

**HYDROGEOLOGICAL INVESTIGATION**

**BOLTON NORTH HILL  
OPTION 1 & OPTION 2 LANDS**

**TOWN OF CALEDON  
REGION OF PEEL**

**PREPARED FOR:**

**BOLTON NORTH HILL LANDOWNERS GROUP**

**PREPARED BY:**

**C.F. CROZIER & ASSOCIATES INC.  
2800 HIGH POINT DRIVE, SUITE 100  
MILTON, ON L9T 6P4**

**DECEMBER 2024**

**CFCA FILE NO. 708-3446**

**TOWN OF CALEDON  
PLANNING  
RECEIVED  
Feb 19, 2025**

The material in this report reflects best judgment in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. C.F. Crozier & Associates Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



**CROZIER**

Revision Number	Date	Comments
Rev.0	March 3, 2022	Hydrogeological Investigation Report submitted to Bolton North Landowners Group for draft review.
Rev.1	April 4, 2022	Issued for 1 <sup>st</sup> Submission.
Rev.2	December 13, 2024	Issued for 2 <sup>nd</sup> Submission.



## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>2.0</b>	<b>SITE DESCRIPTION .....</b>	<b>1</b>
2.1	Site Location .....	1
2.2	Land Use.....	2
2.3	Source Protection .....	2
<b>3.0</b>	<b>GEOLOGY .....</b>	<b>3</b>
3.1	Physiography, Drainage, and Topography.....	3
3.2	Regional Geology .....	3
3.3	Local Geology .....	4
<b>4.0</b>	<b>HYDROGEOLOGY .....</b>	<b>4</b>
4.1	MECP Wells .....	4
4.2	Groundwater Properties.....	5
4.3	Aquifer Properties .....	5
<b>5.0</b>	<b>FIELD WORK.....</b>	<b>6</b>
5.1	Monitoring Well Construction.....	6
5.2	Groundwater Monitoring .....	7
<b>6.0</b>	<b>RESULTS .....</b>	<b>7</b>
6.1	Groundwater Levels .....	7
<b>7.0</b>	<b>SITE WATER BALANCE ASSESSMENT .....</b>	<b>7</b>
7.1	Background Information.....	8
7.1.1	Precipitation (P).....	10
7.1.2	Storage (S).....	10
7.1.3	Evaporation/Evapotranspiration (ET).....	10
7.1.4	Water Surplus (R + I) .....	10
7.2	Methodology.....	9
7.3	Pre-Development Infiltration .....	10
7.4	Post-Development Infiltration .....	10
<b>8.0</b>	<b>DESIGN CONSIDERATIONS .....</b>	<b>11</b>
<b>9.0</b>	<b>CONCLUSIONS .....</b>	<b>14</b>
<b>10.0</b>	<b>REFERENCES .....</b>	<b>15</b>

## LIST OF TABLES

<b>Table 1:</b>	Local Geology of Onsite Monitoring Wells
<b>Table 2:</b>	Summary of Regional Hydrostratigraphy in the Humber River Watershed
<b>Table 3:</b>	Summary of Site-Wide Water Balance Assessment
<b>Table 4:</b>	Climate Data (1996-2001) for Bolton North Climate Station
<b>Table 5:</b>	Existing Land Use
<b>Table 6:</b>	Proposed Land Use (Bousfields Inc., December 2021)
<b>Table 7:</b>	Anticipated Seasonally High Groundwater Elevations

## LIST OF APPENDICES

<b>Appendix A:</b>	Monitoring Well Logs
<b>Appendix B:</b>	MECP Well Summary Table
<b>Appendix C:</b>	Manual Water Level Measurements
<b>Appendix D:</b>	Hydrographs
<b>Appendix E:</b>	Site-Wide Water Balance Assessment

## LIST OF FIGURES

<b>Figure 1:</b>	Site Location Plan
<b>Figure 2:</b>	Highly Vulnerable Aquifers
<b>Figure 3:</b>	Physiography
<b>Figure 4:</b>	Topography
<b>Figure 5:</b>	Bedrock Geology
<b>Figure 6:</b>	Surficial Geology
<b>Figure 7:</b>	MECP Well Location Plan
<b>Figure 8:</b>	Onsite Well Location Plan
<b>Figure 9:</b>	Estimated Groundwater Flow Direction

## 1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Bolton North Hill Landowners Group to prepare a hydrogeological investigation to support the proposed Bolton Residential Expansion Settlement (BRES) Option 1 & Option 2 Lands (subject lands). The subject lands are located generally north of the Highway 50 and Columbia Way intersection in the Community of Bolton, Town of Caledon, Region of Peel.

The following report has been prepared to characterize the local hydrogeological regime and delineate any hydrogeological constraints for future development of the Option 1 & Option 2 lands. This study has been prepared in accordance with the Toronto and Region Conservation Authority (TRCA) Hydrogeological Assessment Guidelines (June 2013) and all applicable Town of Caledon and Region of Peel Guidelines.

The following background studies and reports have been reviewed in preparation of this report:

- Preliminary Hydrogeological Investigation prepared by DS Consultants LTD. (DS Consultants, February 2021).
- Concept Plan prepared by Bousfields Inc. (Bousfields, August 2024).
- Schedule C – Bolton Land Use Plan prepared by the Town of Caledon (Town of Caledon, April 2018).
- Approved Source Protection Plan: CTC Source Protection Region prepared by CTC Source Protection Committee (CTC, March 2022).
- Humber River Watershed Scenario Modelling and Analysis Report prepared by Toronto Region Conservation Authority (TRCA) (TRCA, 2008a).
- Humber River State of the Watershed Report – Geology and Groundwater Resources prepared by TRCA (TRCA, 2008b).
- The Physiography of Southern Ontario (Chapman and Putnam, 1984).

## 2.0 Site Description

The following sections describe the plans for the development, the existing land use on and in the vicinity of the subject lands, and information regarding the Source Protection of the site.

### 2.1 Site Location

The Option 1 and Option 2 lands (subject lands) are generally located in the north end of Bolton, Region of Peel. The Option 1 lands are approximately 171 ha and contain land parcels north of Highway 50 and Columbia Way, north and south of Emil Kolb Parkway and east and west of Duffy's Lane. The Option 2 lands are approximately 4.3 ha and are bounded by Columbia Way to the south and Mount Hope Road to the west. The subject lands are currently characterized by agricultural and rural properties, as shown in Figure 1.

The subject lands are composed by many separate properties under separate ownership. Please refer to Figure 1 for land ownership boundaries.

Based on the Concept Plan provided by Bousfields Inc. dated August 2024, the elements envisioned for the development include residential, institutional, commercial space, parks, open space and woodlots, and stormwater management facilities.

## **2.2 Land Use**

The Region of Peel Official Plan classifies the subject lands as "Rural Area," and the Town of Caledon Official Plan designates them as "Agricultural Area." The majority of the land is currently utilized for agriculture and includes single-family homes, barns, and John's Nursery Gardens on the east side of Highway 50. To the south of the subject lands are residential areas, while rural lands lie to the north. A large residential subdivision with detached and semi-detached homes is located south of Columbia Way, with St. Michael Catholic Secondary School situated to the north. The Humber Valley Heritage Trail extends southwest from Highway 50 to Emil Kolb Parkway.

## **2.3 Source Protection**

The subject lands are within the Toronto and Region Source Protection Area and are subject to the policies outlined within the CTC Source Protection Plan (MECP, 2022). Provincial Source Protection mapping shows no wellhead protection areas, intake protection zones, or issue contributing areas in the study area. However, the lands are within a significant groundwater recharge area (SGRA) and a highly vulnerable aquifer (HVA) with a vulnerability index score of 2 to 6. There are no significant threats associated with these scores, so there are no legally binding Source Protection Policies under Section 31 of the Clean Water Act applicable to the subject lands. While no significant drinking water threats are identified, several low to moderate threats exist. Best management practices must be applied to prevent future threats from the following:

- Operation and maintenance of a waste disposal site.
- Operation, storage, and maintenance of systems that collect, treat, or transmit wastewater including stormwater management facilities, sanitary pipes and onsite sewage treatment systems.
- Handling, storage, and application of agricultural source material (ASM).
- Use of category 2 and category 3 non-agricultural source materials (NASM) under Schedule 4 of Ontario Regulation 267/03 including but not limited to industrial organic food waste, culled crops, sewage biosolids and paunch manure.
- Application of commercial fertilizers and pesticides.
- Excluding domestic usage, application, and storage of road salt.
- Use of dense non-aqueous phase liquids (DNAPLs) and organic solvents.
- The handling and storage of a DNAPL and/or fuel.
- The handling, storage, and application of an organic solvent, road salt, and/or pesticide to land.
- The storage of snow.

### **3.0 Geology**

The following sections describes the local and regional geology of the subject lands.

#### **3.1 Physiography, Drainage, and Topography**

As shown in Figure 3, the subject lands are located within the physiographic region known as the South Slope, extending south of the Oak Ridges Moraine, and north of the Peel Plain (Chapman and Putnam, 1984).

The South Slope is bounded by the Oak Ridges Moraine in the north and extends from the Niagara Escarpment in the west to the Trent River in the east. This physiographic region consists of a smooth, faintly drumlinized, clay till plain, which resulted from the movement and deposition of glacial material (Chapman and Putnam, 1984). Landforms of the area include drumlins and flute features. Drumlins are characterized by tear-shaped hills composed of glacial till where flutes are elongated ridges of glacial till. According to Ontario Geological Survey (OGS) mapping, the nearest drumlin features are located northwest of the subject lands in the area known as the Guelph Drumlin Fields, and the nearest flutes are located east of Bolton, on the Oak Ridges Moraine in northern Richmond Hill.

The subject lands are located within the Main Humber River Subwatershed of the regional Humber River Watershed (TRCA, 2008a). The nearest major surface water feature to the subject lands is the Humber River, situated approximately 750 m southwest of the site. A number of drainage features cross the subject property in the form of creeks and streams as shown in Figure 1. Based on field observations, the creeks and streams appear to be intermittently flowing and seasonally driven.

According to Figure 1: Draft Wetland Communities prepared by Dillon Consulting Ltd., eight (8) unique wetlands have been delineated within or near the subject property boundary. Two (2) surface water ponds were identified on the subject lands and appear to be ephemeral, as shown on Figure 1.

Regionally, surface drainage is interpreted to be northwest to southeast in the direction of Lake Ontario. On the subject lands, a natural drainage split runs north-south along the west side of Highway 50, dividing two secondary catchments (TRCA, 2008a). The north catchment drains towards the north and the south catchment drains towards the south. Surface topography of the subject lands range from approximately 245 metres above sea level (masl) at the border of the Oak Ridges Moraine in the north to approximately 220 masl at the border of the Peel Plain in the south (TRCA, 2008b). Figure 4 presents the topography of the subject lands and the surrounding area.

#### **3.2 Regional Geology**

The bedrock geology of the area includes the shales, limestones, dolostones, and siltstones of the Georgian Bay Formation according to OGS mapping. Geological evidence exists that an underground buried channel extends from Georgian Bay to Lake Ontario known as the Laurentian Valley. The Laurentian Channel is estimated to be up to 1.5 km wide and 70 m deep, however, it has since been in-filled with sediments (TRCA, 2008b).

Geologic mapping indicates that local overburden consists primarily of clay to silt textured till derived from glaciolacustrine deposits or shale (OGS, 2022). Near existing river channels, modern and older alluvial deposits made up of clay, silt, sand, and gravel are found. Figures 5 and 6 present the bedrock and surficial geology of the general area. OGS mapping is consistent with the findings of Crozier staff during the construction and installation of monitoring wells across the property in November 2021.

### 3.3 Local Geology

To characterize the hydrogeological regime and establish a baseline for future studies, a field investigation and drilling program was undertaken under the supervision of Crozier in November 2021. From November 1 to November 11, 2021, a total of twenty (20) monitoring wells were installed across the subject property. Further discussion of the field investigation is found in Section 5 and monitoring well logs are found in Appendix A.

Table 1 displays the soils encountered during the field investigation in stratigraphic order.

**Table 1: Local Geology at Onsite Monitoring Well Locations**

Monitoring Wells	Local Surficial Material Observations	Depth (mbgs) <sup>1</sup>
MW1, MW2, MW3	• Dark brown, moist, topsoil with abundant rootlets	0.00 - 0.02
	• Brown silty clay with grey silt seams	0.02 - 4.00
	• Grey clayey silt till with minor gravel	4.00 - 5.00
	• Grey silty clay with minor grey clay seam	5.00 - 6.00
MW5, MW6, MW8, MW9, MW10	• Dark brown, moist, topsoil with abundant rootlets	0.00 - 0.02
	• Brown/grey silty clay with grey silt seams	0.2 - 3.70
	• Grey silt with minor sand	3.70 - 4.60
	• Grey silty clay	4.60 - 6.00
MW4, MW7, MW11, MW12, MW13, MW14, MW15, MW17	• Dark brown, moist, topsoil with abundant rootlets	0.00 - 0.02
	• Brown silty clay	0.02 - 1.80
	• Grey sandy silt	1.80 - 2.50
	• Grey silty clay	2.50 - 3.50
	• Grey silt	3.50 - 5.25
	• Grey silty clay	5.35 - 6.00
MW16, MW18, MW19, MW20	• Dark brown, moist, topsoil with abundant rootlets	0.00 - 0.02
	• Brown silty clay with minor gravel	0.02 - 4.00
	• Grey silty clay with trace gravel	4.00 - 6.00

1. Approximate depth of material interpreted from monitoring well logs in meters below ground surface (mbgs).

Findings during the field investigation are consistent with OGS mapping and local and regional soils investigations.

## 4.0 Hydrogeology

### 4.1 MECP Wells

A review of the MECP Well Record Database identified a total of 206 wells records within 500 m of the subject lands boundaries as shown on Figure 7. A summary table of the well records is included in Appendix B. In general, the identified well records can be summarized as follows:

- Of the 206 well records identified, 153 are domestic supply, domestic/irrigation, or domestic/livestock wells, 13 are monitoring wells, 2 are public wells, 1 well is used for commercial purposes. The remainder are identified as abandoned or testholes.
- Twenty-two (22) existing wells are identified within the subject property boundary.
- Seven (7) well records are constructed within limestone bedrock and the remainder are screened within the overburden aquifer or are unidentified.

- The wells in the general area have an average static water level of 19.0 mbgs and an average depth of 42.3 mbgs.
- Well ID 7172324 corresponds to a cluster of seven (7) monitoring wells with depths ranging from 6.1 mbgs to 30.5 mbgs installed 2011 and are located along Duffy's Lane.
- The well records of the area indicate the surficial material of the study area is primarily brown silty clay covering grey silty clay.

#### **4.2 Groundwater Properties**

Groundwater reports show that in the Humber River Watershed, groundwater generally flows southeast towards Lake Ontario (TRCA, 2008b). Local flow direction changes at major topographic shifts and buried channels. Thus, shallow groundwater on the subject lands likely flows northwest to southeast towards the Humber River tributaries.

In 2004-2005, the TRCA sampled groundwater at various provincial groundwater monitoring network (PGMN) locations to establish a quality baseline across Ontario. Results showed high levels of iron (Fe), hardness, total suspended solids (TSS), manganese (Mn), and phosphorus (P) near the subject lands (TRCA, 2008b). Humber Watershed naturally has high manganese and hardness levels due to the carbonate bedrock in the area. According to Ontario Drinking Water Standards (ODWS), high manganese and iron levels do not pose health risks but may affect water system operations. Hardness values (<200 mg/L) cause plumbing scaling and is classified by ODWS as an aesthetic issue.

#### **4.3 Aquifer Properties**

The hydrostratigraphic framework of the Humber River Watershed has been outlined by the TRCA in the Humber River State of the Watershed Report (2008b). Table 2 summarizes the hydrostratigraphy of the subject lands and surrounding area.

**Table 2: Summary of Regional Hydrostratigraphy in the Humber River Watershed (TRCA, 2008b)**

Layer	Name	Function	Material	Thickness (m)	Water Supply
Youngest - 1	Surficial Lacustrine Deposits	Aquitard	sand, silt, clay		
2	Halton Till	Aquitard	sandy silt to clayey silt till	3-6	
3	Oak Ridges Moraine Aquifer and Mackinaw Interstadial Deposits	Aquifer	gravel, sand, silt, clay	10-100	Domestic
4	Tunnel Channels	Aquifer	interbedded gravel and sand		Domestic, Town of Caledon
5	Newmarket Till	Aquitard	sand, silty sand, silt	1-60	
6	Thornccliffe Formation	Aquifer	sand, silty sand, silt, clay	1-60	
7	Sunnybrook Drift	Aquitard	silt, clay	10-20	
8	Scarborough Formation	Aquifer	silt, clay	1-60	
Oldest – 9	Weathered Bedrock	Aquifer	interbedded limestone and shale		

As shown in Table 2, within the Humber River Watershed, there are major aquifer complexes defined: the Oak Ridges Moraine Aquifer, the Thornccliffe Formation, and the Scarborough Formation. In isolated areas, the Tunnel Channel Aquifer exists within the area near the Laurentian Channel (TRCA, 2008b).

There are four well-based municipal drinking water systems in the Town of Caledon which are owned and operated by the Region of Peel. While there are also many privately owned wells in Caledon, regional water distributed to Bolton residents is drawn from Lake Ontario.

## 5.0 Field Work

Sections 5 and 6 outline the field investigation conducted by Crozier to date as part of this hydrogeological investigation.

### 5.1 Monitoring Well Construction

From November 1 to November 11, 2021, Crozier staff supervised the drilling and installation of twenty (20) groundwater monitoring wells on the subject lands. The monitoring wells were constructed using 50 mm (2-in) Schedule 40 PVC pipe with #10 slot PVC screen. The monitoring well locations were selected to establish subsurface conditions for each parcel and create a detailed groundwater monitoring network (Figure 8)

All wells were constructed at a depth of 6.1 m and screened at 3.05 mbgs. Upon completion of drilling, water was found in twelve (12) of the twenty (20) wells. Static water levels ranged from 2.3 mbgs to 5.0 mbgs following drilling. The most common materials observed during drilling included silty clay, silty sand, sandy silt, and silt. Monitoring well logs are presented in Appendix A.



## 5.2 Groundwater Monitoring

Groundwater monitoring has been ongoing since monitoring well installation in 2021. Manual measurements were collected using an electronic water meter. Automatic water level recording devices were deployed in eleven (11) of twenty (20) wells to collect a comprehensive dataset and predict seasonally high groundwater conditions. Level loggers were set to record water levels on an hourly basis. Results of the groundwater monitoring are presented in Section 6.1 below.

## 6.0 Results

### 6.1 Groundwater Levels

Groundwater monitoring has been ongoing since 2022. A summary table of water levels collected is shown in Appendix C.

Observed groundwater levels range from 258.60 masl to 270.90 masl across the subject lands. Manual readings are noted to be the highest in the centre of the subject lands (MW11, MW12) and decrease to the west (MW18) and southeast (MW1).

Hydrographs displaying continuous water levels from February 2022 – May 2024. In general, water levels in all monitoring wells reach a peak in March – May each year and plummet to a low through August to November.

Seasonal fluctuation is noted to be greater in MW9, MW15, MW16, MW18, and MW20. A change of approximately 4 meters in water level within these wells was observed. This is due to the leaky nature of the confining unit above the water bearing unit. Sand and gravel seams were observed within the confining layer at MW9, MW15, MW16, MW18, and MW20, that were not observed within the other locations. Therefore, the water bearing unit at these wells is interpreted to be semi-confined at these locations.

Within all monitoring wells, little response to precipitation was observed; given the semi-confined to confined nature of the water bearing unit, this type of response is expected. All monitoring wells installed during the 2021 drilling program were installed within the first water bearing unit at each location. In all cases, the unit was grey silty clay to clayey silt with saturated seams of silt to sandy silt material, encountered at a depth ranging from approximately 2.0 mbgs to 3.5 mbgs.

Given the confined to semi-confined nature of the water bearing unit across the subject lands, it is interpreted that the water levels presented in Section 6 and Appendix C are not representative of the water table but a potentiometric surface. In other words, any excavation above the water bearing seams should not encounter groundwater. Therefore, groundwater during construction is not expected to be encountered until a depth of approximately 2.0 mbgs to 3.5 mbgs. Further discussion of design constraints is presented in Section 8.

Figure 9 displays seasonally high groundwater contours to date and interpreted direction of groundwater flow. Based on current monitoring data, groundwater flow is interpreted to be from northwest to southeast across the subject lands.

## 7.0 Site Water Balance Assessment

A site-wide water balance assessment was completed for the subject lands to determine the effect of the proposed development on pre-development infiltration conditions and design criteria for infiltration technologies in achieving site water balance. Please note following water balance assessment was completed using the most recent Concept Plan (Bousfields Inc. August 2024) and

was completed for the entire study area. Water balance requirements for each landowner property should be reviewed at a detailed site plan level and mitigation methods should be tailored to the individual property use.

Table 3 below summarizes the results of the assessment. Detailed calculations are described in Section 7.1 to Section 7.4 and Appendix E.

**Table 3: Summary of Site-Wide Water Balance Assessment**

<b>Pre-Development Infiltration Volume</b> (m <sup>3</sup> /yr)	<b>Post-Development Infiltration Volume without Mitigation</b> (m <sup>3</sup> /yr)	<b>Infiltration Deficit</b> (m <sup>3</sup> /yr)
216,625	80,146	136,479

## 7.1 Background Information

The water balance assessment was conducted in accordance with the accepted site condition values from Table 6.3 of the Urban Storm Drainage Criteria Manual: Volume 1 (Urban Drainage and Flood Control District, 2016) and Table 3.1 of the Stormwater Management Planning and Design Manual (MECP, 2003). The appropriate reference tables are provided in Appendix E.

The overall water balance of the subject lands can be described using the following equation:

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

where:

P	=	precipitation
S	=	change in groundwater storage
R	=	surface water runoff
I	=	infiltration
ET	=	evapotranspiration/evaporation

The components of the water balance equation are estimated using field observations of drainage conditions, land cover, soil types, groundwater conditions and local climate records. The site-specific components of the water balance are discussed in detail in the sections below.

### 7.1.1 Precipitation (P)

The nearest climate station is located 5 km east of the study area and is known as Environment Canada Albion Field Climate Station Number 6150103 (43°55'00.00" N, 79°50'00.00" W, elevation of 281.9 masl). Monthly average precipitation and climate data from 1981 - 2010 was used to complete the water balance calculations for the subject lands. The long-term monthly average for precipitation and climate is shown in Table 4.

**Table 4: Climate Data (1981-2010) for Albion Field Climate Station**

<b>Parameter</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Total</b>
Precipitation (mm)	60	50	50	67	76	76	82	77	75	68	81	58	<b>821<sup>1</sup></b>
Temperature (°C)	-7	-6	-1.4	6.1	12.4	17.3	19.9	19.1	14.3	8.1	2.1	-3.9	<b>6.8<sup>2</sup></b>

1. Total average annual precipitation from 1981-2010.

2. Average annual temperature from 1981 - 2010.

Therefore, based on the data above, the long-term annual average precipitation for the study area is **817 mm/year**.

#### 7.1.2 Storage (S)

Long-term groundwater storage is assumed to be negligible as no evidence of groundwater impact on significant groundwater pumping or withdrawal is noted in regional studies of the area. The seasonal changes in water levels are expected to balance annually.

#### 7.1.3 Evaporation/Evapotranspiration (ET)

The rate of evapotranspiration is a function of the water holding capacity of the soil, soil and vegetation type and overall land cover. Using a soil moisture balance approach and local climate data, the Potential Evapotranspiration (PET) and the Actual Evapotranspiration (AET) at the subject lands can be calculated (see Appendix E). PET refers to a loss of water to the atmosphere given an unlimited water supply. The AET is generally found to be less than the PET due to local climate effects such as soil moisture deficit in the summer months. Therefore, based on local climate conditions the mean annual actual evapotranspiration (AET) is calculated to be **595 mm/year**.

#### 7.1.4 Water Surplus (R + I)

The difference between mean annual precipitation (P) and mean annual actual evapotranspiration (AET) outputs the amount of water surplus for the site. The water surplus either infiltrates (I) into the soil or travels across the site as runoff (R).

The distribution of water that infiltrates into the soil is a function of an infiltration factor as described in Table 3.1 of the Stormwater Management Planning and Design Manual (MECP, 2003). The study area was divided into two separate land use categories—agricultural/residential and woodlot. A separate infiltration factor was assigned to each land use and applied in the calculations (see Table 1 & Table 2 in Appendix E).

The infiltration factor for the agricultural land of the subject lands is assumed to be 0.50 based on topographic factor of 0.2 for rolling land, a soils factor of 0.2 for silty soils and a land cover factor of 0.1 for agricultural lands. The calculated water surplus available for infiltration and for runoff is approximately **222 mm/year**. Using the infiltration factor according to MECP methodology, the potential infiltration and potential runoff are **111 mm/year** and **111 mm/year** respectively. Temperature is independently considered in determining evapotranspiration and is excluded from determination of potential infiltration and potential runoff.

The infiltration factor for woodlots was determined to be 0.6, based on a topographic factor of 0.2 for rolling land, a soils factor of 0.2 for silty soils and a land cover factor of 0.2 for forested areas. Therefore, using MECP methodology, the potential infiltration and potential runoff, independent of temperature, are **133 mm/year** and **89 mm/year** respectively.

## 7.2 Methodology

Using monthly soil-moisture calculations, the pre-development infiltration and runoff volumes were determined for the existing area conditions. This method assumes that the soil does not release water as potential recharge while a soil moisture deficit exists. In the wet season, excess precipitation first restores soil moisture than infiltrates through the soil and is considered indirect runoff or soil recharge.

A soil moisture capacity of 200 mm was assigned to the agricultural areas and 400 mm was used for the wooded areas of the study area using Table 3.1 of the Stormwater Management and Design Manual (MECP, 2003). The soil moisture capacity values were chosen based on soil type and land use. Using 200 mm of retention for agricultural lands and 400 mm of retention for forested lands, the monthly potential evapotranspiration (PET) was calculated using latitude and temperature conditions. The actual evapotranspiration (AET) and water surplus was calculated based on monthly average precipitation and soil moisture conditions. The water balance components were used to estimate the pre-development and post-development water balance scenarios for the entire study area. Detailed water balance calculations for the site are presented in Appendix E.

### 7.3 Pre-Development Infiltration

Using aerial imagery, the existing land use areas for the subject lands were determined. An impervious fraction was assigned to each area based on Table 3.1 of the Stormwater Management and Design Manual (MECP, 2003) and field observations (Table 5). Please note the land use areas were estimated using satellite imagery available through Region of Peel GIS mapping and have been rounded up in some cases to represent a more conservative estimate of pre-infiltration volumes.

**Table 5: Existing Land Use**

Land Use	Impervious Fraction	Approximate Land Area (m <sup>2</sup> )
Agricultural Lands	0.00	1,507,825
Existing Infrastructure and Driveways/Parking	1.00	27,960
Wooded Areas	0.02	229,891
Existing Water Features (ponds, streams)	0.02	20,025

The pre-development water balance calculations are presented in Table 3 of Appendix E. Based on the water balance components, the pre-development infiltration value for the subject lands is calculated to be approximately **216,625 m<sup>3</sup>/year**.

### 7.4 Post-Development Infiltration

The proposed development plan is presented in the Concept Plan prepared by Bousfields Inc. dated August 2024. Table 6 describes the proposed land uses and total areas across the subject lands based on the most recent Concept Plan. Each land use was assigned an impervious fraction using Table 3.1 of the Stormwater Management and Design Manual (MECP, 2003). Please note the land uses have been assigned a maximum impervious fraction. It is the opinion of Crozier that the estimated post-development infiltration volume calculated is conservative.

**Table 6: Proposed Land Use (Bousfields Inc., August 2024)**

Land Use	Approximate Land Area (m <sup>2</sup> )	Quantity (number of units)	Impervious Fraction
Low Density Residential <sup>1</sup>	460,400	1554	0.45
Medium Density Residential <sup>2</sup>	260,800	1334	0.65
High Density Residential <sup>3</sup>	182,900	1248	0.85
Commercial	15,500	2	0.85
Schools	49,000	2	0.55
Parks	103,000	7	0.15
Open Space <sup>4</sup>	39,200	2	0.00
Woodlot	41,000	1	0.02
Roads	537,500	-	1.00
SWM Ponds	96,400	11	0.04

1. Assumed to represent single home dwellings of lot size 0.25 ha to 0.75 ha.

2. Includes townhomes of lot size < 0.25 ha.

3. Includes back-to-back townhomes and apartment buildings.

4. Includes elevated tank area.

The post-development drainage is proposed to mimic existing conditions and is discussed further in Servicing and Stormwater Management Report prepared by Crozier (December 2024).

Based on the water balance components above, the calculated post-development infiltration volumes are estimated to be **80,146 m<sup>3</sup>/year** across the subject lands, creating an infiltration deficit of **136,479 m<sup>3</sup>/yr**. Without any mitigation methods implemented, the proposed development has the potential to reduce infiltration by **63%** compared to pre-development conditions.

An analysis of potential low impact development structures and technologies was prepared by Crozier (under separate cover) to provide options for addressing the infiltration deficit and achieve overall water balance across the subject lands. The options analysis is presented in the Functional Servicing and Stormwater Management Report prepared by Crozier (December 2024). Details of the proposed low impact development measures will be provided as the Concept Plan is refined and further details of each proposed development is provided.

## 8.0 Design Considerations

### 8.1 High Groundwater Conditions

As previously discussed, high groundwater elevations across the subject lands are estimated to range from 2.0 mbgs – 3.5 mbgs or at an elevation of 258.6 masl to 269.7 masl based on the confined to semi-confined nature of the water bearing unit. Anticipated high groundwater elevations across the subject lands with respect to the proposed stormwater management ponds is presented in Table 7.

**Table 7: Anticipated Seasonally High Groundwater Elevations**

<b>SWM Pond Identity<sup>1</sup></b>	<b>Nearest Monitoring Well</b>	<b>Estimated Seasonally High Groundwater Elevation for Design Purposes (masl)</b>
SWMP 1	MW18	257.3
SWMP 2	MW16	261.2
SWMP 3	MW16	261.2
SWMP 4	MW8	262.8
SWMP 5	MW12	267.0
SWMP 6	MW8	262.8
SWMP 7	MW6	261.3
SWMP 8	MW4	257.6

1. Refer to Concept Plan by Bousfields.

It is estimated that infiltration may decrease from 199,128 m<sup>3</sup>/yr to 73,526 m<sup>3</sup>/yr from pre- to post- development respectively. Given that regions of highly vulnerable aquifer and significant groundwater recharge area are noted within the subject property boundary, water balance must be achieved post-development to maintain pre-development conditions. Low impact development (LID) structures or alternative solutions should be implemented to mitigate the infiltration deficit of 125,602 m<sup>3</sup>/yr. As previously mentioned, an LID options analysis was presented in the Functional Servicing and Stormwater Management Report prepared by Crozier (December 2024) submitted under a separate cover.

## 8.2 Long & Short-Term Dewatering

Given the estimated seasonally high groundwater elevations across the property, it is anticipated that construction dewatering and/or long-term dewatering may be required on the subject lands. A detailed dewatering assessment will be conducted as a part of the detailed design stage as final elevations of proposed structures have yet to be determined.

If proposed building footings are to be extended below the reported seasonally high groundwater conditions, it can be expected that short-term and/or long-term groundwater dewatering will be required. Discharge of any dewatering flows should be analyzed against the local sewer use by-law or against provincial standards to ensure that they are within the allowable tolerance. It should also be noted that dependent on the required discharge volumes during and post-construction, additional permitting requirements may apply. If construction volumes are expected to fall between 50,000 L/day and 400,000 L/day registration with the MECP Environmental Activity Sector Register is required. If construction dewatering volumes are to exceed 400,000 L/day, a Permit to Take Water will be required. Similarly, if daily permanent dewatering volumes are to exceed 50,000 L/day post-construction, an additional Permit to Take Water will be required for the groundwater discharge. Local permitting will also likely be required prior to any groundwater discharge.

## 8.3 Contingency Plan for Well Complaints

In the event of any well complaints from private and/or observation wells within 500 m of the Site, the following steps will be implemented to ensure a continued oversight of groundwater quantity and quality in the area during and following construction.

Based on the Hydrogeological Study requirements outlined in the Public Works Design, Specifications & Procedures Manual prepared by the Region of Peel (Region of Peel, 2009), Crozier recommends the Owner to conduct monitoring throughout construction, and one (1) year after the completion of

construction. Given the assumption that groundwater flows in the southeastern direction, Crozier suggests the Owner to monitor at least one monitoring well in each parcel during the construction.

Within the monitoring period, yearly groundwater samples should be taken to ensure no interference with groundwater quality and that no exceedances of the Region of Peel Sewer Use By-Law/Provincial Water Quality Objectives have occurred.

Residences within 500 m of the Site Area will be provided contact information (by the Owner) to address any well complaints. On-site activities must be stopped, and immediate Site investigation will be launched to address and resolve any negatively influencing factors on neighbouring properties.

## 9.0 Conclusions

Based on the findings above, Crozier is prepared to make the following conclusions:

- The subject lands are characterized by silty clay to silt textured till derived from glaciolacustrine tills as identified by geological mapping, MECP well records, and Crozier staff.
- A well records search identified 206 wells within 500 m of the subject lands. The wells are mainly used for domestic water supply and there have been no reported concerns of water quality or quantity issues.
- Locally, the shallow groundwater flow direction is interpreted to flow from northwest to southeast across the subject property towards the tributaries of the Humber River.
- The water bearing zones in the shallow aquifer are confined or semi confined in nature. Water is expected to be found at 2.0 – 3.5 mbgs and is being held in grey silty sand to silt seams.
- The high groundwater elevations are estimated to range from approximately 257 masl to 267 masl across the subject property.
- Based on the Concept Plan (Bousfields Inc. 2024), it is estimated that infiltration may decrease from 216,625 m<sup>3</sup>/yr to 80,146 m<sup>3</sup>/yr from pre- to post- development respectively. LID or alternate solutions to mitigate an infiltration deficit of 136,479 m<sup>3</sup>/a must be explored to maintain pre-development conditions. Please note, design of LID structures is by others.
- It is anticipated that dewatering may be required for some of the proposed developments. Once final building elevations are established dewatering can be discussed.

Should you have any questions or require any further information, please do not hesitate to contact the undersigned.

Respectfully submitted,

**C.F. CROZIER & ASSOCIATES INC.**



Caitlyn MacPhee, EIT, GIT  
Hydrogeology

CM/MD/AL/cj

**C.F. CROZIER & ASSOCIATES INC.**



Chris Gerrits, M.Sc., P.Eng.  
Manager, Hydrogeology

N:\700\708-Bolton NH Landowners Grp\3446-Bolton North Hill\Reports\Hydrogeology\3446\_Hydrogeology Report\_2nd Submission LOPA.docx



## 10.0 References

- Approved Source Protection Plan: CTC Source Protection Region. December 2019. Retrieved from: [https://ctcswp.ca/app/uploads/2021/05/RPT\\_20191205\\_Amended CTCSP FNL.pdf](https://ctcswp.ca/app/uploads/2021/05/RPT_20191205_Amended CTCSP FNL.pdf).
- Bousfields Inc. August 29, 2024. Concept Plan.
- Chapman, L.J. and D.F. Putnam. 1984. The Physiography of Southern Ontario, 3rd Edition. Ontario Geological Survey, Special Volume 2.
- C.F. Crozier & Associates Inc. December 17, 2021. Functional Servicing and Stormwater Management Report.
- Dillon Consulting Ltd. March 2022. Figure 1: Wetland Communities (Draft).
- DS Consultants Ltd. February 11, 2021. Preliminary Hydrogeological Investigation, Proposed Development, Macville Community in Connection with LOPA Application to Establish the Macville Community Secondary Plan Area, Bolton Ontario.
- Ontario Ministry of Environment, Conservation and Parks. February 2022. Source Protection Information Atlas, Retrieved from: <https://www.gisapplication.lrc.gov.on.ca/SourceWaterProtection/Index.html?viewer=SourceWaterProtection.SWPViewer&locale=en-US>.
- Ontario Ministry of Environment, Conservation and Parks. October 2021. Map: Well Records. Retrieved from: <https://www.ontario.ca/environment-and-energy/map-well-records>.
- Ontario Geological Survey Geological Maps and Digital Data Index. Retrieved from: <https://data.ontario.ca/dataset/ontario-geological-survey-geological-maps-and-digital-data-index>
- Toronto and Region Conservation Authority. 2008. Humber River State of the Watershed Report – Geology and Groundwater Resources. Retrieved from: <https://trca.on.ca/dotAsset/50145.pdf>.
- Toronto and Region Conservation Authority. 2008. Humber River Watershed Scenario Modelling and Analysis Report. Retrieved from: <https://trca.on.ca/dotAsset/196551.pdf>.
- Town of Caledon. April 2018. Schedule C – Bolton Land Use Plan. Retrieved from: [https://www.caledon.ca/en/town-services/resources/Documents/business-planning-development/Official\\_Plan\\_Schedule\\_C.pdf](https://www.caledon.ca/en/town-services/resources/Documents/business-planning-development/Official_Plan_Schedule_C.pdf).

# APPENDIX A

## Monitoring Well Logs



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW1-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0601388 4861570
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 265 masl
<b>ADDRESS</b> 9948 Columbia Way, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.81 m
<b>DRILLING DATE</b> 21/11/01	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/01	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Columbia Way parcel, near 'Columbia Way' Sign

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5							TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	264.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt seams, minor gravel		Very Stiff	264
1.5										263.5
2		SS 5.0 - 7.0ft	SS							263
2.5										
3		SS 7.5 - 9.5ft	SS				CLAYEY SILT TILL: Brown, clayey silt till to silty clay till, minor gravel, dense, moist		Hard	262.5
3.5										262
4		SS 10.0 - 12.0ft	SS							261.5
4.5										261
5		SS 15.0 - 17.0ft	SS							260.5
5.5										260
6							SILTY CLAY: Grey, silty clay, moist, dense, minor gravel, seam		Very Stiff	259.5
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			259
7	AU									258.5
7.5										258
										257.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW2-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0601218 4861366
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 263 masl
<b>ADDRESS</b> 9948 Columbia Way, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.89 m
<b>DRILLING DATE</b> 21/11/01	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/01	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Corner of Columbia Way and Mount Hope Road

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5							TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	262.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt seams, minor gravel, @3.05m grey silty clay		Very Stiff	262
1.5										261.5
2		SS 5.0 - 7.0ft	SS							261
2.5										260.5
3		SS 7.5 - 9.5ft	SS							260
3.5										259.5
4										259
4.5		SS 15.0 - 17.0ft	SS				CLAYEY SILT TILL: Grey, clayey silt till to silty clay till, minor gravel, dense, moist			258.5
5										258
5.5							SILTY CLAY: Grey, silty clay, moist, dense, grey clay seam @6.10m		Stiff	257.5
6										257
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at:6.10 m			256.5
7	AU									256
7.5										255.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW3-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0600800 4861761
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 265 masl
<b>ADDRESS</b> Mount Hope Road, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.91 m
<b>DRILLING DATE</b> 21/11/02	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/02	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Behind "No Trespassing" Sign

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	264.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt seams, minor gravel		Very Stiff	264
1.5										263.5
2		SS 5.0 - 7.0ft	SS							263
2.5										262.5
3		SS 7.5 - 9.5ft	SS							262
3.5		SS 10.0 - 12.0ft	SS							261.5
4										261
4.5		SS 15.0 - 17.0ft	SS				SILTY CLAY: Grey, silty clay, moist, dense, grey clay seams			260.5
5								Wet	Stiff	260
5.5										259.5
6										259
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			258.5
7										258
7.5										257.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW4-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0600161 4861208
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 261 masl
<b>ADDRESS</b> Lot 12, Concession 7, Albion	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.99 m
<b>DRILLING DATE</b> 21/11/11	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/10	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Near tree line, mid field near stream

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU			V			TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	260.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, medium dense, minor gravel		Medium	260
1.5										259.5
2		SS 5.0 - 7.0ft	SS				SILTY SAND: Brown, silty sand, saturated	Wet		259
2.5										258.5
3		SS 7.5 - 9.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, medium dense, moist, trace gravel	Moist		258
3.5		SS 10.0 - 12.0ft	SS				SILTY SAND: Brown, silty sand, saturated	Wet		257.5
4										257
4.5		SS 15.0 - 17.0ft	SS				SILTY CLAY: Grey, silty clay, trace gravel	Moist		256.5
5										256
5.5										255.5
6										255
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			254.5
7										254
7.5										253.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW5-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0600122 4861032
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 264 masl
<b>ADDRESS</b> Lot 12, Concession 7, Albion	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.97 m
<b>DRILLING DATE</b> 21/11/02	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/02	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> Near High School scoreboard, North of fence		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	263.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt seams, minor gravel		Very Stiff	263
1.5										262.5
2		SS 5.0 - 7.0ft	SS							262
2.5										261.5
3		SS 7.5 - 9.5ft	SS							261
3.5										260.5
4										260
4.5		SS 15.0 - 17.0ft	SS				SILT: Grey, silt, minor sand, saturated, 1.2 m seam	Wet	Medium	259.5
5							SILTY CLAY: Grey, silty clay, stone poor, moist	Moist	Stiff	259
5.5										258.5
6										258
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			257.5
7										257
7.5										256.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW6-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599914 4860896
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 264 masl
<b>ADDRESS</b> Lot 12, Concession 7, Albion	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.98 m
<b>DRILLING DATE</b> 21/11/02	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/02	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** North edge of field behind autoshop

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	263.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt seams, minor gravel		Very Stiff	263
1.5										262.5
2		SS 5.0 - 7.0ft	SS							262
2.5										261.5
3		SS 7.5 - 9.5ft	SS							261
3.5		SS 10.0 - 12.0ft	SS				SILT: Grey, silt, minor sand, saturated, approximately 0.60 m seam	Wet	Medium	260.5
4							SILTY CLAY: Grey, silty clay, stone poor, moist	Moist	Very Stiff	260
4.5		SS 15.0 - 17.0ft	SS							259.5
5				▽						259
5.5										258.5
6										258
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			257.5
7										257
7.5										256.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1





**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW7-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599802 4861249
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 268 masl
<b>ADDRESS</b> 14337 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/03	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/03	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> Garden centre field along fence line		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	267.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt, minor clay seams, minor gravel		Very Stiff	267
1.5										266.5
2		SS 5.0 - 7.0ft	SS				SANDY SILT: Grey, sandy silt, saturated, approximately 0.60 m seam	Wet	Medium	266
2.5		SS 7.5 - 9.5ft	SS				SILTY CLAY: Grey, silty clay, stone poor, moist	Moist	Stiff	265.5
3										265
3.5		SS 10.0 - 12.0ft	SS				SILT: Grey, silt minor sand, saturated	Wet	Medium	264.5
4										264
4.5		SS 15.0 - 17.0ft	SS							263.5
5										263
5.5							SILTY CLAY: Grey, silty clay, dense, moist	Moist	Stiff	262.5
6										262
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			261.5
7										261
7.5										260.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW8-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599628 4861023
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 266 masl
<b>ADDRESS</b> 14337 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/03	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/03	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Northwest corner of field near garden centre

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	265.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt, minor gravel		Very Stiff	265
1.5										264.5
2		SS 5.0 - 7.0ft	SS				SANDY SILT: Grey, sandy silt, saturated, approximately 0.40 m seam	Wet	Soft - Medium	264
2.5		SS 7.5 - 9.5ft	SS				SILTY CLAY: Grey, silty clay, stone poor, moist	Moist	Very Stiff	263.5
3										263
3.5		SS 10.0 - 12.0ft	SS							262.5
4										262
4.5		SS 15.0 - 17.0ft	SS				SILT: Grey, silt minor sand, saturated, approximately 0.30 m seam	Wet	Medium	261.5
5							SILTY CLAY: Grey, silty clay, dense, moist	Moist	Very Stiff	261
5.5										260.5
6										260
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			259.5
7										259
7.5										258.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW9-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599496 4861220
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 270 masl
<b>ADDRESS</b> 14475 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/04	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/04	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> By existing barn, north edge of field		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	269.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt, minor gravel		Very Stiff	269
1.5										268.5
2		SS 5.0 - 7.0ft	SS							268
2.5										267.5
3		SS 7.5 - 9.5ft	SS							267
3.5		SS 10.0 - 12.0ft	SS				SILTY CLAY: Grey, silty clay, dense, moist			266.5
4										266
4.5		SS 15.0 - 17.0ft	SS							265.5
5							SILT: Grey, silt minor sand, saturated, approximately 0.30 m seam	Wet	Soft - Medium	265
5.5							SILTY CLAY: Grey, silty clay, dense, moist	Moist	Very Stiff	264.5
6										264
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			263.5
7										263
7.5										262.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW10-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599679 4861517
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 263 masl
<b>ADDRESS</b> 14475 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/04	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/04	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> South bank of pond in middle of property		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	262.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, interbedded grey silt, minor gravel		Very Stiff	262
1.5										261.5
2		SS 5.0 - 7.0ft	SS							261
2.5										260.5
3		SS 7.5 - 9.5ft	SS							260
3.5										259.5
4		SS 10.0 - 12.0ft	SS							259
4.5							SILT: Grey, silt minor sand, saturated, approximately 0.30 m seam	Wet	Soft - Medium	258.5
5		SS 15.0 - 17.0ft	SS				SILTY CLAY: Grey, silty clay, dense, moist	Moist	Very Stiff	258
5.5										257.5
6										257
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			256.5
7										256
7.5										255.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW11-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599248 4861525
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 270 masl
<b>ADDRESS</b> 14475 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/04	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/04	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> Northwest corner of property along fence line		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	267.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, dense, minor gravel, trace sand		Very Stiff	267
1.5										266.5
2		SS 5.0 - 7.0ft	SS							266
2.5										265.5
3		SS 7.5 - 9.5ft	SS							265
3.5										264.5
4										264
4.5		SS 15.0 - 17.0ft	SS				SILTY CLAY: Grey, silty clay, dense, moist, trace gravel			263.5
5										263
5.5							SANDY SILT: Grey, silt minor sand, saturated, approximately 0.80 m seam	Wet	Soft - Medium	262.5
6										262
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			261.5
7										261
7.5										260.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW12-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599417 4861745
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 268 masl
<b>ADDRESS</b> 14475 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/04	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/04	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> Edge of field, NE parcel, along fence line		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	267.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, moist, dense, minor gravel, trace sand		Very Stiff	267
1.5										266.5
2		SS 5.0 - 7.0ft	SS							266
2.5										265.5
3		SS 7.5 - 9.5ft	SS							265
3.5		SS 10.0 - 12.0ft	SS				SANDY SILT: Grey, silt minor sand, saturated, approximately 0.80 m seam	Wet	Soft - Medium	264.5
4							SILTY CLAY: Grey, silty clay, dense, moist, trace gravel	Moist	Very Stiff	264
4.5		SS 15.0 - 17.0ft	SS							263.5
5							SILT: Brown to grey, silt, saturated	Wet	Medium	263
5.5							SILTY CLAY: Grey, silty clay, dense, moist, stone poor	Moist	Stiff	262.5
6										262
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			261.5
7										261
7.5										260.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW13-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599098 4861591
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 270 masl
<b>ADDRESS</b> 14685 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/08	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/08	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> Near farm silos		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	269.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, dense, minor gravel, trace sand		Very Stiff	269
1.5										268.5
2		SS 5.0 - 7.0ft	SS							268
2.5										267.5
3		SS 7.5 - 9.5ft	SS							267
3.5		SS 10.0 - 12.0ft	SS							266.5
4							SILTY CLAY: Grey, silty clay, grey silty clay seams, dense, moist, trace gravel			266
4.5										265.5
5		SS 15.0 - 17.0ft	SS							265
5.5							SANDY SILT: Grey, silty sand to sandy silt, saturated, approximately 0.60 m seam	Wet	Medium	264.5
6							SILTY CLAY: Grey, silty clay to clay, dense, moist, trace gravel	Moist	Stiff	264
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			263.5
7										263
7.5										262.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW14-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0599114 4862349
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 269 masl
<b>ADDRESS</b> 14685 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/05	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/05	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Northeast corner of parcel along fence by woodlot and east cornfield

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU			IV			TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	268.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, dense, minor gravel, trace sand		Very Stiff	268
1.5										267.5
2		SS 5.0 - 7.0ft	SS							267
2.5							SANDY SILT: Brown, silty sand to sandy silt, saturated, approximately 0.50 m seam	Wet	Medium	266.5
3		SS 7.5 - 9.5ft	SS				SILTY CLAY: Brown, silty clay, dense, moist, trace gravel	Moist	Stiff	266
3.5										265.5
4		SS 10.0 - 12.0ft	SS				SANDY SILT: Brown, sandy silt, saturated, approximately 1 m	Wet	Medium	265
4.5										264.5
5		SS 15.0 - 17.0ft	SS				SILTY CLAY: Grey, silty clay to clay, dense, moist, trace gravel	Moist	Stiff	264
5.5										263.5
6										263
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			262.5
7										262
7.5										261.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1





**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW15-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0598811 4861951
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 271 masl
<b>ADDRESS</b> 14685 Highway 50, Bolton	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/05	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/05	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Northwest corner of the property, behind red brick

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	270.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, dense, minor gravel, trace sand		Very Stiff	270
1.5										269.5
2		SS 5.0 - 7.0ft	SS							269
2.5										268.5
3		SS 7.5 - 9.5ft	SS							268
3.5		SS 10.0 - 12.0ft	SS				SANDY SILT: Brown, silty sand to sandy silt, saturated, approximately 0.50 m seam	Wet	Medium	267.5
4							SILTY CLAY: Brown, silty clay, grey silty clay seams, dense, moist, trace gravel	Moist	Stiff	267
4.5		SS 15.0 - 17.0ft	SS				SANDY SILT: Brown, sandy silt, saturated, approximately 0.2 m	Wet	Medium	266.5
5							SILTY CLAY: Grey, silty clay to clay, dense, moist, trace gravel	Moist	Stiff	266
5.5										265.5
6										265
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			264.5
7										264
7.5										263.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW16-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0598956 4861168
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 268 masl
<b>ADDRESS</b> Hwy 50 and Hwy 150 Parcel	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b>
<b>DRILLING DATE</b> 21/11/08	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/08	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** Southwest corner of field by treeline

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	267.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, dense, minor gravel		Very Stiff	267
1.5										266.5
2		SS 5.0 - 7.0ft	SS							266
2.5										265.5
3		SS 7.5 - 9.5ft	SS							265
3.5										264.5
4		SS 10.0 - 12.0ft	SS							264
4.5										263.5
5		SS 15.0 - 17.0ft	SS				SILTY CLAY: Grey, silty clay, grey silty clay seams, dense, moist, trace gravel			263
5.5										262.5
6										262
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			261.5
7										261
7.5										260.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW17-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0598998 4861490
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 269 masl
<b>ADDRESS</b> Hwy 50 and Hwy 150 Parcel	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 1.03 m
<b>DRILLING DATE</b> 21/11/09	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/09	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> North of roundabout, northeast corner of property		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	268.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, dense, minor gravel		Very Stiff	268
1.5										267.5
2		SS 5.0 - 7.0ft	SS				SANDY SILT: Brown, sandy silt to silt, minor clay, saturated	Wet	Medium	267
2.5		SS 7.5 - 9.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay to silt seams, moist, dense, minor gravel	Moist	Stiff	266.5
3										266
3.5		SS 10.0 - 12.0ft	SS				SILTY CLAY: Grey, silty clay, grey silty clay seams, dense, moist, trace gravel			265.5
4										265
4.5		SS 15.0 - 17.0ft	SS							264.5
5										264
5.5										263.5
6										263
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			262.5
7										262
7.5										261.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW18-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0598210 4860598
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 261 masl
<b>ADDRESS</b> 14601 Duffy's Lane	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 1.03 m
<b>DRILLING DATE</b> 21/11/09	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/09	<b>CASING</b> PVC	<b>SCREEN</b> PVC
<b>COMMENTS</b> Behind gravel area, willow farm		

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	260.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, medium dense, minor gravel		Medium	260
1.5										259.5
2		SS 5.0 - 7.0ft	SS							259
2.5							CLAY: Grey clay, trace gravel, iron staining, moist, medium dense			258.5
3		SS 7.5 - 9.5ft	SS							258
3.5		SS 10.0 - 12.0ft	SS				SILTY CLAY: Grey, silty clay, grey silty clay seams, dense, moist, trace gravel	Stiff		257.5
4										257
4.5		SS 15.0 - 17.0ft	SS							256.5
5										256
5.5										255.5
6										255
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			254.5
7										254
7.5										253.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW19-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0598395 4861011
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 262 masl
<b>ADDRESS</b> 14601 Duffy's Lane	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 0.95 m
<b>DRILLING DATE</b> 21/11/10	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/10	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** South field, east fence at the start of south treeline

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	261.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, medium dense, minor gravel		Medium	261
1.5										260.5
2		SS 5.0 - 7.0ft	SS							260
2.5										259.5
3		SS 7.5 - 9.5ft	SS							259
3.5		SS 10.0 - 12.0ft	SS				SILTY CLAY: Grey, silty clay, grey silty clay seams, medium dense, moist, trace gravel			258.5
4										258
4.5		SS 15.0 - 17.0ft	SS							257.5
5										257
5.5										256.5
6										256
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			255.5
7										255
7.5										254.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1



**CROZIER**  
CONSULTING ENGINEERS

## MONITORING WELL MW20-21

<b>PROJECT NUMBER</b> 0708 - 3446	<b>DRILLING COMPANY</b> ACE Environmental Drilling	<b>COORDINATES</b> 17T 0598001 4861283
<b>PROJECT NAME</b> Bolton North Hill	<b>DRILLER</b> John/Nick	<b>COORD SYS</b> UTM
<b>CLIENT</b> Bolton North Hill Landowner Group	<b>DRILL RIG</b> GT3126 Geoprobe	<b>SURFACE ELEVATION</b> 265 masl
<b>ADDRESS</b> 14601 Duffy's Lane	<b>DRILLING METHOD</b> Augering Hollow Flight	<b>WELL TOC</b> 1.01 m
<b>DRILLING DATE</b> 21/11/10	<b>TOTAL DEPTH</b> 6.1 m	<b>LOGGED BY</b> CM
<b>LICENCE NO.</b> 7725	<b>DIAMETER</b> 51 mm	<b>CHECKED BY</b> CG

<b>COMPLETION</b> 21/11/10	<b>CASING</b> PVC	<b>SCREEN</b> PVC
----------------------------	-------------------	-------------------

**COMMENTS** In between two iron posts northeast corner of the property

Depth (m)	Drilling Method	Samples	Sample Type	Water	Well Installation	Graphic Log	Material Description	Moisture	Consistency	Elevation (m)
0.5	AU						TOPSOIL: Dark brown, silty to clay silt, organic, abundant rootlets	Moist	Loose	264.5
1		SS 2.5 - 4.5ft	SS				SILTY CLAY: Brown, silty clay, grey silty clay seams, moist, medium dense, minor gravel		Medium	264
1.5										263.5
2		SS 5.0 - 7.0ft	SS							263
2.5										262.5
3		SS 7.5 - 9.5ft	SS							262
3.5		SS 10.0 - 12.0ft	SS							261.5
4							SILTY CLAY: Grey, silty clay, grey silty clay seams, medium dense, moist, trace gravel			261
4.5		SS 15.0 - 17.0ft	SS							260.5
5										260
5.5										259.5
6										259
6.5		SS 20.0 - 22.0ft	SS				Termination Depth at: 6.10 m			258.5
7										258
7.5										257.5

**Disclaimer** This bore log is intended for environmental not geotechnical purposes.

Page 1 of 1

# APPENDIX B

## MECP Well Summary Table



MECP WATER WELL RECORD SUMMARY TABLE									
Project Number: 708-3446 Prepared by: MD					Address: Date completed:		Bolton North Hill Lands 2022-02-01		
Key Number	Well ID	Diameter (mm)	Depth (m)	Static Level (m)	Material(s)	Aquifer <sup>1</sup>	Location <sup>2</sup>	Use	Notes
1	4900332	762	29.9	26.2	sand/sandy clay	OB	W of Highway 50	commercial	
2	7286178	51	12.2	-	sand/silt/clay	OB	W of Caledon King Townline	monitoring	
3	4904789	152	52.7	13.7	gravel/sand/clay	OB	E of Duffy's Lane	domestic	
4	4900283	168	47.5	21.3	sand/silt/clay	OB	W of Duffy's Lane	domestic/livestock	
5	4900477	127	54.9	40.8	sand/silt/clay	OB	W of Caledon King Townline	domestic	
6	4905726	127	55.5	18.3	sand/silt/clay	OB	N of Castlederg Side Rd	domestic	
7	7194829	159	48.8	24.1	sand/silt/clay	OB	S of Castlederg Side Rd	-	water supply
8	4910321	63	161.0	80.2	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
9	7224081	51	5.5	-	sand/silt	OB	E of Highway 50	monitoring	test hole
10	4905679	152	45.1	21.0	gravel/sand/clay	OB	E of Highway 50	domestic	
11	4910352	50	5.8	-	sand/silt/clay	OB	E of Mt Hope Rd	-	test hole
12	4906519	127	33.5	17.7	gravel/sand/silt/clay	OB	S of Mount Hope Rd	domestic	
13	4908660	152	52.7	21.3	gravel/sand/clay	OB	E of Mt Hope Rd	domestic	
14	4907928	203	59.4	14.6	sand/silt/clay	OB	N of Castlederg Side Rd	domestic	
15	4903434	762	10.4	4.3	sand/clay	OB	E of Humber Station Rd	domestic	
16	7104790	159	47.5	25.2	sand/silt/clay	OB	E of Highway 50	domestic/livestock	
17	4908023	152	43.0	22.9	sand/clay	OB	W of Highway 50	domestic	
18	4906535	127	54.3	25.3	sand/clay	OB	N of Castlederg Side Rd	domestic	
19	7264367	150	51.8	-	-	-	S of Castlederg Side Rd	-	abandoned
20	4900390	762	10.1	7.3	sand/clay	OB	S of Castlederg Side Rd	domestic	
21	4904464	127	47.2	19.8	sand/silt/clay	OB	W of Highway 50	domestic	
22	4909470	216	65.2	7.4	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
23	4909893	152	42.7	21.9	sand/clay	OB	W of Mt Hope Rd	domestic	
24	7172324	25	45.7	-	sand/clay	OB	W of Emily Kolb Pkwy	monitoring	test hole/cluster
25	4905187	152	34.1	16.1	sand/clay	OB	N of Castlederg Side Rd	monitoring	
26	4905297	127	33.5	22.6	gravel/sand/clay	OB	S of Columbia Way	domestic	
27	4907617	152	62.5	35.0	sand/silt/clay	OB	W of Caledon King Townline	domestic	
28	4900395	157	80.8	29.9	sand/clay	OB	N of Castlederg Side Rd	domestic	
29	4900388	102	64.0	24.4	sand/clay	OB	W of Mt Hope Rd	domestic/livestock	
30	4907963	152	57.3	25.6	sand/clay	OB	N of Castlederg Side Rd	domestic	
31	4904698	152	42.7	14.6	sand/clay	OB	W of Duffy's Lane	domestic	
32	4906317	152	49.1	25.9	gravel/sand/clay	OB	W of Highway 50	domestic/irrigation	
33	4905630	127	56.4	20.7	sand/clay	OB	W of Mt Hope Rd	domestic	
34	4904788	152	80.2	13.7	gravel/sand/clay	OB	E of Duffy's Lane	domestic	
35	4904097	127	52.1	25.6	sand/clay	OB	W of Highway 50	livestock	
36	7225352	152	25.6	1.0	sand/clay/shale	OB	S of Columbia Way	domestic	
37	7177341	100	39.8	25.9	gravel/sand/clay	OB	N of Castlederg Side Rd	-	abandoned
38	4900456	914	4.3	0.9	gravel/sand/clay	OB	E of Mt Hope Rd	domestic	
39	4904083	762	11.6	3.0	sand/clay	OB	W of Mt Hope Rd	domestic	
40	7164920	46	6.7	-	sand/silt/clay	OB	S of Columbia Way	monitoring	
41	4900281	102	39.0	0.9	gravel/sand/clay	OB	N of Castlederg Side Rd	domestic	
42	4903054	762	9.1	4.3	sand/clay	OB	E of Duffy's Lane	domestic	
43	4905801	152	51.8	21.0	sand/clay	OB	S of Castlederg Side Rd	domestic	
44	7133392	51	10.7	-	silt	OB	N of Emily Kolb Pkwy	monitoring	
45	7040135	152	15.2	-	-	-	E of Mt Hope Rd	-	abandoned
46	4900393	610	7.3	6.1	sand/clay	OB	N of Castlederg Side Rd	domestic	
48	4907092	152	44.2	18.9	sand/silt/clay	OB	N of Castlederg Side Rd	domestic	
49	4907329	152	46.3	14.6	sand/clay	OB	E of Duffy's Lane	domestic	
50	4906738	152	50.3	17.7	sand/silt/clay	OB	E of Highway 50	domestic	
51	4907401	152	60.7	18.3	gravel/silt/clay	OB	N of Castlederg Side Rd	domestic	
52	4900285	102	46.6	18.2	gravel/silt/clay	OB	N of Castlederg Side Rd	domestic	
53	4900331	127	51.8	-	sand/clay	OB	W of Highway 50	domestic	
54	4908373	76	43.3	-	-	-	W of Highway 50	-	abandoned
56	4903668	127	52.4	28.0	sand/silt/clay	OB	W of Caledon King Townline	domestic	
57	7234751	159	50.9	23.8	sand/silt/clay	OB	S of Castlederg Side Rd	-	water supply



Key Number	Well ID	Diameter (mm)	Depth (m)	Static Level (m)	Material(s)	Aquifer <sup>1</sup>	Location <sup>2</sup>	Use	Notes
58	7267797	159	30.5	11.9	sand/clay	OB	W of Duffy's Lane	domestic	
59	4910340	159	54.2	25.2	sand/silt/clay	OB	W of Highway 50	domestic/livestock	
60	7328807	51	10.1	-	sand/silt/clay	OB	W of Caledon King Townline	monitoring	
61	4904790	152	60.4	13.7	sand/clay	OB	E of Duffy's Lane	domestic	
62	4907637	152	71.6	18.3	gravel/sand/clay	OB	S of Castlederg Side Rd	domestic	
63	4910341	159	25.9	14.6	sand/clay	OB	W of Duffy's Lane	domestic	
64	4903446	127	49.7	19.8	sand/silt/clay	OB	N of Castlederg Side Rd	domestic	
65	7224105	52	6.1	-	sand/silt	OB	E of Highway 50	monitoring	test hole
68	4903254	914	6.7	1.5	sand/clay	OB	N of Castlederg Side Rd	domestic	
69	4907148	168	33.5	-	sand/clay	OB	S of Castlederg Side Rd	-	unfinished
70	4906158	152	93.0	24.7	sand/clay/shale	BR	N of Columbia Way	domestic	
71	4906292	762	24.4	6.1	sand/clay	OB	W of The Gore Rd	domestic	
72	4908590	203	52.4	39.3	sand/clay	BR	W of Caledon King Townline	domestic	
73	4903756	914	17.1	13.4	sand/clay	OB	W of Highway 50	domestic	
74	4900473	127	54.3	41.1	sand/silt/clay	OB	W of Caledon King Townline	domestic	
75	4905782	127	52.7	14.3	sand/silt/clay	OB	W of Duffy's Lane	domestic	
77	4907307	152	48.2	38.7	sand/silt/clay	OB	W of Caledon King Townline	domestic	
78	4905731	762	15.2	10.4	sand/clay	OB	N of Columbia Way	domestic	
79	4903260	127	65.5	28.6	sand/clay	OB	N of Castlederg Side Rd	domestic	
80	4907120	152	40.2	16.8	gravel/sand/clay	OB	S of Castlederg Side Rd	domestic	
81	4900385	102	49.4	36.6	sand/clay	OB	E of Highway 50	domestic/livestock	
82	4905852	127	68.6	21.0	sand/silt/clay	OB	W of Mt Hope Rd	domestic	
83	4904036	127	47.2	18.0	sand/clay	OB	W of Caledon King Townline	domestic	
84	4900328	102	40.2	26.2	sand/clay	OB	W of Highway 50	domestic	
85	4903836	914	15.2	-	-	-	W of Mt Hope Rd	-	abandoned
86	4908423	152	54.9	28.0	-	-	S of Columbia Way	-	abandoned
87	4906009	152	52.4	25.6	sand/clay	OB	W of Highway 50	domestic/livestock	
88	4905592	152	57.9	28.6	sand/silt/clay	OB	W of Caledon King Townline	domestic	
89	6909363	127	32.9	21.3	sand/clay	OB	E of Highway 50	domestic/livestock	
90	4905323	-	5.8	0.9	sand/silt/clay	OB	S of Columbia Way	domestic	
91	4900389	127	36.6	25.0	sand/clay	OB	E of Highway 50	domestic	
92	4903055	762	8.5	5.5	sand/clay	OB	N of Castlederg Side Rd	domestic	
93	4909027	159	37.5	21.9	sand/clay	OB	W of Mt Hope Rd	domestic	
94	4906971	152	49.4	36.6	sand/silt/clay	OB	W of Caledon King Townline	domestic	
95	7152393	90	6.7	1.5	gravel/sand/clay	-	S of Castlederg Side Rd	-	abandoned
96	4904387	762	11.6	6.1	sand/clay	OB	W of Duffy's Lane	domestic	
97	4908661	203	49.7	25.9	gravel/silt/clay	OB	S of Castlederg Side Rd	domestic	
98	4908820	203	42.7	20.1	gravel/sand/clay	OB	N of Castlederg Side Rd	irrigation	
99	4907729	152	64.9	28.0	sand/silt/clay	OB	N of Castlederg Side Rd	domestic	
100	4900324	152	73.2	-	silt/clay	-	W of Highway 50	-	abandoned
101	4908498	203	39.6	21.9	gravel/sand/clay	OB	E of Mt Hope Rd	domestic	
102	7224082	51	5.5	-	sand/silt	OB	E of Highway 50	monitoring	test hole
103	4907252	152	35.7	18.9	sand/clay	OB	S of Columbia Way	domestic	
104	7130482	51	7.6	-	silt/clay	OB	W of Caledon King Townline	monitoring	
105	4907993	152	68.3	16.8	sand/silt/clay	OB	Castlederg Side Rd	domestic	
106	4907913	152	22.6	5.2	sand/silt/clay	OB	S of Columbia Way	domestic	
107	4900386	102	57.0	34.4	gravel/sand/clay	OB	S of Columbia Way	domestic/livestock	
109	4907791	127	46.9	20.7	gravel/sand/clay	OB	W of Mt Hope Rd	domestic	
110	4908497	203	38.7	21.3	gravel/sand/clay	OB	E of Mt Hope Rd	domestic	
111	4904451	127	24.7	17.7	gravel/sand/clay	OB	E of Mt Hope Rd	domestic	
112	4903485	914	6.1	1.8	sand/clay	OB	N of Castlederg Side Rd	domestic	
113	4904760	152	56.4	12.2	sand/clay	OB	E of Duffy's Lane	domestic	
114	4903191	127	50.0	38.1	sand/clay	OB	W of Caledon King Townline	domestic	
115	4900447	762	4.3	0.9	sand/clay	OB	S of Columbia Way	domestic	
116	4902960	219	35.0	1.8	sand/silt/clay	OB	W of Caledon King Townline	public	
118	4907989	152	60.4	38.1	sand/clay	OB	W of Caledon King Townline	domestic	
119	7169000	125	7.2	1.9	-	-	E of Highway 50	-	abandoned
120	4900323	127	53.0	23.8	sand/clay	OB	S of Columbia Way	domestic	
122	4908855	159	63.4	21.3	sand/silt/clay	OB	N of Castlederg Side Rd	domestic	
123	7050089	159	51.8	15.2	sand/clay	OB	N of Castlederg Side Rd	domestic	

Key Number	Well ID	Diameter (mm)	Depth (m)	Static Level (m)	Material(s)	Aquifer <sup>1</sup>	Location <sup>2</sup>	Use	Notes
124	4904180	127	44.2	18.0	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
125	7190725	152	54.3	14.6	sand/silt/clay	OB	Castlederg Side Rd	domestic	
126	4906968	152	54.6	38.7	sand/clay	OB	W of Caledon King Townline	-	water supply
127	4900326	127	34.1	20.1	sand/silt/clay	OB	S of Emily Kolb Pkwy	domestic/livestock	
129	4905146	127	55.2	39.6	sand/silt/clay	OB	W of Caledon King Townline	domestic	
130	4904747	152	64.0	15.8	gravel/sand/clay/shale	BR	E of Mt Hope Rd	domestic	
131	4906536	127	52.7	16.5	sand/clay	OB	S of Castlederg Side Rd	domestic/livestock	
132	4906046	152	70.1	17.1	sand/silt/clay	OB	W of Mt Hope Rd	domestic	
133	4900330	133	44.2	15.2	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
134	4900451	762	19.2	14.9	sand/clay	OB	N of Columbia Way	domestic	
135	4906893	152	68.9	14.3	sand/silt/clay	OB	E of Duffy's Lane	domestic	
136	4904697	152	42.7	15.2	sand/clay	OB	W of Duffy's Lane	domestic	
138	4900392	127	47.2	19.2	sand/clay	OB	W of Highway 50	domestic	
139	4908856	159	73.5	16.1	sand/clay	OB	E of Highway 50	domestic	
140	4905966	762	12.2	3.0	sand/clay	OB	E of Highway 50	domestic	
141	7297324	51	3.0	-	clay	OB	S of Columbia Way	monitoring	
142	4906568	159	44.2	15.8	sand/silt/clay	OB	W of Mt Hope Rd	domestic	
143	4900472	762	12.2	9.1	sand/clay	OB	W of Caledon King Townline	domestic	
144	4903539	178	47.5	18.3	gravel/sand/clay	OB	W of Highway 50	domestic	
146	4900387	127	28.4	19.8	sand/clay	OB	E of Highway 50	domestic/livestock	
147	7224080	52	5.5	-	sand/silt/clay	OB	E of Highway 50	monitoring	test hole
148	4900474	127	54.0	32.6	sand/silt/clay	OB	W of Caledon King Townline	domestic	
149	4903681	127	50.6	15.5	gravel/sand/clay	OB	N of Castlederg Side Rd	domestic	
150	4904695	152	42.4	15.5	sand/clay	OB	W of Duffy's Lane	domestic	
151	4900448	762	19.8	-	-	-	S of Columbia Way	-	abandoned
152	4900391	127	44.8	24.4	sand	OB	E of Highway 50	domestic	
153	4909074	159	49.7	25.0	sand/silt/clay	OB	N of Emily Kolb Pkwy	domestic	
155	7254974	152	51.2	19.7	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
157	4903505	762	25.3	22.6	sand/clay	OB	N of Castlederg Side Rd	domestic	
158	4905203	762	8.8	4.3	sand/clay	OB	N of Castlederg Side Rd	domestic	
159	7234742	159	54.9	37.2	sand/clay	OB	W of Caledon King Townline	domestic	
160	4908816	203	43.9	19.8	sand/clay	OB	E of Mt Hope Rd	domestic	
161	4905705	127	57.0	26.5	sand/clay	OB	W of Highway 50	domestic	
162	4900280	178	42.7	19.8	sand/clay	OB	W of Duffy's Lane	domestic/livestock	
163	4909424	152	58.8	21.9	gravel/sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
164	4906569	152	47.2	12.8	sand/silt/clay	OB	W of Mt Hope Rd	domestic	
165	4900284	914	6.7	3.0	sand/clay	OB	S of Castlederg Side Rd	domestic	
166	4908477	152	59.7	25.0	gravel/sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
168	4904184	127	44.5	18.9	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
169	4903555	178	60.7	7.0	sand/clay	OB	N of Castlederg Side Rd	domestic	
170	7297325	51	3.0	-	clay	OB	S of Columbia Way	monitoring	test hole
172	4907328	152	66.5	21.3	sand/silt/clay	OB	W of Duffy's Lane	domestic	
173	4904696	152	42.7	14.6	sand/clay	OB	W of Duffy's Lane	domestic	
174	7185451	159	45.7	14.9	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
175	4900452	127	89.0	-	gravel/silt/clay/shale	BR	E of Mt Hope Rd	-	test hole
176	4900454	102	51.8	12.2	sand/clay	OB	E of Mt Hope Rd	domestic/livestock	
177	4900450	152	60.0	28.4	gravel/sand/clay	OB	S of Columbia Way	domestic	
179	4908731	152	59.7	24.1	silt/clay/shale/limestone	BR	S of Columbia Way	domestic	
180	4907557	152	72.8	24.4	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
181	4900329	168	47.2	19.8	sand/silt/clay	OB	E of Duffy's Lane	domestic/livestock	
182	4908819	203	33.5	18.6	sand/clay	OB	E of Mt Hope Rd	domestic	
183	4900327	102	37.2	18.3	sand/clay	OB	W of Highway 50	domestic	
185	4900453	51	57.6	-	gravel/silt/clay	OB	W of Caledon King Townline	-	test hole
186	4906769	152	33.5	1.8	sand/clay/shale	BR	S of Columbia Way	domestic	
187	4906552	152	57.9	17.1	sand/clay	OB	W of Highway 50	-	water supply
188	4900325	127	79.9	27.7	sand/clay	OB	W of Highway 50	public	
189	4908818	203	48.8	18.9	sand/clay	OB	E of Mt Hope Rd	domestic	
190	7154765	159	38.7	22.3	-	-	S of Castlederg Side Rd	-	abandoned
191	7269814	152	52.7	22.7	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
192	4904599	178	48.5	23.5	gravel/sand/clay	OB	S of Castlederg Side Rd	domestic	

Key Number	Well ID	Diameter (mm)	Depth (m)	Static Level (m)	Material(s)	Aquifer <sup>1</sup>	Location <sup>2</sup>	Use	Notes
194	7101984	158	54.3	31.5	sand/silt/clay	OB	E of Highway 50	domestic	
195	4903224	127	45.7	13.7	gravel/silt/clay	OB	W of Highway 50	domestic	
196	4908693	152	58.5	20.7	sand/silt/clay	OB	S of Castlederg Side Rd	domestic	
197	4907122	152	44.5	32.0	sand/silt/clay	OB	W of Caledon King Townline	domestic	
198	4900384	610	24.1	19.5	sand/clay	OB	S of Columbia Way	domestic	
199	4905068	152	46.9	20.4	sand/clay	OB	S of Castlederg Side Rd	domestic	
200	4906518	152	43.6	18.9	sand/silt/clay	OB	E of Mt Hope Rd	domestic	
202	4900279	762	18.3	9.1	sand/clay	OB	W of Duffy's Lane	domestic	
203	7151771	152	48.2	21.7	sand/clay	OB	S of Castlederg Side Rd	domestic	
204	4903155	762	6.7	2.4	clay	OB	S of Castlederg Side Rd	domestic	
205	4903328	762	14.0	-	clay	-	E of Mt Hope Rd	-	abandoned
206	4900449	127	64.0	27.4	clay/shale	BR	S of Columbia Way	domestic	

Data Source: Ministry of the Environment, Conservation, and Parks, retrieved February 1st, 2022.  
 1. OB = overburden aquifer      BR = bedrock aquifer  
 2. Highlighted - well record identified within the subject lands

# APPENDIX C

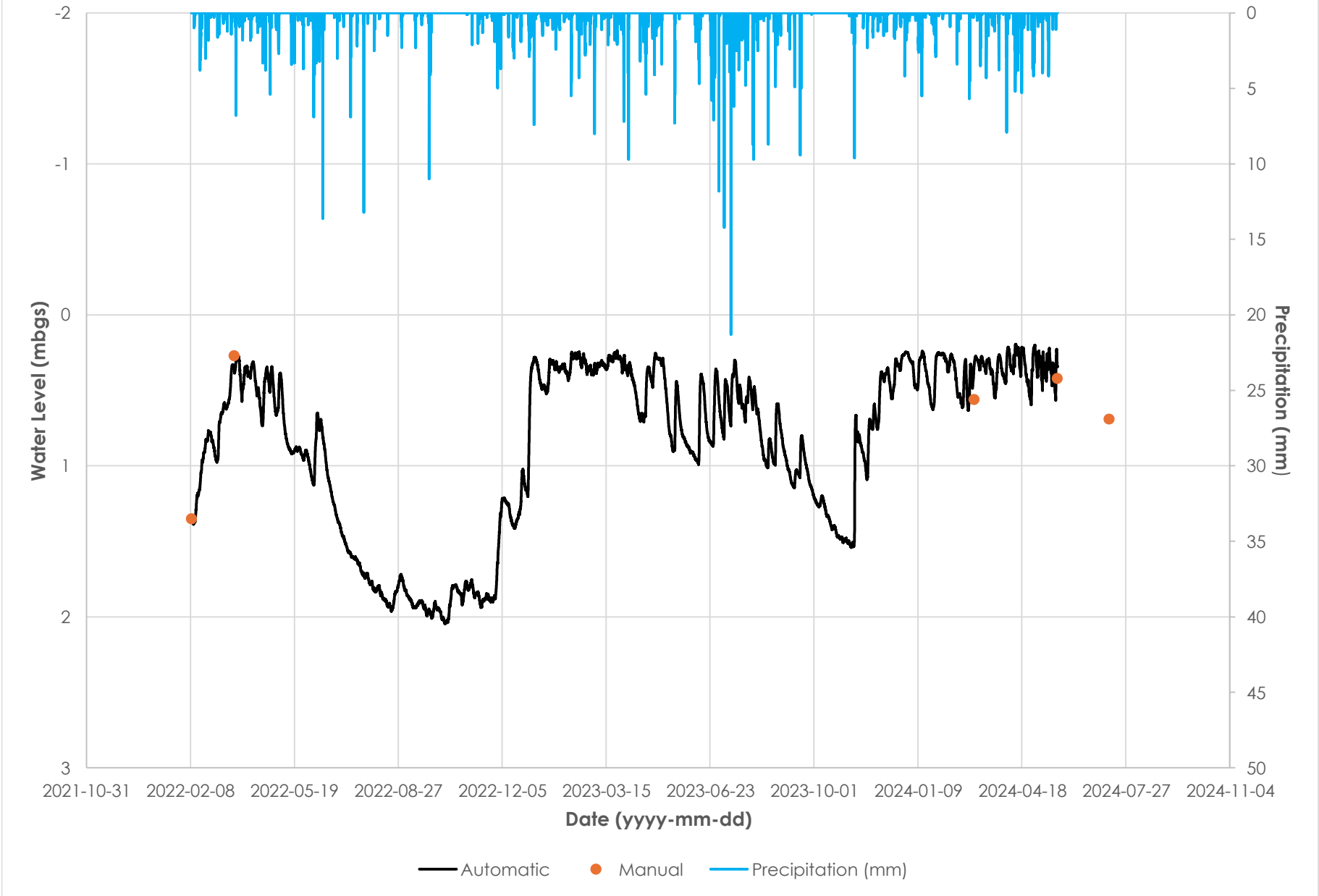
## Manual Water Level Measurements

MANUAL MONITORING WELL WATER LEVELS																		
Monitoring Well	February 8th - February 22nd 2022			March 22, 2022			March 3, 2023			April 26, 2024			May 22, 2024			July 11, 2024		
	Measured Water Level (m)	Water Level (mbgs)	Groundwater Elevation (masl)	Measured Water Level (m)	Water Level (mbgs)	Groundwater Elevation (masl)	Measured Water Level (m)	Water Level (mbgs)	Groundwater Elevation (masl)	Measured Water Level (m)	Water Level (mbgs)	Groundwater Elevation (masl)	Measured Water Level (m)	Water Level (mbgs)	Groundwater Elevation (masl)	Measured Water Level (m)	Water Level (mbgs)	Groundwater Elevation (masl)
MW1	2.16	1.35	259.81	1.08	0.27	260.89	1.37	0.56	260.60				1.23	0.42	260.74	1.50	0.69	260.47
MW2	2.23	1.34	261.43	1.41	0.52	262.25	1.68	0.79	261.98				1.60	0.71	262.06	1.65	0.76	262.01
MW3	3.17	2.26	259.05	1.57	0.66	260.65	1.87	0.96	260.35	1.83	0.92	260.39	1.97	1.06	260.25	2.02	1.11	260.20
MW4	3.39	2.40	258.74	1.47	0.48	260.66	1.38	0.39	260.75	1.81	0.82	260.32	2.03	1.04	260.10			
MW5	3.24	2.27	261.51	2.18	1.21	262.57	2.42	1.45	262.33	3.94	2.97	260.81						
MW6	3.16	2.18	262.59	3.16	2.18	262.59	3.24	2.26	262.51	3.18	2.20	262.57	8.27	7.29	257.48			
MW7	2.88	1.79	264.88	1.69	0.60	266.07	2.03	0.94	265.73				2.03	0.94	265.73			
MW8	2.14	1.06	263.81	1.55	0.47	264.40	1.81	0.73	264.14				2.07	0.99	263.88			
MW9	3.22	2.15	265.68	2.15	1.08	266.75	2.66	1.59	266.24				2.89	1.82	266.01	1.72	0.65	267.18
MW10	2.46	1.38	260.81	2.55	1.47	260.72	2.58	1.50	260.69				2.83	1.75	260.44			
MW11	4.39	3.33	265.57	3.57	2.51	266.39	3.57	2.51	266.39				3.74	2.68	266.22			
MW12	4.12	3.02	267.15	3.43	2.33	267.84	3.14	2.04	268.13				3.03	1.93	268.24			
MW13	2.61	1.52	266.06	2.50	1.41	266.17	2.66	1.57	266.01	2.57	1.48	266.10	2.57	1.48	266.10	2.60	1.51	266.07
MW14	2.54	1.53	269.36	2.03	1.02	269.87	2.05	1.04	269.85				DAMAGED	DAMAGED	DAMAGED			
MW15	2.32	1.30	271.50	1.73	0.71	272.09	1.73	0.71	272.09				2.30	1.28	271.52	2.81	1.79	271.01
MW16	3.87	2.78	262.99	2.99	1.90	263.87	2.99	1.90	263.87				2.67	1.58	264.19	3.10	2.01	263.76
MW17	2.10	1.23	268.06	1.21	0.34	268.95	1.21	0.34	268.95				1.67	0.80	268.49	2.17	1.30	267.99
MW18	2.94	1.91	258.74	2.75	1.72	258.93	2.75	1.72	258.93				2.96	1.93	258.72	3.08	2.05	258.60
MW19	2.70	1.75	261.82	2.18	1.23	262.34	2.18	1.23	262.34				2.00	1.05	262.52	2.11	1.16	262.41
MW20	2.92	1.91	263.50	2.62	1.61	263.80	2.62	1.61	263.80				2.16	1.15	264.26	2.11	1.10	264.31

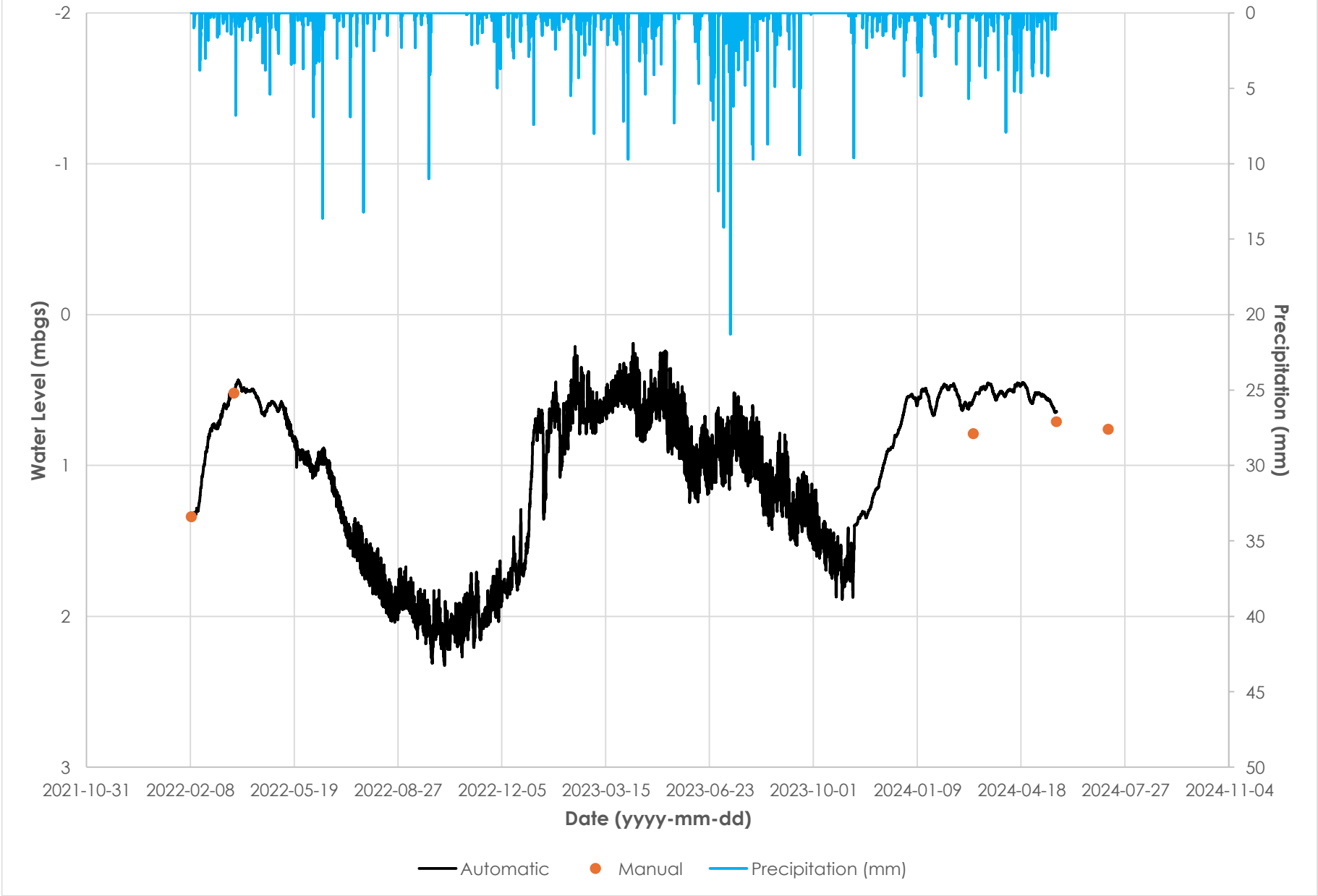
# APPENDIX D

## Hydrographs

MW1 (February 2022 - May 2024)

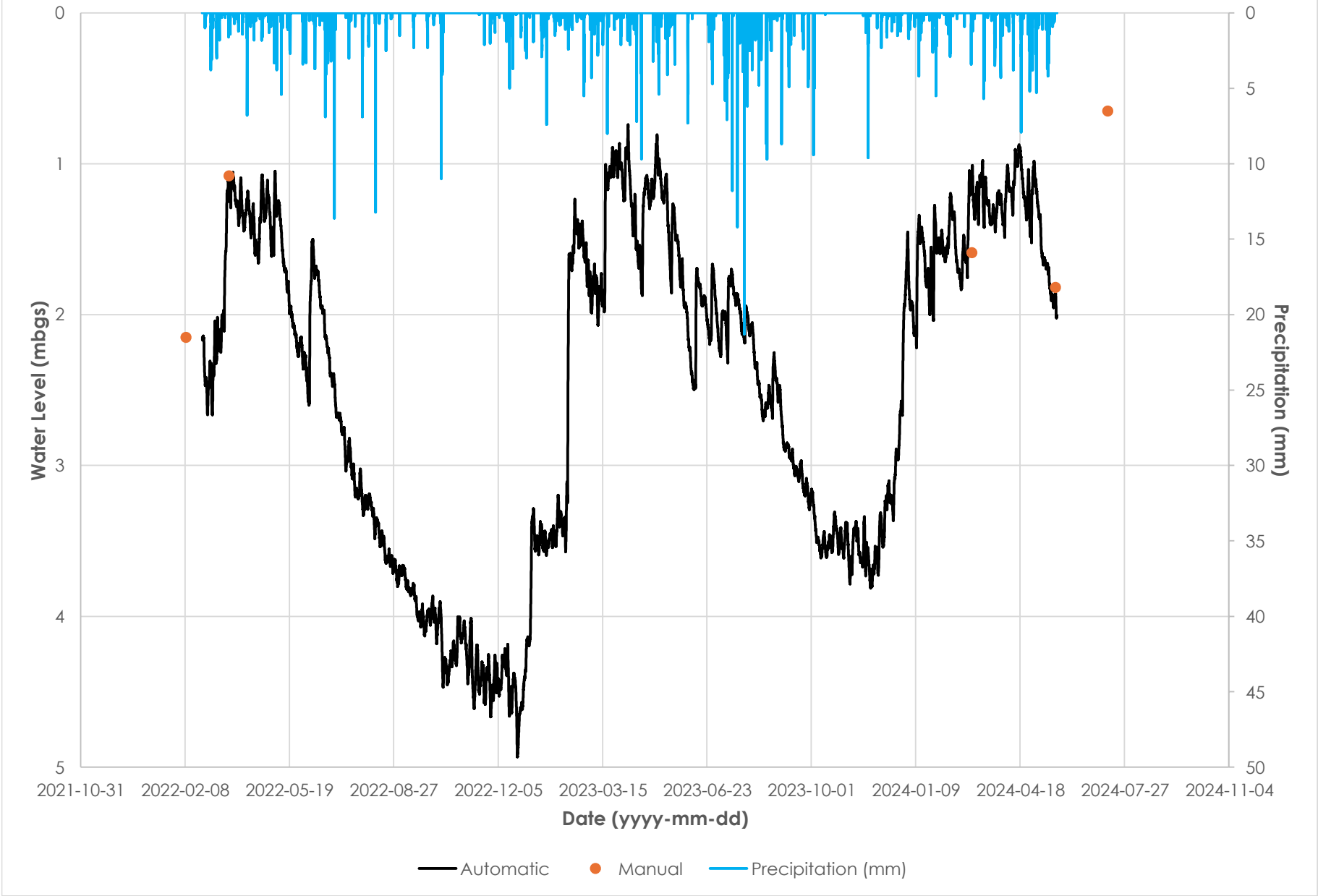


MW2 (February 2022 - May 2024)

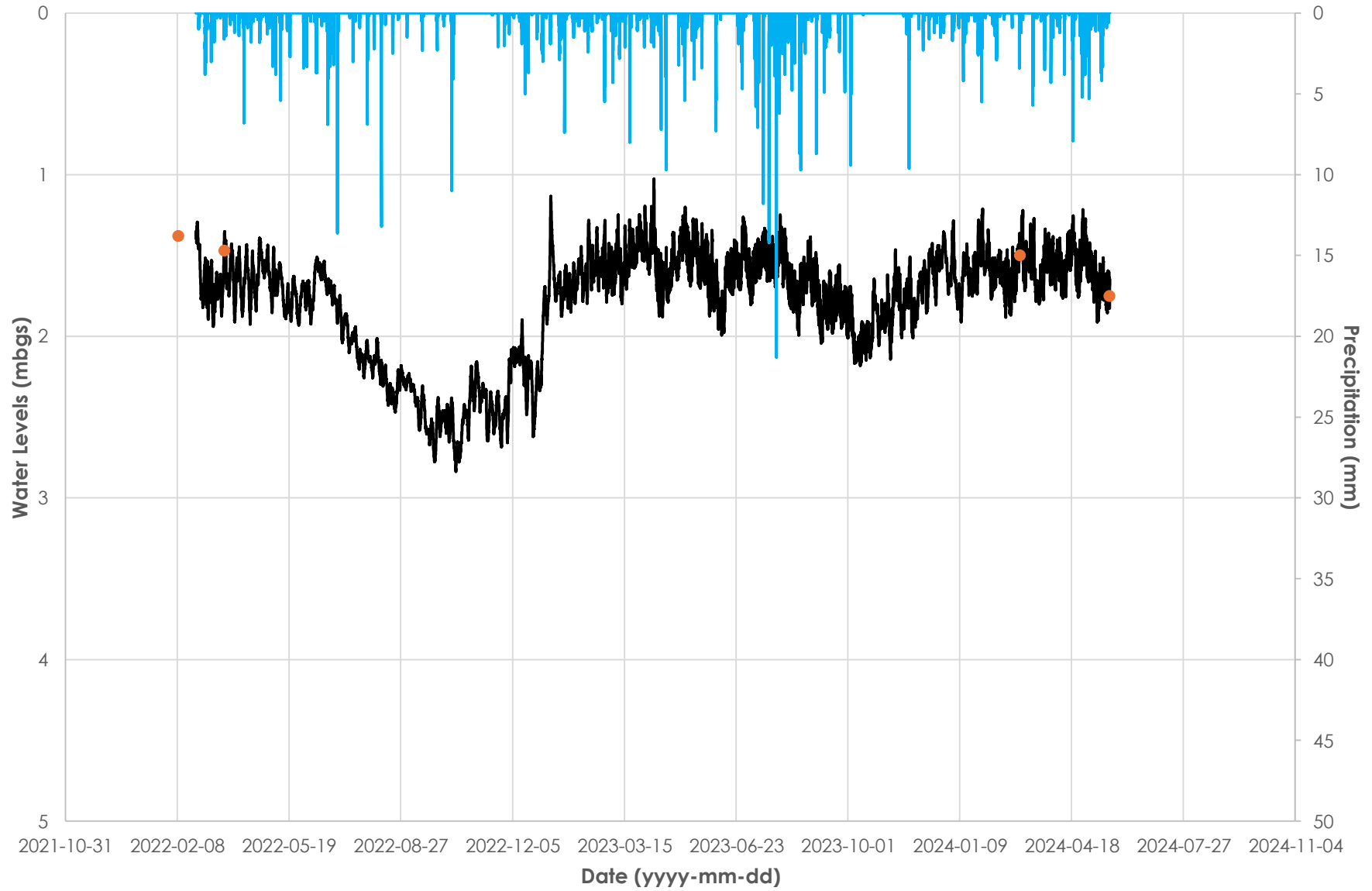




MW9 (February 2022 - May 2024)

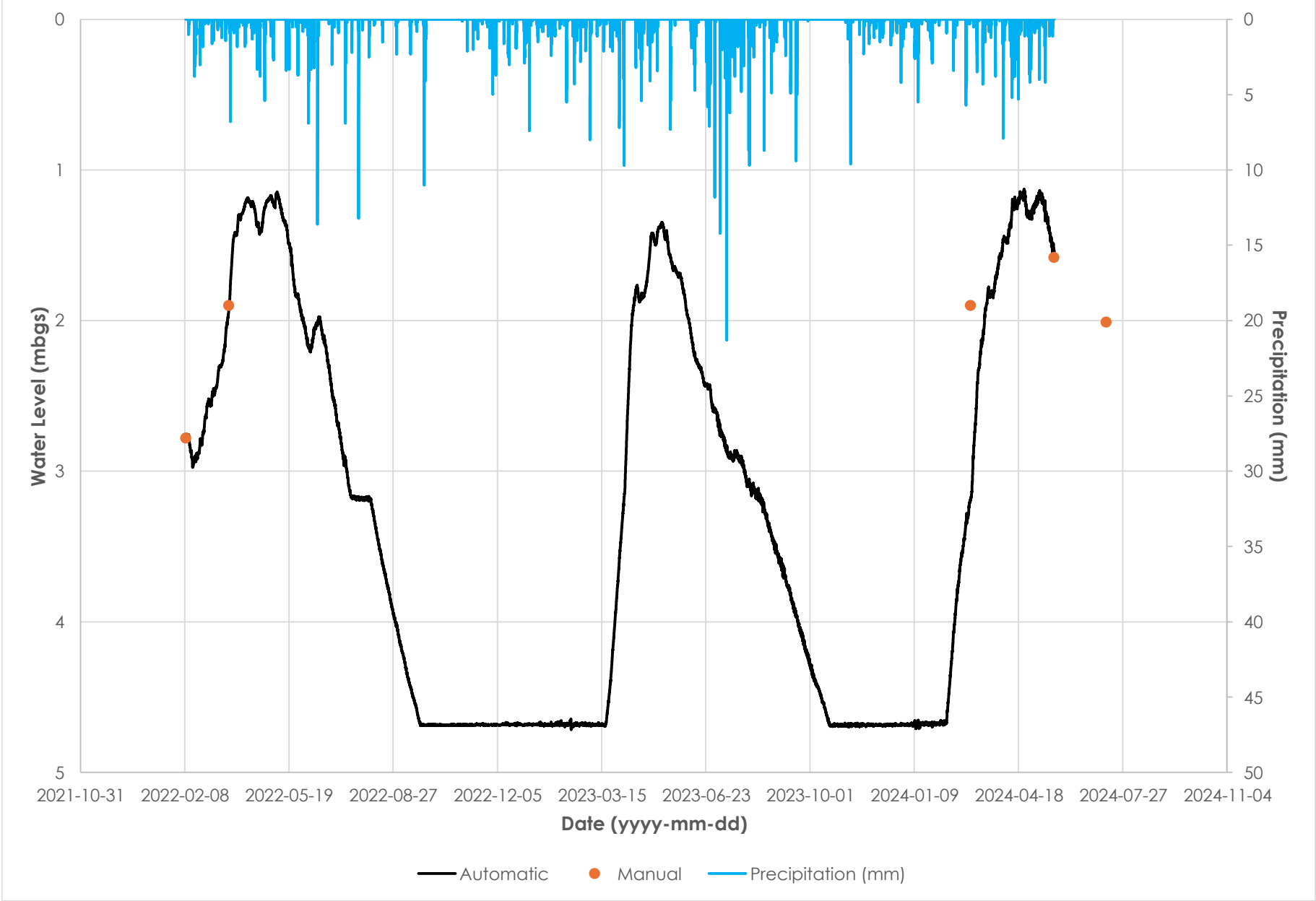


# MW10 (February 2022 - May 2024)

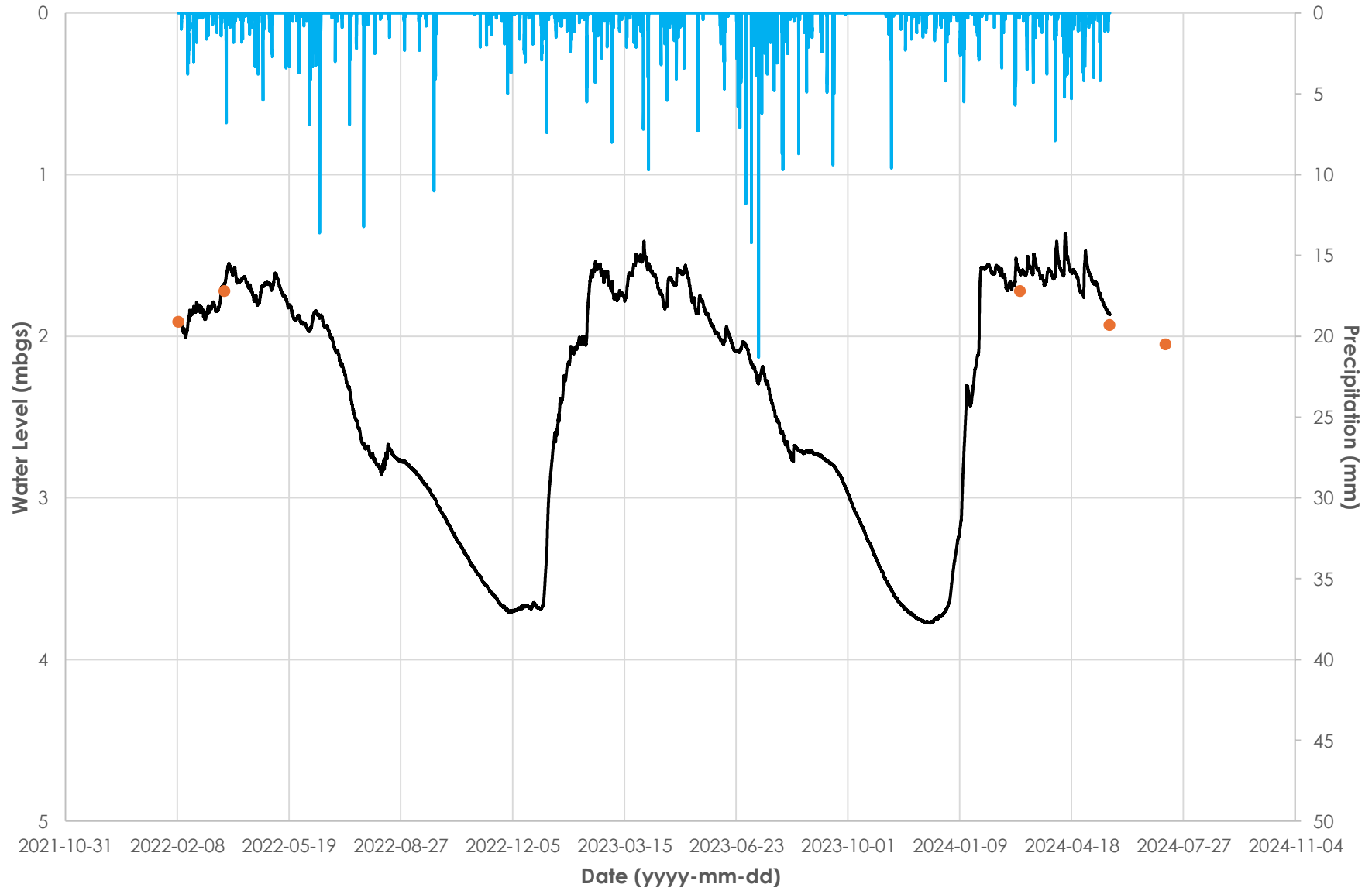


Automatic Manual Precipitation

MW16 (February 2022-May 2024)

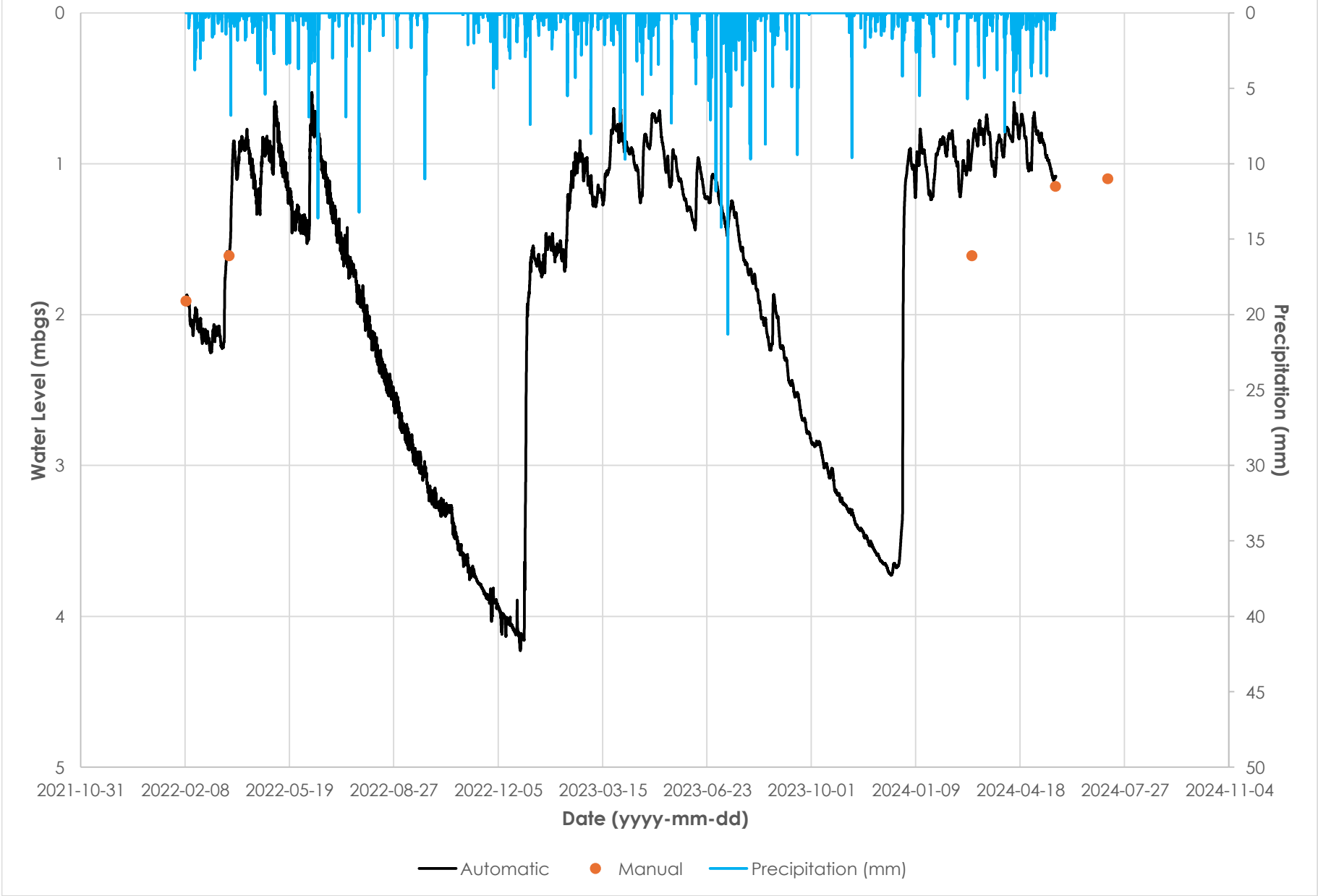


# MW18 (February 2022 - May 2024)

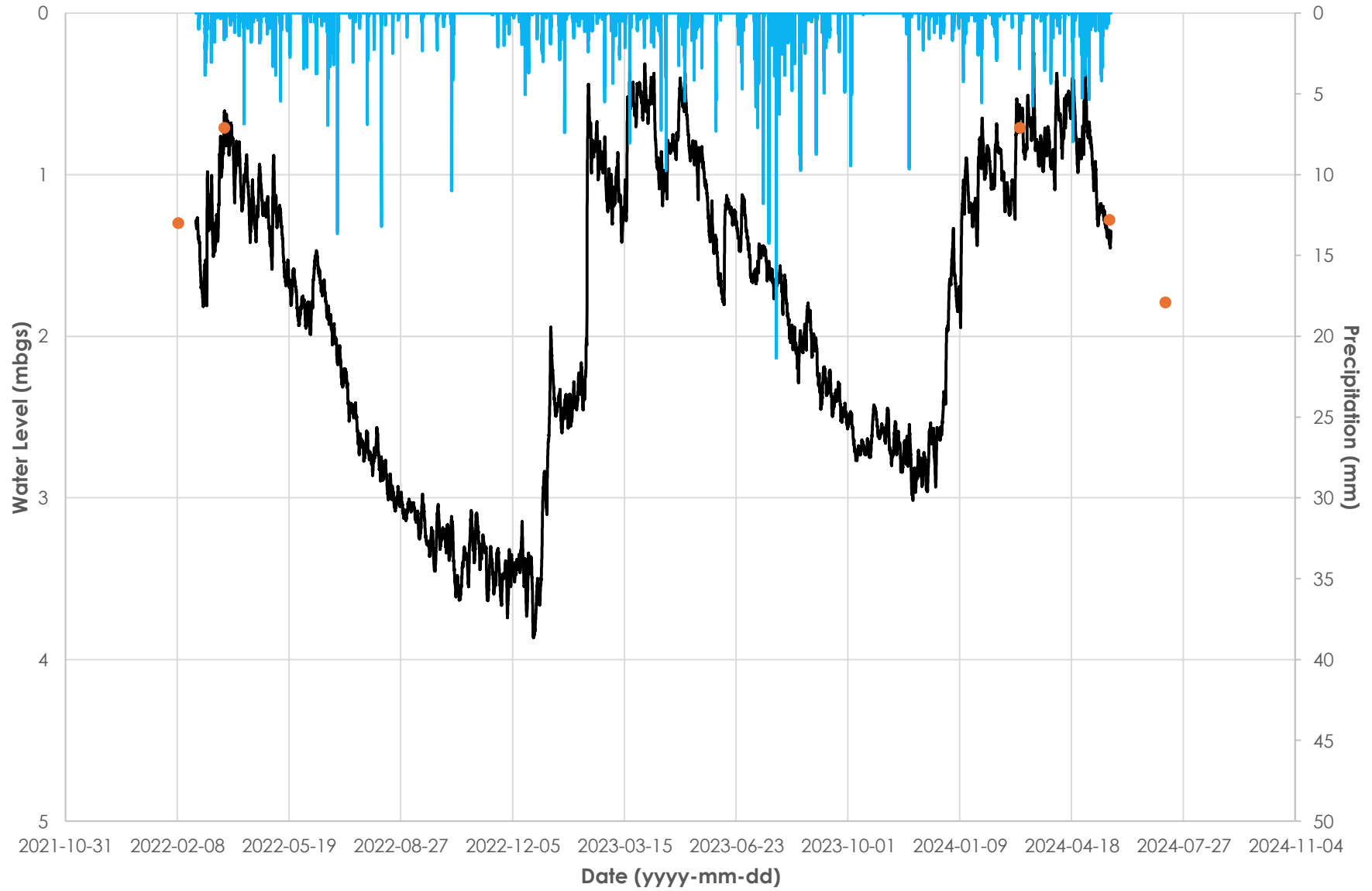


— Automatic    ● Manual    — Precipitation (mm)

MW20 (Feburary 2022-May 2024)



# MW15 (Febraury 2022 - May 2024)



— Automatic    ● Manual    — Precipitation (mm)

# APPENDIX E

## Site-Wide Water Balance Calculations

## Site Information Sheet

Project Number: 708-3446  
 Project Name: Bolton North Hill Secondary Plan  
 Municipality: Caledon  
 Designer: CM  
 Reviewer: CG

Total Site Area: 1,785,700

### Pre-Development

	Agricultural Lands	Existing Infrastructure	Woodlots	Water							
Landuse Area	1507825	27960	229891	20025							
Pervious Area	1507825	0	225293	19624							
Impervious Area	0	27960	4598	401							
Calculated Percent Imperviousness (%)	0%	100%	2%	2%	0%	0%	0%	0%	0%	0%	0%

### Post-Development

	Low Density Residential	Med Density Residential	High Density Residential	Commercial	Schools	Parks	Open Area	Woodlot	Roads	SWM	
Landuse Area	460400	260,800	182900	15500	49000	103000	39,200	41000	537,500	96,400	
Pervious Area	253220	91,280	27,435	2,325	22,050	87,550	39,200	40,180	0	92,544	0
Impervious Area	207180	169520	155465	13175	26950	15450	0	820	537,500	3856	
Calculated Percent Imperviousness (%)	45%	65%	85%	85%	55%	15%	0%	2%	100%	4%	0%

### Notes Entry

Site Plan Reference | Concept Plan  
 Consultant | Bousfields Inc.  
 Date of Plan | Aug-24





## Water Balance Parameters

Thornthwaite & Mather Method

Project Name: Bolton North Hill Secondary Plan

Project Number: 708-3446

Created By: CM

Checked By: CG

Date: 2024-12-12

Project Name:

Bolton North Hill Secondary Plan

Location:

Caledon

Climate Station: ALBION FIELD CENTRE

Longitude: 79°50'00.000" W

Latitude: 43°55'00.000" N

Elevation: 281.9 m

Station ID: 6150103

LATITUDE DEGREES  
**43**

Month	Mean Temperature (C°) <sup>1</sup>	Heat Index [i = (t/5) <sup>1.514</sup> ]	$\alpha$	Potential Evapotranspiration (PET) (mm)	Correction Factor <sup>2</sup>	Adjusted Potential Evapotranspiration (APET) (mm)	Total Precipitation (P) (mm) <sup>1</sup>	P - APET (mm)	APET - P (mm)
January	-7	0.0000	0.4924	0.0000	0.81	0	60.4	60.4	0.0
February	-5.9	0.0000	0.4924	0.0000	0.82	0	50.2	50.2	0.0
March	-1.4	0.0000	0.4924	0.0000	1.02	0	50.3	50.3	0.0
April	6.1	1.3513	0.5165	28.8545	1.12	32	67	34.7	0.0
May	12.4	3.9555	0.5621	60.8270	1.26	77	76.1	0.0	0.5
June	17.3	6.5488	0.6066	86.3244	1.28	110	75.5	0.0	35.0
July	19.9	8.0951	0.6328	100.0131	1.29	129	81.8	0.0	47.2
August	19.1	7.6075	0.6246	95.7908	1.2	115	77.4	0.0	37.5
September	14.3	4.9084	0.5786	70.6617	1.04	73	75	1.5	0.0
October	8.1	2.0759	0.5293	38.8760	0.95	37	68.3	31.4	0.0
November	2.1	0.2689	0.4972	9.4052	0.81	8	81.7	74.1	0.0
December	-3.9	0.0000	0.4924	0.0000	0.77	0	57.7	57.7	0.0
<b>TOTAL</b>	<b>6.8</b>	<b>34.8</b>	<b>1.1</b>			<b>581.5</b>	<b>821.4</b>	<b>360.24</b>	<b>120.30</b>

TOTAL WATER DEFICIT = 120.30 mm  
TOTAL WATER SURPLUS (SURPLUS - DEFICIT) = 239.94 mm

NOTES: 1. Precipitation and Temperature data from the ALBION FIELD CENTRE (Station No.6150103 ) Environment Canada Station Data

2. Latitude adjustment factors determined based on site latitude assuming 12 hours of sunlight per day for 30 days



Catchment ID	Woodlots												
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13	120
Storage (S) (mm)	400	400	400	400	399	364	317	280	281	313	387	400	
Pervious Area Infiltration/Runoff Analysis													
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731
Combined Water Balance													
Pervious ET (m³)	0	0	0	7281	17267	24894	29067	25897	16556	8321	1716	0	130999
Impervious ET (m³)	0	0	0	46	52	52	56	53	52	47	56	0	416
Pervious Runoff (m³)	5443	4524	4533	3126	0	0	0	0	0	0	0	3997	21623
Impervious Runoff (m³)	278	231	231	262	297	295	320	303	293	267	319	265	3361
Pervious Infiltration (m³)	8165	6786	6799	4688	0	0	0	0	0	0	0	5996	32434
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Catchment ID	Water												
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13	120
Storage (S) (mm)	200	200	200	200	199	164	117	80	81	113	187	200	
Pervious Area Infiltration/Runoff Analysis													
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240
Potential Infiltration (I) (mm)	42	35	35	24	0	0	0	0	0	0	0	31	168
Potential Direct Surface Water Runoff (R) (mm)	18	15	15	10	0	0	0	0	0	0	0	13	72
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731
Combined Water Balance													
Pervious ET (m³)	0	0	0	634	1504	2168	2532	2256	1442	725	149	0	11411
Impervious ET (m³)	0	0	0	4	5	5	5	5	5	4	5	0	36
Pervious Runoff (m³)	356	296	296	204	0	0	0	0	0	0	0	261	1413
Impervious Runoff (m³)	24	20	20	23	26	26	28	26	26	23	28	23	293
Pervious Infiltration (m³)	830	690	691	476	0	0	0	0	0	0	0	609	3296
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Pre-Development Water Balance Summary													
Pre-Development Infiltration	216624.9			m³/yr			121.3			mm/yr			
Pre-Development Runoff	228022.4			m³/yr			127.7			mm/yr			

NOTES: 1. Areas and percent imperviousness determined using Concept Plan dated 45528 prepared by Bousfields Inc. .

2. The infiltration factor is determined using the MECP Methodology outlined in Stormwater Drainage Manual 2003.

3. Additional assumptions:

- > Surplus water is unavailable for runoff and recharge in months where water losses from AET exceed precipitation inputs.
- > Runoff, infiltration and evapotranspiration do not occur when average temperature is below zero.
- > Precipitation during winter months (Dec. through Mar. is assumed to be accumulated as snow.
- > Soil Moisture Capacity is at a maximum in April.

Project Name:	<b>Bolton North Hill Secondary Plan</b>
Location:	<b>Caledon</b>

Post-Development Site Summary														
TOTAL SITE AREA (m²)	1,785,700													
	Low Density Residential	Med Density Residential	High Density Residential	Commercial	Schools	Parks	Open Area	Woodlot	Roads	SWM				
Catchment ID														
Topography - flat/rolling/hilly Soils Cover - cultivated/woodland Sum (Infiltration Factor) Soil Moisture Capacity (mm) Catchment Area (m²) Percent Imperviousness (%)	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3				
	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2				
	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1				
	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6				
	250	250	250	250	250	250	250	400	250	250				
	460,400	260,800	182,900	15,500	49,000	103,000	39,200	41,000	537,500	96,400				
	45%	65%	85%	85%	55%	15%	0%	2%	100%	4%				
Catchment ID	Low Density Residential	Med Density Residential	High Density Residential	Commercial	Schools	Parks	Open Area	Woodlot	Roads	SWM	0	0	0	0
Total Impervious Area (m²)	207180	169520	155465	13175	26950	15450	0	820	537500	3856	0	0	0	0
Percentage of Impervious Area (%)	45%	65%	85%	85%	55%	15%	0%	2%	100%	4%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Total Pervious Area (m²)	253,220	91,280	27,435	2,325	22,050	87,550	39,200	40,180	0	92,544	0	0	0	0
Percentage of Pervious Area (%)	55%	35%	15%	15%	45%	85%	100%	98%	0%	96%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Catchment ID	Low Density Residential													
Evapotranspiration/Evaporation Analysis														
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821	
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581	
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240	
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13		
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250		
Pervious Area Infiltration/Runoff Analysis														
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240	
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144	
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96	
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis														
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90	
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731	
Combined Water Balance														
Pervious ET (m³)	0	0	0	8183	19407	27980	32670	29107	18609	9352	1929	0	147237	
Impervious ET (m³)	0	0	0	2082	2365	2346	2542	2405	2331	2123	2539	0	18733	
Pervious Runoff (m³)	6118	5085	5095	3513	0	0	0	0	0	0	0	4493	24303	
Impervious Runoff (m³)	12514	10400	10421	11799	13401	13296	14405	13630	13208	12028	14388	11954	151444	
Pervious Infiltration (m³)	9177	7627	7642	5269	0	0	0	0	0	0	0	6739	36455	
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Catchment ID	Med Density Residential													
Evapotranspiration/Evaporation Analysis														
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821	
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581	
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240	
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13		
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250		
Pervious Area Infiltration/Runoff Analysis														
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240	
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144	
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96	
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis														
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90	
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731	
Combined Water Balance														
Pervious ET (m³)	0	0	0	2950	6996	10086	11777	10493	6708	3371	695	0	53076	
Impervious ET (m³)	0	0	0	1704	1935	1920	2080	1968	1907	1737	2077	0	15328	
Pervious Runoff (m³)	2205	1833	1837	1266	0	0	0	0	0	0	0	1620	8761	
Impervious Runoff (m³)	10239	8510	8527	9654	10965	10879	11787	11153	10807	9841	11772	9781	123916	
Pervious Infiltration (m³)	3308	2749	2755	1900	0	0	0	0	0	0	0	2429	13141	
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0	

Catchment ID		High Density Residential											
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13	
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250	
Previous Area Infiltration/Runoff Analysis													
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731
Combined Water Balance													
Pervious ET (m³)	0	0	0	887	2103	3031	3540	3154	2016	1013	209	0	15952
Impervious ET (m³)	0	0	0	1562	1775	1761	1908	1805	1749	1593	1905	0	14057
Pervious Runoff (m³)	663	551	552	381	0	0	0	0	0	0	0	487	2633
Impervious Runoff (m³)	9390	7804	7820	8854	10056	9977	10809	10228	9911	9026	10796	8970	113642
Pervious Infiltration (m³)	994	826	828	571	0	0	0	0	0	0	0	730	3950
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Catchment ID		Commercial											
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13	
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250	
Previous Area Infiltration/Runoff Analysis													
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731
Combined Water Balance													
Pervious ET (m³)	0	0	0	75	178	257	300	267	171	86	18	0	1352
Impervious ET (m³)	0	0	0	132	150	149	162	153	148	135	161	0	1191
Pervious Runoff (m³)	56	47	47	32	0	0	0	0	0	0	0	41	223
Impervious Runoff (m³)	796	661	663	750	852	846	916	867	840	765	915	760	9631
Pervious Infiltration (m³)	84	70	70	48	0	0	0	0	0	0	0	62	335
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Catchment ID		Schools											
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13	
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250	
Previous Area Infiltration/Runoff Analysis													
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731
Combined Water Balance													
Pervious ET (m³)	0	0	0	713	1690	2436	2845	2535	1620	814	168	0	12821
Impervious ET (m³)	0	0	0	271	308	305	331	313	303	276	330	0	2437
Pervious Runoff (m³)	533	443	444	306	0	0	0	0	0	0	0	391	2116
Impervious Runoff (m³)	1628	1353	1356	1535	1743	1730	1874	1773	1718	1565	1872	1555	19700
Pervious Infiltration (m³)	799	664	665	459	0	0	0	0	0	0	0	587	3174
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Catchment ID		Parks		Evapotranspiration/Evaporation Analysis											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year		
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821		
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581		
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240		
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13			
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250			
Previous Area Infiltration/Runoff Analysis															
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240		
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144		
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96		
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis															
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90		
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731		
Combined Water Balance															
Pervious ET (m³)	0	0	0	2829	6710	9674	11295	10064	6434	3233	667	0	50907		
Impervious ET (m³)	0	0	0	155	176	175	190	179	174	158	189	0	1397		
Pervious Runoff (m³)	2115	1758	1762	1215	0	0	0	0	0	0	0	1553	8403		
Impervious Runoff (m³)	933	776	777	880	999	992	1074	1016	985	897	1073	891	11294		
Pervious Infiltration (m³)	3173	2637	2642	1822	0	0	0	0	0	0	0	2330	12604		
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0		

Catchment ID		Open Area		Evapotranspiration/Evaporation Analysis											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year		
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821		
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581		
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240		
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13			
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250			
Previous Area Infiltration/Runoff Analysis															
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240		
Potential Infiltration (I) (mm)	30	25	25	17	0	0	0	0	0	0	0	22	120		
Potential Direct Surface Water Runoff (R) (mm)	30	25	25	17	0	0	0	0	0	0	0	22	120		
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis															
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90		
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731		
Combined Water Balance															
Pervious ET (m³)	0	0	0	1267	3004	4331	5057	4506	2881	1448	299	0	22793		
Impervious ET (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0		
Pervious Runoff (m³)	1184	984	986	680	0	0	0	0	0	0	0	869	4703		
Impervious Runoff (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0		
Pervious Infiltration (m³)	1184	984	986	680	0	0	0	0	0	0	0	869	4703		
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0		

Catchment ID		Woodlot		Evapotranspiration/Evaporation Analysis											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year		
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821		
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581		
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240		
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13			
Storage (S) (mm)	400	400	400	400	399	364	317	280	281	313	387	400			
Previous Area Infiltration/Runoff Analysis															
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240		
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144		
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96		
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis															
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90		
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731		
Combined Water Balance															
Pervious ET (m³)	0	0	0	1299	3079	4440	5184	4619	2953	1484	306	0	23363		
Impervious ET (m³)	0	0	0	8	9	9	10	10	9	8	10	0	74		
Pervious Runoff (m³)	971	807	808	557	0	0	0	0	0	0	0	713	3856		
Impervious Runoff (m³)	50	41	41	47	53	53	57	54	52	48	57	47	599		
Pervious Infiltration (m³)	1456	1210	1213	836	0	0	0	0	0	0	0	1069	5785		
Impervious Infiltration (m³)	0	0	0	0	0	0	0	0	0	0	0	0	0		

Catchment ID	Roads												
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	60	50	50	67	76	76	82	77	75	68	82	58	821
Adjusted Potential Evapotranspiration (APET)	0	0	0	32	77	110	129	115	73	37	8	0	581
P-APET	60	50	50	35	-1	-35	-47	-38	2	31	74	58	240
Change in Storage	0	0	0	0	-1	-35	-47	-38	2	31	74	13	
Storage (S) (mm)	250	250	250	250	249	214	167	130	131	163	237	250	
Pervious Area Infiltration/Runoff Analysis													
Water Surplus (mm)	60	50	50	35	0	0	0	0	0	0	0	44	240
Potential Infiltration (I) (mm)	36	30	30	21	0	0	0	0	0	0	0	27	144
Potential Direct Surface Water Runoff (R) (mm)	24	20	20	14	0	0	0	0	0	0	0	18	96
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	10	11	11	12	12	11	10	12	0	90
Impervious Runoff (mm)	60	50	50	57	65	64	70	66	64	58	69	58	731
Combined Water Balance													
Pervious ET (m <sup>3</sup> )	0	0	0	0	0	0	0	0	0	0	0	0	0
Impervious ET (m <sup>3</sup> )	0	0	0	5402	6136	6087	6595	6240	6047	5507	6587	0	48601
Pervious Runoff (m <sup>3</sup> )	0	0	0	0	0	0	0	0	0	0	0	0	0
Impervious Runoff (m <sup>3</sup> )	32465	26983	27036	30611	34768	34494	37372	35362	34266	31205	37327	31014	392902
Pervious Infiltration (m <sup>3</sup> )	0	0	0	0	0	0	0	0	0	0	0	0	0
Impervious Infiltration (m <sup>3</sup> )	0	0	0	0	0	0	0	0	0	0	0	0	0

Post-Development Water Balance Summary						
Post-Development Infiltration	80146.1	m <sup>3</sup> /yr	44.9	mm/yr	0.0014	L/s
Post-Development Runoff	873670.0	m <sup>3</sup> /yr	489.3	mm/yr	0.0155	L/s

- NOTES: 1.Areas and percent imperviousness determined using Concept Plan, dated 45528 prepared by Bousfields Inc. .
- 2.The infiltration factor is determined using the MECP Methodology outlined in SWM 2003 Manual.
3. Additional assumptions:
- > Surplus water is unavailable for runoff and recharge in months where water losses from AET exceed precipitation inputs.
  - > Runoff, infiltration and evapotranspiration do not occur when average temperature is below zero.
  - > Precipitation during winter months (Dec. through Mar. is assumed to be accumulated as snow.
  - > Soil Moisture Capacity is at a maximum in April.



## Water Balance Summary

Thornthwaite & Mather Method

Project Name: Bolton North Hill Secondary Plan

Project Number: 708-3446

Created By: CM

Checked By: CG

Date: 2024-12-12

Project Name:

**Bolton North Hill Secondary Plan**

Location:

**Caledon**

Characteristic	Pre-Development	Post-Development	% Change (Pre to Post)
Precipitation (mm/yr)	821.40	821.40	0%
Water Surplus (mm/yr)	239.94	239.94	0%
Evapotranspiration (mm/yr)	581.46	581.46	0%
Natural Infiltration (mm/yr)	121.31	44.88	-63%
Infiltration through LID Measures (mm/yr)	0.00	0.00	-
Total Infiltration (mm/yr)	121.31	44.88	-63%
Total Runoff (mm/yr)	127.69	489.26	283%

<b>Infiltration Deficit (mm/yr)</b>	<b>76.43</b>
-------------------------------------	--------------



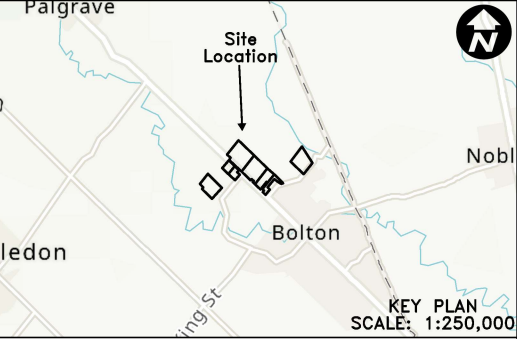
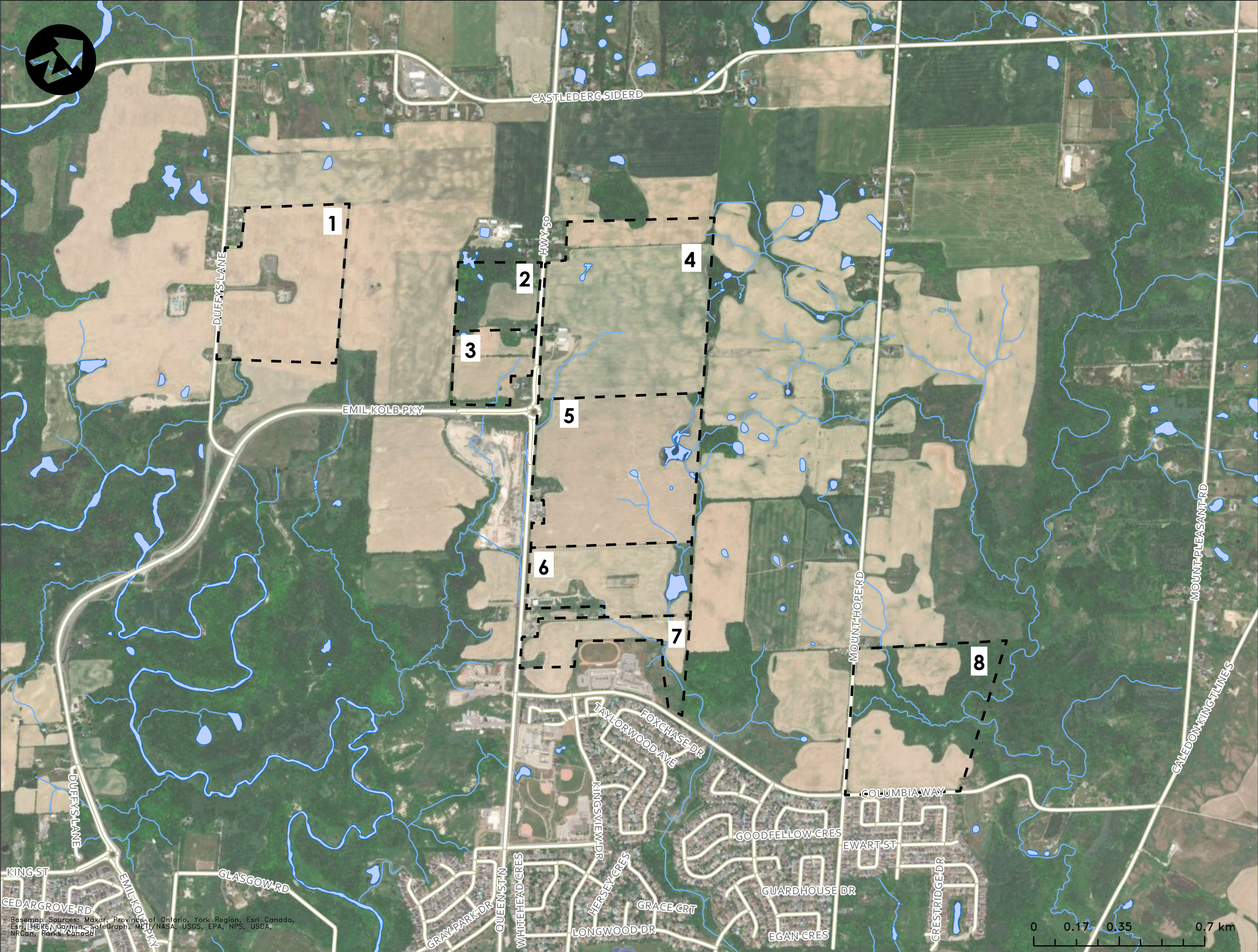
### Adjustment Factors Based on Site Latitude Based on 12 hours of Sunlight per day for 30 days

Latitude °C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50	0.74	0.78	1.02	1.15	1.33	1.36	1.37	1.25	1.06	0.92	0.76	0.70
49	0.75	0.79	1.02	1.14	1.32	1.34	1.35	1.24	1.05	0.93	0.76	0.71
48	0.76	0.80	1.02	1.14	1.31	1.33	1.34	1.23	1.05	0.93	0.77	0.72
47	0.77	0.80	1.02	1.14	1.30	1.32	1.33	1.22	1.04	0.93	0.78	0.73
46	0.79	0.81	1.02	1.13	1.29	1.31	1.32	1.22	1.04	0.94	0.79	0.74
45	0.80	0.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	0.94	0.79	0.75
44	0.81	0.82	1.02	1.13	1.27	1.29	1.30	1.20	1.04	0.95	0.80	0.76
43	0.81	0.82	1.02	1.12	1.26	1.28	1.29	1.20	1.04	0.95	0.81	0.77
42	0.82	0.83	1.03	1.12	1.26	1.27	1.28	1.19	1.04	0.95	0.82	0.79
41	0.83	0.83	1.03	1.11	1.25	1.26	1.27	1.19	1.04	0.96	0.82	0.80
40	0.84	0.83	1.03	1.11	1.24	1.25	1.27	1.18	1.04	0.96	0.83	0.81
39	0.85	0.84	1.03	1.11	1.23	1.24	1.26	1.18	1.04	0.96	0.84	0.82
38	0.85	0.84	1.03	1.10	1.23	1.24	1.25	1.17	1.04	0.96	0.84	0.83
37	0.86	0.84	1.03	1.10	1.22	1.23	1.25	1.17	1.03	0.97	0.85	0.83
36	0.87	0.85	1.03	1.10	1.21	1.22	1.24	1.16	1.03	0.97	0.86	0.84
35	0.87	0.85	1.03	1.09	1.21	1.21	1.23	1.16	1.03	0.97	0.86	0.85
34	0.88	0.85	1.03	1.09	1.20	1.20	1.22	1.16	1.03	0.97	0.87	0.86
33	0.88	0.86	1.03	1.09	1.19	1.20	1.22	1.15	1.03	0.97	0.88	0.86
32	0.89	0.86	1.03	1.08	1.19	1.19	1.21	1.15	1.03	0.98	0.88	0.87
31	0.90	0.87	1.03	1.08	1.18	1.18	1.20	1.14	1.03	0.98	0.89	0.88
30	0.90	0.87	1.03	1.08	1.18	1.17	1.20	1.14	1.03	0.98	0.89	0.88
29	0.91	0.87	1.03	1.07	1.17	1.16	1.19	1.13	1.03	0.98	0.90	0.89
28	0.91	0.88	1.03	1.07	1.16	1.16	1.18	1.13	1.02	0.98	0.90	0.90
27	0.92	0.88	1.03	1.07	1.16	1.15	1.18	1.13	1.02	0.99	0.90	0.90
26	0.92	0.88	1.03	1.06	1.15	1.15	1.17	1.12	1.02	0.99	0.91	0.91
25	0.93	0.89	1.03	1.06	1.15	1.14	1.17	1.12	1.02	0.99	0.91	0.91
20	0.95	0.90	1.03	1.05	1.13	1.11	1.14	1.11	1.02	1.00	0.93	0.94
15	0.97	0.91	1.03	1.04	1.11	1.08	1.12	1.08	1.02	1.01	0.95	0.97
10	1.00	0.91	1.03	1.03	1.08	1.06	1.08	1.07	1.02	1.02	0.98	0.99
5	1.02	0.93	1.03	1.02	1.06	1.03	1.06	1.05	1.01	1.03	0.99	1.02
0	1.04	0.94	1.04	1.01	1.04	1.01	1.04	1.04	1.01	1.04	1.01	1.04
-5	1.06	0.91	1.04	1.00	1.02	0.99	1.02	1.03	1.00	1.05	1.03	1.06
-10	1.08	0.97	1.05	0.99	1.01	0.96	1.00	1.01	1.00	1.06	1.05	1.10
-15	1.12	0.98	1.05	0.98	0.98	0.94	0.97	1.00	1.00	1.07	1.07	1.12
-20	1.14	1.00	1.05	0.97	0.96	0.91	0.95	0.99	1.00	1.08	1.09	1.15
-25	1.17	1.01	1.05	0.96	0.94	0.88	0.93	0.98	1.00	1.10	1.11	1.18
-30	1.20	1.03	1.06	0.95	0.92	0.85	0.90	0.96	1.00	1.12	1.14	1.21
-35	1.23	1.04	1.06	0.94	0.89	0.82	0.87	0.94	1.00	1.13	1.17	1.25
-45	1.27	1.06	1.07	0.93	0.86	0.78	0.84	0.92	1.00	1.15	1.20	1.29
-42	1.28	1.07	1.07	0.92	0.85	0.76	0.82	0.92	1.00	1.16	1.22	1.31
-44	1.30	1.08	1.07	0.92	0.83	0.74	0.81	0.91	0.99	1.17	1.23	1.33
-46	1.32	1.10	1.07	0.91	0.82	0.72	0.79	0.90	0.99	1.17	1.25	1.35
-48	1.34	1.11	1.08	0.90	0.80	0.70	0.76	0.89	0.99	1.18	1.27	1.37
-50	1.37	1.12	1.08	0.89	0.77	0.67	0.74	0.88	0.99	1.19	1.29	1.41

Source: Dunne, T. and Leopold, L.B., 1978. Water in environmental planning, Freeman Publishers.

# FIGURES





LEGEND

- Roads
- Waterbody
- Watercourse
- Accessible Lands
- 1 Pacific Lands
- 2 Polsinelli Lands
- 3 Pacific Lands
- 4 Country Homes Lands
- 5 Oakbank Estates Inc. Lands
- 6 Marhome Ventures Lands
- 7 Wyndcliffe Developments Inc. Lands
- 8 Cold Creek Developments Lands

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project **BOLTON NORTH HILL  
TOWN OF CALEDON**

Drawing **SITE LOCATION PLAN**

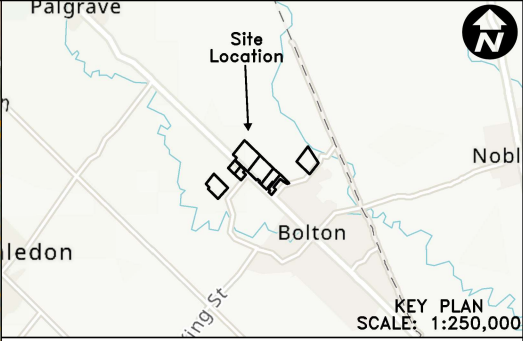
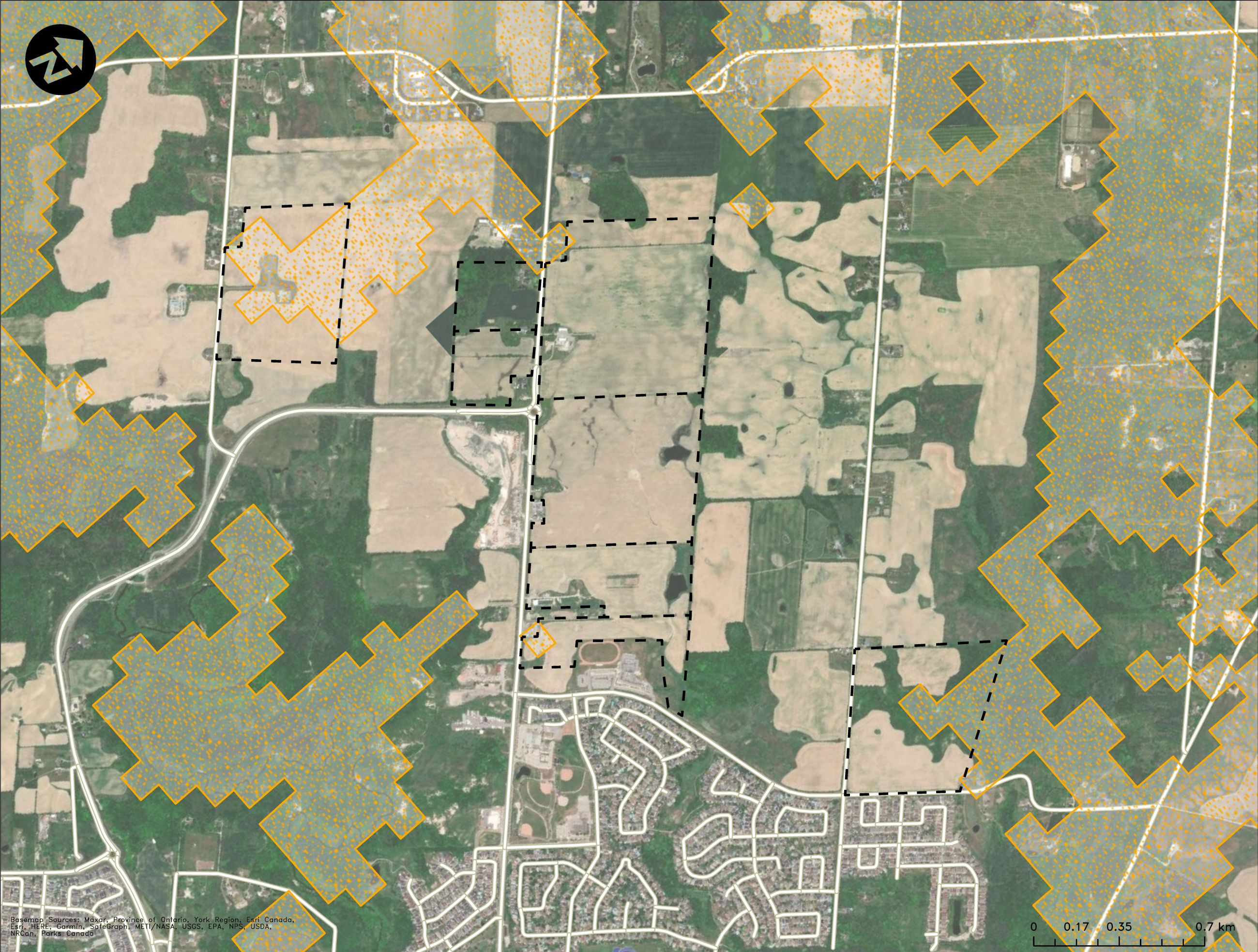
**CROZIER**  
CONSULTING ENGINEERS

2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn	C.M. / E.F.	Design	C.G.	Project No.	0708-3446
Date	22-02-25	Projection	EPSG:26917	Scale	1:15,000
				Dwg.	FIG. 1

Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada





LEGEND

- Roads
- - Accessible Lands
- Orange dotted area Highly Vulnerable Aquifers

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project **BOLTON NORTH HILL  
TOWN OF CALEDON**

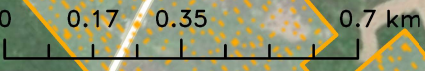
Drawing **HIGHLY VULNERABLE AQUIFERS**

**C CROZIER**  
CONSULTING ENGINEERS

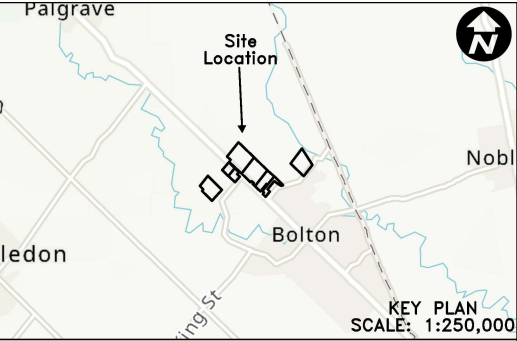
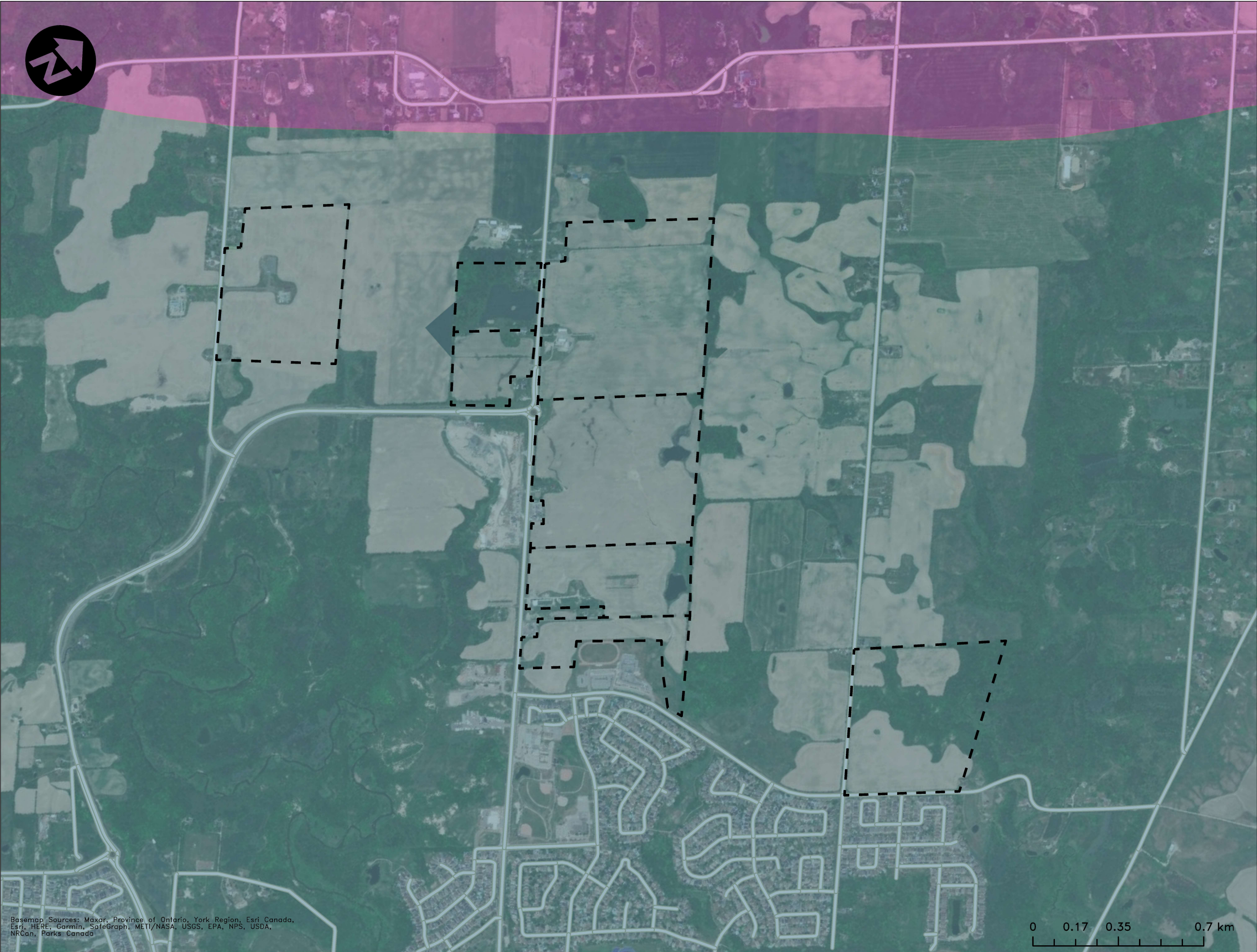
2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn	C.M. / E.F.	Design	C.G.	Project No.	0708-3446
Date	22-02-25	Projection	EPSG:26917	Scale	1:15,000
				Dwg.	FIG. 2

Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada







LEGEND

- Roads
- Accessible Lands
- Physiographic Regions:  
Unit Number, Region Name
- 30, Oak Ridges Moraine
- 32, South Slope

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.


ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

**BOLTON NORTH HILL  
TOWN OF CALEDON**

Drawing

**PHYSIOGRAPHY**

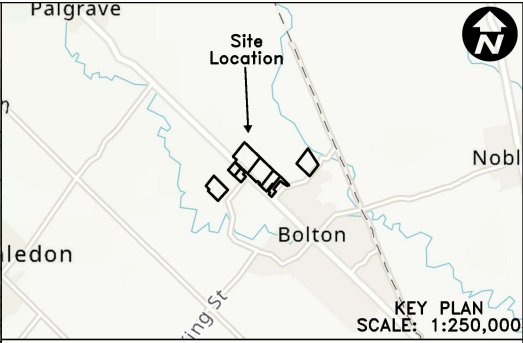
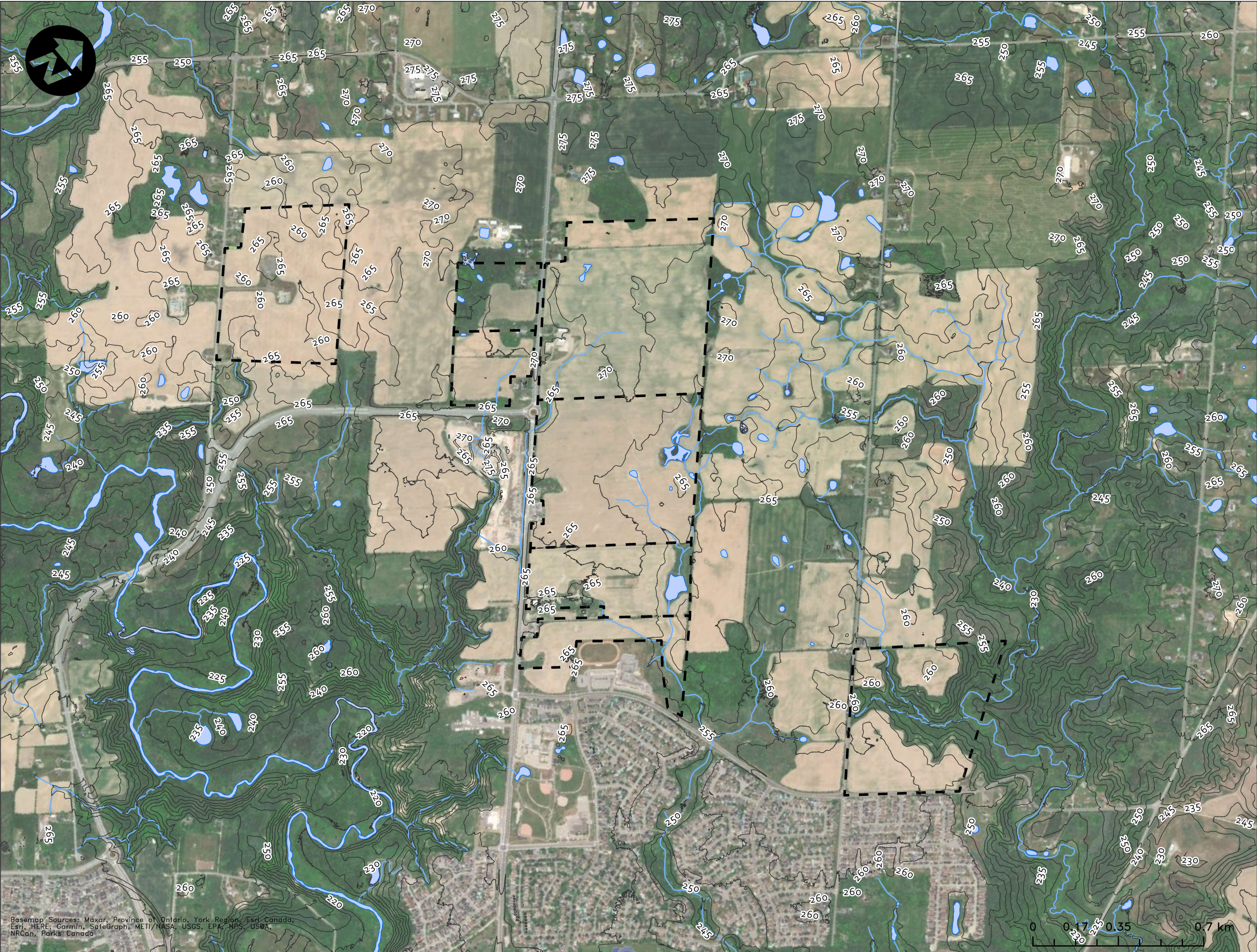


**CROZIER**  
CONSULTING ENGINEERS

2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn C.M. / E.F.	Design C.G.	Project No. <b>0708-3446</b>
Date 22-02-25	Projection EPSG:26917	Scale 1:15,000
		Dwg. <b>FIG. 3</b>





LEGEND

- Waterbody
- Watercourse
- 5 m Contours
- Accessible Lands

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project **BOLTON NORTH HILL**  
**TOWN OF CALEDON**

Drawing **TOPOGRAPHY**

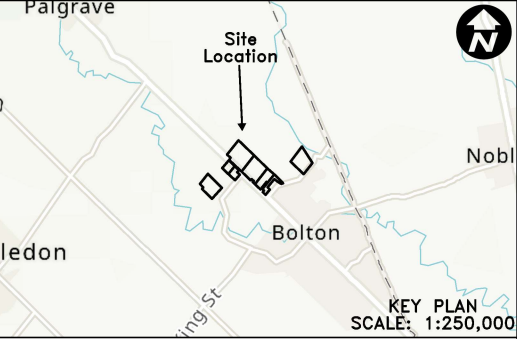
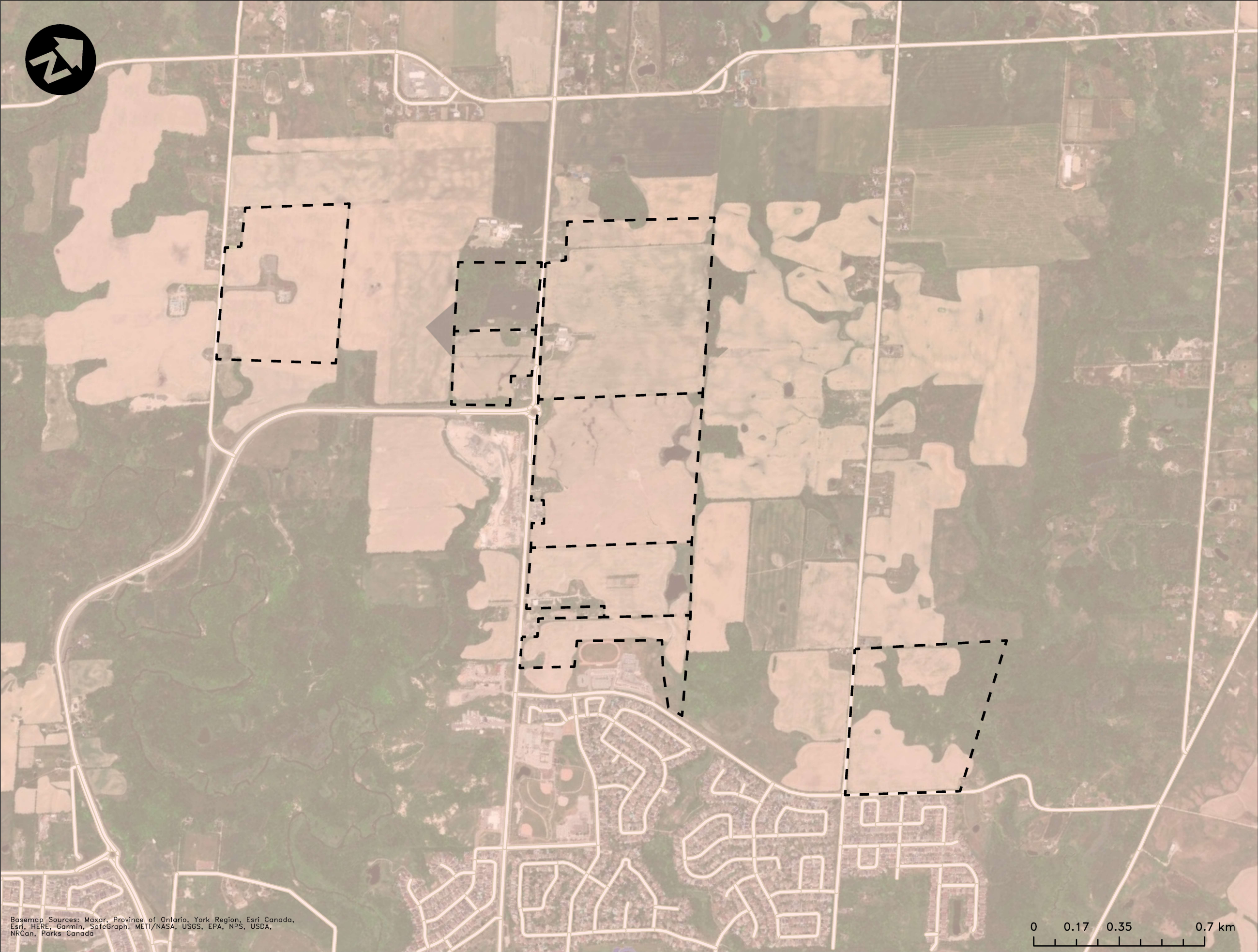
**CROZIER**  
CONSULTING ENGINEERS

2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn C.M. / E.F.	Design C.G.	Project No. <b>0708-3446</b>
Date 22-02-25	Projection EPSG:26917	Scale 1:15,000
		Dwg. <b>FIG. 4</b>

Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada





**LEGEND**

— Roads

- - Accessible Lands

Bedrock Geology:

Stratigraphic Unit

Georgian Bay Formation;  
Blue Mountain Formation;  
Billings Formation;  
Collingwood Member;  
Eastview Member

Queenston Formation

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

**BOLTON NORTH HILL  
TOWN OF CALEDON**

Drawing

**BEDROCK GEOLOGY**

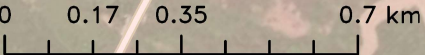


**CROZIER**  
CONSULTING ENGINEERS

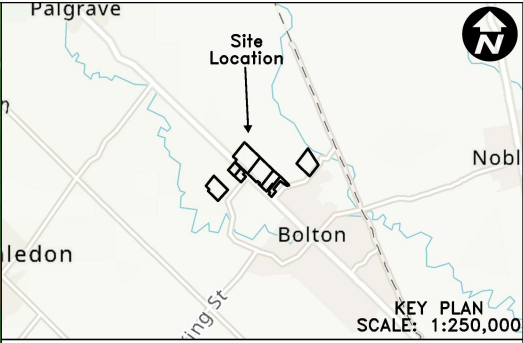
2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn C.M. / E.F.	Design C.G.	Project No. <b>0708-3446</b>
Date 22-02-25	Projection EPSG:26917	Scale 1:15,000
		Dwg. <b>FIG. 5</b>

Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada







LEGEND

- Roads
- Accessible Lands
- Surficial Geology Unit:
  - 12: Older alluvial deposits
  - 19: Modern alluvial deposits
  - 20: Organic deposits
  - 5d: Glaciolacustrine-derived silty to clayey till
  - 6: Ice-contact stratified deposits

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

**BOLTON NORTH HILL  
TOWN OF CALEDON**

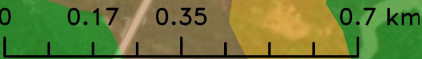
**SURFICIAL GEOLOGY**



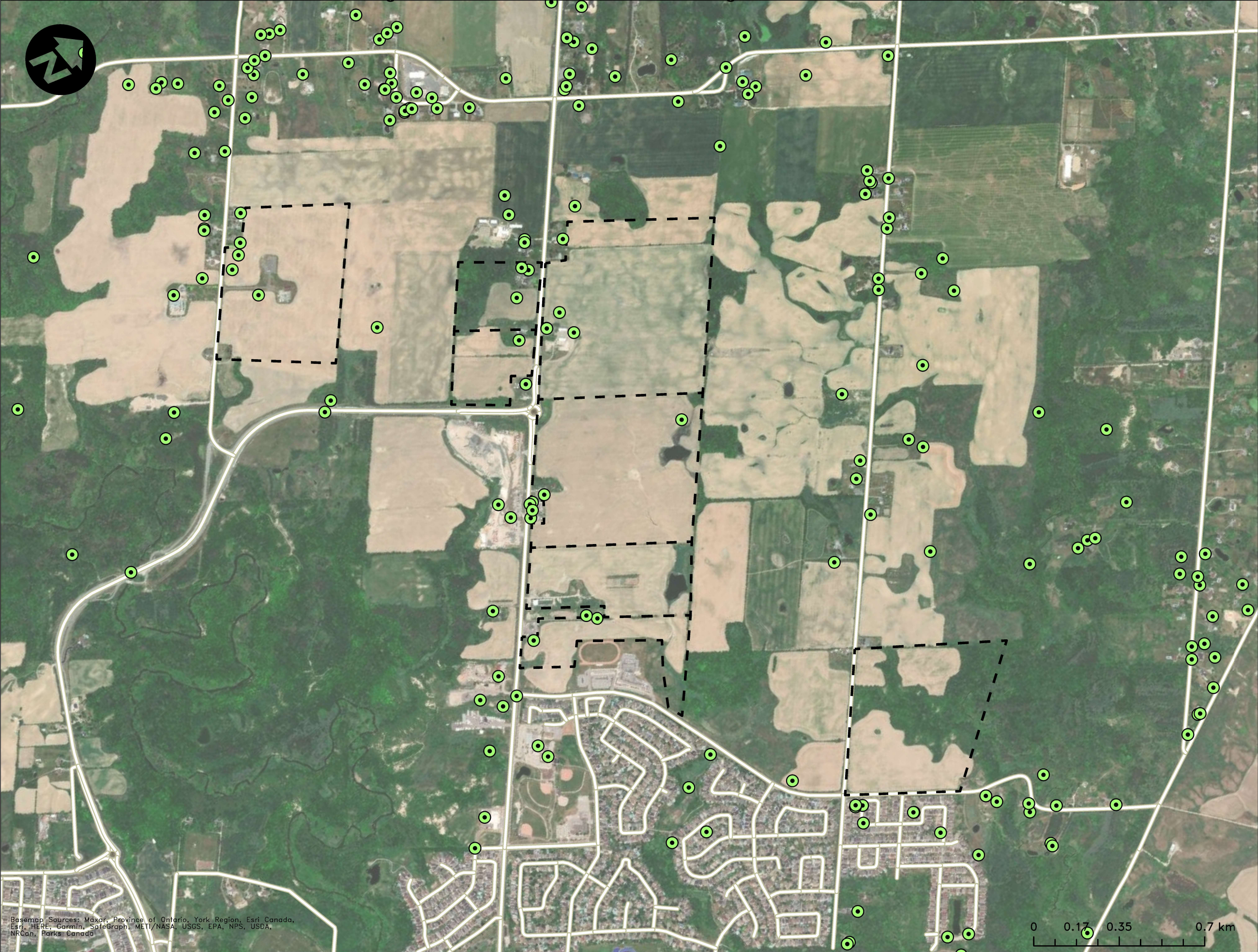
2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn	C.M. / E.F.	Design	C.G.	Project No.	0708-3446
Date	22-02-25	Projection	EPSG:26917	Scale	1:15,000
					Dwg. FIG. 6

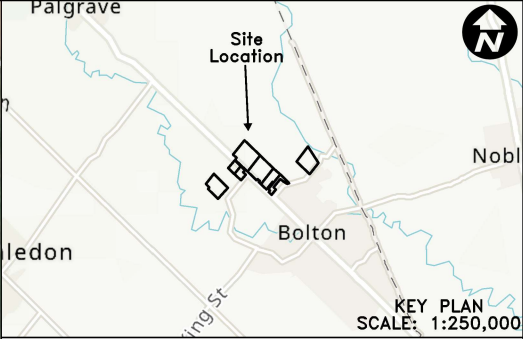
Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada







Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada



LEGEND

- MECP Wells
- Roads
- Accessible Lands

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.


THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project  
**BOLTON NORTH HILL  
TOWN OF CALEDON**

Drawing  
**MECP WELLS**

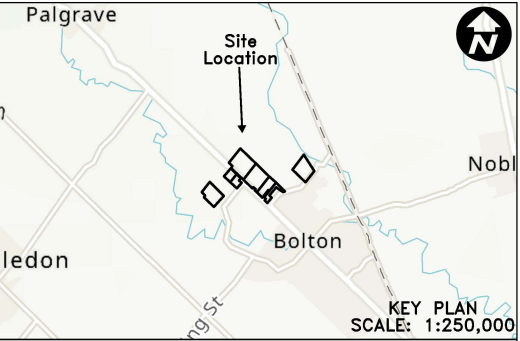
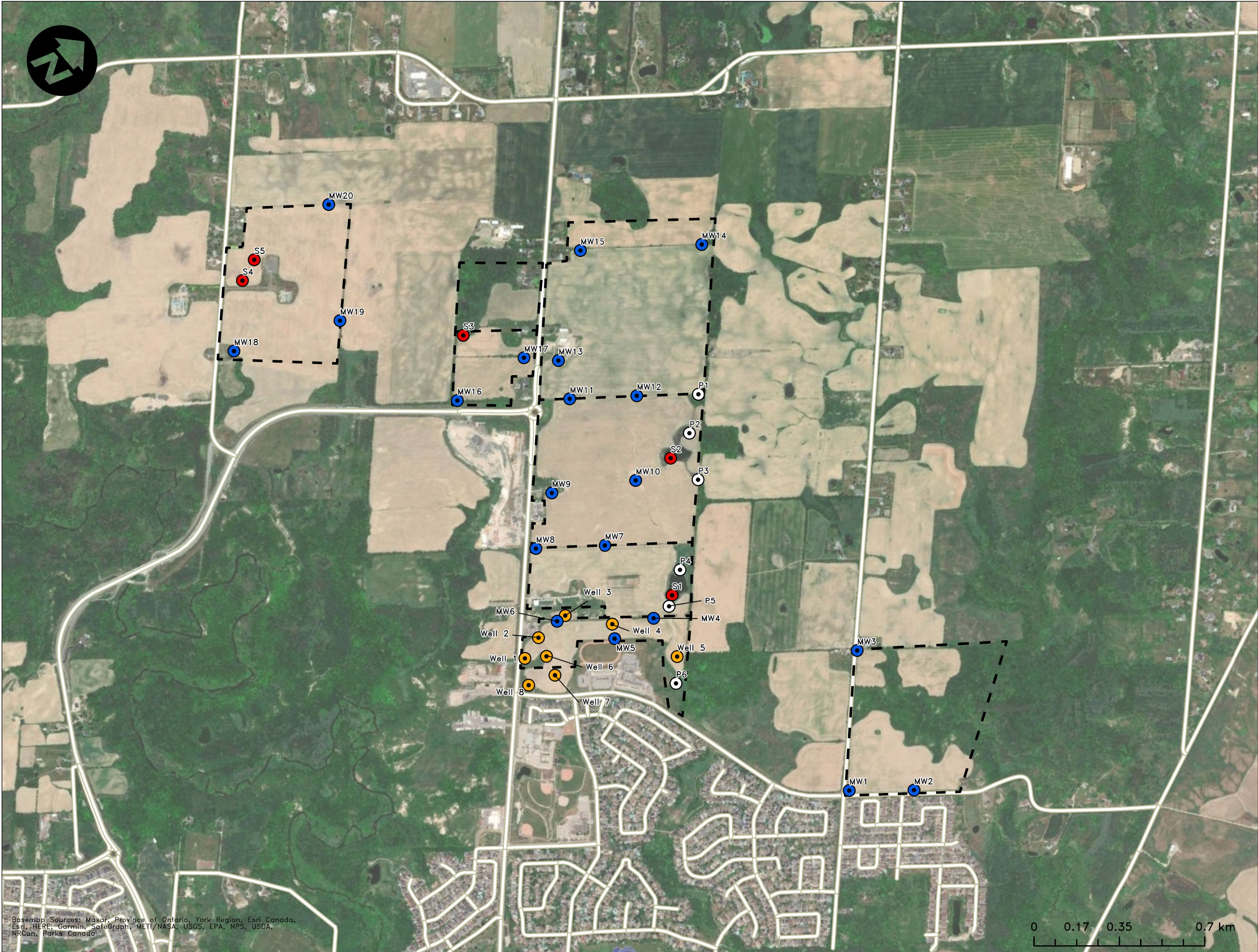


**CROZIER**  
CONSULTING ENGINEERS

2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn C.M. / E.F.	Design C.G.	Project No. <b>0708-3446</b>
Date 22-02-25	Projection EPSG:26917	Scale 1:15,000
		Dwg. <b>FIG. 7</b>





**LEGEND**

**MW1** Monitoring Location

○ Piezometer

● Staff Gauge

● Monitoring Well

● Old Wells

- - - Accessible Lands

— Roads

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project **BOLTON NORTH HILL  
TOWN OF CALEDON**

Drawing **ON SITE WELLS**

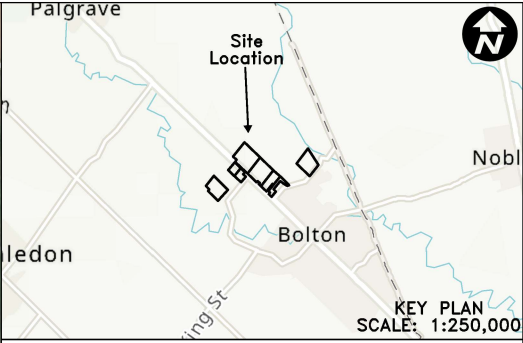
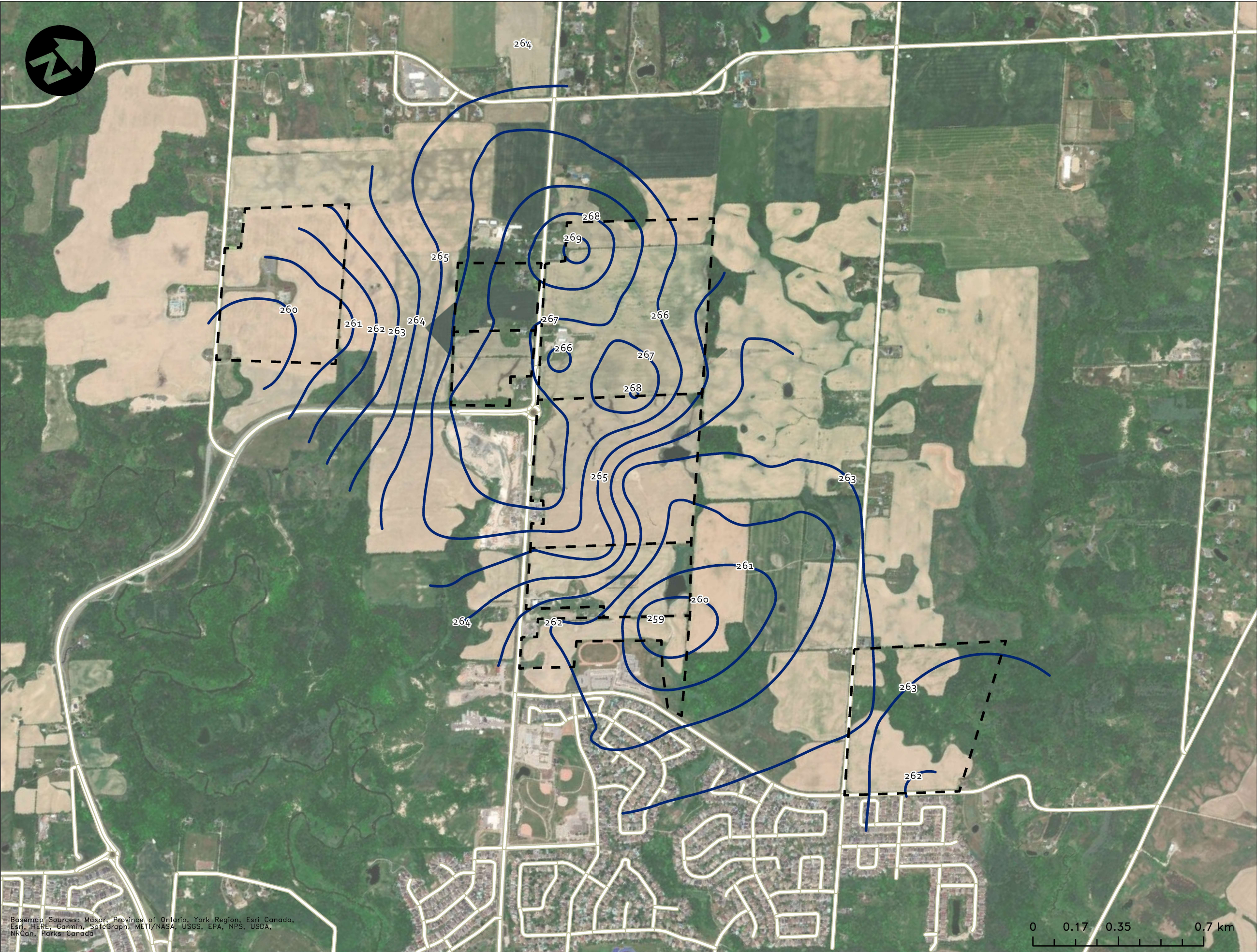
**CROZIER**  
CONSULTING ENGINEERS

2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn C.M. / E.F.	Design C.G.	Project No. <b>0708-3446</b>
Date 22-02-25	Projection EPSG:26917	Scale 1:15,000
		Dwg. <b>FIG. 8</b>

Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada





LEGEND

- Roads
- Accessible Lands
- Groundwater Contour

**DRAWING NOTES:**

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.


THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project **BOLTON NORTH HILL  
TOWN OF CALEDON**

Drawing **ESTIMATED GROUNDWATER  
FLOW DIRECTION**

**CROZIER**  
CONSULTING ENGINEERS

2800 High Point Drive  
Suite 100  
Milton, ON L9T 6P4  
905-875-0026 T  
905-875-4915 F  
www.cfcrozier.ca

Drawn C.M. / E.F.	Design C.G.	Project No. <b>0708-3446</b>
Date 22-02-25	Projection EPSG:26917	Scale 1:15,000

Dwg. **FIG. 9**

Basemap Sources: Maxar, Province of Ontario, York Region, Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, NRCan, Parks Canada

