TATHAM ENGINEERING

Enhancing our communities

900 County Road 6 South, Tiny

HYDROGEOLOGICAL ASSESSMENT

West Ridge Development Corporation

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Issue	Date	Description
1	August 31, 2023	Final Report – Hydrogeological Assessment

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1 Introduction

Tatham Engineering Limited (Tatham) was retained by West Ridge Development Corporation (West Ridge) to complete a hydrogeological assessment for the proposed development property located at 900 County Road 6 South, Township of Tiny, Simcoe County, as shown on Figure 1.

The 5.42 hectare property is located in the community of Wyevale as shown on Figure 2. The property is surrounded by residential properties to the north, an auto repair shop and County Road 6 South followed by a concrete facility and residential dwellings to the east, residential dwellings and wooded undeveloped properties to the south, and agricultural lands to the west.

A previous hydrogeological assessment was carried out by Golder Associates Ltd. and a preliminary report was prepared. However, a development application was not advanced based on the plan of subdivision envisioned at the time. The findings of the Golder field investigations have been used as part of this hydrogeological assessment.

The current proposed development includes 14 single family residential lots, and one Hamlet Commercial Lot with each lot ranging in size from 0.20 to 0.58 hectares. The proposed lots are to be serviced by individual private on-site sewage systems and individual private water supply wells.

1.1 SCOPE OF WORK

The main objectives of the Hydrogeological Investigation were to:

- Establish local and regional geology and hydrogeology;
- Establish the soil and groundwater conditions on-site including infiltration potential and seasonal high groundwater levels;
- Verify the presence of existing water supply wells on-site and within a 250 m radius of the site;
- Assess the feasibility of private water and/or septic servicing on-site; and,
- Prepare a Hydrogeological Assessment report.

To achieve the above objectives, Tatham proposed the following scope of work:

- Complete a desktop review of pertinent geological and hydrogeological resources, Ministry of the Environment, Conservation and Parks (MECP) water well records, previous reports and proposed site plan drawings;

- Assess the feasibility of private water supply wells by verifying the target aquifer has sufficient water supply to support the proposed development, groundwater quality is acceptable, and to assess potential interference at neighbouring water supply wells;
- Complete a nitrate loading assessment for the proposed development to confirm the nitrate concentrations at the downgradient property limit will not exceed the Ontario Drinking Water Standard (ODWS) of 10 mg/L;
- Assess the suitability of the proposed lots for the use of individual private sewage systems and provide system design considerations including confirmation that adequate space is available for the tile beds reserve area; and
- Prepare a Hydrogeological Assessment report in general accordance with the applicable Ministry of the Environment, Conservation and Parks (MECP) D-5-5 and D-5-4 Guidelines.

1.2 REGULATOR REQUIREMENTS

1.2.1 Private On-Site Servicing

Residential developments that are to be reliant on private individual water supply wells and/or septic system are to adhere to the following regulatory guidelines:

- MECP D-5-5: Private Water Wells: Water Supply Assessment
- MECP D-5-4: Individual On-Site Sewage Systems

This hydrogeological assessment will generally follow the above noted guidelines.

2 Background Review

2.1 PHYSIOGRAPHY, SURFICIAL AND BEDROCK GEOLOGY

The Site lies within the physiographic region known as the Simcoe Uplands comprising of sand plains (Chapman and Putnam, 1984). Ontario Geological Survey surficial geology mapping indicates the site consists of coarse-textured glaciolacustrine deposits consisting of sand and gravel with minor silt and clay. The Wye River basin is known to comprise fine-textured silt and clay deposits, with the lower river valley incised into an underlying clay to silt till. Similar deposits are also present in lower lying areas north of Wyevale. The bedrock at the site consists of Bobcaygeon limestone with minor shales in the upper part, of the Simcoe Group. Based on a review of the MECP well records, bedrock was not encountered within the vicinity of the site at the termination depths of wells.

2.2 TOPOGRAPHY AND DRAINAGE

The topography of the site is relatively flat with ground surface elevations ranging from approximately 232 to 234 meters above sea level (m asl). Site drainage is expected to follow the surface topography to lower lying areas and/or towards existing ditching along County Road 6.

In the Wyevale area, the ground surface generally slopes downward to the west, toward Georgian Bay approximately 4.4 km to the west of the site, at an elevation of approximately 176 m asl. The Wye River is located approximately 1.2 km southeast of the Site and flows northeast towards Mud Lake, eventually draining to Georgian Bay in the northeast.

2.3 CLIMATE

Climate normal data from 1981 to 2010 (Environment Canada) measured at the Midland Water Pollution Control Plant weather station (Climate ID: 6115127), the closest weather station with historical data, located approximately 13 km northeast of the site was reviewed. The highest daily average temperature was in July at 20.8˚C and the lowest daily average temperature was in January at -8.5˚C. The yearly average temperature between 1981 to 2010 is 7.1˚C. The total average annual precipitation recorded was 1041 mm. Climate data is tabulated in Appendix A.

In accordance with Thornthwaite and Mather method, a water surplus of 547.3 mm/year was calculated for the site. Detailed calculations are provided in Appendix A for reference.

The infiltration from the annual surplus can be estimated based on infiltration factors from Table 3.1 of the SWM Planning and Design Manual (Ministry of Environment, 2003). Specific infiltration factors are provided for topography, soils and landcover.

Topography.....	0.3
Soils.....	0.4
Cover.....	0.1
Total.....	**0.8**

For the purpose of this assessment, an infiltration factor of 0.8 was assumed for the site resulting in an infiltration rate of 437.84 mm/year.

2.4 WATER WELL RECORDS

To assess the nature of the groundwater resources as well as the history of the current well usage in the area, MECP water well records were reviewed for a 500 m radius surrounding the site. The approximate MECP water well locations are shown on Figure 3, and a summary of the MECP water well records are provided in Appendix B. 63 well records were reviewed within a 500 m radius of the site boundary, as shown on Figure 3.

52 of the records indicated domestic water supply use, one record indicated livestock use, one record indicated irrigation use, one record indicated industrial use, two records indicated municipal use, one record indicated public use, one record indicated it was not in use and the remaining did not specify.

In general, stratigraphy noted from the well records indicated overburden consisting of sand and sand and clay.

A regional cross section was prepared by Golder Associates Ltd. which is provided in Appendix C illustrating the location and depth of private water supply wells, and the hydrostratigraphy of the area.

There are four aquifers identified including: Aquifer A1 (shallowest) through A4 (deepest). Further, a perched water table aquifer was also identified. It Is anticipated the majority of the private water wells in the area are completed in Aquifer A1, and the municipal water supply wells located to the east of County Road 6 are constructed in Aquifers A3/A4.

It is noted one well (Record No.5711098) within the 500 m radius is incorrectly identified as a municipal well and is located about 400 m north of the Site. Information from the County of Simcoe mapping database (https://www.simcoe.ca/dpt/it/gis) indicates this is not an active municipal water supply well.

2.5 SOURCE WATER PROTECTION MAPPING

The site is located in the Severn Sound Source Protection Area (SPA). The site lies within a Municipal Well Head Protection Area (WHPA); however, does not lie within an Intake Protection Zone (IPZ), as shown on Figures 4 and 5. Further, portions of the site lie within a Significant Groundwater Recharge Area (SGRA) and portion of site lies within an area identified as a Highly Vulnerable Aquifer (HVA), as shown on Figures 6 and 7, respectively.

2.6 PREVIOUS HYDROGEOLOGICAL ASSESSMENT

As part of the previous hydrogeological assessment carried out by Golder Associates Ltd. (2021) a complete hydrogeological investigation was carried out including:

- Private On-Site Sewage System Assessment
  - The advancement of eight test pits to a depth of 1.8 to 5.0 m below existing grade (TP19-1 to 19-8) and equipped with standpipes at two locations (TP19-5 and TP19-8) to assess shallow subsurface conditions. Test pit locations are shown on Figure 2 and test pit logs are provided in Appendix D and further discussed in Section 3.1;
  - Four representative soil samples were submitted for gradation testing and the results are provided in Appendix E and further discussed in Section 3.1.
- Private Water Well Assessment
  - A licensed water well driller (Allan Wright Water Wells, License No. 5528) installed a 152 mm diameter test well (TW1). The location of TW1 is shown on Figure 2 and the water well record is provided in Appendix F and discussed further in Section 3.4.
  - A six-hour constant rate pumping test was carried out by Allan Wright Water Wells. Water levels were monitored during the pumping test and during the recovery following the test. Results of the pumping test are provided in Appendix G and discussed further in Section 3.5
  - A representative groundwater quality sample was obtained from TW1 at the end of the six-hour pumping test and submitted for the typical water quality parameters as outlined in MECP Guideline D-5-5 Tables 1 to 3. The results are provided in Appendix H and discussed further in Section 4.2.

The findings of the previous hydrogeological investigation have been utilized as part of this hydrogeological investigation.

3 Subsurface Conditions

3.1 STRATIGRAPHY

The Hydrogeological Investigation carried out by Golder Associates Ltd. (2021) was reviewed for this investigation. The test pit locations are shown on Figure 2 and detailed subsurface test pit logs are provided in Appendix D and geotechnical laboratory testing is provided in Appendix E.

In general, the test pits encountered topsoil or granular overlying a major layer of sand. The soil groups present on the site are SP (sand), SM (silty sand), and MH-SP (silt and sand). A local layer of sandy silt was encountered in Test Pit 19-7 at a depth of 0.6 to 1.8 m below existing grade towards the southern portion of the site.

3.2 GROUNDWATER LEVELS

Standpipes were installed in two test pits (TP19-5 and TP19-8) to facilitate measurements of stabilized groundwater levels across the site. The standpipe installed at TP19-5 comprised a 25 mm ABS standpipe and TP19-7 comprised a 100-mm PVC drain-pipe. A summary of the standpipe installations and groundwater level measurements are presented in Table 1.

Table 1: Monitoring Well Installation Details

TEST PIT ID	INSTALLATION DEPTH(m)	STRATA SCREENED	GROUNDWATER DEPTH (m bgs)	
			February 6, 2020	May 26, 2023
TP19-5	5.2	Sand	Dry	Dry
TP19-8	2.1	Sand	1.1	1.1

Groundwater levels are expected to show seasonal fluctuations and vary in response due to prevailing climate conditions.

3.3 INFILTRATION

The hydraulic conductivity and associated percolation times were estimated utilizing the grain size distribution curves prepared by Golder Associates Ltd., an established empirical formula by Vukovic and Soro (1992), and the Ontario Building Code (2012) Supplementary Standards SB-6. The results of the laboratory testing are summarized in Table 2.

Table 2: Grain Size Analysis

SAMPLE ID	SAMPLE DEPTH (m)	SOIL DESCRIPTION	ESTIMATED HYDRAULIC CONDUCTIVITY (cm/s)	PERCOLATION TIME (mins/cm)
TP1	0.6	Poorly graded sands, gravelly sands, little to no fines (SP)	10^{-2} to 10^{-3}	2 to 8
TP2	0.6	Silty sands, sand-silt mixtures (SM)	10^{-3} to 10^{-4}	8 to 20
TP3	0.6	Poorly graded sands, gravelly sands, little to no fines (SP)	10^{-2} to 10^{-3}	2 to 8
TP7	0.7	Inorganic silts, micaceous and diatomaceous fine sandy or silty soils, elastic silts / poorly graded sands, gravelly sands, little to no fines (MH-SP)	10^{-4} to 10^{-5}	2 to >50

It is noted the K value derived from the particle size distribution curve does not take into consideration site specific details such as compaction, soil structure, organic content and/or the degree of saturation.

3.4 TW1 CONSTRUCTION

Test Well 1 (TW1) had been installed on the property by Allan Wright Water Wells (MECP License 5528) in September 2020 utilizing standard rotary methods. A copy of the water well record (Tag #A210749) is provided in Appendix F.

The water well record notes interbedded layers of sand and clay to the termination depth of 96.5 m below existing grade.

The nominal 152 mm diameter single wall gravel pack test well was constructed within a confined sand aquifer at a depth of 93.0 to 95.7 m below existing grade. The well is constructed with 2.7 m of 10 and 16-slot stainless steel well screen with a theoretical transmitting capacity of 96 L/min. The annular space was sealed with a bentonite grout from surface to a depth of 48 m below existing grade. TW1 was developed and chlorinated upon completion.

The static water level was recorded as 33.7 m below top of casing indicating approximately 59.3 m of available drawdown.

3.5 CONSTANT RATE PUMPING TEST

Allan Wright Water Wells completed a pumping test on TW1 on September 2, 2020 according to Ontario Regulation D-5-5. The pumping test was carried out at a rate of 75.6 L/min.

Water levels were manually measured by Allan Wright Water Wells throughout the pumping test as well as during the recovery phase immediately following the pumping tests. The results of the pumping tests are provided in Appendix G.

During the 6-hour pumping test water levels declined from a static water level of 33.74 m below top of casing to 59.61 m below top of casing at the end of the test. Water levels recovered within 2% of the static water level within 30 minutes of completing of the test.

Transmissivity was estimated. using the Jacob straight-line method for the drawdown verses time trend per log cycle observed in pumping well TW1 (Appendix G), as follows:

$$T = \left(\frac{2.3Q}{4\pi\Delta S}\right)$$

Where:

Q = pumping rate (108.9 m^3/day); and

ΔS = slope of the observed drawdown trend per log cycle (0.5 m).

Accordingly, the aquifer transmissivity was calculated to be 40 m^2/day.

3.6 WATER QUALITY ASSESSMENT

Water quality samples were collected By Golder Associates Ltd. representatives from TW1 during the final one hour of the pumping test. The groundwater sample was kept cool on ice and submitted to an external laboratory (Caduceon Environmental Laboratories) for testing. Groundwater chemistry results are included in the laboratory Certificates of Analysis, provided in Appendix H.

Field measurements of free chlorine during pumping were confirmed to be 0.0 ppm prior to all microbiological sampling to confirm free chlorine concentrations were below 0.0 ppm.

The groundwater sample from TW1 met the ODWS for the parameters tested with the exception of:

- E.Coli with a measured concentration of 1 cfu/100mL compared to an ODWS of 0 cfu/100mL
- Total Coliform with a measured concentration of 6 cfu/100mL compared to an ODWS of 0 cfu/100mL

Given the deep confined nature of the water supply aquifer in which TW1 is installed in it is not typical to have detectable microbiological impacts; however, it is common for newly constructed wells to have adverse bacterial water quality even following development and chlorination. As such an additional groundwater sample was obtained by Golder Associates Ltd. representatives on December 16, 2020 to verify results. The supplemental groundwater quality results indicate both E.Coli. and Total Coliforms to be in compliance with the applicable ODWS (0.0 cfu/100mL).

The measured concentration of sodium was 61.3 mg/L, which does not exceed the aesthetic objective of 200 mg/L, but is above 20 mg/L. In accordance with the ODWS when sodium concentrations in groundwater exceed 20 mg/L which may be significant for persons on sodium-restricted diets and should be registered on title. This information should also be communicated to the local Medical Officer of Health at the time of the issuance of a building permit.

4 Hydrogeological Considerations

4.1 PRIVATE ON-SITE SEWAGE SYSTEM ASSESSMENT

It is noted MECP D-5-4 only applies to wastewater facilities where the average daily flows are anticipated to be less than 10,000 L/day.

For the purposes of this assessment, an impact assessment (Steps 1 to 3) in accordance with MECP D-5-4 was carried out.

4.1.1 Step One: Lot Sizing

In accordance with MECP D-5-4 where individual lot sizes within a proposed development exceed one hectare (2.5 ac) the MECP considers the dilution of sewage effluent by infiltrated precipitation to be adequate to reduce nitrate concentrations to acceptable levels. Assuming the site is not hydrogeologically sensitive, further assessments of impact of septic systems are generally not required.

Lot sizes are anticipated to be less than one hectare (2.5 ac), so Tatham proceeded to Step Two.

4.1.2 Step Two: System Isolation

Where proposed lot sizes are less than one hectare, it is necessary to assess the potential risk of septic effluent to groundwater supplies. Where it can be demonstrated local water supplies are obtained from an aquifer at depth which is hydraulically isolated from the sewage effluent in the receiving soil, further assessments are generally not required. The placement and sizing of the septic beds must take into consideration minimum set back and separation distances as outlined in O.Reg.358 (sewage systems), O.Reg.903 (Ontario Water Resources: Wells), and/or other municipal considerations.

Where it cannot be demonstrated the sewage effluent is hydraulically isolated from the aquifer, Step Three involves a hydrogeological study to evaluate the impact of infiltration of septic effluent from sewage treatment systems (nitrate loading considerations).

Based on Tatham's understanding of the development, private on-site sewage systems will be installed in the shallow sand/silty sand soils, and the on-site water supply well is installed in a deep confined sand aquifer. Although the on-site water supply appears to be isolated from the proposed on-site sewage system; private water supply wells in Wyevale may be installed in shallower unconfined aquifers. As such, Tatham proceeded to Step 3.

4.1.3 Step Three: Nitrate Loading Assessment

Nitrate in septic effluent is attenuated by dilution with infiltrating water, water discharged into the septic bed, and groundwater seepage from the upstream to the downstream side of the property (groundwater flux). For the purposes of this preliminary assessment groundwater flux was not considered in the nitrate dilution calculation, as such the nitrate loading assessment is considered conservative.

The nitrate concentration at the downgradient property line of the 5.42 ha property assuming 14 proposed residential residences with daily effluent flows of 1,000 L/day/lot and one hamlet commercial block with an effluent flow of 2,000 L/day was computed to be 7.98 mg/L, which meets the regulatory requirement of 10 mg/L.

Detailed calculations are provided in Appendix I for reference.

4.1.4 Sewage System Sizing

The Client, who is a OBC licensed designer, has prepared two conceptual designs based on the test pitting and soil gradations results including:

1. Inground bed and natural inground mantle with a contact area of 166 m^2; or,
2. Partially raised bed with imported mantle with a contact area of 266 m^2.

Calculation details are provided in Appendix J.

The proposed lots have areas of 2,000 to 5,800 m^2 and can support conventional septic bed servicing. Actual septic system design flow and home layout may vary and that will be addressed when a building permit application is made.

Based on the grain size analysis results the percolation times (T) are expected to be between 2 to 20 mins/cm for the sand/silty sand soils; however, for the siltier soil encountered at TP19-7 T times between 2 to greater than 50 mins/cm could be encountered. The material encountered in the vicinity of TP19-7 is less suitable for conventional in-ground septic bed design, and it is anticipated that a partially raised septic bed would be implemented in this area.

Based on the above, it is considered feasible the site could be developed with in-ground Class IV septic bed designs except for the area surrounding TP19-7 where partially raised septic bed designs would need to be considered.

All septic system designs will be submitted to the Township for approval and will be constructed by a licensed septic installer.

4.2 WATER SUPPLY ASSESSMENT

4.2.1 Water Supply Potential – Quantity

In accordance with the MECP D-5-5 guideline, a minimum daily water demand of 450 L/day per person, and a peak water demand of 3.75 L/min per person for a 120-minute period is to be assumed. The number of proposed bedrooms for the residences to be constructed on the property have not yet been determined, however, for the purposes of this assessment four bedroom and five persons per dwelling have been assumed. As such, a daily water demand of 2,250 L/day (1.56 L/min) and a peak water demand of 18.75 L/min are considered sufficient to yield an adequate water supply for the proposed residential dwellings.

It is noted for a 5.42 hectare property a minimum of three test wells are to be constructed on-site and tested for 6-hours in accordance with MECP D-5-5. It is recognized typically three test wells would be required to fully assess the available water supply on-site; however, since the lot layout and road alignment have not yet been approved the risk of potentially installing a future private water supply well in a location that can not be utilized as part of the future development plans is quite high. To avoid installing water wells to which cannot be used in the future, this water supply assessment utilized one water supply well and it is requested the construction and testing of additional water wells on-site be a condition of draft plan approval.

A constant rate pumping test carried out on TW1 on-site indicated a pumping rate of about 76 L/min could be achieved for 6-hours with 25.87 m of drawdown noted. Further following the pumping test, recovery within 2% of the original static water levels was noted within 30 minutes.

Assuming a well pump would be placed approximately 3.0 m above the well screen at a depth of 90 m below existing grade, the available drawdown in the well (the different between the pump setting and the static water level) was estimated to be 56.26 m. Considering the constant rate pumping test (at a rate of 76 L/min) resulted in 25.87 m of drawdown, approximately 46% of the total available drawdown, it is considered feasible the peak water demand 18.75 L/min, about 25% of the tested pumping rate, could be achieved by the confined aquifer on-site.

It is recommended future wells be installed within the deep confined aquifer similar to TW1. Assuming typical water usage, and well separation it is not anticipated the concurrent water taking of up to 14 individual water wells would adversely impact the available water supply given such a relatively small percentage of the available drawdown is actually being utilized. To confirm the water taking at neighboring water wells will not interfere with one another it is recommended during future pumping tests water levels are also monitored in at least one neighboring test well/water well during any future constant rate pumping tests.

All future water wells on-site should be installed and tested by a licensed water well contractor in accordance with O.Reg.903.

4.2.2 Water Supply Potential - Quality

The water quality sample obtained from TW1 indicates generally potable groundwater on-site with minor exceedances of sodium. It is noted the initial groundwater sample indicated minor exceedances of bacteria (E.Coli and Total Coliform); however, when resampled the bacteria concentrations were 0 CFU/100 mL for both E.Coli and Total Coliform.

It is considered feasible groundwater found in wells terminated between 93.0 to 95.7 m on-site will yield fresh water. Although not anticipated to be required, future homeowners may wish to consider the implementation of conventional water treatment systems.

Following the construction of future water wells on-site each water well should be sampled in accordance with MECP Guideline D-5-5 Tables 1 to 3.

5 Conclusions and Recommendations

This hydrogeological assessment was carried out to assess the feasibility of privately servicing 14 residential lots and one hamlet commercial lot on the 5.42 hectare site in accordance with MECP Guidelines D-5-4 and D-5-4. As part of this hydrogeological assessment some of the findings of a previous preliminary hydrogeological investigation by Golder Associates Ltd. (2021) were utilized. Based on our review and assessment of the available hydrogeological information our findings and recommendations are summarized below:

- In general, surficial soils comprised topsoil or granular overlying a major layer of sand. Local units of silty sand were noted. The soil was characterized as soil groups SP (sand), SM (silty sand), and MH-SP (silt and sand).
- Groundwater levels were noted at depths of 1.1 m below existing grades at TP19-8 to over 5.2 m below existing grades at TP19-5.
- Based on the grain size analysis results the percolation times (T) are expected to be between 2 to 20 mins/cm for the sand/silty sand soils; however, for the siltier soil encountered at TP19-7 T times between 2 to greater than 50 mins/cm could be encountered.
- It is considered feasible that the site could be developed with in-ground Class IV septic bed designs, with the exception of areas where siltier soils and/or shallow groundwater are encountered which will necessitate the use of partially raised beds. Final septic system designs will be prepared and submitted to the Township in support of a building permit on a lot by lot basis.
- The nitrate concentration at the downgradient property line of the 5.42 ha property assuming 14 proposed residential residences with daily effluent flows of 1,000 L/day/lot and one hamlet commercial block with an effluent flow of 2,000 L/day was computed to be 7.98 mg/L, which meets the regulatory requirement of 10 mg/L.
- TW-1 was pumped at a rate of 75.6 L/min for a period of six hours and pumped 27,216 L over that time with 25.87 m of drawdown observed (46% of the total available drawdown). The volume of water pumped is approximately 12 times the maximum daily requirement of 2,250 L for single family homes. Recovery within 2% of the original static water levels occurred within 30 minutes. It is our opinion that the yield of wells completed within the Aquifer A4 will be adequate for long-term domestic use and protected from contamination of surface activities.
- It is recommended future wells be installed with the deep confined aquifer similar to TW1. Assuming typical water usage, and well separation it is not anticipated the concurrent water

taking of up to 14 individual water wells would adversely impact the available water supply given such a relatively small percentage of the available drawdown is actually being utilized. To confirm the water taking at neighbouring water wells will not interfere with one another it is recommended during future pumping tests water levels are also monitored in at least one on-site Test Well which is not actively being pumped during any future constant rate pumping tests.

- It is recognized typically three test wells would be required to fully assess the available water supply on-site; however, since the lot layout and road alignment have not yet been approved the risk of potentially installing a future private water supply well in a location that can not be utilized as part of the future development plans is quite high. The developer has committed to drill additional wells after Draft Plan Approval and prior to Registration of the subdivision.
- All future water wells on-site should be installed and tested by a licensed water well contractor in accordance with O.Reg.903.
- The water quality sample obtained from TW1 indicates fresh potable groundwater on-site. It is considered feasible groundwater found in wells terminated between 93.0 to 95.7 m on-site will yield fresh water. Although not anticipated to be required, future homeowners may wish to consider the implementation of conventional water treatment systems.
- Following the construction of future water wells on-site each water well should be sampled in accordance with MECP Guideline D-5-5 Tables 1 to 3.

6 References

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Ministry of the Environment and Energy, 1996, D-5-5 Private Wells: Water Supply Assessment.

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N

NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2.CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO.

LEGEND

- SITE
- ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA

GEORGIAN BAY

CONCESSION 8 W.
TINY BEACHES RD. S.
SKYLARK RD.
CONCESSION 6 W.
CONCESSION 6 E.
DAWSONS SRD.
HIGHWAY 93
MARSHALL RD.
MERTZ CORNER RD.
CONCESSION 4 E.
STAMP SRD.
CONCESSION 5 W.
WILDMAN SRD.
CONCESSION 3 W.
CONCESSION 2 E.
BASELINE RD. S.
NICOLET BLVD.
CONCESSION 4 W.
CONCESSION 2 W.
COUNTY RD. 6 S.
COUNTY RD. 27
FLOS RD. ELEVEN E.
BASELINE RD.
CROSSLAND RD.
TINY FLOS TOWNLINE
FLOS RD. ELEVEN W.
FLOS RD. TEN E.
LAWSON RD.
USHERS RD.
FLOS RD. TEN W.
QUEEN ST. E.

0 0.75 1.5 3 KILOMETERS

TATHAM ENGINEERING

900 COUNTY ROAD 6, TINY HYDROGEOLOGICAL ASSESSMENT AREA LOCATION MAP

DWG. No. **FIG-1**

SCALE: 1:50,000	DRAWN: CW	DATE: AUG. 2023	JOB NO. 423386

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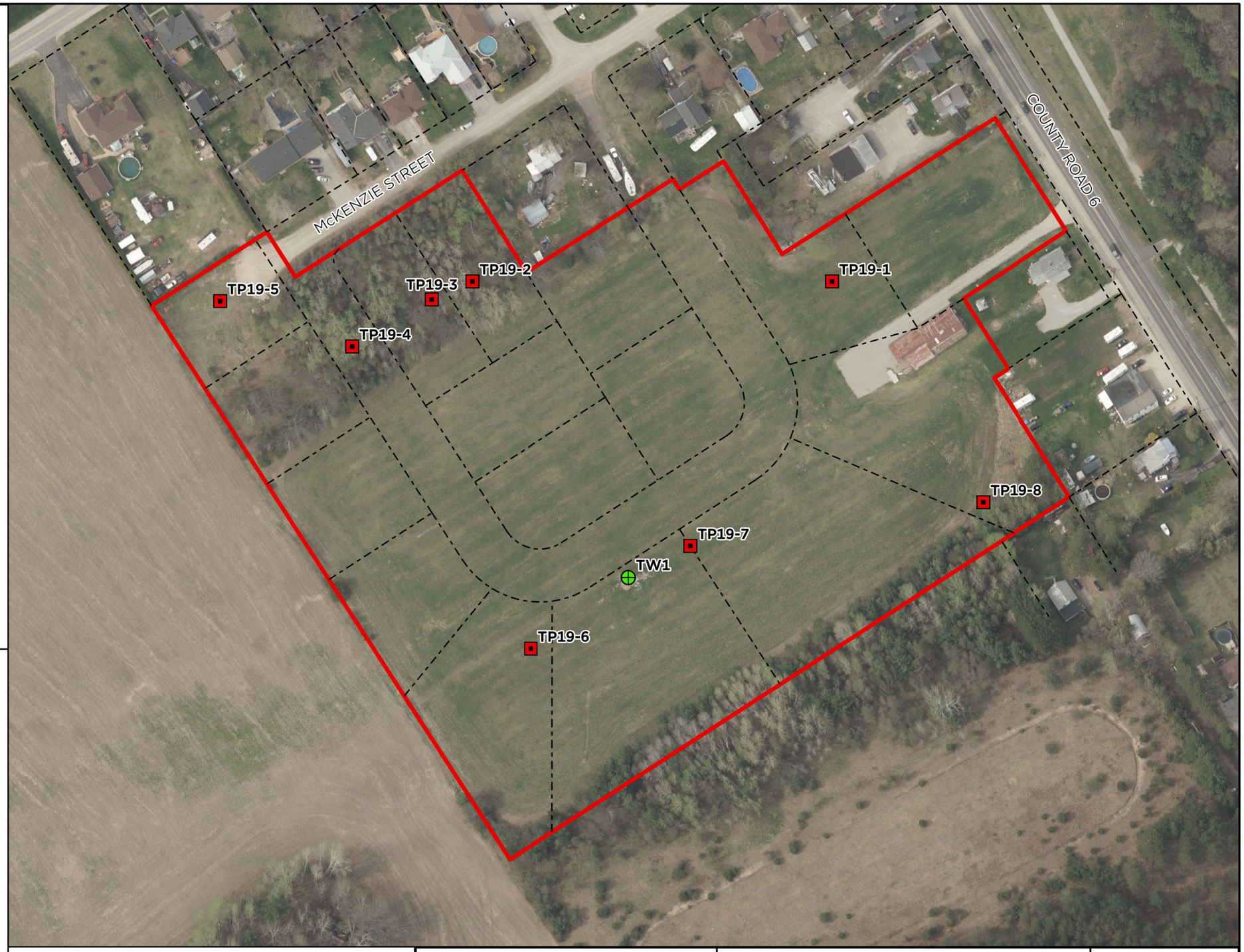
NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2.CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO.

LEGEND

- SITE
- PROPOSED PROPERTY LINE
- TEST WELL
- TEST PIT
- TW1_POINT



0 50 100 METERS

TATHAM ENGINEERING

TEST PIT/TEST WELL LOCATION PLAN
HYDROGEOLOGICAL ASSESSMENT
SITE LOCATION MAP

DWG. No. **FIG-2**

SCALE: 1:1,500 | DRAWN: CW | DATE: AUG. 2023 | JOB NO. 423386

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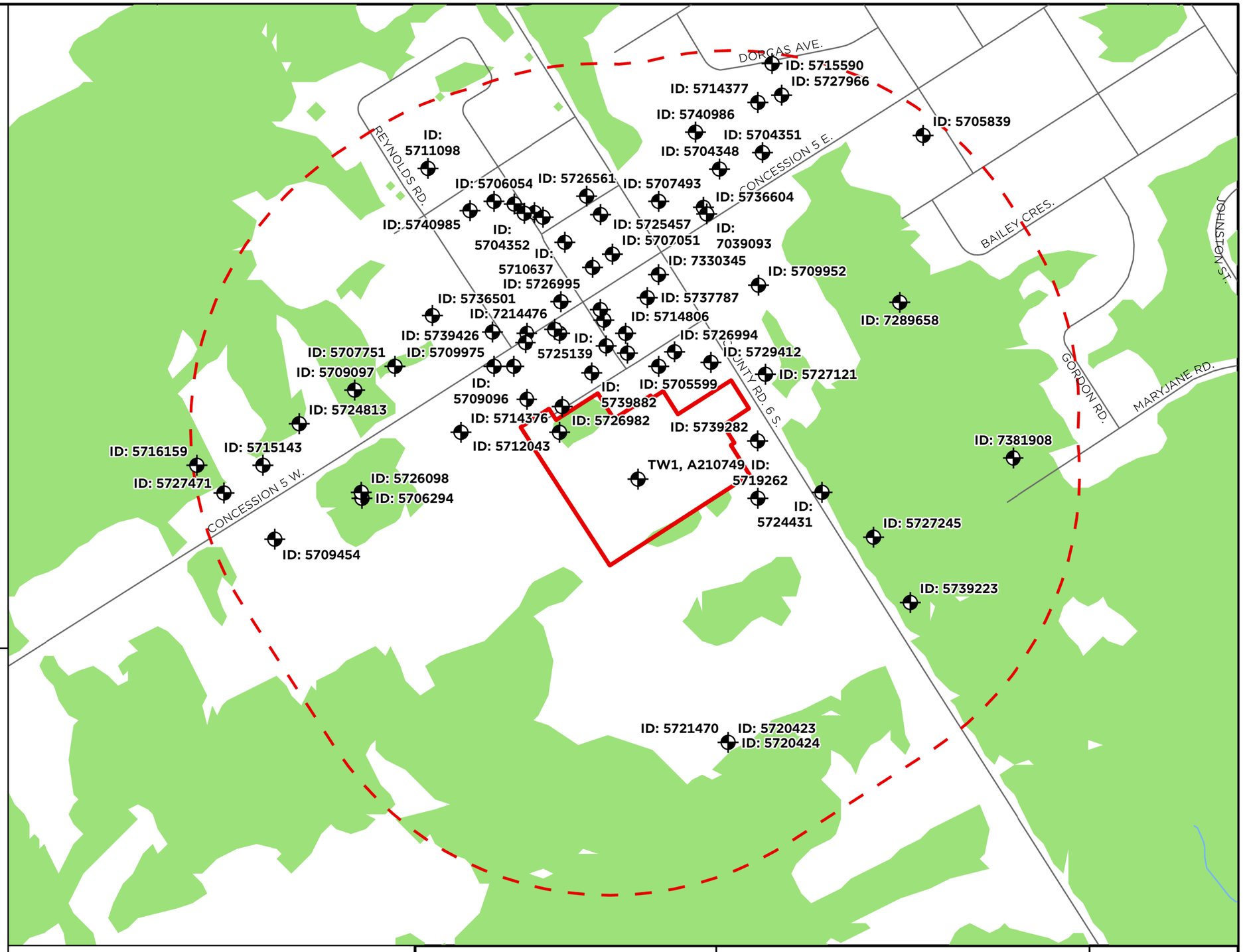
N

NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2.CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO.

LEGEND

- SITE
- SITE BUFFER (500m)
- MECP WATER WELL RCORD
- ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA



0 125 250 500 METERS

TATHAM ENGINEERING

900 COUNTY ROAD 6, TINY
HYDROGEOLOGICAL ASSESSMENT
MECP WELLS

DWG. No. **FIG-3**

SCALE: 1:6,000 | DRAWN: CW | DATE: AUG. 2023 | JOB NO. 423386

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N

CONCESSION 6 W.

REYNOLDS RD.

DORCAS AVE.

GRIER ST.

DAWSONS SRD.

CONCESSION 5 E.

BAILEY CRES.

GORDON RD.

JOHNSTON ST.

MARYJANE RD.

STERLING DR.

CONCESSION 5 W.

COUNTY RD. 6 S.

CONCESSION 4 E.

CONCESSION 4 W.

NOTES:

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO.
3. CONTAINS INFORMATION MADE AVAILABLE UNDER LAKE SIMCOE REGION CONSERVATION AUTHORITY OPEN DATA LICENSE V1.0.
4. SITE IS IN A WELLHEAD PROTECTION AREA

LEGEND

- SITE

WELLHEAD PROTECTION AREA (LSRCA 2022)

- A
- B
- C
- C1
- D
- ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA

0 125 250 500 METERS

TATHAM ENGINEERING

900 COUNTY ROAD 6, TINY HYDROGEOLOGICAL ASSESSMENT WELLHEAD PROTECTION AREA

DWG. No. **FIG-4**

SCALE: 1:10,000 | DRAWN: CW | DATE: AUG. 2023 | JOB NO. 423386

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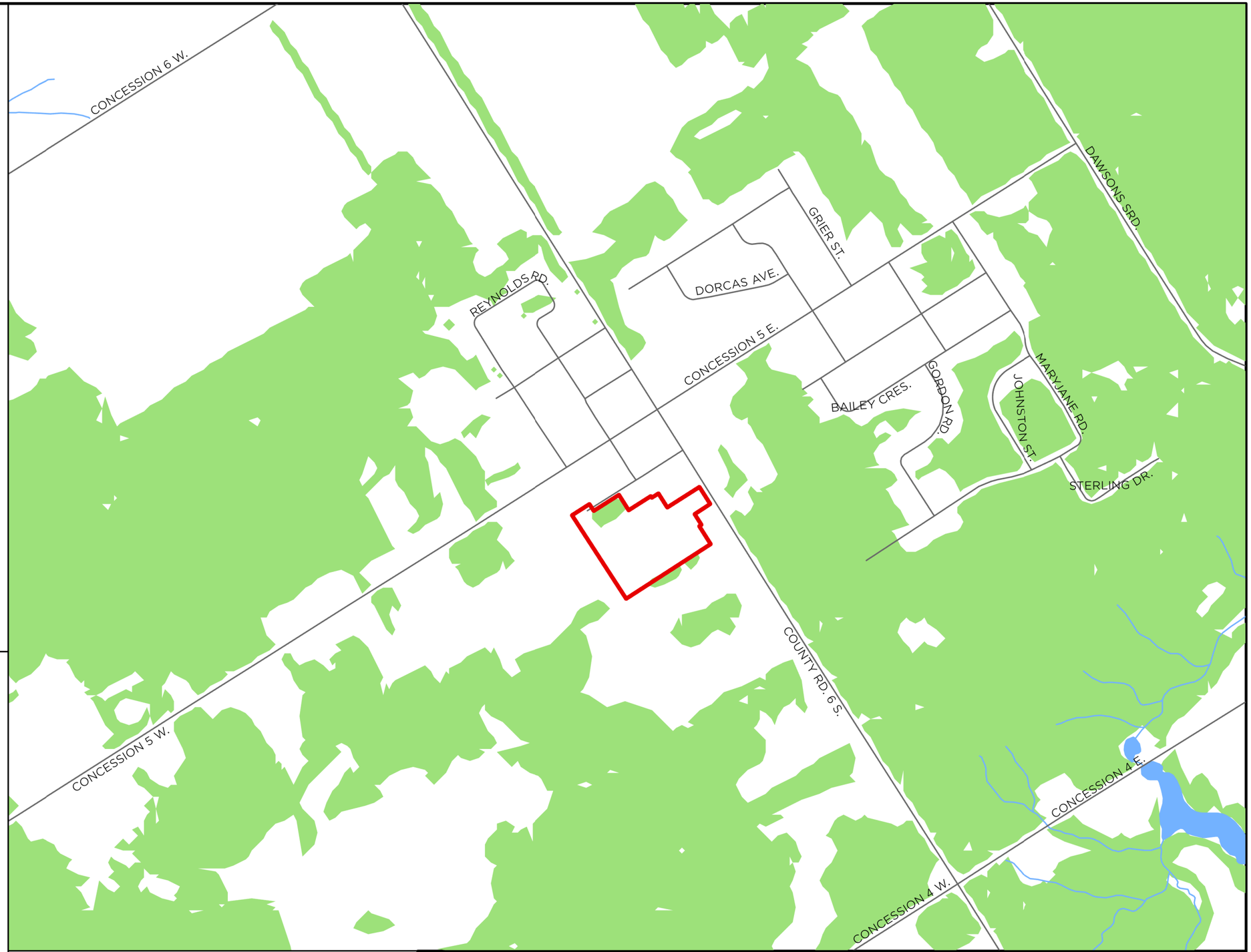
NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2.CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO
3. CONTAINS INFORMATION MADE AVAILABLE UNDER LAKE SIMCOE REGION CONSERVATION AUTHORITY OPEN DATA LICENSE V1.0.
4. SITE IS NOT WITHIN A INTAKE PROTECTION ZONE.

LEGEND

- SITE
- INTAKE PROTECTION ZONES (LSRCA 2022)
  - 1
  - 2
  - 3
- ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA



0 125 250 500 METERS

TATHAM ENGINEERING

900 COUNTY ROAD 6, TINY
HYDROGEOLOGICAL ASSESSMENT
INTAKE PROTECTION ZONE

DWG. No. **FIG-5**

SCALE: 1:10,000 | DRAWN: CW | DATE: AUG. 2023 | JOB NO. 423386

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N

CONCESSION 6 W.
REYNOLDS RD.
DORCAS AVE.
GRIER ST.
DAWSONS SRD.
CONCESSION 5 E.
BAILEY CRES.
GORDON RD.
JOHNSTON ST.
MARYJANE RD.
STERLING DR.
COUNTY RD. 6 S.
CONCESSION 5 W.
CONCESSION 4 E.
CONCESSION 4 W.

NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2.CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO
3. CONTAINS INFORMATION MADE AVAILABLE UNDER LAKE SIMCOE REGION CONSERVATION AUTHORITY OPEN DATA LICENSE V1.0.
4. SITE IS WITHIN A SIGNIFICANT GROUNDWATER RECHARGE AREA

LEGEND

- SITE
- SIGNIFICANT GROUNDWATER RECHARGE AREA
- ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA

0 125 250 500 METERS

TATHAM ENGINEERING

900 COUNTY ROAD 6, TINY
HYDROGEOLOGICAL ASSESSMENT
SIGNIFICANT GROUNDWATER RECHARGE AREA

DWG. No. **FIG-6**

SCALE: 1:10,000 | DRAWN: CW | DATE: AUG. 2023 | JOB NO. 423386

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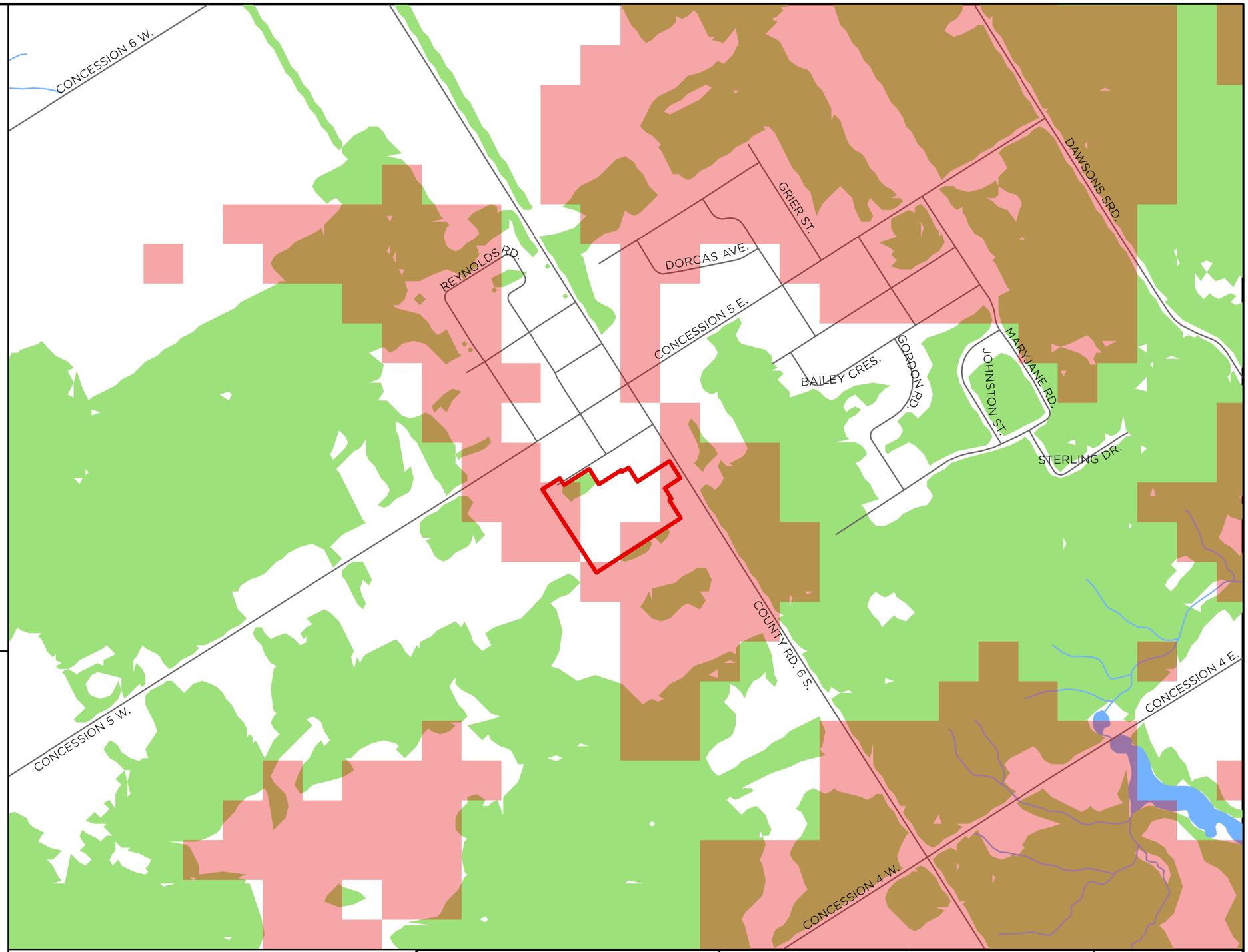

NOTES:

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N
2. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENSE – ONTARIO
3. CONTAINS INFORMATION MADE AVAILABLE UNDER LAKE SIMCOE REGION CONSERVATION AUTHORITY OPEN DATA LICENSE V1.0.
4. SITE IS WITHIN A HIGHLY VULNERABLE AQUIFER.

LEGEND

- SITE
- HIGHLY VULNERABLE AQUIFER
- ROAD
- WATERCOURSE
- WATERBODY
- WOODED AREA

0 125 250 500 METERS

TATHAM ENGINEERING

900 COUNTY ROAD 6, TINY HYDROGEOLOGICAL ASSESSMENT HIGHLY VULNERABLE AQUIFER

DWG. No. **FIG-7**

SCALE: 1:10,000 | DRAWN: CW | DATE: AUG. 2023 | JOB NO. 423386

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Appendix A:
Water Balance

TATHAM ENGINEERING

Water Budget

Project Details

900 County Road 6	423386

Prepared By

AK	June 23, 2023

Water Balance Detials

Methodology	Thornthwaite Method
Climate Data & Source	Midland Water Pollution Control Plant Climate Normal Data for 1981 to 2010 (Environment Canada)
Thornthwaite Coefficient	1.095

Month	Temp (°C)	Precip (mm)	Heat Index	PET (mm)	Daylight Factor	Days	AET (mm)	Surplus (mm)	Deficit (mm)
Jan.	-8.5	109.8	0.0	0.0	0.77	31	0.0	109.8	0.0
Feb.	-6.4	69.9	0.0	0.0	0.87	28	0.0	69.9	0.0
Mar.	-1.9	65.7	0.0	0.0	1.00	31	0.0	65.7	0.0
Apr.	5.8	65.1	1.3	28.8	1.12	30	32.4	32.7	0.0
May	12.2	92.8	3.9	73.7	1.23	31	90.9	1.9	0.0
Jun.	18.1	89.5	7.0	114.9	1.29	30	148.2	0.0	58.7
Jul.	20.8	72.7	8.7	135.3	1.26	31	170.7	0.0	98.0
Aug.	19.9	77.9	8.1	119.1	1.17	31	138.8	0.0	60.9
Sep.	15.9	99.1	5.8	80.6	1.04	30	84.1	15.0	0.0
Oct.	9.3	90.1	2.6	40.7	0.92	31	37.2	52.9	0.0
Nov.	3.2	103.6	0.5	10.7	0.80	30	8.6	95.0	0.0
Dec.	-3.1	104.4	0.0	0.0	0.74	31	0.0	104.4	0.0
Total	**-**	**1041**	**37.7**	**603.8**	**-**	**365**	**710.9**	**547.3**	**217.7**

Additional Notes

PET = Potential Evapotranspiration

AET = Actual Evapotranspiration

Equations

$PET = 16\left(\frac{L}{12}\right)\left(\frac{N}{30}\right)\left(\frac{10T_d}{I}\right)^{\alpha}$ Where

PET is the estimated potential evapotranspiration (mm/month)

T_d is the average daily temperature (degrees Celsius; if this is negative, use 0) of the month being calculated

N is the number of days in the month being calculated

L is the average day length (hours) of the month being calculated

$\alpha = (6.75 \times 10^{-7})I^3 - (7.71 \times 10^{-5})I^2 + (1.792 \times 10^{-2})I + 0.49239$

$I = \sum_{i=1}^{12}\left(\frac{T_{m_i}}{5}\right)^{1.514}$ is a heat index which depends on the 12 monthly mean temperatures T_{m_i}.[1]

Appendix B:
MECP Water Well Records

Township Con Lot	UTM	Date Centr	Casing Dia	Water	Pump Test	Well Use	Screen Depth	Well	Formation
TINY TOWNSHIP 04 014	17 585013 4944864 W	2005/05 7074	6.25	FR 0108	67//7/2:	DO	0104 4	5739882 (Z24638) A023941	BRWN SAND MSND 0020 GREY CLAY SAND 0065 BRWN SAND MSND 0087 BRWN CLAY 0099 BRWN SAND MSND 0108
TINY TOWNSHIP 04 014	17 585219 4944304 L	1985/11 1467	5	FR 0091	67/74/8/1:30	DO	0095 8	5720423 ()	PEAT 0007 BRWN SAND 0061 GREY SAND 0091 GREY FSND 0091
TINY TOWNSHIP 04 014	17 585219 4944304 L	1985/11 1467	5	FR 0100	67/95/5/3:0	DO	0103 7	5720424 ()	BLCK LOAM SAND 0001 BRWN SAND 0003 GREY CLAY SAND WBRG 0041 BRWN MSND CLAY 0062 BRWN SAND 0100 GREY FSND 0110 GREY CLAY 0110
TINY TOWNSHIP 04 014	17 585219 4944304 L	1986/12 1467	5	FR 0078	54/72/8/3:0	DO	0087 6	5721470 (04921)	BLCK LOAM 0001 BRWN SAND 0078 GREY FSND 0078
TINY TOWNSHIP 05	17 584895 4945120 W	2006/07 7075	6.25 5.61	FR 0067	67/73/15/2:0	DO	0091 4	5741067 (Z47814) A042690	BRWN SAND GRVL BLDR 0012 BRWN SAND GRVL 0042 BRWN SAND 0080 BRWN SAND 0095
TINY TOWNSHIP 05 005	17 585170 4945229 W	2006/07 6454	6				0113 4	5740986 (Z39501) A	
TINY TOWNSHIP 05 013	17 585187 4945105 W	2006/09 2514	6.25	FR 0122	73/120/10/1:0	DO	0120 5	7039093 (Z54599) A048092	BLCK SAND 0001 BRWN SAND 0030 BRWN SAND CLAY 0092 BRWN SAND GRVL 0125
TINY TOWNSHIP 05 014	17 584828 4945110 W	2006/07 6454	6				0085 8	5740985 (Z39504) A	
TINY TOWNSHIP CON 04 001	17 585097 4944978 W	2003/05 3602	6	FR 0118	63/95/6/1:15	DO	0118 3	5737787 (236443)	BRWN SAND 0017 BRWN SAND CLAY SNDY 0044 BRWN SAND 0073 BRWN SAND CLAY CLAY 0113 BRWN SAND CLN WBRG 0121
TINY TOWNSHIP CON 04 013	17 585479 4944971 W	2017/04 5528	6.09 5.51	UT 0213	111/163/42/4: 0	IR	0216 9	7289658 (Z240150) A185896	BRWN SAND 0010 BRWN CLAY 0015 BRWN SAND CLAY LYRD 0130 GREY CLAY SOFT 0158 GREY CLAY STNS 0167 GREY CLAY DNSE 0195 GREY SAND GRVL STNS 0225 GREY GRVL 0232

Township Con Lot	UTM	Date Centr	Casing Dia	Water	Pump Test	Well Use	Screen Depth	Well	Formation
TINY TOWNSHIP CON 04 013	17 585651 4944735 W	2021/01 1851						7381908 (Z336306) A293754 P	
TINY TOWNSHIP CON 04 013	17 585276 4944862 W	1990/08 5528	6	FR 0075	70//5/2:0	DO	0096 3	5727121 (83243)	LOAM 0001 FSND SILT 0012 GREY CLAY 0037 GREY SILT FSND 0075 BRWN FSND 0101 GREY SILT CLAY 0120
TINY TOWNSHIP CON 04 013	17 585495 4944516 W	2004/08 7174	6.25	FR 0073	72/94/5/48:30	DO	0101 10	5739223 (Z05889) A005787	BRWN SAND 0020 GREY CLAY 0052 GREY CLAY SAND 0073 BRWN SAND 0111
TINY TOWNSHIP CON 04 013	17 585265 4944997 W	1973/03 2514	6	FR 0090	72/90/20/1:0	IN	0104 3	5709952 ()	LOAM SAND 0001 BRWN SAND 0010 YLLW SAND 0107
TINY TOWNSHIP CON 04 014	17 584957 4944930 W	2013/08 5528	5.51 5.51			DO		7214476 (Z176814) A138261	
TINY TOWNSHIP CON 04 014	17 585114 4945013 W	2018/07 7219	6	UT 0115	23/31/10/1:0	DO	0117 4	7330345 (Z293702) A253244	GREY SILT SAND GRVL 0115 BRWN CSND LOOS WBRG 0121
TINY TOWNSHIP CON 04 014	17 585067 4944894 W	2018/06 5528	15.5 14	FR 0035	19/24/50/1:	DO	0036 1	7314593 (Z240085) A210626	BRWN SAND 0000 BRWN CLAY SAND 0001 BRWN SAND 0037 BRWN SAND CLAY 0038
TINY TOWNSHIP CON 04 014	17 585083 4944703 W	2020/09 5528						7371523 (Z287441) A210749 P	
TINY TOWNSHIP CON 04 014	17 584968 4944813 W	1990/07 1583	6 5	FR 0107	68/100/7/1:0	DO	0104 3	5726982 (83207)	BRWN SAND MSND 0077 GREY SAND FSND 0110

Township Con Lot	UTM	Date Centr	Casing Dia	Water	Pump Test	Well Use	Screen Depth	Well	Formation
TINY TOWNSHIP CON 04 014	17 585439 4944615 W	1990/08 3602	5	FR 0186 FR 0191	114/150/20/2:0	DO	0187 4	5727245 (72302)	BRWN LOAM 0001 BRWN SAND 0043 GREY CLAY SOFT 0064 GREY CLAY STNS HPAN 0076 BRWN SAND CLAY SNDY 0130 GREY CLAY HARD 0186 BRWN SAND 0191
TINY TOWNSHIP CON 04 014	17 584966 4944972 W	1990/08 1467	5	FR 0090	69/75/8/2:0	DO		5726995 (71534)	LOAM 0001 GREY SAND 0090 BRWN SAND 0110
TINY TOWNSHIP CON 04 014	17 585031 4944944 W	1990/09 1467	5	FR 0100	68/89/8/2:30	DO	0108 4	5727601 (71547)	BRWN CLAY SAND 0017 BRWN SAND 0100 GREY SAND 0112
TINY TOWNSHIP CON 04 014	17 585193 4944880 W	1991/09 2431	6	FR 0188 FR 0193	118/193/5/0:4	DO	0188 4	5729412 (105470)	RED FSND 0006 BRWN FSND 0063 GREY CLAY 0065 BRWN FSND 0089 BRWN FSND 0108 GREY FSND SLTY 0168 GREY CLAY 0177 GREY GRVL STNS SNDY 0181 GREY FSND CLAY LYRD 0188 BRWN CSND GRVL DRTY 0193 GREY CLAY TILL 0194 GREY FSND GRVL SLTY 0200
TINY TOWNSHIP CON 04 014	17 585138 4944896 W	1990/07 1467	5	FR 0099	68/87/8/2:0	DO		5726994 (71533)	BRWN SAND 0091 GREY SAND CLAY 0099 BRWN SAND MSND 0108
TINY TOWNSHIP CON 04 014	17 584814 4944774 W	1977/04 4816	6	FR 0110	67/87/7/2:0	DO	0105 5	5714376 ()	UNKN 0004 BRWN SAND 0080 SAND FGRD 0110
TINY TOWNSHIP CON 04 014	17 584964 4944774 W	1974/09 2340	4	FR 0067	67/84/8/1:0	DO	0109 3	5712043 ()	BRWN FSND LOOS 0027 GREY FSND SILT PCKD 0030 GREY MSND LOOS 0033 GREY FSND SILT LOOS 0055 BRWN MSND CLAY PCKD 0060 BRWN MSND LOOS 0075 GREY FSND LOOS 0112 GREY SILT FSND CLAY 0114
TINY TOWNSHIP CON 04 014	17 584914 4944824 W	1977/09 3602	5	FR 0100	64/95/6/1:30	DO	0103 3	5714605 ()	BRWN SAND FILL 0002 BRWN SAND CLAY STNS 0050 GREY CLAY SNDS HARD 0100 BRWN SAND WBRG 0106
TINY TOWNSHIP CON 04 014	17 584914 4944924 W	1974/03 3602	4	FR 0088	67/80/4/1:0	DO	0090 3	5711011 ()	BRWN CLAY SAND STNS 0025 GREY CLAY HARD 0088 BRWN SAND WBRG 0093

Township Con Lot	UTM	Date Centr	Casing Dia	Water	Pump Test	Well Use	Screen Depth	Well	Formation
TINY TOWNSHIP CON 04 014	17 585264 4944761 W	2004/10 7074	6.25	FR 0105	70/89/7/2:	DO	0103 4	5739282 (Z00751) A000665	BRWN FSND 0020 GREY CLAY 0092 BRWN FSND 0107
TINY TOWNSHIP CON 04 014	17 584912 4944910 W	1988/06 1467	5	FR 0092	67/73/8/2:30	DO	0099 8	5723531 (25872)	BRWN SAND 0017 GREY SAND 0092 BRWN SAND FGRD 0107
TINY TOWNSHIP CON 04 014	17 584663 4944683 W	1989/11 1467	5	FR 0142	103/130/8/2:30	DO		5726098 (65198)	BRWN SAND 0061 GREY SAND 0104 GREY CLAY 0142 GREY SAND SAND 0149
TINY TOWNSHIP CON 04 014	17 585361 4944683 W	1988/12 1920	6	FR 0162	120/130/4/1:0	DO	0160 3	5724431 (23300)	BRWN SAND CLAY MSND 0165
TINY TOWNSHIP CON 04 014	17 584864 4944874 W	1973/06 1510	4	FR 0095	70/90/3/2:0	DO	0103 7	5709975 ()	UNKN 0003 RED CSND 0018 YLLW MSND BLDR 0030 BRWN MSND 0075 FSND 0090 WHIT FSND CLAY 0113
TINY TOWNSHIP CON 04 014	17 584894 4944874 W	1972/09 3602	4	FR 0110	64/86/6/1:0	DO	0112 3	5709096 ()	BRWN SAND 0010 BRWN SAND CLAY 0100 BRWN CLAY HPAN GVLY 0110 BRWN FSND WBRG 0115
TINY TOWNSHIP CON 04 014	17 584964 4944924 W	1970/11 1510	4	FR 0102	80/90/6/1:0	DO	0102 5	5707748 ()	RED MSND 0030 GREY CSND 0090 MSND 0110
TINY TOWNSHIP CON 04 014	17 585064 4944924 W	1977/10 1222	6	FR 0069	69/85/9/1:0	DO	0099 3	5714806 ()	BRWN CLAY 0009 GREY SAND LOOS 0069 BRWN SAND FGRD 0102
TINY TOWNSHIP CON 04 014	17 585264 4944674 W	1984/05 3602	6	FR 0154	111/120/20/:	DO		5719262 ()	BRWN SAND 0040 BRWN SAND CLAY 0101 GREY CLAY HARD 0154 BRWN SAND GRVL CLN 0160
TINY TOWNSHIP CON 04 014	17 585114 4944874 W	1968/04 1510	4	FR 0103	75/90/5/2:0	DO	0099 4	5705599 ()	LOAM 0003 MSND 0090 MSND FSND 0103
TINY TOWNSHIP CON 04 015	17 584532 4944612 W	1972/11 3602	4	FR 0146	100/125/10/1:15	DO	0146 3	5709454 ()	BRWN LOAM 0002 BRWN SAND 0012 BRWN CLAY SAND 0040 GREY CLAY 0080 BRWN FSND 0110 BRWN HPAN 0146 BRWN FSND 0151
TINY TOWNSHIP CON 04 015	17 584664 4944674 W	1969/05 4608	30	FR 0050 FR 0055	55/60//1:0	DO		5706294 ()	WHIT FSND 0050 GREY FSND STNS 0063

Township Con Lot	UTM	Date Centr	Casing Dia	Water	Pump Test	Well Use	Screen Depth	Well	Formation
TINY TOWNSHIP CON 04 016	17 585035 4944905 W	1989/07 3602	6	FR 0105	94/105/10/1:0	DO	0116 5	5725139 (54001)	BRWN SAND GRVL CLAY 0020 GREY CLAY HARD 0085 BRWN SAND DRY 0100 GREY CLAY SNDS 0105 BRWN SAND WBRG 0120
TINY TOWNSHIP CON 05 013	17 585182 4945115 W	2001/12 5528				NU		5736604 (226692) A	
TINY TOWNSHIP CON 05 013	17 585300 4945285 W	1990/09 2431	6	FR 0072 FR 0095	61/92/25/3:30	DO		5727966 (103689)	BRWN LOAM 0001 BRWN FSND 0072 BRWN MSND 0095
TINY TOWNSHIP CON 05 013	17 585264 4945274 W	1977/04 4816	6	FR 0118	73/88/20/2:0	PS	0113 5	5714377 ()	SAND GRVL 0085 FSND 0106 SAND 0118
TINY TOWNSHIP CON 05 013	17 585114 4945124 W	1970/10 1510	4	FR 0095	70/80/5/1:0	DO	0094 4	5707493 ()	RED MSND 0015 WHIT CSND 0100
TINY TOWNSHIP CON 05 013	17 585206 4945173 W	1948/12 2611	4	FR 0209	109//2/8:0	DO	0204 5	5704348 ()	MSND 0120 HPAN BLDR 0204 GRVL MSND 0209
TINY TOWNSHIP CON 05 013	17 585271 4945198 W	1966/11 2514	6	FR 0121	72/120/15/15: 0	PS	0120 6	5704351 ()	LOAM 0002 YLLW MSND 0115 YLLW FSND 0121 YLLW MSND 0127
TINY TOWNSHIP CON 05 014	17 584771 4944951 W	2001/11 1467	5	FR 0091	69/80/8/2:	DO	0094 4	5736501 (228086)	BLCK LOAM 0001 BRWN SAND 0090 GREY CLAY SAND 0091 BRWN SAND 0091
TINY TOWNSHIP CON 05 014	17 584764 4945174 W	1974/05 4816	6	FR 0090	66//20/2:0	MN	0085 8	5711098 ()	SAND GRVL LYRD 0094 SAND SILT 0122 GREY CLAY 0153 SAND CMTD 0188 GREY CLAY 0204 SAND CMTD 0211 GREY CLAY 0245
TINY TOWNSHIP CON 05 014	17 584972 4945062 W	1973/12 3602	4	FR 0080	66/75/8/1:0	DO	0090 3	5710637 ()	BRWN SAND CLAY 0060 GREY CLAY 0080 BRWN SAND 0087 BRWN SAND 0093
TINY TOWNSHIP CON 05 014	17 584862 4944926 W	2004/11 3413	6		62/110/106/2:	DO	0108 8	5739426 (Z19193) A019025	BRWN SAND 0116
TINY TOWNSHIP CON 05 014	17 584910 4945106 W	1989/10 1583	6 5	FR 0095	67//8/1:0	DO		5725868 (64451)	BRWN SAND CLAY 0012 BRWN SAND CSND 0077 GREY SILT 0084 BRWN SAND FSND 0100

Township Con Lot	UTM	Date Centr	Casing Dia	Water	Pump Test	Well Use	Screen Depth	Well	Formation
TINY TOWNSHIP CON 05 014	17 585026 4945104 W	1989/09 1467	5	FR 0091	71/76/8/2:0	DO		5725457 (65184)	BRWN LOAM 0001 BRWN SAND STNS 0012 BRWN SAND 0091 GREY MSND 0096
TINY TOWNSHIP CON 05 014	17 584569 4944787 W	1989/04 3602	6	FR 0150 FR 0159	103/140/15/1:30	DO		5724813 (37995)	BRWN LOAM 0006 BRWN SAND CLAY 0132 GREY CLAY HARD 0150 BRWN SAND WBRG 0159
TINY TOWNSHIP CON 05 014	17 585044 4945044 W	1970/01 1510	4	FR 0110	75/80/6/1:0	DO	0106 4	5707051 ()	RED MSND 0070 FSND 0110
TINY TOWNSHIP CON 05 014	17 584714 4944874 W	1970/11 1510	4	FR 0100	80/90/5/1:0	ST DO	0106 4	5707751 ()	BRWN LOAM MSND 0002 RED MSND STNS 0067 FSND 0085 CSND 0110
TINY TOWNSHIP CON 05 014	17 584653 4944838 W	1972/09 3602	4	FR 0135	90/100/12/1:30	DO	0137 6 0140 3	5709097 ()	BRWN SAND GRVL 0010 BRWN CLAY SAND 0109 BRWN SAND SILT 0125 GREY CLAY 0135 BRWN SAND 0143
TINY TOWNSHIP CON 05 014	17 585014 4945024 W	1978/07 3602	5	FR 0105	68/80/20/1:0	DO	0106 6	5715378 ()	BRWN SAND CLAY 0020 GREY CLAY STNS 0100 BRWN SAND WBRG 0112
TINY TOWNSHIP CON 05 014	17 584926 4945107 W	1961/04 1510	4	FR 0109	43/60/15/2:0	DO	0103 6	5704352 ()	CSND 0010 GRVL MSND 0100 MSND 0109
TINY TOWNSHIP CON 05 014	17 584864 4945124 W	1968/10 1510	4	FR 0100	70/80/10/1:0	DO	0096 4	5706054 ()	RED LOAM MSND 0002 CLAY MSND 0020 CSND 0090 MSND 0100
TINY TOWNSHIP CON 05 015	17 584514 4944724 W	1978/04 3602	5	FR 0148	100/145/8/1:0	DO	0150 6	5715143 ()	BRWN SAND CLAY 0110 GREY CLAY HARD 0125 GREY CLAY SNDS GRVL 0148 BRWN SAND WBRG 0156
TINY TOWNSHIP CON 05 514	17 585005 4945132 W	1989/11 2431	6	FR 0081 FR 0097	71/90/20/4:0	DO		5726561 (74744)	BRWN SAND FSND 0018 BRWN CLAY SLTY FSND 0020 BRWN SAND FSND 0081 BRWN SAND MSND 0097
TINY TOWNSHIP CON 05 814	17 584939 4945100 W	1989/07 1467	5	FR 0091	69/73/8/2:0	DO		5725116 (65156)	BRWN SAND 0090 GREY CLAY SAND 0091 BRWN SAND 0098

UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completed and Well Contractor Licence Number
CASING DIA: Casing diameter in inches
WATER: Unit of Depth in Feet. See Table 4 for meanign of code.
PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hr : Min
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag. A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

Table 1: Core Material and Descriptive Terms

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

Table 2: Core Color

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

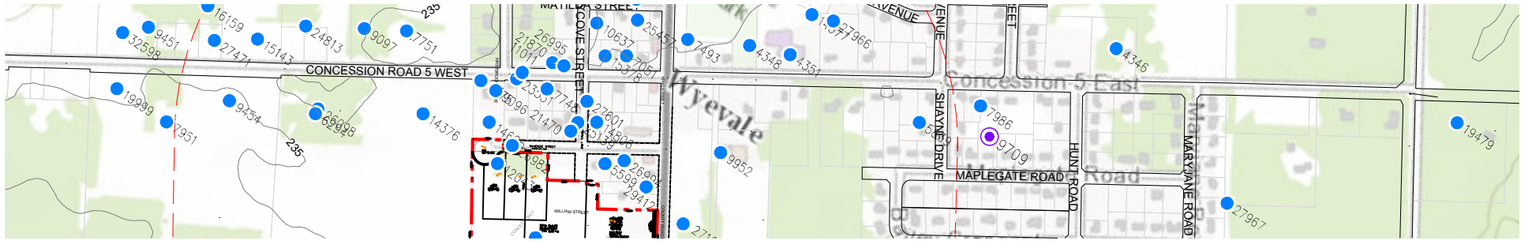
Table 3: Well Use

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

Table 4:Water Detail

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

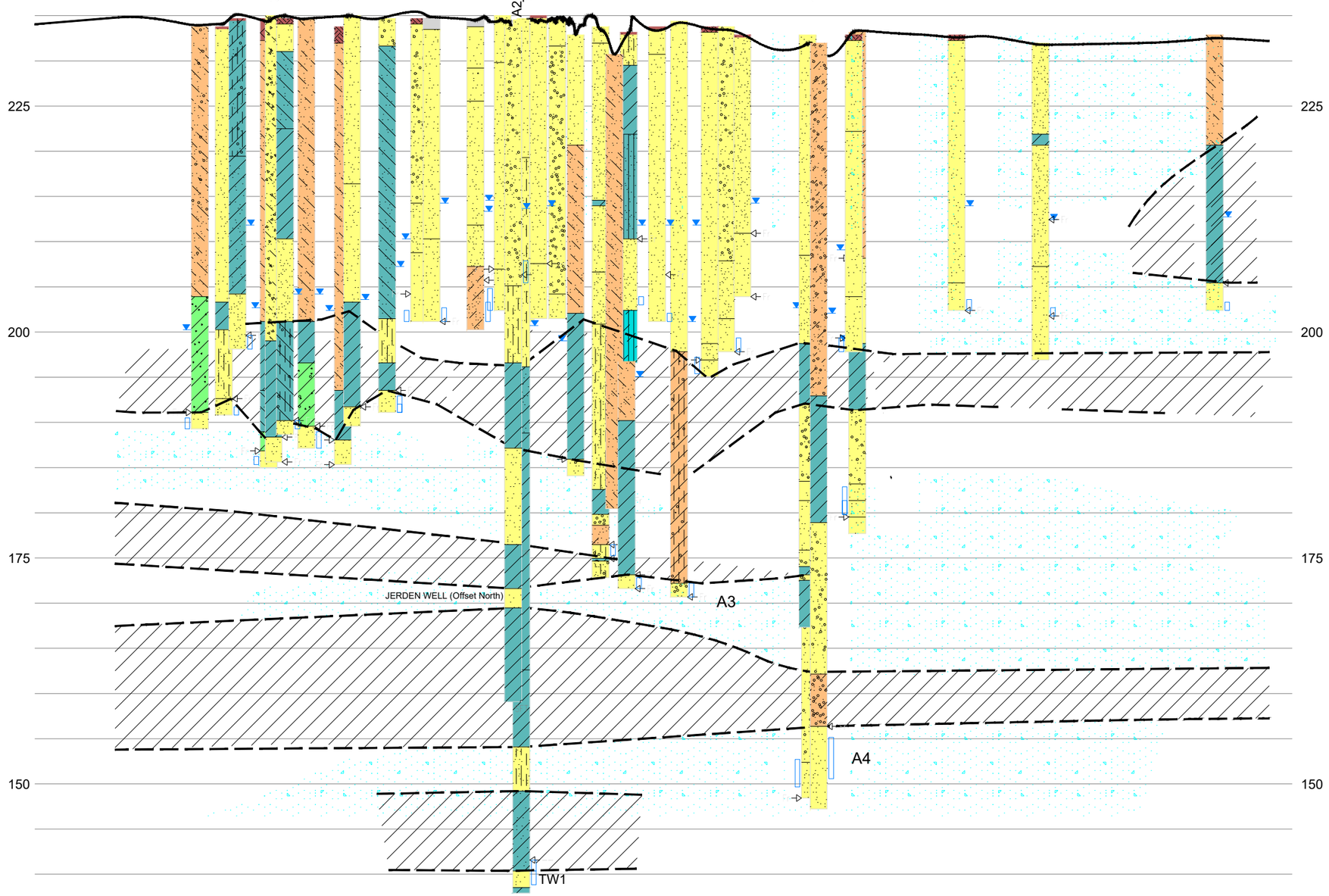
Appendix C:
Regional Hydrogeological Profile



W

19999 9451 7951 27471 16159 9454 15143 24813 26098 9097 7751 14376 9975 23531 A210749 11098 TW1 7748 26995 4352 19262 29412 24431 27121 9952 4348 4351 14377 27966 5839 12268 15590 7986 9709 4346 27967 19479

E



SOIL PATTERN LEGEND AND GENERIC SHADING

- Unoxidized Clay Blue, Grey White, or Undefined
- Oxidized Clay Brown, Red, Yellow
- Silt
- Sand
- Gravel
- Stones, Pebbles
- Boulder
- Till
- Shale
- Limestone
- Crystalline Rock
- Unknown
- Peat/loam
- Sands & Gravels
- Granular Till
- Silt
- Silt Clayey
- Clay
- Till
- Limestones
- Shales
- Precambrian

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Flowing Well
- Water Producing Zone
- Screen

NOTES

Ministry of Environment Water Well Information System, Queen's Printer.
Location and elevations of field verified wells are subject to revision.

Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological evidence.

0 200 400 600 m

1:10000

Plotted 11x17" Tabloid

Projection is UTM NAD 83 Zone 17

CLIENT

WEST RIDGE DEVELOPMENT CORPORATION

PROJECT

HYDROGEOLOGICAL ASSESSMENT
900 COUNTY ROAD 6
TOWNSHIP OF TINY, SIMCOE COUNTY

TITLE

SECTION A - A'

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-01-15
DESIGNED	
PREPARED	JPR
REVIEWED	
APPROVED	DPD

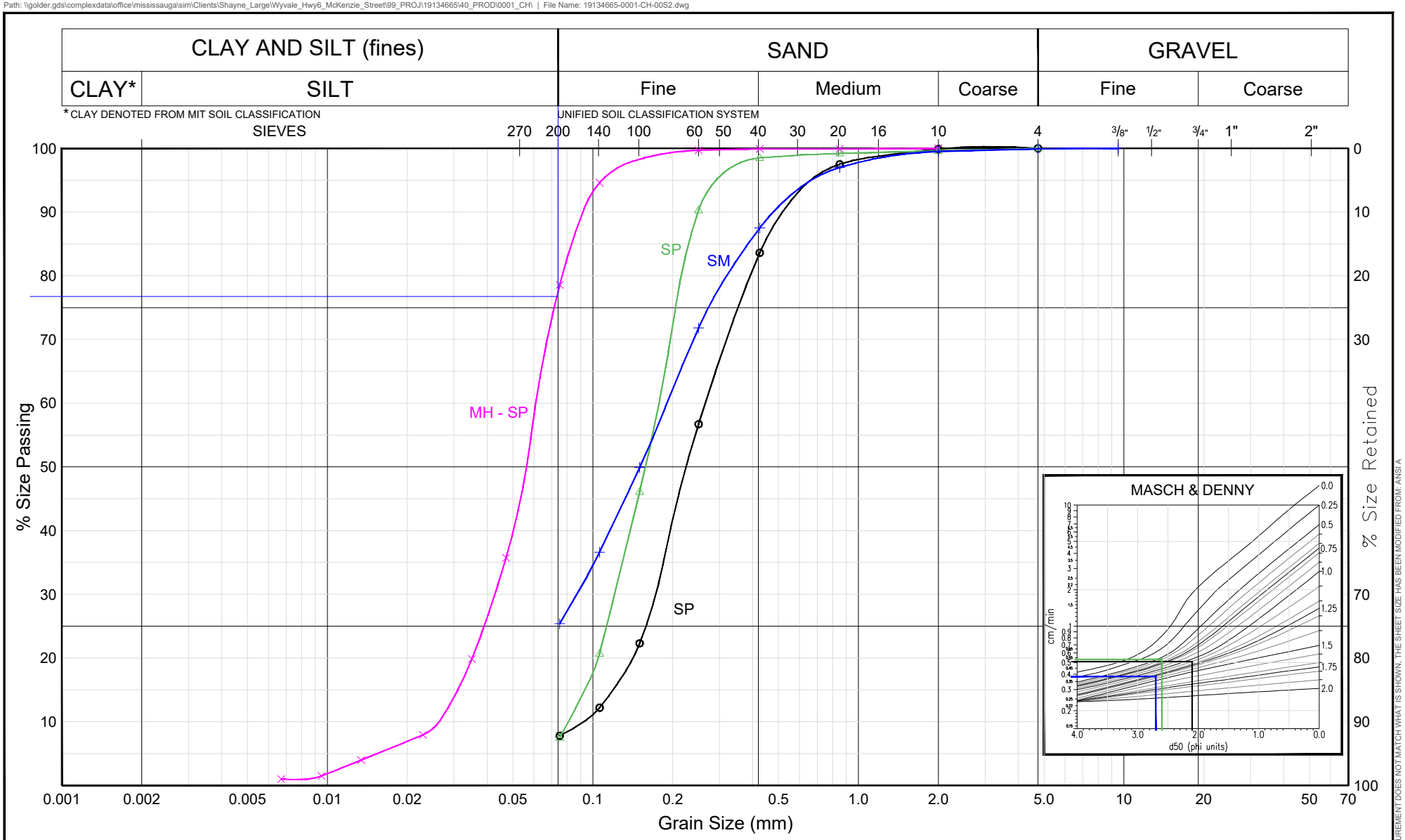
PROJECT NO.	CONTROL	REV.	FIGURE
19134665	0001	----	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Appendix D:
Grain Size Analysis

Last Edited By: jregier Date: 2021-01-15 Time:10:12:47 AM | Printed By: jregier Date: 2021-04-13 Time:11:28:53 AM
Path: \\golder.gds\complexdata\office\mississauga\sim\Clients\Shayne_Large\Wyvale_Hwy6_McKenzie_Street\99_PROJ\19134665\40_PROD\0001_CH\ | File Name: 19134665-0001-CH-00S2.dwg



LEGEND

- TP1 (60 cm)
- TP2 (60 cm)
- TP3 (60 cm)
- TP7 (70 cm)

CLIENT

WEST RIDGE DEVELOPMENT CORPORATION

CONSULTANT

GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-01-15
DESIGNED	
PREPARED	JPR
REVIEWED	
APPROVED	DPD

PROJECT

HYDROGEOLOGICAL ASSESSMENT
900 COUNTY ROAD 6
TOWNSHIP OF TINY, SIMCOE COUNTY

TITLE

GRAIN SIZE ANALYSIS

PROJECT NO.	CONTROL	REV.	FIGURE
19134665	0001	----	B1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 25 mm

Appendix E:
Test Pit Logs

GOLDER ASSOCIATES

TABLE B1 - TEST PIT LOGS

CLIENT: West Ridge Development Corp

JOB NO:				**DATE :** 26-Nov-2019 **BY:** JPR	GOLDER	
STREET County Road 6 & McKenzie Street, Wyevale				**911 Property #**	Logged: JPR	
From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-1**
0	15	Brown	Soft	Loam TOPSOIL		
15	120	Red	Loose	f-m SAND, uniform		
120	~250	Grey	Loose	f-m SAND, uniform bedded, Excavation Caves		
Design or Comments:				Dry to Backhoe Depth		

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-2**
0	8	Brown	Soft	Loam TOPSOIL		
8	~250	Brown	Loose	vf SAND, to Silty f Sand, Grey at Depth		
Design or Comments:				Dry to Backhoe Depth		

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-3**
0	10	Brown	Soft	Loam TOPSOIL; Roots		
10	~250	Brown	Loose	f SAND, Uniform bedding		
Design or Comments:				Dry to Backhoe Depth		

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-4**
0	6	Brown	Soft	Loam TOPSOIL; Roots		
6	~250	Brown	Loose	f SAND, Uniform bedding, Excavation Caves		
Design or Comments:				Dry to Backhoe Depth		

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-5**
0	5	Brown	Soft	Gravelled / Sand Road Spoil		
5	500	Brown	Loose	f SAND, vf-c bedded, to Grey & more Fines Compact at Depth		
Design or Comments:				Dry to Extended Hoe Depth, 1" ABS Standpipe Installed		
				Total Depth 5.20 m; Stick-up 20 cm		
				Measured Dry February 6th, 2020		
Depths in cm's (rounded from nominal feet and inches)						

GOLDER ASSOCIATES

TABLE 1 - TEST PIT INVENTORY

CLIENT: **Shayne Large Wyevale**

JOB NO:	**DATE :** 26-Nov-2019	GOLDER
	BY: JPR	
STREET	**911 Property #**	Logged:
County Road 6 & McKenzie Street, Wyevale		JPR

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-6**
0	20	Brown	Soft	Sandy LOAM		
20	90	Red	Loose	f-m SAND		
90	180	Yellow	Loose	Interbedded SAND, f - c Grained		
180				Intersecting Silt soils at depth 180 cm		
Design or Comments:				Dry to Depth		

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-7**
0	25	Red	Loose	vf SAND, Trace to some Silt		
25	60	Yellow	Compact	m SAND, Silty		
60	180	Grey Mottled	Compact	Sandy SILT, interbedded Sand & Silt Layered		
Design or Comments:				Dry to Depth		

From	**To**	**Colour**	**Density**	**Description**	**TEST PIT #**	**19-8**
0	25	Brown	Soft	Loam TOPSOIL Fill		
25	200		Soft	Fines and Sands, Loamy Fill upper 60 cm's; Caves		
Design or Comments:				Seeps, 4" PVC Drain-pipe installed into Watertable WL 1.985 mbmp (1.1 m from Grade) 6th February 2020		

Depths in cm's (rounded from nominal inches)

Appendix F:
TW1 Well Record

Figure C1 TW1

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (Place Sticker and/or Print Below): Tag#: A 210749

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	WEST RIDGE DEVELOPMENT CORP		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
66 BAILEY CRES	TINY	ON	L0L 2T0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
904 CTY RD 6	TINY	14	4

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE	WYEVALE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	585083	4944703		

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	15.1
BROWN	SAND	SILT		15.1	38.5
GREY	CLAY	SAND		38.5	45.7
GREY	CLAY		DENSE	45.7	71.9
GREY	CLAY		SOFT	71.9	80.5
GREY	SAND		DIRTY	80.5	85.4
GREY	CLAY	SAND		85.4	94.2
BROWN	SAND			94.2	96.0
GREY	CLAY			96.0	96.5

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	21m	BENTONITE GROUT	750Ltr.
47	48	BENTONITE	20KG

Method of Construction

[ ] Cable Tool [ ] Diamond
[X] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used
[X] 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	STEEL	.188	+.7	85.4
14	STEEL	.188	83.4	93.0

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
15	SSTEEL	.016	94.2	95.7
15	SSTEEL	.010	93.0	94.2

Status of Well

[X] 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	Gas	Other, specify
93m	[ ] Fresh [X] 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	95.7	26

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 76.2 m

Pumping rate (l/min / GPM): 76 L/M

Duration of pumping: 6 hrs + 0 min

Final water level end of pumping (m/ft): 59.61 m

If flowing give rate (l/min / GPM): —

Recommended pump depth (m/ft):

Recommended pump rate (l/min / GPM):

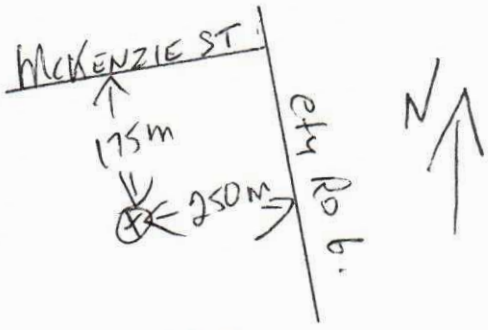
Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	33.74		
1	36.79	1	56.52
2	39.45	2	53.80
3	41.65	3	51.44
4	43.52	4	49.35
5	45.11	5	47.52
10	51.00	10	41.08
15	53.84	15	38.18
20	56.24	20	35.83
25	57.04	25	34.87
30	57.43	30	34.34
40	57.62	40	
50	57.80	50	
60	57.87	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	ALLISDALE

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 GAVIN

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2976		Y Y Y Y M M D D

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
[X] Yes [ ] No	2020 09 03	Audit No. Z287441
	Date Work Completed: 2020 09 03	Received

0506E (2014/11)

Ministry's Copy

Appendix G:
Pumping Test Results

Allan Wright Water Wells Inc

904 Hwy Rd 6

PUMPING CONTRACTOR | PERSON | DATE 09/02/20

PROJECT # Shayne Lange | MEASURING PT 40CM | PUMPING WELL # 6" well field

UNITS | DESCRIPTION | OBSERVATION WELL #

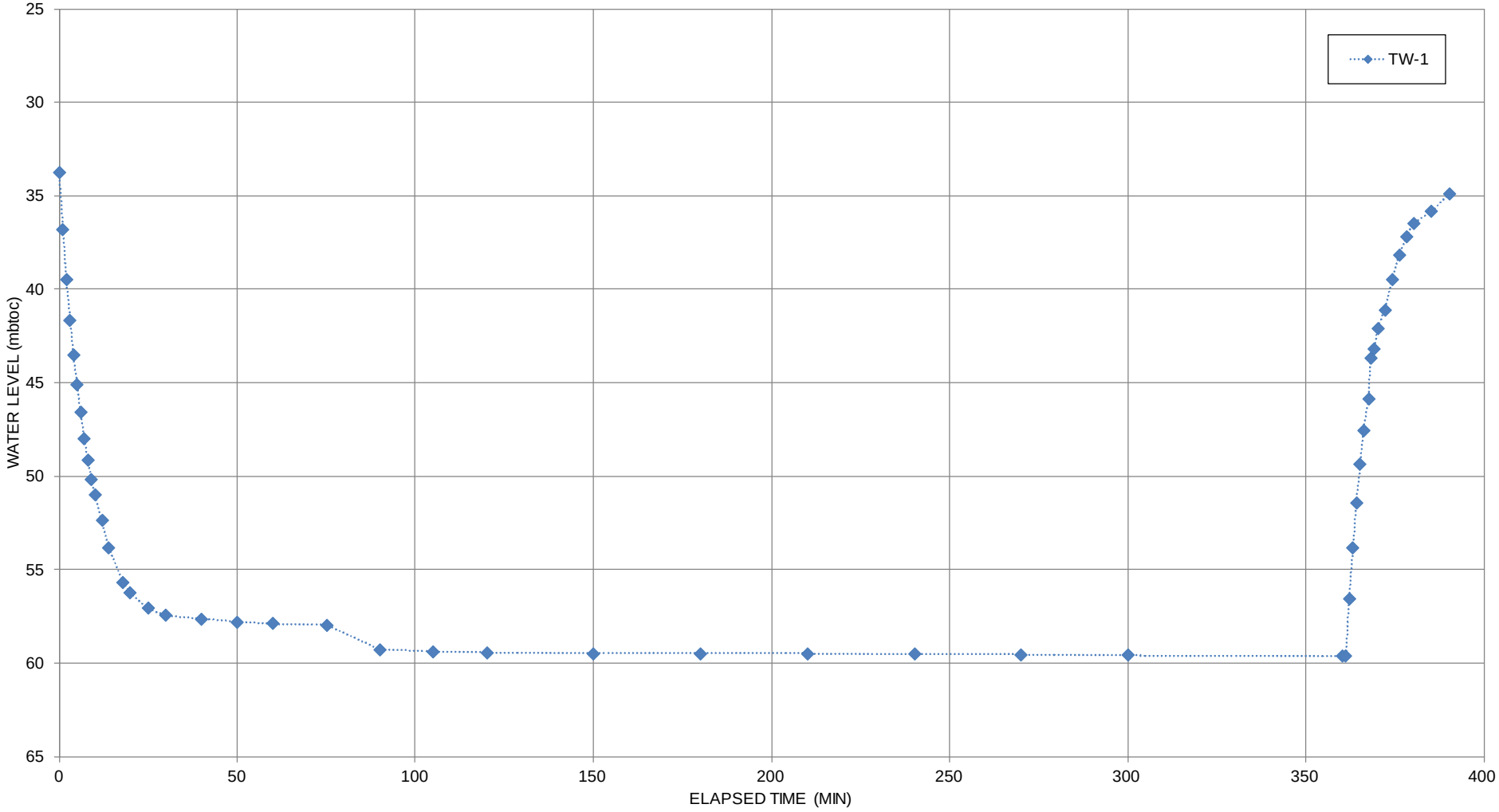
STATIC WL 33.74 | FROM PW | DISCHARGE RATE 20GPM

CLOCK TIME	RUN TIME	WATER LEVEL M	DRAWDOWN	RUN TIME	WATER LEVEL	DRAWDOWN	RUN TIME	WATER LEVEL	RECOVERY
9:02 AM	1	36.79	3.05M	1380			1	56.52	
	2	59.45	2.64	1440			2	53.80	
	3	41.65	2.20				3	51.44	
	4	43.52	1.87				4	49.35	
	5	45.11	1.59				5	47.52	
	6	46.57	1.46				6	45.88	
	7	47.97	1.40				7	43.68	7.30 min
	8	49.13	1.16				8	43.20	
	9	50.15	1.02				9	42.07	
GPM↑	10	51.00	0.85				10	41.08	
	12	52.37	1.37				12	39.46	
	14	53.84	1.47				14	38.17	
	16	54.91	1.07				16	37.20	
	18	55.69	0.78				18	36.45	
	20	56.24	0.55				20	35.83	
	25	57.04	0.80				25	34.87	
	30	57.43	0.39				30	34.34	
	40	57.62	0.19				40		
	50	57.80	0.18				50		
	60	57.87	0.07				60		
GPM↑	75	57.94	0.08				75		
	90	58.26	1.32				90		
	105	59.38	0.12				105		
	120	59.42	0.04				120		
	150	59.48	0.06				150		
	180	59.49	0.01				180		
	210	59.48	-0.01				210		
	240	59.51	0.03				240		
	270	59.52	0.02				270		
	300	59.57	0.05				300		
3:57PM *	360	59.61	0.04				360		
	420						420		
	480						480		
	540								
	600								
	660								
	720								
	780								
	840								
	900								
	960								
	1020								
	1080								
	1140								
	1200								
	1260								
	1320								

* Testing (Sampling)

NOTES

WATER COLOUR/TURBIDITY ON STARTUP



DRAFT

CLIENT
WEST RIDGE DEVELOPMENT CORPORATION

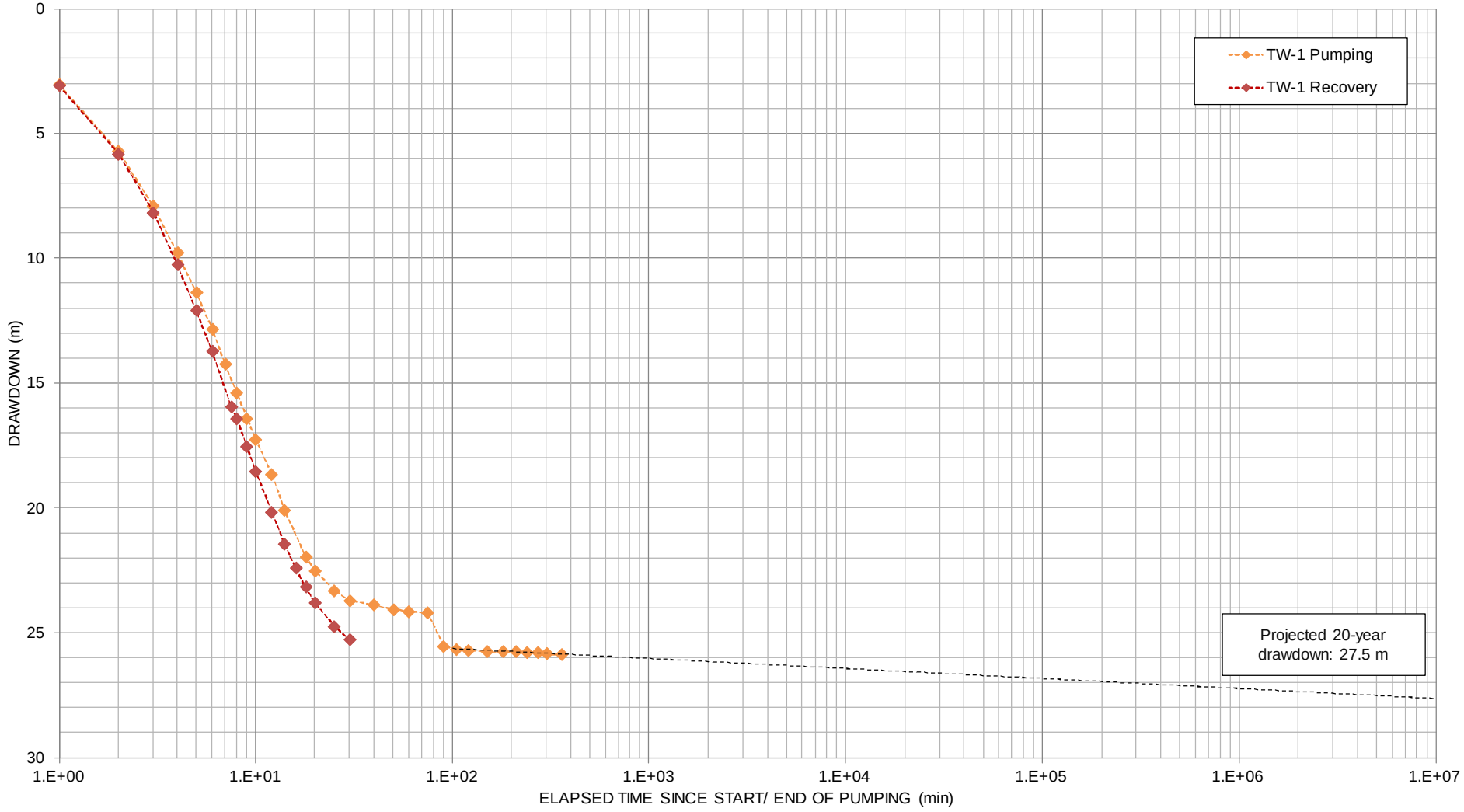
CONSULTANT
GOLDER

YYYY-MM-DD	2021-01-04
PREPARED	HW
DESIGN	HW
REVIEW	XX
APPROVED	XX

PROJECT
HYDROGEOLOGICAL ASSESSMENT
900 COUNTY ROAD 6, TOWNSHIP OF TINY

TITLE
TW-1 CONSTANT RATE PUMPING TEST WATER LEVEL

PROJECT No. 19134665 | Rev. A | FIGURE F-1



DRAFT

CLIENT
WEST RIDGE DEVELOPMENT CORPORATION

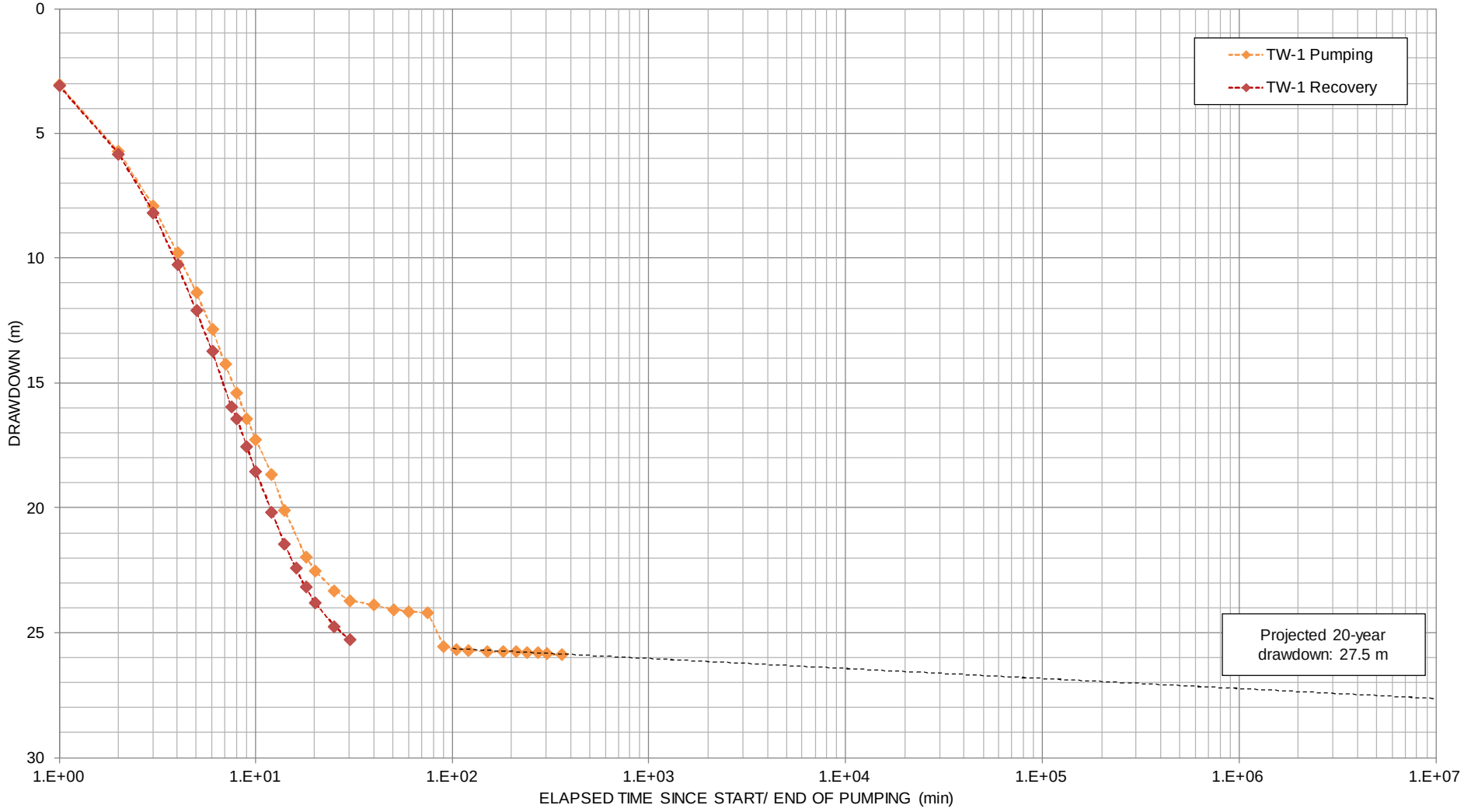
CONSULTANT
GOLDER

YYYY-MM-DD	2021-01-04
PREPARED	HW
DESIGN	HW
REVIEW	XX
APPROVED	XX

PROJECT
HYDROGEOLOGICAL ASSESSMENT
900 COUNTY ROAD 6, TOWNSHIP OF TINY

TITLE
TW-1 CONSTANT RATE PUMPING TEST DRAWDOWN

PROJECT No. 19134665 | Rev. A | FIGURE F-2



DRAFT

CLIENT
WEST RIDGE DEVELOPMENT CORPORATION

CONSULTANT
GOLDER

YYYY-MM-DD	2021-01-04
PREPARED	HW
DESIGN	HW
REVIEW	XX
APPROVED	XX

PROJECT
HYDROGEOLOGICAL ASSESSMENT
900 COUNTY ROAD 6, TOWNSHIP OF TINY

TITLE
TW-1 CONSTANT RATE PUMPING TEST DRAWDOWN

PROJECT No. 19134665 | Rev. A | FIGURE F-2

Appendix H: Groundwater Chemical Testing Results

Table G-1:
Groundwater Analytical Results

Parameter	Units	ODWS[a]				Treatability[b]	TW-1	
							904CR352	904CR352
		MAC	IMAC	AO	OG		2-Sep-20	16-Dec-20
Microbiology & Total Chlorine Residual								
Escherichia coli	CFU/100mL	ND	--	--	--	--	6	0
Total Coliforms	CFU/100mL	ND	--	--	--	--	1	0
Coliform Background Count	CFU/100mL	--	--	--	--	--	>200	124
Heterotrophic Plate Count	CFU/1mL	--	--	--	--	--	-	-
Total Residual Chlorine	mg/L	--	--	--	--	--	-	-
Iron and Manganese (unfiltered)								
Iron	mg/L	--	--	0.3	--	10[j]	0.104	-
Manganese	mg/L	--	--	0.05	--	1	0.006	-
Water Quality and DOC								
Electrical Conductivity	µS/cm	--	--	--	--	--	320	-
pH	pH Units	--	--	--	6.5-8.5	--	8.44	-
Langelier Index	NA	--	--	--	--	--	-0.02	-
Total Hardness (as CaCO3)	mg/L	--	--	--	80-100	--	37.00	-
Total Dissolved Solids	mg/L	--	--	500	--	--	181.00	-
Alkalinity (as CaCO3)	mg/L	--	--	--	30-500	--	106	-
Fluoride	mg/L	1.5[c]	--	--	--	--	0.5	-
Chloride	mg/L	--	--	250	--	250	22.8	-
Nitrate as N	mg/L	10[e]	--	--	--	--	<0.1	-
Nitrite as N	mg/L	1[e]	--	--	--	--	<0.1	-
Sulphate	mg/L	--	--	500[f]	--	500	20.0	-
Ortho Phosphate as P	mg/L	--	--	--	--	--	0.027	-
Reactive Silica	mg/L	--	--	--	--	--	10.6	-
Colour	TCU	--	--	5	--	7	4	-
Turbidity	NTU	--	--	5[g]	see note i	5	4	-
Calcium	mg/L	--	--	--	--	--	8.39	-
Magnesium	mg/L	--	--	--	--	--	3.85	-
Sodium	mg/L	--	--	200[h]	--	200	61.3	-
Potassium	mg/L	--	--	--	--	--	0.60	-
Copper	mg/L	--	--	1	--	--	<0.002	-
Iron	mg/L	--	--	0.3	--	--	0.104	-
Manganese	mg/L	--	--	0.05	--	1	0.006	-
Zinc	mg/L	--	--	5	--	--	<0.005	-
% Difference/ Ion Balance	NA	--	--	--	--	--	3.75	-
Dissolved Organic Carbon	mg/L	--	--	5	--	10	1.0	-

Notes

MAC = Maximum Acceptable Concentration

IMAC = Interim Maximum Acceptable Concentration

AO = Aesthetic Objective

OG = Operational Guideline

mL = millilitre

CFU = Colony-Forming Unit

L/m^3 = Litres per cubic metre

µg/mL = Microgram per millilitre

µS/cm = Microsiemen per centimetre

TCU = True Colour Units

NTU = Nephelometric Turbidity Unit

ND = Not detected

NDOGT = No Data; Overgrown with Target, refers to over-crowding microbial growth.

NDOGN = No Data; Overgrown with nontarget, refers to over-crowding microbial growth.

NA = Not applicable, no units

hr = hour

- = Not analyzed

-- = No stardard, objective, guideline, treatability limit

< = Less than reported detection limit.

* = Laboratory indicates analytical result cannot be relied upon due to result for Coliform Background Count

[a] Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG). June 2003, Revised June 2006. PIBS 4449e01.

[b] Procedure D-5-5. Technical Guideline for Private Wells: Water Supply Assessment. Last Revision August 1996. Table 3: Common Aesthetic, Analytical and Indicator Parameters

[c] Where fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5-0.8 mg/L the optimum level for control of tooth decay. Where supplies contain naturally occuring fluoride at levels

[d] This standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five

[e] Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).

[f] When sulphate levels exceed 500 mg/L, water may have a laxative effect on some people.

[g] Applicable for all waters at the point of consumption.

[h] The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

[i] The Operational Guidelines for filtration processes are provided as performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.

[j] Iron concentrations of up to 5.0 mg/L are treatable with water softeners or manganese greensand filters. Iron concentrations of 5.0 to 10.0 mg/L are treatable by oxidation with filtration through proprietary filter media

Bolded and shaded values exceed one of the Standards, Objectives or Guidelines

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G95160 **REPORT No. B20-26573**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: David Dillon

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 02-Sep-20
DATE REPORTED: 11-Sep-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Wyevale
P.O. NUMBER: 19134665
WATERWORKS NO.

			Client I.D.		904CR352			
			Sample I.D.		B20-26573-1			
			Date Collected		02-Sep-20			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Total Coliform	cfu/100mL	1	MOE E3407	03-Sep-20/B	6			
E coli	cfu/100mL	1	MOE E3407	03-Sep-20/B	1			
Background	cfu/100mL	1	MOE E3407	03-Sep-20/B	> 200			
pH @25°C	pH Units		SM 4500H	04-Sep-20/O	8.44			
Conductivity @25°C	µmho/cm	1	SM 2510B	04-Sep-20/O	320			
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	04-Sep-20/O	106			
Hardness (as CaCO3)	mg/L	1	SM 3120	04-Sep-20/O	37			
Chloride	mg/L	0.5	SM4110C	08-Sep-20/O	22.8			
Fluoride	mg/L	0.1	SM4110C	08-Sep-20/O	0.5			
Nitrite (N)	mg/L	0.1	SM4110C	08-Sep-20/O	< 0.1			
Nitrate (N)	mg/L	0.1	SM4110C	08-Sep-20/O	< 0.1			
Sulphate	mg/L	1	SM4110C	08-Sep-20/O	20			
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	08-Sep-20/O	1.0			
Colour	TCU	2	SM 2120C	08-Sep-20/O	4			
Turbidity	NTU	0.1	SM 2130	04-Sep-20/O	4.0			
Sulphide	mg/L	0.01	SM4500-S2	04-Sep-20/K	0.01			
o-Phosphate (P)	mg/L	0.002	PE4500-S	04-Sep-20/K	0.027			
Ammonia + Ammonium (N)	mg/L	0.01	SM4500-NH3-H	04-Sep-20/K	0.21			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	09-Sep-20/K	0.3			
Organic Nitrogen	mg/L	0.1	E3199A.1	10-Sep-20/K	< 0.1			
Tannins and Lignins	mg/L	0.5	SM5500B	04-Sep-20/K	< 0.5			
Phenolics	mg/L	0.002	MOEE 3179	08-Sep-20/K	< 0.002			
Calcium	mg/L	0.02	SM 3120	04-Sep-20/O	8.39			
Magnesium	mg/L	0.02	SM 3120	04-Sep-20/O	3.85			

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G95160 **REPORT No. B20-26573**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: David Dillon

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 02-Sep-20
DATE REPORTED: 11-Sep-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Wyevale
P.O. NUMBER: 19134665
WATERWORKS NO.

			Client I.D.		904CR352			
			Sample I.D.		B20-26573-1			
			Date Collected		02-Sep-20			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Potassium	mg/L	0.1	SM 3120	04-Sep-20/O	0.6			
Sodium	mg/L	0.2	SM 3120	04-Sep-20/O	61.3			
Copper	mg/L	0.002	SM 3120	04-Sep-20/O	< 0.002			
Iron	mg/L	0.005	SM 3120	04-Sep-20/O	0.104			
Manganese	mg/L	0.001	SM 3120	04-Sep-20/O	0.006			
Silica	mg/L	0.02	SM 3120	04-Sep-20/O	10.6			
Zinc	mg/L	0.005	SM 3120	04-Sep-20/O	< 0.005			
Anion Sum	meq/L		Calc.	09-Sep-20/O	3.19			
Cation Sum	meq/L		Calc.	09-Sep-20/O	3.44			
% Difference	%		Calc.	09-Sep-20/O	3.75			
Ion Ratio	AS/CS		Calc.	09-Sep-20/O	0.928			
Sodium Adsorption Ratio	-		Calc.	09-Sep-20/O	4.40			
TDS(ion sum calc.)	mg/L	1	Calc.	09-Sep-20/O	181			
Conductivity (calc.)	µmho/cm		Calc.	09-Sep-20/O	327			
TDS(calc.)/EC(actual)	-		Calc.	09-Sep-20/O	0.564			
EC(calc.)/EC(actual)	-		Calc.	09-Sep-20/O	1.02			
Langelier Index(25°C)	S.I.		Calc.	09-Sep-20/O	-0.0245			

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G94981 **REPORT No. B20-39607**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: David Dillon

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 16-Dec-20
DATE REPORTED: 18-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Wyevale
P.O. NUMBER: 19134665
WATERWORKS NO.

	Parameter		Total Coliform	E coli	Background		
	Units		cfu/100mL	cfu/100mL	cfu/100mL		
	R.L.		1	1	1		
	Reference Method		MOE E3407	MOE E3407	MOE E3407		
	Date Analyzed/Site		16-Dec-20/B	16-Dec-20/B	16-Dec-20/B		
Client I.D.	Sample I.D.	Date Collected					
904CR652	B20-39607-1	16-Dec-20	0	0	124		

Brandon Burtch
Bacteria Lab Analyst

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Appendix I:
Nitrate Impact Assessment

TATHAM ENGINEERING

Appendix H

Reasonable Use Assessment - Nitrate

Entire Property - No Effluent Treatment

Number of Proposed Residential Lots:	P	14		
Daily Effluent Flow / Lot:	F	1,000	L/day	Reference is made to MECP D-5-4
Number of Hamlet Commerical Lots:	P	1		
Daily Effluent Flow (estimated):	F	2,000	L/day	Assumed flow rate
Subdivision Area:	A	54,200	m^2	
Infiltration Rate:	I	0.44	m/year	Based on the calculated water surplus and infiltration factor (Section 2.3)
Nitrate Loading / Dwelling:	N_s	40	g/day	No treatment
Background Nitrate:	N_b	0.10	mg/L	<0.1 mg/L in baseline groundwater sample

$$V_i = \frac{A * I}{365}$$

Groundwater Recharge:	V_i	65	m^3/day

$$V_b = PF$$

Daily Sewage Volume:	V_b	**16**	m^3/day

$$RNC = \frac{V_i N_b + V_b N_S}{V_i + V_b}$$

Resultant Nitrate Concentration at Site Boundary:	RNC	**7.98**	mg/L

Does the nitrate concentration at the downgradient property boundary meet the ODWS for nitrate (10 mg/L):	**Yes**

Appendix J:
Septic Bed Design Criteria

Table B2: Sample Septic Sizing - Option 1 Sandy Soils

900 County Road 6 south

SEWAGE SYSTEM DESIGN FLOW (Q) DERIVATION (conservative)

A) Numbers of bedrooms = 4 Design flow (Q)= 2000 Litres/day

B) Proposed Floor Area= 200 sq.m. (2152 sq.ft)

Design floor area = 200 sq.m.

addition flow = (200 - 200) x 10 = 0 Litres/day

C) Fixture Units

3 pce bath groups =	3 @ 6 =	18	(flush tank w/c)
2 pce bath groups =	0 @ 5.5 =	0	(flush tank w/c)
extra shower =	0 @ 1.5 =	0	(1 head)
extra sink =	0 @ 1.5 =	0	(1.5" trap)
Kitchen sink =	1 @ 1.5 =	1.5	(Domestic 1.5" trap)
Cloths Washer =	1 @ 1.5 =	1.5	(domestic)
Laundry Tub =	1 @ 1.5 =	1.5	(Domestic 1.5" trap)
	Total =	22.5	

addition flow = (22.5 - 20) x 50 = 125 Litres/day

DESIGN FLOW RATE (Q) = A) + > of B) or C)

Q = 2125 Litres/day

DESIGN PERCOLATION RATE = 10 min/cm

REQUIRE SEPTIC TANK= 2Q
= 4250 L (min)
Use a 4500 L Tank

TRENCH BED
Length of Dist Pipe = QT/200
= 106.25 m
6 runs of 17.75m at 1.6m spacing

FILTER BED DESIGN (alternative)

Req'd Filter Area	Q/75 L/m2		
	=	28.3	m2
Expanded Contact Area	QT/850		
	=	25.0	m2
Loading Area	Q/ 10 l/m2		
	=	212.5	m2

Table B3: Sample Septic Sizing - Option 2 Silty-Sand Soils

900 County Road 6 south

SEWAGE SYSTEM DESIGN FLOW (Q) DERIVATION (conservative)

A)	Numbers of bedrooms =	4	Design flow (Q)=	2000	Litres/day	
B)	Proposed Floor Area=	200	sq.m.	(2152 sq.ft)		
	Design floor area =	200	sq.m.			
	addition flow = (	200	- 200) x 10 =	0	Litres/day	
C)	Fixture Units					
	3 pce bath groups =	3	@ 6 =	18	(flush tank w/c)	
	2 pce bath groups =	0	@ 5.5 =	0	(flush tank w/c)	
	extra shower =	0	@ 1.5 =	0	(1 head)	
	extra sink =	0	@ 1.5 =	0	(1.5" trap)	
	Kitchen sink =	1	@ 1.5 =	1.5	(Domestic 1.5" trap)	
	Cloths Washer =	1	@ 1.5 =	1.5	(domestic)	
	Laundry Tub =	1	@ 1.5 =	1.5	(Domestic 1.5" trap)	
			Total =	22.5		
	addition flow = (	22.5	- 20) x 50 =	125	Litres/day	

DESIGN FLOW RATE (Q) = A) + > of B) or C)

Q = 2125 Litres/day e

DESIGN PERCOLATION RATE = 10 min/cm (imported soils - absorption trenches)
35 min/cm (native soils - loading area)

REQUIRE SEPTIC TANK= 2Q
= 4250 L (min)
Use a 4500 L Tank

TRENCH BED

Length of Dist Pipe = QT/200
= 106.25 m
6 runs of 17.75m at 1.6m spacing
partially raised - imported soils
15m mantle

Loading Area Q/ 8 l/m2
= 265.6 m2

FILTER BED DESIGN (alternative)

Req'd Filter Area Q/75 L/m2
= 28.3 m2

Expanded Contact Area QT/850
= 25.0 m2

Loading Area Q/ 8 l/m2
= 265.6 m2