# Small Scale Hydrogeological Assessment
# Proposed Commercial Development
# '0' Dixie Road
# Caledon, Ontario

**Report #6765 – Gill Caledon**
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A & A ENVIRONMENTAL CONSULTANTS INC.

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# EXECUTIVE SUMMARY

A & A Environmental Consultants Inc. (A&A) was retained by 2476998 Ontario Inc. (the client), to evaluate the potential impact from the proposed commercial development on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The site lies in the southern area of Caledon, Ontario at '0' Dixie Road. The site is bound with residential and agricultural land located northwest of the site, agricultural land to the northeast, commercial and agricultural land southeast of the site, and commercial land to the southwest. The area of the site is approximately 89,520 $m^2$ (22.12 acres). At the time of the investigation, the site was vacant.

The topography in the vicinity of the subject site (a 100-meter radius) was observed to be somewhat hilly, with an unnamed creek flowing northeast through the central area of the site. The subject site elevation varies, but is recorded as being approximately 258 meters above sea level (masl) on the topographic map with the surrounding subject study area sloping from approximately 264 masl to the west to 246 masl to the east. Surface water drainage on the site is expected to infiltrate the permeable ground surface and/or flow towards the unnamed creek flowing northeast through the centre area of the site. Groundwater flow direction may also be influenced by utility trenches or other subsurface structures and may preferentially migrate in these subsurface utility trenches.

Geological maps identified the site to be Halton till characterized by predominantly sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content. The physiographic landform of the site is identified as till plains (drumlinized). The surficial geology identified the site is identified as till. Bedrock in the area of the site is part of the Queenston formation, characterized as shale, siltstone, minor limestone and sandstone. These rocks were formed from weathering of the Precambrian surface (shales) and from the calcareous marine creature skeletons.

A search of the Ministry of Environment, Conservation, and Parks (MECP) well records show a total of four wells located within 500 meters of the subject site, consisting of two domestic wells, one monitoring well, and one well with no use listed.

It is clear from the MECP water well database and the information obtained during the field survey that the local residents obtain their water from a regional water supply system. The subject site is also expected to utilize the Regional Municipality of Peel water system when redeveloped. The MECP well records show groundwater was found at approximately 5.18 mbgs, for a well drilled in the unconfined aquifer to approximately 6.10 mbgs. The MECP well records show groundwater was found between 13.11 – 43.89 mbgs, for a well drilled in the confined aquifer approximately between 17.68 – 45.11 mbgs. It should be noted that the water levels provided in these tables do not represent current water level depths because those wells more likely measured at the time of drilling. However, the drilling program completed at this site show the groundwater was found between 1.457 – 4.134 mbgs for monitoring wells drilled between 4.964 – 6.728 mbgs.

The water table in the study area was defined by installing a total of three monitoring wells in the area of the proposed development. The selection of the monitoring wells was based on the predicted water flow direction, taking into consideration the site location and accessibility for the drill crew. The monitoring wells installed by A&A were drilled to a maximum depth of 6.728 mbgs. There were six groundwater monitoring events that took place between October 2022 and January 2023. All wells contained water in each of the six monitoring events. It was concluded that groundwater was present on site at elevations between 258.034 – 261.136 masl.

A groundwater contour map was plotted using "Golden Software" (Surfer 8) and the measurements of groundwater levels taken on January 13, 2023 from three monitoring wells. This map shows well MW-4 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in northeast direction.

The total precipitation (rainfall plus snowfall) in 2022 was 1,064 mm, with the greatest amounts falling in June and July. June and August show the highest mean daily temperatures during the

year and the lowest temperatures were recorded in February. The average annual precipitation from 1992 – 2022 was calculated using historical data collected at the meteorological station "Bolton SPS" located in Caledon, Ontario and the TRCA water balance tool. The average annual precipitation over the thirty-year period was 868 mm. For the same period, it was calculated that approximately 597 mm/year would be lost to evapotranspiration (Environment Canada, 2022); leaving a total of approximately 271 mm/year available for groundwater recharge and surface runoff.

Based on the water balance assessment, moderate changes are anticipated in the infiltration and runoff due to the proposed development at the subject site. There will be an increase in surface runoff due to the development on-site. Due to the large size of the site and high runoff rate, a stormwater management plan will be needed to manage the stormwater runoff on site.

The analysis results indicate that all health and non-health related parameters were below the standards as outlined in the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

## RECOMMENDATION

Based on the obtained information from this study, A&A has the following recommendations:

1. Due to the increased runoff rate on site post development and the large size of the subject site, a stormwater management plan is recommended. Proper planning as well as implementing LIDs will mitigate the stormwater that accumulates.

2. Due to the water levels being below the foundation bottom, the excavation area will NOT need to undergo in-construction and post-construction dewatering.

3. No adverse impact on the groundwater resources is expected to occur during the development of the subject site with the implementations of these recommended actions.

# 1.0 INTRODUCTION

A & A Environmental Consultants Inc. (A&A) was retained by 2476998 Ontario Inc. (the client), to evaluate the potential impact from the proposed commercial development on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at '0' Dixie Road, Caledon, Ontario (Figure 1). The area of the site is approximately 89,520 $m^2$ (22.12 acres). At the time of the investigation, the site was vacant.

This study describes a small-scale hydrogeological study to obtain a better understanding of the groundwater resources within the study area and includes the characterization of the site using all available geological and hydrogeological information; a discussion of the groundwater quality and a report for the site with conclusions and recommendations.

There is no relationship between the client and A&A other than third-party independent assessor.

## 1.1 Scope of Work

The scope of work included the following where applicable:

- Perform visual/olfactory examination of the site and a walk-through inspection of the property to look for signs of any environmental issues.
- Characterize the site's geological, topography, meteorology, hydrogeology, and groundwater conditions.
- Determination of current activities at the site.
- Obtain utility line locates for all public and private utility lines.
- Drill nine boreholes to a maximum depth of 6.728 m in selected locations. The boreholes will be drilled with a hydraulic soil drill fitted with 4-inch augers. Six borehole was used solely for the geotechnical investigation completed by A&A on the site.
- Install three groundwater monitoring well. The well will be constructed of 51 mm (2") PVC risers with 3.05m long Schedule 40 PVC slotted well screen. Slip end cap will be installed at the end of the riser pipe with threaded drive-points at the bottom of the well. The borehole annulus will be backfilled with silica sand to approximately 0.3 m above the well

screen. A bentonite seal will be placed on the sand pack with a second seal at about 0.3 mbgs. The well will be fitted with a dedicated peristaltic low-flow sample tubing. The well will be installed by a licensed well technician, tagged in accordance with Regulation 903 and recorded on the Ministry of the Environment, Conservation and Park's (MECP) water well information system (WWIS).

- A level survey will be conducted at the site, which consists of measuring the elevation of the top of the well, relative to an arbitrary benchmark. This level survey will be conducted to provide the information used to calculate the groundwater table elevation.
- The groundwater will be sampled and analyzed for selected parameters of concerns.
- Groundwater samples will be evaluated using information obtained from the newly installed monitoring wells following MECP sampling protocol and procedures.
- Evaluate the potential impact of the proposed development on the ground water and surface water resources and their users.
- Provision of a reasonable conclusion regarding the environmental condition of the site.
- Development of recommendations for follow-up investigations if needed.

## 1.2 Changes to Scope of Work

No changes were made to the scope of work.

# 2.0 DESCRIPTION OF THE SUBJECT SITE

The subject site is an irregular shaped lot with an area of 89,520 $m^2$. The site lies in the southern area of Caledon, Ontario at '0' Dixie Road. The site is bound with residential and agricultural land located northwest of the site, agricultural land to the northeast, commercial and agricultural land southeast of the site, and commercial land to the southwest. The subject study area is located within the Humber River watershed which contains the Humber River.

The approximate UTM coordinates are Zone 17T; 596767 m Easting; 4847505 m Northing. The site is zoned as being " A1 – Agricultural" as quoted from Town of Caledon Zoning By-law 2006-50, as amended, and is located north of the intersection of Dixie Road and Mayfield Road. The site is currently vacant.

# 3.0 DEVELOPMENT PLAN

It is understood that the proposed commercial transportation depot development will consist of the following:

- Proposed single-storey commercial building include office and service/repair bays with a total area of 340 $m^2$ and no basement or underground parking.
- Loading area/space.
- 170 Truck/Trailer parking spaces, parking lot, roads, sewer, watermain, and maneuvering area.

The general arrangement of the proposed development is illustrated in Figure 6, (Appendix A).

The total site area is 89,520 $m^2$ with a total of 8,025 $m^2$ being developed as impermeable surfaces.

# 4.0 PHYSICAL SETTING

## 4.1 Topography

The regional topography, which is an area within a 5 km radius from the site, has a slope towards southeast towards the Humber River. The site sits in the Humber River Watershed that consists of the main channel, the Humber River, and then two smaller branches, the East Humber and the West Humber. All together the Humber River Watershed drains an area of 911 $km^2$ with 1,800 km of waterways and 600 bodies of water (Toronto and Region Conservation Authority, 2023). The main branch has its source in the Niagara Escarpment and flows 126 km south to empty into Lake Ontario at Humber Bay east of Etobicoke and ranges from 320 meters above sea level (masl) to 80 masl (Toronto and Region Conservation Authority, 2023). The East Humber has its origins in the Kettle Lakes Region of the Richmond Hill and King Township while the West Humber has its origins in the King City region. The watershed has a mixed land use with 54% rural, 33% urban and 13% urbanizing (Toronto and Region Conservation Authority, 2023).

The topography in the vicinity of the subject site (a 100-meter radius) was observed to be somewhat hilly, with an unnamed creek flowing northeast through the central area of the site. The subject site elevation varies, but is recorded as being approximately 264 masl to 254 masl on the topographic map (Figure 3), with the surrounding subject study area sloping from approximately 271 masl to the west to 246 masl to the east. Surface water drainage on the site is expected to infiltrate the permeable ground surface and/or flow towards the unnamed creek flowing northeast through the centre area of the site.

## 4.2 Geology

The surface deposit in this region, like all of Ontario, was once covered by massive glaciers during the late Wisconsin glacial period. The grinding action of the moving ice masses produced a considerable amount of rock materials, ranging in size from boulders to rock flour which was distributed over the landscape.

**Quaternary Geology:** The sedimentary record of southern Ontario provides evidence for three distinct climatic stages during the Quaternary period: the Illinoisan glacial stage (130-180,000 years before present (y.b.p), Sangamonian interglacial stage (110-130,000 y.b.p.) and the Wisconsinan glacial stage (110-10,000 y.b.p; Johnson et al, 1997).

The Quaternary geology identified the site to be Halton till consisting of predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor during the Pleistocene epoch.

**Paleozoic Geology:** Bedrock in the area of the Site is part of the Queenston formation, characterized as shale, siltstone, minor limestone and sandstone. These rocks were formed from weathering of the Precambrian surface (shales) and from the calcareous marine creature skeletons.

**Physiography of Southern Ontario:** The physiography of southern Ontario was altered considerably by the glacial and interglacial episodes that took place throughout the Quaternary period (2 million years to present). Southern Ontario's glacial history is very complex and has been interpreted and discussed by many (Barnett 1992; Karrow 1967; Chapman and Putnam 1984; Dreimanis and Goldthwait 1973; etc.). The site is identified on the Till Plains (drumlinized) landform within the South Slope region.

**Surficial Geology:** The site is identified as clay to silt-textured till deposits derived from glaciolacustrine deposits or shale.

### 4.2.1 Overburden Detailed Summary

The drilling program conducted for this study indicates the overburden deposits are generally consistent across the property. All boreholes revealed underlain the surface to be characterized as follows:

- **Topsoil**
  - Topsoil layer was encountered at the ground surface with approximate thickness of 150mm. The data provided here pertaining to the topsoil thickness is confirmed at the borehole locations only and may vary between and beyond the boreholes.

- **Native Soil:**
  - The surficial topsoil layer was underlain by the following layers of native soils. The native soil at borehole locations was encountered at depths ranging from 0.05 to 0.1 m below the original ground surface.
    - **Weathered/Disturbed Soil:** The upper weathered zone to depths ranging from 0.05 m to 0.8 m below the existing grade was consisted of sandy silt trace to some clay and gravel, loose, grey, moist.
    - **Sandy Silt till to Sandy Clayey Silt:** Underneath the weathered/distributed layer, native soil deposits of sandy clayey silt, trace to some gravel. These deposits were greyish/grey to brown, firm to hard, no odour, moist to wet, trace gravel, occasionally cobbles are encountered.

# 5.0 HYDROGEOLOGICAL CONDITIONS

## 5.1 Hydrogeology

Groundwater and surface water are expected to flow towards the natural slope of the ground surface. Although the surface topography typically has great influence on the groundwater flow it has been observed in several areas that bedrock topography also has a significant influence on the flow, in some cases more so than surface topography. In the latter case, this is believed to be due to relatively impermeable bedrock underlying a much more permeable silt overburden. Based on the regional topography, groundwater flow is inferred to be in a southwestern direction towards the Humber River. The groundwater flow direction may also be influenced by utility trenches and other subsurface structures and may migrate in the bedding stone of the subsurface utility trenches.

During the hydrogeological investigation on the site, three groundwater monitoring wells were installed within the annulus of borehole BH-1, BH-2, and BH-4 (Figure 4). The wells were constructed of 51 mm (2") PVC risers with a 3.05m long Schedule 40 PVC slotted well screen. A 'J-plug' secure end cap was installed at the top of the riser pipe with a threaded drive-point at the bottom of the well screen. The borehole annulus was backfilled with silica sand to approximately 0.3m above the well screen. A bentonite seal was placed on the sand pack to about 0.3mbgs. Each well was fitted with a dedicated low-flow sampling tubing and a protective, a steel well protector was installed around the riser. The wells were installed by A&A Environmental Consultants Inc., licensed well technicians in accordance with Ontario Regulation 903.

These wells are used to determine the direction of groundwater flow and quality of the groundwater. A level survey was conducted at the site, which consisted of measuring the elevation of the top of the well casings, relative to a benchmark. This level survey was conducted to provide information used to calculate the groundwater table elevation, hydraulic gradient and flow direction. Groundwater levels were obtained from each monitoring well on October 22, 2022, November 10, 2022, December 02, 2022, December 16, 2022, December 29, 2022, and January 13, 2023. They were recorded to the nearest 0.01 m accuracy, using an electronic water-

table level tape. The total depth of each well was measured and recorded. The groundwater elevations are shown in the well logs (see Tables 1-2 below). These show the highest elevation near MW-1 near the south end of the site and the lowest at MW-4 near the middle of the subject site.

Groundwater flow direction was determined using the groundwater elevation on site from the January 13, 2023 groundwater monitoring event.

**Table 1 – Monitoring Well Details January 13, 2023**

| Project #6765-Gill Caledon<br>0' Dixie Road, Caledon, Ontario | | | |
|---|---|---|---|
| **Date Logged: January 13, 2023** | **Logged by: J. Osborne** | | |
| **Monitoring Well #** | **MW-1** | **MW-2** | **MW-4** |
| **Location** | Southeast Area of Subject Site | Northeast Area of the Subject Site | North Middle Area of the Subject Site |
| **Pipe Size (mm)** | 51 | 30.5 | 30.5 |
| **UTM Zone** | 17T | 17T | 17T |
| **Easting** | 596423 | 596428 | 596603 |
| **Northing** | 4847045 | 4847184 | 4847276 |
| **Top of Pipe (masl)** | 262.849 | 259.622 | 259.437 |
| **Water Level (m)** | 1.713 | 0.411 | 0.606 |
| **Water Level (masl)** | 261.136 | 259.211 | 258.831 |
| **Total Depth (m)** | 6.548 | 4.964 | 6.728 |
| BM = 264.00 masl, Ground surface near Fire Hydrant, South Corner of Subject Site | | | |

**Table 2 – Groundwater Monitoring Program Levels**

| Monitoring Well | Elevation (masl) | Groundwater Elevations (masl) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 22-Oct-22 | 10-Nov-22 | 02-Dec-22 | 16-Dec-22 | 29-Dec-22 | 13-Jan-23 |
| MW-1 | 262.849 | 258.715 | 258.835 | 258.910 | 259.055 | 259.114 | 261.136 |
| MW-2 | 259.622 | 258.187 | 258.243 | 258.271 | 258.714 | 258.864 | 259.211 |
| MW-4 | 259.437 | 258.034 | 258.309 | 258.361 | 258.632 | 258.594 | 258.831 |

The seasonal change in groundwater hydraulic gradient due to rainfall and spring runoff have a significant influence on the groundwater flow velocities. The groundwater flow velocities were calculated using a hydraulic gradient of 0.0136 m/m (MW-1 to MW-4), using January 13, 2023 groundwater elevation and the hydraulic conductivity of 1 x $10^{-5}$ cm/s for silt and clay materials,

with an estimated porosity of 35% (Fetter 2001). The average linear velocity can thus be calculated using the following equation:

$$v = \frac{ki}{n}$$

Where "k" is the hydraulic conductivity, "i" is the hydraulic gradient, and "n "the porosity. By using the above information, the average linear velocities for the silt and clay materials are estimated to be 0.123 m/year.

A groundwater contour map, shown below in Figure 5, Appendix A, was plotted using Golden Surfer™ (Surfer 8) and the measurements of groundwater levels taken on January 13, 2023 from three monitoring wells installed in the unconfined aquifer. This map shows MW-4 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in northeastern direction.

## 5.2 Meteorological Conditions

Meteorological conditions, such as precipitation (rainfall and snowfall) and temperature are of particular interest for understanding the existing surface water regime; the amount of water available for groundwater recharge; and for developing a surface water management system at the subject site. Data for 2022 describing the climatic variables was obtained from the Environment Canada meteorological station "Bolton SPS", located in Caledon, Ontario (Table 3). However, climate varies across large area both spatially and temporally with local variation created by such factors as topography and prevailing winds. Human activities can also affect local climate. Deforestation may increase stream and peak flood flows while decreasing evapotranspiration. Urbanization can increase cloudiness, precipitation and extreme winter temperatures while decreasing relative humidity, incident radiation and wind speed (Phillips and McCulloch, 1972).

The total precipitation (rainfall plus snowfall) in 2022 was 1,064 mm, with the greatest amounts falling in June and July. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in February.

**Table 3 – 2022 Meteorological Data (Caledon, ON)**

| MONTH | TOTAL PRECIPITATION (mm) | MEAN TEMPERATURE (°C) |
|---|---|---|
| JANUARY | **138.4** | **-4.9** |
| FEBRUARY | **76.7** | **-9.8** |
| MARCH | **43.4** | **0.6** |
| APRIL | **93.0** | **2.1** |
| MAY | **67.8** | **11.7** |
| JUNE | **54.8** | **18.5** |
| JULY | **109.2** | **20.0** |
| AUGUST | **82.3** | **20.2** |
| SEPTEMBER | **35.6** | **12.8** |
| OCTOBER | **127.3** | **9.4** |
| NOVEMBER | **175.6** | **-1.9** |
| DECEMBER | **60.0** | **-8.0** |
| **SUM** | **1064** | |
| **AVERAGE** | | **5.9** |

*Denotes incomplete data

Climate is usually defined as normals (or averages) of weather variable over a 30-year period as defined by the World Meteorological Organization (WMO). These "climate normals" refer to arithmetic calculations based on observed climate values for a given location over a specified time period. Climate normals are often used to classify a region's climate and for research in many environmental fields. There are many ways to calculate "climate normals" and the most useful ones adhere to accepted standards. The WMO considers thirty years long enough to eliminate year-to-year variations. Thus, the WMO climatological standard period for normal's calculations are computed over a 30-year period of consecutive records, starting January 1st and ending December 31st. In addition, the WMO established that normal's should be arithmetic

means calculated for each month of the year form daily data with a limited number of allowable missing values.

The average annual precipitation from 1992-2022 was calculated using historical data collected at the "Bolton SPS" meteorological station, located in Caledon, Ontario and the Toronto and Region Conservation Authority (TRCA) Water Balance Tool. The average annual precipitation was used to estimate the total amount of water available for surface water and groundwater resources. The average annual precipitation over the thirty-year period was 868 mm. For the same period, it was calculated that approximately 597 mm/year would be lost to evapotranspiration leaving a total of approximately 271 mm/year available for groundwater recharge and surface runoff (Environment Canada, 2022).

The natural freeze-thaw cycle, which occurs each year in southern Ontario, significantly impacts the rate and timing of surface water runoff and groundwater recharge. Typically, watercourses in the Caledon area are frozen over by late January and clear by late March to mid April. There is usually snow on the ground by the end of December, with the greatest accumulations in January and February. By late March, warmer spring temperatures melt the snow pack and normally there is little or no snow cover remaining by the end of April. From January to early March surficial soils are normally frozen and relatively impervious to infiltration. Most of the spring melt waters end up as surface runoff, contributing to high flows in the water bodies near the site.

Climate change has had a significant impact on this region and other regions of Canada. In recent years, it has been noted that snow does not accumulate on the ground until January, rather than in late December. In a warming climate, more precipitation will fall in the form of rain rather than snow, filling reservoirs to capacity earlier than normal. Additionally, a warming climate will result in snow melting earlier in the year than in previous decades, disrupting the traditional timing of melt water runoff. Together, these changes mean less snow accumulation in the winter and earlier snow-derived water runoff in the spring, challenging the capacities of existing water reservoirs.

## 5.3 Groundwater Recharge

Recharge or infiltration to the groundwater system occurs by the migration of precipitation through the surficial soil. The amount of recharge or infiltration at a specific site depends on the amount of precipitation evaporated back into the atmosphere, the amount of water transpired from natural vegetation to the air, site topography, type of vegetation and surficial soil type. Surficial geology influences recharge rates. Areas of hummocky topography exhibit higher recharge rates since soil run-off collects in depressions where it can then infiltrate through the surficial soils. Reduction in recharge within urban settings occur due to paved driveways/roads or impermeable rooftop surfaces.

## 5.4 Hydraulic Properties

The amount and rate of groundwater flow through porous media is determined by the hydraulic properties of the unit, particularly hydraulic conductivity (K), the hydraulic gradient and porosity. The response of a flow system to various stresses is largely determined by the previously mentioned parameters along with storage. Hydraulic conductivity is a key hydraulic parameter that can be estimated by numerous field and laboratory methods including slug tests and pumping tests.

## 5.5 Site-Level Water Balance

The basic water balance for a particular area can be expressed as:

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

(Thornthwaite and Mather, 1957)

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Runoff (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero under steady state conditions) (mm/year)

Based on the Thornthwaite and Mather methodology, the water balance is accounting water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from surface water and vegetation (ET). When long-term average values of P, R, I, and ET are used there is minimal or no net change to groundwater storage (ΔS).

### 5.5.1 Precipitation and Evapotranspiration

Based on the Canada Climate Normals data from Environment Canada for "Bolton SPS" station between 1992 and 2022 (Environment Canada, 2022); the average annual precipitation was 868 mm. For the same period, it was calculated that approximately 597 mm/year would be lost to evapotranspiration; leaving a total of approximately 271 mm/year available for groundwater recharge and surface runoff.

### 5.5.2 Infiltration and Runoff

As indicated, there is a water surplus of 271 mm/year at the Site, which becomes the infiltration and runoff components of the water balance. The rate of infiltration at a site is expected to vary, based on a number of factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface runoff, the MECP infiltration factor was used. The MECP Stormwater Management (SWM) Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used and a corresponding runoff component was calculated for the soil moisture storage conditions. The calculated volumes of infiltration and runoff in the stage of pre-development and post-development are presented in Appendix F and are discussed as follows.

#### 5.5.2.1 Pre-Development

Considering the fact that the site is fairly level, medium combination of silt and clay, and is currently a vacant property; the site may have an infiltration factor of 0.4, i.e., 40% of water surplus (108.4 mm/year). In the meantime, a total of 162.6 mm/year will become the runoff. Based on the Site's area of 89,520 $m^2$, a total of 9,704 $m^3$ per year will infiltrate, while a total volume of 14,556 $m^3$ per year will become runoff.

#### 5.5.2.2 post-Development

Based on the information provided by the site plan, it is anticipated that after development, approximately 9% of the site area will be the impervious and hard surface area occupied by the buildings and parking area and 91% will be the pervious area, unpaved areas represent landscaped and green area.

Assuming that 20% of the precipitation will become the evaporation in the non-permeable surface areas, the infiltration volume was calculated to be 875.8 $m^3$ per year, which is a deficit of 1,584.2 $m^3$ per year after the development, while the runoff volume was calculated to be 8,834.1 $m^3$ per year, which is a surplus of 18,823.6 $m^3$ per year after the development.

Based on the water balance assessment, moderate changes are anticipated in the infiltration and runoff due to the proposed development at the subject site. There will be an increase in surface runoff due to the development on-site. Due to the large size of the site and high runoff rate, a stormwater management plan will be needed to manage the stormwater runoff on site.

#### 5.5.2.3 Low Impact Developments (LIDs)

Low impact development (LID) practices have been used to reduce peak storm flows, provide water retention and water quality treatment. From a SWM plan, an LID can be used to alter the post development water balance. This will reduce the post-development impact by increasing the infiltration and reducing the runoff. With the implementation of LIDs, the LID infiltration rate will need to be 4,267.7 $m^3$ per year or more. This will increase the total post-development infiltration to 13,101.8 $m^3$ per year and reduce the runoff to 14,556.0 $m^3$ per year, providing the site with infiltration rates and runoff rates that are equivalent or better than the pre-development conditions.

## 5.6 Groundwater Discharge

As part of the water cycle, groundwater is a major contributor to flow in many streams and rivers and strongly influences river and wetland habitats for plants and animals. Groundwater enters the ground in recharge areas and leaves the ground at discharge points. Discharge is continuous as long as sufficient water is available above the discharge point. The most visible evidence of

groundwater discharge occurs as seepage or springs along watercourse banks and is also noted within stream beds as upwellings and boiling creek bed sediments. Based on the groundwater elevation encounter during this investigation groundwater discharge will not be required during the construction at this site.

### 5.6.1 Construction Dewatering Requirements

Construction dewatering is intended to lower the groundwater levels in the excavation areas in order to provide a "dry" working condition for excavations and construction of foundations and/or associated sewer systems.

The construction dewatering generally depends on the design specifications of the foundation and footings, and the proposed sewer system (invert elevation, length and size of underground utility pipes), and the site hydrogeological conditions such as existing ground water levels and flow regime. Drawdown levels are not required and dewatering discharge rates are not needed to achieve the required drawdown levels for maintaining a dry working condition and stable excavation bottom and slopes for the subject site.

### 5.6.2 Pre-construction Dewatering

Based on the proposed design plan, the new development consists of construction of a single-storey building and a large parking area. The building will be built as slab on grade with footings being put no deeper than 1.2 mbgs. The developed area at the Site is approximately 8,025 $m^2$. The ground surface is estimated to be at 261 masl but drops slowly at it approaches the unnamed creek.

### 5.6.3 In-Construction Dewatering

Based on the proposed development, the excavation for construction of the building footings will mainly take place in the till deposits. The till deposit as described before is characterized by predominantly clayey silt matrix, high in matrix carbonate content and clast poor. The lowest proposed footing elevation is at approximately 261.75 masl. The highest water level measured within the footprint of the proposed building was 261.136 in monitoring well MW-1, which is below the proposed designed footing and the target water level for construction. The site grade

will be raised with construction of the proposed development which will ensure that the groundwater will not have an impact on the development. The groundwater level on site would not impact construction to the point of needing a planned dewatering discharge flow for dry conditions. Groundwater isn't expected to impact construction, however if groundwater does rise due to wetter than expected seasons, water can be pumped from the excavation pit to another lower lying area on site.

### 5.6.4 Post-Construction Dewatering

Based on the proposed development, the excavation for construction of the building footings will mainly take place in the overburden materials (clayey sand and silt). The lowest proposed floor elevation is at approximately 264 masl. The highest water level measured in the till deposits was 261.136 masl at monitoring well MW-1, which is below the proposed designed floor slab and the target water level for post-construction. Based on the obtain information, no long-term groundwater management is required because no post-construction discharge of groundwater is needed for the proposed development.

## 5.7 Permit-To-Take-Water/EASR Posting

Any construction dewatering or water takings in Ontario is governed by Ontario Regulation 387/04 – the Water Taking and Transfer, an Ontario Regulation made under the Ontario Water Resources Act (OWRA), and/or Ontario Regulation 63/16 – Registrations under Part II.2 of the Act – Water Taking, made under Environmental Protection Act.

According to O. Reg. 387/04, any water taking over 50,000 litres per day should not take place without a valid permit, which shall be applied in accordance with the MECP's Permit-to-Take-Water (PTTW) Manual, dated April 2005. According to O. Reg. 63/16, the construction site dewatering between 50,000 L/day and 400,000 L/day shall be registered through Environmental Activity and Sector Registry (EASR).

Based on the site condition, positive dewatering will not be workable at the Site for the building footings construction. The construction dewatering (likely by sump pumping) and post

construction drainage were evaluated to be in a mount below 50,000 L/day. Therefore, a PTTW or EASR posting will not be required.

# 6.0 POTENTIAL CONSTRUCTION DEWATERING IMPACTS

## 6.1 Local Water Use

A search of the MECP well records show a total of four wells located within 500 meters of the subject site as follows:

- two domestic wells,
- one monitoring well,
- one well with no use listed.

It is clear from the MECP water well database and the information obtained during the field survey that the local residents obtain their water from a municipal water supply system. Table 4 presents the summary of the wells from the well records, showing the UTM coordinates, drilling date, total depth and water found elevation. The MECP well records show groundwater was found at approximately 5.18 mbgs, for a well drilled in the unconfined aquifer to a depth of approximately 6.10 mbgs. The MECP well records show groundwater was found between 13.11 – 43.89 mbgs, for wells drilled in the confined aquifer to approximate depths of 17.68 – 45.11 mbgs. It should be noted that the water levels provided in these tables do not represent current water level depths because those wells more likely measured at the time of drilling. However, the drilling program completed at this site show the groundwater was found between 1.457 – 4.134 mbgs for monitoring wells drilled between 4.964 – 6.728 mbgs.

The Site and the surrounding properties are expected to be serviced by the municipal water system. Therefore, there should be no impact on the domestic water wells.

**Table 4 – Water Wells on and within 0.5 km of the Proposed Development**

| Well No. | UTM Coordinate Zone 17T | | Date Drilled | Total Depth | Water Level | Water Use |
|---|---|---|---|---|---|---|
| | Easting | Northing | | (mbgs) | (mbgs) | |
| 7130987 | 596372 | 4847110 | 2009 | Unknown | Unknown | No Use Listed |
| 4905710 | 597264 | 4847973 | 1980 | 45.11 | 43.89 | Domestic |
| 4901349 | 596270 | 4847023 | 1960 | 17.68 | 13.11 | Domestic |
| 7294666 | 596291 | 4847111 | 2016 | 6.10 | 5.18 | Monitoring |

## 6.2 Hydrological Evaluation

### 6.2.1 Wellhead Protection Sensitivity Area

The Site and the neighbouring properties are located within a wellhead protection area. There should be no impact on the public wells due to the construction dewatering due to the large proximity of the site to developed wells and the absence of construction dewatering.

### 6.2.2 Surface Water

During the site visits, no standing water was visible. There is an unnamed creek running through the middle of the subject site. There is a large setback of this creek from the development area so no surface water will be affected. After development of this site, a moderate increase to the amount of runoff water will be created. This should be considered during the creation of a SWM plan.

### 6.2.3 Potential Sources of Contamination

No sources of apparent environmental concern were noted on the site.

### 6.2.4 Ground Subsidence in Adjacent Structures

Under certain conditions, dewatering activities can cause ground settlement which results from the increase in effective stresses caused by the lowering of groundwater level and subsequent decrease in pore pressure. Based on obtained groundwater levels during this investigation, no influence is anticipated due to the new development.

# 7.0 GROUNDWATER QUALITY

## 7.1 Groundwater Sampling Protocol

Groundwater samples were collected from one of the monitoring wells using dedicated inertial samplers. Clean nitrile gloves were used to minimize the potential for secondary contamination of the samples. Sampling of the monitoring well, MW-1 was conducted December 16, 2022. The groundwater sampling was compared to the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53 – 2010.

Specific Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure that the groundwater samples collected and the subsequent chemical analysis of the samples provided representative results. Upon arrival at each well site, the well was inspected for signs of damage or interference, the well cap removed and the top-of-pipe depth to the water table and to the bottom of the well measured using a Solinst electric depth meter. The top-of-pipe to ground level was also measured. This data was recorded on the field monitoring log sheets and any abnormalities were noted. The volume of the water in the well was calculated and three times this volume was purged from the well using the pre-installed Waterra low-flow tubing. The samples were taken using low-flow peristaltic pumps. All samples were collected into the appropriate bottles, each supplied by the laboratory. Groundwater samples were kept on ice in coolers until delivered to AGAT Laboratories Ltd. (AGAT), of Mississauga, Ontario. AGAT is accredited by the Standards Council of Canada (SCC) and Canadian Association of Laboratory Accreditation (CALA) and is licensed for these tests by the MECP. All samples submitted to the laboratory were identified by a unique sample number. In addition, the laboratory carried out its own internal QA/QC procedures. The results of the chemical analyses are shown in the Certificates of Analysis in Appendix C**.**

## 7.2 Assessment of Water Quality

The following observations were made after careful review of the results of analysis. The health-related parameters tested were Arsenic; Cadmium; Chromium; Lead; and Fluoride. The non-

health related parameters tested were pH; Total Suspended Solids; Aluminum; Copper; Manganese; Titanium and Zinc.

### 7.2.1 Health Related Parameters

- **Total Arsenic:** Arsenic is a semi-metal, a member of the nitrogen family occurring naturally in the environment. It is odorless and tasteless. Consumption in food and water are the major sources of arsenic exposure for the majority of North American citizens. People may also be exposed from industrial sources, as arsenic is used in semiconductor manufacturing, petroleum refining, wood preservatives, animal feed additives, and herbicides. Arsenic can combine with other elements to form inorganic and organic arsenicals. In general, inorganic derivatives are regarded as more toxic than the organic forms and it is primarily the inorganic forms which are present in water. Exposure to arsenic at high levels poses serious health effects as it is a known human carcinogen. In addition, it has been reported to affect the vascular system in humans and has been associated with the development of diabetes. In the monitoring wells, indication of levels of arsenic fell well below the allowable limit for the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Total Cadmium:** Cadmium is a rare element that is extremely unlikely to be present as a significant natural contaminant in drinking water. Cadmium compounds used in electroplated materials and electroplating wastes may be a significant source of drinking water contamination. Other than occupational exposure and inhalation from cigarette smoke, food is the main source of cadmium intake. In the monitoring wells, indication levels of cadmium fell far below the allowable limit of 0.7 mg/L for the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Total Chromium:** If Chromium is present in raw water, it may be oxidized to a more harmful hexavalent form during chlorination. Chromium in the more highly oxidized form may be present in older yellow paints and in residues from plating operations and around old re-circulating water cooling systems. In the monitoring wells, indication levels of total chromium fell far below the allowable limit of 2 mg/L for the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

- **Lead:** Lead is typically only present as a result of corrosion of lead solder, lead containing brass fittings or lead pipes which are found close to or in domestic plumbing and the service connection to buildings. Lead ingestion should be avoided particularly by pregnant women and young children, who are the most susceptible. It is recommended that only the cold-water supply be used for drinking/consumption and only after five minutes of flushing to rid the system of standing water. Corrosion inhibitor addition or other water chemistry adjustments may be made at the treatment plant to reduce lead corrosion rates where necessary. In the monitoring wells, levels of lead fell far below the allowable limit of 1 mg/L for the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Fluoride:** When fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5-0.8 mg/L, the optimum level for control of tooth decay. Where supplies contain naturally occurring fluoride at levels higher than 1.5 mg/L but less than 2.4 mg/L the Ministry of the Health and Long-Term Care recommends an approach through local boards of health to raise public and professional awareness to control excessive exposure to fluoride from other sources. In the monitoring wells, indication levels of Fluoride fell far below the allowable limit of 10 mg/L for the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

### 7.2.2 Non-health Related Parameters

- **pH:** pH is a parameter that indicates the acidity of a water sample. The principal objective in controlling pH is to produce a water that is neither corrosive nor produces incrustation. In the monitoring well tested, indication of pH levels fell within the appropriate range set out by the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Total Suspended Solids (TSS):** TSS are particles that are larger than 2 microns found in the water column. Most suspended solids are made up of inorganic materials, though bacteria and algae can also contribute to the total solid's concentration. Pollutants such as dissolved metals and pathogens can attach to suspended particles and enter the water.

TSS was found to be below the standard of 350 mg/L, set out by the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

- **Total Aluminum:** Aluminum in untreated water is present in the form of fine particles of alumino-silicate clay. These clay particles are effectively removed in coagulation/filtration. Aluminum found in coagulant treated water is due to the presence of aluminum left over from use of the coagulant. High aluminum can cause coating of the pipes resulting in increased energy requirements for pumping, interference with certain industrial processes and flocculation. Medical studies have not provided clear evidence that residual aluminum has any effect on health. The total aluminum found in the monitoring wells sampled, does not exceeded Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Total Copper:** Copper occurs naturally in the environmental but is rarely present in raw water. Copper is used extensively in domestic plumbing in tubing and fittings and is an essential trace component in food. Although the intake of large doses of copper has resulted in adverse health effects such as stomach upsets, the levels at which this occurs are much higher than regulated limits. In the monitoring wells, copper was below the standard set by Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Total Manganese:** Manganese is objectionable in water supplies because it stains black and produces an undesirable taste. Manganese is present in some groundwater because of chemically reducing underground conditions coupled with presence of manganese mineral deposits. Manganese is also occasionally present, seasonally, in surface waters when anaerobic decay processes in sediments occurring. Total Manganese in the samples collected from the monitoring well fell below the standards set out by Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.
- **Total Titanium:** Titanium is an element found naturally in many igneous and sedimentary rocks. Titanium compounds are stable in soil, so only small amounts of titanium end up in water from the weathering of rocks. Titanium may also be present in groundwater due to manufacturing effluent. Titanium is relatively non-toxic. It does not accumulate in the

human body. Total Titanium in the samples collected from the monitoring well fell below the limits set out by Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

- **Total Zinc:** Zinc occurs in small amounts in almost all igneous rocks. The natural zinc content in soil is estimated to be 1-300 mg/kg. Zinc can impart an undesirable taste to drinking water. In natural surface water the concentration of zinc is usually below 10µg/L and in groundwater is between 10-40 µg/L. Acute toxicity can occur in humans if excessive amounts of zinc are ingested. Total Zinc in the groundwater samples analyzed fell below the guidelines set out by the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

Results of analysis were compared to Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010. The results can be found below in Table 5.

**Table 5 – Summary of Groundwater Samples**

| **Sample Description** | **4627298** | | | |
|---|---|---|---|---|
| **Date Sampled** | **12/16/2022** | | | |
| **Parameter** | **Unit** | **G / S** | **RDL** | **MW-1** |
| **CBOD5** | | | | |
| Biochemical Oxygen Demand, Carbonaceous | mg/L | | 2 | <2 |
| **Nonylphenols & Nonylphenol Ethoxylates (HPLC)** | | | | |
| Nonylphenols | mg/L | | 0.001 | <0.001 |
| Nonylphenols Ethoxylates | mg/L | | 0.01 | <0.01 |
| **Peel Region Sanitary - Organics** | | | | |
| Oil and Grease (animal/vegetable) in water | mg/L | 150 | 0.5 | <0.5 |
| Oil and Grease (mineral) in water | mg/L | 15 | 0.5 | <0.5 |
| Methylene Chloride | µg/L | 2000 | 0.3 | <0.0003 |
| trans-1,3-Dichloropropene | µg/L | 140 | 0.30 | <0.0009 |
| Methyl Ethyl Ketone | µg/L | 8000 | 0.9 | <0.0002 |
| cis- 1,2-Dichloroethylene | µg/L | 4000 | 0.2 | <0.0002 |
| Chloroform | µg/L | 40 | 0.2 | <0.0002 |
| Benzene | µg/L | 10 | 0.2 | <0.0002 |
| Trichloroethylene | µg/L | 400 | 0.2 | <0.0002 |
| Toluene | µg/L | 270 | 0.2 | <0.0002 |
| Tetrachloroethene | µg/L | 1000 | 0.1 | <0.0003 |
| Ethylbenzene | µg/L | 160 | 0.1 | <0.0001 |
| 1,1,2,2-Tetrachloroethane | µg/L | 1400 | 0.1 | <0.0001 |

| Sample Description | 4627298 | | | |
|---|---|---|---|---|
| Date Sampled | 12/16/2022 | | | |
| **Parameter** | **Unit** | **G / S** | **RDL** | **MW-1** |
| Styrene | µg/L | 200 | 0.1 | <0.0001 |
| 1,2-Dichlorobenzene | µg/L | 50 | 0.1 | <0.0001 |
| 1,4-Dichlorobenzene | µg/L | 80 | 0.1 | <0.0001 |
| m & p-Xylene | µg/L | | 0.2 | <0.0002 |
| o-Xylene | µg/L | | 0.1 | <0.0001 |
| Xylenes (Total) | µg/L | 1400 | 0.2 | <0.0001 |
| Toluene-d8 | % Recovery | | 1 | 101 |
| 4-Bromofluorobenzene | % Recovery | | 1 | 88 |
| PCBs | µg/L | 1 | 0.2 | <0.0002 |
| Decachlorobiphenyl | % | | 1 | 88 |
| Di-n-butyl phthalate | µg/L | 80 | 0.5 | <0.0005 |
| Bis(2-Ethylhexyl) phthalate | µg/L | 12 | 0.5 | <0.0005 |
| 2,4,6-Tribromophenol | % | | 1 | 89 |
| 2-Fluorophenol | % | | 1 | 85 |
| Chrysene-d12 | % | | 1 | 84 |
| phenol-d6 surrogate | % | | 1 | 79 |
| **Peel Region Sanitary Sewer Use By-Law - Inorganics** | | | | |
| pH | pH Units | 6.0-10.5 | NA | 7.88 |
| Total Suspended Solids | mg/L | 350 | 10 | <10 |
| Fluoride | mg/L | 10 | 0.05 | <0.05 |
| Sulphate | mg/L | 1500 | 0.10 | 62.2 |
| Cyanide, SAD | mg/L | 2 | 0.002 | <0.002 |
| Phenols | mg/L | 1 | 0.004 | 0.027 |
| Total Kjeldahl Nitrogen | mg/L | 100 | 0.10 | <0.02 |
| Total Aluminum | mg/L | 50 | 0.020 | <0.10 |
| Total Antimony | mg/L | 5 | 0.040 | 0.222 |
| Total Arsenic | mg/L | 1 | 0.030 | <0.020 |
| Total Cadmium | mg/L | 0.7 | 0.010 | <0.015 |
| Total Chromium | mg/L | 2 | 0.040 | <0.010 |
| Total Cobalt | mg/L | 5 | 0.040 | <0.015 |
| Total Copper | mg/L | 3 | 0.030 | <0.020 |
| Total Lead | mg/L | 1 | 0.040 | <0.010 |
| Total Manganese | mg/L | 5 | 0.040 | <0.020 |
| Total Mercury | mg/L | 0.01 | 0.0002 | 0.091 |
| Total Molybdenum | mg/L | 5 | 0.040 | <0.0002 |
| Total Nickel | mg/L | 2 | 0.030 | <0.020 |
| Total Phosphorus | mg/L | 10 | 0.02 | <0.015 |

| Sample Description | 4627298 | | | |
|---|---|---|---|---|
| Date Sampled | 12/16/2022 | | | |
| **Parameter** | **Unit** | **G / S** | **RDL** | **MW-1** |
| Total Selenium | mg/L | 1 | 0.004 | <0.002 |
| Total Silver | mg/L | 5 | 0.040 | <0.010 |
| Total Tin | mg/L | 5 | 0.050 | <0.025 |
| Total Titanium | mg/L | 5 | 0.020 | <0.010 |
| Total Zinc | mg/L | 2 | 0.040 | <0.020 |

**Comments:** RDL - Reported Detection Limit;

G / S - Guideline / Standard: Refers to Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010

NOTE: Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

# 8.0 CONCLUSIONS AND RECOMMENDATION

The assessment of the available data indicates that:

- A&A was retained by the client, to evaluate the potential impact from the proposed commercial development on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The site lies in the southern area of Caledon, Ontario at '0' Dixie Road. The area of the site is approximately 89,520 $m^2$ (22.12 acres). At the time of the investigation, the site was vacant.
- The topography in the vicinity of the subject site (a 100-meter radius) ranges from approximately 264 masl to the west to 246 masl to the east site and was observed to be slightly hilly in the western portion with an unnamed creek flowing northeast through the central area of the site.
- The MECP well records show groundwater was found at approximately 5.18 mbgs, for a well drilled in the unconfined aquifer, and approximately between 13.11 – 43.89 mbgs, for a well drilled in the confined aquifer. The drilling program completed at this site confirms the groundwater was measured between 1.457 – 4.134 mbgs for monitoring wells drilled between 4.964 – 6.728 mbgs.
- The water table in the study area was defined by installing a total of three monitoring wells in the area of the proposed development and monitoring these wells on the subject site. The monitoring wells installed by A&A were drilled to a maximum depth of 6.728 mbgs. All wells contained water in each of the six monitoring events. It was concluded that groundwater was present on site at elevations between 258.034 – 261.136 masl.
- A groundwater contour map was plotted using "Golden Software" (Surfer 8) and the measurements of groundwater levels taken on January 13, 2023 from three monitoring wells. This map shows well MW-4 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in northeast direction.
- The total precipitation (rainfall plus snowfall) in 2022 was 1,064 mm. The average annual precipitation over the last thirty-year period was 868 mm. For the same period, it was calculated that approximately 597 mm/year would be lost to evapotranspiration; leaving

a total of approximately 271 mm/year available for groundwater recharge and surface runoff.

- Based on the water balance assessment, moderate changes are anticipated in the infiltration and runoff due to the proposed development at the subject site. There will be an increase in surface runoff due to the development on-site. Due to the large size of the site and high runoff rate, a stormwater management plan will be needed to manage the stormwater runoff on site.
- The analysis results indicate that all health and non-health related parameters were below the standards as outlined in the Regional Municipality of Peel - Limits for Sanitary Sewer Discharge By-law 53-2010.

Based on the obtained information from this study, A&A has the following recommendations:

1. Due to the increased runoff rate on site post development and the large size of the subject site, a stormwater management plan is recommended. Proper planning as well as implementing LIDs will mitigate the stormwater that accumulates.

2. Due to the water levels being below the foundation bottom, the excavation area will NOT need to undergo in-construction and post-construction dewatering.

3. No adverse impact on the groundwater resources is expected to occur during the development of the subject site with the implementations of these recommended actions.

SIGNED:

Thomas Demers, P. Eng., $QP_{ESA}$
Project Manager

SIGNED:


Dr. Ali A. Rasoul, Ph.D., EP, P. Geo.
Senior Hydrogeologist

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# 10.0 QUALIFICATIONS OF THE ASSESSORS

A & A Environmental Consultants Inc. is a multi-disciplinary environmental consulting firm offering consulting services in the fields of site assessments (Phase I-II), cleanups, water resource studies, aggregate permitting, landfill design and monitoring, geotechnical studies, air quality studies, designated substances surveys and environmental impact studies. A&A has more than 20 years of experience in environmental consulting in the province of Ontario, Alberta, Saskatchewan, British Columbia and have preformed thousands of projects from small scale Phase I ESAs to large scale landfill design, hydro-geological studies and groundwater management plans. We have a number of senior, experienced staff who consult in a variety of disciplines and offer our clients expert knowledge in both the technical aspects of a project and the environmental regulations applicable.

**Dr. Ali A. Rasoul, Ph.D., EP, P. Geo., QP**

**Principal Consultant**

The report was reviewed by Dr. Ali A. Rasoul, a Principal Consultant with A&A. He has over 20 years experience in his field. He has completed hundreds of environmental projects including Phase I/II/III ESAs, mould assessments, hydrogeological investigations, designated substances surveys and water management plans. He is a licensed Professional Geoscientist with the Association of Professional Geoscientists of Ontario and a licensed Well Technician in the Province of Ontario (Ministry of the Environment, Conservation and Parks). He is also a licensed Professional Geoscientist in Alberta, Saskatchewan and British Columbia. Dr. Rasoul is registered as a "Qualified Person" for conducting ESAs as defined under Ontario Regulation 153/04 and 511/09.

# 11.0 LIMITATIONS

The report was prepared for the exclusive use of the client. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from A&A will be required. With respect to third parties, A&A has no liability or responsibility for losses of any kind whatsoever including direct or consequential financial effects on transactions or property values, or requirement for follow-up actions and costs.

The investigation undertaken by A&A with respect to this report and any conclusions or recommendations made in this report reflect A&A's judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this site and it is based, in part, upon visual observations of the site as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, or portions of the site, which were unavailable for direct investigation. A&A has used professional judgment in analysing this information and formulating these conclusions.

A&A makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

# APPENDIX A – Site Maps

**Figure 1 – Map Showing the Site Location**

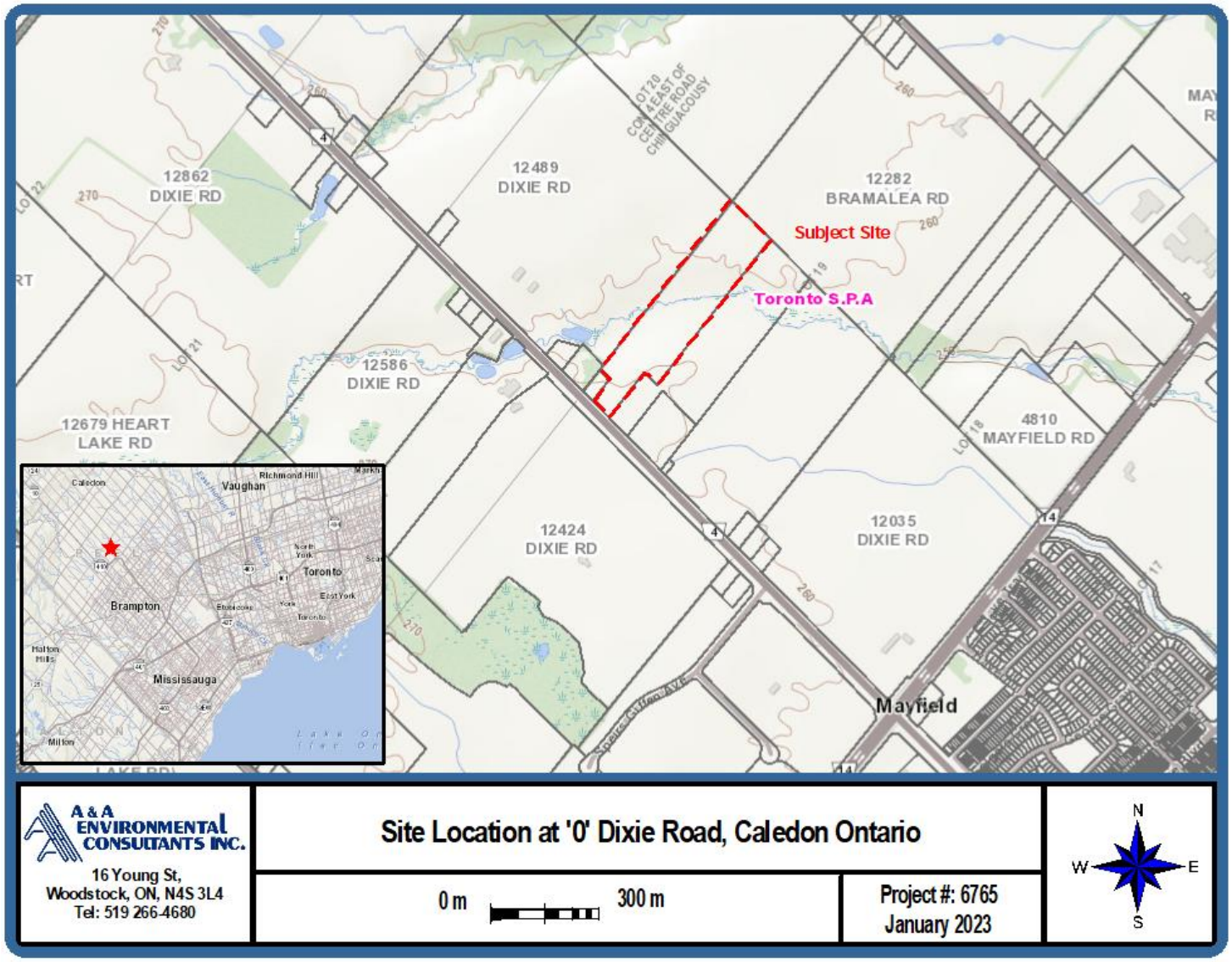


**Figure 2 – Satellite Map of Site and Subject Study Area**

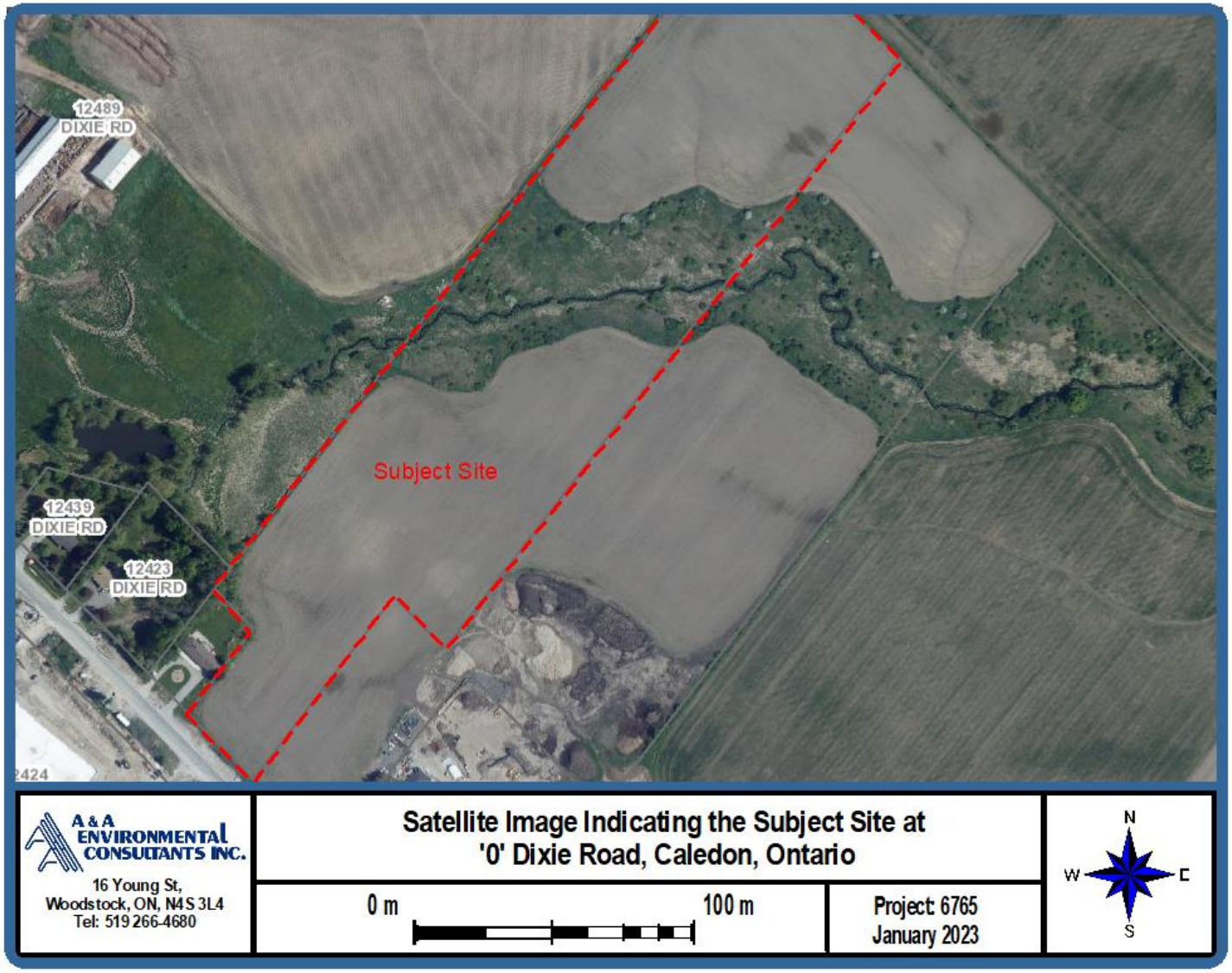


**Figure 3 – Topographic Map**

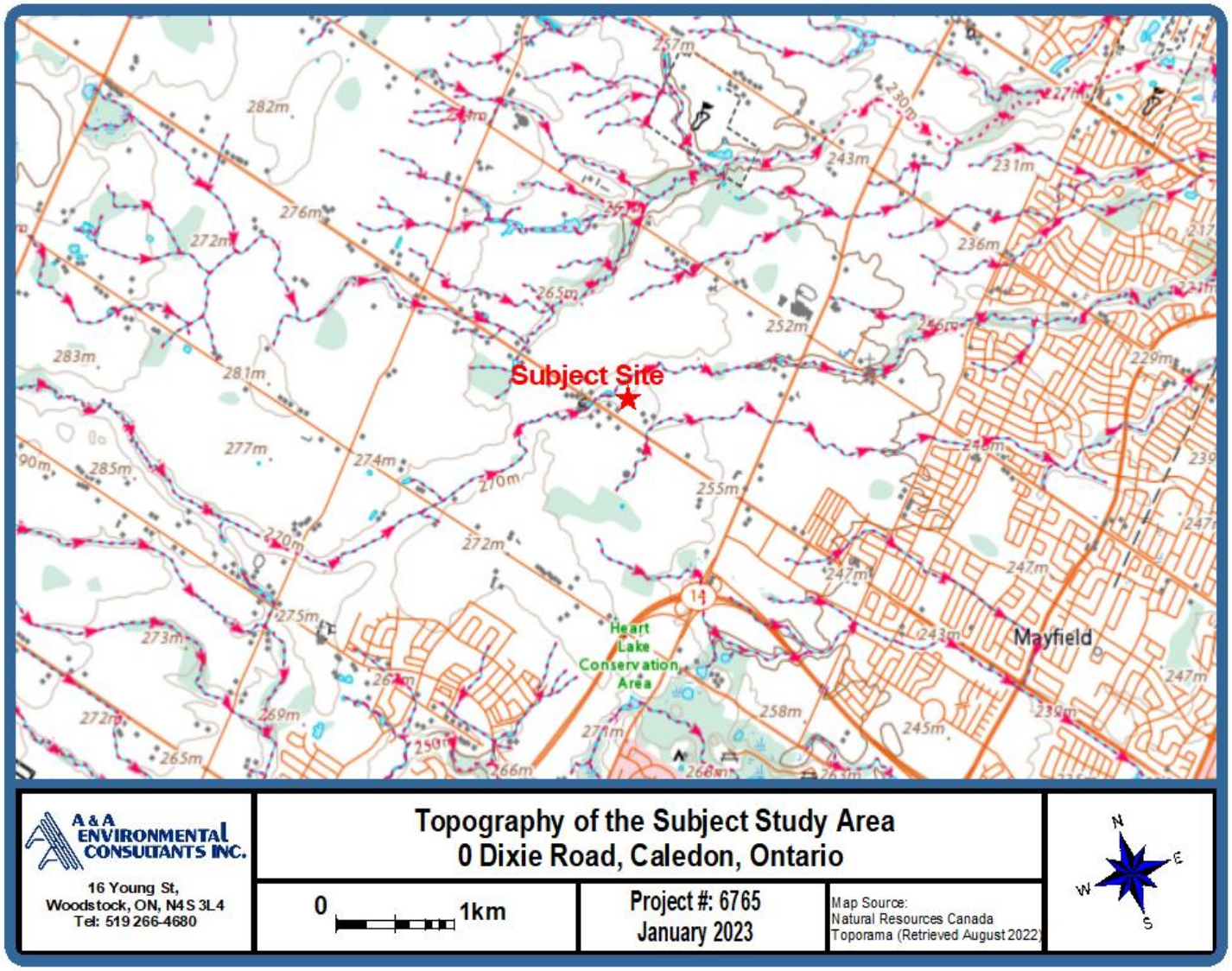


**Figure 4 – Monitoring Wells Location Map – Satellite Image**

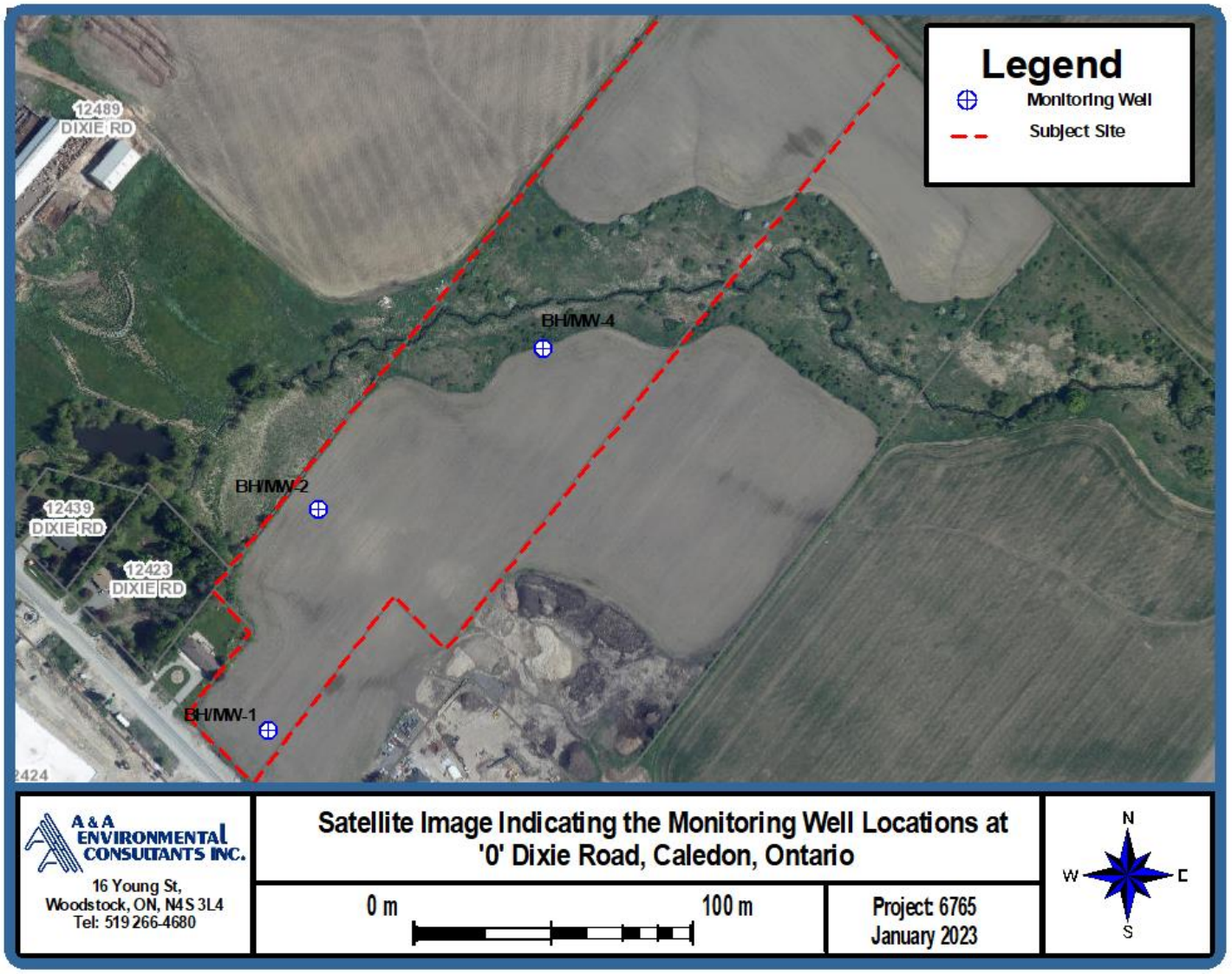


**Figure 5 – Groundwater Contour Map**

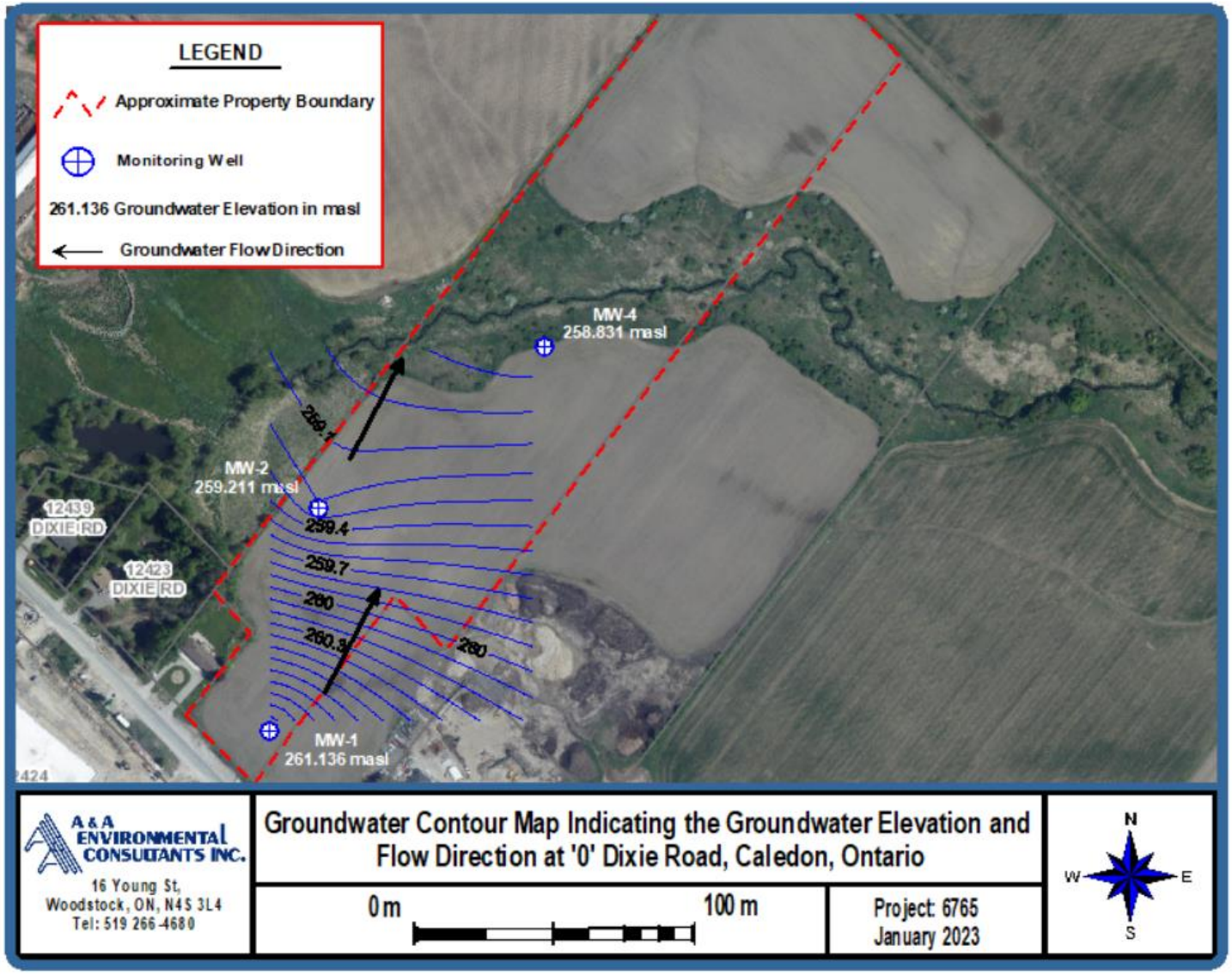
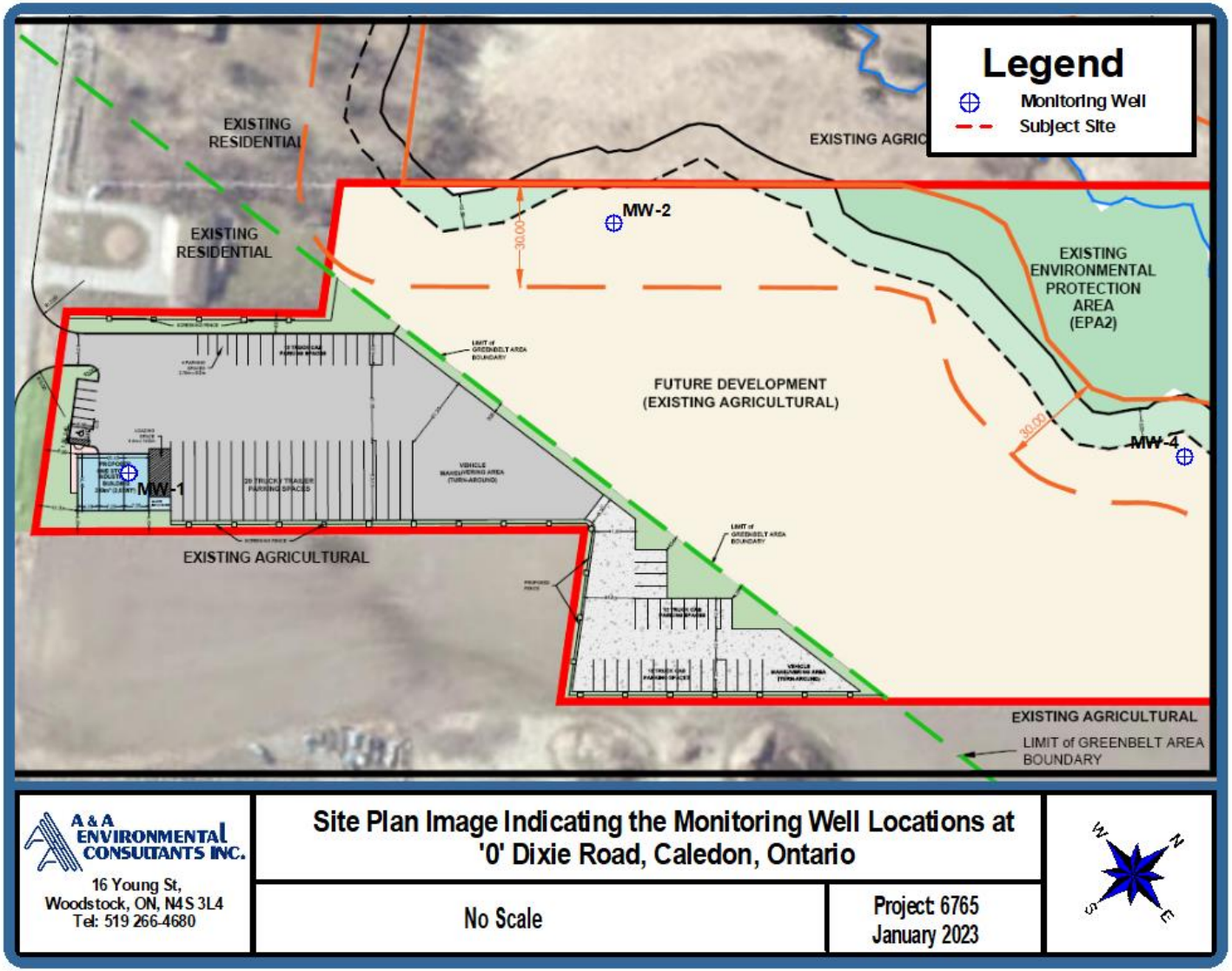


**Figure 6 – Monitoring Wells Location Map – Site Plan Image**

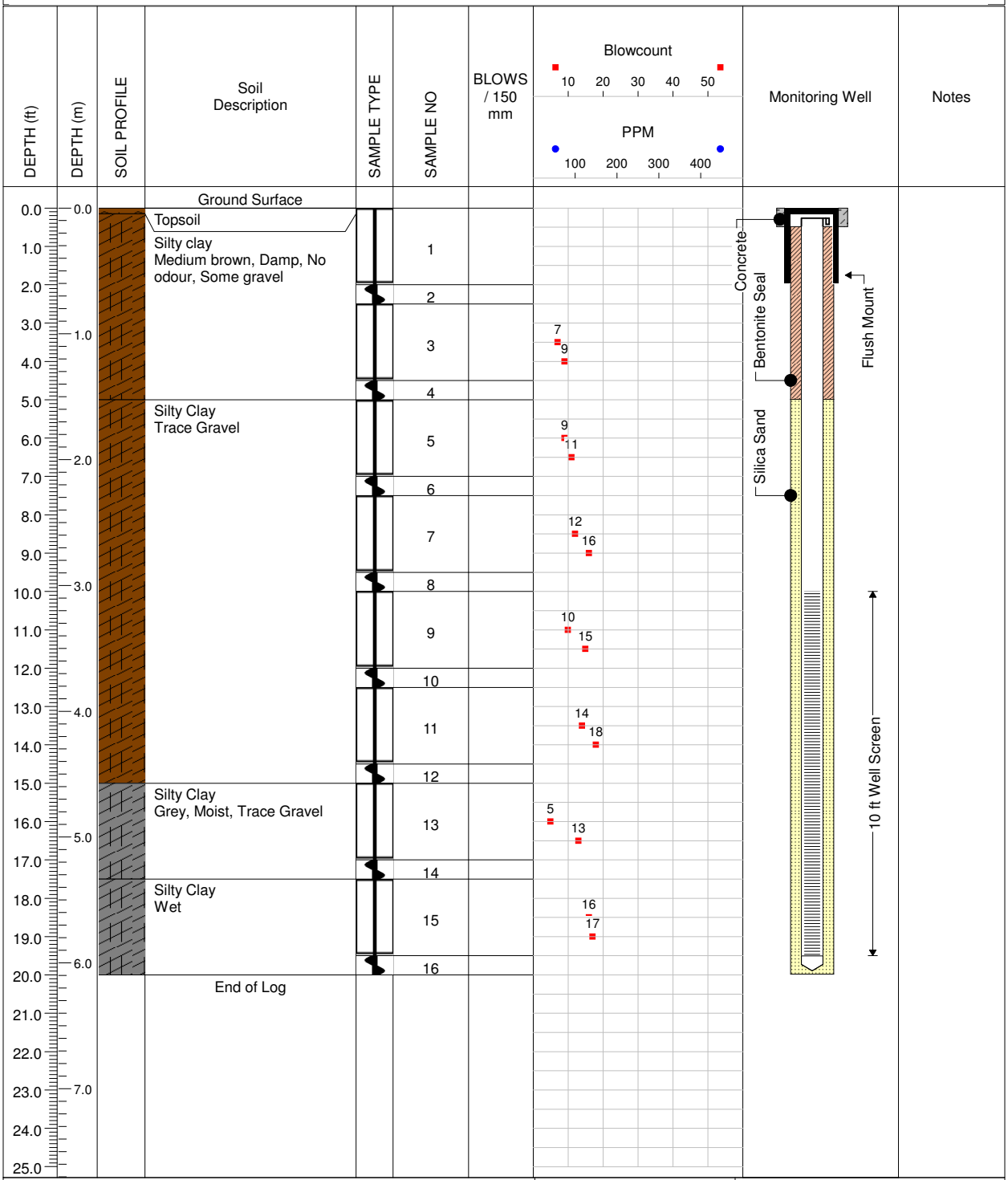


# APPENDIX B – Borehole Logs

| | | |
|---|---|---|
| **PROJECT:** Geotech/hydroGeo | **BH LOCATION:** Within industrial building footprint | **BOREHOLE NO: BH/MW1** |
| **PROJECT NO:** 6765 | **LOCATION:** 0 Dixie Road, Caledon ON | |
| **PROJECT MANAGER:** T. Demers | **COMPANY NAME:** A&A Environmental Consutants Inc | |

SAMPLE TYPE SHELBY TUBE CORE SAMPLE SPT SAMPLE GRAB SAMPLE NO RECOVERY

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



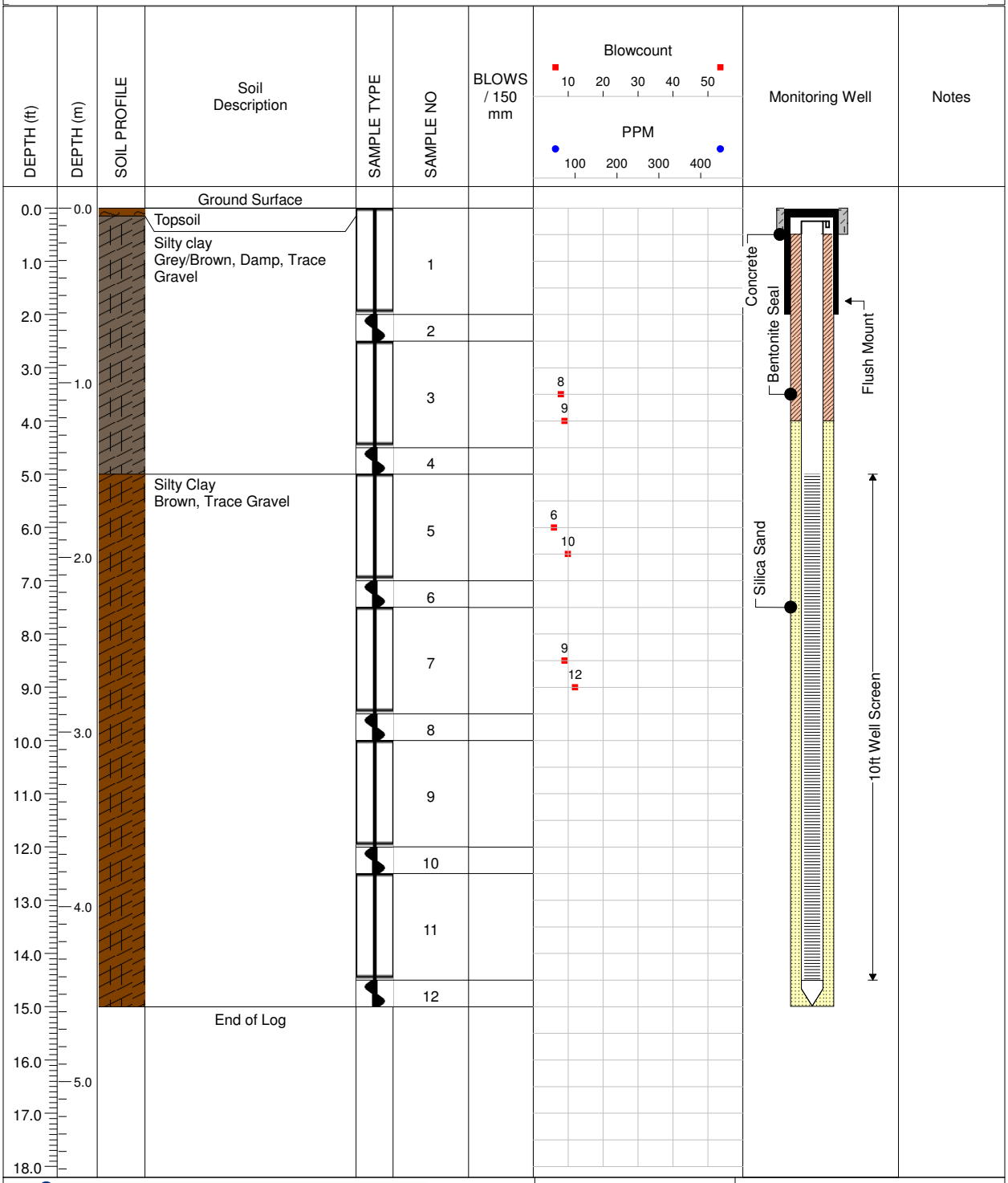

| | |
|---|---|
| **LOGGED BY:** E. Fulsom | **COMPLETION DEPTH:** 20ft |
| **REVIEWED BY:** A. Rasoul | **DRILL METHOD:** Split spoon/HSA |
| **DRILL DATE:** Oct 3, 2022 | **PAGE:** 1 of 1 |

A & A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

| | | |
|---|---|---|
| **PROJECT:** Geotech/hydroGeo | **BH LOCATION:** Central W boundary | **BOREHOLE NO: BH/MW2** |
| **PROJECT NO:** 6765 | **LOCATION:** 0 Dixie Road, Caledon ON | |
| **PROJECT MANAGER:** T. Demers | **COMPANY NAME:** A&A Environmental Consutants Inc | |

SAMPLE TYPE | SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE | BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS




| | |
|---|---|
| **LOGGED BY:** E. Fulsom | **COMPLETION DEPTH:** 15 |
| **REVIEWED BY:** A. Rasoul | **DRILL METHOD:** Split spoon/HSA |
| **DRILL DATE:** Oct 3, 2022 | **PAGE:** 1 of 1 |

A&A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

| | | |
|---|---|---|
| **PROJECT:** Geotech/hydroGeo | **BH LOCATION:** Proposed truck/trailer parking | **BOREHOLE NO: BH/MW4** |
| **PROJECT NO:** 6765 | **LOCATION:** 0 Dixie Road, Caledon ON | |
| **PROJECT MANAGER:** T. Demers | **COMPANY NAME:** A&A Environmental Consutants Inc | |

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS

| DEPTH (ft) | DEPTH (m) | SOIL PROFILE | Soil Description | SAMPLE TYPE | SAMPLE NO | BLOWS / 150 mm | Blowcount / PPM | Monitoring Well | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | | Ground Surface | | | | | | |
| 0.0 | 0.0 | | Topsoil | | | | | | |
| 1.0 | | | Silty clay<br>Brown/Grey, Damp, No odour | | 1 | | | | |
| 2.0 | | | | | 2 | | | | |
| 3.0 | 1.0 | | | | 3 | 8<br>9 | | | |
| 4.0 | | | | | 4 | | | | |
| 5.0 | | | Silty Clay<br>Trace Gravel | | 5 | 15<br>15 | | | |
| 6.0 | 2.0 | | | | 6 | | | | |
| 7.0 | | | | | 7 | 8<br>11 | | | |
| 8.0 | | | | | 8 | | | | |
| 9.0 | | | | | 9 | | | | |
| 10.0 | 3.0 | | | | 10 | | | | |
| 11.0 | | | | | 11 | | | | |
| 12.0 | | | | | 12 | | | | |
| 13.0 | 4.0 | | | | 13 | | | | |
| 14.0 | | | | | 14 | | | | |
| 15.0 | | | Silty Clay<br>Grey, Mosit, Some silt | | 15 | | | | |
| 16.0 | 5.0 | | | | 16 | | | | |
| 17.0 | | | | | | | | | |
| 18.0 | | | Silty Clay<br>Moist to wet | | | | | | |
| 19.0 | | | | | | | | | |
| 20.0 | 6.0 | | End of Log | | | | | | |
| 21.0 | | | | | | | | | |
| 22.0 | | | | | | | | | |
| 23.0 | 7.0 | | | | | | | | |
| 24.0 | | | | | | | | | |
| 25.0 | | | | | | | | | |

Blowcount: 10 20 30 40 50

PPM: 100 200 300 400

Monitoring Well: Concrete Seal; Bentonite Seal; Silica Sand; Flush Mount; 10 ft Well Screen

A & A ENVIRONMENTAL CONSULTANTS INC.
16 Young Street Woodstock, ON

| | |
|---|---|
| **LOGGED BY:** E. Fulsom | **COMPLETION DEPTH:** 20ft |
| **REVIEWED BY:** A. Rasoul | **DRILL METHOD:** Split spoon/HSA |
| **DRILL DATE:** Oct 3, 2022 | **PAGE:** 1 of 1 |

# APPENDIX C – Certificate of Chemical Analysis

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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http://www.agatlabs.com

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**
**16 Young Street**
**WOODSTOCK, ON N4S3L4**
**(519) 266-4680**
**ATTENTION TO: Ali Rasoul**
**PROJECT: 6764 6.11 Caledon**
**AGAT WORK ORDER: 22T981688**
**TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist**
**WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager**
**DATE REPORTED: Jan 03, 2023**
**PAGES (INCLUDING COVER): 11**
**VERSION*: 1**

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

*Disclaimer:*

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

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# Certificate of Analysis

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

## Peel Region Sanitary - Organics

**DATE RECEIVED: 2022-12-16** **DATE REPORTED: 2023-01-03**

| | | SAMPLE DESCRIPTION: | | MW-1 |
|---|---|---|---|---|
| | | SAMPLE TYPE: | | Water |
| | | DATE SAMPLED: | | 2022-12-16 |
| Parameter | Unit | G / S | RDL | 4627298 |
| Oil and Grease (animal/vegetable) in water | mg/L | 150 | 0.5 | <0.5 |
| Oil and Grease (mineral) in water | mg/L | 15 | 0.5 | <0.5 |
| Methylene Chloride | mg/L | 2 | 0.0003 | <0.0003 |
| Methyl Ethyl Ketone | mg/L | 8.0 | 0.0009 | <0.0009 |
| cis-1,2-Dichloroethylene | mg/L | 4 | 0.0002 | <0.0002 |
| Chloroform | mg/L | 0.04 | 0.0002 | <0.0002 |
| Benzene | mg/L | 0.01 | 0.0002 | <0.0002 |
| Trichloroethylene | mg/L | 0.4 | 0.0002 | <0.0002 |
| Toluene | mg/L | 0.27 | 0.0002 | <0.0002 |
| Tetrachloroethene | mg/L | 1 | 0.0002 | <0.0002 |
| trans-1,3-Dichloropropene | mg/L | 0.14 | 0.0003 | <0.0003 |
| Ethylbenzene | mg/L | 0.16 | 0.0001 | <0.0001 |
| 1,1,2,2-Tetrachloroethane | mg/L | 1.4 | 0.0001 | <0.0001 |
| Styrene | mg/L | 0.2 | 0.0001 | <0.0001 |
| 1,2-Dichlorobenzene | mg/L | 0.05 | 0.0001 | <0.0001 |
| 1,4-Dichlorobenzene | mg/L | 0.08 | 0.0001 | <0.0001 |
| m & p-Xylene | mg/L | | 0.0002 | <0.0002 |
| o-Xylene | mg/L | | 0.0001 | <0.0001 |
| Xylenes (Total) | mg/L | 1.4 | 0.0001 | <0.0001 |
| PCBs | mg/L | 0.001 | 0.0002 | <0.0002 |
| Di-n-butyl phthalate | mg/L | 0.08 | 0.0005 | <0.0005 |
| Bis(2-Ethylhexyl)phthalate | mg/L | 0.012 | 0.0005 | <0.0005 |
| NP2EO | mg/L | | 0.01 | <0.01 |
| NP1EO | mg/L | | 0.01 | <0.01 |
| 4n-NP | mg/L | | 0.001 | <0.001 |
| NP | mg/L | | 0.001 | <0.001 |
| Nonylphenols | mg/L | 0.02 | 0.001 | <0.001 |
| Nonylphenol Ethoxylates | mg/L | 0.2 | 0.01 | <0.01 |

Certified By: N Popnikolof

AGAT Laboratories

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# Certificate of Analysis

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

## Peel Region Sanitary - Organics

**DATE RECEIVED: 2022-12-16**

**DATE REPORTED: 2023-01-03**

| | | SAMPLE DESCRIPTION: | MW-1 |
|---|---|---|---|
| | | SAMPLE TYPE: | Water |
| | | DATE SAMPLED: | 2022-12-16 |
| Surrogate | Unit | Acceptable Limits | 4627298 |
| Toluene-d8 | % Recovery | 50-140 | 101 |
| 4-Bromofluorobenzene | % Recovery | 50-140 | 88 |
| Decachlorobiphenyl | % | 50-140 | 88 |
| 2,4,6-Tribromophenol | % | 50-140 | 89 |
| 2-Fluorophenol | % | 50-140 | 85 |
| Chrysene-d12 | % | 50-140 | 84 |
| phenol-d6 surrogate | % | 50-140 | 79 |

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Peel Sanitary By-Law 53-2010
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

**4627298** Oil and Grease animal/vegetable is a calculated parameter. The calculated value is the difference between Total O&G and Mineral O&G.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopowkolof

AGAT Laboratories

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# Certificate of Analysis

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

## CBOD5

**DATE RECEIVED: 2022-12-16**

**DATE REPORTED: 2023-01-03**

| | | | SAMPLE DESCRIPTION: | MW-1 |
|---|---|---|---|---|
| | | | SAMPLE TYPE: | Water |
| | | | DATE SAMPLED: | 2022-12-16 |
| **Parameter** | **Unit** | **G / S** | **RDL** | **4627298** |
| Biochemical Oxygen Demand, Carbonaceous | mg/L | | 2.00 | <2.00 |

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard

**4627298** Sample analyzed past hold time

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Amanjot Bhela

AGAT Laboratories

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# Certificate of Analysis

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

## Peel Sanitary Sewer Use By-Law - Inorganics

**DATE RECEIVED: 2022-12-16**

**DATE REPORTED: 2023-01-03**

| | | SAMPLE DESCRIPTION: | | MW-1 |
|---|---|---|---|---|
| | | SAMPLE TYPE: | | Water |
| | | DATE SAMPLED: | | 2022-12-16 |
| Parameter | Unit | G / S | RDL | 4627298 |
| pH | pH Units | 5.5-10 | NA | 7.88 |
| Total Suspended Solids | mg/L | 350 | 10 | <10 |
| Fluoride | mg/L | 10 | 0.05 | <0.05 |
| Sulphate | mg/L | 1500 | 0.10 | 62.2 |
| Cyanide, SAD | mg/L | 2 | 0.002 | <0.002 |
| Phenols | mg/L | 1.0 | 0.002 | 0.027 |
| Total Phosphorus | mg/L | 10 | 0.02 | <0.02 |
| Total Kjeldahl Nitrogen | mg/L | 100 | 0.10 | <0.10 |
| Total Aluminum | mg/L | 50 | 0.010 | 0.222 |
| Total Antimony | mg/L | 5 | 0.020 | <0.020 |
| Total Arsenic | mg/L | 1 | 0.015 | <0.015 |
| Total Cadmium | mg/L | 0.7 | 0.010 | <0.010 |
| Total Chromium | mg/L | 5 | 0.015 | <0.015 |
| Total Cobalt | mg/L | 5 | 0.020 | <0.020 |
| Total Copper | mg/L | 3 | 0.010 | <0.010 |
| Total Lead | mg/L | 3 | 0.020 | <0.020 |
| Total Manganese | mg/L | 5 | 0.020 | 0.091 |
| Total Mercury | mg/L | 0.01 | 0.0002 | <0.0002 |
| Total Molybdenum | mg/L | 5 | 0.020 | <0.020 |
| Total Nickel | mg/L | 3 | 0.015 | <0.015 |
| Total Selenium | mg/L | 1 | 0.002 | <0.002 |
| Total Silver | mg/L | 5 | 0.010 | <0.010 |
| Total Tin | mg/L | 5 | 0.025 | <0.025 |
| Total Titanium | mg/L | 5 | 0.010 | <0.010 |
| Total Zinc | mg/L | 3 | 0.020 | <0.020 |

**Comments:** RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Peel Sanitary By-Law 53-2010
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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# Quality Assurance

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

## Trace Organics Analysis

| RPT Date: Jan 03, 2023 | | | DUPLICATE | | | | REFERENCE MATERIAL | | | METHOD BLANK SPIKE | | | MATRIX SPIKE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | Batch | Sample Id | Dup #1 | Dup #2 | RPD | Method Blank | Measured Value | Acceptable Limits | | Recovery | Acceptable Limits | | Recovery | Acceptable Limits | |
| | | | | | | | | Lower | Upper | | Lower | Upper | | Lower | Upper |
| **Peel Region Sanitary - Organics** | | | | | | | | | | | | | | | |
| Oil and Grease (animal/vegetable) in water | 4615831 | | < 0.5 | < 0.5 | NA | < 0.5 | 109% | 70% | 130% | 102% | 70% | 130% | 98% | 70% | 130% |
| Oil and Grease (mineral) in water | 4615831 | | < 0.5 | < 0.5 | NA | < 0.5 | 87% | 70% | 130% | 72% | 70% | 130% | 95% | 70% | 130% |
| Methylene Chloride | 4627298 | 4627298 | <0.0003 | <0.0003 | NA | < 0.0003 | 116% | 50% | 140% | 111% | 60% | 130% | 108% | 50% | 140% |
| Methyl Ethyl Ketone | 4627298 | 4627298 | <0.0009 | <0.0009 | NA | < 0.0009 | 98% | 50% | 140% | 119% | 50% | 140% | 77% | 50% | 140% |
| cis-1,2-Dichloroethylene | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 111% | 50% | 140% | 97% | 60% | 130% | 104% | 50% | 140% |
| Chloroform | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 105% | 50% | 140% | 90% | 60% | 130% | 95% | 50% | 140% |
| Benzene | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 114% | 50% | 140% | 90% | 60% | 130% | 87% | 50% | 140% |
| Trichloroethylene | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 87% | 50% | 140% | 79% | 60% | 130% | 117% | 50% | 140% |
| Toluene | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 90% | 50% | 140% | 74% | 60% | 130% | 89% | 50% | 140% |
| Tetrachloroethene | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 94% | 50% | 140% | 79% | 60% | 130% | 101% | 50% | 140% |
| trans-1,3-Dichloropropene | 4627298 | 4627298 | <0.0003 | <0.0003 | NA | < 0.0003 | 73% | 50% | 140% | 74% | 60% | 130% | 111% | 50% | 140% |
| Ethylbenzene | 4627298 | 4627298 | <0.0001 | <0.0001 | NA | < 0.0001 | 83% | 50% | 140% | 72% | 60% | 130% | 82% | 50% | 140% |
| 1,1,2,2-Tetrachloroethane | 4627298 | 4627298 | <0.0001 | <0.0001 | NA | < 0.0001 | 99% | 50% | 140% | 84% | 60% | 130% | 75% | 50% | 140% |
| Styrene | 4627298 | 4627298 | <0.0001 | <0.0001 | NA | < 0.0001 | 75% | 50% | 140% | 84% | 60% | 130% | 72% | 50% | 140% |
| 1,2-Dichlorobenzene | 4627298 | 4627298 | <0.0001 | <0.0001 | NA | < 0.0001 | 86% | 50% | 140% | 96% | 60% | 130% | 87% | 50% | 140% |
| 1,4-Dichlorobenzene | 4627298 | 4627298 | <0.0001 | <0.0001 | NA | < 0.0001 | 83% | 50% | 140% | 81% | 60% | 130% | 84% | 50% | 140% |
| m & p-Xylene | 4627298 | 4627298 | <0.0002 | <0.0002 | NA | < 0.0002 | 96% | 50% | 140% | 93% | 60% | 130% | 74% | 50% | 140% |
| o-Xylene | 4627298 | 4627298 | <0.0001 | <0.0001 | NA | < 0.0001 | 83% | 50% | 140% | 96% | 60% | 130% | 79% | 50% | 140% |
| PCBs | 4628496 | | < 0.0002 | < 0.0002 | NA | < 0.0002 | 99% | 50% | 140% | 91% | 50% | 140% | 86% | 50% | 140% |
| Di-n-butyl phthalate | 4681468 | | < 0.0005 | < 0.0005 | NA | < 0.0005 | 85% | 50% | 140% | 84% | 50% | 140% | 102% | 50% | 140% |
| Bis(2-Ethylhexyl)phthalate | 4681468 | | < 0.0005 | < 0.0005 | NA | < 0.0005 | 79% | 50% | 140% | 89% | 50% | 140% | 79% | 50% | 140% |
| NP2EO | 4628496 | | < 0.01 | < 0.01 | NA | < 0.01 | 77% | 50% | 130% | 72% | 50% | 130% | 77% | 50% | 130% |
| NP1EO | 4628496 | | < 0.01 | < 0.01 | NA | < 0.01 | 106% | 50% | 130% | 102% | 50% | 130% | 108% | 50% | 130% |
| 4n-NP | 4628496 | | < 0.001 | < 0.001 | NA | < 0.001 | 79% | 50% | 130% | 82% | 50% | 130% | 81% | 50% | 130% |
| NP | 4628496 | | < 0.001 | < 0.001 | NA | < 0.001 | 87% | 50% | 130% | 101% | 50% | 130% | 99% | 50% | 130% |

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

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# Quality Assurance

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

## Water Analysis

**RPT Date: Jan 03, 2023**

| PARAMETER | Batch | Sample Id | DUPLICATE | | | Method Blank | REFERENCE MATERIAL | | | METHOD BLANK SPIKE | | | MATRIX SPIKE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dup #1 | Dup #2 | RPD | | Measured Value | Acceptable Limits | | Recovery | Acceptable Limits | | Recovery | Acceptable Limits | |
| | | | | | | | | Lower | Upper | | Lower | Upper | | Lower | Upper |
| **Peel Sanitary Sewer Use By-Law - Inorganics** | | | | | | | | | | | | | | | |
| pH | 4626108 | | 7.78 | 7.82 | 0.5% | NA | 101% | 90% | 110% | NA | | | NA | | |
| Total Suspended Solids | 4634859 | | <10 | <10 | NA | < 10 | 100% | 80% | 120% | NA | | | NA | | |
| Fluoride | 4624497 | | <0.13 | <0.13 | NA | < 0.05 | 109% | 70% | 130% | 103% | 80% | 120% | 106% | 70% | 130% |
| Sulphate | 4624497 | | 27.1 | 28.2 | 4.0% | < 0.10 | 107% | 70% | 130% | 104% | 80% | 120% | 107% | 70% | 130% |
| Cyanide, SAD | 4618923 | | 0.002 | 0.004 | NA | < 0.002 | 100% | 70% | 130% | 102% | 80% | 120% | 100% | 70% | 130% |
| Phenols | 4631040 | | <0.002 | <0.002 | NA | < 0.002 | 110% | 90% | 110% | 108% | 90% | 110% | 107% | 80% | 120% |
| Total Phosphorus | 4627913 | | 0.02 | <0.02 | NA | < 0.02 | 101% | 70% | 130% | 102% | 80% | 120% | 94% | 70% | 130% |
| Total Kjeldahl Nitrogen | 4634323 | | 0.18 | 0.20 | NA | < 0.10 | 102% | 70% | 130% | 101% | 80% | 120% | 94% | 70% | 130% |
| Total Aluminum | 4631185 | | 0.017 | 0.019 | NA | < 0.010 | 98% | 70% | 130% | 101% | 80% | 120% | 102% | 70% | 130% |
| Total Antimony | 4631185 | | <0.020 | <0.020 | NA | < 0.020 | 102% | 70% | 130% | 100% | 80% | 120% | 98% | 70% | 130% |
| Total Arsenic | 4631185 | | <0.015 | <0.015 | NA | < 0.015 | 95% | 70% | 130% | 95% | 80% | 120% | 98% | 70% | 130% |
| Total Cadmium | 4631185 | | <0.010 | <0.010 | NA | < 0.010 | 103% | 70% | 130% | 101% | 80% | 120% | 99% | 70% | 130% |
| Total Chromium | 4631185 | | <0.015 | <0.015 | NA | < 0.015 | 96% | 70% | 130% | 101% | 80% | 120% | 101% | 70% | 130% |
| Total Cobalt | 4631185 | | <0.020 | <0.020 | NA | < 0.020 | 98% | 70% | 130% | 100% | 80% | 120% | 101% | 70% | 130% |
| Total Copper | 4631185 | | 0.011 | 0.011 | NA | < 0.010 | 97% | 70% | 130% | 97% | 80% | 120% | 94% | 70% | 130% |
| Total Lead | 4631185 | | <0.020 | <0.020 | NA | < 0.020 | 96% | 70% | 130% | 92% | 80% | 120% | 92% | 70% | 130% |
| Total Manganese | 4631185 | | <0.020 | <0.020 | NA | < 0.020 | 98% | 70% | 130% | 105% | 80% | 120% | 103% | 70% | 130% |
| Total Mercury | 4622130 | | <0.0002 | <0.0002 | NA | < 0.0002 | 101% | 70% | 130% | 102% | 80% | 120% | 99% | 70% | 130% |
| Total Molybdenum | 4631185 | | <0.020 | <0.020 | NA | < 0.020 | 102% | 70% | 130% | 104% | 80% | 120% | 107% | 70% | 130% |
| Total Nickel | 4631185 | | <0.015 | <0.015 | NA | < 0.015 | 96% | 70% | 130% | 95% | 80% | 120% | 101% | 70% | 130% |
| Total Selenium | 4631185 | | <0.002 | <0.002 | NA | < 0.002 | 96% | 70% | 130% | 100% | 80% | 120% | 94% | 70% | 130% |
| Total Silver | 4631185 | | <0.010 | <0.010 | NA | < 0.010 | 93% | 70% | 130% | 97% | 80% | 120% | 94% | 70% | 130% |
| Total Tin | 4631185 | | <0.025 | <0.025 | NA | < 0.025 | 107% | 70% | 130% | 102% | 80% | 120% | 98% | 70% | 130% |
| Total Titanium | 4631185 | | <0.010 | <0.010 | NA | < 0.010 | 96% | 70% | 130% | 110% | 80% | 120% | 107% | 70% | 130% |
| Total Zinc | 4631185 | | <0.020 | <0.020 | NA | < 0.020 | 101% | 70% | 130% | 100% | 80% | 120% | 98% | 70% | 130% |
| **CBOD5** | | | | | | | | | | | | | | | |
| Biochemical Oxygen Demand, Carbonaceous | 4640946 | | 598 | 545 | 9.3% | < 2 | 98% | 70% | 130% | NA | | | NA | | |

Comments: NA Signifies Not Applicable
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:

AGAT Laboratories

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# Method Summary

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

| PARAMETER | AGAT S.O.P | LITERATURE REFERENCE | ANALYTICAL TECHNIQUE |
|---|---|---|---|
| **Trace Organics Analysis** | | | |
| Oil and Grease (animal/vegetable) in water | VOL-91-5011 | EPA SW-846 3510C & SM5520 | BALANCE |
| Oil and Grease (mineral) in water | VOL-91-5011 | EPA SW-846 3510C & SM 5520 | BALANCE |
| Methylene Chloride | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Methyl Ethyl Ketone | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| cis-1,2-Dichloroethylene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Chloroform | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Benzene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Trichloroethylene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Toluene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Tetrachloroethene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| trans-1,3-Dichloropropene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Ethylbenzene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| 1,1,2,2-Tetrachloroethane | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Styrene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| 1,2-Dichlorobenzene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| 1,4-Dichlorobenzene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| m & p-Xylene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| o-Xylene | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| Xylenes (Total) | VOL-91-5001 | modified from EPA 5030B & EPA 8260D | CALCULATION |
| Toluene-d8 | VOL-91- 5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| 4-Bromofluorobenzene | VOL-91- 5001 | modified from EPA 5030B & EPA 8260D | (P&T)GC/MS |
| PCBs | ORG-91-5112 | modified from EPA SW-846 3510C & 8082A | GC/ECD |
| Decachlorobiphenyl | ORG-91-5112 | modified from EPA SW846 3510C & 8082A | GC/ECD |
| Di-n-butyl phthalate | ORG-91-5114 | modified from EPA SW-846 3510C & 8270E | GC/MS |
| Bis(2-Ethylhexyl)phthalate | ORG-91-5114 | modified from EPA SW-846 3510C & 8270E | GC/MS |
| 2,4,6-Tribromophenol | ORG-91-5114 | modified from EPA 3510C and EPA 8270E | GC/MS |
| 2-Fluorophenol | ORG-91-5114 | modified from EPA 3510C and EPA 8270E | GC/MS |
| Chrysene-d12 | ORG-91-5114 | modified from EPA 3510C and EPA 8270E | GC/MS |

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# Method Summary

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

| PARAMETER | AGAT S.O.P | LITERATURE REFERENCE | ANALYTICAL TECHNIQUE |
|---|---|---|---|
| phenol-d6 surrogate | ORG-91-5114 | modified from EPA 3510C and EPA 8270E | GC/MS |
| NP2EO | ORG-91-5122 | modified ASTM D7485-16 | HPLC |
| NP1EO | ORG-91-5122 | modified ASTM D7485-16 | HPLC |
| 4n-NP | ORG-91-5122 | modified ASTM D7485-16 | HPLC |
| NP | ORG-91-5122 | modified ASTM D7485-16 | HPLC |
| Nonylphenols | ORG-91-5122 | modified ASTM D7485-16 | CALCULATION |
| Nonylphenol Ethoxylates | ORG-91-5122 | modified ASTM D7485-16 | CALCULATION |

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# Method Summary

**CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC**

**AGAT WORK ORDER: 22T981688**

**PROJECT: 6764 6.11 Caledon**

**ATTENTION TO: Ali Rasoul**

**SAMPLING SITE:Dixie Rd, Caledon**

**SAMPLED BY:J Osborne**

| PARAMETER | AGAT S.O.P | LITERATURE REFERENCE | ANALYTICAL TECHNIQUE |
|---|---|---|---|
| **Water Analysis** | | | |
| Biochemical Oxygen Demand, Carbonaceous | INOR-121-6023 | SM 5210 B | INCUBATOR |
| pH | INOR-93-6000 | modified from SM 4500-H+ B | PC TITRATE |
| Total Suspended Solids | INOR-93-6028 | modified from EPA 1684,ON MOECC E3139,SM 2540C,D | BALANCE |
| Fluoride | INOR-93-6004 | modified from SM 4110 B | ION CHROMATOGRAPH |
| Sulphate | INOR-93-6004 | modified from SM 4110 B | ION CHROMATOGRAPH |
| Cyanide, SAD | INOR-93-6051 | modified from MOECC E3015; SM 4500-CN- A, B, & C | TECHNICON AUTO ANALYZER |
| Phenols | INOR-93-6072 | modified from SM 5530 D | LACHAT FIA |
| Total Phosphorus | INOR-93-6022 | modified from SM 4500-P B and SM 4500-P E | SPECTROPHOTOMETER |
| Total Kjeldahl Nitrogen | INOR-93-6048 | modified from EPA 351.2 and SM 4500-NORG D | LACHAT FIA |
| Total Aluminum | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Antimony | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Arsenic | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Cadmium | MET -93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Chromium | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Cobalt | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Copper | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Lead | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Manganese | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Mercury | MET-93-6100 | modified from EPA 245.2 and SM 3112 B | CVAAS |
| Total Molybdenum | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Nickel | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Selenium | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Silver | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Tin | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Titanium | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |
| Total Zinc | MET-93-6103 | modified from EPA 200.8, 3005A, 3010A & 6020B | ICP-MS |

# AGAT Laboratories

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## Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

**Laboratory Use Only**
Work Order #: 22T981688
Cooler Quantity: ~~6.5~~ 1 Lg
Arrival Temperatures: 6.5 | 8.2 | 8.4
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes: Loose ice

### Report Information:
Company: A & A Environmental Consultants Inc.
Contact: Dr. Ali Rasoul
Address: 16 Young St
Woodstock, ON
Phone: 519-266-4680 Fax: 519-266-3666
Reports to be sent to:
1. Email: arasoul@aaenvironmental.ca, vsowden@aaenvironmental.ca
2. Email: sscott@aaenvironmental.ca,

### Regulatory Requirements:
☐ No Regulatory Requirement
(Please check all applicable boxes)
☑ Regulation 153/04
Table (Indicate One): ☑ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One): ☑ Coarse ☐ Fine
☒ Sewer Use: ☒ Sanitary ☐ Storm
Region: Peel (Indicate One)
☐ MISA
☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☒ Yes ☒ No

Report Guideline on Certificate of Analysis: ☑ Yes ☐ No

### Turnaround Time (TAT) Required:
Regular TAT ☑ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays
For 'Same Day' analysis, please contact your AGAT CPM

### Project Information:
Project: 67164 Bill Caledon
Site Location: Dixie Rd. Caledon
Sampled By: J Osborne
AGAT Quote #: 368057 PO: 67164
Please note: If quotation number is not provided, client will be billed full price for analysis.

### Invoice Information:
Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

### Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

| Sample Identification | Date Sampled | Time Sampled | # of Containers | Sample Matrix | Comments/ Special Instructions | Field Filtered - Metals, Hg, CrVI (Y/N) | O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides)) | O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr* ☑ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR | O. Reg 153: Full Metals Scan | O. Reg 153: Regulation/Custom Metals | O. Reg 153: Nutrients: ☐ TP ☐ $NH_3$ ☐ TKN ☐ $NO_3$ ☐ $NO_2$ ☐ $NO_3+NO_2$ | O. Reg 153: Volatiles: ☐ VOC ☐ BTEX ☐ THM | O. Reg 153: PHCs F1 - F4 | O. Reg 153: ABNs | O. Reg 153: PAHs | O. Reg 153: PCBs: ☐ Total ☐ Aroclors | O. Reg 153: Organochlorine Pesticides | O. Reg 153: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs | Sewer Use | Metals Soil 93-101 | Metals Water 93-196 | CCME F1-F4/VOCs Soil 91-248 | CCME F1-F4/VOCs Water 91-249 | CCME F1-F4/ BTEX Water 91-205 | Sieve & texture (75 Micron) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | 12/16/22 | | 25 | GW | | N | | | | | | | | | | | | | | | X | | | | | |

Samples Relinquished By (Print Name and Sign): J Osborne — Date: 12/16/22 — Time:
Samples Relinquished By (Print Name and Sign): E Fulsom — Date: 12/16/22 — Time:
Samples Relinquished By (Print Name and Sign): — Date: — Time:
Samples Received By (Print Name and Sign): Zaid — Date: — Time:
Samples Received By (Print Name and Sign): — Date: — Time:
Samples Received By (Print Name and Sign): — Date: — Time:

'22 DEC 16 3:08PM

Page 1 of 1
N°:

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

# APPENDIX D – MECP Well Records

# Water Well Records - Report #6765

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|
| CALEDON TOWN (CHINGU HS E 04 019 | 17 596372 4847110 W | 2009-09 4011 | | | 4///: | | | 7130987 (Z89936) A | |
| | | | | | | | | | ***1*** |
| CALEDON TOWN (CHINGU HS E 04 019 | 17 597264 4847973 W | 1980-10 3317 | 5 5 | FR 0144 | 53/60/12/1:30 | DO | 0144 4 | 4905710 () | BRWN CLAY STNS 0020 GREY CLAY STNS 0060 GREY CLAY SILT 0132 FSND SILT CLAY 0142 SAND GRVL 0148 |
| CALEDON TOWN (CHINGU HS E 03 020 | 17 596270 4847023 W | 1960-09 1307 | 30 | FR 0043 | 43//1/: | DO | | 4901349 () | BRWN LOAM CLAY 0015 GREY CLAY STNS 0043 QSND 0058 |
| | | | | | | | | | ***DO 2*** |
| CALEDON TOWN (CHINGU HS E 04 020 | 17 596291 4847111 W | 2016-03 7360 | 2 | UT 0020 | | MO | 0020 5 | 7294666 (Z221295) A201920 | GREY SILT CLAY HARD 0020 |
| | | | | | | | | | ***MO 1*** |

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|

Total Wells: 4

Notes:
UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completedand Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL ( AUDIT # ) Well Tag . A: Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

## 1. Core Material and Descriptive terms

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

### 2. Core Color

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

### 3. Well Use

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

### 4. Water Detail

| Code | Description | Code | Description |
|---|---|---|---|
| FR | Fresh | GS | Gas |
| SA | Salty | IR | Iron |
| SU | Sulphur | | |
| MN | Mineral | | |
| UK | Unknown | | |

# APPENDIX E – Water Balance Calculation

| | Area ($m^2$) | Infiltration Factors | | | | Precipitation Data | | Calculated | |
|---|---|---|---|---|---|---|---|---|---|
| | | Topography | Soil | Cover | Accumulative Infiltration Factors | P (mm/y) ($m^3$/y) | E (mm/y) ($m^3$/y) | I (mm/y) ($m^3$/y) | R (mm/y) ($m^3$/y) |
| **Pre-development** | | | | | | | | | |
| Impervious Area | 0 | | | | | 868 | 174 | 0 | 694 |
| | | | | | | 0.0 | 0.0 | 0.0 | 0.0 |
| Pervious Area | 89520 | 0.15 | 0.2 | 0.05 | 0.4 | 868 | 597 | 108.4 | 162.6 |
| | | (Fairly Hilly) | (Clayey Silt) | | | 77703.4 | 53443.4 | 9704.0 | 14556.0 |

| Inputs | $m^3$/year | Outputs | $m^3$/year |
|---|---|---|---|
| Total Precipitation | 77703.4 | Total Evapotranspiration | 53443.4 |
| | | Total Infiltration | 9704.0 |
| | | Total Runoff | 14556.0 |
| Total | 77703.4 | Total | 77703.4 |
| Difference (Inputs-Outputs) | | 0 | |

| **Post Development** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Impervious Area | 8025 | | | | | 868 | 174 | 0 | 694 |
| | | | | | | 6965.7 | 1393.1 | 0.0 | 5572.6 |
| Pervious Area | 81495 | 0.15 | 0.2 | 0.05 | 0.4 | 868 | 597 | 108.4 | 162.6 |
| | | (Fairly Hilly) | (Clayey Silt) | | | 70737.7 | 48652.5 | 8834.1 | 13251.1 |

| Inputs | $m^3$/year | Outputs | $m^3$/year |
|---|---|---|---|
| Total Precipitation | 77703.4 | Total Evapotranspiration | 50045.7 |
| | | Total Infiltration | 8834.1 |
| | | Total Runoff | 18823.6 |
| Total | 77703.4 | Total | 77703.4 |
| Difference (Inputs-Outputs) | | 0 | |

| Developmental Impacts | Infiltration | Runoff |
|---|---|---|
| **Sub-Total Post-Development ($m^3$/year)** | 8834.1 | 18823.6 |
| **Impacts from Pre to Post Development ($m^3$/year)** | -869.9 | 4267.7 |
| **Low-Impact Development (LID) - Design** | 4267.7 | |
| **Impacts from Pre to Post Development with LID ($m^3$/year)** | 13101.8 | 14556.0 |