] YES [X] NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Ontario Drinking Water Standards (ODWQS)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]
Ice Packs [X] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]
Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			9.7°C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	April 3, 2017						3 APR 17	1435

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.

SM

Appendix E

Groundwater Mounding Calculations

Table E.1a. Condo LID-5917a Permeable Pavement Groundwater Mounding Impacts.

SWM-5917a - (2,050m^2 Contact Area)		
Input Values		
R	0.01	Infiltration Rate (m/day)
Sy	0.20	Specific Yield (dimensionless)
K	7.78E+00	Horizontal Hydraulic Conductivity (m/day)
x	22.64	1/2 length of Basin (y direction, in metres)
y	22.64	1/2 length of Basin (x direction, in metres)
t	365	Infiltration Period (days)
$h_{i(0)}$	10	initial saturated thickness (m)

Predicted Mound Height		
Groundwater Mound (m)	Distance from basin Centre (m)	Groundwater Elevation (m amsl)
0.13	0	346.43
0.13	2	346.43
0.13	4	346.43
0.12	6	346.42
0.12	10	346.42
0.12	15	346.42
0.12	20	346.42
0.11	25	346.41
0.09	50	346.39
0.07	100	346.37

Table E.1b. Condo LID-5917b Bioretention Swale Groundwater Mounding Impacts.

SWM-5917b - (320m^2 Contact Area)		
Input Values		
R	0.01	Infiltration Rate (m/day)
Sy	0.20	Specific Yield (dimensionless)
K	7.78E+00	Horizontal Hydraulic Conductivity (m/day)
x	8.94	1/2 length of Basin (y direction, in metres)
y	8.94	1/2 length of Basin (x direction, in metres)
t	365	Infiltration Period (days)
$h_{i(0)}$	10	initial saturated thickness (m)

Predicted Mound Height		
Groundwater Mound (m)	Distance from basin Centre (m)	Groundwater Elevation (m amsl)
0.02	0	346.32
0.02	2	346.32
0.02	4	346.32
0.02	6	346.32
0.02	10	346.32
0.02	15	346.32
0.02	20	346.32
0.02	25	346.32
0.01	50	346.31
0.01	100	346.31

Table E.2. Multi-Res SWMF-5915 Volume Reduction Facility Groundwater Mounding Impacts.

SWMF-5915 - (165m^2 Contact Area)		
Input Values		
R	0.03	Infiltration Rate (m/day)
Sy	0.20	Specific Yield (dimensionless)
K	2.08E+00	Horizontal Hydraulic Conductivity (m/day)
x	5.50	1/2 length of Basin (y direction, in metres)
y	7.50	1/2 length of Basin (x direction, in metres)
t	365	Infiltration Period (days)
$h_{i(0)}$	10	initial saturated thickness (m)

Predicted Mound Height		
Groundwater Mound (m)	Distance from basin Centre (m)	Groundwater Elevation (m amsl)
0.18	0	349.68
0.18	2	349.68
0.17	4	349.67
0.17	6	349.67
0.16	10	349.66
0.15	15	349.65
0.14	20	349.64
0.13	25	349.63
0.10	50	349.60
0.07	100	349.57

Table E.3. INF-7914a Multi-Res Block 19 Groundwater Mounding Impacts.

INF-1794a Facility - (46m^2 Contact Area)		
Input Values		
R	0.04	Infiltration Rate (m/day)
Sy	0.20	Specific Yield (dimensionless)
K	1.11E-01	Horizontal Hydraulic Conductivity (m/day)
x	3.39	1/2 length of Basin (y direction, in metres)
y	3.39	1/2 length of Basin (x direction, in metres)
t	365	Infiltration Period (days)
$h_{i(0)}$	10	initial saturated thickness (m)

Predicted Mound Height		
Groundwater Mound (m)	Distance from basin Centre (m)	Groundwater Elevation (m amsl)
0.88	0	348.88
0.85	2	348.85
0.76	4	348.76
0.67	6	348.67
0.54	10	348.54
0.43	15	348.43
0.36	20	348.36
0.30	25	348.30
0.15	50	348.15
0.05	100	348.05

Table E.4. INF-7914b Multi-Res Block 18 Groundwater Mounding Impacts.

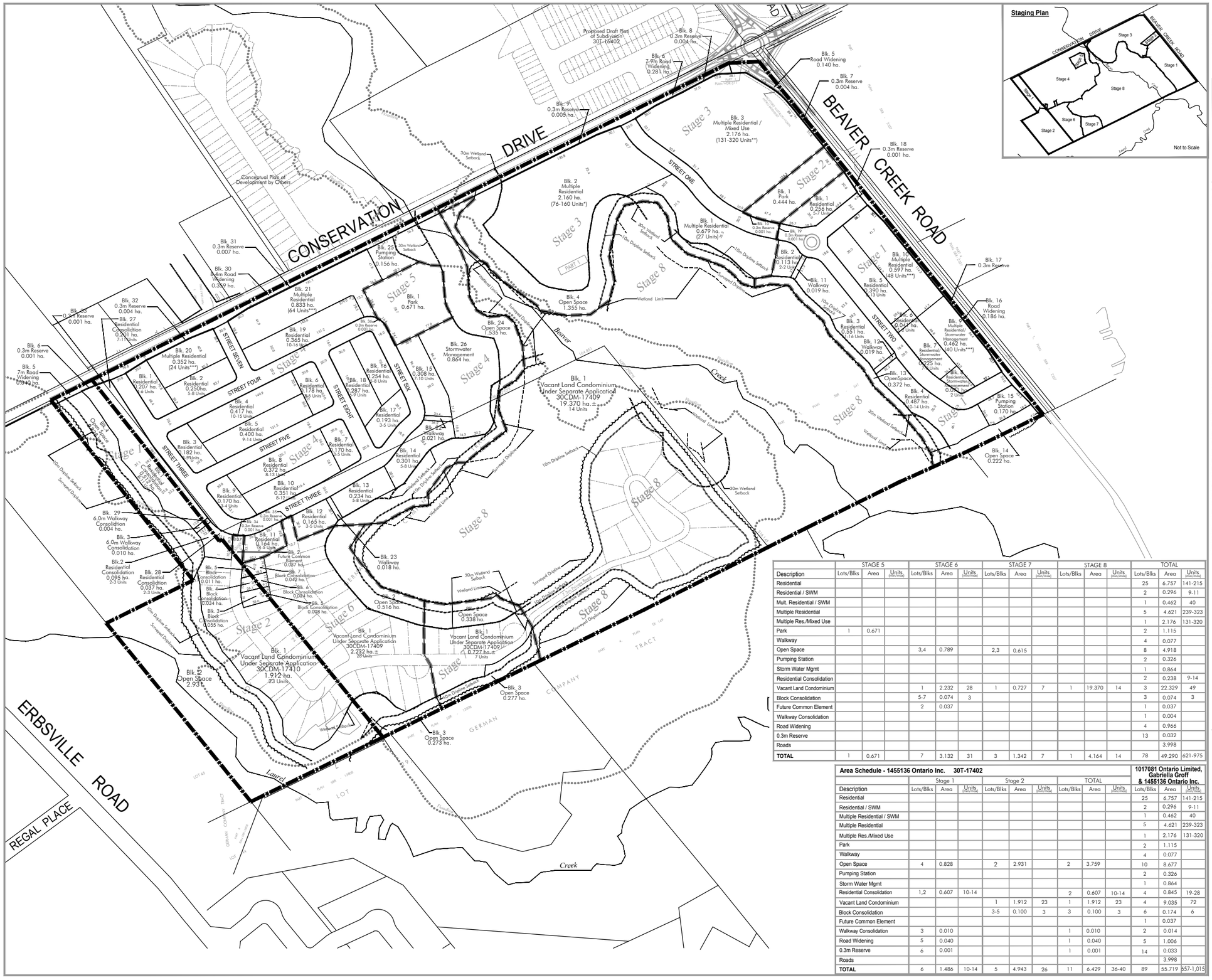
INF-7914b Facility - (67m^2 Contact Area)		
Input Values (MW103-11)		
R	0.04	Infiltration Rate (m/day)
Sy	0.20	Specific Yield (dimensionless)
K	2.08E+00	Horizontal Hydraulic Conductivity (m/day)
x	4.09	1/2 length of Basin (y direction, in metres)
y	4.09	1/2 length of Basin (x direction, in metres)
t	365	Infiltration Period (days)
$h_{i(0)}$	10	initial saturated thickness (m)

Predicted Mound Height		
Groundwater Mound (m)	Distance from basin Centre (m)	Groundwater Elevation (m amsl)
0.11	0	346.61
0.11	2	346.61
0.10	4	346.60
0.10	6	346.60
0.10	10	346.60
0.09	15	346.59
0.08	20	346.58
0.08	25	346.58
0.06	50	346.56
0.05	100	346.55

Appendix F

Draft Plan of Subdivision dated July 14, 2020

Figure 6


CONSERVATION DRIVE
BEAVER CREEK ROAD
STREET ONE
STREET TWO
STREET THREE
STREET FOUR
STREET FIVE
STREET SIX
STREET SEVEN
STREET EIGHT
STREET NINE
Proposed Draft Plan of Subdivision 30T-15402
Conceptual Plan of Development by Others
Blk. 1 Vacant Land Condominium Under Separate Application 30CDM-17409 19.370 ha.± 14 Units
Blk. 1 Vacant Land Condominium Under Separate Application 30CDM-17410 1.912 ha. 23 Units
Blk. 1 Vacant Land Condominium Under Separate Application 30CDM-17409 0.727ha.± 7 Units
Blk. 1 Vacant Land Condominium Under Separate Application 30CDM-17409 2.232 ha.± 28 Units
Blk. 1 Multiple Residential 0.679 ha. (27 Units)
Blk. 1 Residential 0.256 ha. 2-7 Units
Blk. 2 Residential 0.113 ha. 2-2 Units
Blk. 1 Park 0.444 ha.
Blk. 1 Park 0.671 ha.
Blk. 2 Multiple Residential 2.160 ha. (76-160 Units*)
Blk. 3 Multiple Residential / Mixed Use 2.176 ha. (131-320 Units**)
Blk. 4 Open Space 1.355 ha.
Blk. 24 Open Space 1.535 ha.
Blk. 2 Open Space 0.516 ha.
Blk. 2 Open Space 0.338 ha.
Blk. 3 Open Space 0.277 ha.
Blk. 3 Open Space 0.273 ha.
Blk. 14 Open Space 0.222 ha.
Blk. 32 Open Space 2.931
Blk. 4 Open Space 0.222 ha.
Blk. 25 Pumping Station 0.156 ha.
Blk. 15 Pumping Station 0.170 ha.
Blk. 26 Stormwater Management 0.864 ha.
Blk. 7 Residential/ Stormwater Management 0.225 ha. 2-7 Units
Blk. 8 Residential/ Stormwater Management 0.225 ha. 2-7 Units
Blk. 9 Residential/ Stormwater Management 0.225 ha. 2-7 Units
Blk. 10 Multiple Residential/ Stormwater Management 0.462 ha. (40 Units***)
Blk. 5 Residential 2.390 ha. 13 Units
Blk. 6 Residential 0.041 ha. 2 Units
Blk. 17 0.3m Reserve
Blk. 16 Road Widening 0.186 ha.
Blk. 15 Pumping Station 0.170 ha.
Blk. 5 Road Widening 0.140 ha.
Blk. 6 7.9m Road Widening 0.281 ha.
Blk. 7 0.3m Reserve 0.004 ha.
Blk. 8 0.3m Reserve 0.004 ha.
Blk. 9 0.3m Reserve 0.005 ha.
Blk. 18 0.3m Reserve 0.001 ha.
Blk. 19 0.3m Reserve 0.001 ha.
Blk. 31 0.3m Reserve 0.007 ha.
Blk. 30 0.4m Road Widening 0.002 ha.
Blk. 33 0.3m Reserve 0.001 ha.
Blk. 32 0.3m Reserve 0.004 ha.
Blk. 27 Residential Consolidation 0.201 ha. 7-11 Units
Blk. 6 0.3m Reserve 0.001 ha.
Blk. 5 7m Road Widening 0.044 ha.
Blk. 29 6.0m Walkway Consolidation 0.004 ha.
Blk. 3 6.0m Walkway Consolidation 0.010 ha.
Blk. 2 Residential Consolidation 0.095 ha. 2-3 Units
Blk. 28 Residential Consolidation 0.037 ha. 2-3 Units
Blk. 5 Block Consolidation 0.011 ha.
Blk. 4 Block Consolidation 0.034 ha.
Blk. 3 Block Consolidation 0.055 ha.
Blk. 7 Block Consolidation 0.042 ha.
Blk. 6 Block Consolidation 0.024 ha.
Blk. 8 Block Consolidation 0.008 ha.
Blk. 2 Future Common Element 0.037 ha.
Blk. 1 Residential 0.207 ha. 4-6 Units
Blk. 2 Residential 0.250ha. 5-8 Units
Blk. 4 Residential 0.417 ha. 10-15 Units
Blk. 5 Residential 0.400 ha. 9-14 Units
Blk. 3 Residential 0.182 ha. 3-5 Units
Blk. 8 Residential 0.372 ha. 8-13 Units
Blk. 9 Residential 0.170 ha. 3-4 Units
Blk. 10 Residential 0.351 ha. 8-12 Units
Blk. 11 Residential 0.164 ha. 3-5 Units
Blk. 12 Residential 0.165 ha. 3-5 Units
Blk. 13 Residential 0.234 ha. 5-8 Units
Blk. 14 Residential 0.301 ha. 5-8 Units
Blk. 16 Residential 0.254 ha. 5-8 Units
Blk. 17 Residential 0.193 ha. 3-5 Units
Blk. 18 Residential 0.287 ha. 5-9 Units
Blk. 19 Residential 0.365 ha. 10-16 Units
Blk. 20 Multiple Residential 0.352 ha. (24 Units***)
Blk. 21 Multiple Residential 0.833 ha. (64 Units***)
Blk. 22 Walkway 0.021 ha.
Blk. 23 Walkway 0.018 ha.
Blk. 11 Walkway 0.019 ha.
Blk. 12 Walkway 0.019 ha.
Blk. 4 Residential 0.487 ha. 9-14 Units
Blk. 3 Residential 0.551 ha. 7-16 Units
Blk. 13 OpenSpace 0.372 ha.
Blk. 10 Residential/ Stormwater Management 0.225 ha. 2 Units
Blk. 33 Residential 0.597 ha. (48 Units***)
Blk. 18 Residential 0.287 ha. 5-9 Units
Blk. 19 Residential 0.365 ha. 10-16 Units
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Blk. 31 0.3m Reserve 0.007 ha.
Blk. 30 0.4m Road Widening 0.002 ha.
Blk. 33 0.3m Reserve 0.001 ha.
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Blk. 6 Block Consolidation 0.024 ha.
Blk. 8 Block Consolidation 0.008 ha.
Blk. 2 Future Common Element 0.037 ha.