



**GROUNDWATER QUALITY IMPACT ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
PART LOTS 22 AND 23, CONCESSION 2 SCD (KEPPEL)
COMMUNITY OF SHALLOW LAKE
TOWNSHIP OF GEORGIAN BLUFFS, GREY COUNTY**

Prepared for:

**Sunset View Farms & Investments Ltd.
320091 Sideroad 25
Shallow Lake, ON N0H 2K0**

Prepared by:

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Project No. 21-112

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21-112

August 29, 2025

Sunset View Farms & Investments Ltd.
320091 Sideroad 25
Shallow Lake, Ontario
N0H 2K0

Attention: Mr. Christian Nagel

RE: Groundwater Quality Impact Assessment for On-Site Sewage Systems
Proposed Residential Development, Part Lots 22 and 23, Concession 2 SCD (Keppel)
Community of Shallow Lake, Township of Georgian Bluffs, Grey County

Dear Sir,

This report provides the results of an assessment of potential impacts on groundwater quality from on-site sewage systems, carried out in accordance with MECP Procedure D-5-4 for a proposed residential development at the property described as Part of Lot 23, Concession 2 South of Centre Diagonal (SCD) in the geographic Township of Keppel and Part of Lot 1, Judge's Plan 857 (Keppel), now located in the community of Shallow Lake in the Township of Georgian Bluffs. The assessment was carried out in support of a proposal to develop a 27-lot residential subdivision on the 8.1-hectare property.

We trust that this report meets your present requirements. If we can be of additional assistance in this regard, please do not hesitate to contact this office.

GSS Engineering Consultants Ltd.

A handwritten signature in blue ink, appearing to read 'W. Brad Benson', is written over a light blue horizontal line.

W. Brad Benson, P.Eng.
Senior Hydrogeologist

WBB/bb

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1.0 INTRODUCTION

1.1 General

This report provides the results of an assessment by GSS Engineering Consultants Ltd. (GSS) of potential impacts on groundwater quality as a result of nitrate loading from the on-site sewage systems for a proposed residential development on an 8.14-hectare (20.1-acre) parcel of land located in Parts of Lots 22 and 23, Concession 2 South of the Centre Diagonal (SCD), Geographic Township of Keppel, now in the Township of Georgian Bluffs (hereafter referred to as the Site). The Site is legally described as Part of Lot 23, Concession 2 SCD (Keppel) and Part of Lot 1, Judge's Plan 857 (Keppel). The Site is located within the defined Settlement Area for Shallow Lake and is zoned as Planned Development Zone (PD). The current use of the Site is agricultural cropland and a treed area.

1.2 Background and Planning Requirements

GSS understood that Sunset View Farms & Investments Ltd. (the Owner) is planning to develop the Site with twenty-seven (27) residential properties (26 single-family houses and one fourplex) to be serviced with individual on-site sewage systems and a municipal water supply obtained from the Shallow Lake Drinking Water System. The purpose of this assessment was to make an evaluation of the potential impacts to groundwater quality from the sewage systems in accordance with the requirements of the Grey County Official Plan and Ministry of the Environment, Conservation and Parks (MECP) Procedure D-5-4.

1.3 Scope of Work

Paragraph 18) of Section 8.9.1 of the Grey County Official Plan (consolidated August 9, 2024) indicated that new lot creation less than 0.4 ha in size on individual private services, or on partial services using private individual septic systems, shall only be considered with the successful completion of a nitrate study in accordance with MECP D-5 Series Guideline.

Assessment of the potential impact on groundwater from developments serviced with individual on-site sewage systems is described in MECP Procedure D-5-4, Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment (1996). The proposed development was evaluated in accordance with Step Three of that procedure by using a predictive assessment to evaluate the risk that the combined effects from the sewage systems on each lot will cause the nitrate concentration in groundwater at the downgradient Site boundary to exceed 10 milligrams per litre (mg/L).

The scope of work included review of relevant background information, a reconnaissance of the Site, and collection and analysis of groundwater samples from existing wells on or in the vicinity of the Site to assess the background nitrate concentration.

2.0 SITE DESCRIPTION

The Site is located on the north side of Princess Street (Highway 6) near the west edge of the community of Shallow Lake, as shown on **Figure 1**. Princess Street is oriented in a roughly northwest-southeast direction adjacent to the Site. For the purpose of identifying directions in this report, north was generally considered to be perpendicular to Princess Street.

Based on the plan of survey for the proposed development (Callon Dietz Incorporated, September 2022), the area of the Site is 8.14 ha (20.1 ac). The majority of the Site is roughly rectangular-shaped, with a relatively narrow strip extending south to Princess Street where there is 34 m of frontage. Most of the Site is located within what was originally Lot 22, Concession 2 SCD of the Township of Keppel, within a parcel described as Lot 1, Judge's Plan 857. A 0.28-ha, rectangular-shaped area on the west side of the south portion of the Site extended westerly into Lot 23, Concession 2 SCD. All of the Site was located within the identified limit of settlement area for Shallow Lake. The Site has no assigned municipal address. Information on Grey County Maps indicated that the current zoning of the Site was Planned Development (PD). The Site Owner also owned the adjacent 24-ha (59-ac) property to the north and northwest of the Site in the west half of Lot 22 and east half of Lot 23.

Current land use in the vicinity of the Site is shown on the aerial image on **Figure 2**. Much of the western portion of the Site (approximately 4.9 ha) currently consists of cultivated farmland, accessed from Princess Street. The eastern portion of the Site (approximately 3.2 ha) is currently wooded and was identified as Significant Woodland on mapping from Appendix B of the Grey County OP.

Contours at 5 m intervals shown on a Ministry of Natural Resources (MNR) 1:10,000 Ontario Base Map (OBM) indicated that the ground surface in the vicinity of the Site sloped down in an easterly direction. Contours at 0.5 m intervals derived for the Site on Ontario AgMaps similarly indicated that the ground surface on the Site declined in an easterly direction, from elevation 241.5 m at the southwest corner, adjacent to the community centre, to elevation 237 m at the northeast corner, with an average slope of approximately 1 m per 100 m. Surface drainage across the Site was inferred to be in a due easterly direction.

The Site was bordered to the north and northwest by additional cultivated farmland owned by the Site Owner. The southern portion of the Site was bordered to the west by the Shallow Lake & District Community Centre, which contained an arena, ball diamond, and recreational facilities. On the south side of the Site, closest to Princess Street, the west part was bordered by a wellness and fitness centre and the east part was bordered by residential properties fronting onto Princess Street. Residential properties and a commercial property were located on the south side of Princess Street, south of the Site. To the east, the Site was bordered by single-family residential properties fronting onto Howe Drive, constructed in the period between 2010 and 2020.

On the 2002 topographic mapping (MNR OBM), the closest watercourse to the Site was Park Head Creek, shown approximately 310 m east-southeast of the northeast corner of the Site at the closest point. A relatively large wetland area was shown on the east side of Park Head Creek. The creek and associated wetland were shown at approximate elevation 223 m east of the Site. As previously noted, surface drainage on the Site was inferred to be in an easterly direction toward

the creek. Drainage mapping generated using the MNR Ontario Watershed Information Tool (OWIT) indicated that the entire Site was located within the drainage area for Park Head Creek north of Princess Street (Highway 6).

3.0 HYDROGEOLOGICAL SETTING

Quaternary (near-surface overburden) geology in the vicinity of the Site was shown on Ontario Geological Survey (OGS) Map P.2559 (Sharpe and Jamieson, 1982). Approximately the southern two-thirds of the Site was located within an area identified as exposed bedrock, described as Amabel Formation dolostone (Eramosa Member – bituminous). The northern portion of the Site was shown to be located within an extensive deposit of Bruce till (stoney, sandy silt) that extended north and west of the Site. Immediately east of Howe Drive, opposite the south half of the Site, the Quaternary geology mapping identified a large glaciolacustrine (deep-water) deposit consisting of silty clay and clay. The seamless, GIS-based, surficial geology mapping for Southern Ontario developed by the OGS, originally in 2003 and revised in 2010 (OGS MRD-128 and MRD-128-REV), was consistent with the 1982 Quaternary geology mapping for the vicinity of the Site. That geology mapping is shown on **Figure 3**.

Paleozoic (bedrock) geology in the vicinity of the Site was shown on OGS Preliminary Map P.3236 (Armstrong, 1993). The bedrock underlying the Site was mapped as Guelph Formation dolostone, Lithofacies G_c – light grey-tan to brown, tabular bedded. The seamless, GIS-based, Paleozoic geology mapping for southern Ontario published by the OGS in 2007 (Armstrong and Dodge) similarly showed the Site to be underlain by Guelph Formation dolostone.

Most properties in the community of Shallow Lake are currently serviced by the municipal water supply, identified as the Shallow Lake Drinking Water System. That system is supplied by two drilled wells located on the south side of Highway 6, approximately 1.3 km west of the Site. It was understood that the water supply for the proposed development at the Site will be obtained from the municipal system. The Grey and Bruce Counties Groundwater Study (Waterloo Hydrogeologic, Inc., 2003) indicated that the Shallow Lake Water System was comprised of two bedrock wells, Well #2 constructed in 1996 and Well #3 constructed in 1999. GSS could not identify a well record for Well #2. The record inferred to be associated with Well #3 (MECP Well ID 2514177) indicated that the 200-mm diameter well was drilled to a depth of 61.0 m (200 feet), encountering 2.7 m of till-like overburden underlain by limestone to a depth 56.4 m, where blue shale was encountered. Water-producing zones were reportedly encountered at depths of 27.4 to 30.5 m and 54.9 m. The static water level was at a depth of 10.7 m. A copy of the water well record is included in **Appendix A**.

GSS reviewed available water well records from the database for the MECP water well information system (WWIS) to obtain information on the subsurface conditions in the vicinity of the Site. The well record search identified records for thirty-three (33) wells located within approximately 300 m of the Site. All of the wells were completed in the bedrock, which was encountered at depths ranging from 0 to 9.1 m (0 to 30 feet). The total well depths ranged from 13.7 to 75.3 m (45 to 247 feet). In general, the elevation of the bedrock surface followed the ground surface topography and dipped to the east-southeast in the vicinity of the Site.

Nine of the 33 wells reportedly encountered at least 1.5 m of overburden above the bedrock. The overburden was typically described as clay, clay with stones, or hardpan with stones, with a maximum reported depth of 7.6 m. GSS inferred that those soils would have a relatively low hydraulic conductivity. The reported depths at which water was found typically ranged from

approximately 18 to 40 m (60 to 130 feet). Only two wells reportedly found water at a depth of less than 18 m.

Additional information on the hydrogeological setting of the Site was provided in the assessment report for the presence of karst topography (GSS, August 2025).

4.0 FIELD WORK

4.1 Test Pit Investigation

Eight test pits, designated TP1 to TP8, were excavated at the Site on April 27, 2023 to investigate the shallow soil conditions and identify the depth to bedrock. The test pits were excavated to depths ranging from 0.5 to 1.3 m with a compact excavator supplied and operated by a local contractor. The test pit locations were chosen to provide reasonable coverage across the accessible (non-treed) portion of the Site and are shown on the Site Development Plan, **Figure 4**. A GSS representative monitored the encountered soil and bedrock conditions in the test pits and collected representative soil samples. The subsurface conditions are described on the test pit logs in **Appendix B**. The locations of the test pits were recorded using a hand-held GPS device and the ground surface elevations at the test pit locations were obtained from the topographic plan derived for the Site.

All of the test pits encountered surficial topsoil, ranging in thickness from 0.1 to 0.4 m. Beneath the topsoil, the encountered soils consisted predominantly of a sandy silt matrix with varying amounts of clay, gravel, cobbles, boulders, and broken rock. All of the test pits encountered bedrock, at depths ranging from 0.5 to 1.3 m below ground. At TP1, TP2, and TP7, the upper bedrock was layered and fragmented and could be broken relatively easily with the excavator. TP1 was excavated approximately 0.4 m into the bedrock without encountering sound rock. TP2 was excavated 0.15 m into the upper bedrock before encountering sounder rock. The bedrock surface in TP7 was uneven and the test pit was terminated without encountering solid, impenetrable rock. No open fractures or evidence of solution weathering or widening of fractures was noted in the exposed bedrock. A summary of the conditions encountered in the test pits is provided in **Table 4-1**, below. Reference should be made to the test pit logs in Appendix B for a more detailed description of the encountered subsurface conditions.

Table 4-1: Summary of Information for Test Pits

TP ID	Ground Surface Elevation (m)	Final Depth (mbgs)	Encountered Bedrock		Encountered Soil Strata
			Depth (mbgs)	Elevation (m)	
TP1	240.5	1.1	0.7	239.8	Topsoil, Sandy Silt, some clay, gravel
TP2	239.3	0.8	0.6	238.6	Topsoil, Sandy Silt, some clay, gravel
TP3	238.4	1.1	1.1	237.4	Topsoil, Sandy Silt, some clay, gravel
TP4	238.2	1.3	1.3	236.9	Topsoil, Sandy Silt, some clay, gravel
TP5	238.2	0.6	0.6	237.6	Topsoil, Sandy Silt, some clay, gravel
TP6	238.9	0.5	0.5	238.4	Topsoil, Sandy Silt, some clay, gravel
TP7	239.6	0.6	0.6	239.1	Topsoil, Sandy Silt, some clay, gravel
TP8	240.9	1.2	0.9	240.0	Topsoil, Sandy Silt, some clay, gravel

Notes: 1. Elevations in metres relative to geodetic datum
 2. mbgs = metres below ground surface

A sample of the soil encountered between 0.8 and 1.2 m depth in TP4 was submitted to GM BluePlan Engineering Limited (GMBP) in Owen Sound for grain size analysis and estimation of the associated percolation 'T' time. The results of the testing are included in Appendix B. Section 8.7.2.1 of the Ontario Building Code specified that a sewage leaching bed shall not be located in soils having a percolation time of less than 1 minute per cm (min/cm) or greater than 50 min/cm. In the GMBP report, the soil was described as a clayey gravel and the estimated percolation 'T' time was 30 to 40 min/cm. Based on the amount of silt and clay in the sample, the report indicated that it would not be feasible to construct an in-ground leaching bed in such soil. A raised leaching bed constructed of suitable imported material was recommended. Considering the depth to the encountered bedrock, GSS considered that raised leaching beds would likely be necessary for all of the lots in the proposed development, regardless of the soil conditions.

The elevations of the encountered bedrock ranged from approximately 240.0 m at TP8 in the southwest corner of the Site to 236.9 m at TP4 near the northeast corner of the Site. The information obtained from the test pits indicated that the bedrock surface generally dipped toward the east-northeast in the cultivated portion of the Site.

4.2 Groundwater Monitoring

In conjunction with the reconnaissance and survey of the Site, a 125-mm (5-inch) diameter steel casing for what appeared to be a water supply well was identified near the southeast corner of the Site, shown as Well 1 on Figure 4. A 50-mm diameter PVC monitoring well with a compression cap had been installed inside the steel casing, making the well unsuitable for water supply. GSS sounded the PVC monitoring well to a depth of 24.4 m below ground surface. The annular space between the PVC pipe and the steel casing had been filled to a depth of 1.65 mbgs. Based on the well location, casing diameter, and sounded depth, no water well record could be associated with the identified well. The purpose of the monitoring well was not apparent.

GSS measured the groundwater level in the monitoring well on four occasions, as summarized in **Table 4-2**, below. The measured groundwater levels ranged from a high of 14.94 mbgs (elevation 224.85 m) on May 6, 2024 to a low of 18.23 mbgs (elevation 221.55 m) on September 27, 2023, a variation of 3.3 m. Based on the depth of the monitoring well, the measured water levels were considered to be indicative of the water table elevation. Based on the water level data, GSS inferred that the depth to the water table on the Site was typically of the order of 15 m or more below ground surface.

Table 4-2: Groundwater Level Monitoring Data for Well 1

Date	Water Level (mbgs)	Water Level Elevation (m)	Comment
Sep 28 2023	17.81	221.97	--
Nov 20 2023	15.84	223.94	Collected Sample
May 6 2024	14.93	224.85	Collected Sample
Sep 27 2024	18.23	221.55	--

On November 20, 2023 and May 6, 2024, GSS collected groundwater samples from Well 1 for analysis of a standard package of inorganic water quality indicator parameters. The samples were collected using a dedicated Waterra inertial pump and length of 13-mm ID polyethylene tubing installed in the well. In excess of three well volumes of water were purged from the well prior to collecting the initial sample and in excess of two well volumes of water were purged prior to collecting the second sample. The samples were collected from the tubing into appropriate bottles provided by the analytical laboratory. Sub-samples for analysis of metals were filtered in the field using disposable, 0.45 micron in-line filters. The samples were submitted to Caduceon Environmental Laboratories in Richmond Hill for analysis. A copy of the laboratory certificate of analysis is included in **Appendix C**. The analytical results are summarized in **Table 4-3**, below. For context, the results were compared to the relevant Ontario Drinking Water Quality Standards (ODWQS).

Table 4-3: Groundwater Quality Data for Well 1

Parameter	Units	ODWQS	20-Nov-2023	06-May-2024
pH	pH Units	6.5 - 8.5 (OG)	7.93	8.82
Conductivity	µmho/cm	-	627	569
Alkalinity (as CaCO ₃)	mg/L	30 - 500 (OG)	294	251
Hardness (as CaCO ₃)	mg/L	80 - 100 (OG)	<u>353</u>	<u>288</u>
Chloride	mg/L	250 (AO)	10.7	6.9
Fluoride	mg/L	1.5 (MAC)	0.3	0.3
Nitrite (N)	mg/L	1.0 (MAC)	<0.05	<0.05
Nitrate (N)	mg/L	10.0 (MAC)	3.92	5.87
Sulphate	mg/L	500 (AO)	17	12
Potassium	mg/L	-	2.8	2.2
Sodium	mg/L	200 (AO)	8.8	2.2
Calcium	mg/L	-	83.6	66.1
Magnesium	mg/L	-	35.0	29.9
Iron	mg/L	0.3 (AO)	<u>1.24</u>	<0.005
Copper	mg/L	1 (AO)	0.003	<0.002
Manganese	mg/L	0.05 (AO)	<u>0.182</u>	<0.001
Zinc	mg/L	5 (AO)	0.087	0.017
Total Dissolved Solids	mg/L	500 (AO)	353	296

Notes: 1. OG – Operational Guideline; AO – Aesthetic Objective; MAC – Maximum Acceptable Concentration
2. Concentrations higher than a standard are shown in **bold** and underlined.

The total dissolved solids (TDS) concentrations in the samples were relatively low and were considered to be consistent with relatively shallow groundwater that was not substantially impacted by surface activities. The iron and manganese concentrations were elevated in the first sample but not in the second sample. The measured nitrate concentrations of 3.92 mg/L in the November 2023 sample and 5.87 mg/L in the May 2024 sample were considered to be elevated, but were less than the ODWQS maximum acceptable concentration for nitrate of 10.0 mg/L.

To assess the nitrate concentrations in groundwater in the bedrock aquifer upgradient and cross-gradient from the Site, water samples were collected from private wells at locations northwest and northeast of the Site. One sample was collected at the dairy farm owned by the Site Owner and located at 320091 Sideroad 25, approximately 700 m northwest of the Site. Review of the MECP well records identified two wells on that property (Well IDs 2516719, 7329799). Copies of the well records are included in Appendix A. The records indicated that the wells were located in relatively close proximity, with one constructed in 2005 and the other in 2018. Bedrock was encountered beneath clayey overburden at a depth of approximately 4.5 m, and both wells were advanced to a depth of more than 65 m, sufficient to encounter shale beneath the upper limestone. Water-bearing zones were reportedly encountered at similar depths in both wells; a shallower zone at approximately 32 to 36 m and a deeper zone at 60 m. The Site Owner indicated that there was a third, much older well located in the vicinity of the other two wells. A GSS representative did not observe that well and a well record could not be associated with that well. The Site Owner indicated that water was drawn from all three wells and combined in the adjacent pump house where the sample was collected.

The second sampled well (ID 7363044) was located at 75 Howe Drive, beyond the end of the cul-de-sac, approximately 150 m northeast of the Site. A copy of the well record is included in Appendix A. The record indicated that well was constructed in 2020 and was advanced to a depth of 31.1 m, similar to the depth of Well 1. The overburden reportedly consisted of sand and stones and extended to a depth of 7.3 m. Water-bearing zones were reportedly encountered in the bedrock between 21.3 and 30.5 m. The static water level was recorded at a depth of 14.3 m.

The locations of the sampled water supply wells are shown on Figure 5. Water samples were collected at both locations by the Site Owner on September 26, 2024 and provided to a GSS representative on September 27. GSS submitted the samples to Caduceon Environmental Laboratories in Richmond Hill for analysis of nitrate. A copy of the certificate of analysis is included in Appendix B. Nitrate was not detected (<0.05 mg/L) in the sample from the dairy farm at 320091 Sideroad 25, and nitrate was detected at a concentration of 0.81 mg/L in the sample from the residential property at 75 Howe Drive.

Regional scale mapping for the bedrock aquifer in the vicinity of the Site (Turner, 1978) indicated that the groundwater flow direction was generally in a westerly direction. The identified wellhead protection area for the municipal wells located west of the Site generally indicated that the groundwater flow direction was in a west-southwesterly direction; however, the limit of the identified groundwater capture zone (WHPA-D) extended only 690 m east-northeast of the most easterly well. Bedrock topography mapping (Sharpe, 1982) indicated the presence of a local bedrock high located between the municipal wells and the Site, and the watershed mapping referenced in Section 2.3 indicated the presence of a local watershed divide west of the Site.

Comparison of recorded static water levels for selected water wells in the vicinity of the Site, including the wells shown on Figure 5, indicated that locally the groundwater flow direction in the bedrock aquifer in the vicinity of the Site was in a south-southeasterly direction, toward the lower portion of Park Head Creek.

Land use in the inferred upgradient direction northwest of the Site was predominantly agricultural, and application of nutrients on those lands was considered to be the most likely source of the elevated nitrate concentrations measured in Well 1. Agricultural use of the Site would be discontinued in conjunction with the proposed development of Site, which could potentially result in a decrease in the nitrate concentration at Well 1. The location of the sewage leaching bed for the community centre was not identified but was inferred to be in the eastern portion of the arena property approximately 240 m west-northwest of Well 1. Based on the distance and direction, that leaching bed was considered unlikely to be the primary source of the elevated nitrate at Well 1. Similarly, a mounded area that appeared to be the sewage leaching bed for the apartment building located at 415 Main Street was observed at a location approximately 50 m southeast of Well 1; however, that was in an inferred downgradient direction and was considered unlikely to be the primary source of elevated nitrate at Well 1.

Information on the nitrate concentration in the water supply from the Shallow Lake Drinking Water System is provided subsequently in Section 5.2.

5.0 ASSESSMENT OF POTENTIAL IMPACTS ON GROUNDWATER QUALITY FROM ON-SITE SEWAGE SYSTEMS

5.1 Approach

An evaluation of the potential impacts on groundwater quality from the sewage systems for the proposed residential use of the Site was carried out in general accordance with the method identified in MECP Procedure D-5-4 (1996) for individual on-site sewage systems: water quality impact risk assessment.

Contaminant attenuation mechanisms were evaluated to assess the risk that the effluent from the on-Site sewage systems will cause the concentration of nitrate-nitrogen in groundwater to exceed 10 mg/L at the downgradient boundary of the Site. Procedure D-5-4 outlined a three-step assessment process, with the need to advance to the next step depending on the conditions defined in the previous step. A predictive assessment in accordance with the considerations and assumptions identified in Step 3 of Procedure D-5-4 was carried out for the Site. Two components were considered in the predictive assessment: contaminant source and contaminant attenuation. Total nitrogen converted to nitrate-nitrogen was considered to be the critical contaminant. For the purpose of predicting the potential for groundwater impacts, a nitrate loading of 40 grams/day was to be used for each proposed residential dwelling in the absence of tertiary treatment for nitrate removal. Contaminant attenuation is described below.

Procedure D-5-4 identified the following considerations to be implemented when assessing contaminant attenuation.

- Only dilution from infiltrating precipitation is acceptable as a quantifiable attenuation mechanism for nitrate. Mixing with groundwater flowing through the site is normally not allowed.
- The available moisture surplus should normally be obtained from Environment Canada data. Where it is available, information from long-term, site specific, detailed water balance and/or groundwater studies can be used.
- Estimates of the amount of moisture surplus that infiltrates into the ground must be based on site-specific factors such as soil type, topography, surface geology, and impermeable areas.
- The volume of sewage effluent used as dilution water in mass balance equations should not exceed 1,000 L/day/lot.

It was understood that the Owner intends to incorporate tertiary treatment for enhanced removal of nitrate into the sewage systems for each individual lot in order to increase the number of lots that can be developed on the Site. Options for on-site residential wastewater treatment technologies, including nitrate-reduction technologies, have been developed relatively recently. These treatment systems have been recognized by the province through the Ontario Building Code, with a reference to the CAN/BNQ 3680-600 standard for certification of treatment systems. GSS understands that proprietary tertiary treatment systems that can reduce the nitrate concentration in domestic sewage by as much as 50% are currently available.

5.2 Results

Dilution from infiltrating precipitation is the primary mechanism for attenuation of nitrate impacts in groundwater. An estimate of infiltration at the Site was obtained using two different methods and then comparing the results to identify a suitable value for this assessment.

Dilution from infiltrating precipitation at the Site was initially estimated using information from the Tier 1 Surface Water Budget and Stress Assessment Report prepared for the Saugeen Valley, Grey Sauble, and Northern Bruce Peninsula Source Protection Region (AquaResource, 2008). That study included the development and calibration of a GAWSER surface water model to estimate components of the hydrologic cycle for the major watersheds. The GAWSER model predicted how specific combinations of Quaternary geology, land cover, and topography would respond to a precipitation event. Precipitation was input into the model from observed climate records. The model apportioned precipitation into evapotranspiration, runoff, and recharge. Streamflow hydrographs were created based on the hydrologic response of each catchment and the model was calibrated by comparing the simulated hydrographs to recorded streamflow.

The entire area of the Tier 1 surface water study was divided into 47 subwatersheds. The Site was located within the Sauble River / Hepworth subwatershed. The selected study period for climate data was from 1985 to 2005. The average water budget model results for the relevant subwatershed were summarized by AquaResource (2008) as follows:

ID	Subwatershed	Area (km ²)	Precipitation (mm)	Evapotranspiration (mm)	Runoff (mm)	Recharge (mm)
22	Sauble River / Hepworth	84	1,141	552	329	260

The estimated average annual evapotranspiration for the subwatershed was 552 mm, leaving 589 mm of precipitation as potential recharge, without the effects of runoff. Within the subwatershed, there would be variations in the estimated evapotranspiration, runoff, and recharge values based on differences in surface topography, surface cover, and soil conditions. For the averaged conditions across the subwatershed, the Tier 1 report (AquaResource, 2008) indicated a mean annual runoff component of 329 mm and a mean annual recharge or infiltration of 260 mm.

GSS also estimated the annual precipitation in the vicinity of the Site using the Ontario Watershed Information Tool (OWIT). The characteristics for a drainage area generated for Park Head Creek at Princess Street using the OWIT indicated an average annual precipitation of 1137 mm, which was consistent with the annual precipitation of 1141 mm from the Tier 1 Water Budget (AquaResource, 2008). For comparison, the 1991 – 2020 normal precipitation for the Environment Canada Wiarton Airport station was 1074 mm.

Quaternary and surficial geology mapping (Sharpe and Jamieson, 1982; OGS MRD-128-REV, 2010) indicated that approximately the southern two-thirds of the Site was located within an area identified as exposed bedrock, described as Amabel Formation dolostone (Eramosa Member – bituminous). Paleozoic (bedrock) geology in the vicinity of the Site shown on OGS Preliminary

Map P.3236 (Armstrong, 1993) and the seamless, GIS-based, Paleozoic geology mapping for southern Ontario published by the OGS in 2007 (Armstrong and Dodge) identified the bedrock underlying the Site as Guelph Formation dolostone. The northern portion of the Site was shown to be located within an extensive deposit of Bruce till (stoney, sandy silt). As described in Section 4.1, eight test pits excavated at the Site encountered bedrock at depths ranging from 0.5 to 1.3 m below ground. The upper soils, beneath the surficial topsoil, consisted predominantly of a sandy silt matrix with varying amounts of clay, gravel, cobbles, boulders, and broken rock. Despite the presence of shallow bedrock, the Site appeared to be relatively well-drained. No standing water was observed during any of the site visits.

Using information in the MECP Stormwater Management Planning and Design Manual (2003), a combined infiltration factor of 0.45 was identified for the Site, based on topography consisting of rolling to hilly land (average slope of 10 m/km, component value of 0.15), low to moderate permeability soils (component of 0.2), and cultivated ground cover rather than woodland (component of 0.1) for the post-development conditions. Applying this infiltration factor to the potential recharge of 589 mm resulted in an estimated infiltration of 265 mm. That was generally consistent with the estimated average annual recharge of 260 mm obtained from the Tier 1 surface water budget (AquaResource, 2008).

Based on the available information and the conditions at the Site, GSS conservatively considered that an estimated average infiltration of 200 mm per year (0.55 mm/day or 0.00055 m/day) was reasonable for this assessment.

The volume of infiltration for dilution of nitrate was estimated based on the Site area of 81,350 m² (8.14 ha). At an infiltration rate of 200 mm per annum, the total volume of infiltration on the Site would be 16,270 m³/y or 44,580 L/d. It was understood that the intent is to promote on-Site infiltration of stormwater in conjunction with the development. A site grading and drainage plan from the functional servicing report for the Site (GSS, 2025) indicated that stormwater runoff would be conveyed by roadside and rear yard ditches to an on-Site retention pond. For this assessment, allowance was made for 15% impermeable areas on the Site, which would reduce the estimated volume of infiltration to 37,890 L/d.

Procedure D-5-4 noted that the volume of sewage effluent, if used as dilution water in mass balance equations, should not exceed 1,000 L/day/lot. This would reasonably be expected to underestimate the dilution from sewage effluent for a multi-unit development on a single lot. To obtain clarification on the appropriate approach for use of sewage effluent as dilution water in a Procedure D-5-4 predictive assessment for a multi-unit development on a single lot, GSS previously contacted a Senior Environmental Officer at the MECP Owen Sound District Office. In an email response, a senior Hydrogeologist in the Technical Support Section of the MECP Southwest Regional Office indicated that it was his opinion that the volume of sewage effluent used for dilution water in mass balance calculations should properly be interpreted as not to exceed 1,000 L/day/lot per residential dwelling unit, and need not be limited to 1,000 L/day/lot.

The current plan is to develop the Site with twenty-six (26) single-family properties, numbered Lots 2 to 27 as shown on Figure 4, and one fourplex to be constructed on Lot 1, for a total of 30 residential dwelling units. The average area of the identified 26 single-family residential lots was

approximately 2,300 m² (0.57 ac). Notwithstanding the findings of this nitrate loading assessment, each individual lot must be of sufficient size to accommodate the anticipated building and on-site sewage system, together with appropriate setbacks.

Procedure D-5-4 identified a nitrate loading rate from sewage effluent of 40 grams per residential dwelling unit per day as appropriate for evaluating impacts to groundwater. A 50% reduction in the nitrate concentration from tertiary treatment would reduce the nitrate loading to 20 g/day/unit, which would be equivalent to 600 g/day for 30 residential dwelling units. Infiltration from precipitation was estimated to contain nitrate at a concentration of 0.35 mg/L, based on the mean value for rain and snow identified in a 1967 study on the composition of precipitation in Ontario (Rutherford, 1967).

The subdivision will be supplied with water from the Shallow Lake Drinking Water System. Available annual reports for that system for the years 2016, 2020, 2021, and 2023 indicated that the average annual nitrate concentrations in the treated water, based on analysis of four samples per year, ranged from 0.37 mg/L in 2020 to 0.55 mg/L in 2023, with an overall average nitrate concentration of 0.44 mg/L. To address potential effects from the slightly elevated background nitrate concentration in groundwater in the vicinity of the Site, the dilution water from sewage effluent, which would be obtained from the municipal water supply, was assumed to contain nitrate at a concentration of 0.44 mg/L. With 50% removal of nitrate from tertiary treatment, the estimated background nitrate concentration in sewage effluent would be reduced to 0.22 mg/L.

A mass balance analysis was carried out to predict the nitrate concentration in groundwater at the Site boundary relative to the concentration of 10 mg/L identified in Procedure D-5-4 as an indicator of groundwater impact potential. A summary of the mass balance components is provided below.

Estimated Dilution Volume for Attenuation

- development area: 81,350 m²
- estimated infiltration rate: 200 mm per annum
- estimated infiltration volume: 16,270 m³/y (44,580 L/d)
- reduced infiltration volume based on assumed 15% impermeable areas: 37,890 L/d
- dilution water from sewage effluent: 1,000 L/d/lot x 30 dwelling units = 30,000 L/d

Estimated Nitrate Loading

- sanitary sewage (with 50% nitrate removal): 20 g/d/unit x 30 units = 600 g/d (600,000 mg/d)
- nitrate in precipitation: estimated 0.35 mg/L x 37,890 L/d = 13,260 mg/d
- background nitrate in sewage effluent dilution water: 0.22 mg/L x 30,000 L/d = 6,600 mg/d

The daily mass balance equation for estimating the nitrate concentration in groundwater at the downgradient boundary of the Site was as follows:

$$\text{Nitrate Concentration } N \left(\frac{\text{mg}}{\text{L}} \right) = \frac{600,000 \text{ mg/d} + 13,260 \text{ mg/d} + 6,600 \text{ mg/d}}{37,890 \text{ L/d} + 30,000 \text{ L/d}} = 9.1 \text{ mg/L}$$

With tertiary treatment for 50% removal of nitrate, the predicted nitrate concentration in groundwater at the development boundary was 9.1 mg/L, which was less than the concentration of 10 mg/L identified in Procedure D-5-4 as an indicator of potential groundwater impacts. The same mass balance equation indicated that a minimum reduction of 45% of nitrate in sewage would be necessary to achieve the target threshold of 10 mg/L in groundwater.

Notwithstanding the predicted nitrate concentration in groundwater at the Site boundary, each individual lot must be of sufficient size to accommodate the anticipated building and individual on-site sewage system, together with appropriate setbacks.

6.0 SUMMARY OF FINDINGS

An evaluation of the potential groundwater quality impacts from on-Site sewage systems carried out in general accordance with the requirements of Paragraph 18) of Section 8.9.1 of the Grey County Official Plan and the considerations and assumptions for a predictive assessment identified in MECP Procedure D-5-4 resulted in an estimated nitrate concentration in groundwater at the Site boundary of 9.1 mg/L, assuming 50% removal of nitrate from sewage through the use of a suitable tertiary treatment system on each lot. That result was less than the concentration of 10 mg/L identified in Procedure D-5-4 as an indicator of potential groundwater impacts. The analysis indicated that a minimum treatment level of 45% removal of nitrate would be necessary to achieve a maximum predicted nitrate concentration of 10 mg/L at the Site boundary.

In summary, subject to the information presented in this report, it is the opinion of GSS that the Site is suitable for the proposed development with respect to potential impacts to groundwater quality from the on-Site sewage systems.

Respectfully submitted,

GSS Engineering Consultants Ltd.



W. Brad Benson, P.Eng.
Senior Hydrogeologist

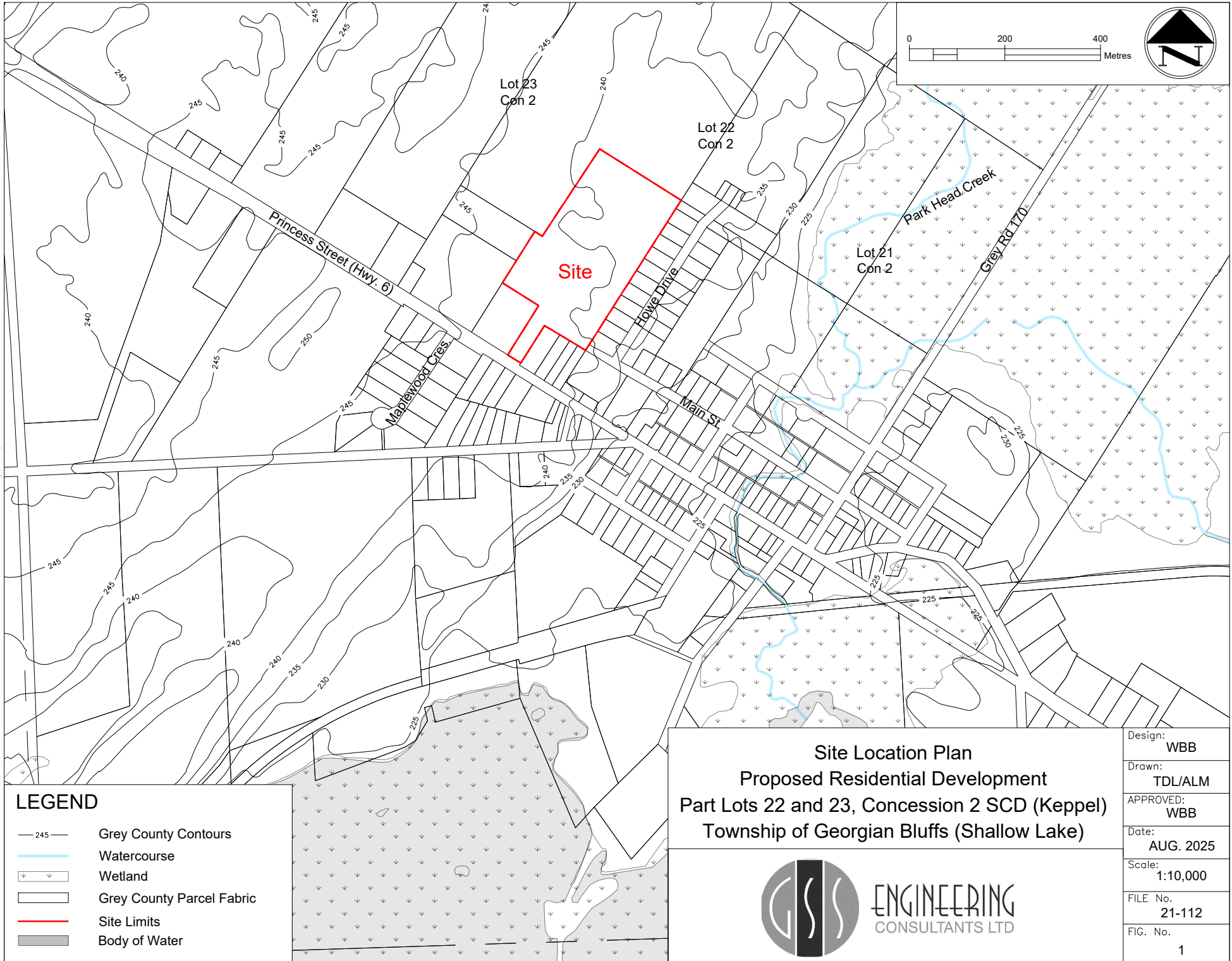
WBB/bb



7.0 REFERENCES

- AquaResource, Inc. (2008). *Saugeen Valley, Grey Sauble, and Northern Bruce Peninsula Tier 1 Surface Water Budget and Stress Assessment Report*.
- Ontario Geological Survey (2010). *Surficial Geology of Southern Ontario*, Miscellaneous Release - Data (MRD) 128 - Revised (replaces the map previously released as MRD 128 (2003)).
- Ontario Ministry of the Environment (2003). *Stormwater Management Planning and Design Manual*.
- Ontario Ministry of the Environment and Energy (1996). *Procedure D-5-4, Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment*.
- Rutherford, G.K. (1967). *A Preliminary Study of the Composition of Precipitation in S.E. Ontario*, Canadian Journal of Earth Sciences, Volume 4, Number 6, December 1967, 11 p.
- Sharpe, D.R. (1982). *Bedrock Topography of the Wiarton Area, Southern Ontario*, Ontario Geological Survey Map P.2561, Scale 1:50,000, Compilation 1977-1981.
- Sharpe, W.R., and Jamieson, G.R. (1982). *Quaternary Geology of the Wiarton Area, Southern Ontario*, Ontario Geological Survey, Map P.2559, Scale 1:50,000.
- Turner, M.E. (1978). *Ministry of the Environment Hydrogeologic Map 78-5, Guelph-Amabel Aquifer, Markdale to Owen Sound*, Scale 1:100,000.

FIGURES



LEGEND

- 245 Grey County Contours
- Watercourse
- Wetland
- Grey County Parcel Fabric
- Site Limits
- Body of Water

Site Location Plan
Proposed Residential Development
Part Lots 22 and 23, Concession 2 SCD (Keppel)
Township of Georgian Bluffs (Shallow Lake)



Design:	WBB
Drawn:	TDL/ALM
APPROVED:	WBB
Date:	AUG. 2025
Scale:	1:10,000
FILE No.	21-112
FIG. No.	1

Monday, March 31, 2025 4:51:00 PM



Reference:
Grey County Parcel Mapping
Image: Google Earth (May 28, 2021)

Surrounding Land Use
Proposed Residential Development
Part Lots 22 and 23, Concession 2 SCD (Keppel)
Township of Georgian Bluffs (Shallow Lake)



Design:	WBB
Drawn:	TDL/ALM
APPROVED:	WBB
Date:	AUG. 2025
Scale:	1:5,000
FILE No.	21-112
FIG. No.	2



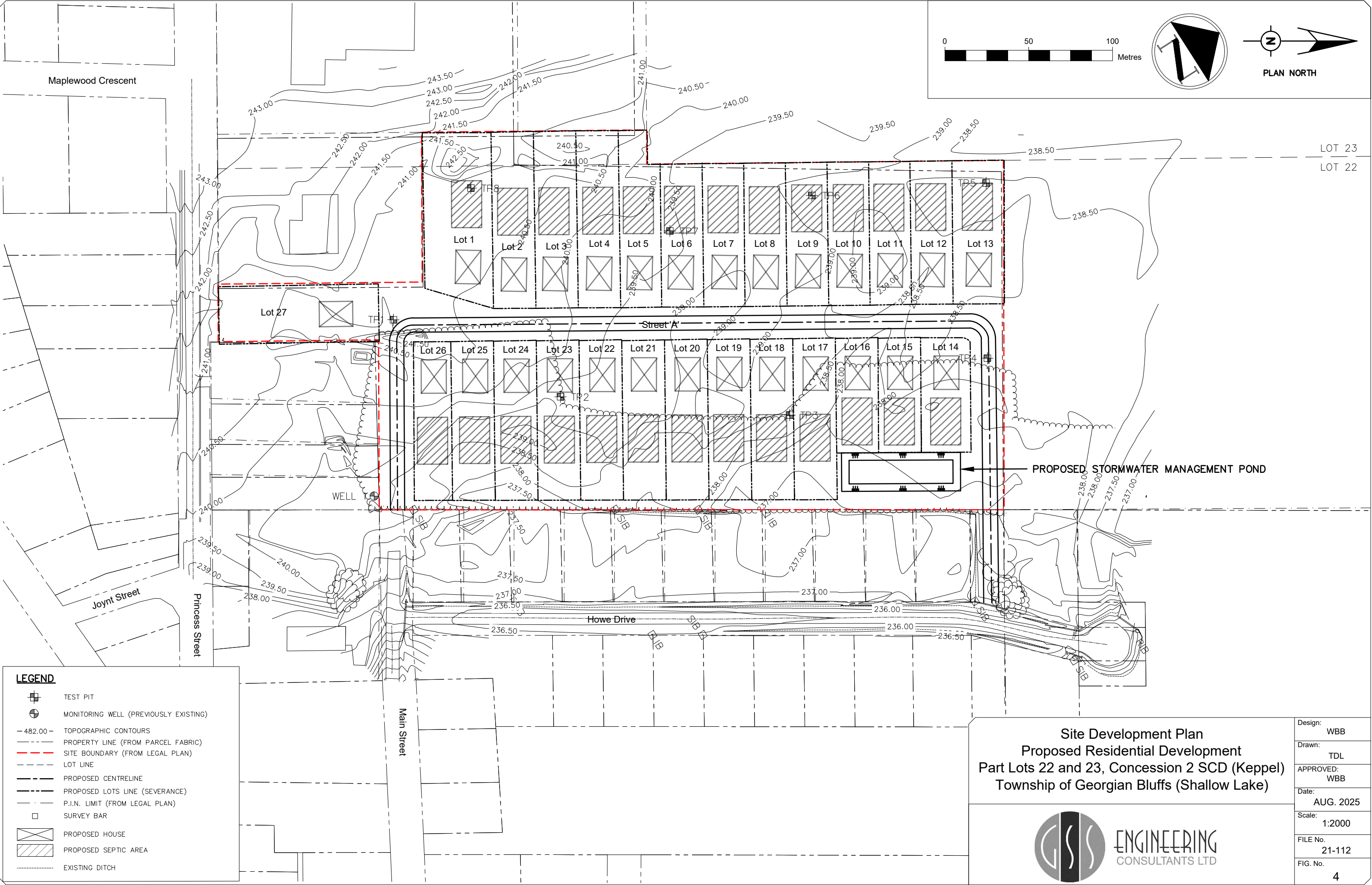
Reference: Ontario Geological Survey (2010). Surficial Geology of Southern Ontario, Miscellaneous Release - Data (MRD) 128 - Revised.

- | | |
|---|--|
| 3 Paleozoic bedrock | 8 Fine-textured glaciolacustrine deposits; silt and clay, minor sand and gravel
8a Massive to well laminated
8b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits |
| 5b 5b Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain | 9 Coarse-textured glaciolacustrine deposits: sand, gravel, minor silt and clay
9a Deltaic deposits
9b Littoral deposits
9c Foreslope and basinal deposits |
| 6 Ice-contact stratified deposits; sand and gravel, minor silt, clay and till
6a In moraines, eskers, kames and crevasse fills
6b In subaqueous fans | 20 Organic Deposits: peat, muck, marl |

Surficial Geology Mapping
Proposed Residential Development
Part Lots 22 and 23, Concession 2 SCD (Keppel)
Township of Georgian Bluffs (Shallow Lake)



Design:	WBB
Drawn:	TDL/ALM
APPROVED:	WBB
Date:	AUG. 2025
Scale:	1:15,000
FILE No.	21-112
FIG. No.	3



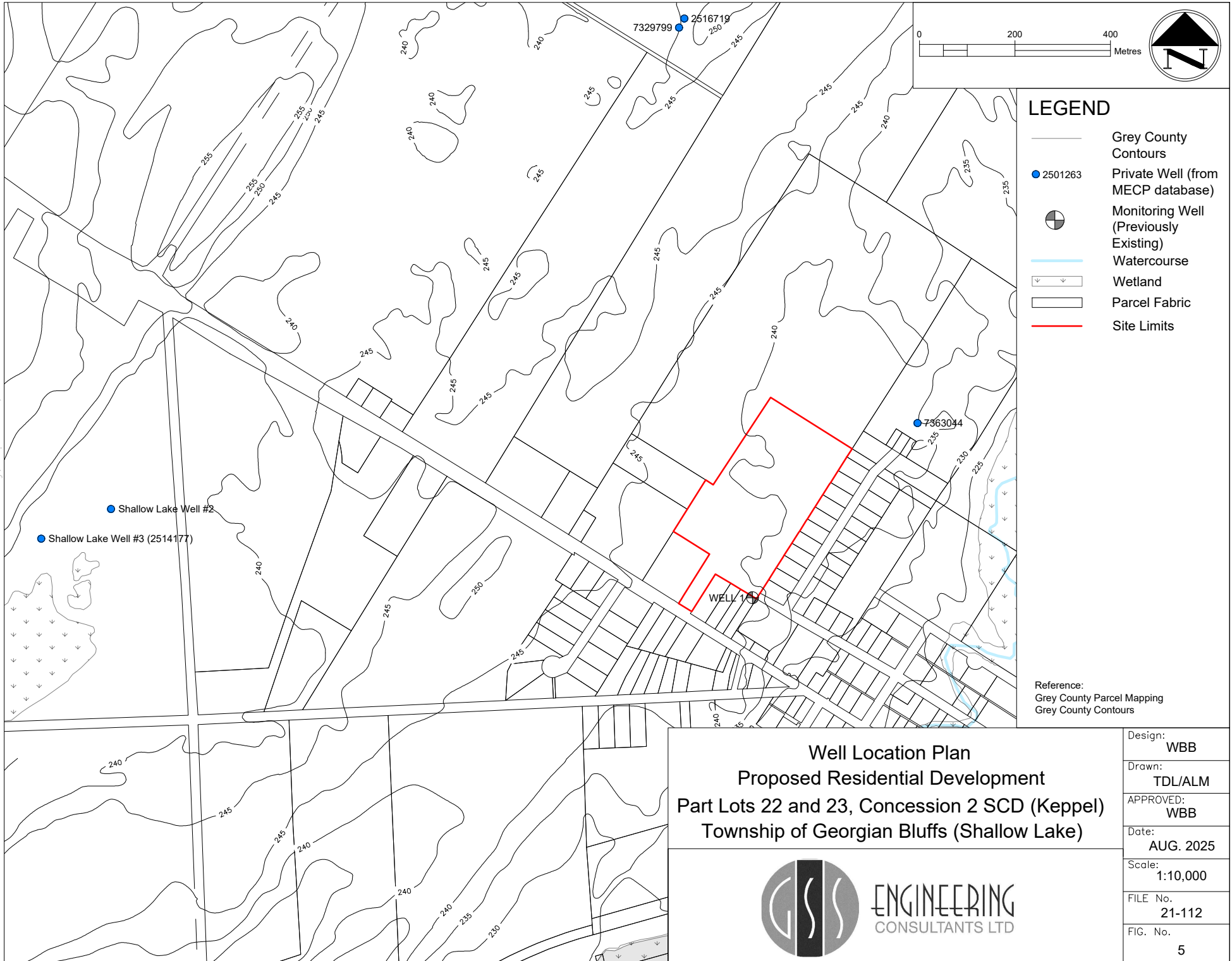
LEGEND

- TEST PIT
- MONITORING WELL (PREVIOUSLY EXISTING)
- TOPOGRAPHIC CONTOURS
- PROPERTY LINE (FROM PARCEL FABRIC)
- SITE BOUNDARY (FROM LEGAL PLAN)
- LOT LINE
- PROPOSED CENTRELINE
- PROPOSED LOTS LINE (SEVERANCE)
- P.I.N. LIMIT (FROM LEGAL PLAN)
- SURVEY BAR
- PROPOSED HOUSE
- PROPOSED SEPTIC AREA
- EXISTING DITCH

Site Development Plan
Proposed Residential Development
Part Lots 22 and 23, Concession 2 SCD (Keppel)
Township of Georgian Bluffs (Shallow Lake)



Design:	WBB
Drawn:	TDL
APPROVED:	WBB
Date:	AUG. 2025
Scale:	1:2000
FILE No.	21-112
FIG. No.	4



LEGEND

- Grey County Contours
- 2501263 Private Well (from MECP database)
- Monitoring Well (Previously Existing)
- Watercourse
- Wetland
- Parcel Fabric
- Site Limits

Reference:
Grey County Parcel Mapping
Grey County Contours

Well Location Plan
Proposed Residential Development
Part Lots 22 and 23, Concession 2 SCD (Keppel)
Township of Georgian Bluffs (Shallow Lake)



Design:	WBB
Drawn:	TDL/ALM
APPROVED:	WBB
Date:	AUG. 2025
Scale:	1:10,000
FILE No.	21-112
FIG. No.	5

APPENDIX A

MECP Water Well Records



The Ontario Water Resources Act **WATER WELL RECORD**

11

2514177

Municipality
25 009

Con. CON 08

County or District <i>Barre</i>		Township/Borough/City/Town/Village <i>Kippale</i>		Con block tract survey, etc. <i>VIII</i>		Lot <i>6</i>		25-27	
[Redacted]		Address <i>Rt #2 Shallow Lake</i>				Date completed		48-53	
						day month year			
[Redacted]		Northing		RC		Elevation		RC	
[Redacted]		Basin Code		ii		iii		iv	
[Redacted]		1 2		T M 10		12 17		18 24	
[Redacted]		25		26		30		31	
[Redacted]		47							

[illegible][illegible]

41		WATER RECORD				42	
Water found at - feet		Kind of water					
10-13 90-150	1 ☒ Fresh	3 ☐ Sulphur	14				
	2 ☐ Salty	4 ☐ Minerals					
15-18 150-	1 ☒ Fresh	3 ☐ Sulphur	19				
	2 ☐ Salty	4 ☐ Minerals					
20-23	1 ☐ Fresh	3 ☐ Sulphur	24				
	2 ☐ Salty	4 ☐ Minerals					
25-28	1 ☐ Fresh	3 ☐ Sulphur	29				
	2 ☐ Salty	4 ☐ Minerals					
30-33	1 ☐ Fresh	3 ☐ Sulphur	34				
	2 ☐ Salty	4 ☐ Minerals					

51		CASING & OPEN HOLE RECORD			
Inside diam inches	Material	Wall thickness inches	Depth - feet		
			From	To	
10-11 8 1/4	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	12 205	0	13-16 50	
17-18	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☒ Open hole 5 ☐ Plastic	19	50	20-23 200	
24-25	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	26		27-30	

SCREEN	Sizes of opening (Slot No.)	31-33	Diameter	34-38	Length	39-40
			inches		feet	
	Material and type			Depth at top of screen	41-44	45
					feet	

61		PLUGGING & SEALING RECORD	
☒ Annular space		☐ Abandonment	
Depth set at - feet		Material and type (Cement grout, bentonite, etc.)	
From	To		
10-13	14-17	Cement	
9	50		
18-21	22-25		
26-29	30-33	80	

71	Pumping test method ¹⁰ ☐ Pump ☒ Bailor		Pumping rate ¹¹⁻¹⁴ 100+ GPM		Duration of pumping ¹⁷⁻¹⁸ 1 Hours 0 Mins	
	Static level ¹⁹⁻²¹ 35 feet		Water level end of pumping ²²⁻²⁴ 200 feet		Water levels during ²⁵ ☐ Pumping ☒ Recovery	
			15 minutes ²⁶⁻²⁸ 35 feet		30 minutes ²⁹⁻³¹ 35 feet	
			45 minutes ³²⁻³⁴ feet		60 minutes ³⁵⁻³⁷ feet	
	If flowing give rate ³⁸⁻⁴¹ GPM		Pump intake set at ⁴² 200 RDS feet		Water at end of test ☒ Clear ☐ Cloudy	
PUMPING TEST	Recommended pump type ☐ Shallow ☒ Deep		Recommended pump setting ⁴³⁻⁴⁵ 180 feet		Recommended pump rate ⁴⁶⁻⁴⁹ 100 GPM	

FINAL STATUS OF WELL		54
1 ☒ Water supply	5 ☐ Abandoned, insufficient supply	9 ☐ Unfinished
2 ☐ Observation well	6 ☐ Abandoned, poor quality	10 ☐ Replacement well
3 ☐ Test hole	7 ☐ Abandoned (Other)	
4 ☐ Recharge well	8 ☐ Dewatering	

WATER USE		55-56
1 ☐ Domestic	5 ☐ Commercial	9 ☐ Not used
2 ☐ Stock	6 ☒ Municipal	10 ☐ Other
3 ☐ Irrigation	7 ☐ Public supply	
4 ☐ Industrial	8 ☐ Cooling & air conditioning	

METHOD OF CONSTRUCTION		57
1 ☐ Cable tool	5 ☒ Air percussion	9 ☐ Driving
2 ☐ Rotary (conventional)	6 ☐ Boring	10 ☐ Digging
3 ☐ Rotary (reverse)	7 ☐ Diamond	11 ☐ Other
4 ☐ Rotary (air)	8 ☐ Jetting	

LOCATION OF WELL

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

WELL
No 5

202538

Name of Well Contractor	Well Contractor's Licence No.
Wm Wright Well Drillers Ltd	5527
Address	
Box 167 Hysawatha Ont	
Name of Well Technician	Well Technician's Licence No.
Wm Wright	
Signature of Technician/Contractor	Submission date
Wm Wright	day mo yr

MINISTRY USE ONLY	Data source	58	Contractor	59-62	Date received	63-68	80
			5507		FEB 23 2000		
Date of inspection		Inspector					
Remarks		CSS.ES0					

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

Well Owner's Information and Location of Well Information

Ministry Use Only									
MUN				CON				LOT	

RR#/Street Number/Name <i>RR #5</i>				City/Town/Village <i>Shallow Lake</i>		Site/Compartment/Block/Tract etc.	
GPS Reading	NAD <i>83</i>	Zone <i>17T</i>	Easting <i>0492613</i>	Northing <i>4941772</i>	Unit Make/Model <i>Cummins B</i>	Mode of Operation:	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

[illegible][illegible][illegible]

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	

Well Contractor/Technician Information		
Name of Well Contractor	Well Contractor's Licence No.	
Wm. Wright Well Drillers Ltd	5507	
Business Address (street name, number, city etc.)		
Box 967 Heworth East		
Name of Well Technician (last name, first name)	Well Technician's Licence No.	
John Wright	T-0140	
Signature of Technician/Contractor	Date Submitted	
[Signature]	YYYY	MM DD

Location of Well

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

The diagram illustrates the location of a well. A horizontal line represents Hwy 6, with 'HEPDORTH' written on the left and 'SHALLOW LAKE' on the right. A vertical line segment labeled '2K' with an arrow pointing down represents the distance from the road to the well. A horizontal line segment labeled '350'' with an arrow pointing left represents the distance from the lot line to the well. A north arrow points upwards, labeled 'N'.

Audit No. z 38951	Date Well Completed yyyy mm dd 05/10/20
Was the well owner's information package delivered? ☐ Yes ☒ No	Date Delivered yyyy mm dd 05/10/20

Ministry Use Only			
Data Source	Contractor 5507		
Date Received YYYY MM DD JAN 18 2006	Date of Inspection	YYYY	MM DD
Remarks	Well Record Number		

Web Location

Address of Well Location (Street Number/Name) 326091 Ashland 25			Township Durham Bluffs		Lot	Concession
County/District/Municipality Durham			City/Town/Village Georgetown		Province Ontario	Postal Code N0H 2K0
UTM Coordinates: Zone Easting Northing NAD 83 17 4921599 4941760			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/m)	
				From	To
			clay stones	0	14
			limestone	14	210
			blue shale	210	245

Annular Space

Depth Set at (m/ft)		Type of Sealant Used (Material and Type)	Volume Placed (m ³ /ft ³)
From	To		
0	28	bestonite	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Airpercussion
☒ Other, specify rotary air

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 (mm/ft)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (mm/ft)	Depth (m/ft)	
			From	To
6 1/2	steel	188	2	28

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*

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (mm)	
			From	To

Water Details

Water found at Depth <u>105</u> (mft) ☒ Gas	Kind of Water: ☒ Fresh ☐ Untested ☐ Other, specify _____
Water found at Depth <u>196</u> (mft) ☒ Gas	Kind of Water: ☒ Fresh ☐ Untested ☐ Other, specify _____
Water found at Depth (mft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify _____

Hole Diameter

Depth (m/ft)		Diameter (cm/ft)
From	To	
0	28	10
28	215	6

Well Contractor and Well Technician Information

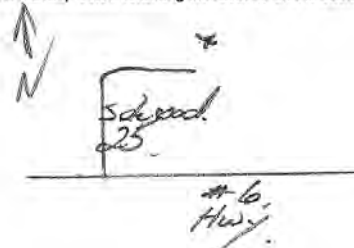
Business Name of Well Contractor <i>Leam Well Drilling & Well Services Ltd</i>		Well Contractor's Licence No. <i>55017</i>
Business Address (Street Number/Name) <i>Box 167 Hiramouth</i>		Municipality <i>S.B.P.</i>
Province <i>East</i>	Postal Code <i>N0A1V0</i>	Business E-mail Address
Bus. Telephone No. (inc. area code) <i>5083551180</i>		Name of Well Technician (Last Name, First Name) <i>Leam Well Drilling</i>
Well Technician's Licence No. <i>5141</i>	Signature of Technician and/or Contractor <i>Leam Well Drilling</i>	Date Submitted <i>Y Y Y Y M M D D</i>
OSDFE (2014/11)		Minister's Code

Results of Well Yield Testing

After test of well yield, water was:		Draw Down		Recovery	
☒ Clear and sand free ☐ Other, specify _____		Time (min)	Water Level (mft)	Time (min)	Water Level (mft)
If pumping discontinued, give reason:		Static Level	45		
		1		1	
Pump intake set at (mft)		2		2	
215		3		3	
Pumping rate (l/min / GPM)		4		4	
45		5		5	
Duration of pumping		10		10	
1 hrs + _____ min		15		15	
Final water level end of pumping (mft)		20		20	
215		25		25	
If flowing give rate (l/min / GPM)		30		30	
		40		40	
Recommended pump depth (mft)		50		50	
200		60		60	
Recommended pumping rate (l/min / GPM)					
5					
Well production (l/min / GPM)					
Disinfected?					
☒ Yes ☐ No					

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well owner's information package delivered ☒ Yes ☐ No	Date Package Delivered Y Y Y Y M M D D 20180818	Ministry Use Only Audit No. 2297258 MAR 15 2019 Received
	Date Work Completed	



A294904

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization Barry's Construction	E-mail Address	☐ Well Constructed by Well Owner
Mailing Address (Street Number/Name) 7839 Hwy 21	Municipality Allenford	Province ON	Postal Code
Telephone No. (inc. area code)			

Well Location

Address of Well Location (Street Number/Name) 75 Howe Drive	Township Georgian Bluffs	Lot	Concession
County/District/Municipality Grey	City/Town/Village Shallow Lake	Province Ontario	Postal Code
UTM Coordinates Zone NAD 83	Easting 1174931034940925	Northing Plan 16M34	Municipal Plan and Sublot Number BLK 31
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	To
Black	Topsoil			0	2
Brown	Sand	Stones		2	24
Brown	Limestone		Broken	24	26
Brown	Limestone		Solid	26	42
Brown	Limestone	Grey Layers		42	70
Grey	Limestone		Solid	70	102

Annular Space		
Depth Set at (m/ft) From 0	To 26	Type of Sealant Used (Material and Type) Bentonite
Volume Placed (m³/ft³)		

Method of Construction	Well Use
☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☒ Air percussion ☐ Other, specify	☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☒ Public ☒ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify
☐ Commercial ☐ Not used ☐ Municipal ☐ Dewatering ☐ Test Hole ☐ Monitoring ☐ Cooling & Air Conditioning	

Construction Record - Casing				Status of Well	
Inside Diameter (cm/in) 6 3/16 6	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) Steel Open	Wall Thickness (cm/in) .219	Depth (m/ft) From +1.5 26 To 26 102	☒ 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	

Construction Record - Screen			
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From To

Water Details		Hole Diameter	
Water found at Depth 70 (m/ft)	Kind of Water: ☒ Fresh ☐ Untested ☐ Gas ☐ Other, specify	Depth (m/ft) From 0 To 26	Diameter (cm/in) 10
Water found at Depth 100 (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify	26	6
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify		

Well Contractor and Well Technician Information			
Business Name of Well Contractor Tan Wright & Co Well Drilling		Well Contractor's Licence No. 5505	
Business Address (Street Number/Name) R.R. #1		Municipality Shallow Lake	
Province ON	Postal Code N0H2K0	Business E-mail Address	

Bus. Telephone No. (inc. area code) 519 376 4380	Name of Well Technician (Last Name, First Name) Wright, Dan & Kevin
Well Technician's Licence No. 3958	Signature of Technician and/or Contractor [Signature]
Date Submitted YYYYMMDD 20200420	

Results of Well Yield Testing			
After test of well yield, water was: ☒ Clear and sand free ☐ Other, specify		Draw Down	
If pumping discontinued, give reason:		Time (min)	Water Level (m/ft)
Pump intake set at (m/ft) 85		Static Level 47	
Pumping rate (l/min / GPM) 5		1 47.2	1 47
Duration of pumping 2 hrs + min		2	2
Final water level end of pumping (m/ft) 49.7		3	3
If flowing give rate (l/min / GPM)		4 47.5	4
Recommended pump depth (m/ft) 85		5 47.6	5
Recommended pump rate (l/min / GPM) 5		10 48	10
Well production (l/min / GPM) 7		15 48.4	15
Disinfected? ☒ Yes ☐ No		20 48.7	20
		25 49	25
		30 49.1	30
		40 49.3	40
		50 49.5	50
		60 49.7	60

Map of Well Location	
Please provide a map below following instructions on the back.	

Comments:	Well owner's information package delivered ☒ Yes ☐ No	Date Package Delivered 20200420	Date Work Completed 20200420
Ministry Use Only		Audit No. 2329254	
		JUL 21 2020 Received	

APPENDIX B

Test Pit Logs and Grain Size Analysis



TEST PIT LOG – TP 1

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 240.5 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.41	TOPSOIL			
0.41	0.71	Brown SANDY SILT, some clay, trace to some gravel.	1	0.41 - 0.71	
0.71	1.07	Dolostone BEDROCK, layered, fragmented, can be broken with hoe.			
	1.07	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 2

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 239.3 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.30	TOPSOIL			
0.30	0.61	Brown SANDY SILT, some clay and gravel.			
0.61	0.76	Dolostone BEDROCK, upper 0.15 m fragmented, solid at 0.76 m depth.			
	0.76	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 3

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 238.4 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.30	TOPSOIL			
0.30	1.07	Brown SANDY SILT, some clay and gravel, with boulders and broken rock.	1	0.61 - 0.76	
1.07	--	Dolostone BEDROCK, solid, no open fractures.			
	1.07	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 4

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 238.2 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.30	TOPSOIL			
0.30	1.32	Brown SILTY SAND, some gravel, trace to some clay. Boulders and broken rock increasing with depth.	1	0.81 - 1.22	Grain size analysis. Estimated 'T' time 30 - 40 min/cm.
1.32	--	Dolostone BEDROCK, solid, no open fractures.			
	1.32	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 5

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 238.2 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.13	TOPSOIL			
0.13	0.61	Brown SANDY SILT, some clay, trace to some gravel, with cobbles, boulders, and rock fragments.			
0.61	--	Whitish-grey dolostone BEDROCK, no open fractures.			
	0.61	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 6

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 238.9 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.20	TOPSOIL			
0.20	0.51	Brown SANDY SILT, some clay, trace to some gravel, with cobbles and rock fragments.			
0.51	--	Whitish-grey dolostone BEDROCK, solid, uneven, no open fractures.			
	0.51	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 7

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 239.6 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.20	TOPSOIL			
0.20	0.56	Brown SANDY SILT, some clay, trace gravel, some rock fragments.			
0.56	--	Whitish-grey, dolostone BEDROCK, layered, can be broken with hoe.			Encountered rock as shallow as 0.4 m depth.
	0.56	End of Test Pit			Water Condition: Dry



TEST PIT LOG – TP 8

Location: Part Lot 23, Con 2 SCD (Keppel), Georgian Bluffs

Project No. 21-112

Ground Elevation: 240.9 m

Date: April 27, 2023

DEPTH (m)		SOIL DESCRIPTION	SAMPLES		REMARKS
From	To		No.	Depth (m)	
0	0.20	TOPSOIL			
0.20	0.91	Brown SANDY SILT, some clay, trace to some gravel, rock fragments.			
0.91	--	Whitish-grey, dolostone BEDROCK, solid, uneven surface, no open fractures.			Bedrock surface as deep as 1.2 m depth. Uneven surface; not penetrated with hoe.
	1.22	End of Test Pit			Water Condition: Dry



May 16, 2023
Our File: 218194

Via Email: Bradbenenson@gssengineering.ca

GSS Engineering Consultants Ltd.
1010-9th Ave West, Unit 104D
Owen Sound, ON N4K 5R7

Attention: Brad Benson P. Eng

Re: Soil Testing for Sewage System
GSS No. 21-112
Plan 857, Pt. Lot 1, Pt. Lot 22, Conc 2 SCD
Township of Georgian Bluffs

Dear Brad,

As requested, we have performed a grading analysis on the soil sample delivered to us on May 4, 2023. It is understood that the sample was collected from a testpit (TP-4) in the area where a leaching or filter bed is proposed to be constructed.

The sample from testpit TP-4 is a clayey gravel. From the attached Grain-Size Distribution Curve and based on the Hazen Formula, we estimate the co-efficient of permeability to be in the order of 6.4×10^{-5} cm/second. Based on this result and the relationship of soil types to percolation times as per the Ontario Building Code (OBC), we have assessed a percolation time, "T" of 30 to 40 minutes/cm for the sample.

Due to the amount of silt and clay in the soil in the sample, the "T" time is elevated and therefore it is not feasible to construct an in-ground system in such soil. A raised system constructed of approved imported material must be considered.

Increased amounts of silt and clay will negatively affect the percolation time and the performance of the leaching or filter bed. The percolation time is also dependent upon the density, structure, and moisture content of the soil and the installation methods utilized. Therefore, it is the responsibility of the owner, system designer, and contractor to monitor the quality of the soils across the site and any imported material to assure themselves that the design criteria are met and if necessary, adjust the design of the system.

Should you have any questions, please do not hesitate to contact me.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED

Per:

A handwritten signature in blue ink, appearing to read 'Wm. E. Dubeau'.

Wm. E. Dubeau, P.Eng.
WED/mr

Encl.

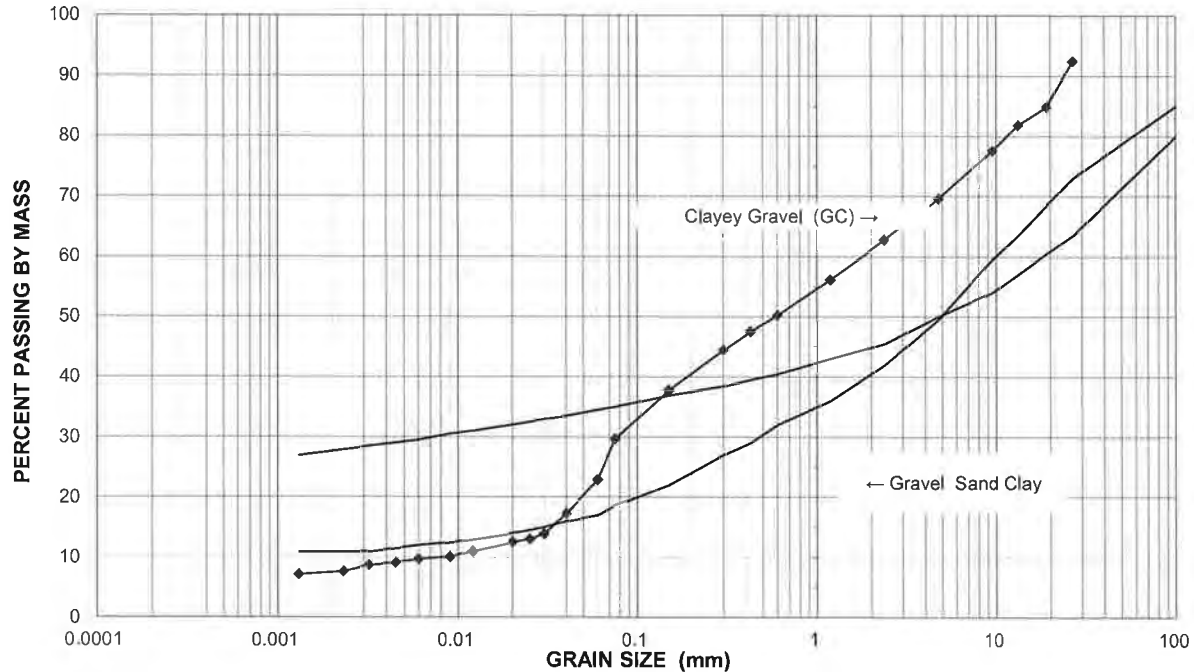
cc: File No: 218194

PARTICLE SIZE ANALYSIS

PROJECT: M.T. GSS Engineering (#21-112)
 LOCATION: Plan 857, Part lot 1; Part lot 22, concession 2 SCD, Township of G
 CLIENT: GSS Engineering
 SOIL TYPE: Clayey Gravel with Sand and some Silt
 GRAPH #: 4 - Clayey Gravels, Gravel Sand Clay Mixtures

FILE NO.: 218194
 LAB SAMPLE NO.: S-4977
 SAMPLE DATE: Apr-27 RCVD May-4
 SAMPLED BY: Client
 SOURCE: TH @2.7-4 ft

PARTICLE SIZE DISTRIBUTION



←		FINE		MEDIUM		COARSE		FINE		COARSE	
CLAY		SILT		SAND				GRAVEL			
SIEVE SIZE PARTICLE DIA. (mm)		PERCENT PASSING		HYDROMETER PARTICLE DIA. (mm)				PERCENT PASSING			
		SAMPLE						SAMPLE			
26.5		92.4		0.0600				23.0			
19		84.9		0.0400				17.3			
13.2		81.9		0.0300				13.9			
9.5		77.6		0.0250				13.0			
4.75		69.7		0.0200				12.5			
2.36		62.6		0.0120				11.1			
1.180		56.2		0.0090				10.1			
0.600		50.3		0.0060				9.7			
0.425		47.6		0.0045				9.2			
0.300		44.4		0.0032				8.7			
0.150		37.8		0.0023				7.8			
0.075		29.7		0.0013				7.3			

D₁₀: 0.008 mm D₆₀: 1.87 mm Cu: 234

Coefficient of Permeability: 6.4×10^{-5} cm/sec "T" Time: 30 to 40 mins/cm

Comments:

APPENDIX C

Groundwater Quality Data

C.O.C.: -

REPORT No: 23-032866 - Rev. 0

Report To:

GSS Engineering Consultant Ltd.
945 3rd Ave E
Suite 230
Owen Sound, ON N4K 2K8

CADUCEON Environmental Laboratories

110 West Beaver Creek Rd
Unit #14
Richmond Hill, ON L4B 1J9

Attention: Brad Benson

DATE RECEIVED: 2023-Nov-21
DATE REPORTED: 2023-Nov-27
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: Shallow Lake
P.O. NUMBER: 21-112

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	1	OTTAWA	PCURIEL	2023-Nov-22	A-IC-01	SM 4110B
Cond/pH/Alk Auto (Liquid)	1	OTTAWA	SBOUDREAU	2023-Nov-22	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Ion Balance (Calc)	1	OTTAWA	ASCHNEIDER		CP-028	MECP E3196
ICP/OES (Liquid)	1	OTTAWA	APRUDYVUS	2023-Nov-24	D-ICP-01	SM 3120B

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *



Michelle Dubien
Data Specialist

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report
REPORT No: 23-032866 - Rev. 0

					Client I.D.
					Well 1
					Sample I.D.
					23-032866-1
					Date Collected
					2023-Nov-20
Parameter	Units	R.L.	Limits	DWG	
Alkalinity(CaCO3) to pH4.5	mg/L	5	500	OG	294
Conductivity @25°C	uS/cm	1			627
pH @25°C	pH units	-	8.5	OG	7.93
Fluoride	mg/L	0.1	1.5	MAC	0.3
Chloride	mg/L	0.5	250	AO	10.7
Nitrate (N)	mg/L	0.05	10.0	MAC	3.92
Nitrite (N)	mg/L	0.05	1.0	MAC	<0.05
Sulphate	mg/L	1	500	AO	17
Hardness (as CaCO3)	mg/L as CaCO3	0.02	100	OG	353
Calcium	mg/L	0.02			83.6
Copper	mg/L	0.002	1	AO	0.003
Iron	mg/L	0.005	0.3	AO	1.24
Magnesium	mg/L	0.02			35.0
Manganese	mg/L	0.001	0.05	AO	0.182
Potassium	mg/L	0.1			2.8
Sodium	mg/L	0.2	200, 20, 20	AO, WL, MAC	8.8
Zinc	mg/L	0.005	5	AO	0.087
Anion Sum	meq/L	-			6.81
Cation Sum	meq/L	-			7.58
% Difference	%	-			5.35
TDS (Ion Sum Calc)	mg/L	1	500	AO	353



Michelle Dubien
Data Specialist

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 23-032866 - Rev. 0

					Client I.D.	Well 1
					Sample I.D.	23-032866-1
					Date Collected	2023-Nov-20
					DWG	-
Parameter	Units	R.L.	Limits			
Conductivity Calc	µmho/cm	-				651

DWG - Drinking Water Guidelines

ODWS - Ontario Drinking Water Standards

AO - Aesthetic Objectives

IMAC - Interim Maximum Acceptable Concentration

MAC - Maximum Acceptable Concentration

ODWO - D-5-5 Objective

OG - Operational Guidelines

WL - Warning Level - Sodium Restricted Diets

Summary of Exceedances		
Aesthetic Objectives		
Well 1	Found Value	Limit
Iron	1.24	0.3
Manganese	0.182	0.05
Operational Guidelines		
Well 1	Found Value	Limit
Hardness (as CaCO ₃)	353	100



Michelle Dubien
Data Specialist

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

C.O.C.: -

REPORT No: 24-012761 - Rev. 0

Report To:

GSS Engineering Consultant Ltd.
945 3rd Ave E
Suite 230
Owen Sound, ON N4K 2K8

CADUCEON Environmental Laboratories

110 West Beaver Creek Rd
Unit #14
Richmond Hill, ON L4B 1J9

Attention: Brad Benson

DATE RECEIVED: 2024-May-07
DATE REPORTED: 2024-May-10
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: Shallow Lake
P.O. NUMBER: 21-112

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	1	OTTAWA	PCURIEL	2024-May-08	A-IC-01	SM 4110B
Cond/pH/Alk Auto (Liquid)	1	OTTAWA	SBOUDREAU	2024-May-09	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Ion Balance (Calc)	1	OTTAWA	ASCHNEIDER		CP-028	MECP E3196
ICP/OES (Liquid)	1	OTTAWA	APRUDYVUS	2024-May-09	D-ICP-01	SM 3120B

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *



Michelle Dubien
Data Specialist

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report
REPORT No: 24-012761 - Rev. 0

					Client I.D.
					Well 1
					Sample I.D.
					24-012761-1
					Date Collected
					2024-May-06
Parameter	Units	R.L.	Limits	DWG	
Alkalinity(CaCO3) to pH4.5	mg/L	5	500	OG	251
Conductivity @25°C	uS/cm	1			569
pH @25°C	pH units	-	8.5	OG	7.82
Fluoride	mg/L	0.1	1.5	MAC	0.3
Chloride	mg/L	0.5	250	AO	6.9
Nitrate (N)	mg/L	0.05	10.0	MAC	5.87
Nitrite (N)	mg/L	0.05	1.0	MAC	<0.05
Sulphate	mg/L	1	500	AO	12
Hardness (as CaCO3)	mg/L as CaCO3	0.02	100	OG	288
Calcium	mg/L	0.02			66.1
Copper	mg/L	0.002	1	AO	<0.002
Iron	mg/L	0.005	0.3	AO	<0.005
Magnesium	mg/L	0.02			29.9
Manganese	mg/L	0.001	0.05	AO	<0.001
Potassium	mg/L	0.1			2.2
Sodium	mg/L	0.2	200, 20, 20	AO, WL, MAC	2.2
Zinc	mg/L	0.005	5	AO	0.017
Anion Sum	meq/L	-			5.90
Cation Sum	meq/L	-			5.91
% Difference	%	-			0.0979
TDS (Ion Sum Calc)	mg/L	1	500	AO	296



Michelle Dubien
Data Specialist

The analytical results reported herein refer to the samples as received and relate only to the items tested. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

					Client I.D.	Well 1
					Sample I.D.	24-012761-1
					Date Collected	2024-May-06
Parameter	Units	R.L.	Limits	DWG		
Conductivity Calc	µmho/cm	-			545	
pH (Client Data)	pH units	-			7.1	
Temperature (Client Data)	°C	-			10.6	

DWG - Drinking Water Guidelines

ODWS - Ontario Drinking Water Standards

AO - Aesthetic Objectives

IMAC - Interim Maximum Acceptable Concentration

MAC - Maximum Acceptable Concentration

ODWO - D-5-5 Objective

OG - Operational Guidelines

WL - Warning Level - Sodium Restricted Diets

Summary of Exceedances**Operational Guidelines**

Well 1	Found Value	Limit
Hardness (as CaCO ₃)	288	100

**Michelle Dubien**
Data Specialist

C.O.C.: -

REPORT No: 24-030518 - Rev. 0

Report To:

GSS Engineering Consultant Ltd.
945 3rd Ave E
Suite 230
Owen Sound, ON N4K 2K8

CADUCEON Environmental Laboratories

110 West Beaver Creek Rd
Unit #14
Richmond Hill, ON L4B 1J9

Attention: Brad Benson

DATE RECEIVED: 2024-Oct-02
DATE REPORTED: 2024-Oct-04
SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: Shallow Lake
P.O. NUMBER: 21-112

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	2	OTTAWA	PCURIEL	2024-Oct-03	A-IC-01	SM 4110B

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *

Parameter	Units	R.L.	Limits	DWG	Client I.D.	
					Sample I.D.	
					Date Collected	
Nitrate (N)	mg/L	0.05	10.0	MAC	<0.05	0.81

DWG - Drinking Water Guidelines

ODWS - Ontario Drinking Water Standards

AO - Aesthetic Objectives

IMAC - Interim Maximum Acceptable Concentration

MAC - Maximum Acceptable Concentration

ODWO - D-5-5 Objective

OG - Operational Guidelines

WL - Warning Level - Sodium Restricted Diets



Michelle Dubien
Data Specialist