Hydrogeological Assessment

Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road West
Springwater, Ontario

County of Simcoe

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Executive Summary

A Hydrogeological Assessment was undertaken for County of Simcoe in support of a proposed Environmental Resource Recovery Centre (ERRC) development at 2976 Horseshoe Valley Road West, in Springwater, Ontario (Site). The proposed development includes an organics processing facility, materials management facility, truck servicing facility, administrative building with public education space, and associated roads and paved surfaces. The objective of this assessment was to:

- Assess current groundwater conditions, including quantification of potential impacts to the local groundwater regime (quality and quantity), and groundwater supply for the development.
- Identify hydrologically-sensitive features for recharge/discharge function protection (i.e., wetlands and/or watercourses).
- A water balance analysis to estimate the groundwater recharge potential at the Site, under pre-development and proposed post development conditions.
- Determine the requirement and options for groundwater control during construction and required approvals.

The Site is located in rural area and is designated as a County Forest. There are several small rural residential communities in the vicinity of the Site, and the surrounding area consists of agricultural lands, with farmhouses, barns and ancillary buildings. Adjacent properties are serviced with individual water supply wells and septic systems.

A wetland (not evaluated) is situated within the northeast corner of the Site. A watercourse originates in this area and flows to Matheson Creek, which is situated approximately 700 metres (m) to the east of the Site.

The Site is underlain by a glaciofluvial sand deposit. The hydraulic conductivity (K_h) of the sand is 2.8×10^{-3} cm/s, which is medium to high and indicates the fine to medium textured glaciofluvial deposit behaves as an aquifer.

The water table was encountered at depths of more than 10 mBGS across the ERCC footprint area during the August and September monitoring events. Groundwater flow is in a westerly direction, based on the monitoring completed to date. Seasonal groundwater level monitoring will be undertaken to verify the flow direction and to determine groundwater table fluctuations.

Construction activities are not anticipated to require groundwater takings based on the deep water table. It is anticipated that the excavations would be relatively small, such that, a construction EASR for groundwater seepage and stormwater management would not be required.

The ERRC facility will require a water supply well for maintenance and washroom facilities, and it is expected that the water usage would be much less than the amount that would require a Ministry of the Environment and Climate Change (MOECC) Permit To Take Water (PTTW) of 50,000 Litres per day (L/day). The water supply well is not anticipated to interfere with private wells in the area, based on the low takings and because the area of influence would be small and close to the supply well.

The amount of impervious surfaces (roofs, roads) is anticipated to increase from the existing pre-development condition to the post development condition. Based on the water balance, it is anticipated that there will be a net increase of the Site runoff with an annual water surplus of approximately 14,700 m^3. The deep water table, and the presence of sandy soils, which have moderate to high infiltration potential will facilitate the infiltration of collected water post development.

The potential wetland near the northeast portion of the Site may constrain stormwater management options. Drainage patterns need to be maintained to provide similar hydrologic contributions to this feature. The form and function of the wetland area will be assessed based on seasonal monitoring.

Development of the Site is not anticipated to have an adverse impact on groundwater or surface water, given appropriate stormwater and natural environment mitigation construction methods are implemented.

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1. Introduction

GHD Limited (GHD) was retained by the County of Simcoe to undertake a preliminary Hydrogeological Assessment for a proposed Environmental Resource Recovery Centre (ERRC) development located at 2976 Horseshoe Valley Road West, in Springwater, Ontario (herein referred to as the Property or Site) (**Figure 1.1**).

The Site is situated on the north side of Horseshoe Valley Road West, approximately 3 kilometers west of Highway 400. The Site is rectangular in shape and is described as Lot 2, Concession 1 in the Township of Springwater, County of Simcoe. The Site is approximately 84 hectares (ha) in size and the land use designation is Greenlands in the County of Simcoe Official Plan (County of Simcoe Official Plan, Schedule 5.1). The Site is identified as the Freele County Forest Tract in the Township of Springwater and is covered by a forest area with the exception of a small access road/trail.

The Site is proposed to be redeveloped as a co-located Organics Processing Facility (OPF) and Materials Management Facility (MMF) and is anticipated to consist of these facilities and a truck servicing facility, administrative building with public education space, and associated roads and paved surfaces. Additional details are provided in the Facility Characteristics Report (GHD, November 2016). The development footprint is centrally located and is anticipated to occupy approximately 4.5 ha within the 84 hectares of the Site (**Figure 1.2**).

The proposed OPF and MMF buildings will be serviced by a groundwater supply well and individual septic system. The buildings will be surrounded by paved parking and driveway areas. The access to the facility will be the existing unpaved road/trail that will be upgraded to include heavy-duty asphalt pavement to accommodate waste collection vehicles.

The objective of this hydrogeological assessment is to characterize the current geological and hydrogeological conditions and includes:

1. Assessment of current groundwater conditions, including quantification of potential impacts to the local groundwater regime (quality and quantity), and groundwater supply for the development.
2. Hydrologically-sensitive features for recharge/discharge function protection (i.e., wetlands and/or watercourses).
3. Completion of a water balance analysis to estimate the groundwater recharge potential at the Site, under pre-development and proposed post development conditions.
4. The requirement and options for groundwater control during construction and required approvals.

2. Background

2.1 Site Description

The Site is located in rural area and is designated as a County Forest (**Figure 2.1**). There are several small residential communities in the area, which include Apto, located approximately 2 kilometres (km) to the west of the Site, Anten Mills approximately 4 km to the west, and Craighurst located approximately 4 km to the east of the Site. Small residential subdivisions are present on Fox Farm Road and Ohara Lane south of the Site, and there are several farmhouses, barns and ancillary buildings in proximity to Site. The Site is not serviced with any utilities (water, waste water and power), and residential properties in the vicinity of the Site are serviced with individual water supply wells and septic systems.

The Site is bounded to the north by Rainbow Valley Road East and to the south by Horseshoe Valley Road West. The Site can be accessed from either road, and has a connecting trail that runs roughly north-south through the middle of the Site, which bends to the west at the north end. The surrounding area to the west of the Site consists of agricultural lands, with farmhouses, barns and ancillary buildings. Lands to the north, east and south of the Site are largely forested, and a Hydro transmission line corridor crosses the southeast corner of the Site. A small cemetery (Apto Cemetery) is located adjacent to the southwest corner of the Site.

The closest farmhouses relative to the ERRC footprint area are situated more than 300 metres to the northwest on Rainbow Valley Road, and 500 metres to the southwest on Horseshoe Valley Road. A residential property is also located in the forested area approximately 300 metres to the east of the ERRC footprint.

The topography slopes from west to east across the Site toward Matheson Creek. The topography ranges from an elevation of 265 metres above mean sea level (mAMSL) near the west side of the Site to 245 mAMSL on the east boundary. At the north end of the Site, the topography is relatively flat at an elevation of approximately 240 (mAMSL), which is coincident with a wetland area.

The Site is located in the Matheson Creek watershed (**Figure 2.2**). Matheson Creek is situated approximately 700 metres (m) to the east of the Site. The watershed divide between the Matheson Creek and the Nottawasaga River is situated approximately 2 km to the west of the Site.

The Site is situated within the Nottawasaga Valley Conservation Authority (NVCA) watershed, and portions of the Site are within the NVCA regulated area. The property is currently designated as Greenlands, and a wetland feature (not evaluated) is located on the northeast corner of the Site (**Figure 2.3**).

Two tributaries of Matheson Creek are mapped on the Site, as identified by the Natural Heritage Information Center (NHIC) and NVCA mapping resources. One watercourse originates at the wetland area near the northeast corner of the Site, and the second watercourse crosses the south portion of the Site. This south watercourse could not be located during site visits and investigations completed at the Site.

2.2 Regional Setting

The Site is not located within any Wellhead Protection Areas, Highly Vulnerable Aquifer Areas, or High Significant Recharge Areas within the Nottawasaga Valley Source Protection region (SGBLS, 2015).

The Site is located in the Simcoe Uplands physiographic region (Chapman and Putnam 1984), which is characterized by a drumlinized till plain and sand plain (**Figure 2.4**). The topography on the till plain is generally undulating within an elevation range of approximately 240 to 260 metres above mean sea level (mAMSL). Matheson Creek is steeply incised into the sand plain at an elevation of 220 mAMSL.

Overburden underlying the Site is approximately 120 metres (m) thick, and is generally described as a thick sequence of Pleistocene glacial deposits overlying limestone and shale bedrock of the Middle Ordovician, Simcoe Group Formations (OGS, 1991).

Regional surficial geology mapping of the area indicates that the Site and surrounding lands are underlain by sandy deposits and foreshore basinal deposits (sand and silt) (**Figure 2.5**). The surficial geology and general stratigraphic framework for the Site and surrounding area consists of the following deposits:

- **Surficial Soil** – Topsoil
- **Glaciofluvial** - Sand
- **Glaciolacustrine Foreshore Deposits** – Sand and Silt
- **Bedrock** – Limestone, Shale

The location of recorded Ministry of Environment and Climate Change (MOECC) water wells within 500 m of the Site is presented on **Figure 2.6,** and a summary of the records is presented in **Appendix F** (MOECC Water Well Record Formation Report, Individual Well Records). The compilation of well records was obtained from the MOECC Water Well Information System, without revision or omission, as such, some records are not necessarily for wells within the study area.

Based on review of the well records, the majority of wells reported in the immediate vicinity of the Site consist of domestic water supply wells. The wells are typically 6 to 5-inch diameter drilled wells completed to depths of 30 to 43 metres below ground surface (mBGS) and screened within sand. The records indicate sand was often encountered throughout the well depth, with some intervening layers of clay and sand. The water table was typically found at depths of about 27 mBGS, based on static water levels reported in the wells records. Pumping rates recommended by the driller ranged from 27 to 45 Litres per minute (L/min), with one well (#7214502) that had a recommended rate of 350 L/min.

Review of the water well record information indicates that the overburden is primarily comprised of fine to medium textured sand deposits which extend to depths of more than 50 mBGS. The hydrostratigraphy consists of the following units:

- ***Aquifer*** (***Unconfined)*** – fine to medium textured sand
- ***Aquitard*** **-** limestone, shale bedrock

In general, the sandy overburden forms a thick unconfined aquifer overlying bedrock.

3. Methodology

Cognizant of the objectives of the project, the following activities were undertaken:

- Borehole advancement and installation of monitoring wells in selected boreholes to facilitate the collection of groundwater levels to determine groundwater flow conditions.
- Installation of three (3) mini-piezometers within the wetland area to the northeast of the Site to assess the form and function of the wetland, and groundwater surface water interactions.
- Groundwater level monitoring to determine groundwater flow direction and seasonal fluctuations of the groundwater table.
- Guelph Permeameter testing to determine the hydraulic conductivity of the unsaturated surficial soils. This preliminary infiltration testing provides soil parameters for storm water management recommendations. Additional testing will be required to support any proposed LID storm water management options during detailed design.
- Aquifer testing (single well response tests) to determine hydraulic conductivity and groundwater flux of the water bearing deposits.
- Groundwater level monitoring to determine seasonal fluctuations of the groundwater table.
- Collection of groundwater samples to assess the groundwater quality with respect to Ontario Drinking Water Standards.
- Surface water monitoring of a tributary of Matheson Creek at Rainbow Valley Road East, and of Matheson Creek at Horseshoe Valley Road West.

The investigative activities listed above were completed concurrently with a geotechnical investigation (GHD 2016b). The investigative locations are shown on **Figure 3.1**. The details of these investigations are summarized in the following sections, and the field investigation methodology and protocols are provided in **Appendix A**.

3.1 Borehole Advancement/Monitoring Well Installations

Drilling activities were completed in August 2016 Boreholes were advanced by Profile Drilling Inc., utilizing a track-mounted rotary drill rig equipped with hollow stem augers, and under the full time supervision of a GHD field technician. In addition, an ecologist was present and directed drill crews with respect to access (paths) and drill sites to avoid sensitive features, and the NVCA was notified of drilling activities and locations.

Boreholes were advanced to depths up to 30.2 metres below ground surface (mBGS). Soil samples were collected using a 50 mm outside diameter split spoon sampler. Representative samples were collected at 0.75 metre intervals to 3.6 mBGS, and at 1.5 m intervals thereafter to the termination depth of drilling.

Monitoring wells were installed in four of the boreholes to depths ranging from 14.9 to 30.2 mBGS. The borehole and monitoring well locations are shown on **Figure 3.1,** and the completion details for the monitoring wells and boreholes are provided on **Table 3.1**. Stratigraphic and Instrumentation logs for the monitoring wells and selected boreholes are provided in **Appendix B.1**.

All monitoring wells were instrumented with a 3 m (10-foot) long, 50 mm (2-inch) inside diameter, No. 10 slot, Schedule 40 PVC screen, and a riser pipe of required length. A silica sand pack was placed in the annular space between the PVC screen/riser pipe and the borehole, from the bottom of the well screen to at least 0.60 m above the top of the well screen. Bentonite seal was placed above the sand pack to within 0.30 m of the ground surface. A protective monument casing with a concrete collar was placed around each of the monitoring wells upon completion. The drilling and monitoring well installation methods and procedures are discussed in **Appendix A**

Groundwater levels measured subsequent to the completion of the monitoring well installations are presented on the Stratigraphic and Instrumentation logs in **Appendix B.1**. Groundwater levels were allowed to stabilize for at least 24 hours following well installation before a groundwater level was recorded.

Grain size analyses, consisting of sieve and hydrometer testing, were carried out on selected samples collected from the drilled boreholes. The results of these tests are summarized in **Table 3.2**, and the grain size distribution test results are presented in **Appendix B.2**.

3.2 Guelph Permeameter Testing

In-situ permeability testing was undertaken using a Guelph Permeameter (GP) in accordance with ASTM D5126 to provide infiltration parameters and assist in the development of stormwater management options. The Guelph Permeameter determines the field saturated hydraulic conductivity in the vadose zone above the water table. The testing was completed at three (3) locations within the proposed development area (GP1-16), downgradient of the footprint (GP2-16) and within the wetland area (GP3-16) (**Figure 3.1**).

The boreholes for the infiltration tests were hand augered to depths of 0.5 to 0.7 mBGS. The Guelph permeameter tests were completed in the native sand soils.

The field permeameter test consisted of the following activities:

- Excavation of a cylindrical borehole to the interval to be tested.
- Placement of the permeameter in the borehole and filling of the borehole with water.
- Initiation of the permeameter and setting of the desired head and monitoring the rate of decline of the water level in the reservoir until steady state conditions.

The hydraulic conductivity measured in the unsaturated (vadose) zone is referred to as the “field-saturated” hydraulic conductivity (K*fs*) (Reynolds, 1986). The Guelph Permeameter method measures the steady-state flow rate (Q) necessary to maintain a constant depth of water (H) in an uncased borehole. K*fs* is then calculated from Q and H using the analytical solutions presented in **Appendix C** (after Reynolds et al., 1985).

The test results are discussed in Section 4.0.

3.3 Single Well Response Tests

In-situ hydraulic response testing, referred to as single well response tests (SWRT), were completed on selected monitoring wells to estimate the horizontal hydraulic conductivity of the water bearing deposits underlying the Site.

Single well response tests involve the injection or removal of a known volume of water into/from the well and measuring the water level response in the well until it returns to static conditions (i.e., falling/rising head test). The results of the hydraulic testing were analyzed using the Bouwer and Rice (1976) and Hvorslev (1951) solutions for unconfined conditions using the software package AQTESOLV™. These solutions were used to determine the horizontal hydraulic conductivity of the geologic deposits within the immediate vicinity of the screened interval of each monitoring well. The SWRT methodology is presented in **Appendix A.** The results of the testing are presented in **Appendix D,** and discussed in Section 4.0.

3.4 Groundwater Level Monitoring

Groundwater levels were collected in August and September 2016. Groundwater level measurements obtained from the monitoring wells are summarized in **Table 3.3a** and **Table 3.3b** Measurements with respect to metres above mean sea level (mAMSL) are presented in **Table 3.3a**, and groundwater levels measured in metre below ground surface (mBGS) are presented in **Table 3.3b.** The groundwater elevation hydrographs are presented in **Appendix E**.

Groundwater level monitoring will be undertaken for an eight (8) month period to assess the 'high' groundwater levels through a 'wet' season (fall). Groundwater levels will be collected both manually on a bi-monthly basis, and with data loggers for continuous collection of water levels. Manual measurements will be collected using a Solinst water level meter, and electronic data loggers (Solinst Model 3001 – Levelogger Edge) are installed in three (3) monitoring wells (MW1-16, MW2-16, and MW3-16) to continuously record water levels. A Solinst baralogger is used (suspended in air in one of the monitoring wells) to correct the water level data for atmospheric pressure.

3.4.1 Mini-piezometer Installation

Three (3) mini-piezometers, MP1-16 to MP3-16 were installed within the wetland area on the northeast portion of the Site (**Figure 3.1**). The piezometers were installed using a manual slide hammer until refusal, which is generally about 1 to 2 mBGS. The piezometers consist of a 20 mm diameter (3/4-inch) pipe and stainless steel well point. The installation details for the mini-piezometers are provided in **Table 3.1.**

The mini-piezometers are used to determine the vertical gradient between groundwater and surface water. Data loggers (Solinst Leveloggers) are installed in the mini-piezometers to continuously record shallow groundwater levels inside the mini-piezometer and surface water levels outside the piezometer at adjacent staff gauge locations to provide a detailed record of groundwater-surface interactions, and the response of groundwater to climatic conditions throughout the seasons.

3.5 Groundwater Quality

Groundwater samples were collected in August 2016 from each of the monitoring wells and analyzed for general chemistry and metal parameters (Ontario Drinking Water Standards, MOE, 2003; revised June 2006) to determine baseline conditions and characterize the groundwater quality (**Table 3.4**).

Prior to sampling, the wells were developed to ensure that the sample collected was representative of groundwater quality. Purging of the well was considered to be complete when three consistent field measurement readings of pH, conductivity, and temperature had been obtained after each well volume removed.

The samples (unfiltered) were submitted under chain of custody procedures to AGAT Laboratories of Mississauga, Ontario for chemical analysis. The groundwater quality analytical results are discussed in **Section 4.0**.

3.6 Surface Water Flow

A surface water monitoring program was undertaken to characterize the baseflow in a tributary of Matheson Creek (SW1-16) at Rainbow Valley Road and of Matheson Creek at Horseshoe Valley Road (SW2-16), and to assess the groundwater surface water interactions. The monitoring locations were determined based on accessibility, stream sensitivity (potential aquatic habitat), stream transect characteristics, and the potential for groundwater discharge.

Stream flow measurements are collected manually using a Valeport Electromagnetic Flow Meter, and continuously using a Solinst Levelogger Edge (Edge). Measurements are collected on a monthly basis, during a non-storm event and immediately following a major storm event (minimum of three days following rainfall event).

Flows at each location have been measured in compliance with the Ontario Stream Assessment Protocol (MNR, 2010), and is calculated by the two methods identified by Ministry of Natural Resources, the Mean Method (mean velocities taken at the panel sides) and the Mid Method (panel width is the sum of half the distance to either adjacent velocity measurement). The average result from the two methods was used.

4. Geology and Hydrogeology

The following sections provide a detailed description of the geology and hydrogeology of the Site, based on the results of the investigations completed and on the available background information. Hydrostratigraphic cross sections referenced as A-A', and B-B' across the Site are shown on **Figures 4.1** and **4.2.** The cross-section locations are shown on **Figure 3.1**.

4.1 Site Geology

Based on observations during the installation of the monitoring wells and advancement of boreholes, the following surficial materials and geologic deposits underlie the Site (see **Figures 4.1** and **4.2)**:

- ***Topsoil (0 to 0.3 mBGS) –*** topsoil with organics
- ***Fill (0 to 1.5 mBGS)*** – re-worked native soil, sand some silt to silty sand
- ***Sand (0.3 to 30 mBGS)*** – *glaciofluvial deposits consisting of sand, sandy silt to silty sand*.

All boreholes encountered a thin surficial layer of topsoil at the ground surface, which varied in thickness between 25 mm and 35 mm. In some areas fill was encountered comprised of re-worked native soils, mainly consisting of sand some silt to silty sand trace gravel. Fill was locally encountered underlying the topsoil, and extended generally to 0.5 to 1.5 mBGS. The fill has moist to very moist conditions, and the Standard Penetration Test (SPT) 'N' values ranged between 10 to 20 blows per 0.3 m of penetration, indicating a compact state.

The topsoil and fill is underlain by a fine to medium textured glaciofluvial deposit, comprised of sand, sandy silt to silty sand with some thin and discontinuous layers of silt and silty clay. In general the sand deposit is very moist and loose near surface and becomes moist and very dense with increasing depth. The sand deposit is brown to greyish brown, and moist. SPT 'N' values varied between 8 to in excess of 100 blows per 300 mm of penetration, indicating a compact to very dense condition.

The sand deposit was encountered in all of the boreholes and monitoring wells advanced extending to depths ranging between 0.3 mBGS and 30.2 mBGS (termination depth of borehole). Based on the grain size analyses, the sand deposit contains 84 to 96 percent sand and 4 to 16 percent silt, (**Table 3.2**).

Discontinuous layers of silt and clayey silt are present within the sand. A silt layer was encountered in BH1-16 from approximately 6 to 8 mBGS, and in MW1-16 from approximately 21 to 30 mBGS. A fine textured compact native clayey silty layer was also encountered in BH8-16 at a depth of approximately 3 to 4.5 mBGS.

No boreholes advanced during the drilling activities encountered bedrock.

4.2 Site Hydrogeology

4.2.1 Hydrostratigraphic Units

Hydrostratigraphic profiles are presented on **Figures 4.1 and 4.2** and the primary aquifer/aquitard units underlying the Site include the following:

Fill – Based on the borehole investigations the fill and shallow native sand and silty sand soils are unsaturated over the Site. During 'wet' seasonal conditions the shallow soils form 'perched' conditions, and support infiltration and recharge to the deeper unconfined aquifer.

Sand Aquifer (Unconfined) – The sand, silty sand to sandy silt forms an unconfined aquifer

Although not encountered during the drilling activities, the bedrock forms an underlying aquitard.

4.2.2 Unsaturated Properties

Guelph Permeameter Tests were completed on the unsaturated sand deposits. The field saturated hydraulic conductivity (K_{fs}) is 7.1 x 10^{-4} cm/s (geomean) (**Figures C.1 to C.3**). The corresponding infiltration rate is 78 mm/hr, which converts to a percolation time of 8 min/cm. The field saturated hydraulic conductivity indicates the sand provides medium to high infiltration and recharge conditions.

4.2.3 Flow Direction and Gradients

The groundwater elevation contours for monitoring wells screened within the sand aquifer are presented on **Figure 4.3** using the September 30, 2016 water elevation data**.** The water table ranges in elevation from approximately 236.1 to 233.3 mAMSL within the ERRC footprint area of the Site (**Table 3.3a**). Based on the groundwater level measurements, groundwater flow is in a westerly direction.

The average horizontal groundwater gradient across the footprint area is approximately 0.01 metres per metre (m/m), based on the difference in groundwater level elevations perpendicular to groundwater flow between MW1-16 and MW2-16 (236.1 – 233.33 mAMSL / 300 m = 0.01).

The depth to watertable is presented on **Figure 4.4**. The water table within the ERRC footprint area is present within the sand deposit at depths ranging from 9.3 to 25.8 mBGS (**Table 3.3a**).

Seasonal groundwater fluctuations and confirmation of the flow direction will be determined based on 'wet season' monitoring (fall/spring).

4.2.4 Saturated Hydraulic Properties

The fine to medium textured glaciofluvial deposit forms an unconfined aquifer underlying the Site. A summary of the hydraulic properties is presented in **Table 4.1.** Based on the results from the SWRTs, the geometric mean hydraulic conductivity (K_h) is 2.8 x 10^{-3} cm/s, which is representative of the sand deposit. The groundwater flux (per square metre) in the deposit can be estimated using the following relationship:

$q = Ki$

where:

q = groundwater flux (per square metre)

K = hydraulic conductivity (2.8 x10^{-5} m/s)

i = hydraulic gradient (0.01 m/m)

Therefore the estimated groundwater flux in the glaciofluvial deposit is estimated to be 2.8 x10^{-7} m/s, per square metre (2.8 x10^{-5} m/s x 0.01 m/m = 2.8 x10^{-7} m/s). The flow rate per square metre of aquifer is approximately 0.02 L/min (2.8 x10^{-7} m/s x 60 sec/minute x 1,000 L/m^3 = 0.02 L/min). Based on this, the hydraulic conductivity and flow rate is relatively high.

4.2.5 Groundwater-Surface Water Interaction

The water table is at a depth of about 8 to 10 metres below the wetland feature on the north portion of the Site (**Figure 4.4**). It is anticipated that during the spring freshet the wetland is recharged by snowmelt, surface water runoff and/or precipitation events, and that it gradually loses water throughout the year and recharges the aquifer. It is expected the wetland will be dry in the summer and throughout the majority of the year.

Monitoring to date indicates dry conditions throughout the summer and early fall monitoring period. No standing surface water was found in the vicinity of the mini-piezometers and the piezometers were dry.

Groundwater level monitoring will be undertaken for the mini-piezometers to assess seasonal fluctuations. Data loggers inside and outside the piezometers will continuously record water levels and provide a detailed record of the response of groundwater and surface water within the wetland area to climatic conditions throughout the year.

4.3 Water Taking Evaluation

Construction Water Takings

Conceptually, the ERRC buildings will be constructed with slab on grade foundations, with no below ground structures (basement). Below grade excavations would be required for services (water, septic). Given the water table beneath the Site is more than 9 mBGS, dewatering for the construction of the building and installation of services is not anticipated to be required.

Any water accumulations into excavations from precipitation or surface runoff is anticipated to be very minor, and well below the amount that would require an MOECC Environmental Activity and Sector Registry (EASR) (O. Reg. 63/16) of 50,000 L/day.

Operational Water Takings

The ERRC facility will require a groundwater supply well to service the buildings for maintenance and washroom facilities. The water supply well would likely be screened in the sand aquifer at a depth of approximately 30 mBGS, similar to other domestic water supply wells in the vicinity of the Site.

The results from the single well response tests were utilized to determine the hydraulic properties (hydraulic conductivity, transmissivity) and conditions to provide the basis for estimating the area of influence for the water supply well, based on a water taking of 10,000 L/day. The area of influence was determined using analytical methods for an unconfined aquifer, using the Neuman (1972, 1973b, 1975a) analytical method**.** The equation can be used to predict the drawdown and area of influence, using the following equations:

EQUATION AND PARAMETERS

$$h_o - h = \frac{Q}{4\pi T} W(u_b, \eta) \quad (1) \qquad u_b = \frac{r^2 S_y}{4Tt} \quad (2) \qquad \eta = \frac{r^2}{b^2} \quad (3)$$

where:

$h_0 - h$ = drawdown
Q = constant pumping rate
$W(u_b, n)$ = well function for an unconfined aquifer with delayed yield response
T = transmissivity
r = distance from pumping well
S_y = specific yield
u_b = dimensionless
t = time after the start of pumping
b = aquifer thickness

For these estimations, the following was assumed:

- The aquifer is horizontal, confined top and bottom, infinite in horizontal extent, of constant thickness, and homogeneous and isotropic.
- That there is only one pumping well.
- The pumping rate is constant with time.
- Well diameter is infinitely small.
- The well penetrates the entire aquifer.
- Hydraulic head in the aquifer is uniform throughout prior to pumping.
- Flow is radial to wells.

The analytical model input parameters and estimated water taking rate are presented on **Figure 4.5.** The apparent transmissivity of the sand is estimated to be 19.4 m^2/day, based on the hydraulic conductivity of 2.8 $x10^{-5}$ m/s (geomean) for the sand, and saturated thickness of 8 m (2.8 $x10^{-5}$ m/s x 86,400 s/day x 8 m = 19.4 m^2/day). An assumed specific yield of 0.3 (dimensionless) was used based on the unconfined nature of the sand deposit.

Using the analytical model, the groundwater taking is predicted to result in an area of influence of less than 20 m from the water supply well, based on a maximum water taking of up to 10 cubic metres per day (m^3/day), which is 10,000 L/day or a pumping rate of approximately 7 litres per minute (L/min). The predicted Area of Influence is presented on **Figure 4.6** and represents the radial distance to where there would be little if any effect on the water table.

Using the above methodology and assuming a maximum water taking of up to 50,000 L/day, the area of influence would be less than 30 metres from the water supply well. The water supply well area of influence is anticipated to be small and close to the well.

4.4 Groundwater Quality

Groundwater quality samples (unfiltered) were collected from each of the monitoring wells (MW1-16 to MW4-16) for laboratory analysis of general chemistry and metal parameters listed in the Ministry of the Environment and Climate Chance (MOECC) Ontario Drinking Water Standards (ODWS) to determine baseline groundwater quality. Results from the laboratory analyses are presented in **Table 4.5** and the laboratory analytical report is provided in **Appendix G**.

The majority of parameters tested did not exceed the MOECC ODWS for health-related parameters, with the exception of chromium (total) and lead (total) for the sample collected at MW2-16. The concentration of chromium (total) was 0.058 mg/L, which marginally above the ODWS criteria of 0.05 mg/L, and the concentration of lead (total) was 0.011 mG/L, which was also marginally above the ODWS criteria of 0.01 mg/L.

The sodium concentration for the sample collected from MW1 -16 was 33 mg/L, which exceeds the ODWS criteria of 20 mg/L for persons on a sodium restricted diet.

The hardness of the water ranges from 140 to 260 mg/L (expressed as milligrams of calcium carbonate per litre), which is below the ideal range for water hardness of 80 to 100 mg/L. Hardness is an aesthetic, not health related, parameter. The sample turbidity ranged from 6.7 to 23 Nephelometric Turbidity Units (NTU) for three of the samples analysed, which exceeds the aesthetic objective of 5 NTU. The concentration of organic nitrogen ranged from 0.16 to 0.36 mg/L, which exceeds the ODWS aesthetic criteria of 0.15 mg/L.

A few metal (total) parameters exceeded operational guideline and aesthetic parameter concentrations. The samples analysed exceeded the MOECC ODWS for aluminum, iron and manganese.

Water supply well treatment will be needed to address the water quality for health, aesthetic and operational parameters that exceed the ODWS criteria to ensure it is safe for use as a potable water supply.

4.5 Water Balance

A water balance was undertaken to determine the amount of surplus water potentially generated as a result of the development (increase in impermeable surfaces). This was then used to assist in the evaluation of options to manage the surplus.

The water balance was estimated using the most recent version of the water balance model developed by Meteorological Service of Canada (MSC, see Johnstone and Louie, 2008). The new MSC's water balance method accounts for snow accumulation and melt (degree-day method of USACE, 1956), potential evapotranspiration (Thornthwaite and Mather, 1955), soil storage (Phillips, 1976), actual evapotranspiration, and moisture deficit and surplus. The MSC program calculated a 'water surplus' as the final product, which is the total water available in a given month to run off as surface overland flow and/or infiltrate to the ground and recharge the groundwater table. The MSC water balance model runs with continuous daily precipitation and air temperature data. The use of daily data allowed for more accurate modelling of snowmelt and snow storage, which are of particular importance in Canadian climate (Johnstone and Louie, 1983).

Daily air temperature and precipitation data from Environment Canada's Shanty Bay weather station (Climate ID: 6117684), for the period from January 2000 to February 2015, was inputted into the water balance model. Any missing data during this period (when the weather station has been out of service) was filled in with data observed at the Environment Canada's Coldwater Warminster (ID: 6111769), Barrie Landfill (ID: 6110556), and Barrie-Oro (ID: 6117700) weather stations.

The Site's latitude, longitude, and an estimate of the water holding capacity of the soil was also input to the model. The water holding capacity has been estimated based on soil and land use characteristics of the study area under Existing and Proposed conditions. Currently, the area of proposed development consists of 100% pervious (heavily forested area). Once the area has been developed, it is assumed that the proposed facility footprint will encompass approximately 4.5 ha, which is approximately 5% of the total Site. The assumption is due to the unknown configuration of the facility footprint. The soils underlying the Site are described as sand to sandy silty, with a low runoff potential and high infiltration. The water holding capacity was determined from tables provided in the Ontario's Stormwater Management Planning and Design Manual (MOE, 2003b), which relate water holding capacity to soil type and land use.

4.5.1 Water Balance Calculations

The water balance calculations for existing and proposed conditions are presented in **Table 4.3** to **4.10**. Water surplus is the total water available in a given month to run off as surface overland flow and/or infiltrate to the ground and recharge the groundwater table. Based on the water balance calculations, it is estimated that there will be an increase in the amount of water surplus from existing conditions to the proposed conditions of approximately 14,700 cubic metres (m^3) annually.

The water surplus of 14,700 m^3 is determined by subtracting the existing conditions precipitation surplus total of 4,900 m^3 (**Table 4.4)** from the proposed conditions precipitation surplus total of 19,600 m^3 (**Table 4.5**) (19,573 m^3 – 4,865 m^3 = 14,708 m^3). The increase in the surplus is due to the increase in potential surface runoff, caused by the increase in impervious area and decrease in permeable surfaces for infiltration.

In addition to addressing the increase in peak flow and volume, storm water management controls should concentrate on enhancing infiltration within the developed area to maintain the hydrological conditions of the downstream surface water features (adjacent wetland areas)

4.5.2 Stormwater Management Options

Under the proposed development, the amount of runoff would increase as a result of the increase in impervious area and decrease in permeable surfaces. Additional measures would need to be considered to promote evapotranspiration and infiltration on-Site and reduce runoff. Due to the soil conditions and existing Site conditions, it is encouraged that proposed stormwater management system infiltrate runoff for all storm event (up-to an including the 100-year storm event).

Stormwater management options that would address evapotranspiration and infiltration issues and reduce the amount of potential runoff to existing conditions are presented in **Table 4.6** and discussed in the following sections.

The stormwater management options would maintain existing drainage patterns and, most importantly, provide similar hydrologic contributions to maintain the downstream surface water features. It is important to allow additional runoff to replicate the slow contribution of groundwater and slowly compensate for the loss in infiltration that would have ultimately recharged the deep aquifer. By working at a treatment train approach, the below conceptual stormwater management options would also minimize the potential for slope erosion, and reduce water quality loadings.

The conceptual stormwater management options would be constructed as per Ministry of Environment and Climate Change (MOECC, 2003) and TRCA guidelines (CVC & TRCA, 2010) and additional construction measures could be required to meet guidelines. These options include:

- Reduction of grading to 0.5 - 1.0% slope in landscape areas to allow for additional evapotranspiration and infiltration.
- Scarification, or tilling of the soil to a depth of approximately 300 mm, would enhance evapotranspiration and infiltration within the landscaped areas to overcome soil compaction that occurs during construction.
- Directing excess surface runoff the facility footprint to vegetated filter strips located along the outer border of the facility footprint. The vegetated filter strip will be approximate 3 to 5 metres (m) in width, remain unmaintained and shallow sloped, to promote absorption of surface runoff and allow for infiltration and evapotranspiration. Overflow would be directed to an enhanced vegetated swale surrounding the facility footprint.
- The vegetated enhanced swales will be shallow (less than 1.0% slope), heavily vegetated and fitted with rock check dams allow for ponding within the swales, further enhancing infiltration storage and evapotranspiration.
- The vegetated enhanced swale will then discharge into a conceptual stormwater management pond (SWMP). The conceptual SWMP would be sized to capture all rainfall events, up-to and including the 100-year storm event. Since the underlying soil conditions consist of highly infiltrative soils (sand to sandy silt) and that existing land conditions consist of heavily forested area, pre-development peak flows are assumed to be minimal. Also due to the Facility's vicinity to a wetland area, it is encouraged to maintain the hydrological conditions of the downstream surface water features. Therefore the SWMP is sized to capture the majority of rainfall events (excluding events greater than the 100-year storm event and large concurrent storm events) and infiltrate the captured runoff. The SWMP would also be sized to address quantity (maintain peak flows to existing conditions levels) and quality (Enhance Protection Levels) controls for the runoff from the facility footprint. The stormwater management pond would be designed as per Ministry of Environment and Climate Change (MOECC) guidelines, with a permanent pool that would encourage evapotranspiration. Any overflow from the SWMP, which is possible during rainfall events greater than a 100-year storm event and large concurrent rainfall events, would discharge to a drainage ditch along the access road and discharge to the existing drainage ditch along Horseshoe Valley Road West and ultimately to Matheson Creek.

5. Development Constraints

The proposed development consists of the ERRC organic processing facility, associated roads and paved surfaces and stormwater management pond.

There are no surface water features on the Site, with the exception of a wetland area in the northeast portion of the Site.

Construction Water Takings

It is anticipated that there will be no groundwater seepage into construction excavations, and water accumulations into the excavations will be from precipitation and surface runoff. These accumulations are anticipated to be very small and will be below MOECC permit requirements.

Operational Water Takings

The ERRC facility water supply well is not anticipated to interfere with private wells in the area, as the water demand is low and the maximum area of influence is less than 30 metres from the well. Based on this, the area of influence will not extend beyond the property boundaries.

Stormwater Management

The amount of impervious surfaces (roofs, roads) is anticipated to increase from the existing pre-development condition to the post development condition. The volume of evapotranspiration and infiltration decreases and the runoff increases as a result of the increase in impervious area and impermeable surfaces (roads/driveways, roofs). Based on the water balance, there is a predicted net increase of the Site runoff with an annual water surplus of 14,700 m^3.

Re-development of the Site is anticipated to increase the runoff from the Site, and as such mitigation methods will be required to address stormwater runoff and compensate for the loss of infiltration.

Surface water flow and shallow infiltration is anticipated to be directed toward stormwater management features located on the Site. Verification of appropriate infiltration measures that would control surface water runoff (quantity and quality) and maintain ground water recharge and function on the Site are addressed through the stormwater management plan.

Surface Water Features

The wetland on the northeast portion of the Site may constrain stormwater management options, as surface drainage patterns would need to be maintained to provide similar hydrologic contributions to this feature.

The form and function of the potential wetland area will be assessed based on seasonal monitoring, but it is anticipated that potential impacts on groundwater/surface water interactions is low, based on the deep water table (more than 8 m) below the wetland.

5.1 Mitigation

The stormwater management features and erosion and sediment controls should be designed to control surface water flow and promote infiltration and evapotranspiration. Given appropriate stormwater and natural environment mitigation construction methods are implemented re-development of the Site is not anticipated to have an adverse impact on the groundwater or local hydrologic features.

Recommended efforts to mitigate impacts to the potential wetland feature include:

- Installation of appropriate erosion and sediment controls and maintenance for the duration of all construction activities and minimum vegetation establishment periods.
- Minimization of any disturbance to vegetation adjacent to the potential wetland.

6. Summary and Conclusions

Based on the results of the hydrogeological investigation and monitoring undertaken to date, the following summary and conclusions are provided:

1. The development area is primarily underlain by a fine to medium glaciofluvial deposit, which comprises an unconfined sand aquifer.
2. The groundwater table is encountered over the majority of the ERRC area at depths of more than 10 mBGS. The water table elevations range from approximately 233.3 to 236.1 mAMSL. Groundwater table fluctuations for the Site will be determined based on seasonal monitoring.
3. The hydraulic conductivity (K_h) of the sand is 2.8 x 10^{-3} cm/s (geomean), which is relatively high and indicates the medium textured glaciofluvial deposit behaves as an aquifer.
4. The infiltration rate within the shallow native sand soils (less than 0.7 mBGS) is 78 millimetres per hour (mm/hr), which converts to a percolation time of 8 minutes per centimeter (min/cm). The native sand provides medium to high infiltration and recharge conditions.
5. Construction activities will likely not require groundwater takings based on the deep water table beneath the Site. It is anticipated that there will be no groundwater seepage into construction excavations, and that the excavations would be relatively small, such that, a construction EASR for groundwater seepage and stormwater management would not be required.
6. A water supply well for the ERRC facility maintenance and washroom facilities is not anticipated to interfere with private wells in the area, because water usage would be minimal, and the area of influence would be small and close to the well.
7. In general, the groundwater is interpreted to be of good quality given that the majority of parameters tested did not exceed the MOECC ODWS for health-related parameters, with the exception of chromium (total) and lead (total) for the sample collected at MW2-16. A few metal (total) parameters exceeded operational guideline and aesthetic parameter concentrations. Water supply well treatment will be needed to address the water quality for

health, aesthetic and operational parameters that exceed the ODWS criteria to ensure it is safe for use as a potable water supply.

8. The amount of impervious surfaces (roofs, roads) is anticipated to increase from the existing pre-development condition to the post development condition. Based on the water balance, there is a predicted net increase of the Site runoff with an annual water surplus of approximately 14,700 m^3.

9. It is anticipated that infiltration of collected water post development can be facilitated based on the deep water table, and the presence of sandy soils, which have high infiltration potential.

10. The wetland on the northwest portion of the Site may constrain stormwater management options. Drainage patterns may need to be maintained to provide similar hydrologic contributions to this feature. The form and function of the potential wetland area will be assessed based on seasonal monitoring.

11. Development of the Site is not anticipated to have an adverse impact on groundwater or surface water, given appropriate stormwater and natural environment mitigation construction methods are implemented.

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MNR NRVIS, 2015. Produced by GHD under license from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016; Site Location Map; Inset Map: ESRI Data & Maps 2008 Data Distribution Application (DDA)

MNR NRVIS, 2015. Produced by GHD under license from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2016; Aerial Image: ESRI Basemap Imagery, Capture Date: January 2013, Accessed 2015.

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All of Which is Respectfully Submitted,

GHD

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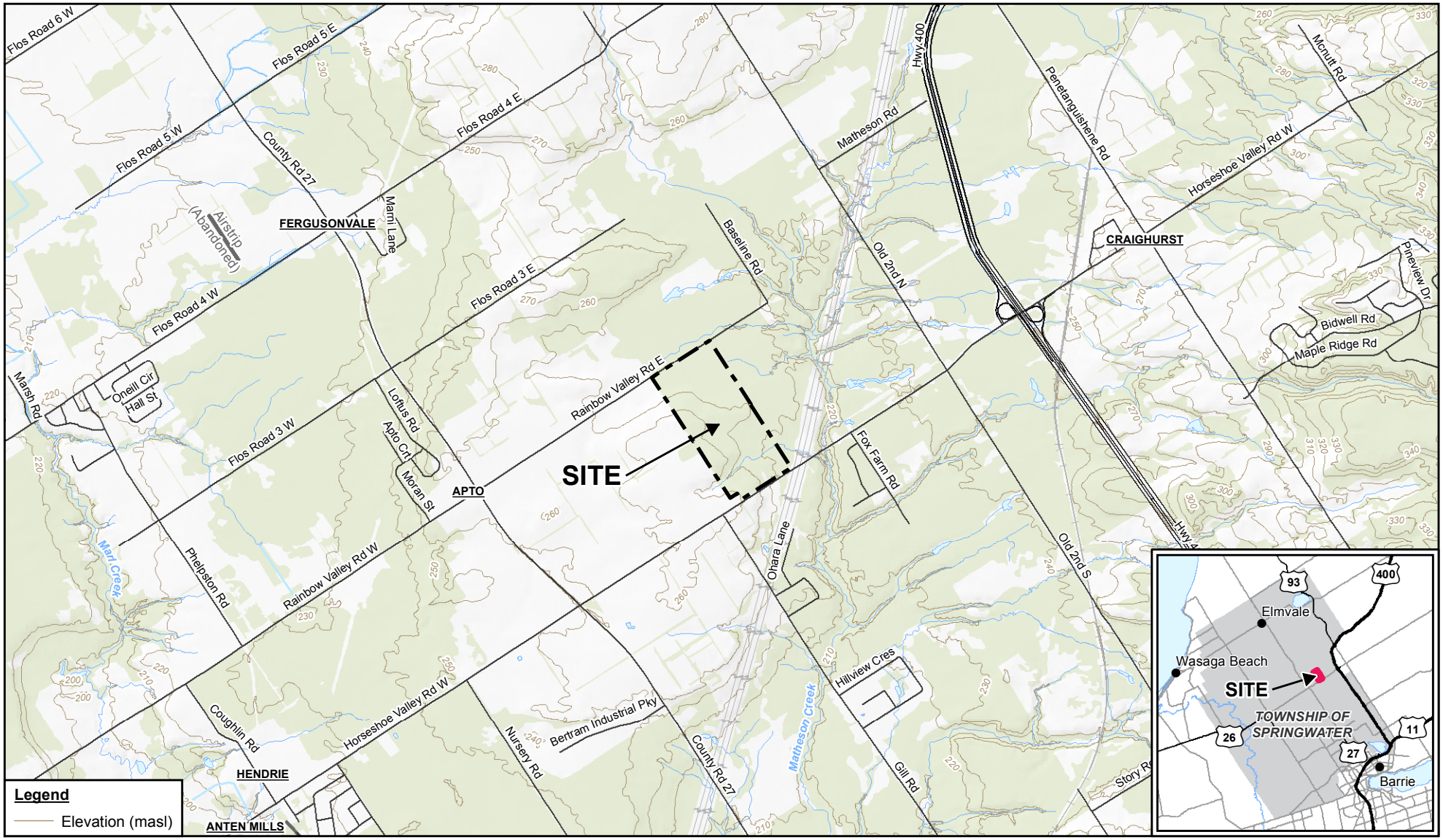
Thomas Guoth, P. Eng.

Figures



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0 500 1,000 1,500
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

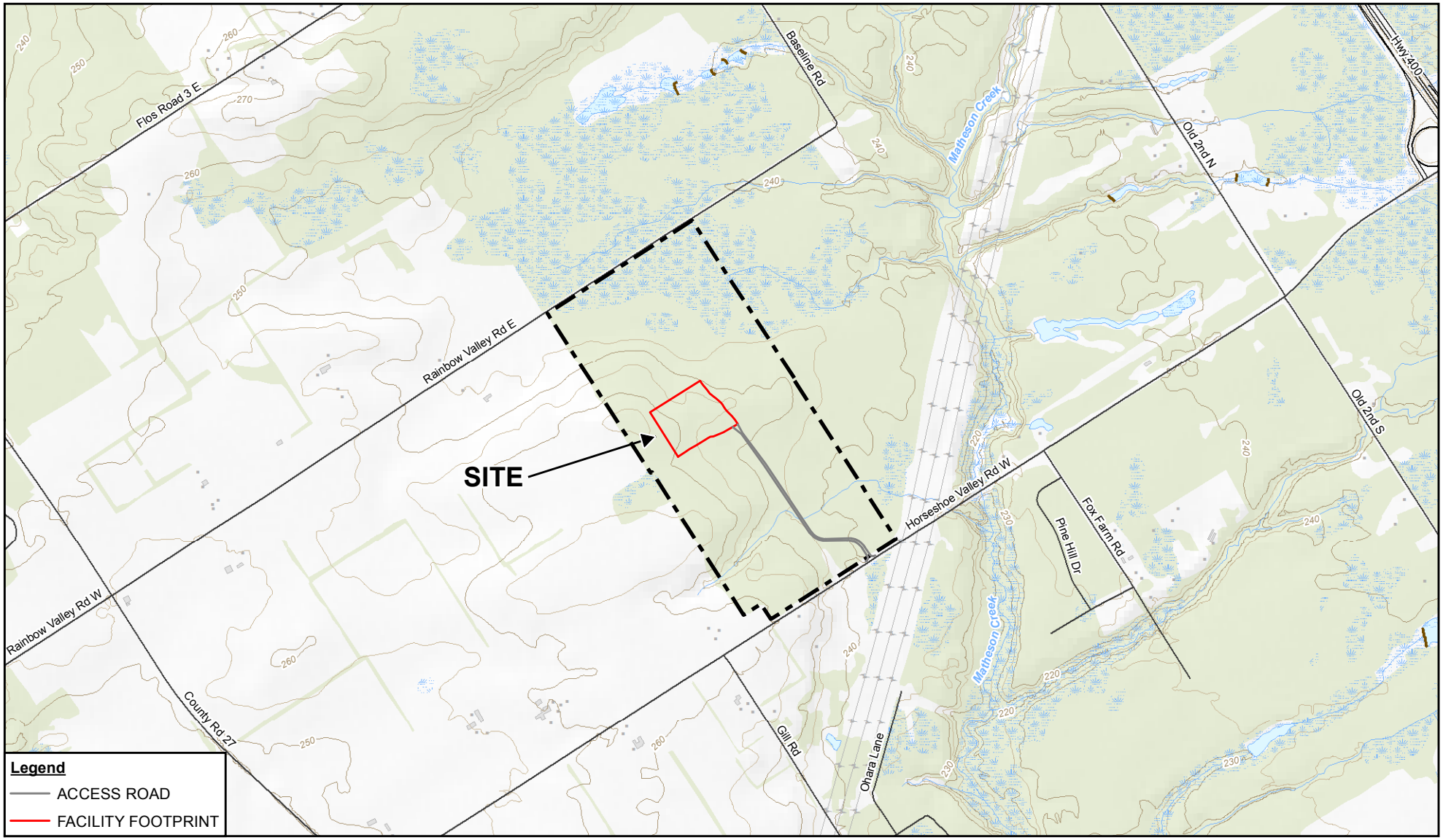
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 4, 2016

SITE LOCATION

FIGURE 1.1

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA001.mxd



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Coordinate System:
NAD 1983 UTM Zone 17N

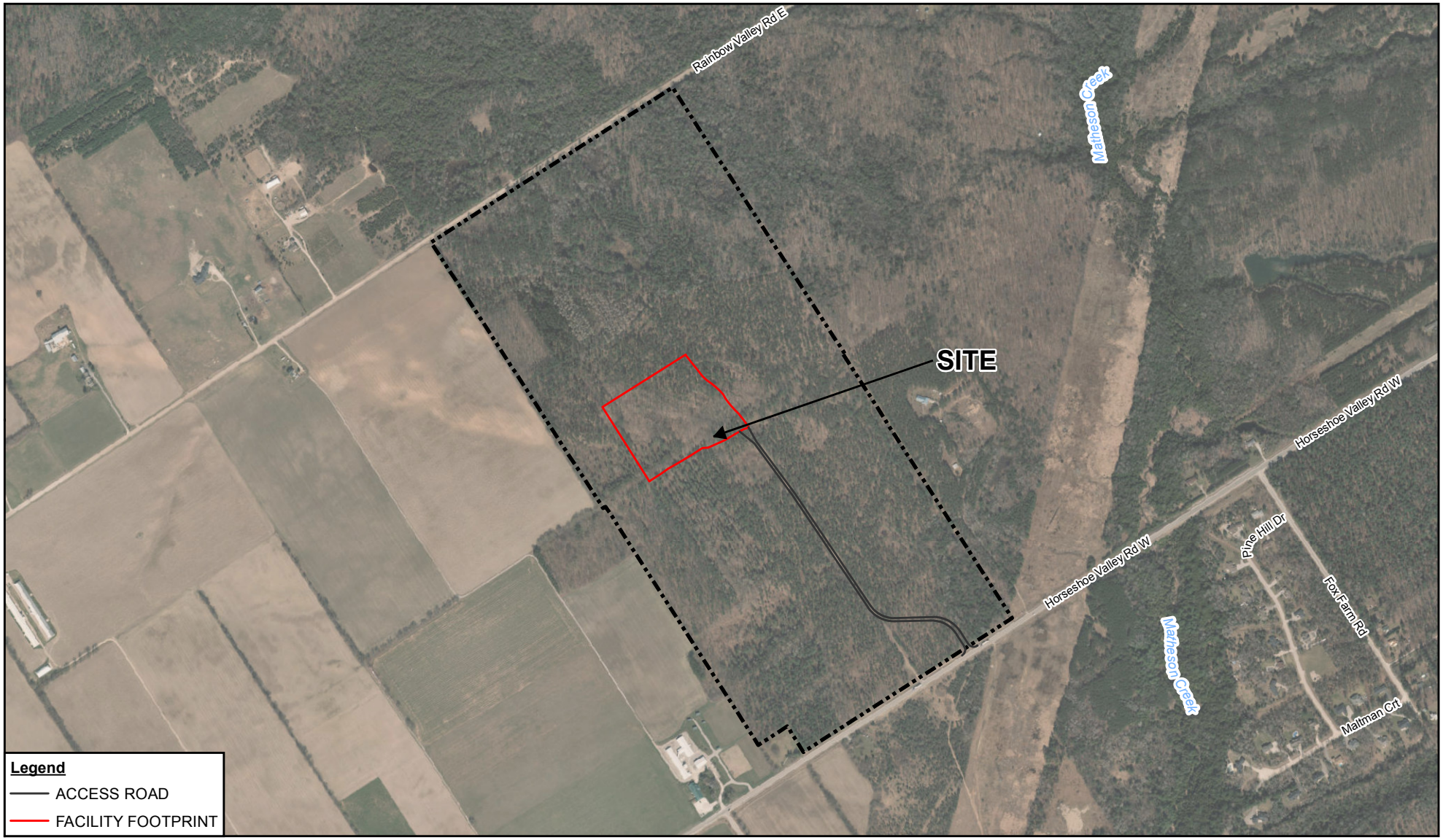
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 25, 2016

SITE PLAN

FIGURE 1.2

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA002.mxd



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Coordinate System:
NAD 1983 UTM Zone 17N

N

GHD

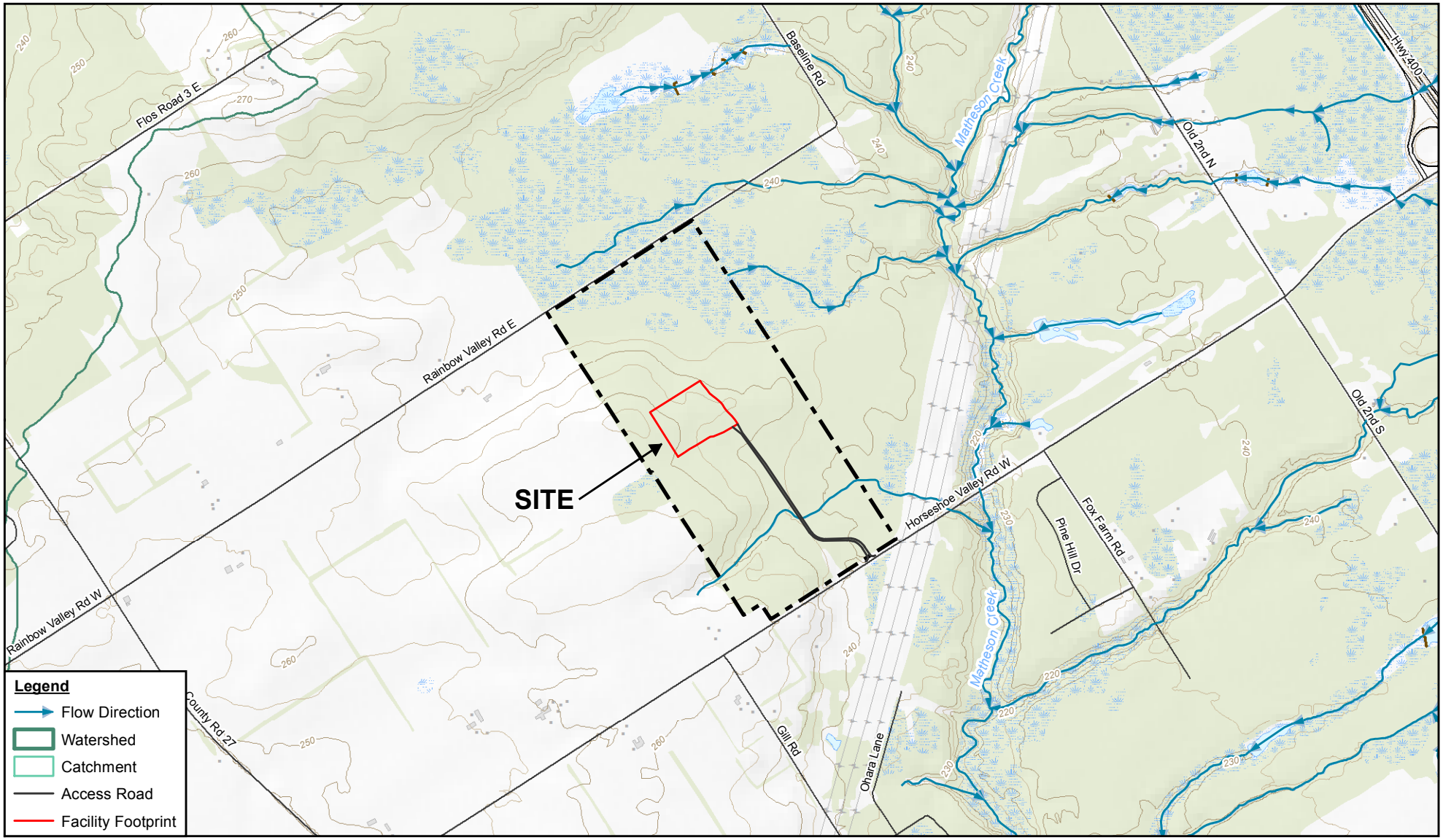
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 25, 2016

LAND USE (AERIAL IMAGE)

FIGURE 2.1

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA003.mxd



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0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

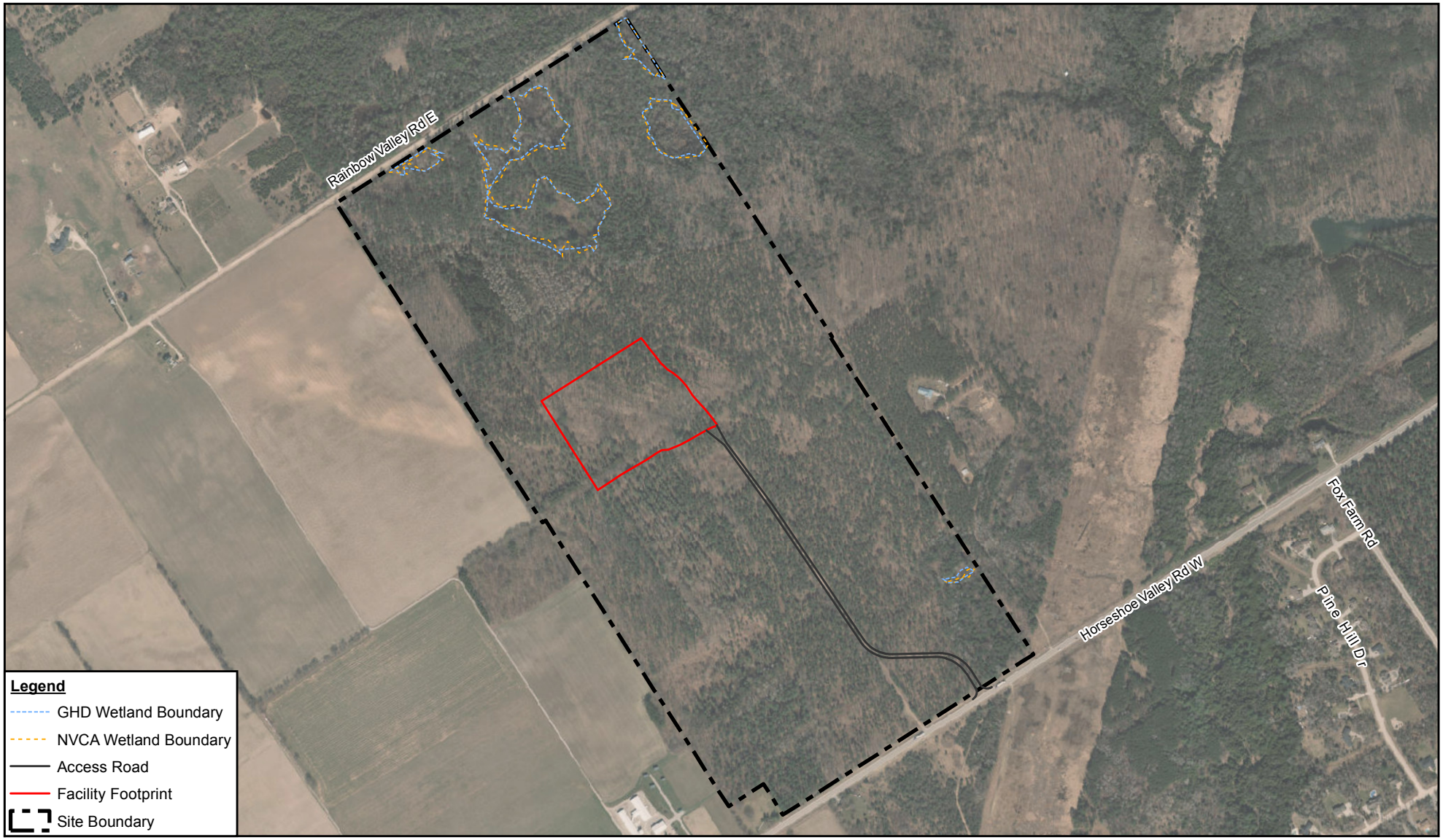
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 25, 2016

SURFACE WATER FEATURES

FIGURE 2.2

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA004.mxd



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Meters

Coordinate System:
NAD 1983 UTM Zone 17N

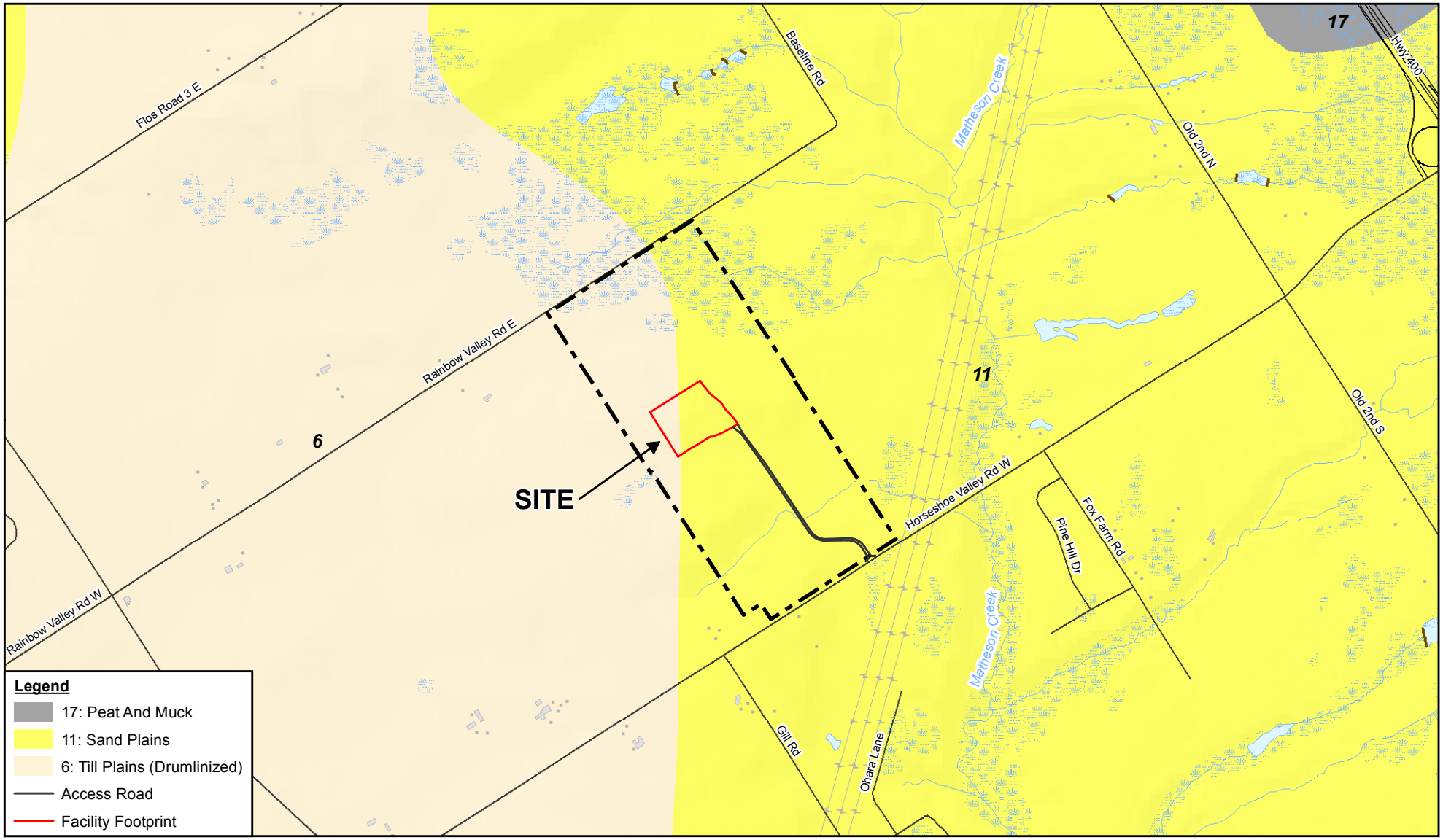
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 31, 2016

WETLANDS

FIGURE 2.3

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA005.mxd



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

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Meters

Coordinate System:
NAD 1983 UTM Zone 17N

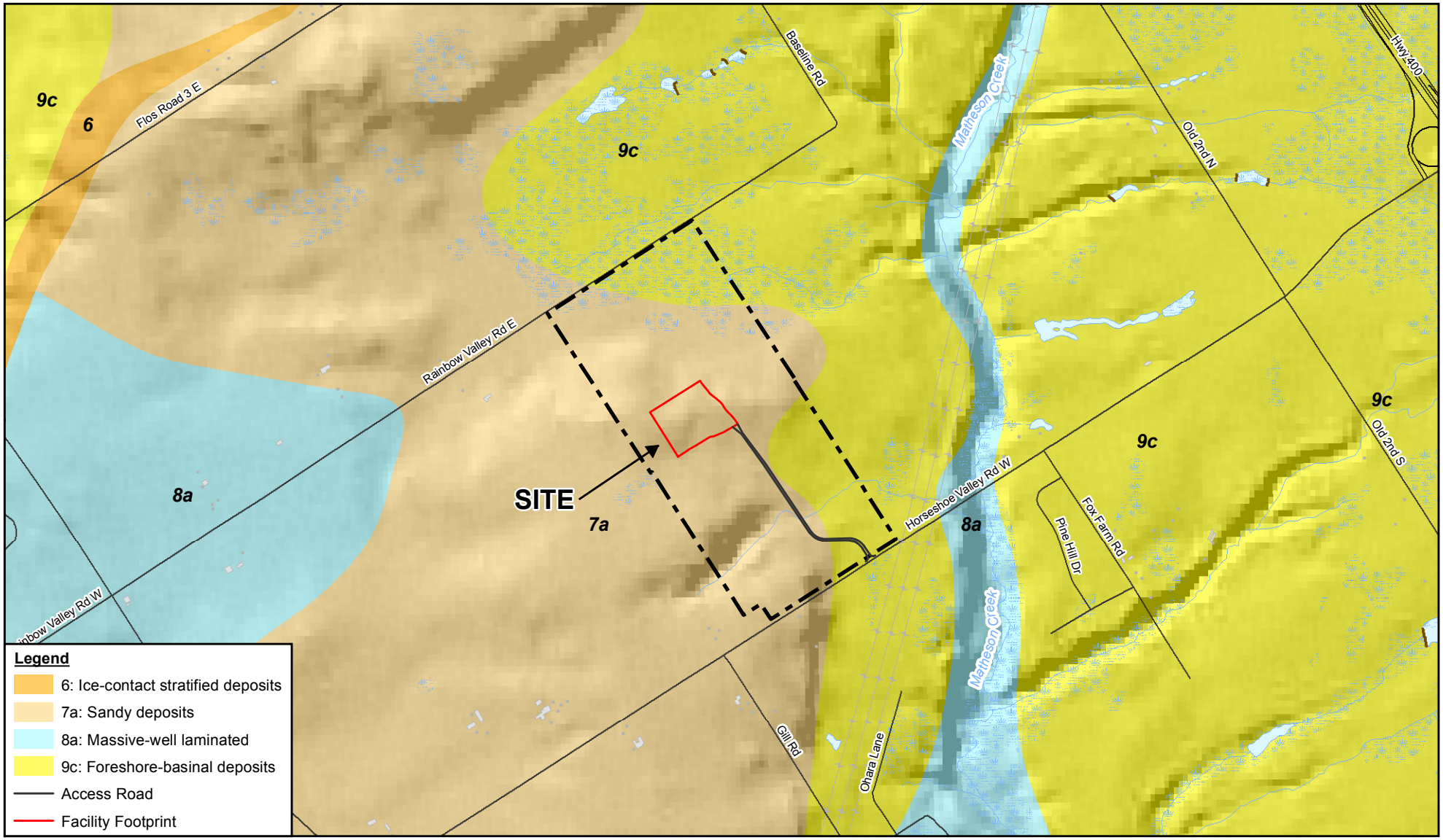
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 25, 2016

PHYSIOGRAPHY

FIGURE 2.4

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA006.mxd



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Ontario Geological Survey 2003. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release---Data 128.

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

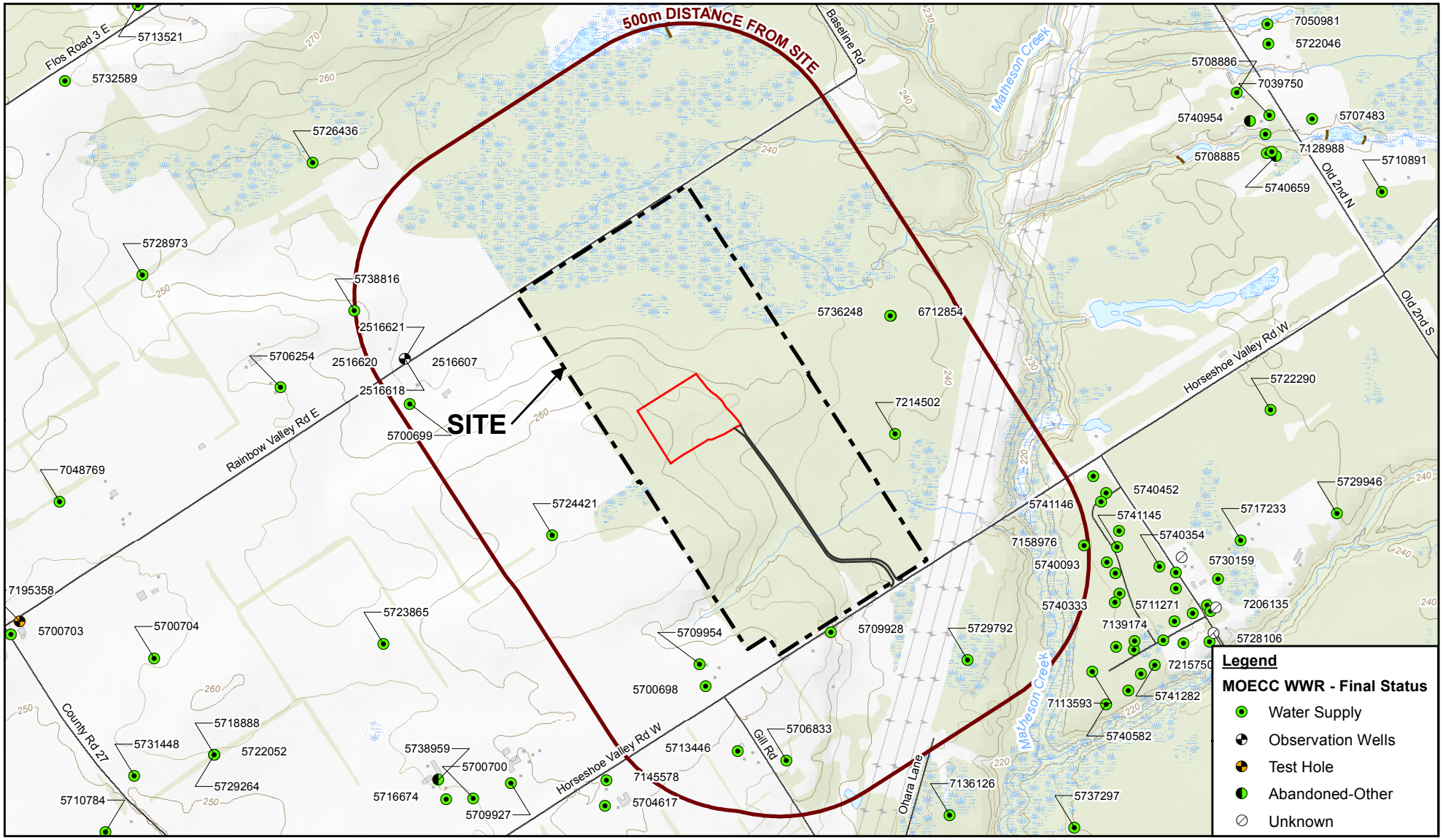
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 25, 2016

SURFICIAL GEOLOGY

FIGURE 2.5

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA007.mxd



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Coordinate System:
NAD 1983 UTM Zone 17N

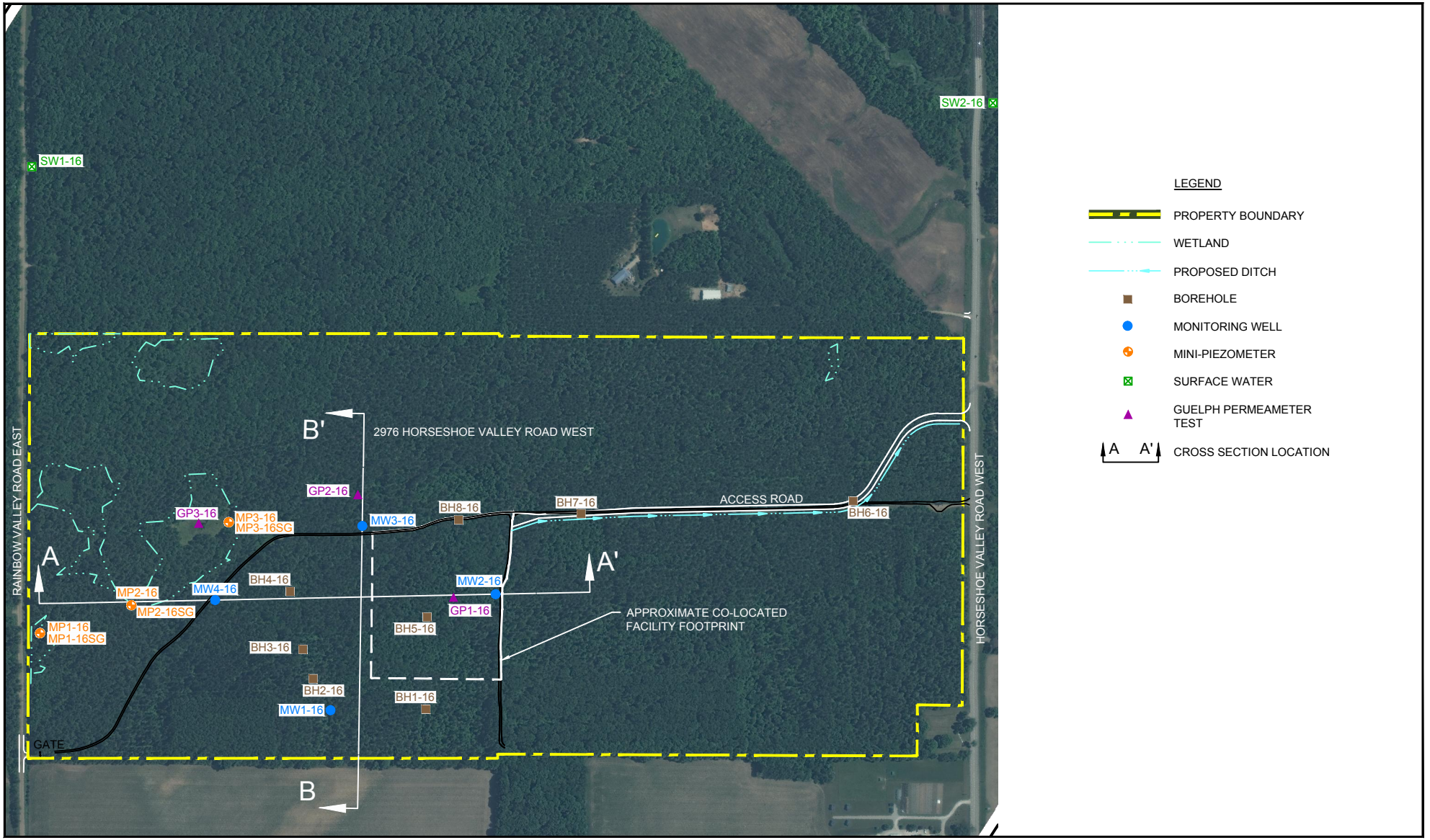
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER
HYDROGEOLOGICAL ASSESSMENT

86822
Oct 25, 2016

MOECC WATER WELL RECORDS

FIGURE 2.6

GIS File: Q:\GIS\PROJECTS\86000s\86822\Layouts\009\86822-00(009)GIS-WA008.mxd



0 80 160 240m

COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
HYDROGEOLOGICAL ASSESSMENT
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

086822-03

Nov 14, 2016

INVESTIGATIVE LOCATIONS

FIGURE 3.1

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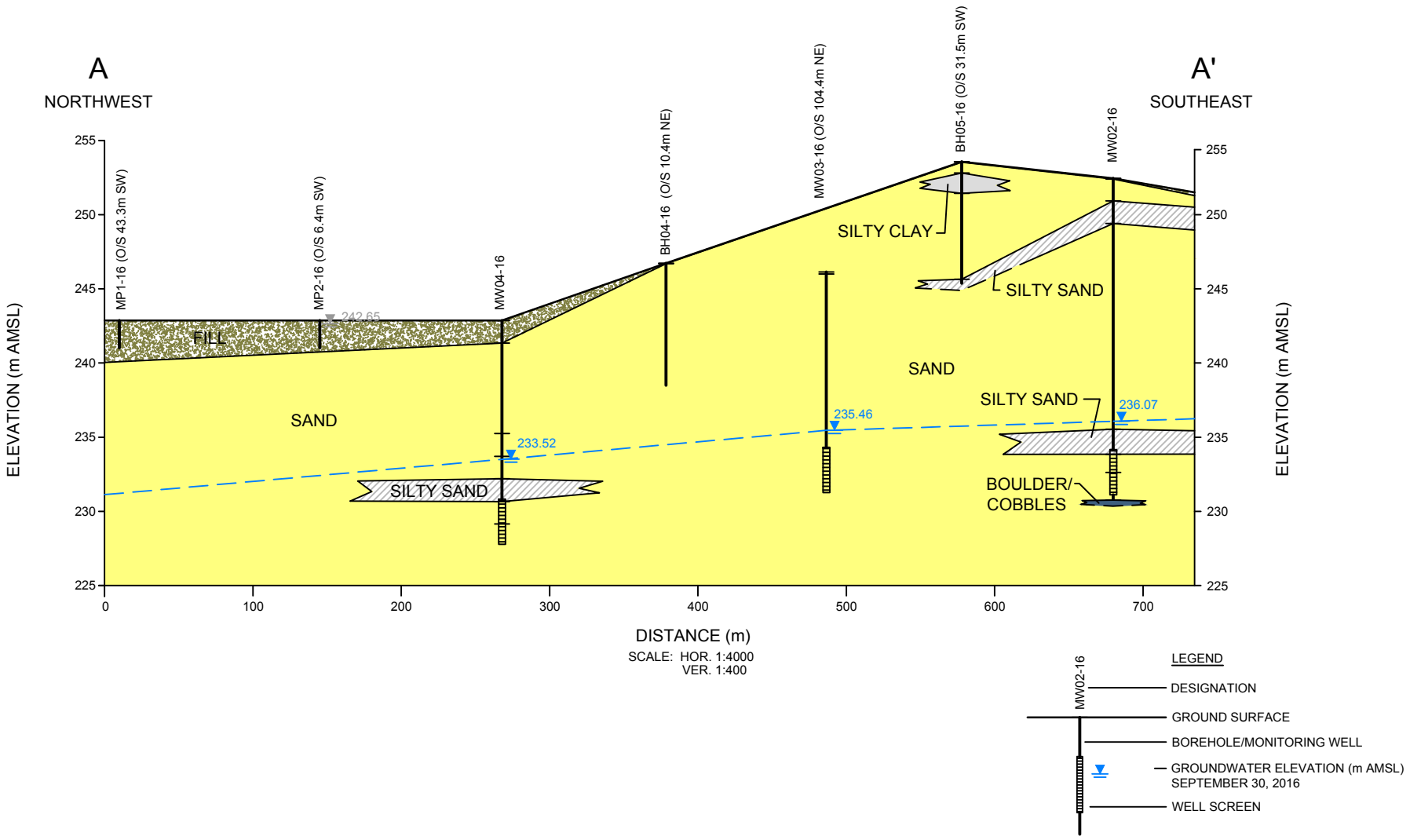


COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
HYDROGEOLOGICAL ASSESSMENT
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

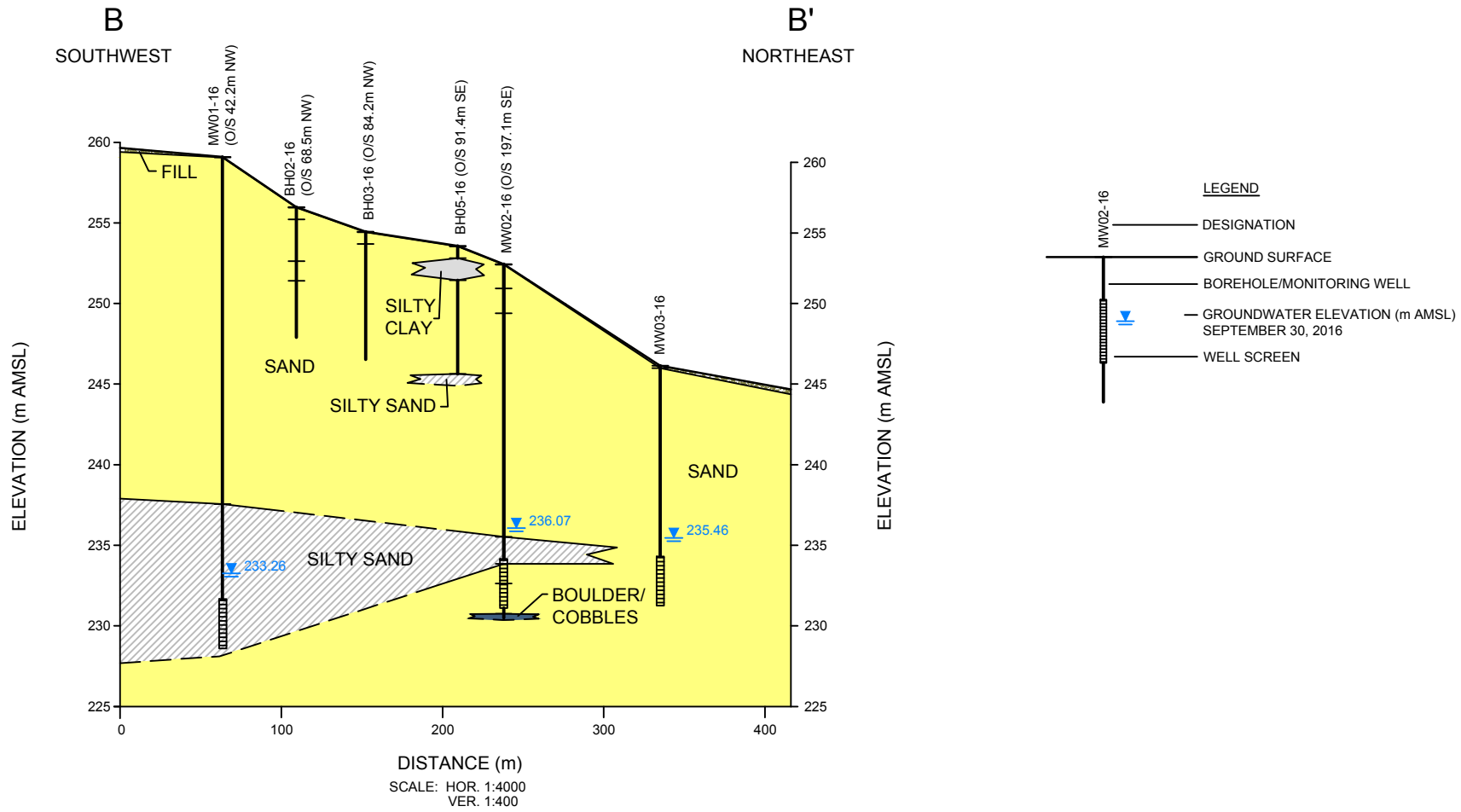
086822-03

Nov 14, 2016

CROSS SECTION A-A'

FIGURE 4.1

CAD File: I:\CAD\6-chars\08----\0868--\086822\086822-REPORTS\086822-03(009)GN\086822-03(009)GN-TO002.dwg



COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
HYDROGEOLOGICAL ASSESSMENT
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

086822-03

Nov 14, 2016

CROSS SECTION B-B'

FIGURE 4.2

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0 80 160 240m

COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
HYDROGEOLOGICAL ASSESSMENT
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

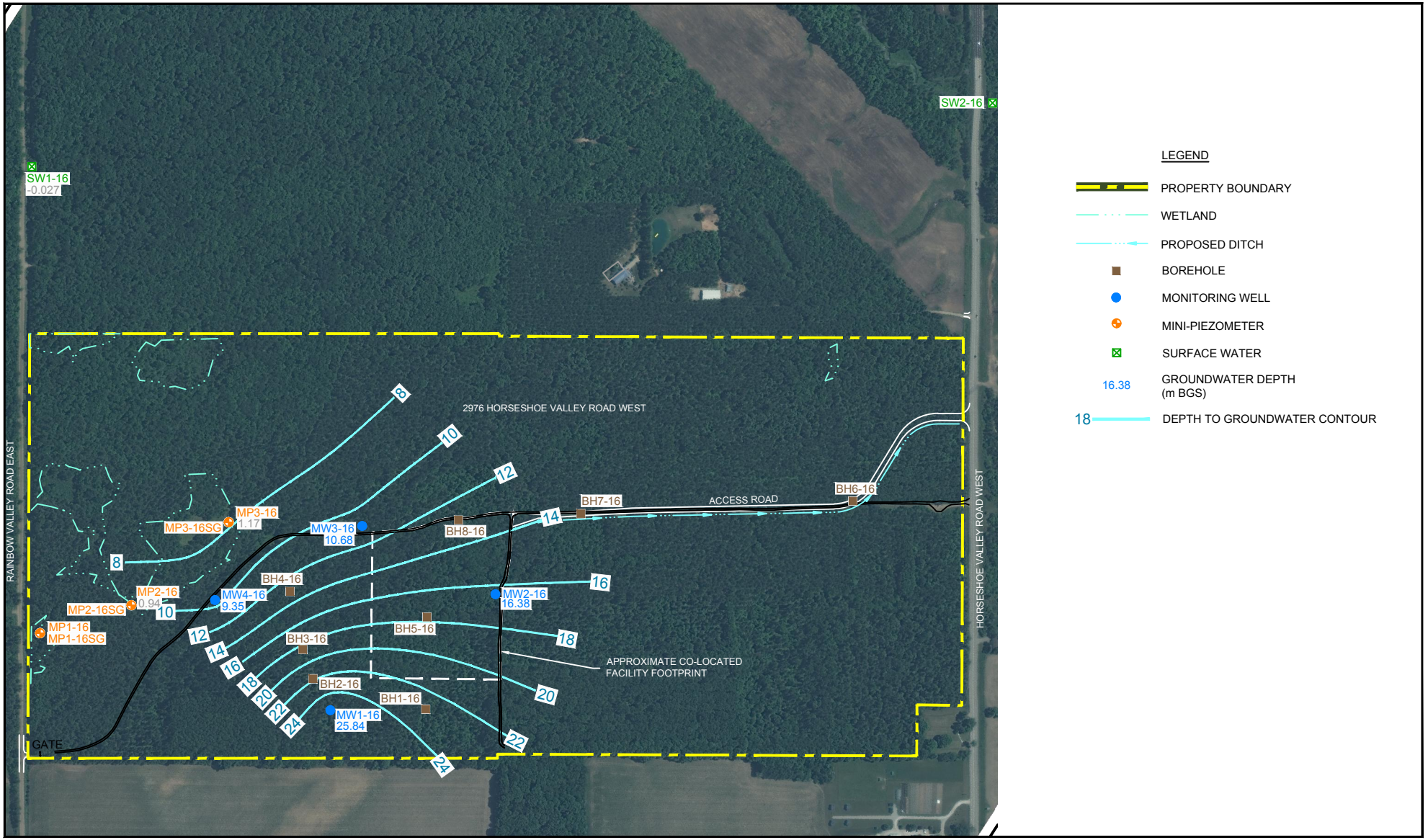
086822-03

Nov 14, 2016

GROUNDWATER ELEVATION CONTOURS (SEPT. 30, 2016)

FIGURE 4.3

CAD File: I:\CAD\6-chars\08--\0868--\086822\086822-REPORTS\086822-03(009)GN\086822-03(009)GN-TO003.dwg



0 80 160 240m

COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
HYDROGEOLOGICAL ASSESSMENT
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

086822-03

Nov 14, 2016

DEPTH TO GROUNDWATER CONTOURS (SEPT. 30, 2016)

FIGURE 4.4

CAD File: I:\CAD\6-chars\08----\0868--\086822\086822-REPORTS\086822-03(009)GN\086822-03(009)GN-TO004.dwg

FIGURE 4.5

ANALYTICAL MODEL INPUT PARAMETERS
HYDROGEOLOGICAL ASSESSMENT
ERRC
County of Simcoe

AQUIFER PARAMETERS			
S	Storativity	**0.3**	
S_y	Specific Yield	**0.3**	
b	Thickness of Aquifer	**8.0**	m
T	Transmissivity	**19.4**	m^2/day

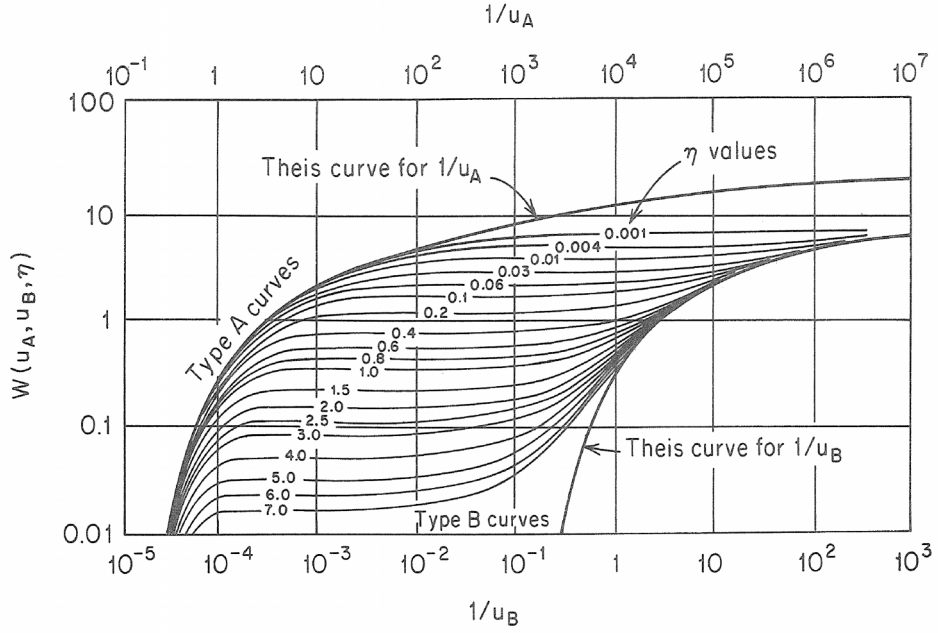
PUMPING REGIME			
t	Time from Start of Pumping	**1**	days
r	Distance from Pumping Well	**0.1**	m

μ Parameter
Select Parameter
μB

PUMP SETTINGS

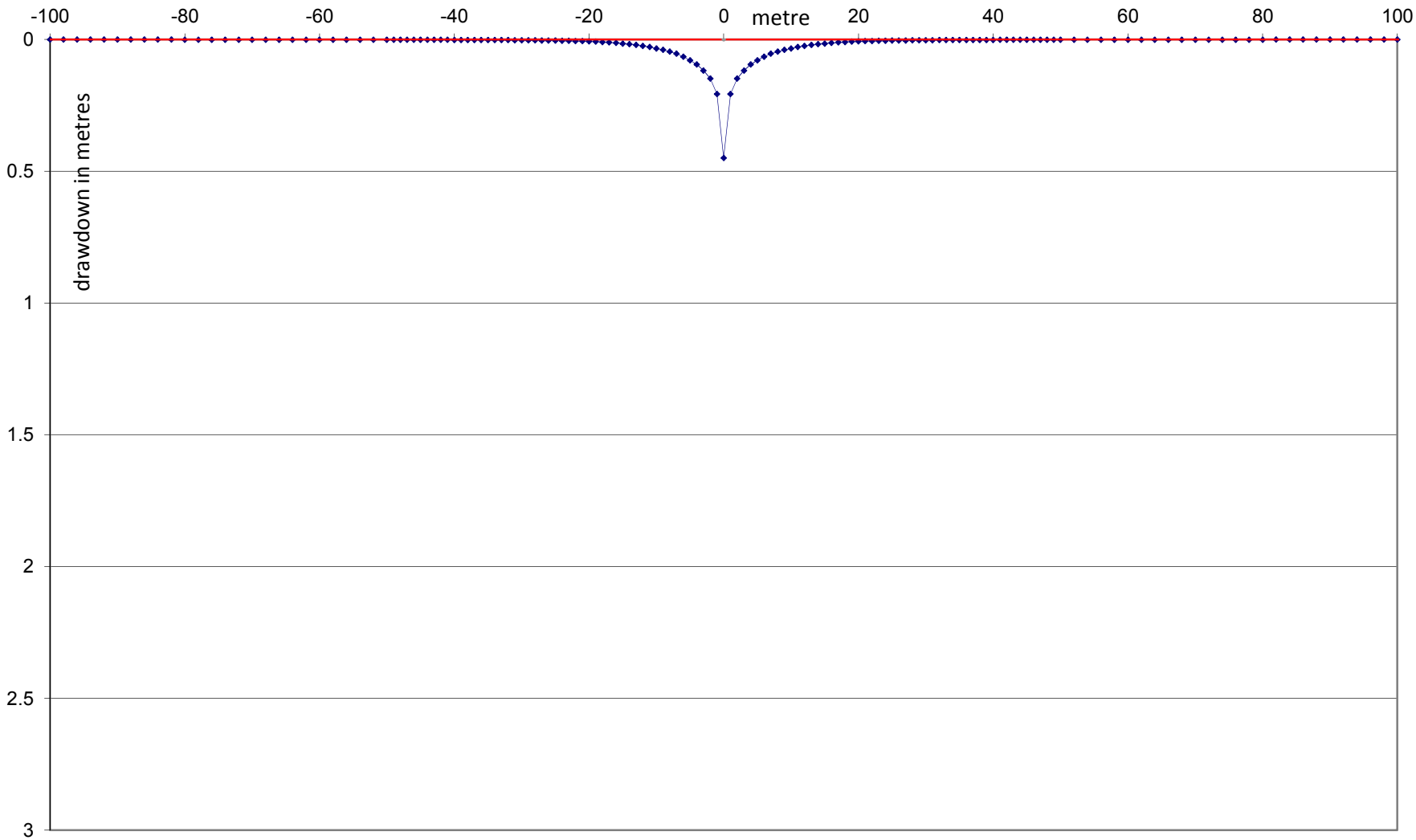
Pumping Well	Pumping Rate		Distance to Shaft Centre		α	
PW-1	10	m^3/day	0	m	0	°
PW-2	0	m^3/day	0	m	0	°
PW-3	0	m^3/day	0	m	0	°
PW-4	0	m^3/day	0	m	0	°
PW-5	0	m^3/day	0	m	0	°
PW-6	0	m^3/day	0	m	0	°
PW-7	0	m^3/day	0	m	0	°
PW-8	0	m^3/day	0	m	0	°
PW-9	0	m^3/day	0	m	0	°
PW-10	0	m^3/day	0	m	0	°
Total	10	m^3/day				

7 L/min



SHAFT MODEL SETTINGS		
Outter Radius of Shaft	0.01	m
Inner Radius of Shaft	0.01	m
Depth of shaft (below SWL)	0	m
Target Drawdown (optional)	0	m

AREA OF INFLUENCE
HYDROGEOLOGICAL ASSESSMENT
ERRC
County of Simcoe



Tables

Table 3.1

Monitoring Well Completion Details
Hydrogeological Investigation
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

Well ID	Easting	Northing	Ground Elevation (m AMSL)	Top of Riser Elevation (m AMSL)	Total Depth Drilled (m BGS)	Screened Interval (m BGS) Top	Screened Interval (m BGS) Bottom	Screened Interval (m AMSL) Top	Screened Interval (m AMSL) Bottom	Sandpack Interval (m BGS) Top	Sandpack Interval (m BGS) Bottom	Sandpack Interval (m AMSL) Top	Sandpack Interval (m AMSL) Bottom	Screened Material
MONITORING WELLS														
MW1-16	597082	4929846	259.10	260.00	30.18	27.50	30.49	231.60	228.61	24.39	30.49	234.71	228.61	Silt
MW2-16	597357	4929736	252.45	253.35	21.95	18.30	21.64	234.15	230.81	18.30	21.34	234.15	231.11	Silty Sand, Sand
MW3-16	597335	4929954	246.14	246.99	14.88	11.90	14.88	234.24	231.26	11.40	14.88	234.74	231.26	Sand
MW4-16	597126	4930077	242.86	243.67	15.09	12.00	15.09	230.86	227.77	11.59	15.09	231.27	227.77	Silty Sand, Sand
GEOTECHNICAL BOREHOLES														
BH01-16	597160	4929730	260.66	-	7.90	-	-	-	-	-	-	-	-	-
BH02-16	597107	4929893	255.98	-	8.08	-	-	-	-	-	-	-	-	-
BH03-16	597135	4929929	254.46	-	7.93	-	-	-	-	-	-	-	-	-
BH04-16	597197	4929991	246.73	-	8.23	-	-	-	-	-	-	-	-	-
BH05-16	597274	4929801	253.57	-	8.23	-	-	-	-	-	-	-	-	-
BH06-16	597757	4929369	243.44	-	5.18	-	-	-	-	-	-	-	-	-
BH07-16	597525	4929694	247.11	-	5.18	-	-	-	-	-	-	-	-	-
BH08-16	597419	4929840	252.71	-	5.18	-	-	-	-	-	-	-	-	-
						-	-	-	-	-	-	-	-	-
MINIPIEZOMETERS														
MP1-16	596946	4930266	241.80	243.24	1.45	-	-	-	-	-	-	-	-	-
MP1-16SG	596946	4930266	-	242.92	-	-	-	-	-	-	-	-	-	-
MP2-16	597053	4930176	241.71	242.72	1.31	-	-	-	-	-	-	-	-	-
MP2-16SG	597053	4930176	-	242.74	-	-	-	-	-	-	-	-	-	-
MP3-16	597233	4930122	-	-	0.56	-	-	-	-	-	-	-	-	-
MP3-16SG	597233	4930122	-	-	-	-	-	-	-	-	-	-	-	-
SW1-16	597515	4930648	239.01	239.24	-	-	-	-	-	-	-	-	-	-
SW2-16	598360	4929514	216.62	218.58	-	-	-	-	-	-	-	-	-	-

Notes:
BM Station: 00819798284 at 244.394 Surveying locations are based on a steel rod with brass cap bench mark on the east side of Hwy 27, 8.6km South of Junction of Hwy 27 and 92 in Elmvale, 9.6km North of the Junction of Hwy 26 and 27 at Midhurst, 0.4km South of Flos Township concession 3 and 18.1m East of Centerline of hwy 27

Table 3.2

Sample Key
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

Test Pit No.	Percent			d_{10} (mm)	Description	Approximated Hydraulic Conductivity (cm/sec)[1]
	Gravel	Sand	Silt			
BH1-16	0	84	16	-	Sand, Some Silt	10^{-3} - 10^{-5}
BH4-16	0	85	15	-	Sand, Some Silt	10^{-3} - 10^{-5}
BH7-16	0	85	15	-	Sand, Some Silt	10^{-3} - 10^{-5}
BH8-16	0	96	4	-	Sand, Trace Silt	10^{-3} - 10^{-5}
					Geometric Mean[3]	**1.00E-04**

Note: 1) Hydraulic conductivity estimated by Supplementary Guidelines to Ontario Building Code 1997, Table 2

Table 3.3a

Summary of Groundwater Levels (m AMSL)
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

	MW1-16	MW2-15	MW3-16	MW4-16
Ground Elevation (mAMSL)	259.10	252.45	246.14	242.86
Reference Elevation (mAMSL)[(1)]	260.00	253.35	246.99	243.67
20-Jul-2016	-	-	-	-
19-Aug-2016	-	236.16	235.69	-
22-Aug-2016	-	235.65	-	233.60
23-Aug-2016	233.20	236.29	-	233.61
30-Sep-2016	233.26	236.07	235.46	233.52

Notes:

(1) Reference elevation taken from top of riser pipe.

mAMSL metres Above Mean Sea Level

mBGS metres Below Ground Surface.

mBTOR metres Below Top of Riser.

Elevations referenced with respect to a geodetic benchmark - Steel rod with brass cap bench mark on east site of highway 27, 8.6 km south of the junction of highway 27 and 92 in Elmvale, 9.6 km North of the juntions of highway 26 and 27 at Midhurst, 0.4 km south of Flos Town

Table 3.3b

Summary of Groundwater Levels (m BGS)
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

	MW1-16	MW2-15	MW3-16	MW4-16
Ground Elevation (mAMSL)	259.10	252.45	246.14	242.86
Reference Elevation (mAMSL)[(1)]	260.00	253.35	246.99	243.67
20-Jul-2016	-	-	-	-
19-Aug-2016	-	16.29	10.45	-
22-Aug-2016	-	16.80	-	9.27
23-Aug-2016	25.90	16.16	-	9.26
30-Sep-2016	25.84	16.38	10.68	9.35

Notes:

(1) Reference elevation taken from top of riser pipe.

mAMSL metres Above Mean Sea Level

mBGS metres Below Ground Surface.

mBTOR metres Below Top of Riser.

Elevations referenced with respect to a geodetic benchmark - Steel rod with brass cap bench mark on east site of highway 27, 8.6 km south of the junction of highway 27 and 92 in Elmvale, 9.6 km North of the juntions of highway 26 and 27 at Midhurst, 0.4 km south of Flos Town concession 3 rd and 18.1m east of centerline of highway 27. Benchmark

Table 3.4

Sample Key
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

Sample	Sample Type	Sample ID [1]	Sample Date	Ontario Drinking Water Standards (Table 2)					Provincial Water Quality Objectives (Table 2)				
				Inorganics	Dissolved Metals	Metals	Semi-Volatiles	Volatiles	Inorganics	Dissolved Metals	Metals	Semi-Volatiles	Volatiles
MW01	Groundwater	GW-86882-082316-SA-MW01	23-Aug-16	√	√	√	-	-	√	√	√	-	-
MW02	Groundwater	GW-86882-082216-SA-MW02	22-Aug-16	√	√	√	-	-	√	√	√	-	-
MW03	Groundwater	GW-86882-081916-SA-MW03	19-Aug-16	√	√	√	-	-	√	√	√	-	-
MW04	Groundwater	GW-86882-082216-SA-MW04	22-Aug-16	√	√	√	-	-	√	√	√	-	-

Notes:

(1) Complete Sample Identification for GW-076877-BF-200614. GW stands for groundwater; next 6 digits (076885) are GHD project number; next 6 digits represent the date (mm/dd/yy); next two characters are initials of field technician; next digits signify sample number.

Table 4.1

Summary of Hydraulic Conductivity
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

			Hydraulic Conductivity (m/s)		Hydraulic Conductivity (cm/s)		
Borehole ID	**Geologic Unit (Screened):**	**Depth (mBGS)**	**Falling**	**Rising**	**Falling**	**Rising**	Method
MW1-16	Silt	30.5	4.7E-06	1.40E-06	4.7E-04	1.40E-04	Bouwer-Rice
			9.9E-06	1.94E-06	9.9E-04	1.94E-04	Hvorslev
MW2-16	Silty Sand, Sand	21.3	2.0E-05	1.56E-05	2.0E-03	1.56E-03	Bouwer-Rice
			1.4E-06	1.11E-06	1.4E-04	1.11E-04	Hvorslev
MW3-16	Sand	14.9	-	1.13E-04	-	1.13E-02	Bouwer-Rice
			-	1.44E-04	-	1.44E-02	Hvorslev
			-	3.11E-04	-	3.11E-02	Bouwer-Rice
			-	4.30E-04	-	4.30E-02	Hvorslev
			-	1.21E-04	-	1.21E-02	Bouwer-Rice
			-	1.62E-04	-	1.62E-02	Hvorslev
MW4-16	Silty Sand, Sand	15.1	3.8E-05	4.53E-05	3.8E-03	4.53E-03	Bouwer-Rice
			5.0E-05	5.92E-05	5.0E-03	5.92E-03	Hvorslev
			3.8E-05	4.20E-05	3.8E-03	4.20E-03	Bouwer-Rice
			4.9E-05	5.59E-05	4.9E-03	5.59E-03	Hvorslev
		Geometric Mean (m/s)		**2.78E-05**		**2.78E-03**	

Table 4.2

Summary of Groundwater Analytical Results (ODWS)
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

Sample Location:			**MW01**	**MW02**	**MW03**	**MW04**
Sample ID:			**GW-86882-082316-SA-MW01**	**GW-86882-082216-SA-MW02**	**GW-86882-081916-SA-MW03**	**GW-86882-082216-SA-MW04**
Sample Date:			**8/22/2016**	**8/22/2016**	**8/22/2016**	**8/22/2016**
Parameters	**Units**	**Parameter Limits ODWS**				
Dissolved Metals						
Calcium (dissolved)	mg/L	-	50	72	82	42
Magnesium (dissolved)	mg/L	-	10	13	13	8
Potassium (dissolved)	mg/L	-	2.6	2.4	2.1	1.4
Sodium (dissolved)	mg/L	20 (AO)	**29**	7	9.6	8.2
Total Metals						
Aluminum	mg/L	0.10 (OG)	**16**	**22**	**4.4**	**5**
Antimony	mg/L	0.006 (OG)	(ND < 0.0005)	(ND < 0.0005)	(ND < 0.0005)	(ND < 0.0005)
Arsenic	mg/L	0.025 (OG)	0.0035	0.003	(ND < 0.001)	(ND < 0.001)
Barium	mg/L	1.0 (MAC)	0.22	0.31	0.1	0.26
Beryllium	mg/L	-	0.00059	0.00079	(ND < 0.0005)	(ND < 0.0005)
Boron	mg/L	5.0 (IMAC)	0.031	0.025	0.015	(ND < 0.01)
Cadmium	mg/L	0.005 (MAC)	(ND < 0.0001)	(ND < 0.0001)	(ND < 0.0001)	(ND < 0.0001)
Chromium	mg/L	0.05 (MAC)	0.022	**0.058**	0.0085	0.009
Cobalt	mg/L	-	0.011	0.022	0.0042	0.0043
Copper	mg/L	1.0 (AO)	0.034	0.055	0.014	0.014
Iron	mg/L	0.30 (AO)	**25**	**39**	**6.5**	**8.2**
Lead	mg/L	0.01 (MAC)	0.0088	**0.011**	0.0023	0.0033
Manganese	mg/L	0.05 (AO)	**1.3**	**1.7**	**0.26**	**0.36**
Molybdenum	mg/L	-	0.011	0.034	0.0024	0.0015
Nickel	mg/L	-	0.019	0.034	0.0084	0.0067
Phosphorus	mg/L	-	6.5	2.2	0.12	2
Selenium	mg/L	0.01 (MAC)	(ND < 0.002)	(ND < 0.002)	(ND < 0.002)	(ND < 0.002)
Silver	mg/L	-	(ND < 0.0001)	(ND < 0.0001)	(ND < 0.0001)	(ND < 0.0001)
Sodium	mg/L	20 (AO)	**33**	9.3	10	9.1
Thallium	mg/L	-	0.00021	0.00038	0.000088	0.000078
Tungsten	mg/L	-	(ND < 0.001)	0.031	(ND < 0.001)	(ND < 0.001)
Uranium	mg/L	0.02 (MAC)	0.0031	0.0014	0.0029	0.0025
Vanadium	mg/L	-	0.038	0.051	0.0093	0.011
Zinc	mg/L	5.0 (AO)	0.051	0.079	0.02	0.017
Zirconium	mg/L	-	0.0082	0.0092	0.0015	0.0016

Table 4.2

Summary of Groundwater Analytical Results (ODWS)
Hydrogeological Assessment
Environmental Resource Recovery Centre (ERRC)
2976 Horseshoe Valley Road, Springwater
County of Simcoe

Sample Location:			**MW01**	**MW02**	**MW03**	**MW04**
Sample ID:			**GW-86882-082316-SA-MW01**	**GW-86882-082216-SA-MW02**	**GW-86882-081916-SA-MW03**	**GW-86882-082216-SA-MW04**
Sample Date:			**8/22/2016**	**8/22/2016**	**8/22/2016**	**8/22/2016**
Parameters	**Units**	**Parameter Limits ODWS**				
Inorganics						
Ammonia-N	mg/L	-	0.12	0.13	(ND < 0.050)	(ND < 0.050)
Color	TCU	5 (AO)	(ND < 2)	(ND < 2)	(ND < 2)	(ND < 2)
Total dissolved solids (TDS)	mg/L	500 (AO)	328	300	336	214
Fluoride	mg/L	1.5 (MAC)	(ND < 0.10)	(ND < 0.10)	(ND < 0.10)	(ND < 0.10)
Hardness	mg/L	80-100 (OG)	**170**	**230**	**260**	**140**
Total kjeldahl nitrogen (TKN)	mg/L	-	0.48	0.82	0.17	0.16
Dissolved organic carbon (DOC)	mg/L	-	0.74	1.0	2.9	2.3
Nitrogen, organic	mg/L	0.15 (AO)	**0.36**	**0.69**	**0.17**	**0.16**
pH, field	s.u.	6.5-8.5 (OG)	7.71	7.56	7.30	7.97
pH, lab	s.u.	6.5-8.5 (OG)	8.05	7.96	7.88	7.98
Phosphorus	mg/L	-	3.8	2.4	0.13	1.9
Sulfate (dissolved)	mg/L	500 (AO)	31	12	20	23
Sulfide	mg/L	0.05 (AO)	(ND < 0.020)	(ND < 0.020)	(ND < 0.020)	(ND < 0.020)
Turbidity	NTU	5.0 (AO)	**15**	**23**	**6.7**	4.2
Alkalinity, bicarbonate (calculated)	mg/L	-	200	240	270	130
Alkalinity, carbonate (calculated)	mg/L	-	2.1	2.0	1.9	1.2
Alkalinity, total (as CaCO3)	mg/L	30-500 (AO)	200	240	270	130
%difference/ion balance	%	-	3.30	1.44	2.13	1.34
Chloride (dissolved)	mg/L	250 (AO)	7.6	2.8	3.5	2.2
Hydroxide (as CaCO3)	mg/L	-	(ND < 1.0)	(ND < 1.0)	(ND < 1.0)	(ND < 1.0)
Nitrate (as N)	mg/L	10.0 (MAC)	0.80	1.54	(ND < 0.10)	0.12
Nitrite (as N)	mg/L	1.0 (MAC)	0.019	0.012	(ND < 0.010)	(ND < 0.010)
Nitrite/Nitrate	mg/L	10.0 (MAC)	0.81	1.56	(ND < 0.10)	0.12
Orthophosphate	mg/L	-	(ND < 0.010)	(ND < 0.010)	(ND < 0.010)	(ND < 0.010)
Temperature, field	Deg C	15 (AO)	10.48	9.70	10.93	9.83
Total suspended solids (TSS)	mg/L	-	2000	3000	300	610
Un-ionized ammonia	mg/L	-	0.0014	0.0010	(ND < 0.0005)	(ND < 0.00084)

Footnotes:

ND	Not detected at the associated reporting limit.
0.151	Parameter Exceeds Ontario Drinking Water Standards, Table 2 (ODWS, PIBS-4449e01)

Table 4.3

Land Type Annual Averages
Proposed ERRC
Simcoe County
Springwater, Ontario

Topsoil

Month	Temperature (^{o}C)	Precipitation (mm)	Rainfall (mm)	Snowmelt (mm)	Potential Evapotranspiration (mm)	Actual Evapotranspiration (mm)	Water Surplus (mm)
January	-7.5	85	19	28	1	1	44
February	-7.1	88	19	21	1	1	36
March	-1.4	61	31	98	8	8	121
April	6	76	68	69	32	32	107
May	12.9	81	81	0	78	78	19
June	17.8	92	92	0	112	112	8
July	20.4	83	83	0	131	130	0
August	19.7	77	77	0	117	109	0
September	16.1	83	83	0	81	77	0
October	9.3	89	89	0	41	41	0
November	3.2	89	73	11	14	14	19
December	-3.1	97	36	23	3	3	39
Total		1001	751	250	619	606	395

Sandy Silt

Month	Temperature (^{o}C)	Precipitation (mm)	Rainfall (mm)	Snowmelt (mm)	Potential Evapotranspiration (mm)	Actual Evapotranspiration (mm)	Water Surplus (mm)
January	-7.5	85	19	28	1	1	45
February	-7.1	88	19	21	1	1	38
March	-1.4	61	31	98	8	8	121
April	6	76	68	69	32	32	106
May	12.9	81	81	0	78	78	19
June	17.8	92	92	0	112	111	8
July	20.4	83	83	0	131	119	0
August	19.7	77	77	0	117	91	0
September	16.1	83	83	0	81	69	0
October	9.3	89	89	0	41	41	5
November	3.2	89	73	11	14	14	37
December	-3.1	97	36	23	3	3	53
Total		1001	751	250	619	568	433

Table 4.3

Land Type Annual Averages
Proposed ERRC
Simcoe County
Springwater, Ontario

Impervious Area (Hard-Packed Gravel)

Month	Temperature (^{o}C)	Precipitation (mm)	Rainfall (mm)	Snowmelt (mm)	Potential Evapotranspiration (mm)	Actual Evapotranspiration (mm)	Water Surplus (mm)
January	-7.5	85	19	28	1	1	46
February	-7.1	88	19	21	1	1	39
March	-1.4	61	31	98	8	8	120
April	6	76	68	69	32	32	106
May	12.9	81	81	0	78	66	19
June	17.8	92	92	0	112	83	11
July	20.4	83	83	0	131	86	0
August	19.7	77	77	0	117	77	0
September	16.1	83	83	0	81	68	10
October	9.3	89	89	0	41	40	44
November	3.2	89	73	11	14	14	69
December	-3.1	97	36	23	3	3	56
Total		1001	751	250	619	479	520

Table 4.4

Existing Conditions Water Balance
Proposed ERRC
Simcoe County
Springwater, Ontario

Detail	Units	Impervious Area	Existing Pervious Cover	Total
Input Information				
Land Type [1]	%	0	100	100
Area [2]	ha	0.00	4.49	4.49
Soil Type		Sandy Silt	Sandy Silt	
Hydrologic Soil Group		AB	AB	
Pervious Infiltration Factor				
Topography		-	0.2	
Soil		-	0.4	
Land Type		-	0.15	
TOTAL		0	0.75	
Average Annual Depth [1]				
Precipitation	**(mm)**	1001	1001	
Evapotranspiration	**(mm)**	479	568	
Output Information				
Annual Rainfall Volume	**(m^3)**	**0**	**44,989**	**44,989**
Annual Evapotranspiration Volume	**(m^3)**	**0**	**25,528**	**25,528**
Precipitation Surplus	**(m^3)**	0	19,461	**19,461**
Annual Groundwater Recharge Volume [2]	**(m^3)**	**0**	**14,596**	**14,596**
Annual Runoff Volume	**(m^3)**	**0**	**4,865**	**4,865**

Notes:

1. This amount was proportionally modified to represent average annual conditions using the Shanty Bay weather station (Climate ID: 6117684) Climate Normals data.

Table 4.5

Proposed Uncontrolled Conditions Water Balance
Proposed ERRC
Simcoe County
Springwater, Ontario

Detail	Units	Impervious	Urban Lawn	Total
Input Information				
Land Type [1]	%	89	11	100
Total Area	ha	4.00	0.49	4.49
Underlying Soil Type		Sandy Silt	Topsoil	
Hydrologic Soil Group		AB	BC	
Pervious Infiltration Factor				
Topography		-	0.3	
Soil		-	0.3	
Land Type		-	-	
TOTAL		0	0.6	
Average Annual Depth [2]				
Precipitation	**(mm)**	1001	1001	
Evapotranspiration	**(mm)**	479	606	493
Output Information				
Annual Rainfall Volume	**(m^3)**	**40,040**	**4,949**	**44,989**
Annual Evapotranspiration Volume	**(m^3)**	**19,160**	**2,996**	**22,156**
Surplus	**(m^3)**	20,880	1,953	**22,833**
Annual Groundwater Recharge Volume [3]	**(m^3)**	**2,088**	**1,172**	**3,260**
Annual Runoff Volume	**(m^3)**	**18,792**	**781**	**19,573**

Notes:

1. Land Area Assumptions:
a) Total Imperivious Area:

Land Type	Total Area (ha)	% Impervious	Total Imp. Area (ha)
ERRC	4.49	89	4.00
Total	**4.49**	**89.00**	**4.00**

Notes:

1. This amount was proportionally modified to represent average annual conditions using the Shanty Bay weather station (Climate ID: 6117684) Climate Normals data.

Table 4.6

Proposed Conditions Water Balance
Additional Infiltration and Evaporation Measures
Proposed ERRC
Simcoe County
Springwater, Ontario

Additional Evaporative Lossess

Stormwater Management Pond

Surface area of permanent pool [1]	2,467	m^2
Excess evaporation from permanent pool [2]	137	mm
Total evaporative losses per year	338	m^3

Enhanced Vegetated Swales

Approx. Length of Swale	525	m
Approx. Ponding within Swale Length	50	% of swale length
Average Surface area at permanent pool [3]	394	m^2
Annual average total lake evaporation [1]	137	mm
Total evaporative losses per year	54	m^3

Total **392** **m^3**

Additional Infiltration Lossess

Stormwater Management Pond - Infiltration Chamber

Area of Infiltraiton Gallery	380	m^2
Total Available Volume [4]	380	m^3
Void Ratio [5]	40%	
Volume of water	152	m^3
Hydraulic Conductivity of native soil [6]	1.07E-06	m/s
Infiltration Rate [7]	18.8	mm/hr
Time to infiltrate water in trench	2.21	days
Total infiltration losses per year [8]	22,885	m^3

Enhanced Swales

Total surface area of water	394	m^2
Volume of water in swale	66	m^3
Hydraulic Conductivity of Topsoil [6]	1.00E-08	m/s
Infiltration Rate [7]	5.4	mm/hr
Time to infiltrate water	3.86	days
Total infiltration losses per year [9]	1,174	m^3

Total **24,060** **m^3**

Notes:

1. As per MOE Standards, assumed water to remain at permanent pool elevation for majority of time.
2. Taken from long term lake evaporation monitoring conducted in southern ontario (630mm/year). The lake evaporation total was reduced by the amount of evapotranspiration allowed for in the water balance calculations in order not to double count evaporative losses.
3. Assumptions on dimensions of Enhanced Swale
   Depth of Check Dam = 0.50 m
   Bottom Width = 0.50 m
   Side Slope = 2.00 H:1V
4. Assumptions on dimensions of clear stone bedding
   Depth of bedding = 1.00 m
5. TRCA, 2010
6. GHD, 2016
7. Using equation within Figure C1 in Appendix C of the TRCA Low impact Planning and Design Guide, with Safety Correction Factor of 2.5

Proposed Conditions Water Balance
Additional Infiltration and Evaporation Measures
Proposed ERRC
Simcoe County
Springwater, Ontario

8. Assumed that the stormwater management pond will infiltrate all runoff up to and including the 100-year storm event
   Therefore all average rainfall amounts between May to October from Shanty Bay weather station
   (Climate ID: 6117684) will infiltrate via the proposed stormwater management pond.
   Amount of Rainfall = 509 mm
9. Average # of days per year w/ rainfall, during May to October and no snowfall, according to Climate Normals
   for Shanty Bay weather station (Climate ID: 6117684)
   # Days with precip.= 69 days
   Amount of Rainfall = 509 mm

Table 4.7

Summary of Calculations
Proposed ERRC
Simcoe County
Springwater, Ontario

Details	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Runoff (m^3)
Pre-development				
Existing Conditions	**44,989**	**25,528**	**14,596**	**4,865**
Percentage of Annual Precipitation		57%	32%	11%
Post-development				
Proposed Conditions (uncontrolled)	**44,989**	**22,156**	**3,260**	**19,573**
Percentage of Annual Precipitation		49%	7%	44%
Additional Infiltration and Evapotranspiration Measures				
Additional Measures				
Low-Impact Development (LID) Measures		392	24,060	
Proposed Conditions (controlled) [1]	**44,989**	**22,548**	**22,441**	**0**
Percentage of Annual Precipitation		50%	50%	0%
Pre- to Post-development Difference				
Proposed Conditions (uncontrolled)	**0**	**-3,372**	**-11,336**	**14,708**
Percentage Change		-7%	-25%	33%
Proposed Conditions (controlled)	**0**	**-2,980**	**7,845**	**-4,865**
Percentage Change		-7%	17%	-11%

Total volume of water losses per year =	44,989	m^3
Percentage of Annual Precipitation lost via water losses =	100%	
Proposed Conditions Runoff Coefficient [2] =	0.75	
Rainfall Amount =	5.00	mm
Runoff Volume (25 m Storm Event) =	169	m^3
Total Volume of Infiltration Galleries =	218	m^3

Notes:

1. The proposed stomwater management pond is sized to store, infiltrate all surface runoff from the proposed Facility, up to and including the 100-year storm. event
2. Runoff Coefficient for hard-packed gravel parking lot

Appendices

Appendix A
Field Investigation Methodology and Protocols

Appendix A Field Investigation Methodology and Protocols

1. Borehole Advancement/Monitoring Well Installation

1.1 Field Activities

Prior to initiating the subsurface investigation activities, all applicable utility companies (gas, telephone, network cables, pipelines and sewers) were contacted through Ontario One-Call.

1.2 Health and Safety

A Site-specific Health and Safety Plan (HASP) outlining specific job tasks and their related hazards was prepared and implemented by GHD prior to initiating field activities. The HASP presents the visually observed Site conditions and identifies potential physical hazards to field personnel. All GHD field and project staff working on and/or visiting the site were required to sign the HASP to document their knowledge of the potential hazards while on-site.

All drilling activities were conducted under Level D Personal Protective Equipment (PPE), which consisted of protective gloves, hard hats, safety glasses, safety boots and reflective vests at all times.

1.3 Borehole Drilling

The drilling work was carried out utilizing a track-mounted drill rig supplied and operated by Profile Drilling Inc., specialist drilling contractors (Ministry of the Environment and Climate Change Licensed Well Drillers), under the full-time supervision of GHD technical representatives.

Twelve (12) boreholes were advanced as part of the Hydrogeological Assessment, between 5.18 and 30.2 mBGS (metres below ground surface). The boreholes were advanced by Profile Drilling Inc. (Profile) using a drill rig equipped with hollow-stem augers. The boreholes were advanced to depths ranging from 5.18 and 30.2 mBGS.

Boreholes were advanced using hollow stem auger drilling methods and soil samples were collected every 0.75 metres to the final depth of investigation in all boreholes using a 50 mm outside diameter split spoon sampler. Prior to use and between each borehole location, the drilling and sampling equipment was thoroughly cleaned using Alconox® soap and potable water rinse.

The soil was logged using the Unified Soil Classification System (USGS), making special note of any visual or olfactory evidence of potential impacts.

1.4 Monitoring Well Installations

Monitoring wells were installed in four (4) selected boreholes by the licensed water well drillers consistent with Regulation 903 – Wells. GHD technical staff supervised the monitoring well construction and well development to ensure conformance with GHD's Standard Operating Procedures.

The monitoring wells were typically constructed with 2-inch (~50 mm) Schedule 40 PVC screen and casing. The screen length used for the monitoring wells was 3.0 metres on average and pre-slotted (No. 10 slot). The annular space between the monitoring well screen and surrounding geological formation were backfilled with No. 3 grade silica sand to an average height of 0.6 metres above the top of the

screen. The remaining annular space was backfilled with bentonite. Some monitoring wells were installed with minor alteration to the above installation details, due to the specific conditions encountered.

To complete the instrumentation, an expandable J-plug was installed on the riser style casing to cover the top of the riser pipe to protect against debris falling into the well and surface runoff infiltration. All wells were with an above-ground steel monument casing (4-inch x 4-inch). Each groundwater monitoring well was instrumented with dedicated sampling equipment consisting of polyethylene tubing and Waterra foot valves for monitoring well development and installation.

The wells will be decommissioned in accordance with Regulation 903, when it is determined that they are no longer required for monitoring.

1.5 Monitoring Well Development

Subsequent to the monitoring well installation, each well was developed to ensure hydraulic connection with the screened hydrostratigraphic unit. A hydraulic connection ensures that groundwater levels and samples are representative of the subsurface condition. Development also aids in achieving low-turbidity samples.

The wells were developed using dedicated 5/8" (~16 mm) diameter polyethylene tubing with a Waterra foot valve. Well development activities were undertaken until purged water was clear. In cases where a well was purged dry before sufficient development, the well water level was allowed to recover before continuing.

1.6 Surveying

Subsequent to installation, all wells and boreholes were surveyed for vertical and lateral control, and for water table elevation reference, using a geodetic benchmark[1] to tie in vertical elevations relative to metres above mean sea level (mAMSL) at the Site. The ground surface and top of riser pipe elevation of each of well were surveyed with respect to this benchmark.

2. Water Level Measurements

The measurement of groundwater levels in monitoring wells was required during the hydrogeological investigation in order to determine the presence and depth of groundwater. Water level measurements were used to determine: hydraulic head, hydraulic gradients and the direction of groundwater flow.

Since many decisions concerning the vertical and horizontal flow of groundwater through various types of geologic conditions depend on groundwater/fluid measurements, the accuracy of the measurements made at an appropriate level of precision is very important. Typically, the precision required is 1 mm, and the equipment employed had measurement resolution at this level.

Manual groundwater level measurements were measured using a Solinst water level meter. Measurements were obtained by lowering the electrode, attached to a graduated polyethylene tape,

[1] Benchmark station: 00819798284, Elevation 244.394 mAMSL (locations are based on a steel rod with brass cap bench mark on the east side of Hwy 27, 8.6km South of Junction of Hwy 27 and 92 in Elmvale, 9.6km North of the Junction of Hwy 26 and 27 at Midhurst, 0.4km South of Flos Township concession 3 and 18.1m East of Centerline of hwy 27) was used as a reference point for surveying purposes.

slowly into the well until the indicator sounded. To ensure accuracy, all fluid level readings were double-checked in the field when recorded.

In order to provide reliable data, each round of water level measurements was collected over as short a period of time as possible. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements was noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data noted if any of these controls are in effect during the groundwater level collection period.

3. Groundwater Sampling

Prior to initiating groundwater sample collection, the wells were purged of the standing stagnant groundwater volume using a dedicated Waterra foot valve and polyethylene tubing. Purging was performed until the water in the well was representative of the actual conditions in the hydrostratigraphic unit. Stabilization was achieved by the removal of at least three times the volume of standing water in the well. Purging was considered complete once purged groundwater field parameters including conductivity, temperature and pH were stable. Stabilization was achieved when field measurements for conductivity and temperature were within a range of plus or minus 10 percent of the average for the last three readings and field measurements for pH were within a range of plus or minus 0.1 pH unit of the average for the last three readings.

The wells were purged using dedicated inertial pumps. In the event of a slowly recharging well, the well was pumped dry to ensure all standing water was removed from the sand pack and then allowed to recover prior to sample collection.

In the event of a well with groundwater that contains a high amount of silt or sediment after well development, a 0.75"x36" PVC water bailer was used to collect the water.

Water samples were collected directly from the dedicated tubing or bailer to laboratory supplied sample containers. Samples were relinquished to Maxxam Laboratories in Mississauga, Ontario under Chain of Custody protocols. The samples were analyzed for Ontario Drinking Water Standards (ODWS) and Provincial Water Quality Objectives (PWQO) criteria.

4. Single Well Response Tests

Single well response tests (SWRT) were completed at four (4) monitoring well installations to determine the hydraulic conductivity of the screened geologic formation. The SWRT consisted of falling head tests (slug tests), and rising head tests (recovery rests) as described in the sections below.

4.1 Falling Head Test (Slug Test)

The slug test involves causing a sudden change in water level in a well and measuring the water level response within that well. Water level change may be induced by suddenly injecting or emplacing a known quantity or "slug" into the well. The slug can water or solid (stainless steel, polyvinyl chloride). A detailed description of the procedure is provided, as follows:

i) The static water level was determined prior to any testing of the well.

ii) A datalogger, programmed to measure water pressure at an appropriate interval (e.g., 5 seconds), was installed in the well at a known depth.

iii) A slug of known dimensions was set in place just above the static water level.

iv) The slug was then released instantaneously until it was completely submerged in the water column.

v) After the initial positive displacement of the water column, water levels were monitored manually.

vi) When the water level reached approximately 90 percent of the original observed (static) water level, the slug was then rapidly removed from the water column to initiate a "rising-head" test.

4.2 Rising Head Test (Recovery Test)

The recovery test also involves causing a sudden change in water level in a well and measuring the water level response within that well. Water level change may be induced by suddenly removing a known quantity or "slug" out of the well. The slug is usually a stainless steel or polyvinyl chloride rod.

Recovery tests were carried out after the slug tests described above. Water level monitoring continued until the water level was within 10 percent of the original static level.

5. Guelph Permeameter Tests

The Guelph Permeameter (GP) is a well-known borehole permeameter technique. Guelph permeameter measurements are carried out in the vadose zone above the water table, where the soil is unsaturated. Steady flow produces a small inner saturated zone adjacent to the well, encased within a larger outer wetted, but unsaturated volume. As a consequence, combined saturated-unsaturated flow occurs.

The GP method measures the steady -state rate necessary to maintain a constant depth of water in an uncased cylindrical borehole above the water table. The field saturated hydraulic conductivity is calculated using an approximate analytical solution. A summary of field procedures is presented below:

- Excavate (hand dig) through fill material to expose native soil if necessary.
- Excavate a cylindrical borehole to the desired depth in the material to be tested.
- Fill the permeameter with water and place over the borehole.
- Start the permeameter by raising the air-inlet tube out of the outlet port.
- Set the desired H level by adjusting the height of the air-inlet tube.
- Monitor the rate of fall of the liquid surface in the reservoir until a steady rate, r, is attained.

The hydraulic conductivity measured in the unsaturated (vadose) zone is referred to as the “field-saturated” hydraulic conductivity (K*fs*) (after Reynolds et al., 1986). The Guelph Permeameter method measures the steady-state flow rate (Q) necessary to maintain a constant depth of water (H) in an uncased borehole. K*fs* is then calculated from Q and H using analytical solutions.

The analytical solution input parameters include the following:

- Reservoir cross sectional area
- Water height
- Borehole radius
- Soil texture
- Steady state rate of water level change

Appendix B
Stratigraphic Logs and Grain Size Analyses

Appendix B.1
Selected Stratigraphic and Instrumentation Logs

REFERENCE No.: 086822 ENCLOSURE No.: 1

BOREHOLE No.: BH01-16
ELEVATION: 260.66 m

BOREHOLE REPORT

Page: 1 of 1

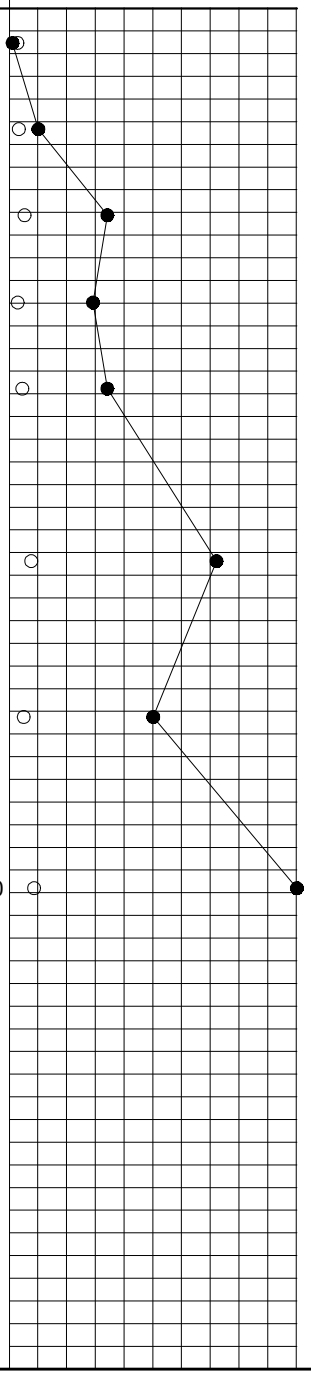
CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 5 August 2016 DATE (FINISH): 5 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

Depth Feet	Depth Metres	Elevation (m) 260.66	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
	0.03	260.63		GROUND SURFACE						
				TOPSOIL : 25 mm						
1				NATIVE : SAND, some silt, fine grained, well graded, trace gravel, rootlets, brown, moist, very loose		SS-1	50	3	1-0-1-1	1
2	0.76	259.90								
3	1.0					SS-2	50	3	1-4-6-8	10
4				SANDY SILT, trace to some clay and gravel, grey, moist, compact to dense						
5										
6						SS-3	100	5	4-21-13-12	34
7	2.0									
8	2.29	258.37		SAND, fine grained, well graded, trace gravel, trace granitic cobbles, brown, moist, dense		SS-4	83	3	7-14-15-14	29
9										
10	3.0									
11						SS-5	83	4	6-13-21-27	34
12										
13	4.0									
14										
15				becoming very dense						
16						SS-6	87	8	27-34-38-48	72
17	5.0									
18										
19										
20	6.0									
21	6.10	254.56		SILT, some sand, trace gravel, brown, moist, very dense		SS-7	100	5	16-50	50
22										
23	7.0									
24										
25										
26	7.90	252.76		granitic cobbles		SS-8	100	9	16-50/ 125mm	100
27	8.0			**END OF BOREHOLE:**						
28										
29				NOTE :						
30	9.0			End of Borehole at 7.90 m bgs						
31				Borehole was dry upon completion						
32				Borehole backfilled with enviroplug medium to the top						
33	10.0			bgs denotes 'below ground surface'						
34										
35										
36	11.0									
37										
38										
39										



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 2

BOREHOLE No.: BH02-16
ELEVATION: 255.98 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 5 August 2016 DATE (FINISH): 5 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

Depth Feet	Depth Metres	Elevation (m) 255.98	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
	GROUND SURFACE									
	0.03	255.95		TOPSOIL : 25 mm						
1				NATIVE : SAND and SILT, trace to some gravel, rootlets, grey, moist, compact		SS-1	75	3	1-6-6-8	12
2										
	0.76	255.22								
3	1.0			SILTY SAND, trace gravel, brown, moist, dense to compact		SS-2	83	10	3-14-21-23	35
4										
5						SS-3	42	10	9-12-13-19	25
6										
7	2.0									
8				dense		SS-4	71	5	7-20-27-40	47
9										
10	3.0									
11	3.35	252.63				SS-5	75	7	10-19-28-33	47
12				SAND, trace silt and gravel, layered, brown, moist, dense						
13	4.0									
14										
15	4.57	251.41								
16				SANDY SILT/SILTY SAND, brown, moist, very dense		SS-6	83	4	12-27-36-50	63
17	5.0									
18										
19										
20	6.0									
21						SS-7	83	2	7-22-32-42	54
22										
23	7.0									
24										
25				silty sand layer		SS-8	94	14	22-32-50	82
26	8.0									
27	8.08	247.90								
28				**END OF BOREHOLE:**						
29										
30	9.0			NOTE : End of Borehole at 8.08 m bgs Borehole was dry upon completion Borehole backfilled with enviroplug medium to the top bgs denotes 'below ground surface'						
31										
32										
33	10.0									
34										
35										
36	11.0									
37										
38										
39										

10 20 30 40 50 60 70 80 90

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 3

BOREHOLE No.: BH03-16
ELEVATION: 254.46 m

BOREHOLE REPORT

Page: 1 of 1

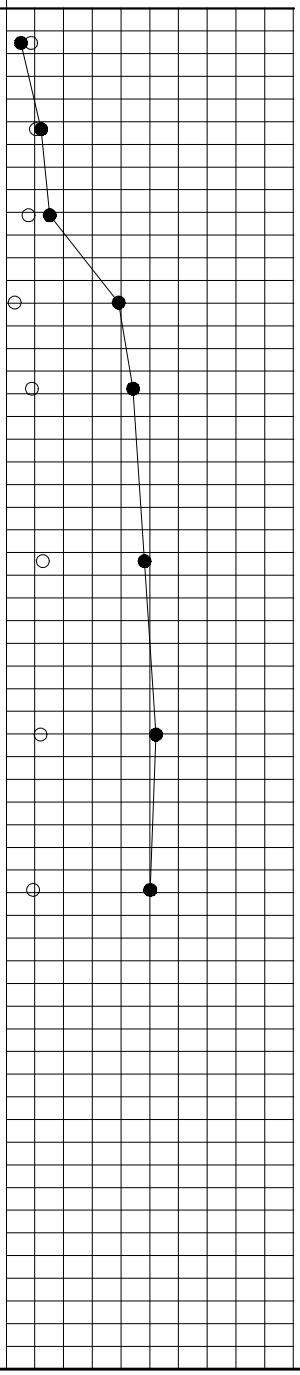
CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 8 August 2016 DATE (FINISH): 8 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
		254.46		GROUND SURFACE						
	0.04	254.42		TOPSOIL with organics : 35 mm						
1				NATIVE : SAND and SILT, trace to some gravel, rootlets, grey, moist, loose		SS-1	62	9	1-2-3-7	5
2	0.76	253.70		SAND, trace silt, occasional sand and silt layers, brown, moist, compact to dense		SS-2	50	10	5-6-6-8	12
3	1.0									
4										
5						SS-3	58	8	4-5-10-15	15
6										
7	2.0					SS-4	71	3	6-18-21-25	39
8										
9						SS-5	100	9	8-19-25-30	44
10	3.0									
11										
12										
13	4.0									
14										
15										
16						SS-6	87	13	10-20-28-32	48
17	5.0									
18										
19										
20	6.0			becoming very dense						
21						SS-7	75	12	11-25-27-33	52
22										
23	7.0									
24										
25										
26	7.93	246.53				SS-8	50	9	17-50	50
27	8.0			**END OF BOREHOLE:**						
28										
29				NOTE :						
30	9.0			End of Borehole at 7.93 m bgs						
31				Borehole was dry upon completion						
32				Borehole backfilled with enviroplug medium to the top						
33	10.0			bgs denotes 'below ground surface'						
34										
35										
36	11.0									
37										
38										
39										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 4

BOREHOLE No.: BH04-16
ELEVATION: 246.73 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 8 August 2016 DATE (FINISH): 8 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) 246.73	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
	0.03	246.70		TOPSOIL with organics : 25 mm						
1				NATIVE : SAND, some silt, trace to some gravel, brown, damp, loose		SS-1	50	5	2-3-4-4	7
3	1.0					SS-2	50	1	1-3-2-3	5
5				occasional sand and silt layers, moist		SS-3	71	3	2-4-5-6	9
7	2.0			becoming dense		SS-4	83	3	5-12-19-21	31
9	3.0					SS-5	92	3	8-18-19-22	37
11	4.0									
13						SS-6	92	7	10-18-22-31	40
15	5.0									
17	6.0									
19				trace clay and gravel, occasional sand and silt layers, brown, moist, very dense		SS-7	71	19	11-26-32-38	58
21	7.0									
23				some silt, trace gravel, greyish brown		SS-8	100	2	12-25-36-50	61
25	8.0									
27	8.23	238.50		**END OF BOREHOLE:**						
29	9.0			NOTE : End of Borehole at 8.23 m bgs Borehole was dry upon completion Borehole backfilled with enviroplug medium to the top bgs denotes 'below ground surface'						
31										
33	10.0									
35										
37	11.0									
39										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 5

BOREHOLE No.: BH05-16
ELEVATION: 253.57 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 9 August 2016 DATE (FINISH): 9 August 2016

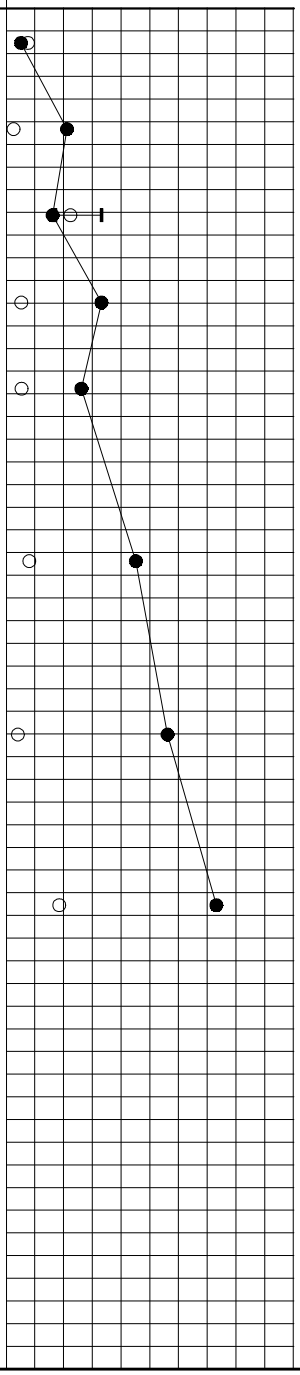
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) 253.57	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
				GROUND SURFACE						
	0.03	253.54		TOPSOIL with organics : 25 mm						
1				NATIVE : SAND, some silt, trace to some gravel,		SS-1	58	7	1-2-3-7	5
2				brown, damp to dry, loose						
	0.76	252.81								
3	1.0			SILTY CLAY, trace gravel, grey, moist,		SS-2	87	2	3-13-8-7	21
4				stiff to very stiff						
5										
6						SS-3	50	22	5-7-9-10	16
7	2.0									
	2.13	251.44		SAND, fine grained, some silt, brown,						
8				moist, dense		SS-4	75	5	6-15-18-14	33
9										
10	3.0					SS-5	67	5	11-16-10-11	26
11										
12				auger grinding						
13	4.0									
14										
15				occasional sansy silt layers, varved						
16						SS-6	83	8	10-18-27-37	45
17	5.0									
18										
19										
20	6.0									
21				some silt, trace gravel, brown, moist,		SS-7	100	4	13-24-32-40	56
22				very dense						
23	7.0									
24										
25										
26	7.93	245.64				SS-8	92	18	10-30-43-50/ 125mm	73
	8.0			SILT, some clay, trace sand and gravel,						
27	8.23	245.34		grey, moist, very dense						
28										
29				**END OF BOREHOLE:**						
30	9.0									
31				NOTE :						
32				End of Borehole at 8.23 m bgs						
33	10.0			Borehole was dry upon completion						
34				Borehole backfilled with enviroplug						
35				medium to the top						
36	11.0			bgs denotes 'below ground surface'						
37										
38										
39										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 6

BOREHOLE No.: BH06-16
ELEVATION: 243.44 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 12 August 2016 DATE (FINISH): 12 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
		243.44		GROUND SURFACE						
1–3	1.0			REWORKED NATIVE : SILTY SAND, some gravel, trace topsoil and rootlets, brown, damp to moist, compact		SS-1	62	6	7-11-9-9	20
						SS-2	67	8	3-6-8-7	14
5	1.52	241.92		NATIVE : SILTY SAND TILL, some gravel, brown, moist, compact		SS-3	62	5	7-13-14-12	27
6–7	2.0			becoming dense						
						SS-4	75	6	10-19-20-24	39
9–10	3.0			auger refusal, very dense		SS-5	100	6	50/ 75mm	100
12–13	4.0					SS-6	100	--	6/125mm	100
15–16	5.0					SS-7	83	5	16-41-45-49	86
17	5.18	238.26		**END OF BOREHOLE:**						

NOTE :
End of Borehole at 5.18 m bgs
Borehole was dry upon completion
Borehole backfilled with enviroplug medium to the top
bgs denotes 'below ground surface'

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 7

BOREHOLE No.: BH07-16
ELEVATION: 247.11 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 12 August 2016 DATE (FINISH): 12 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
		247.11		GROUND SURFACE						
1–2	0.46	246.65		RE-WORKED NATIVE : SAND and SILT, trace gravel, trace to some topsoil, brown, damp to moist, compact		SS-1	67	4	2-6-4-6	10
3–4	1.0			NATIVE : SAND, some silt, trace gravel, reddish brown to greyish brown, loose		SS-2	71	8	1-3-4-5	7
5–6						SS-3	71	9	2-4-6-7	10
7–8	2.0					SS-4	67	6	2-4-4-6	8
9–10	3.0					SS-5	92	10	1-3-5-7	8
11–12										
13–14	4.0			becoming brown, compact		SS-6	79	3	1-4-11-14	15
15–16						SS-7		8	7-12-15-18	27
17	5.0 5.18	241.93		**END OF BOREHOLE:**						
18–39	6.0 7.0 8.0 9.0 10.0 11.0			NOTE : End of Borehole at 5.18 m bgs Borehole was dry upon completion Borehole backfilled with enviroplug medium to the top bgs denotes 'below ground surface'						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 8

BOREHOLE No.: BH08-16
ELEVATION: 252.71 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 12 August 2016 DATE (FINISH): 12 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) 252.71	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
				GROUND SURFACE						
1 2				RE-WORKED NATIVE : SAND, some silt, trace gravel, some topsoil, light brown, moist, loose		SS-1	62	5	2-2-4-3	7
3	0.76	251.95								
3 4	1.0			NATIVE : SAND, some silt, trace gravel, light brown, moist, loose		SS-2	42	5	2-2-2-2	4
5 6						SS-3	58	5	1-1-2-2	3
7 8	2.0					SS-4	67	4	2-2-1-2	3
9	2.90	249.81								
10	3.0			CLAYEY SILT, some sand, trace gravel, grey, moist, stiff		SS-5	54	21	3-6-7-10	13
11 12 13	4.0									
14 15	4.57	248.14								
16	5.0			SANDY SILT TILL, some clay, trace gravel, grey, moist, compact		SS-6	96	8	8-9-11-13	20
17	5.18	247.53								
18 19				**END OF BOREHOLE:**						
20	6.0			NOTE : End of Borehole at 5.18 m bgs Borehole was dry upon completion Borehole backfilled with enviroplug medium to the top bgs denotes 'below ground surface'						
21 22 23	7.0									
24 25 26	8.0									
27 28 29	9.0									
30 31 32	10.0									
33 34 35										
36	11.0									
37 38 39										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 1

BOREHOLE No.: MW01-16
ELEVATION: 259.10 m

BOREHOLE REPORT

Page: 1 of 3

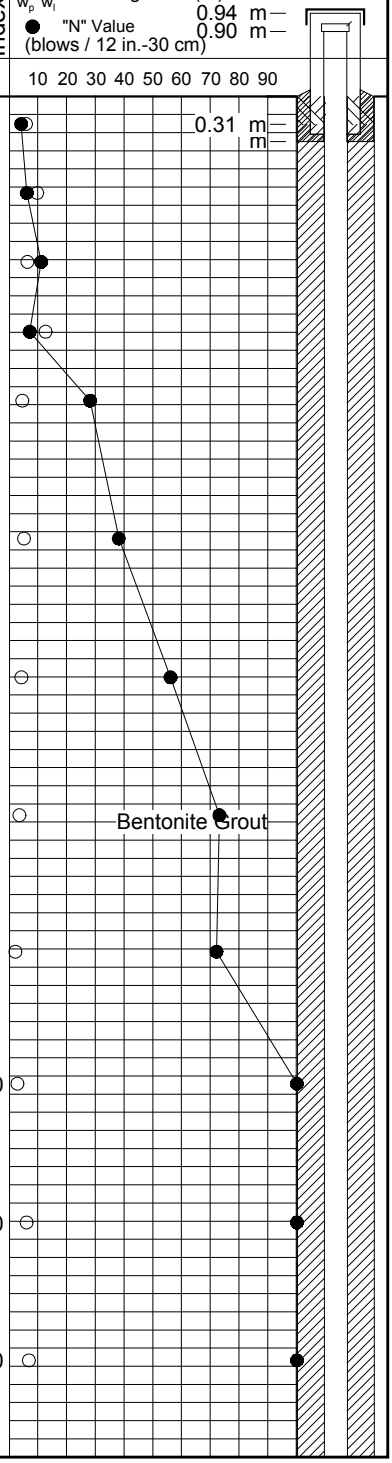
CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 2 August 2016 DATE (FINISH): 4 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) 259.10	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
	0.03	259.07		GROUND SURFACE						
1				TOPSOIL with organics : 25 mm						
2				NATIVE : SAND, some silt, trace gravel, rootlets, light reddish brown, dry to damp, loose		SS-1	62	6	1-2-2-3	4
3	1.0					SS-2	21	10	1-2-4-5	6
4				compact		SS-3	46	6	5-6-5-5	11
5										
6	2.0			fine grained, grey, loose		SS-4	79	13	2-3-4-3	7
7										
8				some silt, trace to some gravel, moist, compact		SS-5	100	4	9-12-16-18	28
9	3.0									
10										
11										
12	4.0									
13				becoming dense		SS-6	92	5	3-16-22-23	38
14										
15	5.0									
16										
17				very dense		SS-7	96	4	14-21-35-43	56
18	6.0									
19										
20										
21	7.0									
22										
23				thin dark bands, layered		SS-8	100	3	19-34-39-44	73
24	8.0									
25										
26										
27	9.0									
28						SS-9	92	2	14-28-44-50/ 75mm	72
29										
30	10.0									
31										
32										
33	11.0					SS-10	87	3	18-35-50/ 125mm	100
34										
35										
36	12.0									
37										
38						SS-11	83	6	14-33-50/ 125mm	100
39	13.0									
40										
41										
42	14.0					SS-12	75	7	15-40-50/ 125mm	100
43										
44										
45										
46										
47										
48										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 1

BOREHOLE No.: MW01-16
ELEVATION: 259.10 m

BOREHOLE REPORT

Page: 2 of 3

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 2 August 2016 DATE (FINISH): 4 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
		259.10		GROUND SURFACE						
	16.0					SS-13	75	1	15-42-50/ 100mm	100
	17.0					SS-14	37	2	30-50/ 75mm	100
	18.0					SS-15	62	4	18-41-50/ 75mm	100
	19.0									
	20.0					SS-16	50	2	19-50	50
	21.0									
70	21.54	237.56		SILT, trace sand and clay, greyish brown, moist, very dense		SS-17	67	18	21-33-50/ 100mm	100
	22.0									
	23.0					SS-18	92	1	20-40-43-45	83
	24.0									
	25.0					SS-19	83	3	25-45-50/ 125	100
	26.0			becoming wet		SS-20	83	15	18-32-24-50	56
	27.0									
	28.0			trace sand and clay, grey		SS-21	92	15	17-45-50	95
	29.0					SS-22	96	18	10-21-38-50	59

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

Bentonite Grout
23.78 m
#2 Granitic Sand
Bentonite Pellets
Screen

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 1

BOREHOLE No.: MW01-16
ELEVATION: 259.10 m

BOREHOLE REPORT

Page: 3 of 3

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 2 August 2016 DATE (FINISH): 4 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR
		259.10		GROUND SURFACE			%			N
99						SS-23	100	15	13-27-50-0	77
100	30.49	228.61		**END OF BOREHOLE:** NOTE : End of Borehole at 30.18 m bgs Borehole was dry upon completion 50 mm diameter monitoring well installed at 30.49 m bgs bgs denotes 'below ground surface'						
101										
102	31.0									
103										
104										
105	32.0									
106										
107										
108	33.0									
109										
110										
111	34.0									
112										
113										
114										
115	35.0									
116										
117										
118	36.0									
119										
120										
121	37.0									
122										
123										
124										
125	38.0									
126										
127										
128	39.0									
129										
130										
131	40.0									
132										
133										
134										
135	41.0									
136										
137										
138	42.0									
139										
140										
141	43.0									
142										
143										
144	44.0									
145										
146										
147										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

30.49 m

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 2

BOREHOLE No.: MW02-16
ELEVATION: 252.45 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 9 August 2016 DATE (FINISH): 9 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) 252.45	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
	0.04	252.41		GROUND SURFACE						
1				TOPSOIL with organics : 35 mm						
2				NATIVE : SAND, some silt, trace clay and gravel, rootlets, brown, moist, loose		SS-1	50	5	1-3-3-4	6
3	1.0			compact		SS-2	50	7	3-5-7-9	12
4										
5	1.52	250.93		SAND and SILT, trace clay and gravel, grey, moist, compact		SS-3	50	9	6-11-15-14	26
6										
7	2.0			becoming loose		SS-4	100	4	5-3-4-11	7
8										
9										
10	3.0									
11	3.05	249.40		SAND, some silt to silty, brown, dry to damp, compact		SS-5	83	1	6-13-11-14	24
12										
13	4.0									
14										
15	4.57	247.88		becoming dense		SS-6	100	6	10-17-24-32	41
16	5.0									
17										
18										
19										
20	6.0									
21						SS-7	96	2	10-21-25-26	46
22										
23	7.0									
24										
25	7.62	244.83		very dense		SS-8	100	2	16-35-40-50	75
26	8.0									
27										
28										
29										
30	9.0			coarse sand, very dense		SS-9	100	2	12-27-30-36	57
31										
32										
33	10.0									
34										
35				fine sand		SS-10	100	3	14-23-33-38	56
36	11.0									
37										
38										
39	12.0									
40				layered/varved		SS-11	92	3	19-36-42-45	78
41										
42										
43	13.0									
44										
45										
46	14.0					SS-12	100	3	13-26-38-41	64
47										
48										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

0.96 m
0.90 m
0.31 m
m

Bentonite Grout

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 2

BOREHOLE No.: MW02-16
ELEVATION: 252.45 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 9 August 2016 DATE (FINISH): 9 August 2016

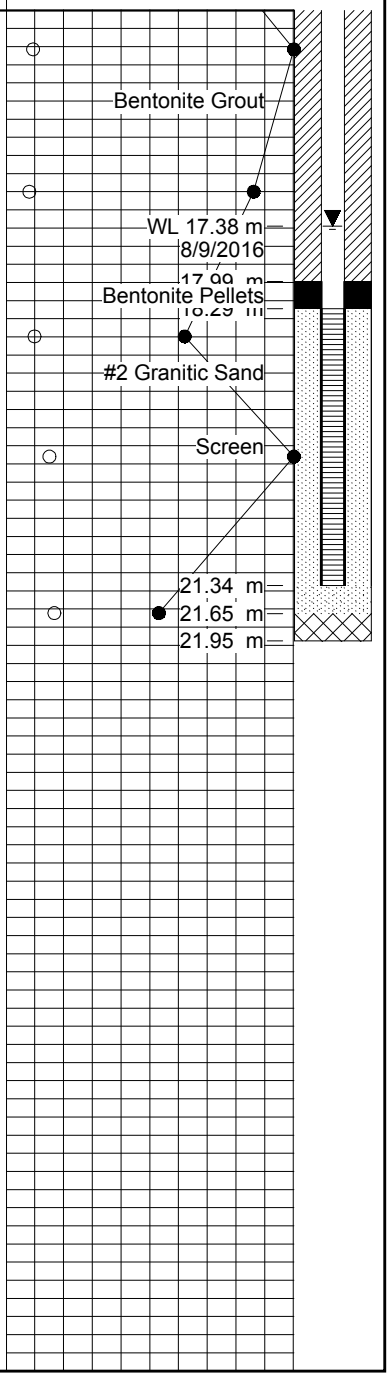
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR
		252.45		GROUND SURFACE			%			N
	16.0					SS-13	79	9	15-39-50/ 75mm	100
	16.92 / 17.0	235.53		SILTY SAND TILL, gravelly, brown, moist, very dense		SS-14	92	8	25-36-50	86
	18.0									
	18.60	233.85		SILTY SAND, trace clay and gravel, brown, wet, very dense sand heaving observed		SS-15	100	10	8-28-34-50	62
	19.0									
	19.82 / 20.0	232.63		SAND, trace silt, brown, wet, very dense		SS-16	100	15	22-50/ 50mm	100
	21.0									
	21.65	230.80		BOULDER/COBBLES, very dense		SS-17	50	17	10-23-30-50	53
	21.95 / 22.0	230.50								
	23.0			**END OF BOREHOLE:**						
	24.0			NOTE : End of Borehole at 21.95 m bgs Groundwater measured at 17.38 m bgs upon completion 50 mm diameter monitoring well installed at 21.34 m bgs Sand heaving encountered at 18.60 m bgs bgs denotes 'below ground surface'						
	25.0									
	26.0									
	27.0									
	28.0									
	29.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 3

BOREHOLE No.: MW03-16
ELEVATION: 246.14 m

BOREHOLE REPORT

Page: 1 of 2

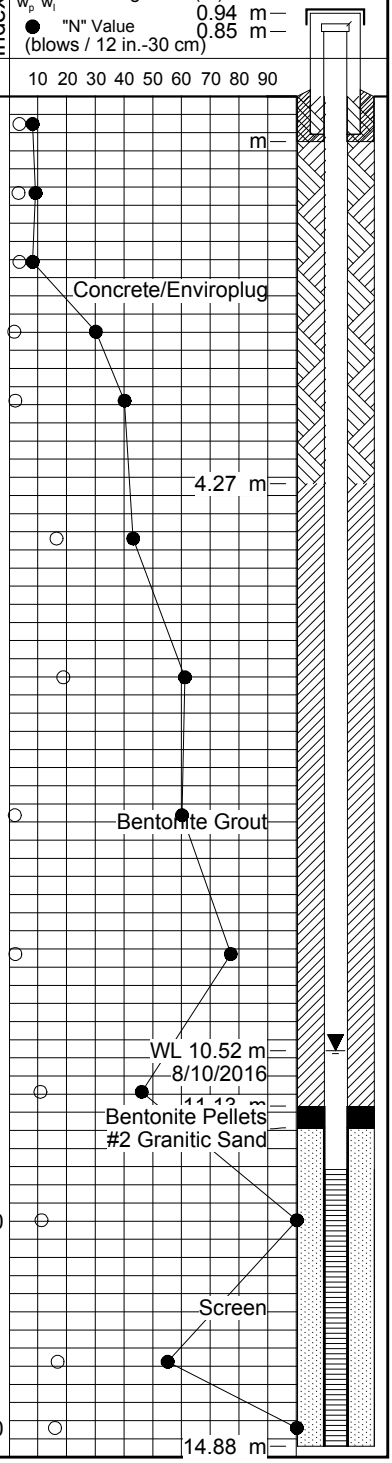
CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 10 August 2016 DATE (FINISH): 10 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) 246.14	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
				GROUND SURFACE						
1	0.15	245.99		TOPSOIL : 150 mm						
2				NATIVE : SAND, some silt, trace clay and gravel, brown, damp to dry, loose		SS-1	33	3	2-3-5-5	8
3	1.0					SS-2	71	3	4-4-5-5	9
4										
5										
6						SS-3	50	3	3-4-4-5	8
7	2.0									
8	2.29	243.85		greyish brown, moist, dense		SS-4	67	2	3-13-17-21	30
9										
10	3.0			damp to dry		SS-5	75	2	10-18-22-18	40
11										
12										
13	4.0									
14										
15										
16	5.0					SS-6	94	16	7-17-26-37	43
17										
18										
19	6.0									
20	6.10	240.04		some gravel, trace silt, brown, moist, very dense		SS-7	100	19	14-28-33-50	61
21										
22										
23	7.0									
24										
25				damp to dry						
26	8.0					SS-8	100	2	15-28-32-44	60
27										
28										
29	9.0									
30										
31						SS-9	100	2	13-33-44-48	77
32										
33	10.0									
34										
35										
36	11.0			dense		SS-10	100	11	13-23-23-38	46
37										
38										
39	12.0									
40	12.20	233.94		very dense		SS-11	100	11	17-38-50/ 75mm	100
41										
42										
43	13.0									
44										
45										
46	14.0					SS-12	100	17	1-5-50	55
47										
48						SS-13	100	16	2-28-50/	100
		231.26								

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)
10 20 30 40 50 60 70 80 90



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 3

BOREHOLE No.: MW03-16
ELEVATION: 246.14 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: S. Andreou CHECKED BY: F. Gergis
DATE (START): 10 August 2016 DATE (FINISH): 10 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N	Shear test (Cu) △ Field, Sensitivity (S) □ Lab, ○ Water content (%), w_p w_l Atterberg limits (%), ● "N" Value (blows / 12 in.-30 cm) 10 20 30 40 50 60 70 80 90
		246.14		GROUND SURFACE							
50	14.88			**END OF BOREHOLE:**					100mm		
51											
52	16.0			NOTE :							
53				End of Borehole at 14.88 m bgs							
54				Groundwater measured at 10.52 m bgs upon completion							
55				50 mm diameter monitoring well installed at 14.88 m bgs							
56	17.0			bgs denotes 'below ground surface'							
57											
58											
59	18.0										
60											
61											
62	19.0										
63											
64											
65											
66	20.0										
67											
68											
69	21.0										
70											
71											
72	22.0										
73											
74											
75	23.0										
76											
77											
78	24.0										
79											
80											
81											
82	25.0										
83											
84											
85	26.0										
86											
87											
88	27.0										
89											
90											
91	28.0										
92											
93											
94	29.0										
95											
96											
97											
98											

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 4

BOREHOLE No.: MW04-16
ELEVATION: 242.86 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: O. Sabeeh CHECKED BY: F. Gergis
DATE (START): 11 August 2016 DATE (FINISH): 11 August 2016

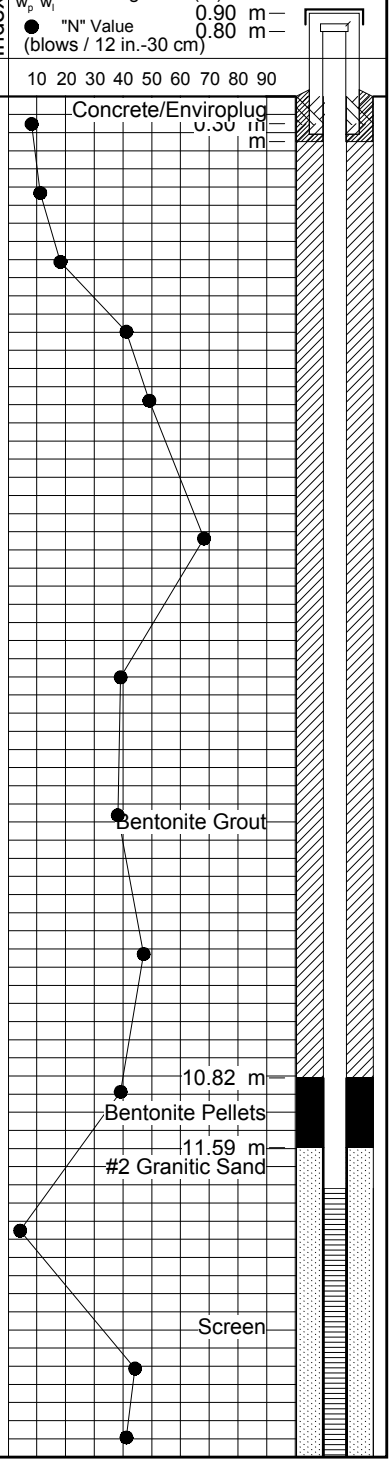
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
		242.86		GROUND SURFACE						
1				FILL : SAND, some silt, trace gravel, trace topsoil with rootlets, brown, damp to moist, loose		SS-1	30	--	2-3-5-4	8
2	0.76	242.10								
3	1.0			SILTY SAND, trace gravel, light brown, damp to dry, compact		SS-2	95	--	3-4-7-14	11
4										
5	1.52	241.34		NATIVE : SILTY SAND/SANDY SILT, trace gravel, dark brown, moist, compact		SS-3	90	--	5-9-9-11	18
6	2.0									
7										
8				trace gravel, rock fragments, dense		SS-4	90	--	11-17-24-25	41
9										
10	3.0					SS-5	90	--	12-24-25-29	49
11										
12										
13	4.0									
14										
15				becoming very dense						
16						SS-6	90	--	10-30-38-48	68
17	5.0									
18										
19										
20	6.0									
21						SS-7	90	--	8-15-24-25	39
22										
23	7.0									
24										
25	7.62	235.24		SAND, trace to some silt, trace gravel, brown, moist, dense		SS-8	90	--	7-14-24-25	38
26	8.0									
27										
28										
29	9.0									
30	9.15	233.71		SILTY SAND, tyrace gravel, brown, very moist, dense		SS-9	50	--	19-23-24-26	47
31										
32										
33	10.0									
34										
35	10.67	232.19		SILT, some sand, trace gravel, grey, very moist to saturated, very dense		SS-10	100	--	9-16-23-24	39
36	11.0									
37										
38										
39	12.0									
40	12.20	230.66		SILTY SAND, trace gravel, grey, saturated, loose		SS-11	100	--	1-2-2-4	4
41										
42										
43	13.0									
44										
45	13.72	229.14		SAND, trace silt and gravel, grey, saturated, dense		SS-12	100	--	6-17-27-40	44
46	14.0									
47										
48				very dense		SS-13	100	--	3-13-28-42	41

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

REFERENCE No.: 086822 ENCLOSURE No.: 4

BOREHOLE No.: MW04-16
ELEVATION: 242.86 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: County of Simcoe
PROJECT: Preliminary Geotechnical Investigation - Environmental Resource Recovery Centre (ERRC)
LOCATION: 2976 Horseshoe Valley Road West, Springwater
DESCRIBED BY: O. Sabeeh CHECKED BY: F. Gergis
DATE (START): 11 August 2016 DATE (FINISH): 11 August 2016

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- RC - ROCK CORE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery TCR %	Moisture Content	Blows per 6 in. / 15 cm or RQD	Penetration Index / SCR N
		242.86		GROUND SURFACE						
	15.09	227.77		**END OF BOREHOLE:** NOTE : End of Borehole at 15.09 m bgs Borehole dry upon completion 50 mm diameter monitoring well installed at 15.09 m bgs bgs denotes 'below ground surface'						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

15.09 m

SOIL LOG WITH GRAPH+WELL 086822.GPJ INSPEC_SOL.GDT 14/9/16

Appendix B.2
Grain Size Distribution Test Results

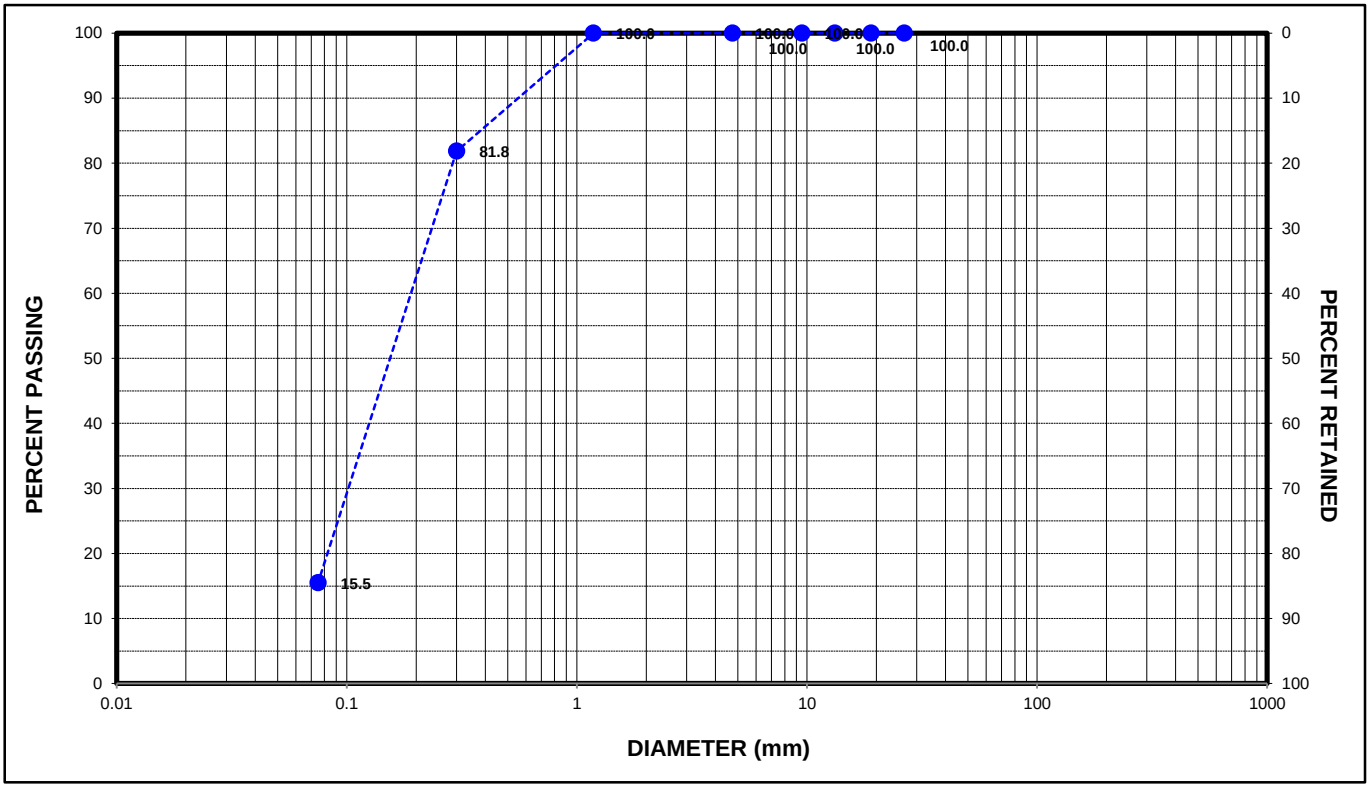
GRANULAR A - SIEVE ANALYSIS (PIT)
(LS-602)

Client:		**Lab no.:**	G1310
Project/Site:	Proposed Organics Processing and Material Management	**Project no.:**	086822

Source: BH1-16 SS2

Sampled by: Date sampled: August 11, 2016

Sieve Size (mm)	Sample % Passing	OPSS 1010 Gradation Specification		
		Minimum %	-	Maximum %
26.5	**100.0**	100	-	
19.0	**100.0**	85	-	100
13.2	**100.0**	65	-	90
9.50	**100.0**	50	-	73
4.75	**100.0**	35	-	55
1.180	**100.0**	15	-	40
0.300	**81.8**	5	-	22
0.075	**15.5**	2	-	8



Remarks: Gravel 0%, Sand 84% , Silt 16% (Sand, Some Silt)

Performed by:	Riddhee Panchal	**Date:**	August 23, 2016
Verified by:	Raj Kadia, C.E.T.	**Date:**	

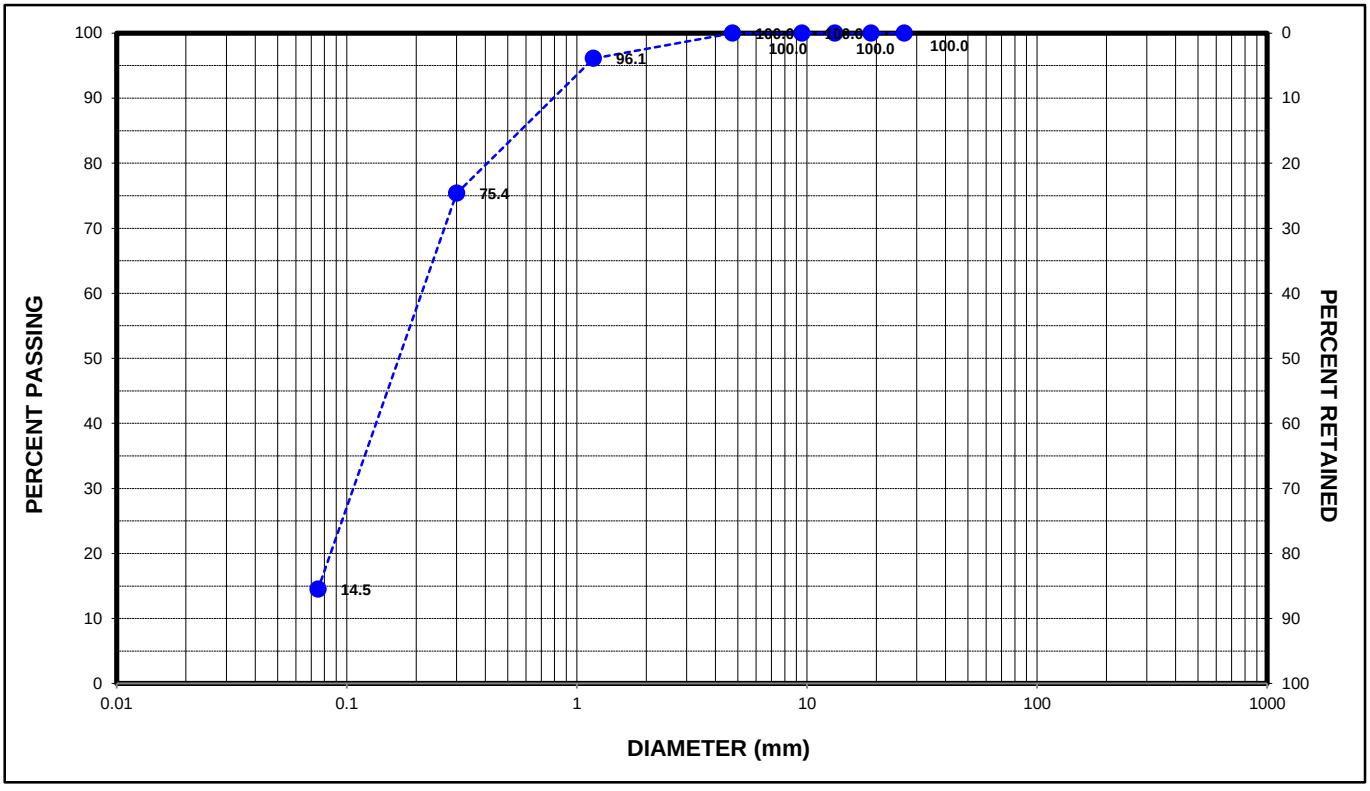
GRANULAR A - SIEVE ANALYSIS (PIT)
(LS-602)

Client:		**Lab no.:**	G1310
Project/Site:	Proposed Organics Processing and Material Management	**Project no.:**	086822

Source: BH4-16 SS2

Sampled by: Date sampled: August 11, 2016

Sieve Size (mm)	Sample % Passing	OPSS 1010 Gradation Specification		
		Minimum %	-	Maximum %
26.5	**100.0**	100	-	
19.0	**100.0**	85	-	100
13.2	**100.0**	65	-	90
9.50	**100.0**	50	-	73
4.75	**100.0**	35	-	55
1.180	**96.1**	15	-	40
0.300	**75.4**	5	-	22
0.075	**14.5**	2	-	8



Remarks: Gravel 0%, Sand 85% , Silt 15% (Sand, Some Silt)

Performed by:	Riddhee Panchal	**Date:**	August 23, 2016
Verified by:	Raj Kadia, C.E.T.	**Date:**	

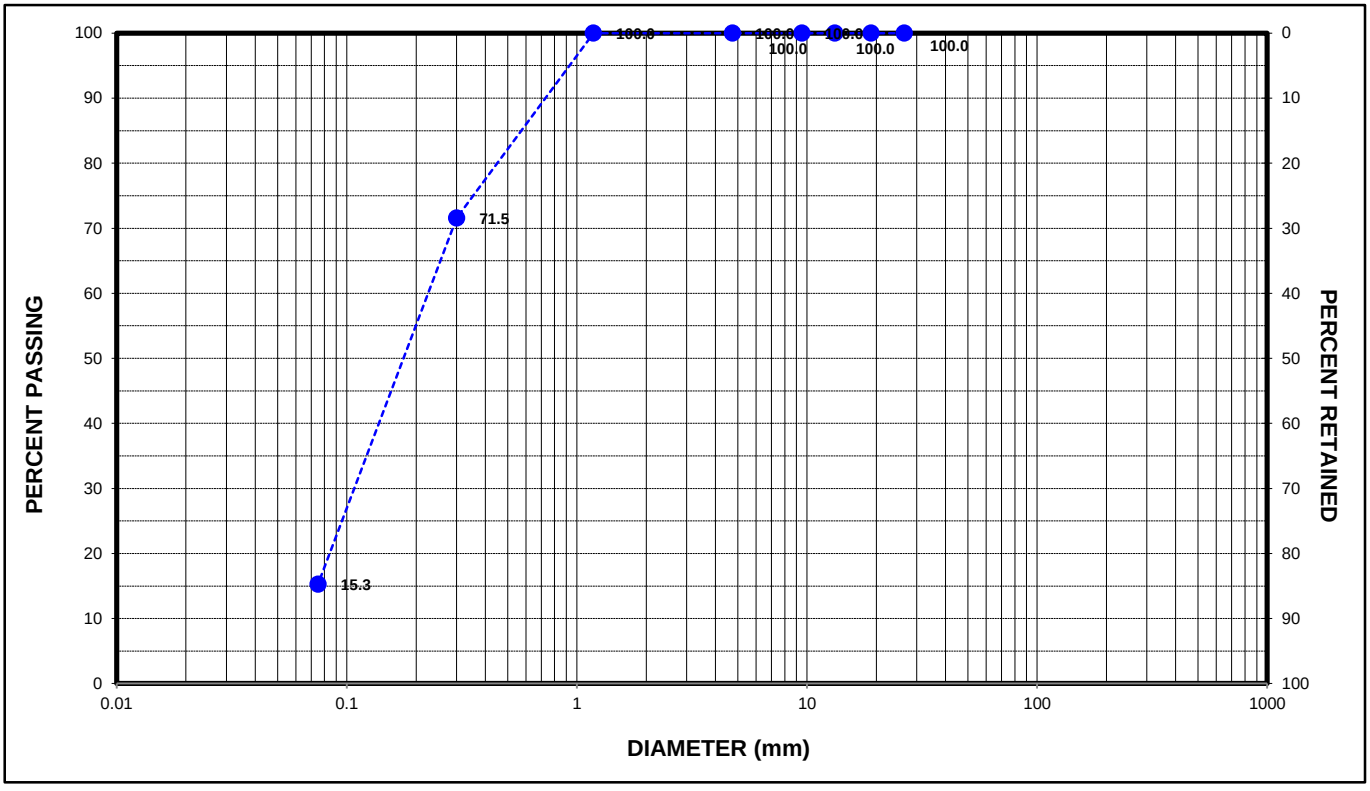
GRANULAR A - SIEVE ANALYSIS (PIT)
(LS-602)

Client:		**Lab no.:**	G1310
Project/Site:	Proposed Organics Processing and Material Management	**Project no.:**	086822

Source: BH7-16 SS2

Sampled by: Date sampled: August 11, 2016

Sieve Size (mm)	Sample % Passing	OPSS 1010 Gradation Specification		
		Minimum %	-	Maximum %
26.5	**100.0**	100	-	
19.0	**100.0**	85	-	100
13.2	**100.0**	65	-	90
9.50	**100.0**	50	-	73
4.75	**100.0**	35	-	55
1.180	**100.0**	15	-	40
0.300	**71.5**	5	-	22
0.075	**15.3**	2	-	8



Remarks: Gravel 0%, Sand 85% , Silt 15% (Sand, Some Silt)

Performed by:	Riddhee Panchal	**Date:**	August 23, 2016
Verified by:	Raj Kadia, C.E.T.	**Date:**	

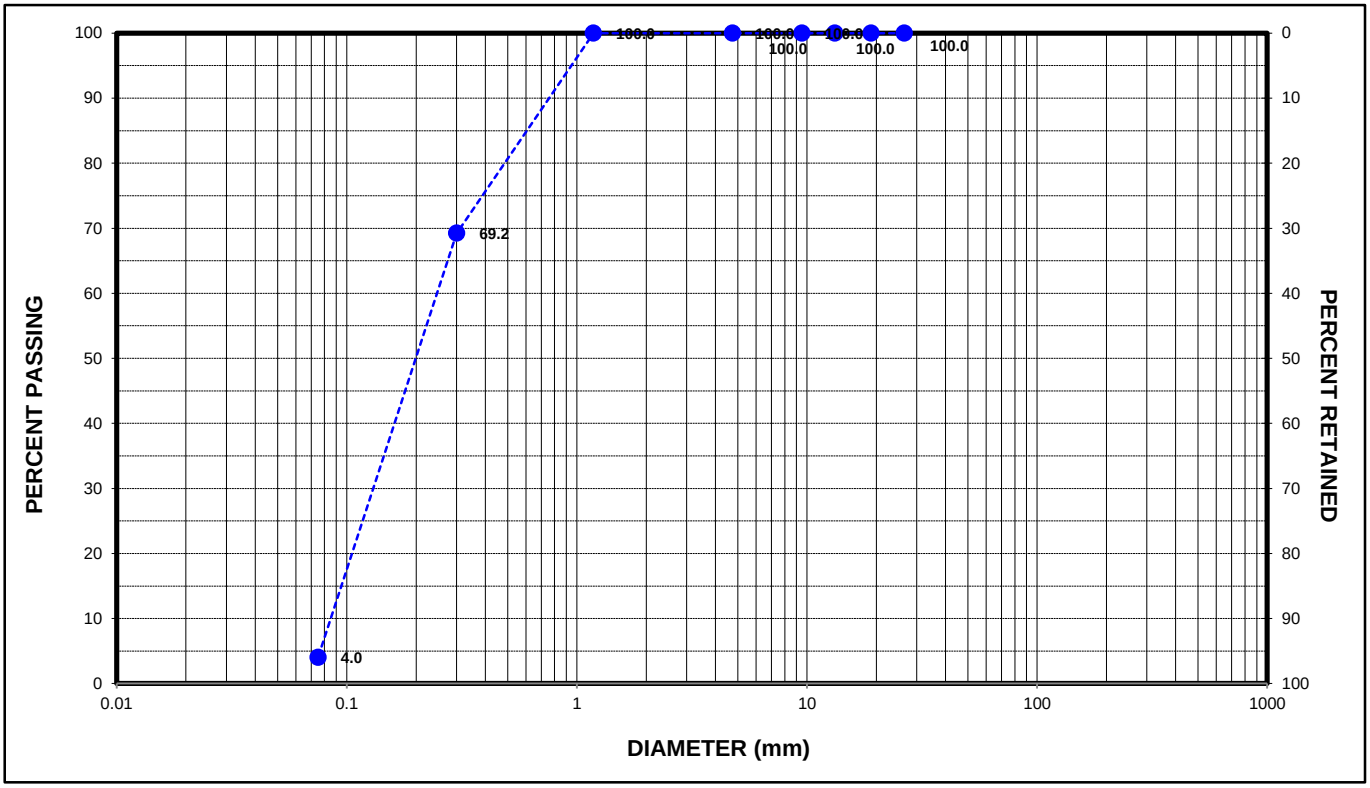
GRANULAR A - SIEVE ANALYSIS (PIT)
(LS-602)

Client:		**Lab no.:**	G1310
Project/Site:	Proposed Organics Processing and Material Management	**Project no.:**	086822

Source: BH8-16 SS2

Sampled by: Date sampled: August 11, 2016

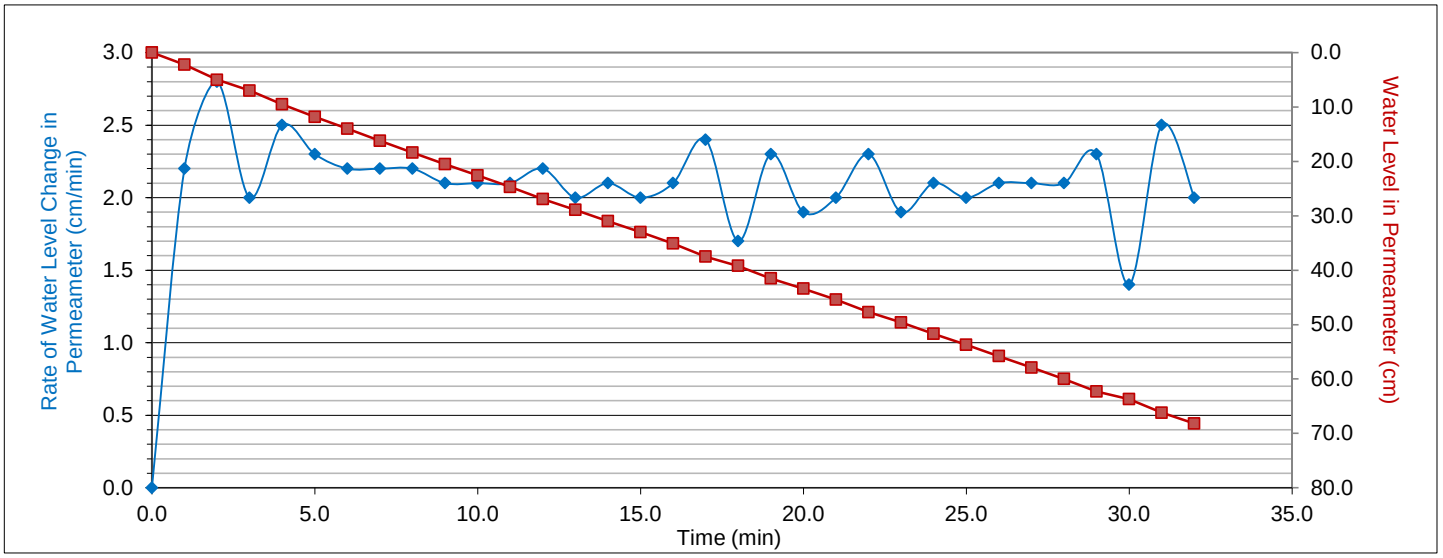
Sieve Size (mm)	Sample % Passing	OPSS 1010 Gradation Specification		
		Minimum %	-	Maximum %
26.5	**100.0**	100	-	
19.0	**100.0**	85	-	100
13.2	**100.0**	65	-	90
9.50	**100.0**	50	-	73
4.75	**100.0**	35	-	55
1.180	**100.0**	15	-	40
0.300	**69.2**	5	-	22
0.075	**4.0**	2	-	8



Remarks: Gravel 0%, Sand 96% , Silt 4% (Sand, Trace Silt)

Performed by:	Riddhee Panchal	**Date:**	August 23, 2016
Verified by:	Raj Kadia, C.E.T.	**Date:**	

Appendix C
Infiltration Analyses



depth of infiltration test = 0.71 *m BGS*

soil description: SAND with silt

grain size analysis results (%)		
gravel	sand	silt & clay
TBD	TBD	TBD

hydraulic conductivity, field saturated[(1)] (K_{fs}) = 1.07E-03 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 87 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm) *min/cm*

= 7 *min/cm*

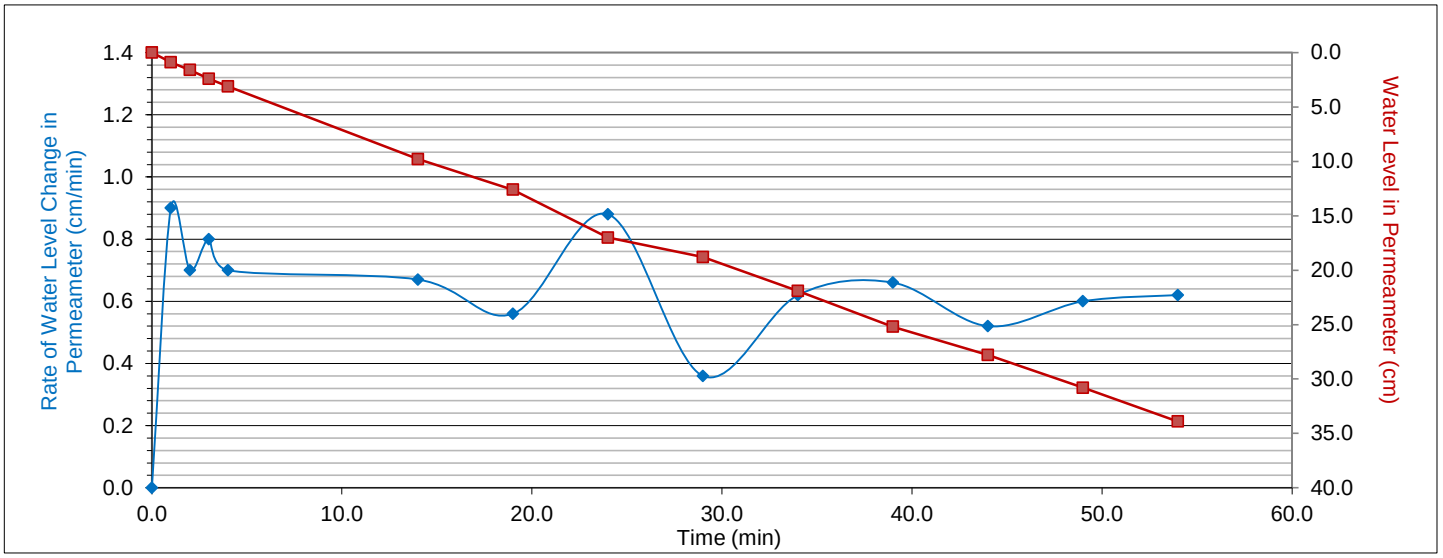
Notes: (1) see Figure C2 for calculation of K_{fs}

(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

GUELPH PERMEAMETER TEST RESULTS (GP01-16) **Figure C.1A**

086822



depth of infiltration test = 0.53 *m BGS*

soil description: SAND with silt

grain size analysis results (%)		
gravel	sand	silt & clay
TBD	TBD	TBD

hydraulic conductivity, field saturated[(1)] (K_{fs}) = 3.07E-04 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 62 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm) *min/cm*

= 10 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}

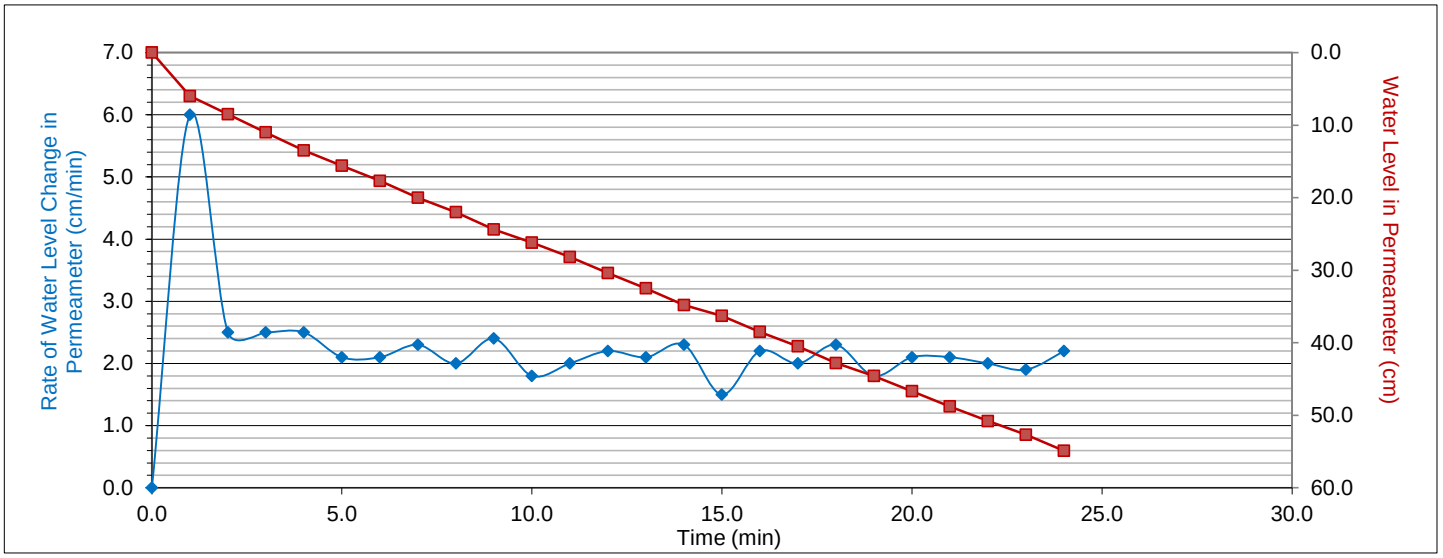
(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

GUELPH PERMEAMETER TEST RESULTS (GP02-16)

Figure C.2A

086822



depth of infiltration test = 0.49 *m BGS*

soil description: SAND with silt

grain size analysis results (%)		
gravel	sand	silt & clay
TBD	TBD	TBD

hydraulic conductivity, field saturated[(1)] (K_{fs}) = 1.07E-03 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 87 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm) *min/cm*

= 7 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}

(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

COUNTY OF SIMCOE
2976 HORSESHOE VALLEY ROAD WEST, SPRINGWATER, ONTARIO
ENVIRONMENTAL RESOURCE RECOVERY CENTRE (ERRC)

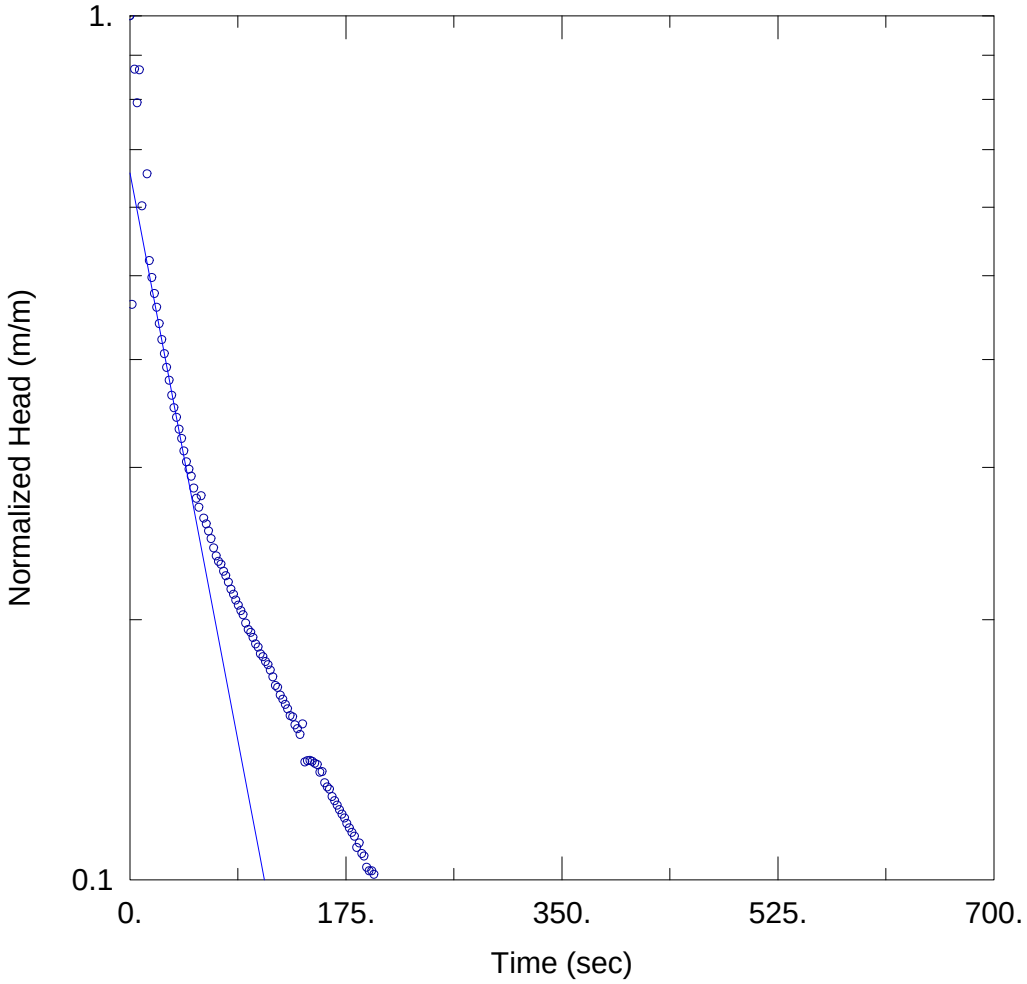
GUELPH PERMEAMETER TEST RESULTS (GP03-16) **Figure C.3A**

086822

Appendix D
Single Well Response Test Analyses

MW1-16 Falling Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	Location:
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW01-16 Falling Hvorslev.aqt
Date: 10/05/16 Time: 15:46:38

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.0009922 cm/sec y0 = 0.5404 m

AQUIFER DATA

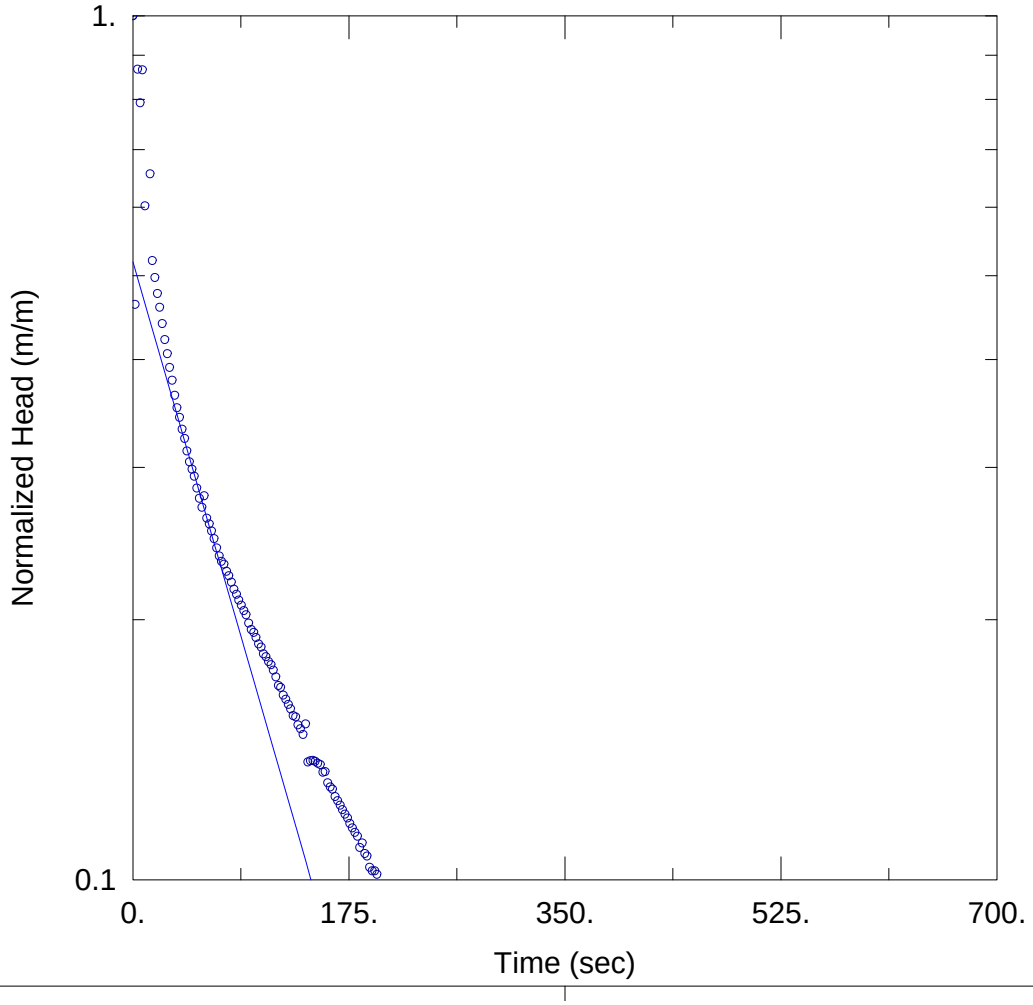
Saturated Thickness: 4.62 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-16)

Initial Displacement: 0.8216 m
Static Water Column Height: 4.62 m
Total Well Penetration Depth: 4.62 m
Screen Length: 3.09 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW1-16 Falling Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Falling.aqt
Date: 10/05/16 Time: 15:46:22

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0004716 cm/sec y0 = 0.4261 m

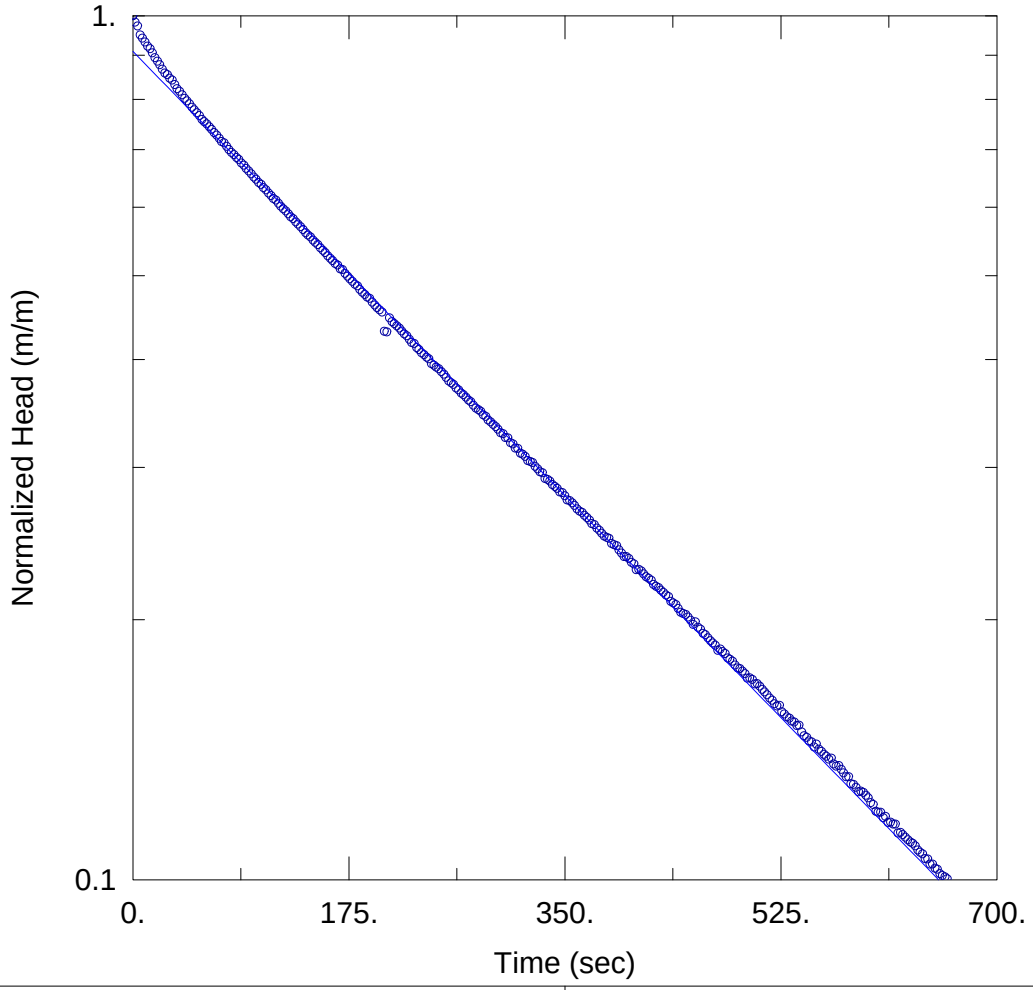
Saturated Thickness: 4.62 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-16)

Initial Displacement: 0.8216 m
Static Water Column Height: 4.62 m
Total Well Penetration Depth: 4.62 m
Screen Length: 3.09 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW1-16 Rising Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW01-16 Rising Hvorslev.aqt
Date: 10/05/16 Time: 15:46:33

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.000194 cm/sec y0 = 0.7168 m

AQUIFER DATA

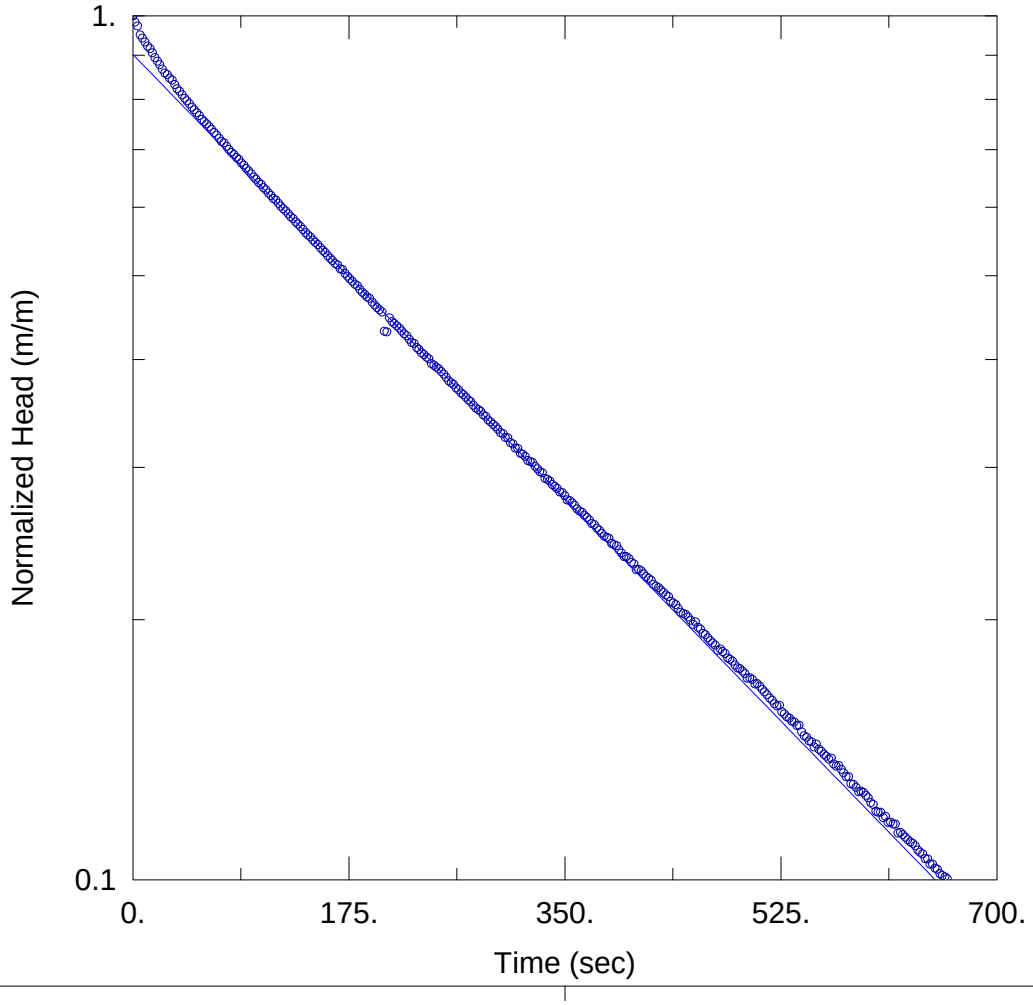
Saturated Thickness: 4.62 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1-16)

Initial Displacement: 0.7886 m
Static Water Column Height: 4.62 m
Total Well Penetration Depth: 4.62 m
Screen Length: 3.09 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW1-16 Rising Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising.aqt
Date: 10/05/16 Time: 15:46:27

Saturated Thickness: 4.62 m Anisotropy Ratio (Kz/Kr): 1.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

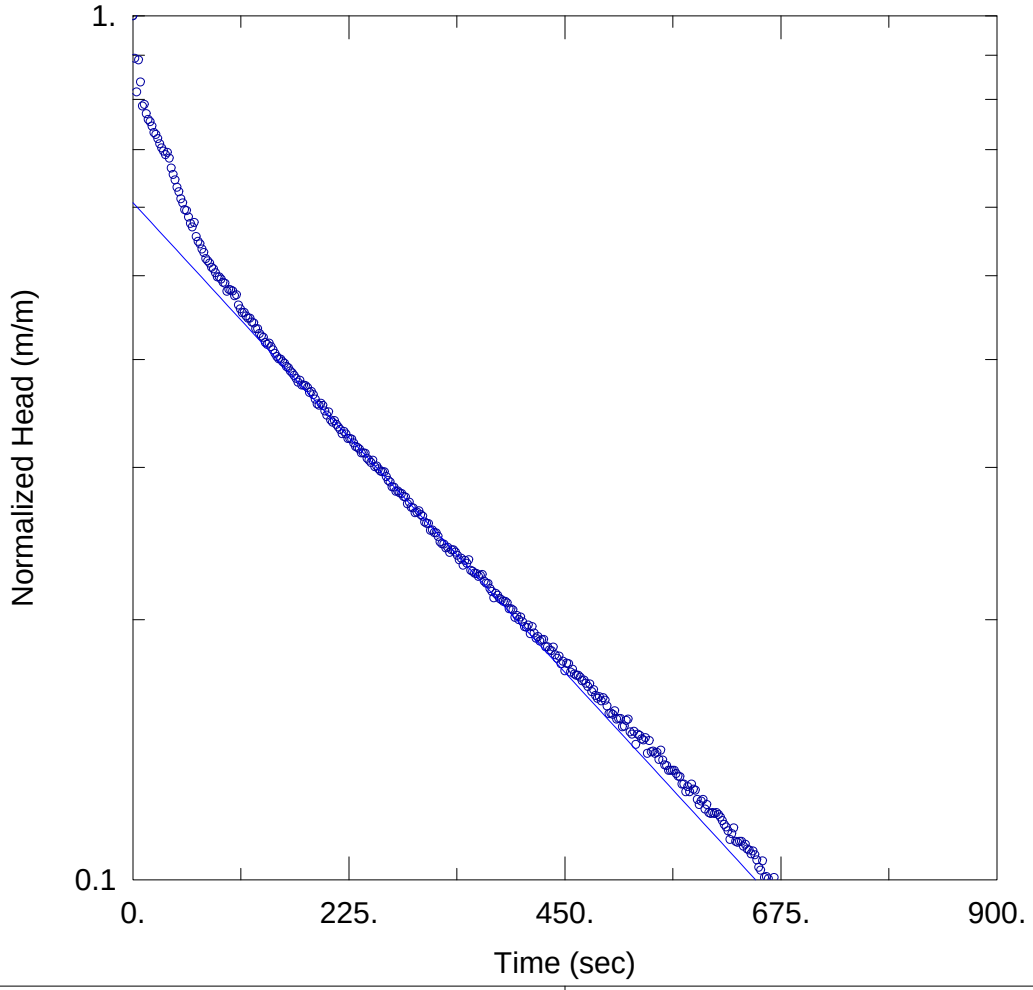
K = 0.00014 cm/sec y0 = 0.711 m

WELL DATA (MW1-16)

Initial Displacement: 0.7886 m
Static Water Column Height: 4.62 m
Total Well Penetration Depth: 4.62 m
Screen Length: 3.09 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW2-16 Falling Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\...\MW02-16 Falling Hvorslev.aqt
Date: 10/05/16 Time: 15:45:52

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.0001413 cm/sec y0 = 0.214 m

AQUIFER DATA

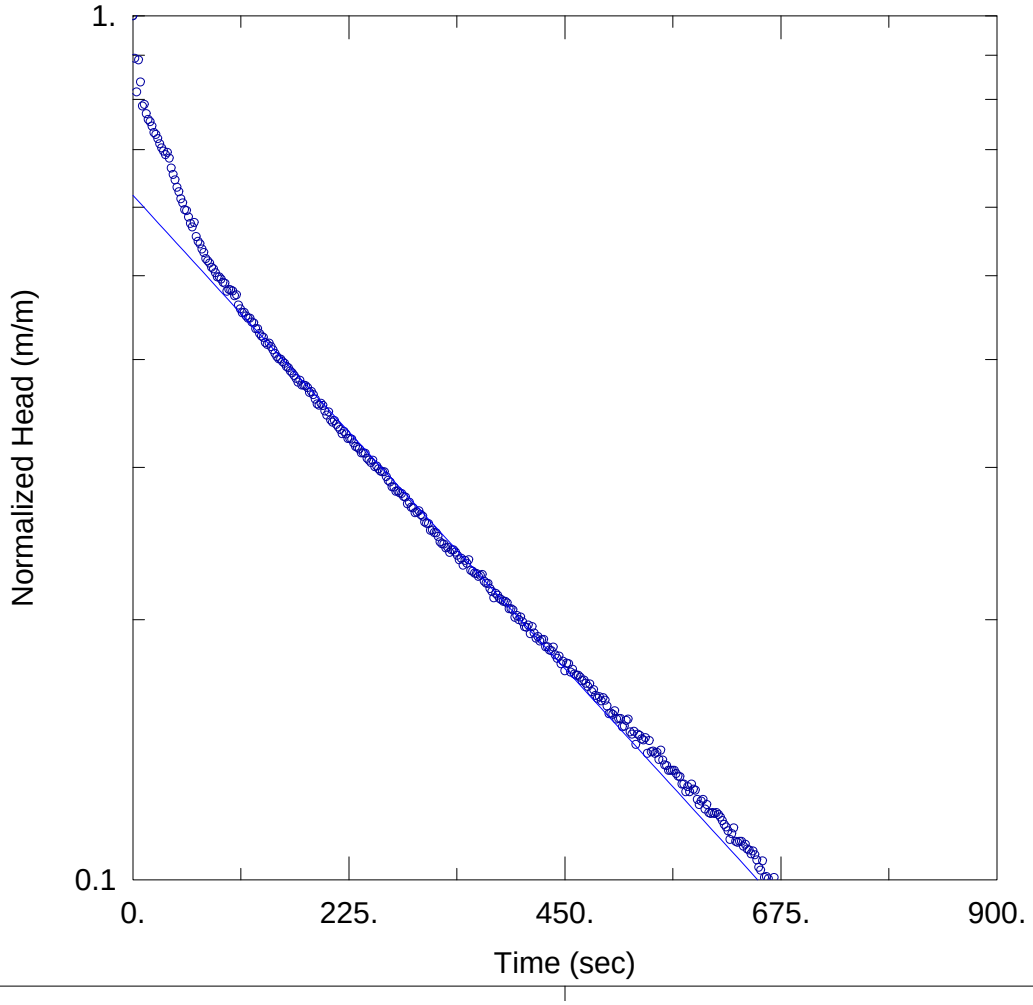
Saturated Thickness: 12.08 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-16)

Initial Displacement: 0.3521 m
Static Water Column Height: 12.08 m
Total Well Penetration Depth: 12.08 m
Screen Length: 3.04 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW2-16 Falling Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Falling.aqt
Date: 10/05/16 Time: 15:46:11

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00203 cm/sec y0 = 0.2182 m

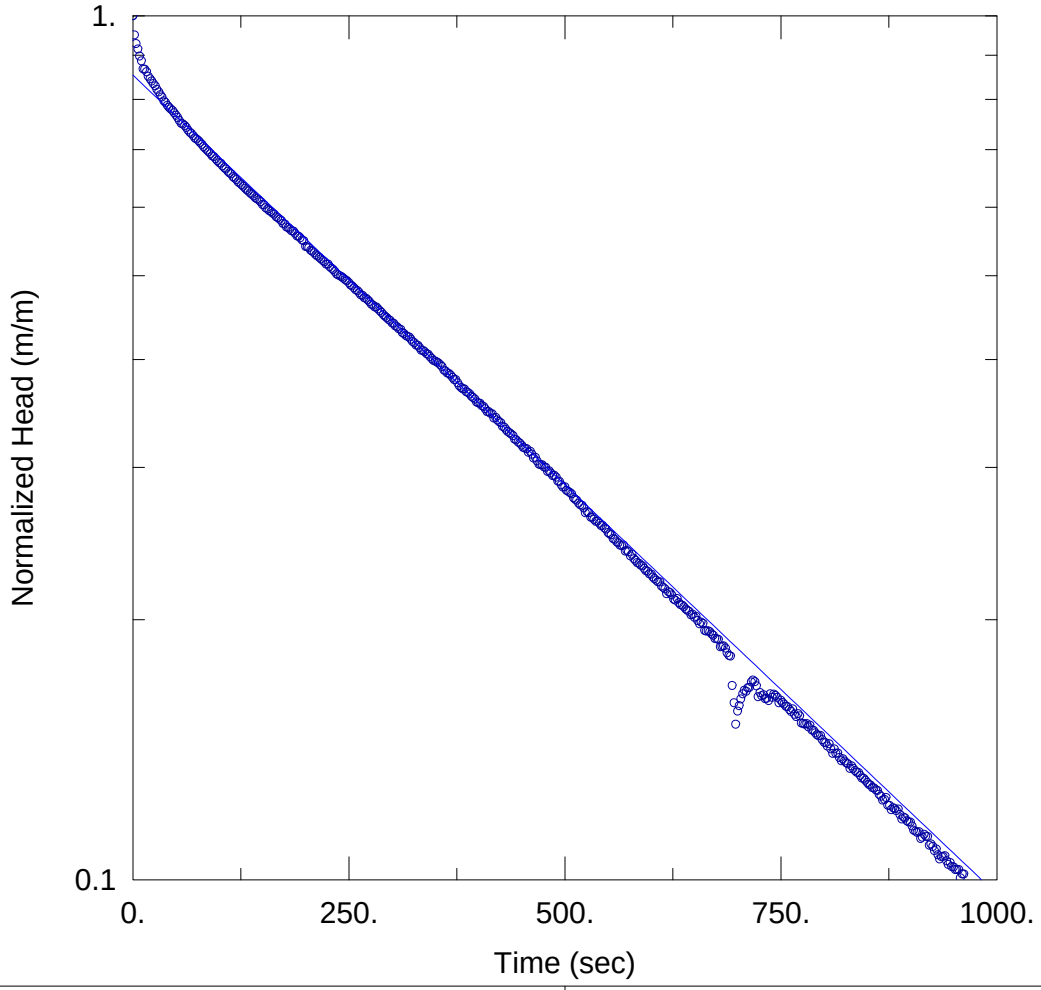
Saturated Thickness: 12.08 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-16)

Initial Displacement: 0.3521 m
Static Water Column Height: 12.08 m
Total Well Penetration Depth: 12.08 m
Screen Length: 3.04 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW2-16 Rising Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\...\MW02-16 Rising Hvorslev.aqt
Date: 10/05/16 Time: 15:45:58

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.0001108 cm/sec y0 = 0.6752 m

AQUIFER DATA

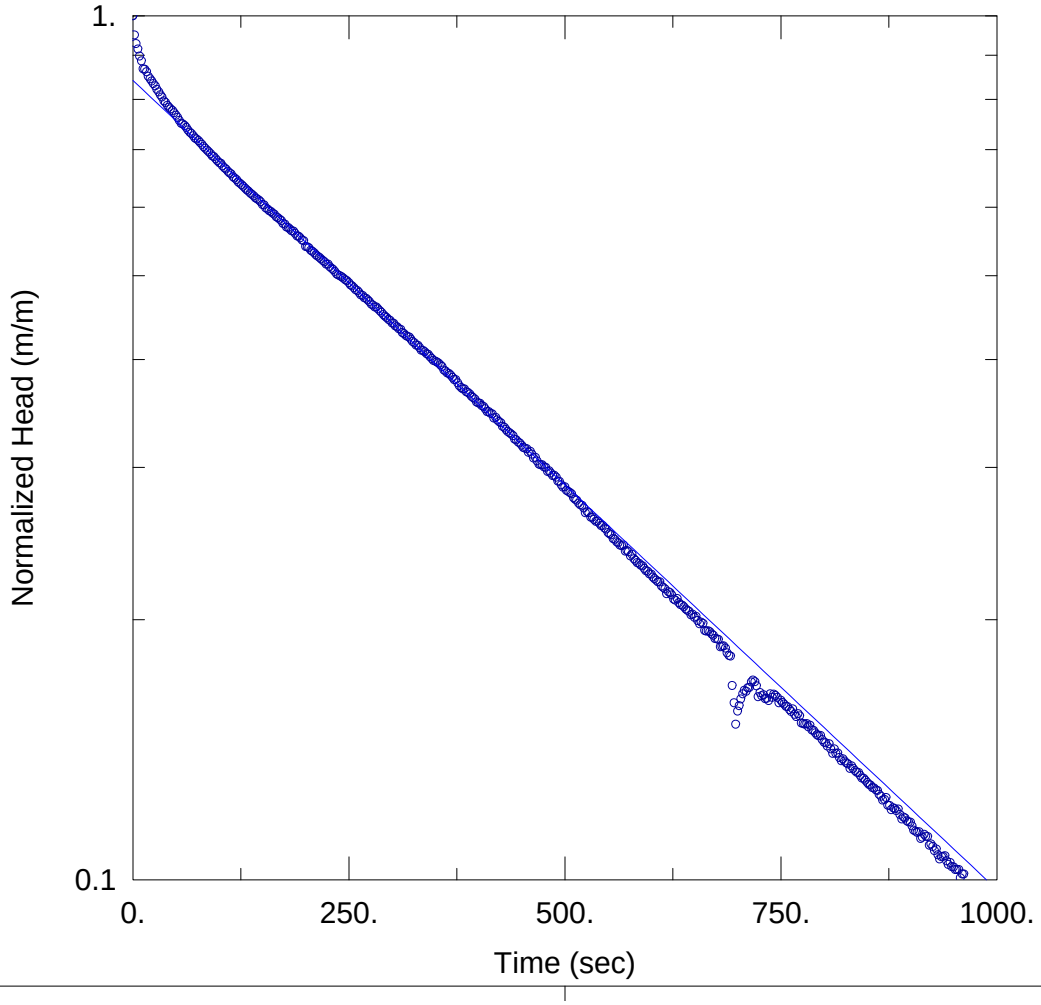
Saturated Thickness: 12.08 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-16)

Initial Displacement: 0.7912 m
Static Water Column Height: 12.08 m
Total Well Penetration Depth: 12.08 m
Screen Length: 3.04 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW2-16 Rising Head

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising.aqt
Date: 10/05/16 Time: 15:46:05

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.001562 cm/sec y0 = 0.6657 m

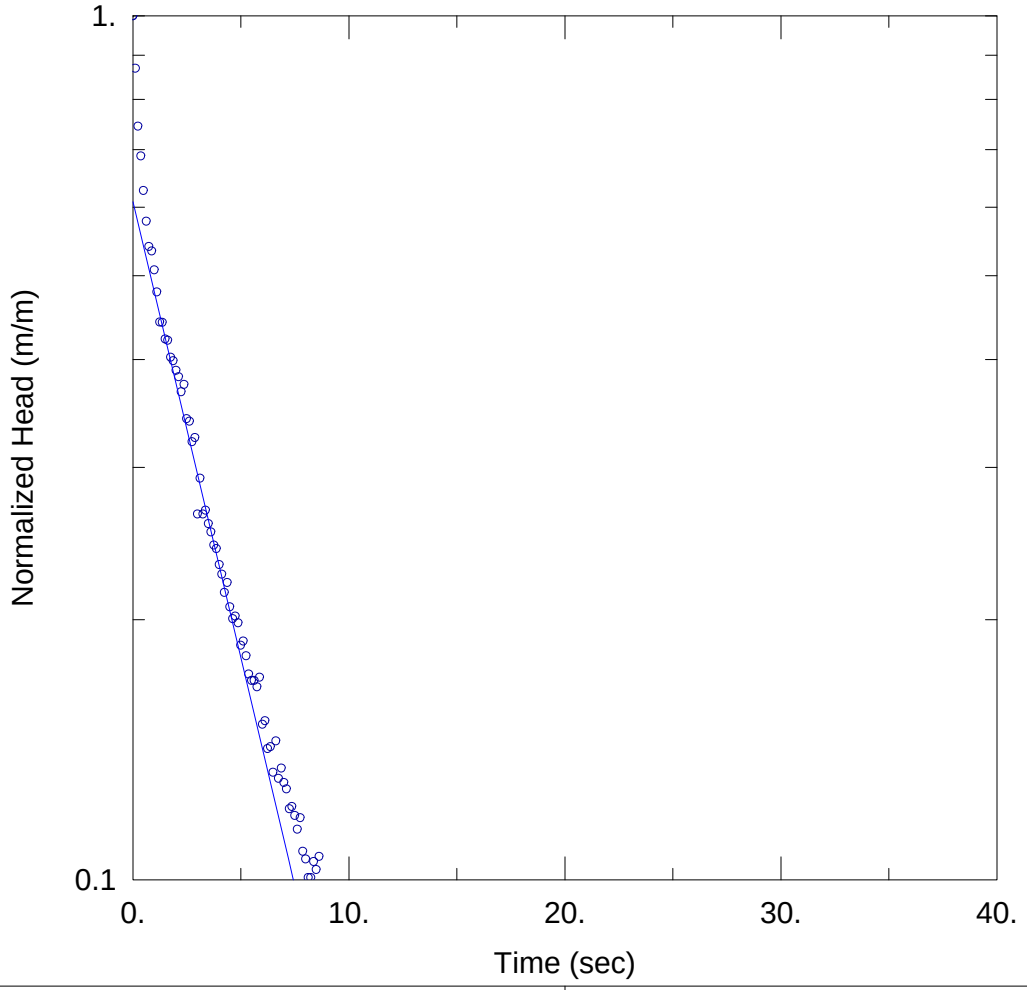
Saturated Thickness: 12.08 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2-16)

Initial Displacement: 0.7912 m
Static Water Column Height: 12.08 m
Total Well Penetration Depth: 12.08 m
Screen Length: 3.04 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW3-16 Rising Head 1

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW03-16 Rising 1 Hvorslev.aqt
Date: 10/05/16 Time: 15:45:38

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.01437 cm/sec y0 = 0.08419 m

AQUIFER DATA

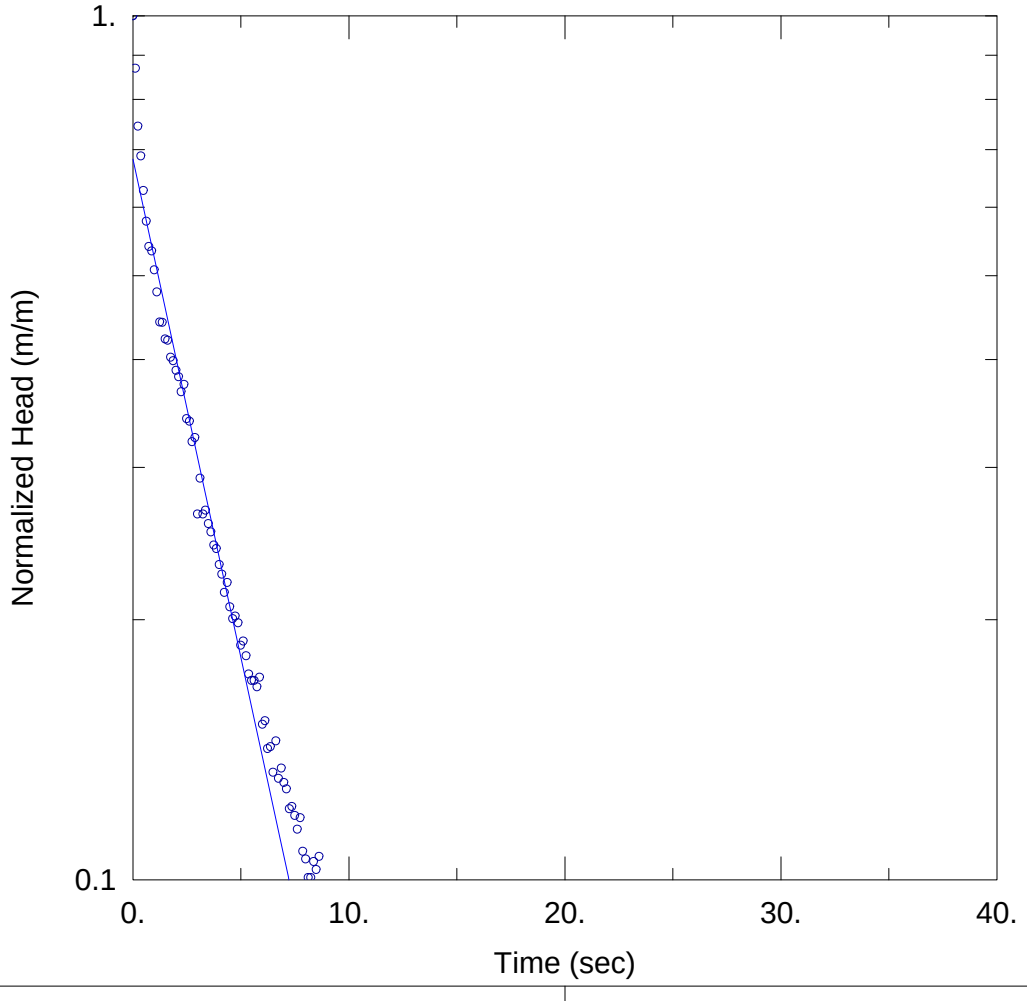
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3-16)

Initial Displacement: 0.1382 m
Static Water Column Height: 3.58 m
Total Well Penetration Depth: 4.43 m
Screen Length: 2.98 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW3-16 Rising Head 1

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising 1.aqt
Date: 10/05/16 Time: 15:45:33

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.01131 cm/sec y0 = 0.09426 m

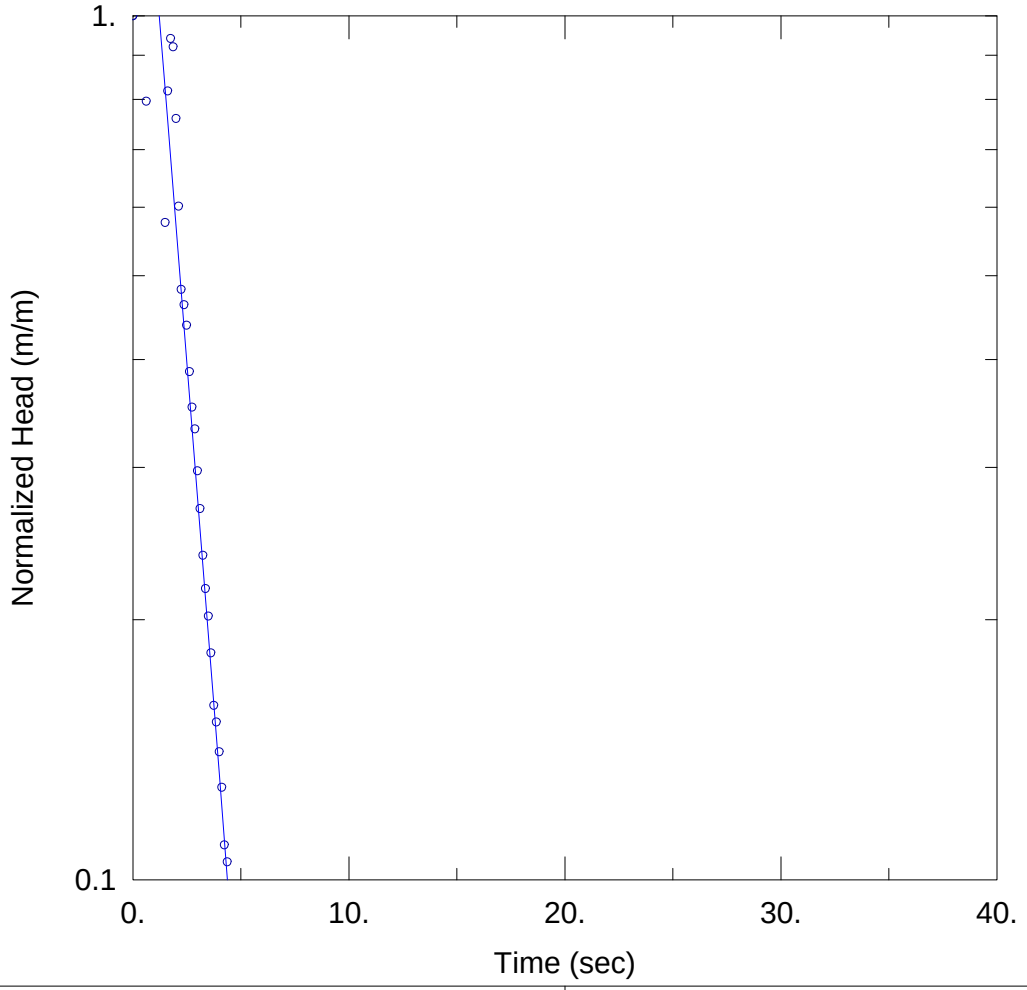
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3-16)

Initial Displacement: 0.1382 m
Static Water Column Height: 3.58 m
Total Well Penetration Depth: 4.43 m
Screen Length: 2.98 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW3-16 Rising Head 2

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW03-16 Rising 2 Hvorslev.aqt
Date: 10/05/16 Time: 15:45:26

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.04304 cm/sec y0 = 0.7513 m

AQUIFER DATA

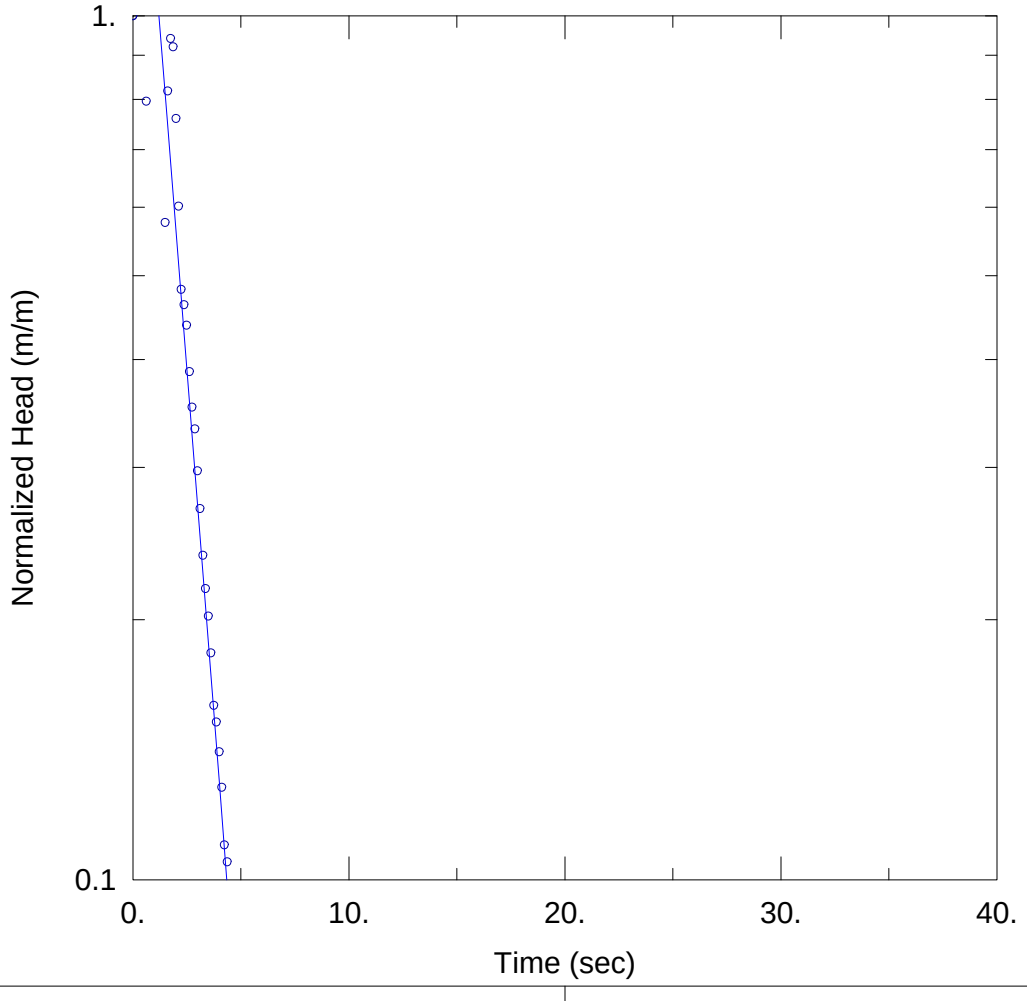
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3-16)

Initial Displacement: 0.3081 m
Static Water Column Height: 3.58 m
Total Well Penetration Depth: 4.43 m
Screen Length: 2.98 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW3-16 Rising Head 2

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising 2.aqt
Date: 10/05/16 Time: 15:45:13

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.03114 cm/sec y0 = 0.7461 m

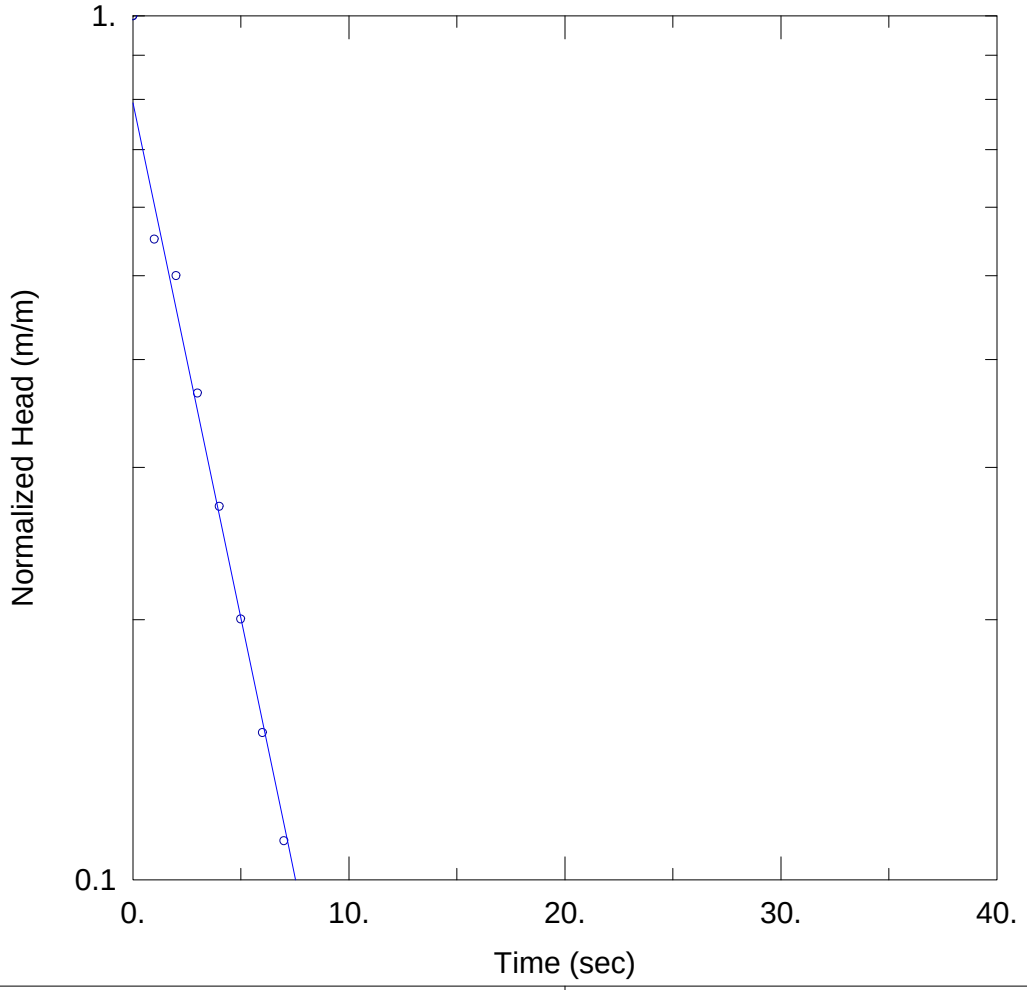
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3-16)

Initial Displacement: 0.3081 m
Static Water Column Height: 3.58 m
Total Well Penetration Depth: 4.43 m
Screen Length: 2.98 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW3-16 Rising Head 3

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW03-16 Rising 3 Hvorslev.aqt
Date: 10/05/16 Time: 15:45:06

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.01624 cm/sec y0 = 0.4619 m

AQUIFER DATA

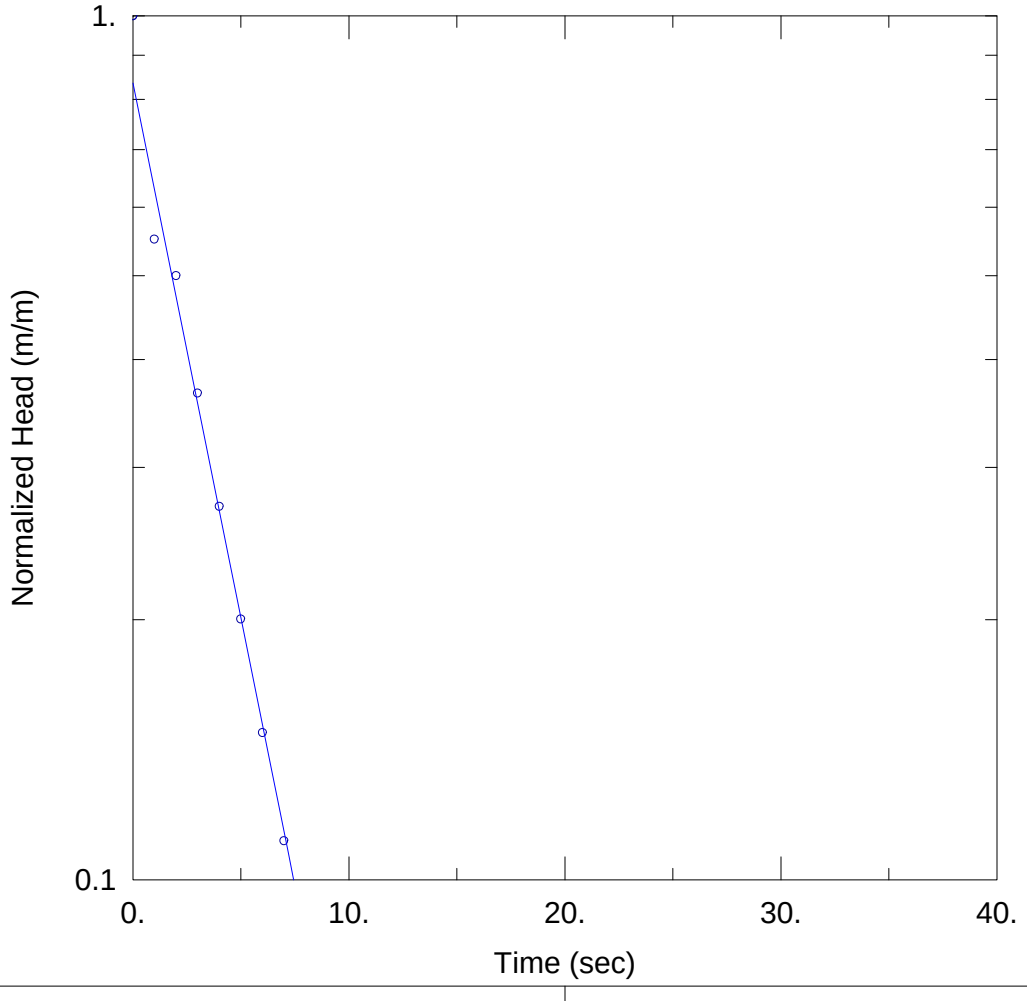
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3-16)

Initial Displacement: 0.5825 m
Static Water Column Height: 3.58 m
Total Well Penetration Depth: 4.43 m
Screen Length: 2.98 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW3-16 Rising Head 3

Prepared By:	Prepared For:
GHD	County of Simcoe
Project: 86822	Location: 2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising 3.aqt
Date: 10/05/16 Time: 15:45:19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.01213 cm/sec y0 = 0.4868 m

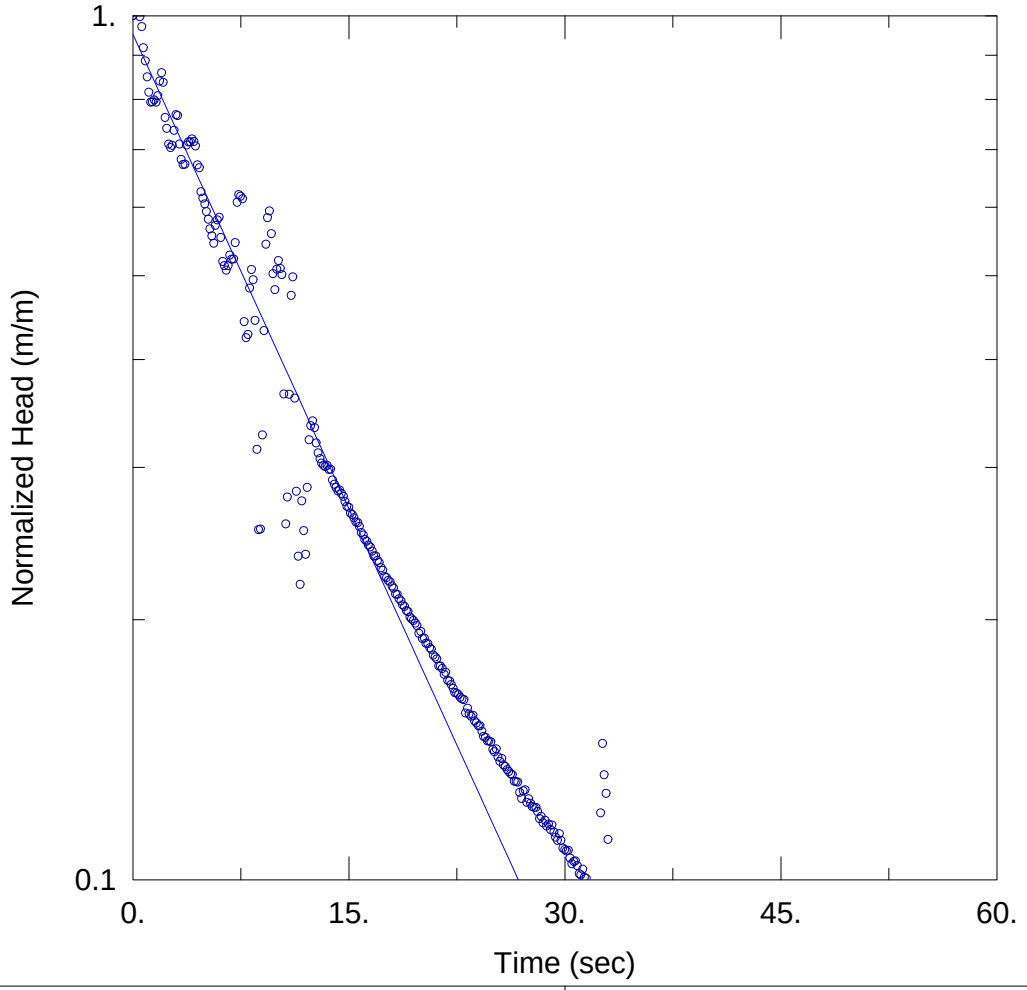
Saturated Thickness: 3.58 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3-16)

Initial Displacement: 0.5825 m
Static Water Column Height: 3.58 m
Total Well Penetration Depth: 4.43 m
Screen Length: 2.98 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Falling Head 1

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW04-16 Falling 1 Hvorslev.aqt
Date: 10/05/16 Time: 15:44:26

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.004961 cm/sec y0 = 0.5692 m

AQUIFER DATA

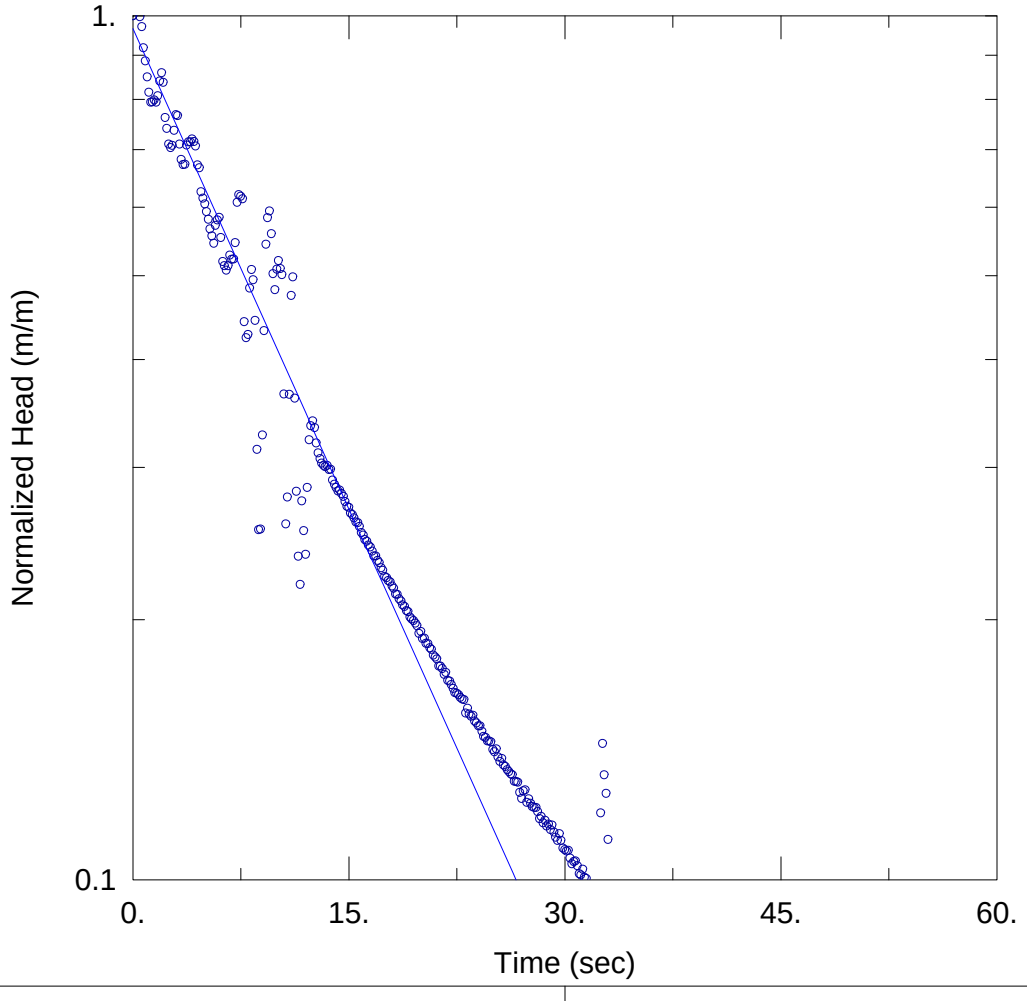
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.5983 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Falling Head 1

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Falling 1.aqt
Date: 10/05/16 Time: 15:44:33

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.003775 cm/sec y0 = 0.5781 m

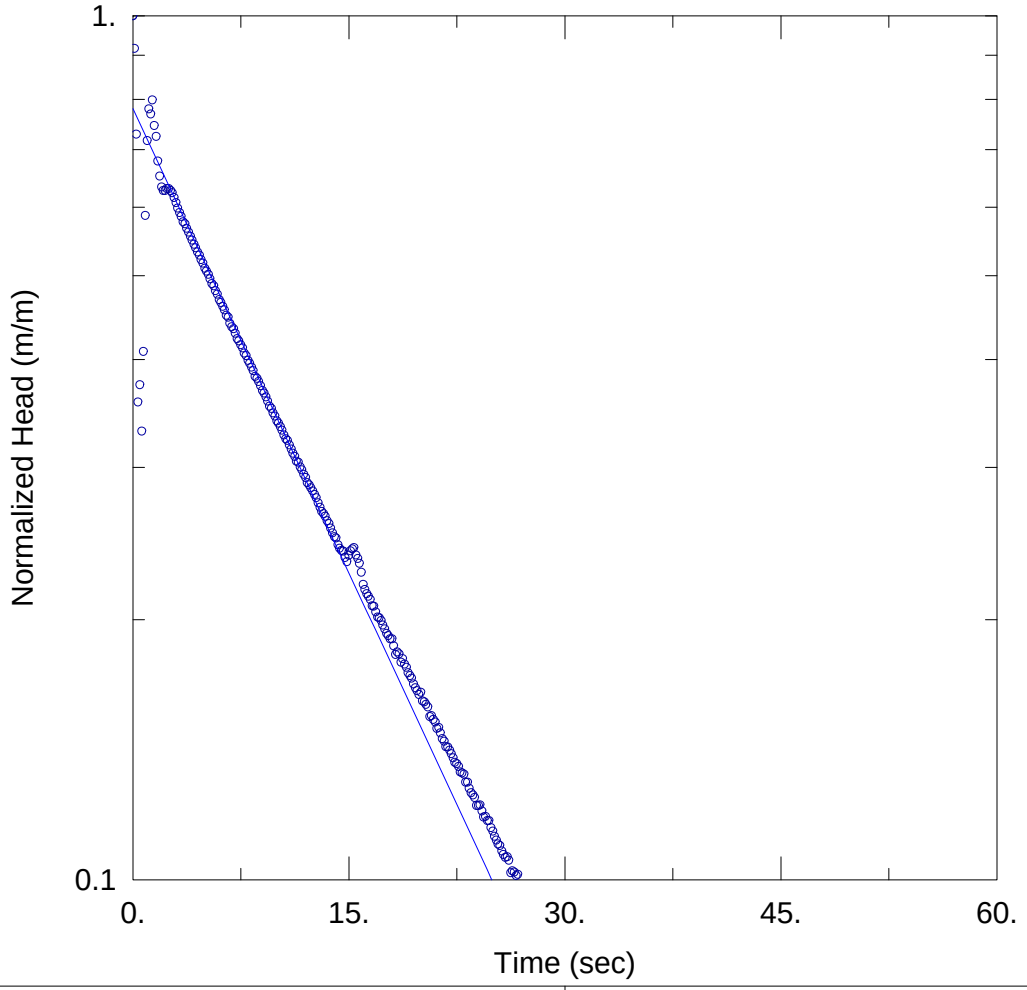
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.5983 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Falling Head 2

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW04-16 Falling 2 Hvorslev.aqt
Date: 10/05/16 Time: 15:43:57

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.004858 cm/sec y0 = 0.4805 m

AQUIFER DATA

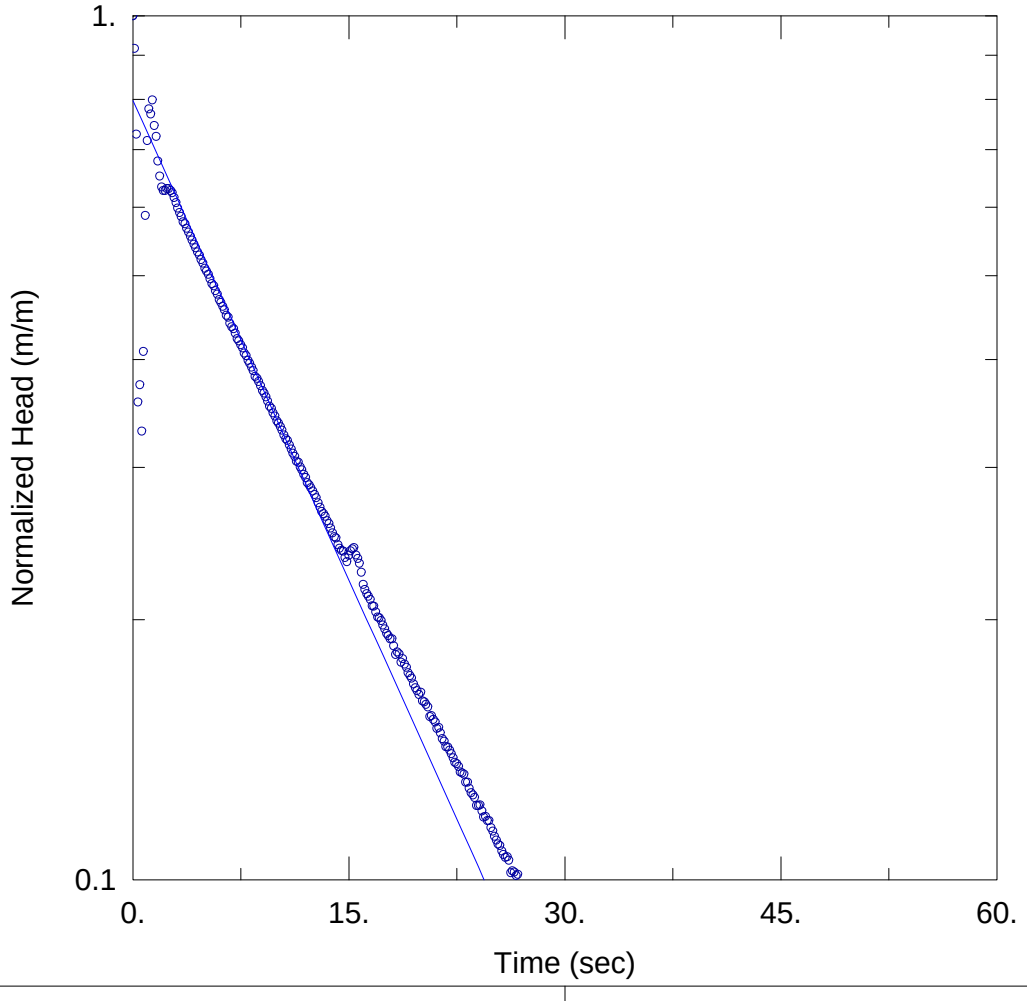
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.6154 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Falling Head 2

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Falling 2.aqt
Date: 10/05/16 Time: 15:44:39

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.003769 cm/sec y0 = 0.4909 m

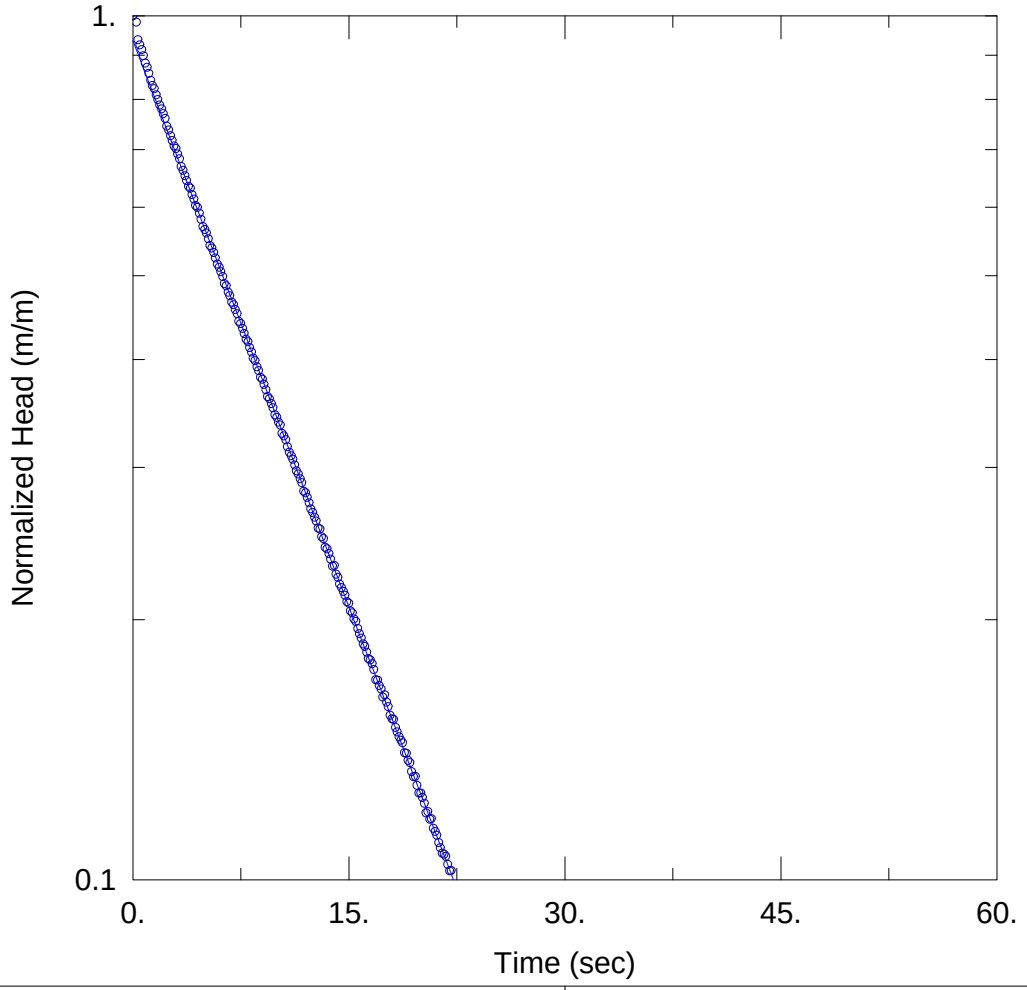
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.6154 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Rising Head 1

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW04-16 Rising 1 Hvorslev.aqt
Date: 10/05/16 Time: 15:43:47

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.005918 cm/sec y0 = 0.7136 m

AQUIFER DATA

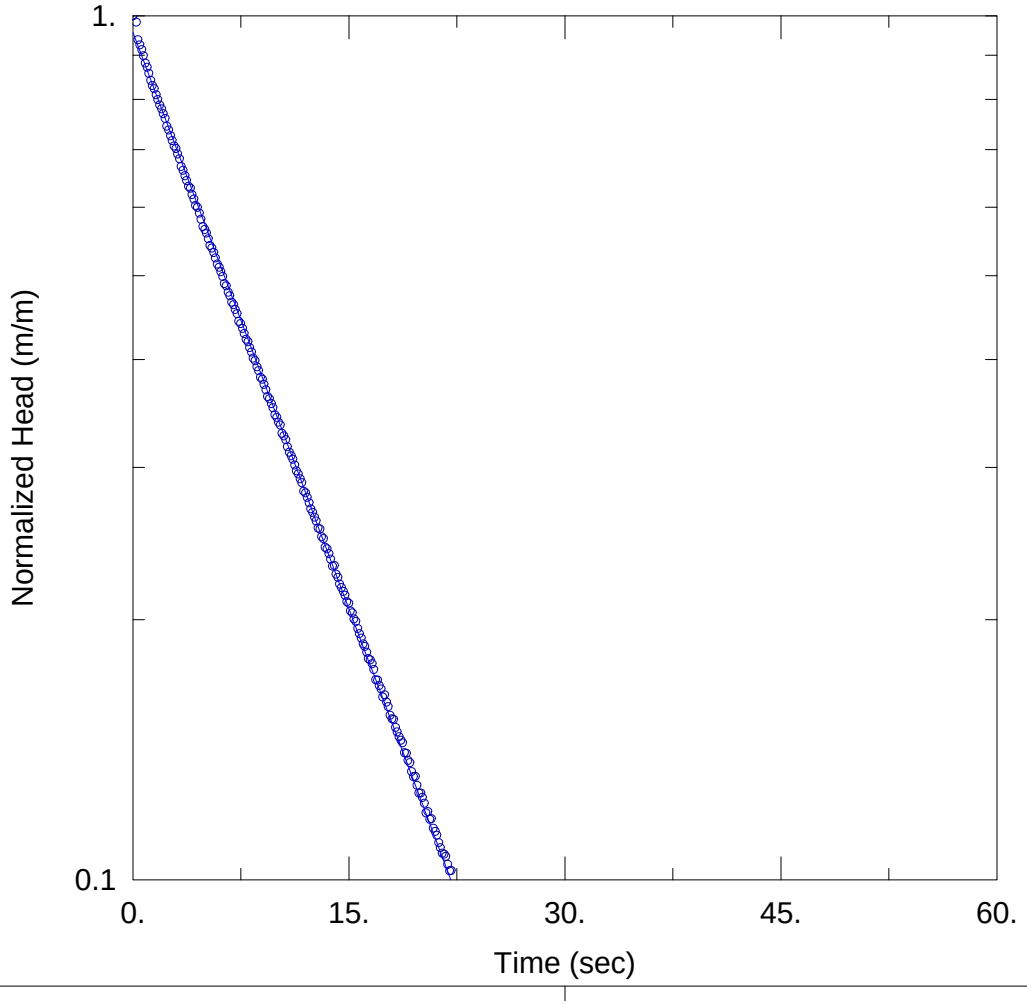
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.7632 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Rising Head 1

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising 1.aqt
Date: 10/05/16 Time: 15:44:18

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.004527 cm/sec y0 = 0.7296 m

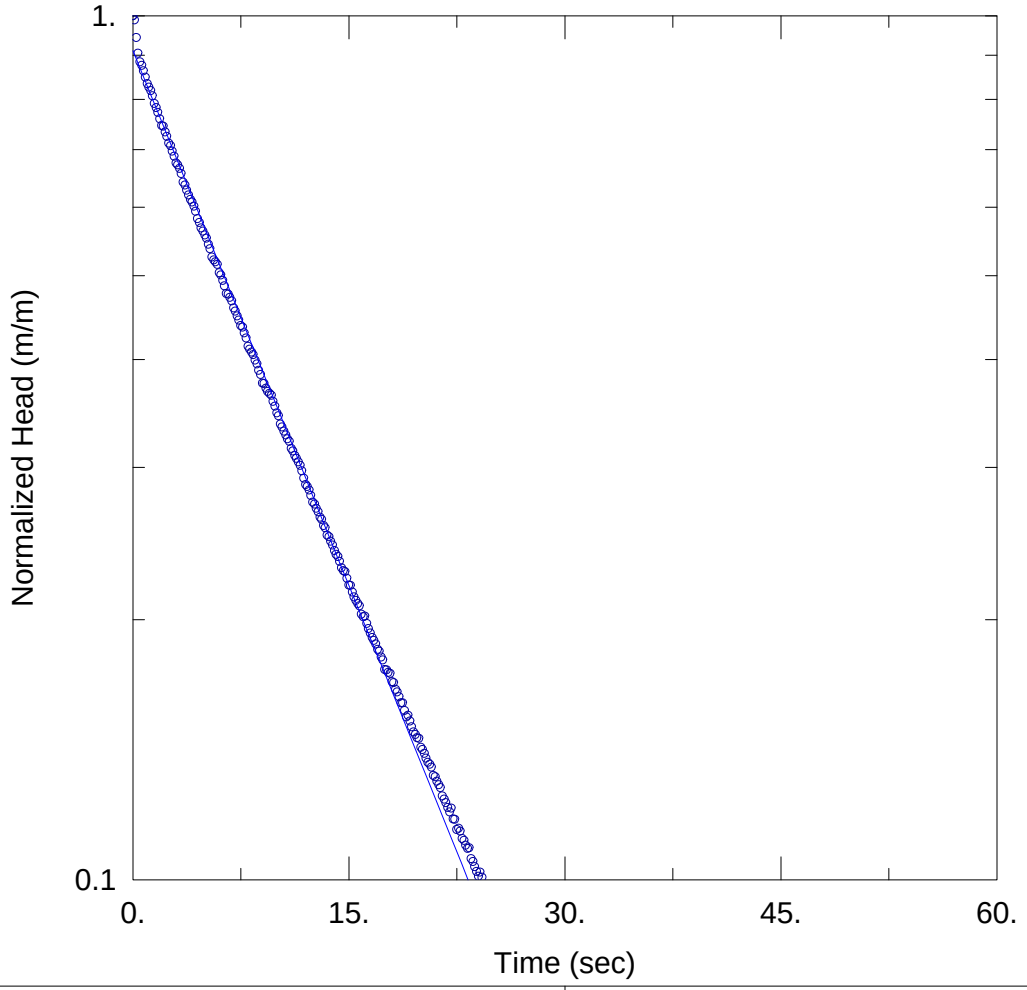
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.7632 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Rising Head 2

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\...\MW04-16 Rising 2 Hvorslev.aqt
Date: 10/05/16 Time: 15:42:50

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 0.005592 cm/sec y0 = 0.6988 m

AQUIFER DATA

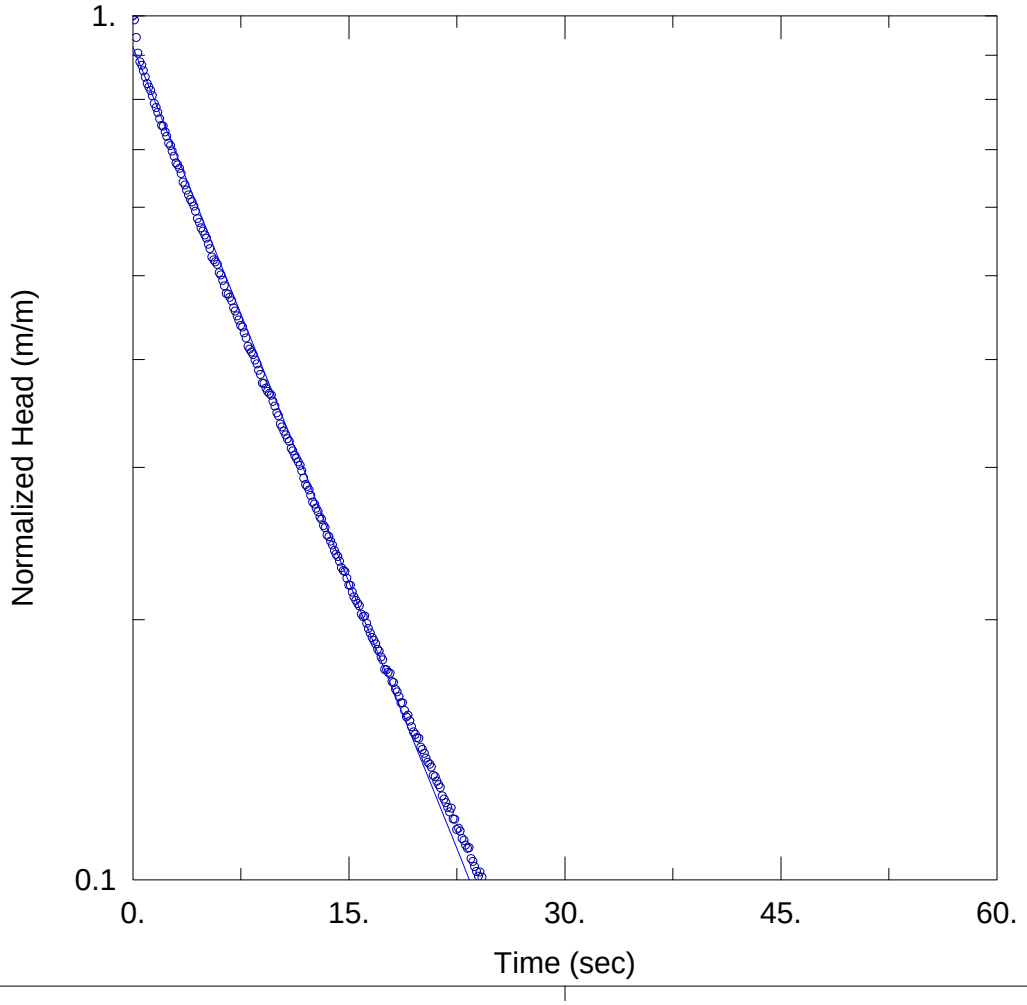
Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.7672 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

MW4-16 Rising Head 2

Prepared By:	Prepared For:
GHD	County of Simcoe
Project:	**Location:**
86822	2972 Horseshoe Valley Rd



Data Set: G:\Projects in Progress\6-chars\08----\0868--\086822\086822-MISC\Hydr\AQUIFER DATA6 Rising 2.aqt
Date: 10/05/16 Time: 15:42:00

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

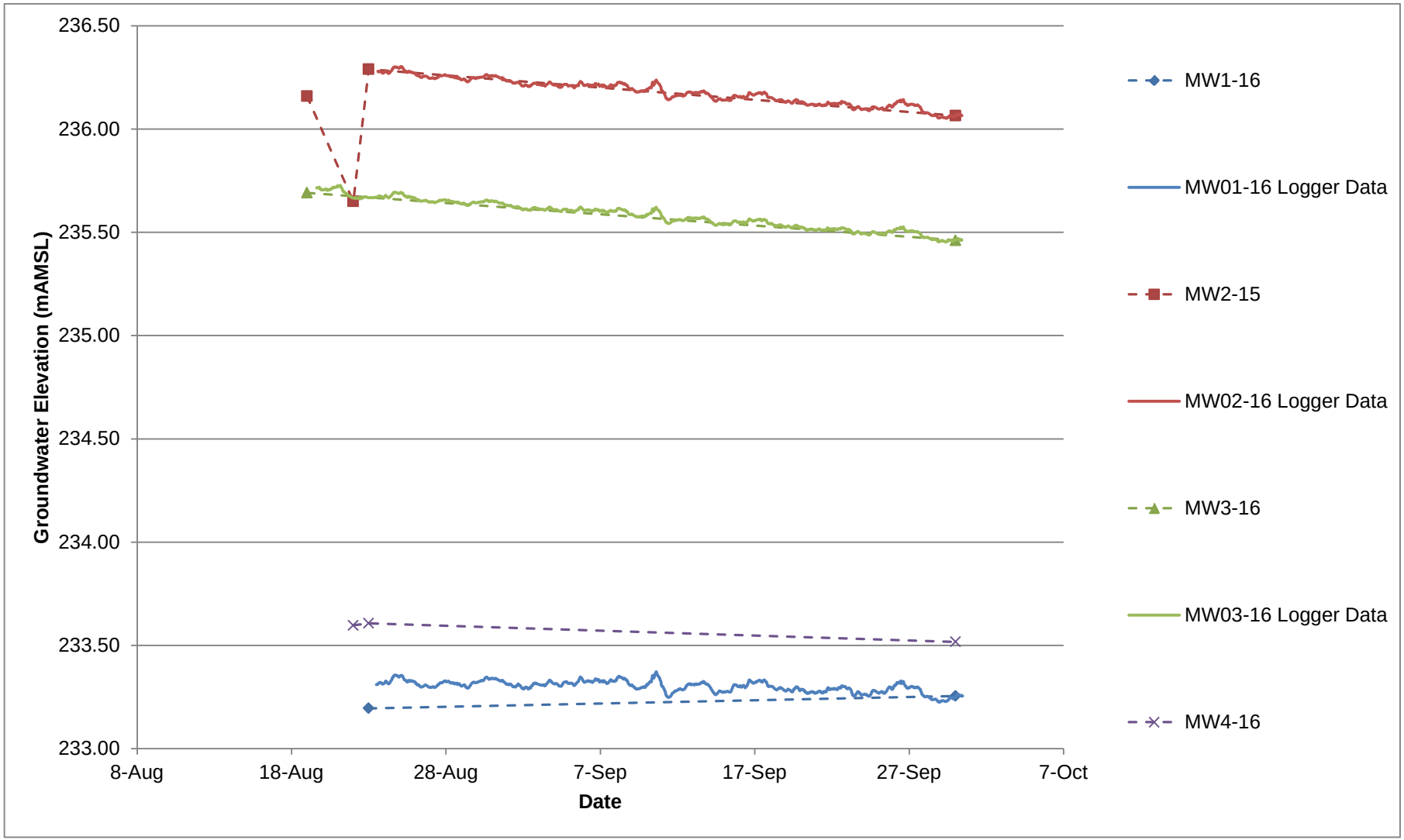
K = 0.004202 cm/sec y0 = 0.7055 m

Saturated Thickness: 5.83 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4-16)

Initial Displacement: 0.7672 m
Static Water Column Height: 5.83 m
Total Well Penetration Depth: 5.83 m
Screen Length: 2.99 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Appendix E
Groundwater Level Hydrographs

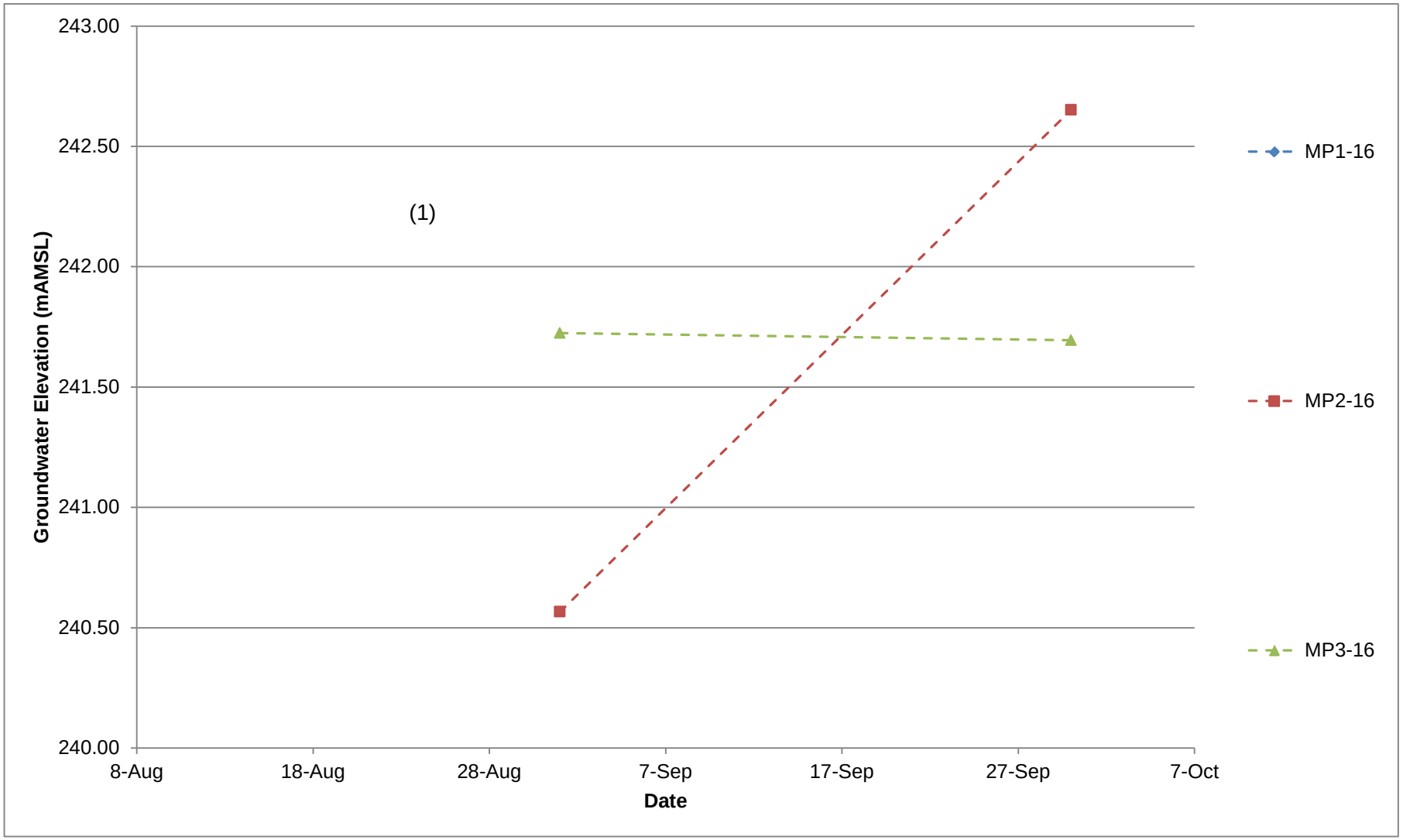


Note: Levellogger for MW4-16 malfunctioned during monitoring

County of Simcoe
Environmental Resource Recovery Centre (ERRC)
Hydrogeological Assessment
2976 Horseshoe Valley Road, Springwater

GROUNDWATER ELEVATION HYDROGRAPHS

Appendix E.1



Note: (1) All Minipiezometer Locations were mostly dry since Aug to Oct. No water elevations availble during this time.

County of Simcoe
Environmental Resource Recovery Centre (ERRC)
Hydrogeological Assessment
2976 Horseshoe Valley Road, Springwater

MINIPIEZOMETER GROUNDWATER ELEVATION HYDROGRAPHS **Appendix E.2**

Appendix F
MOECC Well Records

Appendix F.1
Well Record Formation Report

Ministry of the Environment
Ontario

20/81

The Ontario Water Resources Act

WATER WELL RECORD

31068

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

11 1906252 MUNICIP 19705 CON.

COUNTY OR DISTRICT: Durham
TOWNSHIP BOROUGH CITY TOWN VILLAGE: Brock (Thorah) Beaverton
CON: 5
BLOCK TRACT SURVEY ETC:
LOT: 15
[redacted] 164 Beaverton
DATE COMPLETED: DAY 27 MO 08 YR 81
ELEVATION: 20600 RC 5 0750 RC 5
BASIN CODE: 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH FEET FROM	DEPTH FEET TO
Black	Topsoil			0	1
Clay and Stone				1	20
Clay and Gravel				20	25
Coarse	Gravel			25	28

MOE VF-18

31 0001802 0020 0512 0025 0511 0028 31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0028	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH FEET FROM	DEPTH FEET TO
6 4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0028
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

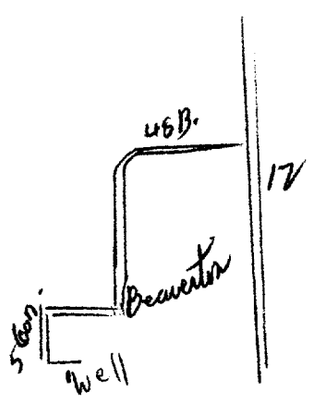
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0002 GPM
DURATION OF PUMPING: 02 HOURS 00 MIN.
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
010 FEET	022 FEET	022 FEET	022 FEET	022 FEET	022 FEET

IF FLOWING GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: FEET
RECOMMENDED PUMPING RATE: 0002 GPM

LOCATION OF WELL

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



DRILLERS REMARKS: 1.4.82

FINAL STATUS OF WELL 1
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER 9 ☐ NOT USED

METHOD OF DRILLING 1
1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Gordon Weaver — LICENCE NUMBER: 5415
ADDRESS: Cobourg
NAME OF DRILLER OR BORER: Weavers Well Drilling — LICENCE NUMBER: 5415
SIGNATURE OF CONTRACTOR: Gordon Weaver
SUBMISSION DATE: DAY 13 MO. 1 YR. 82

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 5415
DATE RECEIVED: 29 01 82
DATE OF INSPECTION:
INSPECTOR:
REMARKS:
CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM NO 0506—4—77 FORM 7

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below)
A023714
A0A023714

Well Record
Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): GREY
Township: SYDENHAM
Lot: Concession:
RR#/Street Number/Name: HWY. 6/10 at COUNTY RD. 18
City/Town/Village: ROCKFORD
Site/Compartment/Block/Tract etc.:
GPS Reading: NAD 83 | Zone 17 | Easting 596437 | Northing 4929983
Unit Make/Model: Garmin eTREX Venture
Mode of Operation: [X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
Brown	Sandy clay	stones, bedrock	Hard	0	9½'

Hole Diameter

Depth From	Depth To	Diameter
0	9½'	6"

Water Record

Water found at ___ Metres / Kind of Water
___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:
___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:
___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:

After test of well yield, water was
[ ] Clear and sediment free
[ ] Other, specify

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam	Material	Wall thickness	Depth From (Ft.)	Depth To (Ft.)
Casing				
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	Sch. 40	0	3'6
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
Screen				
Outside diam		Slot No.		
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	10	9'6	3'6
No Casing or Screen				
	[ ] Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
9'6	2'6	Sand	
2'6	0'	Holeplug	

Method of Construction

[ ] Cable Tool [X] Rotary (air) [ ] Diamond [ ] Digging
[ ] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [X] Not used
[ ] Irrigation [ ] Municipal [ ] Cooling & air conditioning

Final Status of Well

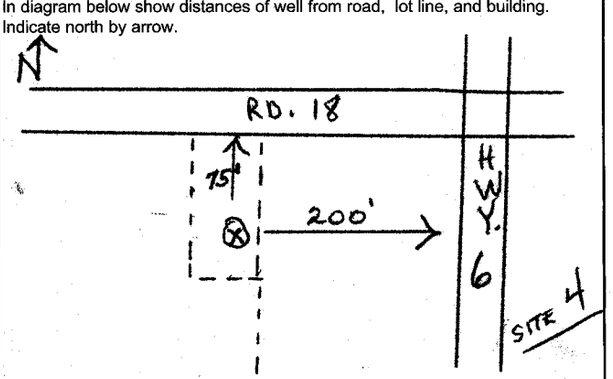
[ ] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[X] Observation well [ ] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED
Well Contractor's Licence No.: 1737
Business Address (street name, number, city etc.): 147 NORTH ST. W, WINGHAM, ONTARIO. N0G 2W0
Name of Well Technician (last name, first name): FENTON DOUG
Well Technician's Licence No.: T2003
Signature of Technician/Contractor: x J.C. Davidson
Date Submitted YYYY MM DD: 2005 09 30

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No.: z 37291
Date Well Completed YYYY MM DD: 2005 07 06
Was the well owner's information package delivered? [ ] Yes [ ] No
Date Delivered YYYY MM DD:

Ministry Use Only

Data Source:
Contractor: 1737
Date Received: NOV 21 2005
Date of Inspection YYYY MM DD:
Remarks:
Well Record Number:

0506E (09/03)
Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]
Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A023714

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

GREY | SYDENHAM

RR#/Street Number/Name: HWY. 6/10 at COUNTY RD. 18

City/Town/Village: ROCKFORD

Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 17 | Easting 596437 | Northing 4929983

Unit Make/Model: Garmin eTREX Venture

Mode of Operation: ☒ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
Brown	Sandy clay	Stones		0'	9'6
Brown	Bedrock			9'6	23'

Hole Diameter

Depth From	Depth To	Diameter
0	23'	6"

Water Record

Water found at ___ Metres / Kind of Water

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☐ Clear and sediment free ☐ Other, specify

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam	Material	Wall thickness	Depth From (Ft.)	Depth To (Ft.)
Casing				
2"	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Sch. 40	0'	13'
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
2"		10	13'	23'
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Ft. Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
23'	12'	Sand	
12'	0'	Holeplug	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

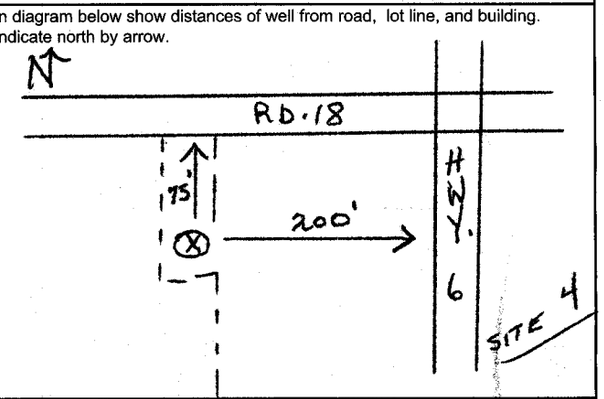
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☐ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 37292

Date Well Completed: YYYY 2005 MM 07 DD 06

Was the well owner's information package delivered? ☐ Yes ☐ No

Date Delivered: YYYY MM DD

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED

Well Contractor's Licence No.: 1737

Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONTARIO. N0G 2W0

Name of Well Technician (last name, first name): FENTON DOUG

Well Technician's Licence No.: T2003

Signature of Technician/Contractor: X D.C. Davidson

Date Submitted: YYYY 2005 MM 09 DD 30

Ministry Use Only

Data Source

Contractor: 1737

Date Received: YYYY MM DD NOV 21 2005

Date of Inspection: YYYY MM DD

Remarks

Well Record Number

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A023714

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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Ministry Use Only

MUN | CON | LOT

[redacted]

Address of Well Location (County/District/Municipality): GREY

Township: SYDENHAM

Lot:

Concession:

RR#/Street Number/Name: HWY. 6/10 at COUNTY RD. 18

City/Town/Village: ROCKFORD

Site/Compartment/Block/Tract etc.:

GPS Reading: NAD 83 | Zone 17 | Easting 596437 | Northing 4929983

Unit Make/Model: Garmin eTREX Venture

Mode of Operation: [X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From (Ft.)	Depth To (Ft.)
Brown	Sandy clay	Stones		0'	9½'
Grey Brn.	Bedrock		Hard	9½'	59'

Hole Diameter

Depth From	Depth To	Diameter
0'	23'	10"
0'	59'	6"

Water Record

Water found at ___ Metres / Kind of Water

- ___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:
- ___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:
- ___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:

After test of well yield, water was
[ ] Clear and sediment free
[ ] Other, specify

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam	Material	Wall thickness	Depth From (Ft.)	Depth To (Ft.)
Casing				
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.219"	0'	23'
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	Sch. 40	0'	49'
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
Screen				
Outside diam		Slot No.		
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	10	49'	59'
No Casing or Screen				
	[ ] Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs +____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Ft. Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0'	23'	10" - Benseal	
0'	47'	Holeplug	
47'	59'	Sand	

Method of Construction

[ ] Cable Tool [X] Rotary (air) [ ] Diamond [ ] Digging
[ ] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [X] Not used
[ ] Irrigation [ ] Municipal [ ] Cooling & air conditioning

Final Status of Well

[ ] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[X] Observation well [ ] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED
Well Contractor's Licence No.: 1737

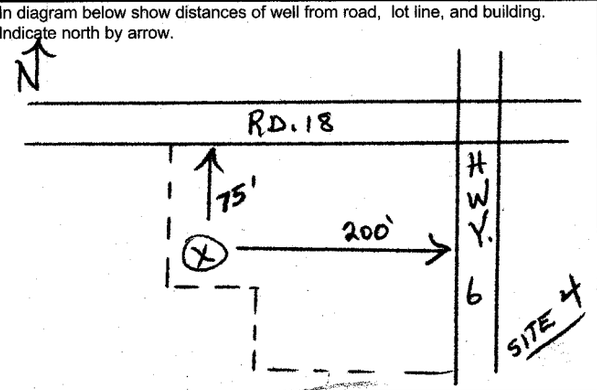
Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONT. N0G 2W0

Name of Well Technician (last name, first name): FENTON DOUG
Well Technician's Licence No.: T2003

Signature of Technician/Contractor: x D.C. Davidson
Date Submitted YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No.: Z 37293

Date Well Completed: YYYY 2005 MM 07 DD 07

Was the well owner's information package delivered? [ ] Yes [ ] No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source

Contractor: 1737

Date Received: NOV 21 2005

Date of Inspection YYYY MM DD

Remarks

Well Record Number

0506E (09/03)

Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A023714

Well Record

Regulation 903 Ontario Water Resources Act

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Ministry Use Only: MUN ____ CON ____ LOT ____

Well Owner's Information and Location of Well Information

[redacted]

GREY | SYDENHAM

RR#/Street Number/Name: HWY. 6/10 at COUNTY RD. 18 | City/Town/Village: ROCKFORD | Site/Compartment/Block/Tract etc.:

GPS Reading: NAD 83 | Zone 17 | Easting 596437 | Northing 4929983 | Unit Make/Model: Garmin eTREX Venture | Mode of Operation: [X] Undifferentiated [ ] Differentiated, specify ____ [ ] Averaged

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Sandy clay	Stones		0	9½'
Brown	Bedrock		Hard	9½'	43'

Hole Diameter

Depth From	Depth To	Diameter
0	22'	10"
0	43'	6"

Water Record

Water found at ___ Metres / Kind of Water

- ___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other: ____
- ___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other: ____
- ___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other: ____

After test of well yield, water was: [ ] Clear and sediment free [ ] Other, specify ____

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam	Material	Wall thickness	Depth From (Ft.)	Depth To (Ft.)
Casing				
6"	[X] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized	.219"	0'	22'
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	Sch.40	0'	33'
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
Screen				
Outside diam		Slot No.		
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	10	33'	43'
No Casing or Screen				
	[ ] Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

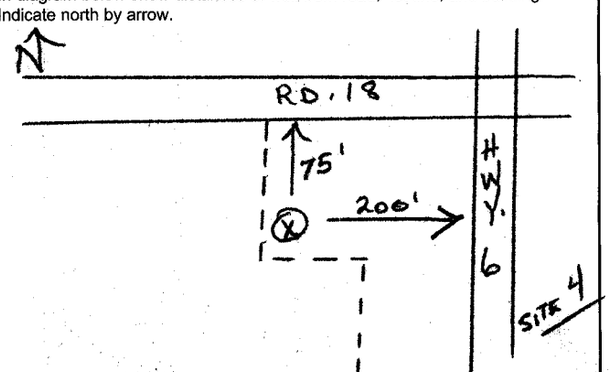
Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0'	22'	10" - Benseal	
0'	31'	Holeplug	
31'	43'	Sand	

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Method of Construction

[ ] Cable Tool [X] Rotary (air) [ ] Diamond [ ] Digging
[ ] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [X] Not used
[ ] Irrigation [ ] Municipal [ ] Cooling & air conditioning

Final Status of Well

[ ] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
[X] Observation well [ ] Abandoned, insufficient supply [ ] Dewatering
[ ] Test Hole [ ] Abandoned, poor quality [ ] Replacement well

Audit No. Z 37294 | Date Well Completed YYYY 2005 MM 07 DD 07

Was the well owner's information package delivered? [ ] Yes [ ] No | Date Delivered YYYY MM DD

Well Contractor/Technician Information

Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED | Well Contractor's Licence No.: 1737

Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONT. N0G 2W0

Name of Well Technician (last name, first name): FENTON DOUG | Well Technician's Licence No.: T2003

Signature of Technician/Contractor: X C. C. Davidson | Date Submitted YYYY 2005 MM 09 DD 30

Ministry Use Only

Data Source | Contractor 1737

Date Received NOV 21 2005 | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A023714

Well Record

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Well Owner's Information and Location of Well Information

[redacted]

GREY

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City/Town/Village: ROCKFORD

Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 17 | Easting 596437 | Northing 4929983

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Mode of Operation: [X] Undifferentiated [ ] Averaged [ ] Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Sandy clay	Stones		0'	9'6
Brown	Bedrock		Hard	9'6	33'

Hole Diameter

Depth From	Depth To	Diameter
0	21'	10"
0	33'	6"

Water Record

Water found at ___ Metres / Kind of Water

___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:

___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:

___ m [ ] Fresh [ ] Sulphur [ ] Gas [ ] Salty [ ] Minerals [ ] Other:

After test of well yield, water was
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[ ] Other, specify

Chlorinated [ ] Yes [ ] No

Construction Record

Inside diam	Material	Wall thickness	Depth From	Depth To
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2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	Sch.40	+2'	23'
	[ ] Steel [ ] Fibreglass [ ] Plastic [ ] Concrete [ ] Galvanized			
Screen				
Outside diam		Slot No.		
2"	[ ] Steel [ ] Fibreglass [X] Plastic [ ] Concrete [ ] Galvanized	10	23'	33'
No Casing or Screen				
	[ ] Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. [ ] Shallow [ ] Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

[X] Annular space [ ] Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0'	21'	10" - Bensea l	
0	23'	6" - Holeplug	
22'	33'	Sand	

Method of Construction

[ ] Cable Tool [X] Rotary (air) [ ] Diamond [ ] Digging
[ ] Rotary (conventional) [ ] Air percussion [ ] Jetting [ ] Other
[ ] Rotary (reverse) [ ] Boring [ ] Driving

Water Use

[ ] Domestic [ ] Industrial [ ] Public Supply [ ] Other
[ ] Stock [ ] Commercial [X] Not used
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Final Status of Well

[ ] Water Supply [ ] Recharge well [ ] Unfinished [ ] Abandoned, (Other)
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Name of Well Contractor: DAVIDSON WELL DRILLING LIMITED
Well Contractor's Licence No.: 1737

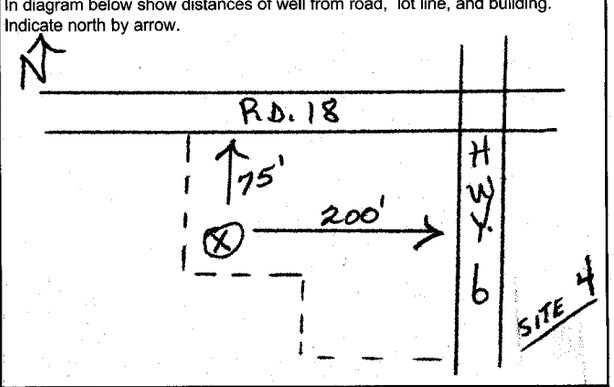
Business Address (street name, number, city etc.): 147 NORTH ST. W. WINGHAM, ONT. N0G 2W0

Name of Well Technician (last name, first name): FENTON DOUG
Well Technician's Licence No.: T2003

Signature of Technician/Contractor: X D.C. Davidson
Date Submitted YYYY MM DD: 2005 09 30

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 37295

Date Well Completed YYYY MM DD: 2005 07 07

Was the well owner's information package delivered? [ ] Yes [ ] No

Date Delivered YYYY MM DD

Ministry Use Only

Data Source

Contractor: 1737

Date Received YYYY MM DD: NOV 21 2005

Date of Inspection YYYY MM DD

Remarks

Well Record Number

0506E (09/03)

Contractor's Copy [ ] Ministry's Copy [X] Well Owner's Copy [ ]

Cette formule est disponible en français

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario ✓ 31D/6E

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

11 | 4605898 | MUNICIP. 46008 | CON. CON 05

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	THORAGH	05 V ~~PLAN 222~~	~~24~~ 016

[redacted] Box 292 BEAUERTON CEDAR BEACH. ONTARIO

DATE COMPLETED: DAY 18 MO. 06 YR. 74

RC. ELEVATION RC. BASIN CODE

1 4605898 17 645932 4920573 4 740 5 22 MAY 05, 1975 63

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	CLAY	GRAVEL	HARD	0	18
GREY	CLAY	GRAVEL	HARD	18	52
GREY	GRAVEL		POROUS	52	53

31 | 0018605/1/1 | 0052295/1/1 | 0053211/1

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
053	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
~~5¼~~ 05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	053
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	0020 GPM	01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY — 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
001 FEET	006 FEET	006 FEET	006 FEET	006 FEET	006 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	25 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☒ SHALLOW ☐ DEEP	025 FEET	0006 GPM

0040 GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01

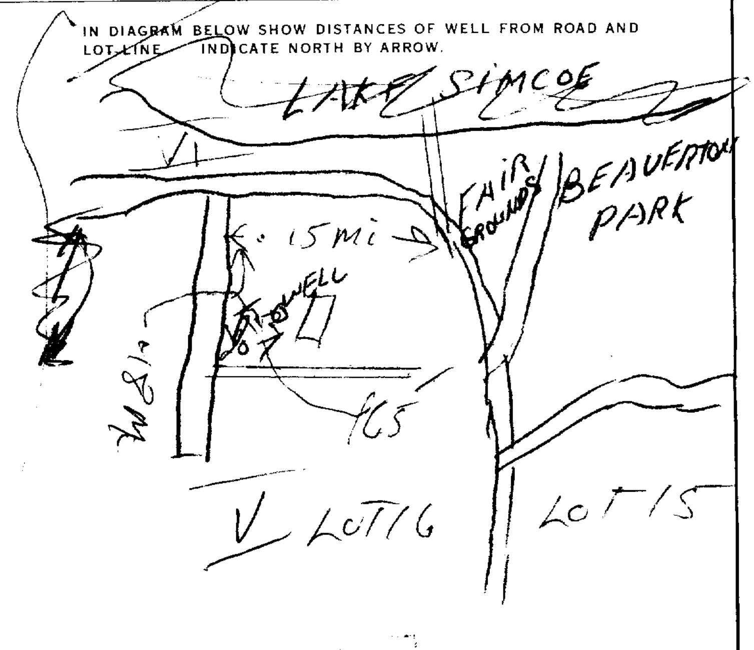
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☐ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

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



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: R.E. BOADWAY — LICENCE NUMBER: 1413
ADDRESS: BOX 397 SUTTON WEST ONT LOE 1RO
NAME OF DRILLER OR BORER: NORM POWELL — LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: R.E. Boadway — SUBMISSION DATE: DAY 18 MO. June YR. 74

OFFICE USE ONLY

DATA SOURCE: 1 — CONTRACTOR: 1413 — DATE RECEIVED: 040774
DATE OF INSPECTION: Oct. 28/74 — INSPECTOR: J.B.
REMARKS: NOT Vented — informed owner. — P/J.B.
R.P. 222 — LOT 24 CSS.S8 — WI/J.B

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-091

UTM 99 Z 9999999 E
9 R 9999999 N
Elev. QV RL
Basin QZB

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

[redacted] 57 No. 698

Water-Well Record

County or Territorial District Simcoe Township, Village, Town or City Flos
Con. [redacted] Street and Number (if in Village, Town or City)
Owner [redacted] Address R.R.9 Shelburne
Date completed Aug 8 / 1957
(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 2"
Length(s) 100 feet
Type of screen Johnson (2) (60#)
Length of screen 8 feet

Pumping Test

Static level 90 feet from top
Pumping rate 300 g.p.h.
Pumping level 95 feet from top
Duration of test 3 Hrs.

Well Log

Overburden and Bedrock Record	From ft.	To ft.
clay with Boulders	Top	30 feet
Hard pan	30	47
gravel with pann	47	94
Clay	94	100
gravel with sand	100	110

Water Record

Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
100	90 from top	fresh

For what purpose(s) is the water to be used?
Home & farm uses (gardens)
Is water clear or cloudy? Clear
Is well on upland, in valley, or on hillside? upland

Drilling firm Alex Cameron
Address R.R. 2 Meadhurst Ont

Name of Driller
Address

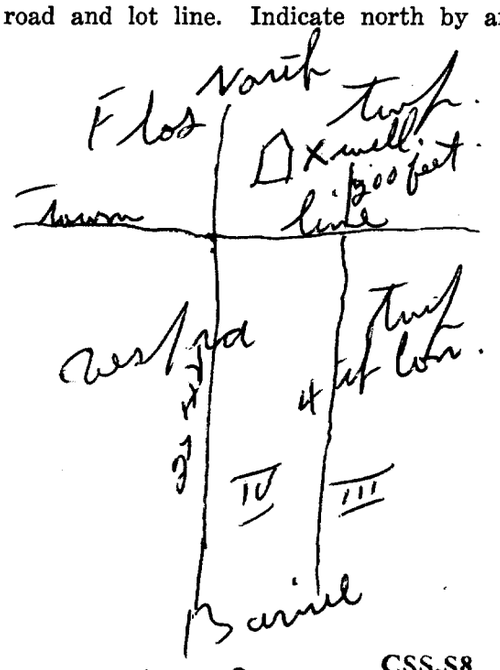
Licence Number 198

I certify that the foregoing statements of fact are true.

Date Aug 21/1957 Alex Cameron
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



well is directly opposite 4th line

Form 5

CSS.S8

UTM | 1 | 7 | Z | 5 9 6 4 3 8 | E
| 5 | R | 4 9 2 9 6 2 0 | N

Elev. | 5 | R | 0 8 2 5 |

Basin | 2 | 2 |

The Ontario Water Resources Commission Act

WATER WELL RECORD

WATER RESOURCES COMMISSION
MAY 1 1967
57 ONTARIO WATER RESOURCES COMMISSION No 699

County or District | 1 | 5 SIMCOE Township, Village, Town or City FLOS

Con. T Lot 3 Date completed 4 (day) FEB. (month) 1967 (year)

[redacted] ress R.R. 1 PHELPSTON.

Casing and Screen Record

Inside diameter of casing 4"
Total length of casing 76'
Type of screen COOK SLOT 16
Length of screen 4'
Depth to top of screen 76'
Diameter of finished hole 4"

Pumping Test

Static level 42'
Test-pumping rate 10 G.P.M.
Pumping level 48'
Duration of test pumping 1 HR.
Water clear or cloudy at end of test CLEAR.
Recommended pumping rate 5 G.P.M.
with pump setting of 60' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Dug WELL	0	42		
HARD PAN	42	74		
COARSE SAND	74	80	74	FRESH

For what purpose(s) is the water to be used? FARM

Is well on upland, in valley, or on hillside? UPLAND

Drilling or Boring Firm A. CAMERON

Address R.R. 1 MIDHURST.

Licence Number 2563

Name of Driller or Borer SAME.

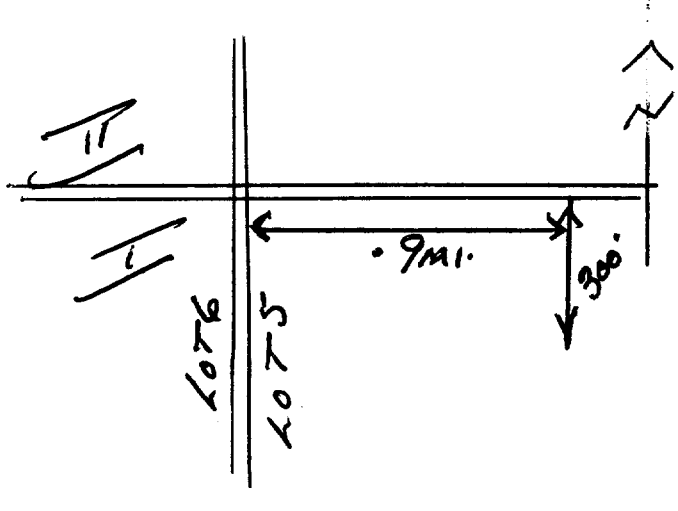
Address

Date APRIL 12/67

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

CSS.S8

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

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

11 | 5706833 | P | MUNICIP. 57016 | CON. CON | 03

COUNTY OR DISTRICT: SIMCOE

TOWNSHIP, ~~BOROUGH, CITY, TOWN, VILLAGE~~: VESPRA TWP

CON., ~~BLOCK, TRACT, SURVEY~~, ETC.: ~~3~~ III

LOT: ~~25~~ 001

OWNER (SURNAME FIRST): [redacted]

ADDRESS: RR 1 MIDHURST

DATE COMPLETED: DAY 15 MO ~~OCT~~ 10 YR 69

UTM: 285720 | RC: 4 | ELEVATION: 0825 | RC: 6 | BASIN CODE: 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
GREY	SAND	CLAY BOULDERS	HARD	0	39
	SAND			39	87
	SILT			87	104
	SAND			104	113

31: aa39209as113 | aa87 09 | a104 06 | 0113 09

32:

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0104	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0110
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
012	05.000 INCHES	03 FEET

MATERIAL AND TYPE: STAINLESS STEEL

DEPTH TO TOP OF SCREEN: 0110 FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0007 GPM.

DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
059 FEET	088 FEET	1 ☐ PUMPING 2 ☒ RECOVERY	059 FEET	059 FEET	059 FEET	059 FEET

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

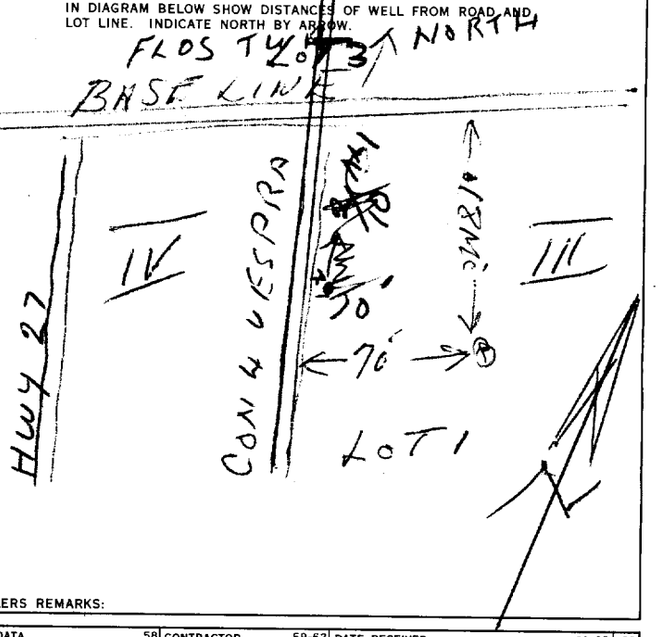
RECOMMENDED PUMP SETTING: 095 FEET

RECOMMENDED PUMPING RATE: 0007 GPM.

000.8 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER 9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: ANDERSON DRILLING | LICENCE NUMBER: 3326

ADDRESS: 58 CAMPBELL AVE BARRIE ONT

NAME OF DRILLER OR BORER: ANDERSON | LICENCE NUMBER: 3326

CONTRACTOR: Anderson | SUBMISSION DATE: DAY 16 MO OCT YR 69

RC COPY

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1204 | DATE RECEIVED: 191169

DATE OF INSPECTION: JAN. 22/70 | INSPECTOR: J.C.B.

REMARKS: CSS.S8

J.R.

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

ONTARIO

310/RW

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

11 — 5709928 — MUNICIP. 5016 — CON. Con 01

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	VESPRA	3	002

[redacted] — DATE COMPLETED: DAY 06 MO. 06 YR. 73

[redacted] 4928915 4 800 5 22 MAR 17, 197[redacted]

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	CLAY			0	35
GREY	SAND	CLAY	STONES	35	85
BROWN	"	"		85	105
"	"			105	112

31 — 01035605 | 00852805 1/2 | 01056805 | 01126805

32

41 WATER RECORD

WATER FOUND AT FEET	KIND OF WATER	
0105	1 ☒ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0109
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
0010	05 INCHES	03 FEET

MATERIAL AND TYPE: JOHNSON 55

DEPTH TO TOP OF SCREEN: 0109 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)
10-13		LEAD ~~PACKER~~
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	0008 GPM	01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
078 FEET	085 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	085 FEET	085 FEET	085 FEET	085 FEET

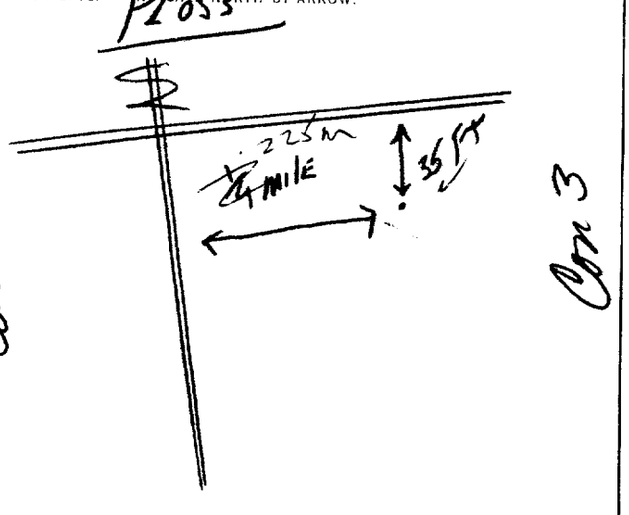
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	FEET	0007 GPM

0001 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS: VESPRA

FINAL STATUS OF WELL	1 ☐ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 01	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

OR

NAME OF WELL CONTRACTOR: KNELSEN WATER WELLS — LICENCE NUMBER: 3203

ADDRESS: RR 1 BARRIE ONT

NAME OF WELL TECHNICIAN (DRILLER OR BORER): A KNELSEN — LICENCE NUMBER: 3213

SIGNATURE OF TECHNICIAN: [signature] — SUBMISSION DATE: DAY 8 MO. 6 YR. 73

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	3203	100773

DATE OF INSPECTION — INSPECTOR

REMARKS:

P

WI

CSS.S8

FORM 7 07-091

OF THE ENVIRONMENT COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

310/12 W.

Water management in Ontario

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

11 | 5709954 | MUNICIP. 57003 | CON. CON 101

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Flos	I	03.

OWNER (SURNAME FIRST) [redacted] ADDRESS RR#2 Phelpston ont

DATE COMPLETED DAY 12 MO. 04 YR. 73

HOLE DEPTH	RC.	ELEVATION	RC.	BASIN CODE		
928818	4	855	5	22	MAR 17, 1975	246

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH FROM	DEPTH TO
			Pit	0	5
L. brown	sand	gravel, clay, boulders		5	40
yellow	sand	gravel, boulders	loose	40	100
yellow	sand		fine	100	113
grey	clay			113	140
grey	clay	sand	fine	140	174
grey	sand		medium	174	178

31 | 0 0 0 5 | 2 3 | 0 0 4 0 6 2 8 1 1 6 5 | 0 1 0 0 5 2 8 1 1 1 3 | 0 1 1 3 5 0 8 | 0 1 4 0 2 0 5 | 0 1 7 4 2 6 5 0 8 | 1

32 | 0 1 7 8 2 0 9

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0174 ft	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
178	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH FROM	DEPTH TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	5	0175
06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
012	06.000 INCHES	03 FEET

MATERIAL AND TYPE: ~~stainless steel~~ DEPTH TO TOP OF SCREEN: 0175 FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0020 GPM. DURATION OF PUMPING: 01 HOURS 30 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☒ RECOVERY) 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
093 FEET	147 FEET	094 FEET	093 FEET	093 FEET	093 FEET

IF FLOWING, GIVE RATE: GPM. PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 118 FEET RECOMMENDED PUMPING RATE: 0009 GPM.

0004 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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

DRILLERS REMARKS:

FINAL STATUS OF WELL: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER 9 ☐ NOT USED

METHOD OF DRILLING: 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: H. HAMMERS LICENCE NUMBER: 2514

ADDRESS: RR# 3 Barrie, Ont.

NAME OF DRILLER OR BORER: H. Hammers LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Henry Hammers SUBMISSION DATE: DAY MO. YR.

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2514 DATE RECEIVED: 100773

DATE OF INSPECTION: INSPECTOR:

REMARKS: CSS.82

P

WI

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MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

31 D 12 W

Ontario

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11 | 5713446 | MUNICIP. 57016 | CON. CON

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Vespra	4	001

[redacted] | ADDRESS RR#1 Midhurst Ont | DATE COMPLETED DAY 21 MO. 05 YR. 25

21 | UTM ZONE 17 | EASTING 597450 | NORTHING 4928550 | RC 5 | ELEVATION 0840 | RC 5 | BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Topsoil			0	1
11	Sand		Loose	1	19
11	11	Gravel, stones	Packed	19	73
11	11			73	98
11	Clay	SILT		98	125
11	Sand		Wet	125	128
11	11		Dead	128	

31 0001602 0019628?7 00736281112 0098628 0125?0506 0128628?1

32 0128628

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0125 - 10-13	1 ☑ FRESH 3 ☐ SULPHUR 14; 2 ☐ SALTY 4 ☐ MINERAL
15-18	1 ☐ FRESH 3 ☐ SULPHUR 19; 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR 24; 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR 29; 2 ☐ SALTY 4 ☐ MINERAL
30-33	1 ☐ FRESH 3 ☐ SULPHUR 34; 2 ☐ SALTY 4 ☐ MINERAL

80

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
10-11 05	1 ☑ STEEL 12; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE	258	0 0125	13-16
17-18	1 ☐ STEEL 19; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL 26; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.) 31-33	DIAMETER 34-38	LENGTH 39-40
012	05000 INCHES	03 FEET
MATERIAL AND TYPE: Johnson SS	DEPTH TO TOP OF SCREEN 41-44: 0125 FEET	80

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	Rubber Packer
18-21	22-25	
26-29	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 10	PUMPING RATE 11-14	DURATION OF PUMPING
1 ☐ PUMP 2 ☑ BAILER	0007 GPM.	01 15-16 HOURS 20 17-18 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	25 WATER LEVELS DURING: 1 ☑ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
078 19-21 FEET	103 22-24 FEET	103 26-28 FEET	103 29-31 FEET	103 32-34 FEET	103 35-37 FEET

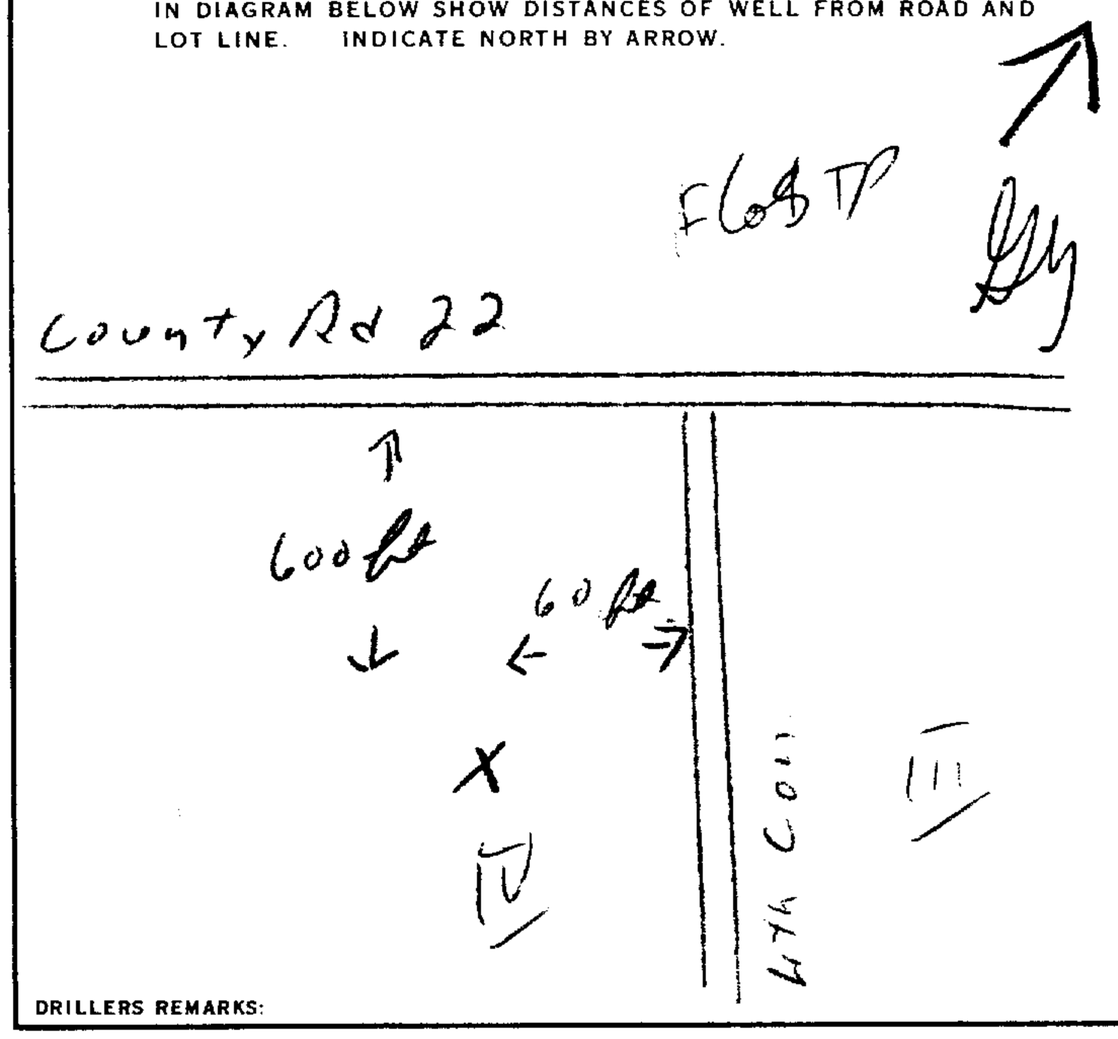
IF FLOWING, GIVE RATE 38-41	PUMP INTAKE SET AT	WATER AT END OF TEST 42
GPM.	FEET	1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING 43-45	RECOMMENDED PUMPING RATE 46-49
☐ SHALLOW ☑ DEEP	110 FEET	0007 GPM.

50-53 ____ GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS:

FINAL STATUS OF WELL 54

1 ☑ WATER SUPPLY 5 ☐ ABANDONED, INSUFFICIENT SUPPLY
2 ☐ OBSERVATION WELL 6 ☐ ABANDONED, POOR QUALITY
3 ☐ TEST HOLE 7 ☐ UNFINISHED
4 ☐ RECHARGE WELL

WATER USE 55-56 01

1 ☑ DOMESTIC 5 ☐ COMMERCIAL
2 ☐ STOCK 6 ☐ MUNICIPAL
3 ☐ IRRIGATION 7 ☐ PUBLIC SUPPLY
4 ☐ INDUSTRIAL 8 ☐ COOLING OR AIR CONDITIONING
☐ OTHER 9 ☐ NOT USED

METHOD OF DRILLING 57

1 ☑ CABLE TOOL 6 ☐ BORING
2 ☐ ROTARY (CONVENTIONAL) 7 ☐ DIAMOND
3 ☐ ROTARY (REVERSE) 8 ☐ JETTING
4 ☐ ROTARY (AIR) 9 ☐ DRIVING
5 ☐ AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR: Knelsen Water Wells | LICENCE NUMBER: 3203

ADDRESS: RR#1 Barrie Ont

NAME OF DRILLER OR BORER: Gord Kent | LICENCE NUMBER: 3135

SIGNATURE OF CONTRACTOR | SUBMISSION DATE: DAY 23 MO. 5 YR. 78

OFFICE USE ONLY

DATA SOURCE 58: 1 | CONTRACTOR 62: 3203 | DATE RECEIVED 63-68: 23 JUN 78 | 80

DATE OF INSPECTION | INSPECTOR

REMARKS: CRS.38 | P JUNE | WI

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Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11 — 5724421 — MUNICIP 57003 — CON. CON 01

COUNTY OR DISTRICT: [redacted] — TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: [redacted] — CON., BLOCK, TRACT, SURVEY, ETC: 1 — LOT: 3

[redacted] RR #2 PHELPSTON ONTARIO

DATE COMPLETED: DAY 11 MO 1 YR 89

ELEVATION — BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	TOPSOIL			0	1
BROWN	SAND	STONES		1	31
GREY	SAND	CLAY		31	106
BROWN	SAND		MEDIUM	106	113
BROWN	SAND		FINE	113	118
GREY	CLAY	SAND		118	146
GREY	CLAY			146	170
GREY	SAND		FINE CEMENTED	170	178
		TOTAL DEPTH	178'		

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
170	1 ☑ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	2' ABOVE GROUND	171
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.): 4' 10 SLOT, 31 12 SLOT — DIAMETER: 5 INCHES — LENGTH: 7 FEET

MATERIAL AND TYPE: JOHNSON STAINLESS — DEPTH TO TOP OF SCREEN: 171 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	K PACKER, quick
18-21	22-25	GEL & CUTTINGS
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER — PUMPING RATE: 8 GPM — DURATION OF PUMPING: 2 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☑ PUMPING 2 ☐ RECOVERY)	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
92 FEET	140 FEET		116 FEET	138 FEET	140 FEET	140 FEET

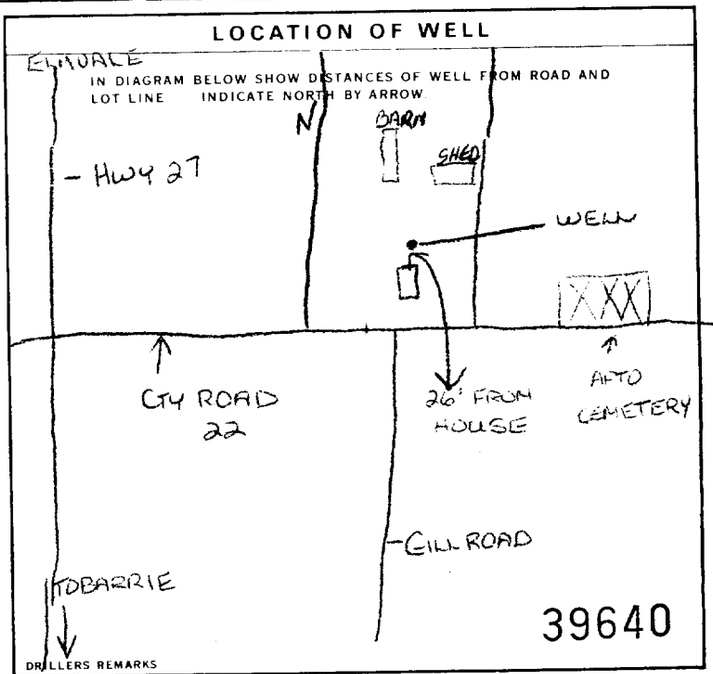
IF FLOWING, GIVE RATE: GPM — PUMP INTAKE SET AT: FEET — WATER AT END OF TEST: 1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP — RECOMMENDED PUMP SETTING: 165 FEET — RECOMMENDED PUMPING RATE: 10 GPM

LOCATION OF WELL

ELEVATE

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



DRILLERS REMARKS: 39640

FINAL STATUS OF WELL

1 ☑ WATER SUPPLY — 2 ☐ OBSERVATION WELL — 3 ☐ TEST HOLE — 4 ☐ RECHARGE WELL — 5 ☐ ABANDONED, INSUFFICIENT SUPPLY — 6 ☐ ABANDONED, POOR QUALITY — 7 ☐ UNFINISHED — 9 ☐ DEWATERING

WATER USE

1 ☑ DOMESTIC — 2 ☑ STOCK — 3 ☐ IRRIGATION — 4 ☐ INDUSTRIAL — 5 ☐ COMMERCIAL — 6 ☐ MUNICIPAL — 7 ☐ PUBLIC SUPPLY — 8 ☐ COOLING OR AIR CONDITIONING — ☐ OTHER — 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☑ CABLE TOOL — 2 ☐ ROTARY (CONVENTIONAL) — 3 ☐ ROTARY (REVERSE) — 4 ☐ ROTARY (AIR) — 5 ☐ AIR PERCUSSION — 6 ☐ BORING — 7 ☐ DIAMOND — 8 ☐ JETTING — 9 ☐ DRIVING — ☐ DIGGING — ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: BLUE & BUKER DRILLING LTD — WELL CONTRACTOR'S LICENCE NUMBER: 1467

ADDRESS: R R #1 BOX 7 BARRIE ONTARIO

NAME OF WELL TECHNICIAN: BRIAN BUKER — WELL TECHNICIAN'S LICENCE NUMBER: T0226

SIGNATURE OF TECHNICIAN/CONTRACTOR: Brian R. Buker — SUBMISSION DATE: DAY 24 MO 1 YR 89

OFFICE USE ONLY

DATA SOURCE: CONTRACTOR 1467 — DATE RECEIVED: JAN 27 1989

DATE OF INSPECTION — INSPECTOR

REMARKS: WDE — CSS.ES

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11

5729792

MUNICIP 57016 CON 03
WELL # 3

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON, BLOCK, TRACT, SURVEY, ETC	LOT
[redacted]	UESPRA	CON 3	1
	CRAIGHURST	DATE COMPLETED DAY 18 MO NOV YR 92	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
BLACK	TOP SOIL			0	1
RED	SAND			1	6
GRAY	CLAY	SAND		6	85
	(MEDIUM	SAND)		85	96
GRAY	CLAY	SILT		96	170
	(MEDIUM	SAND)		170	175
GRAY	CLAY	SILT		175	190
	WATER	BEARING SAND		190	220

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
190	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	210
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
30	6	4

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET
STAINLESS	210

51 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☐ BAILER	25 GPM	1 HOURS 0 MINS

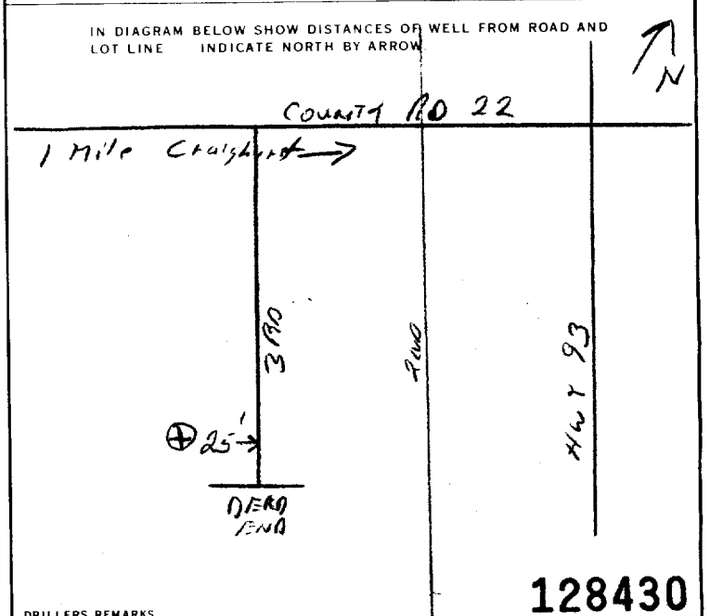
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
0 FEET	180 FEET	86 FEET	20 FEET	2 FEET	FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
1/2 GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	150 FEET	25 GPM

LOCATION OF WELL

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



DRILLERS REMARKS: 128430

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 5 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Drury Well Drilling
WELL CONTRACTOR'S LICENCE NUMBER: 1851
ADDRESS: RR#1 Barrie L4M 4Y8
NAME OF WELL TECHNICIAN: LARRY HASTINGS
WELL TECHNICIAN'S LICENCE NUMBER: T-12041
SIGNATURE OF TECHNICIAN/CONTRACTOR: Larry Hastings
SUBMISSION DATE: DAY 11 MO 01 YR 93

OFFICE USE ONLY

DATA SOURCE: CONTRACTOR 1851
DATE RECEIVED: JAN 15 1993
DATE OF INSPECTION:
INSP. FOR:
REMARKS: CSS.ES

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Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

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Mark correct box with a checkmark, where applicable.

11 (1 2) **5736248** Municipality 57003 (10 14) Con. CON (15 22 23 24) 01

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot (25-27)
SIMCOE	FLOS	1				1

[redacted]

Address: RR#2 PHELPSTON ONT

Date completed (48-53): 29 day 6 month 01 year

21 (1 2) UTM (10 12 17 18 24) Northing RC (25) Elevation RC (26 30) Basin Code (31 47) ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	TOPSOIL			0	1
BROWN	SAND			1	7
GRAY	SAND	CLAY/STONES		7	52
GRAY	CLAY	SAND		52	64
BROWN	SAND			64	71
GRAY	SAND	CLAY		71	—
	TOTAL DEPTH	71 feet			

31 (10 14 15 21) 32 (32 43 54 65 75 80)

41 WATER RECORD

Water found at - feet	Kind of water
64 (10-13)	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (14)
(15-18)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (19)
(20-23)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (24)
(25-28)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (29)
(30-33)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
(10-11) 5	1 ☐ Steel (12) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	1 FT ABOVE GROUND	(13-16) 67
(17-18)	1 ☐ Steel (19) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(20-23)
(24-25)	1 ☐ Steel (26) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38)	Length (39-40)
14	5 inches	4 feet

Material and type: STAINLESS STEEL

Depth at top of screen (41-44): 67 feet (30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
(10-13)	(14-17)	K PACKER
(18-21)	(22-25)	Hole Plug
(26-29)	(30-33) (80)	

71 PUMPING TEST

Pumping test method (10): 1 ☑ Pump 2 ☐ Bailer

Pumping rate (11-14): 5 GPM

Duration of pumping (15-16 Hours, 17-18 Mins): 3 Hours —

Static level (19-21): 12 feet

Water level end of pumping (22-24): 58 feet

Water levels during (25): 1 ☐ Pumping 2 ☐ Recovery

15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
41 feet	56 feet	58 feet	58 feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): ☑ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep

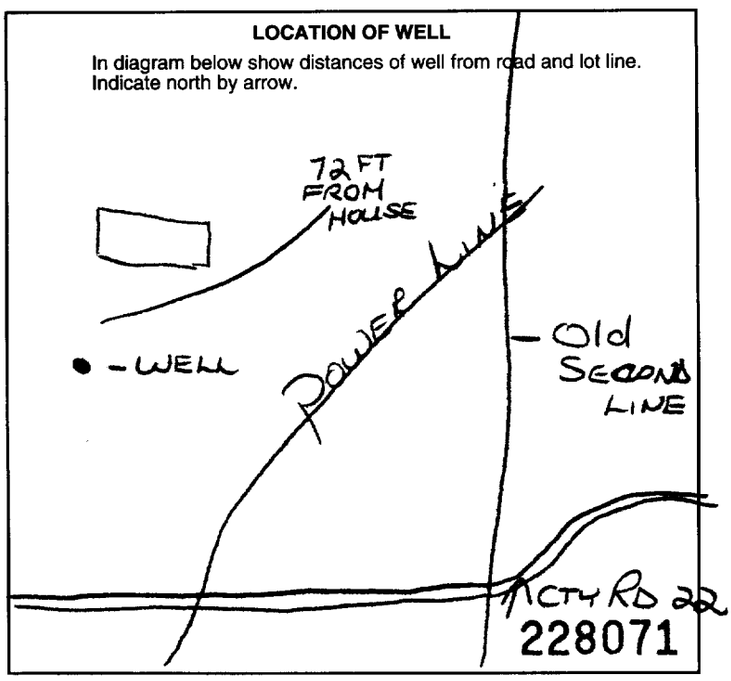
Recommended pump setting (43-45): 67 feet

Recommended pump rate (46-49): 6 GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



FINAL STATUS OF WELL (54)

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE (55-56)

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☑ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor: BUIE & BUKEE DRILLING LTD — Well Contractor's Licence No.: 1467

Address: RR#1 Box 7 BARRIE ONT

Name of Well Technician: BRIAN BUKEE — Well Technician's Licence No.: T0226

Signature of Technician/Contractor: Brian Bukee — Submission date: 15 day 09 mo 01 yr

MINISTRY USE ONLY

Data source (58) — Contractor (59-62): 1467 — Date received (63-68): SEP 19 2001 (80)

Date of inspection — Inspector

Remarks

0506 (07/00) Front Form 9

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Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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11 (1 2) 6712854 Municipality 67003 (10 14) Con. CON (15 22 23 24) 01

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot (25-27)
WELLINGTON	ERIN	I	1
[redacted]	Address	Date completed (28-33) 06 day 11 month 98 year	

21 (1 2) T M (10) Northing (12 17 18 24) RC (25) Elevation (26) RC (30) Basin Code (31 47) ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	Depth – feet To
BR	CLAY	STONES		0	26"
GR	LIMESTONE			26"	70

31 (10 14 15 21 32 43 54 65 75 80)
32

41 WATER RECORD

Water found at – feet (10-13)	Kind of water (14)
48-55	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
(15-18)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (19)
(20-23)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (24)
(25-28)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (29)
(30-33)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
(10-11) 6¼	1 ☑ Steel (12) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	342' (13-16)
(17-18) 6⅛	1 ☐ Steel (19) 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		342"	70 (20-23)
(24-25)	1 ☐ Steel (26) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38) inches	Length (39-40) feet
Material and type	Depth at top of screen (41-44) feet	(30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
(10-13)	(14-17)	
(18-21)	(22-25)	
(26-29)	(30-33) (80)	

71 PUMPING TEST

Pumping test method (10) AIR 1 ☐ Pump 2 ☐ Bailer
Pumping rate (11-14) 10 GPM
Duration of pumping (15-16) 1 Hours (17-18) 30 Mins

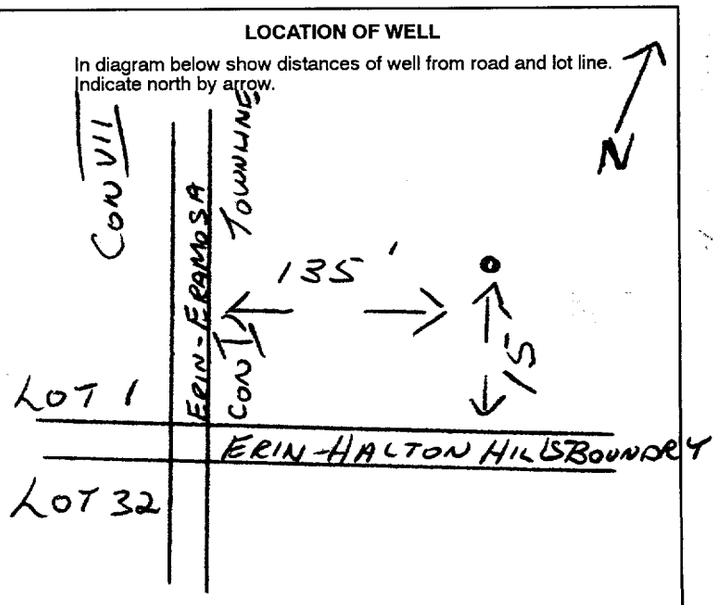
Static level (19-21)	Water level end of pumping (22-24)	Water levels during (25) 1 ☑ Pumping 2 ☐ Recovery: 15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
26 feet	30 feet	30 feet	30 feet	30 feet	30 feet

If flowing give rate (38-41)	Pump intake set at	Water at end of test (42)
GPM	feet	☐ Clear ☐ Cloudy
Recommended pump type: ☐ Shallow ☑ Deep	Recommended pump setting (43-45) 45 feet	Recommended pump rate (46-49) 10 GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



192039
TWC 40

FINAL STATUS OF WELL (54)

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well
5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering
9 ☐ Unfinished 10 ☐ Replacement well

WATER USE (55-56)

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial
5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning
9 ☐ Not used 10 ☐ Other .....

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool 2 ☑ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air)
5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting
9 ☐ Driving 10 ☐ Digging 11 ☐ Other .....

Name of Well Contractor	Well Contractor's Licence No.
LANG WELL DRILLING	3317
Address: RR1 HILLSBURGH ONT	
Name of Well Technician: ROY LANG	Well Technician's Licence No. T-0158
Signature of Technician/Contractor: R. Lang	Submission date: 26 day 12 mo 98 yr

MINISTRY USE ONLY

Data source (58)	Contractor (59-62) 3317	Date received (63-68) JAN 07 1999 (80)
Date of inspection	Inspector	
Remarks: CSS.ES9		

0506 (07/94) Front Form 9

2 - MINISTER OF ENVIRONMENT & ENERGY COPY

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Wel … nt Below)

A 096688

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name): 7 PINEHILL DRIVE

Township: [illegible] SPRINGWATER

Lot:

Concession:

County/District/Municipality: SIMCOE

City/Town/Village: PHELPSTON

Province: Ontario

Postal Code: L0L2K0

UTM Coordinates: NAD 83 Zone 17 Easting 598532 Northing 4929408

Municipal Plan and Sublot Number:

Other:

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sand			0'	10'
Grey	Clay			10'	70'
Grey	Silt			70'	120'
Grey	Clay			120'	165'
Grey	Sand		fine	165'	177'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	20'	14 Bags 3/8 Holeplug	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☒ Other, specify Air Rotary

Well Use

☐ Public ☐ Commercial ☐ Not used ☒ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6"	Steel	.219	+2'	172'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5"	Steel	6'	172'	177'

Status of Well

☒ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 177

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: 3 hrs + ___ min

Final water level end of pumping (m/ft): 135

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 170'

Recommended pump rate (l/min / GPM): 10 gpm

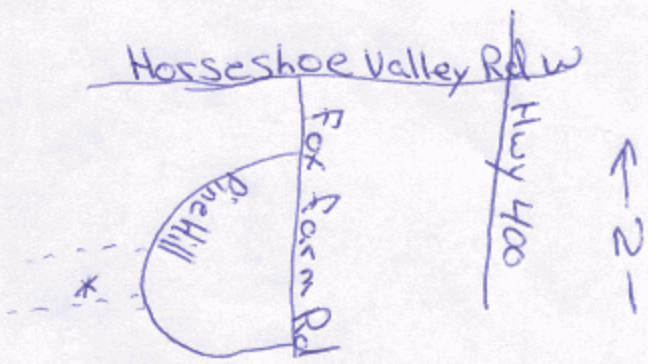
Well production (l/min / GPM): 20+ gpm

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	6.5		135
1		1	121
2		2	113.4
3		3	106.4
4		4	99.8
5		5	93.8
10		10	69.1
15		15	52.1
20		20	40
25		25	31.5
30		30	25.6
40		40	18.3
50		50	14.5
60		60	12.5

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 30 ft from House
100 ft from Road

Well Contractor and Well Technician Information

Business Name of Well Contractor: LONE STAR WELL DIGGING LTD

Well Contractor's Licence No.: 3413

Business Address (Street Number/Name): P.O. Box 280

Municipality: LEFROY

Province: ONT

Postal Code: L0K1W0

Business E-mail Address:

Bus. Telephone No. (inc. area code): 7054363459

Name of Well Technician (Last Name, First Name): JIM MOORE

Well Technician's Licence No.: TH01

Signature of Technician and/or Contractor: Jim Moore

Date Submitted: 2011/01/04

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2011/01/04

Ministry Use Only

Audit No. z123297

Received FEB 09 2011

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Ministry's Copy

Ontario — Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Here): **Tag#: A138281**

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☒ Metric ☐ Imperial

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
292 & HORSESHOE VALLEY RD W	SPRINGWATER	41	PRW CON 2

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE	BARRIE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	594948	4929975		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND			0	3.1
GREY	CLAY	STONE TILL		3.1	9.7
BROWN	SAND		f to med.	9.7	24.4
BROWN	SAND		CS.	24.4	32.0
BROWN	SAND		med.	32.0	36.6
BROWN	SILT	CLAY		36.6	42.7

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	7m	BENTONITE GROUT	380L/hr

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.5	STEEL	.188	+.5	31.7
14	STEEL	.219	30.7	31.7

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
15	S.STEEL	016	29.7	36.0

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	
30m	☐ Fresh ☒ Untested	☐ Gas ☐ Other, *specify*
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	7	26
7	42	22

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft): 25 m

Pumping rate (l/min / GPM): 350 L/m

Duration of pumping: 2 hrs + 30 min

Final water level end of pumping (m/ft): 16.92 m

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 25 m

Recommended pump rate (l/min / GPM): 350 L/m

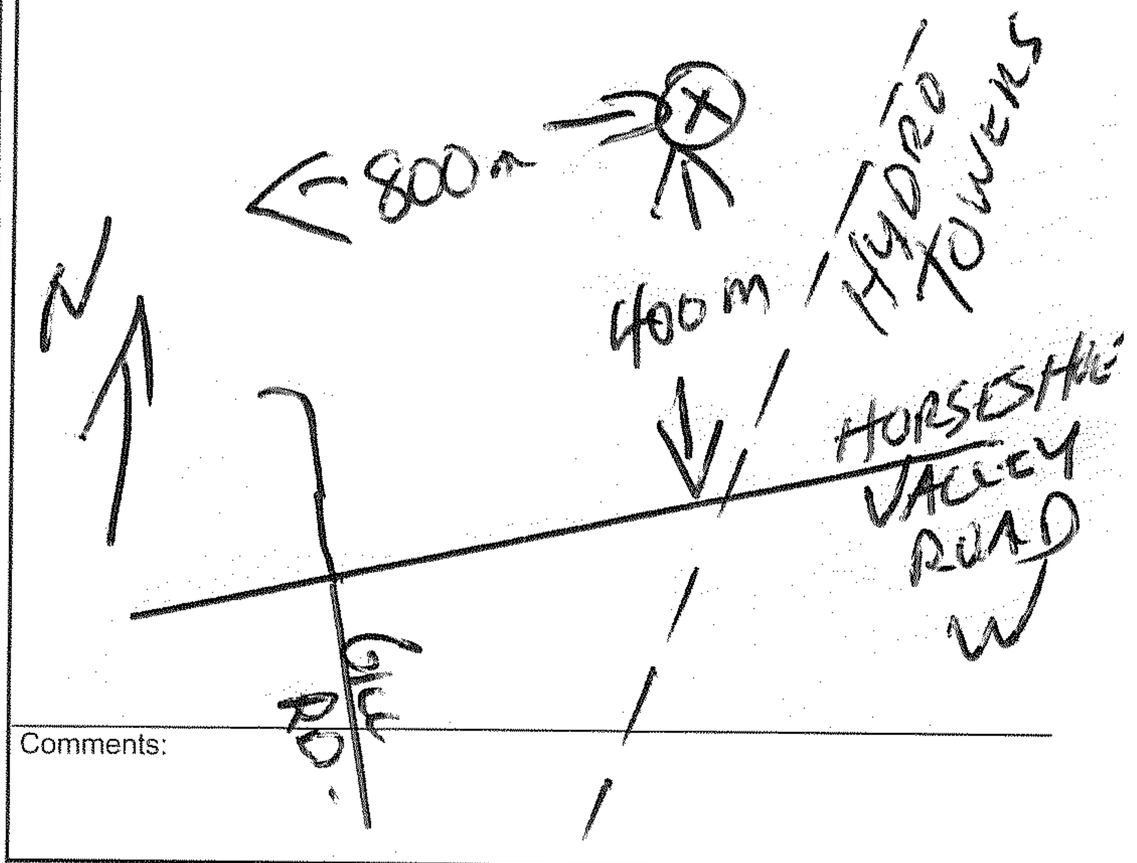
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	3.64m		
1	14.10	1	
2	16.02	2	
3	16.29	3	
4	16.38	4	
5	16.44	5	
10	16.56	10	
15	16.61	15	
20	16.66	20	
25	16.68	25	
30	16.70	30	
40	16.73	40	
50	16.76	50	
60	16.78	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
ALLAN WRIGHT WATER WELLS	5528

Business Address (Street Number/Name)	Municipality
4121 Hwy 93	HILLSDALE

Province	Postal Code	Business E-mail Address
ON	L0L 1V0	awww@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
705 835 5646	WRIGHT, ALLAN

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
2976		

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	20130925	20130925

Ministry Use Only

Audit No. Z176828

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Appendix F.2
Individual Records

UTM 1 9 Z 1 9 9 9 9 9 E
1 9 R 9 9 9 9 9 9 9 N
Elev. 9 RI
Basin 12 B

WAM

57 № 698

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

Water-Well Record

County or Territorial District Simcoe Township, Village, Town or City Flos
Con. 1 3 [redacted] Street and Number (if in Village, Town or City)
Owner [redacted] Address R.R. 3 Phelpston
Date completed July 28 / 1957 (day) (month) (year)

Pipe and Casing Record		Pumping Test	
Casing diameter(s)	2"	Static level	90 feet from top
Length(s)	100 feet	Pumping rate	300 G.P.H.
Type of screen	Johnson (2) (60 G)	Pumping level	95 feet from top
Length of screen	8 feet	Duration of test	3 HR.

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
clay with Boulders	Top	30 feet			
Hard pan	30	47			
gravel with loam	47	94			
clay	94	100	100	90 from top	fresh
gravel with sand	100	110			

For what purpose(s) is the water to be used? Home & farm use (gardens)
Is water clear or cloudy? Clear
Is well on upland, in valley, or on hillside? upland

Drilling firm Alex. Cameron
Address R.R. 3 Midhurst Ont

Name of Driller
Address

Licence Number 1198

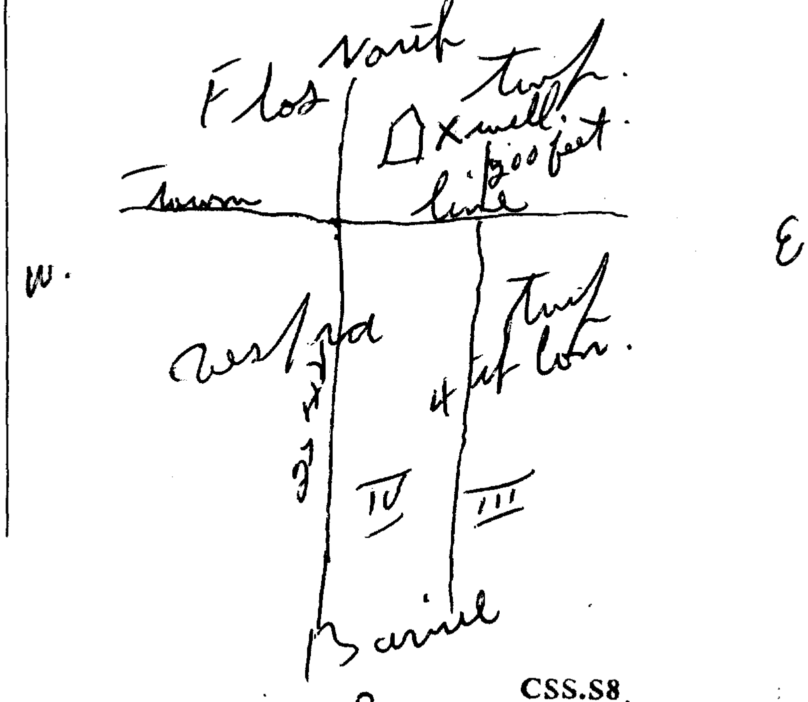
I certify that the foregoing statements of fact are true.

Date Aug 21/1957 Alex Cameron
Signature of Licensee

WAM

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

CSS.S8

well is directly opposite 4th line

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

ONTARIO

310/RW

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

11 — 5709928 — MUNICIP. 5016 — CON. Con 01

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	VESPRA	3	002

[redacted] — DATE COMPLETED: DAY 06 MO. 06 YR. 73

[redacted] 4928915 4 800 5 22 MAR 17, 197[redacted]

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	CLAY			0	35
GREY	SAND	CLAY	STONES	35	85
BROWN	"	"		85	105
"	"			105	112

31 — 01035605 | 00852805 1/2 | 01056805 | 01126805

32

41 WATER RECORD

WATER FOUND AT FEET	KIND OF WATER	
0105	1 ☒ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY	3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0109
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
0010	05 INCHES	03 FEET

MATERIAL AND TYPE: JOHNSON 55

DEPTH TO TOP OF SCREEN: 0109 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)
10-13		LEAD ~~PACKER~~
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	0008 GPM	01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
078 FEET	085 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	085 FEET	085 FEET	085 FEET	085 FEET

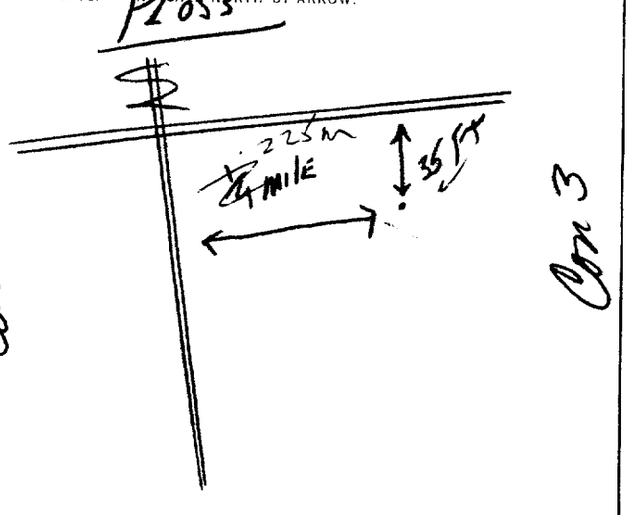
IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	FEET	0007 GPM

0001 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS: VESPRA

FINAL STATUS OF WELL	1 ☐ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 01	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

OR

NAME OF WELL CONTRACTOR: KNELSEN WATER WELLS — LICENCE NUMBER: 3203

ADDRESS: RR 1 BARRIE ONT

NAME OF WELL TECHNICIAN (DRILLER OR BORER): A KNELSEN — LICENCE NUMBER: 3213

SIGNATURE OF TECHNICIAN: [signature] — SUBMISSION DATE: DAY 8 MO. 6 YR. 73

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	3203	100773

DATE OF INSPECTION — INSPECTOR

REMARKS:

P

WI

CSS.S8

FORM 7 07-091

OF THE ENVIRONMENT COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

310/12 W.

Water management in Ontario

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

11 | 5709954 | MUNICIP. 57003 | CON. CON 101

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Flos	I	03.

OWNER (SURNAME FIRST) [redacted] ADDRESS RR#2 Phelpston ont

DATE COMPLETED DAY 12 MO. 04 YR. 73

HOLE DEPTH	RC.	ELEVATION	RC.	BASIN CODE		
928818	4	855	5	22	MAR 17, 1975	246

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH FROM	DEPTH TO
			Pit	0	5
L. brown	sand	gravel, clay, boulders		5	40
yellow	sand	gravel, boulders	loose	40	100
yellow	sand		fine	100	113
grey	clay			113	140
grey	clay	sand	fine	140	174
grey	sand		medium	174	178

31 | 0 0 0 5 | 2 3 | 0 0 4 0 6 2 8 1 1 6 5 | 0 1 0 0 5 2 8 1 1 1 3 | 0 1 1 3 5 0 8 | 0 1 4 0 2 0 5 | 0 1 7 4 2 6 5 0 8 | 1

32 | 0 1 7 8 2 0 9

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0174 ft	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
178	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH FROM	DEPTH TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	5	0175
06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
012	06.000 INCHES	03 FEET

MATERIAL AND TYPE: ~~stainless steel~~ DEPTH TO TOP OF SCREEN: 0175 FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0020 GPM. DURATION OF PUMPING: 01 HOURS 30 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☒ RECOVERY) 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
093 FEET	147 FEET	094 FEET	093 FEET	093 FEET	093 FEET

IF FLOWING, GIVE RATE: GPM. PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 118 FEET RECOMMENDED PUMPING RATE: 0009 GPM.

0004 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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

DRILLERS REMARKS:

FINAL STATUS OF WELL: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER 9 ☐ NOT USED

METHOD OF DRILLING: 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: H. HAMMERS LICENCE NUMBER: 2514

ADDRESS: RR# 3 Barrie, Ont.

NAME OF DRILLER OR BORER: H. Hammers LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Henry Hammers SUBMISSION DATE: DAY MO. YR.

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 2514 DATE RECEIVED: 100773

DATE OF INSPECTION: INSPECTOR:

REMARKS: CSS.82

P

WI

OWRC COPY

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

11 — 5724421 — MUNICIP 57003 — CON. CON 01

COUNTY OR DISTRICT: [redacted] — TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: [redacted] — CON., BLOCK, TRACT, SURVEY, ETC: 1 — LOT: 3

[redacted] RR #2 PHELPSTON ONTARIO

DATE COMPLETED: DAY 11 MO 1 YR 89

ELEVATION — BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	TOPSOIL			0	1
BROWN	SAND	STONES		1	31
GREY	SAND	CLAY		31	106
BROWN	SAND		MEDIUM	106	113
BROWN	SAND		FINE	113	118
GREY	CLAY	SAND		118	146
GREY	CLAY			146	170
GREY	SAND		FINE CEMENTED	170	178
		TOTAL DEPTH	178'		

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
170	1 ☑ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	2' ABOVE GROUND	171
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.): 4' 10 SLOT, 31 12 SLOT — DIAMETER: 5 INCHES — LENGTH: 7 FEET

MATERIAL AND TYPE: JOHNSON STAINLESS — DEPTH TO TOP OF SCREEN: 171 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	K PACKER, quick
18-21	22-25	GEL & CUTTINGS
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER — PUMPING RATE: 8 GPM — DURATION OF PUMPING: 2 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☑ PUMPING 2 ☐ RECOVERY)	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
92 FEET	140 FEET		116 FEET	138 FEET	140 FEET	140 FEET

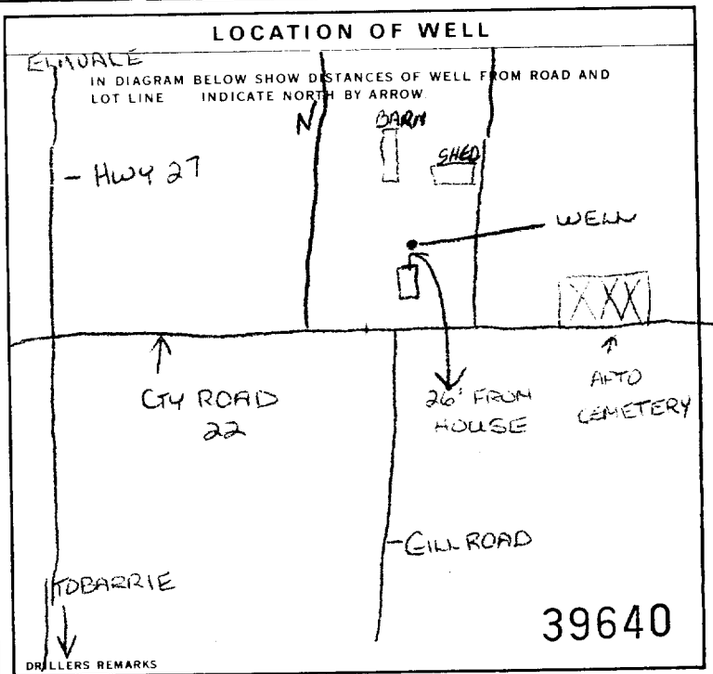
IF FLOWING, GIVE RATE: GPM — PUMP INTAKE SET AT: FEET — WATER AT END OF TEST: 1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP — RECOMMENDED PUMP SETTING: 165 FEET — RECOMMENDED PUMPING RATE: 10 GPM

LOCATION OF WELL

ELEVATE

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



DRILLERS REMARKS: 39640

FINAL STATUS OF WELL

1 ☑ WATER SUPPLY — 2 ☐ OBSERVATION WELL — 3 ☐ TEST HOLE — 4 ☐ RECHARGE WELL — 5 ☐ ABANDONED, INSUFFICIENT SUPPLY — 6 ☐ ABANDONED, POOR QUALITY — 7 ☐ UNFINISHED — 9 ☐ DEWATERING

WATER USE

1 ☑ DOMESTIC — 2 ☑ STOCK — 3 ☐ IRRIGATION — 4 ☐ INDUSTRIAL — 5 ☐ COMMERCIAL — 6 ☐ MUNICIPAL — 7 ☐ PUBLIC SUPPLY — 8 ☐ COOLING OR AIR CONDITIONING — ☐ OTHER — 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☑ CABLE TOOL — 2 ☐ ROTARY (CONVENTIONAL) — 3 ☐ ROTARY (REVERSE) — 4 ☐ ROTARY (AIR) — 5 ☐ AIR PERCUSSION — 6 ☐ BORING — 7 ☐ DIAMOND — 8 ☐ JETTING — 9 ☐ DRIVING — ☐ DIGGING — ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: BLUE & BUKER DRILLING LTD — WELL CONTRACTOR'S LICENCE NUMBER: 1467

ADDRESS: R R #1 BOX 7 BARRIE ONTARIO

NAME OF WELL TECHNICIAN: BRIAN BUKER — WELL TECHNICIAN'S LICENCE NUMBER: T0226

SIGNATURE OF TECHNICIAN/CONTRACTOR: Brian R. Buker — SUBMISSION DATE: DAY 24 MO 1 YR 89

OFFICE USE ONLY

DATA SOURCE: CONTRACTOR 1467 — DATE RECEIVED: JAN 27 1989

DATE OF INSPECTION — INSPECTOR

REMARKS: WDE — CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 (1 2) **5736248** Municipality 57003 (10 14) Con. CON (15 22 23 24) 01

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot (25-27)
SIMCOE	FLOS	1				1

[redacted]

Address: RR#2 PHELPSTON ONT

Date completed (48-53): 29 day 6 month 01 year

21 (1 2) UTM (10 12 17 18 24) Northing RC (25) Elevation RC (26 30) Basin Code (31 47) ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	TOPSOIL			0	1
BROWN	SAND			1	7
GRAY	SAND	CLAY/STONES		7	52
GRAY	CLAY	SAND		52	64
BROWN	SAND			64	71
GRAY	SAND	CLAY		71	—
	TOTAL DEPTH	71 feet			

31 (10 14 15 21) 32 (32 43 54 65 75 80)

41 WATER RECORD

Water found at - feet	Kind of water
64 (10-13)	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (14)
(15-18)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (19)
(20-23)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (24)
(25-28)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (29)
(30-33)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
(10-11) 5	1 ☐ Steel (12) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	1 FT ABOVE GROUND	(13-16) 67
(17-18)	1 ☐ Steel (19) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(20-23)
(24-25)	1 ☐ Steel (26) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38)	Length (39-40)
14	5 inches	4 feet

Material and type: STAINLESS STEEL

Depth at top of screen (41-44): 67 feet (30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
(10-13)	(14-17)	K PACKER
(18-21)	(22-25)	Hole Plug
(26-29)	(30-33) (80)	

71 PUMPING TEST

Pumping test method (10): 1 ☑ Pump 2 ☐ Bailer

Pumping rate (11-14): 5 GPM

Duration of pumping (15-16 Hours, 17-18 Mins): 3 Hours —

Static level (19-21): 12 feet

Water level end of pumping (22-24): 58 feet

Water levels during (25): 1 ☐ Pumping 2 ☐ Recovery

15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
41 feet	56 feet	58 feet	58 feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): ☑ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep

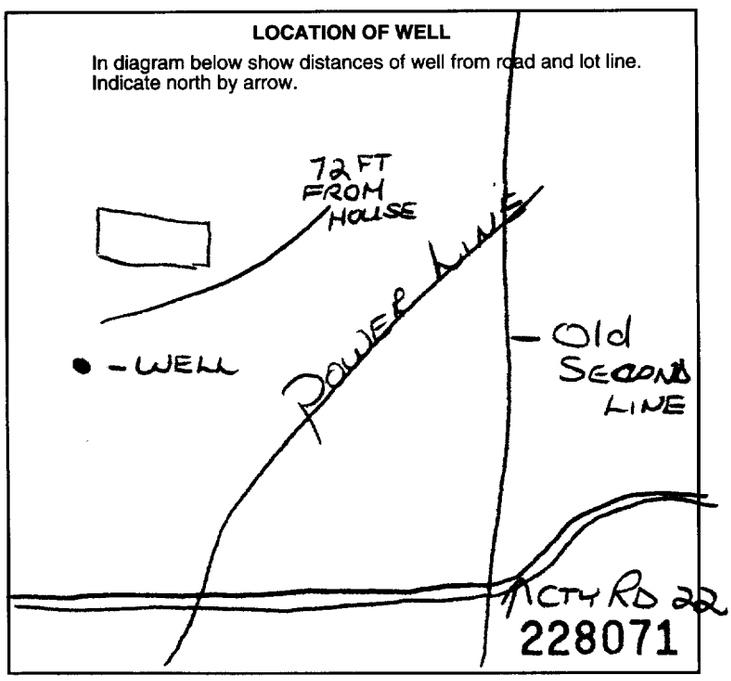
Recommended pump setting (43-45): 67 feet

Recommended pump rate (46-49): 6 GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



FINAL STATUS OF WELL (54)

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE (55-56)

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☑ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor: BUIE & BUKEE DRILLING LTD — Well Contractor's Licence No.: 1467

Address: RR#1 Box 7 BARRIE ONT

Name of Well Technician: BRIAN BUKEE — Well Technician's Licence No.: T0226

Signature of Technician/Contractor: Brian Bukee — Submission date: 15 day 09 mo 01 yr

MINISTRY USE ONLY

Data source (58) — Contractor (59-62): 1467 — Date received (63-68): SEP 19 2001 (80)

Date of inspection — Inspector

Remarks

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario — Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Here): **Tag#: A138281**

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☒ Metric ☐ Imperial

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
292 & HORSESHOE VALLEY RD W	SPRINGWATER	41	PRW CON 2

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE	BARRIE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	594948	4929975		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND			0	3.1
GREY	CLAY	STONE TILL		3.1	9.7
BROWN	SAND		f to med.	9.7	24.4
BROWN	SAND		CS.	24.4	32.0
BROWN	SAND		med.	32.0	36.6
BROWN	SILT	CLAY		36.6	42.7

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	7m	BENTONITE GROUT	380L/hr

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.5	STEEL	.188	+.5	31.7
14	STEEL	.219	30.7	31.7

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
15	S.STEEL	016	29.7	36.0

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	
30m	☐ Fresh ☒ Untested	☐ Gas ☐ Other, *specify*
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	7	26
7	42	22

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft): 25 m

Pumping rate (l/min / GPM): 350 L/m

Duration of pumping: 2 hrs + 30 min

Final water level end of pumping (m/ft): 16.92 m

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 25 m

Recommended pump rate (l/min / GPM): 350 L/m

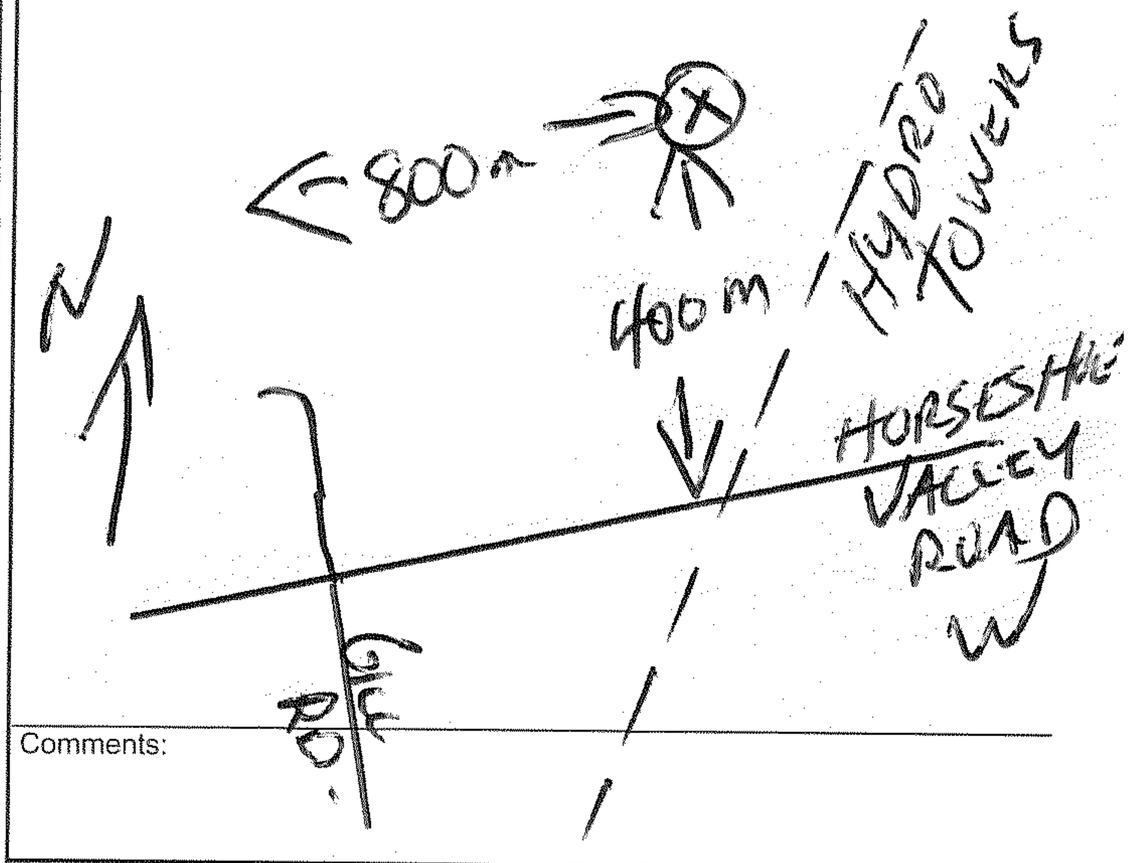
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	3.64m		
1	14.10	1	
2	16.02	2	
3	16.29	3	
4	16.38	4	
5	16.44	5	
10	16.56	10	
15	16.61	15	
20	16.66	20	
25	16.68	25	
30	16.70	30	
40	16.73	40	
50	16.76	50	
60	16.78	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
ALLAN WRIGHT WATER WELLS	5528

Business Address (Street Number/Name)	Municipality
4121 Hwy 93	HILLSDALE

Province	Postal Code	Business E-mail Address
ON	L0L 1V0	awww@bellnet.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
705 835 5646	WRIGHT, ALLAN

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
2976		

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	20130925	20130925

Ministry Use Only

Audit No. Z176828

RECEIVED JAN 09 2014

Ministry's Copy

Appendix G
Laboratory Analytical Reports

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 73504533
Your Project #: 086822-03-5.0
Your C.O.C. #: 572334-01-01

Attention:Jennifer Balkwill

GHD Limited
651 Colby Dr
Waterloo, ON
N2V 1C2

Report Date: 2016/09/07
Report #: R4156757
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6H9596
Received: 2016/08/24, 08:15

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	4	N/A	2016/08/25	CAM SOP-00448	SM 22 2320 B m
Carbonate, Bicarbonate and Hydroxide	4	N/A	2016/08/26	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	4	N/A	2016/08/25	CAM SOP-00463	EPA 325.2 m
Colour	4	N/A	2016/08/26	CAM SOP-00412	SM 22 2120C m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2016/08/26	CAM SOP-00446	SM 22 5310 B m
Fluoride	4	2016/08/24	2016/08/25	CAM SOP-00449	SM 22 4500-F C m
Hardness (calculated as CaCO3)	4	N/A	2016/08/30	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	4	N/A	2016/08/29	CAM SOP-00447	EPA 6020A m
Total Metals Analysis by ICPMS	3	N/A	2016/09/02	CAM SOP-00447	EPA 6020A m
Total Metals Analysis by ICPMS	1	N/A	2016/09/03	CAM SOP-00447	EPA 6020A m
Ion Balance (% Difference)	4	N/A	2016/08/30		
Total Ammonia-N	2	N/A	2016/08/26	CAM SOP-00441	EPA GS I-2522-90 m
Total Ammonia-N	2	N/A	2016/08/29	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2016/08/25	CAM SOP-00440	SM 22 4500-NO3I/NO2B
Nitrate (NO3) and Nitrite (NO2) in Water (2)	3	N/A	2016/08/26	CAM SOP-00440	SM 22 4500-NO3I/NO2B
Organic Nitrogen	4	N/A	2016/08/29		
pH	4	N/A	2016/08/25	CAM SOP-00413	SM 4500H+ B m
Field pH (3)	4	N/A	2016/09/02		Field pH Meter
Orthophosphate	4	N/A	2016/08/25	CAM SOP-00461	EPA 365.1 m
Sulphate by Automated Colourimetry	4	N/A	2016/08/25	CAM SOP-00464	EPA 375.4 m
Sulphide	4	N/A	2016/08/25	CAM SOP-00455	SM 22 4500-S G m
Total Dissolved Solids	4	N/A	2016/08/26	CAM SOP-00428	SM 22 2540C m
Field Temperature (3)	4	N/A	2016/09/06		Field Thermometer
Total Kjeldahl Nitrogen in Water	4	2016/08/26	2016/08/26	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	4	2016/08/29	2016/08/29	CAM SOP-00407	SM 22 4500 P B H m
Low Level Total Suspended Solids	4	N/A	2016/08/25	CAM SOP-00428	SM 22 2540D m
Turbidity	4	N/A	2016/08/25	CAM SOP-00417	SM 22 2130 B m
Un-ionized Ammonia	4	2016/08/24	2016/09/06		

Remarks:

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Your P.O. #: 73504533
Your Project #: 086822-03-5.0
Your C.O.C. #: 572334-01-01

Attention:Jennifer Balkwill

GHD Limited
651 Colby Dr
Waterloo, ON
N2V 1C2

Report Date: 2016/09/07
Report #: R4156757
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6H9596
Received: 2016/08/24, 08:15

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

Maxxam Analytics is accredited for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(3) This is a field test, therefore, the results relate to items that were not analysed at Maxxam Analytics Inc.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Madison Bingley, Project Manager
Email: MBingley@maxxam.ca
Phone# (613)274-3549

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

RESULTS OF ANALYSES OF WATER

Maxxam ID		CYC212			CYC213		
Sampling Date		2016/08/22 17:05			2016/08/22 10:35		
COC Number		572334-01-01			572334-01-01		
	UNITS	GW-86882-082216-SA-MW04	RDL	QC Batch	GW-86882-082316-SA-MW01	RDL	QC Batch
Calculated Parameters							
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	130	1.0	4632822	200	1.0	4632822
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.2	1.0	4632822	2.1	1.0	4632822
Hardness (CaCO3)	mg/L	140	1.0	4632688	170	1.0	4632688
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	4632822	ND	1.0	4632822
Ion Balance (% Difference)	%	1.34	N/A	4633035	3.30	N/A	4633035
Total Organic Nitrogen	mg/L	0.16	0.10	4633247	0.36	0.10	4633247
Total Un-ionized Ammonia	mg/L	ND	0.00084	4633087	0.0014	0.0005	4633087
Field Measurements							
Field Temperature	Celcius	9.83	N/A	ONSITE	10.48	N/A	ONSITE
Field pH	pH	7.97		ONSITE	7.71		ONSITE
Inorganics							
Total Ammonia-N	mg/L	ND	0.050	4636625	0.12	0.050	4636625
Colour	TCU	ND	2	4634074	ND	2	4634074
Total Dissolved Solids	mg/L	214	10	4636293	328	10	4635313
Fluoride (F-)	mg/L	ND	0.10	4633973	ND	0.10	4633973
Total Kjeldahl Nitrogen (TKN)	mg/L	0.16	0.10	4636732	0.48	0.10	4636732
Dissolved Organic Carbon	mg/L	2.3	0.20	4635571	0.74	0.20	4635571
Orthophosphate (P)	mg/L	ND	0.010	4634029	ND	0.010	4634029
pH	pH	7.98		4633983	8.05		4633983
Total Phosphorus	mg/L	1.9	0.2	4638824	3.8	0.2	4638824
Total Suspended Solids	mg/L	610	2	4634800	2000	5	4634800
Dissolved Sulphate (SO4)	mg/L	23	1.0	4634024	31	1.0	4634024
Sulphide	mg/L	ND	0.020	4633388	ND	0.020	4633388
Turbidity	NTU	4.2	0.1	4633223	15	0.1	4633223
Alkalinity (Total as CaCO3)	mg/L	130	1.0	4633984	200	1.0	4633984
Dissolved Chloride (Cl)	mg/L	2.2	1.0	4634011	7.6	1.0	4634011
Nitrite (N)	mg/L	ND	0.010	4634061	0.019	0.010	4634067
Nitrate (N)	mg/L	0.12	0.10	4634061	0.80	0.10	4634067
Nitrate + Nitrite (N)	mg/L	0.12	0.10	4634061	0.81	0.10	4634067

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

RESULTS OF ANALYSES OF WATER

Maxxam ID		CYC214		CYC215		
Sampling Date		2016/08/22 15:45		2016/08/22 13:45		
COC Number		572334-01-01		572334-01-01		
	UNITS	GW-86882-082216-SA-MW02	RDL	GW-86882-081916-SA-MW03	RDL	QC Batch
Calculated Parameters						
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	240	1.0	270	1.0	4632822
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.0	1.0	1.9	1.0	4632822
Hardness (CaCO3)	mg/L	230	1.0	260	1.0	4632688
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	ND	1.0	4632822
Ion Balance (% Difference)	%	1.44	N/A	2.13	N/A	4633035
Total Organic Nitrogen	mg/L	0.69	0.10	0.17	0.10	4633247
Total Un-ionized Ammonia	mg/L	0.0010	0.0005	ND	0.0005	4633087
Field Measurements						
Field Temperature	Celcius	9.70	N/A	10.93	N/A	ONSITE
Field pH	pH	7.56		7.30		ONSITE
Inorganics						
Total Ammonia-N	mg/L	0.13	0.050	ND	0.050	4636413
Colour	TCU	ND	2	ND	2	4634074
Total Dissolved Solids	mg/L	300	10	336	10	4636293
Fluoride (F-)	mg/L	ND	0.10	ND	0.10	4633973
Total Kjeldahl Nitrogen (TKN)	mg/L	0.82	0.10	0.17	0.10	4636732
Dissolved Organic Carbon	mg/L	1.0	0.20	2.9	0.20	4635571
Orthophosphate (P)	mg/L	ND	0.010	ND	0.010	4634029
pH	pH	7.96		7.88		4633983
Total Phosphorus	mg/L	2.4	0.2	0.13	0.02	4638824
Total Suspended Solids	mg/L	3000	5	300	4	4634800
Dissolved Sulphate (SO4)	mg/L	12	1.0	20	1.0	4634024
Sulphide	mg/L	ND	0.020	ND	0.020	4633388
Turbidity	NTU	23	0.1	6.7	0.1	4633223
Alkalinity (Total as CaCO3)	mg/L	240	1.0	270	1.0	4633984
Dissolved Chloride (Cl)	mg/L	2.8	1.0	3.5	1.0	4634011
Nitrite (N)	mg/L	0.012	0.010	ND	0.010	4634061
Nitrate (N)	mg/L	1.54	0.10	ND	0.10	4634061
Nitrate + Nitrite (N)	mg/L	1.56	0.10	ND	0.10	4634061

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
N/A = Not Applicable

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		CYC212		CYC213		CYC214		
Sampling Date		2016/08/22 17:05		2016/08/22 10:35		2016/08/22 15:45		
COC Number		572334-01-01		572334-01-01		572334-01-01		
	UNITS	GW-86882-082216-SA-MW04	RDL	GW-86882-082316-SA-MW01	RDL	GW-86882-082216-SA-MW02	RDL	QC Batch
Metals								
Total Aluminum (Al)	ug/L	5000	5.0	16000	5.0	22000	25	4644849
Total Antimony (Sb)	ug/L	ND	0.50	ND	0.50	ND	0.50	4644849
Total Arsenic (As)	ug/L	ND	1.0	3.5	1.0	3.0	1.0	4644849
Total Barium (Ba)	ug/L	260	2.0	220	2.0	310	2.0	4644849
Total Beryllium (Be)	ug/L	ND	0.50	0.59	0.50	0.79	0.50	4644849
Total Boron (B)	ug/L	ND	10	31	10	25	10	4644849
Total Cadmium (Cd)	ug/L	ND	0.10	ND	0.10	ND	0.10	4644849
Dissolved Calcium (Ca)	ug/L	42000	200	50000	200	72000	200	4636483
Total Chromium (Cr)	ug/L	9.0	5.0	22	5.0	58	5.0	4644849
Total Cobalt (Co)	ug/L	4.3	0.50	11	1.0	22	1.0	4644849
Total Copper (Cu)	ug/L	14	1.0	34	1.0	55	1.0	4644849
Total Iron (Fe)	ug/L	8200	100	25000	100	39000	100	4644849
Total Lead (Pb)	ug/L	3.3	0.50	8.8	0.50	11	0.50	4644849
Dissolved Magnesium (Mg)	ug/L	8000	50	10000	50	13000	50	4636483
Total Manganese (Mn)	ug/L	360	2.0	1300	2.0	1700	2.0	4644849
Total Molybdenum (Mo)	ug/L	1.5	0.50	11	0.50	34	0.50	4644849
Total Nickel (Ni)	ug/L	6.7	1.0	19	2.0	34	2.0	4644849
Total Phosphorus (P)	ug/L	2000	100	6500	100	2200	100	4644849
Dissolved Potassium (K)	ug/L	1400	200	2600	200	2400	200	4636483
Total Selenium (Se)	ug/L	ND	2.0	ND	2.0	ND	2.0	4644849
Total Silver (Ag)	ug/L	ND	0.10	ND	0.10	ND	0.10	4644849
Dissolved Sodium (Na)	ug/L	8200	100	29000	100	7000	100	4636483
Total Sodium (Na)	ug/L	9100	100	33000	100	9300	100	4644849
Total Thallium (Tl)	ug/L	0.078	0.050	0.21	0.050	0.38	0.050	4644849
Total Tungsten (W)	ug/L	ND	1.0	ND	1.0	31	1.0	4644849
Total Uranium (U)	ug/L	2.5	0.10	3.1	0.10	1.4	0.10	4644849
Total Vanadium (V)	ug/L	11	0.50	38	0.50	51	0.50	4644849
Total Zinc (Zn)	ug/L	17	5.0	51	5.0	79	5.0	4644849
Total Zirconium (Zr)	ug/L	1.6	1.0	8.2	1.0	9.2	1.0	4644849

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		CYC214		CYC215		
Sampling Date		2016/08/22 15:45		2016/08/22 13:45		
COC Number		572334-01-01		572334-01-01		
	UNITS	GW-86882-082216-SA-MW02 Lab-Dup	RDL	GW-86882-081916-SA-MW03	RDL	QC Batch
Metals						
Total Aluminum (Al)	ug/L		25	4400	5.0	4644849
Total Antimony (Sb)	ug/L		0.50	ND	0.50	4644849
Total Arsenic (As)	ug/L		1.0	ND	1.0	4644849
Total Barium (Ba)	ug/L		2.0	100	2.0	4644849
Total Beryllium (Be)	ug/L		0.50	ND	0.50	4644849
Total Boron (B)	ug/L		10	15	10	4644849
Total Cadmium (Cd)	ug/L		0.10	ND	0.10	4644849
Dissolved Calcium (Ca)	ug/L	72000	200	82000	200	4636483
Total Chromium (Cr)	ug/L		5.0	8.5	5.0	4644849
Total Cobalt (Co)	ug/L		1.0	4.2	0.50	4644849
Total Copper (Cu)	ug/L		1.0	14	1.0	4644849
Total Iron (Fe)	ug/L		100	6500	100	4644849
Total Lead (Pb)	ug/L		0.50	2.3	0.50	4644849
Dissolved Magnesium (Mg)	ug/L	13000	50	13000	50	4636483
Total Manganese (Mn)	ug/L		2.0	260	2.0	4644849
Total Molybdenum (Mo)	ug/L		0.50	2.4	0.50	4644849
Total Nickel (Ni)	ug/L		2.0	8.4	1.0	4644849
Total Phosphorus (P)	ug/L		100	120	100	4644849
Dissolved Potassium (K)	ug/L	2300	200	2100	200	4636483
Total Selenium (Se)	ug/L		2.0	ND	2.0	4644849
Total Silver (Ag)	ug/L		0.10	ND	0.10	4644849
Dissolved Sodium (Na)	ug/L	6800	100	9600	100	4636483
Total Sodium (Na)	ug/L		100	10000	100	4644849
Total Thallium (Tl)	ug/L		0.050	0.088	0.050	4644849
Total Tungsten (W)	ug/L		1.0	ND	1.0	4644849
Total Uranium (U)	ug/L		0.10	2.9	0.10	4644849
Total Vanadium (V)	ug/L		0.50	9.3	0.50	4644849
Total Zinc (Zn)	ug/L		5.0	20	5.0	4644849
Total Zirconium (Zr)	ug/L		1.0	1.5	1.0	4644849

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not detected

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: CYC212
Sample ID: GW-86882-082216-SA-MW04
Matrix: Water

Collected: 2016/08/22
Shipped:
Received: 2016/08/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4633984	N/A	2016/08/25	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4632822	N/A	2016/08/26	Automated Statchk
Chloride by Automated Colourimetry	KONE	4634011	N/A	2016/08/25	Alina Dobreanu
Colour	SPEC	4634074	N/A	2016/08/26	Viorica Rotaru
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4635571	N/A	2016/08/26	Anastasia Hamanov
Fluoride	ISE	4633973	2016/08/24	2016/08/25	Surinder Rai
Hardness (calculated as CaCO3)		4632688	N/A	2016/08/30	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4636483	N/A	2016/08/29	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	4644849	N/A	2016/09/02	Cristina Petran
Ion Balance (% Difference)	CALC	4633035	N/A	2016/08/30	Automated Statchk
Total Ammonia-N	LACH/NH4	4636625	N/A	2016/08/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4634061	N/A	2016/08/26	Chandra Nandlal
Organic Nitrogen	CALC	4633247	N/A	2016/08/29	Automated Statchk
pH	AT	4633983	N/A	2016/08/25	Surinder Rai
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Orthophosphate	KONE	4634029	N/A	2016/08/25	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4634024	N/A	2016/08/25	Deonarine Ramnarine
Sulphide	ISE/S	4633388	N/A	2016/08/25	Neil Dassanayake
Total Dissolved Solids	BAL	4636293	N/A	2016/08/26	Lu Wang(Alice)
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Total Kjeldahl Nitrogen in Water	SKAL	4636732	2016/08/26	2016/08/26	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4638824	2016/08/29	2016/08/29	Sarabjit Raina
Low Level Total Suspended Solids	BAL	4634800	N/A	2016/08/25	Zahid Soikot
Turbidity	AT	4633223	N/A	2016/08/25	Neil Dassanayake
Un-ionized Ammonia	CALC/NH3	4633087	2016/09/06	2016/09/06	Automated Statchk

Maxxam ID: CYC213
Sample ID: GW-86882-082316-SA-MW01
Matrix: Water

Collected: 2016/08/22
Shipped:
Received: 2016/08/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4633984	N/A	2016/08/25	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4632822	N/A	2016/08/26	Automated Statchk
Chloride by Automated Colourimetry	KONE	4634011	N/A	2016/08/25	Alina Dobreanu
Colour	SPEC	4634074	N/A	2016/08/26	Viorica Rotaru
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4635571	N/A	2016/08/26	Anastasia Hamanov
Fluoride	ISE	4633973	2016/08/24	2016/08/25	Surinder Rai
Hardness (calculated as CaCO3)		4632688	N/A	2016/08/30	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4636483	N/A	2016/08/29	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	4644849	N/A	2016/09/02	Cristina Petran
Ion Balance (% Difference)	CALC	4633035	N/A	2016/08/30	Automated Statchk
Total Ammonia-N	LACH/NH4	4636625	N/A	2016/08/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4634067	N/A	2016/08/25	Chandra Nandlal
Organic Nitrogen	CALC	4633247	N/A	2016/08/29	Automated Statchk

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: CYC213
Sample ID: GW-86882-082316-SA-MW01
Matrix: Water

Collected: 2016/08/22
Shipped:
Received: 2016/08/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH	AT	4633983	N/A	2016/08/25	Surinder Rai
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Orthophosphate	KONE	4634029	N/A	2016/08/25	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4634024	N/A	2016/08/25	Deonarine Ramnarine
Sulphide	ISE/S	4633388	N/A	2016/08/25	Neil Dassanayake
Total Dissolved Solids	BAL	4635313	N/A	2016/08/26	Gurpreet Kaur
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Total Kjeldahl Nitrogen in Water	SKAL	4636732	2016/08/26	2016/08/26	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4638824	2016/08/29	2016/08/29	Sarabjit Raina
Low Level Total Suspended Solids	BAL	4634800	N/A	2016/08/25	Zahid Soikot
Turbidity	AT	4633223	N/A	2016/08/25	Neil Dassanayake
Un-ionized Ammonia	CALC/NH3	4633087	2016/09/06	2016/09/06	Automated Statchk

Maxxam ID: CYC214
Sample ID: GW-86882-082216-SA-MW02
Matrix: Water

Collected: 2016/08/22
Shipped:
Received: 2016/08/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4633984	N/A	2016/08/25	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4632822	N/A	2016/08/26	Automated Statchk
Chloride by Automated Colourimetry	KONE	4634011	N/A	2016/08/25	Alina Dobreanu
Colour	SPEC	4634074	N/A	2016/08/26	Viorica Rotaru
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4635571	N/A	2016/08/26	Anastasia Hamanov
Fluoride	ISE	4633973	2016/08/24	2016/08/25	Surinder Rai
Hardness (calculated as CaCO3)		4632688	N/A	2016/08/30	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4636483	N/A	2016/08/29	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	4644849	N/A	2016/09/03	Cristina Petran
Ion Balance (% Difference)	CALC	4633035	N/A	2016/08/30	Automated Statchk
Total Ammonia-N	LACH/NH4	4636413	N/A	2016/08/26	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4634061	N/A	2016/08/26	Chandra Nandlal
Organic Nitrogen	CALC	4633247	N/A	2016/08/29	Automated Statchk
pH	AT	4633983	N/A	2016/08/25	Surinder Rai
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Orthophosphate	KONE	4634029	N/A	2016/08/25	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4634024	N/A	2016/08/25	Deonarine Ramnarine
Sulphide	ISE/S	4633388	N/A	2016/08/25	Neil Dassanayake
Total Dissolved Solids	BAL	4636293	N/A	2016/08/26	Lu Wang(Alice)
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Total Kjeldahl Nitrogen in Water	SKAL	4636732	2016/08/26	2016/08/26	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4638824	2016/08/29	2016/08/29	Sarabjit Raina
Low Level Total Suspended Solids	BAL	4634800	N/A	2016/08/25	Zahid Soikot
Turbidity	AT	4633223	N/A	2016/08/25	Neil Dassanayake
Un-ionized Ammonia	CALC/NH3	4633087	2016/09/06	2016/09/06	Automated Statchk

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

TEST SUMMARY

Maxxam ID: CYC214 Dup
Sample ID: GW-86882-082216-SA-MW02
Matrix: Water

Collected: 2016/08/22
Shipped:
Received: 2016/08/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	4636483	N/A	2016/08/29	Arefa Dabhad

Maxxam ID: CYC215
Sample ID: GW-86882-081916-SA-MW03
Matrix: Water

Collected: 2016/08/22
Shipped:
Received: 2016/08/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4633984	N/A	2016/08/25	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	4632822	N/A	2016/08/26	Automated Statchk
Chloride by Automated Colourimetry	KONE	4634011	N/A	2016/08/25	Alina Dobreanu
Colour	SPEC	4634074	N/A	2016/08/26	Viorica Rotaru
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4635571	N/A	2016/08/26	Anastasia Hamanov
Fluoride	ISE	4633973	2016/08/24	2016/08/25	Surinder Rai
Hardness (calculated as CaCO3)		4632688	N/A	2016/08/30	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	4636483	N/A	2016/08/29	Arefa Dabhad
Total Metals Analysis by ICPMS	ICP/MS	4644849	N/A	2016/09/02	Cristina Petran
Ion Balance (% Difference)	CALC	4633035	N/A	2016/08/30	Automated Statchk
Total Ammonia-N	LACH/NH4	4636413	N/A	2016/08/26	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4634061	N/A	2016/08/26	Chandra Nandlal
Organic Nitrogen	CALC	4633247	N/A	2016/08/29	Automated Statchk
pH	AT	4633983	N/A	2016/08/25	Surinder Rai
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Orthophosphate	KONE	4634029	N/A	2016/08/25	Alina Dobreanu
Sulphate by Automated Colourimetry	KONE	4634024	N/A	2016/08/25	Deonarine Ramnarine
Sulphide	ISE/S	4633388	N/A	2016/08/25	Neil Dassanayake
Total Dissolved Solids	BAL	4636293	N/A	2016/08/26	Lu Wang(Alice)
Field pH	PH	ONSITE	N/A	2016/08/24	Madison Bingley
Total Kjeldahl Nitrogen in Water	SKAL	4636732	2016/08/26	2016/08/26	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4638824	2016/08/29	2016/08/29	Sarabjit Raina
Low Level Total Suspended Solids	BAL	4634800	N/A	2016/08/25	Zahid Soikot
Turbidity	AT	4633223	N/A	2016/08/25	Neil Dassanayake
Un-ionized Ammonia	CALC/NH3	4633087	2016/09/06	2016/09/06	Automated Statchk

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.0°C

Revised Report (2016/09/07): Updated Unionized Ammonia values.

Results relate only to the items tested.

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4633223	Turbidity	2016/08/25			101	85 - 115	ND, RDL=0.1	NTU	6.3 (1)	20		
4633388	Sulphide	2016/08/25	89	80 - 120	93	80 - 120	ND, RDL=0.020	mg/L	NC (1)	20		
4633973	Fluoride (F-)	2016/08/25	NC	80 - 120	99	80 - 120	ND, RDL=0.10	mg/L	2.3 (1)	20		
4633983	pH	2016/08/25			101	98 - 103			0.083 (1)	N/A		
4633984	Alkalinity (Total as CaCO3)	2016/08/25			95	85 - 115	ND, RDL=1.0	mg/L	0.0013 (1)	25		
4634011	Dissolved Chloride (Cl)	2016/08/25	NC	80 - 120	99	80 - 120	ND, RDL=1.0	mg/L	1.2 (1)	20		
4634024	Dissolved Sulphate (SO4)	2016/08/25	NC	75 - 125	103	80 - 120	ND, RDL=1.0	mg/L	0.20 (1)	20		
4634029	Orthophosphate (P)	2016/08/25	102	75 - 125	101	80 - 120	ND, RDL=0.010	mg/L	NC (1)	25		
4634061	Nitrate (N)	2016/08/26	NC	80 - 120	99	80 - 120	ND, RDL=0.10	mg/L	0.77 (1)	25		
4634061	Nitrite (N)	2016/08/26	97	80 - 120	108	80 - 120	ND, RDL=0.010	mg/L	NC (1)	25		
4634067	Nitrate (N)	2016/08/25	94	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	NC (1)	25		
4634067	Nitrite (N)	2016/08/25	100	80 - 120	111	80 - 120	ND, RDL=0.010	mg/L	NC (1)	25		
4634074	Colour	2016/08/26			100	80 - 120	ND,RDL=2	TCU	NC (1)	25		
4634800	Total Suspended Solids	2016/08/25					ND,RDL=1	mg/L	NC (1)	25	99	85 - 115
4635313	Total Dissolved Solids	2016/08/26					ND, RDL=10	mg/L	4.7 (1)	25	98	90 - 110
4635571	Dissolved Organic Carbon	2016/08/26	NC	80 - 120	102	80 - 120	ND, RDL=0.20	mg/L	0.60 (1)	20		
4636293	Total Dissolved Solids	2016/08/26					ND, RDL=10	mg/L	1.8 (1)	25	101	90 - 110
4636413	Total Ammonia-N	2016/08/26	NC	80 - 120	100	85 - 115	ND, RDL=0.050	mg/L	1.8 (1)	20		
4636483	Dissolved Calcium (Ca)	2016/08/29	NC (2)	80 - 120	97	80 - 120	ND, RDL=200	ug/L	0.22 (3)	20		
4636483	Dissolved Magnesium (Mg)	2016/08/29	NC (2)	80 - 120	97	80 - 120	ND, RDL=50	ug/L	0.035 (3)	20		
4636483	Dissolved Potassium (K)	2016/08/29	100 (2)	80 - 120	96	80 - 120	ND, RDL=200	ug/L	3.0 (3)	20		
4636483	Dissolved Sodium (Na)	2016/08/29	99 (2)	80 - 120	97	80 - 120	ND, RDL=100	ug/L	3.0 (3)	20		
4636625	Total Ammonia-N	2016/08/29	99	80 - 120	99	85 - 115	ND, RDL=0.050	mg/L	NC (1)	20		
4636732	Total Kjeldahl Nitrogen (TKN)	2016/08/26	113	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	NC (1)	20	103	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4638824	Total Phosphorus	2016/08/29	101	80 - 120	93	80 - 120	ND, RDL=0.004	mg/L	NC (1)	20	95	80 - 120
4644849	Total Aluminum (Al)	2016/09/02	104	80 - 120	106	80 - 120	ND, RDL=5.0	ug/L				
4644849	Total Antimony (Sb)	2016/09/02	110	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
4644849	Total Arsenic (As)	2016/09/02	102	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC (1)	20		
4644849	Total Barium (Ba)	2016/09/02	NC	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L				
4644849	Total Beryllium (Be)	2016/09/02	103	80 - 120	102	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
4644849	Total Boron (B)	2016/09/02	NC	80 - 120	99	80 - 120	ND, RDL=10	ug/L	4.1 (1)	20		
4644849	Total Cadmium (Cd)	2016/09/02	102	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L	NC (1)	20		
4644849	Total Chromium (Cr)	2016/09/02	97	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L	NC (1)	20		
4644849	Total Cobalt (Co)	2016/09/02	94	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
4644849	Total Copper (Cu)	2016/09/02	101	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC (1)	20		
4644849	Total Iron (Fe)	2016/09/02	97	80 - 120	99	80 - 120	ND, RDL=100	ug/L	NC (1)	20		
4644849	Total Lead (Pb)	2016/09/02	91	80 - 120	94	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
4644849	Total Manganese (Mn)	2016/09/02	NC	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L				
4644849	Total Molybdenum (Mo)	2016/09/02	108	80 - 120	103	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
4644849	Total Nickel (Ni)	2016/09/02	93	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC (1)	20		
4644849	Total Phosphorus (P)	2016/09/02	110	80 - 120	101	80 - 120	ND, RDL=100	ug/L				
4644849	Total Selenium (Se)	2016/09/02	103	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC (1)	20		
4644849	Total Silver (Ag)	2016/09/02	98	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC (1)	20		
4644849	Total Sodium (Na)	2016/09/02	NC	80 - 120	100	80 - 120	ND, RDL=100	ug/L				
4644849	Total Thallium (Tl)	2016/09/02	91	80 - 120	93	80 - 120	ND, RDL=0.050	ug/L	NC (1)	20		
4644849	Total Tungsten (W)	2016/09/02	98	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC (1)	20		
4644849	Total Uranium (U)	2016/09/02	101	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC (1)	20		
4644849	Total Vanadium (V)	2016/09/02	99	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
4644849	Total Zinc (Zn)	2016/09/02	102	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC (1)	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4644849	Total Zirconium (Zr)	2016/09/02	110	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L	NC (1)	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Duplicate Parent ID

(2) Matrix Spike Parent ID [CYC214-04]

(3) Duplicate Parent ID [CYC214-04]

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Maxxam Job #: B6H9596
Report Date: 2016/09/07

GHD Limited
Client Project #: 086822-03-5.0
Your P.O. #: 73504533
Sampler Initials: SA

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Specialist

Cristina Carriere, Scientific Services

Madison Bingley, Project Manager

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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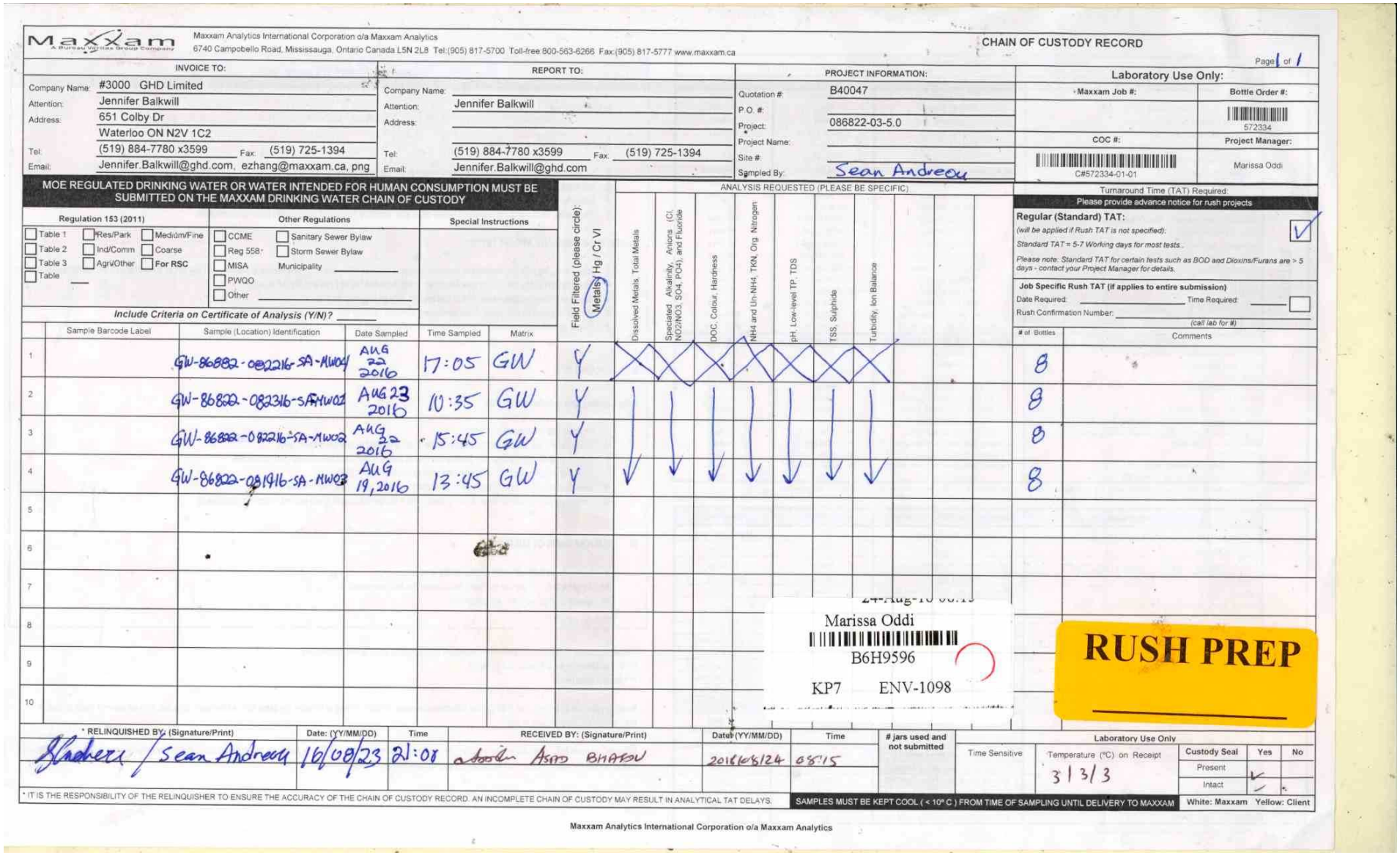

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CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:
Company Name: #3000 GHD Limited
Attention: Jennifer Balkwill
Address: 651 Colby Dr, Waterloo ON N2V 1C2
Tel: (519) 884-7780 x3599 Fax: (519) 725-1394
Email: Jennifer.Balkwill@ghd.com, ezhang@maxxam.ca, png

REPORT TO:
Company Name:
Attention: Jennifer Balkwill
Address:
Tel: (519) 884-7780 x3599 Fax: (519) 725-1394
Email: Jennifer.Balkwill@ghd.com

PROJECT INFORMATION:
Quotation #: B40047
P.O. #:
Project: 086822-03-5.0
Project Name:
Site #:
Sampled By: Sean Andreou

Laboratory Use Only:
Maxxam Job #:
Bottle Order #: 572334
COC #: C#572334-01-01
Project Manager: Marissa Oddi

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): Table 1, Table 2, Table 3, Table ___; Res/Park, Ind/Comm, Agr/Other; Medium/Fine, Coarse, For RSC
Other Regulations: CCME, Reg 558, MISA, PWQO, Other; Sanitary Sewer Bylaw, Storm Sewer Bylaw, Municipality
Special Instructions
Include Criteria on Certificate of Analysis (Y/N)? ___

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects
Regular (Standard) TAT: ✓
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Dissolved Metals, Total Metals	Speciated Alkalinity, Anions (Cl, NO2/NO3, SO4, PO4), and Fluoride	DOC, Colour, Hardness	NH4 and Un-NH4, TKN, Org. Nitrogen	pH, Low-level TP, TDS	TSS, Sulphide	Turbidity, Ion Balance	# of Bottles	Comments
1		GW-86882-082216-SA-MW04	AUG 22 2016	17:05	GW	Y								8	
2		GW-86882-082316-SA-MW02	AUG 23 2016	10:35	GW	Y								8	
3		GW-86882-082216-SA-MW02	AUG 22 2016	15:45	GW	Y								8	
4		GW-86882-081916-SA-MW03	AUG 19, 2016	13:45	GW	Y								8	
5															
6															
7															
8															
9															
10															

24-Aug-16 08:15
Marissa Oddi
B6H9596
KP7 ENV-1098

RUSH PREP

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Sean Andreou	16/08/23	21:08	Ashish Bhatia	2016/08/24	08:15	

Laboratory Use Only
Time Sensitive
Temperature (°C) on Receipt: 3 | 3 | 3
Custody Seal: Present ✓, Intact ✓ — Yes / No

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

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