HYDROGEOLOGICAL IMPACT STUDY
PROPOSED NEW SUB-DIVISION

0 MT. PLEASANT ROAD, TOWN OF CALEDON, ON.

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

Prepared For: 1029629 Ontario Inc.

5/17/2018

Project No.: SP17-212-30

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1. INTRODUCTION AND BACKGROUND

Sirati & Partners Consultants Ltd (SPCL) was retained by 1029629 Ontario Inc (c/o Carriage House Realty Corporation**)** to conduct a Hydrogeological Assessment at the property located at 0 Mount Pleasant Road, Town of Caledon, Ontario. The Site location map is presented in Figure 1-1. The entire Property is an approximately 12.28-hectare (30.34 acres) parcel of land extending approximately 678.5 metres (m) along northeast and southwest and about 181 m along Mount Pleasant Road. The Property is a cultivated land and includes no structures.

The study was generally required to identify potential impact to base flow of local streams or significant natural features within the study area. The hydrogeological study was conducted to assess the subsurface soil conditions, soil stratigraphy, groundwater table condition and its flow direction.

This hydrogeological assessment was initiated in accordance with the following scope of work:

- **Review of available background information**: A review of available geological and hydrogeological information for the site and surrounding areas was conducted. This is done to provide background information to allow for characterization of regional hydrogeological conditions.
- **Detailed site inspection**: An inspection of the property to review existing site conditions including identification of any hydrogeological features such as significant areas of potential groundwater recharge or areas of groundwater discharge.
- **Measurement of groundwater levels:** To confirm the groundwater table levels and elevations using existing boreholes/monitoring wells drilled/installed during the geotechnical investigation program.
- **In-situ hydraulic conductivity tests:** In-situ hydraulic conductivity tests (rising-head tests) in the existing monitoring wells and hydraulic conductivity of the underlying soils in order to determine potential dewatering requirements.
- **Private well survey:** A well survey for properties within approximately 500 m radius of the site boundary and well information to be obtained from the property owners where possible, and if permission is granted.
- **Water Balance (Preliminary):** A detailed water balance study for the proposed development as part of the hydrogeological study. The water balance study is based on available climatic information associated with pre-development and proposed post-development conditions at the subject lands.

The report was prepared to provide an assessment of potential changes to the water balance as a result of Site development, including potential mitigation measures that can be implemented in order to maintain groundwater function at the Site, including managing the overland flow to encourage infiltration.

Following completion of the above-noted study, a detailed report was prepared regarding the Site hydrogeology. The report included the following information:

- Description of the work program and factual information gathered during the study including the results of Site inspection and water level measurements. The results of the subsurface investigations including borehole logs and grain size analysis were reviewed and summarized.
- Significant hydrogeological features and functions at the Site were identified. The report provides the information on the local groundwater functions, particularly with respect to the natural environment.
- The potential impact of the development on local water wells was identified and appropriate mitigating measures were provided.
- Water balance for the existing pre-development and proposed post-development conditions was conducted using the Thornthwaite approach. The water balance calculation was presented using climate information obtained from the nearest Environment Canada weather station. Low Impact Development tool was also utilised to indicate the range of infiltration conditions.

Prior to this hydrogeological assessment, a preliminary geotechnical investigation was conducted by SPCL during which eight (8) boreholes were advanced to characterize the subsurface soil properties and to be partly employed as monitoring wells at a later time. At the time of the geotechnical investigation, the Subject Property (the Site) was also undergoing a Phase One Environmental Site Assessment (ESA) parallel to the hydrogeological assessment.

This report presents the results of the hydrogeological assessment for the proposed development along with supporting materials.

2. LAND USE

The Property, an undeveloped parcel of land, is bounded by Mount Pleasant Road to the east, vegetated woodlot to the south and west, and a single detached residential house to the north. Many times, the municipal boundaries san the watershed boundaries and although the Town of Caledon falls within the Regional Municipality of Peel and Credit River Conservation Authority jurisdictions, the Subject Property falls within the Innisfil Creek subwatershed of Nottawasaga Valley Conservation Authority (NVCA), part of Lake Simcoe Region Conservation (LSRCA) Authority (Figure 2.1).

The Nottawasaga Valley Source Protection Area (SPA) is located in the south-west quarter of the South Georgian Bay-Lake Simcoe (SGBLS) Source Water Protection (SWP) Region and is bounded to the south by the Humber and Credit River watersheds and to the east by the numerous small streams which drain into Lake Simcoe. The Niagara Escarpment forms part of the western boundary, separating the Nottawasaga from the Grand, Grey Sauble and Saugeen watersheds.

A creek flows through southward approximately in the eastern part of the Property. However, no water flow was observed during the Site visits. The Subject Property is situated at the edge of the watershed boundary within the recharge area of the watershed. The mid portion of the Property is elevated with surface water flow diverging west and east from this point, probably marking the watershed boundary.

2.1 OAK RIDGES MORAINE CONSERVATION PLAN, 2017 (ORMCP,2017, O.Reg. 140/02).

As per the ORMCP, 2017, the Subject Property falls within the Palgrave Estate Residential Community (a component of Countryside Area) land use designation (Figure 2-2) area. The Plan provides policies to protect water quality and quantity across the Moraine. Residential development is permitted with respect to the land in the Palgrave Estates Residential Community as shown on the Figure 2-2, subject to the Town of Caledon Official Plan, as amended.

3. DEVELOPMENT PLAN

The property covering an area of about 30.34 acres was proposed to be developed as a residential subdivision, ultimately comprising of eight (8) single detached custom homes.

The pre- and post-development plans are shown in Figure 3-1 and 3-2. The Site statistics presented in these maps were used for the water balance calculations. Based on the Site grading plan provided by the client (Figure 3-3), the average grade elevations at each lot were estimated. Accordingly, the average highest-grade elevation was noticed at the lot number 3 at 297.69 mASL, while the lowest average grade elevation was found at lot 8 at 294.59 mASL.

4. ENVIRONMENTAL FEATURES

A review of the Lake Simcoe Region Watershed, Natural Heritage System (NHS) Mapping of various environmental features is provided in the report entitled "Natural Heritage System for the Lake Simcoe Watershed, prepared for: Lake Simcoe Region Conservation Authority (Beacon Environmental, July 2007)".

The components that comprise the Lake Simcoe Watershed NHS described in the report include:

1. Significant Habitat for Endangered and Threatened Species;
2. Significant Wetlands; Significant Woodlands;
3. Significant Valley Lands;
4. Significant Wildlife Habitat;
5. Areas of Natural and Scientific Interest;
6. Habitat for Fish; and Linkages.

Based on the findings of the report, there appears to be no environmental features within the Subject Area that could be inferred as hydrogeological constrains regarding the proposed development, except an ephemeral creek running from north to south at the eastern part of the Site (Figure 4-1). A 15 m buffer zone was being proposed as no development zone to the west of the ephemeral creek, which is consistent with current guidelines and policy practices within Southern Ontario.

5. PHYSICAL SETTING

5.1 TOPOGRAPHY AND DRAINAGE

Using the interactive topographic map generator (http://www.gisapplication.lrc.gov.on.ca) the Property has as its highest elevated portion at an elevation of about 298 mASL in the northeast and its lowest elevated area with an elevation of about 295 mASL in the southwest as shown in Figure 5-1. The Site topographic map provided by the client is included in the Figure 5-1a, and the lowest elevation of 289.88 mASL was seen in the northwestern part and the highest elevation of 298.01 mASL could be seen in the mid-north portion of the property. The topographic elevations in the south and southwestern parts were 294.75 and 290.81 mASL, respectively.

The Nottawasaga Valley Watershed is one of the four watersheds within South Georgian Bay-Lake Simcoe Source Protection Region. The Nottawasaga Valley watershed has nine subwatersheds including Innisfil Creek subwatershed. The Innisfil Creek subwatershed consists of four main creek systems, namely Innisfil Creek, Bailey Creek, Beeton creek and Penville Creek that drain the southeast portion of the Nottawasaga River watershed. The Subject Property falls within the Beeton Creek system.

Beeton Creek arises on the Oak Ridges Moraine south of Tottenham. Flowing north, the creek enters a reservoir at the Tottenham Conservation Area and then continues downstream. An east branch, originating east of Tottenham,

flows westward through agricultural lands and enters Beeton Creek north of Tottenham. Beeton Creek continues to flow northward through an agricultural landscape, skirting the west side of Beeton before joining Bailey Creek and then entering Innisfil Creek.

Based on the Site grading plan provided by the client, the highest elevation at the mid-portion of the property is about 298 mASL and it slopes both east and west with an elevation of about 290 mASL, with a relief of the area of about 8 m. The most significant topographic feature in the Study Area is the east-west trending Oak Ridges Moraine.

5.2 PHYSIOGRAPHY

The Nottawasaga Valley Watershed is located within five (5) main regional-scale physiographic regions as defined by Chapman and Putnam (1984). These regions include the Horseshoe Moraines, Oak Ridges Moraine, Peterborough Drumlin Field, Schomberg Clay Plains and Simcoe Lowlands (Figure 5-2).

The Subject Property lies within the physiographic region termed as Oak Ridges Moraine. The Oak Ridges Moraine is comprised of rolling sandy hills, hummocky topography and closed depressions that form the source of the headwaters to major stream that drain off the moraine. The moraine within the subwatershed consists primarily of surficial sand and gravel deposits.

The Oak Ridges Moraine (ORM) Complex occupies only a small portion of the Study Area in the Town of Caledon area. The Oak Ridges Moraine is an extensive interlobate moraine that extends from the Caledon area, eastward across the northern limits of the Greater Toronto area.

5.3 OVERBURDEN

Within the subwatershed, the Quaternary sediment thickness is the difference between the ground surface and the interpolated bedrock surface. The thickness of the Quaternary sediments has been determined from borehole and water well information within the subwatershed. Figure 5-3 shows the surficial geology of the area, and the overburden thickness within the Oak Ridges Moraine (ORM) ranges from approximately 56 m to 240 m. The Paleozoic bedrock topography appears to strongly influence the overlying Quaternary sediment thickness and distribution. The thicker Quaternary sediments occur in bedrock topographical lows (i.e. within bedrock valleys and beneath the ORM), while the thinnest areas of Quaternary deposits occur at the north end of the subwatershed, south of Cook's Bay.

5.4 BEDROCK

The bedrock consists of shale, interbedded dolomitic siltstone, and minor limestone, which were deposited in shallow seas about 450 million years ago. These beds, named the Georgian Bay Formation are approximately 250 m thick and dip to the southeast at about 5 m/km. Following long periods of additional sedimentation and erosion, the ancient Laurentian River and its tributaries cut several deep, poorly-defined bedrock valleys trending northwest-

southeast across the area. As depicted in Figure 5-4, the study area is underlain by the Georgian Bay Formation and have an important influence on drift thickness and groundwater distribution in the study area

5 HYDROGEOLOGY

Water well records on file with the MOECC serve as a database for this hydrogeological assessment. The well locations were provided from the MOECC interactive water well record database. A plot of the local water well records is included in Figure 6-1. According to the well records, there appears to be about 17 wells within a 500 m radius around the property. All these wells were completed between 1966 and 2004 with water levels observed at about 9 m. Depths of the wells range between 10 m and 80.4 m (31ft. to 277 ft.). Based on the information extracted from well records where available, all the wells are characterized by medium to coarse sand, with gravel and some stones and clay. No well has encountered bedrock up to the drilled depths of 80.4 m indicating huge thickness of unconsolidated sediments. Water levels ranged between 9.0 m and 45 m. A cross-section depicting the local geologic profile based on the information acquired from well records is shown in Figure 6-2.

6 DOOR TO DOOR WELL SURVEY

A door to door well survey was conducted on July 11,2017 to verify any property that utilizes a private well for domestic purposes, in order to assess any potential future impacts due to the Site development. Accordingly, the properties within 500 m radius of the Site were investigated and one domestic use well was identified immediately north of the property (Figure 6-1). However, in spite of best efforts, we could not reach the property owner to obtain well information. It is recommended to contact the home owner to get well information before any construction excavation begins at the Subject Property.

7 BOREHOLE INSTALLATION PROGRAM

Eight boreholes (BH1 to BH8) were drilled during June 1 and 2, 2017, for the geotechnical investigation to depths ranging from 8.2 to 11.2 metres below ground surface (mbgs). Figure 8-1 shows the borehole location plan. Boreholes were drilled with hollow stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of SPCL personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the SPCL laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all the soil samples were tested for moisture content.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed in five boreholes (BH1, BH2, BH4, BH6 & BH8) for the long-term (stabilized) groundwater level monitoring.

The elevations at the borehole locations were surveyed by the SPCL personnel using a differential GPS system.

The borehole logs indicate the presence of thick overburden materials consisting of:

- Fill materials from grade to 1.5 mbgs
- Sand, fine to medium from 1.5 m to 4.6 mbgs
- Sandy Silt material from 4.6 m to 7.6 mbgs
- Silty Sand from 7.6 to 9.1 mbgs
- Clayey Silt to Silty Clay 9.1 to 11.2 mbgs

8.1 HYDROGEOLOGICAL CROSS SECTIONS

Two cross sections (NE-SW, Figure 8-2 and Figure 8-3), as shown in Figure 8-1, one along the north and the other along the south property boundaries, were constructed to illustrate the horizontal and vertical extents of the hydrogeological units. These cross sections pass through most of the monitoring wells from where the water table measurements were obtained during the site visits.

In general, based on the lithology shown in the borehole logs, the Site is characterized by sand with sandy silt to silty sand. Cross sections of soil profile based on the bore logs are presented in Figures 8-2 and 8-3. The borehole logs are presented in Appendix A.

8 GROUNDWATER LEVEL MONITORING

During drilling (short-term), groundwater was found in the boreholes at depths ranging from 4.6 to 9.1 mbgs. The stabilized groundwater table observed in the monitoring wells on June 16, 2017 was at depths ranging from 4.7 to 9.8 mbgs, corresponding to elevations ranging from 286.9 to 282.1 mASL, as listed on Table 9-1. The monitoring well installed in borehole BH6 was found to be wet at bottom.

Table 9-1: Groundwater Levels Observed in Monitoring Wells, June 16, 2017.

BH/MW	Date of Drilling	Date of Observation	Ground Elevation (mASL)	Depth of Groundwater (m)	Elevation of Groundwater (mASL)
BH1/MW1	June 2, 2017	June 16, 2017	291.9	9.8	282.1
BH2/MW2	June 1, 2017	June 16, 2017	295.8	9.6	286.2
BH4/MW4	June 1, 2017	June 16, 2017	291.6	4.7	286.9
BH6/MW6	June 1, 2017	June 16, 2017	295.1	8.2	286.9
BH8/MW8	June 2, 2017	June 16, 2017	290.9	8.8	282.1

Water level monitoring was completed on July 11, 2017, as a part of door to door survey and hydraulic tests and the results are summarized below in Table 9-2.

Table 9-2: Groundwater Levels Observed in Monitoring Wells, July 11, 2017

BH/MW	Date of Observation	Ground Elevation (mASL)	Depth to Groundwater (mbgl)	Elevation of Groundwater (mASL)
BH1/MW1	July 11, 2017	291.9	9.7	282.2
BH2/MW2	July 11, 2017	295.8	9.5	286.3
BH4/MW4	July 11, 2017	291.6	4.3	287.3
BH6/MW6	July 11, 2017	295.1	DRY	DRY
BH8/MW8	July 11, 2017	290.9	8.7	282.2

The groundwater table contour map was prepared for the summer month of June 2017 (Figure 8-4) and as indicated the groundwater flow was divergent at mid-central portion of the Property flowing towards northeast and southwest.

9.1 LONG TERM GROUNDWATER MONITORING

Sirati & Partners were authorized by 1029629 Ontario Inc. to undertake long term monthly water level monitoring at the Subject Property located at Mt. Pleasant Road, Caledon. The primary objective of the monthly monitoring was to characterize the seasonal groundwater level fluctuations and flow directions at the Subject Property.

This section summarizes changes in groundwater levels at the Subject Property over a period of six (6) months from October 2017 to March 2018.

Table 9-1 Details of the water level measurements from October 2017 to March 2018.

				October 2017		November 2017		December 2017	
Monitor	Easting	Northing	Ground Elevation	Depth to Water	Water Table Elevation	Depth to Water	Water Table Elevation	Depth to Water	Water Table Elevation
			(mASL)	(mbgs)	(mASL)	(mbgs)	(mASL)	(mbgs)	(mASL)
MW1	594824.541	4869284.668	291.90	9.61	282.3	8.80	283.1	9.60	282.30
MW2	594761.854	4869196.908	295.76	9.97	285.8	9.21	286.6	10.13	285.63
MW4	594576.489	4868882.106	291.64	5.05	286.6	4.41	287.2	5.32	286.32
MW6	594801.508	4869020.018	295.13	7.70	287.4	6.93	288.2	7.74	287.39
MW8	594962.874	4869244.776	290.95	8.43	282.5	8.41	282.5	8.50	282.45

January 2018		February 2018		March 2018	
Depth to Water	Water Table Elevation	Depth to Water	Water Table Elevation	Depth to Water	Water Table Elevation
(mbgs)	(mASL)	(mbgs)	(mASL)	(mbgs)	(mASL)
9.50	282.40	9.55	282.35	9.49	282.41
10.12	285.64	10.30	285.46	10.20	285.56
5.42	286.22	5.47	286.17	5.32	286.32
7.72	287.41	7.73	287.40	7.73	287.40
8.58	282.37	8.54	282.41	8.40	282.55

9.2 OCTOBER 2017 SITE VISIT

First site visit of the six-month groundwater monitoring program was completed on October 2017 and continued in subsequent months from November to December, 2017 and January to March 2018. As observed during the Site visits there was no surficial flow within the Subject Property and no surface water ponding was observed. During the October 2017 Site visit it was observed that the monitoring well MW8 was uprooted and a cut was made at the bottom on both the protective steel casing and the PVC pipe, as shown in the attached pictures 1.0 and 2.0. The PVC casing pipe was put back in place, however, it had a big cut at the bottom. If there had been a heavy rainfall, the surface water would have likely penetrated into the well. So, it was imperative to repair the well as soon as possible.

Picture 1.0

Picture 2.0

9.3 DECEMBER 2017 SITE VISIT

During the December 2017 monitoring event, the damaged monitoring well MW8 was restored to its original position, as depicted in the pictures below. However, the protective steel casing could not be set in place due to the hard ground.

9.4 INFERRED GROUNDWATER FLOW

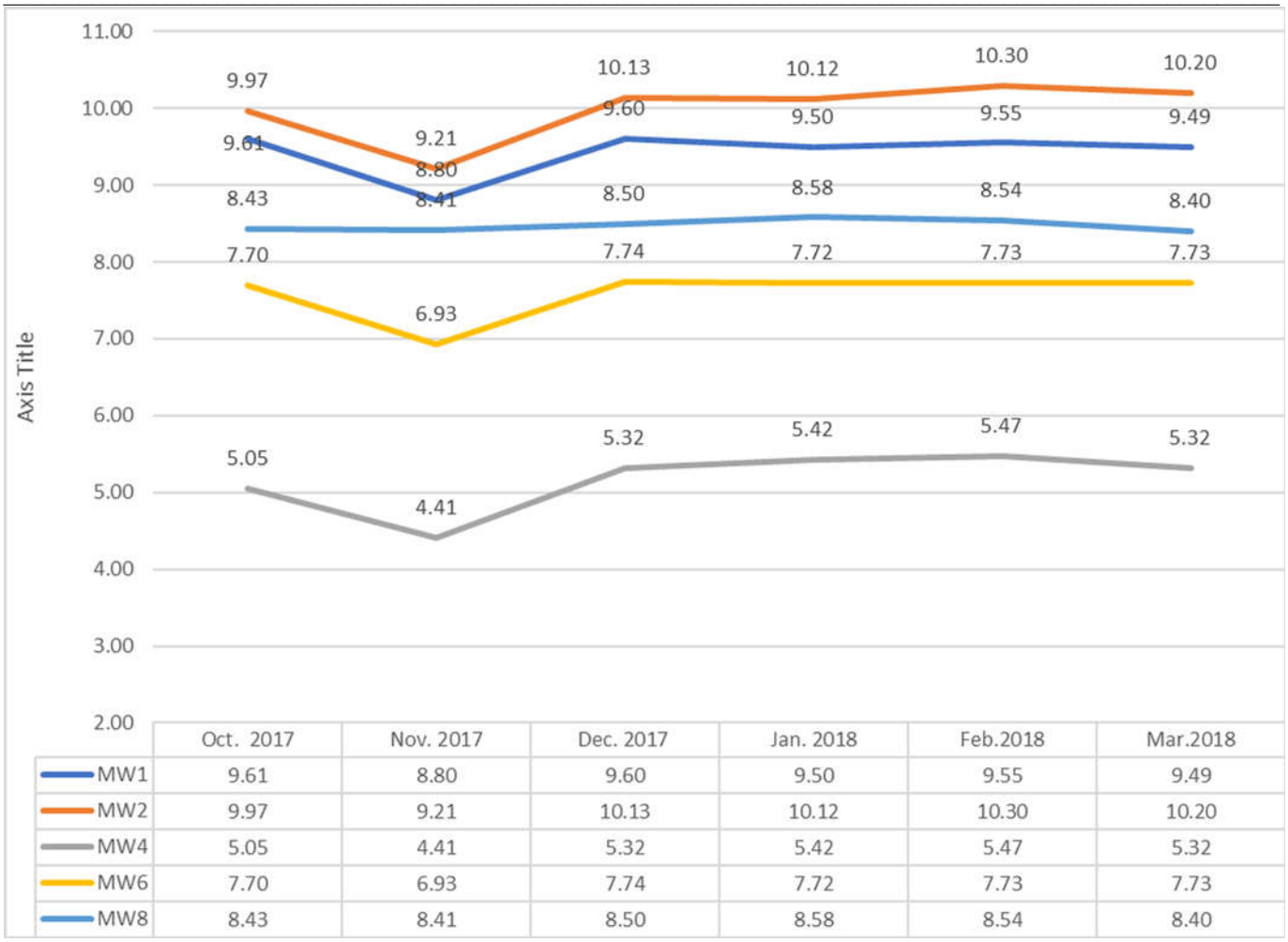
The maps presented (Figure 9-1 to Figure 9-6) in this report provide an overview of magnitudes and extents of rises and declines of water levels at each monitoring well.

Groundwater levels measured during the first Site visit on October 25, 2017 (Table 9-1) were utilized to draw the water table contours at the Site to see the existing trend in the flow direction. All the wells were completed within the overburden and no bedrock was encountered in the wells. Typically, the depth to groundwater level as measured within the monitoring wells ranged from 4.41 mbgs at monitoring well MW4 to 10.30 mbgs at MW2, while the elevations ranged between 282.29 mASL (MW1) and 288.20 mASL (MW6) for the entire site. The monitoring well MW2 is situated at a location of higher ground elevation of 295.76 mASL, with the corresponding lowest depth to groundwater at 10.30 mbgs, during February 2018 monitoring event.

Groundwater contours were drawn using Surfer program, presented on the Figures 9-1 to 9-6 and as observed the highest water table elevation (288.20 mASL) was encountered at monitoring well MW6 and groundwater flow was divergent from this location. It appears that the Subject Property is situated at the watershed boundary with the surface drainage flowing towards opposite directions from a common highest point in correspondence of monitoring well MW6 area. This trend was consistent throughout the entire monitoring period, as shown in the groundwater table contour maps. Also, the flow of surficial drainage was divergent from MW6, following the surface topography.

The flow from the water table aquifers (i.e. surficial aquifers) generally mimics surface-water watersheds drainage directions, and their flow usually does not cross surface boundaries. The shallow groundwater flow at the Site appears to follow the watershed boundary.

The Figure 9-7 below shows the monthly variations of the groundwater table elevations over the period of the monitoring. As shown in the Figure 9-7, there was very little change in the groundwater table elevations except in the monitoring well MW8 which does not show any marked variation in the water levels.



	Oct. 2017	Nov. 2017	Dec. 2017	Jan. 2018	Feb.2018	Mar.2018
MW1	9.61	8.80	9.60	9.50	9.55	9.49
MW2	9.97	9.21	10.13	10.12	10.30	10.20
MW4	5.05	4.41	5.32	5.42	5.47	5.32
MW6	7.70	6.93	7.74	7.72	7.73	7.73
MW8	8.43	8.41	8.50	8.58	8.54	8.40

Fig 9-7. Monthly Water Table Elevation Changes from October 2017 to March 2018

As observed from the monitoring data and the Figure 9-7 above, there was a rise in the water levels in all the monitoring wells across the Site, except at MW8, during the monitoring period of November 2017. This was probably due to the prevailing warm temperatures with associated high precipitation events in the month of November 2017. There was a total of 59.8 mm (Environment Canada 2018) precipitation in the month of November 2017, causing the water levels to rise by a magnitude of 0.76 m at monitoring well MW2.

9 IN-SITU HYDRAULIC CONDUCTIVITY TEST

Slug tests were conducted on two of the monitoring wells on July 11,2017, as monitoring the well MW6 was dry and the other two monitoring wells (MW1 and MW8) had deep water levels with very flat water columns. Hydraulic conductivity ("k") was calculated using the Hvorslev method for rising head tests conducted on MW2 and MW4. The results are summarized in Table 10-1 and are compared to typical ranges of hydraulic conductivities of soil types similar to those found at the Site. Plots of the rising head tests along with calculations of the hydraulic conductivity based on Hvorslev method are presented in Appendix B. The "k" values closely resemble the lithology encountered in the monitoring wells.

Table 10.1. Results of Slug (Rising Head) Tests and Estimated Infiltration Rates.

Monitor	Hydraulic Conductivity (m/s)	Soil Type	Range of Hydraulic Conductivity (m/s) *	Estimated Infiltration Rates (mm/hr) **
MW2	$1.52 * 10^{-8}$	Silty Sand to Clayey Silt Till	$10^{-9} – 10^{-6}$	14
MW4	$1.67 * 10^{-7}$	Sandy Silt to Silt	$10^{-9} – 10^{-6}$	31
Average	**$9.11 * 10^{-8}$**			**22.5**

* Domenico, P.A. and F.W. Schwartz, 1990. *Physical and Chemical Hydrogeology*, John Wiley & Sons, New York, 824 p.
** Infiltration rates based on OMMAH, 1997.

Based on the approximate relationship between the hydraulic conductivity and infiltration rate (OMMAH 1997), the average infiltration rate corresponding to the average hydraulic conductivity of $9.11 * 10^{-6}$ cm/sec was estimated to be about 22.5 mm/hour (Table 10.1).

10 CONSTRUCTION DEWATERING

As per the information from the client's, the development consists of an eight-lot subdivision and the lowest level in the proposed development is to be the one level basement of standard height of about 3.0 m in the lots 1 to 8 with each lot covering a net usable area ranging between 0.53 ha and 0.77 ha (5300 to 7700 m^2) (Figure 3-2). Since the general slope and the ground profile of the land is uneven, it would be difficult to consider the whole area as one parcel and estimate the dewatering volumes. Hence, each lot was considered as eight (8) independent houses or blocks, as shown in Figure 3-2 and the need of dewatering was assessed for each block. Based on the average ground elevation at each block and the assumed geodetic elevation of one level basement, the requirement of short-term dewatering was determined. The cross-section depicting the depths and elevations of existing ground, groundwater and the assumed final construction excavation elevations are shown in Figures 11-1 to 11-2.

As shown in the cross-sections, the average groundwater elevations at all the blocks were well below the proposed final construction excavation geodetic elevations and hence there is no requirement for dewatering at all these blocks and at the entire Site.

11 LONG TERM GROUNDWATER DEWATERING

The proposed development includes a set of individual homes and as such do not require an elaborate drainage system for long term dewatering. Considering the depth to the one level basement (Figures 11-1 and 11-2) where the drainage tiles are proposed to be situated to lower the hydrostatic pressure acting on the footing walls, it appears evident that the existing groundwater table is well below this level and hence no long-term dewatering estimates related to the groundwater table are possible.

The best possible basement dewatering (also called basement waterproofing) systems include an interior baseboard drainage system around the perimeter of the basement. This drainage system will direct the water to a sump pump,

which then discharges the water from the house to the sewer line or downhill away from the house, effectively protecting the structure.

12 ASSESSMENT OF POTENTIAL IMPACTS

Short-Term Discharge of Pumped Ground Water (Construction)

No short-term groundwater control system is required at the Site as no dewatering is expected at the Subject Property and hence, no environmental impacts are anticipated. Also, no well interference is expected to occur on the private water supply wells within 500 m radius around the Site.

Long-Term Discharge of Pumped Ground Water (Post Construction)

For a development of this type consisting of individual homes with independent basement dewatering systems, the issue of long-term discharge of pumped groundwater does not arise and is not a requirement.

Source Water Protection and Well Head Protection Areas.

The Subject property lies within the Palgrave municipal supply well No.3 wellhead protection area (WHPA) and within the WHPA-D (5 and 25-year time of travel zone, Figure 13-1), secondary protection zone. Also, based on the Figure 13-2, the Subject Property is situated on the low-vulnerability score area within the WHPA, in terms of groundwater vulnerability for contamination. Moreover, there is no construction dewatering activity at the Site and hence no environmental impacts, either qualitative or quantitative of any kind are expected to occur on the WHPAs and on the municipal water supplies of the area due to the property development.

13 WATER BALANCE

A preliminary water balance for the Site was calculated for both pre-development and post-development conditions in order to assess the change in overall rate of infiltration. Impermeable and permeable surfaces in pre-development and post-development plans were identified and their surface areas (as measured and cross-checked using the drawings/information provided by the client) were used for calculating the amount of run-off and infiltration. The post-development plan consists of different types of surface as listed in Table 14.1.

Table 14.1. Pre-and Post-development plan statistics for the property.

Type of Land Coverage	Pre-Development Area(ha)	Post- Development Area (ha)
Roofs	-	0.28
Roadway/Paving/Parking	-	1.26
Bioswales' Area	-	0.19
Landscape/Vegetated Area	12.28	10.55
Total	**12.28**	**12.28**

Monthly average temperature and precipitation data were obtained from Environment Canada, for Orangeville WPCP station (climate identifier: 6155790) as the nearest station located at about 8 km distance from the Property. Data was available between the years 1962 to 2006. Temporal variations of temperature and rainfall are shown in Figures 14-1 and 14-2. Long-term average annual rainfall at the Property is 725 mm.

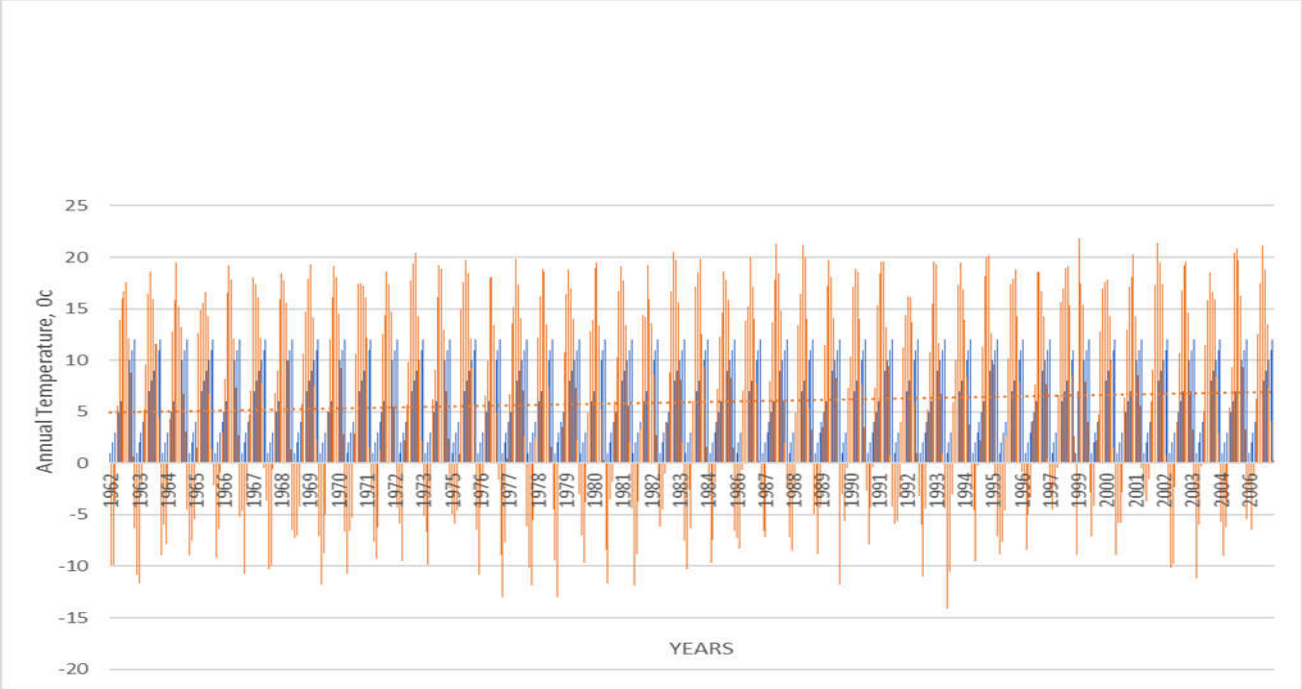


Figure 14-1 Average Annual Temperature at the Site

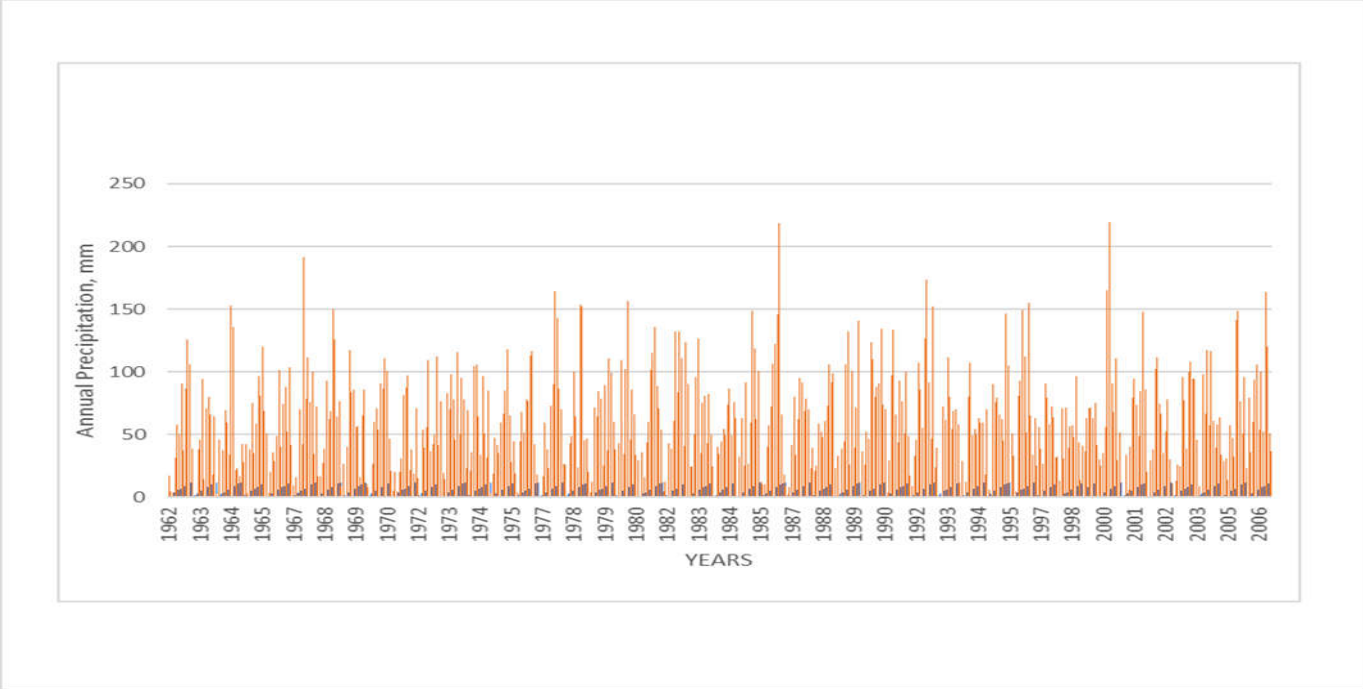


Figure 14-2 Average Annual Precipitation at the Site

Average monthly variations of both temperature and precipitation were calculated for the period from 1962 to 2006 and is presented below in Figures 14-3 and 14-4, respectively. The highest temperature was recorded in the month of July, while the highest rainfall was in the month of August.

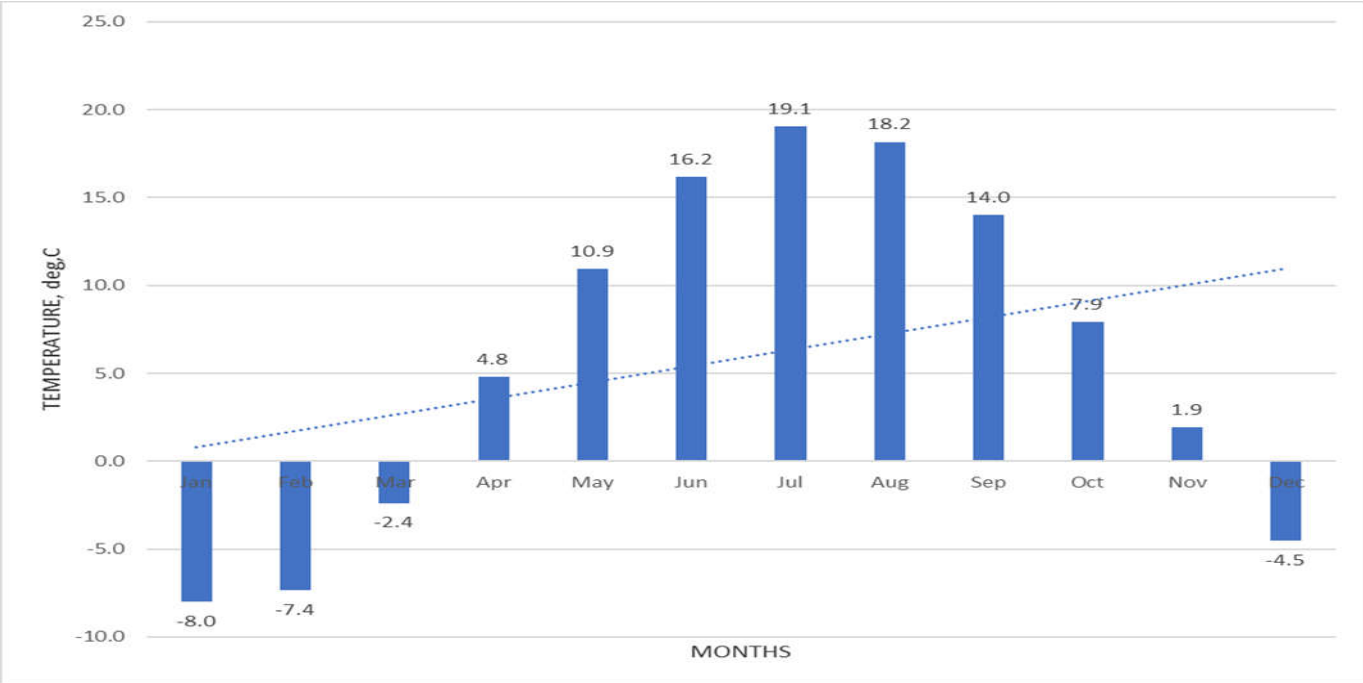


Figure 14-3 Average Monthly Temperature at the Site

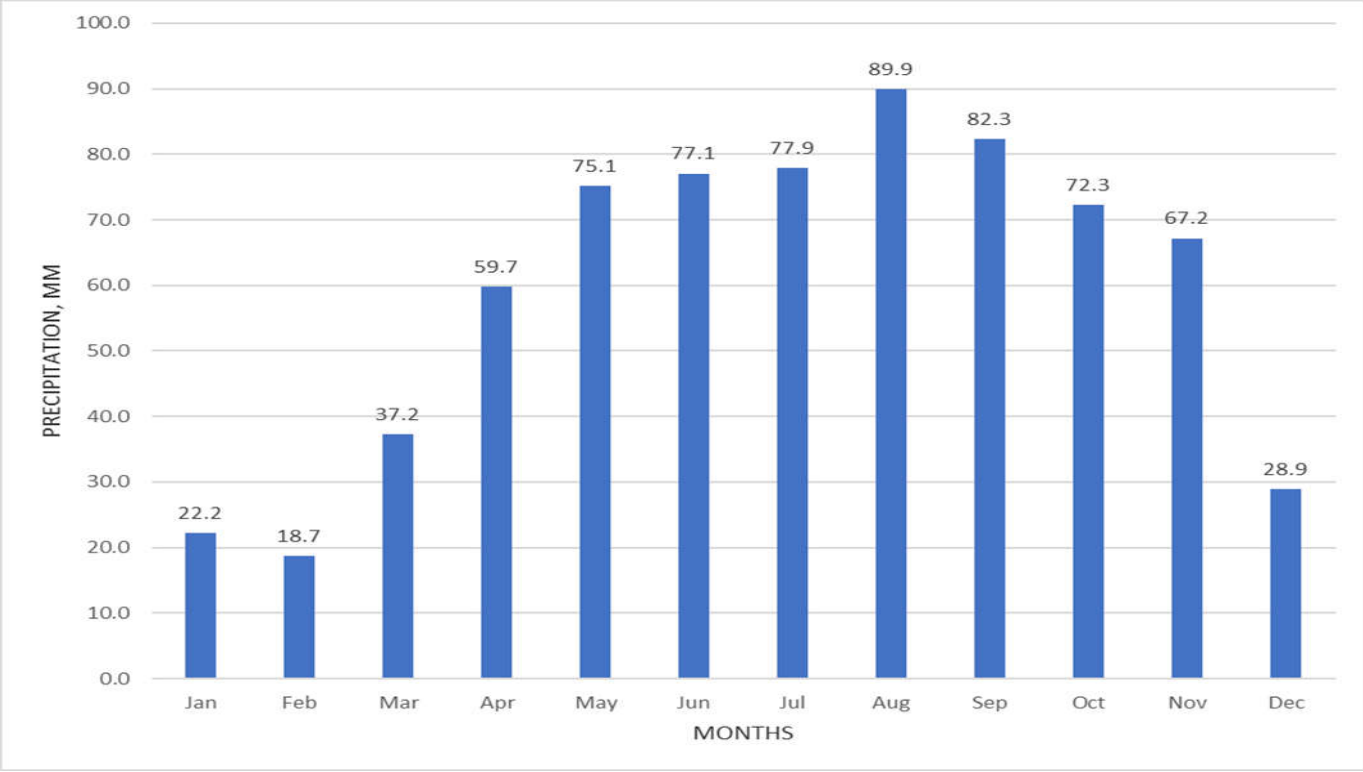


Figure 14-4 Average Monthly Precipitation at the Site

Table 14.2 Pre- and Post Development Water Balance Calculation.

Pre-Development	Area	Precipitation	Evapotrans-piration	Precipitation	Evapotrans-piration	Runoff	Infiltration
	(m^2)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)
Landscape/vegetated Areas	122800	725	529	89030	64961	4814	19255
Bioswale Area							
Roadway/Parking/Paving							
Roof Area							
Total	122800				**64961**	**4814**	**19255**
Post-Development	Area (m2)	(mm)	(mm)	**m3**	**m3**	**m3**	
Landscape/vegetated Areas	105500	725	529	76488	55810	4136	16542
Bioswale Area	1930	725	529	1399	102	0	1297
Roadway/Parking/Paving	12550	725	529	9099	5311	3030	758
Roof Area	2820	725	529	2045	1492	553	0
Total	122800				**62715**	**7718**	**18597**
Difference (-deficit, + increase) in m3/year					**-2247**	**2905**	**-658**

Note: The Precipitation and Evapotranspiration values were obtained from the Thonthwaite program run.

The client is proposing roadside bioretention swales (Figure 3-2), as per the Town's standard detail, to capture and convey road run-off. The water will flow along the length of the bioretention swale and filter through a 0.50 m deep filtration media to a 1.2 m wide by 1.2 m deep stone trench below for infiltration. Bioswales protect water quality by protecting local waterways from stormwater pollutants and reduce standing water (puddles) that can attract mosquitoes.

Potential evapotranspiration was estimated to be about 529 mm/annum using the USGS Thornthwaite Monthly Water Balance software (Appendix D) utilizing average monthly temperature and precipitation results of the preliminary water balance presented in Table 14-2, indicated about 658 m^3/annum deficit in infiltration and an increase of about 2,905 m^3/annum in run-off.

The Low Impact Development Treatment Train Tool (LID TTT) has been developed by Lake Simcoe Region Conservation Authority (LSRCA), Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA) (http://www.lsrca.on.ca/Pages/LIDTTTool.aspx) as a tool to help developers, consultants, municipalities and landowners understand and implement more sustainable stormwater management planning and design practices in their watersheds.

Accordingly, water balance was also calculated alternatively using the new Version 1.2.1 of the LID TTT and the infiltration deficit as a result of site development was calculated to be at 1,223 m^3 whereas run-off was increased by 8,900 m^3. A report generated by LIDTT Tool is presented in Appendix D.

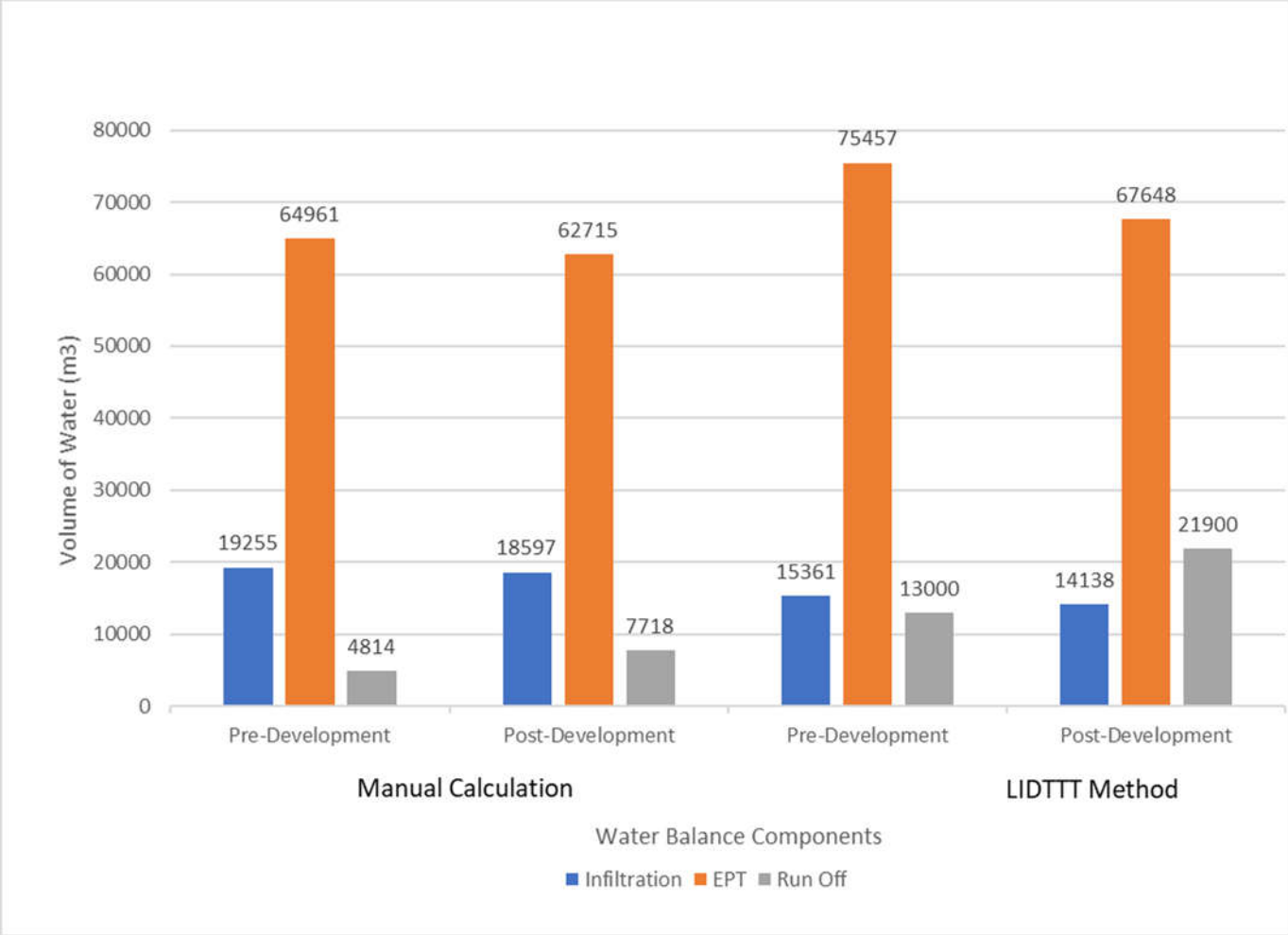


Figure 14-5. Comparison of Manual and LIDTTT Water Balance Components

The Property mainly includes sandy silt to silty sand and clayey silt till. Appropriate low-impact development techniques can be applied to maintain the overall groundwater recharge across the Site area. The net increase in run-off provides huge potential to compensate the infiltration deficit and an opportunity for maintenance of groundwater recharge through a variety of infiltration techniques. The amount of deficit in infiltration upon development of the Site does seem to be low being about 658 m^3/annum or about 2 m^3/day.

Low Impact Development (LID) techniques are, however, recommended to be considered as part of the storm water management concept for the Site, in order to reduce the infiltration deficit. The following measures can be incorporated in the development:

- Collection of clean run-off from the building rooftops and redirection to grassed areas and overland flow.
- Use of infiltration trenches or perforated pipes at selected areas
- Provision of an extra thickness of topsoil at the Site (approximately 0.3 m) on open areas to promote water storage in surficial soil and infiltration.
- Provision of gradual slopes to open areas and back-yards in order to allow time for roof run-off to infiltrate into the topsoil.

14.1 LID TECHNIQUE DESIGN

It should be noted that the LID techniques implementation dealt with in this report are to be considered only as a recommendation. SPCL is not providing any design of LID techniques since these will be designed and provided by the project engineer under separate cover to provide appropriate site-specific LID design to increase the above-mentioned infiltration deficit.

14 WATER QUALITY

Collection and chemical analysis of groundwater samples was not required in order to compare to Lake Simcoe Region Sanitary and Combined Sewer Use By-laws, due to the fact that no dewatering either short-term or long-term was anticipated at the Subject Property.

15 CONCLUSIONS AND RECOMMENDATIONS

This report was prepared by SPCL in support of a proposed residential development at the Site located at 0 Mt. Pleasant Road, Town of Caledon, Lake Simcoe Region Conservation Authority, Ontario. Based on the hydrogeological investigation conducted on the Subject Property the following conclusions are presented:

- Topographically the Site appears to be situated on a watershed divide with ground surface sloping from the highest elevation at monitoring well MW6 sloping towards northeast and southwest with an average highest ground elevation of 296.38 mASL at the mid- portion of the property.
- The Subject Property falls within the Beeton Creek secondary watershed of Innisfil Creek subwatershed of Nottawasaga Valley Conservation Authority (NVCA), part of Lake Simcoe Region Conservation (LSRCA) Authority.
- Groundwater level monitoring was completed between October 2017 and March 2018, besides the July 2017 monitoring on the existing monitoring wells, as part of monthly monitoring at the Subject Property.
- The monitoring data has suggested that there was little change in the water table elevations during the monitoring period and the seasonal average water table elevations were as shown below.

Summer ((July 2017)	Winter (December 2017)	Spring (March 2018)
284.50 mASL	284.82 mASL	284.85 mASL

- Water level recovery was noticed in all the monitoring wells in the month of November 2017, probably due to high precipitation events and the snow melt conditions observed during that period.
- There was very little change in the water levels as observed at the monitoring well MW8 with depth to water level between 8.43 and 8.58 mbgs all along the monitoring period of six months.
- In-situ hydraulic conductivity tests resulted in $1.52*10^{-8}$ m/sec at MW2 and $1.67*10^{-7}$ m/sec at MW4 with an average hydraulic conductivity of about $9.11*10^{-8}$ m/s, which is in the typical range of hydraulic conductivity for sandy silt to clay silt till, as observed in the boreholes.
- Based on the relationship between the average hydraulic conductivity and soil infiltration rate, the infiltration rates ranged between 14 and 31 mm/hour, with an average infiltration rate of 22.5 mm/hour for the entire Site.
- Short-term construction dewatering is not a requirement at the entire Site and at each lot due to the fact that a very deep-water table is present at the Site, which does not intersect the proposed basement geodetic elevations at each house lot.
- Long term dewatering (foundation drainage) is not a requirement for the Site since the groundwater table doesn't intersect the basement walls.
- A preliminary water balance was conducted for the Site to compare the pre- and post-development infiltration rates resulting in approximately 658 m^3/annum (about 2 m^3 /day) deficit in the

infiltration. This can very easily be compensated through application of appropriate LID measures using the run-off generated at the Site.

- Groundwater sample collection and analysis as per sewer use By-Laws was not a requirement since no groundwater dewatering is expected at the Site.

Based on the hydrogeological investigation at the Subject Property, the impacts to surrounding natural features resulting from the proposed development are considered to be from low to negligible.

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LIMITATIONS AND USE OF THE REPORT

This report was produced for the sole use of Briarwood Group (the Client) for the property located at 0 Mt. Pleasant Road, Town of Caledon, Lake Simcoe Region Conservation Authority, Ontario and may not be relied upon by any other person or entity without the written authorization of Sirati & Partners Consultants Limited (SPCL).The conclusions presented in this report are professional opinions based on the historical and current records search, visual observations and limited information provided by persons knowledgeable about past and current activities on this site. As such, SPCL cannot be held responsible for environmental conditions at the Property that was not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SPCL cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The assessment should not be considered a comprehensive audit that eliminates all risks of encountering environmental problems. The information presented herein this report is primarily based on information collected during the hydrogeological study based on the condition of the Property at the time of site inspection/drilling followed by a review of historical data, as appended to this report.

In assessing the environmental setting of the Property, SPCL has solely relied upon information supplied by others in good faith and has therefore assumed that the information supplied is factual and accurate. We accept no responsibility for any inaccurate information, misrepresentation or for any deficiency of the information supplied by any third party.

The scope of services performed in the execution of this investigation may not be appropriate to satisfy third parties. SPCL accepts no responsibility for damages if any, suffered by any third party as a result of decisions made or action taken based on this report. Any use, copying or distribution of the report in whole or in part is not permitted without the express written permission of SPCL and use of findings, conclusions and recommendations represented in this report, is at the sole risk of third parties.

In the event that during future work new information regarding the environmental condition of the Property is encountered, or in the event that the outstanding responses from the regulatory agencies indicate outstanding issues on file with respect to the Property, SPCL should be notified in order that we may re-evaluate the findings of this assessment and provide amendments, as required.

Should you have any questions regarding the information presented or limitation set in this report, please do not hesitate to contact our office.

Yours truly,

Sirati and Partners Consultants Limited

Sudhakar Kurli, P.Geo.
Hydrogeologist

Dr. Giorgio Garofalo, P. Geo., QP
Manager – Environmental Division

FIGURES

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Engineering Solutions

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Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

Property Boundary

Project Title:

Hydrogeological Investigation

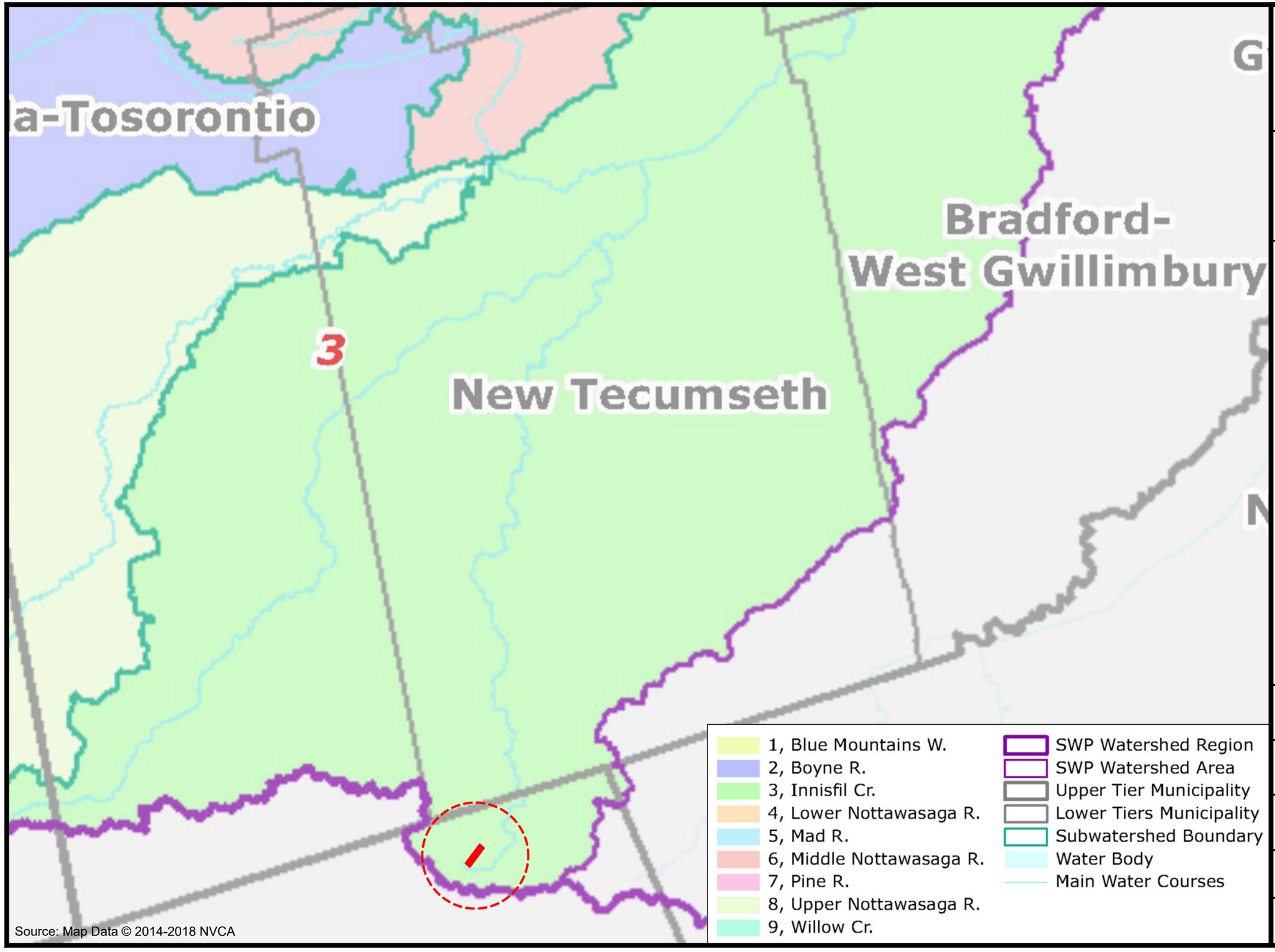
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Site Location Plan

Scale:	Project Number:
0m 100m 200m	SP17-212-30
Date: April 2018	**Figure Number:** 1-1



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Legend:

Subject Site

Approximate Site Location

Project Title:

Hydrogeological Investigation

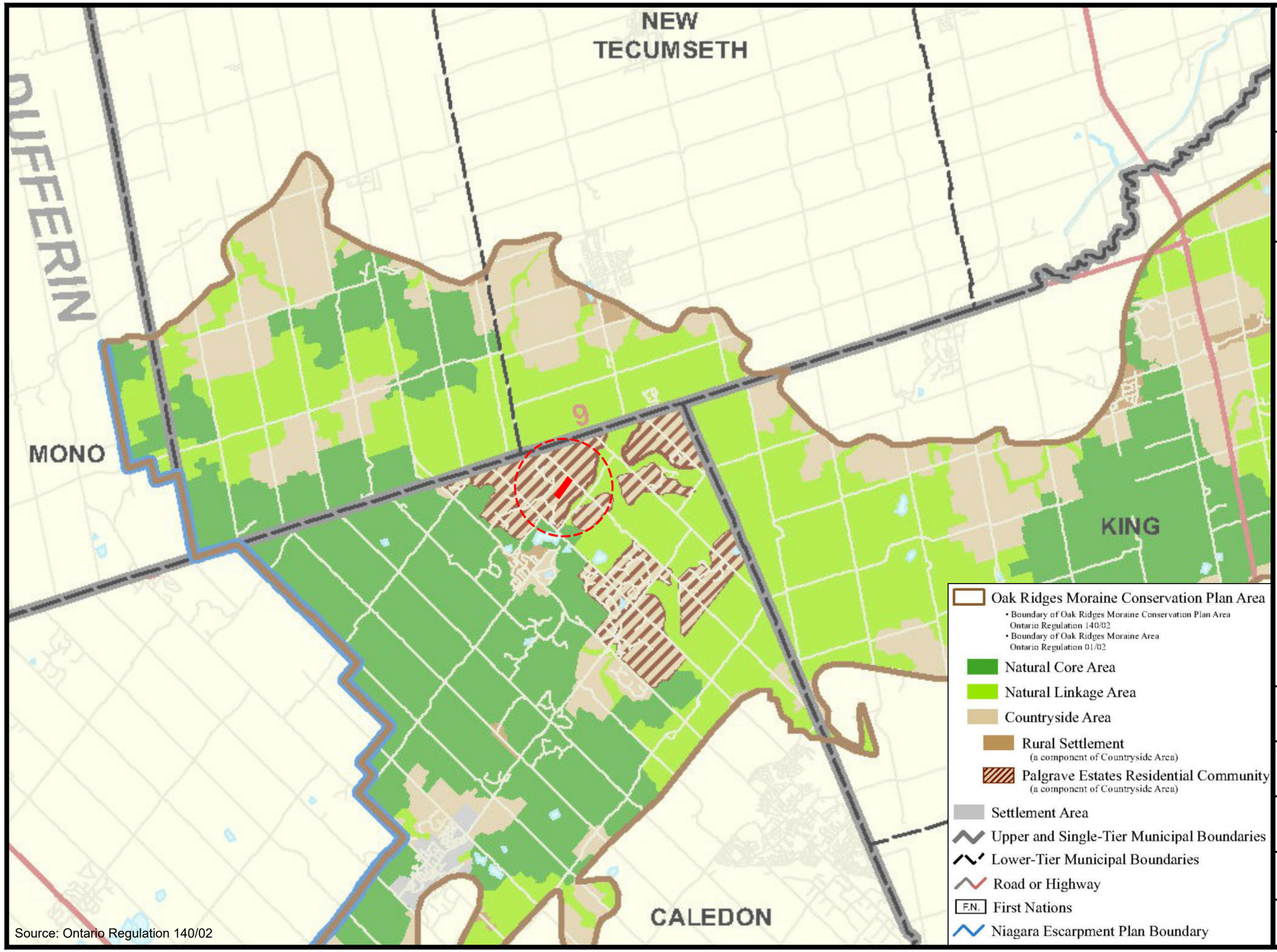
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Watershed Map

Scale:	Project Number:
0m 1km 2km	SP17-212-30
Date:	**Figure Number:**
April 2018	2-1



Source: Ontario Regulation 140/02

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North:

Legend:

Subject Site

Approximate Site Location

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Oak Ridges Moraine Conservation Plan
Land Use Designation Map

Scale:	Project Number:
0m 1km 2km	SP17-212-30
Date:	**Figure Number:**
April 2018	2-2

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North:

Legend:

- Property Boundary
- Paving
- Roof
- Landscape

Site Statistics:

Paving:	0 sq.m
Roof:	0 sq.m
Landscape:	122800 sq.m
Total	122800 sq.m

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

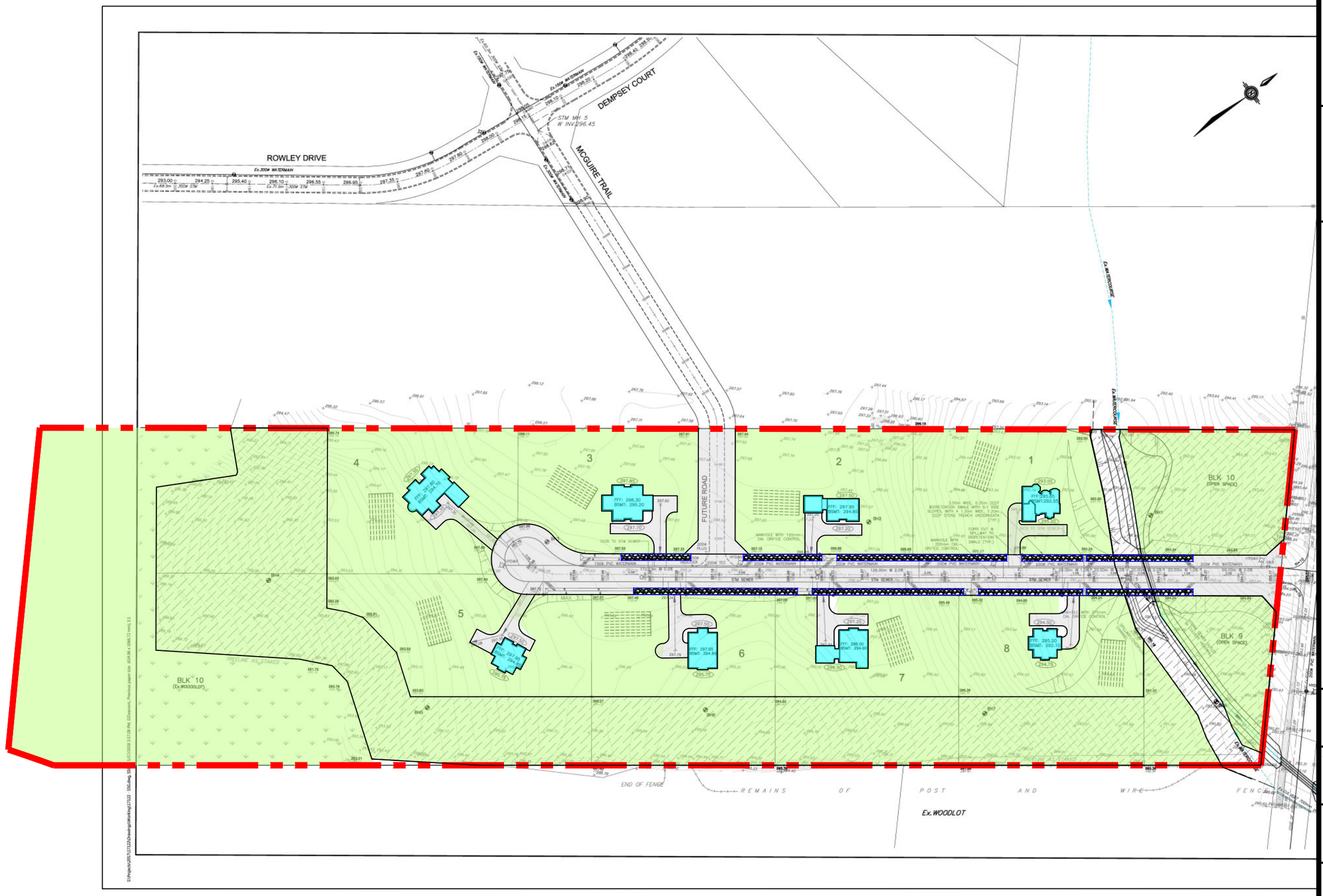
Pre-Development Plan

Scale: 0m 50m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 3-1



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Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

- Property Boundary
- Paving
- Roof
- Landscape
- Proposed Bioswale

Site Statistics:

Paving:	12550 sq.m
Roof:	2820 sq.m
Bioswale:	1930 sq.m
Landscape:	105500 sq.m
Total	122800 sq.m

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

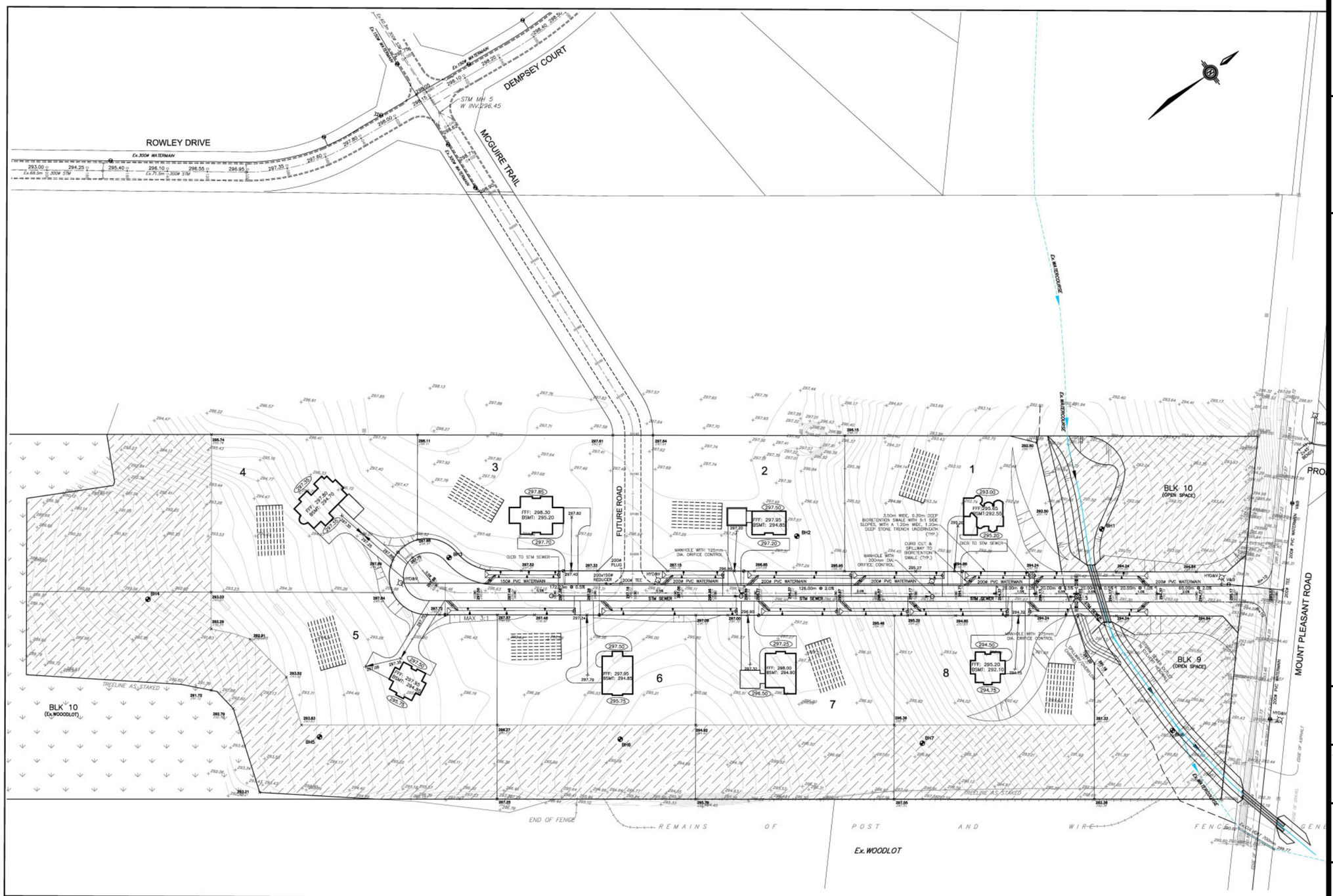
Post-Development Plan

Scale: 0m – 50m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 3-2



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North:

Legend:

Property Boundary

Project Title:

Hydrogeological Investigation

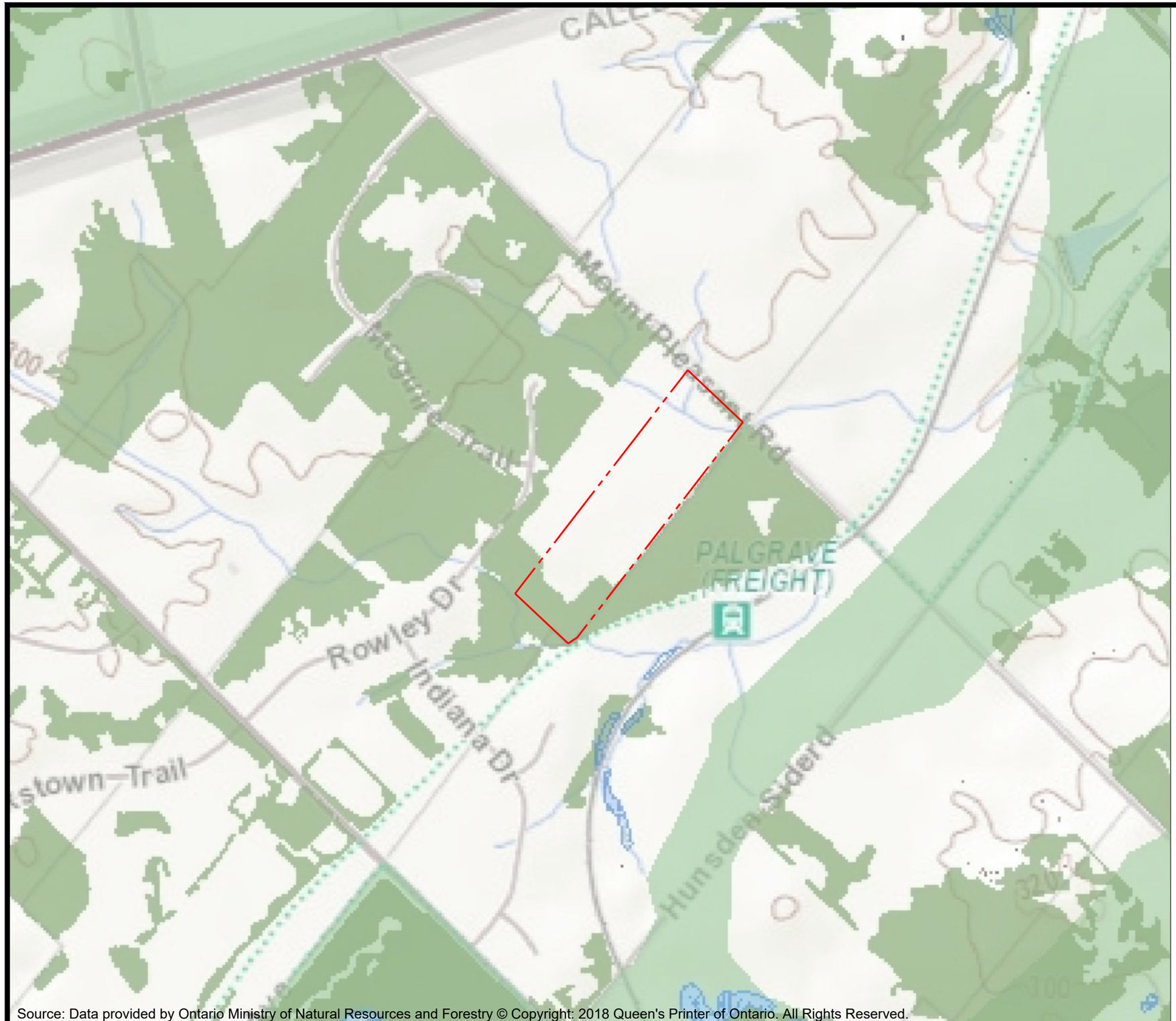
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Site Grading Plan

Scale:	Project Number:
0m 50m	SP17-212-30
Date:	**Figure Number:**
April 2018	3-3



Assessment Parcel
Woodland
Conservation Reserve
Provincial Park
Natural Heritage System
Ecoregion

Wetland
- Provincially Significant Wetland Evaluated
- Non - Provincially Significant Wetland Evaluated
- Unevaluated Wetland

Area of Natural Heritage & Scientific Interest (ANSI)
- Provincially Significant Life Science ANSI
- Provincially Significant Earth Science ANSI

Greenbelt Plan
- Boundary
- River Valley Connections

Land Use Designations
- Protected Countryside
- Towns and Villages
- Hamlets
- Urban River Valley
- Specialty Crop Area

Niagara Escarpment Plan (NEP)
- Boundary
- Parks and Open Space System

Land Use Designations
- Escarpment Natural Area
- Escarpment Protection Area
- Escarpment Rural Area
- Mineral Resource Extraction Area
- Escarpment Recreation Area
- Urban Area
- Minor Urban Centre

Oak Ridges Moraine Conservation Plan (ORM)
- Boundary

Land Use Designations
- Natural Core Area
- Natural Linkage Area
- Countryside Area
- Rural Settlement
- Palgrave Estates Residential Community
- Settlement Area

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North:

Legend:

Property Boundary

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Natural Features Area Map - Lake Simcoe Region

Scale:	Project Number:
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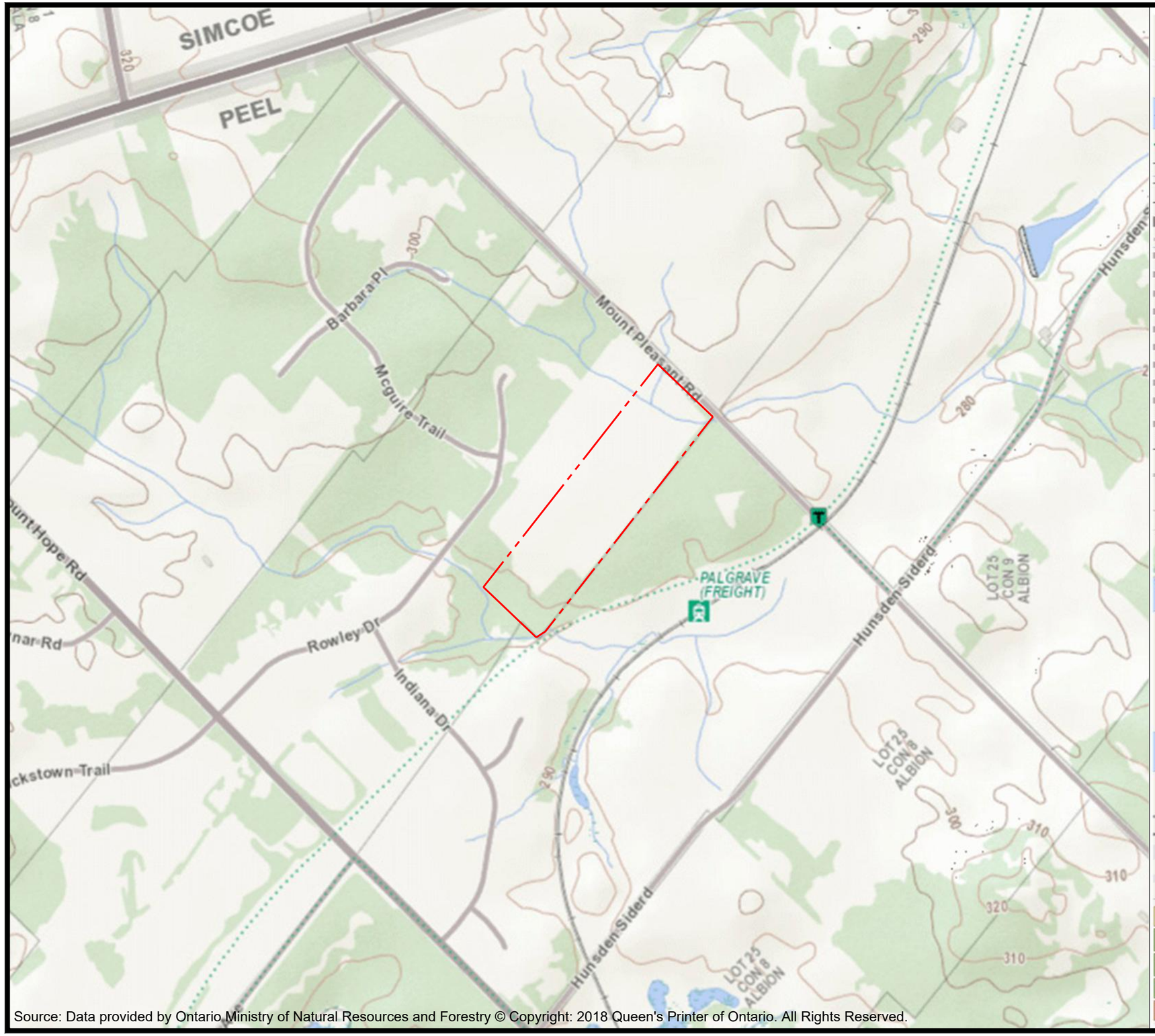
Date: April 2018	**Figure Number:** 4-1



Building as Symbol
Building to Scale
Airport
Heliport \ Hospital Heliport
Seaplane Base
Ferry Route
Trail Head \ Trail
Railway \ Train Station
Railway with Bridge
Railway with Tunnel
Road (Major → Minor)
Winter Road
Road with Bridge
Road with Tunnel
Primary, Kings or 400 Series Highway
Secondary Highway
Tertiary Highway
District, County, Regional or Municipal Road
Toll Highway
One Way Road
Road with Permanent Blocked Passage
420 500 / 421 499 Road with Address Ranges
Hydro Line, Communication Line or Unknown Transmission Line
Natural Gas Pipeline, Water Pipeline or Unknown Pipeline
208 Spot Height
200 Index Contour
Contour
Wooded Area
Wetland
Waterbody
184 Waterbody Elevation
Watercourse
Falls
Rapids
Rapids \ Falls
Rapids
Rocks
Lock Gate
Dam \ Hydro Wall
Dam \ Hydro Wall
Provincial \ State Boundary
International Boundary
Upper Tier \ District Municipal Boundary
Lower Tier \ Single Tier Municipal Boundary
Lot Line
Indian Reserve
Provincial Park
National Park
Conservation Reserve
Military Lands

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North:

Legend:

Property Boundary

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

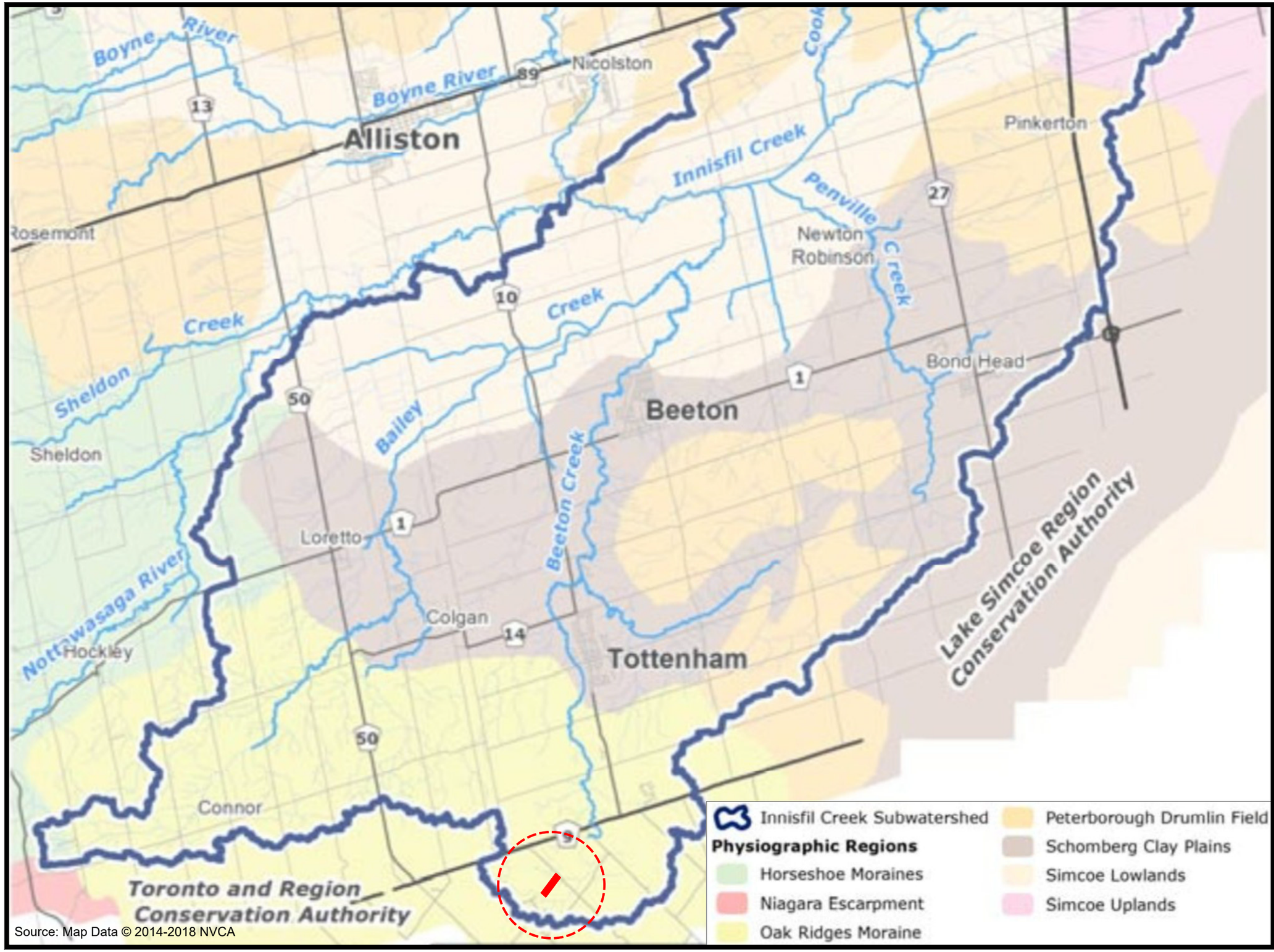
Figure Title:
Topographic Map

Scale: 0m 100m 200m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 5-1



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North:

Legend:

Subject Site

Approximate Site Location

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Physiography Map

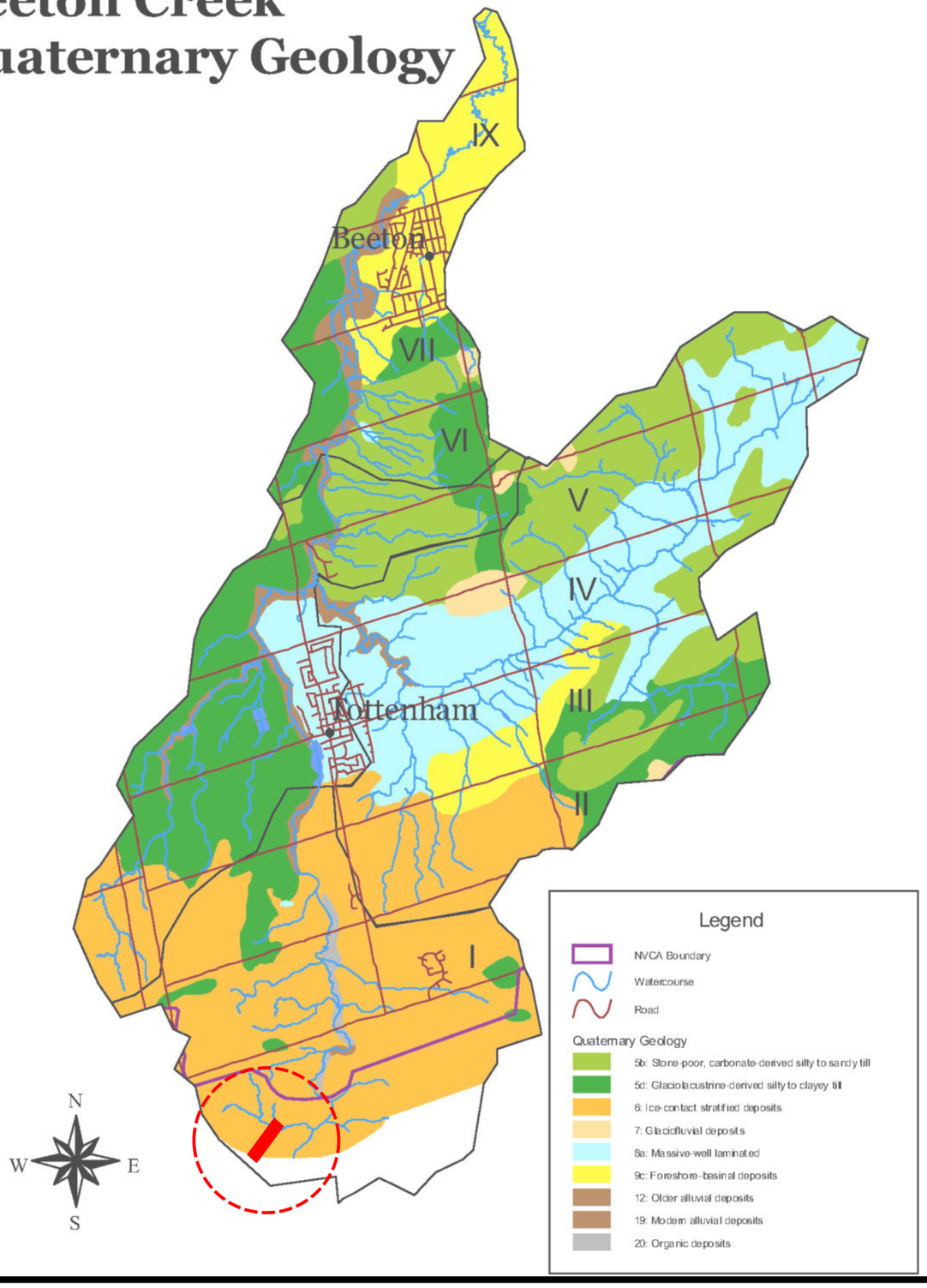
Scale: 0m 1km 2km

Project Number: SP17-212-30

Date: April 2018

Figure Number: 5-2

Beeton Creek
Quaternary Geology



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North:

Legend:

Subject Site

Approximate Site Location

Project Title:

Hydrogeological Investigation

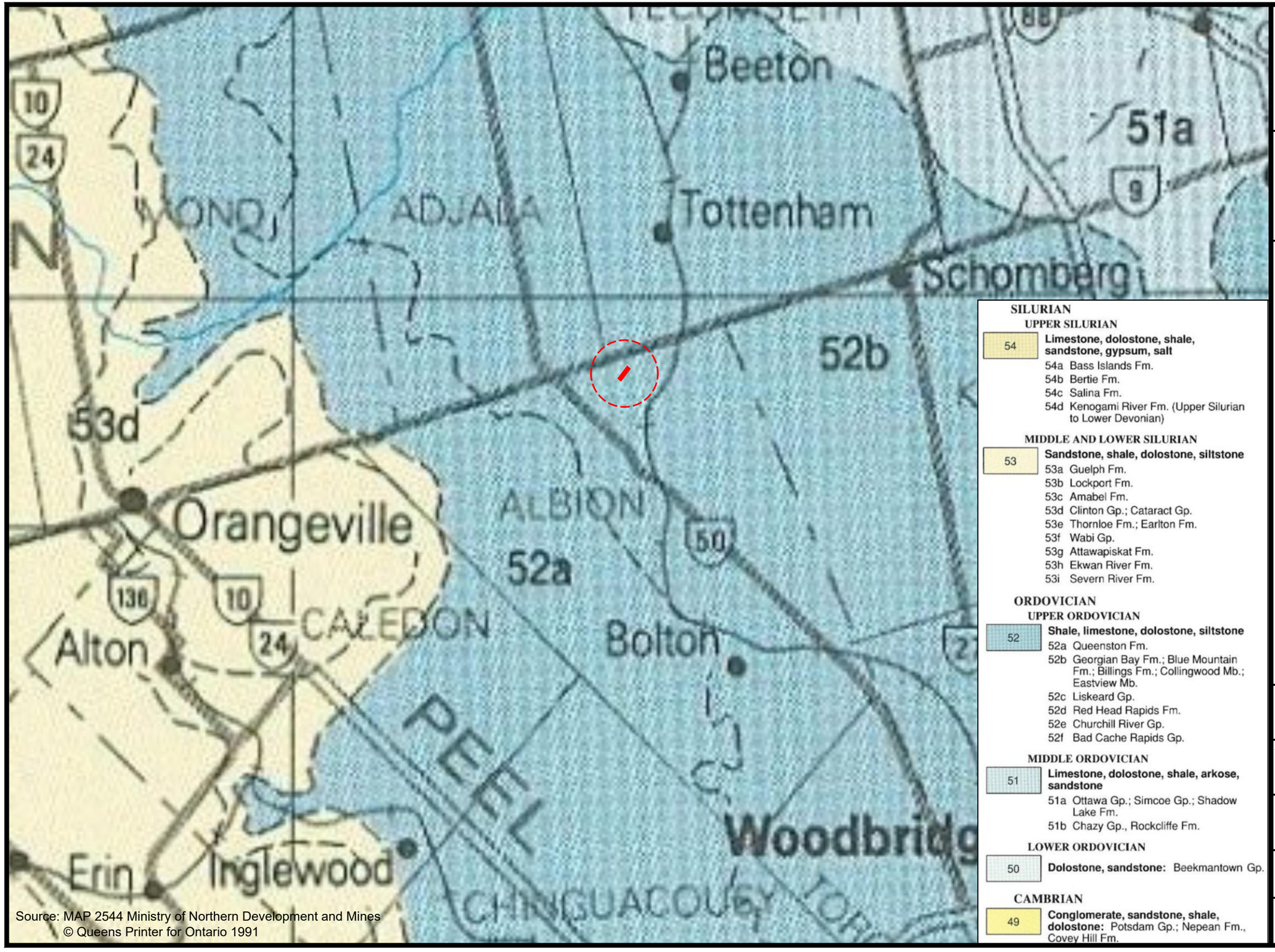
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Surficial Geology Map

Scale:	Project Number:
0m 500m	SP17-212-30
Date:	**Figure Number:**
April 2018	5-3



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North:

Legend:

Subject Site

Approximate Site Location

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

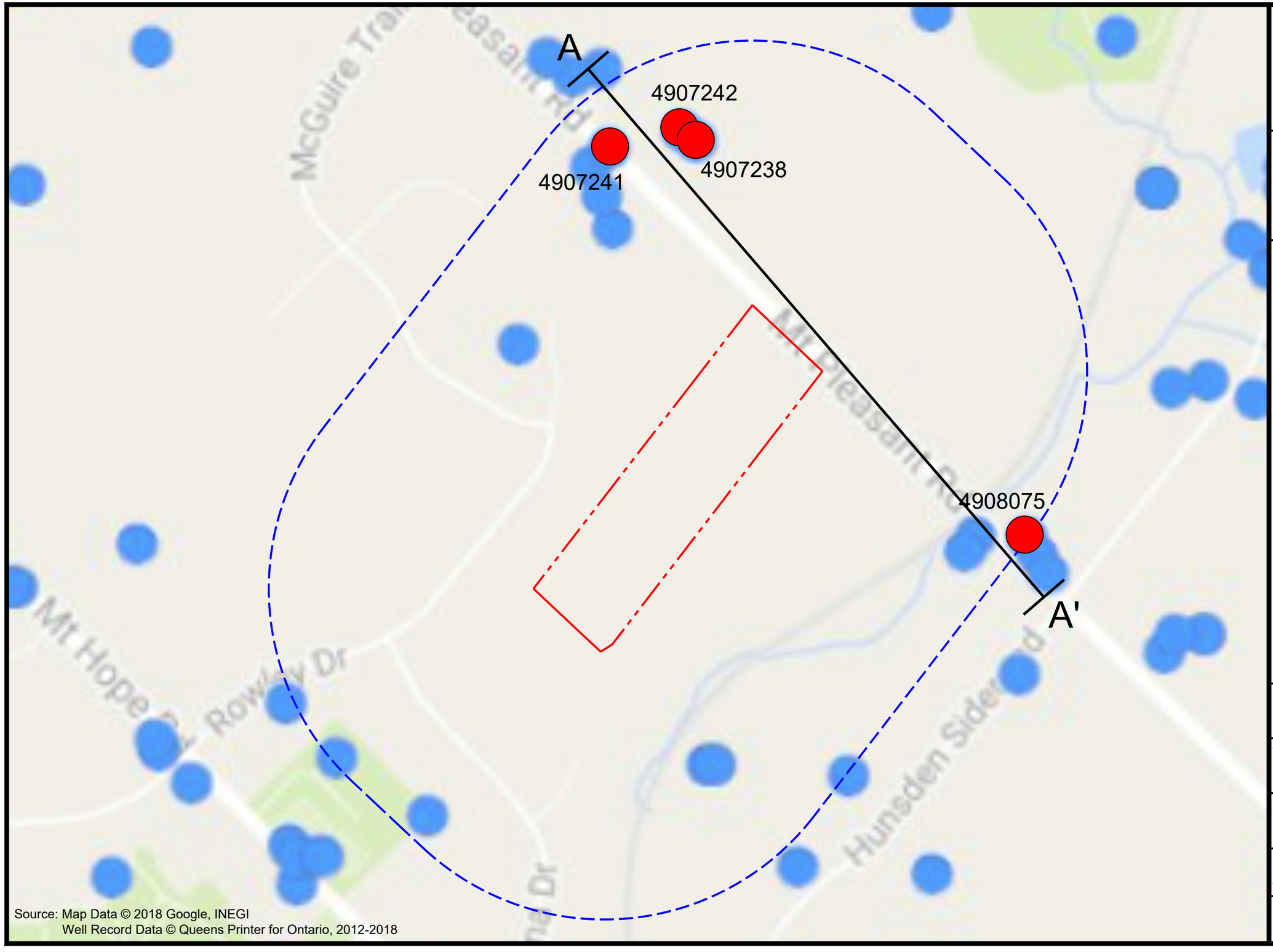
Figure Title:
Bedrock Geology

Scale: 0m 2km 4km

Project Number: SP17-212-30

Date: April 2018

Figure Number: 5-4



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Engineering Solutions

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Vaughan, ON L4K 0M7
Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

Property Boundary

500 m Study Area

Project Title:

Hydrogeological Investigation

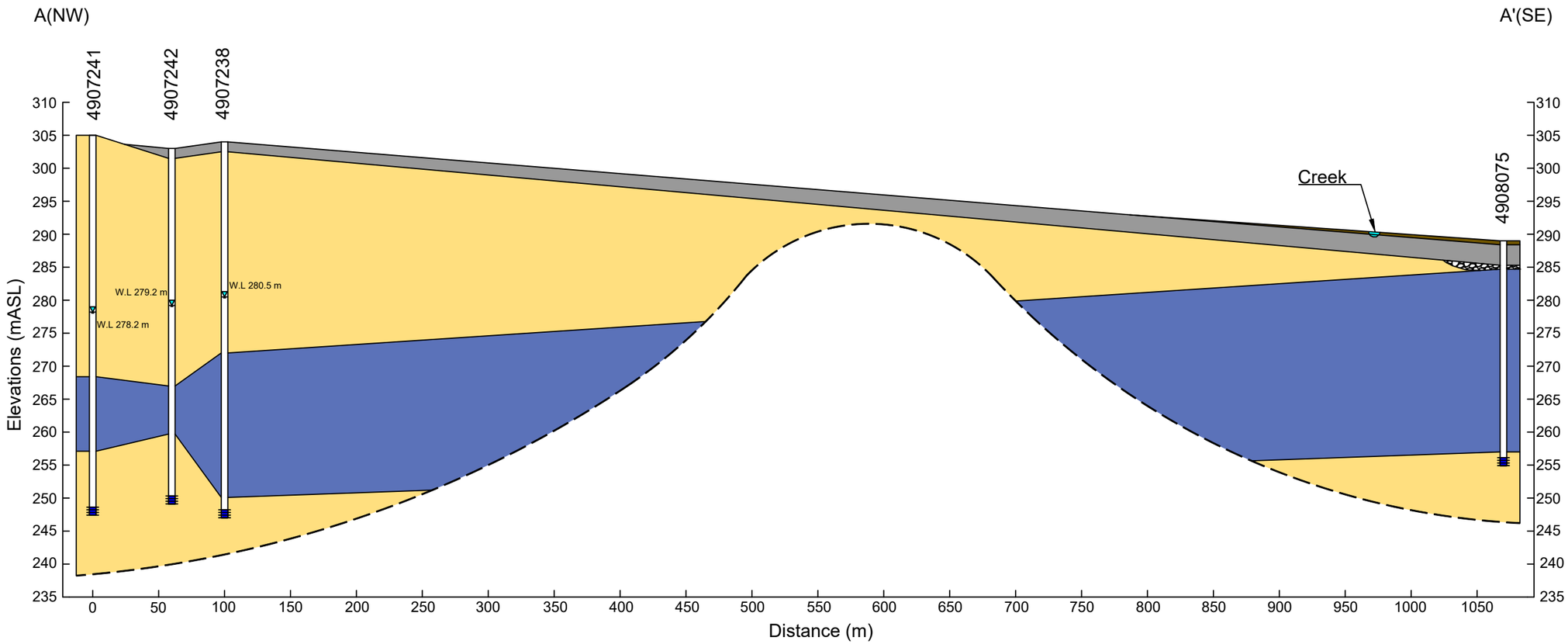
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

MOECC Well Record Map

Scale:	Project Number:
0m 100m 200m	SP17-212-30
Date:	**Figure Number:**
April 2018	6-1



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North:

Legend:

- Top Soil
- Sand
- Clay
- Silt
- Gravel

1234567
- Borehole / Well ID
- Water Level
- Well Screen

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
MOECC Well Record Cross Section A-A'

Scale:	Project Number:
As Shown	SP17-212-30
Date:	**Figure Number:**
April 2018	6-2

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North:

N

Legend:

- Property Boundary
- Creek
- Creek Buffer
- Monitoring Well
- Borehole

Project Title:

Hydrogeological Investigation

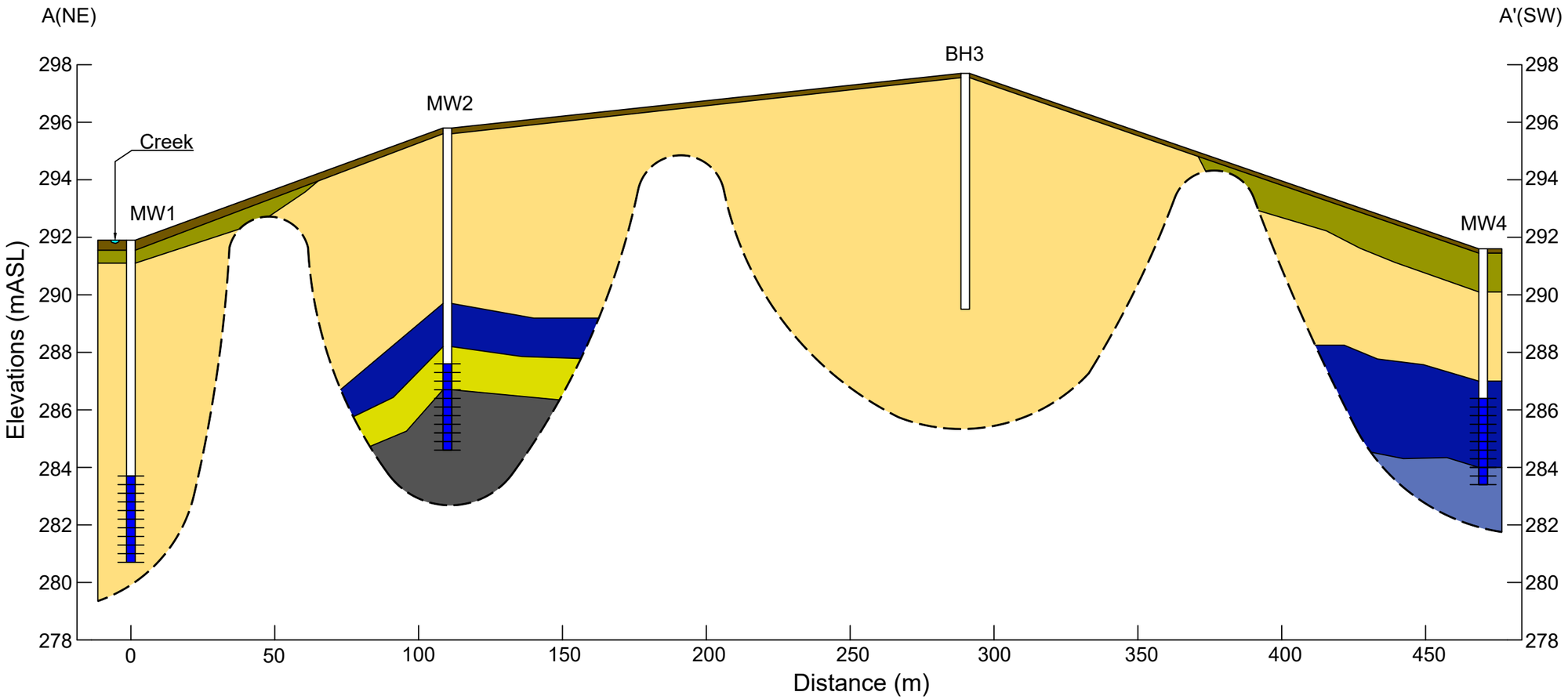
Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

SPCL Borehole / Monitoring Well Location Map

Scale:	Project Number:
0m 30m 60m	SP17-212-30
Date:	**Figure Number:**
April 2018	8-1



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North:

Legend:

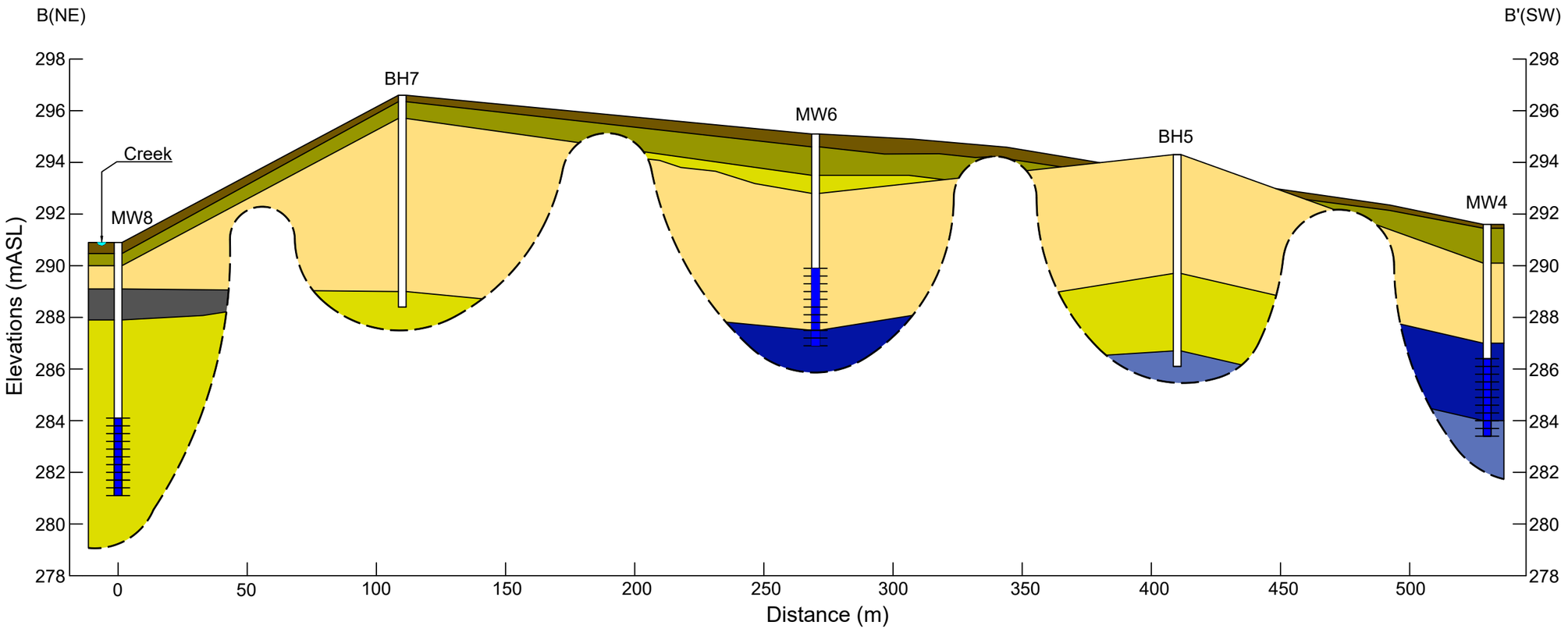
- Top Soil
- Fill
- Sand
- Silty Sand
- Clayey Silt / Silty Clay
- Sandy Silt
- Silt
- MW1 — Borehole / Well ID
- Water Level
- Well Screen

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
SPCL Borehole Cross Section A-A'

Scale:	Project Number:
As Shown	SP17-212-30
Date:	**Figure Number:**
April 2018	8-2



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North:

Legend:

- Top Soil
- Fill
- Sand
- Silty Sand
- Clayey Silt / Silty Clay
- Sandy Silt
- Silt
- MW1 — Borehole / Well ID
- Water Level
- Well Screen

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

SPCL Borehole Cross Section B-B'

Scale:	Project Number:
As Shown	SP17-212-30
Date:	**Figure Number:**
April 2018	8-3

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North:

N

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contours - June 2017

Scale: 0m 30m 60m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 8-4

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North:

N

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contours - October 2017

Scale: 0m 30m 60m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 9-1

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North:

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contours - November 2017

Scale: 0m 30m 60m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 9-2

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North:

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contours - December 2017

Scale: 0m 30m 60m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 9-3

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North:

N

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Inferred Groundwater Table Contours - January 2018

Scale:	Project Number:
0m 30m 60m	SP17-212-30
Date:	**Figure Number:**
April 2018	9-4

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North:

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contours - February 2018

Scale: 0m 30m 60m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 9-5

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North:

Legend:

- Contour Line
- Inferred Groundwater Flow Direction
- 188.0 mASL — Monitoring Well & Groundwater Elevation

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Inferred Groundwater Table Contours - March 2018

Scale: 0m 30m 60m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 9-6

Average Ground Elevation 294.37 mASL

Basement Elevation 291.37 mASL

Excavation Base Elevation 290.92 mASL
(No Dewatering Required)

Block 1

Average Groundwater Elevation 284.12 mASL

Average Ground Elevation 296.75 mASL

Basement Elevation 293.75mASL

Excavation Base Elevation 293.30 mASL
(No Dewatering Required)

Block 2

Average Groundwater Elevation 285.77 mASL

Average Ground Elevation 297.69 mASL

Basement Elevation 294.69 mASL

Excavation Base Elevation 294.05 mASL
(No Dewatering Required)

Block 3

Average Groundwater Elevation 285.77 mASL

Average Ground Elevation 296.75 mASL

Basement Elevation 293.75 mASL

Excavation Base Elevation 293.30 mASL
(No Dewatering Required)

Block 4

Average Groundwater Elevation 286.47 mASL

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North:

Legend:

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Dewatering Cross Sections - Blocks 1 to 4

Scale:	Project Number:
As Shown	SP17-212-30
Date:	**Figure Number:**
April 2018	11-1

Average Ground Elevation 295.00 mASL

Basement Elevation 292.00 mASL

Excavation Base Elevation 291.55 mASL
(No Dewatering Required)

Block 5

Average Groundwater Elevation 286.47 mASL

Average Ground Elevation 297.06 mASL

Basement Elevation 294.06mASL

Excavation Base Elevation 293.61 mASL
(No Dewatering Required)

Block 6

Average Groundwater Elevation 287.54 mASL

Average Ground Elevation 296.16 mASL

Basement Elevation 293.16 mASL

Excavation Base Elevation 292.71 mASL
(No Dewatering Required)

Block 7

Average Groundwater Elevation 285.01 mASL

Average Ground Elevation 293.74 mASL

Basement Elevation 290.74 mASL

Excavation Base Elevation 290.29 mASL
(No Dewatering Required)

Block 8

Average Groundwater Elevation 282.14 mASL

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North:

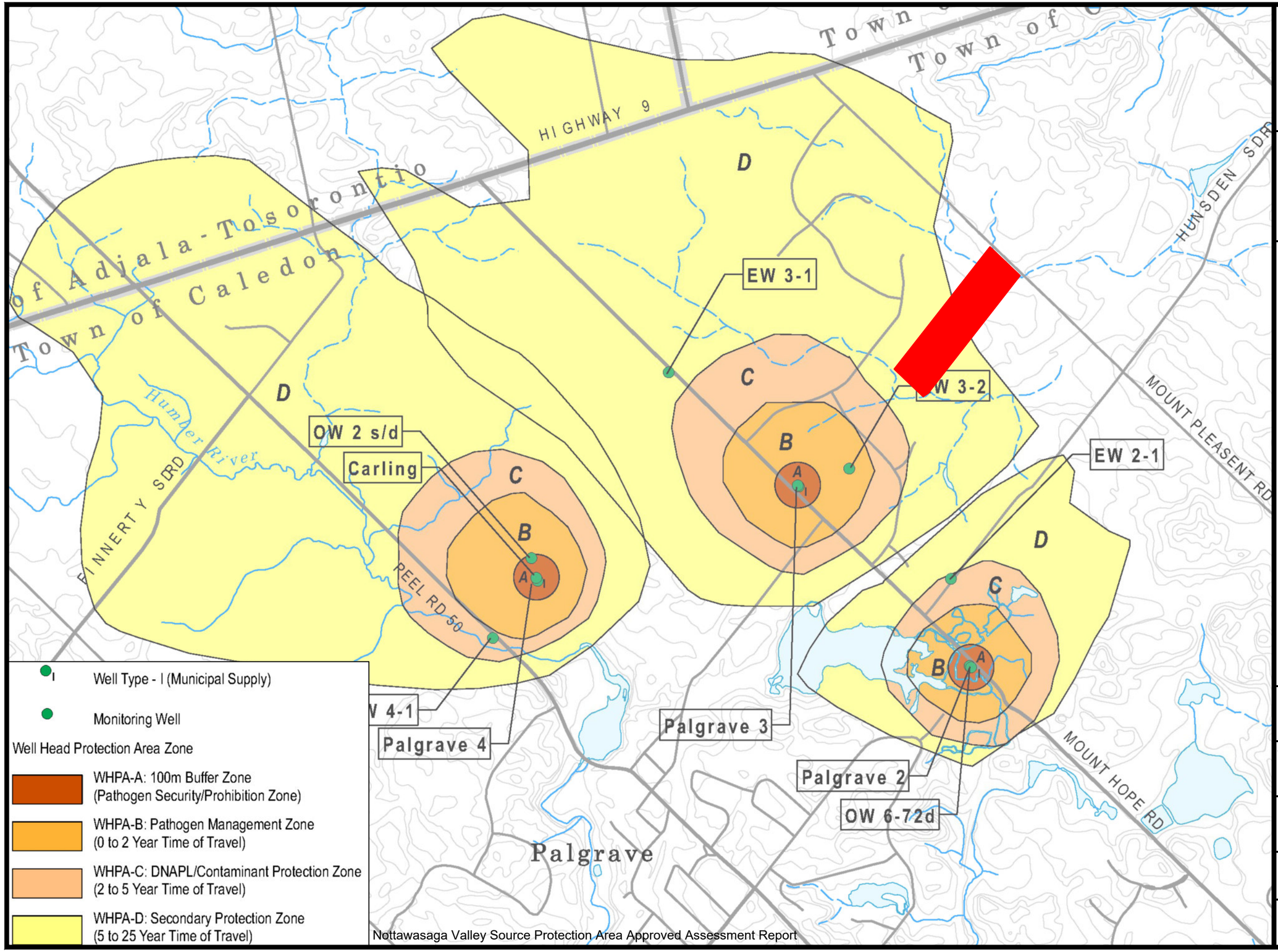
Legend:

Project Title:
Hydrogeological Investigation

Site Location:
0 Mt. Pleasant Road, Caledon, ON.

Figure Title:
Dewatering Cross Sections - Blocks 5 to 8

Scale:	Project Number:
As Shown	SP17-212-30
Date: April 2018	**Figure Number:** 11-2



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Vaughan, ON L4K 0M7
Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

Subject Site

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Well Head Protection Area (Palgrave Well#3) Map

Scale:

0m 200m 400m

Project Number:

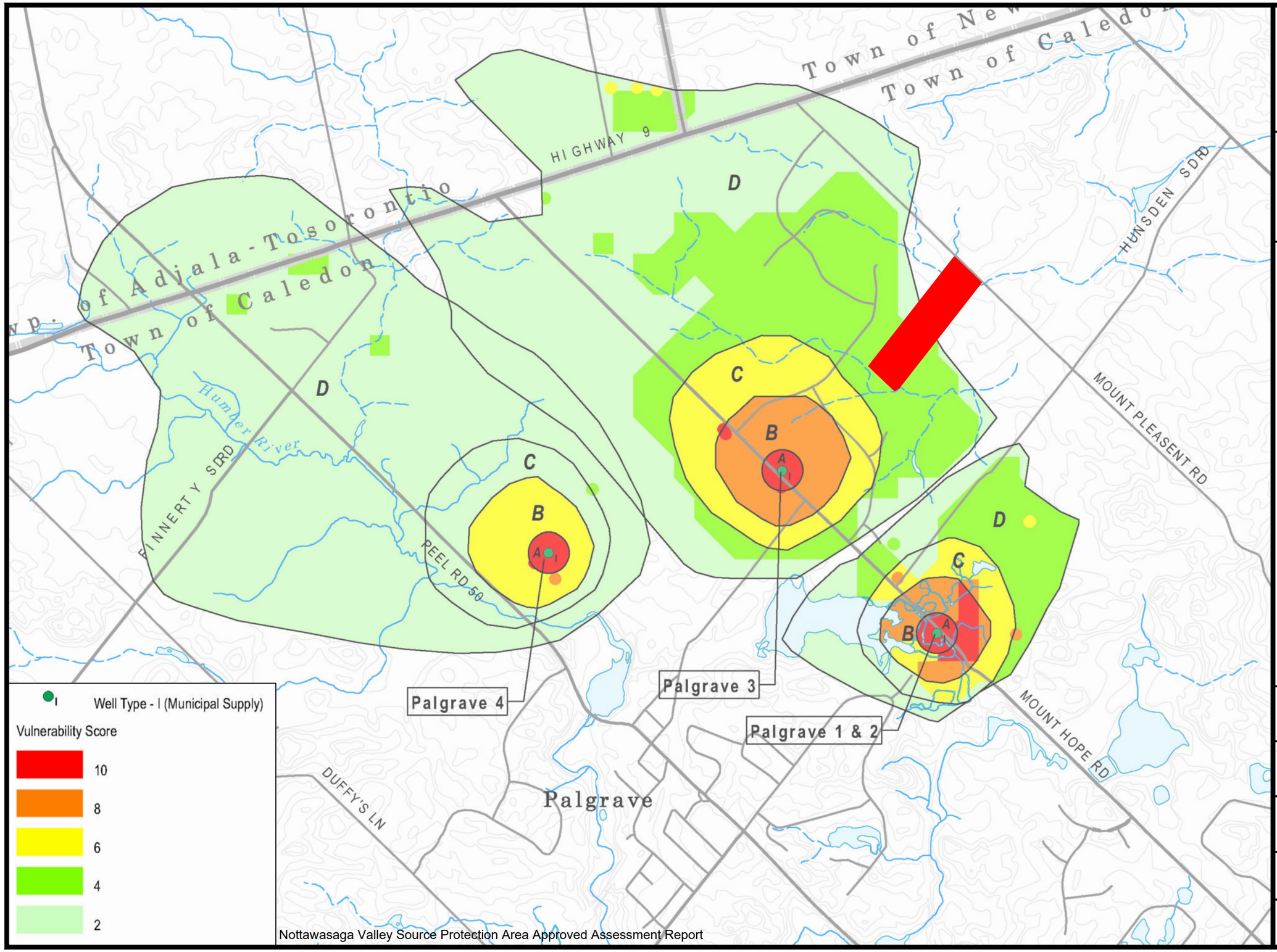
SP17-212-30

Date:

April 2018

Figure Number:

13-1



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Vaughan, ON L4K 0M7
Phone#905-669-4477, Fax#905-669-4488

North:

Legend:

Subject Site

Project Title:

Hydrogeological Investigation

Site Location:

0 Mt. Pleasant Road, Caledon, ON.

Figure Title:

Vulnerability Scores (Palgrave Well#3) Map

Scale: 0m 200m 400m

Project Number: SP17-212-30

Date: April 2018

Figure Number: 13-2

APPENDICES

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APPENDIX A

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LOG OF BOREHOLE BH1

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasent Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/02/2017

REF. NO.: SP17-212-10
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
291.9												
0.0 / 291.6	**TOPSOIL:** 350mm		1	SS	7							
0.4 / 291.1	**FILL:** silty sand, trace clay, trace rootlets, brown, moist, loose											
1 0.8	**SAND:** trace silt, trace gravel, brown, moist, very loose		2	SS	3		291					
			3	SS	2		290					
2			4	SS	2							
3			5	SS	4		289					0 96 2 2
4			6	SS	2		288					
5							287					
6	compact below 6.1m		7	SS	12		286					
7							285					
8			8	SS	22		284					
9	very moist to wet below 9.1m		9	SS	17		283					
10						W. L. 282.1 m Jun 16, 2017						
11 280.7			10	SS	17		281					
11.2	**END OF BOREHOLE** Notes: 1) Monitoring well installed in the borehole upon completion. 2) Water level in monitoring well at 9.8m on June 16, 2017.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Sirati & Partners Consultants Ltd.
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LOG OF BOREHOLE BH2

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasent Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.8								
295.6 0.0	**TOPSOIL:** 200mm							
0.2	**SAND:** trace silt, trace gravel, brown, moist, loose to compact		1	SS	6			
			2	SS	18		295	
			3	SS	21		294	
			4	SS	16		293	
	occasional silt seams at 3m		5	SS	20			
			6	SS	26		292	
289.7							291	
6.1	**SILT TO SANDY SILT:** trace clay, trace gravel, grey, wet, compact		7	SS	20		290	0 10 66 24
288.2							289	
7.6	**SILTY SAND:** trace clay, brown, wet, compact		8	SS	29		288	
286.7							287	
9.1	**CLAYEY SILT TO SILTY CLAY:** trace sand, occasional sand seams, greyish brown, wet, stiff		9	SS	9	W. L. 286.2 m Jun 16, 2017		
			10	SS	13		285	
284.6								
11.2	**END OF BOREHOLE**							

Notes:
1) Monitoring well installed in the borehole upon completion.
2) Water level in monitoring well at 9.6m on June 16, 2017.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

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LOG OF BOREHOLE BH3

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 4

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"							
297.7												
297.6	**TOPSOIL:** 150mm											
0.2	**SAND:** weathered/disturbed, trace silt, brown, moist, loose		1	SS	6							
296.9							297					
1 0.8	**SAND:** trace silt, brown, moist, compact		2	SS	12							
	occasional silt seams at 1.5m		3	SS	23		296					
2			4	SS	27							
3			5	SS	24		295					
4			6	SS	25		294					
5			7	SS	25		293					
6							292					
7							291					
8 289.5			8	SS	26		290					
8.2	**END OF BOREHOLE** Notes: 1) Borehole dry on completion.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH4

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasent Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
291.6												
291.6 / 0.0	**TOPSOIL:** 150mm											
0.2	**FILL:** silty sand, trace topsoil, dark brown, moist, very loose		1	SS	4		291					
1			2	SS	3							
290.1												
1.5	**SAND:** some silt, brown, moist, compact		3	SS	17		290					
2			4	SS	26		289					
3			5	SS	21							
4							288					
287.0			6	SS	19	▽	287	W. L. 286.9 m Jun 16, 2017				
4.6	**SANDY SILT:** trace clay, trace gravel, grey, wet, compact											
5							286					
6			7	SS	16							
7							285					
284.0												
7.6	**SILT:** trace sand, grey, wet, compact						284					
8			8	SS	19							
283.4												
8.2	**END OF BOREHOLE**											

Notes:
1) Monitoring well installed in the borehole upon completion.
2) Water level in monitoring well at 4.7m on June 16, 2017.

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ε_f=3% Strain at Failure

Sirati & Partners Consultants Ltd.
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LOG OF BOREHOLE BH5

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
294.3												
0.0	**SAND:** trace silt, trace gravel, brown, moist, loose to compact		1	SS	7		294					
			2	SS	6							
							293					
			3	SS	9							
							292					
			4	SS	11							
			5	SS	13		291					
289.7							290					
4.6	**SANDY SILT TO SILTY SAND:** trace clay, greyish brown, moist to wet, compact		6	SS	25							0 23 65 12
							289					
			7	SS	22		288					
286.7							287					
7.6	**INTERBEDED SAND AND SILT:** trace clay, brown, moist, dense		8	SS	35							
286.1												
8.2	**END OF BOREHOLE** Notes: 1) Borehole open and dry on completion.											

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH6

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/01/2017

REF. NO.: SP17-212-10
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
295.1					
0.0 / 294.6	**TOPSOIL:** 500mm	1	SS	5	295
0.5 / 294.3	**FILL:** sandy silt, trace topsoil, brown, moist, loose				
1 0.8 / 293.5	**POSSIBLE FILL:** sand, trace silt, brown, moist, very loose	2	SS	2	294
1.6 / 292.8	**SILTY SAND:** trace clay, brown, moist, very loose	3	SS	4	
2.3	**SAND:** trace silt, trace gravel, occasional silt layers, brown to greyish brown, moist to very moist, compact to dense	4	SS	25	293
3		5	SS	27	292
4		6	SS	34	291
5					290
6		7	SS	41	289
7 / 287.5					288
7.6 / 286.9	**SILT TO SANDY SILT:** trace clay, grey, moist, compact	8	SS	28	287
8.2	**END OF BOREHOLE** Notes: 1) Monitoring well installed in the borehole upon completion.				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ε=3% Strain at Failure

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH7

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/02/2017

REF. NO.: SP17-212-10
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
296.6 / 0.0	**TOPSOIL:** 250mm						
296.4 / 0.3	**FILL:** sand, some silt, brown, moist, loose		1	SS	6		
295.8 / 0.9	**FILL:** sandy silt to silty sand mixed with topsoil, brown, moist, compact		2	SS	15		296
	SAND: trace silt, trace gravel, brown to greyish brown, moist, compact		3	SS	18		295
			4	SS	22		294
			5	SS	33		293
			6	SS	21		292
			7	SS	22		290
289.0 / 7.6	**SILTY FINE SAND:** trace clay, layer of silt, brown, wet, compact		8	SS	21		289
288.4 / 8.2	**END OF BOREHOLE** Notes: 1) Borehole open and water level at 7.8m during drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ε=3%: Strain at Failure

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

LOG OF BOREHOLE BH8

PROJECT: Geotechnical, Environmental and Hydrogeological Services
CLIENT: 1029629 Ontario Inc.
PROJECT LOCATION: Mt Pleasant Road, Caledon, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1

DRILLING DATA
Method: Hollow Stem Augers
Diameter: 200mm
Date: Jun/02/2017

REF. NO.: SP17-212-10
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
290.9							
0.0 / 290.5	**TOPSOIL:** 430mm		1	SS	8		
0.4 / 290.0	**FILL:** silty sand, trace clay, dark brown, moist, loose						
0.9 / 289.1	**SAND:** trace silt, brown, moist, very loose to compact		2	SS	4		290
1.8 / 287.9	**CLAYEY SILT TO SILTY CLAY:** trace sand, brown, moist, stiff		3	SS	11		289
			4	SS	10		
3.0	**SANDY SILT TO SILTY SAND:** trace clay, trace gravel, brown, moist, compact to dense		5	SS	13		288
			6	SS	42		287
							286
			7	SS	37		285
	wet below 7.6m		8	SS	34		284
						W. L. 282.1 m Jun 16, 2017	283
281.1			9	SS	25		
9.8	**END OF BOREHOLE** Notes: 1) Monitoring well installed in the borehole upon completion. 2) Water level in monitoring well at 8.8m on June 16, 2017.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

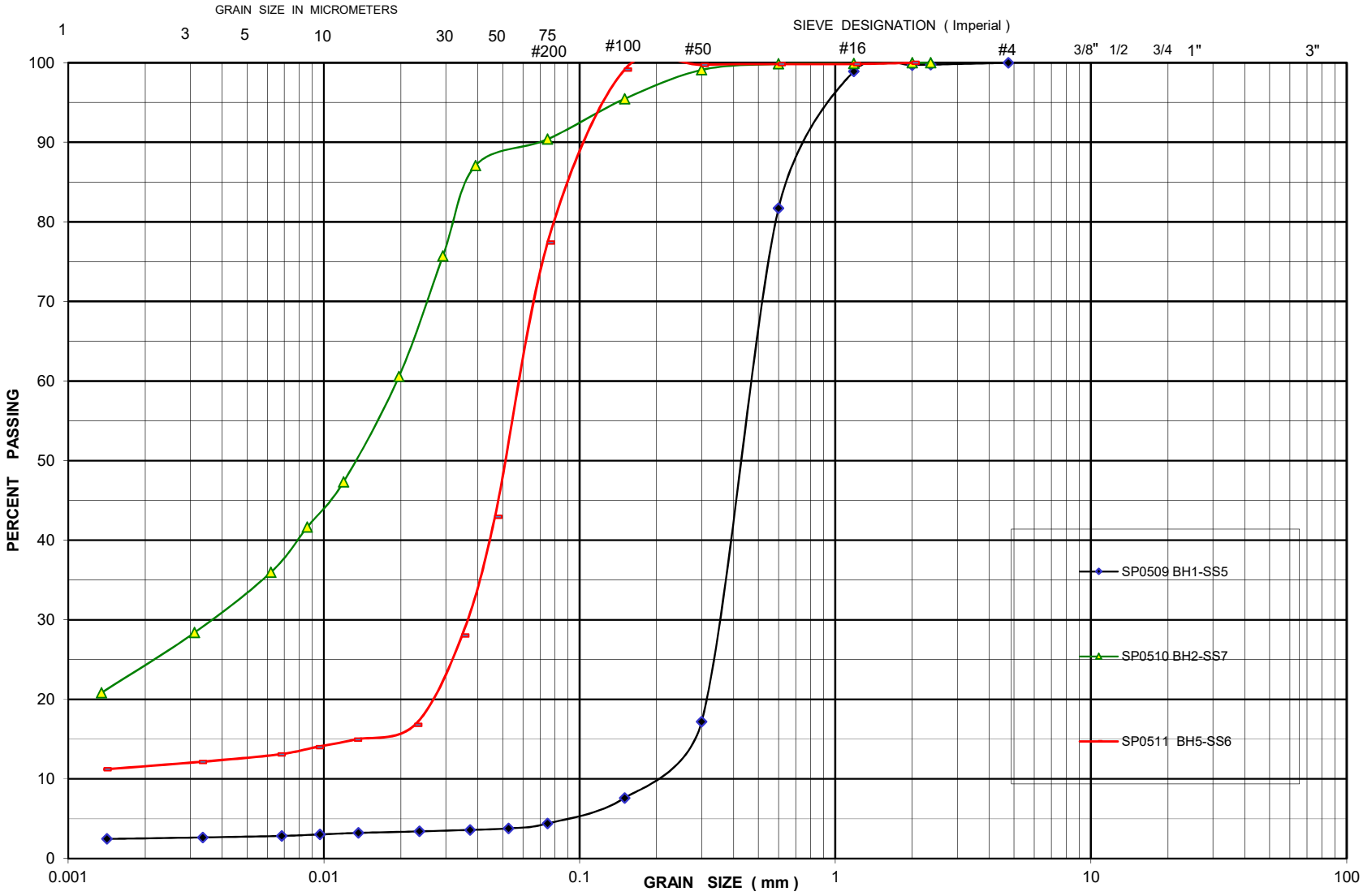
SPCL SOIL LOG SP17-212-10 - MOUNT PLEASANT, CALEDON.GPJ SPCL.GDT 7/5/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



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GRAIN SIZE DISTRIBUTION

Project: SP17-212-30

DateApril 2018

APPENDIX B

Sirati & Partners Consultants Ltd.
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Engineering Solutions

BH 2: Hydraulic Conductivity Test

t	h	h/h0
0	10.980	1.000
5	10.930	0.995
10	10.900	0.993
15	10.870	0.990
20	10.860	0.989
25	10.850	0.988
30	10.820	0.985
35	10.810	0.985
60	10.830	0.986
75	10.810	0.985
90	10.800	0.984
105	10.780	0.982
120	10.770	0.981
150	10.745	0.979
180	10.720	0.976
210	10.710	0.975
240	10.695	0.974
270	10.675	0.972
300	10.665	0.971
330	10.635	0.969
390	10.635	0.969
420	10.630	0.968
480	10.600	0.965
540	10.580	0.964
600	10.560	0.962
900	10.490	0.955
1200	10.460	0.953
1800	10.410	0.948
2700	10.380	0.945

Hvorslev time lag

$$K = \frac{r_c^2 \, 2.303 \log(2L/r_s)}{2LT}$$

h = head (m)= initial depth to water – depth to water at time (t)

h_o = initial head (m) 10.98

t = time

K = hydraulic conductivity (m/s)

L = intake length (m) (Length of screen) 3.2808

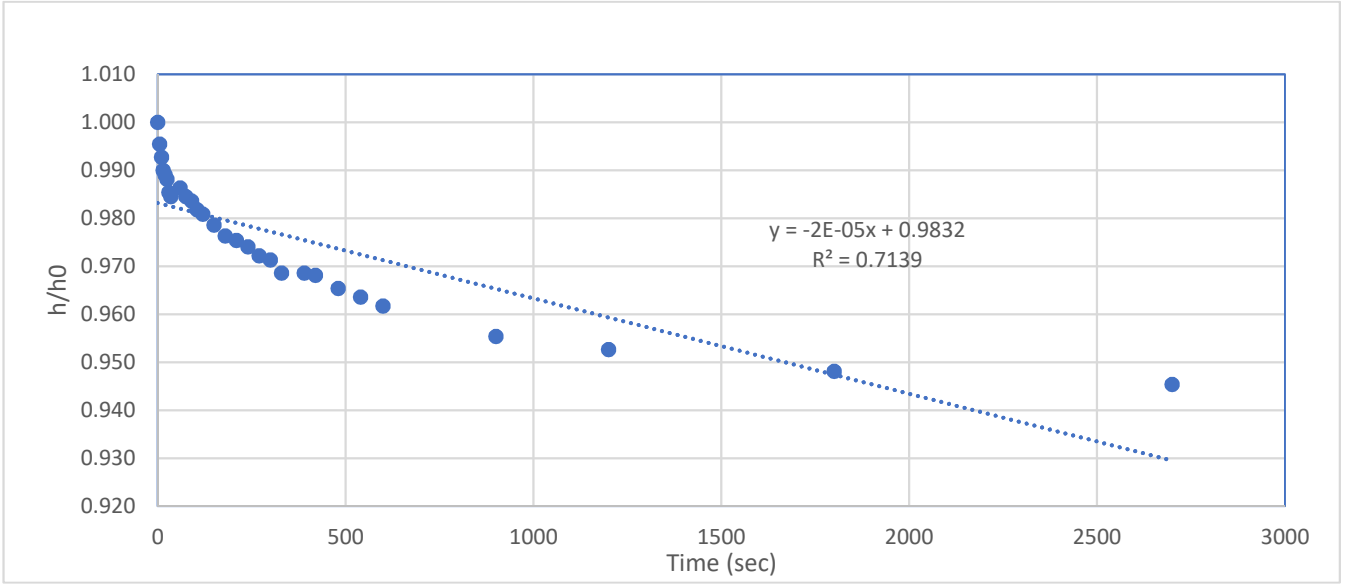
r_i = radius of influence = approx. 100*$r_{s\,(m)}$ 5

r_s = radius of intake (OD) (m) 0.05

r_c = casing radius (ID) (m) 0.025

T = time lag (sec) (time when $h/h_o = 0.37$)

BH2 - Mt.Pleasant, Caledon, ON



Hvorselov

T **30660 sec**

K **1.52E-08 m/sec**

BH 4: Hydraulic Conductivity Test

t	h	h/h0
0	6.750	1
5	6.640	0.983704
10	6.610	0.979259
15	6.570	0.973333
20	6.540	0.968889
25	6.510	0.964444
30	6.490	0.961481
35	6.460	0.957037
40	6.430	0.952593
45	6.400	0.948148
50	6.360	0.942222
55	6.340	0.939259
60	6.310	0.934815
75	6.260	0.927407
90	6.150	0.911111
105	6.080	0.900741
120	6.010	0.89037
150	5.890	0.872593
180	5.780	0.856296
210	5.690	0.842963
240	5.600	0.82963
270	5.540	0.820741
300	5.490	0.813333
360	5.400	0.8
420	5.310	0.786667
480	5.235	0.775556
540	5.205	0.771111
600	5.180	0.767407
900	5.135	0.760741
1800	5.100	0.755556

Hvorslev time lag

$$K = \frac{r_c^2 \, 2.303 \log(2L/r_s)}{2LT}$$

h = head (m)= initial depth to water – depth to water at time (t)

h_o = initial head (m) 6.75

t = time

K = hydraulic conductivity (m/s)

L = intake length (m) 3.2808

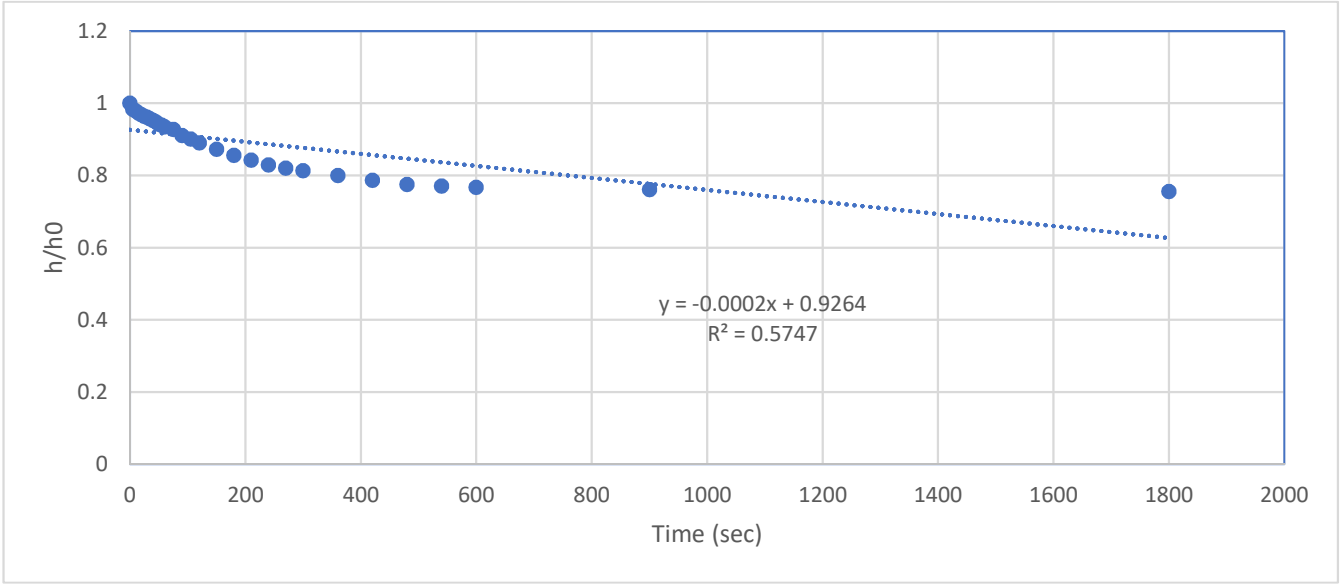
r_i = radius of influence = approx. 100*$r_{s\,(m)}$ 5

r_s = radius of intake (OD) (m) 0.05

r_c = casing radius (ID) (m) 0.025

T = time lag (sec) (time when $h/h_o = 0.37$)

BH4 - Mt.Pleasant, Caledon, ON



Hvorselov

T **2782 sec**

K **1.67E-07 m/sec**

Rising Head Test
PO # SP17-212-30
Address : Mount Pleasant Rd, Caledon
Date of Rising Head test : July 11,2017
Test by : Naz & Sudhakar

BH/MW#	Water Level	Well Depth	S/ U
MW2	10.24	11.43	0.72

Water level at 0 sec : h0	10.98	
Screen : 10 feet		
Drilling Rig : Hollow Stem		

Time (s)	h	h/h0
0	10.980	1.000
5	10.930	0.995
10	10.900	0.993
15	10.870	0.990
20	10.860	0.989
25	10.850	0.988
30	10.820	0.985
35	10.810	0.985
60	10.830	0.986
75	10.810	0.985
90	10.800	0.984
105	10.780	0.982
120	10.770	0.981
150	10.745	0.979
180	10.720	0.976
210	10.710	0.975
240	10.695	0.974
270	10.675	0.972
300	10.665	0.971
330	10.635	0.969
390	10.635	0.969
420	10.630	0.968
480	10.600	0.965
540	10.580	0.964
600	10.560	0.962
900	10.490	0.955
1200	10.460	0.953
1800	10.410	0.948
2700	10.380	0.945

Rising Head Test
PO # SP17-212-30
Address : Mount Pleasant Rd, Caledon
Date of Rising Head test : July 11,2017
Test by : Naz & Sudhakar

BH/MW#	Water Level	Well Depth	S/ U
MW4	5.07	8.03	0.75

Water level at 0 sec : h0	6.75	
Screen : 10 feet		
Drilling Rig : Hollow Stem		

Time (s)	h	h/h0
0	6.750	1.000
5	6.640	0.984
10	6.610	0.979
15	6.570	0.973
20	6.540	0.969
25	6.510	0.964
30	6.490	0.961
35	6.460	0.957
40	6.430	0.953
45	6.400	0.948
50	6.360	0.942
55	6.340	0.939
60	6.310	0.935
75	6.260	0.927
90	6.150	0.911
105	6.080	0.901
120	6.010	0.890
150	5.890	0.873
180	5.780	0.856
210	5.690	0.843
240	5.600	0.830
270	5.540	0.821
300	5.490	0.813
360	5.400	0.800
420	5.310	0.787
480	5.235	0.776
540	5.205	0.771
600	5.180	0.767
900	5.135	0.761
1800	5.100	0.756

APPENDIX C

Sirati & Partners Consultants Ltd.
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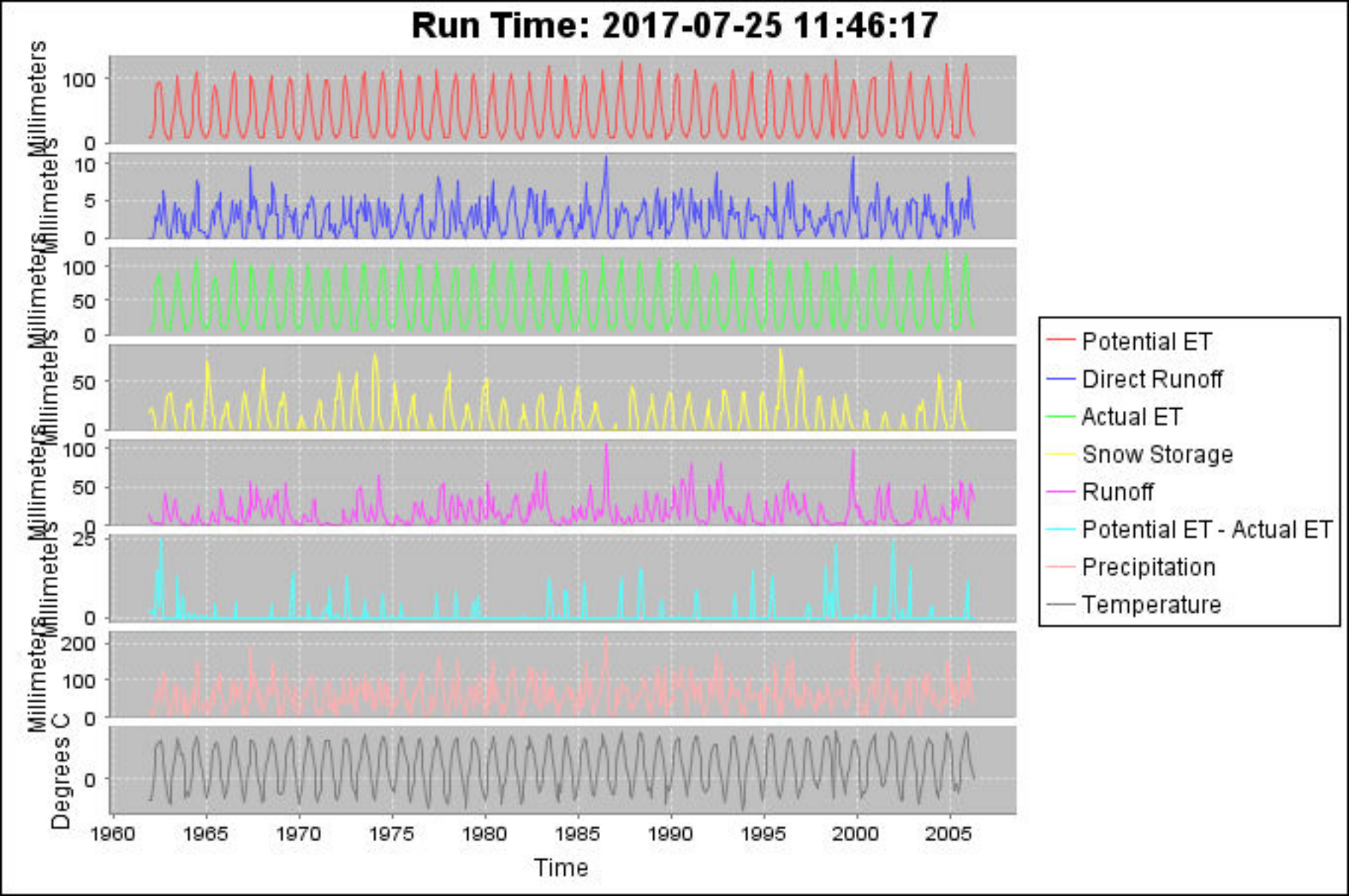
Engineering Solutions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Millimeters
100
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Millimeters
10
5
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Millimeters
100
50
0
Millimeters
50
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Millimeters
25
0
Millimeters
200
100
0
Degrees C
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Time
Potential ET
Direct Runoff
Actual ET
Snow Storage
Runoff
Potential ET - Actual ET
Precipitation
Temperature

Climate Data-Thornthawaite

1962	1	-9.9	17.5
1962	2	-9.9	4.6
1962	3	-3.7	3.8
1962	4	5.6	31.5
1962	5	13.9	58.4
1962	6	16	50
1962	7	16.7	90.9
1962	8	17.6	37.3
1962	9	12.1	86.4
1962	10	8.8	125.7
1962	11	0.6	105.9
1962	12	-6.3	38.9
1963	1	-10.8	1
1963	2	-11.7	1.5
1963	3	-2.1	38.1
1963	4	5.2	46.2
1963	5	9.6	94.2
1963	6	16.4	14.5
1963	7	18.6	70.9
1963	8	15.9	80
1963	9	11.6	65.8
1963	10	11.6	18.3
1963	11	4.5	64.3
1963	12	-8.9	2.8
1964	1	-6	45.7
1964	2	-7.9	0
1964	3	-2.6	37.1
1964	4	4.3	69.3
1964	5	12.8	59.7
1964	6	15.8	33.8
1964	7	19.5	152.7
1964	8	15.2	136.1
1964	9	13.2	21.6
1964	10	6.7	23.1
1964	11	3.1	17
1964	12	-4.5	42.4
1965	1	-8.9	27.9
1965	2	-7.5	42.2
1965	3	-5.4	3.3
1965	4	1.5	37.8
1965	5	12.6	75.2
1965	6	14.9	35.3
1965	7	15.6	58.7
1965	8	16.6	96.5
1965	9	14.3	80.8
1965	10	6.7	119.9
1965	11	1.4	69.1
1965	12	-2.1	51.1

1966	1	-9.2	2.8
1966	2	-6.4	20.6
1966	3	-0.9	36.1
1966	4	3	29
1966	5	8.2	48.8
1966	6	16.5	101.3
1966	7	19.2	40.4
1966	8	17.8	74.7
1966	9	12.1	87.9
1966	10	7.3	52.3
1966	11	2.7	103.4
1966	12	-5.2	41.4
1967	1	-4.7	9.9
1967	2	-10.7	16
1967	3	-3.7	2.5
1967	4	4.7	69.9
1967	5	7.1	42.7
1967	6	18	191.8
1967	7	17.4	78.7
1967	8	16.1	111.8
1967	9	12.2	75.9
1967	10	7.7	99.8
1967	11	-0.5	34.3
1967	12	-3.6	72.1
1968	1	-10.3	16.5
1968	2	-10	17
1968	3	-0.6	27.2
1968	4	6.8	38.9
1968	5	9	92.7
1968	6	15.9	62
1968	7	18.4	68.6
1968	8	17.7	150.4
1968	9	15.6	125.5
1968	10	9.9	64.8
1968	11	1.3	76.7
1968	12	-6.5	8.6
1969	1	-7.3	26.4
1969	2	-7	0
1969	3	-4.2	40.4
1969	4	5.8	117.3
1969	5	10.6	84.1
1969	6	14.7	85.6
1969	7	17.9	56.1
1969	8	19.3	56.4
1969	9	14.2	15.7
1969	10	7.5	65.3
1969	11	2.3	85.9
1969	12	-7.1	10.9

1970	1	-11.8	8.1
1970	2	-8.7	1
1970	3	-5	26.4
1970	4	5.1	60.5
1970	5	12	70.9
1970	6	16.1	53.6
1970	7	19.1	90.7
1970	8	18.1	86.4
1970	9	14.5	110.7
1970	10	9.2	101.1
1970	11	2.8	47
1970	12	-6.7	20.8
1971	1	-10.7	5.1
1971	2	-6.6	20.6
1971	3	-5.3	4.8
1971	4	2.9	20.3
1971	5	10.6	31
1971	6	17.4	81.5
1971	7	17.5	87.1
1971	8	17.2	97.5
1971	9	16.1	21.8
1971	10	12.2	37.8
1971	11	1.6	18.5
1971	12	-2.7	70.9
1972	1	-7.6	15
1972	2	-9.3	0
1972	3	-6.2	53.6
1972	4	1.3	39.6
1972	5	12.5	56.1
1972	6	14.4	109.5
1972	7	18.6	36.8
1972	8	17.4	42.7
1972	9	14.7	50.5
1972	10	5.5	112.5
1972	11	-0.1	41.4
1972	12	-4.3	76.5
1973	1	-5.9	19.8
1973	2	-9.5	14.7
1973	3	2.2	82.8
1973	4	5.7	70.4
1973	5	9.8	98
1973	6	17.7	78
1973	7	19.4	46
1973	8	20.4	115.8
1973	9	14.3	50
1973	10	10	95.3
1973	11	2.2	77.7
1973	12	-5.1	23.1

1974	1	-6.7	69.6
1974	2	-9.9	21.1
1974	3	-2.8	36.3
1974	4	6.2	104.1
1974	5	9.1	106.2
1974	6	16.1	64.8
1974	7	19.2	33.5
1974	8	18.9	96.5
1974	9	13	51.1
1974	10	7	31.8
1974	11	2.4	85.1
1974	12	-2.4	3.3
1975	1	-4.9	19.1
1975	2	-5.9	47.5
1975	3	-4.6	41.9
1975	4	0.9	35.1
1975	5	15	59.4
1975	6	17.6	66.5
1975	7	19.7	85.1
1975	8	18.4	117.9
1975	9	12.1	65
1975	10	9.2	28.4
1975	11	5.7	44.7
1975	12	-6.5	18.5
1976	1	-10.8	3.6
1976	2	-4.3	44.5
1976	3	-1.1	68.1
1976	4	6.5	51.8
1976	5	9.9	77.7
1976	6	18	76.5
1976	7	18.1	112.8
1976	9	13.4	116.8
1976	10	5	42.7
1976	11	-1.6	17.8
1976	12	-8.9	1.3
1977	1	-13	0
1977	2	-7.7	16.8
1977	3	0.5	59.3
1977	4	6.7	37.9
1977	5	13.6	23.1
1977	6	15.1	73
1977	7	19.8	90.3
1977	8	17.3	164
1977	9	14.1	142.9
1977	10	7.1	86.8
1977	11	2.6	70.3
1977	12	-6.1	26.6
1978	1	-10.1	25.9

1978	2	-11.9	0
1978	3	-5.5	43.2
1978	4	2.5	48.8
1978	5	12.2	100.2
1978	6	16.2	64.8
1978	7	18.9	23.8
1978	8	18.6	153.8
1978	9	13.5	152.2
1978	10	7.4	45.2
1978	11	1.6	46.6
1978	12	-4.5	20.4
1979	1	-9.4	4
1979	2	-13	12.2
1979	3	-0.1	71.4
1979	4	3.5	64.6
1979	5	10.8	84.2
1979	6	16.4	78.4
1979	7	18.8	25
1979	8	17	89.2
1979	9	14	37.4
1979	10	7.3	111.2
1979	11	2.3	99.6
1979	12	-3	60.2
1980	1	-7	37.8
1980	2	-9.7	1
1980	3	-3.8	43.4
1980	4	4.9	109.3
1980	5	12.8	34.2
1980	6	13.9	102
1980	7	19	156.2
1980	8	19.5	46
1980	9	13.4	86
1980	10	5.2	66
1980	11	0.3	33.8
1980	12	-8.4	29.2
1981	1	-11.7	0
1981	2	-3.5	35.7
1981	3	-1.8	16
1981	4	6	43.6
1981	5	10.3	60
1981	6	16.7	101.8
1981	7	19.1	115.4
1981	8	17.7	136
1981	9	13.4	88.8
1981	10	5.6	70.6
1981	11	2	53.8
1981	12	-4.4	4.6
1982	1	-11.9	12.2

1982	2	-8.8	0
1982	3	-3.7	43
1982	4	3.2	39
1982	5	14.4	60.6
1982	6	14.2	132.6
1982	7	19.2	83.8
1982	8	15.9	132.6
1982	9	13.6	110.8
1982	10	8.6	41.2
1982	11	2.7	123.4
1982	12	-1	90
1983	1	-6.1	24.6
1983	2	-4.5	24.2
1983	3	-1	50
1983	4	3.9	96.2
1983	5	8.8	126.4
1983	6	16.7	35
1983	7	20.5	75.4
1983	8	19.7	81.2
1983	9	15.7	43.4
1983	10	8.1	82
1983	11	2	50.4
1983	12	-7.5	24.6
1984	1	-10.3	0
1984	2	-2.6	40.5
1984	3	-6.3	34.4
1984	4	6	44.2
1984	6	17.1	54.6
1984	7	18.5	49.4
1984	8	19.8	73.8
1984	9	12.5	86.7
1984	10	9.4	49.6
1984	11	1.6	76.2
1984	12	-1.8	63.2
1985	1	-9.7	0.8
1985	2	-7.4	32.4
1985	3	-1.9	63.1
1985	4	7.2	25
1985	5	12.3	91.6
1985	6	14.6	26.6
1985	7	18.6	59.6
1985	8	17.8	148.7
1985	9	15.8	118.9
1985	10	8.3	62.4
1985	11	1.5	100.6
1985	12	-6.6	12.4
1986	1	-7.3	10.2
1986	2	-8.3	10.1

1986	3	-0.7	40.4
1986	4	7.1	57.5
1986	5	13.8	72.1
1986	6	15.2	106.9
1986	7	20	122
1986	8	17.1	145.6
1986	9	14	218.9
1986	10	7.8	65.6
1986	11	0.2	18.4
1986	12	-3.2	9.2
1987	1	-6.6	2.4
1987	2	-7.2	8
1987	3	-0.1	41.7
1987	4	7.9	80
1987	5	13.7	33.6
1987	6	17.8	62
1987	7	21.3	95.1
1987	8	18.4	91.6
1987	9	14.8	68.5
1987	10	6	79
1987	11	1.9	70.2
1987	12	-2.4	23.3
1988	1	-7.2	39.2
1988	2	-8.5	21
1988	3	-2.5	25.4
1988	4	4.9	58.9
1988	5	13.4	52.4
1988	6	16.4	48.2
1988	7	21.2	61.2
1988	8	20	73
1988	9	14	106.1
1988	10	5.4	91.3
1988	11	3.2	98.5
1988	12	-4.9	23.2
1989	1	-4.1	33
1989	2	-8.8	2
1989	3	-4.3	39
1989	4	3.5	44.7
1989	5	11.5	106.2
1989	6	17.2	132
1989	7	19.7	26.2
1989	8	18.1	100.6
1989	9	14.1	39.7
1989	10	8.3	71.6
1989	11	0.1	140.6
1989	12	-11.8	2
1990	1	-3	37
1990	2	-5.6	26.2

1990	3	-0.5	52.4
1990	4	7.3	46.6
1990	5	10.4	123.4
1990	6	17.1	109.8
1990	7	18.9	80.4
1990	8	18.5	88.1
1990	9	14	90.9
1990	10	7.7	134.4
1990	11	3.5	73.5
1990	12	-2.7	70
1991	1	-7.9	3.8
1991	2	-4.3	29.8
1991	3	-0.4	97.6
1991	4	7.3	133.6
1991	5	15.3	65.6
1991	6	18.4	44.1
1991	7	19.6	93
1991	8	19.6	76.6
1991	9	13.2	51.1
1991	10	9.4	100.2
1991	11	0.7	48.6
1991	12	-4.2	17.5
1992	1	-5.9	9
1992	2	-5.6	33.2
1992	3	-3.4	45.6
1992	4	4	107.2
1992	5	11.2	85.6
1992	6	14.4	55.4
1992	7	16.2	126.6
1992	8	16.1	173.8
1992	9	13.7	91.4
1992	10	5.9	46.6
1992	11	1	152.2
1992	12	-3.2	23.6
1993	1	-6	39.4
1993	2	-11	0
1993	3	-4.4	0.2
1993	4	5.2	72.1
1993	5	10.8	61.6
1993	6	15.5	111.4
1993	7	19.6	80.4
1993	8	19.3	54.4
1993	9	11.7	68.8
1993	10	6.7	70.3
1993	11	1	58.4
1993	12	-4.4	12
1994	1	-14.1	28.5
1994	2	-10.6	0

1994	3	-3	12.4
1994	4	5.9	80.4
1994	5	10	107.6
1994	6	17.3	49.4
1994	7	19.5	54.7
1994	8	16.9	50
1994	9	13.9	63
1994	10	8.4	59.5
1994	11	3.8	59.2
1994	12	-2.1	18.4
1995	1	-4.6	69.9
1995	2	-9.5	6
1995	3	-0.2	1.4
1995	4	2.2	90
1995	5	11.3	76.2
1995	6	18.2	79.8
1995	7	20	65.9
1995	8	20.2	62.2
1995	9	12.6	45.4
1995	10	9.6	146.3
1995	11	-1.3	105.2
1995	12	-7.1	0
1996	1	-8.8	50.8
1996	2	-7.6	33.4
1996	3	-4.6	4.8
1996	4	2.6	80.8
1996	5	10.2	93
1996	6	17.4	149.2
1996	7	17.9	112.4
1996	8	18.8	52
1996	9	14.3	155.1
1996	10	7.9	65.2
1996	11	-0.8	33.6
1996	12	-2	63.2
1997	1	-8.4	25.5
1997	2	-5	55.6
1997	3	-3.4	39
1997	4	4.1	26.6
1997	5	7.7	90.8
1997	6	18.5	79.7
1997	7	18.6	58.3
1997	8	16.7	72.5
1997	9	14.3	63.7
1997	10	7.7	31.6
1997	11	0.5	32.6
1997	12	-2.8	13
1998	1	-4.5	71.2
1998	2	-2.3	30.8

1998	3	-0.5	71.8
1998	4	6.6	39.2
1998	5	15.7	56.7
1998	6	17	57
1998	7	19	47.8
1998	8	19.1	96.4
1998	9	15.3	44
1998	10	8.5	13.6
1998	11	2.6	40.6
1999	1	-8.8	37
1999	7	21.8	63.4
1999	8	17.5	70.7
1999	9	15.4	71.6
1999	10	7.9	63.1
1999	11	4	75.4
1999	12	-2.8	42
2000	1	-7.1	30.6
2000	2	-4.1	25
2000	3	2.2	35.1
2000	4	4.7	56
2000	5	12.8	164.9
2000	6	17	219
2000	7	17.6	91.2
2000	8	17.8	68.4
2000	9	14.3	110.6
2000	10	9.8	29.6
2000	11	1.5	51.4
2000	12	-8.9	0
2001	1	-5.8	0
2001	2	-5.8	34
2001	3	-2.8	6
2001	4	6.4	40
2001	5	13	79.2
2001	6	17.1	94.4
2001	7	18.1	73.6
2001	8	20.3	48.6
2001	9	14.3	84.4
2001	10	8.5	147.9
2001	11	5.6	85.6
2001	12	-0.5	20
2002	1	-2.8	1
2002	2	-3.7	29.8
2002	3	-1.5	38.1
2002	4	6	102.5
2002	5	9.1	111.4
2002	6	17.3	74.8
2002	7	21.4	66.6
2002	8	19.5	35

2002	9	17.4	52.5
2002	10	6.7	78
2002	11	0.8	30
2002	12	-3.9	11
2003	1	-10.1	0
2003	2	-9.8	13
2003	3	-2.3	25.8
2003	4	3.9	24.6
2003	5	10.7	95.6
2003	6	16.8	77.3
2003	7	19.2	38.8
2003	8	19.6	99.9
2003	9	14.6	107.8
2003	10	7	94.6
2003	11	3.2	94.4
2003	12	-2.5	45.6
2004	1	-11.2	9.2
2004	2	-6	1
2004	3	-0.3	98
2004	4	5.1	66.3
2004	5	11.5	117
2004	6	15.8	57.5
2004	7	18.5	116.7
2004	8	16.6	60.8
2004	9	15.9	39.7
2004	10	8.4	58.4
2004	11	2.9	63.9
2004	12	-5.7	33.5
2005	1	-9	29
2005	2	-6.2	31.2
2005	3	-3.8	14
2005	4	5.4	57.1
2005	5	9.3	47.2
2005	6	20.4	32.3
2005	7	20.9	141.7
2005	8	19.7	148.3
2005	9	16.3	76.6
2005	10	9.3	51
2005	11	3.2	95.9
2005	12	-5.4	23.3
2006	1	-2.2	79.3
2006	2	-6.5	36
2006	3	-1.3	59.9
2006	4	6.3	93.6
2006	5	12.5	106.1
2006	6	17.5	53.9
2006	7	21.1	100.4
2006	8	18.8	52.6

Climate Data-Thornthawaite

2006	9	13.5	163.3
2006	10	7.3	120.2
2006	11	4.1	50.8
2006	12	0.3	36.6

APPENDIX D

Sirati & Partners Consultants Ltd.
Geotechnical & Environmental Services
Engineering Solutions

Summary

Site	Project Name	Project Title	Storm Type
Pre-Development	Mt.Pleasant Caledon	SP17-212-30	avg-annual
Post-Development	Mt Pleasant, Caledon	SP17-212-30	avg-annual

Water Balance Comparison

Site	Site Area	Site Rainfall In (mm) (m^3)	Site Infiltration (mm) (m^3)	Site Evapotranspiration (mm) (m^3)	External Outflow (mm) (m^3)	Rainfall Reduction (mm) (%)
Pre-Development Total	12.30 ha	847.60 mm 104,254.80 m^3	124.89 mm 15,361.47 m^3	613.47 mm 75,456.81 m^3	105.69 mm 13,000.00 m^3	741.91 mm 87.53 %
Post-Development Total	12.28 ha	847.60 mm 104,076.80 m^3	115.14 mm 14,138.04 m^3	550.92 mm 67,647.47 m^3	178.35 mm 21,900.00 m^3	669.25 mm 78.96 %
Difference	**-0.02 ha**	**0.00 mm** **-178.00 m^3**	**-9.75 mm** **-1,223.43 m^3**	**-62.55 mm** **-7,809.34 m^3**	**72.66 mm** **8,900.00 m^3**	**-72.66 mm** **-8.57 %**
Difference	**-0.17 %**	**-0.00 %**	**-7.81 %**	**-10.20 %**	**68.75 %**	**-9.79 %**

Water Balance | Pre-Development

Catchment	Site Area	Site Rainfall In (mm) (m^3)	Site Infiltration (mm) (m^3)	Site Evapotranspiration (mm) (m^3)	External Outflow (mm) (m^3)	Rainfall Reduction (mm) (%)
1	12.30 ha	847.60 mm 104,254.80 m^3	124.89 mm 15,361.47 m^3	613.47 mm 75,456.81 m^3	105.69 mm 13,000.00 m^3	741.91 mm 87.53 %
TOTAL	**12.30 ha**	**847.60 mm** **104,254.80 m^3**	**124.89 mm** **15,361.47 m^3**	**613.47 mm** **75,456.81 m^3**	**105.69 mm** **13,000.00 m^3**	**741.91 mm** **87.53 %**

Water Balance | Post-Development

Catchment	Site Area	Site Rainfall In (mm) (m^3)	Site Infiltration (mm) (m^3)	Site Evapotranspiration (mm) (m^3)	External Outflow (mm) (m^3)	Rainfall Reduction (mm) (%)
1	12.28 ha	847.60 mm 104,076.80 m^3	115.14 mm 14,138.04 m^3	550.92 mm 67,647.47 m^3	178.35 mm 21,900.00 m^3	669.25 mm 78.96 %
TOTAL	**12.28 ha**	**847.60 mm** **104,076.80 m^3**	**115.14 mm** **14,138.04 m^3**	**550.92 mm** **67,647.47 m^3**	**178.35 mm** **21,900.00 m^3**	**669.25 mm** **78.96 %**

Map | Pre-Development

Map | Post-Development

LID Summary | Post-Development

Element	Type	LID Area	Drawdown Time	Effective Impervious to Pervious Ratio	FLOW	TSS	TP
					Flow In (m^3)	Load In (kg)	Load In (kg)
					Flow Out (m^3)	Load Out (kg)	Load Out (kg)
					Actual Reduction (%)	Actual Reduction (%)	Actual Reduction (%)

Loading Summary TSS | Pre Development

Catchment	Total Catchment TSS Removal	Peak Outflow	Generated Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)
Catchment 1	0.000 %	0.132 m^3/s	13,000.000 m^3 70.000 mg/l 910.000 kg	13,005.000 m^3 69.973 mg/l 910.000 kg
Total	**0.000 %**	**0.132 m^3/s**	**13,000.000 m^3** **70.000 mg/l** **910.000 kg**	**13,005.000 m^3** **69.973 mg/l** **910.000 kg**

Loading Summary TSS | Post Development

Catchment	Total Catchment TSS Removal	Peak Outflow	Generated Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)
Catchment 1	0.000 %	0.185 m^3/s	21,850.000 m^3 69.365 mg/l 1,515.632 kg	21,854.000 m^3 69.353 mg/l 1,515.632 kg
Total	**0.000 %**	**0.185 m^3/s**	**21,850.000 m^3** **69.365 mg/l** **1,515.632 kg**	**21,854.000 m^3** **69.353 mg/l** **1,515.632 kg**

Loading Summary TP | Pre Development

Catchment	Total Catchment TP Removal	Peak Outflow	Generated Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)
Catchment 1	0.000 %	0.132 m^3/s	13,000.000 m^3 0.200 mg/l 2.600 kg	13,005.000 m^3 0.200 mg/l 2.600 kg
Total	**0.000 %**	**0.132 m^3/s**	**13,000.000 m^3** **0.200 mg/l** **2.600 kg**	**13,005.000 m^3** **0.200 mg/l** **2.600 kg**

Loading Summary TP | Post Development

Catchment	Total Catchment TP Removal	Peak Outflow	Generated Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Average Concentration (mg/l) Total Load (kg)
Catchment 1	0.000 %	0.185 m^3/s	21,850.000 m^3 0.192 mg/l 4.205 kg	21,854.000 m^3 0.192 mg/l 4.205 kg
Total	**0.000 %**	**0.185 m^3/s**	**21,850.000 m^3** **0.192 mg/l** **4.205 kg**	**21,854.000 m^3** **0.192 mg/l** **4.205 kg**

Peak Flow | Pre-Development

Catchment	Element	Description	Peak outflow
1	Pre-Dev Mt Pleasant Outfall 1	PEAK RUNOFF FLOW from MAXIMUM FLOW at	0.13 m^3/s 0.132 m^3/s

Peak Flow | Post-Development

Catchment	Element	Description	Peak outflow
1	Post_dev Mt.Pleasant, Caledon Outfall 2	PEAK RUNOFF FLOW from MAXIMUM FLOW at	0.19 m^3/s 0.185 m^3/s

Loading TSS | Pre Development

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming Total Flow (m^3) Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Concentration (mg/l) Total Load (kg)
Pre-Dev Mt Pleasant	0 %	0.13 m^3/s	104,254.800 m^3 70.000 mg/l 7,297.836 kg	13,000.000 m^3 70.000 mg/l 910.000 kg
Outfall 1	0 %	0.132 m^3/s	13,005.000 m^3 69.973 mg/l 910.000 kg	13,005.000 m^3 69.973 mg/l 910.000 kg

Loading TSS | Post Development

TSS - Catchment 1

Name	LID Type (removal)	Peak Outflow	Incoming Total Flow (m^3) Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Concentration (mg/l) Total Load (kg)
Post_dev Mt.Pleasant, Caledon	0 %	0.19 m^3/s	104,076.804 m^3 69.365 mg/l 7,219.319 kg	21,850.000 m^3 69.365 mg/l 1,515.632 kg
Outfall 2	0 %	0.185 m^3/s	21,854.000 m^3 69.353 mg/l 1,515.632 kg	21,854.000 m^3 69.353 mg/l 1,515.632 kg

Loading TP | Pre Development

TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming Total Flow (m^3) Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Concentration (mg/l) Total Load (kg)
Pre-Dev Mt Pleasant	0 %	0.13 m^3/s	104,254.800 m^3 0.200 mg/l 20.851 kg	13,000.000 m^3 0.200 mg/l 2.600 kg
Outfall 1	0 %	0.132 m^3/s	13,005.000 m^3 0.200 mg/l 2.600 kg	13,005.000 m^3 0.200 mg/l 2.600 kg

Loading TP | Post Development

TP - Catchment 1

Name	LID Type	Peak Outflow	Incoming Total Flow (m^3) Concentration (mg/l) Total Load (kg)	Outgoing Total Flow (m^3) Concentration (mg/l) Total Load (kg)
Post_dev Mt.Pleasant, Caledon	0 %	0.19 m^3/s	104,076.804 m^3 0.192 mg/l 20.032 kg	21,850.000 m^3 0.192 mg/l 4.205 kg
Outfall 2	0 %	0.185 m^3/s	21,854.000 m^3 0.192 mg/l 4.205 kg	21,854.000 m^3 0.192 mg/l 4.205 kg

Detailed Report Parameters | Pre Development

Pre-Dev Mt Pleasant

Field	Value
Subcatchment name	Pre-Dev Mt Pleasant
Catchment	1
Total AREA (HA)	12.3
Impervious area (HA)	0
Roof area (HA)	0
Landscaped area (HA)	12.3
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.1
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	2.54
Weighted Curve Number	84

Outfall 1

Field	Value
Name	Outfall 1
Catchment	1
Outfall Elevation (m)	0

Detailed Report Parameters | Post Development

Post_dev Mt.Pleasant, Caledon

Field	Value
Subcatchment name	Post_dev Mt.Pleasant, Caledon
Catchment	1
Total AREA (HA)	12.279
Impervious area (HA)	1.25552775
Roof area (HA)	0.282417
Landscaped area (HA)	10.5488889
Row Crop area (HA)	0
Open Space / Parkland area (HA)	0.19278030000000002
Forest area (HA)	0
Wetland area (HA)	0
Other area (HA)	0
Manning's n for impervious areas	0.01
Manning's n for pervious areas	0.1
Depression storage for impervious areas (mm)	2
Depression storage for pervious areas (mm)	2.54
Weighted Curve Number	83.9

Outfall 2

Field	Value
Name	Outfall 2
Catchment	1
Outfall Elevation (m)	0