Hydrogeological Assessment Report – 74 Edwards Drive, Keene, Ontario

February 7, 2025

Prepared for:
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1.0 Introduction

Cambium Inc. (Cambium) was retained by Yvette Johnson (Client) to complete a hydrogeological assessment of the property located at 74 Edwards Drive, in Keene, Ontario (Site).

The Client intends to develop the Site as a residential subdivision. The proposed development will be serviced by municipal water, however, there are no municipal services available for wastewater disposal. Therefore, the Site will require private on-site servicing for wastewater.

The hydrogeological assessment outlined herein was completed to support developing the Site in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Guideline D-5-4 (Ministry of the Environment, 1996). The suitability for disposal of wastewater on-site was reviewed by identifying and assessing the native soils at the Site and the position of the shallow water table, water quality testing of the shallow aquifer, hydraulic testing of the native soils, identification of surficial slopes across the Site. In addition, an assessment of the attenuation capacity of Site for the contamination of nitrogen from the on-site wastewater systems is included herein.

1.1 Site Description

The Site is located on the parcel address 74 Edwards Drive on Otonabee Concession 7, Lot 14 in the Township of Otonabee South Monaghan. It is approximately 14.1 ha (34.8 ac) in size and is irregularly shaped. The Property Roll Number applicable to the Site is 15060100032430000000. The property is classified as a future Development 8 (FD-8) Zone.

The Site is situated in an area that is undeveloped and is heavily vegetated with a mix of trees, shrubs, and grasses. A wetland occupies the eastern side of the property and is not included in the proposed development plan. Agricultural land use borders the Site to the south and west and northwest. Residential and rural residential land use borders the Site to the east and northeast. There is a public school located along the southeast border of the Site. Indian River is located approximately 580 m east of the Site.

The regional location of the Site is outlined on Figure 1. The property boundaries are outlined in Figure 2. A proposed development plan is included in Appendix A.

1.2 Proposed Development

The proposed development will include subdividing the western portion of the Site into 16 residential lots. The proposed development will be provided water servicing from a municipal supply. However, wastewater will be treated onsite with private systems. A wildlife corridor will be maintained north of the proposed development.

The entire Site is 14.1 ha, however 6.2 ha in the eastern area of the Site is considered a Regulated Area by Otonabee Conservation and will not be developed.

The proposed lots vary in size, with the minimum lot size of about 1.17 ha. The footprint of each dwelling will be approximately 255 m².

The proposed development also includes an internal roadway and a wildlife corridor (approximately 2.5 ha). The eastern portion of the property (6.2 ha) is not included in the proposed development plan (Appendix A).

2.0 Methodology

This section outlines the methodology followed to complete the hydrogeological assessment.

2.1 Background Information

A thorough review of the available relevant background information was undertaken for this study, which included the following:

- Chapman and Putnam (1984). The Physiography of Southern Ontario: Ontario Geological Survey, Special Volume 2.
- Ontario Geological Survey (2011). 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release – Data 126 – Revision 1. Ontario Geological Survey.
- Ontario Geological Survey (2010). Surficial Geology of Southern Ontario: Ontario Geological Survey
- Source Protection Area Mapping provided by the MECP.
- Water Well Information System (WWIS) provided by the MECP.

2.2 Test Pit Investigation

On October 11, 2022, Cambium completed a test-pit investigation to determine the shallow subsurface conditions across the property. The test-pits were excavated using a tracked excavator under the supervision of a Cambium technologist. Prior to the subsurface investigations, Cambium arranged for public underground utilities through Ontario One Call to be located and marked at the Site.

A total of 16 test-pits, designated as TP101-22 through TP116-22, were advanced throughout the Site to a depth of 2 meters below ground surface (mbgs) or to termination on bedrock. Soil samples were collected from unique strata in the test pits and were handled by the Cambium technologist using dedicated nitrile gloves. Soil samples were logged for soil colour, texture, structure, moisture content, and consistency/compactness. Open test-pits were backfilled with

the excavated soils and compacted with the backhoe bucket. The test-pit logs are provided in Appendix B. Test-pit locations have been outlined on Figure 2.

2.3 Borehole Investigation

A borehole investigation was conducted at the Site on October 19 and 20, 2023 to assess subsurface conditions. Drilling and sampling were completed using a track-mounted drill rig operating under the supervision of a Cambium technician. Ten boreholes, identified as BH101-23 through BH110-23, were advanced in the locations shown on Figure 2. Termination depths varied based on predetermined depths for individual boreholes and auger and Standard Penetration Test (SPT) refusal in some locations.

The boreholes were advanced to the sampling depths by means of continuous flight solid stem augers with 50 mm outer diameter split spoon samplers. SPT N values were recorded for the sampled intervals as the number of blows required to drive a split spoon sampler 305 mm into the soil, using a 63.5 kg drop hammer falling 750 mm, as per ASTM D1586 procedures. The SPT N values are used in this report to assess consistency of cohesive soils and relative density of non-cohesive materials.

The encountered soil units were logged in the field using visual and tactile methods, and samples were placed in labelled plastic bags for transport, future reference, laboratory testing, and storage. Open boreholes were checked for groundwater and general stability prior to backfilling.

Three boreholes, BH101-23, BH107-23, and BH109-23 were completed as monitoring wells to assess groundwater conditions over time and complete potential groundwater testing for other associated studies. All boreholes not equipped as monitoring wells were backfilled and sealed in accordance with Ontario Regulation (O.Reg.) 903.

Borehole locations were surveyed in the field using a Sokkia RTK unit. Elevations were measured in relation to a Standard Iron Bar property boundary marker with an elevation of 216.69 metres above sea level (masl). The ground surface at the location of each borehole

was measured relative to this elevation, with an accuracy of 0.01 m. The prepared borehole logs are provided in Appendix C.

2.4 Laboratory Testing

Four soil samples from the 2022 test pits and seven soil samples from the 2023 boreholes were selected for physical laboratory testing. A grain size analysis was performed on all samples, while moisture content testing was completed on the seven borehole samples and soil percolation times were calculated from the four test pit samples. Results are presented in Appendix D and are discussed in Section 3.1.

2.5 Hydrogeological Field Tasks

On March 14, 2023, Cambium staff visited the Site to complete Single Well Hydraulic Tests (SWHTs) and take groundwater samples from monitoring wells BH101-23, BH107-23, and BH109-23. The wells were developed by surging prior to testing and sampling. Rising head tests were conducted by purging water out of each monitoring well and measuring water level recovery with manual measurements and a datalogger. Water level recovery was monitored using an automated water level logging device and validated with manual measurements. The hydraulic conductivity of water bearing units screened in each well were estimated using the Hvorslev (1951) method in the software AQTESOLV. The results for the SWHTs are presented in Appendix E and are discussed further in Section 4.2.

Water samples were collected after purging three well volumes from each monitoring well. The samples were delivered to SGS Laboratories in Lakefield for analysis and analyzed for ammonia, dissolved and total phosphorous, nitrate, and nitrate. The certificate of analysis is attached in Appendix F and the water chemistry results are discussed further in Section 4.1.

Water level measurements are on-going at the Site. In addition to the water levels collected on March 14, 2024, prior to the SWHTs, Cambium returned to the Site to take water levels on April 19, 2024. Cambium staff will continue to return to the site on a regular basis for a period of approximately one year to measure water levels. Water levels are discussed further in Section 3.4.

3.0 Geological and Hydrogeological Setting

The Site is located within the physiographic region known as the Peterborough Drumlin Field (Chapman & Putnam, 2007). The Peterborough Drumlin Field is a rolling till plain that encompasses land between Hastings County to the east and Simcoe County to the west. It is characterized by approximately 3,000 drumlins composed of calcareous till, as well as areas with drumlinized hills and till plains (Chapman & Putnam, 1984). The entire Site is located in the subwatershed of Rice Lake and is part of the Otonabee-Peterborough source protection area.

The Site is predominantly vacant woodland throughout, with an unevaluated wetland occupying approximately the eastern third of the property (Appendix A).

The topography on Site ranges from approximately 217 to 239 masl. The topographic highpoint is located along the central northern border on the tail of a southwest-northeast trending drumlin. From this high point, the ground slopes downward in all directions. The lowest elevations occur in wetland on the east side of the Site, which is separated from the highpoint by a steep slope. A topographic map of the Site is available in Appendix A.

According to the Ontario Geological Survey (2010), the surficial geology at the Site contains the following three surficial units:

1. Fine textured glaciolacustrine deposits with minor sand and gravel – located in the eastern half of the Site.
2. Course textured glaciolacustrine deposits with minor silt and clay – located in the southwestern corner of the Site.
3. Stone-poor, sandy silt to silty sand textured till – located in the northwestern corner of the Site.

The topographic highpoint is mapped in the till unit and is associated with the lee slope of a drumlinoid feature. The fine and coarse textured glaciolacustrine units occupy relatively low elevations in comparison to the till unit, with the Site's wetland entirely mapped in the fine-textured glaciolacustrine unit.

The bedrock geology of the is characterized as limestone, dolostone, shale, arkose, and sandstone from the Shadow Lake formation (Ontario Geological Survey, 2011).

3.1 Subsurface Investigation

The completed depths of the 16 test-pits ranged between 1.65 and 2.13 mbgs. All boreholes were terminated at depths ranging from 5.0 to 6.6 mbgs, except for borehole BH103-23 that terminated at a depth of 1.0 mbgs due to refusal on large boulders in that area. Bedrock was not encountered in any test pit or borehole.

As shown on test pit logs attached in Appendix B, topsoil was encountered from 0.05 to 0.30 mbgs. The underlying soils were primarily logged as silty sand to sand and silt. Clay and silt layers were encountered at the base of three test pits (TP112, TP114, and TP115) starting at around 1 mbgs. In the silty sand and sand and silt units, traces of gravel, cobbles, and clay were occasionally noted.

Like the test pit results, the borehole logs attached in Appendix C show that the shallow overburden at the Site primarily consists of a thin layer of silt and sand topsoil (ranging from 0.1 to 0.4 m thick), underlain by silty sand to sand and silt down to 0.6 to 1.5 mbgs. Also, akin to the test pit investigation, two borehole logs encountered a clay and silt unit at depths of 0.6 and 1.4 mbgs, which were 1.5 and 1.2 m in thickness respectively.

Below these units, the borehole logs generally observed a dense glacial till with either a sandy silt or gravelly sand texture, containing various amounts of clay, gravel, silt, cobbles, and boulders. Glacial till was encountered in all boreholes except for BH103-23, which terminated due to auger refusal on a presumed boulder, and BH104-23, which terminated in silty sand. Based on the till's borehole log descriptions and from mapping of geological units from Sharpe et al. (1999) in the area, the till below the Site is believed to be part of the Newmarket Till, which Sharpe et al. (1999) describes as "*dense, stoney (5-15% gravel), silty sand to sandy silt diamicton*".

The results of the grain size analysis are summarized in Table 1. The grain size results generally corroborate the soil descriptions in the field, although a few test pit samples logged

as having trace / no fines had a higher fines content then originally logged. Calculated percolation times for the test pit samples ranged from 14 to 20 min/cm, with a geometric mean of 16.5 min/cm.

Table 1 Laboratory sediment analysis results

Borehole/ Test Pit	Depth (mbgs)	Texture Description from Borehole Log[1]	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Moisture Content (%)	Soil Percolation Time T (min/cm)
BH101-23	4.6 – 5.0	Till - Sandy Silt, some clay, some gravel	11	34	37	18	6.5	N/A
BH102-23	0.6 – 1.1	Sand - some gravel, some silt	15	69	11	5	3.6	N/A
BH104-23	6.1 – 6.6	Silty Sand – trace clay	0	62	32	6	18.7	N/A
BH106-23	1.6 – 2.0	Sandy Silt Till and Silt and Sand	4	41	47	8	8.9	N/A
BH107-23	0.1 – 0.6	Silty Sand – some clay, trace gravel	8	43	34	15	7.9	N/A
BH109-23	1.5 – 2.0	Clay and Silt - some sand	0	15	42	43	26.0	N/A
BH110-23	2.3 – 2.9	Till - Gravelly Sand, some silt, trace clay	33	45	15	7	4.6	N/A
TP103-22	0.2 – 1.3	Fine to medium sand, trace silt, trace clay, trace gravel	14	42	44		N/A	20
TP106-22	0.2 – 0.6	Fine sand, trace silt and gravel	9	58	33		N/A	18
TP110-22	0.4 – 1.6	Fine to medium sand, some gravel, some cobbles	18	58	24		N/A	14
TP114-22	0.3 – 0.9	Fine Sand, trace gravel	1	73	26		N/A	14

[1] borehole log descriptions are based on field classification of soils.

3.2 Water Well Records

Cambium accessed the MECP WWIS to review water well records within 500 m of the Site.

There were approximately 115 water well records located within 500 m of the Site (see Figure 3). Of these wells, 64 were screened in overburden and 51 were finished in bedrock. From the well records, overburden consisted primarily of clay and gravel with some sand constituents. Bedrock consisted primarily of grey to black limestone, with granite or shale being encountered occasionally. In regards to well use, 98 wells are used water supply, eight are abandoned, four were test holes, one is an observation well, and four wells don't have information about their use. Summaries of the WWIS well record search, including total depth of the wells, depths at which water was first encountered, static water levels, and recommended pumping rates for the wells are provided in Table 2 and Appendix G.

Table 2 MECP Well Record Summary

Well Type		Depth (mbgs)	Water First Found At (mbgs)	Static Water Level (mbgs)	Recommended Pumping Rate (L/min)
Overburden Well Count = 64	Maximum	40.2	40.2	21.0	136
	Minimum	2.3	1.5	0.0	14
	Average	18.1	17.0	5.1	31
Bedrock Well Count = 51	Maximum	166.4	48.8	16.0	68
	Minimum	13.7	5.5	0.0	5
	Average	33.3	22.9	5.7	22

Based on the well records, overburden wells varied in depth from 2.3 to 40.2 mbgs, with an average depth of 18.1 mbgs. The bedrock wells were drilled between depths of 13.7 and 166.4 mbgs, with an average depth of 33.3 mbgs. Of the wells drilled into bedrock, bedrock was encountered from 0.0 to 54.9 mbgs, with an average overburden thickness of 23.0 mbgs.

The static water levels for the overburden wells varied from 0 to 21 mbgs with an average of 5.1 mbgs. The static water levels for the bedrock wells varied from 0 to 16 mbgs with an average of 5.1 mbgs. The recommended pumping rates for the overburden wells varied from

14 to 136 liters per minute (L/min), with a mean of 31 L/min. The recommended pumping rates for the bedrock wells varied from 5 to 68 L/min, with a mean of 22 L/min.

3.3 Vulnerable and Regulated Areas

To assess environmental features, databases maintained by the Otonabee Conservation and the MECP were reviewed.

According to the data reviewed, the Site is situated within the Otonabee River subwatershed under the authority of the Otonabee-Peterborough Source Protection Area. As per Otonabee Conservation's mapping, the eastern half of the Site is located with a regulated area (O.Reg 41/24; Appendix A). Note that all planned lots are outside this regulated area.

As per the MECP's Source Water Protection Information Atlas (SPIA), the Site is located partially within the following vulnerable areas (as shown in Appendix A):

- Highly Vulnerable Aquifer (HVA), with a vulnerability score of 6 on the northeast of Site.
- Significant Groundwater Recharge Area (SGRA) with a vulnerability score of 4 on the southwest of Site.

Additionally, the municipal supply well known as the Keene Heights Subdivision Well 4 (referred to as Well 4) is located along the Site's southern border. Ministry Well Record No. 5107403 (see Appendix G) describes the installation of Well 4. At Well 4, till sediments extended to a depth of about 10.4 mbgs. Predominantly gravel sediments were encountered between 10.4 and 24.7 mbgs. Bedrock was encountered at 24.7 mbgs. The location of Well 4 is outlined in Appendix H.

As Cambium understands Well 4 is currently used as a stand-by back up well. The primary water needs of the local population who draw on the municipal supply are provided by a separate municipal supply well (referred to as Well 1) located further north and east of the Site, at the end of Keene Drive (Earth FX Inc., 2013). See Appendix H for the location of Well 1. This information suggests that the water supplied to the proposed development will be likely be sourced primarily from Well 1 (to be confirmed).

Wellhead Protection Areas (WHPAs) of the Keene Heights Subdivision Well 4 extend away from the wellhead and encompass several areas of the Site (see Figure 6, Appendix A and Appendix H). The WHPAs partially found within the Site are listed below:

- WHPA-A with a vulnerability score of 10.
- WHPA-B with a vulnerability score of 8 and 6.
- WHPA-C1 with a vulnerability score of 6.
- WHPA-C with a vulnerability score of 2.

Further discussions regarding source protection policies as they apply to the proposed development are outlined in Section 7.0 of this document.

3.4 Groundwater Levels and Flow Directions

Water levels were measured from the three monitoring wells on-Site in March, April, May, June and September of 2024. Groundwater levels and elevations are outlined below in Table 3. Water levels varied between 0.29 and 2.98 mbgs. Groundwater elevations varied from 215.54 to 231.23 masl during the monitoring period. The shallowest water levels were recorded in April, with the shallowest water level (0.29 mbgs) being recorded at well BH109-23. Groundwater level monitoring was ongoing at the time this document was prepared.

Groundwater elevation contours and inferred flow directions from April 19, 2024, are presented in Figure 4. Note that groundwater elevation contours were drawn considering both the Site's topography and the measured groundwater elevations. Topography was considered because of the limited number of monitoring wells on the Site and the Site's inherently variable topography. As shown on Figure 4, groundwater west of the Site's ridge likely flows southwest towards Rice Lake and water east of the ridge flows southeast towards the Site's wetland, Rice Lake, or Indian River. While there are no water levels available on the eastern side of the Site, water is similarly expected to flow to the southeast based on the topography around the Site.

Table 3 Groundwater Level and Elevation Information

		BH101-23	BH107-23	BH109-23
Top of Pipe Elevation (masl)[1]		231.66	233.09	218.62
Ground Surface Elevation (masl)[1]		230.79	232.10	217.80
Depth (mbgs)[2]		6.5	6.5	5.3
Stick-up (m)		0.87	0.99	0.82
Mar 14, 2024	Water Level (mbgs)[2]	1.13	1.72	1.46
	Groundwater Elevation (masl)[1]	229.66	230.38	216.34
Apr 19, 2024	Water Level (mbgs)[2]	0.72	0.87	0.29
	Groundwater Elevation (masl)[1]	230.07	231.23	217.51
May 22, 2024	Water Level (mbgs)[2]	1.43	1.62	1.46
	Groundwater Elevation (masl)[1]	229.36	230.48	216.34
Jun 13, 2024	Water Level (mbgs)[2]	2.15	2.30	1.82
	Groundwater Elevation (masl)[1]	228.64	229.80	215.99
Sep 5, 2024	Water Level (mbgs)[2]	2.35	2.98	2.26
	Groundwater Elevation (masl)[1]	228.44	229.12	215.54

1. *meters above sea level*
2. *metres below ground surface*

3.5 Conceptual Model of Overburden Geology

Cambium's subsurface investigation, in conjunction with the Ontario Geological Survey (OGS) surficial geology mapping, were used to generate a conceptual model and understanding of overburden geology across the Site.

Based on the work of Sharpe et al. (1996) and Sharpe et al. (1999), the till that dominates most of the substrate at the Site is believed to be part of the Newmarket Till unit. The grain size analyses of soils sampled onsite corroborate the OGS mapping, and till is assumed to be found at surface below the majority of the development area.

Information included in the well record of Well 4 (No. 5107403) indicates that clay dominant soils (interpreted to be Newmarket Till) extend to a depth of 10.4 mbgs and were underlain by gravel dominant soils to a depth of 24.7 mbgs. Limestone bedrock was encountered at a depth of 24.7 mbgs.

Based on the discussion above and the results from Sections 3.1 to 3.4, the following conclusions are drawn about the geological/hydrogeological setting of the Site:

1. The eastern half of the Site is largely covered by a wetland. Below any potential surficial organic wetland material, the sediment is characterized by fine to coarse grained glaciolacustrine deposits for approximately first meter or two of the soil profile. Newmarket Till is assumed to underly these deposits.
2. There are two distinct overburden strata in the area of the Site.
    a. The till sediments (interpreted to be Newmarket Till) which extends from surface to 10.4 m at Well 4. The monitoring wells tested as part of this assessment are all interpreted to be installed in the shallow Newmarket Till sediments (see Table 3). The till sediments were saturated but are considered a confining sedimentary unit (see Section 3.5.1),
    b. Beneath the Newmarket Till are saturated gravel sediments which extend to limestone bedrock. The saturated gravel sediments are the supply aquifer that Well 4 has intercepted.
3. The overlying till sediments are interpreted to act as a confining layer. As such, the underlying gravel aquifer is considered to be a “confined overburden” system (as per the Trent Assessment Report (Trent Conservation Coalition Source Protection Committee, 2022)).
4. Groundwater levels within the till sediments throughout the Site are expected to range from roughly 0 mbgs in the vicinity of the wetland to roughly 2 mbgs along the ridge during wetter periods. Water levels on or near the ridge may be slightly deeper during drier times of the year.
5. There is a north-south trending ridge that crosses the western half of the Site. Groundwater flow in the shallow till sediments on the west of this ridge is inferred to flow southwest towards Rice Lake, while shallow groundwater flow east of the ridge is assumed to flow southeast to either Rice Lake or to Indian River.

6. Runoff that infiltrates into the subsurface at the Site is not expected to contribute a significant amount of recharge to the local gravel aquifer (which Well 4 has intercepted), since it is considered to a “confined overburden” aquifer system.
7. The groundwater flow direction in the confined gravel aquifer was not confirmed as part of this assessment. Presumably the direction of groundwater flow in these sediments is towards the southeast, as per the available WHPA mapping (Figure 6 and Appendix A). The aquifer in the deep gravel dominated sediments is considered a confined system, as per available source protection plan information (Trent Conservation Coalition Source Protection Committee, 2022).
8. Bedrock was not encountered during Cambium’s investigation. Information included in the well record of Well 4 indicates that bedrock was encountered at a depth of 24.7 mbgs.

3.5.1 Keene Heights Subdivision Municipal Supply Well 4

Municipal supply Well 4 is located adjacent the Site to the south. The supply well was screened from about 11 to 13.4 mbgs within the gravel sediments. Figure 19 of the Trent Assessment Report (Trent Conservation Coalition Source Protection Committee, 2022) includes a geological cross section that was extended through the Site and includes Well 4 (see Appendix A). The information outlined in the cross section indicates that there is approximately 10 m of confining till sediments that extend across the width of the Site.

As per the subsurface investigation, boreholes BH106-23, BH108-23, BH109-23 and BH110-23 were all completed in till sediments between 6.2 mbgs and 6.3 mbgs. These data indicate that the confining till sediments extend to at least 6.2 mbgs.

At the time this document was prepared the proposed development will be provided water from a municipal supply (presumably Keene Heights Subdivision Well #1 – located off-site to the northeast). Wastewater will be treated by private on-site wastewater treatment system. Information from the Client indicates that the municipal supply watermain will be installed in a trench advanced to depth of 2.2 mbgs. Further, excavations for the road will be advanced to a maximum depth of approximately 2.5 mbgs, as the proposed road climbs the drumlin.

As outlined above, there is approximately 10 to 10.4 m of confining sediments overlying the gravel aquifer. At the maximum anticipated excavation depth of 2.5 mbgs, there will still be about 7.5 to 7.9 m of confining till sediments confining the gravel aquifer.

In addition to the above, the hydraulic conductivity of the till in the area of was determined to be very low (6×10^{-9} m/s) from testing completed at well BH109-23 (see Section 4.2), which is located adjacent to Well 4.

The information outlined herein indicates that following development there will still be between 7.5 and 7.9 m of confining till sediments overlying the gravel aquifer into which Well 4 is installed. Further, the hydraulic conductivity of the till in the area of Well 4 was very low.

Due to the above information, it is expected that the excavations advanced as part of the water main construction will not significantly impair the capacity of the till sediments to adequately confine the gravel aquifer. As such, significant impairment of the gravel aquifer (and subsequently the water quality produced from Well 4) is not expected. Further investigations of the confining condition can be reviewed at a later date, if needed, upon review of this information by regulating authorities.

3.5.2 Other Construction Considerations

Cambium recommends that all construction activities and structures remain above the groundwater table wherever possible. Doing so will not increase the vulnerability of the development in those areas. This is outlined in the Wellfield Vulnerability report prepared for Keene Heights Subdivision Municipal Supply Wells 1 and 4 (Earth FX Inc., 2013), as indicated on Page 14:

“With respect to the last item, it should be noted that in this analysis of SWAT times, unsaturated zone travel times (UZAT) were set equal to zero. Therefore, constructed pathways that could possibly reduce unsaturated zone travel times, such as pipeline bedding and excavations above the water table, would not result in an increase in the vulnerability scores already assigned.”

4.0 Groundwater Chemistry and SWHT Results

4.1 Background Groundwater Chemistry

Water chemistry results for nitrate and other key nutrients from March 14, 2024, are shown in Table 4, and the certificate of analyses is available in Appendix F. Nitrate concentrations were less than the project laboratory's detection limit in each sample taken and are less than the Ontario Drinking Water Quality Standard (ODWQS) of 10 mg/L. Concentrations of ammonia, nitrite, and dissolved phosphorous were also generally below the detection limit.

Table 4 Groundwater Quality Results

Parameter	BH101-23	BH107-23	BH109-23
Ammonia + Ammonium (N) (mg/L)	< 0.1	< 0.1	0.1
Nitrite (as N) (mg/L)	< 0.03	< 0.03	< 0.03
Nitrate (as N) (mg/L)	< 0.06	< 0.06	< 0.06
Phosphorus (dissolved) (mg/L)	< 0.003	0.004	< 0.003
Phosphorus (total) (mg/L)	0.136	0.118	0.136

ODWQS Exceedances are bold and shaded

4.2 In-Situ Hydraulic Conductivity Test Results

The hydraulic conductivity (K-value) results from monitoring wells BH101-24, BH107-24, and BH109-24 are presented in Table 5. Detailed analysis reports are reported in Appendix E.

Table 5 Estimated Hydraulic Conductivity as per SWHT

Well ID	Estimated Hydraulic Conductivity (m/s)	Tested Soil Type
BH101-23	2×10^{-7}	Gravelly Sand to Sandy Silt Till
BH107-23	4×10^{-9}	Sandy Silt Till
BH109-23	6×10^{-9}	Sandy Silt Till

The estimated hydraulic conductivities ranged from 4×10^{-9} to 2×10^{-7} m/s, with a mean of 6×10^{-8} m/s. The results are consistent with the hydraulic conductivity values typically found in

the Newmarket Till, which has K values ranging from 10^{-6} to 10^{-11} m/s (Sharpe, et al., 1996). The higher K value at BH101-23 is likely the result of the screened interval's relatively higher sand and gravel fraction.

5.0 Water Balance Assessment

5.1 Water Balance Modelling

The water balance of the Site can broadly be described by the following equation:

$P = R + I + ET + \Delta S$

Where:

P = Precipitation (mm/year)

R = Run-off (mm/year)

I = Infiltration (mm/year)

ET = Evapotranspiration (mm/year)

ΔS = Change in groundwater storage (taken as zero) (mm/year)

Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from ground or evapotranspiration by vegetation (ET). When long-term average values of P, R, I, and ET are used, there is minimal or no net change to groundwater storage (ΔS).

The water balance described herein does not account for catchment areas that extend off-Site. The calculations compare the pre- and post-development water balance changes within the Site boundaries.

The property is currently undeveloped forest and wetland. It is understood that the proposed residential development includes the development of 16 single-family detached homes. In addition, there will be a wildlife corridor, and a parkland area.

Based on the available design information, the development area at the Site can be generally categorized into five landscape types: paved area, roof area, landscape area, forested area, and wetland. A summary of the surface areas of the development is listed in Table 6.

Table 6 Pre- and Post-Development Statistics

Type of Land Coverage	Pre-Development Area (m^2)	Post Development Area (m^2)
Paved Areas – Road and Driveways	0	8,236
Building Roof Area (16 Dwellings – 255 m²/roof)	0	4,080
Landscaped Area	0	37,884
Forested Area	91,600	41,400
Wetland Area	49,400	49,400
Total	**141,000**	**141,000**

Supporting information referenced herein (including detailed water balance calculations) is attached in Appendix I.

5.2 Water Surplus

The water surplus is calculated by determining the difference between precipitation and evapotranspiration (changes in soil water storage was assumed to be negligible over the course of a year). The volume of water surplus is further sub-divided into water that runs off site and water that infiltrate the on-site soils as groundwater recharge. This section describes the calculation of the water surplus, while the Section 5.3 describes the partitioning of the water surplus between groundwater recharge and runoff.

The Thornthwaite and Mather (1957) method was used to calculate the water surplus for the wetland, forest, and landscaped landcover types. The equation requires the following inputs: monthly precipitation totals, monthly temperature, latitude, and available water storage capacity and root depth of the soils. The climatic data including monthly average temperature and precipitation from 1981 and 2010 were obtained from Environment Canada for the PETERBOROUGH A (Climate ID: 6166418) weather station. The average annual precipitation was recorded to be 855 mm/year and the average annual evapotranspiration was estimated to be about 493 mm/year using the USGS Thornthwaite Monthly Water Balance methodology (Appendix I). Accordingly, the water surplus is calculated to be 362 mm/year.

Transpiration does not occur from roofed or paved areas. It was assumed that 10% of precipitation falling on these surfaces is lost directly to evaporation. The remaining depth (i.e., 90% of precipitation) was considered surplus and converted to infiltration and/or runoff.

5.3 Infiltration Rates

The volume of surplus water that infiltrates through pervious surfaces on-Site was determined by applying an infiltration factor to the surplus water depth. The surplus water that does not infiltrate into pervious surfaces will leave the Site as surface water runoff. The infiltration factor varies from 0 to 1, with 0 meaning that all surplus water runs offsite (as with the paved and roof areas) and 1 meaning that the entire water surplus infiltrates the ground and ends up as groundwater recharge.

While soils within a wetland may be pervious, an infiltration factor of 0 was chosen for the wetland, as it is assumed to be an area of groundwater discharge and/or insignificant groundwater recharge. For the landscaped and forested areas, an infiltration factor was calculated based on topography, soils, and vegetation cover as per the guidance from the MECP *Stormwater Management Planning and Design Manual* (SMPDM) (Ministry of the Environment, 2003).

Outside of the wetland, the Site slopes generally range from 50 to 250 m/km, characterizing the topography as ‘hilly’ according to the SWPDM. The cover of the landscaped areas is akin to the ‘Cultivated Lands’ category of the SWPDM, while the forest is represented by the SMPDM’s ‘Woodland’ cover type.

For soil characteristics, as was stated in Section 3.5, the Newmarket Till is the dominant soil unit at the Site, and is assumed to be the surficial geological unit below most of the development area. For the most representative soil type according to the SMPDM, it is worth noting that glacial tills, such as the Newmarket Till, often have considerably lower infiltration capacities than what would be suggested based on their soil texture alone. Indeed, the hydraulic conductivities of the Newmarket Till based on the SWHTs performed on-site are more akin to the K values of silts and clays than they are to sandier soil types (e.g., silty sand) (Freeze & Cherry, 1979). Furthermore, studies which have evaluated infiltration into the

Newmarket Till have estimated that it can have as little as 35 to 50 mm of recharge per year (Sharpe, 2022), which is more akin to recharge rates found in clayey soils. Therefore, the SWPDM's 'tight impervious clay' soil type was selected as a representative soil type for both the till and fine-grained glaciolacustrine deposits on-Site. Because a small portion of the Site has coarse-grained glaciolacustrine deposits at surface, the overall SWPDM soil infiltration factor was taken to be 0.15, halfway between the 'tight impervious clay' and 'medium combinations of clay and loam' infiltration factors.

Based on these assumptions, the calculated infiltration factor for landscaped areas and forested areas is 0.35 and 0.45 respectively, as summarized in Table 7.

Table 7 Infiltration Factor Calculations for Landscaped Areas and Forested Areas.

Infiltration Factor	Landscaped Areas	Forested Areas
Topography	Hilly = 0.1	Hilly = 0.1
Soil	Majority Low Permeability Soils = 0.15	Majority Tight Impervious Soils with Some Permeable Sand = 0.15
Cover	Cultivated Lands = 0.1	Woodland = 0.2
Infiltration Factor (I)	**0.35**	**0.45**

For the post-development water balance, the septic effluent discharge is also considered net recharge / infiltration for the Site's water balance. Septic effluent discharge is considered to be 100% recharge/infiltration, as the lots will be serviced by a municipal water supply and as the septic systems will be below grade. Guideline D-5-4 recommends that a septic effluent discharge rate of 1,000 L/day is assumed for residential lots. Given that there are 16 proposed lots, the total septic effluent discharge is set as 16,000 L/day, or 5,840 m^3/year.

5.4 Pre-Development Water Balance

The water balance for the existing conditions of the Site is summarized in Table 8. The pre-development infiltration rate was calculated to be about 14,922 m^3/year and the runoff rate was about 36,120 m^3/year.

Table 8 Pre-Development Water Balance

Land Use		Area (m²)	Precipitation (m³/year)	Evapo-transpiration (m³/year)	Infiltration (m³/year)	Run-off (m³/year)
Wetland Area		49,400	42,237	24,354	-	17,883
Pervious Recharge Areas	Forested Area	91,600	78,318	45,159	14,922	18,238
	Landscape Area	-	-	-	-	-
Total		**141,000**	**120,555**	**69,513**	**14,922**	**36,120**

5.5 Post-Development Water Balance

The post-development water balance is summarized in Table 9. Just considering the 'natural' portion of the water balance (with septic effluent excluded), the post development infiltration rate was calculated to be about 11,544 m³/year, while the runoff volume was calculated to be about 44,517 m³/year. With effluent discharge considered, the runoff remains unchanged (as the effluent directly discharges to the overburden) but the infiltration rate increases to 17,384 m³/year.

Table 9 Post-Development Water Balance

Land Use		Area (m²)	Precipitation (m³/year)	Evapo-transpiration (m³/year)	Infiltration (m³/year)	Run-off (m³/year)
Impervious Areas	Paved Area	8,236	7,042	704	-	6,338
	Roof Area	4,080	3,488	349	-	3,140
Wetland Area		49,400	42,237	24,354		17,883
Pervious Recharge Area Pervious Areas	Forested Area	41,400	35,397	20,410	6,744	8,243
	Landscape Area	37,884	32,391	18,677	4,800	8,914
Totals Before Effluent		**141,000**	**120,555**	**64,494**	**11,544**	**44,517**
Effluent Discharge from Septic Systems		-	-	-	5,840	-
Totals With Effluent		**141,000**	**120,555**	**64,494**	**17,384**	**44,517**
Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.						

5.6 Water Balance Comparison

The water balances of the pre-development and post-development scenarios are summarized below in Table 10.

Table 10 Water Balance Comparison

	Precipitation (m^3/year)	Evapotranspiration (m^3/year)	Infiltration (m^3/year)	Run-off (m^3/year)
Pre-Development	120,555	69,513	14,922	36,120
Post-Development	120,555	64,494	17,384	44,517
Change in Volume	-	-5,019	2,462	8,396
Change in %	**-**	**-7**	**+17**	**+23**
Post-development values above consider septic effluent discharge.				

Based on the above, runoff is expected to increase by 8,396 m^3/year from pre- to post-development conditions. The infiltration rate will be reduce from 14,922 to 11,554 m^3/year, however when septic effluent loading is included (5,840 m^3/year), the infiltration rate increases to 17,384 m^3/year. The post-development infiltration rate is expected to be greater than the pre-development infiltration rate.

6.0 Wastewater Assessment

As per Guideline D-5-4 *Technical Guideline for Individual On-Site Sewage Systems: Water Quality Risk Assessment* (Ministry of the Environment, 1996), an assessment was completed to determine the feasibility of utilizing on-Site sewage disposal for the development.

The creation of 16 new residential lots will increase wastewater effluent loading into the overburden soils in the area and subsequently the shallow overburden aquifer that is present regionally. Within the effluent, nitrate is considered the key contaminant due to the human health concerns.

Guideline D-5-4 requires that the effluent plume at the Site boundary to be within the ODWQS limit of 10 mg/L for nitrate to prevent contamination of adjacent properties. Guideline D-5-4 also states that "*the Ministry will normally not support development in areas where background nitrate-nitrogen concentrations exceed 10mg/L*". Given that background nitrate concentrations in the groundwater are well below the ODWQS limit (as described in Section 4.1), a mass balance of nitrate at the Site is warranted to evaluate if the proposed development is likely to meet the requirements of Guideline D-5-4. The following sections will outline the methods and results of the nitrate loading assessment.

6.1 Predictive Assessment

Although natural processes and soil interaction can result in nitrate being attenuated in the receiving aquifer system, Guideline D-5-4 states that only dilution can be used as the principal attenuation mechanism to predict future nitrate concentrations. As such, a mass balance calculation is used here to determine the potential impact of developing residential lots on the Site.

For the mass balance, Guideline D-5-4 recommends that a septic effluent discharge rate of 1,000 L/day is assumed for residential lots, and that the nitrate concentration in that effluent be set at 40 mg/L. Therefore, as mentioned in Section 5.3, the total effluent discharge is taken to be 16,000 L/day. Although groundwater throughflow from upgradient areas may contribute to nitrate dilution, it is conservatively assumed that only precipitation infiltrating within the Site

boundaries acts to dilute the effluent discharge. It was assumed that the concentration of nitrate in precipitation was 0.1 mg/L.

The mass balance calculation to estimate the nitrate concentration at the property boundaries is outlined below as:

$$QtCt = QeCe + QiCi$$

Where:

- Qt = Total dilution volume ($Qe + Qi$)
- Ct = Total concentration of nitrate at the property boundary
- Qe = Volume of septic effluent
- Ce = Concentration of nitrate in effluent (40 mg/L)
- Qi = Volume of groundwater recharge (11,544 m³/year – from Table 9)
- Ci = Concentration of nitrate in groundwater recharge (0.1 mg/L)

In order to determine the concentration of nitrate at the property boundary (Ct), the above mass balance equation is arranged as follows:

$$Ct = (QeCe + QiCi)/Qt$$

This equation was used for the developable portion of the Site. The results of the equation have been outlined in Table 11 below:

Table 11 Predictive assessment of nitrate concentration without mitigation

Variable	Value
Number of Lots on Site	16
Volume of Sewage Effluent (Q_e)	16 Lots x 1,000 L/day = 16,000 L/day
C_e	40 mg/L
Q_i	31,627 L/day
C_i	0.1 mg/L
Q_t	47,627 L/day
C_t	**13.5 mg/L**

With no treatment and assuming that only groundwater recharge on-Site is used to dilute effluent and that no roof-runoff infiltrates into the ground, the resultant nitrate concentration at the property boundary is 13.5 mg/L. As 13.5 mg/L is greater than the ODWQS limit of 10 mg/L,

use of on-site septic systems for the 16 proposed lots would require (1) an increase the on-Site groundwater recharge rate, or (2) a decrease in the concentration of nitrate in the septic effluent discharge, or a combination of both.

In regard to Point 2 above, some advanced treatment systems capable of Level IV treatment can reduce the concentration of nitrate to approximately 50% of that of a conventional wastewater treatment system (to approximately 20 mg/L). These units could be used to increase lot density for the proposed development while complying with the requirements of Guideline D-5-4. Even without increasing infiltration, if the nitrate concentration in the septic effluent discharge is reduced to 20 mg/L in the mass balance above, the nitrate concentration at the property boundary would be 6.8 mg/L, as shown in Table 12. Therefore, advanced treatment of effluent discharge is deemed as a feasible method for the proposed development to comply with the requirements in Guideline D-5-4.

Table 12 Predictive assessment of nitrate concentration with advanced treatment.

Variable	Value
Number of Lots	16
Volume of Sewage Effluent (Q_e)	16 Lots x 1,000 L/day = 16,000 L/day
C_e	20 mg/L
Q_i	31,627 L/day
C_i	0.1 mg/L
Q_t	47,627 L/day
C_t	**6.8 mg/L**

6.1.1 Conceptual Site Layout

A conceptual wastewater treatment system layout is shown in Figure 5, and is based upon the information provided the Client (specifically the footprint of the proposed dwellings and wastewater treatment systems). The conceptual locations of primary and reserve beds are outlined on Figure 5, in addition to the location of the dwellings. The proposed lot sizes in the development plan are considered sufficient since a primary and a reserve bed, plus a dwelling, could be placed within each lot. It is noted that the conceptual locations of the dwellings did not necessarily take into consideration existing or proposed grades. The surface grades of the site,

once developed, should be reviewed considered when finalizing the development plan (specifically in consideration of the wastewater treatment systems).

7.0 Source Water Protection and Risk Management

As discussed in Section 3.3, the Site is in a HVA, WHPA, and a SGRA, with the Otonabee-Peterborough Source Protection Area (Appendix A). The policy information included in this Section was taken from the Trent Source Protection Plan (TCCSPR, 2024). Further, this section of the report addresses concerns raised by Otonabee Conservation in a memo dated April 18, 2024 (Otonabee Conservation, 2024).

7.1 HVA

An HVA is an aquifer that can be easily changed or affected by contamination from both human activities and natural processes. This is a result of preferential pathways to the aquifer or the areas intrinsic susceptibility as a function of the thickness and permeability of the overlying soils. In Ontario, a HVA is defined as having an Intrinsic Susceptibility Index (ISI) of less than 30. In general, an HVA will consist of granular materials (e.g., sand and/or gravel) or fractured rock that has a high permeability and is near the surface of the ground. It is important to protect highly vulnerable areas to prevent drinking water contamination.

In accordance with the Trent Assessment Report (Volume 1), the activities that are or would be drinking water threats in highly vulnerable aquifers and significant groundwater recharge areas include the following:

1. Activities prescribed to be drinking water threats in paragraphs 19 and 20 of subsection 1.1 (1) of O. Reg 287/07 (paragraphs relate to taking water and reducing recharge, respectively).
2. Activities identified as local threats by the Source Protection Committee
3. Activities that contribute to drinking water issues.

Development activities should be mindful of water taking and reducing water recharge in the highly vulnerable area located on the Site. There is a local threat in the Otonabee-Peterborough Source Protection Area related to landscaping (e.g. mown grass) that promotes waterfowl gathering next to watercourses, but not in the Keene Heights Subdivision Municipal Well. No issue contributing areas were identified at the Site.

7.2 WHPA

WHPAs are vulnerable areas around groundwater wells which could be susceptible to contamination. The WHPAs are delineated by the time that the contaminant would take to reach the municipal well supply. The delineation divided into protective zones around the well. These zones are not perfect circles; instead, it is determined via a function of how water travels underground and is influences by slope of the land, depth of the well, sediment type, etc.)

The WHPAs are delineated as follows:

- WHPA-A: The area within a 100-metre radius from a wellhead. This area is considered the most vulnerable area for well intakes.
- WHPA-B: The area within which the time of a contaminant could travel to the well is up to and including 2 years. This area excludes the area from WHPA-A.
- WHPA-C: The area within which the time of a contaminant could travel to the well is up to and including 5 years. This area excludes the area from WHPA-A and WHPA-B.
- WHPA-D: The area within which the time of a contaminant could travel to the well is up to and including 25 years. This area excludes the area from WHPA-A, WHPA-B, and WHPA-C.
- WHPA-E: The area is only delineated if there is surface water influence on the municipal well.

As per SPIA mapping, the Site falls within the Keene Heights Subdivision Municipal Well System (Figure 6), specifically for Well 4. The WHPAs on the Site include: WHPA-A (vulnerability score of 10), WHPA-B (vulnerability score of 8 and 6), WHPA-C (vulnerability score of 6 and 2) and WHPA-D (vulnerability score of 2). A policy applicability map can be found in Appendix I.

As per the Risk Management Office Memo, the following activities were considered significant threats.

- Handling and/or storage of liquid fuel (> 250L) may be prohibited.
- Storm water management pond within 100 m of the municipal well and will be a significant threat under updated Technical Rules expected to come into effect before 2025 and will be subject to the municipal Environment Compliance Approval.
- Sewage systems in the areas of highest vulnerability will be subject to mandatory inspection programs as required by the Ontario Building Code.

7.2.1 Stormwater Management Pond

The Risk Management Office Memo included a review of an older version of the proposed development plan, which outlined the stormwater management pond being within the 100 m of Well 4. The stormwater management strategy has now changed, and stormwater will now be directed further northeast of the municipal supply well to a series of storage tanks located beneath the access roadway. The storage tanks will be located outside of the 100 m radius of Well 4 (Jewell Engineering, 2024). As such, the proposed stormwater management plan is considered compliant with applicable source protection policies. The locations of the storage tanks are outlined in Appendix A.

7.2.2 Septic Systems

This activity is considered a significant drinking water threat within a WHPA-A (10). It is expected that all wastewater treatment systems being installed in the development will be less than 10,000 litres and be regulated by the *Ontario Building Code Act.* As such, the following policy applies:

S-5(1) – *where connection to a municipal sewage collection system is not feasible, new development will be serviced by a sewage system constructed to standards of the Ontario Building Code to ensure that the activity is not a significant drinking water threat.*

Further to the policy noted above; to avoid future nitrate issues, the systems should be designed with advanced Level IV treatment as discussed in Section 6.1.

Cambium expects that the all the wastewater systems will be inspected regularly, once constructed, as required by Otonabee Conservation (2024). As such, the proposed wastewater treatment systems are considered to be in compliance with applicable source protection policies.

7.2.3 Fuel Storage

Future handling and storage of fuel in quantities greater than 2,500 L is prohibited in a WHPA-A (10) unless it is stored for use in a back up generator, intended for use during a municipal emergency (Policy F-1).

Seeing as the proposed development is for residential development, a significant amount of fuel storage is not expected. Once developed, signage can be posted to outline the restrictions on fuel storage.

7.3 SGRA

The Site is located in a SGRA with a vulnerability score of 4 in the southwest corner of Site, with the remainder of the Site not within a SGRA.

SGRAs are areas on the landscape, which are characterized by porous soils, such as sand or gravel, which allows water to seep easily into the ground and flow to an aquifer. A recharge area is considered significant when it helps maintain the water level in an aquifer that supplies a community or private residence with drinking water.

The proposed development would decrease infiltration into the subsurface by increasing impervious areas. However, once effluent disposal is considered (see the water balance in Section 5.0), total water infiltration on-site is expected to increase when compared to pre-development conditions. Seeing as pre-development infiltration rates will be maintained (at least) upon development, the SGRA found onsite is not expected to be significantly influenced.

The wastewater treatment systems must be built in accordance with the Ontario Building Code. In addition, Cambium recommends that the wastewater treatment systems include a form of advanced treatment to reduce the concentration of nitrate in effluent by approximately

50%. In consideration of the above, the impact on the groundwater recharge are considered to be low to negligible.

7.4 Transport Pathways

An analysis of transport pathways was included in Sections 3.5.1 and 3.5.2 of this report. In summary, some excavations may extend a few meters into the confining layer overlying the supply aquifer into which the Keene Heights Subdivision Well 4 has been installed. Available information indicates that there will still be several meters of confining material remaining, even after the excavations are completed (between 7.5 and 7.9 m). Further, the confining sediments have been shown to have a very low hydraulic conductivity. Due to the above, and based off of available data, the water quality of the underlying supply aquifer is not likely at risk of significant degradation upon development of the Site. Investigations of the confining condition can be reviewed at a later date, if needed, upon review of this information by regulating authorities.

Cambium recommends that all construction and development activities remain above the groundwater table when possible. This is to further reduce potential influences on the underlying supply aquifer.

8.0 Conclusions and Recommendations

Cambium was retained by Yvette Johnson to complete a hydrogeological assessment of the property located at 74 Edwards Drive, Keene, Ontario.

The Site was determined to overlie deep overburden deposits (tens of meters thick), primarily consisting of Newmarket Till. A north-south trending ridge runs through the central-western portion of the Site, with groundwater west of this divide presumed to flow southwest towards Rice Lake and groundwater east of this divide presumed to flow southeast towards the Indian River and/or Rice Lake.

Based on water level measurements from March and April 2024, the water table is shallow and groundwater depths ranged from 0.29 to 2.98 mbgs. The estimated hydraulic conductivities of the shallow soils ranged between 4×10^{-9} m/sec and 2×10^{-7} m/sec.

Accounting for septic effluent discharge post-development, the post-development water balance resulted in a net infiltration surplus of 2,462 m^3/year compared to the pre-development infiltration rate, while the runoff rate is expected to increase by 8,396 m^3/year. As infiltration is expected to be greater post-development than pre-development, no LID measures are necessarily required to maintain pre-development infiltration rates.

With traditional wastewater treatment systems (i.e., no nitrate reduction), the predicted nitrate concentration at the property boundary was calculated to be 13.5 mg/L. As this concentration exceeds the ODWQS limit of 10 mg/L, additional measures would be required to develop the Site with the proposed 16 lots.

When advanced treatment systems that can reduce the concentration of nitrate in effluent to 20 mg/L are considered, the calculated nitrate concentration at the property boundary reduces to 6.8 mg/L. Therefore, advanced treatment of septic discharge is deemed a feasible method for the development to be completed at the proposed density and meet the requirements in Guideline D-5-4.

It is noted that the conceptual locations of the dwellings did not necessarily take into consideration existing or proposed grades. The surface grades of the site, once developed,

should be reviewed considered when finalizing the development plan (specifically in consideration of the wastewater treatment systems).

Cambium expects that the all the wastewater will be inspected regularly, once constructed, as required by Otonabee Conservation. As such, the proposed wastewater treatment systems are considered to be in compliance with applicable source protection policies.

The proposed stormwater management system includes a series of tanks beneath the access roadway. The storage tanks will be located outside of the 100 m radius of the Keene Heights Subdivision. As such, the proposed stormwater management plan is considered to be compliant with applicable source protection policies.

Seeing as the proposed development is for residential development, a significant amount of fuel storage is not expected. Once developed, signage can be posted to outline the restrictions on fuel storage.

Total water infiltration on-site is expected to increase when compared to pre-development conditions (when infiltration from the wastewater treatment systems is considered). Seeing as pre-development infiltration rates will be maintained (at least) upon development, the SGRA found onsite is not expected to be significantly influenced.

Available information indicates that there will still be several meters of confining material remaining, even after the excavations are completed (between 7.5 and 7.9 m). Further, the confining sediments have been shown to have a very low hydraulic conductivity. Due to the above, and based off of available data, the water quality of the underlying supply aquifer is not likely at risk of significant degradation upon development of the Site. Investigations of the confining condition can be reviewed at a later date, if needed, upon review of this information by regulating authorities.

Cambium recommends that all construction and development activities remain above the groundwater table when possible. This is to further reduce potential influences on the underlying supply aquifer.

9.0 Closing

Cambium trusts that this report meets with your expectations. If you have any questions or require clarification of any aspect of this submission, please do not hesitate to contact the undersigned at (705) 742-7900.

Respectfully submitted,

Cambium Inc.

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11.0 Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

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Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.

Reliance

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Personal Liability

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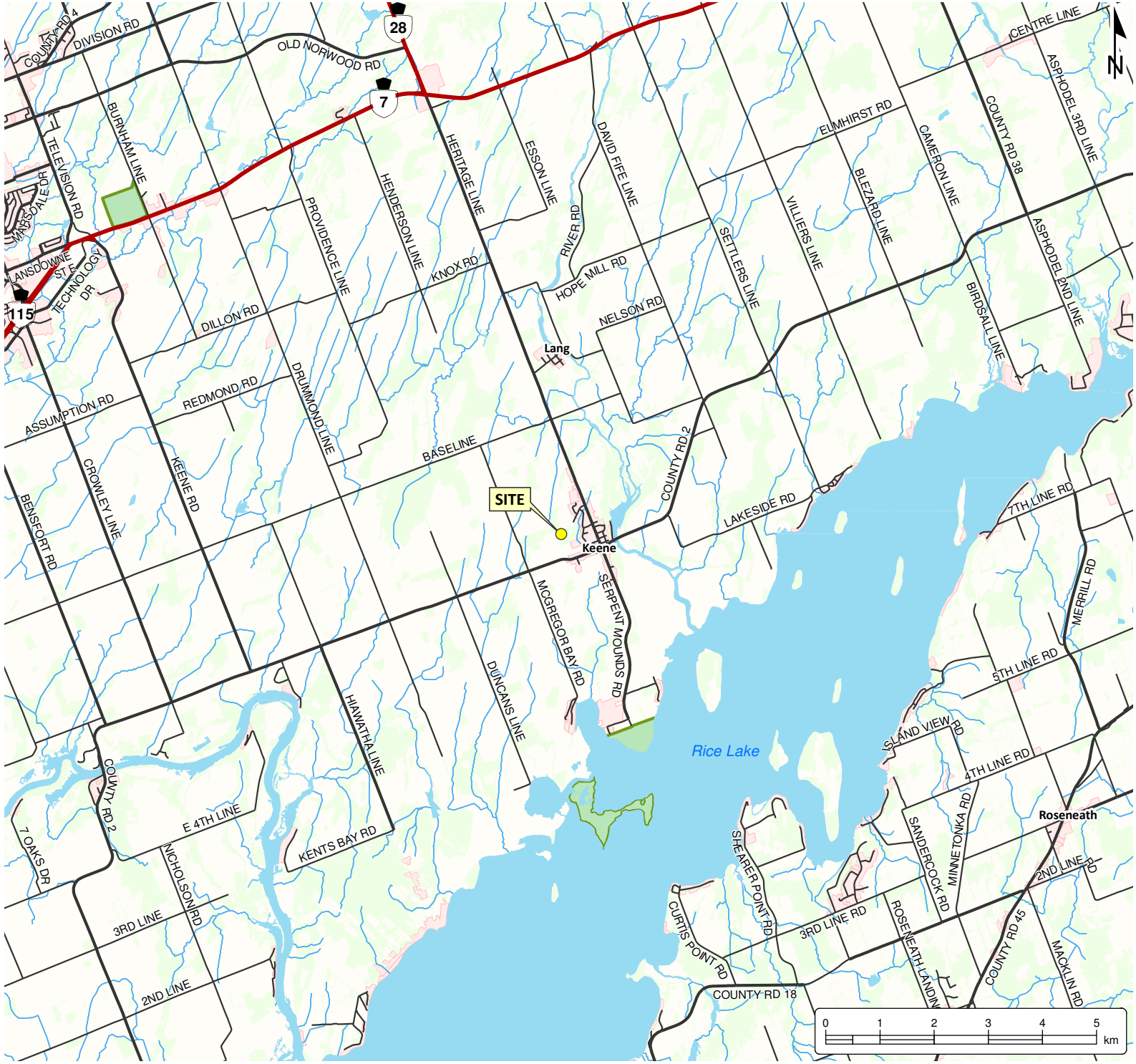
Appended Figures



HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON
74 Edwards Drive,
Keene, Ontario

LEGEND

- Highway
- Major Road
- Minor Road
- Watercourse
- Water Area
- Provincial Park
- Wooded Area
- Built Up Area

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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REGIONAL LOCATION MAP

Project No.: 15831-002		Date: December 2022	Rev.:
Scale: 1:100,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: KW	Figure: 1	

O:\GIS\MXDs\15800-15899\15831-002 Yvette Johnston - HydroGeo - Estate Subdivision\2022-12-13 FIG 1 - Regional Location Map.mxd

HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON
74 Edwards Drive
Keene, Ontario

LEGEND

- Benchmark
- Borehole
- Monitoring Well
- Test Pit
- Site (approximate)

Notes:
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SITE PLAN

Project No.: 15831-002		Date: October 2024 Rev.:	
Scale: 1:3,000		Projection: NAD 1983 UTM Zone 17N	
Created by: MAT	Checked by: CM	Figure:	2

O:\GIS\MXDs\15800-15899\15831-002 15831-002 Yvette Johnston - HydroGeo - Estate Subdivision\2024-05-15 Hydro G.aprx

HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON
74 Edwards Drive,
Keene, Ontario

LEGEND

- Water Well Records
- StudyArea (500m)
- Site (approximate)

Notes:
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MECP WELL RECORDS WITHIN 500m

Project No.: 15831-002		Date: December 2022 Rev.:	
Scale: 1:8,500		Projection: NAD 1983 UTM Zone 17N	
Created by: PAS	Checked by: KW	Figure:	3

O:\GIS\MXDs\15800-15899\15831-002 15831-002 Yvette Johnston - HydroGeo - Estate Subdivision\2022-12-07 FIG 3 MECP Well Records.mxd

HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON
74 Edwards Drive
Keene, Ontario

LEGEND

- Benchmark
- Borehole
- Monitoring Well
- (231.23) Groundwater Elevation (April 19, 2024)
- Groundwater Flow Direction
- Groundwater Contour (1m interval)
- Surface Contour (5m intervals)
- Site (approximate)

Notes:
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GROUNDWATER CONTOUR PLAN

Project No.: 15831-002		Date: January 2025	Rev.:
Scale: 1:2,500		Projection: NAD 1983 UTM Zone 17N	
Created by: MAT	Checked by: CM	Figure: 4	

O:\GIS\MXDs\15800-15899\15831-002 15831-002 Yvette Johnston - HydroGeo - Estate Subdivision\2024-05-15 Hydro G.aprx

HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON
74 Edwards Drive
Keene, Ontario

LEGEND

- 3.3m Property Line Setback
- Proposed Septic Primary Bed (150m²)
- Proposed Septic Reserve Bed (150m²)
- Proposed Building Footprint
- Site (approximate)

Notes:
- Concept Sketch reference created by RFA Planning Consultant Inc.
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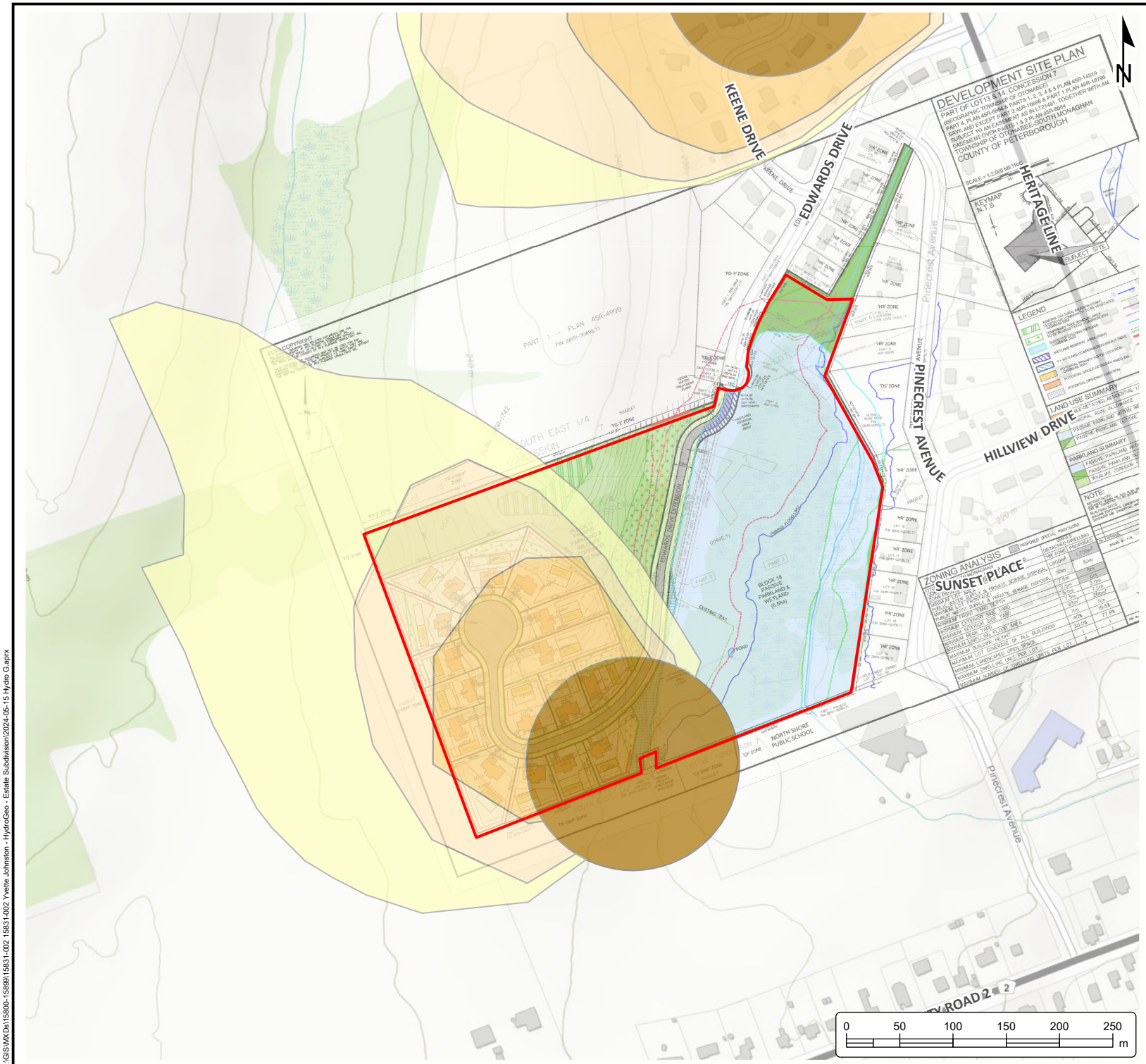
CONCEPTUAL WASTEWATER TREATMENT SYSTEM LAYOUT

Project No.: 15831-002		Date: January 2025	
		Rev.:	
Scale: 1:2,000		Projection: NAD 1983 UTM Zone 17N	
Created by: MAT	Checked by: CM	Figure: 5	

O:\GIS\MXDs\15800-15899\15831-002 15831-002 Yvette Johnston - HydroGeo - Estate Subdivision\2024-05-15 Hydro G.aprx



HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON
74 Edwards Drive
Keene, Ontario

LEGEND

- Site (approximate)

Wellhead Protection Zone

- Area A
- Area B
- Area C
- Area D

Notes:
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WELLHEAD PROTECTION AREA

Project No.: 15831-002		Date: January 2025 Rev.:	
Scale: 1:5,000		Projection: NAD 1983 UTM Zone 17N	
Created by: MAT	Checked by: CM	Figure:	6

O:\GIS\MXDs\15800-15899\15831-002 15831-002 Yvette Johnston - HydroGeo - Estate Subdivision\2024-05-15 Hydro G.aprx

Appendix A

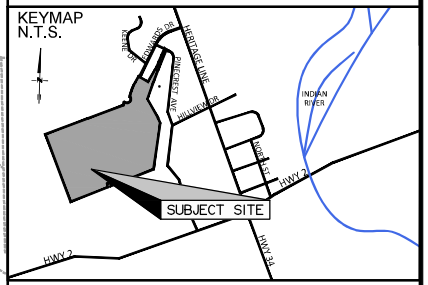
Site Development Plans and Land Information

DEVELOPMENT SITE PLAN

PART OF LOT13 & 14, CONCESSION 7
(GEOGRAPHIC TOWNSHIP OF OTONABEE)
PART 4, PLAN 45R-6864 & PARTS 1, 2, 3, 4 & 5 PLAN 45R-14319
SAVE AND EXCEPT PART 2 45R-16688 & PART 1 PLAN 45R-16795
SUBJECT TO AN EASEMENT AS IN LT21491, TOGETHER WITH AN EASEMENT OVER PARTS 1 & 2 PLAN 45R-6864
TOWNSHIP OF OTONABEE-SOUTH MONAGHAN
COUNTY OF PETERBOROUGH

SCALE = 1:2,000 METRIC
0 40 80m

KEYMAP
N.T.S.



LEGEND

- MINERAL CULTURAL MEADOW (CUM1) VEGETATIVE COMMUNITY - TO BE VEGETATED - CAMBIUM 2024
- TEMPORARY TREE REMOVAL AREA TO BE RE-VEGETATED - CAMBIUM 2024
- SURVEYED EXISTING WETLAND - CAMBIUM, 2022
- WETLAND REMOVAL AREA (580m²)
- 3:1 WETLAND COMPENSATION AREA (1,742m²)
- POTENTIAL PRIMARY SEPTIC LOCATION - CAMBIUM, 2024
- POTENTIAL SINGLE-DETACHED DWELLING
- POTENTIAL DRIVEWAY LOCATION
- TIMMINS FLOODLINE - JEWELL, 2024
- EXISTING NATURAL TRAIL
- 15m FLOODLINE SETBACK
- 30m WETLAND SETBACK
- WATERCOURSE
- EXISTING EASEMENT LINES
- PROPOSED RETAINING WALL
- TOP OF SLOPE - CAMBIUM, 2022
- BOTTOM OF SLOPE - CAMBIUM, 2022
- POTENTIAL SEPTIC RESERVE LOCATION - CAMBIUM, 2024

LAND USE SUMMARY

	AREA(ha.)	AREA%	UNITS
SINGLE-DETACHED RESIDENTIAL LOTS	3.78	26.9	16
MUNICIPAL ROAD ALLOWANCE	1.27	9.0	
PASSIVE PARKLAND WITHIN WETLAND	5.93	42.1	
PASSIVE PARKLAND OUTSIDE OF WETLAND	3.12	22.0	
TOTAL	14.10ha	100.0%	16

PARKLAND SUMMARY

PASSIVE PARKLAND WITHIN WETLAND	5.93
PASSIVE PARKLAND OUTSIDE OF WETLAND	0.62
WILDLIFE CORRIDOR - OUTSIDE WETLAND	2.5
PARKLAND TOTAL	9.05ha

NOTE:

METRIC NOTE:
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO BY DIVIDING BY 0.3048.

BUILDING NOTE:
BUILDING FOOTPRINTS, LANDSCAPED OPEN SPACE AND DRIVEWAYS ARE CONCEPTUAL AND SUBJECT TO CHANGE.

SURVEY NOTE
DRAWING CREATED USING DATA FROM PLAN 45R-14319 BY BENNDER SURVEYING LTD. DATED FEBRUARY 12 2008
CONTOUR DATA PROVIDED BY JEWEL ENGINEERING.

ZONING ANALYSIS

PROPOSED SPECIAL PROVISIONS

OTONABEE-SOUTH MONAGHAN COMPREHENSIVE ZONING BY-LAW No. 2010-65	SINGLE DETACHED DWELLING 'HR' ZONE	PROPOSED
ZONE PROVISION - SECTION 8.2		
MINIMUM LOT AREA PUBLIC WATER SUPPLY & PRIVATE SEWAGE DISPOSAL	1,800m²	1,709m²
MINIMUM LOT FRONTAGE: PUBLIC WATER SUPPLY & PRIVATE SEWAGE DISPOSAL	30m	30m
MINIMUM FRONT YARD DEPTH	7.5m	6m
MINIMUM EXTERIOR SIDE YARD	7.5m	6m
MINIMUM INTERIOR SIDE YARD	3.0m	3.0m
MINIMUM REAR YARD	7.5m	7.5m
MINIMUM DWELLING FLOOR AREA	93m²	266m²
MAXIMUM BUILDING HEIGHT	11m	11m
MAXIMUM LOT COVERAGE OF ALL BUILDINGS	40%	15.5%
MINIMUM LANDSCAPED OPEN SPACE	30.0%	77.8%
MAXIMUM DWELLING UNIT PER LOT	1	1
MAXIMUM NUMBER OF DWELLING UNITS PER LOT	2	1

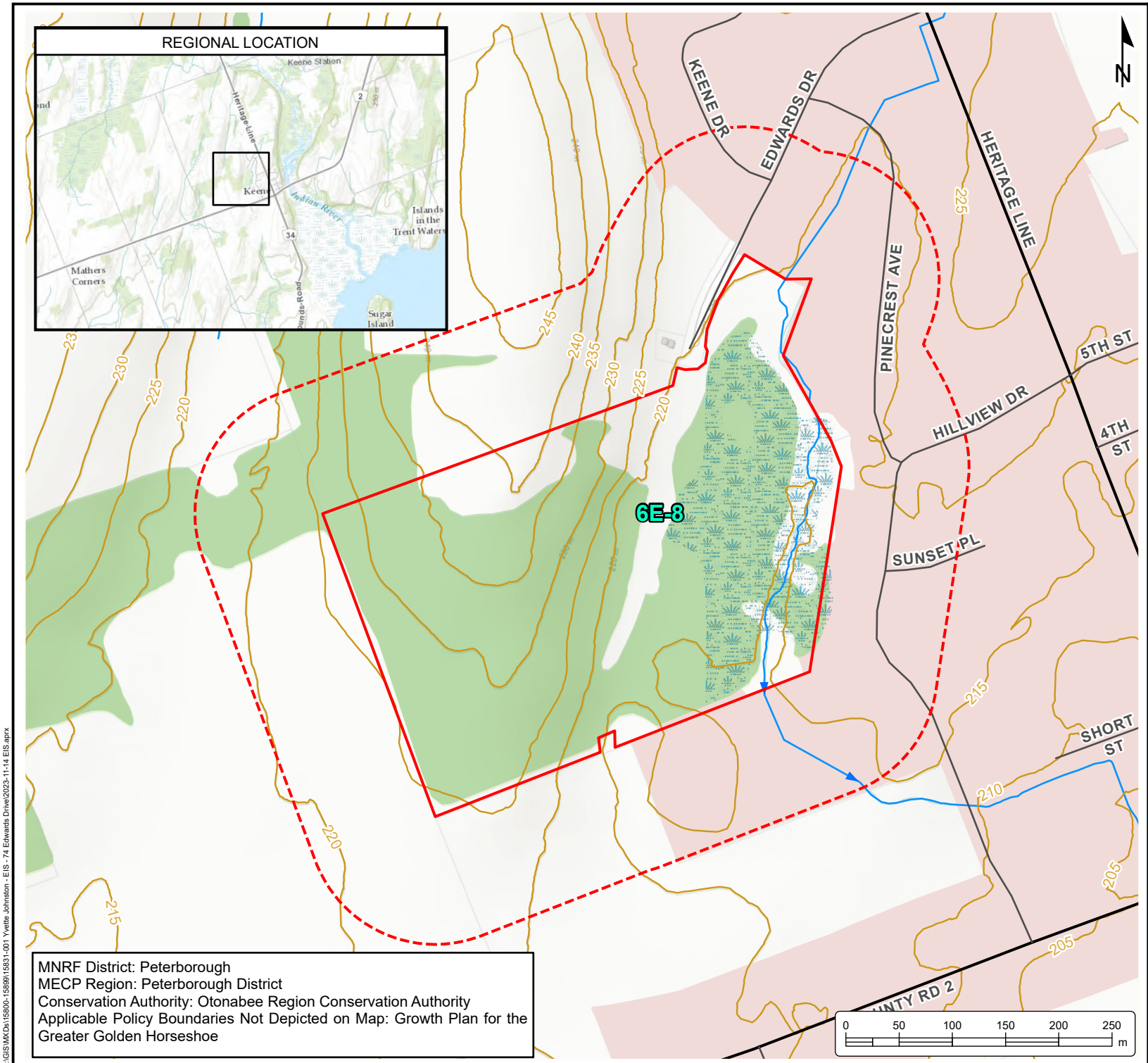
No.	REVISION	DATE	APPR'D

DRAWN BY: F.M. | CHECKED BY: S.L. | DATE: JANUARY 23, 2025 | SCALE: 1:2,000

JAN 23, 2025

JOB No. 888

RFA PLANNING CONSULTANT INC
211 Dundas Street East, Suite 202, Belleville, Ontario, K8N 1E2



HYDROGEOLOGICAL ASSESSMENT

YVETTE JOHNSTON 74
Edwards Drive
Keene, Ontario

LEGEND

- Major Road
- Minor Road
- Contours (5m Interval)
- Watercourse, Permanent
- Wetland Unevaluated
- Wooded Area
- Built Up Area
- Ecodistrict
- 120m Adjacent Lands
- Site (13.91 ha, approximate)

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Site Topography

Project No.: 15831-001		Date: May 2024	Rev.:
Scale: 1:5,000		Projection: NAD 1983 UTM Zone 17N	
Created by: MAT	Checked by: CM	Figure:	

O:\GIS\MXDs\15800-15899\15831-001 Yvette Johnston - EIS - 74 Edwards Drive\2023-11-14 EIS.aprx

Flood Mapping 2022

5/9/2024, 4:19:49 PM

Regulated Area

Floodplain

1:4,514

0 0.03 0.06 0.11 mi

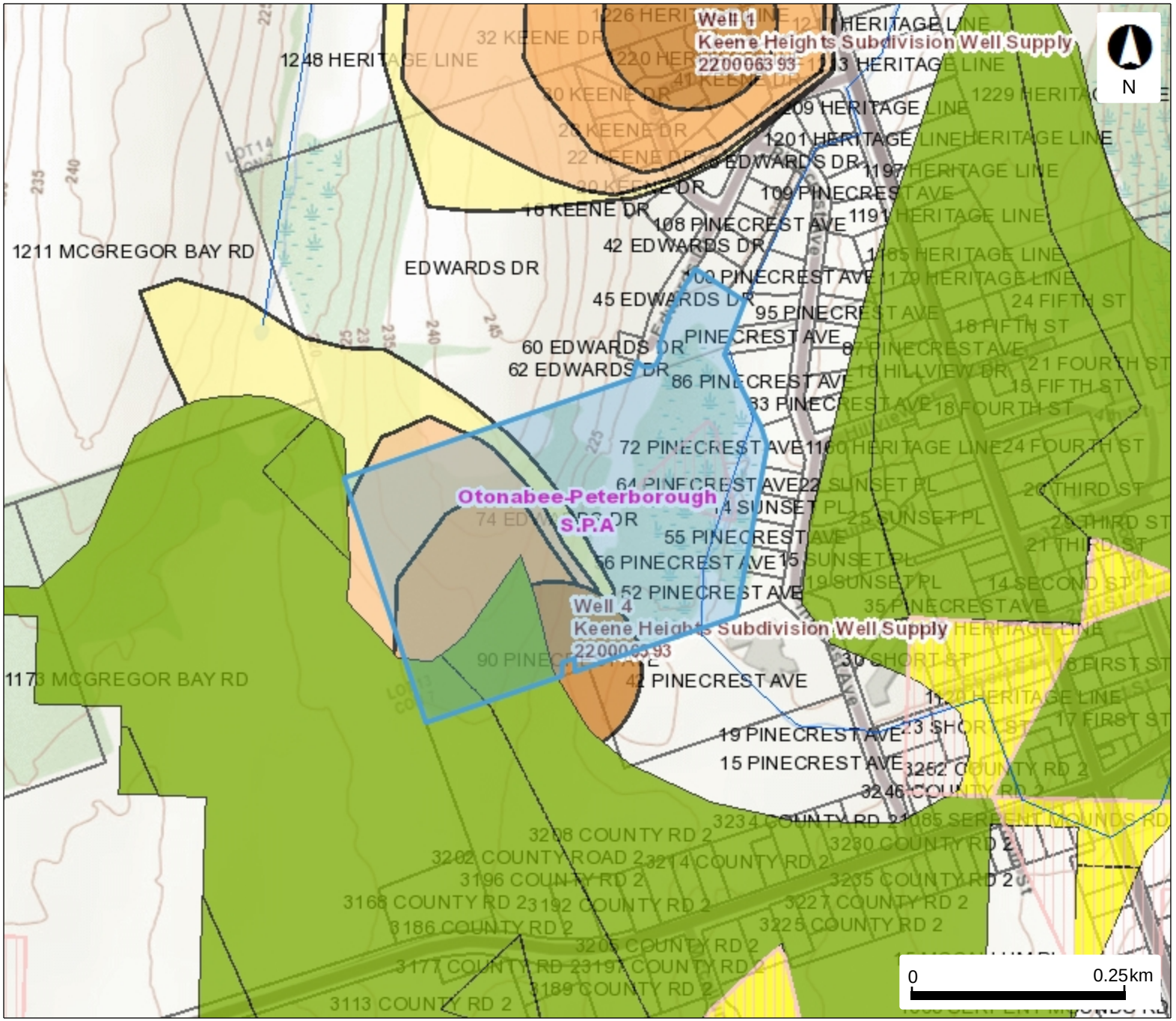
0 0.04 0.09 0.17 km

Esri Canada, Maxar

Printed from the Flood Mapping 2022 Web Application

Otonabee Region Conservation Authority

Source Protection Information Atlas Map



Legend

- Watercourse Direction
- Source Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Area
  - 0
  - 2
  - 4
  - 6
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F
- Intake Protection Zone 1
- Intake Protection Zone 2
- Assessment Parcel with Addre

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Ontario

Map Created: 12/6/2022
Map Center: 44.24327 N, -78.16925 W

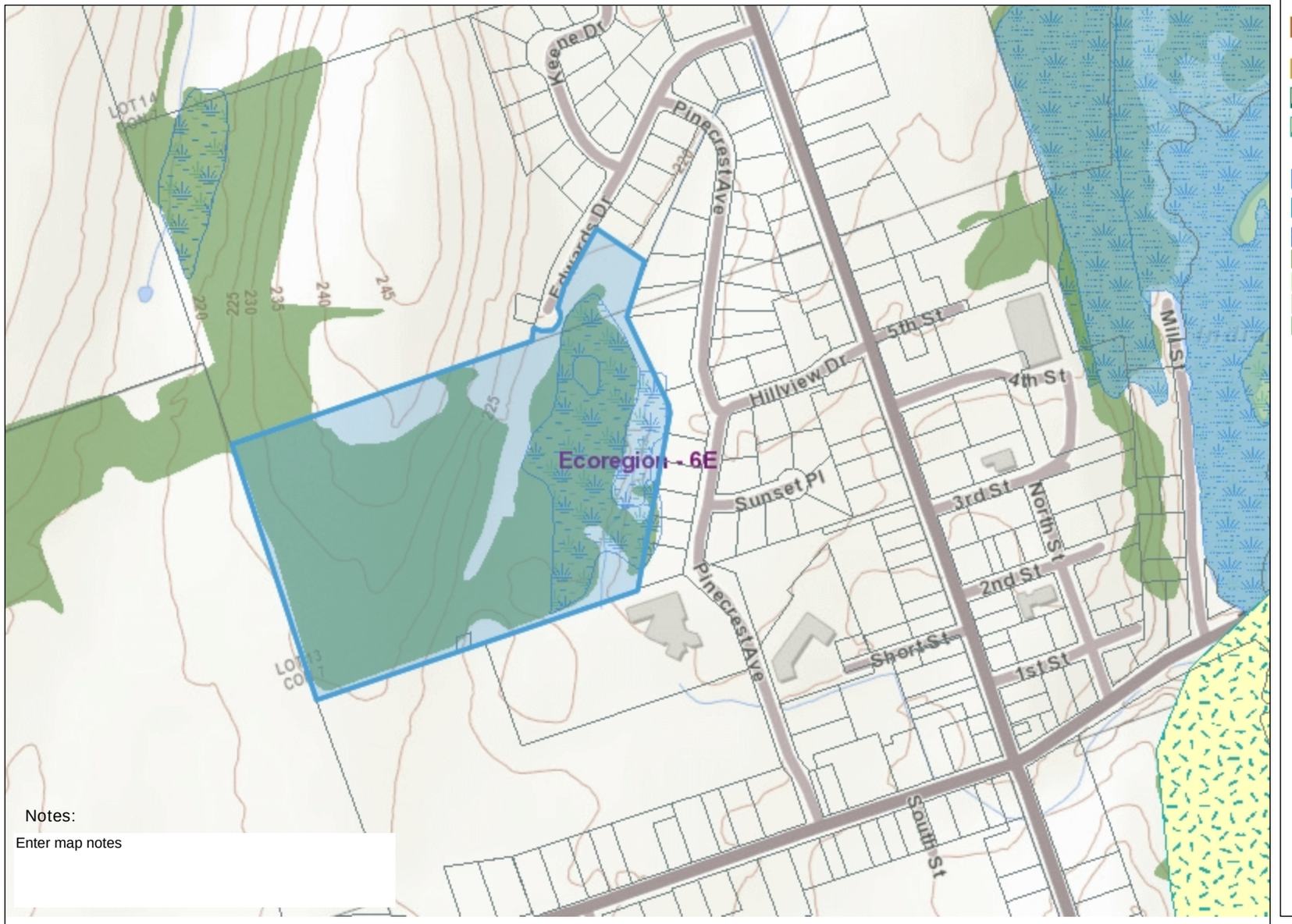
Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Natural Heritage Areas Map

Map created:12/6/2022



Notes:

Enter map notes

Legend

- Assessment Parcel
- Ecoregion
- ANSI
- Earth Science Provincially Significant/sciences de la terre d'importance provinciale
- Earth Science Regionally Significant/sciences de la terre d'importance régionale
- Life Science Provincially Significant/sciences de la vie d'importance provinciale
- Life Science Regionally Significant/sciences de la vie d'importance régionale
- Evaluated Wetland
- Provincially Significant/considérée d'importance provinciale
- Non-Provincially Significant/non considérée d'importance provinciale
- Unevaluated Wetland
- Woodland
- Conservation Reserve
- Provincial Park
- Natural Heritage System

0.3 0 0.16 0.3 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

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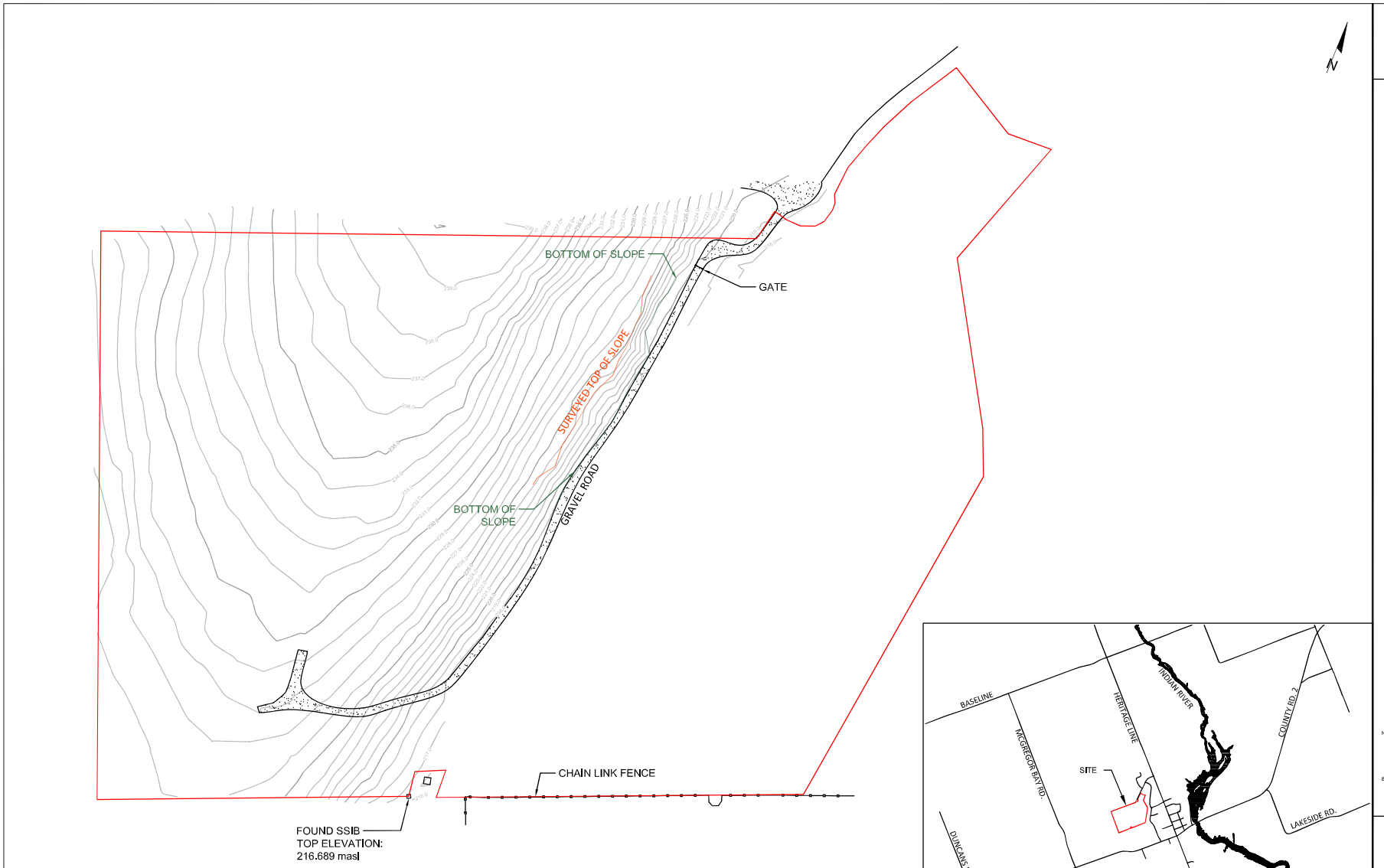

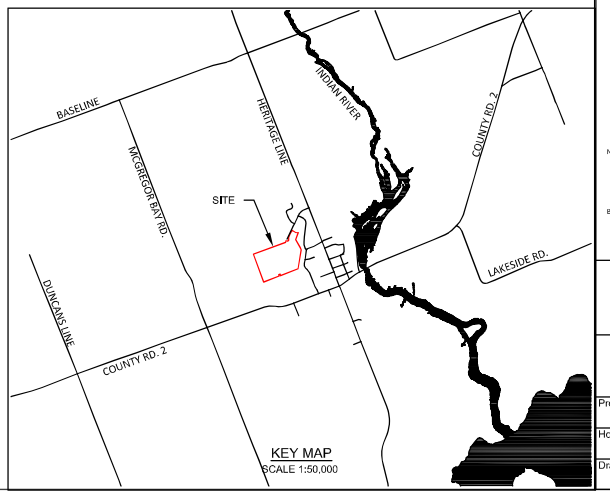

TOPOGRAPHIC SURVEY
YVETTE JOHNSTON

74 Edwards Drive,
Keene, Ontario

LEGEND

Notes:
1. Survey completed by Cambium Inc. July 26, 2022.
2. Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
3. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.

Benchmarks:
1. Cosine benchmark 001196OU3238, with elevation of 206.936. Benchmark is situated 0.642m above ground at the time of the survey. Shot was taken on the ground surface adjacent to the benchmark.

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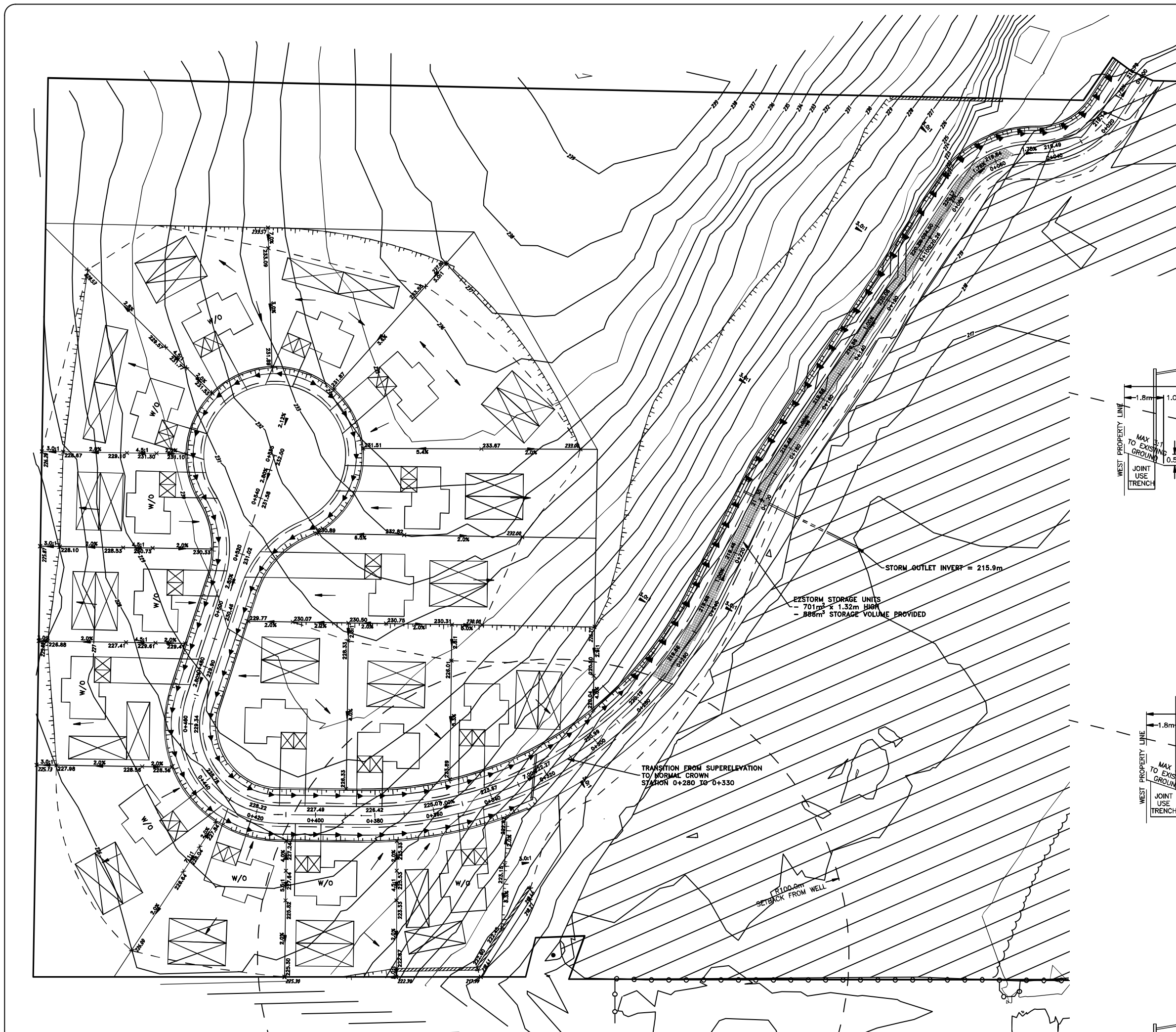
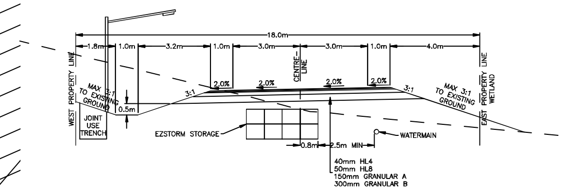
TOPOGRAPHIC SITE PLAN

Project No.:	Date:
15831-001	August 2022
Horizontal Scale:	Vertical Scale:
1:2,000	N/A
Drawn By: MAT	Checked By: JM
Figure: 1	

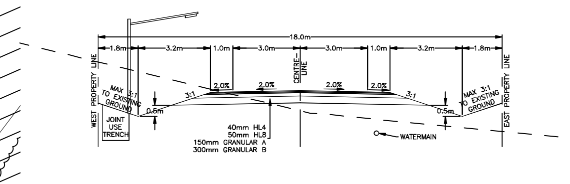
P:\15800 to 15899\15831-001 Yvette Johnston – 185 - 74 Edwards Drive\Graphics\Drawings\CAD\2022\08-09 Topo Site Plan.dwg

09/19/2024

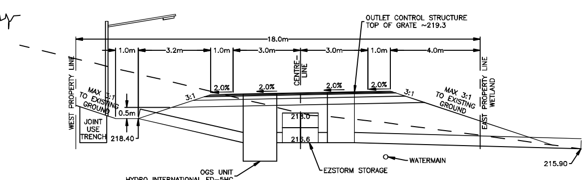




STREET A - TYPICAL CROSS-SECTION
STA. 0+000 TO 0+330



STREET A - TYPICAL CROSS-SECTION
STA. 0+330 TO 0+520



UNDERGROUND STORMWATER STORAGE SYSTEM -
CROSS SECTION @ STA. 0+200

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	11/01/2024	REVISED LOT LAYOUT	JH

LEGEND

- SWALE/DITCH
- TOP OF SLOPE
- TOE OF SLOPE
- RETAINING WALL
- WELLHEAD PROTECTION ZONE (100m)
- 235.00 EXISTING GROUND ELEVATION
- 235.00 PROPOSED GROUND ELEVATION

JEWELL
ENGINEERING

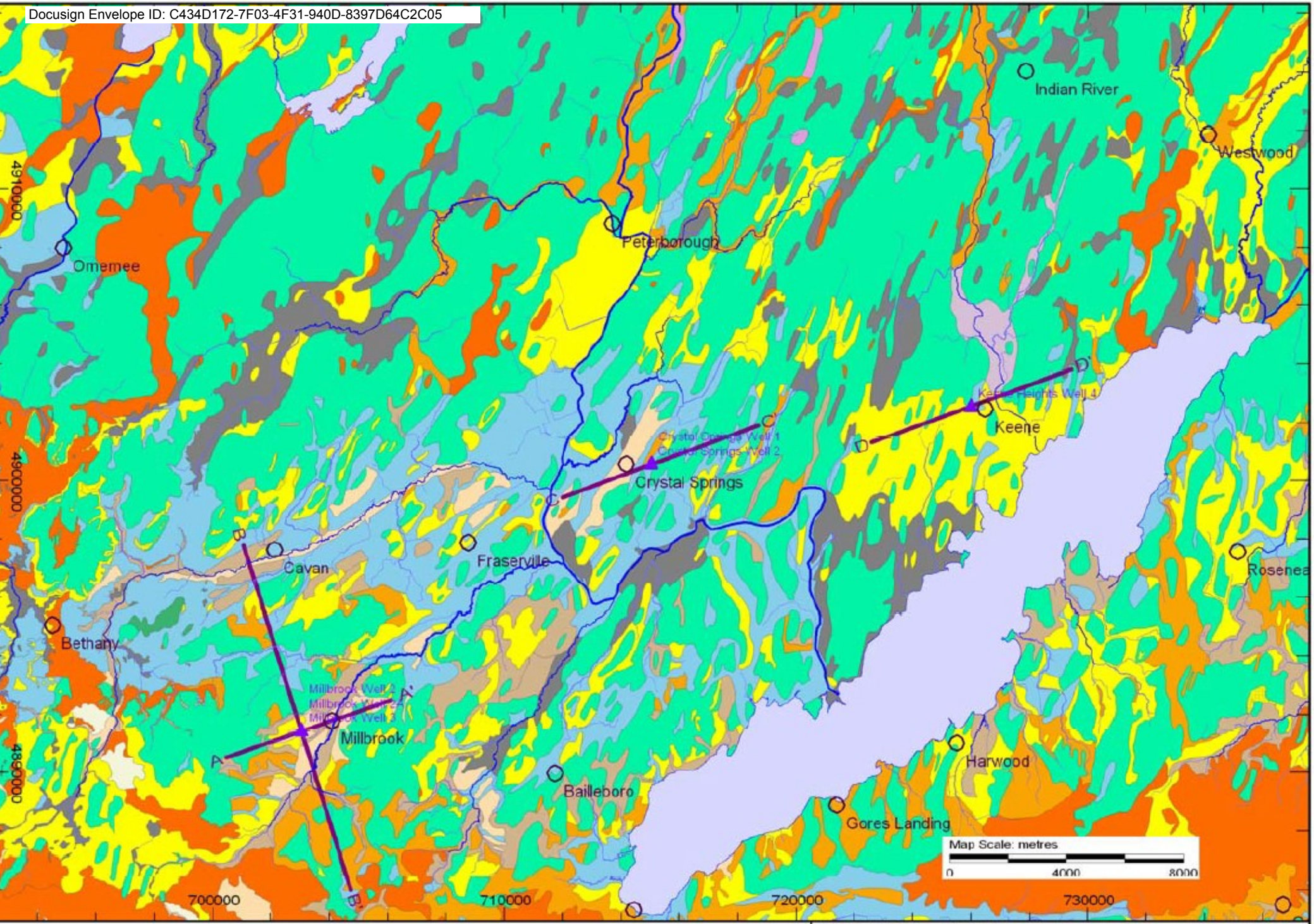
KEENE SUBDIVISION

KEENE, ONTARIO
TOWNSHIP OF OTONABEE-SOUTH MONAGHAN

PRELIMINARY GRADING PLAN

DRAWN BY: JH	PROJECT NO: 220-5237
DESIGNED BY:	DATE: November 2024
CHECKED BY: AMR	SCALE: HORIZONTAL - 1:750, VERTICAL - N/A
APPROVED BY:	CONTRACT NO:
	DRAWING NO: GR-1

F:\FTP\PROJECT FILES\1 CIVIL 3D PROJECT FILES\2205237 - KEENE SUBDIVISION\3 SHEETS\5237 - GR1



Base Map Legend:

- Roads
- Streams
- Lakes

- Ice contact stratified deposits
- Glaciofluvial sand and gravel
- Glaciolacustrine sand and gravel
- Silt to sand till
- Glaciolacustrine silt and clay
- Alluvium
- Organic deposits
- Bedrock
- Geologic Section Line

Earthfx Incorporated

Wellfield Vulnerability - Millbrook, Crystal Springs, and Keene Heights

Surficial Geology - Rice Lake area

March 2010

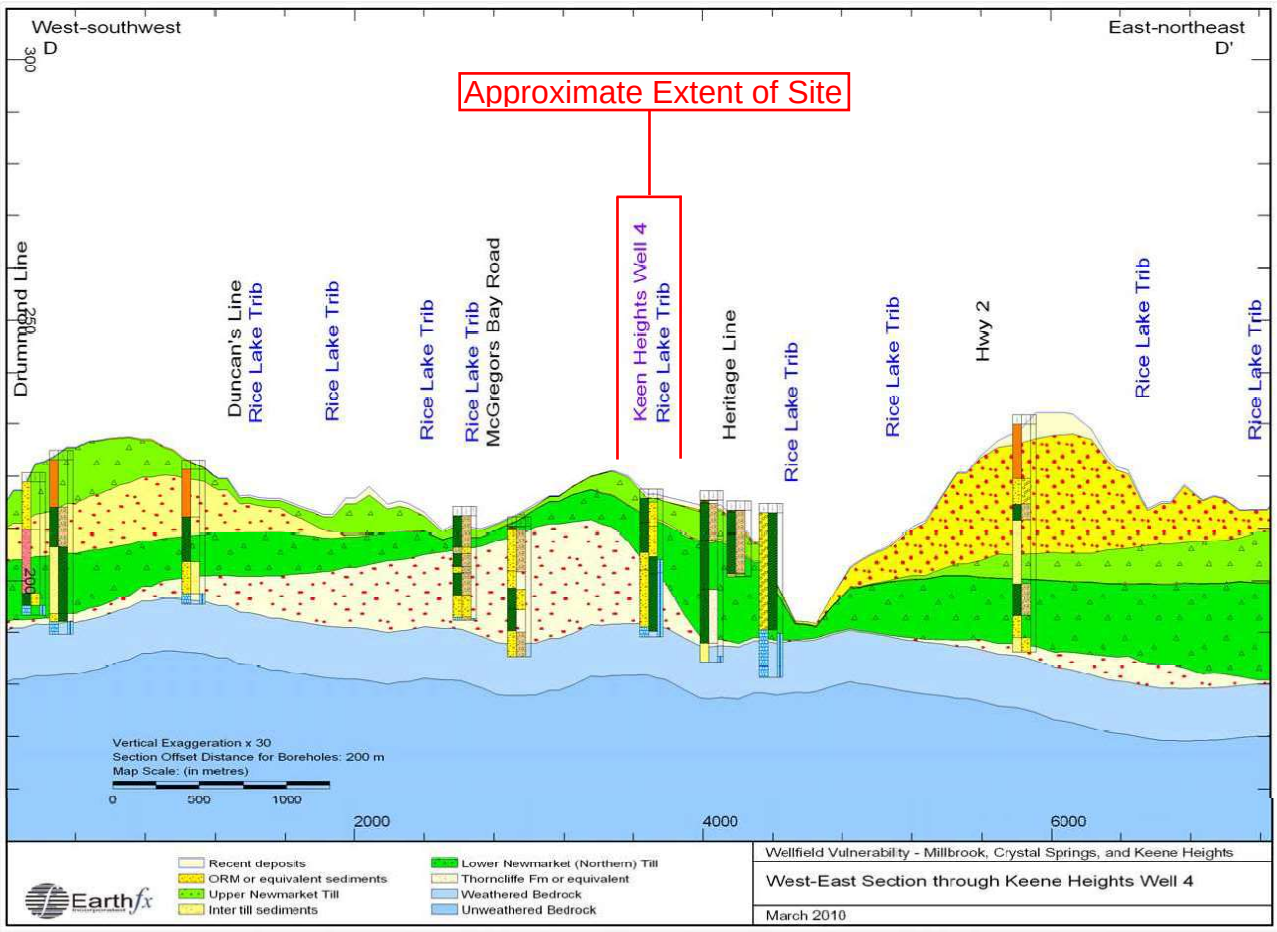


Figure 19: West-East cross section through Keene Heights Well 4 (section line shown on Figure 8).

Appendix B
Test Pit Logs

Appendix B: TEST PIT LOGS

Test Pit ID	Depth (mbgs[1])	Material Description	Sample
TP101-22	0.00-0.30	TOPSOIL, with organics and roots	
	0.30-2.06	Light brown, SAND AND SILT, some gravel, trace cobble, loose, dry	GS1
		Test Pit completed at 2.06 mbgs at specified target depth. Water level and bedrock contact not observed.	
TP102-22	0.00-0.30	TOPSOIL, with organics	
	0.30-1.45	Light brown, SAND AND SILT, trace gravel, trace cobble, loose, dry	GS1
	1.45-2.03	Brown-grey, SAND AND SILT, trace-some clay, trace gravel, compact, dry	GS2
		Test Pit completed at 2.03 mbgs at specified target depth. Water level and bedrock contact not observed.	
TP103-22	0.00-0.23	TOPSOIL, with organics	
	0.23-1.27	Light brown, SAND AND SILT, some gravel, trace cobble, trace boulder, loose, dry	GS1
	1.27-2.13	Grey-brown, SAND AND SILT, trace-some clay, trace gravel, loose, dry	GS2
		Test Pit completed at 2.13 mbgs at specified target depth. Water level and bedrock contact not observed.	
TP104-22	0.00-0.25	TOPSOIL, with organics	
	0.25-0.86	Brown, fine-medium SAND, trace silt, trace gravel, loose, dry	GS1
	0.86-2.06	Light brown-grey, find SAND, trace silt, trace clay, trace gravel, loose, dry	GS2
		Test Pit completed at 2.06 mbgs at specified target depth.	
TP105-22	0.00-0.25	TOPSOIL, with organics	
	0.25-0.56	Red-brown, silty SAND, trace silt, trace gravel, loose, dry	GS1
	0.56-0.84	Light brown, fine SAND, trace gravel, loose, dry	GS2
	0.84-2.08	Light brown, fine-medium SAND, some clay, trace silt, trace gravel, loose, dry	GS3
		Test Pit completed at 2.08 mbgs at specified target depth.	
TP106-22	0.00-0.23	TOPSOIL, with organics	
	0.23-0.61	Red-brown, silty SAND, trace gravel, compact, dry	GS1
	0.61-2.08	Grey-brown, fine-medium SAND, some clay, trace silt, trace gravel, compact, dry	GS2
		Test Pit completed at 2.08 mbgs at specified target depth.	
TP107-22	0.00-0.25	TOPSOIL, with organics	
	0.25-0.53	Red-brown, silty SAND, trace roots, loose, dry	GS1
	0.53-0.76	Grey silt, trace sand, trace clay, compact, moist	GS2
	0.76-2.01	Grey, silty SAND, some clay, trace gravel, loose, dry	GS3
		Test Pit completed at 2.01 mbgs at specified target depth.	
TP108-22	0.00-0.25	TOPSOIL, with organics	
	0.25-1.93	Grey, silty SAND, trace gravel, compact, dry	GS1
		Test Pit completed at 1.93 mbgs at specified target depth.	
TP109-22	0.00-0.05	TOPSOIL, with organics	
	0.05-0.30	Dark brown-red, silty SAND, some gravel, loose, dry	GS1
	0.30-0.64	Brown, silty SAND, loose, dry	GS2
	0.64-2.03	Grey, silty SAND, some clay, some gravel, compact, dry	GS3
		Test Pit completed at 2.03 mbgs at specified target depth.	

1. mbgs = metres below ground surface

Appendix C
Borehole Logs

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Log of Borehole: BH101-23

Client: Yvette Johnston
Project Name: Geo - 74 Edwards Drive, Keene
Project No.: 15831-003
Contractor: ACE Drilling
Method: Solid Stem Auger
Date Completed: October 20, 2023
Location: 74 Edwards Drive, Keene
UTM: 17 T 725789.47 m E, 4902833.4 m N
Elevation: 230.79 masl

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
230 / 0		TOPSOIL: 125 mm thick	1A							
		SILT: Brown, silt, some sand, trace to some gravel, trace to some organics (rootlets and wood fibres), dry to moist, loose	1B	SS	70	19				
230 / 1		-becomes compact	2	SS	0	15			Bentonite Plug; Pipe	
		TILL: Light brown, gravelly sand, some silt, trace to some clay, dry to moist, compact	3	SS	100	11				
229 / 2		-becomes dense	4	SS	100	49				
228 / 3		-becomes compact	5	SS	60	23			Sand Pack; PVC Screen	Groundwater level was measured at 2.67 mbeg (228.12 masl) on November 3, 2023
227 / 4		TILL: Light browmn, sandy silt, some clay, some gravel, dry to moist, very dense	6	SS	100	50				SS6 GSA: 11% Sand 34% Gravel 37% Silt 18% Clay
226 / 5										
225 / 6		-becomes light grey	7	SS	100	50			Cap	
224 / 7		Borehole terminated at 6.5 mbeg in sandy silt till								Borehole was open and dry upon drilling completion

Logged By: T. Paget
Input By: J. Monroy

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Log of Borehole: BH102-23

Client:	Yvette Johnston	**Project Name:**	Geo - 74 Edwards Drive, Keene	**Project No.:**	15831-003
Contractor:	ACE Drilling	**Method:**	Solid Stem Auger	**Date Completed:**	October 19, 2023
Location:	74 Edwards Drive, Keene	**UTM:**	17 T 725892.84 m E, 4902843.70 m N	**Elevation:**	238.12 masl

Elevation (m)	Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
238	0		TOPSOIL: 150 mm thick	1B							
			SAND: Brown, sand, some gravel, some silt, dry to moist, loose	1B	SS	75	7				
			-becomes compact	2A	SS	100	21				SS2A GSA: 15% Gravel 69% Sand 11% Silt 5% Clay
237	1		TILL: Brown, sandy silt, some gravel, some clay, dry to moist, compact	2B							
				3	SS	90	25				
236	2		-becomes moist and dense	4	SS	100	45				
235	3		-becomes very dense	5	SS	100	50				
234	4			6	SS	100	50				Auger grinding at 4.5 mbeg on presumed cobble
233	5		Borehole terminated at 5.0 mbeg due to auger refusal on presumed boulder	7	SS	100	50				
232	6										Borehole caved to 4.5 mbeg and was dry upon drilling completion
231	7										

Logged By: T. Paget **Input By:** J. Monroy

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Log of Borehole: BH103-23

Client: Yvette Johnston
Project Name: Geo - 74 Edwards Drive, Keene
Project No.: 15831-003
Contractor: ACE Drilling
Method: Solid Stem Auger
Date Completed: October 19, 2023
Location: 74 Edwards Drive, Keene
UTM: 17 T 725948.21 m E, 4902878.82 m N
Elevation: 239.61 masl

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
0 / 239		TOPSOIL: 200 mm thick	1A							
		SAND: Brown, sand, some silt, trace to some gravel, dry to moist, compact	1B	SS	85	13				
1 / 238			2	SS	60	50				
		Borehole terminated at 1.0 mbeg due to auger refusal on presumed boulder								Borehole open and dry upon drilling completion
2 / 237										
3 / 236										
4 / 235										
5 / 234										
6 / 233										
7										

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Log of Borehole: BH104-23

Client:	Yvette Johnston	**Project Name:**	Geo - 74 Edwards Drive, Keene	**Project No.:**	15831-003
Contractor:	ACE Drilling	**Method:**	Solid Stem Auger	**Date Completed:**	October 20, 2023
Location:	74 Edwards Drive, Keene	**UTM:**	17 T 725961.54 m E, 4902825.67 m N	**Elevation:**	235.30 masl

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
235	0	TOPSOIL: 150 mm thick	1A					
		SAND: Brown, sand, some silt, some gravel, trace organics, dry to moist, loose	1B	SS	100	7		
	1	TILL: Light brown, gravelly sand, some silt, trace clay, dry to moist, dense	2	SS	85	50		
234		TILL: Light brown, sandy silt, some clay, some gravel, dry to moist, compact	3	SS	100	16		Cobbles encountered at approximate depth of 1.5 mbeg
	2		4	SS	100	25		
233			5	SS	100	47		
	3	-becomes dense	6A	SS	95	48		
232			6B	SS				
	4							
231		SILTY SAND: Light brown, silty sand, medium grained, trace clay, moist, dense						Borehole caved to 5.5 mbegs with groundwater at 5.2 mbeg upon drilling completion
	5							
230								
	6	-becomes wet	7	SS	100	49		SS7 GSA: 0% Gravel 62% Sand 32% Silt 6% Clay
229								
	7	Borehole terminated at 6.6 mbeg in silty sand						
228								

% Moisture: 25 50 75
SPT (N) / DCPT: 10 20 30 40

Logged By: T. Paget **Input By:** J. Monroy

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Log of Borehole: BH105-23

Client: Yvette Johnston
Project Name: Geo - 74 Edwards Drive, Keene
Project No.: 15831-003
Contractor: ACE Drilling
Method: Solid Stem Auger
Date Completed: October 19, 2023
Location: 74 Edwards Drive, Keene
UTM: 17 T 725866.92 m E, 4902713.24 m N
Elevation: 231.39 masl

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
231 / 0		TOPSOIL: 200 mm thick	1A							
		SAND: Brown, sand, some gravel, dry to moist, loose	1B	SS	50	9				
1		CLAY AND SILT: Light brown, clay and silt, some sand, trace gravel, DTPL, stiff	2	SS	40	11				
230 / 2		CLAY AND SILT: Light brown to light grey, clay and silt, some sand, trace gravel, some organics, WTPL, soft	3	SS	80	3				
229		TILL: Light brown to light grey, sandy silt, some gravel, some clay, dry to moist, compact	4	SS	100	19				
3		-becomes very dense	5	SS	100	50				Auger grinding from 3.0 mbeg to 4.5 mbeg on presumed cobbles
228 / 4		TILL: Light brown to light grey, gravelly sand, some silt, trace clay, wet, very dense	6	SS	100	50				
227 / 5										
226 / 6		-becomes grey	7	SS	100	50				Borehole caved to 5.6 mbeg with groundwater at 4.3 mbeg upon drilling completion
225 / 7		Borehole terminated at 6.5 mbeg in gravelly sand till								

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Input By: J. Monroy

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Log of Borehole: BH106-23

Client: Yvette Johnston
Project Name: Geo - 74 Edwards Drive, Keene
Project No.: 15831-003
Contractor: ACE Drilling
Method: Solid Stem Auger
Date Completed: October 19, 2023
Location: 74 Edwards Drive, Keene
UTM: 17 T 725920.11 m E, 4902718.95 m N
Elevation: 232.84 masl

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
232	0	TOPSOIL: 200 mm thick	1A							
		TILL: Light brown, sandy silt, some gravel, some clay, dry to moist, dense	1B	SS	60	37				
	1	-becomes compact	2	SS	100	22				Auger grinding from 0.8 mbeg to 1.5 mbeg on presumed cobbles
		-becomes dense	3A							
231	2	SILT AND SAND: Light brown, silt and sand, trace clay, trace gravel, moist, dense	3B	SS	100	43				SS3B GSA: 4% Gravel 41% Sand 47% Silt 8% Clay
		TILL: Light brown, gravelly sand, some silt, trace clay, moist, dense	4	SS	95	41				Cobbles encountered again at approximate depth of 2.3 mbeg
230	3	-becomes very dense	5	SS	95	50				
229	4	TILL: Light brown, sandy silt, some gravel, some clay, dry to moist, very dense	6	SS	100	50				Cobbles encountered again at approximate depth of 4.6 mbeg
228	5									
227	6		7	SS	85	50				Borehole caved to 5.5 mbeg and was dry upon drilling completion
226	7	Borehole terminated at 6.3 mbeg in sandy silt till								

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Input By: J. Monroy

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Log of Borehole: BH107-23

Client: Yvette Johnston
Project Name: Geo - 74 Edwards Drive, Keene
Project No.: 15831-003
Contractor: ACE Drilling
Method: Solid Stem Auger
Date Completed: October 20, 2023
Location: 74 Edwards Drive, Keene
UTM: 17 T 725964.66 m E, 4902765.49 m N
Elevation: 232.10 masl

Elevation (m)	Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
232	0		TOPSOIL: 100 mm thick	1A							
			SILTY SAND: Orangey brown, silty sand, some clay, trace gravel, some organics, dry to moist, compact	1B	SS	75	11				SS1B GSA: 8% Gravel 43% Sand 34% Silt 15% Clay
			TILL: Light brown, gravelly sand, some silt, trace clay, dry to moist, dense	2	SS	100	42				
231	1									*Bentonite Plug*	
			-becomes compact	3	SS	100	23			*Pipe*	
230	2										
			TILL: Light brown, sandy silt, some gravel, some clay, moist to wet, compact	4	SS	100	24				Cobbles encountered at approximate depth of 2.3 mbeg
229	3		-becomes dense	5	SS	100	43				Borehole was open and dry upon drilling completion
228	4									*Sand Pack*	
			-becomes very dense	6	SS	100	50			*PVC Screen*	Auger grinding at 4.5 mbeg on presumed cobble
227	5		-becomes grey								
226	6			7	SS	90	50			*Cap*	Groundwater level was measured at 5.83 mbeg (226.27 masl) on November 3, 2023
225	7		Borehole terminated at 6.5 mbeg in sandy silt till								

Logged By: T. Paget
Input By: J. Monroy

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Log of Borehole: BH108-23

Client:	Yvette Johnston	**Project Name:**	Geo - 74 Edwards Drive, Keene	**Project No.:**	15831-003
Contractor:	ACE Drilling	**Method:**	Solid Stem Auger	**Date Completed:**	October 19, 2023
Location:	74 Edwards Drive, Keene	**UTM:**	17 T 725909.67 m E, 4902613.13 m N	**Elevation:**	228.34 masl

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
0 / 228		TOPSOIL: 305 mm thick	1A	SS	15	22				
		TILL: Light brown, sandy silt, some gravel, trace to some clay, dry to moist, compact	1B							
1 / 227		-becomes dense	2	SS	70	44				
		-becomes compact	3	SS	90	27				Auger grinding at 1.5 mbeg on presumed cobble
2 / 226		-becomes very dense	4	SS	55	50				
3 / 225			5	SS	100	50				
4 / 224		TILL: Light brown, gravelly sand, some silt, trace clay, moist to wet, very dense	6	SS	100	50				Cobbles encountered again at approximate depth of 4.6 mbeg
5 / 223										
6 / 222			7	SS	100	50				Borehole caved to 5.8 mbeg and was dry upon drilling completion
7		Borehole terminated at 6.2 mbeg in gravelly sand till								

Logged By: T. Paget **Input By:** J. Monroy

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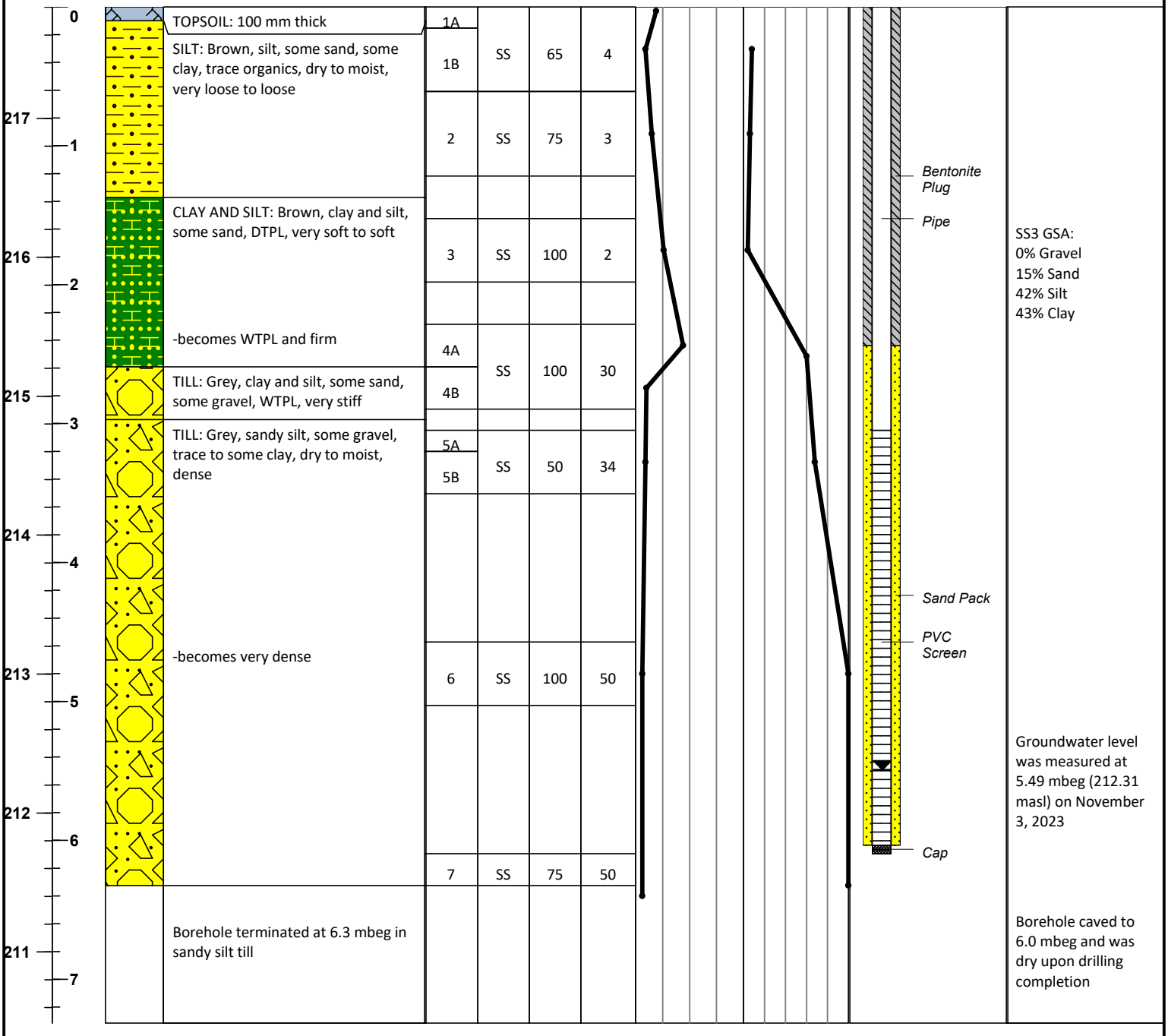
Log of Borehole: BH109-23

Client:	Yvette Johnston	**Project Name:**	Geo - 74 Edwards Drive, Keene	**Project No.:**	15831-003
Contractor:	ACE Drilling	**Method:**	Solid Stem Auger	**Date Completed:**	October 20, 2023
Location:	74 Edwards Drive, Keene	**UTM:**	17 T 725997.69 m E, 4902607.50 m N	**Elevation:**	217.80 masl

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N) / DCPT	Well Installation	Remarks
217	0	TOPSOIL: 100 mm thick	1A					
		SILT: Brown, silt, some sand, some clay, trace organics, dry to moist, very loose to loose	1B	SS	65	4		
	1		2	SS	75	3		
216	2	CLAY AND SILT: Brown, clay and silt, some sand, DTPL, very soft to soft	3	SS	100	2	Bentonite Plug Pipe	SS3 GSA: 0% Gravel 15% Sand 42% Silt 43% Clay
		-becomes WTPL and firm	4A	SS	100	30		
215	3	TILL: Grey, clay and silt, some sand, some gravel, WTPL, very stiff	4B					
		TILL: Grey, sandy silt, some gravel, trace to some clay, dry to moist, dense	5A	SS	50	34		
214	4		5B					
		-becomes very dense	6	SS	100	50	Sand Pack PVC Screen	Groundwater level was measured at 5.49 mbeg (212.31 masl) on November 3, 2023
213	5							
212	6		7	SS	75	50	Cap	
211	7	Borehole terminated at 6.3 mbeg in sandy silt till						Borehole caved to 6.0 mbeg and was dry upon drilling completion



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Log of Borehole: BH110-23

Client: Yvette Johnston
Project Name: Geo - 74 Edwards Drive, Keene
Project No.: 15831-003
Contractor: ACE Drilling
Method: Solid Stem Auger
Date Completed: October 19, 2023
Location: 74 Edwards Drive, Keene
UTM: 17 T725989.25 m E, 4902645.13 m N
Elevation: 221.10 masl

Elevation (m)	Depth	Lithology	Description	Number	Type	% Recovery	SPT (N) / DCPT	% Moisture (25 50 75)	SPT (N) / DCPT (10 20 30 40)	Well Installation	Remarks
221	0		TOPSOIL: 405 mm thick	1A	SS	100	7				
				1B							
			SILT: Light brown, silt, some sand, trace gravel, dry to moist, loose	2A							
			TILL: Light brown, sandy silt, some gravel, trace to some clay, dry to moist, compact	2B	SS	100	21				
220	1										
				3	SS	75	12				Auger grinding at 1.5 mbeg on presumed cobble
219	2										Cobbles encountered again at approximate depth of 2.3 mbeg
			TILL: Light brown, gravelly sand, some silt, trace clay, moist to wet, compact	4	SS	65	23				SS4 GSA: 33% Gravel 45% Sand 15% Silt 7% Clay
218	3		-becomes wet and dense	5	SS	60	39				
217	4										
			-becomes light brown to grey, and very dense	6	SS	80	50				Cobbles encountered again at approximate depth of 4.6 mbeg
216	5										
215	6			7	SS	100	50				
			Borehole terminated at 6.3 mbeg in gravelly sand till								
214	7										

Logged By: T. Paget
Input By: J. Monroy

Appendix D
Grain Size Analysis

Grain Size Distribution Chart

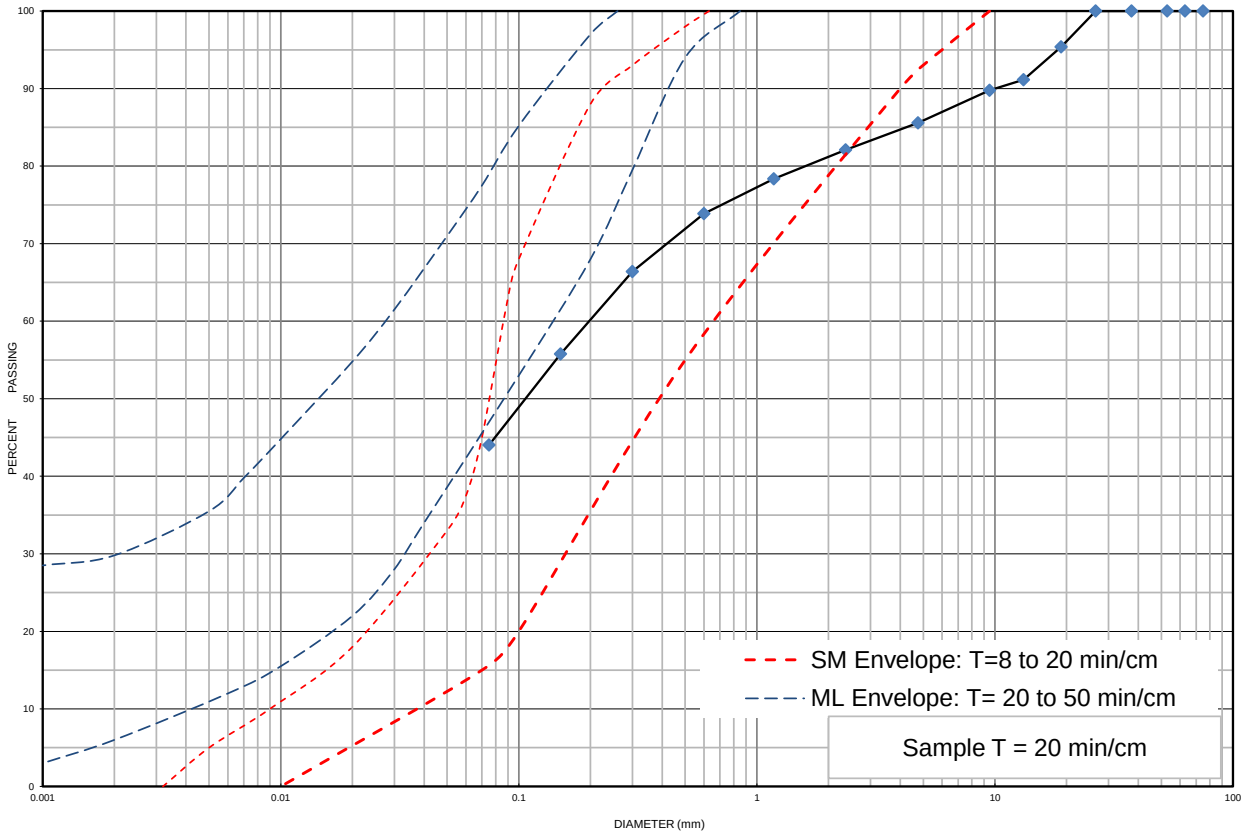
Project Number: *15831-001* **Client:** *Yvette Johnston*

Project Name: *Estate Subdivision - 74 Edwards Drive, Keene*

Sample Date: *October 11, 2022* **Sampled By:** *Peter Roebuck - Cambium Inc.*

Location: *TP 103-22 GS 1* **Depth:** **Lab Sample No:** *S-22-1487*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 103-22	GS 1		14	42	44		6.0

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sand and Silt some Gravel	SM	0.200	-	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *October 18, 2022*

(Senior Project Manager)

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Grain Size Distribution Chart

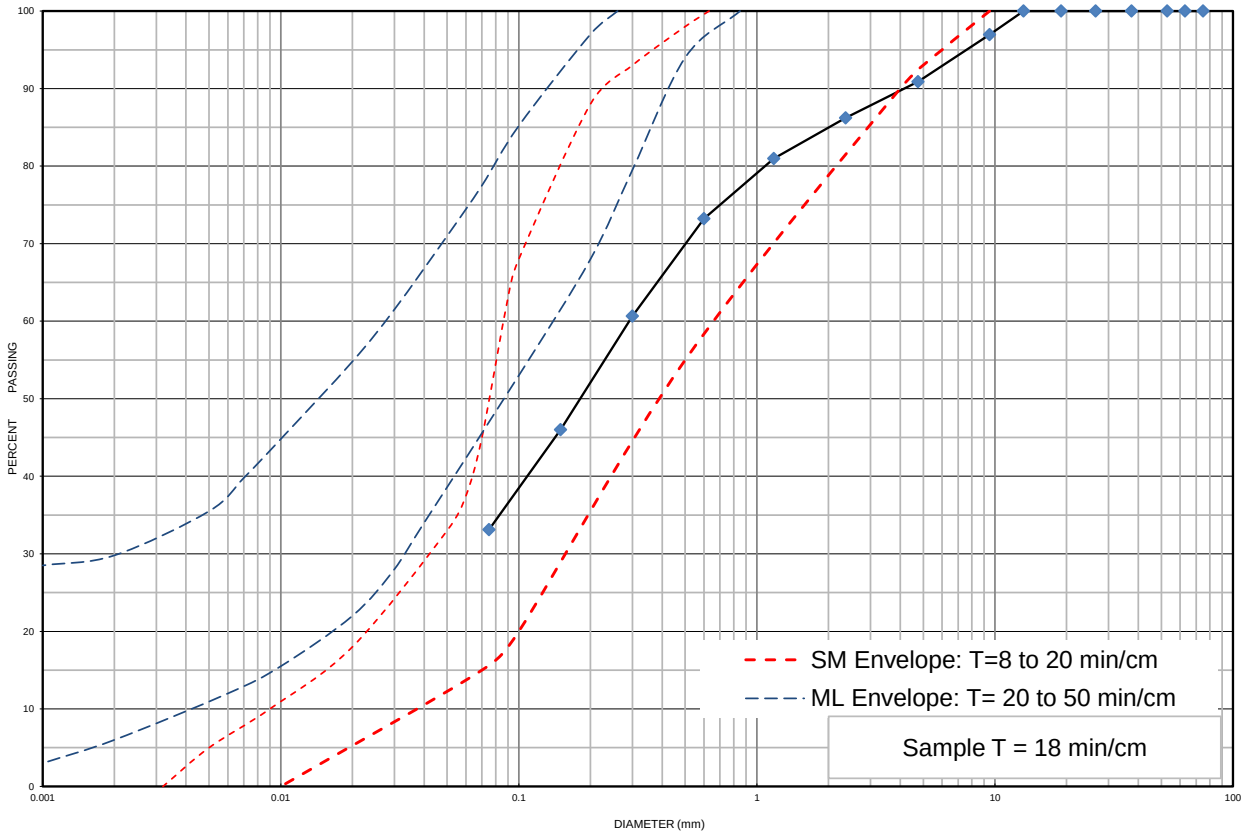
Project Number: *15831-001* **Client:** *Yvette Johnston*

Project Name: *Estate Subdivision - 74 Edwards Drive, Keene*

Sample Date: *October 11, 2022* **Sampled By:** *Peter Roebuck - Cambium Inc.*

Location: *TP 106-22 GS 1* **Depth:** **Lab Sample No:** *S-22-1488*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 106-22	GS 1		9	58	33		9.2

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand trace Gravel	SM	0.290	-	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *October 18, 2022*

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Grain Size Distribution Chart

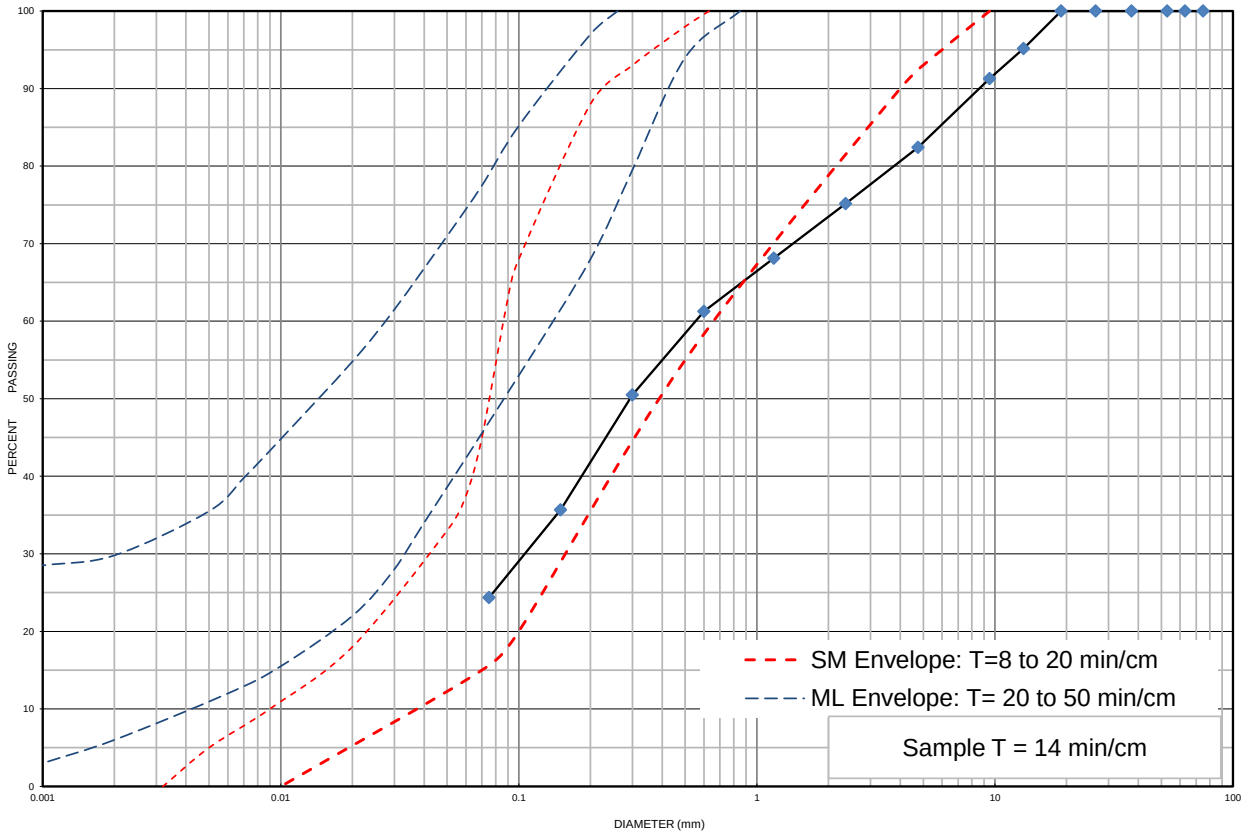
Project Number: *15831-001* **Client:** *Yvette Johnston*

Project Name: *Estate Subdivision - 74 Edwards Drive, Keene*

Sample Date: *October 11, 2022* **Sampled By:** *Peter Roebuck - Cambium Inc.*

Location: *TP 110-22 GS 2* **Depth:** **Lab Sample No:** *S-22-1489*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 110-22	GS 2		18	58	24		3.1

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand some Gravel	SM	0.560	0.115	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *October 18, 2022*

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Grain Size Distribution Chart

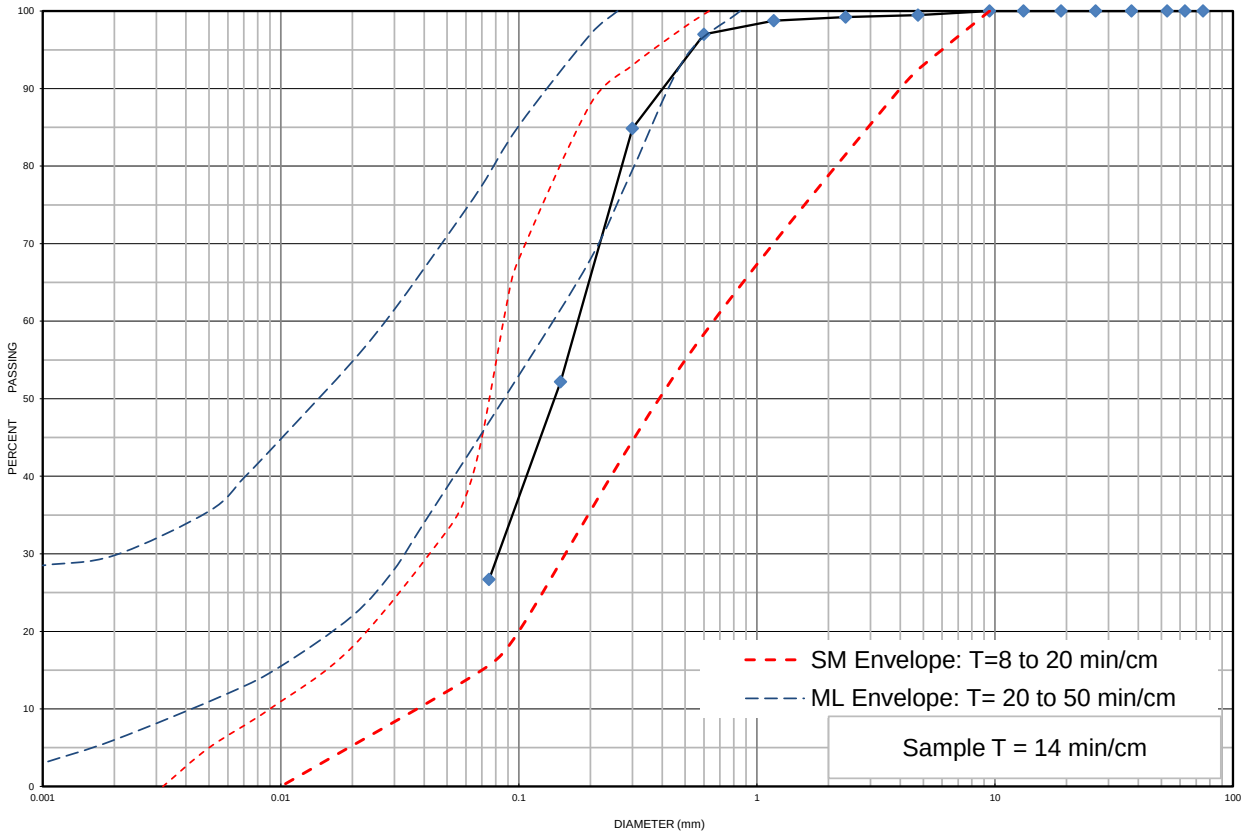
Project Number: *15831-001* **Client:** *Yvette Johnston*

Project Name: *Estate Subdivision - 74 Edwards Drive, Keene*

Sample Date: *October 11, 2022* **Sampled By:** *Peter Roebuck - Cambium Inc.*

Location: *TP 114-22 GS 1* **Depth:** **Lab Sample No:** *S-22-1490*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 114-22	GS 1		1	73	26		12.5

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand trace Gravel	SM	0.175	0.081	-	-	-

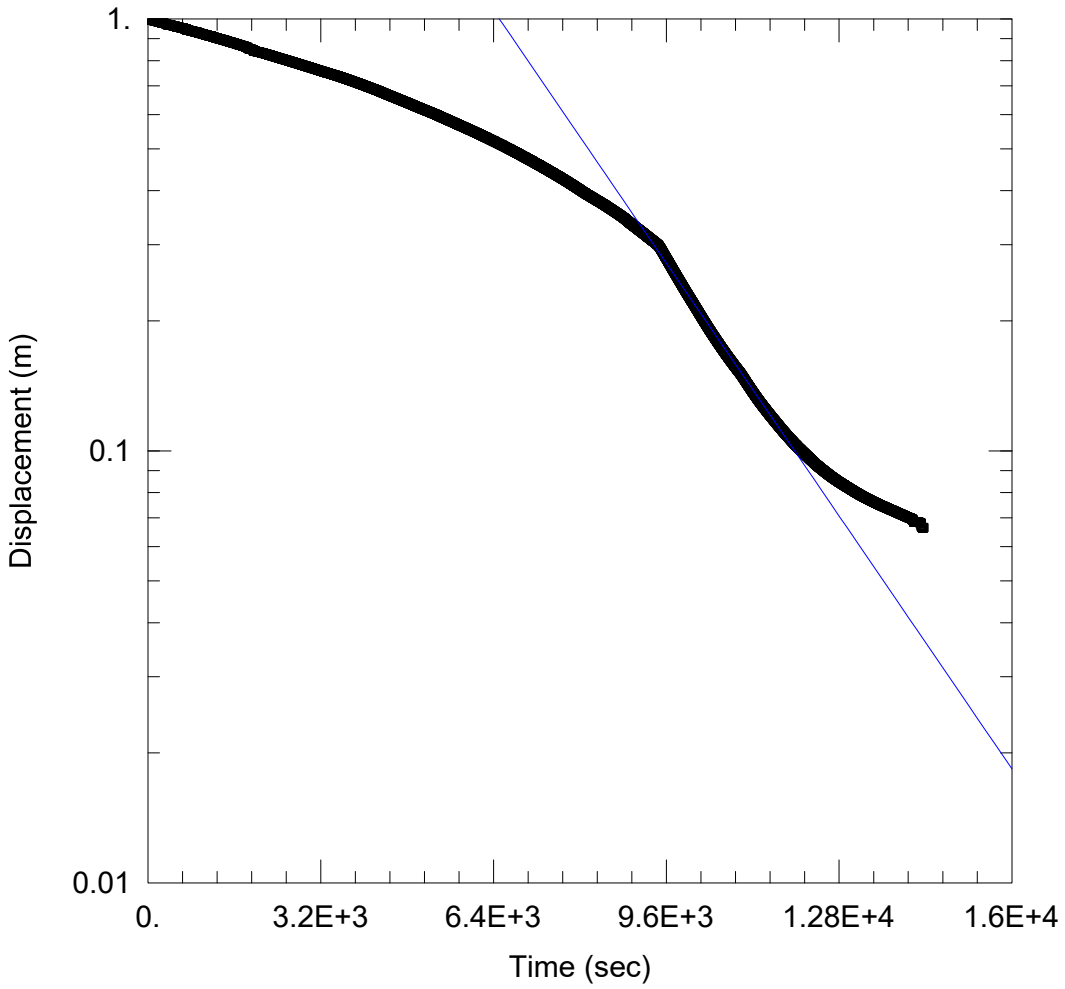
Additional information availabe upon request

Issued By: _____ *Date Issued:* *October 18, 2022*

(Senior Project Manager)

Cambium Inc. (Laboratory)
866.217.7900 | cambium-inc.com
194 Sophia St. | Peterborough | ON | K9H 1E5

Appendix E
SWHT Results



BH101-23 BAIL TEST

Data Set: C:\Users\Ben.Didemus\Documents\Keene Subdivision\BH101_23 Bail Test.aqt
Date: 05/03/24 Time: 12:00:28

PROJECT INFORMATION

Company: Cambium
Client: Yvette Johnston
Project: 15831-002
Location: 74 Edwards Dr., Keene, ON
Test Well: BH101-23
Test Date: March 14, 2024

AQUIFER DATA

Saturated Thickness: 5.37 m Anisotropy Ratio (Kz/Kr): 1.

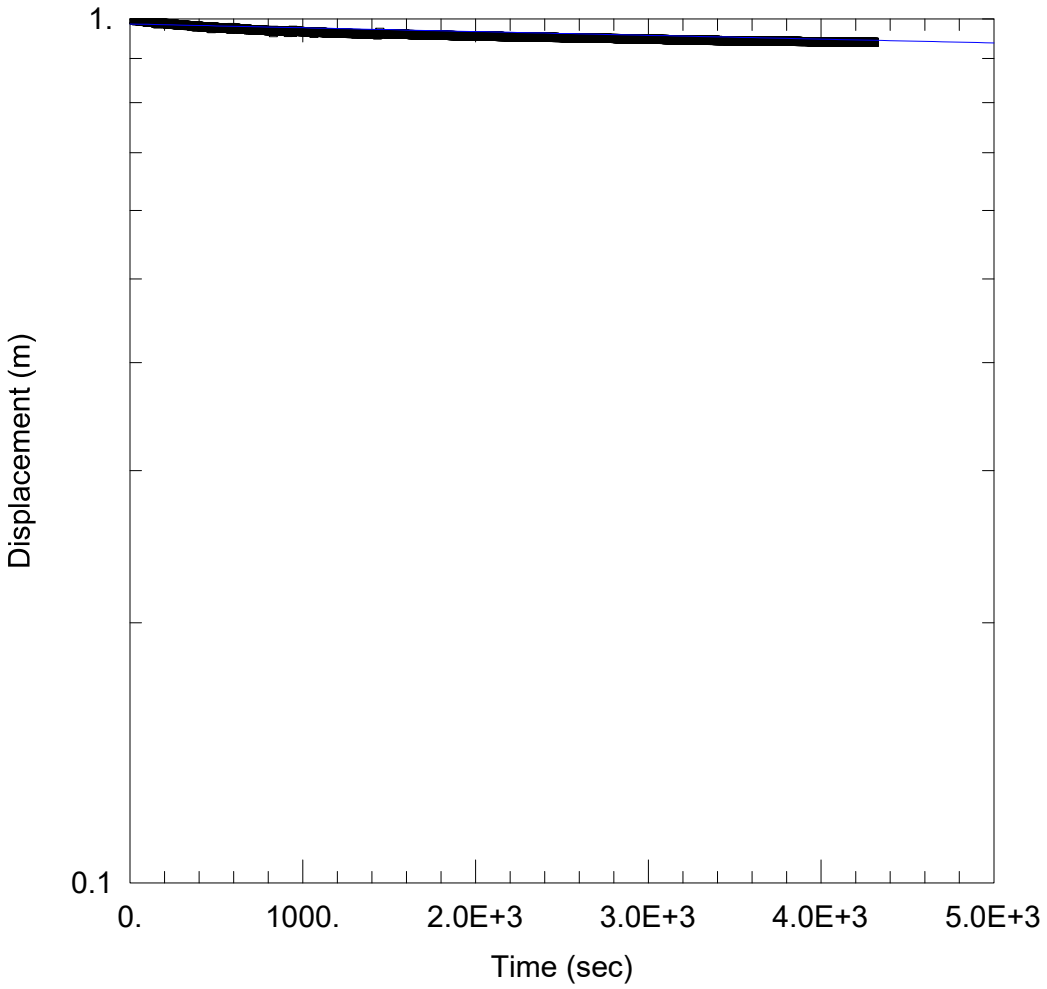
WELL DATA (BH101-23)

Initial Displacement: 3.896 m Static Water Column Height: 4.02 m
Total Well Penetration Depth: 4.068 m Screen Length: 3.048 m
Casing Radius: 0.0254 m Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 1.644E-7 m/sec y0 = 15.48 m



BH107-23 BAIL TEST

Data Set: C:\Users\Ben.Didemus\Documents\Keene Subdivision\BH107_23 Bail Test.aqt
Date: 05/05/24 Time: 21:36:01

PROJECT INFORMATION

Company: Cambium
Client: Yvette Johnston
Project: 15831-002
Location: 74 Edwards Dr., Keene, ON
Test Well: BH107-23
Test Date: March 14, 2024

AQUIFER DATA

Saturated Thickness: 4.776 m Anisotropy Ratio (Kz/Kr): 1.

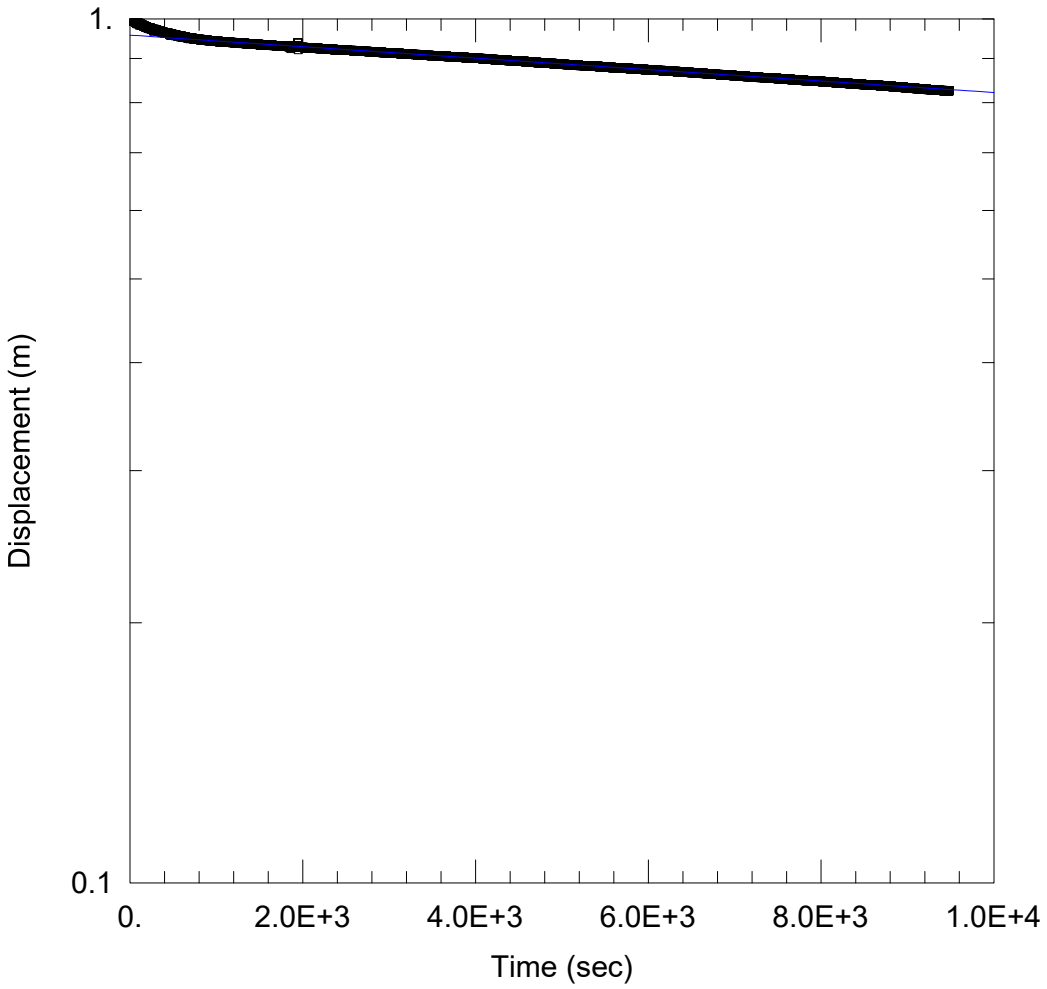
WELL DATA (BH107-23)

Initial Displacement: 3.507 m
Total Well Penetration Depth: 4.374 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.326 m
Screen Length: 3.048 m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Confined Solution Method: Hvorslev

K = 3.93E-9 m/sec y0 = 0.9863 m



BH109-23 BAIL TEST

Data Set: C:\Users\Ben.Didemus\Documents\Keene Subdivision\BH109_23 Bail Test.aqt
Date: 05/03/24 Time: 12:22:55

PROJECT INFORMATION

Company: Cambium
Client: Yvette Johnston
Project: 15831-002
Location: 74 Edwards Dr., Keene, ON
Test Well: BH109-23
Test Date: March 14, 2024

AQUIFER DATA

Saturated Thickness: 4.837 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH109-23)

Initial Displacement: 4.338 m
Total Well Penetration Depth: 4.635 m
Casing Radius: 0.0254 m
Static Water Column Height: 4.587 m
Screen Length: 3.048 m
Well Radius: 0.0762 m

SOLUTION

Aquifer Model: Confined
Solution Method: Hvorslev
K = 5.957E-9 m/sec
y0 = 0.9573 m

Appendix F
Certificate of Analyses

FINAL REPORT

CA15041-MAR24 R1

15831-002, Yvette Johnston - Estate Subdivision

Prepared for

Cambium Inc.

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Cambium Inc.	Project Specialist	Jill Campbell, B.Sc.,GISAS
		Laboratory	SGS Canada Inc.
Address	194 Sofia Street, Peterborough Canada, K9H 1E3 Phone: 705-742-7900. Fax:705-742-7907	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Cameron MacDougall	Telephone	2165
Telephone	705-742-7900	Facsimile	705-652-6365
Facsimile	705-742-7907	Email	jill.campbell@sgs.com
Email	cameron.macdougall@cambium-inc.com; file@cambium-inc.cc	SGS Reference	CA15041-MAR24
Project	15831-002, Yvette Johnston - Estate Subdivision	Received	03/14/2024
Order Number		Approved	03/21/2024
Samples	Ground Water (3)	Report Number	CA15041-MAR24 R1
		Date Reported	03/21/2024

COMMENTS

Temperature of Sample upon Receipt: 9
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

TABLE OF CONTENTS

FINAL REPORT

CA15041-MAR24 R1

Client: Cambium Inc.
Project: 15831-002, Yvette Johnston - Estate Subdivision
Project Manager: Cameron MacDougall
Samplers: Warren Young

MATRIX: WATER

L1 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

				Sample Number	9	10	11
				Sample Name	BH101-23	BH107-23	BH109-23
				Sample Matrix	Ground Water	Ground Water	Ground Water
				Sample Date	14/03/2024	14/03/2024	14/03/2024
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
General Chemistry						
Ammonia+Ammonium (N)	as N mg/L	0.1		< 0.1	< 0.1	0.1
Metals and Inorganics						
Nitrite (as N)	as N mg/L	0.03	1	< 0.03	< 0.03	< 0.03
Nitrate (as N)	as N mg/L	0.06	10	< 0.06	< 0.06	< 0.06
Phosphorus (total)	mg/L	0.003		0.136	0.118	0.136
Phosphorus (dissolved)	mg/L	0.003		< 0.003	0.004	< 0.003

EXCEEDANCE SUMMARY

No exceedances are present above the regulatory limit(s) indicated

FINAL REPORT

QC SUMMARY

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0144-MAR24	as N mg/L	0.1	<0.1	ND	10	100	90	110	97	75	125

Anions by IC

Method: EPA300/MA300-Ions1.3 I Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nitrite (as N)	DIO0355-MAR24	mg/L	0.03	<0.03	ND	20	97	90	110	95	75	125
Nitrate (as N)	DIO0355-MAR24	mg/L	0.06	<0.06	ND	20	98	90	110	100	75	125

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 I Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (total)	EMS0184-MAR24	mg/L	0.003	<0.003	ND	20	93	90	110	NV	70	130

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.
Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.
LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.
Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.
RL: Reporting limit
RPD: Relative percent difference
AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.
Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.
Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (General)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com
SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com

Laboratory Information Section

Received Date (mm/dd/yyyy): 03/14/2024	LAB LIMS #: mar 15041
Received Time (After Hours Only): 17:30	Temperature Upon Receipt (°C): 9° x 3

Billing & Reporting Information

Invoice/Receipt to {3}:		
Company:	Cambium-Peterborough	
Attention:	Cameron MacDougall & Warren Young	
Address:	194 Sophia Street Peterborough, ON K9H 1E5	
Email:		
Project Name:	Yvette Johnston - Estate Subdivision	Project #: 15831-002

Quote #: 2024 417

Attached Parameter List: ☐ YES ☑ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☑ NO

Specify:

* Rush TA Requests Require Lab Approval

Client Information/Report To:

Client Lab #:

Company Name:	**Cambium Environmental**	**Phone Number:**	**705.957.0137**
Contact Name:	**Cameron MacDougall & Warren Young**	**Fax Number:**	
Address:	**194 Sophia Street, Peterborough, ON, K9H 1E5**	**E-mail:**	cameron.macdougall@cambium-inc.com, warren.young@cambium-inc.com
Copy to:			

Sample Information

Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Bottles	Analysis Requested (please enter the analysis required below and check off which analysis applies to each sample)							
				Nitrate	Nitrite	Ammonia	Total phosphorus	Dissolved phosphorus			
BH101-23	3/14/2024	11:20	3	X	X	X	X	X			
BH107-23	3/14/2024	2:35PM	3	X	X	X	X	X			
BH109-23	3/14/2024	12:55	3	X	X	X	X	X			
**Compare against ODWS (non reportable)											
**Lab Filter Dissoved Phosporus											

Sampled By {1}:	Warren Young	(Signature)	Date: 03/14/24	(mm/dd/yy)
Relinquished by {2}:	Warren Young	(Signature)	Date: 03/14/24	(mm/dd/yy)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request.

Appendix G

MECP Well Records

Water Well Records Summary Report

Produced by Cambium Inc. using MOECP Water Well Information System (WWIS)

All units in meters unless otherwise specified

Well ID: 5102566 **Easting:** 726699 **UTM Zone** 17
Construction Date: 1967-08-29 **Northing:** 4902270 **Positional Accuracy:** unknown UTM

Well Depth: 27.4 **Water Kind** FRESH **Pump Rate (LPM):** 18
Well Diameter (cm): 15.2 **Final Status** Water Supply **Recommended Pump Rate:** 18
Water First Found: 27.4 **Primary Water Use:** Domestic **Pumping Duration (h:m):** 2 : 0
Static Level: 15

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	8.23
3	CLAY	8.23	25.9
4	LIMESTONE	25.9	27.4

Well ID: 5102568 **Easting:** 726655 **UTM Zone** 17
Construction Date: 1967-05-16 **Northing:** 4902351 **Positional Accuracy:** margin of error : 100 m - 300 m

Well Depth: 21.3 **Water Kind** SULPHUR **Pump Rate (LPM):**
Well Diameter (cm): 15.2 **Final Status** Abandoned-Q **Recommended Pump Rate:**
Water First Found: 19.8 **Primary Water Use:** Not Used **Pumping Duration (h:m):**
Static Level:

Layer:	Driller's Description:	Top:	Bottom:
1	PREV. DRILLED	0	8.23
2	LIMESTONE	8.23	21.3

Well ID: 5102569 **Easting:** 726489 **UTM Zone** 17
Construction Date: 1962-10-02 **Northing:** 4902636 **Positional Accuracy:** unknown UTM

Well Depth: 17.7 **Water Kind** SULPHUR **Pump Rate (LPM):** 9
Well Diameter (cm): 15.2 **Final Status** Water Supply **Recommended Pump Rate:** 9
Water First Found: 16.8 **Primary Water Use:** Commerical **Pumping Duration (h:m):** 4 : 0
Static Level: 2

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	1.83
2	LIMESTONE	1.83	17.7

Well ID: 5102574 **Easting:** 726697 **UTM Zone** 17
Construction Date: 1957-10-29 **Northing:** 4902194 **Positional Accuracy:** unknown UTM

Well Depth: 28.4 **Water Kind** FRESH **Pump Rate (LPM):** 5
Well Diameter (cm): 15.2 **Final Status** Water Supply **Recommended Pump Rate:**
Water First Found: 28.4 **Primary Water Use:** Domestic **Pumping Duration (h:m):** 3 : 0
Static Level: 12

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	19.8
3	MEDIUM SAND	19.8	28.4

Well ID: 5102576
Construction Date: 1967-05-16
Easting: 726649
Northing: 4902844
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 22.3
Well Diameter (cm): 15.2
Water First Found: 19.8
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 182
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	6.71
2	GRAVEL	6.71	8.53
3	CLAY	8.53	15.2
4	GRAVEL	15.2	19.8
5	GRAVEL	19.8	21.3
6	LIMESTONE	21.3	22.3

Well ID: 5102577
Construction Date: 1966-01-03
Easting: 726569
Northing: 4902846
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 18
Well Diameter (cm): 15.2
Water First Found: 16.8
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.66
3	CLAY	3.66	14.6
4	COARSE SAND	14.6	18

Well ID: 5102578
Construction Date: 1963-01-07
Easting: 726642
Northing: 4902723
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 23.2
Well Diameter (cm): 15.2
Water First Found: 22.3
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 55
Recommended Pump Rate: 55
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	4.88
2	CLAY	4.88	22.3
3	LIMESTONE	22.3	23.2

Well ID: 5102579
Construction Date: 1962-01-25
Easting: 726486
Northing: 4902978
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 38.7
Well Diameter (cm): 15.2
Water First Found: 36.9
Static Level: 12
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 9
Recommended Pump Rate: 9
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	5.49
2	GRAVEL	5.49	7.62
3	CLAY	7.62	32

4	GRAVEL	32	33.2
5	CLAY	33.2	36.6
6	LIMESTONE	36.6	38.7

Well ID: 5102580
Construction Date: 1959-09-03
Easting: 726649
Northing: 4902814
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 31.7
Well Diameter (cm): 15.2
Water First Found: 30.5
Static Level: 10
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 73
Recommended Pump Rate: 23
Pumping Duration (h:m): 5 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	BOULDERS	0	22.6
2	LIMESTONE	22.6	31.7

Well ID: 5102582
Construction Date: 1957-12-04
Easting: 726589
Northing: 4902609
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 21.3
Well Diameter (cm): 15.2
Water First Found: 18.9
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate:
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	4.57
3	CLAY	4.57	10.4
4	CLAY	10.4	12.2
5	SHALE	12.2	18.9
6	LIMESTONE	18.9	21.3

Well ID: 5102583
Construction Date: 1967-12-13
Easting: 726550
Northing: 4902640
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 6.1
Well Diameter (cm): 15.2
Water First Found: 5.49
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	3.05
3	GRAVEL	3.05	5.18
4	GRAVEL	5.18	6.1

Well ID: 5102584
Construction Date: 1967-12-13
Easting: 726493
Northing: 4902807
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 26.2
Well Diameter (cm): 15.2
Water First Found: 26.2
Static Level: 4
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.66
3	GRAVEL	3.66	5.79
4	CLAY	5.79	9.14
5	CLAY	9.14	25.6
6	SHALE	25.6	26.2

Well ID: 5102585
Construction Date: 1967-05-16
Easting: 726353
Northing: 4903146
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 44.2
Well Diameter (cm): 15.2
Water First Found: 33.5
Static Level: 9
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 55
Recommended Pump Rate: 23
Pumping Duration (h:m): 6 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	5.49
2	GRAVEL	5.49	7.62
3	CLAY	7.62	24.4
4	GRAVEL	24.4	36.6
5	CLAY	36.6	39.6
6	LIMESTONE	39.6	44.2

Well ID: 5102586
Construction Date: 1967-12-13
Easting: 726642
Northing: 4902728
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 6.4
Well Diameter (cm): 15.2
Water First Found: 6.40
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 23
Pumping Duration (h:m): 5 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	3.05
3	GRAVEL	3.05	5.18
4	GRAVEL	5.18	6.40

Well ID: 5102624
Construction Date: 1967-05-16
Easting: 726541
Northing: 4902434
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 11.6
Well Diameter (cm): 15.2
Water First Found: 9.14
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 91
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57

2	CLAY	4.57	9.14
3	GRAVEL	9.14	11.6

Well ID: 5102625
Construction Date: 1965-07-09
Easting: 726473
Northing: 4902596
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 6.4
Well Diameter (cm): 15.2
Water First Found: 4.88
Static Level: 0
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 45
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	4.88
3	GRAVEL	4.88	6.40

Well ID: 5102626
Construction Date: 1964-08-05
Easting: 726454
Northing: 4902647
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 10.4
Well Diameter (cm): 15.2
Water First Found: 8.84
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	8.53
3	CLAY	8.53	10.4

Well ID: 5102627
Construction Date: 1954-03-03
Easting: 725485
Northing: 4902202
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 11.9
Well Diameter (cm): 15.2
Water First Found: 11.9
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate:
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	HARDPAN	0	7.92
2	CLAY	7.92	11.9

Well ID: 5102628
Construction Date: 1965-07-09
Easting: 726478
Northing: 4902566
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 6.71
Well Diameter (cm): 15.2
Water First Found: 5.79
Static Level: 1
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 45
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	5.79
3	GRAVEL	5.79	6.71

Well ID: 5102629
Construction Date: 1954-11-02
Easting: 726274
Northing: 4902409
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 19.2
Well Diameter (cm): 20.3
Water First Found: 15.2
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Public
Pump Rate (LPM): 45
Recommended Pump Rate:
Pumping Duration (h:m): 5 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	14.0
3	LIMESTONE	14.0	19.2

Well ID: 5102630
Construction Date: 1952-01-22
Easting: 726219
Northing: 4903229
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 12.8
Well Diameter (cm): 15.2
Water First Found: 12.8
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Livestock
Pump Rate (LPM): 36
Recommended Pump Rate:
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	12.5
3	GRAVEL	12.5	12.8

Well ID: 5104585
Construction Date: 1969-01-21
Easting: 726282
Northing: 4902714
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 24.4
Well Diameter (cm): 15.2
Water First Found: 24.4
Static Level: 7
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 32
Recommended Pump Rate: 18
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	8.23
2	CLAY	8.23	8.53
3	GRAVEL	8.53	24.4

Well ID: 5104586
Construction Date: 1969-01-21
Easting: 726172
Northing: 4903374
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 22.9
Well Diameter (cm): 15.2
Water First Found: 22.9
Static Level: 9
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 68
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	7.92
3	CLAY	7.92	22.3
4	GRAVEL	22.3	22.9

Well ID: 5104801
Construction Date: 1969-12-05
Easting: 726665
Northing: 4903073
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 23.2
Well Diameter (cm): 15.2
Water First Found: 23.2
Static Level: 21
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 27
Recommended Pump Rate: 27
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	FILL	0	0.91
2	CLAY	0.91	4.57
3	FINE SAND	4.57	23.2

Well ID: 5104854
Construction Date: 1970-01-29
Easting: 726215
Northing: 4902853
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 24.7
Well Diameter (cm): 15.2
Water First Found: 24.7
Static Level: 9
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	7.32
3	CLAY	7.32	24.4
4	GRAVEL	24.4	24.7

Well ID: 5104869
Construction Date: 1969-11-07
Easting: 726325
Northing: 4902738
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 18
Well Diameter (cm): 15.2
Water First Found: 17.1
Static Level: 8
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	5.49
3	CLAY	5.49	16.8
4	CLAY	16.8	18

Well ID: 5104870
Construction Date: 1970-02-02
Easting: 726225
Northing: 4902743
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 24.7
Well Diameter (cm): 15.2
Water First Found: 23.8
Static Level: 6
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 36
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	4.57
3	CLAY	4.57	23.8
4	GRAVEL	23.8	24.7

Well ID: 5104920
Construction Date: 1970-02-02
Easting: 726345
Northing: 4902663
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 31.1
Well Diameter (cm): 15.2
Water First Found: 29
Static Level: 11
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 36
Pumping Duration (h:m): 16 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	7.62
3	CLAY	7.62	17.1
4	CLAY	17.1	27.4
5	COARSE SAND	27.4	31.1

Well ID: 5104963
Construction Date: 1970-02-02
Easting: 726515
Northing: 4902473
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 11.6
Well Diameter (cm): 15.2
Water First Found: 10.7
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.05
3	CLAY	3.05	10.7
4	COARSE SAND	10.7	11.6

Well ID: 5105388
Construction Date: 1971-02-04
Easting: 726215
Northing: 4902373
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 14.9
Well Diameter (cm): 15.2
Water First Found: 14.9
Static Level: 6
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	6.71
2	CLAY	6.71	14.6
3	GRAVEL	14.6	14.9

Well ID: 5105402
Construction Date: 1971-02-04
Easting: 726255
Northing: 4902823
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 32.9
Well Diameter (cm): 15.2
Water First Found: 32.3
Static Level: 9
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	9.14
2	CLAY	9.14	21.3
3	CLAY	21.3	32.3
4	GRAVEL	32.3	32.9

Well ID: 5105662
Construction Date: 1971-09-14
Easting: 726265
Northing: 4902293
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 13.7
Well Diameter (cm): 15.2
Water First Found: 9.75
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	7.92
3	GRAVEL	7.92	10.7
4	LIMESTONE	10.7	13.7

Well ID: 5105878
Construction Date: 1972-04-18
Easting: 726275
Northing: 4902883
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 29
Well Diameter (cm): 15.2
Water First Found: 27.4
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 32
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 45

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.27
2	CLAY	4.27	9.75
3	GRAVEL	9.75	11.3
4	CLAY	11.3	27.4
5	GRAVEL	27.4	29

Well ID: 5105910
Construction Date: 1972-06-01
Easting: 726265
Northing: 4902723
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 25
Well Diameter (cm): 15.2
Water First Found: 24.4
Static Level: 0
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 27
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	6.1
2	CLAY	6.1	24.4
3	GRAVEL	24.4	25

Well ID: 5105913
Construction Date: 1972-06-01
Easting: 726555
Northing: 4902763
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 23.5
Well Diameter (cm): 15.2
Water First Found: 22.9
Static Level: 8
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 45
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	18.3
2	CLAY	18.3	22.9
3	COARSE SAND	22.9	23.2
4	GRAVEL	23.2	23.5

Well ID: 5105934
Construction Date: 1972-06-02
Easting: 726355
Northing: 4902873
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 29.3
Well Diameter (cm): 15.2
Water First Found: 29.3
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 55
Recommended Pump Rate: 36
Pumping Duration (h:m): 2 : 15

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	7.92
3	CLAY	7.92	12.5
4	CLAY	13.5	28.0
5	GRAVEL	28.0	29.3

Well ID: 5106221
Construction Date: 1972-12-21
Easting: 725965
Northing: 4902223
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 33.5
Well Diameter (cm): 15.2
Water First Found: 30.5
Static Level: 7
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 5 : 20

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	TOPSOIL	0.3(	7.62
3	CLAY	7.62	29.3
4	LIMESTONE	29.3	33.5

Well ID: 5106301
Construction Date: 1973-04-09
Easting: 726415
Northing: 4902853
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 30.8
Well Diameter (cm): 15.2
Water First Found: 29.6
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 2 : 20

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.66
2	CLAY	3.66	15.2
3	CLAY	15.2	22.6
4	CLAY	22.6	29
5	LIMESTONE	29	30.8

Well ID: 5106354
Construction Date: 1973-04-09
Easting: 726495
Northing: 4902943
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 40.2
Well Diameter (cm): 15.2
Water First Found: 40.2
Static Level: 7
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	8.53
2	CLAY	8.53	39.6
3	GRAVEL	39.6	40.2

Well ID: 5106417
Construction Date: 1972-08-31
Easting: 726415
Northing: 4902883
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 7.92
Well Diameter (cm): 91.4
Water First Found: 7.62
Static Level:
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.66
3	CLAY	3.66	7.62
4	GRAVEL	7.62	7.92

Well ID: 5106672
Construction Date: 1973-11-14
Easting: 726628
Northing: 4902556
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 6.71
Well Diameter (cm): 15.2
Water First Found: 6.1
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 68
Recommended Pump Rate: 45
Pumping Duration (h:m): 2 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	6.1

3	GRAVEL	6.1	6.71

Well ID: 5106693
Construction Date: 1974-01-03
Easting: 726389
Northing: 4902675
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 10.1
Well Diameter (cm): 76.2
Water First Found: 7.01
Static Level: 7
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 23
Recommended Pump Rate: 18
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	2.44
2	CLAY	2.44	7.01
3	SAND	7.01	7.32
4	CLAY	7.32	10.1

Well ID: 5106885
Construction Date: 1974-03-21
Easting: 726675
Northing: 4902445
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 11.3
Well Diameter (cm): 15.2
Water First Found: 10.4
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 27
Recommended Pump Rate: 23
Pumping Duration (h:m): 1 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	1.52
2	CLAY	1.52	5.18
3	CLAY	5.18	10.4
4	GRAVEL	10.4	11.3

Well ID: 5107150
Construction Date: 1974-10-15
Easting: 726434
Northing: 4902682
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 33.8
Well Diameter (cm): 15.2
Water First Found: 29.9
Static Level: 4
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate:
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREVIOUSLY DUG	0	5.79
2	CLAY	5.79	29
3	LIMESTONE	29	33.8

Well ID: 5107169
Construction Date: 1974-10-23
Easting: 726157
Northing: 4902847
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 25.6
Well Diameter (cm): 15.2
Water First Found: 25.3
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 136
Recommended Pump Rate: 136
Pumping Duration (h:m): 2 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.27
2	CLAY	4.27	25
3	GRAVEL	25	25.6

Well ID: 5107245
Construction Date: 1974-12-30
Easting: 726422
Northing: 4902794
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 25.6
Well Diameter (cm): 15.2
Water First Found: 24.4
Static Level: 0
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 68
Recommended Pump Rate: 68
Pumping Duration (h:m): 5 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREV. DRILLED	0	25.6

Well ID: 5107281
Construction Date: 1975-02-04
Easting: 726211
Northing: 4902859
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 39.0
Well Diameter (cm): 15.2
Water First Found: 26.8
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 5
Recommended Pump Rate: 5
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	6.1
2	GRAVEL	6.1	26.5
3	GRAVEL	26.5	27.1
4	HARDPAN	27.1	29
5	LIMESTONE	29	39.0

Well ID: 5107282
Construction Date: 1975-02-04
Easting: 726175
Northing: 4902813
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 27.7
Well Diameter (cm): 12.7
Water First Found: 18.6
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 41
Recommended Pump Rate: 41
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.35
2	GRAVEL	3.35	10.7
3	CLAY	10.7	17.4
4	CLAY	17.4	18.6
5	CLAY	18.6	27.7

Well ID: 5107403
Construction Date: 1975-03-18
Easting: 726100
Northing: 4902552
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 26.5
Well Diameter (cm): 15.2
Water First Found: 10.7
Static Level:
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 68
Recommended Pump Rate: 68
Pumping Duration (h:m): 7 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	CLAY	4.57	10.4
3	GRAVEL	10.4	13.7
4	GRAVEL	13.7	24.7
5	LIMESTONE	24.7	26.5

Well ID: 5107478
Construction Date: 1975-06-25
Easting: 726465
Northing: 4902373
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 19.8
Well Diameter (cm): 15.2
Water First Found: 18.3
Static Level: 12
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 45
Pumping Duration (h:m): 1 : 40

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	CLAY	4.57	13.1
3	LIMESTONE	13.1	19.8

Well ID: 5107608
Construction Date: 1968-12-04
Easting: 726175
Northing: 4903373
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 22.9
Well Diameter (cm): 15.2
Water First Found: 22.9
Static Level: 9
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 68
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	7.92
3	CLAY	7.92	22.3
4	GRAVEL	22.3	22.9

Well ID: 5107837
Construction Date: 1976-03-15
Easting: 726615
Northing: 4902573
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 27.4
Well Diameter (cm): 15.2
Water First Found: 15.9
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREV. DRILLED	0	7.92

2	CLAY	7.92	15.9
3	FINE GRAVEL	15.9	16.8
4	LIMESTONE	16.8	19.2
5	LIMESTONE	19.2	27.4

Well ID: 5107908
Construction Date: 1976-05-10
Easting: 726465
Northing: 4902523
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 25.6
Well Diameter (cm): 15.2
Water First Found: 24.4
Static Level: 7
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 114
Recommended Pump Rate:
Pumping Duration (h:m): 3 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	PREV. DRILLED	0	6.71
2	CLAY	6.71	22.9
3	CLAY	22.9	24.4
4	COARSE GRAVEL	24.4	25.6

Well ID: 5107912
Construction Date: 1976-05-10
Easting: 726215
Northing: 4902423
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 12.2
Well Diameter (cm): 15.2
Water First Found: 11
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Public
Pump Rate (LPM): 23
Recommended Pump Rate:
Pumping Duration (h:m): 3 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	9.45
3	COARSE GRAVEL	9.45	12.2

Well ID: 5108059
Construction Date: 1976-09-15
Easting: 726475
Northing: 4902763
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 12.8
Well Diameter (cm): 15.2
Water First Found: 12.5
Static Level: 8
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 10

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	4.57
3	CLAY	4.57	12.2
4	SAND	12.2	12.5
5	SAND	12.5	12.8

Well ID: 5108209
Construction Date: 1976-10-08
Easting: 726285
Northing: 4902803
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 22.9
Well Diameter (cm): 15.2
Water First Found: 22.9
Static Level: 5
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 40 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30

2	CLAY	0.30	6.71
3	CLAY	6.71	13.7
4	FINE GRAVEL	13.7	22.9

Well ID: 5108259
Construction Date: 1976-11-25
Easting: 726625
Northing: 4902603
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 7.62
Well Diameter (cm): 15.2
Water First Found: 7.62
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 36
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	4.27
3	CLAY	4.27	7.62

Well ID: 5108565
Construction Date: 1977-08-31
Easting: 726255
Northing: 4903063
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 25.6
Well Diameter (cm): 15.2
Water First Found: 24.1
Static Level: 8
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 41
Recommended Pump Rate: 23
Pumping Duration (h:m): 6 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	SAND	0.30	7.62
3	CLAY	7.62	24.1
4	LIMESTONE	24.1	25
5	LIMESTONE	25	25.6

Well ID: 5108721
Construction Date: 1977-11-16
Easting: 726575
Northing: 4902443
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 44.8
Well Diameter (cm): 15.2
Water First Found: 5.49
Static Level: 2
Water Kind FRESH
Final Status Test Hole
Primary Water Use: Not Used
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	0.61
2	GRAVEL	0.61	5.49
3	COARSE SAND	5.49	9.14
4	GRAVEL	9.14	12.2
5	LIMESTONE	12.2	44.8

Well ID: 5109243
Construction Date: 1978-12-18
Easting: 726362
Northing: 4902724
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 23.2
Well Diameter (cm): 15.2
Water First Found: 23.2
Static Level: 4
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 32
Recommended Pump Rate: 27
Pumping Duration (h:m): 1 : 40

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	6.71

2	CLAY	6.71	21.6
3	LIMESTONE	21.6	23.2

Well ID: 5109537
Construction Date: 1979-09-04

Easting: 726265
Northing: 4902223

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 166
Well Diameter (cm): 15.2
Water First Found: 97.8
Static Level: 2

Water Kind FRESH
Final Status Test Hole
Primary Water Use: Municipal

Pump Rate (LPM): 68
Recommended Pump Rate: 68
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.91
2	CLAY	0.91	2.44
3	SAND	2.44	3.96
4	CLAY	3.96	11.6
5	LIMESTONE	11.6	29.3
6	LIMESTONE	29.3	148
7	GRANITE	148	153
8	GRANITE	153	166

Well ID: 5110350
Construction Date: 1981-11-18

Easting: 726565
Northing: 4902773

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 41.5
Well Diameter (cm): 15.2
Water First Found: 20.1
Static Level: 5

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 5
Recommended Pump Rate: 5
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	GRAVEL	0.30	5.49
3	GRAVEL	5.49	20.1
4	LIMESTONE	20.1	41.5

Well ID: 5112111
Construction Date: 1986-12-17

Easting: 725594
Northing: 4903198

UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 30.5
Well Diameter (cm): 15.2
Water First Found: 18.3
Static Level: 6

Water Kind Not stated
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	PREV. DRILLED	0	18.3

2	LIMESTONE	18.3	30.5

Well ID: 5112331
Construction Date: 1987-05-21
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 23.8
Well Diameter (cm): 15.2
Water First Found: 20.1
Static Level: 3
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 45
Recommended Pump Rate: 45
Pumping Duration (h:m): 6 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	3.66
3	SAND	3.66	11.6
4	GRAVEL	11.6	14.9
5	SAND	14.9	20.1
6	LIMESTONE	20.1	23.8

Well ID: 5113256
Construction Date: 1988-08-04
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 13.4
Well Diameter (cm): 15.2
Water First Found: 12.5
Static Level: 3
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 45
Recommended Pump Rate: 45
Pumping Duration (h:m): 4 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	9.14
3	GRAVEL	9.14	12.2
4	SAND	12.2	13.4

Well ID: 5113257
Construction Date: 1988-08-04
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 38.4
Well Diameter (cm): 15.2
Water First Found: 23.8
Static Level: 16
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 5
Recommended Pump Rate: 5
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	23.2
2	LIMESTONE	23.2	38.4

Well ID: 5113258
Construction Date: 1988-08-04
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 29.9
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status
Primary Water Use:
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	25.9
2	LIMESTONE	25.9	29.9

Well ID: 5113259
Construction Date: 1988-08-04
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 26.2
Well Diameter (cm):
Water First Found: 23.8
Static Level:
Water Kind Not stated
Final Status Abandoned-Q
Primary Water Use:
Pump Rate (LPM): 5
Recommended Pump Rate:
Pumping Duration (h:m): 1 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	23.8
2	LIMESTONE	23.8	26.2

Well ID: 5113308
Construction Date: 1988-09-02
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 9.75
Well Diameter (cm): 15.2
Water First Found: 9.45
Static Level: 1
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 73
Recommended Pump Rate: 73
Pumping Duration (h:m): 2 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	7.62
2	CLAY	7.62	9.45
3	GRAVEL	9.45	9.75

Well ID: 5113309
Construction Date: 1988-09-02
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 18.9
Well Diameter (cm): 15.2
Water First Found: 13.7
Static Level: 6
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 27
Recommended Pump Rate: 27
Pumping Duration (h:m): 2 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	8.23
2	CLAY	8.23	13.7
3	FINE SAND	13.7	14
4	CLAY	14.0	18.9

Well ID: 5113310
Construction Date: 1988-09-02
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 27.7
Well Diameter (cm): 15.2
Water First Found: 26.2
Static Level: 8
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 0 : 15

Layer:	Driller's Description:	Top:	Bottom:

1	GRAVEL	0	7.62
2	CLAY	7.62	26.2
3	SHALE	26.2	26.8
4	LIMESTONE	26.8	27.7

Well ID: 5113313
Construction Date: 1988-09-02
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 43
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status
Primary Water Use:
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	STONES	0	12.2
2	CLAY	12.2	33.5
3	LIMESTONE	33.5	43

Well ID: 5114794
Construction Date: 1990-08-08
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 15.2
Well Diameter (cm): 15.2
Water First Found: 14.6
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Commerical
Pump Rate (LPM): 36
Recommended Pump Rate: 36
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.05
2	CLAY	3.05	14.6
3	COARSE GRAVEL	14.6	15.2

Well ID: 5115198
Construction Date: 1991-04-15
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 27.7
Well Diameter (cm): 15.2
Water First Found: 27.7
Static Level: 8
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 45
Recommended Pump Rate: 36
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	15.2
3	CLAY	15.2	25.9
4	LIMESTONE	25.9	27.7

Well ID: 5115254
Construction Date: 1991-05-13
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 16.5
Well Diameter (cm): 15.2
Water First Found: 15.9
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 27
Recommended Pump Rate: 23
Pumping Duration (h:m): 24 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	15.9
3	GRAVEL	15.9	16.5

Well ID: 5115360
Construction Date: 1991-07-12
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 38.1
Well Diameter (cm): 15.2
Water First Found: 35.0
Static Level: 14
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 50
Recommended Pump Rate: 27
Pumping Duration (h:m): 5 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	7.62
3	CLAY	7.62	16.8
4	CLAY	16.8	27.4
5	GRAVEL	27.4	29.9
6	CLAY	29.9	35.0
7	GRAVEL	35.0	36.9
8	LIMESTONE	36.9	38.1

Well ID: 5115547
Construction Date: 1991-11-06
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 18.3
Well Diameter (cm): 15.2
Water First Found: 18.3
Static Level: 6
Water Kind Not stated
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 4 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	GRAVEL	0.30	6.1
3	CLAY	6.1	14.6
4	GRAVEL	14.6	17.7
5	COARSE GRAVEL	17.7	18.3

Well ID: 5116469
Construction Date: 1994-02-23
Easting: 725818
Northing: 4902619
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth: 34.8
Well Diameter (cm): 15.2
Water First Found: 31.7
Static Level: 9
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30

2	CLAY	0.30	7.32
3	CLAY	7.32	30.5
4	LIMESTONE	30.5	31.7
5	LIMESTONE	31.7	34.8

Well ID: 5117235 **Easting:** 725818 **UTM Zone** 17
Construction Date: 1996-06-07 **Northing:** 4902619 **Positional Accuracy:** unknown UTM

Well Depth: 24.7 **Water Kind** FRESH **Pump Rate (LPM):** 14
Well Diameter (cm): 15.2 **Final Status** Water Supply **Recommended Pump Rate:** 14
Water First Found: 17.4 **Primary Water Use:** Domestic **Pumping Duration (h:m):** 8 : 0
Static Level: 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.88
2	SAND	4.88	17.1
3	SHALE	17.1	17.4
4	LIMESTONE	17.4	24.7

Well ID: 5118491 **Easting:** 725815 **UTM Zone** 17
Construction Date: 2000-08-21 **Northing:** 4902620 **Positional Accuracy:** unknown UTM

Well Depth: 31.1 **Water Kind** FRESH **Pump Rate (LPM):** 32
Well Diameter (cm): 15.2 **Final Status** Water Supply **Recommended Pump Rate:** 23
Water First Found: 31.4 **Primary Water Use:** Domestic **Pumping Duration (h:m):** 2 : 0
Static Level: 7

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	30.8
2	LIMESTONE	30.8	31.1

Well ID: 5119071 **Easting:** 726558 **UTM Zone** 17
Construction Date: 2002-05-21 **Northing:** 4902661 **Positional Accuracy:** margin of error : 10 - 30 m

Well Depth: 24.7 **Water Kind** FRESH **Pump Rate (LPM):** 23
Well Diameter (cm): 15.2 **Final Status** Water Supply **Recommended Pump Rate:** 23
Water First Found: 24.7 **Primary Water Use:** Domestic **Pumping Duration (h:m):** 4 : 0
Static Level: 3

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	9.14
3	CLAY	9.14	24.4
4	GRAVEL	24.4	24.7

Well ID: 5119682 **Easting:** 725815 **UTM Zone** 17
Construction Date: 2003-12-02 **Northing:** 4902620 **Positional Accuracy:** unknown UTM

Well Depth: **Water Kind** **Pump Rate (LPM):**
Well Diameter (cm): **Final Status** Abandoned-Q **Recommended Pump Rate:**
Water First Found: **Primary Water Use:** Not Used **Pumping Duration (h:m):**
Static Level:

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 5119683
Construction Date: 2003-12-02
Easting: 725815
Northing: 4902620
UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status Abandoned-Q
Primary Water Use: Not Used
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 5120677
Construction Date: 2006-04-28
Easting: 726311
Northing: 4903249
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status Abandoned-Ot
Primary Water Use:
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 5120798
Construction Date: 2006-08-02
Easting: 726404
Northing: 4902500
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 12.8
Well Diameter (cm): 15.9
Water First Found: 12.8
Static Level: 0
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 27
Pumping Duration (h:m): 4 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	1.22
2	CLAY	1.22	5.18
3	CLAY	5.18	11
4	SAND	11	12.8

Well ID: 7051235
Construction Date: 2007-10-22
Easting: 726486
Northing: 4902419
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 16.8
Well Diameter (cm): 15.9
Water First Found: 12.2
Static Level: 2
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 23
Recommended Pump Rate: 18
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	7.92
3	CLAY	7.92	12.2
4	LIMESTONE	12.2	16.8

Well ID: 7051239
Construction Date: 2007-10-22
Easting: 726284
Northing: 4902680
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 26.5
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status
Primary Water Use:
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

1		0	26.5

Well ID: 7101844
Construction Date: 2008-02-04
Easting: 726297
Northing: 4902352
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 10.1
Well Diameter (cm): 15.9
Water First Found: 10.1
Static Level: 4
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 27
Recommended Pump Rate: 27
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	5.49
2	SAND	5.49	9.75
3	GRAVEL	9.75	10.1

Well ID: 7103874
Construction Date: 2008-04-11
Easting: 726207
Northing: 4902307
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 24
Well Diameter (cm):
Water First Found: 20.4
Static Level: 4
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Public
Pump Rate (LPM): 19
Recommended Pump Rate: 19
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	1.10
2	CLAY	1.10	10.4
3	CLAY	10.4	19.2
4	CLAY	19.2	20.4
5	GRAVEL	20.4	24
6	LIMESTONE	24	

Well ID: 7159542
Construction Date: 2011-02-24
Easting: 725777
Northing: 4902870
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status Abandoned-Su
Primary Water Use:
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7159559
Construction Date: 2011-02-24
Easting: 725956
Northing: 4902963
UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 90.5
Well Diameter (cm): 15.2
Water First Found:
Static Level:
Water Kind
Final Status Test Hole
Primary Water Use: Municipal
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	6.71
3	CLAY	6.71	28.0

4	GRAVEL	28.0	32.6
5	CLAY	32.6	48.2
6	CLAY	48.2	54.6
7	CLAY	54.6	54.9
8	LIMESTONE	54.9	90.5

Well ID: 7159560
Construction Date: 2011-02-24

Easting: 725777
Northing: 4902870

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 47.6
Well Diameter (cm): 15.2
Water First Found:
Static Level:

Water Kind
Final Status Test Hole
Primary Water Use: Municipal

Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.15
2	CLAY	0.15	4.88
3	CLAY	4.88	22
4	GRAVEL	22	23.8
5	CLAY	23.8	38.1
6	LIMESTONE	38.1	47.5

Well ID: 7160679
Construction Date: 2011-03-18

Easting: 725879
Northing: 4902352

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth:
Well Diameter (cm):
Water First Found:
Static Level: 5

Water Kind
Final Status
Primary Water Use:

Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 1 : 30

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7161114
Construction Date: 2011-03-29

Easting: 726488
Northing: 4902480

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth: 19.5
Well Diameter (cm): 15.9
Water First Found: 19.2
Static Level: 2

Water Kind Untested
Final Status Water Supply
Primary Water Use: Public

Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 3 : 20

Layer:	Driller's Description:	Top:	Bottom:

1	TOPSOIL	0	0.61
2	GRAVEL	0.61	5.79
3	CLAY	5.79	8.53
4	GRAVEL	8.53	12.2
5	CLAY	12.2	13.1
6	LIMESTONE	13.1	19.5

Well ID: 7175332
Construction Date: 2012-01-19

Easting: 726312
Northing: 4902722

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 27.7
Well Diameter (cm): 15.9
Water First Found: 24.1
Static Level: 6

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Public

Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	4.27
3	CLAY	4.27	22.3
4	CLAY	22.3	22.6
5	CLAY	22.6	24.1
6	LIMESTONE	24.1	27.7

Well ID: 7175333
Construction Date: 2012-01-19
Easting: 726346
Northing: 4902730
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 32.3
Well Diameter (cm): 15.9
Water First Found: 26.2
Static Level: 4
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Public
Pump Rate (LPM): 27
Recommended Pump Rate: 18
Pumping Duration (h:m): 24 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	12.2
3	CLAY	12.2	19.2
4	CLAY	19.2	23.8
5	SAND	23.8	24.1
6	GRAVEL	24.1	26.2
7	LIMESTONE	26.2	32.3
8		32.3	

Well ID: 7177190
Construction Date: 2012-02-23
Easting: 726417
Northing: 4903261
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 29.3
Well Diameter (cm): 15.9
Water First Found: 28.4
Static Level: 18
Water Kind
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 23
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	5.49
3	CLAY	5.49	9.75
4	GRAVEL	9.75	22
5	SAND	22	28.4
6	GRAVEL	28.4	29.3

Well ID: 7178021
Construction Date: 2012-03-14
Easting: 726056
Northing: 4902984
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 40.5
Well Diameter (cm):
Water First Found:
Static Level:
Water Kind
Final Status Abandoned-Su
Primary Water Use:
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	2.13
2	SAND	2.13	4.88
3	CLAY	4.88	21.3
4	GRAVEL	21.3	34.4
5	LIMESTONE	34.4	40.5

Well ID: 7178022
Construction Date: 2012-03-14
Easting: 726134
Northing: 4903344
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 20.9
Well Diameter (cm): 15.9
Water First Found: 18.3
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Municipal
Pump Rate (LPM): 100
Recommended Pump Rate:
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	0.61
2	SILT	0.61	2.44
3	GRAVEL	2.44	4.88
4	SAND	4.88	10.4
5	SAND	10.4	20.9

Well ID: 7184458
Construction Date: 2012-07-24
Easting: 726573
Northing: 4902577
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:
Well Diameter (cm): 15.9
Water First Found: 7.62
Static Level: 1
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Public
Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:

Well ID: 7188154
Construction Date: 2012-09-27
Easting: 726567
Northing: 4902518
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 14.6
Well Diameter (cm): 15.9
Water First Found: 13.1
Static Level: 3
Water Kind GAS
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	7.62
3	SAND	7.62	8.23
4	GRAVEL	8.23	13.1
5	LIMESTONE	13.1	14.6

Well ID: 7215811
Construction Date: 2014-02-05
Easting: 726529
Northing: 4902518
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 6.1
Well Diameter (cm): 5.08
Water First Found: 2.74
Static Level:
Water Kind Untested
Final Status Observation W
Primary Water Use: Monitoring an
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	SILT	0	1.83
2	CLAY	1.83	4.27
3	SILT	4.27	6.1

Well ID: 7218122
Construction Date: 2014-03-20
Easting: 726351
Northing: 4902922
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 25.3
Well Diameter (cm): 15.9
Water First Found: 25.3
Static Level: 9
Water Kind Untested
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 3 : 15

Layer:	Driller's Description:	Top:	Bottom:
1		0	0.61
2	STONES	0.61	6.1
3	GRAVEL	6.1	24.7
4	GRAVEL	24.7	25.3

Well ID: 7218124
Construction Date: 2014-03-20
Easting: 726502
Northing: 4902478
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 7.92
Well Diameter (cm): 91.4
Water First Found:
Static Level:
Water Kind
Final Status Abandoned-Q
Primary Water Use: Not Used
Pump Rate (LPM):
Recommended Pump Rate:
Pumping Duration (h:m):

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.52
2		1.52	7.92

Well ID: 7236794
Construction Date: 2015-01-30
Easting: 726266
Northing: 4902203
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 29
Well Diameter (cm): 15.9
Water First Found: 29
Static Level: 4
Water Kind
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	5.18
3	CLAY	5.18	17.7
4	STONES	17.7	18.3
5	LIMESTONE	18.3	29

Well ID: 7259514
Construction Date: 2016-03-22
Easting: 726179
Northing: 4903404
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 16.8
Well Diameter (cm): 15.9
Water First Found: 16.8
Static Level: 7
Water Kind Untested
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 41
Recommended Pump Rate: 45
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	GRAVEL	0.61	5.49
3	GRAVEL	5.49	13.7
4	GRAVEL	13.7	16.8

Well ID: 7271020
Construction Date: 2016-09-08
Easting: 726631
Northing: 4902622
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 30.8
Well Diameter (cm): 15.6
Water First Found: 18.9
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 68
Recommended Pump Rate: 23
Pumping Duration (h:m): 2 :

Layer:	Driller's Description:	Top:	Bottom:
1	LIMESTONE	0	30.8
1	LIMESTONE	0	30.8

Well ID: 7275063
Construction Date: 2016-11-22
Easting: 726358
Northing: 4903523
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 45.7
Well Diameter (cm): 15.9
Water First Found: 25
Static Level: 5
Water Kind
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	7.32
3	CLAY	7.32	25
4	SHALE	25	25.9
5	LIMESTONE	25.9	45.7

Well ID: 7280977
Construction Date: 2017-02-13
Easting: 726140
Northing: 4902377
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 2.32
Well Diameter (cm): 91.4
Water First Found: 1.52
Static Level: 1
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 15
Recommended Pump Rate: 23
Pumping Duration (h:m): : 30

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	1.52
2	CLAY	1.52	2.32

Well ID: 7286651
Construction Date: 2017-05-15
Easting: 726469
Northing: 4902539
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 14.9
Well Diameter (cm): 15.2
Water First Found: 14.0
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 18
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 : 30

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	SAND	0.30	4.57
3	CLAY	4.57	6.1
4	GRAVEL	6.1	12.6
5	SAND	12.6	12.8
6	CLAY	12.8	14.0
7	LIMESTONE	14.0	14.9

Well ID: 7303017
Construction Date: 2018-01-10

Easting: 726253
Northing: 4903504

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 21.3
Well Diameter (cm): 15.9
Water First Found: 21.3
Static Level: 5

Water Kind Untested
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 32
Recommended Pump Rate: 32
Pumping Duration (h:m): 5 : 25

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	18.3
3	SAND	18.3	21.3

Well ID: 7303021
Construction Date: 2018-01-10

Easting: 726303
Northing: 4903463

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 48.8
Well Diameter (cm): 15.9
Water First Found: 48.8
Static Level: 9

Water Kind Untested
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 9
Recommended Pump Rate: 9
Pumping Duration (h:m): 2 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	44.2
3	LIMESTONE	44.2	48.8

Well ID: 7305906
Construction Date: 2018-02-15

Easting: 726413
Northing: 4903085

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 29.9
Well Diameter (cm): 15.6
Water First Found: 26.5
Static Level: 8

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 64
Recommended Pump Rate: 27
Pumping Duration (h:m): 3 : 10

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.91
2	CLAY	0.91	5.18
3	CLAY	5.18	5.79
4	CLAY	5.79	18.3
5	CLAY	18.3	21.3
6	CLAY	21.3	26.5
7	FINE GRAVEL	26.5	28.4
8	FINE GRAVEL	28.4	29.9

Well ID: 7312656
Construction Date: 2018-06-14

Easting: 726375
Northing: 4902540

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 14.0
Well Diameter (cm): 15.9
Water First Found: 14.0
Static Level: 2

Water Kind
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 45
Recommended Pump Rate: 32
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.61
2	CLAY	0.61	4.57
3	CLAY	4.57	14.0
4	SAND	14.0	14.0

Well ID: 7347456
Construction Date: 2019-11-18

Easting: 726561
Northing: 4902698

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 22.3
Well Diameter (cm): 15.9
Water First Found: 19.8
Static Level: 3

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 18
Recommended Pump Rate: 18
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.91
2	CLAY	0.91	8.53
3	CLAY	8.53	19.5
4	SAND	19.5	19.8
5	LIMESTONE	19.8	22.3

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WELL #4 Well Record

31 D/16

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

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

5107403 | MUNICIP. 5101.4 | CON. C ØN 07

COUNTY OR ~~DISTRICT~~	TOWNSHIP, ~~BLOCK, TRACT, SURVEY, ETC.~~	CON., ~~BLOCK, TRACT, SURVEY, ETC.~~	LOT
Peterborough	Otonabee	7	013

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
~~Irwin Sargent & Lowes Ltd~~ Keene Heights Ltd	P. O. Box 1210, Peterborough, Ont.	DAY 26 MO 02 YR 75

2 | ZONE 17 | EASTING 1085 | NORTHING 4902329 | RC 4 | ELEVATION 0720 | RC 4 | BASIN CODE 24 | II | III | IV

~~Keene Heights Ltd~~ 19 726

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Clay	Gravel	Soft	0	15
Grey	Clay	Gravel & stones	Hard	15	34
Grey	Water gravel	Clay & stones	Soft	34	45
~~Grey~~	~~Gravel~~	Some Clay	Hard	45	81
Grey	Limestone		Porous	81	87

OWRC V-5

31 | 0015605111 | 0034205111 | 0045R11051 2 | 0081211105 | 0087215

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0035-45 Untested	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
~~06~~ 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	~~36~~ 0036
~~Drilled~~ 06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		36	~~87~~ 0087
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
~~30 and 35~~ 030	06.000 INCHES	08 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
Stainless steel	0036 FEET

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	0015 GPM	07 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
— Flows FEET	025 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	025 FEET	025 FEET	025 FEET	025 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
0001 GPM	50 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	050 FEET	0015 GPM

000.6 GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL

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

WATER USE 01

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

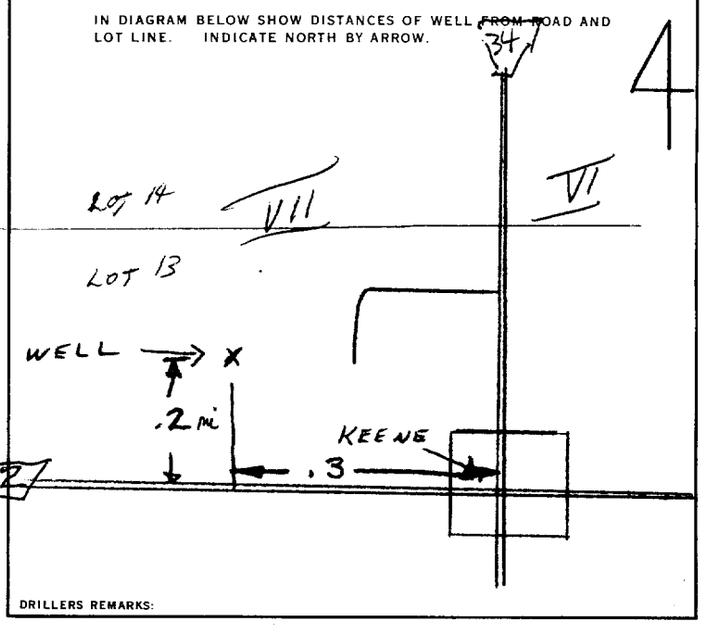
METHOD OF DRILLING

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

LOCATION OF WELL

TW-4 2602 N

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



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: Faulkner Well Drilling Co.Ltd — LICENCE NUMBER: 2104

ADDRESS: 769 Erskine Ave., Peterborough, Ont.

NAME OF DRILLER OR BORER: Donald Miller — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: W. R. Faulkner — SUBMISSION DATE: DAY 28 MO. 2 YR 75

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2104 | DATE RECEIVED 180375

DATE OF INSPECTION May 23/75 | INSPECTOR J.B.

REMARKS:

P

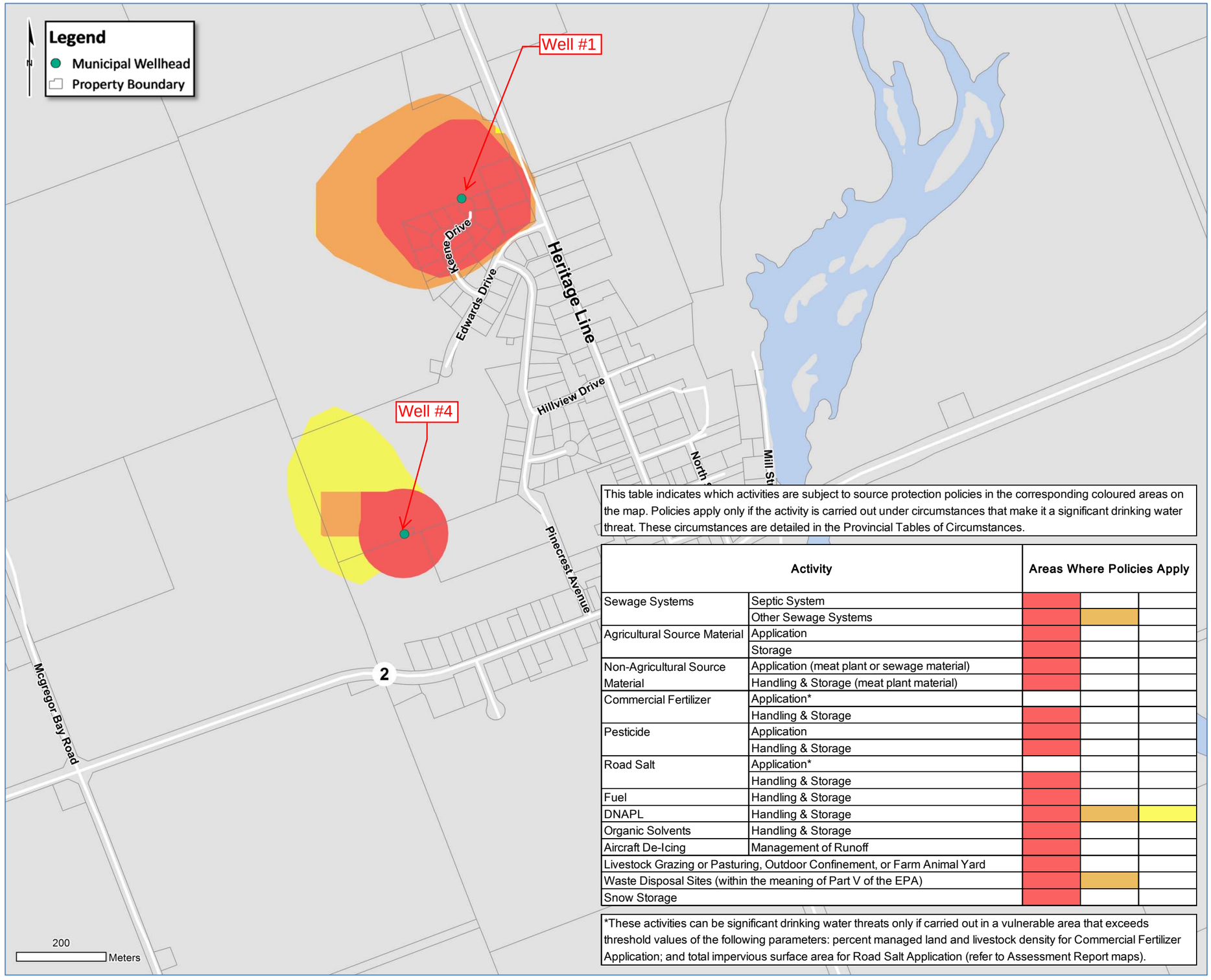
WI

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 MOE 07-091

Appendix H

Source Protection Applicable Policy Map

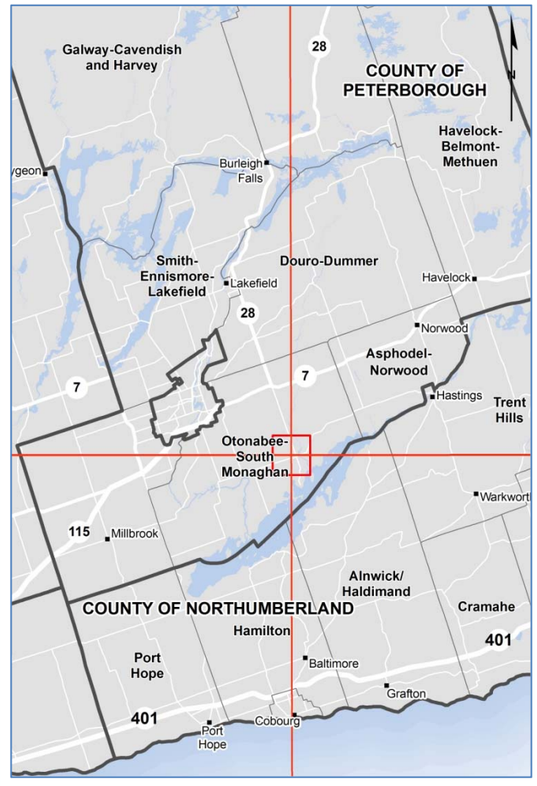


DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

Keene Heights Municipal Well System

Otonabee-Peterborough Source Protection Area

Policy Applicability Map



This table indicates which activities are subject to source protection policies in the corresponding coloured areas on the map. Policies apply only if the activity is carried out under circumstances that make it a significant drinking water threat. These circumstances are detailed in the Provincial Tables of Circumstances.

Activity		Areas Where Policies Apply		
Sewage Systems	Septic System			
	Other Sewage Systems			
Agricultural Source Material	Application			
	Storage			
Non-Agricultural Source Material	Application (meat plant or sewage material)			
	Handling & Storage (meat plant material)			
Commercial Fertilizer	Application*			
	Handling & Storage			
Pesticide	Application			
	Handling & Storage			
Road Salt	Application*			
	Handling & Storage			
Fuel	Handling & Storage			
DNAPL	Handling & Storage			
Organic Solvents	Handling & Storage			
Aircraft De-Icing	Management of Runoff			
Livestock Grazing or Pasturing, Outdoor Confinement, or Farm Animal Yard				
Waste Disposal Sites (within the meaning of Part V of the EPA)				
Snow Storage				

*These activities can be significant drinking water threats only if carried out in a vulnerable area that exceeds threshold values of the following parameters: percent managed land and livestock density for Commercial Fertilizer Application; and total impervious surface area for Road Salt Application (refer to Assessment Report maps).

PRODUCED BY Lower Trent Conservation on behalf of the Trent Conservation Coalition Source Protection Committee, 2014.

Waterbodies and watercourses located within the extent of an intake protection zone or wellhead protection area are included in that zone.

Ontario
Made possible through the support of the Government of Ontario

Trent Conservation Coalition Source Protection Region

www.trentsourceprotection.on.ca

Appendix I

Site-Wide Water Balance and Nitrate Calculations

Water Balance Calculations

74 Edwards Drive Keene, ON

Landscaped Areas

THORNTHWAITE-TYPE MONTHLY WATER-BALANCE MODEL

modified from Dingman 2015: Box 6-8 (pg 299) using ET model of Hamon (1963)

		Input Data				Computed Values							
											Surplus	362	mm/yr
Weather Station Location:	**Peterbourough A**					**Latitude:**	**44.2**	**degree**					
Solar Declination (degree)	-20.6	-12.6	-1.5	10.0	19.0	23.1	21.0	13.4	2.6	-9.0	-18.5	-23.0	
DayLength (hr)*	9.1	10.3	11.8	13.3	14.6	15.3	14.9	13.8	12.3	10.8	9.5	8.7	
Available Water Storage Capacity		0.12	m/m		**Root Depth**	500	mm			**SOILmax**	60.0	mm	

MONTHLY WATER BALANCE DATA

Temperatures in C, water-balance terms in mm.

Month:	J	F	M	A	M	J	J	A	S	O	N	D	Year
TEMPERATURE (T)	-8.5	-7.0	-1.8	5.9	12.1	17.0	19.6	18.3	13.9	7.5	1.9	-4.4	
PRECIPITATION (P)	57.4	51.5	56.1	68.6	81.5	79.9	70.6	77.0	85.3	76.9	86.4	64.2	855
RAIN	24.5	24.7	30.8	60.5	81.4	79.9	70.6	77.0	84.5	75.2	71.7	31.8	713
SNOW	33	27	25	8	0	0	0	0	1	2	15	32	143
MELT FACTOR (F)	0.00	0.00	0.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00	0.32	0.00	
PACK	75	102	127	2	0	0	0	0	0	0	10	42	
MELT	0	0	0	133	2	0	0	0	1	2	5	0	143
INPUT (W)	25	25	31	194	84	80	71	77	85	77	76	32	855
POTENTIAL ET (PET)	0	0	0	40	67	91	108	92	61	37	22	0	517
NET INPUT (ΔW)	25	25	31	154	17	-11	-37	-15	24	40	55	32	
SOIL MOISTURE (SOIL)	60	60	60	60	60	50	27	21	45	60	60	60	
ΔSOIL	0	0	0	0	0	-10	-23	-6	24	15	0	0	0
ET	0	0	0	40	67	90	93	83	61	37	22	0	493
SURPLUS=W-ET-DSOIL	25	25	31	154	17	0	0	0	0	25	55	32	362

Notes:

Precipitation, Rain, Temperature, and Latitude are inputted parameters

SOILmax = available water storage capacity * root depth

m = month

D = Day length (hrs) $=2*\cos^{-1}(-\tan(\text{Latitude})*\tan(\text{Declination}))/0.2618$ [calculation is in radians]

$SNOW_m = P_m - RAIN_m$

$F_m = 0$ if $T_m <= 0^oC$; $F_m = 0.167*T_m$ if $0^oC<T_m<6^oC$; $F_m = 1$ if $T_m>=6^oC$

$PACK_m = (1-F_m)*(SNOW_m+PACK_{m-1})$

$MELT = F_m*(SNOW_m+PACK_{m-1})$

$W_m = RAIN_m+MELT_m$.

PET = 0 if $T_m<0$; otherwise $PET = 2.98*0.611*\exp(17.3*T_m/(T_m+237))/(T_m+237.2)$*Number of days in month [Hamon ET model (1963)]

$\Delta W_m = W_m - PET_m$

$SOIL = \min\{[\Delta W_m+SOIL_{m-1}], SOILmax\}$, if $\Delta Wm>0$; otherwise $SOIL = SOIL_{m-1}* \exp(\Delta W/SOILmax)$

$\Delta SOIL = SOIL_{m-1}-SOIL_m$

ET = PET if $W_m > PET$; otherwise, $ET=W_m-\Delta SOIL$

Pre and Post-Development Water Balance Calculations

74 Edwards Drive, Keene, ON

Water Balance Results

Water Surplus Landscaped Areas		
Precipitation	855	mm/yr
Actual Evapotranspiration	493	mm/yr
Water Surplus	362	mm/yr

Infiltration Factors	
Landscape Type	Infiltration Factors
Paved Areas	0
Roofs	0
Wetlands	0
Forests	
Topography: Hilly	0.1
Soil Type: Tight, Impervious Clay	0.15
Cover: Woodland	0.2
Total Infiltration Factor	**0.45**
Landscaped Areas	
Topography: Hilly	0.1
Soil Type: Tight, Impervious Clay	0.15
Cover: Cultivated Land	0.1
Total Infiltration Factor	**0.35**

Areas		
Pre Development	Area (ha)	Area (m2)
Total Paved Area	0.0	0
Total Roof Area	0.0	0
Wetland	4.9	49,400
Forest	9.2	91,600
Total Landscaped Area	0.0	0
Total	14.1	141,000
Post Development		
Total Paved Area	0.8	8,236
Total Roof Area	0.4	4,080
Wetland	4.9	49,400
Total Forest	4.1	41,400
Total Landscaped Area	3.8	37,884
Total	14.1	141,000

Pre-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	-	-	-	-	-
	Roof Area	-	-	-	-	-
Discharge Areas	Wetland	49,400	42,237	24,354	-	17,883
Pervious Areas	Forested Areas	91,600	78,318	45,159	14,922	18,238
	Landscape Area	-	-	-	-	-
Totals		141,000	120,555	69,513	14,922	36,120

Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.

Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	8,236	7,042	704	-	6,338
	Roof Area	4,080	3,488	349	-	3,140
Discharge Areas	Wetland	49,400	42,237	24,354	-	17,883
Pervious Areas	Forested Areas	41,400	35,397	20,410	6,744	8,243
	Landscape Area	37,884	32,391	18,677	4,800	8,914
Total Before Effluent		141,000	120,555	64,494	11,544	44,517
Effluent Discharge		-	-	-	5,840	-
Total With Effluent]		141,000	120,555	64,494	17,384	44,517

Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.

Comparision of Pre- and Post -Development

	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	120,555	69,513	14,922	36,120
Post-Development	120,555	64,494	17,384	44,517
Change in Volume	-	-5,019	2,462	8,396
Change in %	-	-7	17	23

Requirement for Infiltration of Roof Run-off

Volume of Pre-Development Infiltration (m^3/yr)	14,922
Volume of Post-Development Infiltration (m^3/yr)	17,384
Deficit from Pre to Post Development Infiltration (m^3/yr)	- 2,462
Percentage of Roof Runoff required to match the pre-development infiltration (%)	-

Predictive Assessment of Nitrate Concentration Without Mitigation

Number of lots	16
Septic Discharge per lot (L/day)	1,000
Qe - total septic discharge (L/day)	16,000
Ce - nitrate concentration in effluent (mg/L)	40
Qi - total groundwater recharge (L/day)	31,627
Ci - nitrate concentration in groundwater recharge (mg/L)	0.10
Qt - Total dilution volume (L/day)	47,627
Ct - total concentration of nitrate at property boundary (mg/L)	**13.5**

Predictive Assessment of Nitrate Concentration With Advanced Treatment

Number of lots	16
Septic Discharge per lot (L/day)	1,000
Qe - total septic discharge (L/day)	16,000
Ce - nitrate concentration in effluent (mg/L)	20
Qi - total groundwater recharge (L/day)	31,627
Ci - nitrate concentration in groundwater recharge (mg/L)	0.10
Qt - Total dilution volume (L/day)	47,627
Ct - total concentration of nitrate at property boundary (mg/L)	**6.8**