Small-Scale Hydrogeological Assessment
Residential Property Located at
14027 Hurontario Street,
Inglewood, ON

Report #4545 – BVD Inglewood
November 29, 2019

Prepared for:
Mr. Bikram Dhillon
BVD Petroleum
T: 416-848-4111 ext 303
C: 416-523-2898
F: 1 866 346 8863
E-mail: bikram.dhillon@bvdpetroleum.com

Prepared by:
A & A Environmental Consultants Inc.
16 Young Street
Woodstock, ON N4S 3L4
Tel: 519 266-4680
Fax: 519 266-3666

A & A ENVIRONMENTAL CONSULTANTS INC.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

A & A Environmental Consultants Inc. (A&A) was retained by Mr. Bikram Dhillon, on behalf of BVD Petroleum (the client) to evaluate the potential impact from the proposed development of a retail fuel outlet (RFO) with it's associated convenient store and parking spaces, as well was a Burger King restaurant on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located 14027 Hurontario Street, Inglewood, Ontario. The Site is bounded to the north and west by residential housing and agricultural land use, to the east by commercial and residential land use, and to the south by commercial land use. The area of the Site is approximately 32,122.80 m^2 (7.94 acres). At the time of the investigation, the site consisted of one residential property with an unoccupied single-storey residential dwelling.

The topography in the vicinity of the subject site (a 100-meter radius), is relatively flat with a slope south to southeastward towards tributaries of Etobicoke Creek. The area does have some rolling topography due to drumlin features in the surrounding area. The topographic map indicates the subject site at an elevation of approximately 288 meters above sea level (masl).
The quaternary geology in this area is identified as Halton Till, characterized as predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor. Geological maps indicate surficial deposits in the vicinity of the Site to be comprised of till. A till blanket from the Oak Ridge's Moraine covers most of the northern portion of the Greater Toronto Area (GTA). Bedrock in the area of the Site is part of the Queenston Formation characterized as shale, siltstone, minor limestone and sandstone. The formation also contains thin layers of calcareous sandstone, bioclastic, argillaceous and silty limestone, as well as calcareous sandstone.

It is clear from the water well database and the information obtained during the field survey that the local residents obtain their water from a municipal water supply system. The subject site is also expected to utilize the municipal water system when developed. The Ministry of Environment, Conservation, and Parks (MECP) well records show groundwater was found between 1.22-46.03 meters below ground level (mbgl), for wells drilled between 4.9-47.6 mbgl;

however, the drilling program completed at this site indicates the groundwater was found between 3.580-4.080 mbgl for monitoring wells drilled between 6.910-8.320 mbgl.

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 three monitoring wells installed by A&A were drilled to a maximum depth of 7.564 mbgl. There were two existing monitoring wells on site from a previous unknown investigation. A total of six groundwater monitoring events took place over a four-month period. All wells contained water in each of the six monitoring events. During the first two event, the two existing monitoring wells were not measured. The events took place in 2019 on July 12, August 9, October 1, October 21, November 4, and November 18. It was concluded that groundwater was present on site at elevations between 284-288 masl.

A groundwater contour map was plotted using "Golden Software" (Surfer 8) and the measurements of groundwater levels taken on November 4, 2019 from the three monitoring wells installed as well as the two existing monitoring wells. This map shows well EMW-1 being at the lowest water elevation compared with the other wells. The general direction of groundwater flow was found to be in the east-northeast direction.

The total precipitation (rainfall plus snowfall) in 2018 was 1090.6 mm, with the greatest amounts falling in April and August. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in January. The average annual precipitation from 1988-2018 was calculated using historical data collected at the meteorological station located in Orangeville, Ontario. 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 904.63 mm. For the same period, it was calculated that approximately 784.75 mm/year would be lost to evapotranspiration (Environment Canada, 2018); leaving a total of approximately 119.80 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. A storm water management plan will be needed to manage the storm water runoff on site.

The analysis results indicate that all health and non-health related parameters were below The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010, Limit of Sanitary Sewer Discharge; with the exception of MW3, which had an exceedance of 3320 mg/L for Total Dissolved Solids (TDS) compared to the guideline standard of 350 mg/L. It is recommended that a settling tank be constructed onsite before discharging water to the municipal sewer system.

RECOMMENDATION

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

1. A stormwater management plan will be needed to mitigate the creation of excess stormwater runoff.
2. A settling tank be constructed on-site before discharging water to the municipal sanitary sewer system.

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

1.0 INTRODUCTION

A & A Environmental Consultants Inc. (A&A) was retained by Mr. Bikram Dhillon, on behalf of BVD Petroleum (the client), to evaluate the potential impact from the proposed development of a retail fuel outlet (RFO) with it's associated convenient store and parking spaces, as well as a Burger King restaurant on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located at 14027 Hurontario Street, Inglewood, Ontario, (Appendix A). The Site is bounded to the north and west by residential housing and agricultural land use, to the east by commercial and residential land use, and to the south by commercial land use. The area of the Site is approximately 32,122.80 m^2 (7.94 acres). At the time of the investigation, the site consisted of one residential property with an unoccupied single-storey residential dwelling, surrounded by a vacant vegetated field.

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 three boreholes to a maximum depth of 9.14 m in selected locations. The boreholes will be drilled with a hydraulic soil drill fitted with 4-inch augers.

- Install at three groundwater monitoring wells to cover the entire site. The wells will be constructed of 51 mm (2") PVC risers with 3.05 m long Schedule 40 PVC slotted well screen. Slip end caps will be installed at the end of the riser pipe with threaded drive-points at the bottom of the well. The borehole annuluses 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 mbgl. The well will be fitted with a dedicated inertial sampler. 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 a rectangular shaped lot with an approximate area of 32,122.80 m^2. The site lies in the southern outskirts of Caledon, Ontario; northwest of the intersection of Hurontario Street and King Street. The Site is bounded to the north and west by residential housing and agricultural land use, to the east by commercial and residential land use, and to the south by commercial land use. The site lies in an urban setting with mixed commercial, agricultural, and residential land use. The study site is located within the Central Lake Ontario watershed which contains Etobicoke Creek. Etobicoke Creek has its origins in the Oak Ridge's Moraine (ORM) and flows south and emptying into Lake Ontario.

The approximate UTM coordinates are Zone 17T; 590279 m Easting and 4847461 m Northing. The site is zoned as being, "CV-267 – Village Commercial" as quoted from the Town of Caledon By-law 2006-50. The area inspected included one rectangular shaped property. The site currently is developed with an unoccupied single-storey residential dwelling.

3.0 DEVELOPMENT PLAN

It is understood that the proposed future development will consist of the following:

- One building having a footprint of 600 m^2 consisting of a convenience store and a restaurant with a drive thru.
- One building having a footprint of 293 m^2 consisting of a Burger King restaurant and a drive thru.
- Two future buildings having a footprint of 332 m^2.
- Five underground storage tanks (USTs).
- Four fuel pump islands with a canopy.
- Five fuel pump cardlock island
- A parking area for:
    - 112 total parking spaces, which includes 5 spaces for trucks.
- There will be two access points, one from Hurontario Street in the northwest corner of the site and the other from King Street in the southwest corner of the site.

A site plan can be seen in Appendix A, Figure 5.

4.0 PHYSICAL SETTING

4.1 Topography

The regional topography, which is an area within a 5 km radius from the site has a range of 297 masl to the northwest and 274 masl to the southeast. The topographic map shows tributaries of Etobicoke Creek, Credit River and various unidentified wetlands are all within a 5 km radius and are all flowing in an east/southeast direction towards Lake Ontario; over the region.

The topography in the vicinity of the subject site (a 100-meter radius), is relatively flat with a slope south to southeastward towards Etobicoke Creek. The area does have some rolling topography due to drumlin features in the surrounding area. The topographic map indicates the subject site is at an approximate elevation of 287 masl.

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.

The physiography of southern Ontario was altered considerably by the glacial and interglacial episodes that took place throughout the Quaternary (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 sedimentary record of southern Ontario provides evidence for three distinct climatic stages during the Quaternary: 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 in this area is identified as Halton Till, characterized as predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor.

Geological maps indicate surficial deposits in the vicinity of the Site to be comprised of till. A till blanket from the Oak Ridge's Moraine covers most of the northern portion of the GTA. The till is of little value as an aggregate because of an excess of silt and clay (MHBC Planning Ltd. & Ontario Geological Survey, 1999).

Paleozoic Geology: Bedrock in the area of the Site is part of the Queenston Formation characterized as shale, siltstone, minor limestone and sandstone. The formation also contains thin layers of calcareous sandstone, bioclastic, argillaceous and silty limestone, as well as calcareous sandstone.

The drilling program conducted for this study indicates the overburden deposits are generally consistent across the property. Generally, the soil profile consists of silt followed by clayey silt and clay to depth. The silt extends to depths ranging from approximately 0 m to 2.29 m below the existing grade. The silt was assessed as soft and damp. A stratum of native clayey silt was encountered underlying the silt in the boreholes. The clayey silt found below that extends to depths ranging from approximately 0.76 m to 6.10 m. The clayey silt was considered soft and damp to moist. The clay found below that extends to depth ranging from approximately 3.05 m to 9.14 m Bedrock was not encountered during the drilling program.

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 sand overburden. Based on the regional topography, groundwater flow is inferred to be in a south/southeast direction towards Etobicoke Creek. 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 geotechnical investigation on the site, three groundwater monitoring wells were installed within the annulus of boreholes BH/MW1, BH/MW2, and BH/MW3 during this investigation (Figure 4). The wells were constructed of 51 mm (2") PVC risers with a 3.05 m 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 0.3 m above the well screen. A bentonite seal was placed on the sand pack to about 0.3 mbgl. The wells were fitted with a dedicated inertial sampler and a protective, flush-mount steel well protector was installed around the risers. The wells were installed by A&A, licensed well technicians in accordance with Ontario Regulation 903. There were two additional wells found on site from an unknown investigation. They are labelled as existing monitoring wells (EMW) 1 and 2.

These wells are used to determine the quality and direction of groundwater flow. 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 in 2019 on July 12, August 9, October 1, October

21, November 4, and November 18. 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 1-6 below). These show the highest elevation at MW-1 near the south corner and the lowest at EMW-2 near the north corner of the property.

.

Table 1 – Monitoring Well Details July 12, 2019

Project #4545-BVD Inglewood 14027 Hurontario Street, Inglewood, ON					
Date Logged: July 12, 2019			**Logged by: H. Bruin**		
Monitoring Well #	**MW-1**	**MW-2**	**MW-3**	**EMW-1**	**EMW-2**
Location	Near northwest corner of residential dwelling	Near central portion of the subject site	Southeast portion of subject site	North Area of Site – Previously installed	North Area of Site – Previously installed
Pipe Size (mm)	51	51	51	51	51
UTM Zone	17T	17T	17T	17T	17T
Easting	590246	590278	590277	590228	590254
Northing	4847453	4847437	4847372	4847545	4847571
Top of Pipe (masl)	289.766	289.601	289.466	289.183	289.086
Water Level (m)	5.310	6.446	2.289	Not Measured	Not Measured
Water Level (masl)	284.456	283.155	287.177	–	–
Total Depth (m)	6.009	7.564	7.146	Not Measured	Not Measured
Benchmark is centre of manhole on King Street, near south corner of the subject site. 288.510 masl					

Table 2 – Monitoring Well Details August 9, 2019

Project #4545-BVD Inglewood 14027 Hurontario Street, Inglewood, ON					
Date Logged: August 9, 2019			**Logged by: T. Demers**		
Monitoring Well #	**MW-1**	**MW-2**	**MW-3**	**EMW-1**	**EMW-2**
Location	Near northwest corner of residential dwelling	Near central portion of the subject site	Southeast portion of subject site	North area of site – previously installed	North area of site – previously installed
Pipe Size (mm)	51	51	51	51	51
UTM Zone	17T	17T	17T	17T	17T
Easting	590246	590278	590277	590228	590254
Northing	4847453	4847437	4847372	4847545	4847571
Top of Pipe (masl)	289.766	289.601	289.466	289.183	289.086
Water Level (m)	2.387	2.087	2.369	Not Measured	Not Measured
Water Level (masl)	287.379	287.514	287.097	–	–
Total Depth (m)	6.009	7.564	7.146	Not Measured	Not Measured
Benchmark is centre of manhole on King Street, near south corner of the subject site. 288.510 masl					

Table 3 – Monitoring Well Details October 1, 2019

Project #4545-BVD Inglewood 14027 Hurontario Street, Inglewood, ON					
Date Logged: October 1, 2019			Logged by: T. Thornton		
Monitoring Well #	**MW-1**	**MW-2**	**MW-3**	**EMW-1**	**EMW-2**
Location	Near northwest corner of residential dwelling	Near central portion of the subject site	Southeast portion of subject site	North area of site – previously installed	North area of site – previously installed
Pipe Size (mm)	51	51	51	51	51
UTM Zone	17T	17T	17T	17T	17T
Easting	590246	590278	590277	590228	590254
Northing	4847453	4847437	4847372	4847545	4847571
Top of Pipe (masl)	289.766	289.601	289.466	289.183	289.086
Water Level (m)	2.913	2.550	2.759	2.711	2.646
Water Level (masl)	286.853	287.051	286.707	286.472	286.440
Total Depth (m)	6.009	7.564	7.146	5.410	5.702
Benchmark is centre of manhole on King Street, near south corner of the subject site. 288.510 masl					

Table 4 – Monitoring Well Details October 21, 2019

Project #4545-BVD Inglewood 14027 Hurontario Street, Inglewood, ON					
Date Logged: October 21, 2019			Logged by: J. Stuart		
Monitoring Well #	**MW-1**	**MW-2**	**MW-3**	**EMW-1**	**EMW-2**
Location	Near northwest corner of residential dwelling	Near central portion of the subject site	Southeast portion of subject site	North area of site – previously installed	North area of site – previously installed
Pipe Size (mm)	51	51	51	51	51
UTM Zone	17T	17T	17T	17T	17T
Easting	590246	590278	590277	590228	590254
Northing	4847453	4847437	4847372	4847545	4847571
Top of Pipe (masl)	289.766	289.601	289.466	289.183	289.086
Water Level (m)	3.051	2.639	2.816	2.890	2.790
Water Level (masl)	286.853	287.051	286.707	286.472	286.440
Total Depth (m)	6.009	7.564	7.146	5.410	5.702
Benchmark is centre of manhole on King Street, near south corner of the subject site. 288.510 masl					

Table 5 – Monitoring Well Details November 4, 2019

Project #4545-BVD Inglewood 14027 Hurontario Street, Inglewood, ON					
Date Logged: November 4, 2019			**Logged by: T. Thornton**		
Monitoring Well #	**MW-1**	**MW-2**	**MW-3**	**EMW-1**	**EMW-2**
Location	Near northwest corner of residential dwelling	Near central portion of the subject site	Southeast portion of subject site	North area of site – previously installed	North area of site – previously installed
Pipe Size (mm)	51	51	51	51	51
UTM Zone	17T	17T	17T	17T	17T
Easting	590246	590278	590277	590228	590254
Northing	4847453	4847437	4847372	4847545	4847571
Top of Pipe (masl)	289.766	289.601	289.466	289.183	289.086
Water Level (m)	2.082	2.031	2.018	2.488	2.431
Water Level (masl)	287.684	287.570	287.488	286.695	286.655
Total Depth (m)	6.009	7.564	7.146	5.410	5.702
Benchmark is centre of manhole on King Street, near south corner of the subject site. 288.510 masl					

Table 6 – Monitoring Well Details November 18, 2019

Project #4545-BVD Inglewood 14027 Hurontario Street, Inglewood, ON					
Date Logged: November 18 18, 2019			**Logged by: M. Richardson**		
Monitoring Well #	**MW-1**	**MW-2**	**MW-3**	**EMW-1**	**EMW-2**
Location	Near northwest corner of residential dwelling	Near central portion of the subject site	Southeast portion of subject site	North area of site – previously installed	North area of site – previously installed
Pipe Size (mm)	51	51	51	51	51
UTM Zone	17T	17T	17T	17T	17T
Easting	590246	590278	590277	590228	590254
Northing	4847453	4847437	4847372	4847545	4847571
Top of Pipe (masl)	289.766	289.601	289.466	289.183	289.086
Water Level (m)	1.781	1.749	1.886	2.030	2.051
Water Level (masl)	287.985	287.852	287.580	287.153	287.035
Total Depth (m)	6.009	7.564	7.146	5.410	5.702
Benchmark is centre of manhole on King Street, near south corner of the subject site. 288.510 masl					

Groundwater flow direction was determined using the groundwater elevation of the November 4, 2019 groundwater monitoring event. The seasonal change in groundwater hydraulic gradient due to rainfall and spring runoff have a significant influence on the groundwater flow velocities, so the groundwater flow velocities was calculated using a hydraulic gradient of 0.00756 m/m (MW-1 to EMW-2) and a hydraulic conductivity 1.07 x 10^{-4} cm/s according the percolation test carried out on site, 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 silty clay material are estimated to be between 0.729 m/year.

A groundwater contour map, shown in Figure 6, Appendix A, was plotted using Golden Surfer™ (Surfer 8) and the measurements of groundwater levels taken on November 4, 2019 from five monitoring wells installed in the unconfined, near surface aquifer. This map shows well EMW-1 being at the lowest water elevation compared with the other wells used. The general direction of groundwater flow was found to be in an east-northeast 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 2018 describing the climatic variables was obtained from the Environment Canada meteorological station at Orangeville meteorological station, located in Orangeville, ON (Table 7). 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 2018 was 1090.6 mm, with the greatest amounts falling in April and August. July and August show the highest mean daily temperatures during the year and the lowest temperatures were recorded in January.

Table 7 – 2018 Meteorological Data (Orangeville, ON)

MONTH	TOTAL PRECIPITATION (mm)	MEAN TEMPERATURE (°C)
JANUARY	132.6	-7.9
FEBRUARY	85.5	-4.2
MARCH	68.7	-2.5
APRIL	140.5	1.1
MAY	74.1	15.5
JUNE	47.9	17.2
JULY	111.9	20.5
AUGUST	164.1	20.7
SEPTEMBER	23.6	16.4
OCTOBER	89.9	6.9
NOVEMBER	82.8	-1.2
DECEMBER	69	-2.6
SUM	1090.6	
AVERAGE		6.66

*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 normals calculations are computer 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 1989-2018 was calculated using historical data collected at the meteorological station located in Orangeville, Ontario. 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 904.63 mm/year. For the same period, it was calculated that approximately 784.75 mm/year would be lost to evapotranspiration (Environment Canada, 2018); leaving a total of approximately 119.80 mm/year available for groundwater recharge and surface runoff.

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 GTA 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 Water Balance Assessment

The area inspected included one rectangular shaped property. The site is currently developed with an unoccupied single-storey residential dwelling.

5.6 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).

5.6.1 Precipitation and Evapotranspiration

Based on the Canada Climate Normals data from Environment Canada for the Orangeville Station for the years 1988 to 2018. The average annual precipitation over the thirty-year period was 904.63 mm/year. For the same period, it was calculated that approximately 784.75 mm/year would be lost to evapotranspiration (according to Thornthwaite Formula-Environment Canada, 2018); leaving a total of approximately 119.80 mm/year available for groundwater recharge and surface runoff.

5.6.2 Infiltration and Runoff

As indicated, there is a water surplus of 119.80 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 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 E and are discussed as follows.

5.6.2.1 Pre-development

Considering the fact that the site has a slightly hilly landscape, medium combination of silt and loam, and an open area, the Site may have an infiltration factor of 0.5, i.e., 50% of water surplus (59.90 mm/year). In the meantime, a total of 59.90 mm/year will become the runoff. Based on the pre-development site layout, 1 % of the site area will be the impervious and hard surface area occupied by the buildings and parking area and 99% will be the pervious area, unpaved areas represent landscaped and green area. Based on the Site's area of 32,122.80 m^2 and assuming that 20% of the precipitation will become the evaporation in the non-permeable surface areas, a total of 1912.76 m^3 per year will infiltrate, while a total volume of 2050.43 m^3 per year will become runoff.

5.6.2.2 Post-development

Based on the information provided by the amendment to an existing approved site plan, it is anticipated that after development, approximately 58% of the site area will be the impervious and hard surface area occupied by the buildings and parking area and 42% 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 809.75 m^3 per year, which is a deficit of 1103.01m^3 per year after the development, while the runoff volume was calculated to be 14273.75 m^3 per year, which is a surplus of 12223.32 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. A storm water management plan, will be needed to manage the storm water runoff on site.

5.7 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 be required during the site construction at this site.

5.7.1 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.

5.7.2 Pre-construction Dewatering

Based on the propose design plan, the new development consists of construction of four buildings. The buildings will be built slab-on grade with footings being put no deeper than 2.5 m (7.5 ft). The developed area at the Site is approximately 18,604.4 m^2.

5.7.3 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 silt to silty clay matrix, high in matrix carbonate content and clast poor. The highest water level measured in the till deposits was 287.985 masl at Monitoring Well MW-1, which is below the proposed designed footing, but above the target water level for construction. Given the low hydraulic conductivity of the till deposits in the order of 1.07 x 10^{-4} cm/s and the limited drawdown to be required, a positive dewatering may not be feasible. Instead, sump pumping at the bottom of excavation may be applied accordingly if needed. During the construction, groundwater control would be considered for the water coming from surface water runoff. To estimate the potential construction dewatering, the following assumptions would be made:

Based on the obtained information we can calculate the discharge by consider a rectangular block of aquifer below the water table at the subject site. The block has horizontal width *w,* vertical thickness *h* and horizontal (or near horizontal) length *L.* Suppose that water is moving through the soil in the direction parallel to the edges of length Land perpendicular to the cross section with edge lengths w and *h.* Since the water can move only through the connected pores, the discharge *Q* of the water through the cross section can calculate using the following equation:

$$Q = A_{\text{pores}} v,$$

Where A_{pores} is the total cross-sectional area of all the connected pores in the aquifer cross section, and *v* is the speed of the water in the pores as the water passes the cross section. The cross section of the aquifer, for the total area of the buildings of 1700 m^2 with vertical thickness below water surface of approximately 1.5 m, by using the above information, the groundwater seepage to the building excavation is estimated to be approximately at rate of 5.09 m^3/day. The proposed development is going to excavate below the groundwater table at each lot site. There is the possibility that surface water may accumulate and find its way down the foundation walls

during a heavy rain fall and melting snow in the spring season, which will be required to be pumped out off site.

5.7.4 Post-Construction Dewatering

Based on the proposed development, the excavation for construction of the building footings will mainly take place in the till deposits. The highest water level measured in the till deposits was 287.985 masl at Monitoring Well MW-1, which is below the proposed designed footing and the target water level for 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.

5.8 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 75 wells located within 500 meters of the surrounding area as follows: two are listed as a public wells, thirty-one are listed as domestic wells, one as a commercial/domestic well, four as monitoring test-holes, eight monitoring wells, one test-hole, seven commercial wells, one livestock/domestic well, seven wells listed as not used, and thirteen wells 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. The subject site is also expected to utilize the municipal water system when developed. Table 8 presents the summary of the wells from the well records, showing the UTM coordinate, drilling date, total depth and water found elevation. The MECP well records show groundwater was found between 1.22-46.03 mbgl, for wells drilled between 4.9-47.6 mbgl. 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 3.580-4.080 mbgl for monitoring wells drilled between 6.910-8.320 mbgl.

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 8 – 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		(mbgl)	(mbgl)	
7103066	590392	4847233	2007	7.62	Unknown	Unknown
7109015	590253	4847385	2008	Unknown	Unknown	Unknown
7044689	590253	4847284	2007	5.49	Unknown	Unknown
7102240	590469	4847122	2008	5.18	Unknown	Monitoring Test-hole
7102241	590479	4847129	2008	5.79	Unknown	Monitoring
7102243	590475	4847126	2008	5.49	Unknown	Monitoring
7155344	590292	4847309	2010	Unknown	Unknown	Monitoring
7102242	590472	4847123	2008	5.49	1.22	Test-hole
7236715	590216	4847318	2014	5.18	Unknown	Monitoring
7216922	590395	4847123	2014	5.79	Unknown	Monitoring Test-hole
7216921	590348	4847015	2014	5.49	Unknown	Monitoring Test-hole
7216920	590391	4847092	2014	5.79	Unknown	Monitoring Test-hole
7193855	590756	4847336	2012	6.10	Unknown	Monitoring
728953	590253	4847242	Unknown	2.13	Unknown	Unknown
4910353	590077	4847385	2006	6.10	Unknown	Not used
7167140	590222	4847367	2011	6.10	Unknown	Monitoring
7104575	590248	4847385	2007	6.10	4.57	Not used
4909820	590350	4847292	2005	6.71	6.10	Not used
4909763	590088	4847013	2005	23.77	23.77	Commercial
4901136	590372	4847234	1957	7.62	7.62	Domestic
4904938	590414	4847473	1976	11.28	10.06	Domestic
7289531	590438	4847472	Unknown	Unknown	2.13	Unknown
4906394	590536	4847234	1985	20.12	18.29	Domestic
7277994	590491	4847568	2016	Unknown	3.97	Unknown
4906284	590522	4847191	1984	12.80	6.10	Domestic
4905184	590414	4847223	1977	14.33	12.19	Domestic
4905691	590614	4847023	1977	50.60	42.67	Domestic
4906404	590410	4847338	1985	19.81	15.24	Domestic
4904247	590324	4847177	1973	13.41	10.67	Domestic
4905821	590514	4847173	1981	15.54	10.66	Commercial/Domestic
4901139	590436	4847460	1965	43.89	39.62	Domestic
4907387	590386	4847488	1990	23.47	12.19	Domestic
7147078	590366	4847284	2010	Unknown	Unknown	Unknown
4901141	590518	4847079	1967	12.19	9.75	Domestic
4905185	590194	4847423	1977	16.15	10.67	Domestic
7118691	590411	4847814	2009	Unknown	Unknown	Not used
4906405	590560	4847778	1985	14.94	12.19	Domestic
7118690	590476	4847794	2009	Unknown	Unknown	Not Used

Well No.	UTM Coordinate Zone 17T		Date Drilled	Total Depth	Water Level	Water Use
	Easting	Northing		(mbgl)	(mbgl)	
7045631	590223	4847441	2007	29.26	29.26	Public
4906985	590562	4847821	1988	12.19	21.03	Domestic
7104751	590364	4847470	2008	9.75	Unknown	Not used
70445629	590267	4847417	2007	29.26	29.26	Public
4901639	590136	4847343	1960	13.72	7.62	Domestic
4904815	590066	4847029	1975	24.08	23.77	Domestic
4904560	590350	4847069	1974	23.16	21.34	Domestic
4904370	590306	4847116	1974	49.38	45.72	Commercial
4903961	590190	4847163	1971	24.38	21.34	Domestic
4901641	590212	4847183	1967	30.18	28.04	Domestic
4901640	590198	4847143	1966	24.69	23.77	Domestic
4904875	590164	4847073	1976	21.03	20.73	Domestic
7274243	590184	4847114	2016	Unknown	5.49	Unknown
4906279	590460	4847053	1984	18.29	8.53	Domestic
7221652	590229	4847227	2014	Unknown	0.61	Unknown
7183809	590334	4847068	2012	Unknown	Unknown	Unknown
4907472	590268	4847175	1990	14.63	16.46	Commercial
7294944	590119	4846968	2017	Unknown	Unknown	Monitoring Test-hole
4910067	590253	4847132	2006	5.79	4.88	Not used
7183808	590313	4847068	2012	Unknown	Unknown	Unknown
7183807	590319	4847199	2012	Unknown	Unknown	Unknown
4905982	590380	4847105	1982	17.68	10.67	Domestic
4902903	590184	4847293	1968	38.40	35.97	Commercial
7267156	590229	4847331	2014	4.88	1.22	Monitoring
4901642	590202	4847273	1954	45.11	45.11	Domestic
4901643	590002	4847247	1955	36.27	36.27	Livestock/Domestic
4901645	590122	4847157	1963	17.98	17.98	Domestic
4901646	590146	4847318	1963	18.29	18.29	Commercial
4901647	590080	4847337	1963	22.86	21.95	Domestic
4907639	589824	4847703	1992	47.55	46.02	Commercial
4901649	590156	4847303	1963	15.24	14.33	Commercial
7114487	590218	4847100	2008	6.10	1.83	Monitoring
4906494	590142	4847200	1986	25.60	25.60	Domestic
4904900	590114	4847173	1976	23.47	23.47	Domestic
4906406	589978	4847098	1985	10.97	6.10	Domestic
4906095	590240	4847282	1983	28.04	25.91	Domestic
4901648	590122	4847192	1963	23.47	21.34	Domestic

6.2 Wellhead Protection Sensitivity Area

The Site and the neighboring properties are not located within any wellhead protection area. Therefore, there should be no impact on the public wells due to the construction dewatering.

6.3 Surface Water

There is no source of surface water on site.

6.4 Potential Sources of Contamination

An RFO and its associated pump island and UST's are located approximately 25 m south of the subject site. There is concern of potential contamination arising from this land-use, which was addressed during the Phase II Environmental Site Assessment (ESA) for the subject site. The Phase II ESA, determined there to be no contaminants of concern from the RFO to the south of the subject site.

6.5 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 influenced is anticipated due to the new reconstruction.

7.0 GROUNDWATER QUALITY

7.1 Groundwater Sampling Protocol

Groundwater samples were collected from 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 wells was conducted on October 1, 2019. The groundwater sampling was compared to The Regional Municipality of Peel Sewer Use Bylaw No. 53-2010 for discharge to the sanitary sewer.

Specific Quality Assurance/Quality Control (QA/QC) measures were undertaken to ensure that the groundwater samples collected and the subsequent chemical analyses 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 inertial 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; Fluoride and Lead. The non-health related parameters tested were pH; Total Suspended Solids; Aluminum; Copper;

Manganese; Titanium and Zinc. Results of analysis were compared to The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.

7.2.1 Health Related Parameters

- **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 of 1 mg/L for The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.
- **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 Sanitary Sewer Use Bylaw No. 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 5 mg/L for The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 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. Fluoride in the groundwater samples was not detected.
- **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 3 mg/L for The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 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 Sanitary Sewer Use Bylaw No. 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 solids concentration. Pollutants such as dissolved metals and pathogens can attach to suspended particles and enter the water. The TSS found in the monitoring wells sampled, does not exceeded The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010; with the exception of MW3, which had an exceedance of 3320 mg/L compared to the guideline standard of 350 mg/L.

It is recommended that a settling tank be constructed onsite before discharging water to the municipal sewer system.

- **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 aluminum found in the monitoring wells sampled, does not exceeded The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.
- **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 The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.
- **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. Manganese in the samples collected from the monitoring well fell below the standards set out by The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.
- **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. Titanium in the samples collected from the monitoring well fell below the limits set out by The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.

- **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. Zinc in the groundwater samples analyzed fell below the guidelines set out by The Regional Municipality of Peel Sanitary Sewer Use Bylaw No. 53-2010.

Table 9 – Summary of Groundwater Samples

Parameter	Unit	G / S	RDL	MW1	MW2	MW3
Total Nonylphenol	mg/L		0.001	<0.001	<0.001	<0.001
NP1EO	mg/L		0.001	<0.001	<0.001	<0.001
NP2EO	mg/L		0.0003	<0.0003	<0.0003	<0.0003
Total Nonylphenol Ethoxylates	mg/L		0.001	<0.001	<0.001	<0.001

Parameter	Unit	G / S	RDL	MW-1	MW-2	MW-3
Oil and Grease (animal/vegetable) in water	mg/L	150	0.5	1.3	<0.5	1.1
Oil and Grease (mineral) in water	mg/L	15	0.5	<0.5	<0.5	<0.5

Parameter	Unit	G / S	RDL	MW-1	MW-2	MW-3
Methylene Chloride	mg/L	2	0.0003	<0.0003	<0.0003	<0.0003
trans-1,3-Dichloropropene	mg/L	8.0	0.0009	<0.0009	<0.0009	<0.0009
Methyl Ethyl Ketone	mg/L	4	0.0002	<0.0002	<0.0002	<0.0002
cis- 1,2-Dichloroethylene	mg/L	0.04	0.0002	<0.0002	<0.0002	<0.0002
Chloroform	mg/L	0.01	0.0002	<0.0002	<0.0002	<0.0002
Benzene	mg/L	0.4	0.0002	<0.0002	<0.0002	<0.0002
Trichloroethylene	mg/L	0.27	0.0002	0.0003	<0.0002	0.0004
Toluene	mg/L	1	0.0001	<0.0001	<0.0001	<0.0001
Tetrachloroethylene	mg/L	0.14	0.0003	<0.0003	<0.0003	<0.0003
Ethylbenzene	mg/L	0.16	0.0001	<0.0001	<0.0001	<0.0001
1,1,2,2-Tetrachloroethane	mg/L	1.4	0.0001	<0.0001	<0.0001	<0.0001
Styrene	mg/L	0.2	0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichlorobenzene	mg/L	0.05	0.0001	<0.0001	<0.0001	<0.0001
1,4-Dichlorobenzene	mg/L	0.08	0.0001	<0.0001	<0.0001	<0.0001
Total Xylenes	mg/L	1.4	0.0001	<0.0001	<0.0001	<0.0001
PCBs	mg/L	0.001	0.0002	<0.0002	<0.0002	<0.0002
Di-n-butyl phthalate	mg/L	0.08	0.0005	<0.0005	<0.0005	<0.0005
Bis(2-Ethylhexyl)phthalate	mg/L	0.012	0.0005	<0.0005	<0.0005	<0.0005

Parameter	Unit	G / S	RDL	MW-1	MW-2	MW-3
pH	pH Units	5.5-10	NA	7.80	NA	7.80
BOD (5)	mg/L	300	5	<5	5	<5
Fluoride	mg/L	350	10	27	10	<10
Sulphate	mg/L	10	0.25	<0.25	0.25	<0.25
Total Cyanide	mg/L	1500	0.50	169	0.50	156
Total Kjeldahl Nitrogen	mg/L	2	0.002	<0.002	0.002	<0.002
Phenols	mg/L	1.0	0.002	<0.002	0.002	<0.002
Total Phosphorus	mg/L	10	0.2	2.04	0.02	0.03
Total Suspended Solids	mg/L	100	0.10	0.82	0.10	0.20
Total Aluminum	mg/L	50	0.020	25.2	0.020	0.053
Total Antimony	mg/L	5	0.020	<0.020	0.020	<0.020
Total Arsenic	mg/L	1	0.015	<0.015	0.015	<0.015
Total Cadmium	mg/L	0.7	0.010	<0.010	0.010	<0.010
Total Chromium	mg/L	5	0.015	0.038	0.015	<0.015
Total Cobalt	mg/L	5	0.020	0.023	0.020	<0.020
Total Copper	mg/L	3	0.010	0.065	0.010	<0.010
Total Lead	mg/L	3	0.020	0.022	0.020	<0.020
Total Manganese	mg/L	5	0.020	2.34	0.020	0.096
Total Mercury	mg/L	0.01	0.0002	<0.0002	0.0002	<0.0002
Total Molybdenum	mg/L	5	0.020	<0.020	0.020	<0.020
Total Nickel	mg/L	3	0.015	0.045	0.015	<0.015
Total Selenium	mg/L	1	0.020	<0.020	0.020	<0.020
Total Silver	mg/L	5	0.010	<0.010	0.010	<0.010
Total Tin	mg/L	5	0.025	<0.025	0.025	<0.025
Total Titanium	mg/L	5	0.020	0.607	0.020	<0.020
Total Zinc	mg/L	3	0.020	0.123	0.020	<0.020

Comments: RDL - Reported Detection Limit;
G / S - Guideline / Standard: Refers to ON Peel Region SN
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 Mr. Bikram Dhillon, on behalf of BVD Petroleum (the client) to evaluate the potential impact from the proposed development of an RFO with it's associated convenient store and parking spaces, as well was a Burger King restaurant on local groundwater/surface water resources by conducting a small-scale hydrogeological study. The subject site is located 14027 Hurontario Street, Inglewood, Ontario. The area of the Site is approximately 32,122.80 m^2 (7.94 acres). At the time of the investigation, the site consisted of one residential property with an unoccupied single-storey residential dwelling.
- The topography on the Subject Site indicates an elevation of approximately 288 masl to the southeast towards tributaries of Etobicoke Creek. The area does have some rolling topography due to drumlin features in the surrounding area.
- Geological maps indicate surficial deposits in the vicinity of the Site to be comprised of till. A Bedrock in the area of the site is part of the Queenston Formation characterized as shale, siltstone, sandstone, and limestone.
- A search of the MECP well records show a total of 75 wells located within 500 meters of the surrounding area as follows: The MECP well records show groundwater was found between 1.22-46.03 mbgl, for wells drilled between 4.9-47.6 mbgl. However, the drilling program completed at this site show the groundwater was found between 3.580-4.080 mbgl for monitoring wells drilled between 6.910-8.320 mbgl.
- 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 three monitoring wells installed by A&A were drilled to a maximum depth of 7.564 m. There were two existing monitoring wells on site from a previous unknown investigation. A total of six groundwater monitoring events took place. All wells contained water in each of the six monitoring events. During the first two event, the two existing monitoring wells were not measured. The events took place in 2019 on July 12, August 9, October 1, October 21, November 4,

and November 18. It was concluded that groundwater is present on site at elevations between 284-288 masl.

- The total precipitation (rainfall plus snowfall) in 2018 was 1090.60 mm. The average annual precipitation from 1988-2018 was 904.63 mm. For the same period, it was calculated that approximately 784.75 mm/year would be lost to evapotranspiration (Environment Canada, 2018); leaving a total of approximately 119.80 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. A storm water management plan will be needed to manage the storm water runoff on site.
- The analysis results indicate that all health and non-health related parameters were below The Regional Municipality of Peel Sewer Use Bylaw No. 53-2010 limits from Sanitary Sewer Discharge; with the exception of MW3, which had an exceedance of 3320 mg/L for TDS compared to the guideline standard of 350 mg/L. It is recommended that a settling tank be constructed onsite before discharging water to the municipal sewer system.

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

1. A stormwater management plan will be needed to mitigate the creation of excess stormwater runoff.
2. A settling tank be constructed on-site before discharging water to the municipal sanitary sewer system.

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

SIGNED:

Thomas Demers, BASc. (Hons. Env.), EIT

Project Manager

SIGNED:

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

Senior Hydrogeologist

9.0 REFERENCES

Barnett, P.J., 1992. Quaternary geology of Ontario, p. 1011-1088. **In** P.C. Thurston, H.R. Williams, R.H. Sutcliffe and G.M. Stott, eds., Geology of Ontario. Ontario Geological Survey, Toronto, Special Volume 4, Part 2, 1525 p.

Regional Municipality of Durham, 2015, The Regional Municipality of Durham Sewer Use Bylaw No. 55-2013. https://www.durham.ca/Modules/Bylaws/Bylaw/Details/fe6d9913-9b9e-4fd2-8cb9-5b0c1e91e988

Cooper, H.H., Jr. and Jacob, C.E., 1946. A generalized graphical method for evaluating formation constant and summarizing well-field history: American Geophysics Union Transactions, v. 27, no.4, p526-534.

Environment Canada, 2018. Evapotranspiration. Obtained from: http://farmwest.com/climate/et. Accessed on October 4, 2019.

Earthfx. 2006. ViewLog modeled GRD output files dated June 9, 2006.

Fetter, C. W., 2001, Applied Hydrogeology, Upper Saddle River, New Jersey 07458, Fourth Edition.

Geological Survey of Canada Map 1263A, titled *Geology, Toronto-Windsor Area, Ontario*.

Government of Ontario, 2003. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. Obtained from: http://www.creditvalleyca.ca/wp-content/uploads/2011/03/std01_079707.pdf. Accessed on October 3, 2019.

Ontario Geological Survey Preliminary Map P.2222, titled *Quaternary Geology, Sarnia-Brights Cove Area*.

Ontario Geological Survey Preliminary Map P.2206, *Bedrock Topography, Sarnia- Brights Cove Area.*

Phillips, D.W. and McCulloch, J.A.W., 1972, The Climate of the Great Lakes Basin: Climatological Studies, Number 20, Environment Canada, Atmospheric Environment Service.

Thornthwaite, C. W., and J. R. Mather published the first version entitled “The Water Balance,” *Publications in Climatology* VIII (1): 1-104, Drexel Institute of Climatology, Centerton, NJ.

University of Waterloo Southern Ontario Paleozoic Rocks, 2017, https://uwaterloo.ca/earth-sciences-museum/resources/minerals-ontario/southern-ontario-paleozoic-rocks Accessed on: November 19, 2019

Waterloo Hydrogeological, Inc. 2004. Six Conservation Authorities FEFLOW Groundwater Model, Conceptual Model Report. Obtained from: http://thamesriver.on.ca/wp-content/uploads/Groundwater/ModelingProject/Concept_Model_Report_Final.pdf. Accessed on: November 19, 2019.

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

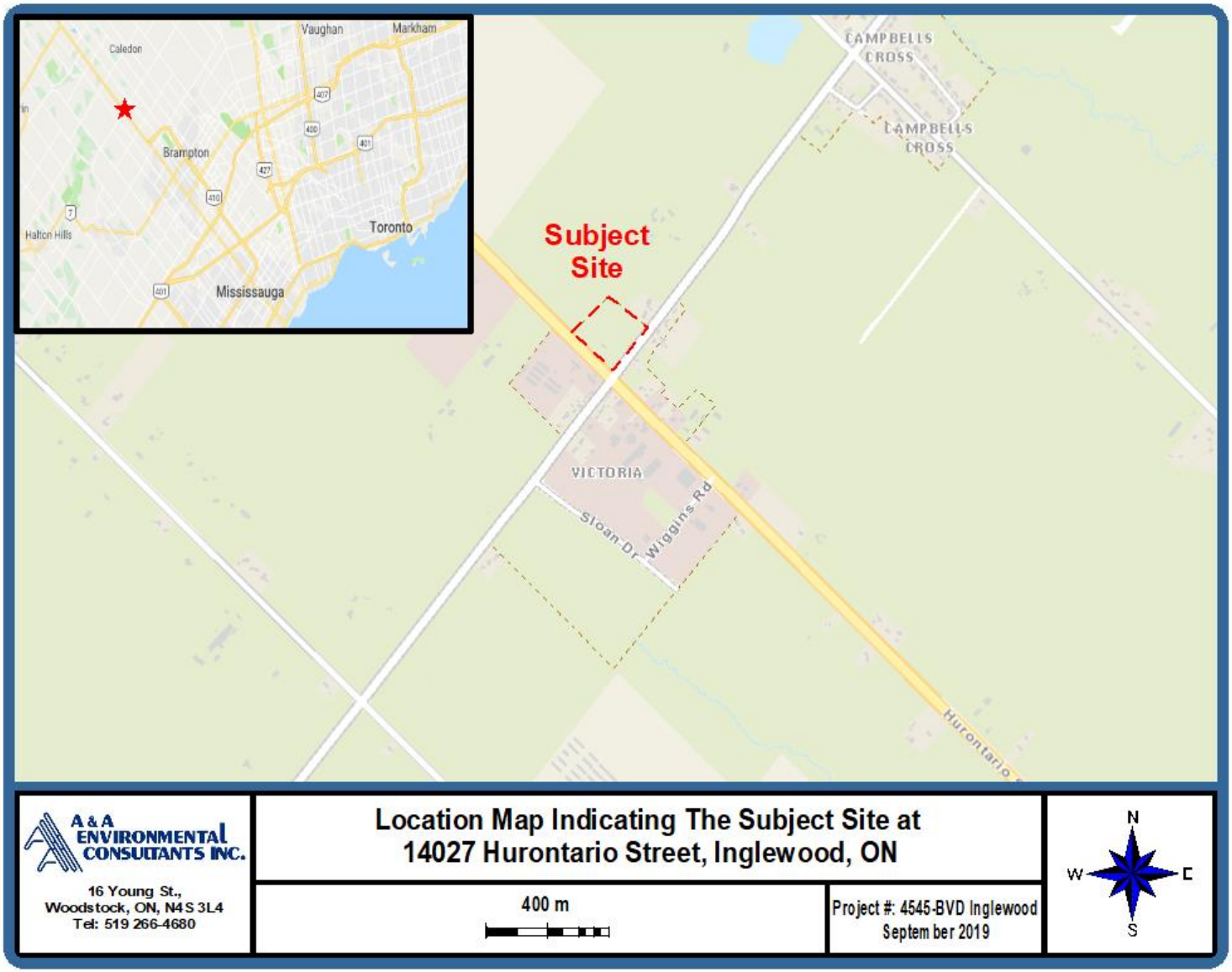


Figure 2 – Satellite Map of Site and Subject Study Area

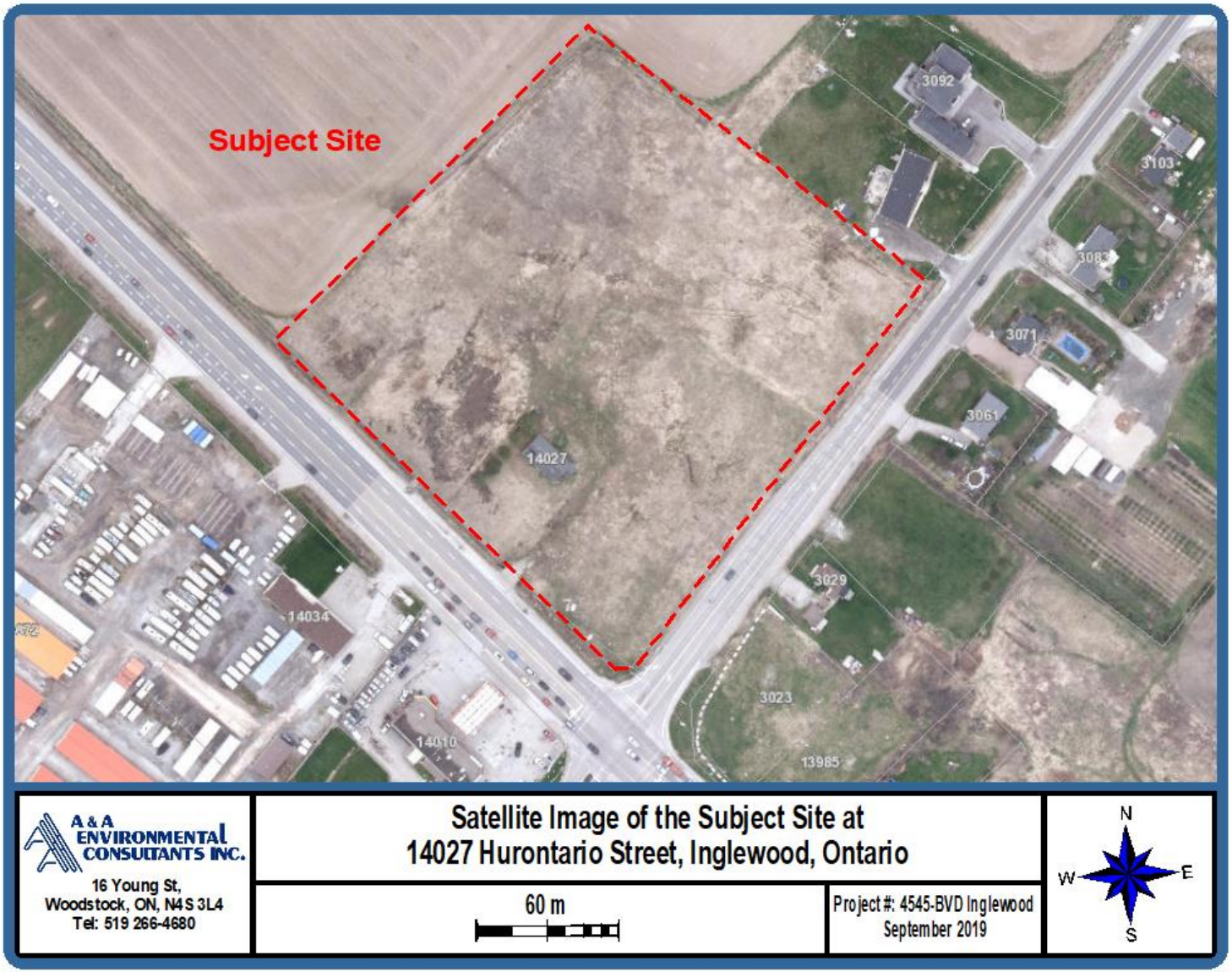


Figure 3 – Topographic Map

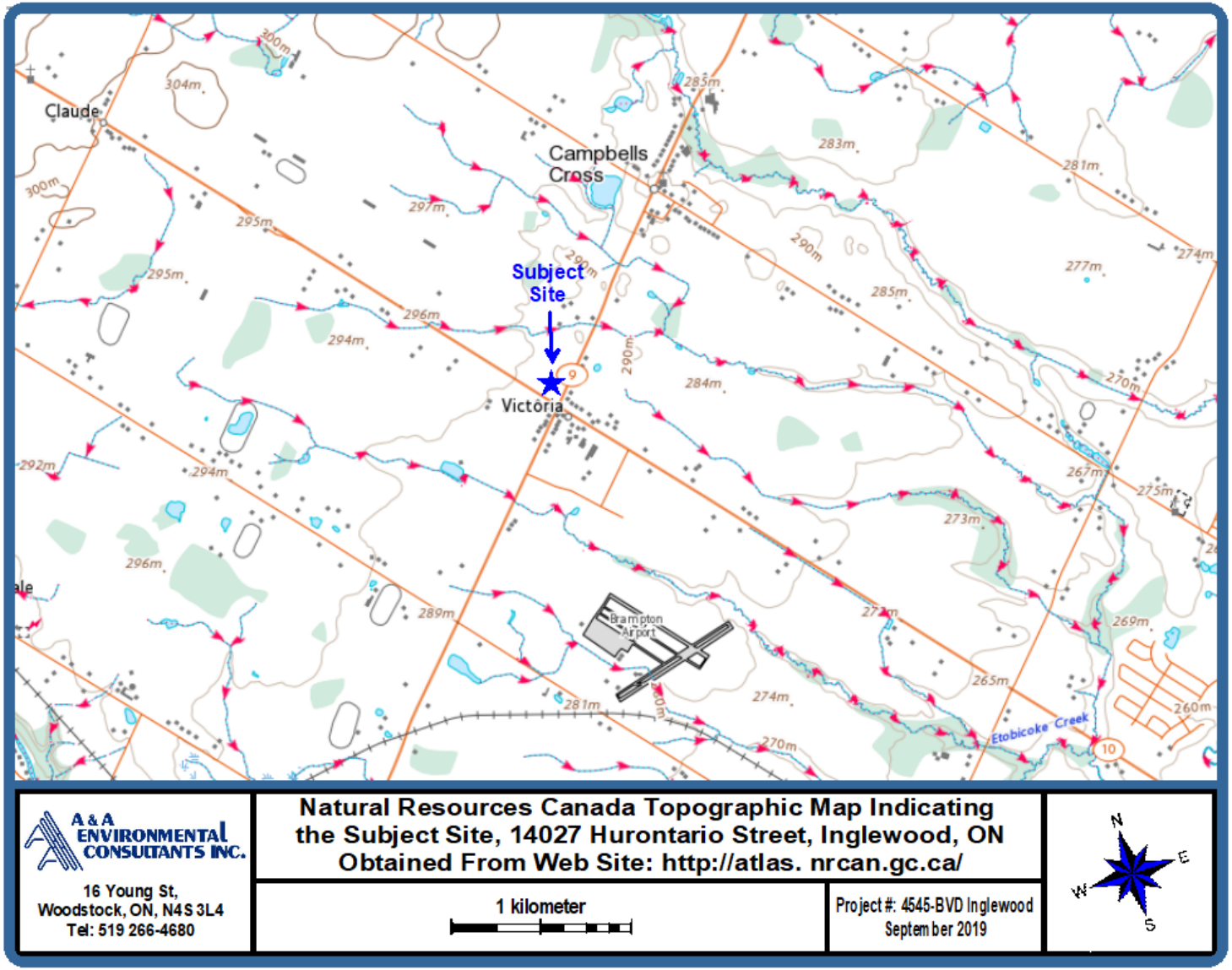


Figure 4 – Monitoring Wells Location Map

Figure 5 – Monitoring Well Locations, Site Plan Map

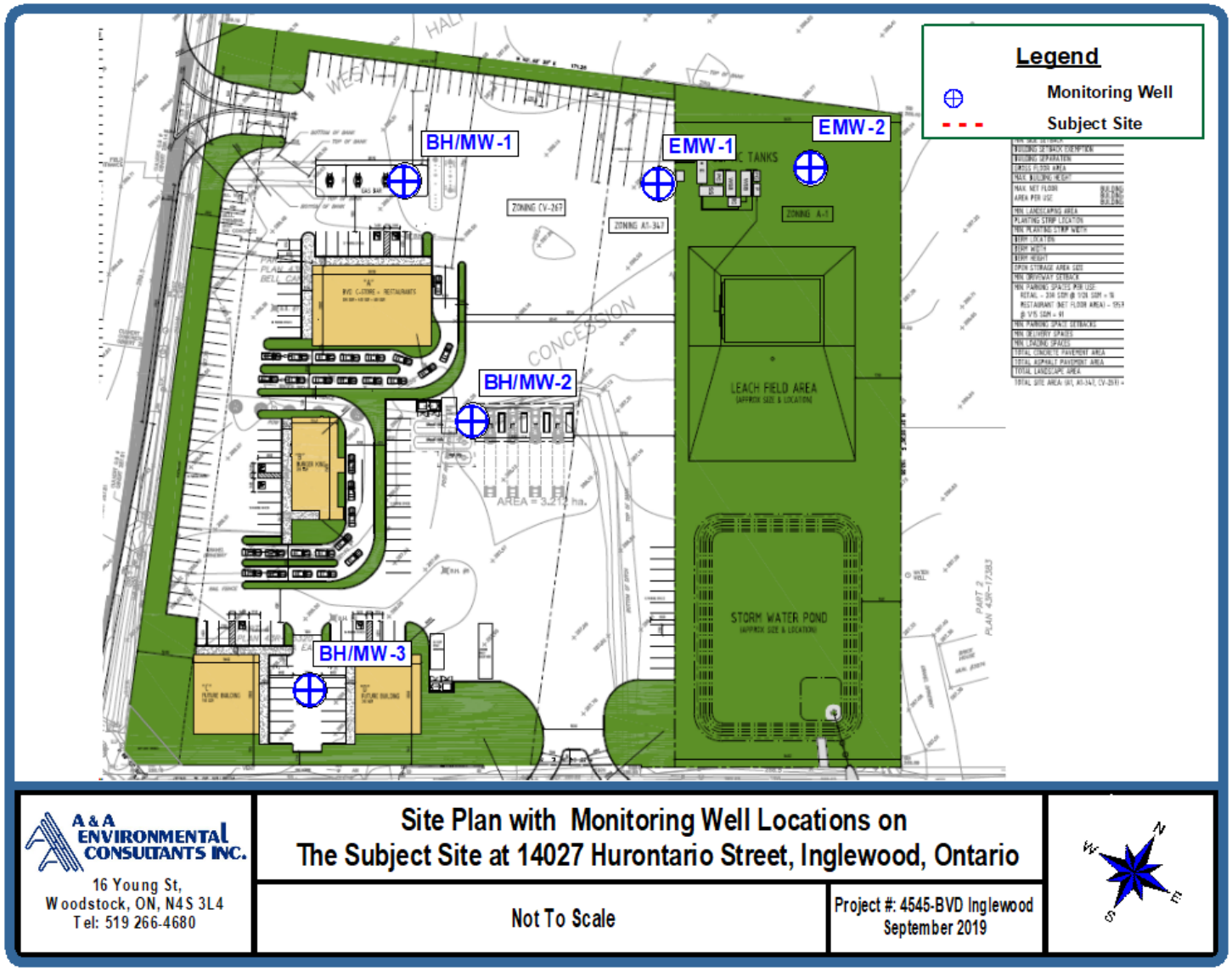
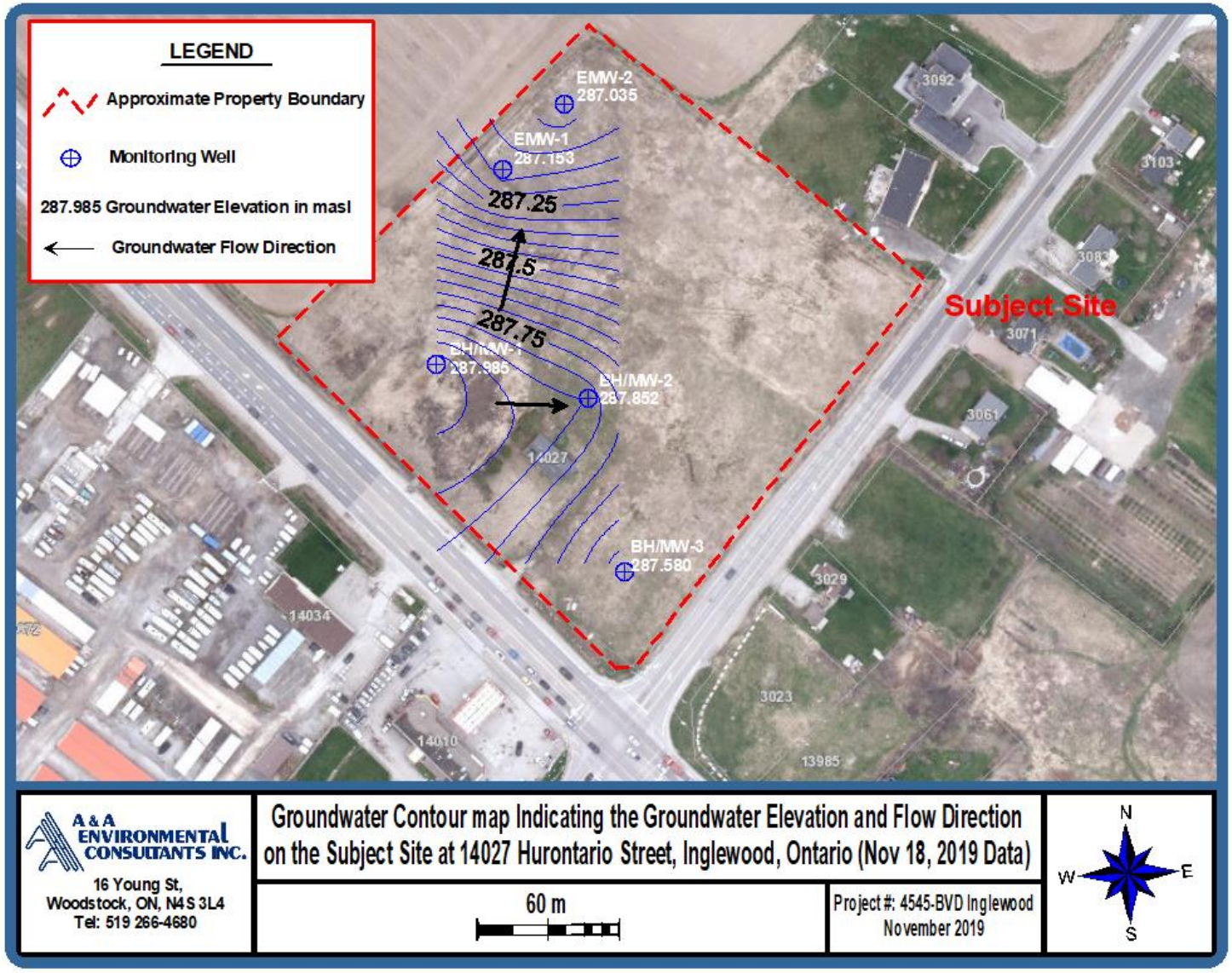


Figure 6 – Groundwater Contour Map

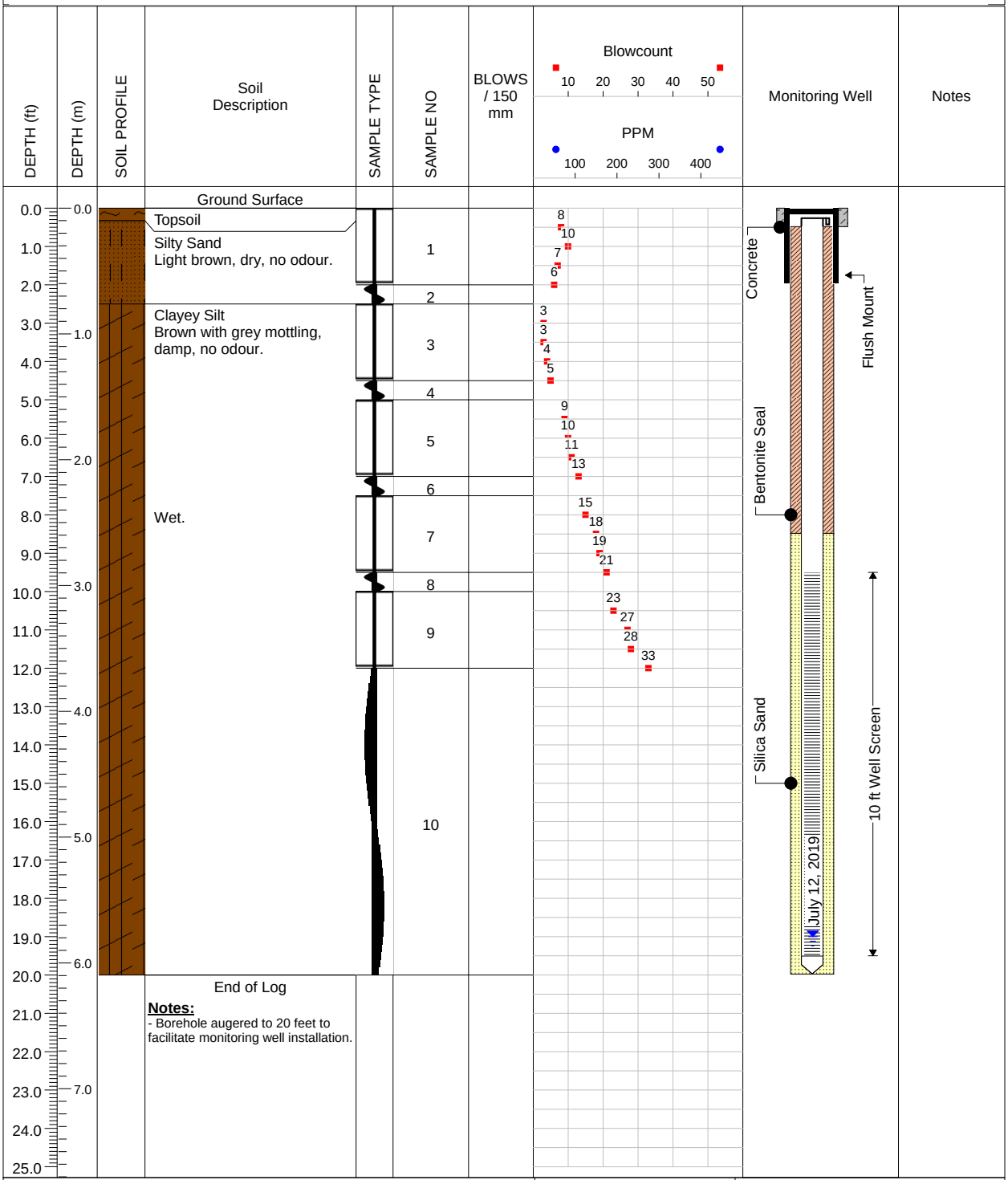


APPENDIX B – Borehole Logs

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** Northeast portion of subject site	**BOREHOLE NO: BH/MW1**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS

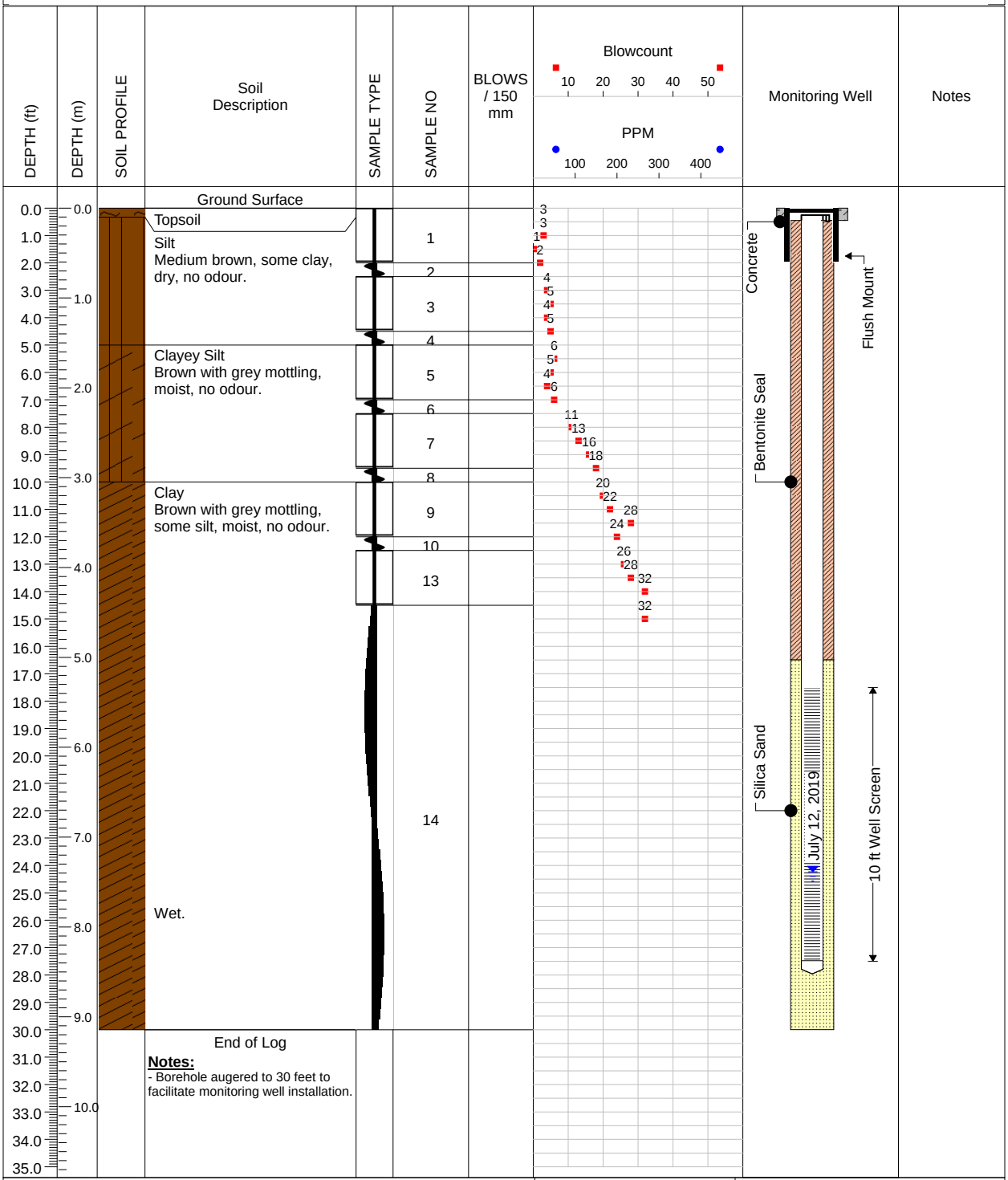


A & A Environmental Consultant Inc. 16 Young Street Woodstock, ON	**LOGGED BY:** T. Thornton	**COMPLETION DEPTH:** 20 feet
	REVIEWED BY: A. Rasoul	**DRILL METHOD:** Split spoon & rotary
	DRILL DATE: July 12, 2019	**Page:** 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** Central south portion of subject site	**BOREHOLE NO: BH/MW2**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS

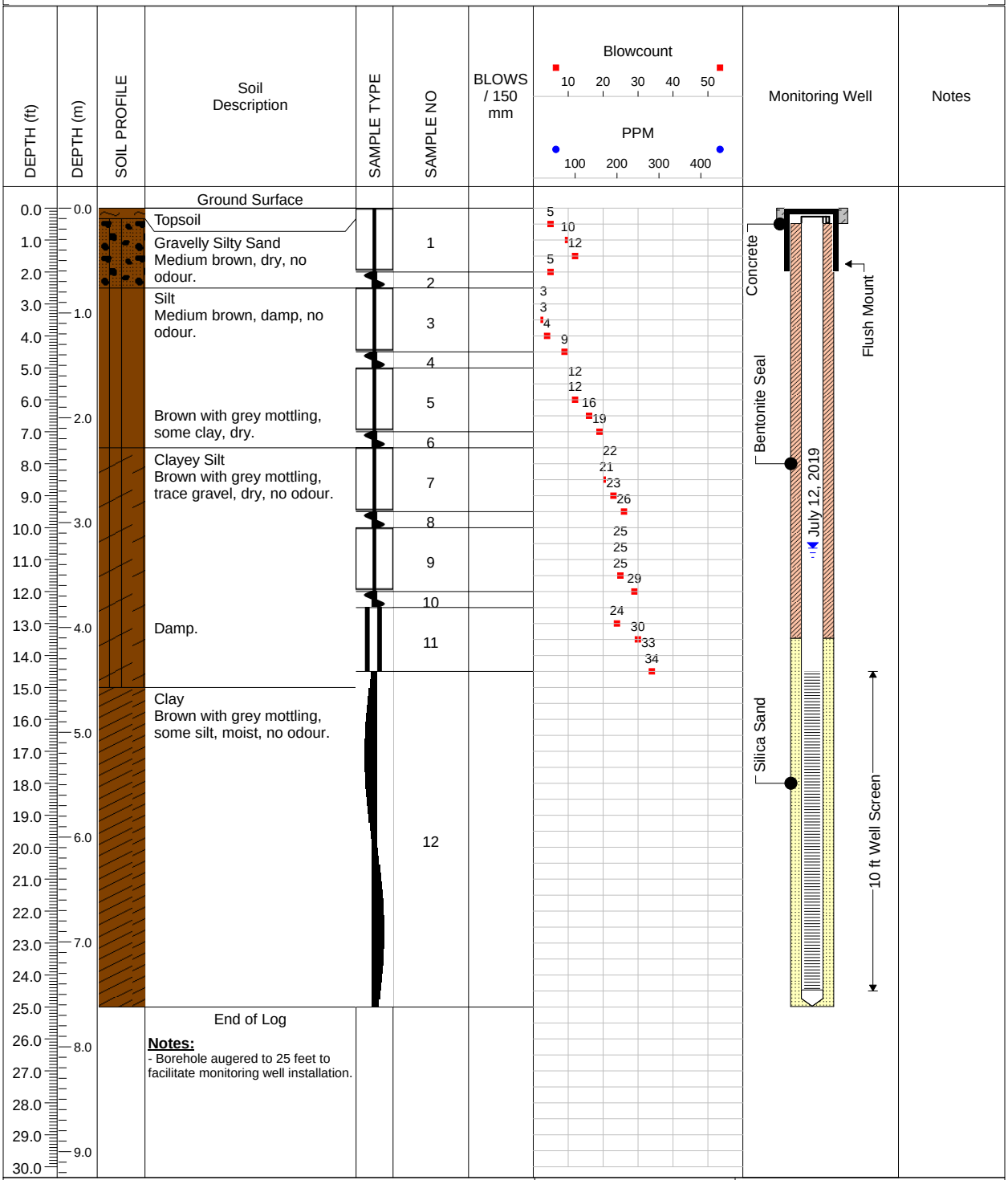


A & A Environmental Consultant Inc. 16 Young Street Woodstock, ON	**LOGGED BY:** T. Thornton **REVIEWED BY:** A. Rasoul **DRILL DATE:** July 12, 2019
	COMPLETION DEPTH: 30 feet **DRILL METHOD:** Split spoon & rotary **Page:** 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** South portion of subject site	**BOREHOLE NO: BH/MW3**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



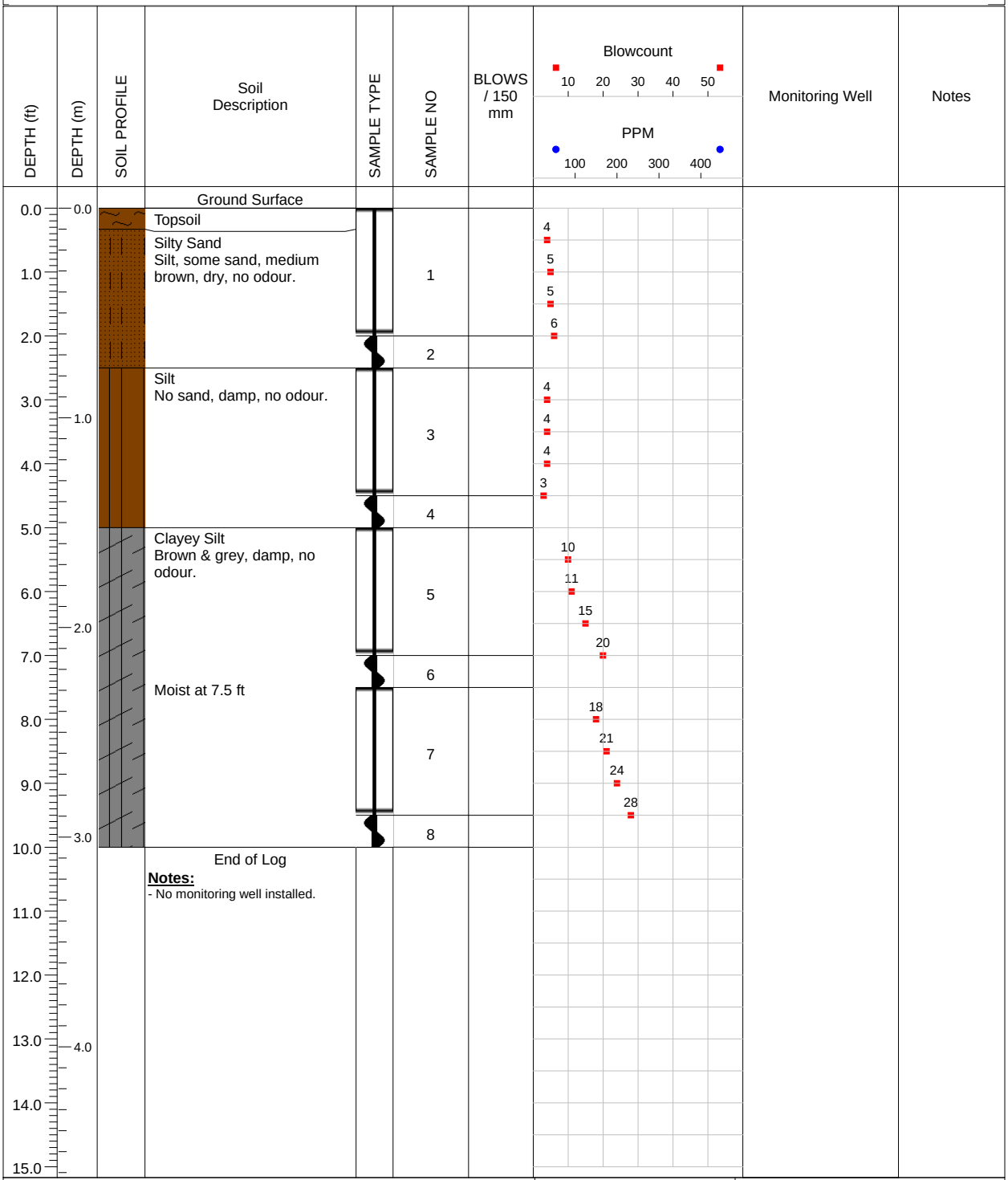
Notes:
- Borehole augered to 25 feet to facilitate monitoring well installation.

A & A Environmental Consultant Inc. 16 Young Street Woodstock, ON	**LOGGED BY:** T. Thornton
	REVIEWED BY: A. Rasoul
	DRILL DATE: July 12, 2019
	COMPLETION DEPTH: 25 feet
	DRILL METHOD: Split spoon & rotary
	Page: 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** Central portion of subject site	**BOREHOLE NO: BH4**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



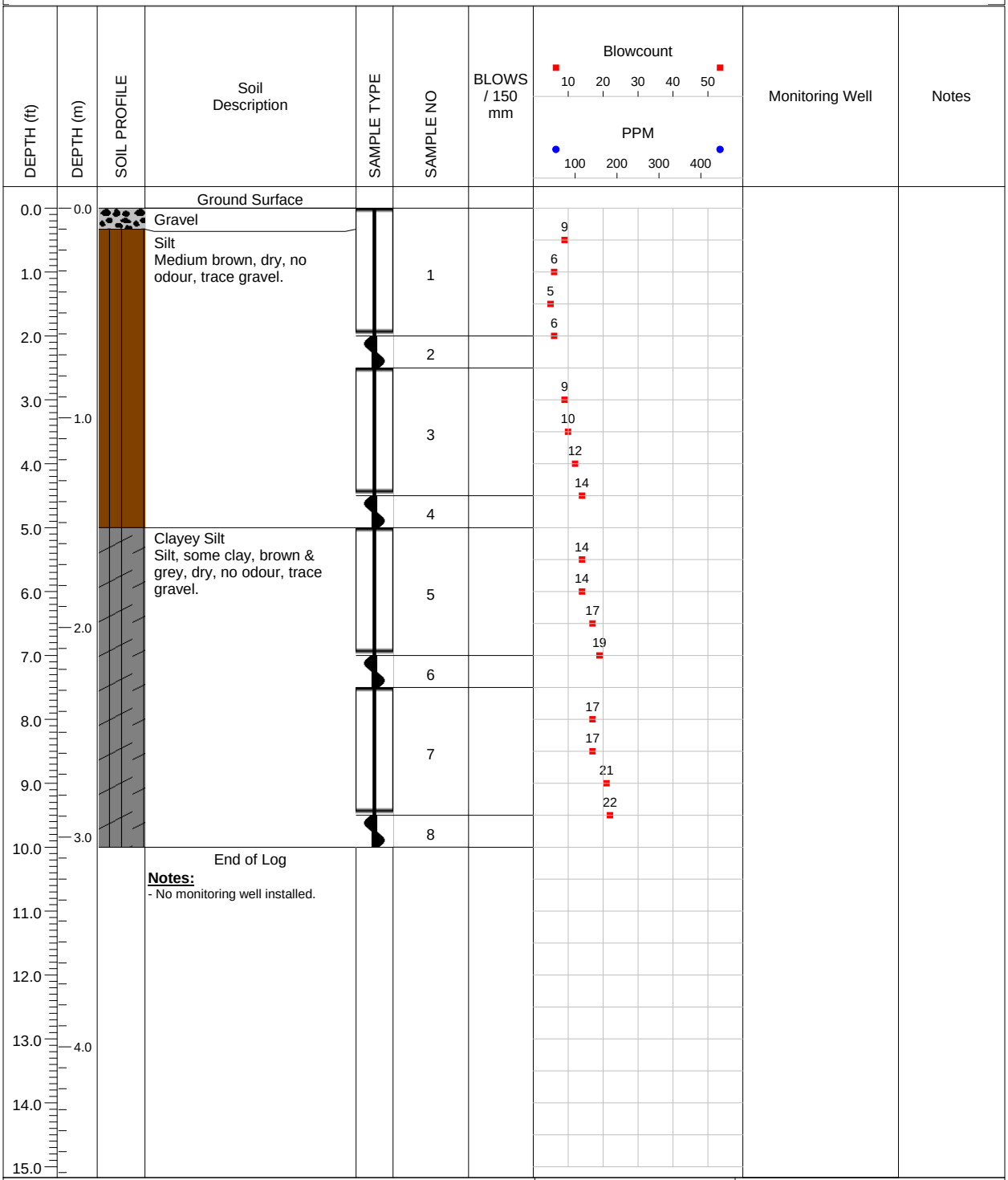
A & A Environmental Consultant Inc.
16 Young Street Woodstock, ON

LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 10 feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** Split spoon
DRILL DATE: July 12, 2019	**Page:** 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** Central W boundary	**BOREHOLE NO: BH5**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS

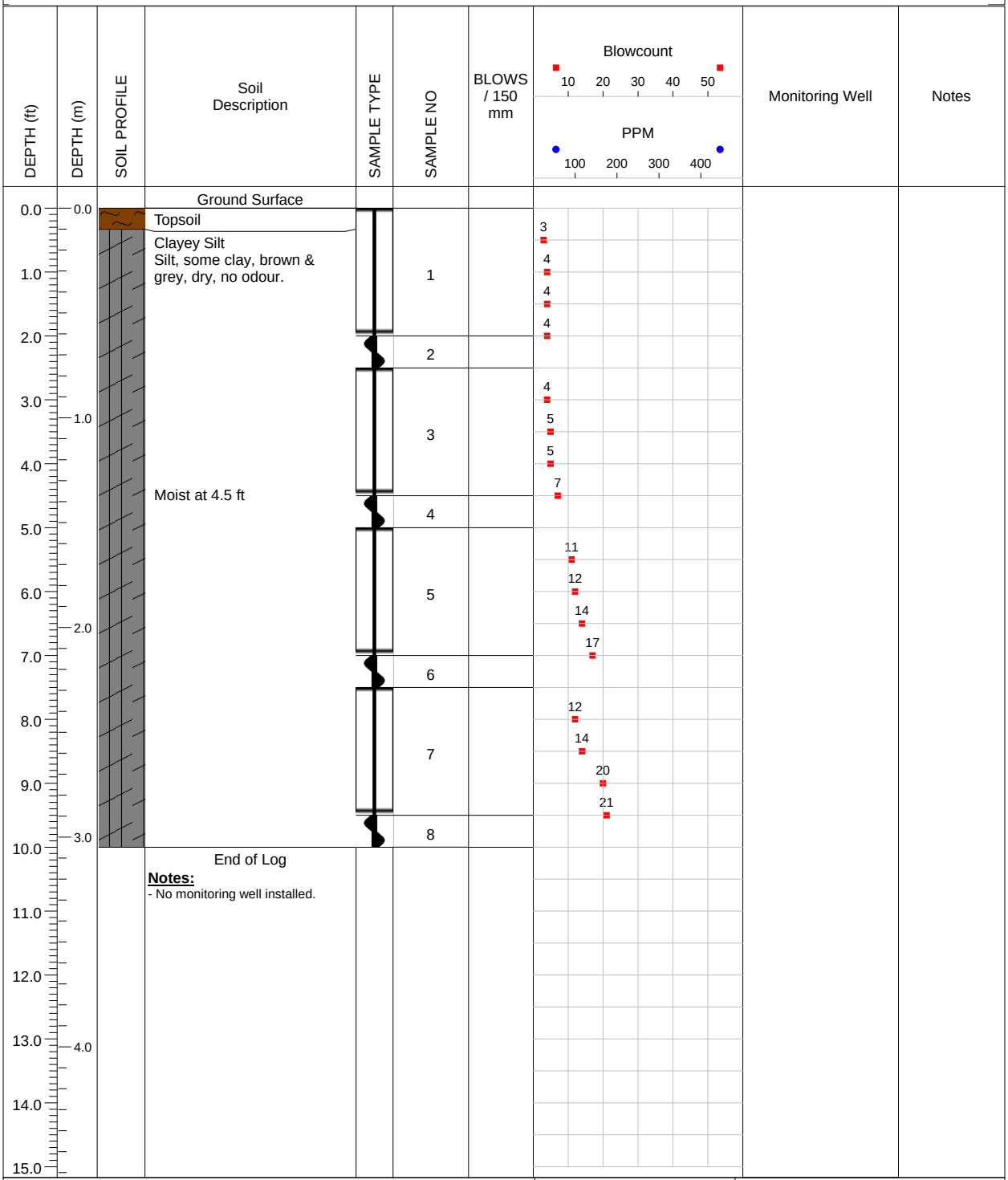


A & A Environmental Consultant Inc. 16 Young Street Woodstock, ON	**LOGGED BY:** T. Thornton	**COMPLETION DEPTH:** 10 feet
	REVIEWED BY: A. Rasoul	**DRILL METHOD:** Split spoon
	DRILL DATE: July 12, 2019	**Page:** 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** NW portion of site	**BOREHOLE NO: BH6**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



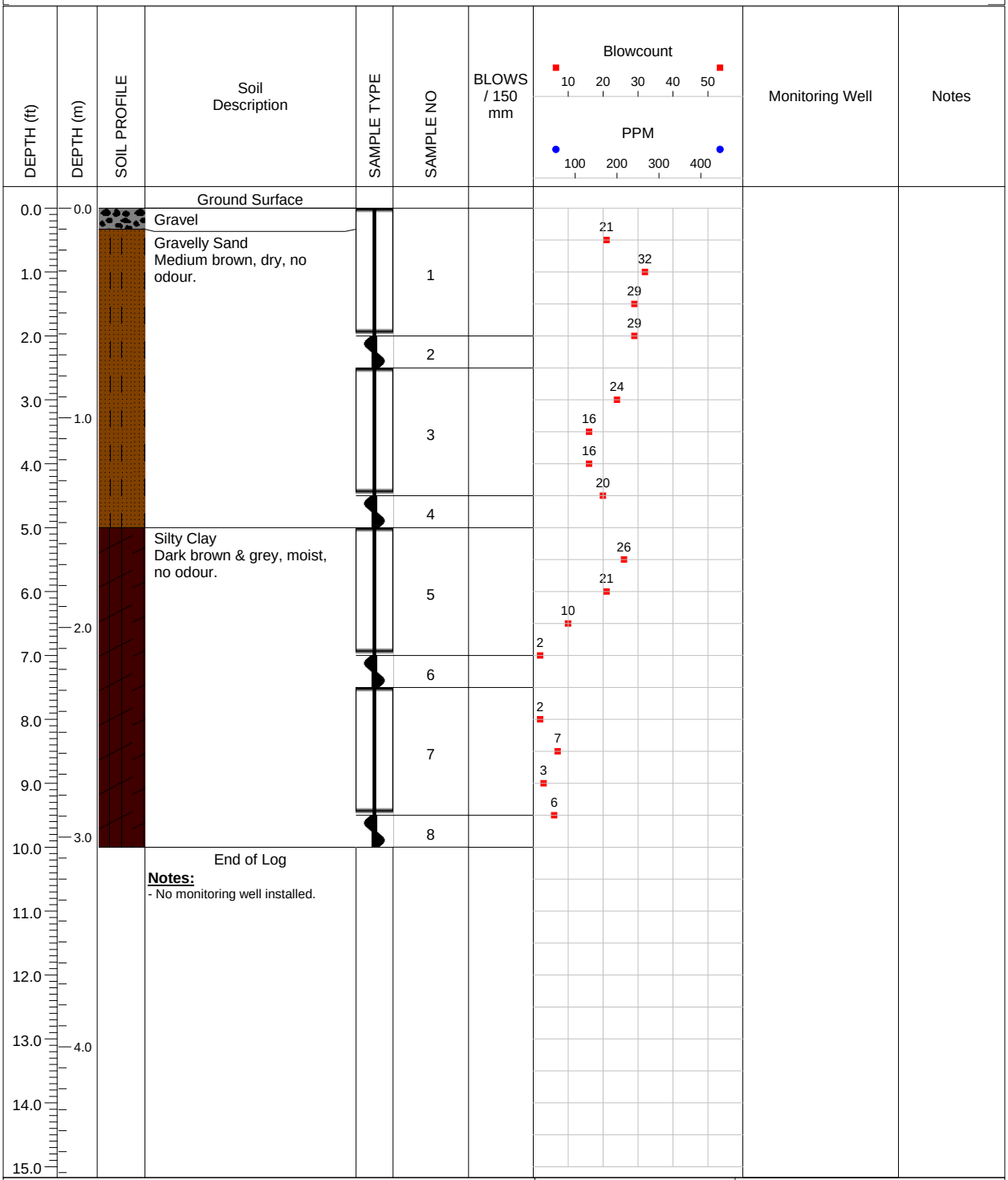
A & A Environmental Consultant Inc.
16 Young Street Woodstock, ON

LOGGED BY: T. Thornton	**COMPLETION DEPTH:** 10 feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** Split spoon
DRILL DATE: July 12, 2019	**Page:** 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** Along Hurontario St Rd	**BOREHOLE NO: BH7**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



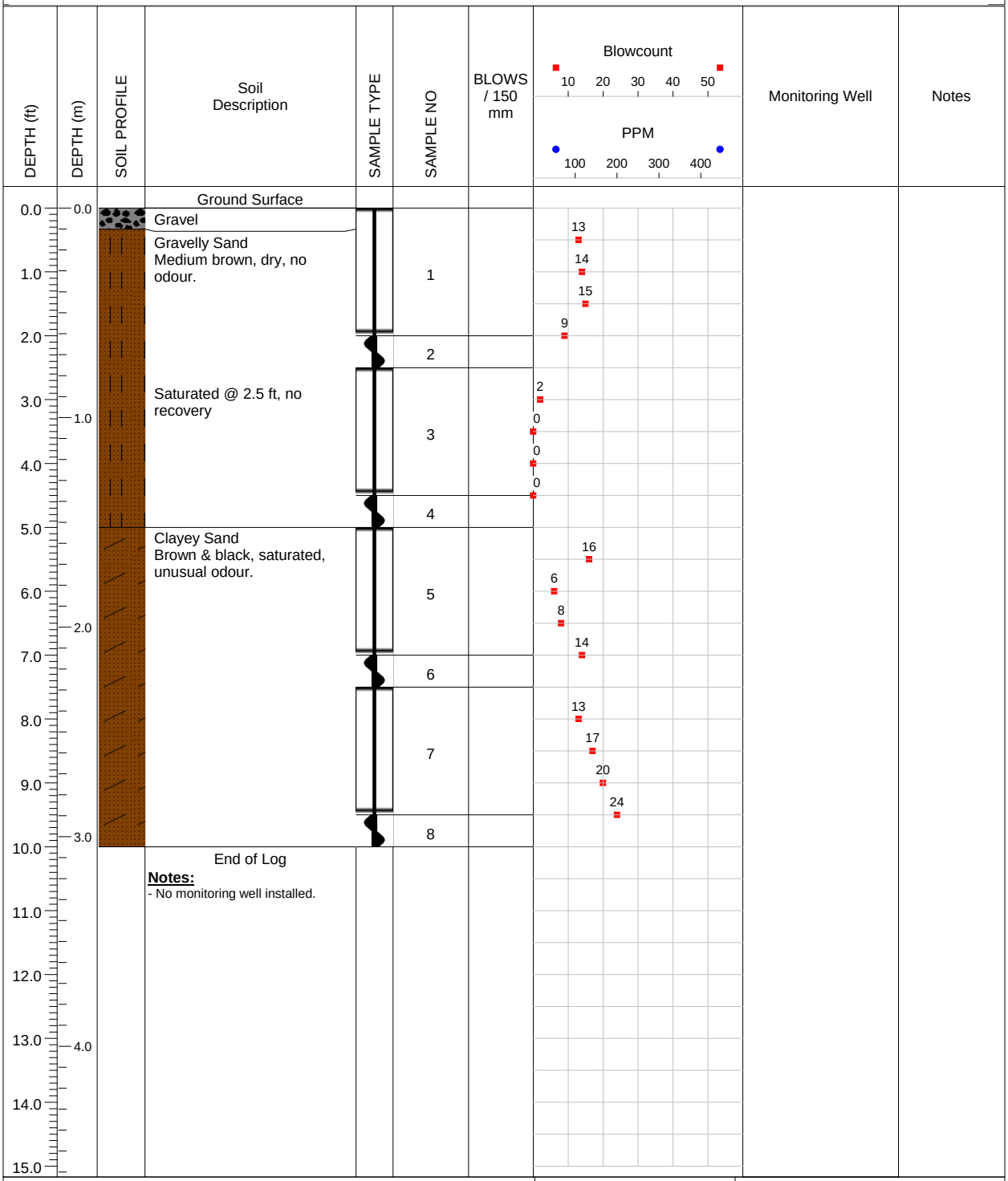
A & A Environmental Consultant Inc.
16 Young Street Woodstock, ON

LOGGED BY: M. Richardson	**COMPLETION DEPTH:** 10 feet
REVIEWED BY: A. Rasoul	**DRILL METHOD:** Split spoon
DRILL DATE: Oct 1, 2019	**Page:** 1 of 1

PROJECT: Geotechnical & Hydrogeo	**BH LOCATION:** Along King St Rd	**BOREHOLE NO: BH8**
PROJECT NO: 4545- BVD Inglewood	**LOCATION:** NE corner of Hurontario Street & King Street Intersection, Inglewood, ON	
PROJECT MANAGER: T. Demers	**COMPANY NAME:** A&A Environmental Consultants Inc.	

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

BACKFILL TYPE BENTONITE PEA GRAVEL SLOUGH GROUT DRILL CUTTINGS



A & A Environmental Consultant Inc. 16 Young Street Woodstock, ON	**LOGGED BY:** M. Richardson **COMPLETION DEPTH:** 10 feet
	REVIEWED BY: A. Rasoul **DRILL METHOD:** Split spoon
	DRILL DATE: Oct 1, 2019 **Page:** 1 of 1

APPENDIX C – Certificate of Chemical Analysis

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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: 4545-BVD Caledon

AGAT WORK ORDER: 19T524961

TRACE ORGANICS REVIEWED BY: Navdeep Kaur Kansera, Senior Lab Technician

ULTRA TRACE REVIEWED BY: Philippe Morneau, chimiste

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Oct 16, 2019

PAGES (INCLUDING COVER): 12

VERSION*: 1

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

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Peel Region Sanitary - Organics

DATE RECEIVED: 2019-10-01

DATE REPORTED: 2019-10-16

		SAMPLE DESCRIPTION:		MW1	MW2	MW3
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2019-10-01	2019-10-01	2019-10-01
Parameter	Unit	G / S	RDL	576692	576694	576695
Oil and Grease (animal/vegetable) in water	mg/L	150	0.5	1.3	<0.5	1.1
Oil and Grease (mineral) in water	mg/L	15	0.5	<0.5	<0.5	<0.5
Methylene Chloride	mg/L	2	0.0003	<0.0003	<0.0003	<0.0003
Methyl Ethyl Ketone	mg/L	8.0	0.0009	<0.0009	<0.0009	<0.0009
cis- 1,2-Dichloroethylene	mg/L	4	0.0002	<0.0002	<0.0002	<0.0002
Chloroform	mg/L	0.04	0.0002	<0.0002	<0.0002	<0.0002
Benzene	mg/L	0.01	0.0002	<0.0002	<0.0002	<0.0002
Trichloroethylene	mg/L	0.4	0.0002	<0.0002	<0.0002	<0.0002
Toluene	mg/L	0.27	0.0002	0.0003	<0.0002	0.0004
Tetrachloroethylene	mg/L	1	0.0001	<0.0001	<0.0001	<0.0001
trans-1,3-Dichloropropylene	mg/L	0.14	0.0003	<0.0003	<0.0003	<0.0003
Ethylbenzene	mg/L	0.16	0.0001	<0.0001	<0.0001	<0.0001
1,1,2,2-Tetrachloroethane	mg/L	1.4	0.0001	<0.0001	<0.0001	<0.0001
Styrene	mg/L	0.2	0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichlorobenzene	mg/L	0.05	0.0001	<0.0001	<0.0001	<0.0001
1,4-Dichlorobenzene	mg/L	0.08	0.0001	<0.0001	<0.0001	<0.0001
Total Xylenes	mg/L	1.4	0.0001	<0.0001	<0.0001	<0.0001
PCBs	mg/L	0.001	0.0002	<0.0002	<0.0002	<0.0002
Di-n-butyl phthalate	mg/L	0.08	0.0005	<0.0005	<0.0005	<0.0005
Bis(2-Ethylhexyl)phthalate	mg/L	0.012	0.0005	<0.0005	<0.0005	<0.0005

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.

576692-576695 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.
Total Nonylphenol Ethoxylates is reported as the sum of Nonylphenol Ethoxylate and Nonylphenol Diethoxylate. NP/NPE analysis done at AGAT 5623 McAdam Road Mississauga location.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Navdeep Kansera

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Nonylphenol and Nonylphenol Ethoxylates (Ontario, mg/L)

DATE RECEIVED: 2019-10-01

DATE REPORTED: 2019-10-16

		SAMPLE DESCRIPTION:		MW1	MW2	MW3
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		2019-10-01	2019-10-01	2019-10-01
Parameter	Unit	G / S	RDL	576692	576694	576695
Total Nonylphenol	mg/L		0.001	<0.001	<0.001	<0.001
NP1EO	mg/L		0.001	<0.001	<0.001	<0.001
NP2EO	mg/L		0.0003	<0.0003	<0.0003	<0.0003
Total Nonylphenol Ethoxylates	mg/L		0.001	<0.001	<0.001	<0.001

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

Analysis performed at AGAT Montreal (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Peel Sanitary Sewer Use By-Law - Inorganics

DATE RECEIVED: 2019-10-01

DATE REPORTED: 2019-10-16

		SAMPLE DESCRIPTION:		MW1		MW2		MW3
		SAMPLE TYPE:		Water		Water		Water
		DATE SAMPLED:		2019-10-01		2019-10-01		2019-10-01
Parameter	Unit	G / S	RDL	576692	RDL	576694	RDL	576695
pH	pH Units	5.5-10	NA	7.80	NA	7.80	NA	7.67
CBOD (5)	mg/L	300	5	<5	5	<5	5	<5
Total Suspended Solids	mg/L	350	10	27	10	<10	10	3320
Fluoride	mg/L	10	0.25	<0.25	0.25	<0.25	0.25	<0.25
Sulphate	mg/L	1500	0.50	169	0.50	156	0.50	74.9
Total Cyanide	mg/L	2	0.002	<0.002	0.002	<0.002	0.002	<0.002
Phenols	mg/L	1.0	0.002	<0.002	0.002	<0.002	0.002	<0.002
Total Phosphorus	mg/L	10	0.2	2.04	0.02	0.03	0.2	2.20
Total Kjeldahl Nitrogen	mg/L	100	0.10	0.82	0.10	0.20	0.10	0.40
Total Aluminum	mg/L	50	0.020	25.2	0.020	0.053	0.020	12.8
Total Antimony	mg/L	5	0.020	<0.020	0.020	<0.020	0.020	<0.020
Total Arsenic	mg/L	1	0.015	<0.015	0.015	<0.015	0.015	<0.015
Total Cadmium	mg/L	0.7	0.010	<0.010	0.010	<0.010	0.010	<0.010
Total Chromium	mg/L	5	0.015	0.038	0.015	<0.015	0.015	0.018
Total Cobalt	mg/L	5	0.020	0.023	0.020	<0.020	0.020	<0.020
Total Copper	mg/L	3	0.010	0.065	0.010	<0.010	0.010	0.031
Total Lead	mg/L	3	0.020	0.022	0.020	<0.020	0.020	<0.020
Total Manganese	mg/L	5	0.020	2.34	0.020	0.096	0.020	1.52
Total Mercury	mg/L	0.01	0.0002	<0.0002	0.0002	<0.0002	0.0002	<0.0002
Total Molybdenum	mg/L	5	0.020	<0.020	0.020	<0.020	0.020	<0.020
Total Nickel	mg/L	3	0.015	0.045	0.015	<0.015	0.015	0.020
Total Selenium	mg/L	1	0.020	<0.020	0.020	<0.020	0.020	<0.020
Total Silver	mg/L	5	0.010	<0.010	0.010	<0.010	0.010	<0.010
Total Tin	mg/L	5	0.025	<0.025	0.025	<0.025	0.025	<0.025
Total Titanium	mg/L	5	0.020	0.607	0.020	<0.020	0.020	0.319
Total Zinc	mg/L	3	0.020	0.123	0.020	<0.020	0.020	0.062

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Peel Sanitary Sewer Use By-Law - Inorganics

DATE RECEIVED: 2019-10-01

DATE REPORTED: 2019-10-16

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.

576692-576695 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Guideline Violation

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

ATTENTION TO: Ali Rasoul

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
576695	MW3	ON Peel SN 53-2010	Peel Sanitary Sewer Use By-Law - Inorganics	Total Suspended Solids	mg/L	350	3320

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 16, 2019			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	548682		0.7	0.7	NA	< 0.5	70%	70%	130%	105%	70%	130%	82%	70%	130%
Oil and Grease (mineral) in water	548682		<0.5	<0.5	NA	< 0.5	78%	70%	130%	78%	70%	130%	78%	70%	130%
Methylene Chloride	576694	576694	< 0.0003	< 0.0003	NA	< 0.0003	112%	60%	130%	108%	60%	130%	104%	60%	130%
Methyl Ethyl Ketone	576694	576694	< 0.0009	< 0.0009	NA	< 0.0009	88%	60%	130%	98%	60%	130%	87%	60%	130%
cis- 1,2-Dichloroethylene	576694	576694	< 0.0002	< 0.0002	NA	< 0.0002	116%	60%	130%	101%	60%	130%	88%	60%	130%
Chloroform	576694	576694	< 0.0002	< 0.0002	NA	< 0.0002	87%	60%	130%	87%	60%	130%	94%	60%	130%
Benzene	576694	576694	< 0.0002	< 0.0002	NA	< 0.0002	99%	60%	130%	91%	60%	130%	79%	60%	130%
Trichloroethylene	576694	576694	< 0.0002	< 0.0002	NA	< 0.0002	102%	60%	130%	101%	60%	130%	99%	60%	130%
Toluene	576694	576694	< 0.0002	< 0.0002	NA	< 0.0002	110%	60%	130%	109%	60%	130%	79%	60%	130%
Tetrachloroethylene	576694	576694	< 0.0001	< 0.0001	NA	< 0.0001	87%	60%	130%	95%	60%	130%	101%	60%	130%
trans-1,3-Dichloropropylene	576694	576694	< 0.0003	< 0.0003	NA	< 0.0003	111%	60%	130%	88%	60%	130%	103%	60%	130%
Ethylbenzene	576694	576694	< 0.0001	< 0.0001	NA	< 0.0001	104%	60%	130%	112%	60%	130%	77%	60%	130%
1,1,2,2-Tetrachloroethane	576694	576694	< 0.0001	< 0.0001	NA	< 0.0001	97%	60%	130%	112%	60%	130%	96%	60%	130%
Styrene	576694	576694	< 0.0001	< 0.0001	NA	< 0.0001	98%	60%	130%	92%	60%	130%	87%	60%	130%
1,2-Dichlorobenzene	576694	576694	< 0.0001	< 0.0001	NA	< 0.0001	98%	60%	130%	109%	60%	130%	110%	60%	130%
1,4-Dichlorobenzene	576694	576694	< 0.0001	< 0.0001	NA	< 0.0001	113%	60%	130%	119%	60%	130%	89%	60%	130%
PCBs		TW	< 0.0002	< 0.0002	NA	< 0.0002	102%	60%	130%	99%	60%	130%	85%	60%	130%
Di-n-butyl phthalate	566617		< 0.0005	< 0.0005	NA	< 0.0005	110%	60%	130%	113%	60%	130%	101%	60%	130%
Bis(2-Ethylhexyl)phthalate	566617		< 0.0005	< 0.0005	NA	< 0.0005	112%	60%	130%	106%	60%	130%	101%	60%	130%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
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: Navdeep Kansera

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Ultra Trace Analysis

RPT Date: Oct 16, 2019			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
Nonylphenol and Nonylphenol Ethoxylates (Ontario, mg/L)															
Total Nonylphenol	1	580687	< 0.001	< 0.001	NA	< 0.001	83%	60%	140%	NA	60%	140%	NA	60%	140%
NP1EO	1	580687	< 0.001	< 0.001	NA	< 0.001	102%	60%	140%	NA	60%	140%	NA	60%	140%
NP2EO	1	580687	< 0.0003	< 0.0003	NA	< 0.0003	110%	60%	140%	NA	60%	140%	NA	60%	140%

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 16, 2019			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 Sanitary Sewer Use By-Law - Inorganics															
pH	579313		7.73	7.71	0.3%	NA	100%	90%	110%	NA			NA		
CBOD (5)	575175		<5	<5	NA	< 5	101%	75%	125%	NA			NA		
Total Suspended Solids	579310		16	16	NA	< 10	98%	80%	120%	NA			NA		
Fluoride	576692	576692	<0.25	<0.25	NA	< 0.05	107%	90%	110%	94%	90%	110%	96%	85%	115%
Sulphate	576692	576692	169	173	2.3%	< 0.10	96%	90%	110%	106%	90%	110%	98%	85%	115%
Total Cyanide	548034		0.003	0.004	NA	< 0.002	104%	80%	120%	109%	90%	110%	110%	70%	130%
Phenols	576692	576692	<0.002	<0.002	NA	< 0.002	100%	90%	110%	96%	90%	110%	99%	80%	120%
Total Phosphorus	576852		0.30	0.28	6.9%	< 0.02	105%	90%	110%	104%	90%	110%	110%	80%	120%
Total Kjeldahl Nitrogen	574125		5.34	5.54	3.7%	< 0.10	100%	80%	120%	103%	80%	120%	101%	70%	130%
Total Aluminum	581051		1.25	1.23	1.6%	< 0.020	108%	90%	110%	110%	80%	120%	112%	70%	130%
Total Antimony	581051		<0.020	<0.020	NA	< 0.020	102%	90%	110%	93%	80%	120%	95%	70%	130%
Total Arsenic	581051		<0.015	<0.015	NA	< 0.015	100%	90%	110%	95%	80%	120%	103%	70%	130%
Total Cadmium	581051		<0.010	<0.010	NA	< 0.010	101%	90%	110%	101%	80%	120%	119%	70%	130%
Total Chromium	581051		<0.015	<0.015	NA	< 0.015	103%	90%	110%	102%	80%	120%	102%	70%	130%
Total Cobalt	581051		<0.020	<0.020	NA	< 0.020	99%	90%	110%	99%	80%	120%	100%	70%	130%
Total Copper	581051		<0.010	<0.010	NA	< 0.010	102%	90%	110%	101%	80%	120%	100%	70%	130%
Total Lead	581051		<0.020	<0.020	NA	< 0.020	103%	90%	110%	103%	80%	120%	97%	70%	130%
Total Manganese	581051		0.186	0.188	1.1%	< 0.020	108%	90%	110%	111%	80%	120%	103%	70%	130%
Total Mercury	581383		<0.0002	<0.0002	NA	< 0.0002	101%	90%	110%	98%	90%	110%	101%	80%	120%
Total Molybdenum	581051		<0.020	<0.020	NA	< 0.020	100%	90%	110%	100%	80%	120%	108%	70%	130%
Total Nickel	581051		<0.015	<0.015	NA	< 0.015	101%	90%	110%	102%	80%	120%	100%	70%	130%
Total Selenium	581051		<0.020	<0.020	NA	< 0.020	96%	90%	110%	91%	80%	120%	100%	70%	130%
Total Silver	581051		<0.010	<0.010	NA	< 0.010	102%	90%	110%	107%	80%	120%	107%	70%	130%
Total Tin	581051		<0.025	<0.025	NA	< 0.025	105%	90%	110%	100%	80%	120%	101%	70%	130%
Total Titanium	581051		0.055	0.051	NA	< 0.020	103%	90%	110%	100%	80%	120%	100%	70%	130%
Total Zinc	581051		0.071	0.071	NA	< 0.020	102%	90%	110%	99%	80%	120%	102%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

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	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
cis- 1,2-Dichloroethylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
trans-1,3-Dichloropropylene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Styrene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
Total Xylenes	VOL-91-5001	EPA SW-846 5030B & 8260B	(P&T)GC/MS
PCBs	ORG-91-5112	EPA SW-846 3510C & 8082A	GC/ECD
Di-n-butyl phthalate	ORG-91-5114	EPA SW-846 3510C & 8270E	GC/MS
Bis(2-Ethylhexyl)phthalate	ORG-91-5114	EPA SW-846 3510C & 8270E	GC/MS
Ultra Trace Analysis			
Total Nonylphenol	NA	ASTM D7065-6	LC/MS/MS
NP1EO	NA	ASTM D7065-6	LC/MS/MS
NP2EO	NA	ASTM D7065-6	LC/MS/MS
Total Nonylphenol Ethoxylates	NA	ASTM D7065-6	LC/MS/MS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: A & A ENVIRONMENTAL CONSULTANTS INC

AGAT WORK ORDER: 19T524961

PROJECT: 4545-BVD Caledon

ATTENTION TO: Ali Rasoul

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
CBOD (5)	INOR-93-6006	SM 5210 B	DO METER
Total Suspended Solids	INOR-93-6028	SM 2540 D	BALANCE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Total Cyanide	INOR-93-6051	MOE 3015 & SM 4500 CN- A,B,C	TECHNICON AUTO ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Total Phosphorus	INOR-93-6022	SM 4500-P B&E	SPECTROPHOTOMETER
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Total Aluminum	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Antimony	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Arsenic	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Cadmium	MET -93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Chromium	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Cobalt	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Copper	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Lead	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Manganese	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Mercury	MET-93-6100	EPA SW 846 7470 & 245.1	CVAAS
Total Molybdenum	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Nickel	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Selenium	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Silver	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Tin	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Titanium	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS
Total Zinc	MET-93-6103	EPA SW-846 3010A &6020A	ICP-MS

AGAT Laboratories

2 Large

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

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 #: 19TS24961

Cooler Quantity:
Arrival Temperatures: 17.7 | 15.9 | 14.4 / 15.6 | 17.2 | 11.3
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes: On 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, labresults@aaenvironmental.ca
2. Email: vsowden@aaenvironmental.ca ; tdemers@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 Region (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: 4545-BVD Caledon
Site Location: Inglewood, ON
Sampled By: T. Thornton
AGAT Quote #: ASAA1130 PO: 4545-BVD Caledon
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	Y/N
MW1	Oct 1/19	12:00pm	17	GW		N
MW2	↓	2:30pm	17	GW		N
MW3	↓	1:00pm	17	GW		N

Field Filtered - Metals, Hg, CrVI

O. Reg 153
- Metals and Inorganics ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)
- ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☑ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR
- Full Metals Scan
- Regulation/Custom Metals
- Nutrients: ☐ TP ☐ NH_4 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2
- Volatiles: ☐ VOC ☐ BTEX ☐ THM
- PHCs F1 - F4
- ABNs
- PAHs
- PCBs: ☐ Total ☐ Arocolors
- Organochlorine Pesticides
- 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
- CCME F1-F4/BTEX Soil 91-101

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Tyler Thornton Tyler Thornton	Oct 1/19	2:30pm	[signature]	Oct 1/2019	2:35

Page 1 of 1
N°:

Document ID: DIV-78-1511.015

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

Date Issued: March 16, 2018

APPENDIX D – MECP Well Records

Water Well Records

November 15, 2018

11:42:28 AM

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION	17 590392 4847233 W	2007-10 7215	2		///:			7103066 (Z68036) A041765	BRWN CLAY DNSE 0025
CALEDON TOWN (ALBION	17 590253 4847385 W	2008-05 6607						7109015 (M02432) A054753 A	
CALEDON TOWN (CALEDO	17 590469 4847284 W	2007-05 7241	1.5				0003 15	7044689 (Z66271) A056695 A	BRWN FILL SAND LOOS 0002 BRWN CLAY SILT DNSE 0012 GREY SILT CLAY DNSE 0018
CALEDON TOWN (CALEDO	17 590470 4847122 W	2008-02 7241	1.99		///:	MT		7102240 (Z77941) A061502	BRWN SAND DNSE 0012 GREY SILT SAND PCKD 0014 GREY SILT CLAY PCKD 0017
CALEDON TOWN (CALEDO	17 590479 4847129 W	2008-02 7241	1.99		///:	MO		7102241 (Z77944) A061501	BRWN SAND DNSE 0012 GREY SILT SAND PCKD 0014 GREY SILT CLAY PCKD 0019
CALEDON TOWN (CALEDO	17 590475 4847126 W	2008-02 7241	1.99		///:	MO		7102243 (Z77942) A061500	BRWN SAND DNSE 0012 GREY SILT SAND PCKD 0014 GREY SILT CLAY PCKD 0018
CALEDON TOWN (CALEDO	17 590292 4847309 W	2010-09 6032	2			MO	0010 10	7155344 (Z109008) A	
CALEDON TOWN (CALEDO	17 590472 4847123 W	2008-02 7241	1.99		///:	TH		7102242 (Z77943) A061499	BRWN SAND DNSE 0012 GREY SILT SAND PCKD 0014 GREY SILT CLAY PCKD 0018
CALEDON TOWN (CHINGU	17 590216 4847318 W	2014-04 7324	1.97	FR 0004		MO	0007 10	7236715 (Z168363) A154740 A	BRWN SILT SAND GRVL 0008 GREY SILT CLAY 0017
CALEDON TOWN (CHINGU	17 590395 4847123 W	2014-02 7241	1.5			MT	0009 10	7216922 (Z184520) A157837	BRWN GRVL FILL 0004 BRWN SILT CLAY 0014 GREY SAND SILT 0019
CALEDON TOWN (CHINGU	17 590348 4847015 W	2014-02 7241	1.5			MT	0008 10	7216921 (Z184521) A157729	BRWN GRVL FILL 0004 BRWN SILT CLAY 0014 GREY SAND SILT 0018
CALEDON TOWN (CHINGU	17 590391 4847092 W	2014-02 7241	1.5			MT	0009 10	7216920 (Z184548) A157728	BRWN GRVL SAND FILL 0004 BRWN SILT CLAY 0014 GREY SILT SAND 0019
CALEDON TOWN (CHINGU	17 590756 4847336 W	2012-12 7501	2			MO	0010 10	7193855 (Z157407) A130846	BRWN SILT CLAY HARD 0007 GREY CLAY GRVL SOFT 0017 GREY SAND SOFT 0020
CALEDON TOWN (CHINGU	17 590253 4847242 W	7147	35.4	UT 0007				7289532 (Z254987) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (CHINGU	17 590077 4847385 W	2006-08 6032	0.20			NU	0010 10	4910353 (Z05155) A005380	BRWN SILT SAND CLAY 0020
CALEDON TOWN (CHINGU	17 590222 4847367 W	2011-04 6032	2			MO	0020 10	7167140 (Z121254) A106853	GREY SILT FILL HARD 0020
CALEDON TOWN (CHINGU	17 590248 4847385 W	2007-10 6607	2.00	FR 0015		NU		7104575 (M00670) A054753	BRWN SAND CLAY SILT 0020
CALEDON TOWN (CHINGU	17 590350 4847292 W	2005-06 6607	2.00	0020		NU	0017 5	4909820 (Z28274) A026579	BRWN SAND STNS GRVL 0005 BRWN SAND SILT 0010 GREY CLAY SILT 0016 GREY CLAY WBRG 0022
CALEDON TOWN (CHINGU 01 027	17 590088 4847013 W	2005-05 2336	6	FR 0078	1/68/5/5:	CO		4909763 (Z26691) A010309	BRWN CLAY STNS 0010 GREY CLAY STNS 0050 GREY CLAY SAND GRVL 0072 GREY GRVL FSND 0078
CALEDON TOWN (CHINGU HS E 01 027	17 590372 4847234 W	1957-03 1307	36	FR 0025	10//3/:	DO		4901136 ()	BRWN LOAM CLAY 0015 GREY CLAY STNS 0023 GREY CSND 0025
CALEDON TOWN (CHINGU HS E 01 027	17 590414 4847473 W	1976-07 4919	30	UK 0020 UK 0033	10/35//0:30	DO		4904938 ()	BRWN LOAM HARD 0001 BRWN SAND HARD 0010 GREY CLAY HARD 0030 GREY GRVL LYRD LOOS 0037
CALEDON TOWN (CHINGU HS E 01 027	17 590438 4847472 W	7147	5.90	UT 0007				7289531 (Z254986) A	
CALEDON TOWN (CHINGU HS E 01 027	17 590536 4847234 W	1985-05 4919	30 30	UK 0060	20/60//:30	DO		4906394 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0060 GREY SAND LOOS 0066
CALEDON TOWN (CHINGU HS E 01 027	17 590491 4847568 W	2016-11 7147	35.4	FR 0013				7277994 (Z246067) A	
CALEDON TOWN (CHINGU HS E 01 027	17 590522 4847191 W	1984-06 4919	30 30	UK 0020	20/40//:30	DO		4906284 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 BRWN CLAY SAND PCKD 0042
CALEDON TOWN (CHINGU HS E 01 027	17 590414 4847223 W	1977-06 4919	30 30	UK 0028 UK 0040	18/40//0:30	DO		4905184 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0010 GREY CLAY HARD 0040 GREY SAND LOOS 0047
CALEDON TOWN (CHINGU HS E 01 027	17 590614 4847023 W	1977-01 3513	5	FR 0070 UK 0140	45///:	DO		4905691 ()	BRWN CLAY 0025 GREY CLAY 0070 GREY SAND GRVL DRTY 0105 RED SHLE 0166
CALEDON TOWN (CHINGU HS E 01 027	17 590410 4847338 W	1985-06 4919	30 30	UK 0040 UK 0050	15/60//:30	DO		4906404 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY SAND LYRD 0065
CALEDON TOWN (CHINGU HS E 01 027	17 590324 4847177 W	1973-12 4919	30	UK 0035	20/40/0/:	DO		4904247 ()	BRWN LOAM 0001 BRWN CLAY 0010 GREY CLAY 0035 GREY SAND 0044
CALEDON TOWN (CHINGU HS E 01 027	17 590514 4847173 W	1981-01 4919	30 30	UK 0022 UK 0035	20/48//0:30	CO DO		4905821 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY SAND LYRD 0035 GREY CLAY HARD 0051
CALEDON TOWN (CHINGU HS E 01 027	17 590436 4847460 W	1965-09 3513	5 5	FR 0130	18/144/3/4:0	DO		4901139 ()	PRDG 0024 BLUE CLAY 0046 CLAY GRVL 0049 CLAY MSND 0120 RED SHLE 0144
CALEDON TOWN (CHINGU HS E 01 027	17 590386 4847488 W	1990-07 4919	30	UK 0020 UK 0040	20/40/10/1:0	DO		4907387 (77174)	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY SAND PCKD 0077

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (CHINGUHS E 01 027	17 590366 4847284 W	2010-05 4011			9///:			7147078 (Z117386) A	
CALEDON TOWN (CHINGUHS E 01 027	17 590518 4847079 W	1967-05 1325	30	FR 0032	23/38/1/0:30	DO		4901141 ()	LOAM 0003 BRWN CLAY 0017 MSND 0020 BLUE CLAY 0029 MSND 0032 BLUE CLAY 0040
CALEDON TOWN (CHINGUHS E 01 028	17 590194 4847423 W	1977-06 4919	30 30	UK 0035	10/50//0:30	DO		4905185 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0035 GREY SAND LOOS 0040 GREY CLAY HARD 0053
CALEDON TOWN (CHINGUHS E 01 028	17 590411 4847814 W	2009-01 4011	29.5		13///:	NU		7118691 (Z89952) A	
CALEDON TOWN (CHINGUHS E 01 028	17 590560 4847778 W	1985-06 4919	30 30	UK 0040	20/40//:35	DO		4906405 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0040 GREY SAND LOOS 0049
CALEDON TOWN (CHINGUHS E 01 028	17 590476 4847794 W	2009-01 4011			10///:	NU		7118690 (Z89951) A	
CALEDON TOWN (CHINGUHS E 01 028	17 590223 4847441 W	2007-03 2576	6 5	FR 0091 FR 0096	16//6/1:	PS	0091 5	7045631 (Z37500) A054371	LOAM 0001 BRWN SILT CLAY GRVL 0022 GREY GRVL SAND SILT 0060 GREY CLAY GRVL 0071 BRWN GRVL CLAY SILT 0073 GREY CLAY GRVL 0090 GREY GRVL SILT 0096
CALEDON TOWN (CHINGUHS E 01 028	17 590562 4847821 W	1988-12 4919	30	UK 0040	30/50/10/1:0	DO		4906985 (47104)	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0040 GREY SAND LOOS 0069
CALEDON TOWN (CHINGUHS E 01 028	17 590364 4847470 W	2008-04 7305		0018		NU		7104751 (Z74869) A057206	BRWN LOAM SLTY LOAM 0004 BRWN SILT GRVL CLAY 0009 GREY SILT GRVL CLAY 0015 GREY SILT CLAY GRVL 0024 RED SILT CLAY 0026 GREY SILT GRVL CLAY 0027 GREY SAND SILT GRVL 0031 GREY SILT GRVL CLAY 0032
CALEDON TOWN (CHINGUHS E 01 028	17 590267 4847417 W	2007-03 2576	6 5	FR 0090 FR 0096	15//5/6:	PS	0091 5	7045629 (Z66770) A054370	LOAM 0001 BRWN CLAY GRVL 0013 GREY CLAY SLTY GRVL 0090 GREY SILT GRVL 0096
CALEDON TOWN (CHINGUHS W 01 027	17 590136 4847343 W	1960-06 1307	30	FR 0025	25///:	DO		4901639 ()	BRWN CLAY 0015 GREY CLAY 0025 MSND 0026 GREY CLAY 0045
CALEDON TOWN (CHINGUHS W 01 027	17 590066 4847029 W	1975-12 2918	5	FR 0078	30/69/3/1:0	DO		4904815 ()	GREY SAND CLAY 0069 SAND GRVL 0079
CALEDON TOWN (CHINGUHS W 01 027	17 590350 4847069 W	1974-08 3513	5	FR 0070	20/70/3/3:0	DO		4904560 ()	BRWN CLAY 0032 GREY CLAY SAND GRVL 0075 RED GRVL 0076
CALEDON TOWN (CHINGUHS W 01 027	17 590306 4847116 W	1974-02 1660	6 6	MN 0150	10/120/4/1:0	CO		4904370 ()	SAND STNS 0003 BRWN SAND 0035 GREY SILT 0060 GREY SILT STNS 0110 RED CLAY STNS 0113 RED SHLE 0162
CALEDON TOWN (CHINGUHS W 01 027	17 590190 4847163 W	1971-10 3513	5 5	FR 0070	26/60/5/4:0	DO		4903961 ()	BRWN LOAM 0001 BRWN CLAY 0022 BRWN CLAY SAND 0036 BLUE CLAY 0070 GREY GRVL SAND 0080
CALEDON TOWN (CHINGUHS W 01 027	17 590212 4847183 W	1967-09 4813	5	FR 0092	30/60/12/3:0	DO	0095 4	4901641 ()	BRWN CLAY 0020 BLUE CLAY STNS 0050 MSND 0060 GRVL 0092 MSND 0099
CALEDON TOWN (CHINGUHS W 01 027	17 590198 4847143 W	1966-11 4813	5	FR 0078	30/73/3/3:0	DO	0077 4	4901640 ()	BRWN CLAY 0016 BLUE CLAY STNS 0078 MSND 0081
CALEDON TOWN (CHINGUHS W 01 027	17 590164 4847073 W	1976-05 2918	6	FR 0068	10/30/2/4:0	DO		4904875 ()	GREY CLAY SAND 0058 SAND GRVL 0069

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (CHINGUHS W 01 027	17 590184 4847114 W	2016-10 7147	5.90	FR 0018				7274243 (Z246042) A	
CALEDON TOWN (CHINGUHS W 01 027	17 590460 4847053 W	1984-06 4919	30 30	UK 0028	20/58//:30	DO		4906279 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0028 GREY GRVL PCKD 0030 GREY CLAY HARD 0060
CALEDON TOWN (CHINGUHS W 01 027	17 590229 4847227 W	2014-05 7147	35.4	FR 0002				7221652 (Z180550) A	
CALEDON TOWN (CHINGUHS W 01 027	17 590334 4847068 W	2012-06 2123			10///:			7183809 (Z133440) A073940 A	
CALEDON TOWN (CHINGUHS W 01 027	17 590268 4847175 W	1990-09 4868	36 30 30	FR 0020 FR 0048	17/27/5/1:0	CO		4907472 (74524)	BRWN LOAM 0002 BRWN CLAY 0016 GREY CLAY 0020 BRWN SAND LOOS 0023 GREY CLAY SLTY 0048 BRWN SAND LOOS 0052 GREY CLAY 0054
CALEDON TOWN (CHINGUHS W 01 027	17 590119 4846968 W	2017-08 7407	6 2 6 6			TH MO		7294944 (Z247289) A	
CALEDON TOWN (CHINGUHS W 01 027	17 590253 4847132 W	2006-02 6946	2.04	0016	///:	NU	0014 5	4910067 (Z10106) A010071	BRWN SAND SLTY GRVL 0002 BRWN SILT SNDY CLYY 0004 BRWN SILT SNDY CLYY 0007 BRWN SILT CLYY SNDY 0009 BRWN SILT CLYY SNDY 0012 BRWN SILT SNDY CLYY 0014 BRWN SAND SLTY GRVL 0017 BRWN SILT SNDY CLYY 0019
CALEDON TOWN (CHINGUHS W 01 027	17 590313 4847068 W	2012-06 2123			23///1:0			7183808 (Z133446) A089970 A	
CALEDON TOWN (CHINGUHS W 01 027	17 590319 4847199 W	2012-06 2123		FR	///:			7183807 (Z133445) A073941 A	
CALEDON TOWN (CHINGUHS W 01 027	17 590380 4847105 W	1982-08 4919	30 30 30	UK 0020 UK 0035	20/56//:20	DO		4905982 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0035 GREY GRVL LOOS 0037 GREN CLAY HARD 0058
CALEDON TOWN (CHINGUHS W 01 028	17 590184 4847293 W	1968-02 2643	7 7	FR 0118	14/25/10/2:0	CO		4902903 ()	PRDG 0050 RED SHLE 0126
CALEDON TOWN (CHINGUHS W 01 028	17 590229 4847331 W	2014-04 7324	1.97	FR 0004		MO	0006 10	7267156 (Z168362) A154740	BRWN SILT SAND GRVL 0004 BRWN SILT SAND SILT 0016
CALEDON TOWN (CHINGUHS W 01 028	17 590202 4847273 W	1954-05 3514	4 4	FR 0148	12/128/4/:	DO		4901642 ()	LOAM 0003 BLUE CLAY 0070 MSND 0083 BLDR 0090 RED SHLE 0148
CALEDON TOWN (CHINGUHS W 01 028	17 590002 4847247 W	1955-11 3514	4	FR 0119	10/20/6/5:0	ST DO		4901643 ()	PRDG 0022 BLUE CLAY 0115 GRVL 0119
CALEDON TOWN (CHINGUHS W 01 028	17 590122 4847157 W	1963-04 1307	30	FR 0059	0//2/:	DO		4901645 ()	BRWN LOAM CLAY 0012 GREY CLAY 0057 MSND 0059
CALEDON TOWN (CHINGUHS W 01 028	17 590146 4847318 W	1963-09 1307	30	FR 0060	20//1/:	CO		4901646 ()	BRWN LOAM CLAY 0012 GREY CLAY 0045 RED CLAY 0058 MSND 0060
CALEDON TOWN (CHINGUHS W 01 028	17 590080 4847337 W	1963-10 1309	6	FR 0072	12/60/2/4:0	DO		4901647 ()	BLCK LOAM 0001 GREY CLAY 0034 GREY CLAY MSND GRVL 0068 MSND GRVL CLAY 0075

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (CHINGU HS W 01 028	17 589824 4847703 W	1992-03 3903	6	FR 0151	16/130/12/24:0	CO	0146 5	4907639 (104221)	BRWN CLAY STNS HARD 0016 GREY CLAY STNS HARD 0020 GREY FSND CLAY LYRD 0043 GREY CLAY STNS HARD 0069 RED CLAY STNS HARD 0122 GREY SAND SILT LYRD 0140 RED CLAY DNSE 0143 GREY SAND GRVL LYRD 0152 GREY ROCK SHLE DNSE 0156
CALEDON TOWN (CHINGU HS W 01 028	17 590156 4847303 W	1963-11 4813	7	FR 0047	20/28/10/2:0	CO	0046 4	4901649 ()	BRWN CLAY 0020 BLUE CLAY 0043 HPAN 0047 MSND 0050
CALEDON TOWN (CHINGU HS W 01 028	17 590218 4847100 W	2008-10 6946	2.04	OT 0006		MO	0010 10	7114487 (Z91268) A080292	BRWN SAND SILT STNS 0002 GREY SILT SAND CLAY 0005 GREY SILT SAND CLAY 0010 GREY SILT CLAY GRVL 0012 GREY SILT SAND CLAY 0015 GREY SAND SILT CLAY 0020
CALEDON TOWN (CHINGU HS W 01 028	17 590142 4847200 W	1986-10 4005	6	FR 0084	12/40/36/2:0	DO		4906494 (00286)	BRWN CLAY SNDY LOOS 0010 BRWN CLAY LOOS 0018 GREY CLAY LOOS 0056 GREY CLAY SNDY LOOS 0062 GREY FGVL FSND LOOS 0082 GREY CGVL CSND PCKD 0084
CALEDON TOWN (CHINGU HS W 01 028	17 590114 4847173 W	1976-06 5417	6	FR 0077	12/50/20/1:0	DO		4904900 ()	GREY CLAY FGVL 0077
CALEDON TOWN (CHINGU HS W 01 028	17 589978 4847098 W	1985-06 4919	30	UK 0020	10/28//:36	DO		4906406 ()	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0030 GREY SAND LOOS 0036
CALEDON TOWN (CHINGU HS W 01 028	17 590240 4847282 W	1983-12 3602	6	FR 0085	12/80/2507/1:30	DO	0085 7	4906095 ()	BRWN CLAY STNS 0050 BRWN CLAY SHLE 0085 BRWN SAND WBRG 0092
CALEDON TOWN (CHINGU HS W 01 028	17 590122 4847192 W	1963-11 1309	6	FR 0070	18/36/2/20:0	DO		4901648 ()	BRWN CLAY 0008 CLAY MSND GRVL 0066 CLAY GRVL 0073 MSND CLAY GRVL 0077

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)	E (mm/y)	I (mm/y) (m^3/y)	R (mm/y) (m^3/y)
Pre-development									
Impervious Area	190.23					904.63	180.93	0 (0)	723.70 (137.67)
Previous Area	31,932.57	0.15 (slightly hilly)	0.2 (medium sandy silt)	0.15	0.5	904.63	784.75	59.90 (1912.76)	59.90 (1912.76)
Post Development									
Impervious Area	18,604.40					904.63	180.93	0 (0)	723.70 (13461.00)
Pervious Area	13,518.40	0.15 (slightly hilly)	0.2 (medium sandy silt)	0.15	0.5	904.63	784.75	59.90 (809.75)	59.90 (809.75)

	Infiltration	Runoff
Sub-Total Post-Development	809.75 (m^3/y)	14,273.75 (m^3/y)
The Difference Due to the Proposed Development	-1,103.01 (m^3/y)	+12,223.32 (m^3/y)